



C&I and Public Sector Custom Program Impact Evaluation Report

Energy Efficiency Plan: Program Year 2023
(1/1/2023-12/31/2023)

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Peoples Gas and North Shore Gas

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1. Introduction

This report presents the results of the impact evaluation of the Peoples Gas (PGL) and North Shore Gas (NSG) 2023 Custom programs and a summary of the energy impacts for the total program, as well as relevant measure and program structure details. The appendix presents the impact analysis methodology. Program year 2023 covers January 1, 2023 through December 31, 2023.

2. Program Description

The Custom program provides PGL and NSG private sector commercial and industrial (C&I) and public sector (PS) customers with rebates on a custom basis; these are applications for measures not covered under the Prescriptive Rebate path. Typical market sectors for this program include larger customers in light and heavy manufacturing, hospitals, hotels, public sector facilities, and other process heating intensive businesses.

Custom rebates are on a dollar per therm basis, subject to payback and project cost limitations. PGL and NSG may revise eligible measures and incentives as driven by current market conditions, changes to codes and standards, technology, evaluation results, and program management knowledge.

The PGL Custom program had 22 participants in 2023 and completed 35 retrofits, as shown in Table 2-1.

Table 2-1. 2023 Volumetric Summary for PGL

Participation	Private	Public	Total
Participants *	14	8	22
Installed Retrofits †	23	12	35

* Participants are defined as unique work order IDs

† Installed Projects are defined as unique retrofit for each participant

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

The NSG program had four participants in 2023 and completed seven retrofits, as shown in Table 2-2.

Table 2-2. 2023 Volumetric Summary for NSG

Participation	Private	Public	Total
Participants *	3	1	4
Installed Retrofits †	6	1	7

* Participants are defined as unique work order IDs

† Installed Projects are defined as unique retrofit for each participant

Source: North Shore Gas tracking data and Guidehouse evaluation team analysis.

3. Program Savings Detail

Table 3-1 summarizes the energy savings the PGL Custom Program achieved by sector in 2023.

Table 3-1. 2023 Annual Energy Savings Summary for PGL

Program Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Private	392,252	115%	452,916	0.74	335,158
Public	119,585	101%	120,930	0.92	111,256
Total or Weighted Average	511,838	112%	573,847	0.78	446,414

Note: Totals may not sum due to rounding.

* 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 website: https://www.ilsag.info/ntg_2023.

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

Table 3-2 summarizes the energy savings the NSG Custom Program achieved by sector in 2023.

Table 3-2. 2023 Annual Energy Savings Summary for NSG

Program Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Private	116,641	99%	115,714	0.74	85,628
Public	14,295	102%	14,535	0.92	13,372
Total or Weighted Average	130,936	99%	130,249	0.76	99,000

* 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 website: https://www.ilsag.info/ntg_2023.

Source: North Shore Gas tracking data and Guidehouse evaluation team analysis.

4. Program Savings by Measure

The Custom Program does not offer prescribed measures. The measures included in Table 4-1 and Table 4-2 have been manually characterized by the evaluation team. The realization rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings for a sample of the Custom program projects. Realization rate findings for individual sampled projects are provided in Appendix B.

Of the 35 retrofits completed for the 22 participants in PY2023, the PGL program rebated six types of measures for private sector participants and six type of measures for public sector participants in 2023 as shown in Table 4-1. The Pipe Insulation and Demand Control Ventilation measures contributed the most savings.

Table 4-1. 2023 Annual Energy Savings by Measure for PGL

Program Category	Savings Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG [†]	Verified Net Savings (Therms)
Private	Boiler Combustion Controls	49,144	125%	61,304	0.74	45,365
	Boiler Replacement	26,676	125%	33,277	0.74	24,625
	Demand Control Ventilation	101,761	125%	126,940	0.74	93,935
	HVAC Other	6,625	102%	6,737	0.74	4,985
	Pipe Insulation	196,833	108%	213,258	0.74	157,811
	Space Conditioning Controls	11,213	102%	11,401	0.74	8,437
Private Subtotal		392,252	115%	452,916	0.74	335,158
Public	Boiler Combustion Controls and Condensate Recovery	17,226	102%	17,515	0.92	16,114
	Boiler Condensate Recovery	3,881	110%	4,252	0.92	3,911
	HVAC Custom	1,515	110%	1,659	0.92	1,527
	Pipe Insulation	83,852	100%	84,173	0.92	77,439
	Process Other	5,320	102%	5,409	0.92	4,976
	Space Conditioning Controls	7,792	102%	7,922	0.92	7,289
Public Subtotal		119,585	101%	120,930	0.92	111,256
Total or Weighted Average		511,838	112%	573,847	0.78	446,414

Note: Totals may not sum due to rounding.

† A deemed value. Available on the SAG website: https://www.ilsag.info/ntg_2023.

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

Of the seven retrofits completed for the four participants in PY2023, the NSG program rebated one type of measure for private sector participants and one type of measure for public sector participants in 2023 as shown in Table 4-2. The Pipe Insulation measure contributed the most savings.

Table 4-2. 2023 Annual Energy Savings by Measure for NSG

Program Category	Savings Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG [†]	Verified Net Savings (Therms)
Private	Pipe Insulation	116,641	99%	115,714	0.74	85,628
Public	Space Conditioning Controls	14,295	102%	14,535	0.92	13,372
Total or Weighted Average		130,936	99%	130,249	0.76	99,000

† A deemed value. Available on the SAG website: https://www.ilsag.info/ntg_2023.

Source: North Shore Gas tracking data and Guidehouse team analysis.

5. Impact Analysis Findings and Recommendations

5.1 Impact Parameter Estimates

Table 5-1 shows the realization rate and data source from the evaluation review. The realization rate is the ratio of the verified savings to the ex ante savings. Following Table 5-1, we provide findings and recommendations from the evaluation. Appendix A provides a description of the impact analysis methodology. Realization rates and findings for individual sampled projects are provided in **Error! Reference source not found.** Appendix B. Appendix C provides the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing this impact evaluation report.

Table 5-1. 2023 Verified Gross Savings Parameters

Measure	Unit Basis	Ex Ante Gross (Therms/unit)	Verified Gross (Therms/unit)	Realization Rate	Data Source(s)
PGL Custom	Project	Vary	Vary	112%	PGL/NSG Program Tracking Data (PTD*), Illinois Technical Reference Manual (IL-TRM) v11.0†, Project File, Utility Data, Site Specific Verification‡
NSG Custom	Project	Vary	Vary	99%	PGL/NSG Program Tracking Data (PTD*), Illinois Technical Reference Manual (IL-TRM) v11.0†, Project File, Utility Data, Site Specific Verification‡

* Program Tracking Data (PTD) provided by Peoples Gas and North Shore Gas; extract dated January 30, 2024.

† State of Illinois Technical Reference Manual version 11.0 from <http://www.ilsag.info/technical-reference-manual.html>.

‡ Project files and monthly billing data provided by Peoples Gas and North Shore Gas. When conducted, on-site and telephone interview data collected by Guidehouse.

5.2 Findings and Recommendations

The evaluation team found the largest deviation from ex ante savings was in one Boiler Replacement retrofit and one Demand Control Ventilation retrofit. The evaluation team also found discrepancies in Program Tracking Data (PTD) and project files. General findings and recommendations are presented below. The detailed realization rates and evaluation findings for individual sampled projects are provided in **Error! Reference source not found.**

Finding 1. For projects WO-4550349, WO-4297008, and WO-5231436, the net savings reported in the Program Tracking Data (PTD) file used a Net-to-Gross Ratio (NTGR) of 0.74. These sites are Public Sector and should use a NTGR of 0.92.¹ The evaluation team generally uses the net savings from the PTD and the NTGR to back calculate gross savings, but used the gross savings directly from the project files for these three projects to avoid the impact of the incorrect NTGR.

¹ Net-to-Gross Ratio from https://www.ilsag.info/ntg_2023.

Recommendation 1. Provide both Gross Savings and Net Savings for projects in the PTD. Conduct QC of the PTD to ensure the corresponding NTGR is applied for each project based on its business sector.

Finding 2. For project WO-4298219, three entries were submitted in the PTD with one entry being the sum of the other two entries. Only two measures were installed at this participating site and the third entry was identified to be a duplication and should be excluded from the PTD. The evaluation team used the gross savings of the two installation measures from the project file and excluded any savings claimed under the third entry.

Recommendation 2. Conduct QC of the PTD to ensure projects and measures are not claimed more than once.

Finding 3. For Boiler Replacement project WO-4298219, the ex ante load distribution for the boilers was evenly distributed between the boilers, which did not match the actual operating sequence of the system. The verified savings was updated to address this issue. Also, the ex ante calculator claimed 4% baseline cycling loss toward the efficiency gain for the new boiler. Due to the boiler efficiency used in the calculator already included the baseline turndown, the evaluation team excluded the 4% cycling factor from the savings calculation. The RR of this project is at 154%, which is highly relevant to the load distribution adjustment.

Recommendation 3. For Boiler Replacement projects with multiple boilers onsite, confirm and apply the correct load for each boiler for accurate savings results. Documentation to support the load estimates should be collected and provided along with the project files.

Finding 4. For Demand Control Ventilation Project WO-4298112, the implementation contractor provided additional information to correct the outside airflow used in the calculator, which increased the savings considerably. The ex ante calculator was not developed for the purpose of quantifying savings using outside airflow as the full supply airflow. The evaluator updated to use a simplified calculator with a focus on the outside airflow and adjusted the unoccupied hours Air Change Hour (ACH) from 4 to 3 to better accommodate the post installation setpoint of 2-4 ACH. Also, the project summary described four contaminations occurring per week, during which the air change in the labs was maintained at a high level. Since during these occurrences, the baseline and post installation air change are consistent, the evaluation team excluded any energy savings from the hours with a contamination. These updates resulted in a RR of 144%.

Recommendation 4. For custom projects, available calculators should be used in the designated approach with correct key inputs and parameters based on system operation. If possible, collect and provide baseline and post installation trending data to support key inputs and parameters.

Finding 5. For Pipe Insulation Projects WO-4298210, WO-4550349, WO-4478542, WO-4296726, WO-4297121, WO-4297077, WO-4297008, WO-4297935, and WO-4466359, no reference documentation was provided for the boiler efficiency used in the ex ante calculations. The evaluation team updated the boiler efficiency based on one of the following references: site

record, boiler plant info, boiler tune-up record, communication with customer, or IL-TRM Version 11 Section 4.4.14. The Realization Rates (RRs) of these projects ranged from 96% to 106%.

Recommendation 5. For Pipe Insulation projects, provide the references and/or data sources for the boiler efficiency as well as other key inputs and parameters, including pipe and fitting quantify, size, insulation material, and operating temperatures.

Finding 6a. For Space Conditioning Controls Project WO-4297270, the ex ante Air Handling Unit (AHU) airflow did not match the air test and balance report. The evaluator updated the AHU airflow to 31,108 CFM, and the project received a RR of 109%.

Finding 6b. For Pipe Insulation Project WO-4478542 and WO-4634471, the insulation thicknesses used in ex ante calculations are not consistent with the customer communication results or the purchase documentation. The evaluation team updated the thicknesses of insulation for these two projects, which resulted in RRs of 98% and 103%.

Recommendation 6. For custom projects, double-check the inputs in the calculator against available project documentation to ensure the key parameters are consistent with the project installation scope and the equipment documentation.

Finding 7. For Space Conditioning Controls Project WO-4297270, the ex ante calculation missed an input for December average outdoor air temperature, which was a key input directly impacting calculated usage during the month of December. The evaluation team addressed this issue, which resulted in a reduction in savings. Due to other changes made to this project savings during evaluation, the RR of this project is 109%.

Recommendation 7. For custom projects, enhance the QC process of the savings calculator to avoid missing key inputs and components in the calculation algorithm.

Appendix A. Impact Analysis Methodology

The evaluation team conducted site-specific research to verify project savings that were not based on measures specified in the TRM. Projects were randomly selected through 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, based on gross energy savings boundaries that placed about one-third of program-level savings into each stratum. Projects making up the bottom 2% savings of the program are categorized as Strata 4 and not selected for sample reviews. Table A-1 shows a profile of the sample selection. Table A-2 shows the sample precision for PGL and NSG projects combined.

Table A-1. 2023 Profile of Gross Impact Sample for Custom Projects

Population Summary				Sample Summary		
Program	Sampling Strata	Number of Projects (N)	Ex Ante Gross Savings (Therms)	n	Ex Ante Gross Savings (Therms)	Sampled % of Population (% Therms)
PGL NSG Custom	1	4	236,651	4	236,651	100%
	2	5	195,703	4	156,413	80%
	3	14	200,370	8	140,864	70%
	4	3	10,050	0	-	0%
TOTAL or Weighted Average		26	642,774	16	533,928	83%

Source: Guidehouse evaluation team analysis.

Table A-2. 2023 Gross Realization Rates and Relative Precision at 90% Confidence Level

Program	Strata	Relative Precision + or -%	Mean RR	Standard Error
PGL NSG Custom	1	0%	125%	0.00
	2	1%	99%	0.01
	3	1%	102%	0.01
	4	NA	NA	NA
Custom Total RR (90/10)		0%	110%	0.00

Source: Guidehouse evaluation team analysis

Engineering Review of 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 measure in the sampled project, engineers estimated verified 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), pre-inspection reports and photos, post inspection reports and photos, and calculation spreadsheets.

On-Site Data Collection

During the 2023 evaluation, onsite visits to collect project data were completed for a subset of three of the 16 custom program participants. Communication with customers through phone calls were completed for a subset of four of the 16 custom program participants.

Appendix B. Impact Analysis Supplemental Information

Table B-1 provides a summary of verification results and adjustments for the PGL and NSG sampled projects.

Table B-1. 2023 PGL and NSG 2023 Summary of Sample M&V Results

Project ID	Measure	Program	Realization Rate	Comments
WO-4298112	Demand Control Ventilation	PG C&I Custom	144%	Increased baseline OA% based on info provided by contractor; increased ventilation for unoccupied hours based on documentation; accounted for four contamination occurrences per week during occupied hours; updated to a simplified calculator.
WO-4298210	Pipe Insulation	PG C&I Custom	99%	Adjusted boiler efficiency to be 82.7% based on site records. 3E Plus results used in verified savings calculation.
WO-4298219	Boiler Replacement	PG C&I Custom	154%	Updated boiler load distribution in the calculation. Excluded 4% baseline cycling loss from the savings.
WO-4298201	Boiler Combustion Controls	PG C&I Custom	100%	No adjustment
WO-4550349	Pipe Insulation	PG Public Custom	96%	Adjusted boiler efficiency to be 85% based on communication with customer. 3E Plus results used in verified savings calculation.
WO-4478542	Pipe Insulation	NSG C&I Custom	98%	Adjusted boiler efficiency to be 80.7% based on IL-TRM Section 4.4.14. 3E Plus results used in verified savings calculation. Insulation thickness updated to 1.5 inch based on documentation and customer communication.
WO-4296726	Pipe Insulation	NSG C&I Custom	101%	Adjusted boiler efficiency to be 80.7% based on IL-TRM Section 4.4.14. 3E Plus results used in verified savings calculation.
WO-4297121	Pipe Insulation	PG C&I Custom	102%	Adjusted boiler efficiency to be 82% based on previous boiler tune-up results. 3E Plus results used in verified savings calculation.

Project ID	Measure	Program	Realization Rate	Comments
WO-4297077	Pipe Insulation	PG C&I Custom	102%	Adjusted boiler efficiency to be 80.7% based on IL-TRM Section 4.4.14. 3E Plus results used in verified savings calculation.
WO-4297008	Pipe Insulation	PG Public Custom	100%	Adjusted boiler efficiency to be 80.7% based on IL-TRM Section 4.4.14. 3E Plus results used in verified savings calculation.
WO-4297935	Pipe Insulation	PG C&I Custom	99%	Adjusted boiler efficiency to be 87.4% based on boiler plant info. 3E Plus results used in verified savings calculation.
WO-4296795	Space Conditioning Controls	NSG Public Custom	100%	No adjustment
WO-4466359	Pipe Insulation	PG C&I Custom	106%	Adjusted boiler efficiency to be 80.7% based on IL-TRM Section 4.4.14. 3E Plus results used in verified savings calculation.
WO-5231436	Pipe Insulation	PG Public Custom	100%	No adjustment
WO-4297270	Space Conditioning Controls	PG C&I Custom	109%	AHU airflow is updated to 31,108 CFM. Converted to use a temperature bin analysis. Included December temperature in the verified savings which was missing in the ex ante analysis.
WO-4634471	Pipe Insulation	PG C&I Custom	103%	Updated the insulation thickness to 3 inch based on purchase order. 3E Plus results used in verified savings calculation.

Source: Guidehouse evaluation analysis of program data.

Appendix C. Program Specific Inputs for the Illinois TRC

Table C-1 and Table C-2 show the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing this impact evaluation report. Currently, additional required cost data (e.g., measure costs, program level incentive, and non-incentive costs) are not included in Table C-1 and Table C-2 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. 2023 Verified Cost Effectiveness Inputs – PGL

Program Category	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Private	Boiler Combustion Controls	Project	1	20	49,144	61,304	45,365
	Boiler Replacement	Project	1	25	26,676	33,277	24,625
	Demand Control Ventilation	Project	1	10	101,761	126,940	93,935
	HVAC Custom	Project	1	15	6,625	6,737	4,985
	Pipe Insulation	Project	9	15	196,833	213,258	157,811
	Space Conditioning Controls	Project	1	15	11,213	11,401	8,437
Public	Boiler Combustion Controls and Condensate Recovery	Project	1	17.5	17,226	17,515	16,114
	Boiler Condensate Recovery	Project	1	15	3,881	4,252	3,911
	HVAC Custom	Project	1	15	1,515	1,659	1,527
	Pipe Insulation	Project	3	15	83,852	84,173	77,439
	Process Custom	Project	1	16	5,320	5,409	4,976
	Space Conditioning Controls	Project	1	15	7,792	7,922	7,289
Total or Weighted Average			22	15.1	511,838	573,847	446,414

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

Table C-2. 2023 Verified Cost Effectiveness Inputs – NSG

Program Category	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Private	Pipe Insulation	Project	3	15	116,641	115,714	85,628
Public	Space Conditioning Controls	Project	1	15	14,295	14,535	13,372
Total or Weighted Average			4	15.0	130,936	130,249	99,000

Source: North Shore Gas tracking data and Guidehouse evaluation team analysis.