

# Business Energy Efficiency Rebates Impact Evaluation Report

Energy Efficiency Plan Year 2020 (1/1/2020-12/31/2020)

**Prepared for:** 

Nicor Gas

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## 1. Introduction

This report presents the results of the Nicor Gas 2020 Business Energy Efficiency Rebates (BEER) Program impact evaluation. It includes a summary of the total program's energy impacts, broken out by program structure and relevant measures. Program year 2020 covers January 1, 2020 through December 31, 2020.

## 2. Program Description

The BEER Program provides incentives to business and public sector customers who install new, highly efficient space heating, water heating, pipe insulation, commercial kitchen, and weather-stripping equipment covered by the program. It also provides rebates for other prescriptive cost-effective equipment and services such as boiler tune-ups to improve the energy efficiency of existing equipment. Additionally, the program offers free assessments and direct install measures such as efficient faucet aerators, low flow showerheads, and pre-rinse sprayers.

The target market of the BEER Program is business and public sector customers using 60,000 or more therms per year. The program relies on wholesale and retail trade allies as well as business trade associations to help market the program to Nicor Gas end-use customers. The BEER Program is implemented by CLEAResult.

The program had 377 participants in 2020 and completed 427 projects as shown in Table 2-1. The program contains customers in both the Private and Public sectors.

Participation	Direct Install	Prescriptive	Total
Private Sector			
Participants *	7	209	216
Installed Projects †	7	238	245
Measure Types Installed	4	12	16
Public Sector			
Participants *	82	84	161
Installed Projects †	82	100	182
Measure Types Installed	3	8	11
Program 2020 Total			
Participants *	89	289	377
Installed Projects †	89	338	427
Measure Types Installed	4	13	17

### Table 2-1. 2020 Volumetric Findings Detail

\* Participants are defined as the number of unique site addresses

† Installed Projects are defined as the number of unique Project IDs



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

Program Category	Program Path	Measure	Quantity	Installed
	r rogram r atri	Weasure	Unit	Quantity
	Direct Install	Commercial Weather Stripping	Linear Feet	3
		Low Flow Faucet Aerator	Each	1,058
		Low Flow Showerhead	Each	19
		Spray Valve	Each	1
		Boller Tune Up, Process	Each	24
		Combination Oven	Each	5
Private			Each	5
		Demand Controlled Ventilation	Sensor	351
		Fryer	Each	10
		High Efficiency Boiler	Each	14
	Prescriptive	High Efficiency Furnace	Each	60
		Infrared Heater	Each	74
		Ozone Laundry	Each	5
		Pipe Insulation	Linear Feet	9,999
		Small Commercial Thermostat	Each	14
		Steam Trap	Each	1,103
	Direct Install	Commercial Weather Stripping	Linear Feet	16
		Low Flow Faucet Aerator	Each	1,818
		Low Flow Showerhead	Each	86
		Boiler Tune Up, Space Heating	Each	75
		Demand Controlled Ventilation	Sensor	4
Public		High Efficiency Boiler	Each	42
	Drogorintivo	High Efficiency Furnace	Each	12
	Prescriptive	Infrared Heater	Each	7
		Small Commercial Thermostat	Each	1
		Steam Trap	Each	124
		Water Heater	Each	1

### Table 2-2. 2020 Installed Measure Quantities



## 3. Program Savings Detail

Table 3-1 summarizes the energy savings the BEER Program achieved by path in 2020. The two paths include Direct Install and Prescriptive measures.

### Table 3-1. 2020 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	37,819	100%	37,715	0.86	32,435
Prescriptive	1,619,687	100%	1,626,122	0.86	1,398,465
Private Subtotal	1,657,505	100%	1,663,837	0.86	1,430,900
Public					
Direct Install	10,467	100%	10,465	0.86	9,000
Prescriptive	378,358	100%	378,501	0.86	325,511
Public Subtotal	388,826	100%	388,966	0.86	334,511
Total or Weighted Average	2,046,331	100%	2,052,803	0.86	1,765,411

\* 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\_2020.



### 4. Program Savings by Measure

The program includes 30 reported measure names, which Guidehouse collapsed into 17 Research Categories, as shown in Table 4-1 for the program overall. Table 4-2 and Table 4-3 presents the results by program sector type. The steam trap and boiler measures contributed the most savings.

Program Management	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
	Commercial Weather Stripping	196	100%	196	0.86	169
Direct Install	Low Flow Faucet Aerator	46,101	100%	45,996	0.86	39,556
Direct install	Low Flow Showerhead	1,751	100%	1,751	0.86	1,506
	Spray Valve	237	100%	237	0.86	204
	Boiler Tune Up, Process	279,064	100%	279,064	0.86	239,995
	Boiler Tune Up, Space Heating	182,021	100%	182,021	0.86	156,538
	Combination Oven	1,819	100%	1,820	0.86	1,565
	Demand Controlled Ventilation	83,055	100%	83,055	0.86	71,427
	Fryer	23,680	100%	23,680	0.86	20,365
	High Efficiency Boiler	227,547	100%	227,547	0.86	195,691
Prescriptive	High Efficiency Furnace	23,412	100%	23,415	0.86	20,137
	Infrared Heater	36,531	100%	36,531	0.86	31,417
	Ozone Laundry	20,275	100%	20,277	0.86	17,438
	Pipe Insulation	88,992	100%	88,956	0.86	76,502
	Small Commercial Thermostat	715	1000%	7,146	0.86	6,145
	Steam Trap	1,030,898	100%	1,031,074	0.86	886,724
	Water Heater	38	100%	38	0.86	33
Program Tota	al or Weighted Average	2,046,331	100%	2,052,803	0.86	1,765,411

### Table 4-1. 2020 Annual Energy Savings by Measure – Program Total

\* 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\_2020.



Program Management	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
	Commercial Weather Stripping	31	100%	31	0.86	27
Direct Install	Low Flow Faucet Aerator	37,172	100%	37,068	0.86	31,879
Direct Install	Low Flow Showerhead	378	100%	378	0.86	325
	Spray Valve	237	100%	237	0.86	204
	Boiler Tune Up, Process	279,064	100%	279,064	0.86	239,995
	Boiler Tune Up, Space Heating	22,400	100%	22,400	0.86	19,264
	Combination Oven	1,819	100%	1,820	0.86	1,565
	Demand Controlled Ventilation	81,365	100%	81,365	0.86	69,974
	Fryer	23,680	100%	23,680	0.86	20,365
Prescriptive	High Efficiency Boiler	29,983	100%	29,983	0.86	25,786
	High Efficiency Furnace	18,379	100%	18,379	0.86	15,806
	Infrared Heater	33,374	100%	33,374	0.86	28,702
	Ozone Laundry	20,275	100%	20,277	0.86	17,438
	Pipe Insulation	88,992	100%	88,956	0.86	76,502
	Small Commercial Thermostat	699	1000%	6,991	0.86	6,012
	Steam Trap	1,019,657	100%	1,019,834	0.86	877,057
Program Total	or Weighted Average	1,657,505	100%	1,663,837	0.86	1,430,900

### Table 4-2. 2020 Annual Energy Savings by Measure – Private Sector

\* 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\_2020.



Program Management	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
	Commercial Weather Stripping	165	100%	165	0.86	142
Direct Install	Low Flow Faucet Aerator	8,930	100%	8,928	0.86	7,678
	Low Flow Showerhead	1,372	100%	1,372	0.86	1,180
	Boiler Tune Up, Space Heating	159,621	100%	159,621	0.86	137,274
	Demand Controlled Ventilation	1,690	100%	1,690	0.86	1,453
	High Efficiency Boiler	197,564	100%	197,564	0.86	169,905
Dressriptive	High Efficiency Furnace	5,033	100%	5,036	0.86	4,331
Flesciptive	Infrared Heater	3,157	100%	3,157	0.86	2,715
	Small Commercial Thermostat	15	1000%	155	0.86	133
	Steam Trap	11,240	100%	11,240	0.86	9,667
	Water Heater	38	100%	38	0.86	33
Program Total	or Weighted Average	388.826	100%	388.966	0.86	334.511

### Table 4-3. 2020 Annual Energy Savings by Measure – Public Sector

\* 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\_2020.

## **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%. Appendix A provides a description of the impact analysis methodology. Table B-1 in Appendix B shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing this impact evaluation report.

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	Realization Rate	Data Source(s)*
Boiler Tune Up, Process	Each	Varies	Varies	100%	TRM v8.0† - 4.4.3
Boiler Tune Up, Space Heating	Each	Varies	Varies	100%	TRM v8.0 - 4.4.2
Combination Oven	Each	363.7	364.0	100%	TRM v8.0 - 4.2.1
Commercial Weather Stripping	Linear Ft.	3.44	3.44	100%	TRM v8.0 - 4.8.16
Demand Controlled Ventilation	Sensor	Varies	Varies	100%	TRM v8.0 - 4.4.19
Fryer	Each	Varies	Varies	100%	TRM v8.0 - 4.2.7
High Efficiency Boiler	Each	Varies	Varies	100%	TRM v8.0 - 4.4.10
High Efficiency Furnace	Each	Varies	Varies	100%	TRM v8.0 - 4.4.11
Infrared Heater	Each	451.0	451.0	100%	TRM v8.0 - 4.4.12
Low Flow Faucet Aerator	Each	Varies	Varies	100%	TRM v8.0 - 4.3.2
Low Flow Showerhead	Each	Varies	Varies	100%	TRM v8.0 - 4.3.3
Ozone Laundry	Each	Varies	Varies	100%	TRM v8.0 - 4.3.6
Pipe Insulation	Linear Ft.	Varies	Varies	100%	TRM v8.0 - 4.4.14
Small Commercial Thermostat	Each	Varies	Varies	1000%	TRM v8.0 - 4.4.48
Spray Valve	Each	Varies	Varies	100%	TRM v8.0 - 4.2.11
Steam Trap	Each	Varies	Varies	100%	TRM v8.0 - 4.4.16
Water Heater	Each	Varies	Varies	100%	TRM v8.0 - 4.3.1

### Table 5-1. Verified Gross Savings Parameters

\* Program Tracking Data (PTD) provided by Nicor Gas, extract dated January 31, 2021.

† State of Illinois Technical Reference Manual version 8.0 (TRM v8.0) from http://www.ilsag.info/technical-reference-manual.html.

### **5.2 Findings and Recommendations**

### 5.2.1 Boiler Tune Up, Process

The realization rate for the Boiler Tune Up, Process measure is 100%. The tracking data erroneously reported the boiler input heating capacity of project PRJ-2773741 as 291,000 Btu/h. This resulted in a gross savings realization rate of 1%. We requested project application documents and the vendor's tune-up report from Nicor Gas to resolve the discrepancy. After reviewing the documents, we confirmed the capacity was 29,100,000 Btu/h, which resulted in a 100% realization rate. Nicor Gas tracks heating input capacity in units of Btu/h, while the TRM v8.0 algorithm uses "kBtu/hr" (1,000 Btu per hour) and the application form records "MBTUH" (also 1,000 Btu per hour, but MBTUH is commonly used in the trade).

**Recommendation 1.** Ensure the savings inputs are being reported correctly. Tracked input values should match the units used in the Illinois Technical Reference Manual (TRM) algorithms and application forms.

### 5.2.2 Low Flow Showerhead

The Low Flow Showerhead has a realization rate of 100%. One project ID PRJ-2388713 installed 40 showerheads with 2.0 gallons per minute high efficiency flow rate. The evaluation team verified the measure specs from the model number. The comparatively large quantity installed was plausible for the High School building type, and Nicor Gas confirmed the count represented the project.

### 5.2.3 Pipe Insulation

The Pipe Insulation measure has a realization rate of 100%. For Project IDs PRJ-2548224 and PRJ-2548226, the implementation contractor assumed year-round recirculation input values to calculate ex ante savings with 8,766 Equivalent Full Load Hours (EFLH), although 1,430 hours were reported in the tracking system. The evaluation team confirmed with Nicor Gas that the recirculation is year-round and the verified savings agreed with the ex ante savings. The discrepancy can be seen in the examples listed in Table 5-2.

Measure Name	Project ID	Reported EFLH	EFLH Assumed in Ex Ante Savings	Discrepancy
Pipe Insulation, Indoor LPS Space Heat	PRJ-2548224	1430	8766	Yes
Pipe Insulation, Indoor LPS Space Heat	PRJ-2548226	1430	8766	Yes
Pipe Insulation, Indoor HW Space Heat	PRJ-2548693	4963	4963	No
Pipe Insulation, Indoor LPS Space Heat	PRJ-2773730	4963	4963	No

### Table 5-2. Pipe Insulation EFLH Discrepancy

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

**Recommendation 2.** To avoid the evaluation risk resulting from adjusting savings, include a field in the tracking data provided to evaluators that indicates when a pipe insulation measure is installed on a year-round recirculation system or heating season recirculation.



### 5.2.4 Small Commercial Thermostat

The realization rate for Small Commercial Thermostats is 1000%. The ex-post verified savings for this measure are calculated using the algorithm of TRM v8.0 section 4.4.48, as shown in Figure 5-1. This algorithm produces a savings value ten times greater than the ex-ante value. Guidehouse found that the ex-ante savings divided the therms savings by 1,000,000 rather than the deemed 100,000 Btu/Therm.

### Figure 5-1. Small Commercial Thermostat Therms Savings Algorithm

NATURAL GAS SAVINGS

```
ΔTherms = (EFLH<sub>heat</sub> * Capacity * 1/AFUE * Heating_Reduction)/ 100,000Btu/Therm
```

Source: TRM v8.0, section 4.4.48.

**Recommendation 3.** Correct the savings input error in the tracking system for consistency with the TRM.

### 5.2.5 Storage Water Heater

The Water Heater measure has a realization rate of 100%. The provided tracking data rounded the value for baseline efficiency ( $UEF_{gasbase}$ ) to 0.6. However, the calculation to determine this value (Equation 5-1) shows it should be 0.5667. The tracking data inputs used can be seen in Table 5-3.

### **Equation 5-1.Storage Water Heater Baseline Efficiency**

Equipment Type	Sub Category	Federal Standard – Uniform Energy Factor <sup>262</sup>
	≤55 gallon tanks,	UEF = 0.6483 – (0.0017 * Rated Storage Volume in
Residential	>4000 Btu/h/gal	Gallons)
Gas Storage Water Heaters ≤75,000 Btu/h	>55 gallon and ≤100 gallon tanks, >4000 Btu/h/gal	UEF = 0.7897 – (0.0004 * Rated Storage Volume in Gallons)

Source: TRM v8.0, section 4.3.1.

### Table 5-3. Storage Water Heater Savings Inputs

Measure	Project ID	Size (Gallons)	Hot Water Use (Gallons)	UEF <sub>gasbase</sub>	UEF <sub>Eff</sub>	Gross Therms Realization Rate (RR)
Storage Water Heater, >0.67 EF	PRJ-2512215	48	16386	0.6	0.73	100%

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

**Recommendation 4.** If savings inputs are deemed in the TRM, the implementation contractor should ensure that deemed inputs are applied consistently as found in the TRM. Rounding the inputs might underestimate or overestimate expected deemed savings.



## Appendix A. Impact Analysis Methodology

Guidehouse calculated the verified ex-post gross savings for each research category by conducting a review of the tracking data and applying the algorithms of the TRM v8.0<sup>1</sup>. The evaluation team checked that provided savings inputs matched what was in the TRM v8.0, and that custom inputs were used properly or adjusted as necessary. Then the savings algorithms were applied to determine the ex-post savings of each measure. Verified gross realization rates are calculated by dividing the ex-post calculated savings by the reported ex-ante gross savings.

<sup>&</sup>lt;sup>1</sup> Available on the SAG web site: http://www.ilsag.info/technical-reference-manual.html

## Appendix B. Program Specific Inputs for the Illinois TRC

Table B-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.

Program Path	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Direct Install	Commercial Weather Stripping	Linear Feet	19	10.0	196	196	169
	Low Flow Faucet Aerator	Each	2,876	10.0	46,101	45,996	39,556
	Low Flow Showerhead	Each	105	10.0	1,751	1,751	1,506
	Spray Valve	Each	1	5.0	237	237	204
Prescriptive	Boiler Tune Up, Process	Each	24	3.0	279,064	279,064	239,995
	Boiler Tune Up, Space Heating	Each	82	3.0	182,021	182,021	156,538
	Combination Oven	Each	5	12.0	1,819	1,820	1,565
	Demand Controlled Ventilation	Senso r	355	10.0	83,055	83,055	71,427
	Fryer	Each	10	12.0	23,680	23,680	20,365
	High Efficiency Boiler	Each	56	25.0	227,547	227,547	195,691
	High Efficiency Furnace	Each	72	17.0	23,412	23,415	20,137
	Infrared Heater	Each	81	12.0	36,531	36,531	31,417
	Ozone Laundry	Each	5	10.0	20,275	20,277	17,438
	Pipe Insulation	Linear Feet	9,999	15.0	88,992	88,956	76,502
	Small Commercial Thermostat	Each	15	11.0	715	7,146	6,145
	Steam Trap	Each	1,227	6.0	1,030,898	1,031,074	886,724
	Water Heater	Each	1	15.0	38	38	33
Total or Weighted Average				8.5	2,046,331	2,052,803	1,765,411

### Table B-1. Verified Cost Effectiveness Inputs