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|  | C&I and Public Sector Custom Program Impact Evaluation Report  Energy Efficiency Plan: Program Year 2023  (1/1/2023-12/31/2023) | | | | |
|  | Prepared for:  Peoples Gas and North Shore Gas  DRAFT  April 29, 2024 | | | | |
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# 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.

# 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.

# 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 | 104% | 406,984 | 0.74 | 301,168 |
| **Public** | 119,585 | 101% | 120,542 | 0.92 | 110,898 |
| **Total or Weighted Average** | **511,838** | **103%** | **527,526** |  | **412,067** |

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 web site: 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** |  | **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 web site: https://www.ilsag.info/ntg\_2023.

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

# 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.

The PGL program rebated six measures for private sector participants and six 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 | 105% | 51,835 | 0.74 | 38,358 |
| Boiler Replacement | 26,676 | 105% | 28,137 | 0.74 | 20,821 |
| Demand Control Ventilation | 101,761 | 105% | 107,333 | 0.74 | 79,426 |
| HVAC Custom | 6,625 | 102% | 6,737 | 0.74 | 4,985 |
| Pipe Insulation | 196,833 | 102% | 201,542 | 0.74 | 149,141 |
| Space Conditioning Controls | 11,213 | 102% | 11,401 | 0.74 | 8,437 |
| ***Private Subtotal*** | | ***392,252*** | ***104%*** | ***406,984*** | ***0.74*** | ***301,168*** |
| Public | Boiler Combustion Controls and Condensate Recovery | 17,226 | 102% | 17,515 | 0.92 | 16,114 |
| Boiler Condensate Recovery | 3,881 | 102% | 3,972 | 0.92 | 3,654 |
| HVAC Custom | 1,515 | 102% | 1,550 | 0.92 | 1,426 |
| Pipe Insulation | 83,852 | 100% | 84,173 | 0.92 | 77,439 |
| Process Custom | 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%*** | ***120,542*** | ***0.92*** | ***110,898*** |
| **Total or Weighted Average** | | **511,838** | **103%** | **527,526** |  | **412,067** |

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 web site: https://www.ilsag.info/ntg\_2023.

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

The NSG program rebated one measure for private sector participants and one 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** |  | **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 web site: <https://www.ilsag.info/ntg_2023>.

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

# Impact Analysis Findings and Recommendations

## 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 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 | 103% | 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.

## Findings and Recommendations

The evaluation team found the largest deviation from ex ante savings were in one Boiler Replacement 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 Appendix B.

**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]](#footnote-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.

**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 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 4.** 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 5a.** 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 5b.** 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 thicknessed of insulation for these two projects and resulted in RRs of 98% and 103%.

**Recommendation 5.** 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 6a.** 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%.

**Finding 6b.** For Demand Control Ventilation Project WO-4298112, the project summary described four contaminations occurring per week during which the air change in the labs were 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. This updated minorly impacted the verified savings, with a RR of 99%.

**Recommendation 6.** For custom projects, enhance the QC process of the savings calculator to avoid missing key inputs and components in the calculation algorithm.

##### 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 is 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 ‑. 2023 Profile of Gross Impact Sample for Custom Projects

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Population Summary** | | | **Sample Summary** | | |
| **Program** | **Sampling Strata** | **Number of Projects (N)** | **Ex Ante Gross Savings** | **n** | **Ex Ante Gross Savings** | **Sampled % of Population** |
| **(Therms)** | **(Therms)** | **(% 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** | **Mean RR** | **Standard Error** |
| **+ or -%** |
| PGL NSG Custom | 1 | 0% | 105% | 0.00 |
| 2 | 1% | 99% | 0.01 |
| 3 | 1% | 102% | 0.01 |
| 4 | NA | NA | NA |
| **Custom Total RR (90/10)** |  | **0%** | **102%** | **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.

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##### 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 | 99% | Accounted for four contamination occurrences per week during occupied hours. |
| 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. |
| 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.

##### 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 | 51,835 | 38,358 |
|  | Boiler Replacement | Project | 1 | 25 | 26,676 | 28,137 | 20,821 |
|  | Demand Control Ventilation | Project | 1 | 10 | 101,761 | 107,333 | 79,426 |
|  | HVAC Custom | Project | 1 | 15 | 6,625 | 6,737 | 4,985 |
|  | Pipe Insulation | Project | 9 | 15 | 196,833 | 201,542 | 149,141 |
|  | 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 | 3,972 | 3,654 |
|  | HVAC Custom | Project | 1 | 15 | 1,515 | 1,550 | 1,426 |
|  | 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** | **527,526** | **412,067** |

*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.*

1. Net-to-Gross Ratio from <https://www.ilsag.info/ntg_2023>. [↑](#footnote-ref-1)