Guidehouse

Small Business Impact Evaluation Report

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

Presented to
Nicor Gas

Final

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Small Business Impact Evaluation Report

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1. Introduction

This report presents the results of the impact evaluation of the Nicor Gas 2019 Small Business 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 January 1, 2019 through December 31, 2019.

2. Program Description

The Small Business (SB) Program is designed to assist qualified Nicor Gas non-residential customers[1] to achieve natural gas energy savings through installation of direct-install (DI) energy efficiency measures and prescriptive incentives offered for select measures. The program targets both private sector and public sector customers. The Small Business Program is implemented by CLEAResult.

The 2019 program had 149 participants, including 122 in the private sector and 27 in the public sector. These participants completed 720 and 57 projects, respectively.

Table 2-1. 2019 Volumetric Summary

Participation	Direct Install	Prescriptive	Total*
Private Sector			
Participants †	53	79	122
Installed Projects ‡	129	604	720
Installed Measures	478	2,437	2,915
Public Sector			
Participants †	23	8	27
Installed Projects ‡	40	19	57
Installed Measures	276	28	304

* Total may not equal sum across rows if participants or projects take part in both direct install and prescriptive measures
† Participants are defined as unique contact names
‡ Installed Projects are defined as unique project IDs
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.

[1] The offering is available to small commercial and public sector customers of Nicor Gas territory that use less than 60,000 therms or less of natural gas consumption. Eligible small businesses must be a business owned or operated by an individual or a nonprofit or religious organization. If the business is a franchise, the owner/operator must own fewer than 10 franchise locations. Franchisees owning or operating more than 10 franchise locations will be addressed on a case by case basis for eligibility. For public sector customers the facility as a whole must use less than 60,000 therms a year.

Table 2-2. 2019 Installed Measure Quantities

Program Category	Program Path	Measure	Quantity Unit	Installed Quantity
Private	Direct Install	Domestic Hot Water (DHW) Pipe Insulation	Ln Ft	89
		Faucet Aerator - Bath	Each	296
		Faucet Aerator - Bath Laminar	Each	15
		Faucet Aerator - Kitchen	Each	87
		Salon Sprayer	Each	14
		Showerheads	Each	39
		Spray Valve (Small Restaurants)	Each	7
	Prescriptive	Boiler Reset Controls	Each	3
		Boiler Tune Up, Process	Each	61
		Boiler Tune Up, Space Heating	Each	26
		Commercial Weather Stripping	Ln Ft	34
		Conveyor Oven	Each	1
		Demand Controlled Ventilation	Each	3
		Fryer	Each	1
		High Efficiency Boiler	Each	22
		High Efficiency Furnace	Each	163
		Infrared Charbroiler	Each	1
		Infrared Heaters	Each	16
		Pipe Insulation	Ln Ft	2,696
		Programmable Thermostat	Each	32
		Rack Oven	Each	1
		Steam Trap	Each	2,079
		Custom Projects	Projects	2
Public	Direct Install	DHW Pipe Insulation	Ln Ft	12
		Faucet Aerator - Bath	Each	205
		Faucet Aerator - Kitchen	Each	47
		Showerheads	Each	20
		Spray Valve (Small Restaurants)	Each	2
	Prescriptive	Boiler Tune Up, Space Heating	Each	4
		Commercial Steamer	Each	2
		Commercial Weather Stripping	Ln Ft	4
		High Efficiency Boiler	Each	6
		High Efficiency Furnace	Each	9
		Infrared Heaters	Each	2
		Programmable Thermostat	Each	2

Source: Nicor Gas tracking data and Guidehouse team analysis.

3. Savings Summary

Table 3-1 summarizes the energy savings the Small Business 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)
Private					
Direct Install	6,093	100%	6,049	0.92	5,566
Prescriptive	1,288,019	100%	1,288,039	0.83	1,069,072
Custom	26,736	99%	26,496	0.93	24,641
Private Subtotal	**1,320,848**	**100%**	**1,320,584**	NA	**1,099,279**
Public					
Direct Install	1,635	100%	1,629	0.92	1,499
Prescriptive	29,588	100%	29,588	0.83	24,558
Public Subtotal	**31,223**	**100%**	**31,217**	**NA**	**26,057**
Total	**1,352,071**	**100%**	**1,351,801**	**NA**	**1,125,336**

* 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_2018-10-01_Final Aerator Showerhead Correction 2019-04-12.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html.
Source: Nicor Gas tracking data and Guidehouse team analysis.

4. Program Savings by Measure

The program includes 24 measures as shown in the following table. The steam trap and boiler tune up measures contributed the most savings.

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

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Direct Install	DHW Pipe Insulation	107	52%	56	0.92	51
	Faucet Aerator – Bath	2,933	100%	2,933	0.92	2,698
	Faucet Aerator - Bath Laminar	501	100%	501	0.92	461
	Faucet Aerator - Kitchen	964	100%	964	0.92	887
	Salon Sprayer	1,433	100%	1,433	0.92	1,318
	Showerheads	1,274	100%	1,276	0.92	1,174
	Spray Valve (Small Restaurants)	516	100%	516	0.92	475
Prescriptive	Boiler Reset Controls	6,117	100%	6,117	0.83	5,077
	Boiler Tune Up, Process	134,822	100%	134,822	0.83	111,903
	Boiler Tune Up, Space Heating	29,836	100%	29,814	0.83	24,746
	Commercial Steamer	1,299	100%	1,299	0.83	1,078
	Commercial Weather Stripping	392	100%	392	0.83	325
	Conveyor Oven	2,652	100%	2,652	0.83	2,201
	Demand Controlled Ventilation	390	100%	390	0.83	324
	Fryer	1,040	100%	1,040	0.83	863
	High Efficiency Boiler	54,634	100%	54,480	0.83	45,218
	High Efficiency Furnace	43,621	100%	43,621	0.83	36,205
	Infrared Charbroiler	707	100%	707	0.83	587
	Infrared Heaters	8,118	100%	8,118	0.83	6,738
	Pipe Insulation	9,001	100%	9,002	0.83	7,472
	Programmable Thermostat	1,369	100%	1,369	0.83	1,136
	Rack Oven	1,931	100%	1,931	0.83	1,602
	Steam Trap	1,021,677	100%	1,021,872	0.83	848,154
	Custom	26,736	99%	26,496	0.93	24,641
Program 2019 Total		**1,352,071**	**100%**	**1,351,801**	**NA**	**1,125,336**

* 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_2018-10-01_Final Aerator Showerhead Correction 2019-04-12.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html.
Source: Nicor Gas tracking data and Guidehouse team analysis.

Table 4-2. 2019 Annual Energy Savings by Measure – Private Sector

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Direct Install	DHW Pipe Insulation	94	52%	49	0.92	45
	Faucet Aerator - Bath	2,165	100%	2,165	0.92	1,991
	Faucet Aerator - Bath Laminar	501	100%	501	0.92	461
	Faucet Aerator - Kitchen	657	100%	657	0.92	604
	Salon Sprayer	1,433	100%	1,433	0.92	1,318
	Showerheads	842	100%	844	0.92	776
	Spray Valve (Small Restaurants)	401	100%	401	0.92	369
Prescriptive	Boiler Reset Controls	6,117	100%	6,117	0.83	5,077
	Boiler Tune Up, Process	134,822	100%	134,822	0.83	111,903
	Boiler Tune Up, Space Heating	25,248	100%	25,227	0.83	20,938
	Commercial Weather Stripping	351	100%	351	0.83	291
	Conveyor Oven	2,652	100%	2,652	0.83	2,201
	Demand Controlled Ventilation	390	100%	390	0.83	324
	Fryer	1,040	100%	1,040	0.83	863
	High Efficiency Boiler	34,118	100%	33,964	0.83	28,190
	High Efficiency Furnace	41,407	100%	41,407	0.83	34,368
	Infrared Charbroiler	707	100%	707	0.83	587
	Infrared Heaters	7,216	100%	7,216	0.83	5,989
	Pipe Insulation	9,001	100%	9,002	0.83	7,472
	Programmable Thermostat	1,340	100%	1,340	0.83	1,113
	Rack Oven	1,931	100%	1,931	0.83	1,602
	Steam Trap	1,021,677	100%	1,021,872	0.83	848,154
	Custom	26,736	99%	26,496	0.93	24,641
Program Total		**1,320,848**	**100%**	**1,320,584**	**NA**	**1,099,279**

* 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_2018-10-01_Final Aerator Showerhead Correction 2019-04-12.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html.
Source: Nicor Gas tracking data and Guidehouse team analysis.

Table 4-3. 2019 Annual Energy Savings by Measure – Public Sector

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Direct Install	DHW Pipe Insulation	13	83%	7	0.92	6
	Faucet Aerator - Bath	768	100%	768	0.92	707
	Faucet Aerator - Kitchen	307	100%	307	0.92	283
	Showerheads	432	100%	433	0.92	398
	Spray Valve (Small Restaurants)	115	100%	115	0.92	105
	Boiler Tune Up, Space Heating	4,588	100%	4,588	0.83	3,808
	Commercial Steamer	1,299	100%	1,299	0.83	1,078
	Commercial Weather Stripping	41	100%	41	0.83	34
	High Efficiency Boiler	20,516	100%	20,516	0.83	17,028
	High Efficiency Furnace	2,214	100%	2,214	0.83	1,838
	Infrared Heaters	902	100%	902	0.83	749
	Programmable Thermostat	29	100%	29	0.83	24
Program Total		**31,223**	**100%**	**31,217**	**NA**	**26,057**

* 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_2018-10-01_Final Aerator Showerhead Correction 2019-04-12.xlsx, which is to be found on the Illinois SAG web site: http://ilsag.info/net-to-gross-framework.html.
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)
Boiler Reset Controls	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.4
Boiler Tune Up, Process	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.3
Boiler Tune Up, Space Heating	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.2
Commercial Steamer	Each	649.28	649.28	100%	IL TRM v7.0 4.2.3
Comm. Weather Stripping	Ln Ft	10.32	10.32	100%	IL TRM v8.0 4.8.16
Conveyor Oven	Each	2,652.00	2,652.00	100%	IL TRM v7.0, 4.2.4
Demand Controlled Ventilation	Each	130.00	130.00	100%	IL TRM v7.0, 4.4.19
DHW Pipe Insulation	Ln Ft	1.06	0.55	52%	IL TRM v7.0, 5.4.1
Faucet Aerator - Bath	Each	Vary	Vary	100%	IL TRM v7.0, 4.3.2
Faucet Aerator - Bath Laminar	Each	Vary	Vary	100%	IL TRM v7.0, 4.3.2
Faucet Aerator - Kitchen	Each	Vary	Vary	100%	IL TRM v7.0, 4.3.2
Fryer	Each	1,040.29	1,040.29	100%	IL TRM v7.0, 4.2.7
High Efficiency Boiler	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.10
High Efficiency Furnace	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.11
Infrared Charbroiler	Each	707.00	707.00	100%	IL TRM v7.0, 4.2.12
Infrared Heaters	Each	451.00	451.00	100%	IL TRM v7.0, 4.4.12
Pipe Insulation	Ln Ft	Vary	Vary	100%	IL TRM v7.0, 4.4.14
Programmable Thermostat	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.18
Rack Oven	Each	1,930.50	1,930.50	100%	IL TRMv7.0 4.2.18
Salon Sprayer	Each	102.33	102.33	100%	IL TRM v7.0, 4.2.11
Showerheads	Each	Vary	Vary	100%	IL TRM v7.0, 4.3.3
Spray Valve (Small Restaurants)	Each	57.31	57.31	100%	IL TRM v7.0, 4.2.11
Steam Trap	Each	Vary	Vary	100%	IL TRM v7.0, 4.4.16
Custom Measures	Project	Vary	Vary	99%	Project File Review, Customer Interview, Monthly Billing Data ‡

* Program Tracking Data (PTD) provided by Nicor Gas, final extract dated February 7, 2020.
† State of Illinois Technical Reference Manual version 7.0 from http://www.ilsag.info/technical-reference-manual.html.
‡ Project files and monthly billing data provided by Nicor Gas. Customer interview conducted by Guidehouse.

DHW Pipe Insulation

The TRM v7.0 updated the DHW pipe insulation savings algorithm to include the existing circumference of the pipe, C_{exist}, and the circumference of the pipe after adding insulation, C_{new}, as seen below:

Natural Gas Savings for DHW Pipe Systems:

$$\Delta Therm = ((C_{exist} / R_{exist} - C_{new} / R_{new}) * L * \Delta T * 8{,}766) / \eta DHW / 100{,}000$$

State of Illinois Technical Reference Manual version 7.0, section 5.4.1, page 171

The tracking data only included a single variable for pipe circumference. Guidehouse used default inputs from TRM v7.0 and supplemented with additional information provided by Nicor Gas. We calculated verified savings using R_{new} of 4 (from R_{exist} 1.0 + R value of insulation), and C_{new} of 0.458 (0.75 +0.5 + 0.5)* π/12 = 0.458). The verified gross savings realization rate was 52%.

Recommendation 1. Guidehouse recommends the implementer add data fields for the new circumference variables from TRM v8.0 and apply the updated savings algorithm for DHW hot water pipe wrap (TRM section 5.4.1).

High Efficiency Furnace

Guidehouse found a tracking data entry error for two projects: PRJ-2315490 and PRJ-2242805. The tracked capacity input for these projects are, respectively, 8,800 MBH and 12,000 MBH. Upon verification of the model numbers, we found the capacities as 88,000 MBH and 120,000 MBH. The ex ante savings were consistent with the verified savings we calculated using the higher (correct) input capacities.

We verified the savings realization rate for PRJ-2239093 was 100%, although the tracking inputs were inconsistent. The tracked EFLH (1,504 hours) matched the tracked building type (Religious) but the ex ante therm savings were consistent with an Office – Low Rise building type (EFLH = 1,425 hours). Upon examination of contact and site information, the building was found to be a low-rise office associated with publications for a religious institution, and not a place of worship. Guidehouse calculated verified savings based on the low-rise office building type. The high efficiency furnace measures had an overall gross savings realization rate of 100%.

Recommendation 2. Nicor Gas should verify that tracking data inputs match the values used to calculate ex ante savings and consistently apply the TRM algorithm.

Custom

Custom project NG-18-037 updated the VAV controls for an office building and has a realization rate of 97%. The savings are based on therm usage per heating degree days projected over a standard year for the baseline and efficient cases. Guidehouse updated the savings to include post-installation data and to use per day therm usage to account for uneven billing periods. Project NG-18-001 was verified with 100% savings realization rate (adjusted summer definition with minimal impact on final savings).

Table 5-2. Details of Custom Measures

Project ID	Measure	Ex Ante Gross Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	NTG	Verified Net Savings (Therms)
NG-18-037	VAV Controls	10,303	97%	9,994	0.93	8,295
NG-18-001	Grain Dryer	16,433	100%	16,502	0.93	13,697
Total		**26,736**	**99%**	26,496	0.93	24,641

Source: Nicor Gas tracking and billing data, participant interview, and Guidehouse team analysis.

Recommendation 3. The program should use post-installation data when available and per-day values instead of monthly values to account for uneven billing periods.

Prescriptive Projects with Custom NTGs

Several measure installations for projects identified as a "Prescriptive" sub-program type in the tracking data were assigned "Custom" sub-program NTG values. The measures affected were hydronic boilers (2 instances), programmable thermostats (34 instances), and large conveyor oven (one instance).
The two hydronic boiler measure installations (Prescriptive project PRJ-2160307) used the 2018 Small Business Custom NTG of 0.88. The conveyor oven (PRJ-2198930) and programmable thermostats (example, PRJ-2119773) were assigned the 2019 Custom NTG value of 0.93. We assigned the 2019 Small Business Prescriptive NTG of 0.83 to the Prescriptive projects, consistent with the tracking data.

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 version 7.0 methodology to calculate verified gross savings or relied on custom inputs as provided in the tracking database.

Engineering Review of Custom Project Files

For each selected project, an in-depth application review is performed to assess the engineering methods, parameters and assumptions used to generate all ex ante impact estimates. For each custom project, engineers estimated ex post gross savings based on their review of documentation and engineering analysis.

To support this review, the implementation contractor provided project documentation in electronic format for each sampled project. Documentation included some or all scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), inspection reports and photos, and calculation spreadsheets.

Guidehouse requested and received gas billing history for project NG-18-037 and held a telephone interview with the customer contact, which we used to estimate to verified savings.

7. Appendix 3. 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

Program Path	Research Category	Units	Quantity	EUL	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Direct Install	DHW Pipe Insulation	Ln Ft	101	15	107	56	51
	Faucet Aerator - Bath	Each	501	10	2,933	2,933	2,698
	Faucet Aerator - Bath Laminar	Each	15	10	501	501	461
	Faucet Aerator - Kitchen	Each	134	10	964	964	887
	Salon Sprayer	Each	14	5	1,433	1,433	1,318
	Showerheads	Each	59	10	1,274	1,276	1,174
	Spray Valve (Small Restaurants)	Each	9	5	516	516	475
Custom	VAV Controls Upgrade with Schedule	Project	1	15	10,303	9,994	9,294
	Grain Dryer	Project	1	20	16,433	16,502	15,347
Prescriptive	Boiler Reset Controls	Each	3	20	6,117	6,117	5,077
	Boiler Tune Up, Process	Each	61	3	134,822	134,822	111,903
	Boiler Tune Up, Space Heating	Each	30	3	29,836	29,814	24,746
	Commercial Steamer	Each	2	12	1,299	1,299	1,078
	Commercial Weather Stripping	Ln Ft	38	10	392	392	325
	Conveyor Oven	Each	1	17	2,652	2,652	2,201
	Demand Controlled Ventilation	Each	3	10	390	390	324
	Fryer	Each	1	12	1,040	1,040	863
	High Efficiency Boiler	Each	28	20	54,634	54,480	45,218
	High Efficiency Furnace	Each	172	16.5	43,621	43,621	36,205
	Infrared Charbroiler	Each	1	12	707	707	587
	Infrared Heaters	Each	18	12	8,118	8,118	6,738
	Pipe Insulation	Ln Ft	2696	15	9,001	9002	7,472
	Programmable Thermostat	Each	34	8	1,369	1,369	1,136
	Rack Oven	Each	1	12	1,931	1,931	1,602
	Steam Trap	Each	2079	6	1,021,677	1,021,872	848,154
Total			**6,003**	**7.0**	**1,352,071**	**1,351,801**	**1,125,336**

Source: Nicor Gas tracking data and Guidehouse team analysis.