



Elementary Energy Education Program Evaluation Report

Final

**Energy Efficiency Plan:
Gas Plan Year 5
(6/1/2015-5/31/2016)**

**Presented to
Nicor Gas Company**

May 19, 2017

Prepared by:

**Christy Zook
Navigant Consulting**

**Rick Berry
Navigant Consulting**

www.navigant.com

Submitted to:

Nicor Gas Company
1844 Ferry Road
Naperville, IL 60563

Submitted by:

Navigant
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Contact:

Randy Gunn, Managing Director
312.583.5714
randy.gunn@navigant.com

Kevin Grabner, Associate Director
608.497.2323
kevin.grabner@navigant.com

Laura Agapay-Read, Managing Consultant
312.583.4178
laura.agapay.read@navigant.com

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

TABLE OF CONTENTS

- E. Executive Summary 4**
 - E.1 Program Savings 4
 - E.2 Program Savings by Measure 5
 - E.3 Impact Estimate Parameters for Future Use 6
 - E.4 Program Volumetric Detail..... 7
 - E.5 Findings and Recommendations 7
- 1. Introduction 9**
 - 1.1 Program Description..... 9
 - 1.2 Evaluation Objectives 10
- 2. Evaluation Approach 11**
 - 2.1 Overview of Data Collection Activities 11
 - 2.2 Verified Savings Parameters..... 12
 - 2.2.1 Verified Gross Program Savings Analysis Approach 12
 - 2.2.2 Verified Net Program Savings Analysis Approach 12
 - 2.3 Process Evaluation..... 13
- 3. Gross Impact Evaluation 14**
 - 3.1 Program Tracking Data Review 14
 - 3.2 Program Volumetric Findings 14
 - 3.3 Gross Program Impact Parameter Estimates 16
 - 3.4 Verified Gross Program Impact Results..... 16
- 4. Net Impact Evaluation 19**
- 5. Process Evaluation 20**
 - 5.1 Program Changes since GPY4 20
 - 5.2 Participant Feedback..... 20
 - 5.3 Planned Changes for GPY6/EPY9..... 20
 - 5.3.1 Measures in Kits 21
 - 5.3.2 Program Materials 21
 - 5.3.3 Participation Targets..... 21
- 6. Findings and Recommendations 22**
- 7. Appendix 24**
 - 7.1 Gross Program Impact Parameter Estimates 24

LIST OF FIGURES AND TABLES

Figures

Figure 3-1. Percentage of Measures Distributed by Type 15
 Figure 3-2. Percentage of Natural Gas Savings by Measure Type 18

Tables

Table E-1. Nicor Gas GPY5 EEE Program Natural Gas and Electricity Savings 5
 Table E-2. Nicor Gas GPY5 EEE Program Natural Gas and Electricity Savings by Measure 6
 Table E-4. Nicor Gas GPY5 EEE Program Primary Participation Detail 7

Table 1-1. Items Included in the Take Home Kit 10
 Table 2-1. Core Data Collection Activities and Samples in GPY5 11
 Table 2-2. Additional Resources 11
 Table 2-3. GPY5 Verified Gross Savings Parameter Data Sources 12
 Table 3-1. Nicor Gas GPY5 EEE Program Primary Participation Detail 15
 Table 3-2. Nicor Gas GPY5 EEE Program Impact Results 17
 Table 3-3. GPY5 Measure Level Unit Savings 18
 Table 4-1. Nicor Gas GPY5 EEE Program Natural Gas and Electric Savings 19
 Table 5-1. Items Included in Super Savers Energy Kit 21
 Table 7-1. Showerhead Custom and Deemed Values Comparison 25
 Table 7-2. Kitchen Aerator Custom and Deemed Values Comparison 26
 Table 7-3. Bathroom Aerators Custom and Deemed Values Comparison 27
 Table 7-4. Hot Water Temperature Setback Custom and Deemed Values Comparison 28
 Table 7-5. Shower Timer Inputs and Variables 29

E. EXECUTIVE SUMMARY

This report presents a summary of the findings and results from the impact and process evaluation of the joint Commonwealth Edison (ComEd) EPY8 and Nicor Gas GPY5¹ Elementary Energy Education (EEE) program. Branded as “SUPER SAVERS,” the EEE Program’s primary focus is to produce natural gas and electricity savings in the residential sector by motivating fifth grade students and their families to reduce energy consumption from water heating and lighting in their home. Additionally, the EEE program aims to increase participation in other Nicor Gas programs via cross-marketing and increased customer awareness of energy efficiency issues. Because the utilities and the implementation contractor, Resource Action Programs (RAP), invested significant time and resources into re-designing the program in GPY4/EPY7, there were no significant changes made in GPY5/EPY8.

E.1 Program Savings

This program is offered to schools served by Nicor Gas and an electricity delivery provider other than ComEd (Nicor Gas only) and to schools served by both Nicor Gas and ComEd (“Joint” refers to the utilities’ joint service territory). The program is also offered to schools served jointly by Peoples Gas and ComEd and North Shore Gas and ComEd, however savings from those kits are not included in this report.

Table E-1 summarizes the verified natural gas and electricity² savings from the EEE program in the Nicor Gas service territory. Verified gross savings were calculated using the Illinois TRM Version 4.0³ algorithms and parameters.

¹ The GPY5 and EPY8 program years began June 1, 2015 and ended May 31, 2016.

² Electricity savings are included in this report for cost-effectiveness analysis.

³ www.ilsag.info/technical-reference-manual.html

Table E-1. Nicor Gas GPY5 EEE Program Natural Gas and Electricity Savings

Program/Path	Energy Savings (Therms)	Energy Savings (kWh)	Demand Savings (kW)	Peak Demand Savings (kW)
Ex Ante Gross Savings ⁴	102,223	NA	NA	NA
Verified Gross Realization Rate	0.94	NA	NA	NA
Verified Gross Savings	95,774	1,083,184	3,674.38	110.21
Net-to-Gross Ratio ⁵	1.05	Varies by Measure	Varies by Measure	Varies by Measure
Verified Net Savings ⁶	100,562	1,058,466	3,727.86	108.02

Source: Evaluation analysis of GPY5 program tracking data (September 9, 2016 data extract) and Illinois Statewide Technical Reference Manuals.⁷

E.2 Program Savings by Measure

Table E-2 summarizes the natural gas and electric savings from the Nicor Gas only and Joint kits measure type.

⁴ The term "Ex Ante" refers to the forecasted savings reported by the Program Administrator that have not been independently verified through evaluation. Savings that have been independently verified by the Evaluation Contractor are referred to as "Verified".

⁵ The Net-to-Gross Ratio (NTGR) used for calculating verified net savings is deemed prospectively through a consensus process managed by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). Deemed NTGRs are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Value_s_2015-03-01.pdf

⁶ Verified Net Savings = NTGR * Verified Gross Savings

⁷ Illinois Statewide Technical Reference Manual for Energy Efficiency (TRM). The effective TRM for GPY5 is Version 4.0, available from the Illinois Energy Efficiency Stakeholder Advisory Group web site: http://www.ilsag.info/il_trm_version_4.html. The list of TRM Version 4.0 errata in effect for GPY5 is provided in TRM Version 5.0, available at: http://www.ilsag.info/il_trm_version_5.html

Table E-2. Nicor Gas GPY5 EEE Program Natural Gas and Electricity Savings by Measure

Savings Type	Measure	Ex Ante Gross Savings	Verified Gross RR	Verified Gross Savings	NTGR	Verified Net Savings
Therms	Low Flow Showerhead	60,629	0.87	52,804	1.05	55,444
	Kitchen Faucet Aerators	28,601	0.74	21,237	1.05	22,299
	Bathroom Faucet Aerator	7,086	0.61	4,317	1.05	4,533
	Water Heater Setback	5,906	0.37	2,202	1.05	2,312
	Shower Timer	NA	NA	15,214	1.05	15,974
	Total		102,223	0.94	95,774	1.05
kWh	Low Flow Showerhead	NA	NA	395,372	1.05	415,141
	Kitchen Faucet Aerators	NA	NA	186,583	1.04	194,047
	Bathroom Faucet Aerator	NA	NA	34,906	1.04	36,303
	Water Heater Setback	NA	NA	18,646	1.00	18,646
	CFLs	NA	NA	313,797	0.83	260,452
	Shower Timer	NA	NA	133,878	1.00	133,878
	Total		NA	NA	1,083,184	
Peak kW	Low Flow Showerhead	NA	NA	22.02	1.05	23.12
	Kitchen Faucet Aerators	NA	NA	23.33	1.04	24.26
	Bathroom Faucet Aerator	NA	NA	24.64	1.04	25.63
	Water Heater Setback	NA	NA	2.13	1.00	2.13
	CFLs	NA	NA	30.63	0.83	25.43
	Shower Timer	NA	NA	7.45	1.00	7.45
	Total		NA	NA	110.21	

Source: Evaluation analysis of GPY5 program tracking data (September 9, 2016 data extract).

E.3 Impact Estimate Parameters for Future Use

The evaluation team did not conduct any additional research on impact savings parameters for deeming in future versions of the Illinois TRM as a part of the GPY5 evaluation. The net-to-gross (NTG) value for natural gas savings was deemed at the program-level in this program year (GPY5/EPY8) as well as next program year, based on the Illinois Stakeholder Advisory Group's consensus process and from previous evaluation research (as seen in the table below). For GPY6/EPY9, every measure's NTGR was deemed at 1.0.

E.4 Program Volumetric Detail

Table E-4 below presents GPY5 program participation reported by the implementation contractor, RAP, for the Nicor Gas EEE program. The program distributed 8,737 kits and a total of 78,633 measures. Detailed volumetric breakdown of the measure type and savings quantity are provided in the program-level analysis in Section 3.

Table E-3. Nicor Gas GPY5 EEE Program Primary Participation Detail

Metric	Measures Distributed
Number of Total Kits Distributed	8,737
Number of Measures/Kit	9
Number of Showerheads Distributed	8,737
Number of CFLs Distributed	26,211
Number of Bathroom Aerators Distributed	17,474
Number of Kitchen Aerators Distributed	8,737
Water Heater Setback Instructions Distributed	8,737
Number of Shower Timers Distributed	8,737
Number of Total Measures Distributed	78,633

Source: Navigant analysis of GPY5 program tracking data (September 9, 2016 data extract).

E.5 Findings and Recommendations

The following provides insight into key program findings and recommendations.⁸ The program performed well in GPY5, exceeding participation targets for the year with high marks for customer satisfaction.

Program Participation

Finding 1. The program distributed 8,737 kits in the Nicor Gas service area, exceeding the participation target of 8,600 kits.

Finding 2. The return rate of the student survey forms for the program overall was 45 percent, exceeding the target of 40 percent. The return rate was considered high enough that the sample was representative of the population and therefore allowed Navigant to calculate the custom inputs that the TRM allows when determining unit savings for each measure.

Verified Gross Savings and Realization Rate.

Finding 3. Navigant's review of the ex ante calculations for the GPY5/EPY8 Elementary Energy Education program resulted in verified gross energy savings of 95,774 therms in the Nicor Gas territory, a gross realization rate of 94 percent.

⁸ The Executive Summary presents the most important of the Section 6 Findings and Recommendations. Findings and Recommendations in the Executive Summary are numbered to match Section 6 for consistent reference to individual findings and recommendations. Therefore, gaps in numbering may occur in the Executive Summary.

Finding 4. Navigant calculated different ex post values for custom inputs using the student survey responses - including the number of people per household, percentage of households served by gas water heaters, magnitude of setback, and in service rates (ISR). Nicor Gas used values from Navigant's GPY1/EPY4 evaluation for the custom inputs used to calculate energy savings and assumed the proportion of gas water heating used by the participants to be 100 percent. Navigant used custom inputs as calculated by the GPY5/EPY8 participant responses to the student survey form. A comparison of the custom inputs is provided in Appendix 7.1.

Finding 5. Nicor Gas assumed that both bathroom aerators have an ISR of 0.30; however, the participant survey found the ISR of the second aerator (0.12 for single family, 0.09 for multi-family) to be approximately half the ISR of the first aerator (0.22 for single family, 0.24 for multi-family).

Recommendation 1. The program should use the student survey form data in order to calculate custom inputs where allowed by the TRM. The differences in the custom inputs as described in Finding 4, resulted in an 81 percent realization rate, a decrease of 19,572 therms.

Finding 6. The program did not calculate savings separately for single family and multi-family housing types. This understates the gross savings for the program.

Recommendation 2. The program should calculate savings for CFLs, aerators, showerheads, and water heater setbacks for single family homes separately from multi-family homes to increase the degree of accuracy of its ex ante savings estimates. Generally, the multi-family inputs result in higher savings numbers. For example, when using only the single family inputs to calculate savings, Navigant found a decrease in total program savings of 10 percent or 9,823 therms.

Process Evaluation.

Finding 9. The program is performing well. Comments about the program from parents and teachers are generally uniformly positive. Of the 119 teachers in the Nicor Gas service territories who responded to the educator evaluation questions asked by RAP (39 percent of participating teachers), 98 percent of them said they would participate in the program again and recommend it to other colleagues.

1. INTRODUCTION

1.1 Program Description

This report includes Navigant Consulting Inc.'s (Navigant's) findings and recommendations from the impact and process evaluation of the joint Nicor Gas, Peoples Gas (PG), and North Shore Gas (NSG) Gas Plan Year 5 (GPY5) and Commonwealth Edison Company (ComEd) Plan Year 8 (GPY5/EPY8) Elementary Energy Education (EEE) program.⁹ The EEE program is implemented by Resource Action Programs (RAP) and is branded "SUPER SAVERS." In GPY5/EPY8, the program targeted fifth grade students in public and private schools that are customers of Nicor Gas or jointly ComEd and Nicor Gas, ComEd and Peoples Gas, and ComEd and North Shore Gas. Schools received an invitation to participate and register to receive program materials; alternatively, schools could register on the program website to join a waiting list if the program was fully-enrolled when they registered. Schools that had previously participated in the program were also invited to participate. The program used a "teacher-lead instruction" program model where the teacher could choose to teach the curriculum over five or ten days and focus on one kit measure per day. After the lesson, students took home a kit that included water conservation measures; instruments to measure water and ambient temperature, as well as water flow rates; CFLs; shower timers; and a student survey form where participants reported details of their family's participation. Table 1-1 below details the items included in the energy efficiency take-home kit. Students and teachers were incentivized to return the student survey forms with a \$50 mini-grant for each class that completed and returned 80 percent of the forms. RAP based the program's savings on the installation rate of implemented measures reported in the student survey form 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, ComEd, Peoples Gas, and North Shore Gas programs via cross-marketing and increased customer awareness of energy efficiency issues.

⁹ This program is jointly administered with ComEd, Nicor Gas, Peoples Gas and North Shore Gas. The GPY5 gas program year began June 1, 2015 and ended May 31, 2016 which is the same time period as Electric Plan Year 8 (EPY8).

Table 1-1. Items Included in the Take Home Kit

Items
Intellishower showerhead (1.5 gpm)
Niagara kitchen aerator (1.5 gpm)
Two Niagara bathroom aerators (1.0 gpm)
Three 13-watt CFLs (Joint kits only)
Instructions to set back water heater temperature
Shower timer
Product Installation Instruction Booklet
Super Savers Installation Video
Flow rate test bag
Digital water and ambient temperature thermometer
Scratch n. sniff mercaptan (natural gas odorant) stickers
Student survey form
Energy Saving Tips for the Family Booklet
Nicor Gas promotional brochure
ComEd Smart Ideas® for Your Home pamphlet (Joint kits only)

1.2 Evaluation Objectives

The objectives for the GPY5/EPY8 evaluation were to determine the program's verified gross and net savings and if the program met its energy and demand savings targets. Navigant conducted limited process research for the EEE program in GPY5/EPY8.

2. EVALUATION APPROACH

This section provides an overview of the data collection methods, gross and net impact evaluation approaches, and process evaluation approaches that occurred for the GPY5 evaluation. For this impact evaluation, gross savings were evaluated by (1) reviewing the implementer-submitted work papers to assure that savings were calculated correctly and in adherence with Illinois TRM v4.0 and (2) cross-checking totals with the tracking system. Navigant calculated verified net savings using a deemed net-to-gross (NTG) ratio based on previous evaluation research and approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process.¹⁰ Navigant conducted a limited process evaluation that included in-depth interviews with program staff, review of program documents and operating procedures, and analysis of parent and teacher survey responses collected by RAP.

2.1 Overview of Data Collection Activities

The core data collection activities included in-depth interviews with program managers, engineering and project file reviews. The primary data collection activities are shown in the following table.

Table 2-1. Core Data Collection Activities and Samples in GPY5

What	Who	Target Completes	Completions Achieved	When	Comments
Program Tracking Database	Participants	All	All	December 2016 – February 2017	Source of information for verified gross analysis
In Depth Interviews	Program Manager/Implementer Staff	4	4	September 2016	Included staff from ComEd, Nicor Gas, Peoples Gas, North Shore Gas, and RAP.

Source: Navigant.

Table 2-2. Additional Resources

Reference Source	Author	Application	Gross Impacts	Process
Illinois Technical Reference Manual	Illinois Energy Efficiency Stakeholder Advisory Group (SAG)	EEE Measure Impact Analysis	X	
Student Survey Form	From RAP	Impact Analysis	X	
Teacher Survey Responses	From RAP	Process Analysis		X
Parent-Guardian Survey Responses	From RAP	Process Analysis		X

¹⁰ Illinois Stakeholder Advisory Group, ilsag.info

2.2 Verified Savings Parameters

Navigant calculated verified gross and net program impacts for six types of measures with deemed savings values: low-flow showerheads, kitchen and bathroom faucet aerators, CFLs, water heater setback, and shower timers. These measures account for all quantifiable GPY5/EPY8 natural gas and electric savings.

2.2.1 Verified Gross Program Savings Analysis Approach

Verified gross and net savings resulting from the GPY5/EPY8 program were calculated by multiplying the total quantity of kits by the measure level unit savings.

Unit savings are calculated using the algorithms from the Illinois TRM v4.0 and total quantity is the number of each type of measure distributed. The Illinois TRM deems most input parameters for showerheads, faucet aerators, water heater setback, and CFLs (for detailed description of engineering algorithms and inputs used, see Appendix 7.1).

Table 2-3 lists the source of the measures that Navigant used from the Illinois TRM. The Illinois TRM v4.0 allows for custom values to be used for household size, in service rate, single- vs multi-family housing type split, and % domestic hot water, and Navigant based verified values on student survey form data. Navigant also calculated savings for single family homes separately from multi-family homes given the different values for household size and showers per household.

Table 2-3. GPY5 Verified Gross Savings Parameter Data Sources

Gross Savings Input Parameters	Deemed Input Data Source
Showerheads	Illinois TRM v4.0 – Section 5.4.5
Kitchen Aerators	Illinois TRM v4.0 – Section 5.4.4
Faucet Aerators	Illinois TRM v4.0 – Section 5.4.4
CFLs	Illinois TRM v4.0 – Section 5.5.1
Water Heater Temperature Setback	Illinois TRM v4.0 – Section 5.4.6
Shower Timers	Custom Calculation

Source: Evaluation analysis of programs data and Illinois TRM documents.

‡ Source: State of Illinois Technical Reference Manuals, <http://www.ilsag.info/technical-reference-manual.html>.

2.2.2 Verified Net Program Savings Analysis Approach

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a deemed net-to-gross ratio (NTGR) of 1.05 for gas measures while the deemed NTGRs for electric measures varied by measure. In GPY5/EPY8, the NTGR estimates used to calculate the verified net

savings were based on past evaluation research and approved through a consensus process managed through the Illinois Energy Efficiency Stakeholder Advisory Group (SAG).¹¹

2.3 Process Evaluation

A limited process evaluation was conducted for GPY5. It was based on interviews with program staff and the implementation contractor and the analysis of parent and teacher survey responses collected by RAP.

Navigant conducted interviews with Nicor Gas, ComEd Peoples Gas and North Shore Gas program managers as well as with the RAP implementation staff in the summer of 2016. These interviews discussed the program's energy savings and participation, as well as changes implemented in GPY5/EPY8.

¹¹ Source: Deemed NTGR values are available on the Illinois Energy Efficiency Stakeholder Advisory Group web site.

http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Peoples_Gas_and_North_Shore_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

3. GROSS IMPACT EVALUATION

Navigant's review of the ex ante calculations for the Nicor Gas GPY5/EPY8 EEE program resulted in verified gross energy savings of 95,774 therms, a gross realization rate 94 percent.

3.1 Program Tracking Data Review

Nicor Gas' tracking system and savings documentation for GPY5/EPY8 consisted of (1) a spreadsheet containing per unit energy savings estimates and inputs used to calculate the per unit savings estimates, and (2) a spreadsheet containing the number of kits distributed (including joint ComEd-Nicor Gas kits and Nicor Gas only kits). The algorithms and inputs for unit savings calculations were contained in the energy savings spreadsheet.

Key findings include:

1. Overall, Navigant received all applicable data in order to conduct the gross impact analysis.
2. Nicor Gas assumed the proportion of natural gas water heating to be 100 percent; however, the proportion of natural gas water heating reported by participants was 64 percent.
3. Nicor Gas did not calculate savings separately for single family and multi-family homes. This resulted in differences between ex ante gross savings and verified gross savings.
4. Nicor Gas did not track savings attributed to the shower timer measure.
5. Nicor Gas assumed that both bathroom aerators have an in service rate (ISR) of 0.30; however, the participant survey found the ISR of the second aerator (0.12 for single family, 0.09 for multi-family) to be approximately half the ISR of the first aerator (0.22 for single family, 0.24 for multi-family).

3.2 Program Volumetric Findings

As shown in Table 3-1, the Nicor Gas program distributed 8,737 kits in GPY5/EPY8 and distributed a total of 78,633 measures. Of these participants, 8,350 were joint Nicor Gas-ComEd participants, while 387 were Nicor Gas only participants.

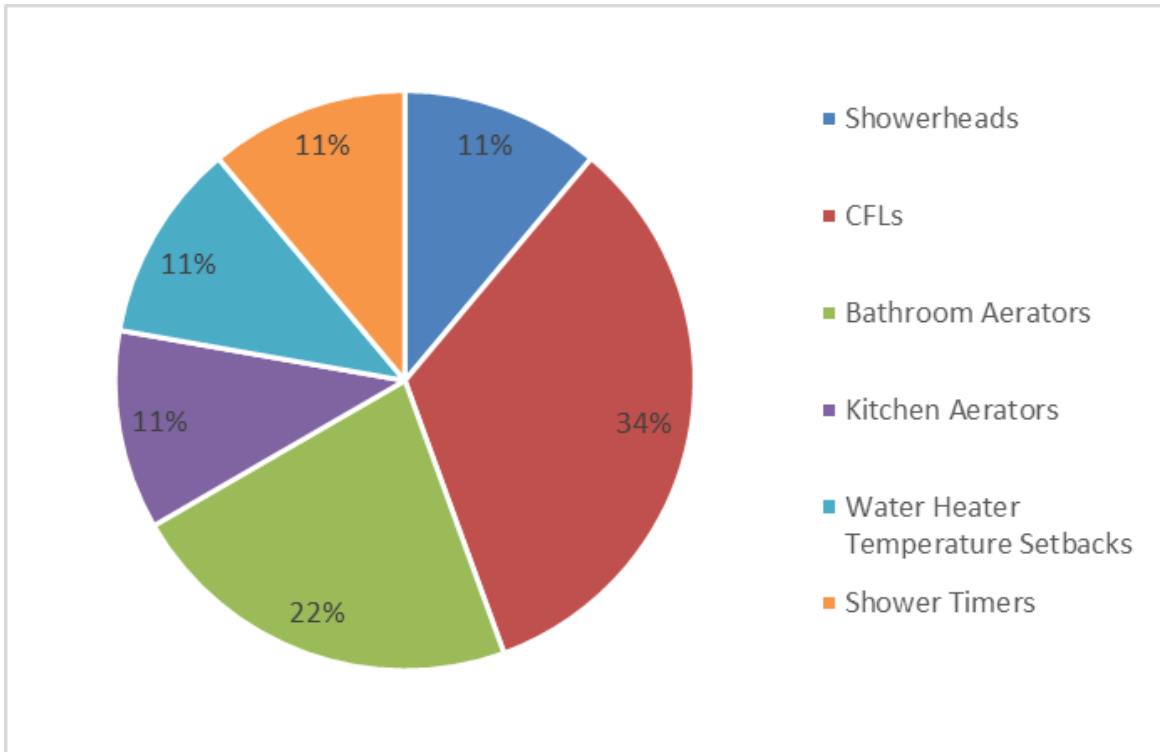
Table 3-1. Nicor Gas GPY5 EEE Program Primary Participation Detail

Metric	Measures Distributed
Number of Total Kits Distributed	8,737
Number of Measures/Kit	9
Number of Showerheads Distributed	8,737
Number of CFLs Distributed	26,211
Number of Bathroom Aerators Distributed	17,474
Number of Kitchen Aerators Distributed	8,737
Water Heater Setback Instructions Distributed	8,737
Number of Shower Timers Distributed	8,737
Number of Total Measures Distributed	78,633

Source: Navigant analysis of GPY5 program tracking data (September 9, 2016 data extract).

Figure 3-1 disaggregates the measure mix by type. For the EEE program overall, domestic hot water measures contributed 66 percent of the measure quantity in GPY5, while lighting measures contributed the remaining 34 percent.

Figure 3-1. Percentage of Measures Distributed by Type



Source: Navigant Analysis

3.3 Gross Program Impact Parameter Estimates

As described in Section 2, energy and demand savings were estimated using Illinois TRM v4.0. The Illinois TRM deems most input parameters for showerheads, faucet aerators and water heater setback. Navigant used the student survey form data to calculate or adjust several input parameters. Appendix 7.1 details the algorithms used and includes tables that show each input variable by measure, values used by Navigant and the implementer, and whether that variable was deemed by the TRM or if a custom input was allowed. There were some differences in the custom inputs calculated by Navigant and the custom inputs provided by the implementer.

3.4 Verified Gross Program Impact Results

As shown in Table 3-2, the Nicor Gas GPY5/EPY8 EEE Program reported ex ante gross energy savings of 102,223 therms. Evaluation adjustments resulted in verified gross energy savings of 95,774 therms, reflecting the program's gross realization rate of 94 percent.

Water heater setback achieved a relatively low realization rate of 0.37, due to the ex ante estimate using assumed input values rather than custom input values derived from the student survey forms. There are four input values that have been adjusted, all of which decreased the ex post savings for this measure. These input values are temperature setback, water heater efficiency (a function of customer type: single family or multi-family), in service rate and water heater fuel type. See Table 7-4 for more details.

Table 3-2. Nicor Gas GPY5 EEE Program Impact Results

Measure Category	Ex Ante Gross Savings (therms)	Verified Gross Realization Rate	Verified Gross Savings (therms)
Low Flow Showerheads			
Low Flow Showerhead Joint Kits	57,944	0.87	50,465
Low Flow Showerhead Nicor Gas Only	2,686	0.87	2,339
Low Flow Showerhead Total	60,629	0.87	52,804
Kitchen Faucet Aerators			
Kitchen Faucet Aerator Joint Kits	27,334	0.74	20,296
Kitchen Faucet Aerator Nicor Gas Only	1,267	0.74	941
Kitchen Faucet Aerator Total	28,601	0.74	21,237
Bathroom Faucet Aerators			
Bathroom Faucet Aerators Joint Kits	6,773	0.61	4,126
Bathroom Faucet Aerators Nicor Gas Only	314	0.61	191
Bathroom Faucet Aerators Total	7,086	0.61	4,317
Water Heater Setback			
Water Heater Setback Joint Kits	5,645	0.37	2,104
Water Heater Setback Nicor Gas Only	262	0.37	98
Water Heater Setback Total	5,906	0.37	2,202
Shower Timer			
Shower Timer Joint Kits	NA	NA	14,540
Shower Timer Nicor Gas Only	NA	NA	674
Shower Timer Total	NA	NA	15,214
Total	102,223	0.94	95,774

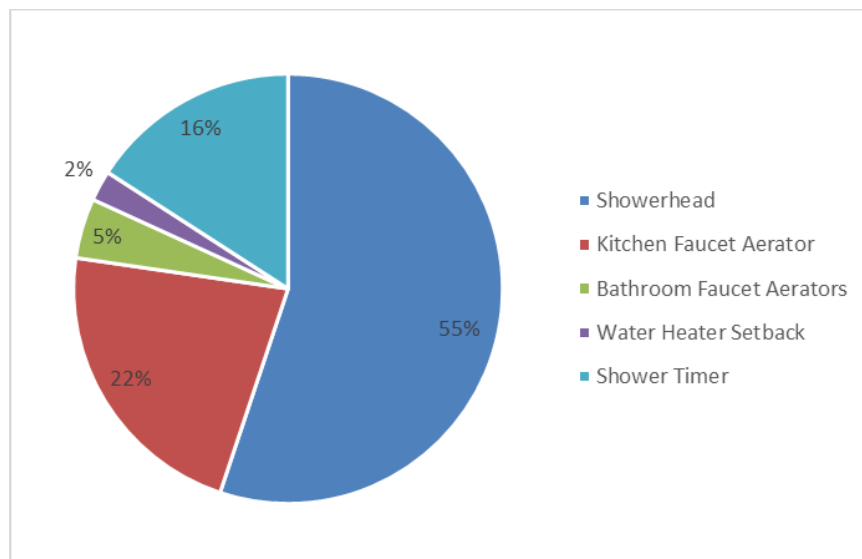
Sources: Program tracking data and Navigant analysis

Table 3-3 below shows the unit savings by measure as well as the total kit savings. These unit savings values contain an in service rate and are multiplied by the single family to multi-family proportion. The following Figure 3-2 illustrates the distribution of verified gas savings by measure type.

Table 3-3. GPY5 Measure Level Unit Savings

Measure	Energy Unit Savings (Therms)
Showerhead (1.5 GPM) - Single Family	4.08
Showerhead (1.5 GPM) - Multi-Family	1.96
Kitchen Aerator (1.5 GPM) - Single Family	1.71
Kitchen Aerator (1.5 GPM) - Multi-Family	0.72
Bathroom Aerator (1.0 GPM) Installed one - Single Family	0.15
Bathroom Aerator (1.0 GPM) Installed one - Multi-Family	0.10
Bathroom Aerator (1.0 GPM) Installed Both - Single Family	0.16
Bathroom Aerator (1.0 GPM) Installed Both - Multi-Family	0.08
Water Heater Temperature Setback (Lowered) - Single Family	0.19
Water Heater Temperature Setback (Lowered) - Multi-Family	0.06
Shower Timers	1.74
Total Kit Savings	10.96
Number of Kits	8,737
Total Gross Savings	95,774

Figure 3-2. Percentage of Natural Gas Savings by Measure Type



Source: Navigant Analysis

4. NET IMPACT EVALUATION

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a NTGR of 1.05 for natural gas measures while NTGR for electric measures varied by measure. As noted in Section 2, the NTGRs used to calculate the net verified savings for the GPY5/EPY8 EEE program were deemed through a consensus process managed by the Illinois SAG.

Table 4-1 summarizes the natural gas and electric savings from the GPY5/EPY8 Nicor Gas EEE program by measure.

Table 4-1. Nicor Gas GPY5 EEE Program Natural Gas and Electric Savings

Savings Type	Measure	Ex Ante Gross Savings	Verified Gross RR	Verified Gross Savings	NTGR	Verified Net Savings
Therms	Low Flow Showerhead	60,629	0.87	52,804	1.05	55,444
	Kitchen Faucet Aerators	28,601	0.74	21,237	1.05	22,299
	Bathroom Faucet Aerator	7,086	0.61	4,317	1.05	4,533
	Water Heater Setback	5,906	0.37	2,202	1.05	2,312
	Shower Timer	NA	NA	15,214	1.05	15,974
	Total		102,223	0.94	95,774	1.05
kWh	Low Flow Showerhead	NA	NA	395,372	1.05	415,141
	Kitchen Faucet Aerators	NA	NA	186,583	1.04	194,047
	Bathroom Faucet Aerator	NA	NA	34,906	1.04	36,303
	Water Heater Setback	NA	NA	18,646	1.00	18,646
	CFLs	NA	NA	313,797	0.83	260,452
	Shower Timer	NA	NA	133,878	1.00	133,878
Total		NA	NA	1,083,184		1,058,466
Peak kW	Low Flow Showerhead	NA	NA	22.02	1.05	23.12
	Kitchen Faucet Aerators	NA	NA	23.33	1.04	24.26
	Bathroom Faucet Aerator	NA	NA	24.64	1.04	25.63
	Water Heater Setback	NA	NA	2.13	1.00	2.13
	CFLs	NA	NA	30.63	0.83	25.43
	Shower Timer	NA	NA	7.45	1.00	7.45
Total		NA	NA	110.21		108.02

Source: Evaluation analysis of GPY5 program tracking data (September 9, 2016 data extract).

5. PROCESS EVALUATION

A limited process evaluation was conducted for the EEE program in GPY5/EPY8. This section includes changes made to the program in GPY5/EPY8 as well as changes planned for GPY6/EPY9.

5.1 Program Changes since GPY4

Because the utilities and RAP invested significant time and resources into re-designing the program in GPY4/EPY7 and participation targets were met, there were very few changes made to the program in GPY5/EPY8. One minor change made to the program included a slight change in participation targets. Participation targets were decreased slightly in GPY5/EPY8 compared to GPY4/EPY7 for Nicor Gas: 8,600 kits compared to 9,550 kits, respectively. There were no changes made to the number or make/model of the measures included in the energy savings kits.

5.2 Participant Feedback

According to respondents of RAP's teacher and parent surveys, this program performed well in GPY5/EPY8. RAP sent an educator evaluation survey to every teacher who participated in GPY5/EPY8. The evaluation team analyzed the raw results from these questions and found that around 119 teachers in the Nicor Gas service territory (39 percent of participating teachers) responded to the survey. About 98 percent of respondents said they would participate in the program again as well as recommend the program to other colleagues. Ninety-eight percent indicated the materials were clearly written and well-organized and that the products in the energy savings kit were easy to use.

Teachers reported the information being taught, the student guides, and the teacher's materials as the best program elements. Additionally, the majority of teachers (about 64 percent) reported the self-installation aspect of the energy savings kits was the best program element for students. When asked to provide possible changes to the program, the majority of teachers had no response or responded "none". Those who did respond with a change noted that some of the materials and activities were too difficult for their students' current reading or math levels and that it was difficult to complete all the program material within the time constraints of the academic year.

Eighteen parents in the Nicor Gas service territory responded to the parent comment card included in the energy savings kit box (less than one percent of participating parents). Ninety-four percent of respondents said the materials were easy for their child to use while 83 percent said they would continue to use the contents in the kit.

5.3 Planned Changes for GPY6/EPY9

There are several changes planned for the program in GPY6/EPY9 including measures in the kits, program materials and participation goals.

5.3.1 Measures in Kits

One of the major changes planned for next year is the addition of LEDs to the energy savings kit. Currently the joint program offers three CFLs (along with water heating measures, shower timers and water heater setback instructions) where next year the program will offer one CFL and two LEDs. This is detailed in Table 5-1 below. This change is part of ComEd’s decision to stop incentivizing CFLs in GPY7/EPY10 and focus on offering LEDs.

Table 5-1. Items Included in Super Savers Energy Kit

Measure	GPY5/EPY8	GPY6/EPY9
Lighting Measures		
CFLs	3 13-Watt	1 13-Watt
LEDs	NA	2
Non-Lighting Measures		
Showerhead	1	1
Kitchen Faucet Aerator	1	1
Bathroom Faucet Aerator	2	2
Water Heater Set Back Instructions	1	1
Shower Timer	1	1

5.3.2 Program Materials

Another change in GPY6/EPY9 will be an update to some of the program materials used for this program. RAP conducted a teacher focus group to gather feedback on the program and explore ways to enhance the program. The focus group met in May 2016 in Chicago, Illinois. Nine teachers participated in the focus group. The teachers’ response to the program was highly positive. When asked about aspects of the program that could be improved, some of their responses included:

- Instructions in the student workbook are too “wordy”.
- The reading/math level in the workbook is too advanced for some fifth graders.
- The survey return deadline should be extended to allow more flexibility for when teachers want to present the program material.
- Include instructions in Spanish for ESL students.

RAP plans to update the student workbooks and student survey return forms in GPY6/EPY9 to incorporate these suggestions.

5.3.3 Participation Targets

Finally, the last change in GPY6/EPY9 will be the increase in participation targets for Nicor Gas. As stated in Section 5.1 above, Nicor Gas’s participation target for GPY5/EPY8 was 8,600 kits while their participation target for GPY6/EPY9 is 9,600 kits.

6. FINDINGS AND RECOMMENDATIONS

The following provides insight into key program findings and recommendations.¹² The program performed well in GPY5/EPY8, exceeding participation targets for the year with high marks for customer satisfaction.

Program Participation

Finding 1. The program distributed 8,737 kits in the Nicor Gas service area, exceeding the participation target of 8,600 kits.

Finding 2. The return rate of the student survey forms for the program overall was 45 percent, exceeding the target of 40 percent. The return rate was considered high enough that the sample was representative of the population and therefore allowed Navigant to calculate the custom inputs that the TRM allows when determining unit savings for each measure.

Verified Gross Impacts and Realization Rate.

Finding 3. Navigant's review of the ex ante calculations for the GPY5/EPY8 Elementary Energy Education Program resulted in verified gross energy savings of 95,774 therms in the Nicor Gas territory, a gross realization rate of 94 percent.

Finding 4. Navigant calculated different ex post values for custom inputs using the student survey responses - including the number of people per household, percentage of households served by gas water heaters, magnitude of setback, and in service rates (ISR). Nicor Gas used values from Navigant's GPY1/EPY4 evaluation for the custom inputs used to calculate energy savings and assumed the proportion of gas water heating used by the participants to be 100 percent. Navigant used custom inputs as calculated by the GPY5 participant responses to the student survey form. A comparison of the custom inputs is provided in Appendix 7.1.

Finding 5. Nicor Gas assumed that both bathroom aerators have an ISR of 0.30; however, the participant survey found the ISR of the second aerator (0.12 for single family, 0.09 for multi-family) to be approximately half the ISR of the first aerator (0.22 for single family, 0.24 for multi-family).

Recommendation 1. The program should use the student survey form data in order to calculate custom inputs where allowed by the TRM. The differences in the custom inputs as described in Finding 4, resulted in an 81 percent realization rate, a decrease of 19,572 therms.

Finding 6. The program did not calculate savings separately for single family and multi-family housing types. This understates the gross savings for the program.

Recommendation 2. The program should calculate savings for CFLs, aerators, showerheads, and water heater setbacks for single family homes separately from multi-family homes to increase the degree of accuracy of its ex ante savings estimates. Generally, the multi-family inputs result in higher savings numbers. For example, when using only the single family inputs to calculate savings, Navigant found a decrease in total program savings of 10 percent or 9,823 therms.

¹² The Executive Summary presents the most important of the Section 6 Findings and Recommendations. Findings and Recommendations in the Executive Summary are numbered to match Section 6 for consistent reference to individual findings and recommendations. Therefore, gaps in numbering may occur in the Executive Summary.

Program Tracking Data Review.

Finding 7. Nicor Gas provided all applicable materials needed for the impact analysis, including a listing of kits distributed and responses to the student survey form.

Verified Net Impacts.

Finding 8. The program achieved verified net savings of 100,562 therms. The net-to-gross ratio for the natural gas program was deemed through the Illinois Stakeholder Advisory Group consensus process at 1.05, while electric impacts are deemed at the measure level and vary by measure.

Process Evaluation.

Finding 9. The program is performing well. Comments about the program from parents and teachers are generally uniformly positive. Of the 119 teachers in the Nicor Gas service territories who responded to the educator evaluation questions asked by RAP (39 percent of participating teachers), 98 percent of them said they would participate in the program again and recommend it to other colleagues.

7. APPENDIX

7.1 Gross Program Impact Parameter Estimates

As described in Section 2.2.1, energy and demand savings were estimated using Illinois TRM v4.0. The Illinois TRM deems most input parameters for showerheads, faucet aerators, and water heater setback.

Navigant used the student survey form data to calculate or adjust several input parameters. The tables below show each input variable by measure, values used by Navigant and the implementer, and whether that variable was deemed by the TRM or if a custom input was allowed.

Equation 1. Showerhead Savings Equation and Inputs, IL TRM v4.0 Section 5.4.5

$$\Delta Therms = \%FossilDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * SPCD * 365.25 / SPH) * EPG_gas * ISR$$

Where:

<i>%FossilDHW</i>	= Proportion of water heating supplied by natural gas heating
<i>GPM_base</i>	= Flow rate of the baseline showerhead
<i>L_base</i>	= Shower length in minutes with baseline showerhead
<i>GPM_low</i>	= As-used flow rate of the low-flow showerhead
<i>L_low</i>	= Shower length in minutes with low-flow showerhead
<i>Household</i>	= Average number of people per household
<i>SPCD</i>	= Showers per capita per day
<i>365.25</i>	= Days per year, on average
<i>SPH</i>	= Showerheads per household so that per-showerhead savings fractions can be determined
<i>EPG_gas</i>	= Energy per gallon of hot water supplied by gas fuel
<i>ISR</i>	= In service rate of showerhead

Table 7-1. Showerhead Custom and Deemed Values Comparison

Value, Navigant	Value, Nicor Gas	Variable	Source	Deemed/ Custom	Discrepancy?
0.64	1.00	%FossilDHW	<i>Survey - HCU6</i>	Custom	Yes
2.35	2.35	GPM_base	<i>IL TRM 5.4.5</i>	Deemed	-
1.50	1.50	GPM_low	<i>Specifications</i>	Actual	-
7.80	7.80	L_base	<i>IL TRM 5.4.5</i>	Deemed	-
7.80	7.80	L_low	<i>IL TRM 5.4.5</i>	Deemed	-
365.25	365.25	Days/year	<i>IL TRM 5.4.5</i>	Deemed	-
4.82	4.74	Household SF	<i>Survey - HCU2</i>	Custom	Yes
4.75	4.74	Household MF	<i>Survey - HCU2</i>	Custom	Yes
0.60	0.60	SPCD	<i>IL TRM 5.4.5</i>	Deemed	-
1.79	1.79	SPH SF	<i>IL TRM 5.4.5</i>	Deemed	-
1.30	1.79	SPH MF	<i>IL TRM 5.4.5</i>	Deemed	Yes
0.00501	0.00501	EPG_Gas_SF	<i>IL TRM 5.4.5</i>	Deemed	-
0.00583	0.00501	EPG_Gas_MF	<i>IL TRM 5.4.5</i>	Deemed	Yes
0.42	0.36	ISR SF	<i>Survey - HA1</i>	Custom	Yes
0.44	0.36	ISR MF	<i>Survey - HA1</i>	Custom	Yes
0.78	NA	%SF	<i>Survey - HCU1</i>	Custom	Yes
0.22	NA	%MF	<i>Survey - HCU1</i>	Custom	Yes

Equation 2. Aerator Savings Equation and Inputs, IL TRM v4.0 Section 5.4.4

$$\Delta Therms = \%FossilDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * 365.25 * DF / FPH) * EPG_gas * ISR$$

Where:

- %FossilDHW* = Proportion of water heating supplied by natural gas heating
- GPM_base* = Flow rate of the baseline aerator
- GPM_low* = As-used flow rate of the low-flow aerator
- L_low* = Average retrofit length faucet use per capita for all faucets in minutes
- L_base* = Average baseline length faucet use per capita for all faucets in minutes
- Household* = Average number of people per household
- 365.25* = Days per year, on average
- DF* = Drain factor
- FPH* = Faucets per household
- EPG_gas* = Energy per gallon of hot water supplied by gas
- ISR* = In service rate of aerator

Table 7-2. Kitchen Aerator Custom and Deemed Values Comparison

Value, Navigant	Value, Nicor Gas	Variable	Source	Deemed/ Custom	Discrepancy?
0.64	1.00	%FossilDHW	Survey - HCU6	Custom	Yes
1.39	1.39	GPM_base	IL TRM 5.4.4	Deemed	-
0.94	0.94	GPM_low	Specifications	Deemed	-
4.50	4.50	L_base	IL TRM 5.4.4	Deemed	-
4.50	4.50	L_low	IL TRM 5.4.4	Deemed	-
365.25	365.25	Days/year	IL TRM 5.4.4	Deemed	-
4.82	4.74	Household SF	Survey - HCU2	Custom	Yes
4.75	4.74	Household MF	Survey - HCU2	Custom	Yes
0.75	0.75	DF	IL TRM 5.4.4	Deemed	-
1.00	1.00	KFPH	IL TRM 5.4.4	Deemed	-
0.00415	0.00415	EPG_gas_SF	IL TRM 5.4.4	Deemed	-
0.00484	0.00415	EPG_gas_MF	IL TRM 5.4.5	Deemed	Yes
0.31	0.30	ISR SF	Survey - HA2	Custom	Yes
0.40	0.30	ISR MF	Survey - HA2	Custom	Yes
0.78	NA	%SF	Survey - HCU1	Custom	Yes
0.22	NA	%MF	Survey - HCU1	Custom	Yes

Source: Evaluation analysis of GPY5 program tracking data (June 16, 2016 data extract).

Table 7-3. Bathroom Aerators Custom and Deemed Values Comparison

Value, Navigant	Value, Nicor Gas	Variable	Source	Deemed/ Custom	Discrepancy ?
0.64	1.00	%FossilDHW	<i>Survey - HCU6</i>	Custom	Yes
1.39	1.39	GPM_base	<i>IL TRM 5.4.4</i>	Deemed	-
0.94	0.94	GPM_low	<i>Specifications</i>	Deemed	-
1.60	1.60	L_base	<i>IL TRM 5.4.4</i>	Deemed	-
1.60	1.60	L_low	<i>IL TRM 5.4.4</i>	Deemed	-
365.25	365.25	Days/year	<i>IL TRM 5.4.4</i>	Deemed	-
4.82	4.74	Household SF	<i>Survey - HCU2</i>	Custom	Yes
4.75	4.74	Household MF	<i>Survey - HCU2</i>	Custom	Yes
0.90	0.90	DF	<i>IL TRM 5.4.4</i>	Deemed	-
2.83	2.83	BFPH - SF	<i>IL TRM 5.4.4</i>	Deemed	-
1.50	2.83	BFPH - MF	<i>IL TRM 5.4.4</i>	Deemed	Yes
0.00341	0.00341	EPG_gas_SF	<i>IL TRM 5.4.4</i>	Deemed	-
0.00397	0.00341	EPG_gas_MF	<i>IL TRM 5.4.5</i>	Deemed	Yes
0.22	0.30	ISR SF, installed one	<i>Survey - HA2</i>	Custom	Yes
0.24	0.30	ISR MF, installed one	<i>Survey - HA2</i>	Custom	Yes
0.12	0.30	ISR SF, installed both	<i>Survey - HA2</i>	Custom	Yes
0.09	0.30	ISR MF, installed both	<i>Survey - HA2</i>	Custom	Yes
0.78	NA	%SF	<i>Survey - HCU1</i>	Custom	Yes
0.22	NA	%MF	<i>Survey - HCU1</i>	Custom	Yes

Source: Evaluation analysis of GPY5 program tracking data (June 16, 2016 data extract).

Equation 3. Hot Water Temperature Setback Savings Equation and Inputs, IL TRM v4.0 Section 5.4.6

$$\Delta Therms = (UA * (Tpre - Tpost) * Hours) / (100,000 * RE_gas)$$

Where:

- U* = Overall heat transfer coefficient of tank (Btu/Hr-°F-ft²)
- A* = Surface area of storage tank (square feet)
- Tpre* = Actual hot water setpoint prior to adjustment
- Tpost* = Actual new hot water setpoint, which may not be lower than 120 degrees
- Hours* = Number of hours in a year (since savings are assumed to be constant over year)
- 100,000* = Converts Btus to therms (Btu/therm)
- RE_gas* = Recovery efficiency of gas water heater

Table 7-4. Hot Water Temperature Setback Custom and Deemed Values Comparison

Value, Navigant	Value, Nicor Gas	Variable	Source	Deemed/ Custom	Discrepancy ?
0.083	0.083	U	IL TRM 5.4.6	Deemed	-
24.99	24.99	A	IL TRM 5.4.6	Deemed	-
8.22	10	(Tpre-Tpost)	Survey - HA8/HA9	Custom	Yes
8,766	8,766	Hours	IL TRM 5.4.6	Deemed	-
100,000	100,000	Btu/therm	IL TRM 5.4.6	Deemed	-
0.78	0.78	RE_gas SF	IL TRM 5.4.6	Deemed	-
0.67	0.78	RE_gas MF	IL TRM 5.4.6	Deemed	Yes
0.20	0.29	ISR SF	Survey - HA2	Custom	Yes
0.20	0.29	ISR MF	Survey - HA2	Custom	Yes
0.78	NA	%SF	Survey - HCU1	Custom	Yes
0.22	NA	%MF	Survey - HCU1	Custom	Yes
0.64	1.00	%FossilDHW	Survey - HCU6	Custom	Yes

Source: Evaluation analysis of GPY5 program tracking data (June 16, 2016 data extract).

Equation 4. Shower Timer Energy Savings Equation

$$\Delta \text{therms} = \% \text{FossilDHW} \times \text{Water Flow (GPM)} \times (\text{Baseline Shower Time} - \text{EEM Shower Time}) \times \text{Household Users} \times 365.25 \times \text{SPCD} \times \text{Usage Factor} \times \text{EPG_Gas}$$

Table 7-5. Shower Timer Inputs and Variables

Value, Navigant	Variable	Notes on values
0.64	%FossilDHW (natural gas)	Calculated from reported values on the NTG survey, this factor adjusts for shower timers that were distributed to houses with electric water heaters.
2.04	Water Flow (GPM)	Based on findings of Nicor Gas Elementary Education GPY4 Joint Evaluation Report
7.80	Baseline Shower Time, minutes	Assumed value from TRM v4.0
5.57	EEM Shower Time, minutes	Based on findings of Nicor Gas Elementary Education GPY4 Joint Evaluation Report
2.59	Household Users	Based on findings of Nicor Gas Elementary Education GPY4 Joint Evaluation Report
365.25	Days/year	Assumed value from TRM v4.0
0.60	SPCD	Showers per capita per day. Assumed value from TRM v4.0
0.21	Usage Factor	Based on findings of Nicor Gas Elementary Education GPY4 Joint Evaluation Report
0.005	EPG_Gas	Assumed value from TRM v4.0

Sources: GPY4 Survey responses, Illinois TRM v4.0, and Navigant analysis