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Business Energy Efficiency Rebate Program
GPY3 Evaluation Report

Final

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

Presented to
Nicor Gas Company

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E. Executive Summary

This report presents a summary of the findings from the impact and process evaluation of the Nicor Gas Business Energy Efficiency Rebate Program (BEER Program) for program year three (GPY3)[1] of the Rider 30 energy efficiency portfolio period. The BEER Program provides incentives to increase the market share of new, highly efficient space heating, water heating, and commercial kitchen equipment as well as rebates for equipment and services to improve the energy efficiency of existing equipment. Participants must purchase and install equipment covered by the program. A rebate form must be filled out and submitted within 90 days of installation. Customers may receive a rebate without pre-approval for participation. The BEER Program relies on wholesale and retail trade allies to assist in the marketing of this program. Trade ally support and engagement is considered to be a key element to the success of this program. The BEER Program is implemented by CLEAResult.

No major changes were introduced to the program measure mix during the GPY3 period. The majority of the savings from the measures installed in GPY3 are derived from deemed values contained in the Illinois Technical Reference Manual (TRM).[2] The GPY3 evaluation involved verifying the compliance of the BEER Program to the TRM or applied necessary research adjustments to non-deemed savings. The evaluation did not conduct participant free ridership analysis applicable to GPY3, but relied on the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) consensus value for GPY3.[2] Navigant conducted interviews with program staff and the implementation contractor staff to verify information about program performance, measures and the tracking system.

E.1. Program Savings

Table E-1 summarizes the natural gas savings from the GPY3 BEER Program.

Table E-1. GPY3 BEER Program Total Natural Gas Savings

Savings Category	Energy Savings (Therms)
Ex Ante Gross Savings (Therms)	11,185,216
Ex Ante Net Savings (Therms)	9,283,730
Verified Gross Savings (Therms)	11,115,153
Verified Net Savings (Therms)	9,225,577
Verified Gross Realization Rate	0.99‡
Net to gross ratio (NTG)	0.83†

Source: Utility tracking data and Navigant analysis; ‡ Based on evaluation research findings
† A deemed value approved by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG).

[1] The GPY3 program year began June 1, 2013 and ended May 31, 2014.

[2] See http://www.ilsag.info/ for more information on the SAG and net-to-gross framework.

E.2. Program Savings by Measure Type

Table E-2 summarizes the program savings by measure type.

Table E-2. GPY3 BEER Program Results by Measure Type

Measure Type	Ex Ante Gross Savings (therms)	Verified Gross Realization Rate‡	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
Boiler/Furnace (incl. tune-up & reset controls)	508,347	86%	438,274	0.83	363,767
Infrared Heating	25,707	100%	25,707	0.83	21,337
Commercial Kitchen Equipment	233,151	100%	233,148	0.83	193,513
Pipe Insulation	342,297	100%	342,297	0.83	284,106
Steam Traps	9,337,384	100%	9,337,396	0.83	7,750,038
Programmable Thermostat	34,532	100%	34,532	0.83	28,662
Process Boiler Tune-Up	628,695	100%	628,695	0.83	521,817
Storage Water Heater	15,873	100%	15,873	0.83	13,175
Outdoor Pool Cover	24,773	100%	24,773	0.83	20,562
Ozone Laundry	34,458	100%	34,458	0.83	28,600
Program Total	11,185,216	99%	11,115,153	0.83	9,225,577

Source: Utility tracking data and Navigant analysis.

E.3. Impact Estimate Parameters

In the course of estimating verified gross and net savings, the evaluation team used a variety of parameters in its calculations. Most of the measure savings parameters were deemed for this program year and others were adjusted based on evaluation research. The key parameters used in the analysis are shown in Table E-3.

Table E-3. Verified Gross and Net Savings Parameter Data Sources

Parameter	Data Source	Deemed or Evaluated?
Measure Quantity Installed	Program tracking system	Evaluated
Net-to-Gross Ratio (NTGR)	SAG Spreadsheet †	Deemed
Verified Gross Realization Rate	Program tracking data, TRM	Evaluated
HVAC Measures Savings Assumptions	Illinois TRM, version 2.0, section 4.4‡ Used TRM (v3.0) for errata correction	Deemed
Water Heaters Savings Assumptions	Illinois TRM, version 2.0, section 4.3‡	Deemed
Steam Traps Savings Assumptions	Illinois TRM, version 2.0, section 4.4.16‡	Deemed
Commercial Kitchen Measures Savings	Illinois TRM, version 2.0, section 4.2‡	Deemed
Indoor HW/Steam Pipe Insulation Savings	Illinois TRM, version 2.0, section 4.4.14‡	Deemed
Commercial Pool Cover Savings	Illinois TRM, version 2.0, section 4.3.4‡	Deemed
Process Boiler Tune-Up Savings	Illinois TRM, version 2.0, section 4.4.3‡	Deemed
Ozone Laundry Savings	Evaluation Research (used TRM v3.0, not deemed in v2.0 for GPY3)	Evaluated
Programmable Thermostat Savings	Evaluation Research (used GPY2 value)	Evaluated

Source: Navigant analysis of programs data
† Deemed values. Source: http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf.
‡ Source: State of Illinois Technical Reference Manuals:
Illinois_Statewide_TRM_Effective_060113_Version_2.0_060713_Clean.pdf
Illinois_Statewide_TRM_Effective_060114_Version_3 0_021414_Final_Clean.pdf (for measure errata corrections).

E.4. Program Volumetric Detail

The BEER Program installed 9,321 measures in GPY3 (+203% from GPY2) from 2,641 projects (+284% from GPY2) and 990 participants (+83% from GPY2). Table E-4 shows the GPY3 BEER Program participation details.

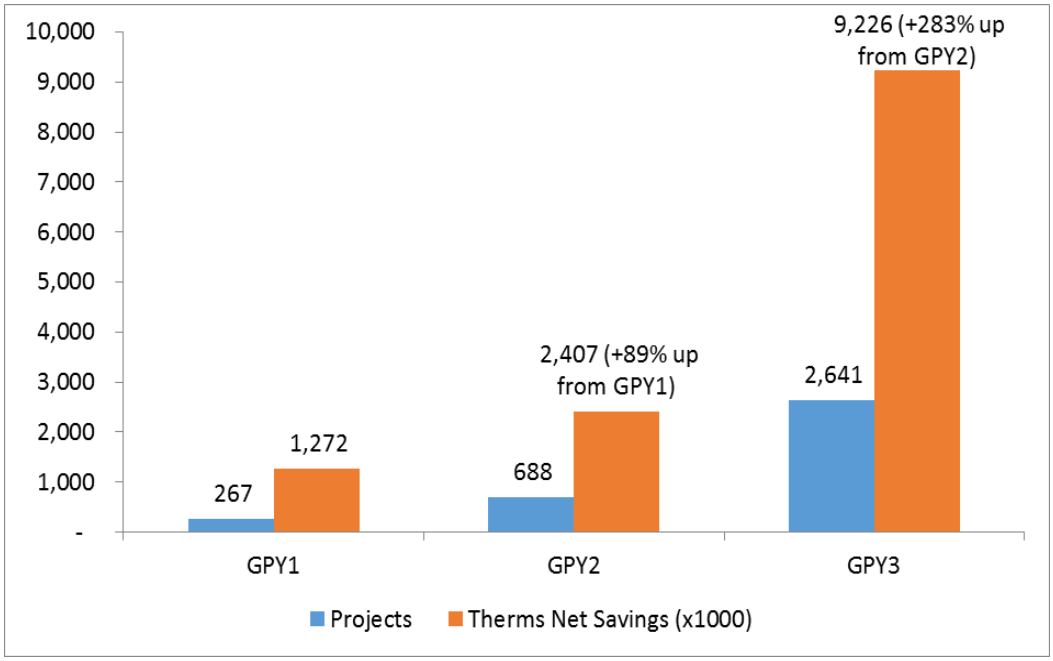
Table E-4. GPY3 BEER Program Primary Participation Detail

Participation Category	GPY3 BEER Program Result
Total Installed Measures	9,321
Implemented Projects	2,641
Business Participants	990
Projects/Participant	2.67
Therms/Project	4,235

Source: Utility tracking data and Navigant analysis.

Figure E-1 provides the comparison of the Rider 30 year-over-year differences in program participation and verified net savings.[3] Participation and savings have both grown substantially since GPY1, the first full year of Rider 30 portfolio operation.

Figure E-1. Year-over-Year Differences in BEER Program Participation and Savings



Source: Utility tracking data and Navigant analysis.

[3] The therm savings shown in Figure E-1 above for GPY2 (2,407 x1000 therms) reflect a true-up that reduced the verified net savings from the GPY2 BEER evaluation report (final report May 8, 2014). The true-up reduced GPY2 verified net therms by 12,914 therms, lowering the verified net therms from 2,419,449 reported on May 8, 2014 to 2,406,535 therms. Details are provided in Appendix 7.1.2.

E.5. Key Findings and Recommendations

The following provides the program findings and recommendations from the GPY3 evaluation.

Program Savings Goals Attainment

Finding 1. The GPY3 BEER Program achieved verified net savings of 9,225,577 therms, which is 248 percent of the GPY3 net savings goal of 3,718,644 therms[4], and an increase of 283 percent over GPY2 savings. The program performance is due primarily to continuous and increased performance of the steam trap replacement measure, which accounted for 84 percent of the GPY3 verified net savings. Overall, the Rider 30 BEER Program three-year total verified net savings was 12,904,121 therms, which exceeded the portfolio planned net savings by 92 percent.

Verified Gross Realization Rates

Finding 2. The GPY3 BEER Program verified gross realization rate was 99 percent.[5] Navigant adjusted the tracking savings for the space heating high efficiency furnace and boilers, boiler tune-up and boiler reset control measures to comply with the Illinois TRM policy directive to apply retroactive error corrections to TRM version 2.0 measures that are identified in TRM version 3.0 as "errata" measures.[6] The adjustments reduced the claimed savings for these measures.

Recommendation 2. Navigant recommends that CLEAResult monitor the TRM update process throughout the program year and update the tracked program measure savings with any published errata updates released during the current program year (in this case GPY4) and prior to releasing final ex ante savings.

Tracking System Review

Finding 3. Navigant observed that contact information for participating customers and trade allies was incomplete. Complete data for the tracking fields "Applicant Name", "Contractor Name" and customer and trade ally email addresses and telephone numbers allow Navigant to approach those surveyed on a more direct and personal front. Providing this information, in addition to project specific information, has been found to increase the overall completion rate of process and net-to-gross (NTG) surveys, remove a potential source of bias, and improve the quality of results.

Recommendation 3. In addition to project specific information (e.g. measure installed, installation address, etc.), CLEAResult should track a complete set of data for trade ally contact name, telephone numbers, and email addresses. In addition to improving the ability to evaluate the program, tracking and monitoring contractor and customer

[4]Nicor Rider 30 4rd Quarterly Report PY3 ICC Filing, Order Docket 10-0562.

[5] Gross Realization Rate = verified gross savings / tracking ex ante gross savings

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

information year over year can be beneficial to the implementation contractor's outreach and customer retention efforts.

Savings Verification Process

Finding 4. The BEER Program tracking database has input fields to collect most of the program measure savings assumptions, but certain custom inputs are not tracked. Inputs are recorded for some measures like the space heating measure efficiencies and capacity inputs, but the sizes in square feet of commercial pool covers (a key savings parameter) were not provided in the tracking data. Similarly, the savings assumptions for the ozone laundry were not provided in the tracking data. Navigant did not adjust the savings for these measures because the total reported program savings from these measures was minimal and reasonable.

Recommendation 4. The tracking system should record and report values for all custom inputs in the measure savings calculations, including those for pool covers and ozone laundry, if different from deemed values in the TRM.

Finding 5. The BEER tracking system extract provided to Navigant did not report parameters and values in the same level of detail as the TRM for some complex measures. Descriptions of the operating pressure (psig) of industrial/process high pressure steam traps in the tracking system do not match the categories listed in the TRM. The tracking system description of ≥ 75 psig steam system is categorized further in the TRM description to differentiate savings (e.g. ≥75 <125 psig or ≥125 <175 psig, etc., similar to how steam trap measures were tracked in the previous program years). Similarly, pipe insulation measures did not include a complete description of pipe sizes and characteristics to verify a specific savings result. These tracking data limitations did not result in savings verification adjustments in GPY3 but adjustments could occur in future program years if the impact evaluation conducts file reviews and on-site visits to obtain measure details at the full level categorized in the TRM.

Recommendation 5. Nicor Gas should consider whether it is feasible to provide Navigant real-time access to the program tracking system to verify full measure-level details and view backup documentation to review project-specific documents, quantities, and invoices for measure savings verification purpose. A similar arrangement exists for the Business Custom Incentive Program and it has improved the efficiency for conducting the program impact evaluation. If access is not feasible, Navigant would make a data request to provide such detail on a random sample draw, and that could be burdensome.

1. Introduction

1.1 Program Description

This report presents a summary of the findings from the impact and process evaluation of the Nicor Gas Business Energy Efficiency Rebate Program (BEER Program) for program year three (GPY3)[7] of the Rider 30 energy efficiency portfolio period. The BEER Program provides incentives to increase the market share of new, highly efficient space heating, water heating, and commercial kitchen equipment as well as rebates for equipment and services to improve the energy efficiency of existing equipment. Participants must purchase and install equipment covered by the program. A rebate form must be filled out and submitted within 90 days of installation. Customers may receive a rebate without pre-approval for participation. The BEER Program relies on wholesale and retail trade allies to assist in the marketing of this program. Trade ally support and engagement is considered to be a key element to the success of this program. The BEER Program is implemented by CLEAResult.

No major changes were introduced to the program measure mix during the GPY3 period. The majority of the savings from the measures installed in GPY3 are derived from deemed values contained in the Illinois Technical Reference Manual (TRM).[9] The GPY3 evaluation involved verifying the compliance of the BEER Program to the TRM or applied necessary research adjustments to non-deemed savings. Net-to Gross (NTG) values used to calculate GPY3 program net savings were deemed through a consensus process by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG).[8] Interviews with program staff and the implementation contractor staff were conducted to verify information about GPY3 program performance, measures and tracking system. Free ridership and spillover research were conducted with GPY3 participants and trade allies through telephone surveys, and the results will be applied in GPY5.

The BEER Program works closely with the Nicor Gas Business Custom Program and the other business programs within the portfolio to target both end-use customers and trade allies. Key to program success is its marketing outreach strategy, including in-person, written and verbal communication, alongside trade ally support. To increase measure uptake in any period, the program may provide incentives to trade allies for specific, limited-time promotions. The implementation contractor conducts workSMART training sessions which educate contractors and trade allies regarding program offerings and energy efficient measures.

1.2 Evaluation Objectives

The objectives of GPY3 BEER Program evaluation are to:

(1) Provide an independent estimate of the net therm savings produced by the program in GPY3.

(2) Review the assumptions and algorithms used to generate the savings reported in the tracking data for compliance with the statewide TRM, and recommend changes if needed.

(3) Interview program staff and the implementation contractor to assess the effectiveness of the administration and implementation of the program.

[7] The GPY3 program year began June 1, 2013 and ended May 31, 2014.

[8] See http://www.ilsag.info/ for more information on the SAG and net-to-gross framework.

2. Evaluation Approach

This evaluation of the BEER Program reflects the third full-scale year of the Nicor Gas Rider 30 Energy Efficiency Portfolio. This section describes the data that Navigant collected and the method for analyzing the data to meet the GPY3 evaluation objectives.

2.1 Primary Data Collection

2.1.1 Overview of Data Collection Activities

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

Table 2-1. GPY3 BEER Program Core Evaluation Activities

Program	Process Evaluation	NTG Research	Tracking Data Review	Project File Reviews	On-site M&V	Billing Analysis	Other
Business Energy Efficiency Rebates	PM/IC Interviews	None	Yes	No	No	No	TRM Compliance

The core activity in the GPY3 evaluation was a tracking system review of measure type and savings using the tracking data received on October 30, 2014. This involved early review of the input fields of the Program Management Tool (PMT) tracking system for the BEER Program, and providing feedback to Nicor Gas and CLEAResult of what additional inputs were necessary to track for the evaluation exercise. Additional interviews were conducted with program staff and implementation staff to assess program performance, and for clarification on tracking system inputs.

The GPY3 participating customer and trade ally data were used for conducting free ridership and spillover research through telephone surveys. Details of the data collected and the free ridership and spillover results are provided in a memo presented to Nicor Gas on January 7, 2015.[9] The research results will be applied in GPY5.

2.1.2 Verified Savings Parameters

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

[9] Nicor Gas Fall 2014 BEER Program NTG Results Final 2015 01 07.docx

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

Parameter	Data Source	Deemed or Evaluated?
NTG	SAG Agreement†	Deemed
Gross Realization Rate	Tracking data and evaluation research	Evaluated
Boiler Cutout/Reset Control	Illinois TRM, version 2.0, section 4.4.4‡ Used TRM (v3.0) for errata correction	Deemed
Space Heating Boiler Tune-Up	Illinois TRM, version 2.0, section 4.4.2‡ Used TRM (v3.0) for errata correction	Deemed
High Efficiency Boilers	Illinois TRM, version 2.0, section 4.4.10‡ Used TRM (v3.0) for errata correction	Deemed
High Efficiency Furnaces	Illinois TRM, version 2.0, section 4.4.11‡ Used TRM (v3.0) for errata correction	Deemed
Process Boiler Tune-Up	Illinois TRM, version 2.0, section 4.4.3‡	Deemed
Pre-Rinse Sprayer	Illinois TRM, version 2.0, section 4.2.11‡	Deemed
Commercial Kitchen Equipment	Illinois TRM, version 2.0, section 4.2‡	Deemed
Water Heaters	Illinois TRM, version 2.0 (section 4.3.1 and 4.3.5) ‡	Deemed
Indoor HW/Steam Pipe Insulation	Illinois TRM, version 2.0, section 4.4.14‡	Deemed
Commercial Pool Cover	Illinois TRM, version 2.0, 4.3.2‡	Deemed
Space Heating (Infrared Heaters)	Illinois TRM, version 2.0, 4.4.12‡	Deemed
Ozone Laundry	Evaluation research	Evaluated
Programmable Thermostats	Use GPY2 evaluation value	Evaluated
Steam Traps	Illinois TRM, version 2.0, 4.4.16‡	Deemed

† *http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf.*
‡ *Reference Manuals: Illinois_Statewide_TRM_Effective_060113_Version_2.0_060713_Clean.pdf; Illinois_Statewide_TRM_Effective_060114_Version_3 0_021414_Final_Clean.pdf (for measure errata corrections)*
Source: Navigant analysis of programs tracking data and secondary research.

2.1.3 Verified Gross Program Savings Analysis Approach

Methods for gross savings verification of TRM measures employed in GPY3 are tracking data review and engineering review of measure savings for compliance with the Illinois TRM. TRM Version 2.0 was used for GPY3 evaluation except for measures with errata correction where Version 3.0 was used. For GPY3 non-deemed commercial and industrial measures such as ozone laundry and

programmable thermostats, Navigant relied on secondary research or previous year's review of non-deemed values to verify the claimed savings. The verified gross savings are the product of verified per unit savings and verified measure quantities.

2.1.4 Verified Net Program Savings Analysis Approach

In GPY3 the NTG ratio used to calculate the net verified savings was deemed by the SAG. For the BEER Program, the NTG ratio was 0.83. Since NTG ratio was deemed for GPY3, no participant customer or trade ally free ridership or spillover research was conducted for GPY3.

As mentioned above, using GPY3 participating customer and trade ally data, Navigant conducted telephone survey research to estimate free ridership and spillover and calculated a NTG that will be applied in GPY5.

2.1.5 Process Evaluation

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

3. Gross Impact Evaluation

The gross impact analysis involved tracking system review and verification of installed measure savings. The verified savings were calculated by multiplying the quantity of measures installed by the verified measure unit savings. The program verified gross realization rate was determined by the ratio of the verified savings and the tracking ex ante savings. Navigant estimated that the BEER GPY3 Program achieved verified gross savings of 11,115,153 therms and a 0.99 verified gross realization rate.

3.1 Tracking System Review and Savings Verification

Over the course of the GPY3 program year, Navigant, Nicor Gas and the program implementation contractor (CLEAResult) maintained close contact regarding the program tracking system (Program Management Tool or PMT) updates and status of previous program evaluation recommendations. Navigant provided early review and feedback on additional input fields to include in the PMT tracking system for the GPY3 evaluation. Navigant used the data extracts from the program's tracking system received on October 30, 2014 to verify the GPY3 program ex ante inputs and ex ante savings. Navigant reviewed but did not adjust measure savings quantities. Below are the key findings from the tracking system review.

1. Navigant applied adjustments to the tracking system savings for the space heating high efficiency furnace and boilers, boiler tune-up and boiler reset control measures. This was in compliance with the SAG and the Illinois TRM Technical Advisory Committee policy directive to apply corrections to errata measures in TRM (v2.0) using the TRM (v3.0) effective June 1, 2013.[10] The errata corrections involved changing the measure savings formula from using input capacity for calculating savings by removing the efficiency variable. Hence the tracking savings for boiler reset control for a 600-MBH boiler changes from 527 therms to 422 therms verified savings. The tracking savings for a 92% AFUE efficient furnace with 120 MBH changes from 226 therms to 208 therms verified savings. These adjustments resulted in an overall program verified gross realization rate of 99 percent.

2. The tracking database has input fields to collect most of the program measure savings assumptions, but not all inputs are tracked. The pool sizes (square feet) of commercial pool covers, the savings assumptions for ozone laundry, and the baseline efficiency for the replacement boiler and furnace measures were not provided. Navigant did not adjust the savings for these measures but recommends that CLEAResult document all custom inputs to measure savings calculations if different from deemed values in the TRM.

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

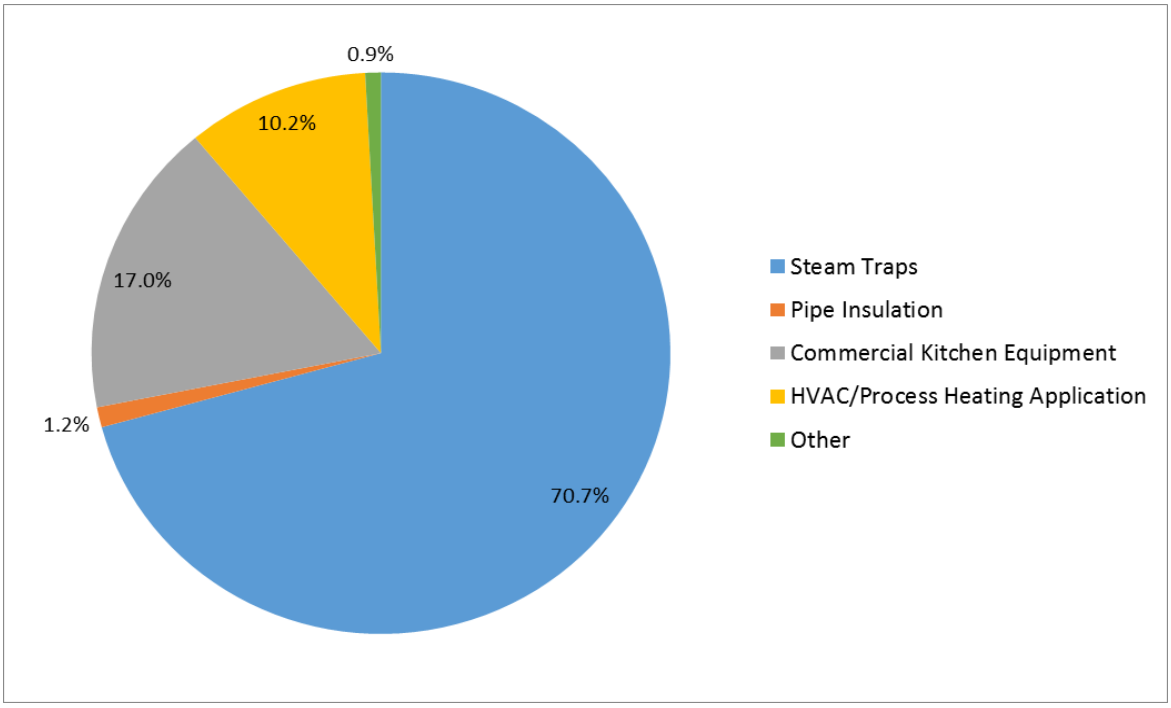
3. The BEER tracking system extract provided to Navigant did not report parameters and values in the same level of detail as the TRM for some complex measures. Descriptions of the operating pressure (psig) of industrial/process high pressure steam traps in the tracking system do not match the categories listed in the TRM. The tracking system description of ≥ 75 psig steam system is categorized further in the TRM description to differentiate savings (e.g. ≥75 <125 psig or ≥125 <175 psig, etc., similar to how steam trap measures were tracked in the previous program years). Similarly, pipe insulation measures did not include a complete description of pipe sizes and characteristics to verify a specific savings result. These tracking data limitations did not result in savings verification adjustments in GPY3 but adjustments could occur in future program years if the impact evaluation conducts file reviews and on-site visits to obtain measure details at the full level categorized in the TRM.

4. Navigant observed that contact information for participating customers and trade allies was incomplete. Complete data for the tracking fields "Applicant Name", "Contractor Name" and customer and trade ally email addresses and telephone numbers allow Navigant to approach those surveyed on a more direct and personal front. Providing this information, in addition to project specific information, has been found to increase the overall completion rate of process and net-to-gross (NTG) surveys, remove a potential source of bias, and improve the quality of results.

3.2 Program Volumetric Findings

The GPY3 BEER Program improved substantially from the previous years in terms of savings and participation. The total number of rebated unit measures increased to 9,321 measures, 2,641 projects and 990 participants. This translates to 2.67 projects per participant and 4,235 therms per project. Figure 3-1 depicts the GPY3 volumetric measure counts. A detail breakdown of the measure counts by end-use category is provided in Table 3-1.

Figure 3-1. GPY3 BEER Program Measure End-use Category



Source: Evaluation review of GPY3 BEER Program tracking database

Steam trap replacements accounted for 71 percent of the measure count in GPY3 (from 39% commercial steam traps and 32% industrial/process steam trap replacements). Pre-rinse spray valves installed in restaurants contributed 16 percent of the measure count in GPY3.

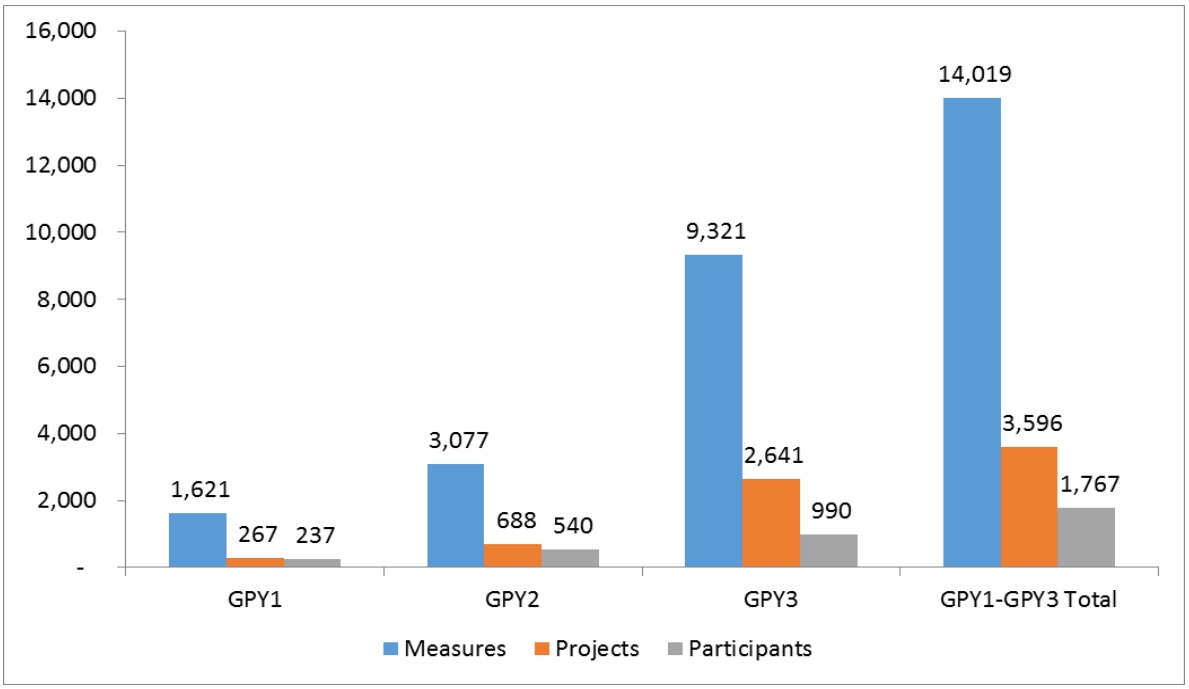
Table 3-1. GPY3 BEER Program Installed Measures by End-use Type

Measure End-use	Measure	Ex Ante Measure Quantity
HVAC/Process Heating Application	Boiler Reset Control	9
	Boiler Tune-Up Space Heating Boiler	119
	Boiler Tune-Up Process Boiler	51
	High Efficiency Boiler	198
	High Efficiency Furnace	335
	Programmable Thermostat	194
	Infrared Heating	57
Steam Traps	Commercial Steam Traps	3,639
	Industrial/process Steam Traps >= 15 and < 75 psig	1,120
	Industrial/process Steam Traps >= 75 psig	1,827
Commercial Kitchen Equipment	Fryer	32
	Pre-Rinse Spray Valve	1,526
	Convection Oven	8
	Salamander Broiler	2
	Pasta Cooker	1
	Combination Oven	3
	Demand Control Ventilation (DCV)	2
	Charbroiler	2
	Steamer	5
	Single Rack Oven	1
	Griddle	1
Other (Ozone Laundry, Outdoor Pool Cover, Water Heater)	Storage Water Heater	65
	Ozone Laundry	4
	Outdoor Pool Cover	12
Pipe Insulation	Indoor Pipe HW/Steam Insulation	108
Total		**9,321**

Source: Evaluation review of GPY3 BEER Program tracking database

Navigant compared the GPY3 measure count, projects and participants with findings from the previous years of the Rider 30 portfolio BEER Program. Details are shown below in Figure 3-2.

Figure 3-2. Year-Over-Year BEER Program Volumetric Details



Source: Evaluation review of GPY3 BEER Program tracking database

By comparison with GPY2, the total number of rebated unit measures in GPY3 increased by 203 percent, number of projects increased by 284 percent and business participants increased by 83 percent.

3.3 Gross Program Impact Parameter Estimates

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

Table 3-2. Verified Gross Savings Parameters

Input Parameters	Value	Unit	Deemed or Evaluated?
Measure Quantity	Vary		Evaluated
Verified Gross Realization Rate	0.99		Evaluated
Commercial HVAC Steam Traps	89.2 (can vary)	therms/unit	Deemed TRM v2.0
Programmable Thermostat	178.0	therms/unit	Evaluated
High Efficiency Furnace	Vary. Corrected errata in TRM v2.0 using TRM v3.0 algorithm and assumptions	therms/unit	Deemed TRM v3.0
Boiler Cutout/Reset Controls		therms/MBTU	
Boiler Tune-up (Heating)		therms/MBTU	
High Efficient Boilers		therms/MBTU	
Boiler Tune-up (Process)	Vary with building type	therms/MBTU	Deemed TRM v2.0
Industrial Steam Traps (varying psig)	All verified as acceptable	therms/unit	Deemed TRM v2.0
Commercial Kitchen Equipment	All verified as acceptable	therms/unit	Deemed TRM v2.0
Storage Water Heater >=0.67 EF	Vary. All verified as acceptable	therms/unit	Deemed TRM v2.0
Pre Rinse Sprayers	117.9	therms/unit	Deemed TRM v2.0
Infrared Heaters	451.0	therms/unit	Deemed TRM v2.0
Large Gas Water Heater >=88% TE	251.2	therms/unit	Deemed TRM v2.0
Outdoor Pool Covers (sq.ft)	1.01	therms/sq.ft	Deemed TRM v2.0
Indoor Pipe HW/Steam Insulation (Ln.ft)	Vary. All verified as acceptable	therms/Ln.ft	Deemed TRM v2.0
Ozone Laundry	30.7	therms/lb-capacity	Evaluated

Source: Utility tracking data and Navigant analysis; Illinois TRM (version 2.0 & 3.0)

3.4 Development of the Verified Gross Realization Rate

The program verified gross realization rate was determined by calculating the ratio of the verified gross savings and the tracking ex ante gross savings. Verified gross realization rates by end-use group were calculated for the program as shown in Table 3-3.

Table 3-3. GPY3 BEER Program Gross Realization Rate by Measure

Rebate Measure Kind	Verified Quantity	Ex Ante Gross Savings	Verified Gross Realization Rate‡	Verified Gross Savings	GPY3 Gross Savings (percent)
Boiler Reset Control	9	29,656	0.80	23,725	0.2%
Boiler Tune-Up (Heating)	119	252,477	0.81	204,028	1.8%
High Efficiency Boiler	198	147,578	0.92	135,962	1.2%
Boiler Tune-Up (Process)	51	628,695	1.00	628,695	5.7%
Commercial Kitchen Equipment	1,583	233,151	1.00	233,148	2.1%
High Efficiency Furnace	335	78,636	0.95	74,560	0.7%
Indoor Pipe HW/Steam Insulation	108	342,297	1.00	342,297	3.1%
Outdoor Pool Cover	12	24,773	1.00	24,773	0.2%
Programmable Thermostat	194	34,532	1.00	34,532	0.3%
Infrared Heating	57	25,707	1.00	25,707	0.2%
Steam Traps	6,586	9,337,384	1.00	9,337,396	84.0%
Ozone Laundry	4	34,458	1.00	34,458	0.3%
Storage Water Heater	65	15,873	1.00	15,873	0.1%
Total	**9,321**	**11,185,216**	**0.99**	**11,115,153**	**100.0%**

Source: Utility tracking data and Navigant analysis
‡ Based on Evaluation research findings

As noted above, correcting errata in the ex ante savings estimate for the space heating high efficiency furnace and boilers, boiler tune-up and boiler reset control measures resulted in a reduction of the verified program gross savings with a 99 percent gross realization rate. Steam trap replacements contributed 84 percent of total GPY3 BEER Program savings.[11]

3.5 Verified Gross Program Impact Results

The verified gross impact result for the GPY3 BEER Program is 11,115,153 therms as shown in Table 3-4. The evaluation reviewed every measure in the tracking database using the TRM or evaluation research to verify measure gross savings.

[11] Overall, Steam traps have contributed 82 percent (85% in GPY1, 78% in GPY2, and 84% in GPY3) of BEER Program savings since Rider 30 commencement.

Table 3-4. GPY3 BEER Program Verified Gross Impact Savings Estimates

Category	Sample	Energy Savings (therms)	90/10 Significance?
HVAC/Process Heating Application			
Ex Ante Gross Savings	†NA	1,197,281	†NA
Verified Gross Realization Rate		0.94	
Verified Gross Savings		1,127,208	
Commercial Kitchen Equipment			
Ex Ante Gross Savings	†NA	233,151	†NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		233,148	
Steam Traps			
Ex Ante Gross Savings	†NA	9,337,384	†NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		9,337,396	
Pipe Insulation			
Ex Ante Gross Savings	†NA	342,297	†NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		342,297	
Other (Ozone Laundry, Outdoor Pool Cover, Water Heater)			
Ex Ante Gross Savings	†NA	75,104	†NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		75,104	
GPY3 BEER Program Total			
Ex Ante Gross Savings	†NA	11,185,216	†NA
Verified Gross Realization Rate		0.99	
Verified Gross Savings		11,115,153	

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

4. Net Impact Evaluation

As noted in Section 2, the SAG[12] approved a net-to-gross ratio of 0.83 for calculating the GPY3 BEER Program verified net savings. The evaluation estimated a verified net savings of 9,225,577 therms for the program in GPY3 as shown in Table 4-1. Confidence and precision levels are not applicable because results are based on deemed values and no sampling was performed.

Table 4-1. GPY3 BEER Program Verified Net Savings Estimates by End-use Category

End-use Category	Ex Ante Gross Savings (therms)	Verified Gross Realization Rate‡	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)	Sample (90/10 Significance?)
HVAC/Process Heating Application	1,197,281	0.94	1,127,208	0.83	935,583	NA
Commercial Kitchen Equipment	233,151	1.00	233,148	0.83	193,513	NA
Steam Traps	9,337,384	1.00	9,337,396	0.83	7,750,038	NA
Pipe Insulation	342,297	1.00	342,297	0.83	284,106	NA
Other (Ozone Laundry, Outdoor Pool Cover, Water Heater)	75,103	1.00	75,104	0.83	62,337	NA
GPY3 Total	**11,185,216**	**0.99**	**11,115,153**	**0.83**	**9,225,577**	**NA**

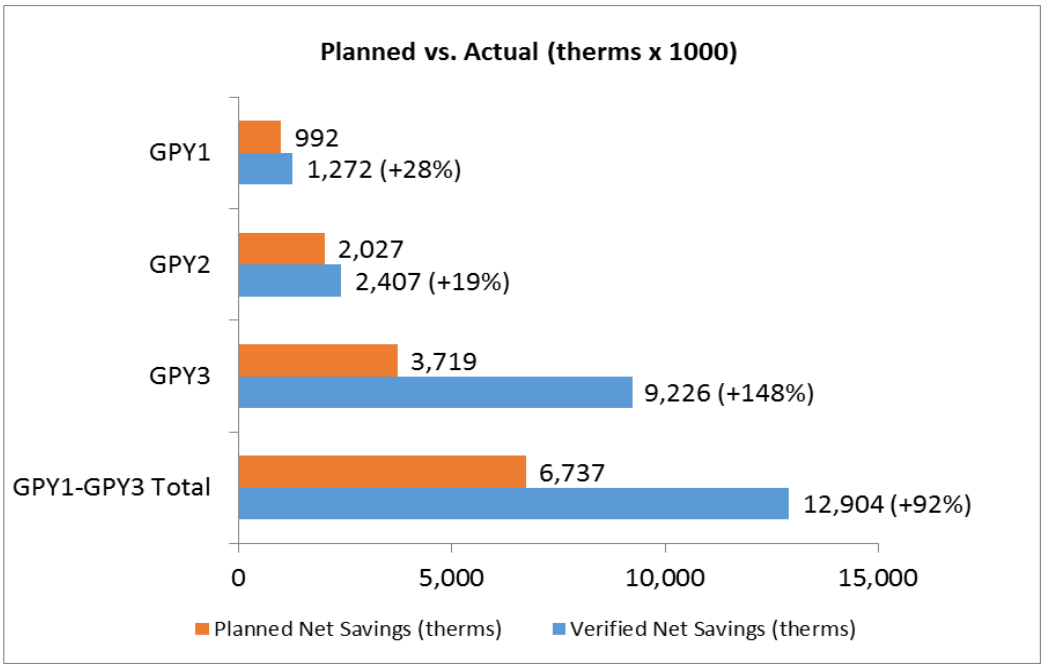
Source: Utility tracking data and Navigant analysis.
‡ Based on evaluation research findings
†SAG approved NTG deemed value.

Figure 4-1 below provides a comparison of Rider 30 BEER Program verified net savings and the planned savings filed with the ICC. The BEER Program exceeded planned energy savings targets year over year. The GPY3 Program achieved 248% of the savings goal. Overall the Rider 30 BEER Program three-year total verified net savings of 12,904,121 exceeded the portfolio planned net savings by 92 percent.[13]

[12] http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf.

[13] Nicor Gas Energy Efficiency Plan 2011-2014 (Revised Plan Filed Pursuant to Order Docket No. 10-0562)

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



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

5. Process Evaluation

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

Information gathered through interviews and other communication did not raise concerns by the evaluation team that merited follow-up process research in GPY3. The observations will be considered when planning GPY4 evaluation activities.

6. Findings and Recommendations

The following provides the program findings and recommendations from the GPY3 evaluation. This section is repeated in its entirety in the Executive Summary.

Program Savings Goals Attainment

Finding 1. The GPY3 BEER Program achieved verified net savings of 9,225,577 therms, which is 248 percent of the GPY3 net savings goal of 3,718,644 therms[14], and an increase of 283 percent over GPY2 savings. The program performance is due primarily to continuous and increased performance of the steam trap replacement measure, which accounted for 84 percent of the GPY3 verified net savings. Overall, the Rider 30 BEER Program three-year total verified net savings was 12,904,121 therms, which exceeded the portfolio planned net savings by 92 percent.

Verified Gross Realization Rates

Finding 2. The GPY3 BEER Program verified gross realization rate was 99 percent.[15] Navigant adjusted the tracking savings for the space heating high efficiency furnace and boilers, boiler tune-up and boiler reset control measures to comply with the Illinois TRM policy directive to apply retroactive error corrections to TRM version 2.0 measures that are identified in TRM version 3.0 as "errata" measures. [16] The adjustments reduced the claimed savings for these measures.

Recommendation 2. Navigant recommends that CLEAResult monitor the TRM update process throughout the program year and update the tracked program measure savings with any published errata updates released during the current program year (in this case GPY4) and prior to releasing final ex ante savings.

Tracking System Review

Finding 3. Navigant observed that contact information for participating customers and trade allies was incomplete. Complete data for the tracking fields "Applicant Name", "Contractor Name" and customer and trade ally email addresses and telephone numbers allow Navigant to approach those surveyed on a more direct and personal front. Providing this information, in addition to project specific information, has been found to increase the overall completion rate of process and net-to-gross (NTG) surveys, remove a potential source of bias, and improve the quality of results.

Recommendation 3. In addition to project specific information (e.g. measure installed, installation address, etc.), CLEAResult should track a complete set of data for trade ally contact name, telephone numbers, and email addresses. In addition to improving the ability to evaluate the program, tracking and monitoring contractor and customer

[14]Nicor Rider 30 4rd Quarterly Report PY3 ICC Filing, Order Docket 10-0562.

[15] Gross Realization Rate = verified gross savings / tracking ex ante gross savings

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

information year over year can be beneficial to the implementation contractor's outreach and customer retention efforts.

Savings Verification Process

Finding 4. The BEER Program tracking database has input fields to collect most of the program measure savings assumptions, but certain custom inputs are not tracked. Inputs are recorded for some measures like the space heating measure efficiencies and capacity inputs, but the sizes in square feet of commercial pool covers (a key savings parameter) were not provided in the tracking data. Similarly, the savings assumptions for the ozone laundry were not provided in the tracking data. Navigant did not adjust the savings for these measures because the total reported program savings from these measures was minimal and reasonable.

Recommendation 4. The tracking system should record and report values for all custom inputs in the measure savings calculations including those for pool covers and ozone laundry, if different from deemed values in the TRM.

Finding 5. The BEER tracking system extract provided to Navigant did not report parameters and values s in the same level of detail as the TRM for some complex measures. Descriptions of the operating pressure (psig) of industrial/process high pressure steam traps in the tracking system do not match the categories listed in the TRM. The tracking system description of ≥ 75 psig steam system is categorized further in the TRM description to differentiate savings (e.g. ≥75 <125 psig or ≥125 <175 psig, etc., similar to how steam trap measures were tracked in the previous program years). Similarly, pipe insulation measures did not include a complete description of pipe sizes and characteristics to verify a specific savings result. These tracking data limitations did not result in savings verification adjustments in GPY3 but adjustments could occur in future program years if the impact evaluation conducts file reviews and on-site visits to obtain measure details at the full level categorized in the TRM.

Recommendation 5. Nicor Gas should consider whether it is feasible to provide Navigant real-time access to the program tracking system to verify full measure-level details and view backup documentation to review project-specific documents, quantities, and invoices for measure savings verification purpose. A similar arrangement exists for the Business Custom Incentive Program and it has improved the efficiency for conducting the program impact evaluation. If access is not feasible, Navigant would make a data request to provide such detail on a random sample draw, and that could be burdensome.

7. Appendix

7.1 Detailed Impact Research Findings and Approaches

7.1.1 Gross Impact Savings Errata Correction

As noted in the above discussions, directive from the Illinois TRM Technical Advisory Committee and the SAG indicated that when a measure error was identified in TRM (v2.0)[17] and the TAC process resulted in a consensus, the measure is identified in TRM (v3.0)[18] as an 'Errata'. In these instances the measure code indicates that a new version of the measure has been published, and that the effective date of the measure dates back to June 1st, 2013" (refer to pages 10-15 of TRM v3.0). The errata correction involved changing the measures savings formula from using input capacity for calculating savings by removing efficiency variable. This changes results in reduction of the measure unit therms savings.

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

High Efficiency Boiler

TRM (v2.0) Algorithm and Assumption
ΔTherms = EFLH * Capacity * (1/EfficiencyRating(base)) – (1/EfficiencyRating(actual)) / 100,000

TRM (v3.0) Errata Correction
ΔTherms = EFLH * Capacity * ((EfficiencyRating(actual) - EfficiencyRating(base)/ EfficiencyRating(base)) / 100,000

Where:
EFHL = Equivalent Full Load Hours for heating (hr)
Capacity = Nominal Heating Input Capacity Boiler Size (Btu/hr) for efficient unit not existing unit
EfficiencyRating(base) = Baseline Boiler Efficiency Rating, dependent on year and boiler type.
EfficiencyRating(actual) = Efficient Boiler Efficiency Rating, use actual value

High Efficiency Furnace

TRM (v2.0) Algorithm and Assumption
Time of Sale:
ΔTherms = EFLH * Capacity * (1/AFUE(exist) - 1/AFUE(eff)) / 100,000 Btu/Therm

Early replacement
ΔTherms = EFLH * Capacity * (1/AFUE(base) - 1/AFUE(eff)) / 100,000 Btu/Therm

[17] *Illinois_Statewide_TRM_Effective_060113_Version_2.0_060713_Clean.pdf*

[18] *Illinois_Statewide_TRM_Effective_060114_Version_3 0_021414_Final_Clean.pdf (for measure errata corrections).*

TRM (v3.0) Errata Correction
Time of Sale:
ΔTherms = EFLH * Capacity * ((AFUE(eff) – AFUE(base)/AFUE(base))/ 100,000 Btu/Therm

Early replacement
ΔTherms = EFLH * Capacity * (AFUE(eff) – AFUE(exist)/ AFUE(exist)) / 100,000 Btu/Therm

Where:
Capacity = Nominal Heating Capacity Furnace Size (btuh)
AFUE(exist)= Existing Furnace Annual Fuel Utilization Efficiency Rating
AFUE(base) = Baseline Furnace Annual Fuel Utilization Efficiency Rating, dependent on year
AFUE(eff) = Efficient Furnace Annual Fuel Utilization Efficiency Rating.
EFHL = Equivalent Full Load Hours for heating (hr)

Space Heating Boiler Tune-Up

TRM (v2.0) Algorithm and Assumption
Δtherms= Ngi* SF * EFLH/(Effpre * 100))

TRM (v3.0) Errata Correction
Δtherms= Ngi* SF * EFLH/(100))

Where:
Ngi = Boiler gas input size (kBTU/hr)
SF = Savings factor
EFLH = Equivalent Full Load Hours for heating (hr)
Effpre = Boiler Combustion Efficiency before Tune-Up

Boiler Cutout/Reset Control

TRM (v2.0) Algorithm and Assumption
Δtherms = Binput * SF * EFLH /(Effpre * 100)

TRM (v3.0) Errata Correction
Δtherms = Binput * SF * EFLH /(100)

Where:
Binput = Boiler Input Capacity (kBTU)
SF = Savings factor
Effpre = Boiler Efficiency
EFLH = Equivalent Full Load Hours for heating (hr)

7.1.2 True-up of GPY2 Verified Gross and Net Impact Savings

The BEER implementation contractor had misapplied the pool cover algorithm the rebates in the GPY2 PMT database that was sent to Navigant. The algorithms for indoor vs outdoor pool/spa covers were conflated, causing the claimed savings for the six GPY2 pool cover rebate records to be reported as 28,859 gross therms instead of the correct 11,168 gross therms, a difference of 17,691gross therms that overstate the GPY2 results. Navigant missed this error and gave a 100% realization rate for these measures.

The numbers have since been corrected in CLEAResult's database and Nicor Gas' database. However, the correction was made after the program's data had been submitted to Navigant, and it was not corrected in the Nicor Gas BEER Program GPY2 Evaluation Report. The true-up calculation is reported below.

Table 7-1. True-up of the GPY2 BEER Program Results for Pool Covers

	Ex Ante Gross Savings (therms)	Verified Gross Realization Rate	Verified Gross Savings (therms)	NTG	Verified Net Savings (therms)
As Reported in GPY2	28,859	1.00	28,859	0.73	21,067
Corrected for GPY2	11,168	1.00	11,168	0.73	8,153
GPY2 True-up	(17,691)		(17,691)		(12,914)

Source: Utility tracking data and Navigant analysis.

The result of the true-up reduced verified net therms from 2,419,449 reported on May 8, 2014 to 2,406,535 therms for the GPY2 BEER Program.