C&I and Public Sector Custom Program Impact Evaluation Report

Energy Efficiency Plan: Program Year 2022 (1/1/2022-12/31/2022)

Prepared for:

Peoples Gas and North Shore Gas

FINAL

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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) 2022 commercial and industrial and public sector Custom programs and a summary of the energy impacts for the total program broken out by relevant measure and program structure details. The appendices present the impact analysis methodology and Illinois total resource cost (TRC) inputs. Program year 2022 covers January 1, 2022 through December 31, 2022.

2. Program Description

The Custom Rebate path provides private sector commercial and industrial (C&I) and public sector (PS) customers with rebates on a custom basis; these are applications that include measures not covered under the Prescriptive Rebate path. For example, burner replacement measures may fall into the Custom Rebate category. New construction projects not participating through the coordinated Non-Residential New Construction program may be treated through the Custom Program[1].

Custom rebates are provided on a dollar per therm basis, subject to limits for payback and project cost. 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. Typical market sectors for this program include larger customers in light and heavy manufacturing, steel and metal working, plastics compounding, and processing, hospitals, food processing, hotels, public sector facilities, commercial laundry and other process heating intensive businesses.

The PGL Custom program had 17 participants in 2022 and completed 23 retrofits, as shown in Table 2-1. No custom new construction projects were completed in the 2022 Custom program.

Table 2-1. 2022 Volumetric Summary for PGL

Participation	Private	Public	Total
Custom Program			
Participants *	12	5	**17**
Installed Retrofits †	17	6	**23**

* Participants are defined as unique project IDs

† Installed Retrofits are defined as unique retrofit for each participant

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

[1] The net savings for Non-Residential New Construction projects coordinated with ComEd are tracked and reported separately, and are not in this Custom Program evaluation report.

The NSG Custom program had two participants in 2022 and completed two retrofits, as shown in Table 2-2.

Table 2-2. 2022 Volumetric Summary for NSG

Participation	Private	Public	Total
Custom Program			
Participants *	1	1	**2**
Installed Retrofits †	1	1	**2**

* Participants are defined as unique project IDs
† Installed Retrofits are defined as unique retrofit for each participant
Source: North Shore Gas tracking data and Guidehouse evaluation team analysis.

3. Savings Summary

Table 3-1 summarizes the energy savings the PGL Custom program achieved by the custom path in 2022.

Table 3-1. 2022 Annual Energy Savings Summary for PGL

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Private	564,456	111%	628,121	0.74	464,810
Public	390,844	102%	396,739	0.92	365,000
Total or Weighted Average	**955,299**	**107%**	**1,024,860**		**829,809**

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 for a sample of Custom Program projects.

† Net-to-Gross (NTG): A deemed value. Available on the Stakeholders Advisory Group (SAG) website: https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/.

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

Table 3-2 summarizes the energy savings achieved by the NSG Custom program in 2022.

Table 3-2. 2022 Annual Energy Savings Summary for NSG

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms	NTG†	Verified Net Savings (Therms)
Private	2,458	99%	2,429	0.74	1,798
Public	12,120	99%	11,979	0.92	11,021
Total or Weighted Average	**14,577**	**99%**	**14,409**		**12,819**

* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings for a sample of Custom Program projects.

† Net-to-Gross (NTG): A deemed value. Available on the Stakeholders Advisory Group (SAG) website: https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/.

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.

Table 4-1. 2022 Annual Energy Savings by Measure for PGL

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Private	Process Custom	173,156	116%	201,438	0.74	149,064
	Pipe Insulation	163,470	99%	161,581	0.74	119,570
	Boiler Combustion Controls	152,007	116%	176,327	0.74	130,482
	Boiler Exhaust Damper Automation	45,376	122%	55,263	0.74	40,895
	Boiler Condensate Recovery	15,555	99%	15,376	0.74	11,378
	Waste Heat Recovery	14,891	122%	18,136	0.74	13,421
Private Subtotal		***564,456***	***111%***	***628,121***	***0.74***	***464,810***
Public	Pipe Insulation	325,008	102%	331,664	0.92	305,131
	Process Custom	35,338	99%	34,930	0.92	32,135
	HVAC Custom	27,139	99%	26,825	0.92	24,679
	Space Conditioning Controls	3,359	99%	3,320	0.92	3,054
Public Subtotal		***390,844***	***102%***	***396,739***	***0.92***	***365,000***
Total or Weighted Average		**955,299**	**107%**	**1,024,860**		**829,809**

Note: Totals may not sum due to rounding.

* Realization rate shown is based on the full sample of projects and is not measure-specific.

† Net-to-Gross (NTG): A deemed value. Available on the Stakeholders Advisory Group (SAG) website: https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/.

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

Table 4-2. 2022 Annual Energy Savings by Measure for NSG

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Private	Process Custom	2,458	99%	2,429	0.74	1,798
Public	Boiler Combustion Controls	12,120	99%	11,979	0.92	11,021
Total or Weighted Average		**14,577**	**99%**	**14,409**		**12,819**

* Realization rate shown is based on the full sample of projects and is not measure-specific.

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 realization rate and data source from the evaluation team's review. The realization rate is the ratio of the verified savings to the ex ante savings. Following Table 5-1 are findings and recommendations. Appendix A provides a description of the impact analysis methodology. Realization rates and findings for individual sampled projects are provided in 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. Verified Gross Savings Parameters

Measure	Unit Basis	Ex Ante Gross (Therms/unit)	Verified Gross (Therms/unit)	Realization Rate	Data Sources
PGL Custom	Project	Vary	Vary	107%	Project File Review, History Billing Data, Telephone and Email Verification of Site-Specific Data*; IL-TRM v10.0†
NSG Custom	Project	Vary	Vary	99%	Project File Review, History Billing Data Telephone and Email Verification of Site-Specific Data*; IL-TRM v10.0†

* Program Tracking Data (PTD) provided by Peoples Gas and North Shore Gas; extracted March 07, 2023. Project files and billing data provided by Peoples Gas and North Shore Gas. Site-specific data collected by Guidehouse.
† Source of inputs for some non-site-specific data. Illinois Statewide Technical Reference Manual version 10.0 from http://www.ilsag.info/technical-reference-manual.html.

5.2 Findings and Recommendations

The evaluation team found the largest deviations from ex ante savings were in two Process Custom retrofits and one Boiler Combustion Controls retrofit. The detailed realization rates and evaluation findings for individual sampled projects are provided in Appendix B. General findings and recommendations follow.

Finding 1. For the Boiler Combustion Controls project 4217695, an oversize factor of 1.3 mistakenly was applied twice in the ex ante calculations. One of these factors was removed in the verified savings calculation.

> **Recommendation 1.** Review the custom program savings calculators, to avoid the same savings factor being applied twice.

Finding 2. For the Boiler Combustion Controls, Boiler Exhaust Damper Automation, and Process Custom projects which involve heating equipment efficiency increase (projects 3267276, 9603045 and 4217695), savings were calculated to be consumption * (1 – baseline efficiency/ post implementation efficiency). The verified savings were updated to be consumption * (post implementation efficiency/baseline efficiency - 1), considering the algorithm

used in the Illinois Statewide Technical Reference Manual (IL-TRM) version 10.0 Section 4.4.10.

Recommendation 2. When calculating savings for heating equipment efficiency increase projects, use the IL-TRM Section 4.4.10 algorithm of consumption * (post implementation efficiency/baseline efficiency - 1).

Finding 3. For the Process Custom project 6018341 to descale the heat recovery steam generators (HRSGs), the savings was calculated based on the steam production of the HRSGs. Based on IL-TRM v10.0 Section 4.4.49, descaling savings should be based on the input capacity of the boiler. The verified savings of the project was updated to be based on the input of the HRSGs.

Recommendation 3. For boiler and steam generator descaling measures, calculate the energy savings based on the equipment input capacity, instead of the equipment output.

Finding 4. For the Process Custom project 9603045 to descale boilers, the thermal efficiency gain of 2.5% from IL-TRM v10.0 Section 4.4.49 was used to quantify the boiler outlet temperature and resulted an increase of combustion efficiency. This combustion efficiency, along with estimated radiant loss and cycling loss, were then used to back calculate the thermal efficiency gain, and resulted in a different value than the original deemed value of 2.5%. The verified savings was updated to apply the thermal efficiency gain of 2.5% directly to the boiler annual consumption.

Recommendation 4. For boiler descaling measures, if site-specific efficiency gain information is collected, it should be used in the savings calculation; otherwise, apply the percent efficiency improvement from IL-TRM Section 4.4.49 directly in the savings calculations.

Finding 5. For the Pipe Insulation projects (3703126, 8904025, 9647486 and 7596866), no reference was provided for the pipe and fitting quantity, size, insulation material, or operating temperatures used in the savings calculator, except for the provided pipping and fitting lists. The evaluation team conducted reviews based on project costs and market rates of insulation to confirm the used values were in a reasonable range. These are key inputs to quantify the project energy savings.

Recommendation 5. For Pipeline Insulation projects, provide the references and/or data sources for the pipe and fitting quantify, size, insulation material, and operating temperatures.

Finding 6. In the ex ante calculators, there were hard coded inputs used to quantify savings without notes indicating the references or data sources.

Recommendation 6. Provide the references and data sources for the hard-coded inputs and use formulas and links instead of hard inputs where possible in the ex ante calculators. For key parameters, submit control system screenshots and/or trend data to support the calculators.

Finding 7. Project 3703126 measure net-to-gross (NTG) values were listed at 0.73 and all the remaining private and public custom projects NTG values were listed at 0.74. These values were not consistent with the deemed values listed on the Stakeholders Advisory Group (SAG) website.

Recommendation 7. Review and update the NTG values in the program tracking data to be consistent with the deemed values listed on the SAG website.

5.3 Historical Realization Rates and NTG Values

Table 5-2 shows the historical gross realization rates and NTG values for the Custom Program.

Table 5-2. Historical Realization Rates and NTG Values

Program Year	PGL Verified Gross RR	NSG Verified Gross RR	PGL NTG	NSG NTG
2018	104%	109%	0.69	0.69
2019	99%	63%	0.69	0.69
2020	99%	94%	0.74	0.74
2021	100%	100%	0.74	0.74
2022	107%	99%	0.74 (Private) 0.92 (Public)	0.74 (Private) 0.92 (Public)

* Beginning January 1, 2018, program year (PY) coincides with calendar year (CY).

Source: Guidehouse evaluation research.

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. The PGL and NSG custom projects were sampled together based on three strata determined by ex ante gross savings. The seventeen PGL Custom sampled projects represent 73% of the PGL Custom Program population gross therm savings. The two NSG Custom projects were only in strata three and the sampled project represented 83% of NSG population savings.

Table A-1 shows a profile of the PGL sample selection and Table A-2 shows the NSG sample selection. Table A-3 provides the sample precision for PGL and NSG combined.

Table A-1 Profile of Gross Impact Sample for PGL 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 Custom	1	1	325,008	1	325,008	100%
	2	3	305,882	2	255,508	84%
	3	13	324,409	6	119,192	37%
TOTAL or Weighted Average		**17**	**955,299**	**9**	**699,709**	**73%**

Source: Guidehouse evaluation team analysis

Table A-2. Profile of Gross Impact Sample for NSG 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)
NSG Custom	1	-	-	-	-	-
	2	-	-	-	-	-
	3	2	14,577	1	12,120	83%
TOTAL		**2**	**14,577**	**1**	**12,120**	**83%**

Source: Guidehouse evaluation team analysis

Table A-3. Gross Realization Rates and Relative Precision at 90% Confidence Level

Program	Strata	Relative Precision + or -%	Mean RR	Standard Error
PGL NSG Custom	1	0%	102%	0.00
	2	35%	122%	0.07
	3	2%	99%	0.01
Total RR (90/10)		**4%**	**107%**	**0.03**

Source: Guidehouse evaluation team analysis

A.1 Engineering Review of Project Files

For each selected project sample, an in-depth review was performed to assess the engineering methods, parameters and assumptions used to generate all ex ante impact estimates. For each measure in the sampled project, the evaluation team estimated verified (ex post) gross savings based on the 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. Site-specific information was also collected through email communications and a site visit during the 2023 evaluation.

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. PGL and NSG 2022 Summary of Sample M&V Results

Project ID	Measure	Program	Realization Rate	Comments
3267276	Process - Boiler Combustion Controls - PG C&I Custom 2022	PGL	105%	Boiler efficiency calculation was updated to be consumption * (post implementation efficiency/baseline efficiency - 1) to match IL-TRM Section 4.4.10 calculations for efficiency increase.
3267276	Process - Boiler Exhaust Damper Automation - PG C&I Custom 2022	PGL	105%	Boiler efficiency calculation was updated to be consumption * (post implementation efficiency/baseline efficiency - 1) to match IL-TRM Section 4.4.10 calculations for efficiency increase.
3703126	Process - Insulation >212 F - PG C&I Custom 2021	PGL	98%	3E Plus 4.1 was used to update calculations. Annual operating hours updated from 8,760 to 8,766 to match IL-TRM Section 4.4.14 default values.
3703126	Process - Insulation 100-212 F - PG C&I Custom 2021	PGL	98%	3E Plus 4.1 was used to update calculations. Annual operating hours updated from 8,760 to 8,766 to match IL-TRM Section 4.4.14 default values.
4217695	Process - Boiler Combustion Controls - NSG PS Custom 2022	NSG	88%	An oversize factor of 1.3 was applied twice in the ex ante calculation; removed one of the applications in the verified savings calculations. Boiler efficiencies were updated to be consistent across the calculator. Boiler efficiency calculation was updated to be consumption * (post implementation efficiency/baseline efficiency - 1) to match IL-TRM Section 4.4.10 calculations for efficiency increase.
6018341	Process - Other - PG C&I Custom 2022	PGL	138%	Updated the savings calculation to be based on HRSG input instead of production.
7596866	Process - Insulation >212 F - PG PS Custom 2022	PGL	102%	3E Plus 4.1 was used to update calculations. Annual operating hours updated from 8,760 to 8,766 to match IL-TRM Section 4.4.14 default values. Adjusted the equivalent length and surface area calculations to match IL-TRM.

Project ID	Measure	Program	Realization Rate	Comments
7596866	Process - Insulation 100-212 F - PG PS Custom 2022	PGL	102%	3E Plus 4.1 was used to update calculations. Annual operating hours updated from 8,760 to 8,766 to match IL-TRM Section 4.4.14 default values. Adjusted the equivalent length and surface area calculations to match IL-TRM.
8274941	HVAC - Space Conditioning Controls - PG PS Custom 2022	PGL	100%	No adjustment
8326081	HVAC - Other - PG PS Custom 2022	PGL	104%	Updated garage door size and applied a cold weather factor according to customer feedback.
8904025	Process - Insulation >212 F - PG C&I Custom 2022	PGL	100%	TRF values for production area were updated from 0.54 to 0.55 according to IL-TRM Section 4.4.14. Boiler efficiency was updated to 86.4% according to project 09603045.
8904025	Process - Insulation 100-212 F - PG C&I Custom 2022	PGL	100%	TRF values for production area were updated from 0.54 to 0.55 according to IL-TRM Section 4.4.14. Boiler efficiency was updated to 86.4% according to project 09603045.
9603045	Process - Other - PG C&I Custom 2022	PGL	75%	The thermal efficiency increase of 2.5% was updated to apply directly to the boiler usage, without the impact of cycling and radiant loss components. Boiler efficiency calculation was updated to be consumption * (post implementation efficiency/baseline efficiency - 1) to match IL-TRM Section 4.4.10 calculations for efficiency increase.
9647486	Process - Insulation >212 F - PG C&I Custom 2022	PGL	99%	Operating temperatures were updated from 219F to 218F as listed in the quality control inspection forms.

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. 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 – PGL

Program Path	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Private	Process Custom	Project	3	8.0	173,156	201,438	149,064
	Pipe Insulation	Project	8	15.0	163,470	161,581	119,570
	Boiler Combustion Controls	Project	3	18.6	152,007	176,327	130,482
	Boiler Exhaust Damper Automation	Project	1	15.0	45,376	55,263	40,895
	Boiler Condensate Recovery	Project	1	15.0	15,555	15,376	11,378
	Waste Heat Recovery	Project	1	15.0	14,891	18,136	13,421
Public	Pipe Insulation	Project	2	15.0	325,008	331,664	305,131
	Process Custom	Project	1	16.0	35,338	34,930	32,135
	HVAC Custom	Project	2	15.0	27,139	26,825	24,679
	Space Conditioning Controls	Project	1	15.0	3,359	3,320	3,054
Total or Weighted Average			**23**	**14.3**	**955,299**	**1,024,860**	**829,809**

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

Table C-2. Verified Cost Effectiveness Inputs – NSG

Program Path	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Private	Process Custom	Project	1	16.0	2,458	2,429	1,798
Public	Boiler Combustion Controls	Project	1	20.3	12,120	11,979	11,021
Total or Weighted Average			**2**	**19.6**	**14,577**	**14,409**	**12,819**

Note: Totals may not sum due to rounding.
Source: North Shore Gas tracking data and Guidehouse evaluation team analysis.