NAVIGANT

Home Energy Efficiency Rebates Program Impact Evaluation Report

Energy Efficiency Plan: Plan Year 2018 (1/1/2018-12/31/2018)

Presented to
Nicor Gas Company

Draft

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

1. Introduction

This report presents the results of the impact evaluation of the Nicor Gas 2018 Home Energy Efficiency Rebates program. It presents a summary of the energy impacts for the total program and broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. The 2018 program covered January 1, 2018 through December 31, 2018.

2. Program Description

The Nicor Gas Home Energy Efficiency Rebate (HEER) Program provides Nicor Gas customers with rebate incentives for purchasing high annual fuel utilization efficiency (AFUE) furnaces and boilers, advanced thermostats, and furnace tune-up services (Verified Quality Installation and Maintenance). Participants may apply for the rebates themselves, or contractors may assist them in the rebate application process. Rebates are processed and sent to residential customers after installation of qualified measures. Members of the Nicor Gas Contractor Circle may offer rebates as instant discounts. In 2018, ComEd processed rebates for advanced thermostats and Nicor Gas reimbursed ComEd for the gas portion ("purchased therms"), removing the need for participants to complete separate rebate applications for gas and electric.

The program had 28,144 participants in 2018 and completed 28,869 projects as shown in the following table.

Table 2-1. 2018 Volumetric Summary

Participation	2018
Participants *	28,144
Installed Projects †	28,869
Installed Measures	29,825

* Participants are defined as unique site account number. Includes 12,633 participants of advanced thermostat rebates processed by ComEd, documented in the file "HEER Smart Thermostat Evaluation Participation Report 4-11-19.xlsx".
† Installed Projects are defined as unique VendorProject_ID. Includes 12,633 projects of advanced thermostat rebates processed by ComEd.
Source: Nicor Gas tracking data and Navigant team analysis.

Table 2-2 summarizes the installed measure quantities that are the basis for verified energy savings.

Table 2-2. 2018 Installed Measure Quantities

Measure	Unit of Quantity	Installed Quantity
Advanced Thermostat - Manual Baseline	Unit	1,335
Advanced Thermostat - Programmable Baseline	Unit	1,685
Advanced Thermostat (ComEd Processed Rebates) *	Unit	12,633
Boilers, >95% AFUE <300 MBH	Unit	157
Furnace, >95%AFUE	Unit	12,675
Furnace, >97% AFUE	Unit	1,079
Verified Quality Installation	Service	105
Verified Quality Maintenance SF	Service	156

* These are advanced thermostat measures with gas and electric rebates processed by ComEd.
Source: Nicor Gas tracking data and Navigant team analysis.

3. Program Savings Summary

Table 3-1 summarizes the energy savings the HEER program achieved in 2018.

Table 3-1. 2018 Annual Energy Savings Summary

Program	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Advanced Thermostats	1,075,657	100%	1,076,026	NA‡	1,076,026
All Other Measures	3,421,876	100%	3,416,781	0.72	2,460,080
Total 2018	**4,497,533**	**100%**	**4,492,807**	**0.79**	**3,536,106**

* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† Net-to-Gross (NTG) is the ratio of verified net savings to verified gross savings. The NTG is a deemed value. Source: Nicor Gas GPY7 NTG Values 2017-03-01 Final Faucet Aerator Correction 2019-03-20.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html. The NTG for all 2018 program measures except Advanced Thermostats is 0.72.
‡ The IL TRM algorithm for advanced thermostat savings calculates net savings, so no NTG adjustment is applicable.
Source: Nicor Gas tracking data and Navigant team analysis. Advanced thermostat rebates processed by ComEd were documented in the file "HEER Smart Thermostat Evaluation Participation Report 4-11-19.xlsx".

4. Program Savings by Measure

The measure-level details of the program are provided in Table 4-1. The program includes 8 measures. The furnace replacement and advanced thermostat measures contributed the most savings to the program.

Table 4-1. 2018 Annual Energy Savings by Measure

Measure	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTG‡	Verified Net Savings (Therms)
Advanced Thermostat - Manual Baseline	118,022	100%	118,073	NA§	118,073
Advanced Thermostat - Programmable Baseline	94,738	100%	94,746	NA§	94,746
Advanced Thermostat (ComEd Processed Rebates) *	862,897	100%	863,207	NA§	863,207
Boilers, >95% AFUE <300 MBH	31,849	100%	31,878	0.72	22,952
Furnace, >95%AFUE	3,077,652	100%	3,079,369	0.72	2,217,145
Furnace, >97% AFUE	277,591	100%	277,859	0.72	200,058
Verified Quality Installation	22,776	100%	22,776	0.72	16,398
Verified Quality Maintenance SF	12,008	41%	4,899	0.72	3,527
Total 2018	**4,497,533**	**100%**	**4,492,807**	**0.79**	**3,536,106**

* These are thermostats therms savings purchased from Commonwealth Edison Company (ComEd)

† Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

‡ Net-to-Gross (NTG) is the ratio of verified net savings to verified gross savings. The NTG is a deemed value. Source: Nicor Gas GPY7 NTG Values 2017-03-01 Final Faucet Aerator Correction 2019-03-20.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html. The NTG for all 2018 program measures except Advanced Thermostats is 0.72.

§ The IL TRM algorithm for advanced thermostat savings calculates net savings, so no NTG adjustment is applicable.

Source: Nicor Gas tracking data and Navigant team analysis. Advanced thermostat rebates processed by ComEd were documented in the file "HEER Smart Thermostat Evaluation Participation Report 4-11-19.xlsx".

5. Impact Analysis Findings and Recommendations

5.1 Impact Parameter Estimates

Table 5-1 shows the unit savings and realization rate findings by measure from our review. The realization rate is the ratio of the verified savings to the ex ante savings. Following the table, findings and recommendations are listed, including discussion of measures with realization rates above or below 100 percent. Appendix 1 provides a description of the impact analysis methodology.

Table 5-1. Verified Gross Savings Parameters

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	Realization Rate	Data Source(s)
Advanced Thermostat - Manual Baseline	Unit	Varies by building type and climate	Verified with minor adjustment	100%	Nicor Gas Program Tracking Data (PTD*), Illinois TRM, v6.0, Section 5.3.16
Advanced Thermostat - Programmable Baseline	Unit	Varies by building type and climate	Verified with minor adjustment	100%	PTD, Illinois TRM, v6.0, Section 5.3.16
Advanced Thermostat (ComEd Processed Rebates)	Unit	Varies by building type and climate	Verified as accurate	100%	PTD, Illinois TRM, v6.0, Section 5.3.16
Boilers, >95% AFUE <300 MBH	Unit	202.86	203.05	100%	PTD, Illinois TRM, v6.0, Section 5.3.6
Furnace, >95% AFUE‡	Unit	242.81	242.95	100%	PTD, Illinois TRM, v6.0, Section 5.3.7
Furnace, >97% AFUE‡	Unit	257.27	257.52	100%	PTD, Illinois TRM, v6.0, Section 5.3.7
Verified Quality Install‡	Service	216.91	216.91	100%	PTD, Illinois TRM, v6.0, Section 5.3.7
Verified Quality Maintenance‡	Service	76.97	31.41	41%	PTD, Illinois TRM, v6.0, Section 5.3.13

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated April 11, 2019.
‡ The measure savings vary by climate zone, the values provided for this measure are weighted average values for the program year. Basis for unit savings is all 156 participants, although not all participants saved energy.
Source: Program Tracking Data provided by Nicor Gas and Navigant analysis. Advanced thermostat rebates processed by ComEd were documented in the file "HEER Smart Thermostat Evaluation Participation Report 4-11-19.xlsx".

5.2 Other Findings and Recommendations

Furnace Replacement

Finding 1. Navigant found that some post-installation efficiency values for the > 97% AFUE measure might be incorrect. For example, in the tracking data the Lennox SLP98UH**** measures have a post installation efficiency of 98.7 percent. However, according to the specification sheets, the Air-Conditioning, Heating & Refrigeration Institute (AHRI)-rated efficiency ranges from 89.1 percent to 98.4 percent. In the tracking data, the Carrier 59MN7A060V1714 has a post-installation efficiency of 98.5 percent. However, the AHRI rated efficiency is 97.4 percent.

Recommendation 1. Navigant recommends the implementer review the AFUE values they are using as the post-installation efficiency values and ensure that these are accurate to the AHRI ratings.

Verified Quality Maintenance

Finding 2. Navigant reproduced ex ante gross savings for Verified Quality Maintenance by applying the TRM measure 5.3.13 Option 2 algorithm (Other Tune-Up Programs):

$$\Delta Therms = (Gas\_Furnace\_Heating\_Load * HF * (1/Effpre - 1/Effpost)$$

Where:

Gas_Furnace_Heating_Load = FurnaceHeatingLoad in tracking data
HF = 1
Effpre= PreInstallation_Efficiency in tracking data
Effpost = PostInstallationEfficiency in the tracking data (Effpre + Eff improvement)

Reviewing the tracking data from all 156 tracked projects, Navigant found two projects with negative ex ante savings, 99 projects with no savings, and 55 projects with positive savings. Following the algorithm, Nicor Gas did not claim savings from the 99 projects where pre-efficiency equaled the post-efficiency, however, they counted negative savings for the two projects where the post-efficiency was lower than the pre-efficiency. The Nicor Gas algorithm claimed savings for instances where Navigant observed post-efficiencies that were not valid, such as going from 78 percent pre-efficiency to 104 percent post-efficiency. Navigant observed 24 instances of post-efficiencies that were greater than 100 percent.

Navigant calculated a realization rate of 41 percent for the Verified Quality Maintenance measure. To estimate verified savings, Navigant excluded projects where we judged that energy savings did not occur, the Nicor Gas projects with zero or negative ex ante savings, and applied the TRM algorithm and assumptions below to the remaining projects.

Navigant used the TRM (v6.0) measure 5.3.13 Residential Furnace Tune-up, Option 1 (Verified Quality Maintenance) algorithm and variables to calculate verified savings.

$$\Delta Therms = (Gas\_Furnace\_Heating\_Load * HF * (1/(AFUE) * (1 - Derating\_pre)) - 1/(AFUE) * (1 - Derating\_post))$$

Where:

Gas_Furnace_Heating_Load = FurnaceHeatingLoad in tracking data
HF = 1
AFUE = Furnace Annual Fuel Utilization Efficiency Rating (Navigant used the TRM default value of AFUE = 64.4% for an existing furnace of unknown efficiency from TRM measure 5.3.7 Gas High Efficiency Furnace)
Derating_pre= 0.064
Derating_post = 0.00

Recommendation 2. Nicor Gas should include quality control checks to remove or adjust projects with invalid post-efficiencies.

Recommendation 3. Nicor Gas should review and observe the contractor field procedures for this quality maintenance measure to identify the cause of the significant number of projects recording no efficiency improvement or invalid post-efficiencies.

Advanced Thermostats

Finding 3. Navigant found several advanced thermostat projects (e.g. PRJ-1754521 and PRJ-1808535) which had incorrect climate zone in the tracking data. The zip codes for the projects are in climate zone 2, not climate zone 3. This was also the case for some of the advanced thermostats rebated through ComEd (e.g. projects EA-0002838788 and EA-0002838911). Some projects also had two different savings values for the same climate zone (e.g. compare project EA-0003102533 and EA-0003629980 with manual thermostat baseline in climate zone 1).

Recommendation 4. Navigant recommends the implementer correct the "ClimateZone" field in the tracking system, so it is consistent with the TRM mapping values.[1] Also, ensure the tracking data from the therms purchased from ComEd are reviewed and savings consistent with the TRM climate zone mapping.

[1] Illinois Zip Codes and Climate Zones Mapping.xlsx

6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

6.1 Verified Gross Program Savings Analysis Approach

Navigant determined verified gross savings for each program measure by conducting a tracking system review. Navigant used the Illinois TRM Version 6.0 methodology to calculate verified gross savings.

Below are the details of the purchased therms for advanced thermostats rebated through ComEd.

Table 6-1. Advanced Thermostat Therms Purchased from ComEd

Property Type	Baseline Type	Quantity (Unit)	Ex Ante Net Therms	Verified Net Therms
Multi-Family Home	Programmable Thermostat	173	6,334	6,334
Multi-Family Home	Manual Thermostat	108	6,200	6,222
Multi-Family Home	Unknown	18	872	872
Single-Family Home	Programmable Thermostat	7,383	416,604	416,339
Single-Family Home	Manual Thermostat	4,542	402,408	402,961
Single-Family Home	Unknown	409	30,480	30,480
Total		**12,633**	**862,897**	**863,207**

Source: Program Tracking Data provided by Nicor Gas (HEER Smart Thermostat Evaluation Participation Report 4-11-19.xlsx) and Navigant analysis.

6.2 Verified Net Program Savings Analysis Approach

Navigant calculated verified net energy savings by multiplying the verified gross savings estimates by a net-to-gross ratio (NTG). In 2018, the NTG estimates used to calculate the net verified savings were based on past evaluation research and defined by a consensus process through SAG, as documented in a spreadsheet.[2]

[2] Source: Nicor Gas GPY7 NTG Values 2017-03-01 Final Faucet Aerator Correction 2019-03-20.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html.

7. Appendix 2. Program-Specific Inputs for the Illinois TRC

The Total Resource Cost (TRC) variable table only includes cost-effectiveness analysis inputs available at the time of finalizing this 2018 impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to the evaluation team later. Detail in this table (e.g., EULs) other than final 2018 savings and program data are subject to change and are not final.

Table 7-1. Total Resource Cost Savings Summary

Research Category (e.g., Measure)	Units	Quantity	Effective Useful Life (years)	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
Advanced Thermostat - Manual Baseline	Unit	1,335	10	118,022	118,073	118,073
Advanced Thermostat - Programmable Baseline	Unit	1,685	10	94,738	94,746	94,746
Advanced Thermostat (ComEd Processed Rebates)	Unit	12,633	10	862,897	863,207	863,207
Boilers, >95% AFUE <300 MBH	Unit	157	25	31,849	31,878	22,952
Furnace, >95% AFUE	Unit	12,675	20	3,077,652	3,079,369	2,217,145
Furnace, >97% AFUE	Unit	1,079	20	277,591	277,859	200,058
Verified Quality Installation	Service	105	20	22,776	22,776	16,398
Verified Quality Maintenance	Service	156	2	12,008	4,899	3,527

Source: Program Tracking Data provided by Nicor Gas and Navigant analysis. Advanced thermostat rebates processed by ComEd were documented in the file "HEER Smart Thermostat Evaluation Participation Report 4-11-19.xlsx".