Guidehouse

Home Energy Efficiency Rebates Impact Evaluation Report

Energy Efficiency Plan: Plan Year 2019 (1/1/2019-12/31/2019)

Presented to
Nicor Gas Company

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1. Introduction

This report presents the results of the impact evaluation of the Nicor Gas 2019 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. Program year 2019 covers measures with a reporting reference date from January 1, 2019 through December 31, 2019.

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, and advanced thermostats. 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 2019, 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 21,654 participants in 2019 and completed 21,903 projects as shown in the following table.

Table 2-1. 2019 Volumetric Summary

Participation	2019
Participants *	21,654
Installed Projects †	21,903
Installed Measures	22,392

* Participants are defined as
† Installed Projects are defined as unique VendorProject_ID. Includes 8,575 projects of advanced thermostat rebates processed by ComEd.
Source: Nicor Gas tracking data and Guidehouse team analysis.

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

Table 2-2. 2019 Installed Measure Quantities

Measure	Quantity Unit	Installed Quantity
Advanced Thermostat - Manual Baseline*	Each	3,537
Advanced Thermostat - Programmable Baseline*	Each	4,638
Advanced Thermostat - Unknown Baseline*	Each	400
Boilers, >95% AFUE <300 MBH	Each	165
Furnace, >95% AFUE	Each	12,549
Furnace, >97% AFUE	Each	1,103

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

3. Savings Summary

Table 3-1 summarizes the energy savings the HEER Program achieved by path in 2019.

Table 3-1. 2019 Annual Energy Savings Summary

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Advanced Thermostats	589,845	100%	589,849	NA‡	589,849
Boilers and Furnaces	2,725,610	98%	2,679,845	0.72	1,929,488
Total	**3,315,455**	**99%**	**3,269,694**		**2,519,338**

* 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_NTG_History_and_2019_Recommendations_Aerator_Showerhead_Correction_2019-04-12.xlsx, which is to be found on the Illinois SAG web site: https://www.ilsag.info/ntg_2019/.
‡ The IL TRM algorithm for advanced thermostat savings calculates net savings, so no NTG adjustment is applicable.
Source: Nicor Gas tracking data and Guidehouse team analysis.

4. Program Savings by Measure

The program includes six measures as shown in the following table. High efficiency furnaces contributed the most savings.

Table 4-1. 2019 Annual Energy Savings by Measure - Program Total

Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Advanced Thermostat - Manual Baseline	306,257	100%	306,261	NA‡	306,261
Advanced Thermostat - Programmable Baseline	256,113	100%	256,113	NA‡	256,113
Advanced Thermostat - Unknown Baseline	27,475	100%	27,475	NA‡	27,475
Boilers, >95% AFUE <300 MBH	37,832	103%	39,156	0.72	28,192
Furnace, >95% AFUE	2,440,038	98%	2,399,314	0.72	1,727,506
Furnace, >97% AFUE	247,740	97%	241,375	0.72	173,790
Total	**3,315,455**	**99%**	**3,269,694**		**2,519,338**

* 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_NTG_History_and_2019_Recommendations_Aerator_Showerhead_Correction_2019-04-12.xlsx, which is to be found on the Illinois SAG web site: https://www.ilsag.info/ntg_2019/.
‡ The IL TRM algorithm for advanced thermostat savings calculates net savings, so no NTG adjustment is applicable.
Source: Nicor Gas tracking data and Guidehouse team analysis.

5. Impact Analysis Findings and Recommendations

5.1 Impact Parameter Estimates

Table 5-1 shows the unit therm 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, we provide findings and recommendations, including discussion of all 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	86.59	86.59	100%	Nicor Gas Program Tracking Data (PTD*), Illinois TRM, v7.0†, Section 5.3.16
Advanced Thermostat - Programmable Baseline	Unit	55.22	55.22	100%	PTD*, Illinois TRM, v7.0†, Section 5.3.16
Advanced Thermostat - Unknown Baseline	Unit	68.69	68.69	100%	PTD*, Illinois TRM, v7.0†, Section 5.3.16
Boilers, >95% AFUE <300 MBH	Unit	229.28	237.31	103%	PTD*, Illinois TRM, v7.0†, Section 5.3.6
Furnace, >95% AFUE	Unit	194.44	191.20	98%	PTD*, Illinois TRM, v7.0†, Section 5.3.7
Furnace, >97% AFUE	Unit	224.61	218.83	97%	PTD*, Illinois TRM, v7.0†, Section 5.3.7

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated February 5, 2020.
† State of Illinois Technical Reference Manual version 7.0 from http://www.ilsag.info/technical-reference-manual.html.

High Efficiency Boiler

Guidehouse found a discrepancy in ex ante savings compared to the verified savings for boilers. The source of the discrepancy could not be identified, but the 103% realization rate was consistent across all boiler projects. Guidehouse used the pre-installation efficiency (base efficiency), post-installation efficiency, and input capacity found in the tracking data as inputs in the algorithm. Guidehouse used climate zone to identify the equivalent full load hours input and used 61.6% for the existing efficiency, per the IL TRM v7.0. Guidehouse also applied the 93% time of sale replacement - 7% early replacement split found in the IL TRM v7.0.

Recommendation 1. Guidehouse recommends that the implementer refer to the Illinois Technical Reference Manual (TRM) v7.0, Section 5.3.6 and compare and update ex ante algorithm and inputs with inputs outlined in this measure.

More than one-third of boiler projects involved combination boilers. This amounts to about 36% of ex ante boiler savings. A two-in-one combination boiler serves space heating needs in a home as well as domestic hot water needs. The current algorithm used to calculate ex ante savings ignores the savings that are achieved from hot water heating. Using measure 5.3.17 will more accurately portray savings from the equipment that is implemented – savings are about 50% higher in the TRM combination boiler example calculation. Combination boilers are also a high-end product, so IL TRM v7.0 Section 5.3.17 uses higher efficiencies as defaults. These boilers can be identified by looking at the model specification

sheet. To calculate and claim the domestic water heating savings, Nicor Gas would need to use the IL TRM to define eligibility criteria and collect additional project data on the before and after water heating configuration.

Recommendation 2. Guidehouse recommends that the implementer consider adding combination boilers as an eligible program measure, using the IL TRM to define eligibility criteria and identify additional project data that needs to be collected on the before and after water heating configuration. The savings methodology for combination boilers is found in IL TRM v7.0, Section 5.3.17.

High Efficiency Furnace

Furnace capacities are incorrect in about 10% of projects. Some values are reported incorrectly, and some measures report the output capacity of the furnace instead of the input capacity. Furnaces are the largest portion of program savings, so the evaluation team made adjustments to capacities to increase accuracy. The evaluation team flagged capacities that were more than 10 MBtu/h different from the nominal capacity identified in the model number. Using this method, 1,331 capacity values were updated. Overall, the reported capacities averaged higher than the nominal capacities, leading to a realization rate lower than 100%. Select projects with adjusted capacities can be found in Table 5-2.

Table 5-2. Sample of Projects with Adjusted Capacities

Project ID	Manufacturer	Model	Reported Capacity (Mbtu/h)	Verified Nominal Capacity (Mbtu/h)
PRJ-2161111	Airease	A95UH1D070B12A	88	70
PRJ-2161453	Airease	A95UH1D045B08A-56	88	45
PRJ-2242829	Armstrong Air	A95UH1E045B12S	88	45
PRJ-2161491	Armstrong Air	A95UH1E110C20	132	110
PRJ-2177404	Bryant	987MA42060V17	80	60
PRJ-2441311	Carrier	59MN7B060C17--14	80	60
PRJ-2161454	Lennox	SLP98UH110XV48C	132	110
PRJ-2177401	Lennox	SLP98UH110XV60C09	132	110

Source: Nicor Gas tracking data and Guidehouse team analysis.

Recommendation 3. Guidehouse recommends the implementer check the specifications of the furnaces with manufacturer data upon entering it in the tracking database. Using nominal capacities from the model number will yield a more accurate capacity (within 10 MBtu/h), but confirming the capacity with specification sheets or the AHRI database upon measure installation would be best practice and completely accurate.

Less than 5% of furnace measures contain incorrect model numbers. There can be additional digits or letters added or there can be parts of a model number that are omitted in the tracked data. For example, PRJ-2441976 has the model number listed as “A97.” For this model, the 8th, 9th, and 10th characters in the model number describe the input capacity, but there are only 3 characters in the tracking data. When verifying capacities and efficiencies, it is easier if the complete and correct model number is entered, so models can be reviewed accurately and with ease.

Recommendation 4. The evaluation team recommends that data entry procedures be reviewed and updated to ensure accurate recording of model numbers. For example, it may be possible

that a drop-down menu created from a database of verified model numbers could be implemented to make model number entry more uniform.

6. Appendix 1. Impact Analysis Methodology

Guidehouse determined verified gross savings for each program measure by conducting a tracking system review. Guidehouse used the Illinois TRM v7.0 methodology to calculate verified gross savings. Guidehouse calculated verified net energy savings by multiplying the verified gross savings estimates by a net-to-gross ratio (NTG). In 2019, 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.[1]

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

Table 7-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of drafting this 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.

Table 7-1. Total Resource Cost Savings Summary

Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Advanced Thermostat - Manual Baseline	Each	3,537	11	306,257	306,261	306,261
Advanced Thermostat - Programmable Baseline	Each	4,638	11	256,113	256,113	256,113
Advanced Thermostat - Unknown Baseline	Each	400	11	27,475	27,475	27,475
Boilers, >95% AFUE <300 MBH	Each	165	25	37,832	39,156	28,192
Furnace, >95% AFUE	Each	12,549	20	2,440,038	2,399,314	1,727,506
Furnace, >97% AFUE	Each	1,103	20	247,740	241,375	173,790
Total		**22,392**	**18.4**	**3,315,455**	**3,269,694**	**2,519,338**

Source: Nicor Gas tracking data and Guidehouse team analysis.

[1] Source: Nicor_Gas_NTG_History_and_2019_Recommendations_Aerator_Showerhead_Correction_2019-04-12.xlsx, which is to be found on the Illinois SAG web site: https://www.ilsag.info/ntg_2019/.