



**Energy Efficiency / Demand Response  
Com Ed Plan Year 4  
Nicor Gas Plan Year 1  
(6/1/2011-5/31/2012)**

**Evaluation Report:  
Elementary Energy Education  
Program**

**FINAL**

**Presented to  
Commonwealth Edison Company and  
Nicor Gas Company**

**July 8, 2013**



Prepared by:  
Randy Gunn  
Managing Director  
Navigant Consulting  
30 S. Wacker Drive, Suite 3100  
Chicago, IL 60606

Phone 312.583.5700  
Fax 312.583.5701

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





**Submitted to:**

ComEd  
Three Lincoln Centre  
Oakbrook Terrace, IL 60181

Nicor Gas  
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  
312.938.4242  
[randy.gunn@navigant.com](mailto:randy.gunn@navigant.com)

Jeff Erickson, Director  
608.497.2322  
[jeff.erickson@navigant.com](mailto:jeff.erickson@navigant.com)  
Julianne Meurice, Associate Director  
312.583.5740  
[julianne.meurice@navigant.com](mailto:julianne.meurice@navigant.com)

**Prepared by:**

Miroslav Lysyuk, Consultant  
Navigant Consulting  
312.583.5804  
[miroslav.lysyuk@navigant.com](mailto:miroslav.lysyuk@navigant.com)

Laura Tabor, Senior Consultant  
Navigant Consulting  
303.728.2470  
[laura.tabor@navigant.com](mailto:laura.tabor@navigant.com)

Christy Galioto, Senior Consultant  
Navigant Consulting  
312.583.4179  
[christine.galioto@navigant.com](mailto:christine.galioto@navigant.com)

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for ComEd and Nicor Gas based upon information provided by ComEd and 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	Evaluation Objectives .....	1
E.2	Evaluation Methods.....	1
E.3	Key Impact Findings and Recommendations .....	2
E.4	Key Process Findings and Recommendations .....	4
<b>1.</b>	<b>Introduction to the Program.....</b>	<b>7</b>
1.1	Program Description.....	7
1.2	Evaluation Questions.....	8
1.2.1	Impact Issues .....	8
1.2.2	Process Issues .....	8
<b>2.</b>	<b>Evaluation Methods.....</b>	<b>10</b>
2.1	Primary Data Collection.....	10
2.2	Additional Research .....	11
2.3	Impact Evaluation Methods.....	12
2.4	Process Evaluation Methods.....	12
<b>3.</b>	<b>Evaluation Results .....</b>	<b>14</b>
3.1	Impact Evaluation Results .....	14
3.1.1	Verification and Due Diligence Procedure Review.....	14
3.1.2	Tracking System Review.....	14
3.1.3	Gross Program Impact Parameter Estimates .....	15
3.1.4	Gross Program Impact Results.....	16
3.1.5	Net Program Impact Parameter Estimates .....	18
3.1.6	Verified Net Program Impact Results .....	20
3.1.7	Qualitative Impact Results .....	21
3.2	Process Evaluation Results .....	22
3.2.1	Program Changes since Rider 29 .....	22
3.2.2	Marketing and Outreach Effectiveness.....	22
3.2.3	Program Design and Process Effectiveness.....	22
3.2.4	Program Satisfaction.....	23
3.2.5	Barriers to Participation .....	24
3.2.5.1	Joint Program Barriers to Installation and Persistence .....	24
3.2.5.2	Nicor Gas-only Program Barriers to Installation and Persistence .....	26
3.2.6	Comparison of Classrooms that Returned HRC Surveys Against Those that Did Not .....	27
<b>4.</b>	<b>Findings and Recommendations .....</b>	<b>29</b>

4.1	Key Impact Findings and Recommendations .....	29
4.2	Key Process Findings and Recommendations .....	30
<b>5.</b>	<b>Appendix .....</b>	<b>32</b>
5.1	Glossary .....	32
5.2	Effects of the IL TRM Implementation on Planned Gas Savings Achievements.....	36
5.3	Verified Gross Program Impact Parameter Estimates .....	37
5.3.1	Low-Flow Showerheads .....	37
5.3.2	Kitchen Faucet Aerators.....	38
5.3.3	Bathroom Faucet Aerators .....	38
5.3.4	CFLs.....	39
5.4	Research Findings Gross Program Impact Parameter Estimates .....	43
5.4.1	Low-Flow Showerheads .....	44
5.4.2	Kitchen Faucet Aerators.....	44
5.4.3	Bathroom Faucet Aerators.....	45
5.4.4	CFLs.....	46
5.5	Research Findings Gross Program Impact Results.....	47
5.6	Net Program Impact Evaluation Methods.....	52
5.6.1	Free Ridership .....	52
5.6.2	Free Ridership Scoring.....	52
5.6.3	Spillover .....	53
5.6.4	Spillover Scoring .....	53
5.6.5	Net-to-Gross (NTG).....	54
5.7	Net Program Impact Parameter Estimate Results .....	54
5.7.1	Free Ridership .....	54
5.8	VDDTSR Memo-Final version.....	58
5.9	Program Theory Logic Model Review .....	67
	Program Theory .....	67
5.9.1	Program Goals.....	67
5.9.2	Motivating Conditions .....	68
5.9.3	Target Audience.....	68
5.9.4	Desired Actions/Behaviors .....	68
5.9.5	Strategies/Rationale .....	68
5.9.6	Messages/Communications Vehicles .....	69
5.9.7	Program Logic.....	69
5.9.8	Resources .....	71
5.9.9	Activities .....	71
5.9.10	Outputs, Outcomes and Key Measurement Indicators .....	72
5.10	Data Collection Instruments.....	75

## List of Figures and Tables

### Figures:

Figure 3-1. Positive Parent Feedback .....	24
Figure 5-1. Elementary Energy Education Program Logic Model.....	70

### Tables:

Table E- 1. GPY1/EPY4 Deemed Gas Savings Estimates (Therms).....	2
Table E- 2.GPY1/EPY4 Deemed Electric Savings Estimates .....	3
Table 2-1. Primary Data Collection Methods and Sources.....	11
Table 2-2. Additional References.....	11
Table 3-1. Evaluated Gross per Unit Energy Savings .....	15
Table 3-2. Verified Gross Savings by Measure and Fuel .....	16
Table 3-3. Comparison of Ex Ante and Verified Gross Savings.....	17
Table 3-4. Distribution of Electric Savings from Nicor Gas-only Kits.....	18
Table 3-5. 14W CFL Carryover .....	18
Table 3-6. Net Program Impact Parameter Estimates.....	19
Table 3-7. Research Findings Ex Post Net Impact Results .....	20
Table 3-8. Reported Behavioral Participation .....	21
Table 3-9. Top Nicor Gas-ComEd Measure-Specific Barriers to Installation and Persistence .....	25
Table 3-10. Nicor Gas-ComEd Survey Finding In-Service Rates .....	25
Table 3-11. Top Nicor Gas-only Measure-Specific Barriers to Installation and Persistence.....	26
Table 3-12. Nicor Gas-only Survey Finding In-Service Rates.....	27
Table 5-1. Nicor Gas-only and Nicor Gas-ComEd GPY1/EPY4 Pre-and Post-TRM Ex Ante Net Gas Savings Estimates (Total Therms) from NEF and WECC .....	36
Table 5-2. Showerhead Verified Gross Impact Parameters .....	37
Table 5-3. Kitchen Aerator Verified Gross Impact Parameters .....	38
Table 5-4. Bathroom Aerator Verified Gross Impact Parameters .....	39
Table 5-5. CFL Verified Gross Impact Parameters .....	40
Table 5-6. Distribution of Incandescent Lamps Removed .....	41
Table 5-7. TRM-Deemed Measure In-service Rates for Verified Gross Savings .....	41
Table 5-8. Participation by Domestic Hot Water (DHW) Fuel Type .....	42
Table 5-9. Unit Verified Gross Savings by Measure .....	42
Table 5-10. Showerhead Research Findings Gross Impact Parameters.....	44
Table 5-11. Kitchen Faucet Aerator Research Findings Gross Impact Parameters.....	45
Table 5-12. Bathroom Aerator Research Findings Gross Impact Parameters.....	46
Table 5-13. CFL Research Findings Gross Impact Parameters .....	47
Table 5-14. Measure Installation, Persistence, and In-Service Rates by Service Territory.....	48
Table 5-15. Comparison of TRM Deemed and Research Findings In-Service Rates .....	48
Table 5-16. Participation by Domestic Hot Water Fuel Type .....	49
Table 5-17. Unit Research Finding Gross Savings per Unit Distributed by Measure .....	49
Table 5-18. Research Findings Gross Savings by Measure and Fuel .....	50
Table 5-19. Comparison of Ex Ante and Research Findings Gross Savings .....	51

Table 5-20. Research Findings Electric Savings for Nicor Gas-only Kits .....	51
Table 5-21. Participant Self-Report Free Ridership Results by Measure by Kit Version .....	55
Table 5-22. Free Ridership: R29 vs. GPY1 Nicor Gas-only Kits.....	55
Table 5-23. R29 Free Ridership: Reported State vs. Hypothetical Behavior .....	56
Table 5-24. Research Findings Spillover Results by Measure by Utility .....	57
Table 5-25. Files reviewed by Navigant.....	60
Table 5-26. Errors resulting from inadequacies in the tracking system .....	64
Table 5-27. Quality Control and Verification Benchmarking Scores .....	65
Table 5-28. Reporting and Tracking Benchmarking Scores .....	66
Table 5-29. Program Inputs and Potential External Influences .....	71
Table 5-30. Elementary Energy Education Program Activities .....	72
Table 5-31. Program Outputs, Key Performance Indicator and Potential Data Sources .....	73
Table 5-32. Program Outcomes, Key Performance Indicators and Potential Data Sources .....	74

## **E. Executive Summary**

This report presents a summary of the findings and results of the joint Elementary Energy Education (EEE) program offered by Nicor Gas and Commonwealth Edison (ComEd). This evaluation covers Nicor Gas Plan Year 1 (GPY1) and ComEd Plan Year 4 (EPY4) which operated June 1, 2011 through May 31, 2012. The EEE program's primary focus is to produce natural gas and electricity savings in the residential sector by motivating 5<sup>th</sup> grade students and their families to reduce energy consumption for water heating and lighting in their home; a secondary goal of the program is to reduce residential use of water. Additionally, the EEE Program aims to increase participation in other Nicor Gas and ComEd programs via cross-marketing and increased customer awareness of energy efficiency issues.

### ***E.1 Evaluation Objectives***

The objectives of the GPY1/EPY4 EEE program evaluation are to (1) quantify net savings impacts from the program; (2) identify ways in which the program can be improved, and (3) determine process-related program strengths and weaknesses.

### ***E.2 Evaluation Methods***

Navigant primarily used participant surveys and in-depth interviews with program staff to gain an understanding of the program as developed in GPY1 and EPY4. In addition to these surveys and interviews, Navigant also reviewed program plans and other documentation. Navigant used these sources to create a logic model for the program, describe program theory, and conduct a preliminary review of planned verification and due diligence procedures. Navigant also reviewed data included in the program tracking system and the proposed approach for calculating savings.

### E.3 Key Impact Findings and Recommendations

Table E- 1. shows deemed and verified gas savings for the Nicor Gas-only and Nicor Gas-ComEd programs. Verified gross savings were calculated using IL TRM algorithms and parameters. The overall participation goal of 10,000 kits distributed (5,000 kits each for Nicor Gas-only and Nicor Gas-ComEd) was nearly met with 4,997 kits distributed to Nicor Gas-only schools, and 4,975 kits distributed to Nicor Gas-ComEd schools. While the verified total net savings of 86,012 therms exceed the total Nicor Gas-only and Nicor Gas-ComEd total ex ante net savings estimate of 33,955 therms, the savings did not meet the overall planned net therm savings goal of 138,600 in Nicor Gas’ compliance filing therms<sup>1 2</sup>.

**Table E- 1. GPY1/EPY4 Deemed Gas Savings Estimates (Therms)**

	Nicor Gas-only	Nicor Gas-ComEd	Total
Ex Ante Gross	17,187	17,111	34,298
Ex Ante Net	17,015	16,940	33,955
Verified Gross <sup>3</sup>	50,119	59,104	109,222
Verified Net <sup>4</sup>	32,790	53,222	86,012
Research Findings NTG Ratio	0.65	0.90	0.79

Source: Navigant Analysis

<sup>1</sup> Nicor Gas EEP Final – Revision for Compliance Filing 05-37-2011 FINAL.docx, pg. 56.

<sup>2</sup> Nicor Gas submitted planning values for the program in its May 2011 compliance filing, before the release of the Illinois TRM. The planning values assumed higher savings estimates than were achieved when using the TRM input assumptions. See Appendix 5.2 for a detailed discussion.

<sup>3</sup> The September 14, 2012 final version of the first State of Illinois Energy Efficiency Technical Reference Manual (TRM) (effective as of June 1, 2012) has been agreed to by Illinois Stakeholder Advisory Group (SAG) participants and is currently pending approval before the Illinois Commerce Commission in Docket No. 12-0528 as of the date of this report. The verified gross savings shown in Table E-1 assumes that measures covered by the TRM are deemed for evaluation purposes in GPY1 Gross savings based on evaluation research findings in GPY1/EPY4 are provided in the Appendix (in particular, research findings gross savings were calculated with the in-service rate and household size based on Navigant survey results).

<sup>4</sup> The evaluation team determined the verified net savings by applying, per measure, survey-determined research findings NTG ratios to the verified gross savings which are based on TRM values and certain custom input (e.g., number of household members). Research findings NTG ratios were used rather than planning NTG ratios because the program underwent significant changes since the previous evaluation. Further discussion of net impact parameter estimates can be found in section 3.1.5.

shows deemed electric savings for the Nicor Gas-ComEd program which exceeded ComEd’s planning goal of achieving 140,000 kWh in net savings.

**Table E- 2.GPY1/EPY4 Deemed Electric Savings Estimates**

	Nicor Gas-ComEd*	
	(kWh)	(kW)
Ex Ante Gross	583,568	NA
Ex Ante Net	408,498	NA
Verified Gross	634,232	58.3
Verified Net	478,865	43.3
Research Findings NTG Ratio	0.76	0.75

*Source: Navigant Analysis*

*\*Nicor Gas-only participant electric savings are not included here but will be included in the benefit-cost analysis.*

Navigant offers the following additional impact findings and recommendations for the program.

- **Finding.** Navigant’s survey included students who returned their Home Report Cards (HRCs) and students who did not. Among Navigant’s results, installation rates did not differ across these two groups of students. This suggests an undocumented assumption of NEF: installation rates reported in the HRCs are representative of all participants, independent of whether a participant returned an HRC.  
**Recommendation:** Use HRC response rates across all participants.
- **Finding.** According to survey data, some program CFLs (13%) may have replaced or could replace other CFLs. This will be an important factor to consider in calculating CFL savings.<sup>5</sup>  
**Recommendation.** Navigant recommends that the program emphasize that the CFLs should replace incandescent and that the HRC include a baseline question.
- **Finding.** The evaluation team found some errors in the tracking system, including discrepancies between HRCs and entries in the tracking system, missing data, and data inconsistencies. This is most likely due to a lack of documented procedures for tracking kits, HRCs, and incentives; tracking of key performance indicators in multiple files; and a lack of method for tracking key performance indicators in the tracking system.  
**Recommendation.** In order to address the tracking system inadequacies, Navigant recommends that the National Energy Foundation (NEF) consolidate their tracking system into a single master multi-user tracking database and establish clear documented procedures for tracking kits, HRCs, and incentives. Furthermore, a key element that must be incorporated into the

<sup>5</sup> Navigant did not include this effect in impact calculations for EPY4: some conflicting survey responses indicated that the question needs to be phrased more clearly.

tracking database is the ability to track the changes made by the program staff at NEF. Since multiple people have access to the tracking system, it is important that updates to key performance indicators be logged (recording when a change is made, by whom, and why).

- Finding.** Navigant recognizes NEF’s approach in estimating installation rates to be superior to simply assuming every measure in every kit distributed is installed. However, documentation of this assumption is absent and is evident only in the savings formula in the Savings Sheets.

**Recommendation.** Navigant recommends that NEF explicitly document their assumption that the installation rate of HRC non-respondents is the same as respondents. NEF can now reference this evaluation which confirms their previously untested assumption.

#### *E.4 Key Process Findings and Recommendations*

Navigant offers the following process findings and recommendations for the program.

- Finding.** The EEE program’s research findings show in-service rates for the showerhead and aerators range from 35-45% for the Nicor Gas-only program and 19-27% for Nicor Gas-ComEd.<sup>6</sup> Survey respondents indicated that fit problems were the most common reason for not installing showerheads and aerators while water pressure concerns, leakage, and a dislike of the measures were the main reported reasons for uninstalling them.

**Recommendation.** To address the installation and persistence barriers in order to increase effective installation rates for the measures in the kit, Navigant recommends the following:

  - Further research the installation and fitting problems of the showerheads and aerators (amounts to about one-third of aerators not installed, and a fifth of showerheads).
  - Evaluate features of other kitchen aerators and showerheads<sup>7</sup> for:
    - Consumer satisfaction
    - Functional performance
    - Base household water pressure requirements
- Finding.** Teachers reported that there were difficulties coordinating program processes in cases where teacher aides or substitutes were present rather than the main classroom teacher. The evaluation team also experienced difficulties administering surveys in classrooms with substitutes present rather than teachers that originally signed up for the program.

**Recommendation.** The evaluation team recommends establishing clear protocols and explanatory materials to address situations where original or lead teachers are not present to administer the program, distribute program kits, or deliver program surveys.
- Finding.** In some cases, teacher and student survey results indicate instructional material in the kits is insufficient for or inaccessible to everyone. Some students indicated they did not

---

<sup>6</sup> The large difference in rates between these two groups is unexpected, and survey results offer no clear explanation. Future evaluations may explore this with additional research.

<sup>7</sup> For GPY2/EPY5, NEF has replaced the GPY1/EPY4 showerheads with a different brand.

know how to install items despite the kit instructions and many students live in Spanish-speaking households.

**Recommendation.** Enhance installation instructions in the kit by:

- Providing Spanish language documentation.
- Adding instructional photographs and/or illustrations.
- Adding video tutorial content to the NEF website to further complement the paper-based installation instructions (in English and Spanish) and include URLs to “see more installation instructions” in paper-based installation instructions.

- **Finding.** The main cited reason for not installing CFLs was misplacement. Misplacement is an indication that all CFLs were not installed immediately upon receiving the kit. Participant survey results confirm this, as the first and second bulbs were installed more than the third bulb. About 81% installed the first CFL, about 73% installed the second, and about 65% installed the third. Common reasons for not immediately installing CFLs may include: participants waiting for other bulbs to burn out, mistrust or dissatisfaction with the technology, or not having a clear idea of where best to install CFLs.

**Recommendation.** Address the trend of not immediately installing CFLs upon using the kit to increase installation rates by:

- Providing tips about CFLs that address common concerns and misconceptions (such as that they are a health hazard due to mercury, that light quality is poor, etc.)
- Emphasizing not to wait for an incandescent to burn out -- that CFLs should replace incandescent bulbs now.
- Giving leading directions for rooms each CFL in the kit could be installed in, thus overcoming any “socket searching” that may impede initial installations of the third CFL. This can be done by putting a sticker on the CFL box that suggests where to install it (e.g. “Put me in a bedroom”).

- **Finding.** The EEE program provides an exceptional marketing opportunity for Nicor Gas and ComEd’s other residential efficiency programs and marketing can be further improved.

**Recommendation.** While the program cross-markets other DSM programs with consistent branding collateral, Navigant recommends that the EEE program expand its efforts to channel participants to other residential programs. Such efforts could be as simple as including brief descriptions of Nicor Gas and ComEd’s other residential programs in the student and teacher guides or a refrigerator magnet with website and program names and pictures. Furthermore, creating a parent-specific “packet for parents” in the kit would better ensure that parents see the Nicor Gas and ComEd program brochures and other program referral material already included in the kit. Channeling efforts could also be as complex as adding an interactive component to the Nicor Gas and ComEd websites that maps educational content from the EEE program to other programs.

- **Finding.** Teachers reported that some parents were leery of signing the program participation permission letter.

**Recommendation.** The evaluation team recommends making participation in the program OPT-OUT rather than OPT-IN. Every parent would receive an OPT-OUT permission letter



well before the presentation and, thus, would have the option to OPT-OUT before the child participates. However, now a non-response to the permission letter would signify OPT-IN.

## 1. Introduction to the Program

### 1.1 Program Description

The Elementary Energy Education (EEE) program is jointly offered by Nicor Gas and Commonwealth Edison (ComEd) who engaged National Energy Foundation (NEF) to implement the program, branded THINK! ENERGY, and Wisconsin Energy Conservation Corporation (WECC) to serve as the Program Administrator for Nicor Gas. In GPY1/EPY4, the program targeted 5<sup>th</sup> grade students in public and large private schools that are customers of Nicor Gas or jointly Nicor Gas and ComEd. Schools received an invitation to participate and register to schedule the interactive presentations; alternatively, schools could register on the program website to join a waiting list if the program was fully-enrolled when they registered. After the presentation, students with signed parent permission forms took home a kit that includes water conservation measures; instruments to measure water and ambient temperature, as well as water flow rates; CFLs; and a household report card (e.g., Scantron form) where they report details of their family's participation. Students and teachers are incentivized to return the report cards with a \$100 mini-grant for each class that completes and returns 80% of their cards. Students are also incentivized to receive a program wristband if they complete and return a card. NEF based the program's savings on the installation rate of implemented measures reported in the household report card against the number of kits that were reported taken home.

The EEE program's primary focus is to produce natural gas and electricity savings in the residential sector by motivating students and their families to take steps through reducing energy consumption for water heating and lighting in their home, a secondary goal of the program is to reduce residential use of water. Additionally, the EEE Program aims to increase participation in other Nicor Gas and ComEd programs via cross-marketing and increased customer awareness of energy efficiency issues.

The Nicor Gas and Nicor Gas-ComEd take home kit, branded "Take Action Kit," contained the following:

- Premium Oxygenics high-efficiency showerhead (2.0 gpm)
- Kitchen faucet aerator (1.5 gpm)
- Bathroom faucet aerator (1.0 gpm)
- Additional faucet plastic fittings
- Three (3) 14-watt CFL bulbs (Nicor Gas-ComEd kits only)
- Shower timer
- Flow rate test bag
- Digital water and ambient temperature thermometer
- Fun Facts Slide Chart
- Scratch 'n sniff mercaptan (natural gas odorant) stickers
- "Turn it Off" light switch stickers
- Nicor Gas Energy Efficiency Program (EEP) sticker with website address

- Parent Comment Card (Business Reply Mail back to program implementer)
- Earn a wristband participation promotion card
- Product Installation Instructions
- Nicor Gas EEP/ComEd Smart Ideas®-branded Kit Box and Student Activity Guide
- Nicor Gas EEP promotional brochure
- ComEd Smart Ideas® for Your Home pamphlet (Nicor Gas-ComEd kits only)

## **1.2 Evaluation Questions**

The GPY1/EPY4 evaluation will seek to answer the following researchable issues:

### **1.2.1 Impact Issues**

1. What is the level of gross and net annual energy (kWh) and peak demand (kW) and natural gas (therm) savings achieved by the program?
2. What are the realization rates? [Defined as evaluation-verified (ex-post) savings divided by program-reported (ex-ante) savings.]
3. What are the net impacts from the program?
4. What is the level of free ridership associated with this program and how can it be reduced?
5. What is the level of spillover associated with this program?
6. Did the program meet its energy savings goals? If not, why not?
7. Are the assumptions and calculations in compliance with the TRM estimates? If not, what changes will be required?

### **1.2.2 Process Issues**

1. Has the program changed since the Rider 29 pilot? If so, why and how?
2. How does the joint utility program offering compare to the Nicor Gas-only one?
3. Is the marketing and outreach to schools, teachers, and parents effective in optimizing participation?
4. How effective are the program design and processes?
5. Are administration and delivery processes efficient and effective, including incentive disbursements and the program's verification and QA/QC procedures?
6. What are key barriers to participation in the program for eligible customers who do not participate and how can these be addressed by the program? Should parental approval be changed from Opt-in to Opt-out?
7. What are program measure effective installation rates and how can they be increased? Should other devices be considered?
8. How do classrooms that returned Home Report Card (HRC) surveys compare to those that didn't? What are the barriers to returning HRCs?

9. Are schools and teachers satisfied with the aspects of program implementation in which they have been involved? Would they register for the program again? Would they recommend it to colleagues?
10. Are participants satisfied with the program?
11. What areas could the program improve to create a more effective program for customers and help increase the energy impacts?

## 2. Evaluation Methods

### 2.1 Primary Data Collection

Table 2-1. summarizes the surveys, interviews, and other primary data sources that are used to assess the evaluation questions. The GPY1/EPY4 gross savings and net-to-gross (NTG) analysis includes participant paper-based surveys from each of the following four groups:

Students in classes that received kits and

1. the teacher returned HRCs, in a Nicor Gas-only school  
(Nicor Gas-only HRC+)
2. the teacher did not return HRCs, in a Nicor Gas-only school  
(Nicor Gas-only HRC-)
3. the teacher returned HRCs, in a Nicor Gas-ComEd school  
(Nicor Gas-ComEd HRC+)
4. the teacher did not return HRCs, in a Nicor Gas-ComEd school  
(Nicor Gas-ComEd HRC-)

The participant survey for GPY1/EPY4 was conducted in May and June 2012, and the response rates of the HRC- groups were lower than anticipated (13 completed surveys from Nicor Gas-only HRC- and 27 from Nicor Gas-ComEd HRC-). Thus the evaluation team's analysis will determine whether the HRC+ results of Nicor Gas-only vs. Nicor Gas-ComEd are sufficiently similar to warrant analyzing the HRC- results of the two groups as one group, yielding a sample size of 40 with a confidence level/margin of error of 90/13. If the HRC+ results of the two groups vary greatly, Navigant will consider repeating the NTG analysis in the next plan year with an updated approach to meet the goal of 70 completes per group.

**Table 2-1. Primary Data Collection Methods and Sources**

Collection Method	Subject Data	Quantity	Gross Impact	Net Impact	Process
Paper Surveys	Program participants	64 Nicor Gas-only HRC+ 13 Nicor Gas-only HRC- 119 Nicor Gas-ComEd HRC+ 27 Nicor Gas-ComEd HRC-	X	X	X
In-Depth Interviews	Program administrators and implementation contractor staff	3			X
Deemed Savings Review	Deemed savings estimates	All	X		
Laboratory Testing	Showerhead and kitchen aerator models distributed by program	3 per model, all models	X		

## 2.2 Additional Research

This evaluation also leveraged additional research materials and performed a literature review. Table 2-2 summarizes these additional sources and their relevance to this evaluation.

**Table 2-2. Additional References**

Reference	Source	Application	Gross Impacts	Net Impacts	Process
Program Tracking Database	Program Administrator	Impact and process evaluations	X		X
Illinois Statewide TRM	Various	Compare deemed savings values	X		
Literature Review	Multiple	Program best practices and NTG perspective	X	X	X

### 2.3 *Impact Evaluation Methods*

Navigant conducted an impact evaluation to quantify gross savings impacts from the EEE program. This evaluation consisted of three phases, as described below.

- Phase 1: Estimating effective installation rates for HRC+ and HRC- participants with results of the participant survey and HRC.
- Phase 2: Review of deemed savings estimates for all measures where the program is claiming savings.<sup>8</sup> We reviewed all deemed program measures for compliance with the statewide TRM.
- Phase 3: Laboratory testing of the high-efficiency showerhead and the kitchen faucet aerator models included in the kits distributed by the program. Nicor Gas requested testing of these models due to mislabeled flow rates. The tests were conducted in spring 2012, and the results of this testing were presented in a memorandum to Nicor Gas dated June 6, 2012. In addition to verifying rated flows at the standard rating pressure of 80 psi, the laboratory testing also explored the relationship between flow rate and water pressure by testing each model at additional water pressure settings of 30 psi, 45 psi, and 60 psi to represent typical residential conditions. Navigant subcontracted this work to the CSA Group (CSA), an independent testing and certification lab. CSA tested three samples of each model: Oxygenics showerhead, Oxygenics showerhead with white label “2.0 GPM”, and the kitchen faucet aerator.

### 2.4 *Process Evaluation Methods*

The process evaluation documented the spectrum of perceptions by different stakeholders of program processes. It included a review of marketing and outreach materials and an examination of potential barriers to program participation and measure persistence by participants. The process evaluation focused on understanding kit use and customer satisfaction with the program measures. It examined the program processes through interviews, surveys, and material review:

- **In depth interviews with program staff and implementation contractor** – Navigant conducted in-depth interviews with three Nicor Gas, ComEd, WECC, and implementation contractor staff members. These interviews assured alignment between the evaluation and the program.
- **Paper survey of HRC survey participating and partially-participating classrooms** – Navigant conducted a paper-based survey of a random sample of classes that received kits, with a goal of 280 completes from students in four groups of classes, as described in the data collection section. The survey assessed satisfaction with the program, barriers to participation and effective installation rate, and informed the net-to-gross analysis. The survey was also used for estimating program impacts and for developing a qualitative understanding of behavioral changes influenced by the program. The sample size was determined by a 90% confidence and a target precision of 10%, assuming 50% response distribution.

---

<sup>8</sup> Thus the GPY1 evaluation will not include behavioral measures such as the shower timer or hot water tank turndown.

- *Review of program marketing and kit materials* – Navigant reviewed EEE program operations, marketing, and outreach materials to confirm its understanding of how the program works and how it is presented to customers. Furthermore, the literature included in the Take Action Kit was reviewed.
- *Review of HRC Survey* – Navigant reviewed the Nicor Gas-only and Nicor Gas-ComEd HRC surveys to ensure that the proper level of information was being gauged to both understand program effectiveness and to estimate impacts.

## 3. Evaluation Results

### 3.1 *Impact Evaluation Results*

This section presents the results of the impact evaluation for the GPY1/EPY4 joint Nicor Gas/ComEd EEE program using the Illinois TRM deemed algorithms and inputs.

#### 3.1.1 **Verification and Due Diligence Procedure Review**

The Navigant team collected program tracking information and the program's Scope of Work from the program contractors; however, the program has no formal operating procedures to review.

The program achieved its participation goals and accumulated a waiting list of teachers wanting to participate (if other schools were unable to participate) which suggests that the application process was effective and presented no substantial barriers to participation. Navigant finds that NEF's method to recruit and process applications from eligible schools is streamlined and needs no improvement.

A full report of the verification and due diligence review, as well as a full listing of observations and recommendations, can be found in Appendix 5.8.

#### 3.1.2 **Tracking System Review**

In order to review NEF's tracking system, Navigant reviewed program documentation, including Program Plan, Final Report, Main Tracking Sheet, Savings Sheets, and HRC Responses. The evaluation team found some errors in the tracking system, including discrepancies between HRCs and entries in the tracking system, missing data, and data inconsistencies. This is most likely due to:

- A lack of documented procedures for tracking kits, HRCs, and incentives
- Tracking of key performance indicators in multiple unconnected files (no master file)
- A lack of method to track updates to key performance indicators in the tracking system

The tracking system errors and inconsistencies may impact savings calculations. In order to address these inadequacies, Navigant recommends that NEF consolidate their tracking system into a single master multi-user tracking database.

A key element that must be incorporated into the tracking database is the ability to track the changes made by the program staff at NEF. Since multiple people have access to the tracking system, it is important that changes to key performance indicators are logged (recording when a change is made, by whom, and why).

A full report of the verification and due diligence review, as well as a full listing of observations and recommendations, can be found in Appendix 5.8.

### 3.1.3 Gross Program Impact Parameter Estimates

Navigant calculated gross program impacts for four measures with deemed savings values: low-flow showerheads, kitchen and bathroom faucet aerators, and CFLs. These measures account for all quantifiable GPY2/EPY5 savings. Only ComEd claims savings from CFLs as they are purely an electric measure. Table 3-1. summarizes the gross unit impacts for each measure. These impacts include in-service rates as deemed by the IL TRM. Full impact parameter estimate calculations leading to the gross unit energy savings values for each measure can be found in Appendix 5.3.

**Table 3-1. Evaluated Gross per Unit Energy Savings**

Measure	Unit Energy Savings (kWh)	Unit Peak Demand Savings (kW)	Unit Energy Savings (Therm)
Showerheads	214	0.008	9.2
Kitchen Aerators	37	0.003	1.7
Bathroom Aerators	45	0.003	2.0
CFLs	36	0.004	0

*Source: Navigant Analysis*

### 3.1.4 Gross Program Impact Results

Table 3-2 presents total verified program savings by fuel and measure type.

**Table 3-2. Verified Gross Savings by Measure and Fuel**

Savings Type	Measure	Nicor Gas-only Total	Nicor Gas-ComEd Total	Program Total*
<b>Therms</b>	Showerheads	35,829	42,253	78,082
	Kitchen Aerators	6,495	7,660	14,155
	Bathroom Aerators	7,794	9,191	16,986
	<b>Total</b>	<b>50,119</b>	<b>59,104</b>	<b>109,222</b>
<b>kWh</b>	Showerheads	183,464	66,186	66,186
	Kitchen Aerators	31,979	11,537	11,537
	Bathroom Aerators	38,375	13,844	13,844
	CFLs	-	542,665	542,665
	<b>Total</b>	<b>253,818</b>	<b>634,232</b>	<b>634,232</b>
<b>kW</b>	Showerheads	7.3	2.6	2.6
	Kitchen Aerators	2.3	0.8	0.8
	Bathroom Aerators	2.3	0.8	0.8
	CFLs	-	54.1	54.1
	<b>Total</b>	<b>11.9</b>	<b>58.3</b>	<b>58.3</b>

Source: Navigant Analysis

\*Nicor Gas-only participant electric savings are not included in the program total, but will be included in the benefit-cost analysis. Navigant reports the Nicor Gas-only program's electric savings figures for informational purposes only and is not factoring them into the program total gross savings since they are not attributable to ComEd territory.

Table 3-3 presents the verified gross savings estimates in comparison with the ex ante estimates as reported by WECC. The Nicor Gas-ComEd program’s electric realization rates appear low because ComEd’s ex ante kWh savings are rough estimate planning values rather than program results-based savings calculations like Nicor Gas’ WECC-determined therm savings estimates. The therm realization rates are greater than 100% in large part because, for verified gross savings, Navigant used the TRM default in-service rates (ISRs) which in some cases were higher than program assumptions<sup>9</sup>. Navigant also used the actual household size of 4.74 instead of the TRM single-family default value of 2.56 since the TRM allows custom inputs for this parameter.

**Table 3-3. Comparison of Ex Ante and Verified Gross Savings**

	Nicor Gas-only	Nicor Gas-ComEd	Program Total
Ex Ante Therms	17,187	17,111	34,298
Verified Therms	50,119	59,104	109,222
Therm Realization Rate	292%	345%	318%
Ex Ante kWh**	308,074	583,568	583,568
Verified kWh	253,818*	634,232	634,232
kWh Realization Rate	82%	109%	109%

Source: “Measures Recalculated\_10062012.xlsx”, Navigant Analysis

\*Navigant reports the Nicor Gas-only program’s electric savings figures for informational purposes only and is not factoring them into the Nicor Gas-only and Nicor Gas-ComEd program total ex ante and verified electric savings since they are not attributable to ComEd territory. \*\*Ex ante kWh based on default unit impacts for the PY2 Single Family Direct Install Program. Navigant assumed an ex ante realization rate of 0.84 for hot water measures based on ComEd’s deemed value for the PY3 Single Family Direct Install Program, as requested by ComEd.

<sup>9</sup> Navigant’s research findings, detailed in the appendices, used ISRs based on the GPY1/EPY4 evaluation surveys.

ComEd provided a list of schools in their service territory that received Nicor Gas-only kits<sup>10</sup>. Navigant assumes that kits distributed to a school in a given utility’s territory will be used by a customer of that utility. Based on this assumption, Table 3-4 below shows the distribution of Nicor Gas-only kits and electricity savings among ComEd electricity customers and non-ComEd electricity customers. The savings are shown here to provide a complete picture of savings achieved by the kits; they are not included in any gross or net (spillover) savings statistics attributed to ComEd because the kits were funded by Nicor Gas. The electricity savings Navigant calculated from these kits came solely from water saving measures.

**Table 3-4. Distribution of Electric Savings from Nicor Gas-only Kits**

	Non-ComEd Electricity Customers	ComEd Electricity Customers	Total
Number of kits	533	4,464	4,997
Percent of kits	11%	89%	100%
Gross kWh	27,073	226,745	253,818
Gross kW	1.3	10.6	11.9

Because the program did not provide ex ante estimates at the measure level for all measures, Navigant could not calculate realization rates at this level for all measures. Table 3-5 shows CFL carryover, which Navigant calculated per the Illinois TRM and which can be included in the EPY4 benefit-cost analysis as well as EPY5 verified savings.

**Table 3-5. 14W CFL Carryover**

CFL Carryover	ISR	Units	kWh	kW
1st year Installations	70%	10,373	542,665	54
2nd Year Installations	15%	2,298	120,245	12
3rd Year Installations	13%	1,955	102,287	10
Lifetime	98%	14,627	765,197	76

### 3.1.5 Net Program Impact Parameter Estimates

The NTG Framework<sup>11</sup> calls for retroactively applying the NTG ratio for “previously evaluated programs undergoing significant changes — either in the program design or delivery, or changes in the market itself.” In GPY1/EPY4, the program added a utility territory and CFL measures to the Nicor Gas-only design to create a joint Nicor Gas-ComEd component. Given these changes, the evaluation team

<sup>10</sup> Nicor Gas-only kits were funded by Nicor Gas.

<sup>11</sup> “Proposed Framework for Counting Net Savings in Illinois.” Memorandum March 12, 2010 from Philip Mosenthal, OEL, and Susan Hedman, OAG.

applied research findings NTG ratios to the verified gross savings estimates for both the Nicor Gas-only and the joint Nicor Gas-ComEd programs to determine respective verified net savings estimates.

Research findings NTG ratios were established using participant survey self-reporting. The evaluation team combined HRC+ and HRC- participant survey results to improve the sample size for NTG calculations.<sup>12</sup> As a result, overall program-specific NTGs are reported for Nicor Gas-only and Nicor Gas-ComEd programs.

Table 3-6 shows the net-to-gross ratio (NTGR) estimates for the Nicor Gas-only and Nicor Gas-ComEd programs as well as the underlying free ridership (FR) and spillover (SO) ratios. Appendix 5.6 further outlines the detailed methodology used for calculating verified net program impact parameter estimates and includes a discussion of the free ridership and spillover results for both utility territories.

**Table 3-6. Net Program Impact Parameter Estimates<sup>13</sup>**

Measure	Research Findings Nicor Gas-only FR	Research Findings Nicor Gas-only SO	Research Findings Nicor Gas-only NTG	Research Findings Nicor Gas-ComEd FR	Research Findings Nicor Gas-ComEd SO	Research Findings Nicor Gas-ComEd NTG
Showerheads	40%	7%	67%	27%	19%	92%
Kitchen Aerators	41%	2%	61%	22%	14%	92%
Bathroom Aerators	43%	7%	64%	30%	9%	79%
CFLs	NA	NA	NA	58%	31%	73%

Source: Navigant participant survey

<sup>12</sup> The evaluation team conducted a statistical chi-squared test to determine whether HRC+ and HRC- sample participants could be treated as one overall group for NTG results and found that they were indeed

<sup>13</sup> The evaluation team finds these free ridership values to be high and has reason to believe that they are inflated due to a response bias in the survey. This is discussed in section 5.7.1.

### 3.1.6 Verified Net Program Impact Results

The evaluation team applied the net program impact parameter estimates to both the Nicor Gas-only and Nicor Gas-ComEd verified gross impact results to determine verified net impacts. Table 3-7 shows the verified net impact findings.

**Table 3-7. Research Findings Ex Post Net Impact Results**

Savings Type	Measure	Nicor Gas-only NTG	Nicor Gas-only Total	Nicor Gas-ComEd NTG	Nicor Gas-ComEd Total	Program Total*
<b>Therms</b>	Showerheads	0.67	23,846	0.92	38,886	62,731
	Kitchen Aerators	0.61	3,971	0.92	7,055	11,026
	Bathroom Aerators	0.64	4,973	0.79	7,281	12,255
	<b>Total</b>		32,790		53,222	86,012
<b>kWh</b>	Showerheads	0.67	122,101	0.92	60,912	60,912*
	Kitchen Aerators	0.61	19,552	0.92	10,626	10,626*
	Bathroom Aerators	0.64	24,487	0.79	10,967	10,967*
	CFLs			0.73	396,361	396,361*
	<b>Total</b>		166,140		478,865	<b>478,865*</b>
<b>kW</b>	Showerheads	0.67	4.8	0.92	2.4	2.4
	Kitchen Aerators	0.61	1.4	0.92	0.8	0.8
	Bathroom Aerators	0.64	1.5	0.79	0.7	0.7
	CFLs			0.73	39.5	39.5
	<b>Total</b>		7.7		43.3	<b>43.3</b>

Source: Navigant Analysis

\*Nicor Gas-only participant electric savings are not included. Navigant reports the Nicor Gas-only program's electric savings figures for informational purposes only and is not factoring them into the Nicor Gas-only and Nicor Gas-ComEd program total ex ante and verified electric savings since they are not attributable to ComEd territory.

### 3.1.7 Qualitative Impact Results

Navigant’s survey results suggest the program effected additional energy savings through behavioral changes. As shown in the summary below, a majority reported using the kits shower timer (55% of Nicor Gas-only and 72% of Nicor Gas-ComEd), and substantial shares reported lowering their water heater temperature and furnace/boiler thermostat and raising their air conditioner thermostat. Quantifying these savings would require collecting additional self-reported metrics, for example, the number of degrees Fahrenheit the participant changed each device and the average shower duration with the shower timer or conducting a billing analysis. Thus the evaluation team will estimate quantitative impact results through these behavioral changes in GPY3/EPY6.

**Table 3-8. Reported Behavioral Participation**

Measure	Nicor Gas-only	Nicor Gas-ComEd
Use The Shower Timer = Yes	55%	72%
-among house holds that do, average number of users	3.1	2.6
Lowered Water Heater Temperature	35%	24%
Lowered Furnace/Boiler Thermostat	41%	30%
Raised Air Conditioner Thermostat	21%	15%

Source: Navigant participant survey

### **3.2 Process Evaluation Results**

This section presents the results of the process evaluation for the GPY1/EPY4 joint Nicor Gas/ComEd EEE program.

#### **3.2.1 Program Changes since Rider 29**

The Rider 30 (R30) program has changed in several ways since Rider 29 (R29). The most notable change has been the introduction of the joint Nicor Gas-ComEd program offering to the original Nicor Gas-only one. As part of the joint program, new school territories were added and CFLs were included into the EEE kits. The joint program offering has allowed the program to expand from about five thousand participating students in R29 to about ten thousand in R30.<sup>14</sup> The program also adopted some recommendations from the R29 evaluation, including a modified HRC survey design and improved program tracking procedures.

#### **3.2.2 Marketing and Outreach Effectiveness**

The marketing and outreach to schools, teachers, and parents was effective in optimizing participation in R30 since NEF nearly met its participation goals for both the Nicor Gas-only and Nicor Gas-ComEd programs. The utilities and the implementation contractor set a goal of reaching approximately 10,000 students and teachers between the Nicor Gas-only and Nicor Gas-ComEd programs. NEF reports that it distributed a total of 4,997 Nicor Gas-only and 4,975 Nicor Gas-ComEd kits to students and teachers during GPY1/EPY4, totaling 9,972 participants, or roughly 10,000 students.

The EEE program provides an exceptional marketing opportunity for Nicor Gas and ComEd’s other residential efficiency programs. The evaluation team reviewed the program kits and found that the program met this opportunity with materials that include URLs to Nicor Gas and ComEd’s Energy Efficiency Program websites, tips to save energy and money, and informational leaflets for both utilities’ other efficiency programs. Navigant recommends that the EEE program expand its efforts to channel participants to other residential programs. Such efforts could be as simple as including brief descriptions of Nicor Gas and ComEd’s other residential programs in the student and teacher guides or a refrigerator magnet with website and program names and pictures. Furthermore, creating a parent-specific “packet for parents” in the kit would better ensure that parents see the Nicor Gas and ComEd program brochures and other program referral material already included in the kit. Channeling efforts could also be as complex as adding an interactive component to the Nicor Gas and ComEd websites that maps educational content from the EEE program to other programs.

#### **3.2.3 Program Design and Process Effectiveness**

The process for a school to register to participate is straightforward: NEF’s recruiting materials and registration website are streamlined with clear instructions. The utilities have a website page dedicated to the program which refers teachers to NEF’s website to register to participate. Since NEF’s reported

---

<sup>14</sup> About 5,000 students participated in each of the Nicor Gas-only and joint programs.

number of kits distributed nearly met NEF's goal there are no indications of substantial barriers for a qualifying school to participate.

### 3.2.4 Program Satisfaction

The evaluation team surveyed teachers and reviewed NEF's reported findings from their teacher surveys and found that teachers are generally satisfied with the program, reported few barriers to participation, and most would recommend the program to colleagues. The EEE program is very popular with teachers, and in general, program materials are sufficiently developed to offer a successful experience. Notable program improvement recommendations from teachers that responded to the Navigant survey include the following:

- Share the program with other grade levels.
- Signing off for the kits was confusing for teacher aids/substitutes.
- Some parents were leery of signing the permission letter.

The evaluation team's review of NEF's reported teacher comments also include the following relevant recommendations for improvement:

- Present the program to parents.
- Ensure teachers receive kits with sufficient lead time before the presentation to prevent kit arrivals after the presentation. Kit arrivals after the presentation cause students to lose interest in installing them.
- Provide a video to students and potentially parents (made accessible online) that shows how to install the kit items.
- Create a Spanish booklet to optimize participation in areas where many families speak and read in Spanish.

Overall, NEF reports about 97% of teachers said they would conduct the program again if they had the opportunity, and 98% would recommend the program to other teachers.

The program also received positive feedback from parents. The evaluation team reviewed NEF's parent survey findings and found that parents reported appreciating the program because they also learned about energy and energy efficiency along with their children. They also reported the program helped make energy efficiency (including "turning the lights off") tangible for their kids and were able to save energy. Though the Navigant evaluation team did not survey parents to verify NEF's findings, one of the teachers in the Navigant survey from the Nicor Gas-only group returned a positive note from a parent claiming noticeable energy savings from the showerhead and shower timer (see Figure 3-1).

**Figure 3-1. Positive Parent Feedback**



*Source: Navigant participant survey*

Overall, the EEE program is favored by both teachers and parents. Section 3.2.5 discusses the evaluation team’s additional findings about barriers to participation.

### **3.2.5 Barriers to Participation**

Given that the teachers and parents are generally satisfied with the program and its processes, the program’s key barriers to participation are related to installing and retaining the measures provided in the program kits. Navigant administered independent, paper-based surveys to the Nicor Gas-only and joint program participants that included questions that gauged in-service rates and customer experiences with the kits’ showerheads, aerators, and CFLs. We received 146 surveys from 10 of 37 randomly selected Nicor Gas-ComEd classrooms and 77 surveys from 6 of 37 Nicor Gas-only classrooms. The findings are presented below by utility program.

#### **3.2.5.1 Joint Program Barriers to Installation and Persistence**

Overall, the Nicor Gas-ComEd joint version of the program had lower initial installation rates for showerheads and aerators than the Nicor Gas-only territory version of the program. Barriers were measure-specific and included the following: dissatisfaction with measures, problems with measure fit and functional integrity, weak water pressure, and a preference for their old faucets or aerators, see Table 3-9. However, Navigant found that the persistence rates across the Nicor Gas-ComEd joint participants and the Nicor Gas-only participants were independent of program version, and thus we applied the same persistence rates across both groups.

**Table 3-9. Top Nicor Gas-ComEd Measure-Specific Barriers to Installation and Persistence**

Measure	Top Reason for Not Installing	Top Reasons for Uninstalling
Showerhead	Preference for own Showerhead	1. Didn't Like it 2. Water Pressure Too Weak
Kitchen Aerator	Did Not Fit	1. Didn't Like it 2. Water Pressure Too Weak 3. It Leaked
Bathroom Aerator	Did Not Fit	1. Didn't Like it 2. It Leaked
CFLs	Misplaced	--

Source: Navigant participant survey

The showerhead was installed by about 37% (n=143) of question respondents, and about 73% of those indicated they were still using it, yielding an effective installation rate of 27%, see Table 3-10. The main reason given for not installing the showerhead was they like their own showerhead more (33%, n=94). Respondents' other common reasons were it did not fit (23%), they did not know how to install it (18%), and they already had an efficient showerhead (17%). Most respondents that uninstalled the showerheads did so because they did not like it (40%, n=10) or the water pressure was weak (30%).

**Table 3-10. Nicor Gas-ComEd Survey Finding In-Service Rates**

Measure	In-Service Rate
Showerhead	27%
Kitchen Aerator	19%
Bathroom Aerator	24%
CFL1	79%
CFL2	72%
CFL3	62%

Source: Navigant participant survey

About 29% (n=143) of question respondents reported they installed the kitchen aerator, and 66% of those indicated that they are still using it, yielding an effective installation rate of 19%, see Table 3-10. The

most common reason reported for not installing the kitchen aerator was that it did not fit (35%, n=110). The other top reasons were that respondents preferred their old aerator or that they already had an efficient aerator. Among those who did install the kitchen aerator, the main reasons cited for removing it was insufficient water pressure and they did not like it (30% each, n=20). A quarter of respondents also indicated they removed the aerator because it leaked.

About 31% (n=142) of question respondents reported installing the bathroom aerator, and 78% of those indicated they are still using it, yielding an effective installation rate of 24%, see Table 3-10. Like the kitchen aerator, the most frequent reasons cited for not installing the bathroom aerator was it did not fit (37%, n=108), they already liked their aerator (24%), or they already had one installed (18%). Respondents' main reasons for uninstalling the bathroom aerator were that they did not like it and that it leaked (33% each, n=12).

Most people installed at least one of the three CFLs included in the Nicor Gas-ComEd kit. About 81% installed the first CFL, about 73% installed the second, and about 65% installed the third. Persistence for the CFLs is high, ranging from 95% to 98%. The resulting effective installation rates for the CFLs are 79% for the first, 72% for the second, and 62% for the third. The most common reason for not installing a CFL was that it was misplaced (29%, n=14).

### 3.2.5.2 Nicor Gas-only Program Barriers to Installation and Persistence

Overall, the Nicor Gas-only version of the program had higher initial installation rates for showerheads and aerators than the Nicor Gas-ComEd joint version of the program. Barriers were measure-specific but it appears that fit was the most common reason for not installing measures while weak water pressure was the most common reason for uninstalling measures, see Table 3-11.

**Table 3-11. Top Nicor Gas-only Measure-Specific Barriers to Installation and Persistence**

Measure	Top Reason for Not Installing	Top Reasons for Uninstalling
Showerhead	Already Had an Efficient Showerhead	<ol style="list-style-type: none"> <li>1. Water Pressure Too Weak</li> <li>2. Didn't Like it</li> </ol>
Kitchen Aerator	Did Not Fit	<ol style="list-style-type: none"> <li>1. Broke or Leaked</li> <li>2. Water Pressure Too Weak</li> </ol>
Bathroom Aerator	Did Not Fit	<ol style="list-style-type: none"> <li>1. Water Pressure Too Weak</li> <li>2. Didn't Like it</li> </ol>

Source: Navigant participant survey

The showerhead was installed by about 61% (n=74) of question respondents, and about 73% of those indicated they were still using it, yielding an effective installation rate of 45%, see Table 3-12. The main reason the respondent gave for not installing the showerhead was they already had an efficient showerhead (38%, n=29) or they like their own showerhead more (24%). Respondents that uninstalled the showerheads did so because water pressure was too weak (80%, n=15) or they did not like it 20%.

**Table 3-12. Nicor Gas-only Survey Finding In-Service Rates**

Measure	In-Service Rate
Showerhead	45%
Kitchen Aerator	35%
Bathroom Aerator	38%

*Source: Navigant participant survey*

About 53% (n=74) of respondents reported they installed the kitchen aerator, and 66% of those indicated that they are still using it, yielding an effective installation rate of 35%, see Table 3-12. The most common reason reported for not installing the kitchen aerator was that it did not fit (42%, n=36). The other top reasons were that participants either preferred their old faucet (28%) or they already had an efficient aerator (11%). Notably, the surveyed participants in Nicor Gas' R29 version of the program gave the same reasons for not installing the kitchen aerators and in the same order. Among those who installed the kitchen aerator, the main reasons cited for removing it were that it broke or leaked (36%) and the water pressure was too weak (21%).

About 49% (n=74) of respondents reported installing the bathroom aerator, and 78% indicated they are still using it, yielding an effective installation rate of 38%, see Table 3-12. Like the kitchen aerator, the most frequent reason cited for not installing the bathroom aerator was that it did not fit (45%, n=40). The second most common reason reported was that respondents already liked their faucet (25%). Respondents' main reasons for uninstalling the bathroom aerator were that water pressure was too weak (50%, n=6) or they did not like it (33%, n=6).

### 3.2.6 Comparison of Classrooms that Returned HRC Surveys Against Those that Did Not

The evaluation team conducted statistical chi-squared tests of the survey data across utilities and across classroom samples that returned HRC surveys against those that did not. The team found that Nicor Gas-only and Nicor Gas-ComEd's program-specific installation rates for high efficiency showerheads and kitchen and bathroom faucet aerators were territory dependent<sup>15</sup> while persistence rates were not

<sup>15</sup> Territory dependency means that survey responses were somehow influenced by the utility territory of the program. The two utility territories in this evaluation are the Nicor Gas-only program territory, and the joint Nicor Gas-ComEd program territory.

territory dependent. This means that there are different factors in the programs and in the territories influencing installation rates between programs. On the other hand, once installed, persistence for these measures is similar across territories.

Further testing of the installation rates for HRC survey return dependency showed that Nicor Gas-only and Nicor Gas-ComEd installation rate responses were not dependent on having submitted an HRC survey to the program. This indicates that classrooms that did not return a survey had the same installation rate patterns as those that did. This may be an indication that classrooms that do not return HRC surveys do not have less engaged students than classrooms that do; instead, circumstances in the classroom, including teacher engagement, may be the reason HRC surveys are not returned in certain classrooms.

## 4. Findings and Recommendations

### 4.1 Key Impact Findings and Recommendations

Navigant offers the following impact findings and recommendations for the program.

- **Finding.** Navigant’s survey included students who returned their Home Report Cards (HRCs) and students who did not. Among Navigant’s results, installation rates did not differ across these two groups of students. This suggests an undocumented assumption of NEF: installation rates reported in the HRCs are representative of all participants, independent of whether a participant returned an HRC.  
**Recommendation:** Use HRC response rates across all participants.
- **Finding.** According to survey data, some program CFLs (13%) may have replaced or could replace other CFLs. This will be an important factor to consider in calculating CFL savings.<sup>16</sup>  
**Recommendation.** Navigant recommends that the program emphasize that the CFLs should replace incandescent and that the HRC include a baseline question.
- **Finding.** The evaluation team found some errors in the tracking system, including discrepancies between HRCs and entries in the tracking system, missing data, and data inconsistencies. This is most likely due to a lack of documented procedures for tracking kits, HRCs, and incentives; tracking of key performance indicators in multiple files; and a lack of method for tracking key performance indicators in the tracking system.  
**Recommendation.** In order to address the tracking system inadequacies, Navigant recommends that the National Energy Foundation (NEF) consolidate their tracking system into a single master multi-user tracking database and establish clear documented procedures for tracking kits, HRCs, and incentives. Furthermore, a key element that must be incorporated into the tracking database is the ability to track the changes made by the program staff at NEF. Since multiple people have access to the tracking system, it is important that updates to key performance indicators be logged (recording when a change is made, by whom, and why).
- **Finding.** Navigant recognizes NEF’s approach in estimating installation rates to be superior to simply assuming every measure in every kit distributed is installed. However, documentation of this assumption is absent and is evident only in the savings formula in the Savings Sheets.  
**Recommendation.** Navigant recommends that NEF explicitly document their assumption that the installation rate of HRC respondents is the same as non-respondents’. NEF can now reference this evaluation which confirms their previously untested assumption.

---

<sup>16</sup> Navigant did not include this effect in impact calculations for EPY4: some conflicting survey responses indicated that the question needs to be phrased more clearly.

## 4.2 Key Process Findings and Recommendations

Navigant offers the following process findings and recommendations for the program.

- **Finding.** The EEE program’s research findings show in-service rates for the showerhead and aerators range from 35-45% for the Nicor Gas-only program and 19-27% for Nicor Gas-ComEd.<sup>17</sup> Survey respondents indicated that fit problems were the most common reason for not installing showerheads and aerators while water pressure concerns, leakage, and a dislike of the measures were the main reported reasons for uninstalling them.

**Recommendation.** To address the installation and persistence barriers in order to increase effective installation rates for the measures in the kit, Navigant recommends the following:

  - Further research the installation and fitting problems of the showerheads and aerators (amounts to about one-third of aerators not installed, and a fifth of showerheads).
  - Evaluate features of other kitchen aerators and showerheads<sup>18</sup> for:
    - Consumer satisfaction
    - Functional performance
    - Base household water pressure requirements
  
- **Finding.** Teachers reported that there were difficulties coordinating program processes in cases where teacher aides or substitutes were present rather than the main classroom teacher. The evaluation team also experienced difficulties administering surveys in classrooms with substitutes present rather than teachers that originally signed up for the program.

**Recommendation.** The evaluation team recommends establishing clear protocols and explanatory materials to address situations where original or lead teachers are not present to administer the program, distribute program kits, or deliver program surveys.
  
- **Finding.** In some cases, teacher and student survey results indicate instructional material in the kits is insufficient for or inaccessible to everyone. Some students indicated they did not know how to install items despite the kit instructions and many students live in Spanish-speaking households.

**Recommendation.** Enhance installation instructions in the kit by:

  - Providing Spanish language documentation
  - Adding instructional photographs and/or illustrations
  - Adding video tutorial content to the NEF website to further complement the paper-based installation instructions (in English and Spanish) and include URLs to “see more installation instructions” in paper-based installation instructions
  
- **Finding.** The main cited reason for not installing CFLs was misplacement. Misplacement is an indication that all CFLs were not installed immediately upon receiving the kit. Participant survey results confirm this, as the first and second bulbs were installed more than the third

---

<sup>17</sup> The large difference in rates between these two groups is unexpected, and survey results offer no clear explanation. Future evaluations may explore this with additional research.

<sup>18</sup> For PY3, NEF has replaced the PY2 showerheads with a different brand.

bulb. About 81% installed the first CFL, about 73% installed the second, and about 65% installed the third. Common reasons for not immediately installing CFLs may include: participants waiting for other bulbs to burn out, mistrust or dissatisfaction with the technology, or not having a clear idea of where best to install CFLs.

**Recommendation.** Address the trend of not immediately installing CFLs upon using the kit to increase installation rates by:

- Providing tips about CFLs that address common concerns and misconceptions (such as that they are a health hazard due to mercury, that light quality is poor, etc.)
  - Emphasizing not to wait for an incandescent to burn out -- that CFLs should replace incandescent bulbs now.
  - Giving leading directions for rooms each CFL in the kit could be installed in, thus overcoming any “socket searching” that may impede initial installations of the third CFL. This can be done by putting a sticker on the CFL box that suggests where to install it (e.g. “Put me in a bedroom”)
- **Finding.** The EEE program provides an exceptional marketing opportunity for Nicor Gas and ComEd’s other residential efficiency programs and marketing can be further improved. **Recommendation.** While the program cross-markets other DSM programs with consistent branding collateral, Navigant recommends that the EEE program expand its efforts to channel participants to other residential programs. Such efforts could be as simple as including brief descriptions of Nicor Gas and ComEd’s other residential programs in the student and teacher guides or a refrigerator magnet with website and program names and pictures. Furthermore, creating a parent-specific “packet for parents” in the kit would better ensure that parents see the Nicor Gas and ComEd program brochures and other program referral material already included in the kit. Channeling efforts could also be as complex as adding an interactive component to the Nicor Gas and ComEd websites that maps educational content from the EEE program to other programs.
- **Finding.** Teachers reported that some parents were leery of signing the program participation permission letter. **Recommendation.** The evaluation team recommends making participation in the program OPT-OUT rather than OPT-IN. Every parent would receive an OPT-OUT permission letter well before the presentation and, thus, would have the option to OPT-OUT before the child participates. However, now a non-response to the permission letter would signify OPT-IN.

## 5. Appendix

### 5.1 Glossary

#### High Level Concepts

##### Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 to May 31, 2009, EPY2 is June 1, 2009 to May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 to May 31, 2012, GPY2 is June 1, 2012 to May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

##### Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY4/GPY1 ComEd's deemed parameters were defined in its filing with the ICC. The Gas utilities agreed to use the parameters defined in the TRM, which came into official force for EPY5/GPY2.

**Application:** When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

##### Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

**Application:** When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

## Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ “Energy” and “Demand” may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the “Terms to be Used in Reports” column).

## Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

**Deemed Value** – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a deemed measure shall use the superscript “D” (e.g., delta watts<sup>D</sup>, HOU-Residential<sup>D</sup>).

**Non-Deemed Value** – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript “E” for “evaluated” (e.g., delta watts<sup>E</sup>, HOU-Residential<sup>E</sup>).

**Default Value** – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript “DV” as in X<sup>DV</sup> (meaning “Default Value”).

**Adjusted Value** – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript “AV” as in X<sup>AV</sup>

## Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012<sup>19</sup>.

**Evaluation:** Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification, measure level research, and program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

*Synonym:* **Evaluation, Measurement and Verification (EM&V)**

**Measure Level Research:** An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

---

<sup>19</sup> IL-TRM\_Policy\_Document\_10-31-12\_Final.docx

**Program Level Research:** An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

**Savings Verification:** An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

**Measure Type:** Measures are categorized into two subcategories: custom and prescriptive.

**Custom:** Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

**Prescriptive:** The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

**Fully Deemed:** Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

**Partially Deemed:** Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

**Customized basis:** Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

## 5.2 Effects of the IL TRM Implementation on Planned Gas Savings Achievements

Nicor Gas submitted program net planning values in its May 2011 compliance filing, prior to the release of the Illinois TRM. The Nicor Gas-only and Nicor Gas-ComEd programs were estimated to achieve 138,600 net therms. However, the planning values assumed higher savings estimates than were achieved when using the IL TRM impact parameter assumptions. The use of TRM inputs explains the large discrepancy between planned and achieved savings.

The overall program ex ante net therms estimates were updated several times. The National Energy Foundation (NEF) reported its ex ante estimates at the end of the GPY1/EPY4 program year. The program administrator, Wisconsin Energy Conservation Corporation (WECC), reported their pre-TRM estimates of ex ante program savings as well. However, after the TRM was released, WECC used TRM inputs to update impact calculations in October 2012, resulting in 33,955 total ex ante therm estimates (see Table 5-1), significantly less than the 138,600 therm Nicor Gas planning value reported in its compliance filing. The evaluation team ultimately used WECC's final GPY1 TRM-based therms estimates as the program ex ante estimates given that they reflect the application of the IL TRM impact parameter estimates.

**Table 5-1. Nicor Gas-only and Nicor Gas-ComEd GPY1/EPY4 Pre-and Post-TRM Ex Ante Net Gas Savings Estimates (Total Therms) from NEF and WECC**

Measure	NEF	WECC Pre-TRM	WECC Post-TRM
Bath Aerator	116,317	9,872	7,914
Kitchen Aerator	127,166	9,872	7,914
Showerhead	134,382	118,467	18,126
Total	377,865	138,212	33,955

Source: WECC

### 5.3 Verified Gross Program Impact Parameter Estimates

This section outlines the gross impact parameter estimate calculations and assumptions used to determine measure-specific per unit savings.

#### 5.3.1 Low-Flow Showerheads

All of the input parameters for calculating low-flow showerhead savings are deemed by the IL TRM. Table 5-2 shows the complete list of input parameters used per the algorithm in the IL TRM.

**Table 5-2. Showerhead Verified Gross Impact Parameters**

Parameter	Gas Value	Electric Value	Source
Gallons per Minute (base)	2.35	2.35	IL TRM: Retrofit or TOS
Gallons per Minute (low)	2	2	Program Standard
Length of Showers - base (minutes)	8.2	8.2	IL TRM
Length of Showers - low (minutes)	8.2	8.2	IL TRM
Household	4.74	4.74	Custom Input: Survey Data
Showers per Capita per Day	0.75	0.75	IL TRM
Showers per Household	1.79	1.79	IL TRM
Shower Temp	105	105	IL TRM
Supply Temp	54.1	54.1	IL TRM
Recovery Efficiency	0.78	0.98	IL TRM
Energy per Gallon	0.0054	0.1268	IL TRM
Deemed In-service Rate	81%	81%	IL TRM
Days per Year	365.25	365.25	IL TRM
Deemed Gross Savings	9.2 therms	214 kWh	Calculated per IL TRM
Coincidence Factor (Electric only)	-	0.0278	IL TRM
Gross Peak kW Savings (Electric only)	-	0.008	Calculated per IL TRM

### 5.3.2 Kitchen Faucet Aerators

All of the inputs to the TRM faucet aerator algorithm are also deemed. Navigant used the proper drain factor deemed specifically for kitchen faucet aerators. Because the TRM does not disaggregate total length of use by kitchen and bathroom faucets, Navigant used the sum of kitchen and bathroom faucets per household for both kitchen and bathroom faucet aerators. Table 5-3 provides a complete list of deemed and adjusted parameters.

**Table 5-3. Kitchen Aerator Verified Gross Impact Parameters**

Parameter	Gas Value	Electric Value	Source
Gallons per Minute (base)	1.2	1.2	IL TRM
Gallons per Minute (low)	0.94	0.94	IL TRM
Length of Use - base (minutes)	9.85	9.85	IL TRM
Length of Use - low (minutes)	9.85	9.85	IL TRM
Household	4.74	4.74	Custom Input: Survey Data
Drain Factor	0.75	0.75	IL TRM
Faucets per House	1	1	IL TRM
Water Temp	90	90	IL TRM
Supply Temp	54.1	54.1	IL TRM
Recovery Efficiency	0.75	0.98	IL TRM
Energy per Gallon	0.0040	0.0894	IL TRM
Deemed In-service Rate	48%	48%	IL TRM
Days per Year	365.25	365.25	IL TRM
Deemed Gross Savings	1.7 therms	37 kWh	Calculated per IL TRM
Coincidence Factor (electric only)	-	0.022	IL TRM
Gross Peak kW Savings (electric only)	-	0.003	Calculated per IL TRM

### 5.3.3 Bathroom Faucet Aerators

Most of the inputs to the TRM bathroom faucet aerator algorithm are also deemed. Navigant again used the proper drain factor deemed specifically for bathroom faucet aerators. Because the TRM does not disaggregate total length of use by kitchen and bathroom faucets, Navigant used the sum of kitchen and

bathroom faucets per household for both kitchen and bathroom faucet aerators. A complete list of deemed and adjusted parameters is presented in Table 5-4.

**Table 5-4. Bathroom Aerator Verified Gross Impact Parameters**

Parameter	Gas Value	Electric Value	Source
Gallons per Minute (base)	1.2	1.2	IL TRM
Gallons per Minute (low)	0.94	0.94	IL TRM
Length of Use - base (minutes)	9.85	9.85	IL TRM
Length of Use - low (minutes)	9.85	9.85	IL TRM
Household	4.74	4.74	Custom Input: Survey Data
Drain Factor	0.9	0.9	IL TRM
Faucets per House	2.83	2.83	IL TRM
Water Temp	90	90	IL TRM
Supply Temp	54.1	54.1	IL TRM
Recovery Efficiency	0.75	0.98	IL TRM
Energy per Gallon	0.0040	0.0894	IL TRM
Deemed In-service Rate	48%	48%	IL TRM
Days per Year	365.25	365.25	IL TRM
Deemed Gross Savings	2.0 therms	45 kWh	Calculated per IL TRM
Coincidence Factor (electric only)	-	0.022	IL TRM
Gross Peak kW Savings (electric only)	-	0.003	Calculated per IL TRM

### 5.3.4 CFLs

The CFL savings algorithms in the TRM are also partially deemed. The key variable parameters are CFL location, baseline wattage, and efficient wattage, shown in Table 5-5, and the algorithm is as follows:

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

In upcoming years, baseline wattages will be adjusted due to the EISA legislation coming into effect, but EPY4 first-year savings are based on standard incandescent wattages since they were installed before the legislation took effect (beginning June 2012).

Navigant used survey data to calculate or adjust several input parameters, baseline wattage, and parameters dependent on bulb location (indoor or outdoor). The TRM provides location-dependent values for many parameters: because the evaluation team knew the distribution of interior and exterior lamps from the evaluation survey, we used the actual split of interior and exterior locations to determine operating hours and waste heat factors rather than using the “Unknown” operating hours, which assume a certain percentage of exterior lamps.

**Table 5-5. CFL Verified Gross Impact Parameters**

CFLs	Indoor*	Outdoor	Source
WattsBase	65.2	65.2	Weighted average incandescent base
WattsEE	14.0	14.0	Program Standard
ISR: Deemed In-service Rate	70%	70%	IL TRM
Hours	938	1825	IL TRM
WHFe: Waste Heat Factor (energy)	1.06	1.0	IL TRM
WHFd: Waste Heat Factor (demand)	1.11	1.0	IL TRM
Coincidence Factor (electric only)	0.095	0.000	IL TRM; Assume exterior only on at night
Delta kWh	35	65	Calculated per IL TRM
Delta Peak kW	0.004	0.000	Calculated per IL TRM

*\*Navigant assumed all lamps not reported installed outside to be in “residential and in-unit multifamily” space for operating hours and coincidence factor and “interior single family or unknown location” for waste heat factors.*

According to the survey data, 82% of the lamps installed replaced incandescent lamps. However, some respondents reported replacing incandescent wattages, so Navigant did not use this data to adjust savings, concluding that the question was not phrased clearly enough. Navigant determined the incandescent baseline using survey responses indicating the wattage of lamps removed. Table 5-6 shows the distribution of these responses.

**Table 5-6. Distribution of Incandescent Lamps Removed**

Incandescent Type Removed	Percent of Total	2011 Baseline (EPY4)
40W	8%	40
60W	62%	60
75W	20%	75
100W	10%	100
<b>Average Baseline Watts</b>		<b>65.2</b>

*Source: Navigant survey data.*

Navigant used TRM-deemed values for self-install measure-specific in-service rates in its verified gross impact calculations. Table 5-7 outlines the TRM-deemed values used by the evaluation team. The research findings gross impact results using survey-determined in-service rates can be found in Section 5.5.

**Table 5-7. TRM-Deemed Measure In-service Rates for Verified Gross Savings**

Measure	In-Service Rate
Showerheads	81%
Kitchen Aerators	48%
Bathroom Aerators	48%
CFLs	70%

*Source: TRM.*

Navigant incorporated the percent of participants with gas and electric hot water heaters in gross impact estimates. Navigant performed a statistical chi test and determined this breakdown was dependent on both service territory and HRC submission status. Table 5-8 shows the percentages of participants with each kind of water heating fuel type.

**Table 5-8. Participation by Domestic Hot Water (DHW) Fuel Type**

	Nicor Gas-only HRC -	Nicor Gas-only HRC +	Nicor Gas-ComEd HRC -	Nicor Gas-ComEd HRC +
Percent Gas DHW	73%	84%	91%	94%
Percent Electric DHW	18%	16%	9%	4%

Source: Navigant survey data.

\*Note: Percentages do not sum to 100% due to "other" responses

For hot water measures, Navigant used the following equation to determine total savings:

$$\text{Total Gross Savings} = \text{Participants} * \text{Units Distributed per Participant} * \text{Percent Gas/Electric} * \text{Unit Gross Savings}$$

Where the unit gross savings incorporates the in-service rate.

For CFLs, Navigant used the same algorithm but omitted the percent gas or electric factor, assuming that CFLs are always powered by electricity. Unit gross savings per installation are presented in Table 5-9.

**Table 5-9. Unit Verified Gross Savings by Measure**

	Unit Energy Savings (kWh)	Unit Peak Demand Savings (kW)	Unit Energy Savings (Therm)
Showerheads	214	0.008	9.2
Kitchen Aerators	37	0.003	1.7
Bathroom Aerators	45	0.003	2.0
CFLs--Overall	36	0.004	0

Source: Navigant analysis.

#### ***5.4 Research Findings Gross Program Impact Parameter Estimates***

This section outlines the research findings gross impact parameter estimate calculations and assumptions used to determine measure-specific research findings per unit savings. Research findings per unit savings estimates are based on survey findings to determine in-service rates. The deemed parameters and research findings parameters that differ are the in-service rates.

#### 5.4.1 Low-Flow Showerheads

All of the input parameters for calculating low-flow showerhead savings are deemed by the IL TRM. However, to calculate the research findings gross savings, Navigant used the in-service rate based on survey data. This in-service rate is the product of the installation rate (percentage of participants installing unit) and the persistence rate (percentage of those who installed who are still using the unit). Table 5-10 shows the complete list of input parameters used, per the algorithm in the IL TRM, to calculate research findings gross savings.

**Table 5-10. Showerhead Research Findings Gross Impact Parameters**

Parameter	Gas Value	Electric Value	Source
Gallons per Minute (base)	2.35	2.35	IL TRM: Retrofit or TOS
Gallons per Minute (low)	2	2	Program Standard
Length of Showers - base (minutes)	8.2	8.2	IL TRM
Length of Showers - low (minutes)	8.2	8.2	IL TRM
Household	4.74	4.74	Survey Data
Showers per Capita per Day	0.75	0.75	IL TRM
Showers per Household	1.79	1.79	IL TRM
Shower Temp	105	105	IL TRM
Supply Temp	54.1	54.1	IL TRM
Recovery Efficiency	0.78	0.98	IL TRM
Energy per Gallon	0.0054	0.1268	IL TRM
<b>Research In-service rate</b>	<b>45%*</b>	<b>27%*</b>	<b>Survey Data</b>
Days per Year	365.25	365.25	IL TRM
Deemed Gross Savings	5.0 therms	72 kWh	Calculated per IL TRM
Coincidence Factor (Electric only)	-	0.0278	IL TRM
Gross Peak kW Savings (Electric only)	-	0.003	Calculated per IL TRM

\*In-service rates in the “gas” and “electric” columns are Nicor Gas only and Nicor Gas and ComEd values, respectively. The in-service rates were applied across both fuels for each service territory.

#### 5.4.2 Kitchen Faucet Aerators

All of the inputs to the TRM faucet aerator algorithm are also deemed. Navigant used the proper drain factor deemed specifically for kitchen faucet aerators. However, to calculate the research findings gross

savings, Navigant used an in-service rate based on survey data. This in-service rate is the product of the installation rate (percentage of participants installing unit) and the persistence rate (percentage of those who installed who are still using the unit). Table 5-11 provides a complete list of deemed and adjusted parameters used to calculate research findings gross savings.

**Table 5-11. Kitchen Faucet Aerator Research Findings Gross Impact Parameters**

Parameter	Gas Value	Electric Value	Source
Gallons per Minute (base)	1.2	1.2	IL TRM
Gallons per Minute (low)	0.94	0.94	IL TRM
Length of Use - base (minutes)	9.85	9.85	IL TRM
Length of Use - low (minutes)	9.85	9.85	IL TRM
Household	4.74	4.74	Survey Data
Drain Factor	0.75	0.75	IL TRM
Faucets per House	1	1	IL TRM
Water Temp	90	90	IL TRM
Supply Temp	54.1	54.1	IL TRM
Recovery Efficiency	0.75	0.98	IL TRM
Energy per Gallon	0.0040	0.0894	IL TRM
<b>Research In-service Rate</b>	<b>35%*</b>	<b>19%*</b>	<b>Survey Data</b>
Days per Year	365.25	365.25	IL TRM
Gross Savings	1.2 therms	15 kWh	Calculated per IL TRM
Coincidence Factor (electric only)	-	0.022	IL TRM
Gross Peak kW Savings (electric only)	-	0.001	Calculated per IL TRM

\*In-service rates in the “gas” and “electric” columns are Nicor Gas only and Nicor Gas and ComEd values, respectively. The in-service rates were applied across both fuels for each service territory.

### 5.4.3 Bathroom Faucet Aerators

Most of the inputs to the TRM bathroom faucet aerator algorithm are also deemed. Navigant again used the proper drain factor deemed specifically for bathroom faucet aerators. However, to calculate the research findings gross savings, Navigant used the in-service rate based on survey data. This in-service rate is the product of the installation rate (percentage of participants installing unit) and the persistence rate (percentage of those who installed who are still using the unit). A complete list of deemed and adjusted parameters used to calculate research findings gross savings is presented in Table 5-12.

**Table 5-12. Bathroom Aerator Research Findings Gross Impact Parameters**

Parameter	Gas Value	Electric Value	Source
Gallons per Minute (base)	1.2	1.2	IL TRM
Gallons per Minute (low)	0.94	0.94	IL TRM
Length of Use - base (minutes)	9.85	9.85	IL TRM
Length of Use - low (minutes)	9.85	9.85	IL TRM
Household	4.74	4.74	Survey Data
Drain Factor	0.9	0.9	IL TRM
Faucets per House	2.83	2.83	IL TRM
Water Temp	90	90	IL TRM
Supply Temp	54.1	54.1	IL TRM
Recovery Efficiency	0.75	0.98	IL TRM
Energy per Gallon	0.0040	0.0894	IL TRM
<b>Research In-service Rate</b>	<b>38%*</b>	<b>24%*</b>	<b>Survey Data</b>
Days per Year	365.25	365.25	IL TRM
Gross Savings	1.6 therms	23 kWh	Calculated per IL TRM
Coincidence Factor (electric only)	-	0.022	IL TRM
Gross Peak kW Savings (electric only)	-	0.001	Calculated per IL TRM

\*In-service rates in the “gas” and “electric” columns are Nicor Gas only and Nicor Gas and ComEd values, respectively. The in-service rates were applied across both fuels for each service territory.

#### 5.4.4 CFLs

The CFL savings algorithms in the TRM are also partially deemed. However, to calculate the research findings gross savings, Navigant used in-service rate based on survey data, shown in Table 5-13.

Navigant used survey data to calculate or adjust several input parameters, baseline wattage, and parameters dependent on bulb location (indoor or outdoor).

**Table 5-13. CFL Research Findings Gross Impact Parameters**

CFLs	Indoor*	Outdoor	Source
WattsBase	65.2	65.2	Weighted average incandescent base from Survey Data
WattsEE	14.0	14.0	Program Standard
<b>Research In-service Rate</b>	<b>71%</b>	<b>71%</b>	<b>Survey Data</b>
Hours	938	1825	IL TRM
WHFe: Waste Heat Factor (energy)	1.06	1.0	IL TRM
WHFd: Waste Heat Factor (demand)	1.11	1.0	IL TRM
Coincidence Factor (electric only)	0.095	0.000	IL TRM; Assume exterior only on at night*
Delta kWh	36	66	Calculated per IL TRM
Delta Peak kW	0.004	0.000	Calculated per IL TRM

\*Navigant used survey data to determine the percent of bulbs installed indoors and outdoors and assumed all lamps not reported installed outside to be in “residential and in-unit multifamily” space for operating hours and coincidence factor and “interior single family or unknown location” for waste heat factors

### 5.5 Research Findings Gross Program Impact Results

Navigant used program tracking data as well as installation and persistence rates from Navigant’s participant survey to determine the total measures installed and currently in use through the program, also known as the in-service rate. The installation rate is calculated as the number of units installed (as reported by survey respondents) divided by the number of units distributed to the survey sample. The persistence rate is calculated by dividing the number of measures reported currently in use by the number originally installed. Finally, the in-service rate is determined by multiplying the installation rate by the persistence rate, yielding the percent of measures originally distributed that are currently in use. The installation, persistence, and in-service rates for each measure and group of participants are shown in Table 5-14. Navigant performed chi tests on the survey responses to determine whether installation rates were dependent on service territory (Nicor Gas-only or Nicor Gas-ComEd) and/or whether students submitted HRCs (HRC+ and HRC-). We found that installation rates were independent of HRC submission but statistically different in the two service territory groups. Installation rates of water-saving measures were lower in the ComEd service territory.<sup>20</sup> Persistence rates were independent of both HRC submission and territory.

<sup>20</sup> Persistence rates were also analyzed using a statistical chi test, and were found to be independent of territory, meaning that participants in Nicor Gas-only and Nicor Gas-ComEd territories were not different in their propensities to keep measures installed.

**Table 5-14. Measure Installation, Persistence, and In-Service Rates by Service Territory**

Measure	Installation Rates		Persistence Rate	In-Service Rates (Installation*Persistence)	
	Nicor Gas Only	Nicor Gas and ComEd	All	Nicor Gas Only	Nicor Gas and ComEd
Showerheads	61%	37%	73%	45%	27%
Kitchen Aerators	53%	29%	66%	35%	19%
Bathroom Aerators	49%	31%	78%	38%	24%
CFLs	NA	73%	97%	NA	71%

Source: Navigant survey data.

Navigant found that the in-service rates were generally different between the survey findings and the TRM deemed values. Table 5-15 compares research findings and TRM deemed in-service rates. The in-service rates determined the difference in verified gross savings and research findings gross savings.

**Table 5-15. Comparison of TRM Deemed and Research Findings In-Service Rates**

	Research Findings In-Service Rates		Deemed In-Service Rates
	Nicor Gas Only	Nicor Gas and ComEd	TRM
Showerheads	45%	27%	81%
Kitchen Aerators	35%	19%	48%
Bathroom Aerators	38%	24%	48%
CFLs	NA	71%	70%

Source: Navigant survey data; TRM.

As in the deemed savings estimates, Navigant also incorporated the percent of participants with gas and electric water heaters. This breakdown was dependent on both service territory and HRC submission status. Table 5-16 shows the percentages of participants with each kind of water heating fuel type.

**Table 5-16. Participation by Domestic Hot Water Fuel Type**

	Nicor Gas HRC -	Nicor Gas HRC +	Nicor Gas- ComEd HRC -	Nicor Gas- ComEd HRC +
Gas	73%	84%	91%	94%
Electric	18%	16%	9%	4%
Propane	0%	0%	0%	1%
Other	9%	0%	0%	1%

Source: Navigant survey data.

\*Note: Percentages do not sum to 100% due to rounding.

For hot water measures, Navigant used the following equation to determine total savings:

$$\text{Total Gross Savings} = \text{Participants} * \text{Units Distributed per Participant} * \text{Percent Gas/Electric} * \text{Gross Savings per Unit Distributed}$$

Where:

$$\text{Gross Savings per Unit Distributed} = \text{Gross Savings} * \text{Installation Rate} * \text{Persistence Rate}$$

For CFLs, Navigant used the same algorithm but omitted the percent gas or electric factor, assuming that CFLs are always powered by electricity. Navigant changed the household size to reflect Navigant survey data averages as well. Unit gross savings per unit distributed are presented in Table 5-17.

**Table 5-17. Unit Research Finding Gross Savings per Unit Distributed by Measure**

	Unit Energy Savings (kWh)	Unit Peak Demand Savings (kW)	Unit Energy Savings (Therm)
Showerheads	72	0	5.0
Kitchen Aerators	15	0	1.2
Bathroom Aerators	23	0	1.6
CFLs--Overall	37	0.005	0

Source: Navigant survey data; TRM; Navigant Analysis.

Table 5-18 presents total program research findings gross savings by fuel and measure type.

**Table 5-18. Research Findings Gross Savings by Measure and Fuel**

Savings Type	Measure	Nicor Gas-only Total	Nicor Gas-ComEd Total	Program Total*
Therms	Showerheads	19,693	14,154	33,847
	Kitchen Aerators	4,726	3,106	7,831
	Bathroom Aerators	6,157	4,624	10,781
	<b>Total</b>	<b>30,575</b>	<b>21,884</b>	<b>52,459</b>
kWh	Showerheads	100,836	22,171	22,171
	Kitchen Aerators	23,266	4,678	4,678
	Bathroom Aerators	30,312	6,965	6,965
	CFLs	-	552,516	552,516
	<b>Total</b>	<b>154,415</b>	<b>586,330</b>	<b>586,330</b>
kW	Showerheads	4.0	0.9	0.9
	Kitchen Aerators	1.7	0.3	0.3
	Bathroom Aerators	1.8	0.4	0.4
	CFLs	-	156.6	156.6
	<b>Total</b>	<b>7.5</b>	<b>158.2</b>	<b>158.2</b>

Source: Navigant analysis.

\*Nicor Gas-only participant electric savings are not included in the program total. Navigant reports the Nicor Gas-only program's electric savings figures for informational purposes only and is not factoring them into the Nicor Gas-only and Nicor Gas-ComEd program total ex ante and verified electric savings since they are not attributable to ComEd's territory.

Table 5-19 presents the research findings gross savings estimates in comparison with the ex ante estimates as reported by WECC. Low installation rates in the ComEd service territory contributed to low therm savings for the Nicor Gas-ComEd group.

**Table 5-19. Comparison of Ex Ante and Research Findings Gross Savings**

	Nicor Gas-only	Nicor Gas-ComEd	Program Total
Ex Ante Therms	17,187	17,111	34,298
Research Findings Therms	30,575	21,884	52,459
Therm Realization Rate	178%	128%	153%
Ex Ante kWh	n/a	583,568	583,568
Research Findings kWh	154,415	586,330	586,330
kWh Realization Rate	n/a	100%	100%

Source: "Therm Savings Estimates (rev 4-4-12).xlsx", Navigant Analysis

\*Nicor Gas-only participant electric savings are not included in the program total. Navigant reports the Nicor Gas-only program's electric savings figures for informational purposes only and is not factoring them into the Nicor Gas-only and Nicor Gas-ComEd program total ex ante and verified electric savings since they are not attributable to ComEd's territory.

Table 5-20 shows the electric savings from Nicor Gas-only kits (those without CFLs) distributed to schools inside and outside ComEd service territory. The electric savings are shown here only for future cost-effectiveness analysis; they are not included in any gross or spillover savings statistics.

**Table 5-20. Research Findings Electric Savings for Nicor Gas-only Kits**

	Non-ComEd Electricity Customers	ComEd Electricity Customers	Total
Number of kits	533	4,464	4,997
Percent of kits	11%	89%	100%
Gross Research kWh	16,471	137,944	154,415
Gross Research kW	0.8	6.7	7.5

## 5.6 Net Program Impact Evaluation Methods

The primary objective of the net savings analysis is to determine each program's net effect on customers' electricity and gas usage. This requires estimating what would have happened in the absence of program activities and incentives. After gross program impacts are adjusted, net program impacts are derived by estimating a Net-to-Gross (NTG) ratio. The NTG ratio quantifies the percentage of the gross program impacts that are attributable to the program. This includes an adjustment for free ridership (the portion of impact that would have occurred even without the program) and spillover (the portion of impact that occurred outside of the program, but would not have occurred in the absence of the program). A customer self-report method was used to estimate the NTG ratio for this evaluation, using data gathered in paper-based surveys.

### 5.6.1 Free Ridership

Free ridership cannot be measured directly due to absent empirical data regarding the counterfactual situation. Thus, free ridership is assessed as a probability score for each measure. The evaluation relies on self-reported data collected during participant paper-based surveys to assign free ridership probability scores to each measure. More specifically, for each measure, the following questions were posed to each measure recipient:

FR1. If the program had not given the [measure], would your family have purchased them from a store?

FR2. On a scale of 0 to 10 with 0 (no) and 10 (yes), would you have bought the same items in the kit if they weren't given to you for free in the kit?

FR3. When would you have purchased and installed [measure]?

### 5.6.2 Free Ridership Scoring

The free ridership data was assembled into a probability score in a step-by-step fashion, applying the following logic:

If the customer reported that they would not have purchased the measure if the program had not given the measure, then the probability of free ridership for that participant is estimated to be zero (based on FR1 above). Similarly, if the customer reported likelihood of purchasing the same measures as provided in the kit less than or equal to 3 (on a 0-10 scale), then the probability of free ridership is estimated to be zero (based on FR2). If neither of the above criteria holds, then responses to question FR3<sup>21</sup>, the timing plans of the potential purchase, and FR2, likelihood of purchasing, were averaged and divided by 10 to calculate the probability of free ridership. The corresponding formula for calculating free ridership is shown below:

$$[(FR2+FR3)/2]/10$$

Note that in the above formula, if FR1 is invalid (missing or "don't know") then the participant's responses for NTG determination are disqualified.

---

<sup>21</sup> The timing responses from FR3 were converted to point values on a 0-10 scale.

This approach is a modification of that used in the Nicor Gas R29 evaluation to add precision and to approximate current free ridership approaches used in other Nicor Gas and ComEd program evaluations.

### 5.6.3 Spillover

The objective of the spillover assessment is to estimate the impact arising from efficient measures installed as a result of the program that were not incented by the program. The evaluation relied on self-reported data collected during the paper-based participant survey to identify these measures and assess the role of the program in the decision to install.

For each measure installed through the program, the following questions are posed to each measure recipient:

SP1. AFTER the program came to your school, did you BUY and INSTALL any showerheads, faucet aerators, or CFLs like the ones in the kit?

SP2. How many additional measures did you install?

SP3. If you bought more showerheads, aerators, or CFLs after the program, how likely was it that you bought them because of the program? (0-10 scale)

### 5.6.4 Spillover Scoring

The survey data was assembled into an assessment of spillover impact through application of the following method:

If the customer installed additional units of the measure following their participation, and the program was highly influential in the decision to install those measures, the adoption is considered to be potentially program spillover:

*[If SP1=1 and SP3 is greater than or equal to 8, then adoption is spillover]*

Any savings associated with spillover were weighted against the total savings of the participant sample for the particular measure to establish a measure-specific spillover rate.

#### *CFL-Specific Adjustments to Spillover*

The impact credit granted for CFL spillover adoptions must avoid double counting impact credit accrued already through the ComEd midstream residential lighting program. Navigant uses the approach established in the ComEd Single Family PY3 evaluation that assumes that 1) the market share of program bulbs is not a readily available number and 2) the residential lighting program PY3 evaluation results indicated a substantial amount of free ridership (41%), and there is no reason that one program's free ridership cannot be another program's net impact. Thus, it is not necessary that bulbs be un-incented for them to legitimately qualify for credit under the Single Family Program.<sup>22</sup> Due to the uncertainty in this

---

<sup>22</sup> There is some available evidence regarding the CFL market share of residential lighting program bulbs. The PY3 residential lighting general population survey revealed that 87% of CFLs are purchased at stores participating in the ComEd lighting program. Among program stores, the shelf space dedicated to ComEd program CFL bulbs is 53% of the overall shelf space dedicated to CFLs (for standard bulbs), and 62% for specialty bulbs. If we assume shelf space relates directly to sales share, then 46% of standard CFLs and 54% of specialty bulbs are Residential Lighting program bulbs.

area, the evaluation team takes the conservative approach used in the PY3 Single Family evaluation and assumes that only 50% of the impact arising from CFL spillover adoptions is creditable to the program. Again, even if these customers purchased a discounted bulb, the purchase decision was either influenced by both programs (making the 50% assumption reasonable) or influenced by only the EEE program (making the 50% assumption conservative).

#### **5.6.5 Net-to-Gross (NTG)**

The final net-to-gross ratios (NTG) for each measure are calculated as:

$$NTG = 1 - [Free Ridership] + [Spillover]$$

Where,

*Free ridership* is the energy savings that would have occurred even in the absence of program activities and sponsorship, expressed as a percent of gross impact.

And,

*Spillover* is the energy savings that occurred as a result of program activities and sponsorships, but was not included in the gross impact accounting, expressed as a percent of gross impact.

### **5.7 Net Program Impact Parameter Estimate Results**

This section details the results of Navigant's verified net impact analysis for the EEE program, which includes adjustments for both free ridership and spillover.

#### **5.7.1 Free Ridership**

The objective of the free ridership assessment is to estimate the impact of program incented measures that would have been installed even in the absence of the program. This cannot be measured directly due to the inability to observe behavior in the absence of the program. Thus, free ridership is assessed as a probability score for each measure. The evaluation relies on self-reported data collected during participant paper-based surveys to assign free ridership probability scores to each measure.

The research finding results of the program free ridership estimates are shown in Table 5-21.

---

**Table 5-21. Participant Self-Report Free Ridership Results by Measure by Kit Version**

Measure	Nicor Gas-only Average FR	n=	Nicor Gas-ComEd Average FR	n=
Showerhead	40%	44	27%	49
Kitchen Aerator	41%	37	22%	39
Bathroom Aerator	43%	35	30%	40
CFL	NA	NA	58%	100

Source: Navigant participant survey.

The evaluation team finds these free ridership values to be high; they are much higher than values estimated in our evaluation of the program under Rider 29 (R29), as shown in Table 5-22

**Table 5-22. Free Ridership: R29 vs. GPY1 Nicor Gas-only Kits**

Measure	R29*	GPY1/EPY4 Algorithm Applied to GPY1 Nicor Gas-only results	R29 Algorithm Applied to R30 GPY1 Nicor Gas-only results
Showerhead	3%	40%	41%
Kitchen Aerator	5%	41%	47%
Bathroom Aerator	2%	43%	44%

Source: Navigant R29 and GPY1 participant surveys.

\*Note the evaluation team used a different free ridership algorithm for R29 than for R30 GPY1/EPY41.

To explore this difference, the evaluation team first reviewed the free ridership algorithms. Since the free ridership algorithm used for GPY1/EPY4 is different from that used for R29, the evaluation team applied R29's free ridership algorithm to GPY1 Nicor Gas-only survey results<sup>23</sup>. The resulting free ridership values (also shown in Table 5-22) are slightly higher than the values estimated using the GPY1/EPY4 algorithm. In other words, the R29 algorithm appears to inflate FR for GPY1 Nicor Gas-only results and the GPY1/EPY4 algorithm appears to be more conservative. Thus:

1. the conservative GPY1/EPY4 algorithm should continue to be used to estimate FR, and
2. the GPY1/EPY4 algorithm does not explain the higher FR values in GPY1/EPY4.

<sup>23</sup> The converse, applying the GPY1/EPY4 approach to R29 results is not possible because the R29 survey lacks the additional questions that the GPY1/EPY4 approach uses to estimate likelihood and timing.

With further investigation, the evaluation team found that the higher values can be partially explained by a difference in the language used in the key survey questions for free ridership between R29 and GPY1/EPY4. The R29 survey asked the following key question to estimate FR (describing a past state):

“If you installed the [measure], **were you already planning to install a** [measure] before you received the kit?”

In contrast, the key FR question of the GPY1/EPY4 survey asked about **hypothetical** behavior, as follows:

“If the program had not given the [measure] in the kit, **would your family have purchased** them from a store?”

The R29 survey also asked a similarly worded question (about **hypothetical** behavior):

“If you had never received the kit, **would you have purchased a** [measure] by 2012?”

However the results of this hypothetical behavior question were not used to estimate R29 free ridership.

When we apply the R29 FR approach using the R29 **hypothetical** behavior questions, the resulting FR values are higher, as shown in Table 5-23 below.

**Table 5-23. R29 Free Ridership: Reported State vs. Hypothetical Behavior**

Measure	Based on Reported State Question	Based on Hypothetical Behavior Question
Showerhead	3%	14%
Kitchen Aerator	5%	11%
Bathroom Aerator	2%	6%

*Source: Navigant R29 participant surveys.*

Thus, the survey question language may account for some of the difference between R29 free ridership values and GPY1/EPY4 values.

The remaining difference can be explained by a high variability in responses due to two factors:

1. Although we asked students to complete the participant surveys with an adult, our method for administering the survey did not afford a way to control this; and
2. Most children do not understand the third conditional (about a condition in the past that did not happen) until their teens.

On the basis of this analysis on R29 and GPY1/EPY4 free ridership, the evaluation team makes the following recommendations on future free ridership research:

1. Free ridership survey questions should ask about past states (“were you planning to install a measure before the program”), rather than about hypothetical behavior (“would you have purchased a measure”);
2. The survey should be administered to ensure responses are from parents (rather than from students).

### Spillover

The objective of the spillover assessment is to estimate the impact arising from efficient measures installed as a result of the program that were not incented by the program. The evaluation relies on self-reported data collected during the paper-based survey to identify these measures and assess the role of the program in the decision to install. Net program impact evaluation methods are presented within Appendix 5.6. Spillover estimates using this approach and expressed as a percent of measure ex post gross impact are shown in Table 5-24 below.

**Table 5-24. Research Findings Spillover Results by Measure by Utility**

Measure	Nicor Gas-only Spillover	n=	Nicor Gas-ComEd Spillover	n=
Showerhead	7%	38	19%	128
Kitchen Aerator	2%	36	14%	89
Bathroom Aerator	7%	34	9%	90
CFL	NA	NA	31%	84

*Source: Navigant participant survey.*

## 5.8 VDDTSR Memo-Final version

**To:** James Jerozal, Dan Rourke, Dave Nichols, Scott Dimetrosky; Nicor and ComEd Program Managers

**Copy:** Gary Swan, Lisa Aumann, Jennifer Hinman, David Brightwell

**From:** Randy Gunn, Laura Agapay, Emily Merchant, Miroslav Lysyuk

**Date:** January 21, 2013

**Re:** Verification, Due Diligence and Tracking System Review of Nicor's Elementary Education Program

### Introduction

This document provides the results from our review of the Elementary Energy Education (EEE) program's savings tracking system and verification and due diligence procedures. Nicor Gas offered this program to schools in its territory (Nicor-Only) and jointly offered this program with ComEd to schools served by both Nicor and ComEd (Nicor-ComEd). Wisconsin Energy Conservation Corporation (WECC) is the program administrator, and National Energy Foundation (NEF) is the implementation contractor. Navigant's review and recommendations are based on administrator and program staff interviews, NEF's Final Report, the program tracking database, and selected project files. Our review focuses on the following questions:

- Are applications complete and supporting documentation received?
- Is project participation (kits distributed) entered accurately?
- Are savings calculated as intended by the program?
- Are appropriate key performance indicators being tracked?
- Are the QA/QC activities adequate and unbiased (e.g., are samples statistical, is there incorrect sampling that may skew results, etc.).

**This memo is based on information disclosed by NEF and WECC to Navigant that is confidential.**

### Overview of Findings and Recommendations:

#### *Verification and Due Diligence*

Given that the program achieved its participation goals and accumulated a waiting list of teachers wanting to participate (if other schools were unable to participate) suggests that the application process was effective and presented no substantial barriers to participation. Navigant finds that NEF's method to recruit and process applications from eligible schools is streamlined and needs no improvement.

Upon acceptance into the program, parents sign a student permission form. Since parents are required to sign a permission form before a student can take a kit home, the evaluation team believes the eligibility process for students may present an undue barrier to participation. The evaluation team found no difficulty obtaining parent signatures in its student surveys (participant and non-participant). Yet, the program may lose potential participants by adding an additional step obtaining a parent signature before students can participate. Furthermore, it may present an additional burden on teachers.

Navigant recommends shifting the participation from opt-in to opt-out. In this structure, students (of participating classes) are assumed to participate unless their parent/guardian has them return their signed request to opt out.

Navigant recognizes NEF's approach to estimate installation rates to be superior to simply assuming every measure of every kit distributed is installed. However, documentation of this assumption is absent and is evident only in the savings formula in the Savings Sheets. This key assumption should be documented and explained in the Savings Sheets and in the Final Report. Furthermore, NEF determines the installation rate based on the responses from the Home Report Cards (HRCs) returned and then applies the installation rate to the unreturned HRCs. While the sample design is the whole population, the final sample is determined by students and teachers: NEF ultimately receives HRCs that were 1) completed and returned to teachers by students and 2) returned to NEF by teachers. This first element, of self-selection, may bias the resultant sample given that a student's non-response may reflect non-installation. Thus the impact evaluation will compare the installation rates of respondents to non-respondents.

### *Reporting and Tracking*

The evaluation team found some errors in the tracking system, including discrepancies between HRCs and entries in the tracking system, missing data, and data inconsistencies. This is most likely due to:

- A lack of documented procedures for tracking kits, HRCs, and incentives
- Tracking of key performance indicators in multiple unconnected files (no master file)
- A lack of method to track updates to key performance indicators in the tracking system

The tracking system errors and inconsistencies may impact savings calculations.

In order to address the tracking system inadequacies, Navigant recommends that NEF consolidate their tracking system into a single master multi-user tracking database and establish clear documented procedures for tracking kits, HRCs, and incentives.

The evaluation team also reviewed the program's key performance indicators (KPIs) and found them to be appropriate for program tracking. KPIs include schools registered, teachers registered, number of students registered, number of kits received and distributed, and incentive award amounts. However tracking is conducted across several Microsoft Excel tracking files and updates to data are not tracked in any way.

A key element that must be incorporated into the tracking database is the ability to track the changes made by the program staff at NEF. Since multiple people have access to the tracking system, it is important that updates to KPIs are logged (recording when a change is made, by whom, and why).

## Data Collection

Navigant’s review of the program’s verification, due diligence, and tracking system included communications with program administration and implementation contractors and reviews of program documentation, including Program Plan, Final Report, Main Tracking Sheet, Savings Sheets, and Raw Household Report Card (HRC) Responses. To conduct the best practices benchmarking assessment, the team consulted the *Best Practices Self-Benchmarking Tool* from the *National Energy Efficiency Best Practices Study*<sup>24</sup>.

Table 5-25 below lists the documents that Navigant reviewed for this assessment.

**Table 5-25. Files reviewed by Navigant**

Document	File Name	Author	Last Updated
Program Plan	5_Elementary Education.docx	Lisa Aumann	7/5/2012
Schools and Presentation Schedule	Participating schools and presentation schedule 10-31-11 (w-Nicor-ComEd staff attendees).xls	Lisa Aumann	3/28/12
Tracked Fields	Elem Ed Nicor-ComEd Data Collection List 2011-12-01.xls	Lisa Aumann	3/28/2012
Schools and Teachers	2011 Nicor Gas School List w-Teacher info (sent 4-9-2012).xls	Lisa Aumann	4/9/2012
Final Report	T!E Nicor Gas 2011 Report – Full.pdf	Lisa Aumann	3/28/2012
Main Tracking Sheet	T!E Nicor-only 2011 Tracking Sheet.xls	Lisa Aumann	5/8/2012
Raw HRC Responses	Nicor-only 2011 Master Raw Data.xls	Lisa Aumann	5/8/2012
Mini-Grants Tracking Sheet	T!E Nicor Gas mini-grants 2011.xls	Lisa Aumann	3/28/2012
Savings Sheet (1 of 2)	Therm Savings Estimates (rev 4-4-12).xls	Lisa Aumann	4/9/2012
Savings Sheet (2 of 2)	Nicor Think! Energy Calculation 2010.xls	Laurie Mason	Unknown

## Review of Program Operating Procedures and Tracking System

The Navigant team collected program tracking information and the program’s Scope of Work from the program contractors. Navigant also analyzed the tracking databases used to distribute program kits and

<sup>24</sup> See the Best Practices Self-Benchmarking Tool developed for the Energy Efficiency Best Practices Project: <http://www.eebestpractices.com/benchmarking.asp>

surveys to participating classrooms, track incentives, organize survey results, and tabulate program savings. The program has no formal operating procedures to review.

#### *Rider 29 Recommendation Adoption*

The evaluation team reviewed whether recommendations from the R29 evaluation were adopted for the R30 program cycle. The following is a review of the recommendations in R29 against program developments to date under R30:

Navigant's review of the Rider 29 program recommended that NEF consolidates their tracking system into a single master multi-user tracking database.

- This has not yet been addressed in the Rider 30 program.

During Rider 29 Navigant determined that NEF did not track in its tracking system the difference between the original number of kits sent to teachers (as initially requested by the teachers) and the final number of kits that the teachers confirmed distributing.

- This has been addressed in the Rider 30 program—there is a column in the tracking sheet that shows the numbers of kits received and the number of kits teachers reported distributed.

During Rider 29 Navigant recommended that NEF at a minimum 1) track the requested number of kits separately from the confirmed number of kits, 2) track the receipt of accountability forms, and 3) track physical counts of kits with shipping records.

- In the Rider 30 analysis the evaluation team did not see any evidence that NEF tracked the receipt of accountability forms. NEF informed Navigant that they do track the accountability forms; however, this was not evident in the documentation that Navigant received.
- Though NEF has improved their process for tracking the number of kits that are taken home in Rider 30, there is still room for improvement. Detailed recommendations can be found in the tracking system review section below.

In Rider 29 the evaluation team found that NEF inconsistently uses the word "participant" in reporting.

- This is still an issue in Rider 30.

In Rider 29 Navigant recommended that NEF maintain an electronic copy of HRCs to safeguard primary data.

- NEF still does not maintain electronic copies of the HRCs.

In Rider 29 the evaluation team recommended that NEF establish a system to track survey counts along the process chain between NEF and the organization that scores the surveys, Resource Action Plan (RAP).

- This remains an issue in Rider 30 and thus the evaluation team reiterates this recommendation.

#### *Application Review*

The program requires two levels of eligibility for participation: 1) a participating school must be in the Nicor Gas and ComEd service territory<sup>25</sup> and 2) a participating student must have written parental/guardian approval.

NEF recruits schools by sending flyers to certain schools in Nicor Gas and ComEd's service territories as appropriate which direct teachers to a website where they can apply to participate in the program. The web-based application process is streamlined and supports participation.

To confirm school eligibility, for each application, NEF checked that each applying school was on the Nicor and Nicor-ComEd-confirmed "Qualified Schools List" of eligible schools. Navigant checked list membership of 30 randomly selected schools and found all thirty to be on the list of eligible schools. For student eligibility, NEF reported tracking parental approval, although this tracking was not made available to Navigant for review. Parents must sign a permission form for their child to participate.

The fact that the program achieved its participation goals and accumulated a waiting list of teachers wanting to participate (if other schools were unable to participate) suggests that the application process was effective and presented no substantial barriers to participation.

#### ***Recommendations***

Navigant finds that NEF's method to recruit and process applications from eligible schools is streamlined and needs no improvement. However, the eligibility process for students may present an undue barrier. Navigant recommends shifting the participation from opt-in to opt-out. In this structure, students (of participating classes) are assumed to participate unless their parent/guardian has them return their signed request to opt-out.

#### *Inspections*

The program does not conduct on-site verification of measure installation. Instead, NEF asks every participant to complete a Scantron survey, known as the Household Report Card (HRC), to estimate kit product installations and behavioral changes after receiving the kit and instruction. NEF offers incentives for students to complete and return the HRC to their teacher (a plastic bracelet) and for teachers to return the HRC to NEF (a mini-grant of up to \$100, based on the percentage of HRCs the teacher returns to NEF). In this way, NEF uses the HRC to estimate the measure installation rate of the participant population, using the whole participant population as the sample. This approach results in a more conservative and accurate estimate of installation rates than simply assuming every measure in every kit taken home is installed.

NEF determines the installation rate based on the responses from the HRCs returned and then applies the installation rate to the unreturned HRCs. While the sample's results are applied to the whole participant

---

<sup>25</sup> Both Nicor and ComEd territory eligibility was required only for the joint program.

population, the sample itself is determined by students and teachers: NEF receives only those HRCs that were 1) completed and returned to teachers by students and 2) returned to NEF by teachers. The first of the two factors is driven by self-selection and consequently may bias the related results given that a student's non-response may reflect non-installation. Consequently, the GPY1/EPY4<sup>26</sup> impact evaluation will compare the installation rates of respondents to non-respondents.

### *Recommendations*

Navigant recognizes NEF's approach to estimate installation rate to be superior to simply assuming every measure of every kit distributed is installed. However, Navigant recommends that NEF explicitly document their assumption that the installation rate of respondents is the same as non-respondents'. Documentation of this assumption is absent and is evident only in the savings formula in the Savings Sheets. This key assumption should be documented and explained in the Savings Sheets and in the Final Report.

### *Tracking System*

In order to evaluate NEF's tracking system Navigant reviewed the documents listed in Table 5-25 above.

In preparation for each school visit, Think! Energy curriculum packets and Take Action! Kits are shipped to the school's designated "lead teacher" in advance of the presentation to distribute amongst other participating teachers. The number of kits teachers receive is determined by their self-reporting in the online application system. Upon receiving kits in the mail, teachers distribute them to students to take home the day of the presentation. NEF tracks final kits distributed by asking teachers to confirm the number of kits they are accountable for and to return to the presenters any kits they believe they will not be able to distribute. Presenters note the adjustments on a teacher accountability form and NEF updates their tracking system based on the adjustments from the form.

NEF tracks the KPIs across several Microsoft Excel tracking files. They include schools registered, teachers registered, number of students registered, number of kits received and distributed, and incentive awards. The team's review found that the KPIs tracked are adequate, but identified three main weaknesses in the system:

- Lacks documented procedures for tracking kits, HRCs, and incentives
- Tracks KPIs in multiple unconnected files (no master file)
- Lacks method to track updates to KPIs in the tracking system

These inadequacies resulted in a number of tracking errors, shown in Table 5-26 below, which Navigant found among the tracking system files:

---

<sup>26</sup> This memo is part of the Nicor PY1 (GPY1) and ComEd PY4 (EPY4) evaluation years.

**Table 5-26. Errors resulting from inadequacies in the tracking system**

Tracking Error	Consequences	
	Savings (Y/N)	Incentives (Y/N)
The RAW HRC Responses includes results for 10 surveys that NEF does not account for in the Main Tracking Sheet.	Y	Y
There are at least 12 additional tracking data discrepancies between the Raw HRC Responses and the Main Tracking Sheet.	Y	Y
Tracking data for one school (Owen Elementary) suggest they returned more HRCs than the tracked number of kits that the program gave them.	Y	Y
Ninety-two HRCs have no school ID associated with them.	N	Y
Several tracked incentives given to teachers do not correspond to the tracked number of kits and tracked number of returned HRCs.	N	Y

*Recommendations*

In order to address these inadequacies, Navigant recommends that NEF consolidate their tracking system into a single master multi-user tracking database.

A key element that must be incorporated into the tracking database is the ability to track the changes made by the program staff at NEF. Since multiple people have access to the tracking system, it is important that changes to KPIs are logged (recording when a change is made, by whom, and why). These changes include updates to the tracking of kits distributed fields in the tracking system as teachers submit their accountability forms.

**Benchmarking**

To conduct the best practices benchmarking assessment, we compared the Elementary Energy Education Program practices (shown in bullet form) with the “Cross-Program Best Practices” portion of the *Best Practice Self-Benchmarking Tool* from the *National Energy Efficiency Best Practice Study*<sup>27</sup>, which are the numbered items in italic font below.

*Quality Control and Verification*

Table 5-27 summarizes the scores as determined by the Self-Benchmarking Tool criteria in the “Quality Control and Verification” section.

---

<sup>27</sup> “Best Practices for Energy Efficiency Programs” benchmarking tool is available at: <http://www.eebestpractices.com/benchmarking.asp>

**Table 5-27. Quality Control and Verification Benchmarking Scores**

ID	Best Practice	Score*
1	Use measure product specification in program requirements & guidelines	Meets best practice
2	Verify accuracy of rebates, coupons, invoices to ensure the reporting system is recording actual product installations by target market	Needs some improvement
3	Assure quality of product through independent testing procedures	Needs significant improvement
4	Assess customer satisfaction with the product through evaluations	Needs some improvement

**\*Scores are on a scale of 0-2 (two being best), based on the metric definitions contained in the tool.**

1. *Use measure product specification in program requirements & guidelines*
  - Meets best practice.
  - Nicor clearly specified measure criteria in their request for proposals (RFP) for this program. The flow rate requirements for the shower heads and faucet aerators used in the kits were specified in the RFP.
2. *Verify accuracy of rebates, coupons, invoices to ensure the reporting system is recording actual product installations by target market*
  - Almost meets best practice – needs some improvement.
  - While NEF attempts to track kit distribution with teacher accountability forms, NEF needs to improve the rigor of that tracking.
3. *Assure quality of product through independent testing procedures*
  - Needs significant improvement.
  - Navigant conducted lab studies on two of the measures in the kits and found discrepancies between the criteria specified in the RFP and the actual flow rates of the devices chosen by NEF. The success of the program’s ability to meet its savings target is in jeopardy due to a lack of testing procedures before the program.
  - Navigant will discuss this issue in the impact evaluation.
4. *Assess customer satisfaction with the product through evaluations*
  - Needs some improvement.
  - While the program conducts teacher and parent evaluations, only teachers are asked about measure satisfaction. Parents should also be asked about measure satisfaction.

#### *Reporting and Tracking*

In order to evaluate the reporting and tracking procedures and tools of Nicor and ComEd’s Elementary Energy Education Programs, Navigant compared their methods to the best practices in the “Reporting and Tracking” section of the Self-Benchmarking Tool. Table 5-28 summarizes the scores as determined by the benchmarking criteria, and the bulleted list below provides additional descriptions of the chosen rating.

**Table 5-28. Reporting and Tracking Benchmarking Scores**

ID	Best Practice	Score*
1	Define & identify key information needed to track & report early in program development process	Meets best practice
2	Clearly articulate the data requirements for measuring program success	Needs some improvement
3	Design program tracking system to support requirements of evaluators as well as program staff	Needs significant improvement
4	Use Internet to facilitate data entry & reporting; build in real time data validation systems	Needs some improvement
5	Automate, as much as is practical, routine functions (e.g., monthly program reports)	Needs some improvement
6	Develop electronic application processes	Meets best practice
7	Develop accurate algorithms & assumptions on which to base savings estimates	Needs some improvement
8	Conduct regular checks of tracking reports to assess program performance	Meets best practice
9	Document tracking system & provide manuals for all users	Needs some improvement
* Scores are based on the metric definitions contained in the tool.		

1. *Define & identify key information needed to track & report early in program development process*
  - Meets best practice.
  - Nicor and NEF identified the program objectives, metrics, and deliverables in the Scope of Work before implementing the program.
  - NEF created a data collection list in the program development process to ensure that the necessary metrics would be tracked. Navigant compared NEF's data collection list to what was actually tracked in the master tracking database and found all data requirements were tracked.
2. *Clearly articulate the data requirements for measuring program success*
  - Needs some improvement.
  - Navigant found that NEF's tracking system and its report use the terms "participant" and "participant rate" inconsistently. Also NEF uses two different types of participants in its reporting and tracking but does not clearly define the differences between them: 1) participants as defined by the number of respondents to a survey question and 2) participants as defined by the number of kits distributed. Navigant suggests NEF define four terms for these distinct concepts in a glossary and use them consistently.
3. *Design program tracking system to support requirements of evaluators as well as program staff*
  - Needs significant improvement.
  - NEF tracked kits distributed, HRCs returned, and incentive data. However multiple and redundant files in various formats increase the risk of errors in tracking data. Navigant suggests using one master system to track all metrics and reduce tracking errors. This system should track adjustments to key performance indicators (date, KPI, adjustment, reason, adjuster).
  - Unused kits are often informally exchanged between classrooms as needed, which improves actual participation. However the tracking system does not account for this.

As a result, there were 92 surveys completed with no school ID associated with them which complicates incentive disbursement.

4. *Use Internet to facilitate data entry & reporting; build in real time data validation systems*
  - Needs some improvement.
  - Teachers submit their application online. The system facilitates application validation by notifying participants which data is required before they can submit their application.
  - Program can expand use of Internet to centralize tracking data updates and validation.
5. *Automate, as much as is practical, routine functions (e.g., monthly program reports)*
  - Needs some improvement.
  - Resource Action Programs (RAP) tabulated survey data using Scantrons and OMR technology, which automated the process and reduced manual tabulation.
  - Program lacks routine periodic check of KPIs.
6. *Develop electronic application processes*
  - Meets best practice.
  - The program participation application process was conducted via a streamlined, program-specific interactive website. NEF's promotional material directed select schools to the site to apply.
7. *Develop accurate algorithms & assumptions on which to base savings estimates*
  - Needs some improvement.
  - Some key input assumptions should be adjusted to reflect the program where possible such as the household size being much higher than the census average and the program delivery mechanism does not cleanly fit with "direct install" or "self-install".
8. *Conduct regular checks of tracking reports to assess program performance*
  - Meets best practice.
  - NEF tracked reports to monitor program performance versus goals to enroll additional schools from the waitlist as needed and ultimately met its goal of kits to distribute.
9. *Document tracking system & provide manuals for all users*
  - Needs some improvement.
  - In the Scope of Work provided by NEF there is a process flow which shows how the data is being tracked. However, the current tracking system does not track adjustments made to key performance indicators (when, why, and by whom the changes were made).

## 5.9 Program Theory Logic Model Review

### *Program Theory*

Program theory is essentially a structured description of the various elements of a program's design: goals, motivating conditions/barriers, target audience, desired actions/behaviors, strategies/rationale, and messages/communications vehicles. The following subsections describe the Elementary Energy Education (EEE) program, which is jointly sponsored by Nicor Gas (Nicor) and ComEd, administered by Wisconsin Energy Conservation Corporation (WECC), and implemented by National Energy Foundation (NEF), in these terms.

#### 5.9.1 Program Goals

The main goal of the EEE Program is to produce immediate and long-term natural gas energy savings in the residential sector by educating elementary school students and their families to think critically about energy and how they can conserve energy in their homes. Though the primary focus of the program is to educate and motivate residential customers to reduce their use of energy for water heating and for lighting, a secondary goal of the program is to reduce residential use of water. Additionally, the EEE

Program aims to increase participation in other Nicor and ComEd programs via cross-marketing and increased customer awareness of energy efficiency issues.

### **5.9.2 Motivating Conditions**

The program is designed to achieve energy savings goals through the education of elementary students and their families about energy savings opportunities and the provision of efficient technologies to achieve those savings. This goal is necessitated by the many barriers that exist to the adoption of energy efficient measures in the household, which can include a lack of energy awareness, competing demands on customers' time and resources, or ambivalence towards replacing household fixtures that are in working order and generally have a long life. Additionally, households that are willing and able to institute more energy efficiency measures may not be knowledgeable of the options available to them. Customer education will be used as a primary tool to stimulate action toward following-through on installation of recommended measures.

### **5.9.3 Target Audience**

The target market for this program will be elementary school students, particularly 5<sup>th</sup> graders, and their families in the Nicor service territory. Schools served by Nicor and ComEd will receive kits that are like the Nicor-only kits but also have CFLs and ComEd program information. For Nicor-only schools, the program will prioritize recruiting schools that have a high percentage of residential customers in the district using natural gas for water heating.

### **5.9.4 Desired Actions/Behaviors**

The program seeks to alter daily behaviors regarding energy conservation among elementary school students and their families. This is accomplished in three primary ways. Elementary students are taught about the basics of energy efficiency and encouraged to have conversations about their energy use with their families at home. Second, participating students are provided with a take-home kit of energy saving measures to install in their homes as part of the energy conversation with their families. Lastly, customers are encouraged to participate in a variety of energy efficiency programs offered by Nicor and ComEd through greater energy awareness and the use of cross-marketing materials.

### **5.9.5 Strategies/Rationale**

The EEE program's strategy is to use student education as a primary tool to induce various actions toward reducing household water and energy use both immediately and over the long-term. The information presented to students during the school presentations and in the take-home kits serve to educate students and their families about the benefits of behaviors that conserve natural gas, electricity, and water. Along with encouragement from teachers and presenters, this information is meant to facilitate a dialogue between students and their families about their household energy use and influence their long-term energy use behavior through increased awareness. Cross-marketing materials included in the take-home kits are intended to steer interested customers to other Nicor and ComEd programs and energy saving opportunities.

Relationships with school administrators and teachers are a key component of the successful delivery of the EEE program. Furthermore, teachers are the primary point of contact between NEF as the program implementer and the students. As a result, teacher encouragement of their students is a critical component in the process of ensuring that students participate, take home the prepared energy efficiency kits, and continue the conversation on energy efficiency after the NEF presentation. Teachers are

provided with a mini-grant as an incentive towards keeping the energy conversation going and ensuring that students return their home report cards (HRCs) summarizing the steps their household has taken as a result of the EEE program.

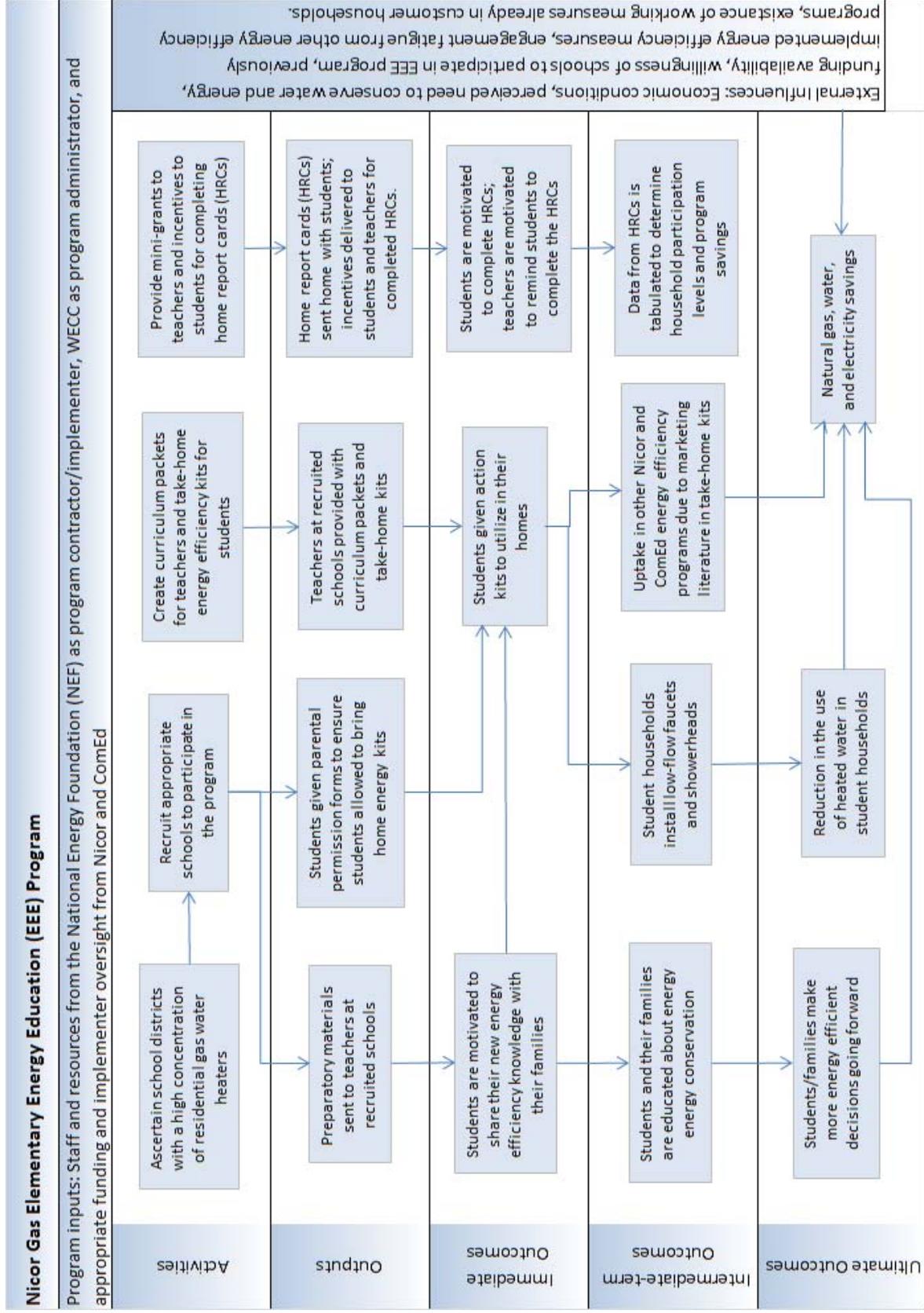
#### **5.9.6 Messages/Communications Vehicles**

To encourage student and household participation, NEF has designed an interactive school presentation that is specifically targeted towards 5<sup>th</sup> graders, to be delivered by NEF-trained instructors. This presentation, combined with informational and promotional materials from Nicor and ComEd, will be the main vehicle through which information is conveyed to students and families. In addition, teachers will also serve as an intermediary between the program and the students. NEF will provide participating teachers with a curriculum packet to aid them in this role.

#### **5.9.7 Program Logic**

The following section describes how the Elementary Energy Education program activities lead to achieving the program energy savings goals. Figure 5-1 presents the program logic model diagram showing the linkages between activities, outputs and outcomes, and identifying potential external influences. The diagram presents the key features of the program.

Figure 5-1. Elementary Energy Education Program Logic Model



### 5.9.8 Resources

The program budget supports the training, education, promotion, and data collection activities of the program implementation contractor, the National Energy Foundation (NEF), to develop an educational program targeted to 5<sup>th</sup> graders. The budget also supports the distribution of take-home energy efficiency kits and promotional materials to participating students, and small program incentives given to teachers and students who meet certain participatory criteria.

There are also external influences that can help or hinder achieving anticipated outcomes. Key program inputs and potential external influences are shown in Table 5-29.

**Table 5-29. Program Inputs and Potential External Influences**

<b>Program Inputs</b>
<ul style="list-style-type: none"><li>• National Energy Foundation (NEF) as program contractor and implementer</li><li>• Nicor and ComEd ratepayer funds</li><li>• Nicor, ComEd, and WECC staff resources and experience administering/managing the program</li></ul>
<b>External Influences and Other Factors</b>
<ul style="list-style-type: none"><li>• Economic conditions</li><li>• Perceived need to conserve water and energy</li><li>• Availability of funding</li><li>• Willingness of school districts to participate in the program</li><li>• Previous energy efficiency measures implemented</li><li>• Increased awareness of energy efficiency measures from other EE programs and campaigns</li><li>• Engagement fatigue from other energy efficiency programs</li><li>• Existing working measures already installed in households</li></ul>

### 5.9.9 Activities

The key program activities, described in more detail in Table 5-30, include:

- Recruitment of participating schools
- Creation and delivery of curriculum packets and take-home energy efficiency kits to schools
- NEF implementation team conducts on-site presentation at participating schools
- Take-home energy efficiency kits given to students
- Incentives for participating students and classrooms
- Post-presentation home report cards (HRCs)



**Table 5-30. Elementary Energy Education Program Activities**

**Recruitment of Participating Schools**

- Determine school districts with high percentage of residential customers with natural gas water heaters
- In communication with the Illinois Department of Education (IDE), Nicor, and ComEd, NEF recruits and schedules schools to participate in the program
- Master schedule created and communicated to Nicor and ComEd

**Curriculum Packets and Energy Efficiency Kits**

- Curriculum packets contain instructions to teacher and action items to be accomplished prior to presentation
- Take-home kits contain energy efficiency materials for home installation, informational brochures, and marketing material for other energy efficiency programs
- Curriculum packets and energy efficiency kits shipped to participating teachers prior to presentation

**School Presentations**

- Each participating school visited by implementation team consisting of two qualified NEF facilitator/instructors
- Presentations last approximately 45 minutes to one hour and are designed for an audience of 50 to 100 students and teachers
- Include instruction on energy and efficiency concepts and hands-on learning activities
- Teachers hand out take-home energy efficiency kits to students shortly after presentation

**Incentives for Participating Students and Classrooms**

- Teachers incentivized with a \$100 mini-grant to return at least 80% of classroom HRCs, detailing installation rates and other household energy behavior
- Students incentivized with a small, token incentive to turn in their HRC to teacher
- Parents incentivized to participate by receiving a free kit of energy efficiency device for home installation

**5.9.10 Outputs, Outcomes and Key Measurement Indicators**

The following section distinguishes between outputs and outcomes. In this document, outputs are defined as the immediate results from specific program activities. Examples for this program would be preparations at schools recruited to participate in the program or parental permission for students to bring home an energy efficiency kit.

Outcomes are distinguished from outputs by their less direct (and often harder to quantify) results from specific program activities. Outcomes represent anticipated impacts associated with the EEE program's activities and will vary depending on such factors as the willingness of households to install the energy efficiency materials provided to participating students. Program activities will lead to immediate outputs that, if successful, will collectively work toward achievement of anticipated intermediate and ultimate program outcomes.

The following tables list outputs (Table 5-31) and outcomes (Table 5-32). For each indicator, a proposed data source or collection approach is presented.



**Table 5-31. Program Outputs, Key Performance Indicator and Potential Data Sources**

<b>Outputs</b>	<b>Indicators</b>	<b>Data Sources and Potential Collection Approaches</b>
Preparatory materials sent to teachers at recruited schools	Number of schools and teachers enrolled in program	Program tracking data
Students given parental permissions forms to ensure they are allowed to bring home energy kits	Number of students granted parental permission to participate	Program tracking data
Teachers at recruited schools provided with curriculum packets and take-home kits	Number of schools and teachers enrolled in program	Program tracking data
Home report cards (HRCs) sent home with students; incentives delivered to students and teachers for completed HRCs.	Number of HRCs completed; number of teacher mini-grants delivered; number of student incentives (wristbands) delivered	HRCs and program tracking data



**Table 5-32. Program Outcomes, Key Performance Indicators and Potential Data Sources**

<b>Outcomes</b>	<b>Key Performance Indicators</b>	<b>Data Sources and Potential Collection Approaches</b>
<b>Immediate</b>		
Students are motivated to share their new energy efficiency knowledge with their families	Number of students participating in program; students who report that they know more about energy after program	HRCs and program tracking data
Students given action kits to utilize in their homes	Number of take-home kits provided to students	Program tracking data
Students are motivated to complete HRCs; teachers are motivated to remind students to complete the HRCs	Student HRC data compiled by implementer	HRCs
<b>Intermediate-Term</b>		
Students and their families are educated about energy conservation	Number of student participating in the energy efficiency presentation and taking home an energy efficiency kit	Program tracking data
Student households install low-flow faucets and showerheads	Household installation rates	HRCs and participant surveys
Uptake in other Nicor and ComEd energy efficiency programs due to marketing literature in take-home kits	Difference-in-difference in program participation rates	Program tracking data
Data from HRCs is tabulated to determine household participation levels and program savings	Household installation rates	HRCs and participant surveys
<b>Ultimate</b>		
Students and families make more energy efficient decisions going forward	Behavioral changes in student households and uptake in Nicor energy efficiency programs	HRCs, participant surveys, and program tracking data
Reduction in the use of heated water in student households	Household installation rates and student measurements	HRCs and participant surveys
Natural gas, water, and electricity savings	Verified kW and kWh savings	Program tracking data and participant surveys



5.10 Data Collection Instruments

Nicor Gas/Com Ed Final Survey

THINK! ENERGY with Nicor Gas and ComEd Program Survey

Parents and Guardians: Earlier this school year, your child participated in the THINK! ENERGY program, which included a take-home kit to help your child teach the family about energy and energy efficiency. The purpose of this survey is to help the sponsors, Nicor and ComEd, improve this program. Please complete this form with your child and have them return it to your classroom teacher. In return for your participation, your child’s classroom will receive a \$75 check!

Name	Date
School	Teacher

- a.
- b. Please check the box next to your answer or write your answer on the blank line.

1. What kind of home do you live in?

- Single House \_\_\_\_\_
- Apartment Building
- Mobile Home
- Other:

2. How many people including you live in this house?

\_\_\_\_\_

3. What do you heat your home with?

- Electricity
- Natural Gas
- Propane
- Wood
- Don't Know
- Other: \_\_\_\_\_

4. Does your family pay for the gas bill for your home?

- Yes
- No
- Not Sure

5. Does your family pay for the electric bill?

- Yes
- No
- Not Sure

6. Do you have your own furnace that heats just your home?

- Yes
- No
- Not Sure

7. Do you have your own water heater that heats water for just your home?



Yes                       No                       Not Sure

**8. What type of fuel does your water heater use?**

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| <input type="checkbox"/> Electricity | <input type="checkbox"/> Wood         |
| <input type="checkbox"/> Natural Gas | <input type="checkbox"/> Don't Know   |
| <input type="checkbox"/> Propane     | <input type="checkbox"/> Other: _____ |

**9. Did you receive a THINK! ENERGY Take Action Kit (with 1 high efficiency showerhead, 1 kitchen faucet aerator, 1 bathroom faucet aerator, and 3 CFLs, among other items) through the program?**

Yes                                       No

**10. Did you fill out and return a survey (the "Household Report Card") to your teacher after the THINK! ENERGY presentation you had in the fall?**

Yes                       No                       Not Sure

**IF YOU ANSWERED "NO" TO QUESTION 9, SKIP TO QUESTION 18!**

**c. Efficient Showerhead**

**11. Did you successfully install the *High Efficiency Showerhead* like the one in this picture?**

Yes                       No



**IF YOU ANSWERED "NO": Fill in the main reasons why not:**

- |  |  |
|--|--|
| <input type="checkbox"/> It did not fit                      | <input type="checkbox"/> Didn't have tools           |
| <input type="checkbox"/> Already had an efficient showerhead | <input type="checkbox"/> Didn't know how to install  |
| <input type="checkbox"/> Landlord won't allow                | <input type="checkbox"/> We liked our own showerhead |
|  | <input type="checkbox"/> Other: _____                |

**IF YOU ANSWERED "YES":**

a) \_\_\_\_\_ Are you still using the efficient showerhead?

Yes, still using it                       No, no longer using it

i. **If you answered "No, no longer using it," fill in the one main reason why not:**

- |  |                                       |
|--|---------------------------------------|
| <input type="checkbox"/> Water pressure was too weak | <input type="checkbox"/> Other: _____ |
| <input type="checkbox"/> I didn't like it            | _____                                 |
| <input type="checkbox"/> It leaked                   |                                       |

**12. Does your family use the *shower timer* from your kit? (It's like the one in the picture to the right)**

Yes, Always                       Yes, Often                       Yes, Occasionally                       No, We don't use it



a) **If you use it, how many family members use the *shower timer*?** \_\_\_\_\_



**d. Kitchen Faucet Aerator**

13. Did you install the *Kitchen Faucet Aerator*? (remember, it's like the one in the picture to the right)

- Yes       No



**IF YOU ANSWERED "NO":** Fill in the main reasons why not:

- |  |                          |                            |
|--|--------------------------|----------------------------|
| <input type="checkbox"/> It did not fit                | <input type="checkbox"/> | Didn't know how to install |
| <input type="checkbox"/> Already had a kitchen aerator | <input type="checkbox"/> | We liked our own           |
| <input type="checkbox"/> Landlord won't allow          | <input type="checkbox"/> | Other: _____               |

- Didn't have tools

**IF YOU ANSWERED "YES":**

a) \_\_\_\_\_ Are you still using the Kitchen Aerator?

- Yes, still using it       No, no longer using it

i. If you answered "No, no longer using it," fill in the main reason why not:

- Water pressure was too weak       Other: \_\_\_\_\_
- I didn't like it

- It leaked

**e. Bathroom Faucet Aerator**

14. Did you install the *Bathroom Faucet Aerator*? (It's like the one to the right).

- Yes       No



**IF YOU ANSWERED "NO":** Fill in the main reasons why not:

- |   |                          |                            |
|---|--------------------------|----------------------------|
| <input type="checkbox"/> It did not fit                 | <input type="checkbox"/> | Didn't know how to install |
| <input type="checkbox"/> Already had a bathroom aerator | <input type="checkbox"/> | We liked our own           |
| <input type="checkbox"/> Landlord won't allow           | <input type="checkbox"/> | Other: _____               |
| <input type="checkbox"/> Didn't have tools              |                          |                            |

**IF YOU ANSWERED "YES":**

a) \_\_\_\_\_ Are you still using the Bathroom Aerator?

- Yes, still using it       No, no longer using it

i. If you answered "No, no longer using it," fill in the main reason why not:

- Water pressure was too weak       Other: \_\_\_\_\_
- I didn't like it

- It leaked

**f. Compact Fluorescent Lights (CFLs) – 3 in the kit**

15. The following questions are about the three CFL light bulbs that were included in your kit. Answer the questions under the bulb you installed.



	 CFL 1	 CFL 2	 CFL 3
Did you install the following CFLs in your kit?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
			
If you said "NO," will you ever use the CFL?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
IF YOU WON'T USE IT, Why not? Answer here →			
IF YOU <u>WILL</u> USE IT, will it replace another CFL, a Regular Light Bulb, or Both?	<input type="checkbox"/> CFL Bulb <input type="checkbox"/> Regular Light Bulb <input type="checkbox"/> Both Types		
<i>For the CFLs you said you <b>INSTALLED</b>, please answer the following questions:</i>			
If you installed the CFL, <u>where</u> did you install it?	<input type="checkbox"/> Kitchen <input type="checkbox"/> Living Rm <input type="checkbox"/> Bedroom <input type="checkbox"/> Bathroom <input type="checkbox"/> Hallway <input type="checkbox"/> Other: _____	<input type="checkbox"/> Kitchen <input type="checkbox"/> Living Rm <input type="checkbox"/> Bedroom <input type="checkbox"/> Bathroom <input type="checkbox"/> Hallway <input type="checkbox"/> Other: _____	<input type="checkbox"/> Kitchen <input type="checkbox"/> Living Rm <input type="checkbox"/> Bedroom <input type="checkbox"/> Bathroom <input type="checkbox"/> Hallway <input type="checkbox"/> Other: _____
Was the old bulb you took out and replaced a regular bulb? 	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
About how many Watts was the old bulb you replaced?	<input type="checkbox"/> 40W - (Not Bright) <input type="checkbox"/> 60W - (Medium Bright) <input type="checkbox"/> 75W - (Bright) <input type="checkbox"/> 100W - (Very Bright) <input type="checkbox"/> Don't remember <input type="checkbox"/> Other: _____	<input type="checkbox"/> 40W - (Not Bright) <input type="checkbox"/> 60W - (Medium Bright) <input type="checkbox"/> 75W - (Bright) <input type="checkbox"/> 100W - (Very Bright) <input type="checkbox"/> Don't remember <input type="checkbox"/> Other: _____	<input type="checkbox"/> 40W - (Not Bright) <input type="checkbox"/> 60W - (Medium Bright) <input type="checkbox"/> 75W - (Bright) <input type="checkbox"/> 100W - (Very Bright) <input type="checkbox"/> Don't remember <input type="checkbox"/> Other: _____
Do you still use the CFL?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
About how many hours a day on average is the light on?	___ Hours	___ Hours	___ Hours

16. If the program had not given the Showerhead, Aerators, and CFLs in the kit, would your family have purchased them from a store? Answer for each item:

a) Efficient Showerhead	b) Kitchen Faucet Aerator	c) Bathroom Faucet Aerator	d) (3) CFLs
<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No
<input type="checkbox"/> Possibly/Maybe	<input type="checkbox"/> Possibly/Maybe	<input type="checkbox"/> Possibly/Maybe	<input type="checkbox"/> Possibly/Maybe



- 17. Use the scale below to put a check mark under the number the best describes you for each item in the kit-**  
**On a scale of 0 to 10, with 0- “No, I would not buy this” and 10 – “Yes, I would buy this.”**  
**Would you have bought the same items in the kit if they weren’t given to you for free in the kit?**

	<---No we would not buy it-->			<-----Maybe we would buy it----->				<-----Yes, we would buy it----->			
	0	1	2	3	4	5	6	7	8	9	10
a) Efficient Showerhead											
b) Kitchen Faucet Aerator											
c) Bathroom Faucet Aerator											
d) CFLs											

**i. FOR EACH ITEM RATED 3 OR HIGHER ABOVE, when would you have purchased and installed them?**

a) Efficient Showerhead	b) Kitchen Faucet Aerator	c) Bathroom Faucet Aerator	d) (3) CFLs
<input type="checkbox"/> November 2011			
<input type="checkbox"/> Before February 2012			
<input type="checkbox"/> After February 2012 but before November 2012	<input type="checkbox"/> After February 2012 but before November 2012	<input type="checkbox"/> After February 2012 but before November 2012	<input type="checkbox"/> After February 2012 but before November 2012
<input type="checkbox"/> After November 2012			
<input type="checkbox"/> We would never have purchased and installed them	<input type="checkbox"/> We would never have purchased and installed them	<input type="checkbox"/> We would never have purchased and installed them	<input type="checkbox"/> We would never have purchased and installed them

**ii. Would you have purchased the same number of CFLs as in the kit (3 CFLs) on your own?**

- |  |                                     |
|--|-------------------------------------|
| <input type="checkbox"/> The Same Number of CFLs | <input type="checkbox"/> None       |
| <input type="checkbox"/> More CFLs               | <input type="checkbox"/> Don't know |
| <input type="checkbox"/> Fewer CFLs              |                                     |



**g. QUESTIONS FOR EVERYONE**

**18. BEFORE the program came to your school, did you BUY and INSTALL any efficient showerheads, faucet aerators, or CFLs like the ones in the kit?**

- Yes                       No

**i. If you answered “Yes” above, please note how many you bought and installed:**

Efficient Showerhead 	Kitchen Aerator 	Bathroom Aerator 	CFLs 
<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1-3
<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 4-7
<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 8-11
<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more	<input type="checkbox"/> 12 or more
<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None

**19. AFTER the program came to your school, did you BUY and INSTALL any showerheads, faucet aerators, or CFLs like the ones in the kit?**

- Yes                       No

**i. If you answered “Yes” above, please note how many you bought and installed:**

Efficient Showerhead 	Kitchen Aerator 	Bathroom Aerator 	CFLs 
<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1-3
<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 4-7
<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 8-11
<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more	<input type="checkbox"/> 12 or more
<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None

**20. Use the scale below to put a check mark under the number that best describes you for each item in the list. If you bought more showerheads, aerators or CFLs after the program, how likely was it that you bought them because of the program?**



(0 means not at all because of program, 10 means very much because of

	<NOT because of program> <Partly because of program> <Because of program>										I Did Not Buy Any More of This Item	
	0	1	2	3	4	5	6	7	8	9		10
(check <input checked="" type="checkbox"/> a box in each row to indicate program influence):												
a) High Efficiency Showerhead												
b) Kitchen Faucet Aerators												
c) Bathroom Faucet Aerators												
d) CFLs												

21. Have you looked into any other Nicor or ComEd energy efficiency program as a result of the THINK! ENERGY program?

- Yes
- No

a) If yes, what program(s) did you find out more information about?

\_\_\_\_\_

22. After this program, did you lower, raise, or keep the same...

a) ...your <u>water heater</u> temperature setting?	<input type="checkbox"/> Lower
	<input type="checkbox"/> Raise
	<input type="checkbox"/> Keep the Same
b) ...your thermostat setting on your <u>furnace/boiler</u> in the winter?	<input type="checkbox"/> Lower
	<input type="checkbox"/> Raise
	<input type="checkbox"/> Keep the Same
c) ...your thermostat setting on your <u>air conditioner</u> in the summer?	<input type="checkbox"/> Lower
	<input type="checkbox"/> Raise
	<input type="checkbox"/> Keep the Same

23. Which best describes you?

- Before the THINK! ENERGY Kit, I did not think about energy changes in my home.
- Before the THINK! ENERGY Kit, I thought about energy changes in my home, but did not do anything.
- Before the THINK! ENERGY Kit, I already made some changes in my home to save energy.
- Before the THINK! ENERGY Kit, I already made major changes in my home to save energy.

24. After participating in this program, are you more or less likely to make other energy changes in your home?

Less Likely

Same as Before

More Likely





Thank you for your input. If you would like more information about other conservation programs available to you, please provide us with your email address or phone number: \_\_\_\_\_

***Parents, please sign below to indicate that you filled out or assisted your child in filling out the survey:***

PARENT SIGNATURE: \_\_\_\_\_

**THANK YOU FOR YOUR PARTICIPATION!**



## Nicor Gas Final Survey

### THINK! ENERGY with Nicor Gas Program Survey

**Parents and Guardians:** Earlier this school year, your child participated in the THINK! ENERGY program, which included a take-home kit to help your child teach the family about energy and energy efficiency. The purpose of this survey is to help the sponsor, Nicor, improve this program. **Please complete this form with your child** and have them return it to your classroom teacher. **In return for your participation, your child's classroom will receive a \$75 check!**

Name	Date
School	Teacher

- h.**
- i. Please check the box next to your answer or write your answer on the blank line.**

#### 22. What kind of home do you live in?

- Single House \_\_\_\_\_
- Apartment Building
- Mobile Home
- Other:

#### 23. How many people including you live in this house?

\_\_\_\_\_

#### 24. What do you heat your home with?

- Electricity  Wood
- Natural Gas  Don't Know
- Propane  Other: \_\_\_\_\_

#### 25. Does your family pay for the gas bill for your home?

- Yes  No  Not Sure

#### 26. Do you have your own furnace that heats just your home?

- Yes  No  Not Sure

#### 27. Do you have your own water heater that heats water for just your home?

- Yes  No  Not Sure

#### 28. What type of fuel does your water heater use?

- Electricity  Wood
- Natural Gas  Don't Know
- Propane  Other: \_\_\_\_\_



29. Did you receive a THINK! ENERGY Take Action Kit (with 1 high efficiency showerhead, 1 kitchen faucet aerator, and 1 bathroom faucet aerator, among other items) through the program?

- Yes  No

30. Did you fill out and return a survey (the "Household Report Card") to your teacher after the THINK! ENERGY presentation you had in the fall?

- Yes  No  Not Sure

**IF YOU ANSWERED "NO" TO QUESTION 8, SKIP TO QUESTION 16!**

j.

k. Efficient Showerhead

31. Did you successfully install the *High Efficiency Showerhead* like the one in this picture?

- Yes  No



**IF YOU ANSWERED "NO":** Fill in the main reasons why not:

- |  |  |
|--|--|
| <input type="checkbox"/> It did not fit                      | <input type="checkbox"/> Didn't have tools           |
| <input type="checkbox"/> Already had an efficient showerhead | <input type="checkbox"/> Didn't know how to install  |
| <input type="checkbox"/> Landlord won't allow                | <input type="checkbox"/> We liked our own showerhead |
|  | <input type="checkbox"/> Other: _____                |

**IF YOU ANSWERED "YES":**

b) \_\_\_\_\_ Are you still using the efficient showerhead?

- Yes, still using it  No, no longer using it

i. If you answered "No, no longer using it," fill in the one main reason why not:

- Water pressure was too weak  Other: \_\_\_\_\_
- I didn't like it \_\_\_\_\_
- It leaked \_\_\_\_\_

32. Does your family use the *shower timer* from your kit? (It's like the one in the picture to the right)

- Yes, Always  Yes, Often  Yes, Occasionally  No, We don't use it



a) If you use it, how many family members use the *shower timer*? \_\_\_\_\_

l. Kitchen Faucet Aerator

33. Did you install the *Kitchen Faucet Aerator*? (Remember, it's like the one in the picture to the right)

- Yes  No

**IF YOU ANSWERED "NO":** Fill in the main reasons why not:

- It did not fit  Already had a kitchen aerator



Landlord won't allow

We liked our own

Other: \_\_\_\_\_

Didn't have tools

Didn't know how to install

**IF YOU ANSWERED "YES":**

b) \_\_\_\_\_ **Are you still**

**using the Kitchen Aerator?**

Yes, still using it

No, no longer using it

ii. **If you answered "No, no longer using it," fill in the main reason why not:**

Water pressure was too weak

Other: \_\_\_\_\_

I didn't like it

It leaked

**m. Bathroom Faucet Aerator**

**34. Did you install the Bathroom Faucet Aerator? (It's like the one to the right).**

Yes  No



**IF YOU ANSWERED "NO":** Fill in the main reasons why not:

It did not fit

Didn't know how to install

Already had a bathroom aerator

We liked our own

Landlord won't allow

Other: \_\_\_\_\_

Didn't have tools

**IF YOU ANSWERED "YES":**

b) \_\_\_\_\_ **Are you still**

**using the Bathroom Aerator?**

Yes, still using it

No, no longer using it

ii. **If you answered "No, no longer using it," fill in the main reason why not:**

Water pressure was too weak

Other: \_\_\_\_\_

I didn't like it

It leaked

**35. If the program had not given the Showerhead and Aerators in the kit, would your family have purchased them from a store? Answer for each item:**

a) Efficient Showerhead	b) Kitchen Faucet Aerator	c) Bathroom Faucet Aerator
<input type="checkbox"/> Yes	<input type="checkbox"/> Yes	<input type="checkbox"/> Yes
<input type="checkbox"/> No	<input type="checkbox"/> No	<input type="checkbox"/> No
<input type="checkbox"/> Possibly/Maybe	<input type="checkbox"/> Possibly/Maybe	<input type="checkbox"/> Possibly/Maybe



36. Use the scale below to put a check mark under the number the best describes you for each item in the kit-  
 On a scale of 0 to 10, with 0- “No, I would not buy this” and 10 – “Yes, I would buy this.”  
 Would you have bought the same items in the kit if they weren’t given to you for free in the kit?

	<---No we would not buy it-->			<-----Maybe we would buy it----->					<-----Yes, we would buy it----->		
	0	1	2	3	4	5	6	7	8	9	10
a) Efficient Showerhead											
b) Kitchen Faucet Aerator											
c) Bathroom Faucet Aerator											

i. FOR EACH ITEM RATED 3 OR HIGHER ABOVE, when would you have purchased and installed them?

a) Efficient Showerhead	b) Kitchen Faucet Aerator	c) Bathroom Faucet Aerator
<input type="checkbox"/> November 2011	<input type="checkbox"/> November 2011	<input type="checkbox"/> November 2011
<input type="checkbox"/> Before February 2012	<input type="checkbox"/> Before February 2012	<input type="checkbox"/> Before February 2012
<input type="checkbox"/> After February 2012 but before November 2012	<input type="checkbox"/> After February 2012 but before November 2012	<input type="checkbox"/> After February 2012 but before November 2012
<input type="checkbox"/> After November 2012	<input type="checkbox"/> After November 2012	<input type="checkbox"/> After November 2012
<input type="checkbox"/> We would never have purchased and installed them	<input type="checkbox"/> We would never have purchased and installed them	<input type="checkbox"/> We would never have purchased and installed them

n. QUESTIONS FOR EVERYONE

37. BEFORE the program came to your school, did you BUY and INSTALL any efficient showerheads or faucet aerators like the ones in the kit?

- Yes                       No

ii. If you answered “Yes” above, please note how many you bought and installed:

Efficient Showerhead 	Kitchen Aerator 	Bathroom Aerator 
<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more
<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None



38. AFTER the program came to your school, did you BUY and INSTALL any showerheads or faucet aerators like the ones in the kit?

- Yes                       No

i. If you answered "Yes" above, please note how many you bought and installed:

Efficient Showerhead 	Kitchen Aerator 	Bathroom Aerator 
<input type="checkbox"/> 1	<input type="checkbox"/> 1	<input type="checkbox"/> 1
<input type="checkbox"/> 2	<input type="checkbox"/> 2	<input type="checkbox"/> 2
<input type="checkbox"/> 3	<input type="checkbox"/> 3	<input type="checkbox"/> 3
<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more	<input type="checkbox"/> 4 or more
<input type="checkbox"/> None	<input type="checkbox"/> None	<input type="checkbox"/> None

39. Use the scale below to put a check mark under the number that best describes you for each item in the list. If you bought more showerheads or aerators after the program, how likely was it that you bought them because of the program?

(0 means not at all because of program, 10 means very much because of)

	<NOT because of program> <Partly because of program> <Because of program>											I Did Not Buy Any More of This Item	
	0	1	2	3	4	5	6	7	8	9	10		
(check <input checked="" type="checkbox"/> a box in each row to indicate program influence):													
a) High Efficiency Showerhead													
b) Kitchen Faucet Aerators													
c) Bathroom Faucet Aerators													

40. Have you looked into any other Nicor energy efficiency program as a result of the THINK! ENERGY program?

- Yes  
 No

b) If yes, what program(s) did you find out more information about?

\_\_\_\_\_

20. After this program, did you lower, raise, or keep the same...



a) ...your <u>water heater</u> temperature setting?	<input type="checkbox"/> Lower
	<input type="checkbox"/> Raise
	<input type="checkbox"/> Keep the Same
b) ...your thermostat setting on your <u>furnace/boiler</u> in the winter?	<input type="checkbox"/> Lower
	<input type="checkbox"/> Raise
	<input type="checkbox"/> Keep the Same
c) ...your thermostat setting on your <u>air conditioner</u> in the summer?	<input type="checkbox"/> Lower
	<input type="checkbox"/> Raise
	<input type="checkbox"/> Keep the Same

**21. Which best describes you?**

- Before the THINK! ENERGY Kit, I did not think about energy changes in my home.
- Before the THINK! ENERGY Kit, I thought about energy changes in my home, but did not do anything.
- Before the THINK! ENERGY Kit, I already made some changes in my home to save energy.
- Before the THINK! ENERGY Kit, I already made major changes in my home to save energy.

**22. After participating in this program, are you more or less likely to make other energy changes in your home?**

Less Likely

Same as Before

More Likely

1



2



3



4



5



Thank you for your input. If you would like more information about other conservation programs available to you, please provide us with your email address or phone number:

---

***Parents, please sign below to indicate that you filled out or assisted your child in filling out the survey:***

PARENT SIGNATURE: \_\_\_\_\_

**THANK YOU FOR YOUR PARTICIPATION!**



powering lives

## 5.4 *Home Energy Savings*



**Energy Efficiency  
ComEd Plan Year 4  
Nicor Gas Plan Year 1  
(6/1/2011-5/31/2012)**

**Evaluation Report:  
Home Energy Savings Program**

**FINAL**

**Presented to  
Commonwealth Edison Company and  
Nicor Gas Company**

May 8, 2013

Submitted by:  
Randy Gunn  
Managing Director  
Navigant Consulting  
30 S. Wacker Drive, Suite 3100  
Chicago, IL 60606

Phone 312.583.5700  
Fax 312.583.5701

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





**Submitted to:**

ComEd  
Three Lincoln Centre  
Oakbrook Terrace, IL 60181

Nicor Gas  
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  
312.938.4242  
randy.gunn@navigant.com

Julianne Meurice, Associate Director  
312.583.5740  
julianne.meurice@navigant.com

Jeff Erickson, Director  
608.497.2322  
jeff.erickson@navigant.com

Rob Neumann  
312.583.2176  
rob.neumann@navigant.com

**Prepared by:**

Miroslav Lysyuk, Senior Consultant  
Navigant Consulting  
312.583.5804  
miroslav.lysyuk@navigant.com

Mark Thornsjo, Managing Consultant  
Navigant Consulting  
651.459.4343  
mark.thornsjo@navigant.com

Ryan Powanda, Senior Consultant  
Navigant Consulting  
303.728.2480  
ryan.powanda@navigant.com

Peter Mercouriou, Consultant  
Navigant Consulting  
360.828.4014  
peter.mercouriou@navigant.com

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for ComEd and Nicor Gas based upon information provided by ComEd, 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	Evaluation Objectives .....	1
E.2	Evaluation Methods.....	1
E.3	Key Impact Findings and Recommendations .....	2
E.4	Key Process Findings and Recommendations .....	5
<b>1.</b>	<b>Introduction to the Program.....</b>	<b>9</b>
1.1	Program Description.....	9
1.1.1	Implementation Strategy .....	9
1.1.2	Program Marketing and Outreach .....	9
1.2	Evaluation Questions.....	10
1.2.1	Impact Questions .....	10
1.2.2	Process Questions .....	10
<b>2.</b>	<b>Evaluation Methods.....</b>	<b>11</b>
2.1	Primary Data Collection.....	11
2.2	Additional Research .....	11
2.3	Impact Evaluation Methods.....	12
2.3.1	Verification and Due Diligence and Tracking System Review.....	12
2.3.2	Gross Program Savings Evaluation.....	12
2.3.3	Net Program Savings Evaluation .....	12
2.4	Process Evaluation Methods.....	13
2.4.1	Data Collection Methods and Sampling Plan .....	13
<b>3.</b>	<b>Evaluation Results .....</b>	<b>15</b>
3.1	Impact Evaluation Results .....	15
3.1.1	Review of Verification and Due Diligence Procedures and Tracking System .....	15
3.1.2	Ex-ante Gross Savings .....	15
3.1.3	Verified Gross Program Savings.....	18
3.1.4	Net-to-Gross Analysis and Verified Net Program Impact Estimates .....	23
3.2	Process Evaluation Results .....	27
3.2.1	Program Changes since Gas Rider 29/EPY3.....	27
3.2.2	Program Awareness .....	27
3.2.3	Marketing and Outreach Effectiveness.....	29
3.2.4	Barriers to Participation .....	31
3.2.5	Participant and Program Partner Satisfaction and Recommendations for Improvement.....	31
3.2.6	Market Effects.....	33
<b>4.</b>	<b>Findings and Recommendations .....</b>	<b>34</b>
4.1	Key Impact Findings and Recommendations .....	34
4.2	Key Process Findings and Recommendations .....	37

<b>5.</b>	<b>Appendix .....</b>	<b>41</b>
5.1	Glossary .....	41
5.2	Detailed Impact Evaluation Methods and Results .....	45
5.2.1	Ex-ante Gross Savings Adjustments.....	45
5.2.2	Direct Install Verified Gross Savings Adjustments .....	45
5.2.3	Weatherization Measures Literature Review.....	46
5.2.4	Net Program Impact Evaluation Methods .....	47
5.2.5	Net Program Impact Parameter Estimate Results.....	50
5.2.6	Survey-Determined Installation and Persistence Rates for Direct Install Measures (For Reference) .....	54
5.2.7	Overall Program Research Findings Gross and Net Savings (For Reference).....	55
5.3	Additional Process Evaluation Results .....	59
5.3.1	Participant Demographics .....	59
5.3.2	Non-Participant Demographics, Attitudes, and Buying Behavior .....	59
5.3.3	Trade Ally Reporting on Program Awareness and Marketing and Outreach Effectiveness .....	59
5.3.4	Trade Ally Reporting on Customer Participation Motives and Barriers to Participation .....	60
5.3.5	Trade Ally Reporting on Market Baseline, Free Ridership, and Spillover.....	61
5.4	VDDTSR Memo-Final Version .....	64
5.5	Program Theory Logic Model Review .....	64
5.6	Data Collection Instruments .....	64
5.6.1	Phone Survey for Participating Customers .....	64
5.6.2	Phone Survey for Non-Participating Customers.....	64
5.6.3	Interview Guide for Trade Allies (Energy Advisors and Weatherization Contractors) .....	64

## List of Figures and Tables

### Figures:

Figure 3-1. Breakdown of GPY1/EPY4 Spring Mailer Participants and Non-Participants.....	28
Figure 3-2. Participant Suggestions for Program Improvement .....	33

### Tables:

Table E- 1. GPY1/EPY4 Savings* .....	3
Table E- 2. GPY1/EPY4 Measure-Level MWh Savings* .....	4
Table E- 3. GPY1/EPY4 Measure-Level Therms Savings* .....	5
Table 2-1. Evaluation Methods .....	11
Table 2-2. Additional Research Sources .....	12
Table 3-1. GPY1/EPY4 HES Participation Goals and Achievements .....	16
Table 3-2. GPY1/EPY4 Ex-Ante Gross Impact, by Measure.....	17
Table 3-3. Percent of Participating Homes Installing Each Program Measure Type, GPY1/EPY4.....	18
Table 3-4. GPY1/EPY4 Survey-Determined Direct Install and Weatherization Measure Installation and Persistence Rates Compared to TRM In-Service Rates.....	20
Table 3-5. GPY1/EPY4 HES Program Verified Gross Savings.....	22
Table 3-6. Verified Net-to-Gross Results by Measures.....	24
Table 3-7. Verified Net-to-Gross Results by Energy and Measure Types.....	25
Table 3-8. GPY1/EPY4 HES Program Verified Net Savings .....	26
Table 3-9. Net Savings Goal vs. Achieved Verified Net Savings .....	27
Table 4-1. GPY1/EPY4 Savings* .....	35
Table 4-2. GPY1/EPY4 Measure-Level MWh Savings*.....	36
Table 4-3. GPY1/EPY4 Measure-Level Therms Savings* .....	37
Table 5-1. Literature Review of Savings for Similar Weatherization Programs .....	46
Table 5-2. Participant Self-Report Free Ridership Results by Measure.....	52
Table 5-3. Spillover Results by Measures .....	53
Table 5-4. GPY1/EPY4 Direct Install Measure Installation and Persistence Rate Results – Survey Determined.....	54
Table 5-5. GPY1/EPY4 HES Program Research Findings Gross Savings.....	56
Table 5-6. GPY1/EPY4 HES Program Research Findings Net Savings.....	57
Table 5-7. GPY1/EPY4 Overall HES Program Research Findings Savings* .....	58

## E. Executive Summary

This document presents the Evaluation Report of the Home Energy Savings (HES) program that was managed jointly by Nicor Gas and Commonwealth Edison (ComEd) and operated between June 1, 2011 to May 31, 2012 (GPY1, EPY4)<sup>1</sup> period. The HES program provided customers in single family homes a discounted home energy assessment and free or incentivized direct install and weatherization measure recommendations and installations.

### E.1 Evaluation Objectives

The objectives of the HES program evaluation in GPY1/EPY4 were to (1) quantify net savings impacts from the program, (2) identify ways in which the program can be improved, and (3) determine process-related program strengths and weaknesses. Evaluation activities will extend across GPY1/EPY4-GPY3/EPY6, with the focus of the GPY1/EPY4 evaluation on high-priority issues, especially those affecting program participation.

### E.2 Evaluation Methods

The main focus of the impact evaluation was to validate estimates of gross and net program savings and program tracking information. The process evaluation included a review of the program's administration, delivery, and a combination of trade ally, participant, and non-participant responses to our research questions.

Data collection included:

1. In-depth interviews
  - a. Nicor Gas staff
  - b. Program administrator
  - c. Program implementation contractor staff (including Energy Advisors)
  - d. Trade Allies – weatherization contractors
2. Telephone surveys with a random sample of full participants (those receiving both assessment and retrofit services)
3. Telephone surveys with a random sample of non-participants
4. Tracking system review and verification of claimed savings, including project documentation review
  - a. Engineering review of the documented algorithms used by the program to calculate energy savings for all measures and the assumptions that feed those algorithms
  - b. Cross-check of a sample of program applications with the tracking database
  - c. Verification that savings are calculated as documented
  - d. Review of other available program information

---

<sup>1</sup> Gas Program Year 1/Electric Program Year 4

### E.3 Key Impact Findings and Recommendations

The evaluation effort succeeded in addressing the key research question posited by the program evaluation plan. Weatherization measure savings are calculated using Conservation Services Group's (CSG) proprietary EnergyMeasure® HOME (EM HOME) software. Navigant performed a desk review of the EM HOME software during GPY1/EPY4. Key findings and recommendations associated with the research questions and evaluation plan are as follows:

- **Finding.** Program verification, due diligence, and tracking system procedures all meet or exceed aspects of national best practices, as documented.
- **Finding.** CSG tracks installation rates during subsequent weatherization or QC activities, but it does not track persistence.  
**Recommendation.** Improvements in savings estimates may be achieved by tracking direct installation measure persistence as a potential program effectiveness indicator by way of follow-up checks during subsequent weatherization or QC activities.
- **Finding.** The data entry process involves taking field notes on paper and then re-entering the information into *EM HOME* on a computer in the work van, which is an instance of duplicate data entry.  
**Recommendation.** Explore switching from paper-to-computer based data entry during the energy assessments to using tablet computers equipped with EM HOME software. This will not only remove duplicative data entry and the potential for errors associated with it, but it could also potentially speed up the assessment process, which currently takes an average of 2.5 hours. By speeding up the assessment process, CSG could use the additional time for customer education helpful to the program. Such a software change would also provide the benefit of automatic, real-time accounting for the inter-connectivity of interdependent variables.
- **Finding.** The tracking database extract did not specify whether values were field-specified or default values.  
**Recommendation.** State whether building characteristics in the tracking system are field-specified or default values (e.g., heating and cooling system efficiencies), to clarify the basis for subsequent savings estimates. CSG stated that this information is visible in the *EM HOME* software suite, but that it would take considerable resources to be made available in the Microsoft Excel format that was used for the data extract submitted to Navigant. This information would be helpful to the evaluation team in determining the accuracy of inputs into the tracking system. This could also be useful as part of energy assessment review and training.
- **Finding.** The *EM HOME* simulation engine does not integrate customer billing data.  
**Recommendation.** Continue refining the *EM HOME* simulation engine to further improve savings estimates and reduce associated uncertainties. Explore options for improving modeling calibration using customer billing data, to provide an added dimension in estimating savings.
- **Finding.** The tracking system did not track kW savings for electric retrofit measures.  
**Recommendation.** Provide kW savings for electric retrofit measures to better facilitate cost-effectiveness estimates and various electric resource planning efforts.

Table E- 1 outlines the program’s electric and therm savings for GPY1/EPY4.<sup>2</sup> The NTG Framework<sup>3</sup> calls for retroactively applying the NTG ratio for “previously evaluated programs undergoing significant changes — either in the program design or delivery, or changes in the market itself.” The evaluation team believes the HES program meets this criterion because the program changed assessment pricing and implementation contractors in GPY1/EPY4. As a result this evaluation uses the NTG ratio calculated from our GPY1/EPY4 research for both the electric and gas components of the program.

**Table E- 1. GPY1/EPY4 Savings\***

	Energy Savings (MWh)	Peak Demand Savings (kW)	Energy Savings (Therms)
Ex-Ante Gross Savings	527	31	104,505
Ex-Ante Net Savings	358	22	96,105
Realization Rate**	1.09	1.30	1.05
Verified Gross Savings	574	40	109,380
Overall NTG Ratio***	0.82	0.80	0.86
Verified Net Savings	468	32	94,597
Planning Net Savings Goal	438	-	220,729
% Net Goal Achieved	107%	-	43%

Source: Navigant Analysis; Nicor EEP Final – Revision for Compliance Filing 05-27-2011 FINAL; ComEd - PY4 QTR 4 Report

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

\*\* Realization rates represent the ratio between verified gross and ex-ante gross savings.

\*\*\*Overall NTG is the ratio between verified net and verified gross savings.

In PY1/PY4 the electric component of the program achieved 107% of planning net savings goals while the gas component of the program achieved 43% of planning net savings goals.

Table E- 2 and Table E- 3 present the measure-specific electric and therm savings for GPY1/EPY4.

<sup>2</sup> The September 14, 2012 final version of the first State of Illinois Energy Efficiency Technical Reference Manual (TRM) (effective as of June 1, 2012) has been agreed to by Illinois Stakeholder Advisory Group (SAG) and the Illinois Commerce Commission in Docket No. 12-0528 as of the date of this report. The verified gross savings shown in Table E-1 are deemed by the TRM for measures outlined in the document. Evaluation research findings for gross savings in GPY1 are provided for reference in the Appendix.

<sup>3</sup> “Proposed Framework for Counting Net Savings in Illinois.” Memorandum March 12, 2010 from Philip Mosenthal, OEI, and Susan Hedman, OAG.

**Table E- 2. GPY1/EPY4 Measure-Level MWh Savings\***

	Measure	Ex-Ante Gross MWh	RR	Verified Gross MWh	NTG	Verified Net MWh
Direct Install Measures	9 Watt CFL	38	1.09	42	0.80	33
	14 Watt CFL	111	1.09	121	0.80	97
	19 Watt CFL	81	1.10	89	0.80	71
	23 Watt CFL	112	1.10	122	0.80	98
	9 Watt Globe CFL	20	1.09	22	0.80	17
	Shower Head	5	1.48	7	0.93	7
	Kitchen Aerator	1	0.46	0	0.99	0
	Bathroom Aerator	2	0.57	1	0.99	1
	Hot Water Temperature Setback	0	-	0	0.88	0
	Pipe Insulation	1	1.54	2	0.93	2
	Programmable Thermostat	0	-	3	0.90	2
	Programmable Thermostat Education	0	-	9	0.90	8
<i>Subtotal</i>		371	1.13	418	0.81	337
Retrofit Measures	Attic Insulation	68	1.00	68	0.81	55
	Wall Insulation	1	1.00	1	0.78	1
	Floor Insulation (Other)	6	1.00	6	0.84	5
	Duct Insulation & Sealing	1	1.00	1	0.80	1
	Air Sealing	80	1.00	80	0.86	69
<i>Subtotal</i>		156	1.00	156	0.84	131
<b>Total Savings</b>		527	1.09	574	0.82	468

Source: Navigant analysis

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

**Table E- 3. GPY1/EPY4 Measure-Level Therms Savings\***

	Measure	Ex-Ante Gross Therms	RR	Verified Gross Therms	NTG	Verified Net Therms
Direct Install Measures	9 Watt CFL	0	-	0	0.80	0
	14 Watt CFL	0	-	0	0.80	0
	19 Watt CFL	0	-	0	0.80	0
	23 Watt CFL	0	-	0	0.80	0
	9 Watt Globe CFL	0	-	0	0.80	0
	Shower Head	19,463	0.98	19,157	0.93	17,847
	Kitchen Aerator	426	0.97	412	0.99	409
	Bathroom Aerator	3,574	0.98	3,512	0.99	3,481
	Hot Water Temperature Setback	1,331	0.96	1,274	0.88	1,116
	Pipe Insulation	3,943	0.98	3,855	0.93	3,581
	Programmable Thermostat	3,261	0.90	2,946	0.90	2,651
	Programmable Thermostat Education	0	-	5,718	0.90	5,146
<i>Subtotal</i>		31,998	1.15	36,873	0.93	34,231
Retrofit Measures	Attic Insulation	34,604	1.00	34,604	0.81	28,181
	Wall Insulation	4,316	1.00	4,316	0.78	3,367
	Floor Insulation (Other)	6,496	1.00	6,496	0.84	5,460
	Duct Insulation & Sealing	111	1.00	111	0.80	89
	Air Sealing	26,979	1.00	26,979	0.86	23,270
<i>Subtotal</i>		72,507	1.00	72,507	0.83	60,366
<b>Total Savings</b>		104,505	1.05	109,380	0.86	94,597

Source: Navigant analysis

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

#### **E.4 Key Process Findings and Recommendations**

At this stage in the program’s development, Navigant finds that program processes are generally well-planned and executed, and that the program is serving participants very well. However, since the program did not reach its participation goals in GPY1/EPY4, the evaluation team conducted research amongst participants, non-participants, and trade allies to determine marketing outreach effectiveness

and potential barriers to participation. Navigant found that the program is using the most effective means of outreach to customers with its program mailers. The program is also targeting the right customers as many non-participants value energy efficiency, are interested in weatherization work, and are tentatively interested in participating but are not fully persuaded by the program's current marketing. Participants, contractors, and non-participants alike agree that marketing material content could be improved. Many program-aware non-participants that received a spring mailer about the program were unaware of the free direct install measures available through the program and thought that getting an assessment would obligate them to purchase weatherization measures. In addition, a noteworthy portion of participants and non-participants aware of the program showed some uncertainty about the program and the utility intentions of discounting and giving out free measures.

Navigant presents the following key process findings and recommendations:

- **Finding.** Program participants and program partners were very satisfied with the program, incentive levels, and processes. About 97% of participants rated their satisfaction as 8 to 10 on a 0-10 point scale and over half of participants stated they were "very satisfied" (the highest rating).
- **Finding.** The program is using an effective means of outreach to customers. Participants and non-participants agreed that program mailers were the best way to reach them. Participants also noted that word-of-mouth and contractor referrals were other important sources of initial information about the program.
- **Finding.** The program targeted the right market of customers in its marketing mailer. Most mailed non-participants both valued energy efficiency and showed potential for participation in the program. On a four-point scale ("not at all valuable," "somewhat valuable," "very valuable," "extremely valuable"), only 3% of respondents indicated energy efficiency was "not at all valuable" to them, and 60% indicated it was either "very valuable" or "extremely valuable." Furthermore, 25% of non-participants reported that they have plans to make energy efficiency improvements to their home in the near future. When asked to indicate what they would do, the most common response was insulation work (39%). This is a strong indication of potential participants among mailed non-participants.
- **Finding.** A promising proportion of program-knowledgeable non-participants are willing to spend the money necessary to participate in the program's weatherization component. Almost a fifth of program-knowledgeable non-participants (about 5% of all mailed customers) noted that they were willing to spend \$750-1,250 on the program if it were to save them money on their energy bills. Another 39% of program-knowledgeable non-participants (about 10% of mailed customers) reported they don't know or are not sure how much they would spend.  
**Recommendation.** The program could benefit from conducting focus groups to explore how best to remove barriers to participation for these program-knowledgeable non-participants.
- **Finding.** Participants, contractors, and non-participants alike agree that marketing material content could be improved. The most common participant recommendation for program improvement was for more informative, persistent, and thorough marketing about the program and its benefits.

- Recommendation.** The evaluation team suggests a workshop meeting of energy advisors, trade allies, and other program stakeholders to gather feedback on the previous year’s program efforts and associated marketing efforts, with the goal of improving the marketing material for future program years. For example, the program may benefit from posting video clips on the program website to clarify program details through a new, information-rich medium. Implementing these recommendations may help identify some sources of participant misunderstandings of program offerings and further strengthen information available to potential participants about the program.
- **Finding.** Many program-aware non-participants were unaware of the free direct install measures available through the program. Furthermore, many non-participants thought that getting an assessment would obligate them to purchase weatherization measures.

**Recommendation.** Consider modifying the program marketing collateral to more clearly emphasize that, while strongly encouraged and that there is considerable program support to do so, customers are not obligated to purchase the weatherization measures suggested by the assessment, along with pointing out that direct install measures provide immediate savings benefits that outweigh the cost of getting an assessment. This emphasis may drive more initial participation. Furthermore, the program may attract more participants by more strongly emphasizing that the nature of the assessment is to inform customers about opportunities to save money on energy bills and to make the home more comfortable. Highlighting the low-risk nature of scheduling an assessment may help hesitant participants feel more comfortable about participating since there are no obligations to install recommended measures.
  - **Finding.** A noteworthy portion of participants and non-participants aware of the program showed some uncertainty about the program and the utility intentions of discounting and giving out free measures. According to non-participant survey results, if program-aware non-participant skepticism about the program is addressed, it could increase the amount of customers that ultimately consider participation from the current 28% that reported thinking about participating upon receiving a program mailer to up to as much as 50%.

**Recommendation.** The program may benefit from addressing these concerns in its marketing and outreach materials in order to tip hesitant but interested potential participants into scheduling an assessment. Given the very high levels of participant satisfaction with the program, the program may consider providing customers summary information from real-world case studies and testimonials that address common misconceptions about the program. These could be presented on the program website, in mailers, and other marketing and outreach material. Issues to address should include why the utilities are willing to incentivize energy efficiency improvements, and the mutually-beneficial nature of the programs for customers and the utilities. Implementing this recommendation may increase the conversion rate for the program mailer.
  - **Finding.** Nearly a third of mailed non-participants did not know what “weatherization” means.

**Recommendation.** Marketing material should meet the needs of the layman and use simplified terminology to describe the program offerings.
  - **Finding.** Though marketing material could benefit from clarification, the overall program marketing message resonates with participant perceptions of the program’s primary benefits. The vast majority of participating customers surveyed saw the primary program benefit to be

reduced energy bills (69%) and receiving a rebate on the cost of installing measures (20%). Nearly half (46%) of participants also cited a variety of other benefits the program provided, including improved comfort, assurance that equipment is running smoothly and safely, environmental benefits, and an improved general awareness and knowledge of what's needed to improve a home's efficiency.<sup>4</sup>

- **Finding.** About 26% of non-participants were aware of the program (mostly through program mailers, word- of-mouth, and contractor referrals), while the remainder were not despite having received mailers. Furthermore, program administrators noted that community outreach was not strong in GPY1/EPY4.

**Recommendation.** Though the program mailers are the most important source of program outreach, the program may consider seeking to capitalize on developing additional communication channels such as various social media as an extension of the word-of mouth awareness building that is already starting to be an important source of program awareness. Furthermore, the program may benefit from community outreach at events that attract the target participant demographic. Implementing these recommendations may increase participation levels and provides additional opportunities to address issues related to customer awareness and understanding about the program.

---

<sup>4</sup> Respondents were allowed multiple responses to the question on program benefits.

## 1. Introduction to the Program

### 1.1 Program Description

The Home Energy Savings (HES) program is a joint program of Nicor Gas and Commonwealth Edison (ComEd), with Nicor Gas leading the program implementation. In GPY1/EPY4<sup>5</sup>, the HES program was expected to achieve 220,729 therms and 438 MWh of net savings through the implementation of home energy assessments to promote discounted weatherization services and the direct installation of energy efficiency measures in residential Nicor Gas-ComEd single-family home residences. To meet these goals, the implementation contractor, Conservation Services Group (CSG), aimed to conduct approximately 2,100 whole-home assessments which would result in about 630 completed jobs in the first program year that ended May 31, 2012.

#### 1.1.1 Implementation Strategy

The HES program provides discounted whole-home assessments (e.g., energy assessments) to customers to identify opportunities for installing energy efficiency measures and weatherizing the home. Program activities are implemented through CSG staff and contracted weatherization providers. During the assessment, free CFLs, showerheads, aerators, hot water temperature setback, programmable thermostat setting, and pipe insulation were directly installed for instant energy savings. A programmable thermostat was also offered at a reduced price for interested participants.

CSG's dedicated assessment staff conducted the energy assessments using proprietary whole-home assessment software. The energy advisors generated custom retrofit recommendation reports by entering home characteristic details gathered during the assessment into the implementation contractor's proprietary program. The customer report outlines recommended measures, potential savings, payback periods, and the amount of incentives available for recommended work. Customers are able to choose which projects they would like to pursue. A program-eligible contractor is then assigned to perform the work and discounts are offered instantaneously. The contractor is responsible for submitting paperwork to CSG to receive rebate funds.

Customers who pursue weatherization projects in PY1 were eligible to receive incentives of 50% of retrofit cost for performing recommended weatherization upgrades to their home, which is capped at a maximum of \$1,250 per home.

#### 1.1.2 Program Marketing and Outreach

The Home Energy Savings program utilizes an integrated marketing plan that includes website content, direct mail promotions to residents, and some community events along with direct promotion by weatherization contractors. The marketing message stresses the importance of homeowners' need to care for their home investment and energy performance. Messaging focuses on getting customers to take advantage of the program's key benefits, savings and comfort. The top three messages conveyed to participants about the benefits of participating are:

---

<sup>5</sup> Gas Program Year 1/Electric Program Year 4

1. Savings & comfort;
2. Simplicity of participating and the potential to save money on home energy use as a result; and
3. Saving money and insuring one's home against rising energy prices.

Trade allies also benefit from the program by having credibility established through participating with the utilities. Furthermore, the program provides program-related administrative and technical training, and standardizes high-quality practices in the market through a quality assurance and control (QA/QC) process.

## **1.2 Evaluation Questions**

The GPY1/EPY4 evaluation addressed the following key research questions:

### **1.2.1 Impact Questions**

1. What is the level of gross annual energy (therm, kWh) and demand (kW) savings induced by the program?
2. What are the net impacts from the program?
3. What is the level of free ridership associated with this program and how can it be reduced?
4. What is the level of spillover associated with this program?
5. Did the program meet its energy savings goals? If not, why not?
6. Are the assumptions and calculations for the direct install measures in compliance with the statewide TRM, and reflective of sound engineering judgment? If not, what changes are required?

### **1.2.2 Process Questions**

1. Has the program changed since Rider 29/EPY3, and if so, why and how?
2. Is customer awareness of the program and are market effects progressing as the program plan and program theory projected?
3. How aware are customers of the direct install and weatherization measures covered by the program?
4. How effective are the program marketing materials and contractor sales efforts in bringing in participants? Overall how effective is the program outreach?
5. Are the program design and processes proving cost-effective in administering the program, given the target and actual participation and impact levels?
6. Are customers and program partners satisfied with the program?
7. What opportunities for program improvement exist?

## 2. Evaluation Methods

### 2.1 Primary Data Collection

Table 2-1 below summarizes the surveys, interviews, and other primary data sources that were used to answer the program’s gross savings, net savings, and process evaluation questions.

**Table 2-1. Evaluation Methods**

Method	Subject	Quantity	Gross Impacts	Net Impacts	Process
Telephone Survey	Non-participants: Customers who were contacted but did not sign up for assessments	68	X		X
Telephone Survey	Participants (Full Participants Only <sup>6</sup> )	54	X (verify measures)	X	X
In-Depth Telephone Interviews	Program manager and IC staff	6	X (DI measure & weatherization model review)	X <sup>7</sup>	X
In-Depth Telephone Interview	Weatherization subcontractors	4		X <sup>8</sup>	X

Source: Navigant analysis

### 2.2 Additional Research

This evaluation also leveraged additional research materials to perform literature review activities. Navigant compared average participant savings for weatherization measures based on analysis of the CSG tracking database with evaluated weatherization savings from similar programs in other states. The results of the literature review are presented in Appendix 5.2.3.

Navigant also used the current Illinois TRM to inform engineering review activities for all direct install measures offered in the HES program.

<sup>6</sup> The GPY1/EPY4 sample consisted only of full participants and did not include any audit-only participants. The GPY2/EPY5 evaluation will be stratified to also include audit-only participants.

<sup>7</sup> Qualitative perspective to inform participants’ NTG self-reports

<sup>8</sup> Qualitative perspective to inform participants’ NTG self-reports

**Table 2-2. Additional Research Sources**

Reference Source	Author	Application	Gross Impacts	Net Impacts	Process
Program Tracking Database	Program Administrator	Impact and Process Evaluation	X		X
Illinois Energy Efficiency Technical Reference Manual	Vermont Energy Investment Corporation (VEIC)	Values for TRM Parameters in Savings Calculations	X		
ComEd PY3 Single Family Evaluation	Navigant	Impact and Process Evaluation	X	X	X

Source: Navigant analysis

### 2.3 Impact Evaluation Methods

This section describes the analytical methods and processes used to evaluate the impacts of the GPY1/EPY4 joint Nicor Gas/ComEd HES program. See Appendix 5.2 for a detailed discussion of impact evaluation methods.

#### 2.3.1 Verification and Due Diligence and Tracking System Review

For the verification and due diligence procedure review, Navigant performed in-depth interviews with CSG and program staff, as well as reviews of program documentation, the tracking system, sample project files, and the implementer’s proprietary software. The tracking system was reviewed in order to verify the completeness and accuracy of the tracking system and to identify any important issues that would affect the impact and process evaluation of the HES program. The results of the due diligence and tracking system review are presented in the results section and in Appendix 5.4.

#### 2.3.2 Gross Program Savings Evaluation

Navigant performed a gross savings evaluation for all measures installed through the HES program, including weatherization and direct install measures. In order to complete this task, the evaluation team first performed a summary of the program ex-ante gross impact accomplishments based on an engineering review of the tracking system. CSG provided the original tracking data, and ex-ante updates to direct install measures were provided by WECC<sup>9</sup> throughout the evaluation process. See Appendix 5.2.1 for the details of the ex-ante net savings updates. Navigant also performed a literature review of similar weatherization programs in order to vet the results of CSG’s *EM HOME* software. The results of this literature review can be found in Appendix 5.2.3.

#### 2.3.3 Net Program Savings Evaluation

The primary objective of the net savings analysis is to determine each program's net effect on customers’ electricity and gas usage. This requires estimating what would have happened in the absence of program

<sup>9</sup> Wisconsin Energy Conservation Corporation

activities and incentives. After gross program impacts are adjusted, net program impacts are derived by estimating a Net-to-Gross (NTG) ratio. The NTG ratio quantifies the percentage of the gross program impacts that are attributable to the program. This includes an adjustment for free ridership (the portion of impact that would have occurred even without the program) and spillover (the portion of impact that occurred outside of the program, but would not have occurred in the absence of the program). A customer self-report method was used to estimate the NTG ratio for this evaluation, using data gathered during participant telephone surveys. Trade ally interview findings were also used to gauge their estimate of overall free-ridership and spillover, to corroborate the participant self-report-based NTG estimates. However, note that the evaluation team did not use the trade ally NTG feedback to inform the participant-determined NTG values used in net impact calculations during this evaluation year, rather noting that feedback for qualitative perspective on the participant self-reports.

The NTG Framework<sup>10</sup> calls for retroactively applying the NTG ratio for “previously evaluated programs undergoing significant changes — either in the program design or delivery, or changes in the market itself.” The HES program meets this criterion, and so this evaluation uses the NTG ratio calculated from our GPY1/EPY4 research. The program design was substantially unchanged other than a change in assessment pricing and implementation contractors in GPY1/EPY4, which could affect free ridership and spillover trends. Details of the measure-specific free ridership and spillover calculation methods can be found in Appendices 5.2.4 and 5.2.5.

## 2.4 *Process Evaluation Methods*

The purpose of the process evaluation was to determine barriers to program participation and ways to improve the program. As such, the evaluation team conducted interviews across the chain of actors in the program including Nicor Gas program staff, implementation contractor staff, and trade allies. The evaluation team also conducted surveys of full participants to determine program satisfaction and to explore demographic trends among participants in relation to non-participants. The team also conducted a non-participant survey to help establish reasons for non-participation and general awareness of the program and interest in energy efficiency. Finally, the evaluation team reviewed program tracking information, marketing and outreach material, and compared these to industry best practices to identify opportunities for program improvement.<sup>11</sup>

### 2.4.1 **Data Collection Methods and Sampling Plan**

Data collection included the following:

1. All program plans and reports;
2. All tracking files and documentation;
3. A random sample of 50 project documents;
4. A demo of the implementation contractor’s proprietary assessment software

---

<sup>10</sup> “Proposed Framework for Counting Net Savings in Illinois.” Memorandum March 12, 2010 from Philip Mosenthal, OEI, and Susan Hedman, OAG.

<sup>11</sup> Industry best practices were determined by referencing the Best Practices Self-Benchmarking Tool developed for the Energy Efficiency Best Practices Project: <http://www.eebestpractices.com/benchmarking.asp>

5. In-depth interviews:
  - a. Nicor Gas staff
  - b. Program administrator (First Tracks Consulting)
  - c. Program implementation contractor (CSG)
6. Telephone surveys for a random stratified sample of full program participants; and
7. Telephone surveys for a random sample of non-participants that were contacted by the program but did not participate.

Navigant conducted in-depth interviews by telephone and email with staff from Nicor Gas, First Tracks, and CSG to clarify program processes, administration, marketing, delivery, tracking systems, and QA/QC procedures. These discussions were driven by questions arising from program details that were not fully described in the program documentation. Furthermore, the evaluation team cross-checked a sample of participant rebate applications against the program tracking system.

Telephone surveys were conducted with 54 randomly selected and stratified full participants. Full participants (direct install and retrofit) were favored over assessment-only (direct install only) participants in order to efficiently gather the most information possible about both direct install and retrofit measures in the program. With this sample size, Navigant achieved a 90% confidence interval and a relative precision of +/- 10%. Without an assessment-only survey sample, it was not possible to determine whether the full-participant direct-install survey provided a statistically reliable understanding of what assessment-only direct-installation dynamics were for the entire program (both full participants and assessment-only participants). The next evaluation cycle will address the assessment-only segment specifically via a telephone survey.

For the non-participant telephone survey, a non-stratified randomly selected sample of 68 completed surveys was targeted to achieve a 90% confidence interval and a relative precision of +/-10%. The sample source was a mailing list Nicor Gas used to promote the program, with assessment participants removed so that only those who were contacted but did not sign up for energy assessments were in the respondent pool.

### 3. Evaluation Results

#### 3.1 Impact Evaluation Results

This section presents the impact evaluation results for the HES program. This section is separated into four parts that trace Navigant’s impact evaluation steps. They are:

- A review of the program’s verification and due diligence procedures and tracking system;
- A summary of the program-reported ex-ante gross savings estimates;
- A summary of installation and persistence rates applied to ex-ante gross savings to arrive at verified gross savings; and
- A summary of adjustments to verified gross savings for free ridership and spillover to estimate verified net savings.

##### 3.1.1 Review of Verification and Due Diligence Procedures and Tracking System

Navigant performed in-depth interviews with CSG and Nicor Gas program staff to verify the operating procedures used in the HES program. In addition, the evaluation team based its findings on reviews of program documentation, the tracking system, sample project files, and a demo of the implementer’s proprietary software. In its due diligence verification analysis, Navigant found that CSG has program processes that reflect national best practices.<sup>12</sup> A full report of the verification and due diligence review, as well as a full listing of observations and recommendations, can be found in Appendix 5.4.

Upon request, CSG provided the evaluation team with a tracking data extract from their proprietary *EnergyMeasure*® HUB and *EnergyMeasure*® HOME (EM HOME) software suites. CSG also provided Navigant with a “data dictionary” that specifies the data variables, to assist in understanding the tracking data structure and contents and performed a thorough demonstration of the software for the evaluation team. Navigant found the organization of the tracking system intuitive and was able to navigate the data with ease. CSG tracks nearly all of the information dictated by national best practice standards. CSG uses a proprietary software suite to track participation information and assessment information. Navigant offers specific recommendations regarding CSG’s tracking system for the Nicor Gas and ComEd joint HES program in the full Verification of Due Diligence and Tracking System Review memo found in Appendix 5.4.

##### 3.1.2 Ex-ante Gross Savings

This section summarizes the ex-ante savings and participation reported in the program tracking database obtained from CSG. For GPY1/EPY4, the HES program set net impact goals of 438 MWh and 220,729 therms, with participation goals of 2,100 assessments and 630 weatherization jobs. After review of the tracking system and updated ex-ante claimed savings, Navigant reports participation in the HES program in GPY1/EPY4 of 1,080 assessments and 320 weatherization jobs, and ex-ante gross savings of 527 MWh and 104,505 therms. HES program goals and achievements are shown in Table 3-1. The program achieved about half of its participation goals for both assessments and weatherization work.

---

<sup>12</sup> Industry best practices were determined by referencing the Best Practices Self-Benchmarking Tool developed for the Energy Efficiency Best Practices Project: <http://www.eebestpractices.com/benchmarking.asp>

**Table 3-1. GPY1/EPY4 HES Participation Goals and Achievements**

Participation Goal	Achieved Participation	% Goal Met
2,100 Assessments	1,080 Assessments	51%
630 Weatherization Jobs	320 Weatherization Jobs	51%

*Source: Navigant analysis of program tracking data*

Table 3-2 below shows the ex-ante energy and demand savings claimed for the HES program for GPY1/EPY4, including both direct install and weatherization measures. The number of participants and the number of installed units are also included for each measure.

In order to better understand measure installation patterns, the evaluation team looked at the amount of homes that installed each measure as a percentage of total homes that received an assessment. Table 3-3 below shows the percentage of assessed homes that installed each measure offered in the HES program. In GPY1/EPY4, 1,080 participants received an assessment and excluding CFLs, pipe insulation and bathroom aerators were the most common direct install measures, while attic insulation and air sealing were the most common retrofit measures. The least common direct install measure was the programmable thermostat, and the least common weatherization measures were wall insulation and duct insulation and sealing. Overall, GPY1/EPY4 retrofit measure penetration approximates that of ComEd’s PY3 Single Family Retrofit Pilot results.

**Table 3-2. GPY1/EPY4 Ex-Ante Gross Impact, by Measure**

	Measure	Participants	Installed Units	Therms	MWh	kW (peak)
Direct Install Measures	9 Watt CFL	355	1,305	0	38.0	3.3
	14 Watt CFL	627	2,564	0	110.8	9.5
	19 Watt CFL	479	1,546	0	81.2	7.0
	23 Watt CFL	506	1,546	0	111.6	9.6
	9 Watt Globe CFL	129	680	0	19.8	1.7
	Low Flow Shower Head	475/7^	744/13^	19,463	4.9	0
	Kitchen Aerator	133/5^	151/5^	426	0.7	0
	Bathroom Aerator	567/10^	1270/21^	3,574	2.4	0
	Hot Water Temperature Setback	199/0^	208/0^	1,331	0	0
	Pipe Insulation	572/11^	1260/29^**	3,943	1.3	0
	Programmable Thermostat	56	62	3,261	0	0
	Programmable Thermostat Education*	314	317	0*	0*	0*
<i>Subtotal</i>				31,998	370.6	31.0
Retrofit Measures	Attic Insulation	309	-	34,604	68.1	0
	Wall Insulation	25	-	4,316	0.8	0
	Floor Insulation (Other)	209	-	6,496	6.2	0
	Duct Insulation & Sealing	15	-	111	0.9	0
	Air Sealing	313	-	26,979	80.2	0
<i>Subtotal</i>				72,507	156.2	0
<b>Total Savings</b>				104,505	526.8	31.0

Source: Navigant analysis of program tracking data

^Participants and installed units broken out for participants with gas and electric hot water heaters. The first number represents the participants or installed units for gas water heaters, and the second number is for electric water heaters.

\*Nicor Gas/ComEd did not claim savings for programmable thermostat education in GPY1/EPY4. Navigant estimated savings for the measure as discussed in appendix 5.2.2.

\*\*Installed units for pipe insulation is reported in 3 ft. segments

**Table 3-3. Percent of Participating Homes Installing Each Program Measure Type, GPY1/EPY4**

	Measure	Participants	GPY1/EPY4 Percent of Participating Homes Installing Measure	ComEd EPY3 Retrofit Pilot Percent of Participating Homes Installing Measure
Direct Install Measures	Assessment Fee	1,080	100%	-
	All CFL Types	940	87%	82%
	Low Flow Shower Head	482	45%	-
	Kitchen Aerator	138	13%	-
	Bathroom Aerator	577	53%	-
	Hot Water Temperature Setback	199	18%	-
	Pipe Insulation	600	56%	-
	Programmable Thermostat	56	5%	-
	Programmable Thermostat Education	314	29%	-
Retrofit Measures	Attic Insulation	309	29%	25%
	Wall Insulation	25	2%	2%
	Floor Insulation (Other)	209	19%	10%
	Duct Insulation & Sealing	15	1%	3%
	Air Sealing	313	29%	29%

Source: Navigant analysis of program tracking data; ComEd Energy Efficiency/Demand Response Plan: Plan Year 3 (6/1/2010-5/31/2011) Evaluation Report: Single Family Programs

### 3.1.3 Verified Gross Program Savings

Navigant performed a gross savings evaluation for all measures installed through the HES program in order to verify ex-ante savings assumptions and to adjust weatherization measures for survey-determined installation and persistence rates.

#### Review of Ex-Ante Gross Impacts

The evaluation team first performed a summary of the program ex-ante gross impact accomplishments based on an engineering review of the tracking system. CSG provided the original tracking data, and updates to direct install measures were provided by WECC<sup>13</sup> throughout the evaluation process. Navigant performed a detailed engineering review of the ex-ante savings assumptions provided by CSG

<sup>13</sup> Wisconsin Energy Conservation Corporation

and WECC and developed verified gross savings values for all of the direct install and weatherization measures. Adjustments to ex-ante savings values were based on updated assumptions and algorithms in the IL TRM, as well as engineering judgment. Further detail on TRM gross savings methodology and updates can be found in Appendix 5.2.3.

The evaluation team further reviewed the software used by CSG to determine ex-ante program impacts in GPY1/EPY4. As stated in the GPY1/EPY4 Evaluation Plan, Navigant chose to conduct a desk review of CSG's *EM HOME* software. As part of the desk review, Navigant performed a literature review to compare evaluated savings values for projects with similar weatherization offerings as the HES program. This was done in order to "vet" the ex-ante savings for weatherization measures in the HES program. Navigant planned to do an expanded evaluation of weatherization measures in future program years if any issues are identified with CSG's weatherization calculation methods. However, Navigant found no issues with the weatherization calculation methods and based on the literature review performed in GPY1/EPY4, Navigant has accepted the ex-ante weatherization savings reported by CSG. Appendix 5.2.3 has a detailed discussion of the literature review findings.

### **Installation and Persistence Rates**

The installation rate is a ratio of customer-reported measure installations to those contained in the program tracking database. The persistence rate is used to reflect the removal of program measures, which can be thrown away, given away, sold, or put into storage. Unlike the installation rate, which can be gauged immediately after a contractor completes work, gauging persistence requires factoring in a period of time after installation before it can be properly measured. Multiplying an installation rate and a persistence rate results in an in-service rate for a measure, which signifies the percentage of a measure reported in the tracking system that is currently verified installed. Thus the in-service rate is multiplied against tracking system ex-ante data to determine verified gross savings.

Navigant used TRM-prescribed in-service rates to calculate verified gross savings for direct install measures; however, since the IL TRM does not outline impact parameter estimates for weatherization measures, the evaluation team conducted a participant survey to determine estimates for these measures. The survey gauged installation rates for measures the tracking system reported installed for each survey participant. Following the installation rate question battery, all respondents were asked a two-part persistence question to identify 1) participants that reported uninstalling one of the measures installed in the program, and 2) which measures were uninstalled by each participant that reported uninstalling something. For a full discussion and outline of measure parameter estimates, see Appendix 5.2.

Table 3-4 shows the installation and persistence rate results for direct install and weatherization measures from Navigant's participant survey alongside the in-service rates deemed in the Illinois TRM for direct install measures.

**Table 3-4. GPY1/EPY4 Survey-Determined Direct Install and Weatherization Measure Installation and Persistence Rates Compared to TRM In-Service Rates**

	Measure	Survey Installation Rate	n=	Survey Persistence Rate	n=	TRM In-Service Rate <sup>14</sup>
Direct Install Measures	All CFL Types	0.98*	45	0.96	45	0.97
	Low Flow Shower Head	1.00	29	0.90	50	0.98
	Kitchen Aerator	0.94*	32	0.90	50	0.95
	Bathroom Aerator	0.94*	32	0.90	50	0.95
	Hot Water Temperature Setback	0.92*	13	0.92	50	1.00
	Pipe Insulation	0.88*	32	1.00	50	1.00
	Programmable Thermostat	1.00**	NA	1.00	50	1.00
	Programmable Thermostat Education	0.35^	17	1.00	50	-
Retrofit Measures	Attic Insulation	0.96*	54	1.00***	NA	-
	Wall Insulation	1.00	7	1.00***	NA	-
	Floor Insulation (Other)	0.71*	38	1.00***	NA	-
	Duct Insulation & Sealing	1.00**	NA	1.00***	NA	-
	Air Sealing	0.94*	54	1.00***	NA	-

Source: Navigant participant survey

\*Navigant reports an installation rate of 1 for these measures as noted in CSG’s QAQC findings.

\*\*Navigant did not collect data for the programmable thermostat and duct insulation and sealing categories because of the relatively small amount of participating homes for these measures. Therefore, Navigant reports an installation rate of 1 for these measures.

\*\*\*Navigant assumed participants would not uninstall retrofit measures and assigned a persistence rate of 1.

^This low installation rate may be due to participant recollection error, especially since this involved programming a household’s existing thermostat rather than installing a new energy efficiency device. However, since this is a behavioral measure where an individual might reset the programming, there is precedent to expect relapse and an in-service rate of less than 1. Since the TRM does not provide an estimate for this measure, the evaluation team will continue to use this value to estimate a survey-determined in-service rate to for gross savings calculations.

Note that according to the participant survey some installation rates are less than 100%. This may be due to respondent self-report recollection error or weatherization terminology confusion, especially given the variety of work contractors performed. Navigant confirmed that CSG performs adequate QAQC follow-up checks on homes and accepts their reported installation rate of 100% for all measures. Navigant also

<sup>14</sup> In-service rates are a multiple of installation and persistence rates.

assumed a persistence rate of 1 for weatherization measures and did not gauge it in the survey as it is unlikely weatherization measures would be uninstalled. As a result, weatherization measures were all assigned an in-service rate of 1.

Navigant applied the TRM deemed in-service rates to direct install measure ex-ante savings, and an in-service rate of 1 to weatherization measure ex-ante savings to determine verified gross savings.

### **Summary of Verified Gross Program Impact Estimates**

This section details the results of Navigant's verified gross impact analysis for the HES program. Navigant adjusted the ex-ante values with algorithm/assumption improvements and by applying the TRM in-service rates listed in the previous section of this report for direct install measures. Verified gross savings for weatherization measures all use an in-service rate of 1, where CSG's QAQC findings inform the installation rates, and a persistence rate of 1 is assumed since weatherization measure uninstallation is unlikely. Table 3-5 summarizes the verified gross results by measure type.<sup>15</sup>

---

<sup>15</sup> The evaluation team calculated an alternative savings estimate for the program as a whole in Appendix 5.2.7 which utilizes Navigant's measure-level installation and persistence rate findings for direct install measures rather than the IL TRM. This was done for reference purposes only.

**Table 3-5. GPY1/EPY4 HES Program Verified Gross Savings**

	Measure	Therms	Therms RR*	MWh	MWh RR*	kW (peak)	kW RR*
Direct Install Measures	9 Watt CFL	0	-	41.6	1.09	4.1	1.27
	14 Watt CFL	0	-	121.1	1.09	12.1	1.27
	19 Watt CFL	0	-	88.9	1.10	8.8	1.27
	23 Watt CFL	0	-	122.3	1.10	12.2	1.27
	9 Watt Globe CFL	0	-	21.7	1.09	2.2	1.27
	Shower Head	19,157	0.98	7.2	1.48	0.5	-
	Kitchen Aerator	412	0.97	0.3	0.46	0.0	-
	Bathroom Aerator	3,512	0.98	1.4	0.57	0.2	-
	Hot Water Temperature Setback	1,274	0.96	0.0	-	0.0	-
	Pipe Insulation	3,855	0.98	2.1	1.54	0.2	-
	Programmable Thermostat	2,946	0.90	2.7	-	0.0	-
Programmable Thermostat Education	5,718 <sup>^</sup>	-	8.5	-	0.0	-	
<i>Subtotal</i>		36,873	1.15 <sup>†</sup>	417.7	1.13	40.2	1.30
Weatherization Measures**	Attic Insulation	34,604	1.00	68.1	1.00	0.0	-
	Wall Insulation	4,316	1.00	0.8	1.00	0.0	-
	Floor Insulation (Other)	6,496	1.00	6.2	1.00	0.0	-
	Duct Insulation & Sealing	111	1.00	0.9	1.00	0.0	-
	Air Sealing	26,979	1.00	80.2	1.00	0.0	-
<i>Subtotal</i>		72,507	1.00	156.2	1.00	0.0	-
<b>Total Savings</b>		109,380	1.05	573.9	1.09	40.2	1.30

Source: Navigant analysis of program tracking data

\*RR = Realization Rate. This is the ratio of verified gross to ex-ante gross savings.

\*\*The TRM does not specify deemed savings values for retrofit measures, thus savings are based on research parameter values

<sup>^</sup>To estimate verified gross savings for the programmable thermostat education measure, Navigant applied the TRM deemed savings value for programmable thermostats to all of the measure participants and then adjusted it by the survey-determined in-service rate of 0.35.

<sup>†</sup>The program did not claim any savings for the programmable thermostat measure which results in an overall realization rate that is above 1.0, even though all individual measures have a realization rate below 1.0.

Low flow showerheads by far accounted for the most direct install therm savings as a percentage of total direct install therm savings, followed by pipe insulation, bathroom aerators, and programmable thermostats. CFLs accounted for the most electric savings in the direct install measure category. Amongst retrofit measures, attic insulation and air sealing accounted for both the most gas and electric savings. Notably, though programmable thermostats were the least installed direct install measure (see Table 3-3), they accounted for almost as much therm savings as bathroom aerators and pipe insulation.

### **3.1.4 Net-to-Gross Analysis and Verified Net Program Impact Estimates**

This section details the results of Navigant’s verified net impact analysis for the HES program, which includes adjustments for both free ridership and spillover in the net-to-gross analysis.

The objective of the free-ridership assessment is to estimate the impact of program incited measures that would have been installed even in the absence of the program. This cannot be measured directly due to the inability to observe behavior in the absence of the program. Thus, free ridership is assessed as a probability score for each measure. The evaluation relies on self-reported data collected during participant telephone surveys to assign free ridership probability scores to each measure. The objective of the spillover assessment is to estimate the impact arising from efficient measures installed as a result of the program that were not incited by the program. The evaluation also relies on self-reported data collected during the telephone survey to identify these measures and assess the role of the program in the decision to install. Summing the free ridership and spillover scores and subtracting them from a factor of 1.0 results in a net-to-gross ratio that the evaluation team applied to verified gross savings to estimate verified net program savings.

#### **Net-to-Gross Analysis**

Navigant calculated net-to-gross values for each direct install and weatherization measure based on the free ridership and spillover results determined using the participant survey. Detailed equations and methodologies are presented in Appendix 5.2.4 and 5.2.5. Final free ridership, spillover, and NTG values are shown in Table 3-6.

**Table 3-6. Verified Net-to-Gross Results by Measures**

	Measure	Free Ridership	FR n=	Spillover	SO n=	NTG
Direct-Install Measures	9 Watt CFL	0.24	45	0.04	3	0.80
	14 Watt CFL	0.24	45	0.04	3	0.80
	19 Watt CFL	0.24	45	0.04	3	0.80
	23 Watt CFL	0.24	45	0.04	3	0.80
	9 Watt Globe CFL	0.24	45	0.04	3	0.80
	Low Flow Shower Head	0.07	29	0.00	0	0.93
	Kitchen Aerator	0.01*	0	0.00*	0	0.99*
	Bathroom Aerator	0.01	32	0.00	0	0.99
	Hot Water Temperature Setback	0.12	12	0.00	0	0.88
	Pipe Insulation	0.12	28	0.05	2	0.93
	Programmable Thermostat	-	0	-	0	0.90**
	Programmable Thermostat Education	-	0	-	0	0.90**
Retrofit Measures	Attic Insulation	0.21	51	0.02	1	0.81
	Wall Insulation	0.22	5	0.00	0	0.78
	Floor Insulation (Other)	0.16	33	0.00	0	0.84
	Duct Insulation & Sealing	-	0	-	0	0.80^
	Air Sealing	0.14	52	0.00	0	0.86
Overall Program		0.15	-	0.01	-	0.86

Source: Navigant participant survey

\*Navigant did not collect NTG data for the kitchen aerator measures, as it represented less than 5% of ex-ante program savings. Navigant applied the bathroom aerator NTG results to the kitchen aerator measure. It was assumed that these measures were similar in free ridership and spillover.

\*\*Navigant did not collect NTG data for the programmable thermostat measures, as it represented less than 5% of ex-ante program savings. Navigant referenced NTG values for comparable programs in the Northeast. A NTG value of 0.89 was used in the 2010 Gas Efficiency Annual Report by the Massachusetts Joint Utilities<sup>16</sup> and a NTG value of 0.90 was used in the Efficiency Vermont Year 2010 Savings Claim<sup>17</sup>. Navigant assigned an average NTG value of 0.90 for programmable thermostat and thermostat education measures.

^Navigant did not collect NTG data for the duct insulation and sealing measure, as it represented less than 5% of ex-ante program savings. Navigant referenced the latest California Energy Commission and California Public Utilities Commissions' 2008 Database for Energy Efficient Resources<sup>18</sup> (DEER Database) to assign a proxy NTG value based on comparable measures and programs. The DEER NTG values are based on assessment and direct install programs in California performed between the years 2003-2005. These include the Southern California Edison In-Home Assessment Program and H&L Energy Savers Programs, which provide assessment and direct install services similar to those of the HES program.

<sup>16</sup>"2010 Gas Energy Efficiency Annual Report", Boston Gas Company, Colonial Gas Company and Essex Gas Company each d/b/a National Grid, August 2011, page 67.

<sup>17</sup>"Year 2010 Savings Claim", Efficiency Vermont, April 1, 2011, page 162.

<sup>18</sup> See the 2008 Database for Energy-Efficient Resources:

[http://www.deeresources.com/deer0911planning/downloads/DEER2008\\_NTG\\_ValuesAndDocumentation\\_080530](http://www.deeresources.com/deer0911planning/downloads/DEER2008_NTG_ValuesAndDocumentation_080530)

Table 3-7 shows NTG results by energy and measure types. Navigant calculated NTG values by applying the measure-specific NTG values outlined in Table 3-6 to the verified measure-specific gross savings outlined in Table 3-5. Doing so allowed the evaluation team to determine overall measure type gross and net savings by energy type. The overall measure type net and gross savings were then converted to an overall measure type NTG ratio by energy type seen in the table below.

**Table 3-7. Verified Net-to-Gross Results by Energy and Measure Types**

Measure Type	Energy Type	NTG
Direct Install Measures	MWh	0.81
	Therms	0.93
	Combined*	0.89
Retrofit Measures	MWh	0.84
	Therms	0.83
	Combined*	0.83
Overall Program	MWh	0.82
	Therms	0.86
	Combined*	0.86

Source: Navigant participant survey

\*Combined savings converts therms and kWh impacts to the same unit for comparison. Navigant converted therms to kWh with the conversion factor of 29.3 therms per kWh.

### Verified Net Program Impact Results

The NTG Framework<sup>19</sup> calls for retroactively applying the NTG ratio for “previously evaluated programs undergoing significant changes — either in the program design or delivery, or changes in the market itself.” The HES program meets this criterion, and so this evaluation uses the NTG ratios calculated from our GPY1/EPY4 participant survey research. The HES program changed assessment pricing and implementation contractors in GPY1/EPY4.

Navigant applied the measure-level net-to-gross (NTG) values determined through its participant survey research to its verified gross savings estimates for each measure to determine program verified net savings. Table 3-8 shows the final evaluated net savings of the Home Energy Savings GPY1/EPY4 program.

<sup>19</sup> “Proposed Framework for Counting Net Savings in Illinois.” Memorandum March 12, 2010 from Philip Mosenthal, OEL, and Susan Hedman, OAG.

**Table 3-8. GPY1/EPY4 HES Program Verified Net Savings**

	Measure	Therms	MWh	kW (peak)
Direct Install Measures	9 Watt CFL	0	33.3	3.3
	14 Watt CFL	0	97.0	9.6
	19 Watt CFL	0	71.2	7.1
	23 Watt CFL	0	97.9	9.7
	9 Watt Globe CFL	0	17.3	1.7
	Shower Head	17,847	6.7	0.4
	Kitchen Aerator	409	0.3	0.0
	Bathroom Aerator	3,481	1.4	0.2
	Hot Water Temperature Setback	1,116	0.0	0.0
	Pipe Insulation	3,581	1.9	0.2
	Programmable Thermostat	2,651	2.4	0.0
	Programmable Thermostat Education	5,146	7.7	0.0
<i>Subtotal</i>		34,231	337	32.3
Retrofit Measures	Attic Insulation	28,181	55.5	0.0
	Wall Insulation	3,367	0.6	0.0
	Floor Insulation (Other)	5,460	5.2	0.0
	Duct Insulation & Sealing	89	0.7	0.0
	Air Sealing	23,270	69.2	0.0
<i>Subtotal</i>		60,366	131	0.0
<b>Total Savings</b>		<b>94,597</b>	<b>468.2</b>	<b>32.3</b>

Source: Navigant analysis

All told, GPY1/EPY4 program net impacts, using evaluated parameters, are 94,597 therms, 468.2 MWh, and 32.3 kW. The combined effect of the gross impact realization rates and net-to-gross ratios on the HES program results in verified net savings that are 91%, 89%, and 104% of ex-ante therms, kWh, and kW savings, respectively. Ultimately, the program achieved 107% of electric net savings goals and 43% of gas net savings goals.

**Table 3-9. Net Savings Goal vs. Achieved Verified Net Savings**

	Net Savings Goal	Verified Net Savings	% Goal Met
Electric	438 MWh	468 MWh	107%
Gas	220,729 therms	94,597 therms	43%

*Source: Navigant Analysis; Nicor EEP Final – Revision for Compliance Filing 05-27-2011 FINAL; ComEd - PY4 QTR 4 Report*

### 3.2 Process Evaluation Results

Since the program did not reach its participation goals in GPY1/EPY4, the evaluation team conducted research amongst full participants (bot assessment/direct install and weatherization services), non-participants, and trade allies to determine marketing outreach effectiveness and potential barriers to participation. The evaluation team further researched program satisfaction amongst participants, as well as the program’s general effects on the market as related to its overall market transformation goals. The findings are outlined in this section.

#### 3.2.1 Program Changes since Gas Rider 29/EPY3

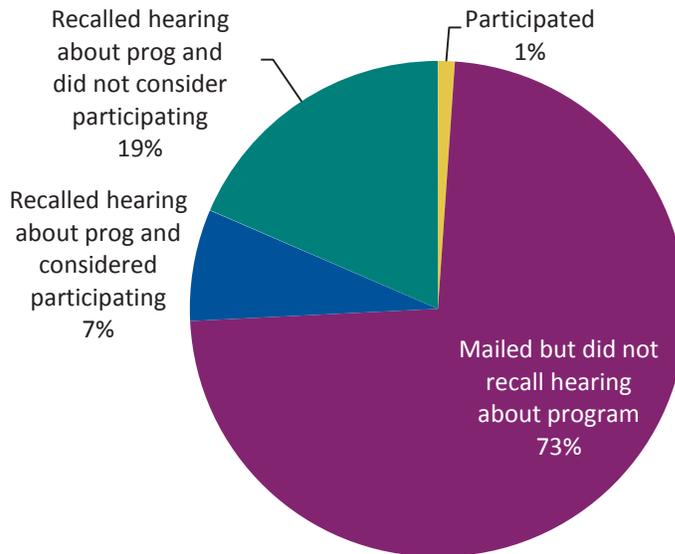
Though the program design is structurally the same since Rider 29, GPY1/EPY4 (Rider 30) has several differences. They include:

- GPY1/EPY4 has a different implementation contractor, assessment pricing has changed, and there are more contractors on board;
- Nicor Gas added weekend assessments;
- Customers were given the option to choose which recommended measures they would like installed rather than the “all or nothing” approach in previous years.

#### 3.2.2 Program Awareness

Customer awareness of the program is progressing as the program plan and program theory projected, even though participation goals were not met. Though the program reports that only 1% of people mailed about the program ended up fully participating, about 26% (n=68) of non-participants that received a program mailer in the spring recalled hearing about the HES program. This finding indicates that a relatively large portion of the population sent a mailer about the program is aware of it. Furthermore, about 28% of non-participants who remembered hearing about the program considered participating in the program, but ultimately did not. This means that out of the nearly 100,000 people mailed about the program, about 28% of the 26% that heard about the program, or about 7,000 individuals, thought about participating in the program but did not (see Figure 3-1).

**Figure 3-1. Breakdown of GPY1/EPY4 Spring Mailer Participants and Non-Participants**



*Source: Non-participant survey and Spring\_2012\_mailing\_list Jim V.xlsx*

Though about a quarter of non-participants know about the program in general, their knowledge of program details is more limited. About 78% of program-knowledgeable non-participants didn't know the program offers free direct install measures with a home energy assessment. Furthermore, about 39% of program-knowledgeable non-participants did not know that they are not obligated to follow-through on all of the home-weatherization recommendations if they perform the home assessment.

Notably, about 28% of all mailed non-participants reported not being aware of what "weatherization" means. Thus, a potential barrier to participation is a lack of understanding about what weatherization is and what benefits it may provide. Marketing material might attempt to further address the need to teach the market about the benefits of weatherization and what it involves.

Most non-participants who made energy efficiency changes in their homes with program-eligible measures did not know about utility incentives. About 57% of non-participant respondents had purchased or installed a measure offered in the HES program within the last 12 months. CFLs (25%), weatherization/insulation measures (19%), and showerheads and faucet aerators (18%) were the top three most common measures reported. About 85% obtained those measures from a hardware store and 13% from a contractor. According to the survey respondents, none of the purchases were made through a utility energy efficiency program and only 15% of respondents were aware, at the time of purchasing and installing the equipment, that there was incentive money available from their utilities to help cover the cost of getting those measures (i.e., 85% reported not being aware of utility rebate programs).<sup>20</sup> Some of these non-participants may have been potential participants for the program had they known about

<sup>20</sup> There is a possibility that some survey respondents may have purchased a measure discounted by a utility program, such as CFLs, without knowing it.

the free direct install measures offered for participating in an assessment; a further subset of these could potentially have become retrofit participants.

### 3.2.3 Marketing and Outreach Effectiveness

The program is using the most effective means of outreach to customers. Though program staff report that only about 1% of people mailed about the program participated, the program mailer was the most effective means of informing participants and non-participants about the program, judging by their reported initial sources for program information. Of the non-participants who remembered hearing about the program, 83% remembered receiving a letter about the program in the mail and 93% of those recalled having opened the letter to read about the program. About 80% of non-participants that read the letter indicate that it was an effective way to communicate about the program and about 61% of non-participants that remembered receiving a letter reported that it was the only way they heard about the program. Accordingly, participants indicated “brochures/fliers through direct mail” (30%) as the primary way they heard about the program. Word of mouth (28%) and contractor “tagged” referrals (15%) were the second and third most common ways heard about the program and a number of miscellaneous other channels were also reported, including television and newspapers. Program administrators note that community outreach was not strong in GPY1.

Program mailers are not only the most effective, but are also the preferred means of outreach among participants and non-participants. Participants and non-participants agreed that program mailers were the best way to reach them. When program-knowledgeable non-participants were asked for the best ways for the utilities to provide them with program information, utility mailings (59%) remained the most popular method, followed by e-mail (17%), and TV and Radio (each 11%). Over half of participants surveyed suggest the program best reach out to customers like them with printed materials sent via mailings, ads/flyers, or with bill inserts. A variety of other methods and media were also suggested, such as online ads and other e-media “blasts” in addition to TV and radio, reflecting the increasingly diverse communications channels available to customers today.

Most (64%) participants who recalled receiving the direct-mail information thought the materials were very useful. Indeed, every participant surveyed who recalled receiving the direct-mail information thought the information was either very useful or at least somewhat useful, and none had immediate thoughts on what might make the materials more useful to them. However, since the program overall did not reach its program intake goal, it suggests a closer look at non-participants’ experience with program outreach to find opportunities to increase its effectiveness since customers did not respond to program marketing as expected.

Though the program uses the most effective means of communicating to customers, the content of the marketing material could be improved. The evaluation team found that the program had non-participants who were interested in participating that were deterred due to insufficient understanding of the program and its benefits. Notably, 22% of non-participants who knew about the program but did not participate reported being concerned or skeptical about the trustworthiness of the program and its incentive offers – 11% of whom reported that as their main barrier to participation.<sup>21</sup>

---

<sup>21</sup> Further barriers to participation are discussed in the Barriers to Participation section.

Trade allies further reaffirmed the need to improve marketing material content. One contractor notes that CSG-provided marketing material is “too vague” and unclear for the layman, which stifles participation motivation. They recommend driving participants to the website to grab their attention. One trade ally noted customers sometimes questioned the motives of the utilities and their promotion of energy conservation, indicating a limited understanding of the program’s merits and financing. As such, the program stands to gain potential participants by more clearly addressing skepticism about the utilities’ intentions with the HES program and a lack of understanding about program offerings.

Though nearly a third of non-participants did not know what weatherization is, most non-participants both valued energy efficiency and showed potential for participation. Most non-participants reported seeing value in making their home energy efficient, and the majority reported previously making energy efficiency changes in their homes. On a four-point scale (“not at all valuable,” “somewhat valuable,” “very valuable,” “extremely valuable”), only 3% of respondents indicated energy efficiency was “not at all valuable” to them, and 60% indicated it was either “very valuable” or “extremely valuable.” Furthermore, 85% of non-participants indicated they had previously made some or major changes in their home to save energy. Thus non-participants are aware of energy efficiency and they’ve most likely done something energy efficient in their home in the past.

The evaluation team also gauged whether non-participants had plans for energy efficiency work on their home in the near future. About 25% of non-participants reported that they have plans to make energy efficiency improvements to their home in the near future. When asked to indicate what they would do, the most common response was insulation work (39%). A further 17% indicated wanting to replace their windows, and another 6% noted wanting to install new doors. Thus, over half of non-participants indicated a desire to retrofit their home against the elements. This finding indicates that, although some non-participants report having already done some previous energy efficiency work, there seems to be clear interest in weatherization work among non-participants.

Program-knowledgeable non-participants were asked how much they would be willing to spend to make their home more energy efficient if the average home energy efficiency retrofit job in the program could save hundreds of dollars a year in avoided energy costs. About 44% reported they would spend \$0 to less than \$250 and 17% (or 5% of all mailed customers) would spend in the range of \$750 to \$1250 on the program. Thus, nearly a fifth of program knowledgeable non-participants would be willing to spend enough to cover the cost of assessment and retrofits, which is a promising indication of potential assessment participants. Another 29% of program-knowledgeable non-participants (about 10% of mailed customers) reported they don’t know or are not sure how much they would spend.

Overall, these findings support the general flow of the program’s marketing efforts and show that – including brochures, word-of-mouth, and contractor referrals in particular – the program’s marketing strategy is having a positive effect on increasing customer awareness. However, since about 74% of non-participants don’t remember hearing about the HES program and a portion of interested non-participants were deterred from the program due to not fully understanding and being skeptical of the program, the program may benefit from 1) expanding to other forms of outreach, and 2) improving its marketing messaging.

### 3.2.4 Barriers to Participation

The evaluation team supplemented its marketing and outreach effectiveness research with additional research into potential barriers to participation.

Overall, program-knowledgeable non-participants reported the most common reason they did not participate in PY1 was because they couldn't afford it (26%). The latter is reflected in the difference in demographics between participants and non-participants, where program participants were almost twice as likely to be making \$100,000 or more than non-participants. Aside from affordability concerns, other barriers noted include:

- A general lack of interest in the program (21%);
- Having already done some work on the home (11%), including one non-participant who participated in a LIHEAP state weatherization program instead;
- Skepticism or mistrust about the program (11%);
- Having switched to an alternative energy provider with cheaper energy costs and thus being ineligible for the program, which is an inaccurate perception;
- Being confident to do the work themselves (someone in construction for over 40 years);
- Having an older home and planning to move away soon due to retirement; and
- Lack of initiative

Trade allies gave two notable barriers for customers already participating in the program:

- 1) Terminology in the program can be too sophisticated
- 2) Certain home conditions (including homes that don't fit the program's ideal "cookie cutter" design) may prevent optimal testing and installations.

Though trade allies generally showed agreement with available program energy efficiency measures, a few additional suggestions were made. Suggestions included considering incorporating injection and/or spray foam to be either incented or explored as a value added incentive to the customer, weather-stripping doors and caulking as cost-effective additions.

### 3.2.5 Participant and Program Partner Satisfaction and Recommendations for Improvement

The vast majority of participating customers surveyed saw the primary program benefit to be reduced energy bills (69%) and receiving a rebate on the cost of installing measures (20%). Nearly half (46%) of the respondents also cited a variety of other benefits the program provided, including improved comfort, assurance that equipment is running smoothly and safely, environmental benefits, and an improved general awareness and knowledge of what's needed to improve a home's efficiency.<sup>22</sup>

About two-thirds of participants surveyed had no concerns or skepticism about the program before they decided to participate, implying a reasonably good understanding that appears to be supported by the positive experience these customers had with the program information. The one-third who did have

---

<sup>22</sup> Respondents were allowed multiple responses to the question on program benefits.

some concern or skepticism noted several points, including the following (in no particular order of importance):

- A feeling that it's too good to be true;
- The program is somehow giving away something for nothing;
- A belief that green initiatives lose money and are poorly administered;
- Wondering how long the economic payback would be;
- Uncertainty whether the program would work on a very old home;
- Whether the program would act quickly once a customer signs up;
- Not understanding what the outcome would be; and
- Simply, the cost a customer would incur.

Even with such reservations, which the program seems to have addressed for participants (as all those with reservations did indeed sign up and participate), respondents overwhelmingly are satisfied with the program overall. About 97% rated their satisfaction as 8 to 10 on a 0-10 point scale and over half of participants stated they were very satisfied (10 rating). There were no aspects of the program (including participation processes, program staff, contractors, program information and measures installed) where customers gave dissatisfied ratings and nearly all aspects received high ratings (8 or higher). Also, over half those surveyed have recommended direct install measures to others since participating in the program, and few measures have been removed since they were installed. The few reasons participants gave for being somewhat dissatisfied mainly concerned scheduling or information being misplaced or not provided, confusion over what was being recommended, particularly difficult installation circumstances and, in one case, dissatisfaction with the showerhead spray pattern.

Participants were asked what opportunities they saw for program improvement, and 69% of respondents offered suggestions to improve the program – though a number of the “suggestions” actually were compliments paid by respondents who were very pleased with the program. The main suggestions were for more informative, persistent, and thorough marketing (about 25% of recommendations). Figure 3-2 summarizes participant suggestions for program improvement:

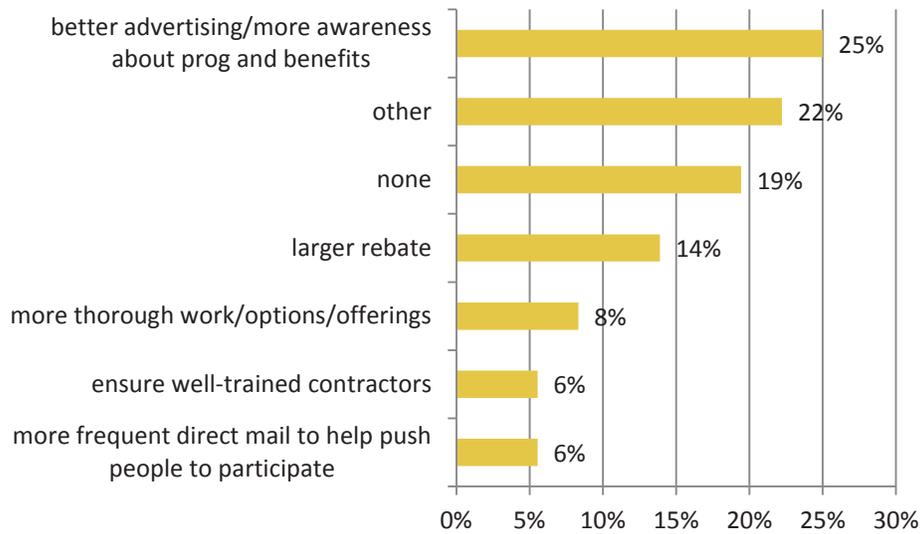
Overall, the suggested marketing and outreach improvements covered a range of possibilities and included the following:

- Marketing showing what the program has done in actual homes
- Simpler, and more marketing
- Testimonials
- Community outreach – town hall or similar organized community events

Most of these suggestions were offered in a positive sense, indicating a need for marginal, not wholesale improvements in the program. In summary, these survey findings show the program has worked very well for those who have participated in it.

Trade allies also agreed that minor adjustments could be made to continue to improve the program. Adjustment suggestions include introducing additional incentivized measures (such as spray foam), making the energy assessments “fit” a wider variety of homes better, as well as implementing additional targeted approaches to the program’s marketing strategies, including targeted community outreach.

**Figure 3-2. Participant Suggestions for Program Improvement**



Source: Navigant participant survey.

### 3.2.6 Market Effects

Overall, trade ally interview and survey findings show that the program is affecting both the customer and trade ally markets. Trade allies indicate that the program is effective in communicating and raising awareness of energy saving initiatives introduced by the utility. Furthermore, trade allies think participants found the level of incentives appropriate to influence measure adoption that otherwise would not have happened. The average free ridership estimated by energy advisors is 18%. Also, both energy advisors and contractors report there may be spillover occurring due to: 1) the competitive advantage participation in the program creates in the market, which potentially influences other contractors to try to compete with the program<sup>23</sup>, and 2) measures that are not incentivized by the program may be pursued by participants with other contractors outside of the program in order to have “complete” home projects. The GPY2/EPY4 evaluation will include more detailed market effects research.

<sup>23</sup> When asked why some contractors may choose not to participate in the program, one weatherization contractor noted that some contractors that may be aware of the program do not participate because they prefer their autonomy rather than following guidelines established by utility programs. Furthermore, contractors are selected to participate by CSG.

## 4. Findings and Recommendations

### 4.1 Key Impact Findings and Recommendations

- **The program achieved** 468 MWh and 94, 597 therms of verified net savings. The electric overall NTG ratio is 0.82 and the gas NTG ratio is 0.86. Overall, the program achieved 107% of its electric and 43% of its gas goals.
- **Finding.** Program verification, due diligence, and tracking system procedures all meet or exceed aspects of national best practices, as documented.
- **Finding.** CSG tracks installation rates during subsequent weatherization or QC activities, but it does not track persistence.  
**Recommendation.** Improvements in savings estimates may be achieved by tracking direct installation measure persistence as a potential program effectiveness indicator by way of follow-up checks during subsequent weatherization or QC activities.
- **Finding.** The data entry process involves taking field notes on paper and then re-entering the information into *EM HOME* on a computer in the work van, which is an instance of duplicate data entry.  
**Recommendation.** Explore switching from paper-to-computer based data entry during the energy assessments to using tablet computers equipped with *EM HOME* software. This will not only remove duplicative data entry and the potential for errors associated with it, but it could also potentially speed up the assessment process, which currently takes an average of 2.5 hours. By speeding up the assessment process, CSG could use the additional time for customer education helpful to the program. Such a software change would also provide the benefit of automatic, real-time accounting for the inter-connectivity of interdependent variables.
- **Finding.** The tracking database extract did not specify whether values were field-specified or default values.  
**Recommendation.** State whether building characteristics in the tracking system are field-specified or default values (e.g., heating and cooling system efficiencies), to clarify the basis for subsequent savings estimates. CSG stated that this information is visible in the *EM HOME* software suite, but that it would take considerable resources to be made available in the Microsoft Excel format that was used for the data extract submitted to Navigant. This information would be helpful to the evaluation team in determining the accuracy of inputs into the tracking system. This could also be useful as part of energy assessment review and training.
- **Finding.** The *EM HOME* simulation engine does not integrate customer billing data.  
**Recommendation.** Continue refining the *EM HOME* simulation engine to further improve savings estimates and reduce associated uncertainties. Explore options for improving modeling calibration using customer billing data, to provide an added dimension in estimating savings.
- **Finding.** The tracking system did not track kW savings for electric retrofit measures.  
**Recommendation.** Provide kW savings for electric retrofit measures to better facilitate cost-effectiveness estimates and various electric resource planning efforts.

Table 4-1 outlines the program’s electric and therm savings for GPY1/EPY4.<sup>24</sup> The NTG Framework<sup>25</sup> calls for retroactively applying the NTG ratio for “previously evaluated programs undergoing significant changes — either in the program design or delivery, or changes in the market itself.” The evaluation team believes the HES program meets this criterion because the program changed assessment pricing and implementation contractors in GPY1/EPY4. As a result this evaluation uses the NTG ratio calculated from our GPY1/EPY4 research for both the electric and gas components of the program.

**Table 4-1. GPY1/EPY4 Savings\***

	Energy Savings (MWh)	Peak Demand Savings (kW)	Energy Savings (Therms)
Ex-Ante Gross Savings	527	31	104,505
Ex-Ante Net Savings	358	22	96,105
Realization Rate**	1.09	1.30	1.05
Verified Gross Savings	574	40	109,380
Overall NTG Ratio****	0.82	0.80	0.86
Verified Net Savings	468	32	94,597
Planning Net Savings Goal	438	-	220,729
% Net Goal Achieved	107%	-	43%

Source: Navigant Analysis; Nicor EEP Final – Revision for Compliance Filing 05-27-2011 FINAL; ComEd - PY4 QTR 4 Report

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

\*\* Realization rates represent the ratio between verified gross and ex-ante gross savings.

\*\*\*\*Overall NTG is the ratio between verified net and verified gross savings.

In PY1/PY4 the electric component of the program achieved 107% of planning net savings goals while the gas component of the program achieved 43% of planning net savings goals.

Table 4-2 and Table 4-3 present the measure-specific electric and therm savings for GPY1/EPY4.

<sup>24</sup> The September 14, 2012 final version of the first State of Illinois Energy Efficiency Technical Reference Manual (TRM) (effective as of June 1, 2012) has been agreed to by Illinois Stakeholder Advisory Group (SAG) and the Illinois Commerce Commission in Docket No. 12-0528 as of the date of this report. The verified gross savings shown in Table E-1 are deemed by the TRM for measures outlined in the document. Evaluation research findings for gross savings in GPY1 are provided for reference in the Appendix.

<sup>25</sup> “Proposed Framework for Counting Net Savings in Illinois.” Memorandum March 12, 2010 from Philip Mosenthal, OEL, and Susan Hedman, OAG.

**Table 4-2. GPY1/EPY4 Measure-Level MWh Savings\***

	Measure	Ex-Ante Gross MWh	RR	Verified Gross MWh	NTG	Verified Net MWh
Direct Install Measures	9 Watt CFL	38	1.09	42	0.80	33
	14 Watt CFL	111	1.09	121	0.80	97
	19 Watt CFL	81	1.10	89	0.80	71
	23 Watt CFL	112	1.10	122	0.80	98
	9 Watt Globe CFL	20	1.09	22	0.80	17
	Shower Head	5	1.48	7	0.93	7
	Kitchen Aerator	1	0.46	0	0.99	0
	Bathroom Aerator	2	0.57	1	0.99	1
	Hot Water Temperature Setback	0	-	0	0.88	0
	Pipe Insulation	1	1.54	2	0.93	2
	Programmable Thermostat	0	-	3	0.90	2
	Programmable Thermostat Education	0	-	9	0.90	8
<i>Subtotal</i>		371	1.13	418	0.81	337
Retrofit Measures	Attic Insulation	68	1.00	68	0.81	55
	Wall Insulation	1	1.00	1	0.78	1
	Floor Insulation (Other)	6	1.00	6	0.84	5
	Duct Insulation & Sealing	1	1.00	1	0.80	1
	Air Sealing	80	1.00	80	0.86	69
<i>Subtotal</i>		156	1.00	156	0.84	131
<b>Total Savings</b>		527	1.09	574	0.82	468

Source: Navigant analysis

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

**Table 4-3. GPY1/EPY4 Measure-Level Therms Savings\***

	Measure	Ex-Ante Gross Therms	RR	Verified Gross Therms	NTG	Verified Net Therms
Direct Install Measures	9 Watt CFL	0	-	0	0.80	0
	14 Watt CFL	0	-	0	0.80	0
	19 Watt CFL	0	-	0	0.80	0
	23 Watt CFL	0	-	0	0.80	0
	9 Watt Globe CFL	0	-	0	0.80	0
	Shower Head	19,463	0.98	19,157	0.93	17,847
	Kitchen Aerator	426	0.97	412	0.99	409
	Bathroom Aerator	3,574	0.98	3,512	0.99	3,481
	Hot Water Temperature Setback	1,331	0.96	1,274	0.88	1,116
	Pipe Insulation	3,943	0.98	3,855	0.93	3,581
	Programmable Thermostat	3,261	0.90	2,946	0.90	2,651
Programmable Thermostat Education	0	-	5,718	0.90	5,146	
<i>Subtotal</i>		31,998	1.15	36,873	0.93	34,231
Retrofit Measures	Attic Insulation	34,604	1.00	34,604	0.81	28,181
	Wall Insulation	4,316	1.00	4,316	0.78	3,367
	Floor Insulation (Other)	6,496	1.00	6,496	0.84	5,460
	Duct Insulation & Sealing	111	1.00	111	0.80	89
	Air Sealing	26,979	1.00	26,979	0.86	23,270
<i>Subtotal</i>		72,507	1.00	72,507	0.83	60,366
<b>Total Savings</b>		104,505	1.05	109,380	0.86	94,597

Source: Navigant analysis

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

## 4.2 Key Process Findings and Recommendations

At this stage in the program’s development, Navigant finds that program processes are generally well-planned and executed, and that the program is serving participants very well. However, since the program did not reach its participation goals in GPY1/EPY4, the evaluation team conducted research amongst participants, non-participants, and trade allies to determine marketing outreach effectiveness and potential barriers to participation. Navigant found that the program is using the most effective

means of outreach to customers with its program mailers. The program is also targeting the right customers as many non-participants value energy efficiency, are interested in weatherization work, and are tentatively interested in participating but are not fully persuaded by the program's current marketing. Participants, contractors, and non-participants alike agree that marketing material content could be improved. Many mailed program-aware non-participants were unaware of the free direct install measures available through the program and thought that getting an assessment would obligate them to purchase weatherization measures. In addition, a noteworthy portion of participants and non-participants aware of the program showed some uncertainty about the program and the utility intentions of discounting and giving out free measures.

Navigant presents the following key process findings and recommendations:

- **Finding.** Program participants and program partners were very satisfied with the program, incentive levels, and processes. About 97% of participants rated their satisfaction as 8 to 10 on a 0-10 point scale and over half of participants stated they were "very satisfied" (the highest rating).
- **Finding.** The program is using an effective means of outreach to customers. Participants and non-participants agreed that program mailers were the best way to reach them. Participants also noted that word-of-mouth and contractor referrals were other important sources of initial information about the program.
- **Finding.** The program targeted the right market of customers in its marketing mailer. Most mailed non-participants both valued energy efficiency and showed potential for participation in the program. On a four-point scale ("not at all valuable," "somewhat valuable," "very valuable," "extremely valuable"), only 3% of respondents indicated energy efficiency was "not at all valuable" to them, and 60% indicated it was either "very valuable" or "extremely valuable." Furthermore, 25% of non-participants reported that they have plans to make energy efficiency improvements to their home in the near future. When asked to indicate what they would do, the most common response was insulation work (39%). This is a strong indication of potential participants among mailed non-participants.
- **Finding.** A promising proportion of program-knowledgeable non-participants are willing to spend the money necessary to participate in the program's weatherization component. Almost a fifth of program-knowledgeable non-participants (about 5% of all mailed customers) noted that they were willing to spend \$750-1,250 on the program if it were to save them money on their energy bills. Another 39% of program-knowledgeable non-participants (about 10% of mailed customers) reported they don't know or are not sure how much they would spend.  
**Recommendation.** The program could benefit from conducting focus groups to explore how best to remove barriers to participation for these program-knowledgeable non-participants.
- **Finding.** Participants, contractors, and non-participants alike agree that marketing material content could be improved. The most common participant recommendation for program improvement was for more informative, persistent, and thorough marketing about the program and its benefits.  
**Recommendation.** The evaluation team suggests a workshop meeting of energy advisors, trade allies, and other program stakeholders to gather feedback on the previous year's program efforts

and associated marketing efforts, with the goal of improving the marketing material for future program years. For example, the program may benefit from posting video clips on the program website to clarify program details through a new, information-rich medium. Implementing these recommendations may help identify some sources of participant misunderstandings of program offerings and further strengthen information available to potential participants about the program.

- **Finding.** Many program-aware non-participants were unaware of the free direct install measures available through the program. Furthermore, many non-participants thought that getting an assessment would obligate them to purchase weatherization measures.  
**Recommendation.** Consider modifying the program marketing collateral to more clearly emphasize that, while strongly encouraged and that there is considerable program support to do so, customers are not obligated to purchase the weatherization measures suggested by the assessment, along with pointing out that direct install measures provide immediate savings benefits that outweigh the cost of getting an assessment. This emphasis may drive more initial participation. Furthermore, the program may attract more participants by more strongly emphasizing that the nature of the assessment is to inform customers about opportunities to save money on energy bills and to make the home more comfortable. Highlighting the low-risk nature of scheduling an assessment may help hesitant participants feel more comfortable about participating since there are no obligations to install recommended measures.
- **Finding.** A noteworthy portion of participants and non-participants aware of the program showed some uncertainty about the program and the utility intentions of discounting and giving out free measures. According to non-participant survey results, if program-aware non-participant skepticism about the program is addressed, it could increase the amount of customers that ultimately consider participation from the current 28% that reported thinking about participating upon receiving a program mailer to up to as much as 50% based on non-participant survey results.  
**Recommendation.** The program may benefit from addressing these concerns in its marketing and outreach materials in order to tip hesitant but interested potential participants into scheduling an assessment. Given the very high levels of participant satisfaction with the program, the program may consider providing customers summary information from real-world case studies and testimonials that address common misconceptions about the program. These could be presented on the program website, in mailers, and other marketing and outreach material. Issues to address should include why the utilities are willing to incentivize energy efficiency improvements, and the mutually-beneficial nature of the programs for customers and the utilities. Implementing this recommendation may increase the conversion rate for the program mailer.
- **Finding.** Nearly a third of mailed non-participants did not know what “weatherization” means.  
**Recommendation.** Marketing material should meet the needs of the layman and use simplified terminology to describe the program offerings.
- **Finding.** Though marketing material could benefit from clarification, the overall program marketing message resonates with participant perceptions of the program’s primary benefits. The vast majority of participating customers surveyed saw the primary program benefit to be reduced energy bills (69%) and receiving a rebate on the cost of installing measures (20%).

Nearly half (46%) of participants also cited a variety of other benefits the program provided, including improved comfort, assurance that equipment is running smoothly and safely, environmental benefits, and an improved general awareness and knowledge of what's needed to improve a home's efficiency.<sup>26</sup>

- **Finding.** About 26% of non-participants were aware of the program (mostly through program mailers, word- of-mouth, and contractor referrals), while the remainder were not despite having received mailers. Furthermore, program administrators noted that community outreach was not strong in GPY1/EPY4.

**Recommendation.** Though the program mailers are the most important source of program outreach, the program may consider seeking to capitalize on developing additional communication channels such as various social media as an extension of the word-of mouth awareness building that is already starting to be an important source of program awareness. Furthermore, the program may benefit from community outreach at events that attract the target participant demographic. Implementing these recommendations may increase participation levels and provides additional opportunities to address issues related to customer awareness and understanding about the program.

---

<sup>26</sup> Respondents were allowed multiple responses to the question on program benefits.

## 5. Appendix

### 5.1 Glossary

#### High Level Concepts

##### Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 to May 31, 2009, EPY2 is June 1, 2009 to May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 to May 31, 2012, GPY2 is June 1, 2012 to May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

##### Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY4/GPY1 ComEd's deemed parameters were defined in its filing with the ICC. The Gas utilities agreed to use the parameters defined in the TRM, which came into official force for EPY5/GPY2.

**Application:** When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

##### Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

**Application:** When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

### Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports†	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ “Energy” and “Demand” may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the “Terms to Be Used in Reports” column).

## Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

**Deemed Value** – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM, Nicor Gas or ComEd’s approved deemed values. Values that are based upon a deemed measure shall use the superscript “D” (e.g., delta watts<sup>D</sup>, HOU-Residential<sup>D</sup>).

**Non-Deemed Value** – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM, Nicor Gas or ComEd’s approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript “E” for “evaluated” (e.g., delta watts<sup>E</sup>, HOU-Residential<sup>E</sup>).

**Default Value** – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript “DV” as in X<sup>DV</sup> (meaning “Default Value”).

**Adjusted Value** – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript “AV” as in X<sup>AV</sup>

## Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012<sup>27</sup>.

**Evaluation:** Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification, measure level research, and program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

*Synonym:* **Evaluation, Measurement and Verification (EM&V)**

**Measure Level Research:** An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms

---

<sup>27</sup> IL-TRM\_Policy\_Document\_10-31-12\_Final.docx

(typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

**Program Level Research:** An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

**Savings Verification:** An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

**Measure Type:** Measures are categorized into two subcategories: custom and prescriptive.

**Custom:** Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

**Prescriptive:** The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

**Fully Deemed:** Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

**Partially Deemed:** Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

**Customized basis:** Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

## 5.2 Detailed Impact Evaluation Methods and Results

### 5.2.1 Ex-ante Gross Savings Adjustments

Navigant performed a gross savings evaluation for all measures installed through the HES program, including weatherization and direct install measures. In order to complete this task, the evaluation team first performed a summary of the program ex-ante gross impact accomplishments based on an engineering review of the program's tracking system. Conservation Services Group (CSG) provided the original tracking data, and updates to direct install measures were provided by Wisconsin Energy Conservation Corporation (WECC) throughout the evaluation process. The details of the ex-ante savings updates are:

- WECC provided updated gas (therm) savings values for all of the HES direct install measures. These updates were based on algorithms and assumptions provided in the latest TRM. WECC applied these changes retroactively to the installed measures reported by CSG. This update affected the kitchen/bathroom aerator measures, as well as low-flow showerheads, hot water temperature setback, pipe insulation, and programmable thermostat measures. Navigant did not receive updated electric (kWh) savings values for direct install measures.

CSG provided the remainder of the ex-ante energy and demand savings values for electric and gas use, which includes all retrofit measures and electric savings for direct install measures.

### 5.2.2 Direct Install Verified Gross Savings Adjustments

Navigant performed a detailed engineering review of the ex-ante savings assumptions provided by CSG and WECC and developed verified gross savings values for all of the direct install measures.

Adjustments to ex-ante savings values were based on updated assumptions and algorithms in the TRM, as well as engineering judgment. Updates to direct install formulas and assumptions are as follows:

- Navigant updated CSG's ex-ante kWh and kW savings for CFL measures in order to comply with the TRM assumptions and algorithms. The TRM states 1,000 annual hours of use and a waste heat factor of 1.06 for energy. The TRM also states a deemed waste heat factor of 1.11 for demand and a coincidence factor of 0.095, which the evaluation team applied in the verified savings estimates.
- WECC provided Navigant with updated gas savings for direct install measures based on the TRM. Navigant performed a review of the updated savings claimed, and found them to coincide with the assumptions provided in the TRM. However, participants with electric hot water heating were not differentiated in the WECC data, so Navigant modified the ex-ante gas savings to account for electric savings. The evaluation team also used the equations and assumptions in the TRM to modify CSG's ex-ante kW savings. Navigant also applied this methodology to bathroom/kitchen aerators and pipe insulation.
- For programmable thermostats and hot water temperature setback, Navigant allowed a maximum of one deemed savings amount per household. Navigant noted four households (7% of total) claiming more than one programmable thermostat deemed savings value in the ex-ante assumptions, as well as nine households (5% of total) claiming multiple deemed savings for hot water temperature setback.
- For the programmable thermostat education measure, Navigant applied the full TRM deemed savings for programmable thermostat education for each participant, and then adjusted the

savings using the participant survey self-reported in-service rate of 0.35. Navigant used the TRM to inform the calculations of the verified kW savings values. CSG did not originally claim ex-ante kW savings for non-CFL direct install measures.

- Navigant used the in-service rates provided in the TRM for all direct install measures.

### 5.2.3 Weatherization Measures Literature Review

Navigant performed a literature review to compare evaluated savings values for projects with similar weatherization offerings as the HES program. This was done in order to ‘vet’ the ex-ante savings for weatherization measures in the HES program. Table 5-1 shows the average gas (therm) savings for participants broken out by the top two savings measures: attic insulation and air sealing. Together, these two weatherization measures accounted for 85% of ex-ante claimed weatherization gas savings, with 48% and 37% from attic insulation and air sealing, respectively. Evaluated savings from four similar programs are also provided in the table below.

**Table 5-1. Literature Review of Savings for Similar Weatherization Programs**

Attic Insulation (therms/ participant)	Air Sealing (therms/ participant)	Program	Year	State	Type of Analysis
152	52	MassSAVE Final Summary QA/QC and Impact Study Report – Appendix B	2008	MA	Billing analysis
78	67	New Hampshire Weatherization Program Impact Evaluation Report	2007	NH	Regression analysis
109	83	Ohio Home Weatherization Assistance Program Impact Evaluation	2006	OH	Billing and regression analysis
84	28	Wisconsin Weatherization Assistance – Evaluation of Program Savings, Fiscal Years 2007-2009	2011	WI	Billing and regression analysis
106	58	Average Literature Review Net Savings			
78-152	28-83	Range Literature Review Net Savings			
112	86	HES Program Average Ex-ante Savings			
91	74	HES Program Average Verified Net Savings*			

Source: Navigant analysis

\*Analysis of verified net savings is presented in Section 3.1.6

Based on the tracking data provided by CSG, Navigant calculated the average ex-ante gas savings for attic insulation and air sealing participants at 112 and 86 therms per participant, respectively. Verified net savings are 91 and 74 therms per participant for attic insulation and air sealing. Literature review findings showed an average net gas savings of 106 therms and a range of savings between 78 and 152 therms for attic insulation projects in similar climates. For air sealing projects, the literature review found an average net gas savings of 58 therms and a range between 28 and 83 therms per participant.

Based on the findings from the literature review, Navigant has determined that the savings values from CSG’s EM Home model compares favorably with evaluated savings for similar programs and climates. It is important to note that:

- The majority of the literature review studies used a billing analysis approach to determine evaluated gas savings. Billing analysis, by design, attempts to correct for NTG impacts on claimed savings values. This in turn lowers the savings associated with those measures.
- Homes in the Illinois program are larger on average than those in the majority of the literature review programs. The average conditioned area of homes that installed attic insulation and performed air sealing is approximately 3400 sq. feet in Illinois. Larger homes typically have higher heating and cooling loads than smaller homes, and would therefore realize greater savings from home weatherization measures.
- Navigant also reviewed CSG’s document, *EnergyMeasure® HOME - Algorithm Description*, and found that the model uses reasonable and respectable assumptions and equations from ASHRAE and the DOE.

Navigant plans to do an expanded evaluation of weatherization measures in future program years. This could entail billing analysis or calibrated simulation efforts, or both approaches as needed to effectively triangulate impact estimates.

#### **5.2.4 Net Program Impact Evaluation Methods**

The primary objective of the net savings analysis is to determine each program's net effect on customers’ electricity and gas usage. This requires estimating what would have happened in the absence of program activities and incentives. After gross program impacts are adjusted, net program impacts are derived by estimating a Net-to-Gross (NTG) ratio. The NTG ratio quantifies the percentage of the gross program impacts that are attributable to the program. This includes an adjustment for free ridership (the portion of impact that would have occurred even without the program) and spillover (the portion of impact that occurred outside of the program, but would not have occurred in the absence of the program). A customer self-report method was used to estimate the NTG ratio for this evaluation, using data gathered during participant telephone surveys. Trade ally interview findings were also used to gauge their estimate of overall free-ridership and spillover, to corroborate the participant self-report-based NTG estimates.

#### **Free Ridership**

Free ridership cannot be measured directly due to absent empirical data regarding the counterfactual situation. Thus, free ridership is assessed as a probability score for each measure. The evaluation relies on self-reported data collected during participant telephone surveys to assign free ridership probability scores to each measure. More specifically, for each measure, the following questions were posed to each measure recipient:

- FR1. Had the participant heard about the program before or after they thought about installing the program measure?
- FR2. Had the participant already begun researching or collecting information about the measure?
- FR3. Had the participant already selected which measure to purchase?
- FR4. Had the participant already selected where they were planning to purchase the measure/a contractor to work with (whichever is more applicable to the measure type)?
- FR5. Did the participant have specific plans to install the measure before learning about the program? (PLANS, y/n)
- FR6. How likely was the participant to install the measure if they had not installed it through the program? (LIKELIHOOD, 0-10)
- FR7. How critical was the program in the decision to install the measure? (IMPORTANCE, 0-10)
- FR8. Would the participant have installed the same measure within a year of when they did if the program didn't exist? (TIMING, 0-10)

### Free Ridership Scoring

The free ridership data was assembled into a probability score in a step-by-step fashion, applying the following logic:

If the customer had not considered the measure prior to participating in the program then the probability of free ridership is estimated to be zero (based on FR1 above). Similarly, if the customer had not begun researching or collecting information about the measure, and the self-reported probability of installing the measure was less than or equal to 3 (on a 0-10 scale), then the probability of free ridership is estimated to be zero (based on FR2 and FR6). If neither of the above criteria holds, then responses to questions FR6, FR7 and FR8 are used to calculate the probability of free ridership.

The program includes both directly installed and weatherization components, where the customer demonstrates very little initiative to install the measures as the actual purchase, recommendation, and installation activities are performed by program staff. For this reason, participant self-reported intentions to install these measures even without the program [FR6 and FR8] are discounted relative to the self-reported importance of the program to the installation [FR7]. Thus the weighting of planning to program importance scoring is at a rate of 2 to 1, as the equation below shows. The corresponding formula for calculating free ridership is shown below:

$$[(FR6+FR8)/2 * (1/3) + (FR7)*(2/3)]$$

Note that in the above formula, if FR6 or FR8 are invalid (missing or “don’t know”) then the first component [(FR6+FR8)/2] relies on the non-missing factor. That is, if FR6 is invalid the formula is: [FR8\*(1/3) + (FR7)\*2/3]. If FR6 and FR8 are missing then the score is based on FR7 alone.

For CFL free ridership scoring, adjustments are made in a few special cases. In particular, free ridership scores are set to zero for customers who report a CFL spillover adoption, or have a low pre-retrofit CFL saturation rate. Customers who reported the program strongly influenced them to install additional CFLs following their participation (i.e. report spillover adoptions) are assumed not to be free riders. This is to reflect the most improbable event that these customers are highly influenced by the program to purchase more CFLs, yet would have purchased CFLs

without the program in any case. Customers who reported that prior to participating in the program less than 10% of their sockets were already retrofit with CFLs are also assumed not to be free riders. In light of the direct installation delivery approach, this adjustment reflects the empirical evidence of the customer’s low propensity to install CFLs independently. Furthermore, a bulb count weight is applied in calculating the overall result for CFL free ridership, while other measure free ridership scores are aggregated using an equal weight, in accordance with the assignment of ex-ante impact.

The approach described above is generally consistent with the approach applied in previous ComEd evaluations of the predecessor Single Family program, including in PY3. However, while the calculations remain identical, the free ridership questions in this program year were expanded to more clearly specify having “specific plans” to mean a participant actually started collecting information about the program prior to their participation [FR2].

### **Program Spillover**

The objective of the spillover assessment is to estimate the impact arising from efficient measures installed as a result of the program that were not incented by the program. The evaluation relies on self-reported data collected during the telephone survey to identify these measures and assess the role of the program in the decision to install. Data from interviews with trade allies where spillover was gauged also are referenced.

For each measure installed through the program, the following questions are posed to each measure recipient:

- SP1. Have you installed any additional measures since receiving the ones through the program?
- SP2. How many additional measures did you install?
- SP3. How influential was the program in encouraging you to install these additional measures? (0-10 scale)

### ***Spillover Scoring***

The survey data was assembled into an assessment of spillover impact through application of the following method:

If the customer installed additional units of the measure following their participation, and the program was highly influential in the decision to install those measures, the adoption is considered to be potentially program spillover:

*[If SP1=1 and SP3 is greater than or equal to 8, then adoption is spillover]*

Any savings associated with spillover were weighted against the total savings of the participant sample for the particular measure to establish a measure-specific spillover rate.

### ***Considerations and Measure-Specific Adjustments to Spillover***

#### ***Compact Fluorescent Bulbs***

The impact credit granted for CFL spillover adoptions must avoid double counting impact credit accrued already through the ComEd midstream residential lighting program. We continue to use the

approach established in the PY3 evaluation that assumes that 1) the market share of program bulbs is not a readily available number, and 2) the residential lighting program PY3 evaluation results indicated a substantial amount of free ridership (41%), and there is no reason that one program’s free ridership cannot be another program’s net impact. Thus, it is not necessary that bulbs be un-incented for them to legitimately qualify for credit under the Single Family Program.<sup>28</sup> Due to the uncertainty in this area, we take the conservative approach used in the PY3 evaluation and assume that only 50% of the impact arising from CFL spillover adoptions is creditable to the program. Again, even if these customers purchased a discounted bulb, the purchase decision was either influenced by both programs (making the 50% assumption reasonable) or influenced by only the HES program (making the 50% assumption conservative).

*Pipe Insulation, Attic Insulation and Air Sealing*

In the case of pipe insulation, the ex-ante impact is based on the installation of up to nine linear feet. Customers that report the installation of additional pipe insulation up to a total of nine linear feet outside of the program and that give the program an influence score of 8 or more qualified as spillover. Similarly, participants in the HES program that reported spillover adoptions of insulation and air sealing measures were credited an impact equivalent to the average verified impact over all the participants as a fraction of the total participant sample’s savings for the particular measure.

**Net-to-Gross Ratio (NTG)**

The final net-to-gross ratios (NTG) for each measure are calculated as:

$$NTG = 1 - [Free Ridership] + [Spillover]$$

Where,

*Free ridership* is the energy savings that would have occurred even in the absence of program activities and sponsorship, expressed as a percent of gross impact.

And,

*Spillover* is the energy savings that occurred as a result of program activities and sponsorships, but was not included in the gross impact accounting, expressed as a percent of gross impact.

**5.2.5 Net Program Impact Parameter Estimate Results**

This section details the results of Navigant’s verified net impact analysis for the HES program, which includes adjustments for both free ridership and spillover.

---

<sup>28</sup> There is some available evidence regarding the CFL market share of residential lighting program bulbs. The PY3 residential lighting general population survey revealed that 87% of CFLs are purchased at stores participating in the ComEd lighting program. Among program stores, the shelf space dedicated to ComEd program CFL bulbs is 53% of the overall shelf space dedicated to CFLs (for standard bulbs), and 62% for specialty bulbs. If we assume shelf space relates directly to sales share, than 46% of standard CFLs and 54% of specialty bulbs are Residential Lighting program bulbs.

### Free Ridership

The objective of the free-ridership assessment is to estimate the impact of program incited measures that would have been installed even in the absence of the program. This cannot be measured directly due to the inability to observe behavior in the absence of the program. Thus, free ridership is assessed as a probability score for each measure. The evaluation relies on self-reported data collected during participant telephone surveys to assign free ridership probability scores to each measure. Furthermore, trade allies were interviewed to gauge their overall sense of free ridership in the weatherization component of the program to help cross-check the participant self-report results. Details on the free ridership telephone survey battery and scoring methods are presented within Section 2.3.3 (page 10). The participant survey in GPY1/EPY4 gauged the level of free ridership for all measures accounting for greater than 5% of ex-ante savings. For measures with less than 5% of program savings, NTG values were estimated based on literature reviews due to survey limitations.

Participants were administered the free-ridership battery in order of the magnitude of savings estimated per measure for each participant. In order to shorten the survey length and prevent participant response bias due to survey length fatigue, we asked participants if they had the same plans and sentiments about program influence for their secondary measures as for their first measure (for direct install and weatherization respectively). If an individual indicated that they had different plans and program influence for their other installed measures, the free ridership battery was repeated for each measure that they had installed and in order of savings generated. Otherwise, they would be skipped to the next section. At the time of analysis, the evaluation team found that the survey instrument had a CATI coding error for the weatherization battery, whereby participants that reported no previous plans to install their first measure (a zero free ridership) were not asked free ridership questions for the remainder of their weatherization measures. This amounted to 17 of 54 participants. Since our best estimate for omitted participant secondary measure free ridership is their zero free ridership response for their first measure, we assigned free ridership values of zero to their secondary measures as well.

The results of the program free-ridership estimates are shown in Table 5-2. The self-report free ridership results for weatherization measures are slightly less than the range specified by trade allies interviewed during the evaluation. Whereas weatherization measure participant self-report free ridership ranged from 14-22%, with an overall average of 18%, the seven trade allies<sup>29</sup> interviewed roughly estimated free ridership between 10-45%, with an average rating of 39%. Given that energy advisors are in contact with customers during the installation decision-making process more than trade allies, their reported free ridership scores are more likely accurate. Looking at their estimates alone, they report that free ridership is between 10-25%, with an average of 18%. The latter matches the participants' self-reported overall weatherization measures free ridership average of 18%.<sup>30</sup>

---

<sup>29</sup> Three CSG energy assessors, and four weatherization contractors

<sup>30</sup> Note that the trade ally free ridership estimates were not used to modify the participant survey-determined estimates and are only presented for additional reference.

**Table 5-2. Participant Self-Report Free Ridership Results by Measure**

Direct Install Measure	Average Free Ridership	n=
Showerhead	7%	29
Bathroom Aerator	1%	32
Pipe Insulation	12%	28
Hot Water Temp Setback	12%	12
CFL	24%	45
Overall DI*	12%	146
Retrofit Measure	Average Free Ridership	n=
Air Sealing	14%	52
Attic Insulation	21%	51
Wall insulation	22%	5
Other Insulation	16%	33
Overall Weatherization*	18%	141

Source: Navigant participant survey

\*Overall DI and weatherization free ridership is calculated by applying the measure specific free ridership values to the verified gross savings values, and calculating the ratio of free ridership energy savings to total gross energy savings. Navigant converted electric and therm savings to a consistent energy value for purposes of calculating overall free ridership.

### Free Ridership and Participant Stratification and Contractor Referrals

The evaluation team also looked at free ridership results by survey savings stratification tier and by whether a participant was referred to the program by a contractor (“tagged”) or not. In both cases, the splitting of the participant sample led to a sample too small to establish separate quantitative free ridership values to use for net impact estimates. However, some qualitative observations can be made that could be tested with a larger or targeted participant survey sample in the future.

Overall, participants in the top savings tier (meaning they had the most savings per project than other tiers), were more likely to be free riders for both direct install and weatherization measures than the second and third highest savings tiers. This may be an indication that participants that pursue more projects are more likely to have had plans to install the measures before and the program was less influential in their decisions to install those measures.

The evaluation team also compared free ridership for participants that were referred to the program by a contractor (and thus “tagged”) to those that applied to the program on their own initiative. The results indicate that participants that were tagged generally had lower free ridership scores for direct install measures than those that contacted the program for an assessment on their own initiative. However, they had higher free ridership scores for weatherization measures. This seems expected, as contractor-referred participants were already looking for weatherization work, and the free direct install measures

were an additional, unintended benefit to participating. On the other hand, the non-tagged participants may initially be drawn to try the program in order to get free direct install measures they would have gotten otherwise, while also exploring potential weatherization work that they ultimately agreed to complete.

**Program Spillover**

The objective of the spillover assessment is to estimate the impact arising from efficient measures installed as a result of the program that were not incented by the program. The evaluation relies on self-reported data collected during the telephone survey to identify these measures and assess the role of the program in the decision to install. Net Program Impact Evaluation Methods are presented within Section 2.3.1.4. Spillover estimates, using this approach and expressed as a percent of measure ex-ante impact, are shown in Table 5-3 below.

**Table 5-3. Spillover Results by Measures**

DI Measure	Spillover	n=
Showerhead	-	-
Bathroom Aerator	-	-
Pipe Insulation	5%	2
Hot Water Temp Setback	-	-
CFL	4%	3
Retrofit Measure	Spillover	n=
Air Sealing	-	-
Attic Insulation	2%	1
Wall insulation	-	-
Other Insulation	-	-

Source: Navigant participant survey

**Mailed Non-participant Spillover**

In analyzing the non-participant survey, the evaluation team identified a qualitative non-program spillover amongst 5.2% of customers mailed about the program that did not participate. Of the 69 surveyed non-participants, 57% reported installing an energy efficient measure in the last year. Of those 10.3% (four people) knew about utility programs including the HES program. Of those four people, a further two (or 50%) said the program was very influential in their decision to install energy efficient measures, and they reported installing weatherization/insulation measures and pipe insulation. Thus, about 5.2% of all mailed non-participants surveyed knew about the program, installed energy efficient measures, and considered the HES program very influential in their installations.

Extrapolating that percentage to the overall population of non-participating customers mailed about the program indicates that 5,200 individuals out of the 100,000 that were mailed may have installed an energy efficient measure in the last year and considered the program influential in that action. Unfortunately, the sample size of non-program spillover customers in the survey was too small to quantify impacts. Quantifying non-program spillover impacts would require a substantially larger non-

participant sample size to capture a statistically significant representation of average savings per spillover incident.

### 5.2.6 Survey-Determined Installation and Persistence Rates for Direct Install Measures (For Reference)

Though TRM values were used to calculate verified gross savings estimates for direct install measures, the following Navigant survey research-determined in-service rates are listed for reference purposes. The evaluation team gauged in-service rates for direct install measures in the participant. We outline them alongside persistence rates for program direct install measures in Table 5-4. The installation rate is a ratio of customer-reported measure installations to those contained in the program tracking database. The persistence rate is used to reflect the removal of program measures, which can be thrown away, given away, sold, put into storage, or altered in some other way as to end their function. Installation rates of less than 1.00 may be due to participant self-report recollection error. CSG reports an installation rate of 100% from their QAQC follow-up visits.

**Table 5-4. GPY1/EPY4 Direct Install Measure Installation and Persistence Rate Results – Survey Determined**

(For Reference - Not Used in Verified Gross Calculations)

Measure	Installation Rate**	Persistence Rate
9 Watt CFL	0.98	0.96
14 Watt CFL	0.98	0.96
19 Watt CFL	0.98	0.96
23 Watt CFL	0.98	0.96
9 Watt Globe CFL	0.98	0.96
Shower Head	1.00	0.90
Kitchen Aerator	1.00*	0.95*
Bathroom Aerator	0.94	0.90
Hot Water Temperature Setback	0.92	0.92
Pipe Insulation	0.88	1.00
Programmable Thermostat	1.00^	1.00^
Programmable Thermostat Education	0.35	1.00

Source: Navigant participant survey

\*Navigant did not collect data for the kitchen aerator measure, and has assigned the persistence rate as 0.95, according to the in-service rate defined in the TRM.

\*\*Installation rates of less than 1.00 may be due to participant self-report recollection error. CSG reports an installation rate of 100% from their QAQC follow-up visits.

^Navigant did not collect data for the programmable thermostat measure, and has assigned an installation and persistence rate of 1.

### **5.2.7 Overall Program Research Findings Gross and Net Savings (For Reference)**

This section presents the evaluated HES Program gross and net savings based on the evaluation team's research findings for direct install and weatherization measures for reference purposes (whereas the verified gross savings in the body of the report were based on TRM-prescribed gross parameter estimates for direct install measures). These savings values include the installation rates, persistence rates, and net-to-gross values determined utilizing the participant survey. Table 5-5 presents the gross program savings and realization rates based on research findings.

**Table 5-5. GPY1/EPY4 HES Program Research Findings Gross Savings**

	Measure	Therms	Therms RR*	MWh	MWh RR*	kW (peak)	kW RR*
Direct Install Measures	9 Watt CFL	0	-	41.0	1.08	4.1	1.25
	14 Watt CFL	0	-	119.5	1.08	11.9	1.25
	19 Watt CFL	0	-	87.7	1.08	8.7	1.25
	23 Watt CFL	0	-	120.6	1.08	12.0	1.25
	9 Watt Globe CFL	0	-	21.4	1.08	2.1	1.25
	Shower Head	17,526	0.90	6.6	1.36	0.4	-
	Kitchen Aerator	391	0.92	0.3	0.44	0.0	-
	Bathroom Aerator	3,328	0.93	1.3	0.54	0.1	-
	Hot Water Temperature Setback	1,167	0.88	0.0	-	0.0	-
	Pipe Insulation	3,855	0.98	2.1	1.54	0.2	-
	Programmable Thermostat	2,946	0.90	2.7	-	0.0	-
Programmable Thermostat Education	2,018	-	3.0	-	0.0	-	
<i>Subtotal</i>		31,230	0.98	406.0	1.10	39.6	1.28
Retrofit Measures	Attic Insulation	34,604	1.00	68.1	1.00	0.0	-
	Wall Insulation	4,316	1.00	0.8	1.00	0.0	-
	Floor Insulation (Other)	6,496	1.00	6.2	1.00	0.0	-
	Duct Insulation & Sealing	111	1.00	0.9	1.00	0.0	-
	Air Sealing	26,979	1.00	80.2	1.00	0.0	-
<i>Subtotal</i>		72,507	1.00	156.2	1.00	0.0	-
<b>Total Savings</b>		103,736	0.99	562.2	1.07	39.6	1.28

Source: Navigant analysis

\*RR = Realization Rate. This is the ratio of research findings gross to ex-ante gross savings.

Table 5-6 presents the net program savings and realization rates based on researching findings.

**Table 5-6. GPY1/EPY4 HES Program Research Findings Net Savings**

	Measure	Therms	MWh	kW (peak)
Direct Install Measures	9 Watt CFL	0	32.8	3.3
	14 Watt CFL	0	95.6	9.5
	19 Watt CFL	0	70.2	7.0
	23 Watt CFL	0	96.5	9.6
	9 Watt Globe CFL	0	17.1	1.7
	Shower Head	16,327	6.1	0.4
	Kitchen Aerator	387	0.3	0.0
	Bathroom Aerator	3,298	1.3	0.1
	Hot Water Temperature Setback	1,023	0.0	0.0
	Pipe Insulation	3,581	1.9	0.2
	Programmable Thermostat	2,651	2.4	0.0
Programmable Thermostat Education	1,816	2.7	0.0	
<i>Subtotal</i>		29,084	327.1	31.9
Retrofit Measures	Attic Insulation	28,181	55.5	0.0
	Wall Insulation	3,367	0.6	0.0
	Floor Insulation (Other)	5,460	5.2	0.0
	Duct Insulation & Sealing	89	0.7	0.0
	Air Sealing	23,270	69.2	0.0
<i>Subtotal</i>		60,366	131.2	0.0
<b>Total Savings</b>		89,450	458.2	31.9

Source: Navigant analysis

Table 5-7 shows the overall program ex-ante and researching findings gross and net savings.

**Table 5-7. GPY1/EPY4 Overall HES Program Research Findings Savings\***

	Energy Savings (MWh)	Peak Demand Savings (kW)	Energy Savings (Therms)
Ex-Ante Gross	527	31	104,505
Ex-Ante Net	358	22	96,105
Research Findings Realization Rate**	1.07	1.28	0.99
Research Findings Gross	562	40	103,736
NTG Ratio****	0.82	0.80	0.86
Research Findings Net	458	32	89,450
Planning Net Savings Goal	438	-	220,729
% Net Goal Achieved	105%	-	41%

Source: Navigant analysis

\*CFLs, temperature turndown, and thermostats are deemed; showerheads, aerators, pipe insulation are partially deemed; all weatherization measures are not deemed.

\*\*Research findings realization rate represent the ratio between research findings gross and ex-ante gross savings.

\*\*\*\*Overall NTG is the ratio between verified/research net and gross savings.

### **5.3 Additional Process Evaluation Results**

This section summarizes additional results from the telephone surveys with participants and non-participants, as well as interviews with trade allies. The surveys and interviews were conducted in October, 2012.

#### **5.3.1 Participant Demographics**

Customers surveyed are mostly in the 31-60 year old age range (72%), all own their homes, over 2/3 of households (69%) earn over \$75,000 annually, and over half (58%) had made at least some previous changes in their home to save energy.

#### **5.3.2 Non-Participant Demographics, Attitudes, and Buying Behavior**

The HES program targeted its spring mailer to areas with high-use households that have good potential for cost effective energy efficiency retrofits. All non-participants that responded reported living in a single family home, and 90% of non-participants own the home. Their households generally consist of 1 to 4 family members (82%) and most homes are between 1,000 and 2,599 square feet (63%). About 45% reported an annual income of \$75,000 or more, compared to 69% of participants. Furthermore, while 29% of non-participants made \$100,000 or more, program participants were almost twice as likely to be making \$100,000 or more (50%).

Most non-participants reported seeing value in making their home energy efficient, and the majority reported previously making energy efficiency changes in their homes. On a four-point scale (“not at all valuable,” “somewhat valuable,” “very valuable,” “extremely valuable”), only 3% of respondents indicated energy efficiency was “not at all valuable” to them, and 60% indicated it was either “very valuable” or “extremely valuable.” Furthermore, 85% (n=68) indicated they had previously made some or major changes in their home to save energy. This may be an indication that many non-participants feel that they have already done something to make their home energy efficient and that they don’t need to do more, largely because energy is still relatively affordable.

#### **5.3.3 Trade Ally Reporting on Program Awareness and Marketing and Outreach Effectiveness**

Weatherization contractors were asked a series of questions to understand their program marketing including about their program-specific marketing, marketing effectiveness, and suggested changes. Contractors generally indicate that they relied on CSG’s marketing efforts for “priming” of customers more than on their own direct marketing efforts outside of referrals. However, they do make use of the flyers they are given by the implementation contractor and find them helpful. Two respondents indicated having distributed supplied marketing material to their customer base and one indicated having done an e-mail blast about the program. Furthermore, another contractor reported putting the program banner on their website provided by CSG and “steering” of customers to the program if they felt it was appropriate. All respondents thought the participation in the program was seasonal, and all marketing efforts should be targeted throughout the winter, late summer, early fall, and spring.

Though the contractors are satisfied with marketing overall, there were several suggestions for marketing improvements:

- One contractor notes that CSG-provided marketing material is “too vague” and unclear for the layman, which stifles participation motivation. They recommend driving participants to the website to grab their attention.

- A contractor noted customers sometimes questioned the motives of the utilities and their promotion of energy conservation, indicating a limited understanding of the program’s merits and reasoning for providing customers incentives.
- One contractor recognized CSG’s need for targeting their marketing to program-eligible participants despite having newspaper, radio, and TV advertisements that apply to the broader Chicago area. This contractor recommended continuing to distribute mailers and further recommended sending personnel from the utility or energy assessment firm to summer festivals, community outreach events (especially those related to conservation, like Earth Day), and trade shows, in which a greater number of potential participants might be concentrated.

The program may benefit from including contractors in the outreach material development, as they have experience directly addressing misunderstandings and questions with customers.

#### **5.3.4 Trade Ally Reporting on Customer Participation Motives and Barriers to Participation**

##### Customer Participation:

Trade Allies provided multiple responses for the reasons customers participated in the program. These included:

- Making the home more comfortable (3 of 7 Trade Allies),
- Improving the performance of their home (2 of 7),
- Taking advantage of the incentive and reducing energy costs (3 of 7), and
- Wanting to move towards a “greener” home (1 of 7).

The energy advisors had a more detailed understanding of the effect of the cost of the assessment than weatherization contractors because they work directly with customers in promoting measure recommendations. The energy advisors reported that customers are happy with the price. They also generally believed that the \$99 assessment brought more serious participants with a higher likelihood of following through on weatherization work than the \$49 assessment price, though the latter increased the number of assessments being performed. It also appears that there may be some additional strain and logistical issues in scheduling for energy advisors as the number of assessments increases.

Energy advisors and contractors agree that participants generally understand the participation process, and they make apparent effort to clarify participation details for them. Furthermore, there appear to be no issues for participants in understanding assessment reports and follow-up processes. In fact, one contractor noted that with the change of implementation contractors, they have noticed a drop in the number of follow-up calls from participants asking for clarification about the program. Thus it appears the implementation contractor’s energy advisors are doing a better job of communicating about the program with customers.

Generally, trade allies believe that there are no major barriers to participation. Instead, customer cost concerns, skepticism with utility motives, and a lack of awareness were reported as broad participation barriers. However, trade allies gave two notable barriers for customers already participating in the program: 1) the terminology in the program can be too sophisticated; and 2) certain home conditions (including homes that don’t fit the program’s ideal “cookie cutter” design) may prevent optimal testing and installations. Though trade allies generally showed agreement with available program energy efficiency measures, a few additional suggestions were made. Suggestions included considering incorporating injection and/or spray foam to be either incented or explored as a value added incentive to

the customer, weather-stripping doors and caulking as cost-effective additions, and additional measures that might help cater to specific types of homes.

Incentives Levels:

All respondents favored the level of incentives in the program. They noted that participants were generally satisfied with the level of incentives offered; furthermore, respondents to the question said that without the program incentives, customers would generally have pursued less comprehensive projects or none at all. Below are excerpts of trade ally feedback regarding their opinions on whether participants would have done the same projects if they did not receive program incentives:

- “Not to the same extent, they’d do some of the work and do it more cheaply, doing it themselves or getting less qualified tradespeople.”
- “...No, they’d not do the same/as much.”
- “Yes, people still would still install the same products, but not correctly to maximize their savings and only if they could afford it. Probably not to this level. Giving them the knowledge of what would happen without it makes them satisfied.”
- “Many wouldn’t install anything”

Program Influence:

In order to gauge program influence, the evaluation team asked contractors what energy efficiency actions customers asked about in GYP1/EPY4 compared to what might have occurred without the program. Two contractors stated that it was difficult to speculate on customer behavior, although it was likely the program was getting customers to ask more questions than had the program not existed. However, the two other respondents said that there was no difference. Of these two, one respondent claimed that participants were more likely to participate if the program money saving potential was promoted rather than the more abstract concept of energy saving.

Three respondents indicated that their sales of weatherization measures have increased “somewhat” since the introduction of the program. Not all respondents provided an estimated percentage of sales; however, they did indicate that the program had helped in the sale of this equipment.

Trade allies were also asked to gauge what percent of people are conducting weatherization work on their own, also known as “do-it-yourselfers.” Two respondents made similar percentage estimates of at around 20-25%. The other respondents could not provide a rough estimate, but they believed a small percentage were installing weatherization measures themselves.

**5.3.5 Trade Ally Reporting on Market Baseline, Free Ridership, and Spillover**

Baseline:

Weatherization contractors were asked a series of quantitative and qualitative questions to gauge baseline market conditions, free ridership, and spillover. Prior to their involvement in the program, three weatherization contractors reported that they made the same measure recommendations to customers as they did during the program in GYP1/EPY4. Prior to participation, contractors indicate that about 30-80% of their customers implemented their recommendations. One contractor reported changing the measures their business recommend since joining the program, and they indicate the program was only somewhat influential in making that decision (3 on a scale from 0 to 10).

Contractors have been somewhat influenced by the program to recommend new measures, but it appears that the program has been more influential in getting participants to install measures they would otherwise not have implemented. Since participating in the program, two contractors indicate about 30% of their customers follow through on their recommendations, and about 50% of those are program participants. All contractors that responded also indicate that they likely would have been recommending the same weatherization measures without the program (scores of 8 to 10 on a 10 point scale). However, three of four contractors indicated customers would be not at all likely to somewhat likely to implement the measures without the program; only one contractor indicated his customers would have been extremely likely to implement the same measures without the program.

Free Ridership:

Trade allies and energy advisors assert that they are extremely influential in influencing participant project implementation when they are the ones consulting participants. Unless participants are referred to the program by a contractor (“tagged”), energy advisors are usually the actors making measure recommendations to participants. Furthermore, all respondents claimed that the program is very influential on customers’ decisions to install weatherization measures (scores of 8-10 on a 10 point scale). The average free-ridership score reported by the energy advisors and contractors is about 37% though most indicated that this is a difficult number to estimate. Since energy advisors are more in touch with customers in the decision-making process, their estimates are more likely accurate. The average energy advisor free ridership estimate is 18%.

Program Spillover:

Half the interviewed contractors claimed that their experiences with the program influenced their recommendations for additional energy efficiency measures with their customers. The two respondents specifically mentioned injection and/or spray foam used primarily for certain insulation applications. These respondents could not provide an accurate estimate of the additional savings these measures may have provided. One of the two contractors estimated that probably about 30% of the program-influenced un-incented measures were installed, an estimate based on their closing rate for in-program projects.

Non-Participant Spillover:

There is some sense by contractors that non-participant trade allies are at a disadvantage if they don’t participate in this program. When asked why these businesses may not be participating, two contractors indicated that other contractors may like being independent or they don’t want to go through the requirements stipulated by the program in order to qualify. Another contractor believes they may not be participating because they haven’t heard about the program.

Contractors were also asked what effect they think the program is having on the market for energy efficiency measures in the Chicago area and their responses were varied. One contractor reported that overall the program is having a significant impact on the contractor market due to the competitive advantage of the rebate, and another contractor speculated that the program is possibly building awareness in the market for customers (which may indirectly influence contractors those customers interact with), rather than contractors directly. In accordance with the latter, one energy advisor reports that the program may be causing non-participant spillover when the program doesn’t cover a measure (such as dense packing a cathedral ceiling), causing the participant to reach out to other local contractors. The advisor also estimates that 65-70% of participants have had quotes from other contractors who give lower quotes, but that with rebates the program is still more competitive. On the other hand, another

energy advisor reported that the program is probably having little influence on the contractor market because not many contractors are aware of the program.

Overall, the interview results indicate that the program is effective in communicating and raising awareness of energy saving initiatives introduced by the utility. As well, trade allies think participants found the level of incentives appropriate to influence measure adoption that otherwise would not have happened. The average free ridership estimated by energy advisors is 18% and both energy advisors and contractors report there may be spillover occurring due to: 1) the competitive advantage participation in the program creates in the market, which potentially influences other contractors to try to compete with the program, and 2) measures that are not incentivized by the program may be pursued by participants with other contractors outside of the program in order to have “complete” home projects. The participants agreed that minor adjustments could be made to continue to improve the program. Adjustment suggestions include introducing additional incentivized measures (such as spray foam), making the energy assessments “fit” a wider variety of homes better, as well as implementing additional targeted approaches to the program’s marketing strategies, including targeted community outreach.

## 5.4 *VDDTSR Memo-Final Version*



NicorComEd - PY1-4-  
HES - VDDTSR Draft

## 5.5 *Program Theory Logic Model Review*



NicorComEd - PY1-4-  
Logic Model - Home E

## 5.6 *Data Collection Instruments*

### 5.6.1 **Phone Survey for Participating Customers**



NicorComEd - PY1-4 -  
HES - Participant Surv

### 5.6.2 **Phone Survey for Non-Participating Customers**



NicorComEd - PY1-4 -  
HES - Non-Participant

### 5.6.3 **Interview Guide for Trade Allies (Energy Advisors and Weatherization Contractors)**



NicorComEd - PY1-4 -  
HES - TA Interviews-

## 5.5 *Home Energy Efficiency Rebates*