Small Business Impact Evaluation Report

Energy Efficiency Plan Year 2021
(1/1/2021-12/31/2021)

Prepared for:

Nicor Gas

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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 2021 Small Business (SB) Program. It presents a summary of the energy impacts for the total program and broken out by relevant measure and program structure details. presents the impact analysis methodology. Program year 2021 covers January 1, 2021 through December 31, 2021.

2. Program Description

The 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 and custom incentives offered for select measures. The program targets both private sector and public sector customers. The SB Program is implemented by CLEAResult.

The 2021 program had 261 participants that completed 281 projects and installed 31 measure types, as shown in Table 2-1.

Table 2-1. 2021 Volumetric Summary

Participation	Direct Install	Prescriptive	Custom	Total
Participants *	170	69	22	261
Installed Projects †	173	86	22	281
Unique Measure Types	8	8	15	31

* Participants are defined as unique site addresses
† Installed Projects are defined as unique project IDs
Source: Nicor Gas tracking data and Guidehouse evaluation 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 must use less than 60,000 therms a year.

Table 2-2. 2021 Installed Measure Quantities

Program Path	Measure	Quantity Unit	Installed Quantity
Direct Install	Domestic Hot Water (DHW) Pipe Insulation	Ln Ft	63
	Faucet Aerator – Bath	Each	640
	Faucet Aerator - Bath Laminar	Each	97
	Faucet Aerator – Kitchen	Each	59
	Salon Sprayer	Each	1
	Commercial Weather Stripping	Ln Ft	20
	Showerheads	Each	228
	Pre Rinse Spray Valve (Small & Medium Sized Restaurants)	Each	9
Prescriptive	Boiler Tune Up, Process	Each	7
	Boiler Tune Up, Space Heating	Each	9
	High Efficiency Boiler	Each	5
	High Efficiency Furnace	Each	44
	Infrared Heaters	Each	13
	Ozone Laundry	Each	1
	Small Commercial Thermostat	Each	5
	Steam Trap	Each	168
Custom	Custom (Excluding GSHP)	Project	21
	Custom Ground Source Heat Pump (GSHP)	Project	1

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.

3. Savings Summary

Table 3-1 summarizes the energy savings the Small Business Program achieved by path in 2021.

Table 3-1. 2021 Annual Energy Savings Summary

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms	NTG†	Verified Net Savings (Therms)
Direct Install	12,263	100%	12,241	0.92	11,261
Prescriptive	131,859	100%	131,982	0.83	109,585
Custom (Excluding GSHP)	103,988	87%	90,464	0.93	84,131
Custom (GSHP)	18,675	54%	10,085	0.93	9,379
Total or Weighted Average	**266,785**	**92%**	**244,772**	**0.88**	**214,356**

* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† A deemed value. Available on the SAG web site: https://www.ilsag.info/ntg_2021.
Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.

4. Program Savings by Measure

The program includes custom measures and 17 direct installation and prescriptive measure types as shown in Table 4-1. The custom measures and steam trap prescriptive measures contributed the most savings.

Table 4-1. 2021 Annual Energy Savings by Measure

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	NTG	Verified Net Savings (Therms)
Direct Install	Faucet Aerator – Kitchen	402	100%	402	0.92	370
	Spray Valve (Small Restaurants)	401	100%	401	0.92	369
	Spray Valve (Medium Restaurants)	344	100%	344	0.92	316
	Commercial Weather Stripping	207	100%	207	0.92	190
	Salon Sprayer	102	100%	102	0.92	94
	DHW Pipe Insulation	67	66%	44	0.92	41
	Faucet Aerator – Bath	3,846	100%	3,839	0.92	3,532
	Faucet Aerator - Bath Laminar	1,969	100%	1,969	0.92	1,811
	Showerheads	4,925	100%	4,933	0.92	4,538
Prescriptive	Steam Trap	53,460	100%	53,478	0.83	44,387
	Boiler Tune Up, Process	18,314	100%	18,314	0.83	15,201
	High Efficiency Furnace	12,800	101%	12,876	0.83	10,687
	Boiler Tune Up, Space Heating	11,117	100%	11,117	0.83	9,227
	Ozone Laundry	26,784	100%	26,784	0.83	22,231
	High Efficiency Boiler	5,523	100%	5,523	0.83	4,584
	Infrared Heaters	3,373	101%	3,402	0.83	2,824
	Small Commercial Thermostat	488	100%	488	0.91	444
Custom	Custom (Excluding GSHP)	103,988	87%	90,464	0.93	84,131
	Custom (GSHP)	18,675	54%	10,085	0.93	9,379
Total or Weighted Average		**266,785**	**92%**	**244,772**	**0.88**	**214,356**

Source: Nicor Gas tracking data and Guidehouse evaluation 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. Following the table, we provide findings and recommendations, including discussion of measures with realization rates above or below 100%. □ provides a description of the impact analysis methodology, and Appendix B provides brief findings for all sampled projects. Appendix C shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing this impact evaluation report.

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 Tune Up, Process	Each	vary	vary	100%	TRM v9.0†, 4.4.3
Boiler Tune Up, Space Heating	Each	947.2	947.2	100%	TRM v9.0, 4.4.2
Commercial Weather Stripping	Ln Ft	vary	vary	100%	TRM v9.0 4.8.16
DHW Pipe Insulation	Ln Ft	1.06	0.70	66%	TRM v9.0, 5.4.1
Faucet Aerator - Bath	Each	vary	vary	100%	TRM v9.0, 4.3.2
Faucet Aerator - Bath Laminar	Each	19.7	19.7	100%	TRM v9.0, 4.3.2
Faucet Aerator - Kitchen	Each	vary	vary	100%	TRM v9.0, 4.3.2
High Efficiency Boiler	Each	vary	vary	100%	TRM v9.0, 4.4.10
High Efficiency Furnace	Each	vary	vary	100%	TRM v9.0, 4.4.11
Infrared Heaters	Each	259.4	254.8	100%	TRM v9.0, 4.4.12
Ozone Laundry	Each	26,784	26,784	100%	TRM v9.0, 4.3.6
Salon Sprayer	Each	102.3	102.3	100%	TRM v9.0, 4.2.11
Showerheads	Each	21.6	21.6	100%	TRM v9.0, 4.3.3
Small Commercial Thermostat	Each	vary	vary	100%	TRM v9.0, 4.4.48
Spray Valve (Small and Medium Restaurants)	Each	vary	vary	100%	TRM v9.0, 4.2.11
Steam Traps	Each	vary	vary	100%	TRM v9.0, 4.4.16
Custom (Excl GSHP)	Each	vary	vary	vary	Project File Review, Monthly Billing Data, Phone Interviews‡
Custom (GSHP)	Each	vary	vary	vary	Project File Review, Monthly Billing Data, Phone Interviews‡

* Program Tracking Data (PTD) provided by Nicor Gas; extract dated January 28, 2022.
† State of Illinois Technical Reference Manual version 9.0 from http://www.ilsag.info/technical-reference-manual.html.
‡ Project files and monthly billing data provided by Nicor Gas. Where conducted, telephone interview data collected by Guidehouse and Driftless Energy.

5.1.1 High Efficiency Furnace

All the high efficiency furnace measures had a verified gross realization rate of 100%, except project PRJ-3052750, which had a realization rate of 128%.

Recommendation 1. Ensure tracking data inputs are consistent with ex ante savings.

5.1.2 DHW Pipe Insulation

All the DHW pipe insulation measures have a verified per unit realization rate of 66%. The ex ante savings assume an average 90°F temperature difference between supplied water and outside air temperature (ΔT = 90°F). The evaluation team used 60°F, which is consistent with the TRM (v9.0).

Recommendation 2. Review the ΔT assumption for the DHW pipe insulation savings and use the TRM deemed value of 60°F.

5.1.3 Infrared Heaters

All the Infrared Heaters have a verified gross realization rate of 100%, except those installed in the Warehouse building type. Five of these six warehouse-based projects are also missing their respective climate zone. The Guidehouse team assigned an EFLH of 1,286 hours for these missing values, based on TRM v9.0. One warehouse-based measure with a climate zone assigned (2), project number PRJ-2992240, has a realization rate of 75%. Two other infrared heater projects, numbers PRJ-2968908 and PRJ-2968908, had a realization rate of 139%.

Recommendation 3. Ensure the tracking data has climate zones for all measure that use climate zones in the savings calculations and that the tracking data inputs are consistent with the ex ante savings.

5.2 Custom Projects

Table 5-2 summarizes the results of evaluation verification on custom projects from 2021. Key findings and recommendations follow the table.

Table 5-2. Details of Custom Measures

Program Component	Ex Ante Gross Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	NTG	Verified Net Savings (Therms)
Custom (Excl. GSHP)	103,988	87%	90,464	0.93	84,131
Custom GSHP	18,675	54%	10,085	0.93	9,379
Total Custom	**122,663**	**82%**	**100,548**	**0.93**	**93,510**

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.

5.2.1 NGPS-20-45 – DCV and RTUs

This project included the installation of four rooftop units (RTUs) at a school. RTU-1 included demand-controlled ventilation (DCV) controls and an energy recovery ventilator (ERV). RTU-2,3, & 4 included only DCV controls. Prior to the completion of the project, heating was provided by the boiler and radiators. Several changes were made to this project which resulted in a decrease in savings and an overall realization rate of 28% (1,070 verified gross therms versus 3,863 ex ante gross therms). The changes include:

- The DCV savings were calculated based on the total RTU CFM rather than the outdoor air (OA) CFM due to a likely cell reference error. Correcting the CFM to include only the OA CFM reduced the savings for the DCV for all four RTUs.
- The effectiveness for the ERV was updated from 68% to 61% based on the manufacturer's specifications.
- RTU-1 was updated to include an ERV with a 50% effectiveness for the baseline (which affects the savings for both the ERV and the DCV calculations). Based on IECC-2018 section C403.7.4 an ERV is required for this RTU.

Recommendation 4. Ensure efficiency inputs (such as ERV effectiveness) are updated to final “as-built” specifications for final ex ante calculations.

Recommendation 5. Ensure the savings for new equipment are compared to an appropriate code-compliant baseline system.

5.2.2 NGPS-20-53 – GSHP

This project included the installation of a geothermal HVAC system. The calculation approach for this project was inconsistent with the approach set forth in the Illinois TRM and did not fully account for the increase in electric usage due to the installation of the heat pump.

Recommendation 6. Ensure that the savings for geothermal HVAC systems are calculated consistent with the TRM methodology and appropriately account for gas savings as well as increased electric usage.

5.2.3 Other Custom Measures

Numerous projects had ex ante savings calculated using a regression with pre- and post-case operation correlated to outdoor air temperature and other site variables (as needed). The savings for three projects were updated due to the original regression not fully capturing the site operation.

- NGPS-20-38 (realization rate 51%) — The ex ante regression was adjusted to better reflect the operation of the system during summer months. The updated analysis, and reduced summer savings, resulted in a significant decrease in overall project savings.
- NG-20-42 (realization rate 91%) — The savings were updated with additional months of data. The data indicated a change in non-HVAC usage unassociated with the project that happened in the months prior to the completion of this project. This resulted in a

slight skew in the regression which overestimated the summer gas savings due to the project. Removing the impact of this change slightly reduced the savings for this project.

- NGPS-20-49 (realization rate 111%) — The boiler system for the site was turned off during summer months resulting in distinctly different operating characteristics and usage profiles during the summer and winter months. The ex ante analysis included both operating regimes in a single temperature-dependent regression. The evaluation updated the analysis to calculate the operation in each regime independently, which increased the savings.

Two projects were found to have verified operating conditions that differed from operating conditions used in the ex ante calculations.

- NGPS-19-03 (realization rate 125%) — The ex ante analysis was adjusted slightly to better reflect the additional energy use of the higher ventilation rates.
- NGPS-20-58 (realization rate 50%) — The savings for this project were reduced due to the equipment not operating as expected. The project included the installation of kitchen vent hood controls. However, the heat from the stove pilot lights was preventing the hood controls from reducing the airflow to the extent expected.

Recommendation 7. Prior to recording final ex ante savings, include additional post-installation gas usage and operating data, when available, to best represent the efficient measure case.

Appendix A. Impact Analysis Methodology

For Direction Installation and Prescriptive measures, Guidehouse determined verified gross savings for each program measure by conducting a tracking system data review. Guidehouse used the Illinois Technical Reference Manual (TRM) version 9.0[2] methodology to calculate verified gross savings or relied on custom inputs as provided in the tracking database.

Engineering Review of Project Files

The 2021 evaluation involved retrospective adjustments to ex ante gross savings on SB Program custom measures installed in 2021. CLEAResult provided documentation of project applications and savings. Documentation included some or all of the following: scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), pre-inspection reports and photos, post inspection reports and photos, and calculation spreadsheets. The evaluation team verified project eligibility and savings based on engineering review, billing data review, and site-specific verification of a sample of custom projects. As needed, telephone interviews were conducted with customer site contacts to confirm operating details and other project characteristics. Guidehouse designed the sample sizes to provide a 90/10 confidence and relative precision level for program-level gross savings verification.

The evaluation team conducted file reviews on a sample of 11 out of 21 SB Program custom projects, excluding the GSHP project. We used a stratified sample design at the tracking record level using the population gross therm savings determined from program tracking data. Strata were defined by project size including a certainty stratum for the GSHP project reviewed as a census. Table A-1 shows a profile of the sample selection. Only stratum 3 involved random sample selection. No projects were selected from the smallest projects, stratum 4, which comprised less than 5% of the population savings, and the population level verified gross realization rate (excluding GSHP) was applied to the stratum 4.

Table A-1. Profile of Gross Impact Sample for Custom Projects

Sample Strata	Population Project Count	Population Ex Ante Gross Therms	Sample Project Count	Sample Ex Ante Gross Therms	Sample Percent of Population
1	3	44,019	3	44,019	100%
2	3	26,088	3	26,088	100%
3	7	29,649	5	20,743	70%
4	8	4,232	0	-	0%
Total (Excl. GSHP)	**21**	**103,988**	**11**	**90,850**	**87%**
Custom GSHP	**1**	**18,675**	**1**	**18,675**	**100%**
Total SB Custom	**22**	**122,663**	**12**	**109,525**	**89%**

Source: Nicor Gas tracking data and Guidehouse team analysis.

[2] State of Illinois Technical Reference Manual version 9.0 from http://www.ilsag.info/technical-reference-manual.html

Table A-2 gives the strata-level verified gross realization rates and statistical precision values at 90% confidence for the Small Business Program custom project path.

Table A-2. Gross Therm Realization Rates and Relative Precision at 90% Confidence Level

Program Sector	Strata	Relative Precision +or-%	Mean RR	Standard Error
C&I and Public Sector SB Custom, Excluding GSHPs	1	0%	77%	0.00
	2	0%	111%	0.00
	3	19%	80%	0.07
	Custom Subtotal RR (90/10) (excluding GSHP)	**4%**	**87%**	**0.02**
Public Sector – Custom GSHP	**Custom GSHP**		**54%**	
Custom Total			**82%**	

Source: Guidehouse analysis

Appendix B. Impact Analysis Supplemental Information

Table B-1 provides a summary of the SB Program custom projects sample selection and verification approach. Table B-2 provides a summary of verification results for the sample.

Table B-1. Profile of 2021 Custom Gross Impact Sample

Project ID	Program Path	Ex Ante Gross Savings (therms)	Strata	Verification Approach	Measure
NGPS-20-38	Custom	17,917	1	File Review	Various, Custom Other
NGPS-19-26	Custom	13,440	1	File Review	Boiler Replacement
NG-20-42	Custom	12,662	1	File Review	High Efficiency Heating Unit
NGPS-20-50	Custom	9,526	2	File Review	Various, Custom Other
NGPS-20-49	Custom	8,240	2	File Review	Boiler Replacement and DHW
NGPS-19-03	Custom	8,322	2	File Review	Custom HVAC - Controls
NGPS-20-69	Custom	6,093	3	File Review	Custom HVAC - Controls/ EMS
NGPS-20-43	Custom	4,662	3	File Review	Boiler Replacement
NGPS-20-45	Custom	3,863	3	File Review	DCV and ERV
NG-20-37	Custom	3,278	3	File Review	Boiler Replacement
NGPS-20-58	Custom	2,847	3	File Review	Kitchen DCV
NGPS-20-53	Custom	18,675	Custom GSHP	File Review	GSHP

Source: Nicor Gas tracking data and Guidehouse team analysis.

Table B-2. 2021 Summary of Custom Program Sample Verification Results

Project ID	Measure Description	Gross RR	Summary of Adjustment
NGPS-20-38	Various, Custom Other	51%	The ex ante regression was adjusted to better reflect the operation of the system during summer months. The updated analysis reduced summer and project savings.
NGPS-19-26	Boiler Replacement	100%	OK
NG-20-42	High Efficiency Heating Unit	91%	The savings were updated with additional months of data. The data indicated a change in non-HVAC usage that happened in the months prior to the installation of the MAUs for this project. Removing the impact of this change slightly reduced the savings for this project.
NGPS-20-50	Various, Custom Other	100%	OK
NGPS-20-49	Boiler Replacement and DHW	111%	This project was completed using a daily regression analysis. Based on a review of the data, there are distinct operating regimes for summer and winter. The evaluation updated the regression to capture the summer and winter operation separately.
NGPS-19-03	Custom HVAC - Controls	125%	The ex ante analysis was adjusted slightly to better reflect the additional energy use of the higher ventilation rates.
NGPS-20-69	Custom HVAC - Controls/ EMS	100%	OK
NGPS-20-43	Boiler Replacement	100%	This project was completed using a regression analysis. The regression was reviewed by evaluation, but no changes were made.
NGPS-20-45	DCV and ERV	28%	Included the installation of four RTUS at a school. RTU-1 included DCV controls and an ERV. RTU-2,3, & 4 included only DCV controls. Prior to the completion of the project, heating was provided by the boiler and radiators. Several changes were made to this project which resulted in a decrease in savings and an overall RR of 28%.
NG-20-37	Boiler Replacement	100%	OK
NGPS-20-58	Kitchen DCV	50%	Savings were reduced due to the equipment not operating as expected. The heat from the stove pilot lights was preventing the hood controls from reducing the airflow to the extent expected.
NGPS-20-53	GSHP	54%	Included the installation of geothermal HVAC systems. The calculation approach for these projects was inconsistent with the approach set forth in the Illinois TRM and did not fully account for the increase in electric usage due to the installation of the heat pump.

Source: Nicor Gas tracking data and Guidehouse team analysis.

Appendix C. Program-Specific Inputs for the Illinois TRC

Table C-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing 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. Guidehouse will include annual and lifetime water savings and greenhouse gas reductions in the end of year summary report.

Table C-1. Verified Cost Effectiveness Inputs - Program

Program Path	Measure	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Direct Install	DHW Pipe Insulation	Ln Ft	63	15.0	67	44	41
	Faucet Aerator – Bath	Each	640	10.0	3,846	3,839	3,532
	Faucet Aerator - Bath Laminar	Each	97	10.0	1,969	1,969	1,811
	Faucet Aerator – Kitchen	Each	59	10.0	402	402	370
	Salon Sprayer	Each	1	5.0	102	102	94
	Commercial Weather Stripping	Ln Ft	20	10.0	207	207	190
	Showerheads	Each	228	10.0	4,925	4,933	4,538
	Pre Rinse Spray Valve (Small & Medium Sized Restaurants)	Each	9	5.0	745	745	685
Prescriptive	Boiler Tune Up, Process	Each	7	3.0	18,314	18,314	15,201
	Boiler Tune Up, Space Heating	Each	9	3.0	11,117	11,117	9,227
	High Efficiency Boiler	Each	5	25.0	5,523	5,523	4,584
	High Efficiency Furnace	Each	44	16.5	12,800	12,876	10,687
	Infrared Heaters	Each	13	12.0	3,373	3,402	2,824
	Ozone Laundry	Each	1	10.0	26,784	26,784	22,231
	Small Commercial Thermostat	Each	5	11.0	488	488	444
	Steam Trap	Each	168	6.0	53,460	53,478	44,387
Custom	Custom (Excl. GSHP)	Project	21	19.6	103,988	90,464	84,131
	Custom GSHP	Project	1	25.0	18,675	10,085	9,379
Total or Weighted Average				**13.1**	**266,785**	**244,772**	**214,356**

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.