

Home 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

August 13, 2015

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E. Executive Summary

This report presents a summary of the findings and results from the impact evaluation of the Nicor Gas program year three (GPY3) ¹ Home Energy Efficiency Rebate Program (Home EER)². Under the Home EER Program, cash incentives were offered to encourage Nicor Gas customers to purchase higher efficiency water and space-heating equipment, and central air conditioning systems for ComEd customers through the complete system replacement (CSR) portion of the program. For a short time in GPY3, the Home EER program added a small direct install pilot program for a few new measures, including aerators, showerheads, and programmable thermostats.

E.1. Program Savings

The following two tables summarize the total program savings and program savings by measure.

Table E-1. GPY3 Program Results

Savings Category	Nicor Gas
Ex Ante Gross Savings ³ (Therms)	4,935,560
Verified Gross Realization Rate	1.00‡
Verified Gross Savings (Therms)	4,948,725
Net to gross ratio (NTGR)	0.79†
Verified Net Savings (Therms)	3,909,493

Source: Utility tracking data and Navigant analysis.

† A deemed value. Approved by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG).

‡ Based on evaluation research findings

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

² While the Home EER and CSR Programs are jointly offered by Nicor Gas and ComEd, this report covers the evaluation of the Nicor Gas component of the program.

³ From Tracking System

Table E-2. GPY3 Program Results by Measure

Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate	Verified Gross Savings (Therms)	NTGR	Verified Net Savings (Therms)
High Efficiency Furnace	4,046,872	1.00‡	4,041,783	0.79†	3,193,008
Programmable Thermostat	796,664	1.02‡	814,426	0.79†	643,396
Storage Water Heater	39,230	1.15‡	44,964	0.79†	35,521
High Efficiency Boiler	34,198	0.97‡	33,102	0.79†	26,151
Showerhead	6,413	0.47‡	3,004	0.79†	2,373
High Efficiency Windows	5,068	1.00‡	5,068	0.79†	4,004
Pipe Insulation	3,449	1.07‡	3,690	0.79†	2,915
Indirect Water Heater	1,762	1.25‡	2,205	0.79†	1,742
Bathroom Aerator	1,635	0.14‡	232	0.79†	183
Kitchen Aerator	270	0.94‡	253	0.79†	200

Source: Utility tracking data and Navigant analysis.

* Have higher verified gross savings due to rounding.

† A deemed value. SAG approved NTG

‡ Based on evaluation research findings.

E.2. Impact Estimate Parameters

The evaluation used parameters as defined by the Illinois Technical Resource Manual (TRM).

Table E-3. Impact Estimate Parameters

Parameter	Data Source	Deemed or Evaluated?
Net to Gross Ratio	SAG Spreadsheet†	Deemed
Realization Rate	Evaluation Research	Evaluated

Source: Navigant analysis

† Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 as consensus in March-August 2013. Distributed in the SAG Meeting on August 5-6, 2013.

[http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013)

[Meeting/Nicor Gas NTG Results and Application GPY1-3.pdf](#)

E.3. Participation Information

The program had 27,617 participants in GPY3 and distributed 43,095 measures as shown in the following table.

Table E-4. GPY3 Primary Participation

Participation	Nicor Gas
Participants	27,617
Total Measure Types	10*
Installed Measures	43,095

Source: Utility tracking data and Navigant analysis

* includes participation for High Efficiency Windows that were installed in GPY2 but rebated in GPY3.

Table E-5 shows participation at the measure level. The most common direct install measure is pipe insulation with 1% of participating homes installing the measure.

Table E-5. GPY3 Measure Participation Detail

Measure	Total Participants	Percent of Participating Homes Installing Measure
High Efficiency Furnace	24,494	88.69%
Programmable Thermostat	15,517	56.19%
Storage Water Heater	1,769	6.41%
DHW Pipe Insulation - Prescriptive	294	1.06%
DHW Pipe Insulation – Direct Install	288	1.04%
High Efficiency Boiler	171	0.62%
Bathroom Aerator	112	0.41%
Showerhead	108	0.39%
Indirect Water Heater	48	0.17%
Kitchen Aerator	46	0.17%
High Efficiency Windows ⁴	41	0.15%

Source: Navigant analysis.

E.4. Findings and Recommendations

The following provides insight into key program findings and recommendations:

⁴ High efficiency windows were offered in GPY2 but not in GPY3; savings here are for windows that were installed in GPY2 and for which rebates were processed in GPY3.

Program Savings

Finding 1. The Nicor Gas Home EER program achieved 3,909,493 verified net therms savings for GPY3 and had 27,617 program participants. Nicor Gas achieved 110% of its GPY3 savings goal of 3,549,337 therm savings. Eighty-two percent of the program savings were from high efficiency furnace participants.

Gross Realization Rates

Finding 2. The bathroom aerator realization rate was 0.14 and the showerhead realization rate was 0.47 because the Illinois TRM assumptions were not used.

Recommendation for Finding 2. The implementation contractor (IC) should thoroughly check the savings algorithms, assumptions, and deemed savings values being used in the program tracking system to ensure that they match the recommendations in the Illinois TRM.

1. Introduction

1.1 Program Description

Under the Rider 30 Home Energy Efficiency Rebate (Home EER) Program, cash incentives and education were offered to encourage upgrading of water- and space-heating equipment among residential customers of Nicor Gas and central air conditioning (CAC) systems for ComEd customers through the complete system replacement (CSR) portion of the program. The Home EER Program was designed to conserve natural gas and electricity and to lower participants' monthly energy bills. Both rental and owner-occupied dwellings are eligible for rebates for furnaces, boilers, storage water heaters, indirect water heaters, and central air conditioning systems. Program participants must be residential customers of Nicor Gas in order to receive rebates for gas saving measures or of Nicor Gas and ComEd to receive rebates for high efficiency furnaces and central air conditioning systems under the CSR portion of the program, and the premises must be used for residential purposes in existing buildings.

The Home EER Program offers customers rebates to invest in long-term savings through better technology and high efficiency equipment. Rebates are offered for the installation of high-efficiency furnaces, boilers, programmable thermostats, domestic hot water (DHW) pipe insulation, water heaters, and central air conditioning systems. Rebates for high efficiency windows were offered in GPY2 but not in GPY3; GPY3 savings include savings achieved by high efficiency windows that were installed during GPY2 but rebated in GPY3. The dollar amount of the rebate depends on the size and efficiency of the replacement measures and ranged from \$20 to \$1,200 for bundle installations. Bundle installations included $\geq 97\%$ AFUE furnaces, ≥ 16 SEER central air conditioners, storage water heaters, pipe insulation, and programmable thermostats. The GPY3 Rider 30 Home EER Program was implemented by Resource Solutions Group (RSG), which has since changed its name to CLEAResult (CR) and ran from June 1, 2013 through May 31, 2014.

1.2 Evaluation Objectives

In line with Navigant's program evaluation plans for the Nicor Gas GPY3 portfolio of energy efficiency programs, the Evaluation Team identified the following key researchable questions for GPY3:

1. What are the program's net and gross savings?
2. Are the TRM algorithms applied appropriately and the tracking system calculating savings correctly?

2. Evaluation Approach

This evaluation of the Nicor Gas Home EER Program reflects the third full-scale year of program operation. During GPY3, 27,617 residential customers participated in the program. Navigant performed a tracking system review to determine ex ante gross savings by measure. To determine verified gross savings by measure, the evaluation team performed a measure verification for measures included in the Illinois TRM and a workpaper review for all other measures. These were compared to find the measure and program level realization rates for the Home EER Program.

2.1 Overview of Data Collection Activities

The core data collection activities included a tracking system review, engineering analysis, and interviews with implementer staff. The full set of data collection activities is shown in the following table.

Table 2-1. Core Data Collection Activities

What	Who	Target Completes	Completes Achieved	When
<i>Impact Assessment</i>				
Tracking System Review	Participants	Census	Census	February-May 2015
Engineering Analysis	Participants	Census	Census	February-May 2015
<i>Process Assessment</i>				
In Depth Interviews	Program Manager/Implementer Staff	1-2	1	March 2014

2.2 Verified Savings Parameters

Navigant used the Illinois TRM Version 2.0 methodology to calculate verified gross savings. However, both indirect water heaters and windows did not have methodologies included in the Illinois TRM. For these measures, Navigant verified workpapers provided by Resource Solutions Group⁵ from GPY2. For the measures it covers, the Illinois TRM deems many values used in the algorithms. Table 2-2. Verified Gross Savings Parameters lists the source of the parameters that Navigant used. The Illinois TRM allows for some custom values to be used in the algorithms as well. Navigant used Nicor Gas HEER tracking data for these values.

⁵ Although RSG has changed name to CLEAResult, the actual workpaper documents are generally referred to as “RSG workpapers”.

Table 2-2. Verified Gross Savings Parameters

Measure	Input Parameter Source
High Efficiency Furnaces	Illinois TRM version 2.0 – Section 5.3.7
Programmable Thermostats	Illinois TRM version 2.0 – Section 5.3.11
Storage Water Heaters	Illinois TRM version 2.0 – Section 5.4.2
High Efficiency Boilers	Illinois TRM version 2.0 – Section 5.3.6
Windows	RSG workpaper
DHW Pipe Insulation	Illinois TRM version 2.0 – Section 5.4.1
Showerheads	Illinois TRM version 2.0 – Section 5.4.5
Indirect Water Heaters	RSG workpaper
Kitchen Aerators	Illinois TRM version 2.0 – Section 5.4.4
Bathroom Aerators	Illinois TRM version 2.0 – Section 5.4.4

Source: Navigant analysis

2.3 Verified Gross Program Savings Analysis Approach

For the deemed savings estimates, Navigant calculated independent estimates of the savings for each measure based on the Illinois Technical Reference Manual version 2.0 (Illinois TRM). Navigant used the tracking data for participant location and equipment specifications. There was no TRM algorithm for Indirect Water Heaters or Windows. In these cases, Navigant verified assumptions from the implementation contractor workpapers and then estimated savings based on them.

2.4 Verified Net Program Savings Analysis Approach

Verified net energy savings were calculated by multiplying the Verified Gross Savings estimates by a net-to-gross ratio (NTGR). For GPY3/EPY6, the evaluation team used NTGR values that were based on past evaluation research and approved through a consensus process with SAG.⁶

2.5 Process Evaluation

The GPY3 evaluation activities included minimal process research, as planned. An implementer interview was conducted to determine any changes in the program.

⁶ http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf

3. Gross Impact Evaluation

This evaluation of the Nicor Gas Home EER Program reflects the third full-scale year of program operation. During GPY3, 27,617 residential customers participated in the program. Navigant performed a tracking system review to determine ex ante gross savings by measure. To determine verified gross savings by measure, the evaluation team performed a measure verification for measures included in the Illinois TRM and a workpaper review for all other measures. These were compared to find the measure and program level realization rates for the Home EER Program.

3.1 Tracking System Review

Navigant performed a verification of the program tracking database to determine ex ante gross savings totals. The purpose of the tracking system review was to ensure these systems gather the data required to accurately calculate program savings. Navigant used customer site locations, measure quantities, efficiencies, and other such recorded information as inputs to Illinois TRM algorithms to determine verified gross savings.

Key findings include:

1. The quantity recorded for all DHW Pipe Insulation projects is one. This is because customers were required to install a minimum of six linear feet to qualify for the rebate of \$10. The number of rebates was recorded in the tracking system instead of the quantity of pipe insulation installed. It is recommended to include the actual linear feet of pipe insulation installed to accurately capture all possible savings from this measure.
2. The ex ante direct install bathroom aerator savings are likely based on incorrect assumptions as they do not match those in the Illinois TRM.

3.2 Program Volumetric Findings

In GPY3 the Nicor Gas Home EER Program served 27,617 participants that installed a total of 43,095 projects across 10 different measures. This is an increase of approximately 93% from GPY2, which had a total of 22,320 projects across 9 different measures. The program manager reports that this increase was due to the program's three-fold increase in marketing and trade ally outreach efforts over GPY2 in response to the increased savings goal for GPY3.

Key findings include:

1. High Efficiency Furnaces show the most participation and savings for the program. Programmable Thermostats have the second most participation and savings for the Home EER Program.
2. Bathroom aerators showed the lowest savings for the program.

Table 3-1. GPY3 Volumetric Findings Detail

Measure	Total Participants	Percent of Participating Homes Installing Measure
High Efficiency Furnace	24,494	88.69%
Programmable Thermostat	15,517	56.19%
Storage Water Heater	1,769	6.41%
DHW Pipe Insulation	581	2.10%
High Efficiency Boiler	171	0.62%
Bathroom Aerator	112	0.41%
Showerhead	108	0.39%
Indirect Water Heater	48	0.17%
Kitchen Aerator	46	0.17%
High Efficiency Windows	41	0.15%

Source: Navigant analysis.

3.3 Gross Program Impact Parameter Estimates

Navigant calculated verified gross savings from the GPY3 HEER program using algorithms and parameters defined in the Illinois TRM version 2.0. Navigant used the Illinois TRM for all measures except indirect water heaters and windows for which RSG workpapers were used.

Table 3-2. Verified Gross Savings Parameters

Measure/Input Parameters	Ex Ante Value	Verified Value	Unit	Source
High Efficiency Furnaces	Varies	Varies	therms/unit	Illinois TRM version 2.0 – Section 5.3.7
Programmable Thermostats	Varies	Varies	therms/household	Illinois TRM version 2.0 – Section 5.3.11
Storage Water Heaters	Varies	Varies	therms/unit	Illinois TRM version 2.0 – Section 5.4.2
High Efficiency Boilers	Varies	Varies	therms/unit	Illinois TRM version 2.0 – Section 5.3.6
Windows	Varies	Varies	therms/unit	RSG workpaper
DHW Pipe Insulation	5.95	6.34	therms/six linear feet	Illinois TRM version 2.0 – Section 5.4.1
Showerheads	42.03	19.891	therms/unit	Illinois TRM version 2.0 – Section 5.4.5
Indirect Water Heaters	36.6 (90%), 42.2 (95%)	40.6 (90%), 46.8 (95%)	therms/unit	RSG workpaper
Kitchen Aerators	5.1	4.769	therms/unit	Illinois TRM version 2.0 – Section 5.4.4
Bathroom Aerators	6.1	0.865	therms/unit	Illinois TRM version 2.0 – Section 5.4.4

Source: Navigant analysis

The GPY3 HEER tracking database provided most input parameters necessary to calculate savings using the Illinois TRM version 2.0 and the provided RSG workpapers.

3.4 Development of the Verified Gross Realization Rate

Navigant determined verified gross realization rates by comparing the ex ante gross savings with the verified gross savings. The results are shown below.

Table 3-3. Verified Gross Realization Rates

Measure	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Realization Rate
High Efficiency Furnace	4,046,872	4,041,783	1.00
Programmable Thermostat	796,664	814,426	1.02
Storage Water Heater	39,230	44,964	1.15
High Efficiency Boiler	34,198	33,102	0.97
High Efficiency Windows	5,068	5,068	1.00
Pipe Insulation	3,449	3,690	1.07
Showerhead	6,413	3,004	0.47
Indirect Water Heater	1,762	2,205	1.25
Kitchen Aerator	270	253	0.94
Bathroom Aerator	1,635	232	0.14
TOTAL	4,935,560	4,948,725	1.00

Source: Utility tracking data and Navigant analysis

3.5 Verified Gross Program Impact Results

As shown in the table above, the largest relative savings discrepancy was in the bathroom aerator measure which received a realization rate of 0.14. Additionally, the showerhead measure received a realization rate of 0.47. The bathroom aerator and showerhead ex ante gross savings were higher than the verified gross savings because incorrect assumptions were likely used with the Illinois TRM algorithm. However, as the savings for these measures are low relative to total program savings, the impact of these measure realization rates is low.

The ex ante gross savings for programmable thermostats were consistently slightly lower than the verified gross savings for the measure. The Illinois TRM algorithm for this measure assumes a 6.2% reduction in gas heating consumption. Navigant used this in conjunction with the gas heating consumption values provided in the Nicor Gas tracking system.

Navigant determined the verified gross savings for storage water heaters to be higher than the ex ante gross savings because a lower baseline efficiency was used in the engineering analysis. The Illinois TRM recommends a baseline efficiency of 0.575 for 50 gallon storage water heaters. A baseline efficiency of 0.594 was being used to calculate the ex ante gross savings.

Navigant found that the high efficiency boiler verified gross savings were slightly higher than the ex ante gross savings for the measure. The specific measure, “Gas High Efficiency Boiler AFUE 90% - June 2013 onwards,” shows a discrepancy in verified gross savings as compared to ex ante gross savings for all boilers in which the new AFUE is 93%. It appears that an efficient AFUE of approximately 95% was used instead of the actual 93%.

Navigant found that the ex ante gross savings for pipe insulation were slightly lower than the verified gross savings for the measure. The Illinois TRM states that the measure should save 3.17 therms per 3 linear feet (or 6.34 therms per 6 linear feet). The ex ante gross savings show a unit savings of approximately 5.95 therms per 6 linear feet.

Indirect water heaters achieved a realization rate of 1.25. It appears that Nicor Gas assumed a storage tank size of 40 gallons instead of 50 gallons as assumed by the Illinois TRM for other water heater measures. Because this measure accounts for a relatively small portion of program savings, this realization rate had a minimal effect on the overall program realization rate.

Kitchen aerators achieved a gross realization rate of 0.94. This is likely based on incorrect assumptions used with the Illinois TRM. As the savings for this measure represent a small percentage of overall program savings, the effect of this realization rate on the program level realization rate is minimal.

The resulting total program verified gross savings is 4,948,725 therms as shown in the following table.

Table 3-4. Verified Gross Impact Savings Estimates

	Gross Energy Savings (Therms)
Ex Ante GPY3 Gross Savings	4,935,560
Verified Gross Realization Rate	1.00‡
Verified Gross Savings	4,948,725

Source: Utility tracking data and Navigant analysis.

‡ Based on evaluation research findings

4. Net Impact Evaluation

For GPY3, SAG⁷ deemed the NTGR value of 0.79 to calculate net savings for Nicor Gas. Table 4-1 shows the verified GPY3 net savings by measure type.

Table 4-1. Verified Net Savings by Measure

Measure	Verified Gross Savings (therms)	Verified Net Savings (Therms)
High Efficiency Furnace	4,041,783	3,193,008
Programmable Thermostat	814,426	643,396
Storage Water Heater	44,964	35,521
High Efficiency Boiler	33,102	26,151
High Efficiency Windows	5,068	4,004
Pipe Insulation	3,690	2,915
Showerhead	3,004	2,373
Indirect Water Heater	2,205	1,742
Kitchen Aerator	253	200
Bathroom Aerator	232	183
TOTAL	4,948,725	3,909,493

Source: Utility tracking data and Navigant analysis

⁷ Document provided by Nicor Gas to the SAG summarizing the SAG-approved NTGR for Nicor Gas for GPY1-GPY3 by consensus in March-August 2013. Distributed in the SAG Meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,2013/Meeting/Nicor_Gas_NTG_Results_and_Application_GPY1-3.pdf).

5. Process Evaluation

The GPY3 evaluation activities included minimal process research, as planned. An implementer interview was conducted to determine any changes in the program. Several program changes were discussed, including changes to the cross-promotional efforts with the Home Energy Assessment Program, additional work with contractors to modify how they present the program to their customers, and the change in rebate processing. However, these changes were in their planning stages during the GPY3 evaluation and were expected to be implemented in GPY4. The GPY4 process evaluation will examine the effects of these changes.

6. Findings and Recommendations

This section summarizes the key impact and process findings and recommendations.

Program Savings

Finding 1. The Nicor Gas Home EER Program achieved 3,909,493 verified net therms savings for GPY3, and had 27,617 program participants. Nicor Gas achieved 110% of its GPY3 savings goal of 3,549,337 therm savings. Eighty-two percent of the program savings were from high efficiency furnace participants.

Gross Realization Rates

Finding 2. The bathroom aerator realization rate was 0.14 and the showerhead realization rate was 0.47, because the Illinois TRM assumptions were not used.

Recommendation for Finding 2. The IC should thoroughly check the savings algorithms, assumptions, and deemed savings values being used in the program tracking system to ensure that they match the recommendations in the Illinois TRM.