



# Home Energy Savings Program Evaluation Report

**FINAL**

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

**Presented to  
Nicor Gas Company**

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## TABLE OF CONTENTS

<b>E. Executive Summary</b> .....	<b>4</b>
E.1 Program Savings .....	4
E.2 Program Savings by Measure .....	5
E.3 Impact Estimate Parameters.....	6
E.4 Program Volumetric Detail .....	7
E.5 Findings and Recommendations .....	7
<b>1. Introduction</b> .....	<b>9</b>
1.1 Program Description.....	9
1.2 Evaluation Objectives.....	9
<b>2. Evaluation Approach</b> .....	<b>10</b>
2.1 Overview of Data Collection Activities.....	10
2.2 Verified Savings Parameters.....	11
2.2.1 Verified Gross Program Savings Analysis Approach .....	11
2.2.2 Verified Net Program Savings Analysis Approach .....	12
2.3 Process Evaluation.....	12
<b>3. Gross Impact Evaluation</b> .....	<b>13</b>
3.1 Program Tracking Data Review .....	13
3.2 Program Volumetric Findings .....	13
3.3 Gross Program Impact Parameter Estimates .....	15
3.4 Verified Gross Program Impact Results.....	16
<b>4. Net Impact Evaluation</b> .....	<b>19</b>
<b>5. Process Evaluation</b> .....	<b>20</b>
5.1 Program Changes Since GPY4 .....	20
5.1.1 Net Energy Savings Goals .....	20
5.1.2 Measures Offered.....	20
5.1.3 Energy Advisor Teams .....	20
5.2 Participant Feedback.....	21
5.3 Program Changes in GPY6.....	21
<b>6. Findings and Recommendations</b> .....	<b>22</b>
<b>7. Appendix</b> .....	<b>25</b>
7.1 Volumetric Anomalies.....	25

## LIST OF FIGURES AND TABLES

### **Figures**

Figure 3-1. Nicor Gas HES Therm Savings by Measure Type .....	15
Figure 3-2. Distribution of Verified Gross Therm Savings by Measure .....	18

### **Tables**

Table E-1. GPY5 Program Results .....	4
Table E-2. GPY5 HES Program Results by Measure .....	5
Table E-3. Impact Estimate Parameters and Methodologies .....	6
Table E-4. GPY5 Primary Participation Detail .....	7
Table 2-1. Core Data Collection Activities in GPY5 .....	10
Table 2-2. Additional Resources .....	10
Table 2-3. GPY5 Verified Gross Savings Parameter Data Sources .....	11
Table 3-1. GPY5 Volumetric and Participation Findings .....	14
Table 3-2. GPY5 HES Program Ex Ante and Verified Gross Savings Parameters .....	16
Table 3-3. Nicor Gas GPY5 HES Program Impact Results .....	17
Table 4-1. GPY5 HES Program Results by Measure .....	19
Table 7-1. Project IDs Claiming Multiple Projects for the Same Measure .....	25
Table 7-2. Project IDs Reporting More Than One Thermostat Measure per Household .....	25

## E. EXECUTIVE SUMMARY

This report presents a summary of the findings and results from the impact and process evaluation of the Nicor Gas program year five (GPY5)<sup>1</sup> Home Energy Savings (HES) Program. The HES Program is an assessment and direct install program jointly implemented by Nicor Gas and Commonwealth Edison (ComEd) with CLEAResult leading the program implementation. This report focuses on natural gas savings achieved by Nicor Gas program participants. Savings from electric measures are included in a separate evaluation report delivered to ComEd.

The HES Program provides a free home energy assessment performed by an energySMART energy advisor (energy advisor). The energy advisor collects information about the home's energy use by examining the heating system (e.g. furnace or boiler), cooling system (air conditioner), water heater, and attic (if accessible). The energy advisor provides a customized report with recommendations identifying additional ways the customer can save energy and money. As part of the energy assessment and when appropriate, the energy advisor installs showerheads, faucet aerators for bathrooms and kitchen, and hot water pipe insulation; installs and/or sets a programmable or smart thermostat; and sets back the water heater temperature. In addition to the free home energy assessment and free direct install measures, the HES Program also offers rebates for air sealing and insulation (ASI) measures for eligible homes installed by an energySMART-approved contractor. Measures include air sealing, attic insulation, duct sealing, basement sidewall, and wall insulation (including exterior wall and foundation sidewall). The ASI component of HES changed June 1, 2015 to a separate activity and not a part of the assessment.

### E.1 Program Savings

The GPY5 HES Program realized net energy savings of 406,511 therms. Table E-1 summarizes the natural gas savings from the Nicor Gas HES Program.

**Table E-1. GPY5 Program Results**

Savings Category	Nicor Gas Result
Ex-Ante Gross Savings <sup>2</sup> (Therms)	366,506
Verified Gross Realization Rate (RR)	106% ‡
Verified Gross Savings (Therms)	387,154
Net-to-Gross Ratio (NTGR)	1.05 †*
Verified Net Savings (Therms)	406,511

*Source: Utility tracking data and Navigant analysis.*

*‡ Based on evaluation research findings*

*† A deemed value. Source:*

*[http://ilsagfiles.org/SAG\\_files/NTG/2015\\_NTG\\_Meetings/Final\\_2015\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-5\\_2015-03-01\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf)*

*\* Smart thermostat savings are based on a billing analysis which yields net savings values, however, that was not established or agreed to when GPY5 NTG values were approved for deeming. For GPY5, program-level NTG values are applied to smart thermostat billing analysis savings.*

<sup>1</sup> The GPY5 program year began June 1, 2015 and ended May 31, 2016.

<sup>2</sup> From Program Tracking System: "HES Evaluation Participation Report v2.xlsx".

## E.2 Program Savings by Measure

Table E-2 summarizes the ex-ante gross savings, verified gross savings, and verified net savings for the GPY5 HES Program by measure. Direct install measures include hot water pipe insulation, low-flow showerheads, low-flow kitchen and bathroom faucet aerators, hot water heater temperature setback, programmable and smart thermostats, and thermostat education. The ASI measures include attic insulation, air sealing, duct sealing, basement sidewall insulation, and wall insulation. Overall, direct install measures contributed 51 percent of program savings, while ASI measures contributed 49 percent program savings.

**Table E-2. GPY5 HES Program Results by Measure**

	Measure Category	Ex-Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Gross Realization Rate ‡	NTGR †	Verified Net Savings (Therms)
Direct Install Measures	Hot Water Pipe Insulation	7,677	7,179	94%	1.05	7,537
	Showerhead	68,698	69,357	101%	1.05	72,825
	Kitchen Aerator	9,050	9,003	99%	1.05	9,453
	Bathroom Aerator	4,324	4,467	103%	1.05	4,690
	Water Heater Set Back	3,854	3,898	101%	1.05	4,093
	Programmable Thermostat	45,666	45,203	99%	1.05	47,463
	Smart Thermostat	26,609	29,803	112%	1.05*	31,293
	Thermostat Education	30,091	29,732	99%	1.05	31,219
	<b>Subtotal</b>	<b>195,967</b>	<b>198,641</b>	<b>101%</b>	<b>1.05</b>	<b>208,573</b>
ASI Measures	Attic Insulation (>R19 to R49)	67,236	67,675	101%	1.05	71,058
	Air Sealing	82,122	99,658	121%	1.05	104,641
	Duct Sealing	8,785	8,785	100%	1.05	9,224
	Wall Insulation	4,696	4,696	100%	1.05	4,931
	Basement Sidewall	7,699	7,699	100%	1.05	8,084
	<b>Subtotal</b>	<b>170,538</b>	<b>188,513</b>	<b>111%</b>	<b>1.05</b>	<b>197,938</b>
	<b>Total§</b>	<b>366,506</b>	<b>387,154</b>	<b>106%</b>	<b>1.05</b>	<b>406,511</b>

Source: Program tracking data and Navigant analysis.

‡ Based on evaluation research findings.

† A deemed value. Source:

[http://ilsagfiles.org/SAG\\_files/NTG/2015\\_NTG\\_Meetings/Final\\_2015\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-5\\_2015-03-01\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf)

\* Smart thermostat savings are based on a billing analysis which yields net savings values, however, that was not established or agreed to when GPY5 NTG values were approved for deeming. For GPY5, program-level NTG values are applied to smart thermostat billing analysis savings.

§ Totals may not sum due to rounding

### E.3 Impact Estimate Parameters

In estimating verified gross and net savings, Navigant used a variety of parameters for our savings calculations. For both direct install and ASI measures, Navigant’s evaluation used parameters as defined by the Illinois Technical Reference Manual version 4.0 (TRM v4.0)<sup>3</sup>. This is different from previous years when, for the ASI measures, the implementation contractor, CLEARResult, used their own calculations in their proprietary EnergyMeasure® Home (EM Home) software. In GPY5, smart thermostats were not deemed in TRM v4.0 as a measure separate from basic programmable thermostats. In 2015, Navigant performed a billing analysis with Illinois residences to develop a savings estimate specifically for smart thermostats that was later adopted as a deemed smart (advanced) thermostat measure in TRM v5.0.<sup>4</sup> For the GPY5 HES Program, Navigant verified smart thermostats as a custom measure evaluation. For the calculations of net savings, Navigant used an overall NTGR value deemed by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) for Nicor Gas GPY5 HES Program savings. This report provides further overview of impact parameters in Section 2.2.

**Table E-3. Impact Estimate Parameters and Methodologies**

Parameter/Measure	Data Source	Deemed or Evaluated?
NTGR – Nicor Gas HES	SAG Document †	Deemed
Faucet Aerators	Illinois TRM v4.0, Section 5.4.4	Deemed
Showerhead	Illinois TRM v4.0, Section 5.4.5	Deemed
Hot Water Pipe Insulation	Illinois TRM v4.0, Section 5.4.1	Deemed
Water Heater Set Back	Illinois TRM v4.0, Section 5.4.6	Deemed
Programmable Thermostat	Illinois TRM v4.0, Section 5.3.11	Deemed
Smart Thermostat	Navigant analysis	Evaluated
Attic Insulation	Illinois TRM v4.0, Section 5.6.4	Deemed
Air Sealing	Illinois TRM v4.0, Section 5.6.1	Deemed
Duct Sealing	Illinois TRM v4.0, Section 5.3.4	Deemed
Wall Insulation	Illinois TRM v4.0, Section 5.6.4	Deemed
Basement Sidewall Insulation	Illinois TRM v4.0, Section 5.6.3	Deemed

Source: Navigant analysis

† A deemed value. Source:

[http://ilsagfiles.org/SAG\\_files/NTG/2015\\_NTG\\_Meetings/Final\\_2015\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GP\\_Y1-5\\_2015-03-01\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GP_Y1-5_2015-03-01_Final.pdf)

<sup>3</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0 Effective June 1, 2015.

[http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Version\\_4/Final\\_Draft/Illinois\\_Statewide\\_TRM\\_Effective\\_060114\\_Version\\_3%200\\_021414\\_Final\\_Clean.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_4/Final_Draft/Illinois_Statewide_TRM_Effective_060114_Version_3%200_021414_Final_Clean.pdf).

<sup>4</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0 Effective June 1, 2016.

[http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Version\\_5/Final/ILTRM\\_Effective\\_060116\\_v5.0\\_Vol\\_3\\_Res\\_021116\\_Final.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/ILTRM_Effective_060116_v5.0_Vol_3_Res_021116_Final.pdf). See measure 5.3.16.

## E.4 Program Volumetric Detail

Table E-4 provides an overview of GPY5 participants. The HES Program had 4,797 participants who had assessments. Of the 4,797 assessment participants, 4,207 participants had direct install products or services. In addition, 706 participants installed ASI measures.

**Table E-4. GPY5 Primary Participation Detail**

Participation	Nicor Gas Results
Assessment Participants §	4,797
Direct Install Participants	4,207
ASI Participants	706
Unique Project IDs §	5,503

Source: Program tracking data and Navigant analysis.

§ The reporting system does not allow for repeat visits to the same project number. Thus, if a site receives an assessment and some measures at that time, but other measures at a later date, those additional measures must be assigned a new project ID, and are not associated with an assessment. Thus, these numbers indicate that 4,797 residential customers participated in the assessment HES Program.

## E.5 Findings and Recommendations

The following provides insight into key program findings and recommendations.<sup>5</sup>

### Program Savings

**Finding 1.** Overall, the HES Program achieved verified gross savings of 387,154 therms with a corresponding verified gross realization rate of 106 percent.

**Finding 2.** Overall, the program achieved 129 percent of its planning target of 316,160 net therms with verified net savings of 406,511 therms.

### Verified Gross Savings and Realization Rate.

#### Finding 4. Using the Correct Home Type

The implementers classified duplexes and triplexes as single family and used the single family deemed savings values on duplexes and triplexes. In contrast, Navigant’s evaluation team used assumptions for multi-family household types on duplexes and triplexes. The TRM does not provide distinguishing definitions for single family and multi-family homes or household types.

<sup>5</sup> 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.



**Recommendation 2.**

We recommend the TRM address this and provide definitions that distinguish single family and multi-family homes or household types. Navigant will recommend this for the next version

**Process Evaluation**

**Finding 11.** The program is performing well. Comments about the program from participants are generally positive with 96 percent of respondents scoring a 5 out of 5 for satisfaction of the energy assessment and energy saving products installed.<sup>6</sup>

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<sup>6</sup> HEA-PY5 8 Survey Results\_Final\_07172016 from Nicor Gas

## 1. INTRODUCTION

### 1.1 Program Description

The HES Program provides a free home energy assessment performed by an energySMART energy advisor (energy advisor). The energy advisor collects information about the home's energy use by examining the heating system (e.g. furnace or boiler), cooling system (air conditioner), water heater, and attic (if accessible). The energy advisor provides a customized report with recommendations identifying additional ways the customer can save energy and money. As part of the energy assessment the energy advisor may directly install showerheads, bathroom and kitchen faucet aerators, hot water pipe insulation, install and/or set a programmable thermostat or smart thermostat, and set back the water heater temperature. In addition to the directly installed measures, the HES Program also offers rebates for air sealing and insulation (ASI) measures for eligible homes installed by an energySMART-approved contractor including air sealing, attic insulation, duct sealing, basement sidewall, and wall insulation.

### 1.2 Evaluation Objectives

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

## 2. EVALUATION APPROACH

To determine verified gross savings, the evaluation team used the Illinois TRM v4.0 for both direct install and ASI measures, except for smart thermostats where Navigant performed a custom analysis using assumptions and algorithms presented in TRM v5.0 for the Advanced Thermostat measure. This is different from GPY4 when, for ASI measure savings estimates, the implementation contractor, CLEARresult, used its own calculations in its proprietary EnergyMeasure® Home (EM Home) software. The verified net savings were calculated using a net-to-gross ratio (NTGR) that was deemed for the GPY5 HES Program. Navigant conducted a limited process review that included in-depth interviews with program staff in GPY5.

### 2.1 Overview of Data Collection Activities

The core data collection activities included review of program tracking data and verification of direct install and ASI measure savings according to the Illinois TRM v4.0. The full set of data collection activities is shown in the following tables.

**Table 2-1. Core Data Collection Activities in GPY5**

What	Who	Completions Achieved		Comments
Tracking System & Engineering Review	Participating Customers	All	March – Aug 2016	Gross savings verification using IL-TRM or through research
In Depth Interviews	Program Manager/Implementer Staff	2	April 2017	Included Program management and implementation contractor staff

Source: Navigant.

The reporting system does not allow for repeat visits to the same project number. Thus, if a site receives an assessment and some measures at once, but other measures at a later date, those additional measures must be assigned a new project ID and are not associated with an assessment.

**Table 2-2. Additional Resources**

Reference Source	Author	Application	Gross Impacts
Illinois Technical Reference Manual Version 4.0	Illinois Stakeholder Advisory Group	HES measure impact analysis	X
Navigant custom analysis used assumptions and algorithms presented in Illinois Technical Reference Manual Version 5.0, Section 5.3.16	Illinois Stakeholder Advisory Group	Smart thermostat impact analysis	X

## 2.2 Verified Savings Parameters

Navigant calculated verified gross and net program impacts for five types of direct install measures and five types of ASI measures with deemed savings values: low-flow showerheads, kitchen and bathroom faucet aerators, pipe insulation, programmable thermostats, attic and wall insulation, air and duct sealing, and basement sidewall insulation. In GPY5, smart thermostats were not deemed in TRM v4.0 as a measure separate from basic programmable thermostats. In 2015, Navigant performed a billing analysis with Illinois residences to develop a savings estimate specifically for smart thermostats that was later adopted as a deemed smart (advanced) thermostat measure in TRM v5.0.<sup>7</sup> For the GPY5 HES Program, Navigant verified smart thermostats as a custom measure evaluation. These measures account for all quantifiable GPY5 natural gas savings.

### 2.2.1 Verified Gross Program Savings Analysis Approach

Navigant estimated verified per-unit savings for each program measure using impact algorithms and input assumptions defined by the Illinois TRM version 4.0 for deemed measures, and evaluation research for non-deemed measures. Table 2-3 below presents the sources for parameters that were used in the verified gross savings analysis, indicating which were examined through GPY5 evaluation research and which were deemed.

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

Parameter	Data Source	Deemed or Evaluated?
Measure Quantity Installed	Program tracking system	Evaluated
Verified Gross Realization Rate	Program tracking data, TRM, Navigant	Evaluated
Residential hot water measure savings assumptions	Illinois TRM, version 4.0, section 5.4‡ Program tracking system	Deemed
Residential pipe insulation savings assumptions	Illinois TRM, version 4.0, sections 5.3 and 5.4‡ Program tracking system	Deemed
Programmable thermostat savings assumptions	Illinois TRM, version 4.0, section 5.3‡ Program tracking system	Deemed
Smart "Advanced" thermostat savings assumptions	Navigant custom measure analysis used assumptions and algorithms presented in Illinois TRM, version 5.0, section 5.3.16‡ Program tracking system	Evaluated
ASI measure savings assumptions	Illinois TRM, version 4.0, sections 5.3 and 5.6‡ Program tracking system	Deemed

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>.

<sup>7</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0 Effective June 1, 2016.

[http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Version\\_5/Final/IL-TRM\\_Effective\\_060116\\_v5.0\\_Vol\\_3\\_Res\\_021116\\_Final.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/IL-TRM_Effective_060116_v5.0_Vol_3_Res_021116_Final.pdf). See measure 5.3.16.

### **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). In GPY5, 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)<sup>8</sup>. The approved, deemed NTGR for the GPY5 Nicor Gas program was 1.05.

### **2.3 Process Evaluation**

A limited process evaluation was conducted for GPY5. It was based on the analysis of the leave-behind pre-paid survey responses collected by CLEAResult and interviews with program staff and the implementation contractor. These interviews discussed the program's energy savings and participation as well as changes implemented in GPY5.

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<sup>8</sup> 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/Nicor\\_Gas\\_Final\\_GPY5\\_Consensus\\_NTG\\_Values\\_2015-03-01.pdf](http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf)

### 3. GROSS IMPACT EVALUATION

This section includes Navigant's gross impact evaluation results. Navigant performed a tracking data review to determine quantity of measures installed and the ex-ante gross savings by measure. To determine the verified gross savings by measure, the evaluation team performed an engineering analysis for each measure using the Illinois TRM Version 4.0.<sup>9</sup> The smart thermostat measure was not available in the TRM v4.0, so evaluated savings values are drawn from TRM v5.0. The program reported ex ante gross savings of 366,506 therms. Navigant reports verified gross savings 387,154 therms, with a corresponding verified gross realization rate of 106 percent.

#### 3.1 Program Tracking Data Review

Navigant performed a verification of the program tracking database to determine ex ante gross savings totals for each measure. The purpose of the tracking system review was to ensure these systems accurately gather the data required to calculate program savings. Navigant used measure quantities and measure specifications supplied by Nicor Gas as inputs to Illinois TRM algorithms to determine verified gross savings.

Key findings include:

1. The reporting system does not allow for repeat visits to the same project ID. Thus, if a site receives an assessment and some measures at that time, but other measures at a later date, those additional measures must be assigned a new project ID, and are not associated with an assessment.
2. The "Basement Sidewall Insulation" measure was mislabeled in the tracking database as "Floor Insulation Above Crawlspace". Additionally, for this measure, the HDD documented in the tracking data is incorrect, however, this number is not used in the ex ante savings calculations. The ex ante savings calculations use the correct value per the associated climate region for the customer. This number should be recorded in the HDD field in the tracking data instead.

#### 3.2 Program Volumetric Findings

The GPY5 HES Program had 4,797 participants who had assessments. Of the 4,797 assessment participants, 4,207 participants had direct install products or services. In addition, 706 participants installed ASI measures. Table 3-1 summarizes the total installed quantity for each measure.

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<sup>9</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0 June 1, 2015.

**Table 3-1. GPY5 Volumetric and Participation Findings**

Measure	Unique Projects	Ex Ante Measure Quantity	Quantity Unit	Ex Post Measure Quantity§
Air Sealing	651	651	Home	651
Assessment (HES) - joint	4,689	4,689	Assessment	4,689
Assessment (HES)	108	108	Assessment	108
Attic Insulation*	691	873,015	Square Feet	873,015
Basement Sidewall	25	8,529	Square Feet	8,529
Wall Insulation	92	41,015	Square Feet	41,015
Bathroom Aerator**	2,813	6,267	Unit	6,267
Kitchen Aerator	1,444	1,616	Unit	1,616
DHW WH Pipe Wrap	1,091	7,242	Linear Feet	7,242
Duct Sealing	17	17	Home	17
Handheld Showerhead	1,263	1,672	Unit	1,672
Showerhead	2,147	3,221	Unit	3,221
Programmable Thermostat§	733	785	Unit	741
Smart Thermostat§	402	438	Unit	404
Thermostat Education§	483	528	Unit	486
WH Set Back	1,054	1,101	Unit	1,101

Source: Navigant analysis.

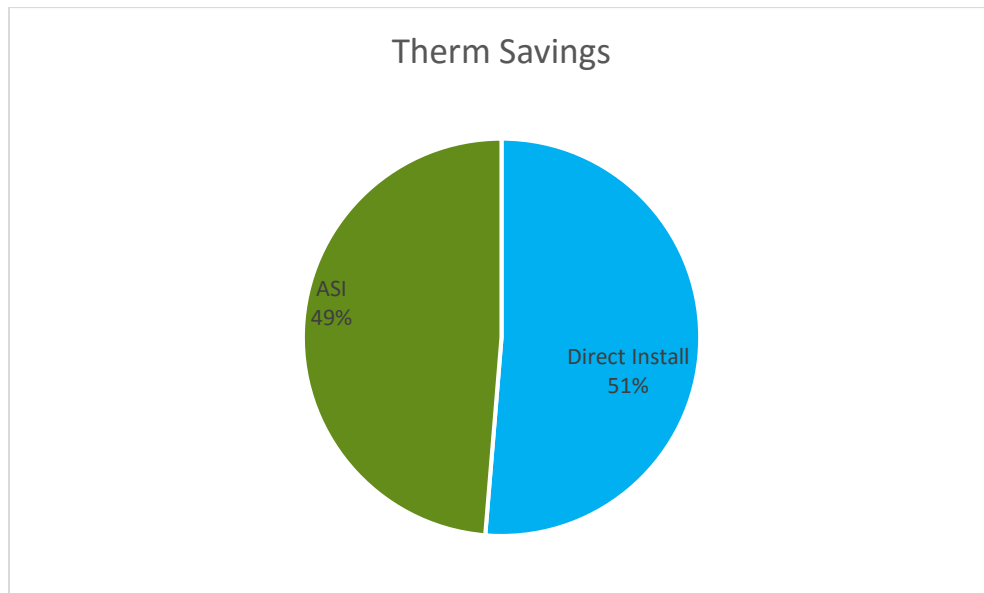
\* Navigant identified 12 project IDs that claimed two separate Attic Insulation projects. These project IDs are documented in Appendix Table 7-1.

\*\* Navigant identified three project IDs that claimed two separate Bathroom Aerator projects. These project IDs are also documented in Appendix Table 7-1.

§ Navigant capped the number of Thermostat measures at one per household. Home types that include more than one household (duplex, triplex, etc.) were allowed more than one thermostat. The ex post measure quantity is the number of units used to calculate savings in the ex post gross and net impact analysis.

Figure 3-1 disaggregates the measure savings by type: direct install and ASI. For Nicor Gas overall, ASI measures contributed 49 percent of the measure savings in GPY5, and direct install measures (including hot water efficiency measures and thermostats) contributed 51 percent.

Figure 3-1. Nicor Gas HES Therm Savings by Measure Type



Source: Nicor Gas program tracking data and Navigant analysis.

### 3.3 Gross Program Impact Parameter Estimates

As described in Section 2.2, Navigant calculated verified gross savings for the GPY5 HES Program deemed savings measures using algorithms and parameters defined in the Illinois TRM 4.0. The smart thermostat measure was not deemed in TRM v4.0 separate from basic programmable thermostats, so Navigant conducted a custom measure analysis using assumptions and algorithms drawn from TRM v5.0. Navigant has no new recommendations for the Illinois TRM based on the GPY5 evaluation.

Although the GPY5 Nicor Gas tracking database provided all input parameters to calculate savings, Navigant recommends updating the tracking database, as detailed in Section 6.

Table 3-2 presents the key parameters and the references used in the verified gross savings calculations.



**Table 3-2. GPY5 HES Program Ex Ante and Verified Gross Savings Parameters**

Measure	Average Ex Ante Gross Savings (Therms/Unit)	Average Verified Gross Savings (Therms/Unit)	Method	Data Source
Air Sealing SF	126.15	153.08		IL TRM v4, Section 5.6.1
Attic Insulation (>R19 to R49) SF	95.64	97.94		IL TRM v4, Section 5.6.4
Bathroom Aerator SF (DI)	1.54	0.71		IL TRM v4, Section 5.4.4
DHW WH Pipe Wrap - 6' - DI	7.04	0.99		IL TRM v4, Section 5.4.1
Duct Sealing SF	516.76	516.76		IL TRM v4, Section 5.3.4
Basement Sidewall	307.96	307.96	All Measures Deemed except Smart Thermostat	IL TRM v4, Section 5.6.2
Handheld Showerhead (DI) SF	18.59	14.15		IL TRM v4, Section 5.4.5
Kitchen Aerator SF (DI)	6.27	5.57		IL TRM v4, Section 5.4.4
Programmable Thermostat (DI)	62.30	61.67		IL TRM v4, Section 5.3.11
Showerhead (DI) SF	21.06	14.19		IL TRM v4, Section 5.4.5
Smart Thermostat – DI	66.19	74.14		Custom analysis using assumptions from IL TRM v5, Section 5.3.16
Thermostat Education (DI)	62.30	61.56		IL TRM v4, Section 5.3.11
Wall Insulation SF	51.05	51.04		IL TRM v4, Section 5.6.4
WH Set Back - MF	3.66	3.70		IL TRM v4, Section 5.4.6

Source: Navigant analysis of program tracking data and CLEAResult documents. 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](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](http://www.ilsag.info/il_trm_version_5.html)

### 3.4 Verified Gross Program Impact Results

Navigant performed a detailed engineering review of the ex ante savings assumptions provided by CLEAResult and developed verified gross therms savings values for all of the direct install and ASI measures. Navigant determined the verified gross realization rates by comparing the ex ante gross savings with the verified gross savings.

As shown in Table 3-3 the Nicor Gas GPY5 HES Program reported ex ante gross energy savings of 366,506 therms. Evaluation adjustments resulted in verified gross energy savings of 387,154 therms, reflecting the program’s gross realization rate of 106 percent.

**Table 3-3. Nicor Gas GPY5 HES Program Impact Results**

	Measure Category	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Gross Realization Rate ‡
Direct Install Measures	Hot Water Pipe Insulation	7,677	7,179	94%
	Showerhead	68,698	69,357	101%
	Kitchen Aerator	9,050	9,003	99%
	Bathroom Aerator	4,324	4,467	103%
	Water Heater Set Back	3,854	3,898	101%
	Programmable Thermostat	45,666	45,203	99%
	Smart Thermostat	26,609	29,803	112%
	Thermostat Education	30,091	29,732	99%
Subtotal		195,967	198,641	101%
ASI Measures	Attic Insulation (>R19 to R49)	67,236	67,675	101%
	Air Sealing	82,122	99,658	121%
	Duct Sealing	8,785	8,785	100%
	Wall Insulation	4,696	4,696	100%
	Basement Sidewall Insulation	7,699	7,699	100%
Subtotal		170,538	188,513	111%
Total§		366,506	387,154	106%

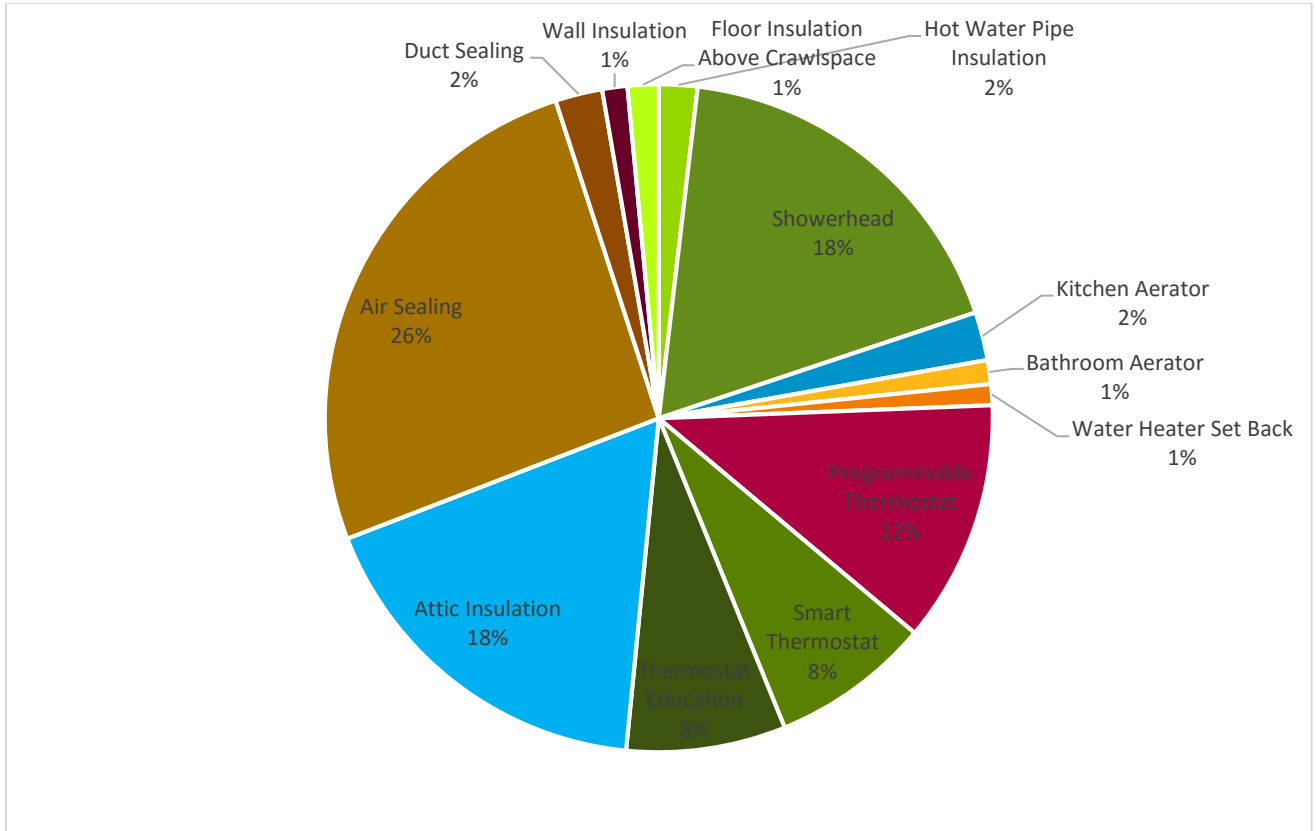
Sources: Program tracking data and Navigant analysis

‡ Based on evaluation research findings.

§Totals may not sum due to rounding

Figure 3-2 below shows the relative distribution of gross energy savings by measure.

Figure 3-2. Distribution of Verified Gross Therm Savings by Measure



Source: Nicor Gas program tracking data and Navigant analysis.

## 4. NET IMPACT EVALUATION

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio. As noted in Section 2.2.2, the NTGR used to calculate the net verified savings for the GPY5 HES Program was deemed to be 1.05 through a consensus process managed by the Illinois SAG.

Table 4-1 below shows the HES Program net savings by measure.

**Table 4-1. GPY5 HES Program Results by Measure**

	Measure Category	Ex-Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Gross Realization Rate ‡	NTGR †	Verified Net Savings (Therms)
Direct Install Measures	Hot Water Pipe Insulation	7,677	7,179	94%	1.05	7,537
	Showerhead	68,698	69,357	101%	1.05	72,825
	Kitchen Aerator	9,050	9,003	99%	1.05	9,453
	Bathroom Aerator	4,324	4,467	103%	1.05	4,690
	Water Heater Set Back	3,854	3,898	101%	1.05	4,093
	Programmable Thermostat	45,666	45,203	99%	1.05	47,463
	Smart Thermostat	26,609	29,803	112%	1.05*	31,293
	Thermostat Education	30,091	29,732	99%	1.05	31,219
Subtotal		195,967	198,641	101%		208,573
ASI Measures	Attic Insulation (>R19 to R49)	67,236	67,675	101%	1.05	71,058
	Air Sealing	82,122	99,658	121%	1.05	104,641
	Duct Sealing	8,785	8,785	100%	1.05	9,224
	Wall Insulation	4,696	4,696	100%	1.05	4,931
	Basement Sidewall Insulation	7,699	7,699	100%	1.05	8,084
Subtotal		170,538	188,513	111%		197,938
<b>Total§</b>		<b>366,506</b>	<b>387,154</b>	<b>106%</b>		<b>406,511</b>

Source: Program tracking data and Navigant analysis.

‡ Based on evaluation research findings.

† A deemed value. Source:

[http://ilsagfiles.org/SAG\\_files/NTG/2015\\_NTG\\_Meetings/Final\\_2015\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-5\\_2015-03-01\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf)

\* Smart thermostat savings are based on a billing analysis which yields net savings values, however, that was not established or agreed to when GPY5 NTG values were approved for deeming. For GPY5, program-level NTG values are applied to smart thermostat billing analysis savings.

§Totals may not sum due to rounding

## 5. PROCESS EVALUATION

A limited process evaluation was conducted for the HES Program in GPY5. Navigant conducted telephone interviews with program managers and implementation staff to learn about changes made to the program in GPY5 as well as changes planned for GPY6.

### 5.1 Program Changes Since GPY4

There were several changes made to the HES Program in GPY5, including adjustments to net savings goals, the measures offered, and the number of energy advisors sent to participant's homes to complete the assessment. These changes are discussed in the sections below.

#### 5.1.1 Net Energy Savings Goals

The HES Program's net energy savings goal was increased in GPY5 to 316,160 net therms compared to 311,000 net therms in GPY4. The HES Program exceeded its GPY5 energy savings goal with 406,511 verified net therms, an increase over the 360,184 verified net savings of GPY4.

#### 5.1.2 Measures Offered

A major change for the HES Program in GPY6 was the addition of new electric and gas measures, including measures with co-pays. A smart thermostat with a co-pay of \$150 was introduced to the program in GPY5. Because the utilities had never offered co-pay measures before, they were not sure how participants were going to respond. Program staff reported that the smart thermostat measure had a 10 percent average installation rate among customers.

On the electric side, ComEd offered the following new measures: free direct install outdoor LEDs, indoor LEDs with a co-pay, and tier one advanced power strip. In the beginning of the program year, the customer uptake for the co-pay LEDs was lower than program staff expected. ComEd decreased the co-pay range amount from \$3.00 - \$10.00 to \$3.00 - \$5.00 in March to better align with the price in the market. After this decrease in co-pay amounts, ComEd saw an increase in co-pay LED installations. The advanced power strip had a higher number of measures installed per home than program staff expected.

#### 5.1.3 Energy Advisor Teams

Another change in GPY5 was size of the energy advisor teams sent into participants' homes. In GPY4 the program utilized two-person teams that typically completed six to seven appointments per day. In GPY5 this was changed to a single person who completed four to five appointments per day. Customer experience was the main driver for this change. Based on previous year, the implementation staff learned that customers felt more comfortable having only one person in their home and were also willing to engage in more meaningful conversations about energy usage.

## 5.2 Participant Feedback

The HES Program used a leave-behind postage pre-paid survey for customers to fill out and return or to enter online via a website. Overall the participant satisfaction for the program in GPY5 was very high, where 96 percent of respondents scored a 5 out of 5 for satisfaction of the assessment and the energy saving products installed, and about 90 percent of respondents said they would recommend the program to a friend or family member.<sup>10</sup>

## 5.3 Program Changes in GPY6

Nicor Gas has minor changes planned for the program in GPY6, including a lower savings goal and modifying the electric measures being offered by ComEd. As stated in Section 5.1.1 above, the savings goals for GPY5 were 316,160 net therms while the savings goal for GPY6 has been decreased to 251,166 net therms.

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<sup>10</sup> HEA-PY5 8 Survey Results\_Final\_07172016 from Nicor Gas

## 6. FINDINGS AND RECOMMENDATIONS

The following provides insight into key program findings and recommendations.<sup>11</sup>

### Program Savings

**Finding 1.** Overall, the HES Program achieved verified gross savings of 387,154 therms with a corresponding verified gross realization rate of 106 percent.

**Finding 2.** Overall, the program achieved 129 percent of its planning target of 316,160 net therms with verified net savings of 406,511 therms.

### Verified Gross Savings and Realization Rate

#### Finding 3. Basement Sidewall Insulation

The implementer clarified that this measure is mislabeled as “Floor Insulation Above Crawlspace” in the database. Additionally, the heating degree days (HDD) identified in the tracking data are not those actually used. The tracking data indicates that an HDD of 6,339 was used for all implementations, however, this value is not from the TRM. The implementer stated that location-based TRM values were actually used in the calculations, which Navigant was able to confirm.

#### Recommendation 1.

The implementer should update the field name in the tracking database to “Basement Sidewall Insulation” as well as update the tracking data to indicate the location-based HDD used.

#### Finding 4. Using the Correct Home Type

The implementers classified duplexes and triplexes as a single family and used the single family deemed savings values on duplexes and triplexes. In contrast, Navigant’s evaluation team used assumptions for multi-family household types on duplexes and triplexes. The TRM does not provide distinguishing definitions for single family and multi-family homes or household types.

#### Recommendation 2.

We recommend the TRM address this and provide definitions that distinguish single family and multi-family homes or household types. Navigant will recommend this for the next version.

#### Finding 5. Smart Thermostats

For GPY5, the smart thermostat measure was not yet included in TRM version 4.0. CLEARResult assigned the programmable thermostat savings value of 62.3 therms per unit to all implementations. Navigant estimated smart thermostat savings using the TRM version 5.0 algorithm and parameters for appropriate home types and for instances of an unknown baseline – manual or programmable thermostat. This resulted in realization rates of 119 percent or 125 percent for single family homes and 71 percent, 74 percent, or 78 percent for multi-family homes, depending on climate zone. Combined, adjusting all smart thermostat savings increased program overall savings by 0.83%.

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<sup>11</sup> 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.

**Recommendation 3.**

Use the TRM version 5.0 algorithm and parameters. We also recommend the TRM provide definitions that distinguish single family and multi-family homes or household types. Navigant will recommend this for the next version.

**Finding 6. Showerheads and Water Heater Setback**

The implementer used the single family input parameters for showerheads of duplexes and triplexes because they classified duplexes and triplexes as single family. The evaluation team classified duplexes and triplexes as multi-family, resulting in realization rates of 127 percent for all multi-family showerheads and 117 percent for multi-family water heater setbacks. Combined, this increased program overall savings by 0.20%.

**Recommendation 4.**

We recommend the TRM provide definitions that distinguish single family and multi-family homes or household types. Navigant will recommend this for the next version.

**Finding 7. Pipe Insulation**

The TRM adds a heat transfer resistance value of 1 to any pipe insulation to account for finite convective heat transfer. This results in a pipe with no insulation having an effective R-value of 1, and the effective R-value of pipe with R-3 insulation being 4. The implementer confirmed through email correspondence that R-3 pipe insulation was installed as part of the program, however, in their calculations, they add the TRM's finite convective heat transfer factor of 1 to 4 instead of to 3, resulting in a post-installation R-value of 5 instead of the appropriate 4. This resulted in consistent realization rates of 94 percent for all pipe insulation measures, a difference which reduces total program net savings by 0.13%.

**Recommendation 5.**

Correct the algorithm such that the "post installation" value is the R-value of the insulation added plus one.

**Finding 8. Programmable Thermostats**

Similar to the hot water measures, the implementer used the single family input parameters for programmable thermostats of duplexes and triplexes because they classified duplexes and triplexes as single family. The evaluation team classified duplexes and triplexes as multi-family. As a result, all multi-family homes received realization rates of 65 percent. Additionally, while the tracking data correctly assigns "Gas Heating Consumption" and "Furnace Heating Load" based on climate zone, this number was not correctly used in the algorithm. Homes in climate zones one and two have loads of 1,052 therms and 1,005 therms respectively, but all homes used 1,005 therms in their calculations. This resulted in 105% realization rates for single family homes in climate zone one. Combined, correcting all Programmable Thermostat errors decreased program overall savings by 0.12%.

**Recommendation 6.**

We recommend the TRM provide definitions that distinguish single family and multi-family homes or household types. Navigant will recommend this for the next version. Also use the deemed TRM furnace heating load in the savings calculations based on climate zone.

**Finding 9. Faucet Aerators**



Navigant made multiple adjustments to the implementer's input parameters for faucet aerators. First, the implementer used the single family input parameters for faucet aerators of duplexes and triplexes because they classified duplexes and triplexes as single family. The evaluation team classified duplexes and triplexes as multi-family. Additionally, the implementer rounded TRM values down while Navigant does not. The energy per gallon was rounded down. Bathroom aerators were rounded down from 0.00341 to 0.0034 and kitchen aerators were rounded down from 0.00415 to 0.0041. There are realization rate discrepancies resulting from these input parameter differences: single family bathroom aerators received a realization rate of 101 percent, multi-family bathroom aerators received a realization rate of 181 percent, and multi-family kitchen aerators received a realization rate of 92 percent. Combined, correcting these errors increased program overall savings by 0.03%.

**Recommendation 7.**

We recommend the TRM provide definitions that distinguish single family and multi-family homes or household types. Navigant will recommend this for the next version.

**Finding 10. Thermostats**

Some homes received more than one thermostat measure and are documented in Table 7-2 in the Appendix. The TRM limits savings for thermostat measures to one per household. Navigant limited thermostat measures to one per project ID, with the exception being multi-family homes.

**Process Evaluation**

**Finding 11.** The program is performing well. Comments about the program from participants are generally positive with 96 percent of respondents scoring a 5 out of 5 for satisfaction of the energy assessment and energy saving products installed.<sup>12</sup>

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<sup>12</sup> HEA-PY5 8 Survey Results\_Final\_07172016 from Nicor Gas

## 7. APPENDIX

### 7.1 Volumetric Anomalies

**Table 7-1. Project IDs Claiming Multiple Projects for the Same Measure**

Project ID	Measure	Number of Projects	Number of Measures Claimed
PRJ-440343	Attic Insulation	2	995
PRJ-498814	Attic Insulation	2	1,014
PRJ-591300	Attic Insulation	2	1,085
PRJ-591975	Attic Insulation	2	1,400
PRJ-628016	Attic Insulation	2	1,425
PRJ-643291	Attic Insulation	2	1,680
PRJ-733889	Attic Insulation	2	1,372
PRJ-784346	Attic Insulation	2	850
PRJ-788428	Attic Insulation	2	540
PRJ-850291	Attic Insulation	2	864
PRJ-865134	Attic Insulation	2	2,622
PRJ-879830	Attic Insulation	2	573
PRJ-389410	Bathroom Aerator	2	3
PRJ-716144	Bathroom Aerator	2	2
PRJ-734121	Bathroom Aerator	2	2

**Table 7-2. Project IDs Reporting More Than One Thermostat Measure per Household**

Project ID	Thermostat Measure	Number of Measures Claimed
PRJ-421461	Programmable Thermostat	2
PRJ-453133	Programmable Thermostat	2
PRJ-453834	Programmable Thermostat	2
PRJ-461928	Programmable Thermostat	2
PRJ-485424	Programmable Thermostat	2
PRJ-485741	Programmable Thermostat	4
PRJ-498073	Programmable Thermostat	2

Project ID	Thermostat Measure	Number of Measures Claimed
PRJ-508633	Programmable Thermostat	2
PRJ-533759	Programmable Thermostat	2
PRJ-535448	Programmable Thermostat	2
PRJ-539328	Programmable Thermostat	2
PRJ-541049	Programmable Thermostat	2
PRJ-542869	Programmable Thermostat	2
PRJ-544881	Programmable Thermostat	2
PRJ-548215	Programmable Thermostat	2
PRJ-555842	Programmable Thermostat	2
PRJ-560884	Programmable Thermostat	2
PRJ-580650	Programmable Thermostat	2
PRJ-586536	Programmable Thermostat	2
PRJ-588304	Programmable Thermostat	2
PRJ-592390	Programmable Thermostat	2
PRJ-601353	Programmable Thermostat	2
PRJ-606368	Programmable Thermostat	2
PRJ-627483	Programmable Thermostat	2
PRJ-651191	Programmable Thermostat	2
PRJ-652530	Programmable Thermostat	2
PRJ-660112	Programmable Thermostat	2
PRJ-660190	Programmable Thermostat	3
PRJ-670709	Programmable Thermostat	2
PRJ-671407	Programmable Thermostat	2
PRJ-687997	Programmable Thermostat	2
PRJ-703666	Programmable Thermostat	2
PRJ-707808	Programmable Thermostat	2
PRJ-709950	Programmable Thermostat	2
PRJ-716970	Programmable Thermostat	2
PRJ-734004	Programmable Thermostat	2
PRJ-735446	Programmable Thermostat	2
PRJ-747589	Programmable Thermostat	2
PRJ-747684	Programmable Thermostat	2

Project ID	Thermostat Measure	Number of Measures Claimed
PRJ-754867	Programmable Thermostat	2
PRJ-765280	Programmable Thermostat	2
PRJ-413518	Thermostat Education	2
PRJ-414781	Thermostat Education	2
PRJ-417919	Thermostat Education	2
PRJ-445203	Thermostat Education	2
PRJ-467386	Thermostat Education	2
PRJ-472061	Thermostat Education	4
PRJ-473806	Thermostat Education	2
PRJ-503818	Thermostat Education	2
PRJ-511471	Thermostat Education	2
PRJ-513418	Thermostat Education	2
PRJ-517004	Thermostat Education	2
PRJ-525621	Thermostat Education	2
PRJ-535571	Thermostat Education	2
PRJ-570206	Thermostat Education	2
PRJ-573564	Thermostat Education	2
PRJ-574340	Thermostat Education	2
PRJ-582696	Thermostat Education	2
PRJ-592487	Thermostat Education	2
PRJ-603209	Thermostat Education	2
PRJ-612609	Thermostat Education	2
PRJ-614623	Thermostat Education	2
PRJ-618980	Thermostat Education	2
PRJ-633015	Thermostat Education	2
PRJ-665357	Thermostat Education	2
PRJ-665847	Thermostat Education	2
PRJ-670769	Thermostat Education	2
PRJ-678267	Thermostat Education	2
PRJ-680344	Thermostat Education	3
PRJ-703554	Thermostat Education	2
PRJ-705222	Thermostat Education	2

Project ID	Thermostat Measure	Number of Measures Claimed
PRJ-715585	Thermostat Education	2
PRJ-723201	Thermostat Education	2
PRJ-725189	Thermostat Education	2
PRJ-728549	Thermostat Education	2
PRJ-736218	Thermostat Education	2
PRJ-738578	Thermostat Education	2
PRJ-779752	Thermostat Education	2
PRJ-500737	Smart Thermostat	2
PRJ-509066	Smart Thermostat	2
PRJ-522189	Smart Thermostat	2
PRJ-522774	Smart Thermostat	2
PRJ-555708	Smart Thermostat	2
PRJ-562508	Smart Thermostat	2
PRJ-564632	Smart Thermostat	2
PRJ-569447	Smart Thermostat	2
PRJ-574792	Smart Thermostat	2
PRJ-580032	Smart Thermostat	2
PRJ-586494	Smart Thermostat	2
PRJ-587820	Smart Thermostat	2
PRJ-589148	Smart Thermostat	2
PRJ-592136	Smart Thermostat	2
PRJ-597474	Smart Thermostat	2
PRJ-597707	Smart Thermostat	2
PRJ-617420	Smart Thermostat	2
PRJ-635253	Smart Thermostat	2
PRJ-666849	Smart Thermostat	2
PRJ-669787	Smart Thermostat	2
PRJ-672901	Smart Thermostat	2
PRJ-697286	Smart Thermostat	2
PRJ-704345	Smart Thermostat	2
PRJ-721879	Smart Thermostat	2
PRJ-743615	Smart Thermostat	2

Project ID	Thermostat Measure	Number of Measures Claimed
PRJ-743862	Smart Thermostat	2
PRJ-759124	Smart Thermostat	2
PRJ-779476	Smart Thermostat	3
PRJ-783918	Smart Thermostat	2
PRJ-785531	Smart Thermostat	2
PRJ-787101	Smart Thermostat	2
PRJ-827470	Smart Thermostat	2
PRJ-846035	Smart Thermostat	2