



# Business Energy Efficiency Rebate Program

GPY5 Evaluation Report

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

FINAL

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Prepared for:

**Nicor Gas Company**

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## 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> Business Energy Efficiency Rebate (BEER) Program. Through the BEER Program, business customers receive incentives for installing new, highly efficient space heating, water heating, pipe insulation and commercial kitchen equipment covered by the program, as well as rebates for other prescriptive cost effective equipment and services to improve the energy efficiency of existing equipment. The program target market is business customers using 60,000 therms or more per year, with reliance on wholesale and retail trade allies and business trade associations to assist in the marketing of the program to Nicor Gas' end-use customers. In addition, the program offers free assessment and direct install measures such as efficient bathroom and kitchen faucet aerators, pre-rinse sprayers and low flow showerheads. The BEER Program is implemented by CLEARResult.

Notable changes in the BEER GPY5 program included:

- At the end of the first quarter the program added bonuses to 10 prescriptive measures in the following five categories: ozone laundry; medium to large condensing and hydronic boilers; furnaces and infrared heaters.
- Provided Trade Ally and customer training for infrared heaters and boiler tune-ups, and distributed new measure fact sheets (infrared heaters) and case studies (ozone laundry).
- Launched a steam trap survey bonus at the beginning of the fourth quarter.
- Increased the share of assessment no-cost direct install measures such as bathroom and kitchen faucet aerators, pre-rinse sprayers and low flow showerheads, most significantly in the hospital, healthcare and hotel/motel business customers.

The GPY5 evaluation involved verifying gross savings, based on deemed values and input algorithms in the Illinois Technical Reference Manual (TRM v4.0)<sup>2</sup>, and calculating verified net impact savings using the Net-to-Gross (NTG) ratio approved through the Illinois Stakeholder Advisory Group (SAG) consensus process for GPY5.<sup>3</sup> Navigant interviewed program staff and the implementation contractor staff to verify information about the tracking system and program changes.

### E.1. Program Savings

Table E-1 and Table E-2 summarize the total program savings and program savings by measure. Table E-1 shows the GPY5 BEER Program achieved verified net energy savings of 2,218,817 therms.

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

<sup>2</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0, available at: <http://www.ilsag.info/technical-reference-manual.html>

<sup>3</sup> [http://ilsagfiles.org/SAG\\_files/NTG/2016\\_NTG\\_Meetings/Final\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-6\\_2016-02-29\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/Nicor_Gas_NTG_Summary_GPY1-6_2016-02-29_Final.pdf)

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

<b>Savings Category</b>	<b>Nicor Gas</b>
Ex Ante Gross Savings <sup>4</sup> (Therms)	3,228,219
Verified Gross Realization Rate	1.01‡
Verified Gross Savings (Therms)	3,262,966
Net to Gross Ratio (NTGR)	0.68†
Verified Net Savings (Therms)	2,218,817

*Source: Utility tracking data and Navigant analysis.*

*‡ Based on evaluation research findings*

*† SAG Deemed Value*

Table E-2 summarizes the ex-ante gross savings, verified gross savings, and verified net savings for the GPY5 BEER Program by measure. Measures with the most savings in GPY5 are steam traps with 78 percent, process boiler tune-ups with 10 percent, and pipe insulation with six percent, while the remaining six percent came from other measures. Prescriptive program path measures contributed 98 percent of the net savings and direct install measures contributed two percent.

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<sup>4</sup> From Program Tracking System

Table E-2. GPY5 BEER Program Results by Measure

Research Category	Measure Type	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate‡	Verified Gross Savings (Therms)	NTGR †	Verified Net Savings (Therms)
Direct Install Measures	Faucet Aerator	51,173	1.00	51,180	0.68	34,803
	Pre-Rinse Spray Valve	183	1.00	183	0.68	125
	Showerhead	27,060	1.00	27,057	0.68	18,399
<i>Subtotal</i>		78,416	1.00	78,421	0.68	53,326
Prescriptive Incentives Measures	Boiler Lockout/Reset Controls	403	1.00	403	0.68	274
	Boiler Tune Up, Heating	30,255	1.00	30,252	0.68	20,571
	Boiler Tune Up, Process	302,125	1.05	318,013	0.68	216,249
	Condensing Unit Heaters	266	1.00	266	0.68	181
	Efficient Boiler	33,823	1.00	33,829	0.68	23,003
	Efficient Furnace	4,900	1.00	4,896	0.68	3,330
	Convection Oven	612	1.00	609	0.68	414
	Energy Star Fryer	12,698	1.00	12,701	0.68	8,637
	Infrared Charbroiler	661	1.00	661	0.68	449
	Infrared Heaters	17,138	1.00	17,138	0.68	11,654
	Ozone Laundry	6,451	1.00	6,451	0.68	4,387
	Piping Insulation	209,538	0.98	206,324	0.68	140,300
	Programmable Thermostat	1,302	0.98	1,280	0.68	871
Steam Trap	2,529,275	1.01	2,551,364	0.68	1,734,928	
Storage Water Heater	356	1.00	356	0.68	242	
<i>Subtotal</i>		3,149,802	1.01	3,184,545	0.68	2,165,491
<b>Total</b>		<b>3,228,219</b>	<b>1.01</b>	<b>3,262,966</b>	<b>0.68</b>	<b>2,218,817</b>

Source: Program tracking data and Navigant analysis.

‡ Based on evaluation research findings.

† SAG Deemed Value:

[http://ilsagfiles.org/SAG\\_files/NTG/2016\\_NTG\\_Meetings/Final\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-6\\_2016-02-29\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/Nicor_Gas_NTG_Summary_GPY1-6_2016-02-29_Final.pdf)

## E.2. Impact Estimate Parameters

Table E-3 shows the key parameters used in the GPY5 impact analysis. Navigant used impact parameters as defined by the Illinois Technical Reference Manual (TRM v4.0) to evaluate the savings for

most program measures, and verified custom input parameters as provided in the tracking system or from a supplemental data provided by Nicor Gas. Navigant calculated verified net savings using a NTGR from previous evaluation research that was deemed by the SAG.

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

Parameter	Data Source	Deemed or Evaluated?
Net to Gross Ratio	SAG Document †	Deemed
Verified Gross Realization Rate	Program Tracking Data, Illinois TRM (v4.0) or custom evaluation	Evaluated
Space Heating, boiler tune-up, and steam trap combustion efficiency	Nicor Gas collected custom values	Evaluated
Industrial steam traps and pipe insulation hours of use	Nicor Gas collected custom values	Evaluated
All other measure inputs	Program Tracking Data, Illinois TRM (v4.0)	Deemed

Source: Navigant analysis

† SAG Deemed Value:

[http://ilsagfiles.org/SAG\\_files/NTG/2016\\_NTG\\_Meetings/Final\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-6\\_2016-02-29\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/Nicor_Gas_NTG_Summary_GPY1-6_2016-02-29_Final.pdf)

### E.3. Participation Information

Table E-4 provides an overview of GPY5 participation. The BEER Program had 173 total participants, including 52 participants who received no-cost assessments and direct install products, and 121 participants who received prescriptive incentives. A total of 474 projects were completed in GPY5, involving the installation of 12,029 measures with realized savings.

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

Participation	Direct Install	Prescriptive Incentive	Program Total
Participants <sup>5</sup>	52	121	173
Completed Projects	65	409	474
Installed Measures <sup>6</sup>	10,362	1,667	12,029

Source: Program tracking data and Navigant analysis.

<sup>5</sup> Participants are defined based on the project site address and number of accounts.

<sup>6</sup> For evaluation reporting purpose, if a measure quantity is reported in the tracking system in linear feet, MBH, or square feet, Navigant treated each row entry of such measure as one measure quantity in this table.



## E.4. Finding and Recommendations

This section summarizes the key findings and recommendations.<sup>7</sup> Section 6 provides the full set of findings and recommendations.

### Gross Realization Rates

**Finding 2.** Navigant verified that most of the GPY5 measures had gross realization rates of 100 percent after reviewing the TRM deemed inputs and the custom input parameters. The verified program-level gross savings realization rate is 101 percent. This is based on verified gross savings of 3,262,966 therms, an increase of 34,747 therms compared with the ex ante 3,228,219 therms. The GPY5 verified gross savings is 104 percent of the program planning goal of 3,137,000 therms.

**Finding 4.** The program effort in GPY5 to diversify the measure mix by providing bonuses and training Trade Allies and customers on certain measure categories appeared to be effective. In addition to the increase in savings of the direct install measures compared with GPY4, savings from boiler-tune ups increased from three to eleven percent, and pipe insulation increased from one to six percent of savings. Savings from steam traps were 78 percent of the GPY5 verified total gross savings, a decrease of 16 percent from the program share in GPY4.

**Recommendation 1.** To encourage a diversified measure mix and expand participation, the evaluation team recommends continued focus on conducting assessments and direct measure installation in addition to offering training and targeted measure incentive bonuses.

### Tracking System Review

**Finding 5.** Most boiler tune-up projects had 100 percent gross realization rates. Navigant found that for the *process* boiler tune-up measure, the hours of use (HOU) in the tracking data did not match the deemed value set in TRM (v4.0). Navigant used a deemed value of 8,766 hours and the boiler combustion efficiency values collected by Nicor Gas. Navigant estimated a 105 percent gross realization rate for all boiler tune-ups.

**Finding 6.** The ex ante savings for pipe insulation matched verified savings for most applications, but there were a limited number projects that Navigant adjusted. Navigant found instances of dry cleaner, hot water space heating, and some steam pipe measures where Nicor Gas calculated ex ante savings using custom HOU values that did not match the HOU inputs in the tracking data or the deemed values Navigant determined from TRM (v4.0).

Navigant adjusted the HOU inputs for these projects to use deemed values from TRM (v4.0). When selecting deemed values for pipe insulation, Navigant found that TRM (v4.0) had more differentiation of system configurations and recirculation approaches than Nicor Gas defined in their tracking system. The evaluation adjustments resulted in a 98 percent gross realization rate for pipe insulation measures overall.

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<sup>7</sup> The Executive Summary presents the most important information from 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.** The evaluation team recommends Nicor Gas review the tracking system HOU input values for process boiler-ups and the pipe insulation measures. In the description of the pipe insulation type, the tracking system should indicate whether the primary piping use is non-recirculation or year-round recirculation, or a seasonal period of pipe use.

**Finding 8.** Navigant adjusted the savings for programmable thermostats. Nicor Gas applied a single weighted average per unit savings value to all programmable thermostats in GPY5, while Navigant estimated the savings for each project and summed to a total. To set the ex ante per unit average savings value for GPY5, Nicor Gas used TRM assumptions to determine the therms savings value for each building type, and then weighted the building type results based on GPY4 participation and measure counts. The ex ante saving input was 34.27 therms per thermostat. Navigant calculated the GPY5 verified savings separately for each participating business type, as required by the TRM (v4.0). We estimated 37.85 therms as an average per unit savings for unknown building types or building types not specified in the TRM by calculating the average of the per unit savings values of participating known TRM building types for verified GPY5 participation.

**Recommendation 3.** The evaluation team recommends that the implementation contractor review the programmable thermostat inputs in the tracking system being used for GPY6, and calculate savings per unit based on the participating business or building type when known, as required by the TRM, and where unknown, use the overall average per unit estimate from the participating building types.

## 1. INTRODUCTION

### 1.1 Program Description

Through the Business Energy Efficiency Rebate (BEER) Program, business customers receive incentives for installing new, highly efficient space heating, water heating, pipe insulation and commercial kitchen equipment covered by the program, as well as rebates for other prescriptive cost effective equipment and services to improve the energy efficiency of existing equipment. The program target market is business customers using 60,000 therms or more per year, with reliance on wholesale and retail trade allies and business trade associations to assist in the marketing of the program to Nicor Gas' end-use customers.

The GPY5 BEER Program rebuilt the pipeline and ramped up after completing and closing out GPY4. The GPY5 program had an additional innovation to boost participation and measure mix diversification. At the end of the first quarter the program added bonuses to 10 prescriptive measures in the following five categories: ozone laundry; medium to large condensing and hydronic boilers; furnaces and infrared heaters. The GPY5 program provided Trade Ally and customer training for infrared heaters and boiler tune-ups, and distributed new measure fact sheets (infrared heaters) and case studies (ozone laundry).

At the beginning of the fourth quarter, the program launched a steam trap survey bonus<sup>8</sup>. The program requires participants seeking rebates for industrial/process or dry cleaner steam traps to submit a steam trap survey with the rebate application that includes the following information:

- Customer business name
- Site address where survey was completed
- For each steam trap:
  - Steam system pressure
  - Steam trap location
  - Steam trap function status (i.e. failed open/leaking, failed closed, or functional)

To facilitate the survey, the program provides a preferred steam trap survey template available for download at [nicorgasrebates.com/steamsurvey](http://nicorgasrebates.com/steamsurvey).

The GPY5 program also increased the share of assessment direct install measures such as bathroom and kitchen faucet aerators, pre-rinse sprayers and low flow showerheads, most significantly in hospital, healthcare and hotel/motel business customers. The BEER Program is implemented by CLEAResult. During GPY5, program tracking data showed that 173 business customers participated in the BEER Program and installed 12,029 rebate and free direct install measures.

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<sup>8</sup> Nico\_Gas\_GPY5\_Q4\_Quarterly\_Report.pdf

## 1.2 Evaluation Objectives

As planned, the Nicor Gas BEER year five (GPY5) evaluation focused on the following key research topics for GPY5:

### **Impact Research:**

1. What is the program's verified gross savings?
2. What is the program's verified net savings?
3. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

### **Process Research:**

The GPY5 process evaluation activities for the BEER program were limited to interviews with program staff and the implementation contractor staff to verify information about the tracking system and latest program offerings.

## 2. EVALUATION APPROACH

The GPY5 evaluation involved verifying gross savings and calculating verified net impact savings using the deemed Net-to-Gross Ratio (NTGR) ratio approved through the Illinois SAG for GPY5.<sup>9</sup> The majority of the savings from the measures installed in GPY5 are derived from deemed values and algorithms contained in the Illinois Technical Reference Manual (TRM).<sup>10</sup> No participant or trade ally free ridership or spillover research was conducted in GPY5. Process research was limited to interviewing program staff and the implementation contractor staff to verify information about the tracking system and program offerings.

### 2.1 Overview of Data Collection Activities

The core data collection activities included a tracking system review and an engineering analysis as shown in the table below.

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

What	Who	Target Completes	Completes Achieved	When
In Depth Interviews	PM/IC	2	2	August 2016
Tracking System & Engineering Review	GPY5 Projects using IL-TRM or through research	All	All	Dec 2016-Feb 2017
Project File Reviews	GPY5 Projects with custom inputs	All	All	Dec 2016-Feb 2017

*Source: Navigant analysis*

### 2.2 Verified Savings Parameters

Table 2-2 below presents the sources for parameters that were used in verified gross savings analysis indicating which were examined through GPY5 evaluation research and which were deemed.

<sup>9</sup>[http://ilsagfiles.org/SAG\\_files/NTG/2016\\_NTG\\_Meetings/Final\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-6\\_2016-02-29\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/Nicor_Gas_NTG_Summary_GPY1-6_2016-02-29_Final.pdf)

<sup>10</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0, available at: <http://www.ilsag.info/technical-reference-manual.html>

**Table 2-2. Verified Gross and Net Savings Parameters**

Measure	Input Parameter Source	Deemed or Evaluated?
NTGR	SAG Agreement†	Deemed
Gross Realization Rate	Tracking data and evaluation research	Evaluated
Faucet Aerator	Illinois TRM, v4.0, section 4.3.2‡	Deemed
Showerhead	Illinois TRM, v4.0, section 4.3.3‡	Deemed
Pre-Rinse Spray Valve	Illinois TRM, v4.0, section 4.2.11‡	Deemed
Boiler Tune Up, Heating	Illinois TRM, v4.0, section 4.4.2‡ & custom input	Evaluated
Boiler Tune Up, Process	Illinois TRM, v4.0, section 4.4.3‡ & custom input	Evaluated
Boiler Cutout/Reset Control	Illinois TRM, v4.0, section 4.4.4‡	Deemed
High Efficiency Boiler	Illinois TRM, v4.0, section 4.4.10‡ & custom input	Evaluated
High Efficiency Furnace	Illinois TRM, v4.0, section 4.4.11‡ & custom input	Evaluated
Ozone Laundry	Illinois TRM, v4.0, section 4.3.6‡	Deemed
Pipe Insulation	Illinois TRM, v4.0, section 4.4.14‡ & custom input	Evaluated
Steam Traps	Illinois TRM, v4.0, section 4.4.16‡ & custom input	Evaluated
Commercial Kitchen – Fryer/Convection Oven	Illinois TRM, v4.0, section 4.2‡	Deemed
Infrared Heaters	Illinois TRM, v4.0, section 4.4.12‡	Deemed
Programmable Thermostat	Illinois TRM, v4.0, section 4.4.18‡	Deemed
Storage Water Heater	Illinois TRM, v4.0, section 4.3.1‡	Deemed

Source: Navigant analysis

† [http://ilsagfiles.org/SAG\\_files/NTG/2016\\_NTG\\_Meetings/Final\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-6\\_2016-02-29\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/Nicor_Gas_NTG_Summary_GPY1-6_2016-02-29_Final.pdf)

‡ Illinois Statewide Technical Reference Manual for Energy Efficiency Version 4.0, available at: <http://www.ilsag.info/technical-reference-manual.html>

## 2.3 Verified Gross Program Savings Analysis Approach

Navigant used the Illinois TRM Version 4.0 methodology to calculate verified gross savings for measures with deemed savings. The Illinois TRM allows for some custom values to be used in the algorithms as well. CLEAResult used custom input variables collected from customer applications alongside TRM deemed inputs to estimate ex ante savings for some measures. Navigant reviewed the custom assumptions in the tracking database and supplemental data provided by CLEAResult to verify the

reasonableness of the custom inputs. To estimate verified gross savings, Navigant multiplied measure quantities from the program tracking system data times the verified per unit savings value.

## 2.4 Verified Net Program Savings Analysis Approach

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a NTGR. For GPY5, the evaluation team used a NTGR value that was deemed.

## 2.5 Process Evaluation and Other Research

The GPY5 process evaluation activities for the BEER program were limited to interviews with program staff and the implementation contractor staff to verify information about the tracking system and program offerings.

### 3. GROSS IMPACT EVALUATION

Navigant performed a verification of the BEER Program tracking database to determine the correctness and reasonableness of the data gathered and required to calculate program savings from direct install and prescriptive rebated measures installed through the program. Navigant used measure quantities, program tracking data and supplemental data of equipment specifications supplied by Nicor Gas as inputs to Illinois TRM algorithms to determine verified gross savings. Navigant estimated that the GPY5 BEER Program achieved verified gross savings of 3,262,966 therms and a 101 percent verified gross realization rate.

#### 3.1 Tracking System Review

The purpose of the tracking system review was to ensure the system gathers the required data to correctly calculate program savings. Nicor Gas and CLEAResult delivered tracking data in December 2016. Navigant's initial analysis of the tracking data revealed that the data fields have not changed from the previous year. Similar to GPY4, the tracked savings input parameters for some measures, including space and process heating equipment, pipe insulation and steam trap measures did not produce the claimed savings. Nicor Gas provided supplemental data to back up the assumptions behind the ex ante savings for the custom inputs. Navigant's savings verification approach used custom inputs when provided in the program tracking data; when not provided, we defaulted to the TRM values unless Nicor Gas provided supplemental custom input data to support the ex ante savings calculation.

Navigant found that for certain program measures, including pipe insulation, steam traps, and process boiler tune-up, the ex ante savings were calculated using custom HOU and boiler efficiency values. However, when custom values were not available from the participant, the program reverted to using TRM deemed inputs. This approach is not consistent with the TRM, which requires that "for the duration of a program year, once a measure savings calculation path is chosen—either on a customized or a prescriptive basis within a particular program—all instances of the measure within that program must be treated consistently".<sup>11</sup> Navigant applied adjustments to deemed and custom savings estimates as needed to reflect requirements in the TRM (v4.0) or based on reasonableness of the custom inputs.

Measures with specific findings from the tracking system review are provided below.

1. **Steam Traps: 101% RR, 78% of Program Net Savings.** Navigant reviewed the custom efficiency values and hours of use (HOU) values to verify savings from commercial and dry cleaner steam traps, and industrial steam traps of various sizes. The commercial steam traps and the dry cleaners had 100 percent gross realization rates. For industrial steam traps, the ex ante savings were calculated using custom HOU and boiler efficiency values. Navigant found that when custom values were not available from the participant, the program used TRM deemed inputs. This approach complies with TRM (v4.0) for boiler efficiencies but the use of deemed HOU inputs for industrial steam traps is required. In this case, TRM policy directs Navigant to treat all HOU values for industrial steam traps as a custom input although evaluators may choose a TRM value for the input. For GPY5, we used custom HOU values for industrial steam traps when they were recorded in supplemental custom data received from Nicor Gas, but used

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<sup>11</sup> [http://ilsagfiles.org/SAG\\_files/Technical\\_Reference\\_Manual/Policy%20Document%20for%20IL%20TRM%2010-25-12.pdf](http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Policy%20Document%20for%20IL%20TRM%2010-25-12.pdf))



deemed values when custom inputs were not available. We note that TRM (v5.0) approved for GPY6 allows steam trap HOU to be a custom value if known or a TRM deemed value if actual values are unknown.

One notable adjustment to steam trap savings was project (PRJ-929850), where an industrial high pressure steam trap reported to have 47.4 therms ex ante savings was verified with 4,985 therms savings. The combined effect of evaluation adjustments resulted in a 101 percent gross realization rate for the steam trap measure category.

2. **Boiler Tune-up: 105% RR, 11% of Program Net Savings.** Most boiler tune-up projects had 100 percent gross realization rates. Navigant found that for the *process* boiler tune-up measure, the hours of use (HOU) in the tracking data did not match the deemed value set in TRM (v4.0). Navigant used a deemed value of 8,766 hours and the boiler combustion efficiency values collected by Nicor Gas. Navigant estimated a 105 percent gross realization rate for all boiler tune-ups.

**Pipe Insulation: 98% RR, 6% of Program Net Savings.** The ex ante savings for pipe insulation matched verified savings for most applications, but there were a limited number projects that Navigant adjusted. Navigant found instances of dry cleaner, hot water space heating, and some steam pipe measures where Nicor Gas calculated ex ante savings using custom HOU values that did not match the HOU inputs in the tracking data or the deemed values Navigant determined from TRM (v4.0). Navigant adjusted the HOU inputs for these projects to use deemed values from TRM (v4.0). When selecting deemed values for pipe insulation, Navigant found that TRM (v4.0) had more differentiation of system configurations and recirculation approaches than Nicor Gas defined in their tracking system. The evaluation adjustments resulted in 98 percent gross realization rate for pipe insulation measures overall.

3. **Programmable Thermostat: 98% RR, <1% of Program Net Savings.** Navigant adjusted the savings for programmable thermostats. Nicor Gas applied a single weighted average per unit savings value to all programmable thermostats in GPY5, while Navigant estimated the savings for each project and summed to a total. To set the ex ante per unit average savings value for GPY5, Nicor Gas used TRM assumptions to determine the therms savings value for each building type, and then weighted the building type results based on GPY4 participation and measure counts. The ex ante saving input was 34.27 therms per thermostat. Navigant calculated the GPY5 verified savings separately for each participating business type, as required by the TRM (v4.0). We estimated 37.85 therms as an average per unit savings for unknown building types or building types not specified in the TRM by calculating an average of the per unit savings values of participating known TRM building types for verified GPY5 participation.
4. **Other Measures: 100% RR, 5% of Program Net Savings.** With exception of steam traps, pipe insulation, programmable thermostats and boiler tune-ups, the reported savings for all other program measures were consistent with the TRM deemed savings. In some cases, evaluation applied minor adjustments due to rounding differences.

## 3.2 Program Volumetric Findings

Table 3-1 provides a breakdown of the GPY5 participants by program category. The BEER Program had 173 total participants, including 52 participants who received a free assessment and no-cost direct install products, and 121 participants who received prescriptive incentives. A total of 474 projects were

completed through the GPY5 program, involving installation of 12,029 direct install and rebate measures. The program paid \$695,266 in incentives, which is about \$0.22 per gross therm.

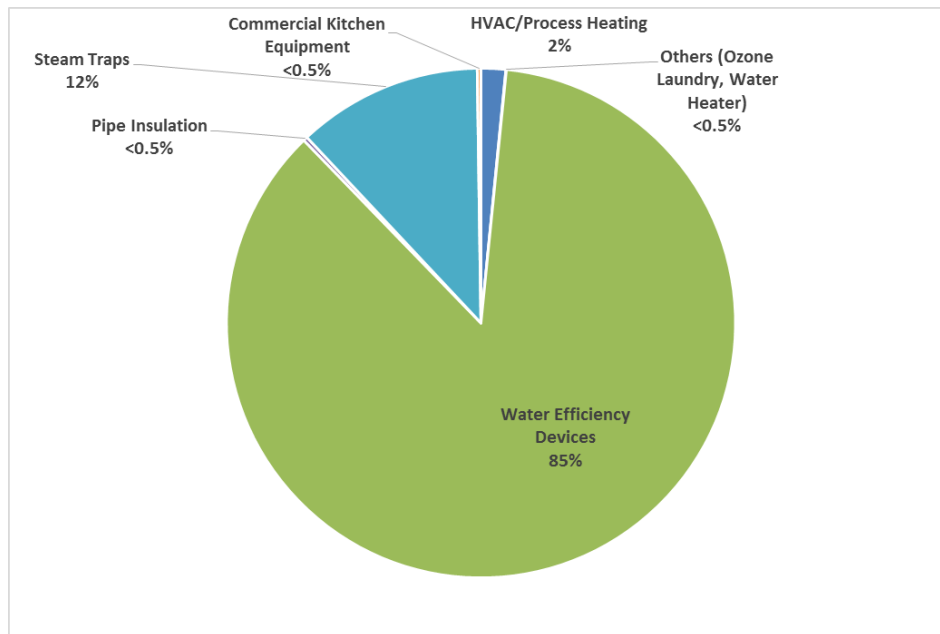
**Table 3-1. GPY5 Primary Participation Detail**

Participation	Direct Install	Prescriptive Incentive	Program Total
Participants <sup>12</sup>	52	121	173
Completed Projects	65	409	474
Installed Measures <sup>13</sup>	10,362	1,667	12,029
Incentive Cost (\$)	-	-	695,266

Source: Program tracking data and Navigant analysis.

Figure 3-1 summarizes the GPY5 volumetric measure counts by end-use category. The program made a significant increase from GPY4 in the offering of free assessments and no-cost direct installation of faucet aerators and showerheads, contributing 85 percent of the unit measure count in GPY5. The majority of the direct install measures were offered to customers in healthcare, hospital and hotel/motel businesses. Steam trap replacements accounted for 12 percent of the measure count, a decrease from 72 percent in GPY4. Other program measures including space heating, tune-ups, pipe insulation and programmable thermostats contributed the remaining three percent of the measure count. Table 3-2 provides a breakdown of the GPY5 participants by program rebate units.

**Figure 3-1. GPY5 BEER Program Measure End-use Category (Number of Measures)**



Source: Program tracking data and Navigant analysis.

<sup>12</sup> Participants are defined based on the project site address and number of accounts.

<sup>13</sup> For evaluation reporting purpose, if a measure quantity is reported in the tracking system in linear feet, MBH, or square feet, Navigant treated each row entry of such measure as one measure quantity in this table.

**Table 3-2. GPY5 BEER Program Installed Measures by Rebate Unit**

Measure Category	Unit of Rebate	Ex Ante Quantity	Verified Quantity
Faucet Aerator	unit	8,543	8,543
Pre-Rinse Spray Valve	unit	1	1
Showerhead	unit	1,818	1,818
Boiler Lockout/Reset Controls	unit	1	1
Boiler Tune Up, Heating	unit	33	33
Boiler Tune Up, Process	unit	38	38
Condensing Unit Heaters	unit	1	1
Efficient Boiler	unit	19	19
Efficient Furnace	unit	20	20
Convection Oven	unit	2	2
Energy Star Fryer	unit	25	25
Infrared Charbroiler	unit	1	1
Infrared Heaters	unit	38	38
Ozone Laundry	unit	2	2
Pipe Insulation	Ln.ft	14,464	14,464
Programmable Thermostat	unit	38	38
Steam Trap	unit	1,415	1,415
Storage Water Heater	unit	2	2

Source: Program tracking data and Navigant analysis.

### 3.3 Gross Program Impact Parameter Estimates

Navigant verified the ex ante savings using the assumptions and algorithms specified in the TRM v4.0 or through engineering analysis for non-deemed measures and custom inputs. Table 3-3 summarizes the input parameters and unit of savings used to estimate program verified gross savings.

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

Input Parameter	Value	Unit	Deemed or Evaluated?
Verified Gross Realization Rate	1.01		Evaluated
Faucet Aerator	5.99	therms/unit	Deemed
Showerhead	21.63 for 1.5 gpm 12.40 for 2.0 gpm	therms/unit	Deemed
Pre-Rinse Spray Valve	183	therms/unit	Deemed
Boiler Tune Up, Heating	Vary. Acceptable as is	therms/unit	Evaluated
Boiler Tune Up, Process	Vary. Adjustment to HOU values	therms/unit	Evaluated
Efficient Boiler	Vary. Verified as acceptable	therms/unit	Evaluated
Efficient Furnace	Vary. Verified as acceptable	therms/unit	Evaluated
Boiler Lockout/Reset Control	402.82	therms/unit	Deemed
Ozone Laundry	30.72	therms/lb-capacity	Deemed
Pipe Insulation	Vary. Adjusted to some HOU values to meet TRM	therms/Ln.ft	Evaluated
Steam Trap	Vary. Used supplemental custom values or appropriate deemed values	therms/unit	Evaluated
Convection Oven	306	therms/unit	Deemed
Fryer	505 for standard fryer (E>50%) 578 for large vat	therms/unit	Deemed Evaluated
Infrared Charbroiler	661	therms/unit	Deemed
Infrared Heaters	451	therms/unit	Deemed
Programmable Thermostat	Vary. Adjustment based on building type	therms/unit	Deemed
Storage Water Heater	251 for >88% TE Standard, 105 for EF>67%, Retail	therms/unit	Deemed

Source: Navigant analysis

### 3.4 Development of the Verified Gross Realization Rate

Navigant determined the verified gross realization rates by comparing the ex ante gross savings with the verified gross savings. The overall program verified gross realization rate is 101 percent, after evaluation applied adjustments notably to savings from steam traps, pipe insulation, process boiler tune-ups, and programmable thermostats. Results by measure are summarized in Table 3-4 below.

Table 3-4. Verified Gross Savings by Measure

End-use	Measure Type	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate‡	Verified Gross Savings (Therms)
Direct Install Water Efficiency	Faucet Aerator	51,173	1.00	51,180
	Pre-Rinse Spray Valve	183	1.00	183
	Showerhead	27,060	1.00	27,057
HVAC/Process Heating	Boiler Lockout/Reset Controls	403	1.00	403
	Boiler Tune Up, Heating	30,255	1.00	30,252
	Boiler Tune Up, Process	302,125	1.05	318,013
	Condensing Unit Heaters	266	1.00	266
	Efficient Boiler	33,823	1.00	33,829
	Programmable Thermostat	1,302	0.98	1,280
	Infrared Heaters	17,138	1.00	17,138
	Efficient Furnace	4,900	1.00	4,896
	Convection Oven	612	1.00	609
Commercial Kitchen Equipment	Fryer	12,698	1.00	12,701
	Infrared Charbroiler	661	1.00	661
	Pipe Insulation	209,538	0.98	206,324
Steam Trap	Steam Trap	2,529,275	1.01	2,551,364
	Ozone Laundry	6,451	1.00	6,451
	Storage Water Heater	356	1.00	356
<b>Total</b>		<b>3,228,219</b>	<b>1.01</b>	<b>3,262,966</b>

Source: Program tracking data and Navigant analysis.

‡ Based on evaluation research findings.

The key findings from the verification analysis include:

- Steam trap measures contributed 78 percent of the GPY5 verified total gross savings, a decrease of 16 percent compared with GPY4 savings. Savings from other measures increased: boiler-tune up savings increased from three to eleven percent, and pipe insulation from one to six percent. The remaining five percent were from other space and process heating equipment, kitchen equipment, water efficiency devices and programmable thermostats.
- The prescriptive rebate path contributed 98 percent of the verified gross savings. The assessment direct install path contributed two percent, which is a significant increase from less than one percent in GPY4.
- The GPY5 verified total gross savings of 3,262,966 therms is 104 percent of its planning goal of 3,137,000 therms.
- Overall, it appears the introduction of bonuses and providing training services to Trade Allies and customers on specific prescriptive measures, and the increase in the offering of no-cost direct

install measures, contributed to increasing GPY5 BEER Program participation (increased project count by 33 percent from GPY4), and diversified the program measure mix by unit count (increased by 278 percent by count from GPY4).

### 3.5 Verified Gross Program Impact Results

As shown in Table 3-5 below, the GPY5 program achieved 3,262,966 therms as total verified gross savings, with 1.01 verified gross realization rate at the program level. The difference between the ex ante gross savings and the verified gross savings is an increase of 34,747 therms.

**Table 3-5. GPY5 Verified Gross Impact Savings Estimates**

Program Path	Measure Type	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate‡	Verified Gross Savings (Therms)
Direct Install Measures	Faucet Aerator	51,173	1.00	51,180
	Pre-Rinse Spray Valve	183	1.00	183
	Showerhead	27,060	1.00	27,057
<i>Subtotal</i>		78,416	1.00	78,421
Prescriptive Incentives Measures	Boiler Lockout/Reset Controls	403	1.00	403
	Boiler Tune Up, Heating	30,255	1.00	30,252
	Boiler Tune Up, Process	302,125	1.05	318,013
	Condensing Unit Heaters	266	1.00	266
	Efficient Boiler	33,823	1.00	33,829
	Efficient Furnace	4,900	1.00	4,896
	Convection Oven	612	1.00	609
	Energy Star Fryer	12,698	1.00	12,701
	Infrared Charbroiler	661	1.00	661
	Infrared Heaters	17,138	1.00	17,138
	Ozone Laundry	6,451	1.00	6,451
	Pipe Insulation	209,538	0.98	206,324
	Programmable Thermostat	1,302	0.98	1,280
Steam Trap	2,529,275	1.01	2,551,364	
Storage Water Heater	356	1.00	356	
<i>Subtotal</i>		3,149,803	1.01	3,184,545
<b>Total</b>		<b>3,228,219</b>	<b>1.01</b>	<b>3,262,966</b>

Source: Program tracking data and Navigant analysis.

#### 4. NET IMPACT EVALUATION

Table 4-1 presents the GPY5 BEER Program net savings. Navigant used the Illinois SAG approved deemed NTG ratio of 0.68 to calculate net savings for the program. Navigant applied the deemed NTG ratio to the verified gross savings, resulting in an estimate of 2,218,817 verified net therm savings for the GPY5 program.

**Table 4-1. GPY5 Verified Net Impact Savings Estimates**

Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate†	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
Direct Install Measures	78,416	1.00	78,421	0.68	53,326
Prescriptive Incentives Measures	3,149,802	1.01	3,184,545	0.68	2,165,491
<b>Total</b>	<b>3,228,219</b>	<b>1.01</b>	<b>3,262,966</b>	<b>0.68</b>	<b>2,218,817</b>

Source: Utility tracking data and Navigant analysis.

† Deemed value. Source:

[http://ilsagfiles.org/SAG\\_files/NTG/2016\\_NTG\\_Meetings/Final\\_Documents/Nicor\\_Gas\\_NTG\\_Summary\\_GPY1-6\\_2016-02-29\\_Final.pdf](http://ilsagfiles.org/SAG_files/NTG/2016_NTG_Meetings/Final_Documents/Nicor_Gas_NTG_Summary_GPY1-6_2016-02-29_Final.pdf)

The GPY5 net savings is 85 percent of its planning goal of 2,603,756 therms. We note that the GPY5 net savings planning goal was based on a forecast NTG ratio of 0.83, which has since changed to 0.68 after evaluation research findings in GPY4 and deeming by the SAG. The GPY5 program performed well in achieving its gross savings target, and relatively were close to achieving its net savings target.

## 5. PROCESS EVALUATION

The GPY5 process evaluation activities for the BEER Program were limited to interviews with program staff and the implementation contractor staff to verify information about the tracking system and program offerings. These interviews with program staff were used to determine areas of interest or focus for the evaluation team to learn more about the program participation or operations for future program improvement research.



## 6. FINDINGS AND RECOMMENDATIONS

This section summarizes the key findings and recommendations.

### Program Savings Achievement

**Finding 1.** Navigant verified net savings of 2,218,817 therms for the GPY5 BEER Program, based on the SAG approved NTG ratio of 0.68. The measures with the most savings are steam traps, process boiler tune-ups, and pipe insulation. The verified net savings is 85 percent of the program net savings goal of 2,603,756 therms.<sup>14</sup> Navigant notes that the GPY5 net savings goal was based on a planning NTG ratio of 0.83, which has since changed to 0.68 after evaluation research findings in GPY4 that were deemed by the SAG. The verified GPY5 gross savings exceeded the planned gross savings.

### Gross Realization Rates

**Finding 2.** Navigant verified that most of the GPY5 measures had gross realization rates of 100 percent after reviewing the TRM deemed inputs and the custom input parameters. The verified program-level gross savings realization rate is 101 percent. This is based on verified gross savings of 3,262,966 therms, an increase of 34,747 therms compared with the ex ante 3,228,219 therms. The GPY5 verified gross savings is 104 percent of the program planning goal of 3,137,000 therms.

**Finding 3.** The prescriptive rebate path contributed 98 percent of the verified gross savings. The direct install path contributed two percent, which is a significant increase from less than one percent in GPY4. The increase in savings of the direct install program path occurred mostly in hospital, healthcare and hotel/motel business participants.

**Finding 4.** The program effort in GPY5 to diversify the measure mix by providing bonuses and training Trade Allies and customers on certain measure categories appeared to be effective. In addition to the increase in savings of the direct install measures compared with GPY4, savings from boiler-tune ups increased from three to eleven percent, and pipe insulation increased from one to six percent of savings. Savings from steam traps were 78 percent of the GPY5 verified total gross savings, a decrease of 16 percent from the program share in GPY4.

**Recommendation 1.** To encourage a diversified measure mix and expand participation, the evaluation team recommends continued focus on conducting assessments and direct measure installation in addition to offering training and targeted measure incentive bonuses.

### Tracking System Review

**Finding 5.** Most boiler tune-up projects had 100 percent gross realization rates. Navigant found that for the *process* boiler tune-up measure, the hours of use (HOU) in the tracking data did not match the deemed value set in TRM (v4.0). Navigant used a deemed value of 8,766 hours and the boiler combustion efficiency values collected by Nicor Gas. Navigant estimated a 105 percent gross realization rate for all boiler tune-ups.

**Finding 6.** The ex ante savings for pipe insulation matched verified savings for most applications, but there were a limited number projects that Navigant adjusted. Navigant found instances of dry

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<sup>14</sup> Nicor Gas Energy Efficiency Plan, June 2014 - May 2017

cleaner, hot water space heating, and some steam pipe measures where Nicor Gas calculated ex ante savings using custom HOU values that did not match the HOU inputs in the tracking data or the deemed values Navigant determined from TRM (v4.0).

Navigant adjusted the HOU inputs for these projects to use deemed values from TRM (v4.0). When selecting deemed values for pipe insulation, Navigant found that TRM (v4.0) had more differentiation of system configurations and recirculation approaches than Nicor Gas defined in their tracking system. The evaluation adjustments resulted in 98 percent gross realization rate for pipe insulation measures overall.

**Recommendation 2.** The evaluation team recommends Nicor Gas review the tracking system HOU input values for process boiler-ups and the pipe insulation measures. In the description of the pipe insulation type, the tracking system should indicate whether the primary piping use is non-recirculation or year-round recirculation, or a seasonal period of pipe use.

**Finding 7.** Commercial and dry cleaner steam traps had deemed input assumptions and were verified with a 100 percent gross realization rate. For industrial steam traps, the ex ante savings were calculated using custom HOU and boiler efficiency values. Navigant found that when custom values were not available from the participant, the program used TRM deemed inputs. This approach complies with TRM (v4.0) for boiler efficiencies but the use of deemed HOU inputs for industrial steam traps is required. In this case, TRM policy directs Navigant to treat all HOU values for industrial steam traps as a custom input although evaluators may choose a TRM value for the input. For GPY5, we used custom HOU values for industrial steam traps when they were recorded in supplemental custom data received from Nicor Gas, but used deemed values when custom inputs were not available. We note that TRM (v5.0) approved for GPY6 allows steam trap HOU to be a custom value if known or a TRM deemed value if actual values are unknown.

One notable adjustment to steam trap savings was project (PRJ-929850), where an industrial high pressure steam trap reported to have 47.4 therms ex ante savings was verified with 4,985 therms savings.

The combined effect of evaluation adjustments resulted in 101 percent gross realization rate for the steam trap measure category.

**Finding 8.** Navigant adjusted the savings for programmable thermostats. Nicor Gas applied a single weighted average per unit savings value to all programmable thermostats in GPY5, while Navigant estimated the savings for each project and summed to a total. To set the ex ante per unit average savings value for GPY5, Nicor Gas used TRM assumptions to determine the therms savings value for each building type, and then weighted the building type results based on GPY4 participation and measure counts. The ex ante saving input was 34.27 therms per thermostat. Navigant calculated the GPY5 verified savings separately for each participating business type, as required by the TRM (v4.0). We estimated 37.85 therms as an average per unit savings for unknown building types or building types not specified in the TRM by calculating an average of the per unit savings values of participating known TRM building types for verified GPY5 participation.

**Recommendation 3.** The evaluation team recommends that the implementation contractor review the programmable thermostat inputs in the tracking system being used for GPY6, and calculate savings per unit based on the participating business or building type when known, as required by the TRM, and where unknown, use the overall average per unit estimate from the participating building types.

### Program Participation

**Finding 9.** The GPY5 BEER Program had 173 participants, including 52 customers who received free assessments and no-cost direct install products, and 121 participants who received prescriptive incentives. A total of 474 projects were completed through the GPY5 program, involving the installation of 12,029 measures (includes 10,362 direct install measures and 1,667 rebate measures). The program paid \$695,266 in incentives, which is about \$0.22 per gross therm.

**Finding 10.** The evaluation team found that the GPY5 BEER program's approach of encouraging a diversification of measures, introducing bonuses, and offering training services for Trade Allies and customers on specific prescriptive measures had a positive impact on program participation. Additionally, expanding the offering of no-cost direct install measures may have contributed to increasing program participation. Overall, GPY5 had an increased project count of 33 percent and a program measure unit count increase of 278 percent from GPY4.