



Business Program Evaluation Report

C&I Custom

FINAL

**Energy Efficiency Plan:
Gas Plan Year 5
(6/1/2015-5/31/2016)**

**Presented to
Peoples Gas and North Shore Gas**

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TABLE OF CONTENTS

E. Executive Summary	1
E.1 Program Savings	2
E.2 Impact Estimate Parameters for Future Use	2
E.3 Program Volumetric Detail	2
E.4 Findings and Recommendations	3
1. Introduction	5
1.1 Program Description.....	5
1.2 Evaluation Objectives.....	5
1.2.1 Impact Questions.....	5
1.2.2 Process Questions	5
2. Evaluation Approach	6
2.1 Overview of Data Collection Activities.....	6
2.2 Verified Savings Parameters.....	6
2.2.1 Verified Gross Program Savings Analysis Approach	6
2.2.2 Verified Net Program Savings Analysis Approach	7
2.3 Process Evaluation.....	8
3. Gross Impact Evaluation	9
3.1 Program Tracking Data Review	9
3.2 Program Volumetric Findings	9
3.3 Gross Program Impact Parameter Estimates	9
3.4 Verified Gross Program Impact Results	11
4. Net Impact Evaluation.....	12
5. Process Evaluation	14
6. Findings and Recommendations	15
7. Appendix	17
7.1 Detailed Impact Research Findings and Approaches.....	17
7.1.1 Gross Impact Sampling	17
7.1.2 Engineering Review of Project Files.....	17

LIST OF FIGURES AND TABLES

Tables

Table E-1. GPY5 Peoples Gas C&I Custom Program Natural Gas Savings.....	2
Table E-2. GPY5 North Shore Gas C&I Custom Program Natural Gas Savings	2
Table E-3. GPY5 Peoples Gas C&I Custom Program Primary Participation	3
Table E-4. GPY5 North Shore Gas C&I Custom Program Primary Participation	3
Table 2-1. Primary Data Collection Activities.....	6
Table 2-2. Profile of GPY5 Gross Impact Sample by Strata (PGL only)	7
Table 2-3. Net-to-Gross Ratios for Evaluation of the GPY5 C&I Custom Program.....	8
Table 3-1. GPY5 Peoples Gas C&I Custom Program Primary Participation.....	9
Table 3-2. GPY5 North Shore Gas C&I Custom Program Primary Participation	9
Table 3-3. GPY5 PGL C&I Custom Program Ex Ante and Verified Gross Savings Parameters	10
Table 3-4. GPY5 NSG C&I Custom Program Ex Ante and Verified Gross Savings Parameters	10
Table 3-5. GPY5 Peoples Gas C&I Custom Program Impact Results	11
Table 3-6. GPY5 North Shore Gas C&I Custom Program Impact Results	11
Table 4-1. Peoples Gas and North Shore Gas GPY5 Program RR and NTGR Values	12
Table 4-2. GPY5 Peoples Gas Custom Program Natural Gas Savings	12
Table 4-3. GPY5 North Shore Gas C&I Custom Program Natural Gas Savings.....	13
Table 7-1. Profile of GPY5 Custom Gross Impact Sample	17
Table 7-2. GPY5 Summary of Sample M&V Results.....	19
Table 7-3. PGL Gross Therms RR and Relative Precision at 90 percent Confidence Level	20

E. EXECUTIVE SUMMARY

This report presents a summary of the findings and results from the impact and process evaluation of the Peoples Gas (PGL) and North Shore Gas (NSG) C&I Custom Program for GPY5, which is part of the comprehensive Business Program.¹ This report covers evaluation activities for measures installed and natural gas savings realized through the Custom Incentives path. Franklin Energy Services LLC., (Franklin Energy) is the implementation contractor for the PGL and NSG Business Program, with trade ally engagement and technical support for program delivery and marketing.

The Custom Incentives path provides incentives on a custom basis; these are applications that include those not covered under the standardized incentives path. For example, burner replacement measures may fall into the Custom Incentive category. PGL and NSG can fund Retro-Commissioning and Business New Construction projects on a \$/therm saved basis negotiated with ComEd under the Custom Incentives path.² Custom incentives are based on the lesser of a buy down to a one year payback, 50% of project cost, or \$1.00 per therm for projects over 7,500 in therm savings (\$0.75 per therm for projects under 7,500 in therm savings). 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, commercial laundry and other process heating intensive businesses.

The Custom Program delivery did not change from the previous year (GPY4). The GPY5 evaluation involved retrospective adjustments to ex ante gross savings on custom measure variables of all projects installed in GPY5. Franklin Energy provided documentation of project applications and savings, and Navigant verified project eligibility and savings based on engineering review, billing data review, and on-site measurement and verification (M&V) of a sample of program measures. Navigant designed the sample sizes to provide a 90/10 confidence and relative precision level for program-level gross savings verification. Navigant calculated GPY5 verified net impact savings using the approved net-to-gross ratio (NTGR) deemed through Illinois Energy Efficiency Stakeholder Advisory Group (SAG) consensus.³ Navigant's GPY5 process evaluation was limited to interviews with the program implementer to learn of any program changes, and to collect project data to conduct the M&V research.

¹ The comprehensive Business Program bundles existing programs into paths, and allows all eligible customers to access any of the five paths as a one-stop-shop based on the customer's needs – the paths are Direct Install, Engineering Assistance, Standard Incentives, Custom Incentives, and Gas Optimization (source: PGL & NSG Energy Efficiency Plan for the Second Triennial Plan period of June 1, 2014 – May 31, 2017 —Plan 2).

² The net savings for Retro-Commissioning and Business New Construction projects are tracked and reported separately under those respective program names, not in this Custom Program evaluation report.

³ The Net-to-Gross Ratio (NTGR) used for calculating verified net savings is deemed prospectively through a consensus process managed by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). Deemed NTGRs (as well historical verified gross Realization Rates) are available at:

http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Peoples_Gas_and_North_Shore_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

E.1 Program Savings

Table E-1 summarizes the natural gas savings from the GPY5 Peoples Gas C&I Custom Program. The verified net savings are 584,302 therms. The verified gross realization rate for energy savings is 100 percent, after evaluation adjustment from billing analysis and engineering reviews of the ex ante savings of a sample of completed projects in GPY5.

Table E-1. GPY5 Peoples Gas C&I Custom Program Natural Gas Savings

Program/Path	Ex Ante Gross Savings ⁴ (Therms)	Ex Ante Net Savings (Therms)	Verified Gross RR ⁵	Verified Gross Savings (Therms)	NTGR ⁶	Verified Net Savings ⁷ (Therms)
GPY5 Total	748,472	560,605	1.00	749,105	0.78	584,302

Source: Evaluation analysis of GPY5 program tracking data (July 19, 2016 data extract) and results from M&V research.

Table E-2 summarizes the natural gas savings from the GPY5 North Shore Gas C&I Custom Program. The verified net savings are 18,509 therms. The verified gross realization rate for energy savings is 96 percent, after Navigant applied an adjustment to savings from one of the two completed projects in GPY5.

Table E-2. GPY5 North Shore Gas C&I Custom Program Natural Gas Savings

Program/Path	Ex Ante Gross Savings (Therms)	Ex Ante Net Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	NTGR	Verified Net Savings (Therms)
GPY5 Total	24,590	18,418	0.96	23,730	0.78	18,509

Source: Evaluation analysis of GPY5 program tracking data (July 19, 2016 data extract)

E.2 Impact Estimate Parameters for Future Use

The evaluation team did not conduct any additional research on net-to-gross ratio (NTGR) components or impact savings parameters for deeming in future versions of the Illinois TRM as part of the GPY5 evaluation.

E.3 Program Volumetric Detail

Table E-3 and Table E-4 below present GPY5 program participation reported by the Program Administrator Franklin Energy for the Peoples Gas and North Shore Gas programs. The PGL program completed 31 projects from 23 participants. The NSG program had two projects from two participants.

⁴ The term "Ex Ante" refers to the forecasted savings reported by the Program Administrator that have not been independently verified through evaluation. Savings that have been independently verified by the Evaluation Contractor are referred to as "Verified".

⁵ Verified Gross Realization Rate (RR) = Verified Gross Savings/Ex Ante Gross Savings.
Verified Gross Savings = RR * Ex Ante Gross Savings

⁶ The Net-to-Gross Ratio (NTGR) used for calculating verified net savings is deemed prospectively through a consensus process managed by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). Deemed NTGRs (as well historical verified gross Realization Rates) are available at:

http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Peoples_Gas_and_North_Shore_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

⁷ Verified Net Savings = NTGR * Verified Gross Savings

Table E-3. GPY5 Peoples Gas C&I Custom Program Primary Participation

Participation	Program Total
Participants	23
Completed Projects	31

Source: Navigant analysis of GPY5 program tracking data (July 19, 2016 data extract).

Table E-4. GPY5 North Shore Gas C&I Custom Program Primary Participation

Participation	Program Total
Participants	2
Completed Projects	2

Source: Navigant analysis of GPY5 program tracking data (July 19, 2016 data extract).

E.4 Findings and Recommendations

The following provides insight into key program findings and recommendations.⁸

Verified Gross Savings and Realization Rate

Finding 1. Navigant randomly sampled fourteen PGL and two NSG projects and performed measurement and verification (M&V) of the sample savings. Based on findings from on-site visits and engineering file reviews, we estimated a verified gross savings of 749,105 therms for PGL, which represents a 100 percent gross realization rate. The North Shore Gas program realized 23,730 therms, which represents a 96 percent gross realization rate.

Finding 2. Navigant verified that twelve of the PGL sampled projects and one of the NSG projects had 100 percent gross realization rates. We adjusted the savings for three other projects based on findings from billing analysis, review of Franklin Energy’s savings workbook inputs and algorithms, and additional information collected from the implementation contractor or site contacts.

Recommendation 1. Navigant recommends that calculations which utilize the combustion efficiency table interpolate using the actual O₂ and stack temperature values. The current calculations use functions and discrete interpolated points for every 0.1% in O₂ concentration and degree (°F) of net stack temperature. The result from the current function is that there are slight variations from interpolated values which when corrected, had resulted in savings adjustments of minus 5 percent to plus 3 percent for certain projects.

Finding 3: Navigant reviewed a new burner project with installation close to the end of the program year that appeared not commissioned adequately to ensure savings during the summer period of the program year. Based on follow up information provided by Franklin Energy, the evaluation adjusted the realization rate from 44 percent to 103 percent. Franklin Energy conducted a follow up inspection of the project facilities and observed fully operational boilers with upgraded burners. Additionally, Franklin Energy provided supporting documentation in the form of inspection photographs and email correspondences that the issues identified in Navigant’s initial analysis with the gas supply and with burner fan sizing

⁸ Numbering on the findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

have been resolved and that there are no remaining issues with the new burners. Navigant also updated the savings workbook interpolation of O₂ concentration and degree (°F) of net stack temperature.

Recommendation 2: Beginning with GPY6, the Custom program-year will end December 31, allowing nine months to complete projects (16 for GPY6) prior to the heating season that starts in October. With this new timeline, it may be possible to design the Custom Program M&V sample to avoid selecting projects that will not have sufficient heating season operating data for verification. Franklin Energy staff and the evaluation team should work together during the program year to identify weather-dependent custom projects that are likely to complete earlier in the program year and those completing in the fourth quarter. The evaluation sampling and verification approach can adapt to reduce uncertainty.

Volumetric Findings

Finding 4. The Peoples Gas program implemented 31 projects from 23 participants, comparable to the 29 participation goal in GPY5.⁹ The North Shore Gas program completed two projects from two participants, compared to a participation goal of 11 in GPY5. The PGL and NSG Business Programs have flexibility to shift savings and therms between program paths, as necessary, throughout the program year to meet the comprehensive Business Program goals.

Verified Net Impact

Finding 5. The evaluation team applied the deemed 0.78 NTG ratio approved by the SAG to estimate the C&I Custom Program verified net savings. The Peoples Gas verified net savings were 548,803 therms, which is 38 percent of the planned net savings goal of 1,528,694 therms. Project sizes were smaller than originally planned. The North Shore Gas verified net savings were 16,227 therms, which is 10 percent of its net savings goal of 190,740 therms, due to small project size in GPY5 and a low participation count.¹⁰

⁹ Second Triennial EEP Compliance Filing.pdf (C&I Custom participation goals GPY4-GPY7)

¹⁰ Realized savings and goals report generated from the Franklin Energy Efficiency Manager program information management system, September 9, 2016. Overall, both PGL and NSG Programs reported lower net savings compared to goal, partly due to Franklin Energy's mid-year adjustment of net savings goals and participation.

1. INTRODUCTION

1.1 Program Description

The Second Triennial Plan¹¹ of the Peoples Gas (PGL) and North Shore Gas (NSG) comprehensive Business Program bundles existing programs into five paths and allows all eligible customers to access any of the paths as a one-stop-shop based on the customer's needs. The paths are Direct Install, Engineering Assistance, Standard Incentives, Custom Incentives, and Gas Optimization. Franklin Energy Services LLC (Franklin Energy) implements the comprehensive Business Program with trade ally engagement and technical support for program delivery and marketing. This report covers our evaluation of measures installed and gas savings realized through the C&I Custom path or program.

The Custom Incentives path provides incentives on a custom basis; these are applications that include those not covered under the standardized incentives path. For example, burner replacement measures may fall into the Custom Incentive category. PGL and NSG can fund Retro-Commissioning and Business New Construction projects on a \$/therm saved basis negotiated with ComEd under the Retro-Commissioning and New Construction Incentives path. The net savings for Retro-Commissioning and Business New Construction projects are tracked and reported separately under those respective program names. Custom incentives are based on the lesser of a buy down to a one year payback, 50% of project cost, or \$1.00 per therm for projects over 7,500 in therm savings (\$0.75 per therm for projects under 7,500 in therm savings). 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, commercial laundry and other process heating intensive businesses.

1.2 Evaluation Objectives

The evaluation team identified the following key researchable questions for GPY5

1.2.1 Impact Questions

1. What are the program's verified gross savings, using field measurement and verification (M&V) and engineering research to estimate savings? What caused the realization rate (RR) adjustments?
2. What are the program's verified net savings?
3. What are the results and findings from field data collection?

1.2.2 Process Questions

The GPY5 process evaluation activities were limited to interviews with program staff to verify information about the tracking database and data requirements for the evaluation.

¹¹ Peoples Gas/North Shore Gas Energy Efficiency Plan for the Second Triennial Plan period of June 1, 2014 – May 31, 2017 (known as —Plan 2). The comprehensive business program paths include – Direct Install, Engineering Assistance, Standard Incentives, Custom Incentives, and Gas Optimization.

2. EVALUATION APPROACH

This section provides an overview of the data collection methods, gross and net impact evaluation approaches, and process evaluation approaches that occurred for the GPY5 evaluation.

2.1 Overview of Data Collection Activities

The core data collection activities included review of the program’s tracking data, site visits for project measurement and verification, and engineering desk file reviews. The primary data collection activities are shown in the following table.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	When	Comments
Engineering File Review*	Participating Customers	14 (PGL) 2 (NSG)	August- December 2016	Review sample of project files with custom inputs for M&V
On-site M&V Audit	Participating Customers	6	June- September 2016	Gross savings verification research at client site
In Depth Interviews	Program Management	2	April-August 2016	April-August 2016

Source: Navigant evaluation team.

*Includes on-site and desk file review projects

2.2 Verified Savings Parameters

This section presents the approach Navigant employed in conducting verified gross and net program savings. Navigant conducted on-site measurement and verification (M&V) and engineering project file reviews on a random sample of projects to verify the Custom Programs’ gross savings and gross realization rates. Net savings were based on deemed NTGRs for the Custom Program in GPY5.

2.2.1 Verified Gross Program Savings Analysis Approach

Navigant conducted on-site M&V and engineering file reviews on sampled program measures to verify the Custom Program gross savings and gross realization rates. The NSG program completed two projects in GPY5 and Navigant completed engineering verification of the claimed savings. The PGL program completed 31 projects and 14 were sampled for M&V, targeting a 90/10 level of confidence and relative precision for program-level verified savings. The PGL projects were stratified 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. Stratum 1 consisted of large projects with project-level ex ante savings greater than 46,000 therms, stratum 3 consisted of small projects with ex ante gross energy savings less than 22,000 therms, and stratum 2 consisted of the medium-sized projects in between. Table 2-2 shows a profile of the PGL sample selection.

Table 2-2. Profile of GPY5 Gross Impact Sample by Strata (PGL only)

Program	Sampling Strata	Population Summary			Sample	
		Number of Projects (N)	Ex Ante Gross Savings (Therms)	Therms Weights	n	Ex Ante Therms
Custom	1	4	274,747	0.37	4	274,747
	2	7	243,154	0.32	5	170,023
	3	20	230,571	0.31	5	78,986
TOTAL		31	748,472	1.00	14	523,757

Source: Evaluation analysis of programs data.

Note: NSG completed only two projects in GPY5, and Navigant conducted a census desk engineering file review of both projects.

Navigant completed six on-site visits out of the 14 projects in the PGL sample, and completed desk engineering file reviews for the eight remaining projects. The 14 sample projects account for 70 percent of the ex ante gross savings from the program population. Navigant extrapolated the estimated measure-level and project-level realization rates to the PGL program population, using a ratio estimation method to yield evaluation-adjusted verified gross energy savings.

For each PGL and NSG project, Navigant performed an in-depth review of the application documentation to assess the engineering methods, parameters and assumptions used to generate all ex ante impact estimates. To support this review, Franklin Energy provided project documentation in electronic format for each project. Documentation included some or all of scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), pre-inspection reports, post inspection reports, photos (when available), and calculation spreadsheets. Navigant collaborated with Franklin Energy through emails and telephone conversations where clarifications were needed to verify the savings input assumptions of the sampled projects, including collection of trend or billing data.

The on-site audits for the PGL projects included interviews with key customer contacts, visual inspection of the systems and equipment, and spot measurements. Navigant developed an analysis plan for each project selected for on-site data collection. Each plan explains the general gross impact approach used (including measurement plans), provides an analysis of the current inputs (based on the application and other available sources at that time), and identifies sources that were used to verify data or obtain newly identified inputs for the ex post gross impact approach. The on-site audit collected data identified in the analysis plan, including monitoring records such as measured temperatures, data from equipment logs, equipment nameplate data, system operation sequences and operating schedules, and description of site conditions that might contribute to baseline selection.

2.2.2 Verified Net Program Savings Analysis Approach

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a deemed net-to-gross ratio (NTGR). In GPY5, the NTGR estimates used to calculate the verified net savings were based on past evaluation research and approved through a consensus process managed through the Illinois Energy Efficiency Stakeholder Advisory Group (SAG)¹². Table 2-3 presents the deemed NTGR by program path.

¹² Source: Deemed NTGR values are available on the Illinois Energy Efficiency Stakeholder Advisory Group web site.

http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Peoples_Gas_and_North_Shore_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

Table 2-3. Net-to-Gross Ratios for Evaluation of the GPY5 C&I Custom Program

Program Path	Utility	GPY5 Deemed NTG Value
C&I Custom	PGL & NSG	0.78

Source: Documents available on the Illinois Energy Efficiency Stakeholder Advisory Group web site.

2.3 Process Evaluation

The GPY5 process evaluation activities were limited to interviews with program staff to verify information about the tracking database and data requirements for the evaluation. We also reviewed program materials to determine if the process recommendations from the GPY5 evaluation were implemented or impacted customer participation.

3. GROSS IMPACT EVALUATION

This section provides detailed analysis and findings from the on-site M&V and file reviews and tracking system review.

3.1 Program Tracking Data Review

Navigant downloaded the final data for the C&I Custom Program impact evaluation from Franklin Energy’s Efficiency Manager¹³ program management information platform. Navigant reviewed the tracking data to verify the completeness and accuracy of the tracking system data to identify any issues that would affect the impact evaluation of the program. Navigant confirmed the records in the quantity field of the tracking data corresponded with the ex ante gross savings in the project’s documentation. These records informed our sampling approach for the M&V task. Most of the M&V savings adjustments were due to using the most up-to-date information collected from the customers during on-site visits or through telephone conversations with Franklin Energy staff.

3.2 Program Volumetric Findings

As shown in Table 3-1, the Peoples Gas Custom Program implemented 31 custom projects from 23 participants. The NSG program completed two projects from two participants.

Table 3-1. GPY5 Peoples Gas C&I Custom Program Primary Participation

Participation	Program Total
Participants	23
Completed Projects	31

Source: Navigant analysis of GPY5 program tracking data (July 19, 2016 data extract).

Table 3-2. GPY5 North Shore Gas C&I Custom Program Primary Participation

Participation	Program Total
Participants	2
Completed Projects	2

Source: Navigant analysis of GPY5 program tracking data (July 19, 2016 data extract).

3.3 Gross Program Impact Parameter Estimates

From the results obtained through the on-site M&V and engineering project file reviews, Navigant calculated the measure-level gross savings. The verified gross realization rates for the projects were determined as the ratio of the verified gross energy savings to ex ante gross energy savings from project-level savings reported in the project documentation. Table 3-3 summarizes the results of the sample-based verified gross realization rates by strata for the Peoples Gas sample.

¹³ Previously the Bensight Data Management Platform

Table 3-3. GPY5 PGL C&I Custom Program Ex Ante and Verified Gross Savings Parameters

Program	Sampling Strata	Sample Size	Sample-Based Ex Ante Gross Savings (Therms)	Sample-Based Verified Gross Realization Rate	Sample-Based Verified Gross Savings (Therms)
Custom	1	4	274,747	1.01	277,130
	2	5	170,023	0.99	168,800
	3	5	78,986	1.00	78,986
Program Level Overall Weighted RR				1.00	
Overall Confidence Interval and Relative Precision (90/10) on RR				±1 percent	

Source: Navigant analysis of program tracking data and M&V results.

Overall, twelve of the fourteen PGL sample projects had a 100 percent gross realization rate. Two PGL projects had gross realization rates below 100 percent. For these projects, one had 96 percent gross realization rate from evaluation billing analysis, the other project had 103 percent gross realization rate, from evaluation on-site M&V findings. For the latter project, the new burners installed were off-line for a period in the summer and savings were not verifiable at that time: issues included supply gas overheating and boiler operating with maximum burner capacity due to undersized combustion fans. The issues were subsequently resolved and the equipment was fully functional. Navigant updated the savings workbook interpolation of O₂ concentration and degree (°F) of net stack temperature.

Details of the evaluation adjustments for the two projects are provided in Table 7-2, in the Appendix 7.1. The overall weighted gross realization rate at the program level was 100 percent, estimated with overall relative precision at ±1 percent at a 90 percent confidence level.

Table 3-4 shows the results of the verified gross realization rates for the NSG projects. For the project with a 95 percent realization rate, Navigant reviewed the project application and other available sources and adjusted the savings based on the updated inputs from the combustion report, and also reviewed the savings workbook interpolation of O₂ concentration and degree (°F) of net stack temperature. The average program gross realization rate is 96 percent for the two projects.

Table 3-4. GPY5 NSG C&I Custom Program Ex Ante and Verified Gross Savings Parameters

Program	Project Number	Sample-Based Ex Ante Gross Savings (Therms)	Sample-Based Verified Gross Realization Rate	Sample-Based Verified Gross Savings (Therms)
Custom	936166	16,404	0.95	15,543
	932823	8,186	1.00	8,186
Program Level Overall RR			0.96	
Overall Confidence Interval and Relative Precision (90/10) on RR			census	

Source: Navigant analysis of program tracking data and M&V results.

3.4 Verified Gross Program Impact Results

Navigant applied the sample strata verified gross realization rates to the population strata to achieve the program level verified gross savings for the PGL program. As shown in Table 3-5, the evaluation research adjustments resulted in verified gross energy savings of 749,105 therms for the GPY5 PGL Custom Program. This reflects a verified gross realization rate of 100 percent.

Table 3-5. GPY5 Peoples Gas C&I Custom Program Impact Results

Program/Path	Ex Ante Gross Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	90/10 Significance?
GPY5 Total	748,472	1.00	749,105	Yes

Source: Evaluation analysis of GPY5 program tracking data (July 19, 2016 data extract) and results from M&V research.

As shown in Table 3-6, the evaluation research adjustments resulted in verified gross energy savings of 23,730 therms for the GPY5 NSG Custom Program. This reflects a verified gross realization rate of 96 percent.

Table 3-6. GPY5 North Shore Gas C&I Custom Program Impact Results

Program/Path	Ex Ante Gross Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	90/10 Significance?
GPY5 Total	24,590	0.96	23,730	Yes

Source: Evaluation analysis of GPY5 program tracking data (July 19, 2016 data extract)

4. NET IMPACT EVALUATION

Verified net energy savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio. As noted in Section 2, the NTGR used to calculate the net verified savings for the GPY5 C&I Custom Program was deemed through a consensus process managed by the Illinois SAG.

When converting ex ante gross to ex ante net savings for tracking and reporting, Franklin Energy Services combines an additional adjustment factor with the net-to-gross ratio. The additional factor accounts for potential gross realization rate adjustments, and is based on a previous year realization rate. This factor must be accounted for when converting ex ante net savings reported in the tracking system to ex ante gross savings. The equations for GPY5 are:

$$\text{GPY5 Ex Ante Net} = \text{Values reported in the GPY5 program tracking data}$$

$$\text{GPY5 Ex Ante Net} = (\text{GPY5 Ex Ante Gross} * \text{GPY4 Verified Gross RR}) * \text{GPY5 Deemed NTGR}$$

$$\text{GPY5 Ex Ante Gross} = \text{GPY5 Ex Ante Net} / (\text{GPY4 Verified Gross RR} * \text{GPY5 Deemed NTGR})$$

Table 4-1 below presents the realization rate and NTGRs used to calculate the program-level net savings.

Table 4-1. Peoples Gas and North Shore Gas GPY5 Program RR and NTGR Values

Program/Path	Embedded GPY4 RR Adjustment Factors	GPY4 RR Source	GPY5 Deemed NTGR	NTGR Source
C&I Custom (PGL & NSG)	1.00	†	0.78	SAG‡

Source: † Navigant evaluation report for the GPY4 C&I Custom Program is available at <http://www.ilsag.info/evaluation-documents.html>.

‡ Deemed Net-to-Gross Ratios are available from:

http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Peoples_Gas_and_North_Shore_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

Table 4-2 summarizes the natural gas savings from the GPY5 Peoples Gas C&I Custom Program. The program achieved 584,302 therms net savings, which is 38 percent of the planned net savings goal of 1,528,694 therms.¹⁴

Table 4-2. GPY5 Peoples Gas Custom Program Natural Gas Savings

Program/Path	Ex Ante Gross Savings (Therms)	Ex Ante Net Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	NTGR	Verified Net Savings (Therms)
GPY5 Total	748,472	560,605	1.00	749,105	0.78	584,302

Source: Evaluation analysis of GPY5 program tracking data (July 19, 2016 data extract) and results from M&V research.

Table 4-3 summarizes the natural gas savings from the GPY5 North Shore Gas C&I Custom Program. The program achieved 18,509 therms net savings, which is 10 percent of the planned net savings goal of 190,740 therms. We note that the PGL and NSG Business Programs have flexibility to shift savings and therms between program paths, as necessary, throughout the program year to meet the comprehensive

¹⁴ Realized savings and goals report generated from the Franklin Energy Efficiency Manager program information management system, September 9, 2016.

Business Programs goals. Overall, both PGL and NSG Programs reported lower net savings compare to goal, partly due to Franklin Energy’s mid-year adjustment of net savings goal and participation.

Table 4-3. GPY5 North Shore Gas C&I Custom Program Natural Gas Savings

Program/Path	Ex Ante Gross Savings (Therms)	Ex Ante Net Savings (Therms)	Verified Gross RR	Verified Gross Savings (Therms)	NTGR	Verified Net Savings (Therms)
GPY5 Total	24,590	18,418	0.96	23,730	0.78	18,509

Source: Evaluation analysis of GPY5 program tracking data (July 19, 2016 data extract)

5. PROCESS EVALUATION

Process research in GPY5 was limited to interviews with program staff and a review of program materials to verify information about program measures and the program tracking system. Navigant conducted interviews with the program staff in May 2016. We also had periodic conversations with program staff over the program year to discuss program forecasts and strategies for future program cycles. There are no process findings to report for GPY5.

6. FINDINGS AND RECOMMENDATIONS

The following provides insight into key program findings and recommendations.

Verified Gross Savings and Realization Rate

Finding 1. Navigant randomly sampled fourteen PGL and two NSG projects and performed measurement and verification (M&V) of the sample savings. Based on findings from on-site visits and engineering file reviews, we estimated a verified gross savings of 749,105 therms for PGL, which represents a 100 percent gross realization rate. The North Shore Gas program realized 23,730 therms, which represents a 96 percent gross realization rate.

Finding 2. Navigant verified that twelve of the PGL sampled projects and one of the NSG projects had 100 percent gross realization rates. We adjusted the savings for three other projects based on findings from billing analysis, review of Franklin Energy's savings workbook inputs and algorithms, and additional information collected from the implementation contractor or site contacts.

Recommendation 1. Navigant recommends that calculations which utilize the combustion efficiency table interpolate using the actual O₂ and stack temperature values. The current calculations use functions and discrete interpolated points for every 0.1% in O₂ concentration and degree (°F) of net stack temperature. The result from the current function is that there are slight variations from interpolated values which when corrected, had resulted in savings adjustments of minus 5 percent to plus 3 percent for certain projects.

Finding 3: Navigant reviewed a new burner project with installation close to the end of the program year that appeared not commissioned adequately to ensure savings during the summer period of the program year. Based on follow up information provided by Franklin Energy, the evaluation adjusted the realization rate from 44 percent to 103 percent. Franklin Energy conducted a follow up inspection of the project facilities and observed fully operational boilers with upgraded burners. Additionally, Franklin Energy provided supporting documentation in the form of inspection photographs and email correspondences that the issues identified in Navigant's initial analysis with the gas supply and with burner fan sizing have been resolved and that there are no remaining issues with the new burners. Navigant also updated the savings workbook interpolation of O₂ concentration and degree (°F) of net stack temperature.

Recommendation 2: Beginning with GPY6, the Custom program-year will end December 31, allowing nine months to complete projects (16 for GPY6) prior to the heating season that starts in October. With this new timeline, it may be possible to design the Custom Program M&V sample to avoid selecting projects that will not have sufficient heating season operating data for verification. Franklin Energy staff and the evaluation team should work together during the program year to identify weather-dependent custom projects that are likely to complete earlier in the program year and those completing in the fourth quarter. The evaluation sampling and verification approach can adapt to reduce uncertainty.

Volumetric Findings

Finding 4. The Peoples Gas program implemented 31 projects from 23 participants, comparable to the 29 participation goal in GPY5.¹⁵ The North Shore Gas program completed two projects from two participants, compared to a participation goal of 11 in GPY5. The PGL and NSG Business Programs have flexibility to shift savings and therms between program paths, as necessary, throughout the program year to meet the comprehensive Business Program goals.

¹⁵ Second Triennial EEP Compliance Filing.pdf (C&I Custom participation goals GPY4-GPY7)

Verified Net Impact

Finding 5. The evaluation team applied the deemed 0.78 NTG ratio approved by the SAG to estimate the C&I Custom Program verified net savings. The Peoples Gas verified net savings were 548,803 therms, which is 38 percent of the planned net savings goal of 1,528,694 therms. Project sizes were smaller than originally planned. The North Shore Gas verified net savings were 16,227 therms, which is 10 percent of its net savings goal of 190,740 therms, due to small project size in GPY5 and a low participation count.¹⁶

¹⁶ Realized savings and goals report generated from the Franklin Energy Efficiency Manager program information management system, September 9, 2016. The PGL and NSG Business Programs have flexibility to shift savings and therms between program paths, as necessary, throughout the program year to meet the comprehensive Business Program goals. Overall, both PGL and NSG Programs reported lower net savings compare to goal, partly due to Franklin Energy's mid-year adjustment of net savings goal and participation.

7. APPENDIX

7.1 Detailed Impact Research Findings and Approaches

7.1.1 Gross Impact Sampling

A sample of 16 (14 PGL and 2 NSG) Custom projects based on a planned target of 90/10 confidence and precision level for program-level verified gross savings was drawn from the PGL and NSG program tracking database of a population of 33 (31 PGL and two NSG) projects to determine verified gross realization rates. The engineering review of the algorithms used by the program to calculate energy savings and the assumptions that feed into those algorithms were assessed and the savings evaluation approach were classified into one of two categories: 1) reasonable and acceptable, or 2) needs revision based on evaluation findings. On-site measurement and verification (M&V) based on IPMVP protocols were conducted for six out of the 16 selected sites including spot measurements. Table 7-1 shows a profile of the sample selection. Navigant reviewed the PGL sample to verify that there is an accurate representation by measure technology and business type within the overall sample.

Table 7-1. Profile of GPY5 Custom Gross Impact Sample

Project ID	Utility	Ex Ante Gross	Strata	M&V Approach	Measure
922373	PGL	82,264	1	On-site	Boilers with Stack Economizers
869285	PGL	71,548	1	On-site	Burner Replacement
1064752	PGL	46,254	1	File Review	Pipe Insulation
940308	PGL	74,680	1	On-site	Pipe Insulation
1045433	PGL	40,040	2	File Review	Burner Upgrade
1109289	PGL	40,859	2	On-site	Steam Pipe Insulation
229584	PGL	24,640	2	File Review	Kiln Replacement
906739	PGL	34,942	2	File Review	Install Condensate Return
1042290	PGL	29,543	2	File Review	Linkageless Burner
1040309	PGL	18,264	3	File Review	Boiler Controls
954829	PGL	15,951	3	File Review	Linkageless Burner
1117333	PGL	8,083	3	File Review	Burner Upgrade
969048	PGL	22,811	3	On-site	Damper Replacement
1008925	PGL	13,877	3	On-site	Pipe Insulation
936166	NSG	16,404	3	File Review	Glycerin Distillation
932823	NSG	24,590	3	File Review	Pipe Insulation

Source: Evaluation analysis of programs data.

7.1.2 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 ex post gross savings based on their review of documentation and engineering analysis.

To support this review, Franklin Energy provided project documentation in electronic format for each sampled project. Documentation included some or all of scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), pre-inspection reports and photos (when available), post inspection reports and photos (when conducted), and calculation spreadsheets.

7.1.2.1 On-Site Data Collection

On-site surveys were completed for a subset of six of the 16 customer applications sampled. For most projects on-site sources include interviews that are completed at the time of the on-site, visual inspection of the systems and equipment, spot measurements, and (less commonly) short-term monitoring (e.g., less than four weeks). An analysis plan is developed for each project selected for on-site data collection. Each plan explains the general gross impact approach used (including monitoring plans), provides an analysis of the current inputs (based on the application and other available sources at that time), and identifies sources that will be used to verify data or obtain newly identified inputs for the ex post gross impact approach.

The engineer assigned to each project first calls to set up an appointment with the customer. During the on-site audit, data identified in the analysis plan is collected, including monitoring records such as measured temperatures, data from equipment logs, equipment nameplate data, system operation sequences and operating schedules, and a careful description of site conditions that might contribute to baseline selection.

All engineers who conduct audits are trained and experienced in completing inspections for related types of projects. Each carries properly calibrated equipment required to conduct the planned activities. They check in with the site contact upon arrival at the business, and check out with that same site contact, or a designated alternate, on departure. The on-site audit consists of a combination of interviewing and taking measurements. During the interview, the engineer meets with a business representative who is knowledgeable about the facility's equipment and operation, and asks a series of questions regarding operating schedules, location of equipment, and equipment operating practices. Following this interview, the engineer makes a series of detailed observations and measurements of the business and equipment. All information is recorded and checked for completeness before leaving the site.

7.1.2.2 Research Findings for the Gross Impact Sample

In Table 7-2 below we present the research findings results for the 16 sampled projects. A total of 13 projects out of the 16 sample achieved 100 percent realization rates, while three projects received some adjustments that increased or reduced their realization rates.

Table 7-2. GPY5 Summary of Sample M&V Results

Project ID	Utility	Measure Description	Research Finding Gross Realization Rate	Summary of Evaluation Adjustment
922373	PGL	Boilers with Stack Economizers	1.00	OK
869285	PGL	Burner Replacement	1.03	New burners were off for a certain period in the summer due to issues with supply gas overheating and boiler operating with maximum burner capacity due to undersized combustion fans. Issues with the burner commissioning were resolved later and equipment was fully functional. Navigant also updated savings workbook interpolation of O ₂ concentration and degree (°F) of net stack temperature
1064752	PGL	Pipe Insulation	1.00	OK
940308	PGL	Pipe Insulation	1.00	OK
1045433	PGL	Burner Upgrade	1.00	OK
1109289	PGL	Steam Pipe Insulation	1.00	OK
229584	PGL	Kiln Replacement	1.00	OK
906739	PGL	Install Condensate Return	1.00	OK
1042290	PGL	Linkageless Burner	0.96	Verified from Billing Analysis
1040309	PGL	Boiler Controls	1.00	OK
954829	PGL	Linkageless Burner	1.00	OK
1117333	PGL	Burner Upgrade	1.00	OK
969048	PGL	Damper Replacement	1.00	OK
1008925	PGL	Pipe Insulation	1.00	OK
936166	NSG	Glycerin Distillation	0.95	Updated inputs from combustion reports. Updated workbook interpolation of O ₂ concentration and degree (°F) of net stack temperature.
932823	NSG	Pipe Insulation	1.00	OK

Source: Navigant analysis of program tracking data and M&V results.

Table 7-3 provides the relative precision at 90 percent level of confidence for the PGL sample. The mean verified gross realization rate for the PGL program was 100 percent at a relative precision of ±1 percent at a 90 percent confidence level.

Table 7-3. PGL Gross Therms RR and Relative Precision at 90 percent Confidence Level

Program/Path	Strata	Relative Precision +or- percent	Low RR	Mean RR	High RR	Std. Error
Custom	1	0%	1.01	1.01	1.01	-
	2	1%	0.99	0.99	1.00	0.01
	3	0%	1.00	1.00	1.00	0.00
Custom Total RR (90/10)		1%	1.00	1.00	1.00	0.01

Source: Navigant analysis

Note: the two NSG projects were census evaluated with a 96 percent gross realization rate.