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Commercial & Industrial (C&I) Prescriptive Rebate Program GPY2 Evaluation Report

Final

Energy Efficiency Plan: Gas Plan Year 2 (6/1/2012-5/31/2013)

Presented to Peoples Gas and North Shore Gas

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E. Executive Summary

This report presents a summary of the findings and results from the Impact and Process Evaluation of the GPY2 Peoples Gas and North Shore Gas (PGL/NSG)[1] Commercial & Industrial Prescriptive Rebate (C&I Prescriptive) program. The C&I Prescriptive program provides rebates to customers to install, replace or retrofit qualifying equipment. The program includes measures such as natural gas heating systems, control technologies, water heating equipment, and food service equipment. The program relies on wholesale and retail trade allies to assist in the marketing of this program. Trade ally support and engagement is considered to be a key element to the success of this program. The C&I Prescriptive program is targeted to active customers of Peoples Gas or North Shore Gas ("the Companies"). In general these customers are supplied natural gas service through rates S.C. No. 2 and S.C. No. 3 (NSG) and S.C. No. 4 (PGL). Franklin Energy Services, LLC (FES) is the implementation contractor (IC) for the initial three year program period (GPY1-GPY3).

Key changes during GPY2 included the introduction of direct installation of water efficiency measures free of charge to interested program participants[2]. Additional new measures introduced with significant savings were industrial steam trap replacements, and hot water and steam boiler pipe insulation. The GPY2 evaluation for the C&I Prescriptive program repeated the previous year's evaluation activities, with some additions to the process and impact evaluations. In addition to participant free ridership, the scope of this year's evaluation included quantification of spillover impacts from participating customers and participant and non-participant trade allies.

E.1. Program Savings

Table E-1 summarizes the natural gas savings from the C&I Prescriptive Program. The evaluation results are presented for two scenarios. The approved Technical Reference Manual (TRM) Version 1.0 unit savings for C&I aerators and showerheads were reviewed by the TRM Technical Advisory Committee and found to have been derived using algorithms containing an error. Pursuant to the IL-TRM Policy Document adopted by the Commission in ICC Docket No. 13-0077, the evaluation verified savings in Table E-1 of this report is shown using both the uncorrected algorithms ("ICC approved TRM Unit Savings") as well as the corrected algorithms ("Corrected TRM Algorithm"). The remaining tables in the report are based on the ICC approved TRM Unit Savings.

[1] The GPY2 program year began June 1, 2012 and ended May 31, 2013.

[2] Direct installation of water efficiency measures such as showerheads, bath/kitchen aerators, and pre rinse sprayers were introduced into the program in the last quarter of GPY2.

Table E-1. GPY2 Total Program Natural Gas Savings

Savings Category †	Peoples Gas Energy Savings (Therms)		North Shore Gas Energy Savings (Therms)	
Ex Ante Gross Savings	4,656,309		207,226	
Ex Ante Net Savings	2,002,361		89,107	
TRM Scenario for Faucet Aerators and Showerheads	*ICC approved TRM Unit Savings*	*Corrected TRM Algorithm*	*ICC approved TRM Unit Savings*	*Corrected TRM Algorithm*
Verified Gross Savings	4,651,497	4,684,154	207,059	207,297
Research Findings Net Savings	2,930,443	2,951,017	130,447	130,597

Source: Utility tracking data and Navigant analysis.
† See the Glossary in the Appendix for definitions

E.2. Program Savings

Table E-2 and Table E-3 summarize the program savings by measure end-use category.

Table E-2. Peoples Gas GPY2 Results by End-use Category

Category	Sample	Energy Savings (Therms)	90/10 Significance?
HVAC Applications			
Ex-Ante GPY2 Gross Savings	NA	2,912,098	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		2,911,405	
Pipe Insulation			
Ex-Ante GPY2 Gross Savings	NA	782,009	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		782,162	
Water Efficiency Device/Water Heater			
Ex-Ante GPY2 Gross Savings	NA	40,265	NA
Verified Gross Realization Rate		0.89[3]	
Verified Gross Savings‡		35,993	
Industrial/Process Steam Traps			
Ex-Ante GPY2 Gross Savings	NA	915,156	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		915,156	
Commercial Kitchen Appliance			
Ex-Ante GPY2 Gross Savings	NA	6,781	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		6,781	
Peoples Gas GPY2 Total			
Ex-Ante GPY2 Gross Savings	NA	4,656,309	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		**4,651,497**	
Spillover (Participating Customer, PSO) ‡	58	0.001	NA
Spillover (Participating TA, TSO) ‡	9	0.02	
Spillover (Non-Participating TA, TNSO) ‡	5	0.02	NA
Free ridership (Participating Customer) ‡	58	0.41	Yes
Spillover Total (PSO + TSO + TNSO) ‡	**NA**	**0.04**	
Free ridership (Evaluation Reporting) ‡	**NA**	**0.41**	**Yes**
Net-to-Gross Ratio (NTGR)‡	**NA**	**0.63**	
Research Findings Net Savings ‡	**NA**	**2,930,443**	**Yes**

Source: Utility tracking data and Navigant analysis.

‡ Based on evaluation research on a sample drawn from a population that combined Peoples Gas and North Shore Gas.

Evaluation Reporting: NTGR = 1-Participating Customer Free-ridership +PSO+TSO+TNSO

[3] The realization rate of less than one is due to the difference in per unit savings. No adjustment was made to quantities.

Table E-3. North Shore Gas GPY2 Results by End-use Category

Category	Sample	Energy Savings (Therms)	90/10 Significance?
HVAC Applications			
Ex-Ante GPY2 Gross Savings	NA	121,221	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		121,255	
Pipe Insulation			
Ex-Ante GPY2 Gross Savings	NA	12,452	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		12,478	
Water Efficiency Device/Water Heater			
Ex-Ante GPY2 Gross Savings	NA	628	NA
Verified Gross Realization Rate		0.64[4]	
Verified Gross Savings‡		401	
Industrial/Process Steam Traps			
Ex-Ante GPY2 Gross Savings	NA	67,033	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		67,033	
Commercial Kitchen Appliance			
Ex-Ante GPY2 Gross Savings	NA	5,893	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		5,893	
North Shore Gas GPY2 Total			
Ex-Ante GPY2 Gross Savings	NA	207,226	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		**207,059**	
Spillover (Participating Customer, PSO) ‡	58	0.001	NA
Spillover (Participating TA, TSO) ‡	9	0.02	
Spillover (Non-Participating TA, TNSO) ‡	5	0.02	NA
Free ridership (Participating Customer) ‡	58	0.41	Yes
Spillover Total (PSO + TSO + TNSO) ‡	**NA**	**0.04**	
Free ridership (Evaluation Reporting) ‡	**NA**	**0.41**	**Yes**
Net-to-Gross Ratio (NTGR)‡	**NA**	**0.63**	
Research Findings Net Savings ‡	**NA**	**130,447**	**Yes**

Source: Utility tracking data and Navigant analysis.
‡ Based on evaluation research on a sample drawn from a population that combined Peoples Gas and North Shore Gas.
Evaluation Reporting: NTGR = 1-Participating Customer Free-ridership +PSO+TSO+TNSO

[4] The realization rate of less than one is due to the difference in per unit savings. No adjustment was made to quantities.

E.3. *Impact Estimate Parameters*

In the course of estimating verified gross and research findings net savings, the evaluation team used a variety of parameters in its calculations. Some of those parameters were deemed for this program year and others were adjusted based on evaluation research. The key parameters used in the analysis are shown in Table E-4.

Table E-4. Impact Estimate Parameters

Parameter	Data Source	Deemed or Evaluated?
Number of measures installed	Program tracking system	Evaluated
Verified Gross Savings	Tracking Data/Illinois TRM/Evaluation Research	Deemed and Evaluated
Research Findings Net-to-gross Ratio (NTGR)	Evaluation Research	Evaluated
Spillover (Participating Customer, PSO)	Evaluation Research	Evaluated
Spillover (Participating TA, TSO)	Evaluation Research	Evaluated
Spillover (Non-Participant TA TNSO)	Evaluation Research	Evaluated
Free ridership (Participating Customer)	Evaluation Research	Evaluated
HVAC Measures per unit Savings	Illinois TRM, version 1.0, section 4.4‡	Deemed
Hot Water End-use Measures Savings	Illinois TRM, version 1.0, sections 4.2 and 4.3, measure code version V01‡	Deemed
Industrial/Process Steam Traps per unit Savings	Illinois TRM, version 1.0, section 4.4.15‡	Deemed
Food Service Measures per unit Savings	Illinois TRM, version 1.0, section 4.2‡	Deemed
Pipe Insulation (DHW) per unit Savings	Illinois TRM, version 1.0, section 5.4.1‡	Deemed
Programmable Thermostat per unit Savings	Integrys_Master_Measure_Document 010213 & Evaluation Research	Evaluated
Pipe Insulation (Steam/HW Boiler) per unit Savings	Integrys_Master_Measure_Document 010213 & Evaluation Research	Evaluated

Source: Utility tracking data and Navigant analysis of survey data.
‡ Source: Integrys_Master_Measure_Document 010213; Illinois TRM (version 1.0)

E.4. Impact Estimate Parameters For Future Use

The approved Technical Reference Manual (TRM)[2] Version 1.0 unit savings for C&I aerators and showerheads were reviewed by the TRM Technical Advisory Committee and found to have been derived using algorithms containing an error. The errata are corrected by removing the redundant GPM factor from the algorithms for aerators and showerheads, with the resulting difference shown in Table E-5. The errata correction (CI-HW_-LFFA-V02-120601) was identified on page 9 in Table 1.4 of the IL-TRM Version 2.0 dated June 7th, 2013 that was approved in Commission's Final Order in ICC Docket No. 13-0437 on November 6, 2013. The evaluation verified savings in Table E-1 of this report is shown using both the uncorrected algorithms ("ICC approved TRM Unit Savings") as well as the corrected algorithms ("Corrected TRM Algorithm"). The remaining tables in the report are based on the ICC approved TRM Unit Savings, and that is why the realization rate is less than 1.0 for faucet aerator measures.

Table E-5. . Impact Estimate for Measures with Known Errata in the v1.0 TRM

Measure Description	Ex Ante Default Unit Savings (Therms/unit)	ICC Approved TRM (v1.0 V01) Unit Savings	Corrected TRM Algorithm (v1.0 V02) Unit Savings
Bathroom Aerator	7.2	5.1	18.0
Kitchen Aerator	15.0	4.3	15.0
Showerhead	13.5	13.5	21.64

Illinois_Statewide_TRM_Effective_060112_Final_091412_Clean
This value is calculated for miscellaneous business category. It may vary per business category.

The evaluation-researched NTG value may be eligible for deeming for future program years. Details are provided in the Table E-6 below. Navigant conducted evaluation research into steam pipe and hot water pipe insulations that may assist the Illinois TRM Technical Advisory Committee annual updating process. Additional details are included in Section 7.2.1 of this evaluation report.

Table E-6. Impact Estimate Parameters for Future Use

Parameter	Value	Data Source
Net-to-gross Ratio (NTGR)	0.63	Participant & Trade Ally Surveys
Free-ridership Estimated from Participating Customer Interviews	0.41	Participant Survey
Participant Reported Spillover	0.001	Participant Survey
Participating Trade Ally Spillover	0.02	Trade Ally Survey
Non-Participating Trade Ally Spillover	0.02	Trade Ally Non-Participant Survey

Source: Utility tracking data and Navigant analysis of survey responses.

[2] State of Illinois Energy Efficiency Technical Reference Manual. Final as of September 14th, 2012. Effective June 1st, 2012.

An estimate of free-ridership incorporating interview responses from participating trade allies was made by Navigant in the course of conducting GPY2 evaluation research. The participating trade ally free-ridership score is Navigant's analysis of their responses to questions asked to estimate "If the program had not existed, approximately what percentage of the rebated measures would your customers have purchased?" The free-ridership estimate from PGL and NSG participating trade allies was a research effort and was not used in GPY2 for evaluation reporting of verified net savings results. The results and approach presented in Appendix 7.2.2 may be considered for future use.

E.4. Participation Information

Overall, the PGL/NSG C&I Prescriptive program performed very well in GPY2 compared to the previous year, due in part to program changes and additional measures including pipe insulation; space heating, industrial and process steam traps; and direct install water efficiency measures. Peoples Gas implemented 732 projects from 459 participants who installed different kinds of energy efficient equipment. North Shore Gas implemented 61 projects from 48 participants, as shown in Table E-7 below.

Table E-7. GPY2 Primary Participation Detail

Participation	Peoples Gas	North Shore Gas
Implemented Projects	732	61
Business Participants	459	48
Rebate Quantity (by MBH)	1,844,051	185,037
Rebate Quantity (by linear foot)	112,117	5,682
Rebate Quantity (by living unit)	4,221	-
Rebate Quantity (by unit measures)	6,894	156
Direct Install Measures (units)	3,021	23

Source: Utility tracking data and Navigant analysis.

E.5. Conclusions and Recommendations

The following provides insight into key program findings and recommendations

Program Savings Goals Attainment

Finding 1. The Peoples Gas GPY2 program achieved evaluation research findings net savings of 2,930,443 Therms, which is 191 percent of the program's net savings goal of 1,536,793 Therms. Compared to GPY1, the Peoples Gas program increased net energy savings by more than 1,200 percent. The North Shore Gas GPY2 program achieved evaluation research findings net savings of 130, 447 Therms which is 51 percent of the program's net savings goal of 257,974 Therms. Compared to GPY1, the North Shore Gas program increased energy savings by 300 percent. Steam traps and pipe insulation were a significant factor in the savings increase of both programs in GPY2.

Recommendation 1. To better achieve program energy savings goals, the program should continue to identify opportunities and encourage program trade allies and contractors to recommend steam trap measures to customers. Trade allies should identify businesses and insulation materials that would be more cost effective, while also ensuring program rules and guidelines for pipe insulations meet the TRM requirements.

Net-to-Gross Ratio

Finding 2. The NTG ratio found in this evaluation is 0.63, derived from evaluation estimates of participant free ridership and spillover and participating and non-participating trade ally spillover. Further, measures with lower free-ridership scores were added and eligibility for boiler tune-up services was tightened in GPY2. The GPY2 NTGR is a substantial increase over the GPY1 NTG ratio of 0.43, which did not include spillover and was based on a more limited set of measures offered in GPY1.

Finding 3. Free ridership among program measures vary depending on the customer or project specific characteristics and the market segment. Overall, 36 percent (21 out of 58 participants) indicated extreme likelihood of installing the same equipment without the program, mostly citing standard practice, condition of the old equipment and maintenance issues as strong basis for implementing measure, with moderate indication of program influence. Although it appears participants with pipe insulation, industrial steam traps and boiler tune-ups contributed to the increase in program participant NTG, it should be noted that the sample sizes for any category except the combined PG and NSG population will not provide statistically significant conclusions regarding individual measures and should be used with caution.

Recommendation 3. Navigant does not recommend removal of any measure from the program in GPY3, but suggests that the IC should encourage trade allies and contractors to improve on the customer application screening process to minimize free ridership.

Verified Gross Realization Rates

Finding 4. Appropriate quality control and quality assurance procedures are in place. With minor exceptions as identified in the report, the program tracking system is accurately recording measure savings estimates based on deemed or partially deemed values from

the State of Illinois Energy Efficiency Technical Reference Manual (Illinois TRM)[5]. The ex ante per unit savings for furnaces, showerheads, and aerators were adjusted to comply with the Illinois TRM, producing a reduction of 4,812 Therms for PGL and 167 therms for NSG compared to the verified gross energy savings. The GPY2 Peoples Gas program verified gross realization rate was 1.00. The GPY2 North Shore Gas program verified gross realization rate was also 1.00.

Recommendation 4. The implementation contractor should update ex-ante per unit measure savings for furnaces, showerheads, and aerators, as detailed in this report.

Savings Estimates

Finding 5. Approximately 41 percent of research findings net energy savings from the Peoples Gas C&I Prescriptive program were from new measures introduced into the program in GPY2, such as industrial/process steam traps, hot water and steam pipe insulations, and boiler combustion management upgrades. Similarly, pipe insulation and industrial steam traps contributed 38 percent of the net savings for North Shore Gas. The implementation contractor's steam pipe insulation measure savings estimates, while reasonable and not requiring an adjustment at this time, stand to benefit from additional engineering research into applicable heat loss correction factors (i.e. heat lost through the insulation system of conditioned space into unconditioned space, sometimes referred to as thermal regain).

Recommendation 5. The program should continue to identify opportunities and encourage program trade allies and contractors to recommend steam traps and pipe insulation measures to customers. The implementation contractor should conduct research to validate engineering assumptions for the heat loss correction factor used in estimating ex-ante savings values for hot water or steam pipe insulation measures installed for space heating applications.

Program Participation

Finding 6. Overall, PGL and NSG C&I Prescriptive program participation increased significantly in GPY2 compared to the previous year, due in part to program changes and additional measures introduced in GPY2. Peoples Gas implemented 732 projects (including 20 direct install projects) which was nearly a 600 percent increase from GPY1. North Shore Gas implemented 61 projects (including 2 direct install projects) which was approximately double the number from GPY1. The multifamily sector accounted for the bulk of the savings (38 percent) and the total number of installed projects and participation for Peoples Gas. For North Shore Gas, the medical sector accounted for the bulk of the savings (35 percent), but the multifamily sector had more projects and participation. Overall, participants indicated strong satisfaction with the program, with 89 percent indicating they were very satisfied with the program.

Recommendation 6. The program has diversified the mixture of program participants and should continue to expand and diversify offerings to the other business sectors.

[5] Illinois Statewide Energy Efficiency Technical Reference Manual (TRM), Version 1.0; Illinois_Statewide_TRM_Effective_060112_Final_091412_Clean.

Trade Ally Satisfaction and Other Participation.

Finding 7. Trade allies were generally very satisfied with the program, as seven respondents (78%) gave a score between four and five (highest), and one respondent gave a score of two and another gave a score of three. The population of non-participant trade allies provided to Navigant contained both residential and non-residential trade allies. Of the 243 non-participants, approximately 18% of the contacts provided did not qualify for the survey. The provided population contained distributors, manufacturers, manufacturer representatives, and residential sector contacts. Considerable time was spent vetting contacts.

Recommendation 7. The IC should continue to market the program to participating trade allies, but also encourage non-participating trade allies to actively pursue and submit projects to the program. The IC should develop a commercial and industrial specific list of non-participating trade allies. By identifying potential trade allies, the IC will be better able to target new contractors to further increase program participation and savings.

Finding 8. The provision of the bonus incentive to customers for replacing or retrofitting specific measures including HVAC heating equipment, pipe insulations and industrial steam traps appears to have increased program participation in GPY2.

Recommendation 8. The program should extend this promotional offer to trade allies and provide incentives to trade allies for specific promotions to continue to add more non-participating trade allies to the program throughout GPY3.

Finding 9. From the non-participant trade ally survey results, trade allies continue to find the application process cumbersome and indicated that there is lack of coordination among utilities to improve communication to the trade allies.

Recommendation 9. The IC should revisit the concerns and recommendations raised by non-participant trade allies as elaborated in Table 5-1, to improve on the dissemination of information to both program trade allies and those potential trade allies working with other utilities.

Overall, the GPY2 Peoples Gas and North Shore Gas C&I Prescriptive programs built on a solid foundation from GPY1 to substantially expand their impacts. The Peoples Gas program increased participation year-over-year and exceeded planned energy savings targets in GPY2 compared to GPY1. The North Shore Gas program increased participation year over year but did not achieve their planned savings target in GPY2, although it increased its savings significantly compared to GPY1. The programs' tracking system is accurately recording measure counts and measure savings, contributing to GPY2 gross realization rates of 1.00 for both Peoples Gas and North Shore Gas. In GPY2, the program-level research finding Net-to-Gross Ratio of 0.63 was a significant increase from GPY1 value of 0.43.

1. Introduction

1.1 Program Description

The Commercial & Industrial (C&I) Prescriptive Rebate program (C&I Prescriptive program) is targeted to all C&I customers. The C&I Prescriptive program provides rebates to customers to install, replace or retrofit qualifying equipment. While the actual list of equipment may vary over time, the program generally includes measures such as natural gas heating systems, control technologies, water heating equipment, and food service equipment. The C&I Prescriptive program is targeted to active customers of Peoples Gas or North Shore Gas ("the Companies"). In general these customers are served under rates S.C. No. 2 and S.C. No. 3 (North Shore Gas) and S.C. No. 4 (Peoples Gas).

Customer rebates are based on a portion of the incremental cost difference between standard or minimum code efficiency and high efficiency equipment that varies by measure. If the common industry practice is to replace equipment with higher efficiency than the standard- or minimum code-required efficiency, the higher efficiency number is used as a baseline from which to calculate the rebate and energy savings. Customers may receive a rebate without pre-approval for participation. The C&I Prescriptive program relies on wholesale and retail trade allies to assist in the marketing of this program. Trade ally support and engagement is considered to be a key element to the success of this program. The C&I Prescriptive program may provide incentives to trade allies for specific, limited-time promotions.

Key changes introduced during this program year include the introduction of direct installation of water efficiency measures free of charge to interested program participants. New measures introduced in GPY2 with significant uptake were space heating and industrial steam trap replacements and hot water and steam boiler pipe insulations. The eligibility criterion for a boiler tune-up was tightened to require no tune-up within the last 36 months.

1.2 Evaluation Objectives

The Evaluation Team identified the following key researchable questions for GPY2:

1.2.1 Impact Questions

1. What is the level of gross annual energy (therms) savings induced by the program?
2. What are the net impacts from this program? What is the level of free ridership associated with this program? What is the level of spillover associated with this program?
3. Did the program meet its energy saving goals? If not, why not?
4. Are the assumptions and calculations of savings in the tracking data in compliance with the statewide TRM? If not, what changes are required?

1.2.2 Process Questions

1. Are program participants satisfied with the program? Are program trade allies satisfied with the program?
2. Has the program been successful in recruiting additional participants? In what ways can the program increase customer participation? Are customers satisfied with the program?
3. Has the program been successful in recruiting additional trade allies? Are trade allies satisfied with the program? In what ways can the program increase the trade ally participation?
4. How has the program changed its marketing and outreach strategies since GPY1?

2. Evaluation Approach

This evaluation of the C&I Prescriptive program reflects the second full-scale year of program operation. The sections below describe the data that was collected, the method of collection, and the method for analyzing the data to answer the impact and process questions. The program's gross impact evaluation focused on verifying the compliance of the program with the State of Illinois Energy Efficiency Technical Reference Manual (Illinois TRM v1.0).[6] If a measure is not in the Illinois TRM or where custom assumptions were used, the evaluation reviewed the savings assumptions to verify reasonableness of claimed savings.

Participant and trade ally surveys were conducted to determine the program level of free ridership and spillover for the GPY2 net to gross research estimation. The process evaluation focused on customer and trade ally program satisfaction, and identification of barriers to participation, with a targeted effort to follow up on the GPY1[7] recommendations and update the conclusions from the GPY1 Verification, Due Diligence and Tracking System memo. The process evaluation also reviewed barriers to program recruitment and ways in which program recruitment and enrollment could be increased for both customers and trade allies.

2.1 Primary Data Collection

2.1.1 Overview of Data Collection Activities

The core data collection activities included the following list.

1. Interviews with implementation contractor and program management staff.
2. Quantitative telephone survey with participant decision makers of a sample of participants selected from the program population.
3. Interviews with participating and non-participating trade allies.
4. Review of secondary sources including internal manuals and the program tracking database.

Program tracking data was requested from Franklin Energy, including:

- Contact information for participating customers, participant and non-participant trade allies, including name, address, and telephone number.
- Date of participation.
- Number and type of measures installed.
- Tracked gross savings estimates (Franklin tracked ex ante net savings).
- Additional data request on steam trap leakage inspections.

Table 2-1 below summarizes the surveys, interviews, and other primary data sources used to answer the impact and process questions noted earlier. The sample sizes and approximate timing of each activity is also presented.

[6] Illinois Statewide Energy Efficiency Technical Reference Manual (TRM), Version 1.0;
[7] PG_NSG CI Prescriptive GPY1 EMV Report 2013-05-09 Final

Table 2-1. Core Data Collection Activities

N	What	Who	Target Completes	Completes Achieved[8]	When	Comments
Impact Assessment						
1	Measure Savings Review	Program Tracking System/ IL_TRM	All	All	July-Sept 2013	Source of information for verified gross analysis
2	Telephone Survey	Participant Customers	70	58	June-July 2013	Data collection supporting NTG and process analysis in the same instrument.
3	Telephone Survey	Participant Trade Allies	10	9	July-Aug 2013	Data collection supporting NTG and process analysis in the same instrument.
4	Telephone Survey	Non-Participant Trade Allies	10	5	July-Aug 2013	Data collection supporting NTG and process analysis in the same instrument.

2.1.2 Verified Savings Parameters

Navigant estimated verified per unit savings for each program measure using impact algorithm sources found in the Illinois TRM for deemed measures, and evaluation research for non-deemed measures. Table 2-2 below presents the sources for parameters that were used in verified gross savings analysis indicating which were examined through GPY2 evaluation research and which were deemed. For measures not included in the Illinois TRM, Navigant reviewed ex-ante values and engineering assumptions provided by the implementation contractor, including steam pipe insulation measures and hot water pipe insulation measures.

[8] Reasonable attempts were made to contact additional participants and non-participants, but they either did not respond to the request for an interview or they refused the interview.

Table 2-2. Verified Gross and Net Savings Parameter Data Sources

Parameter	Data Source	Deemed or Evaluated?
NTG	Evaluation research	Evaluated
Gross Realization Rate	Evaluation research	Evaluated
Boiler Cutout/Reset Controls	TRM v1.0 (section 4.4.4)	Deemed
Boiler Tune-Up Savings	TRM v1.0 (section 4.4.2)	Deemed
High Efficiency Boilers Savings	TRM v1.0 (section 4.4.10)	Deemed
High Efficiency Furnaces Savings	TRM v1.0 (section 4.4.11)	Deemed
Showerhead and Aerators Savings	TRM v1.0 V01 (section 4.3.2 and 4.3.3)	Deemed
Commercial Kitchen (Food Service Equipment) Savings	TRM v1.0 (section 4.2)	Deemed
Water Heaters Savings	TRM v1.0 (section 4.3.1 and 4.3.4)	Deemed
HW/Steam Boilers Pipe Insulation	Integrys_Master_Measure_Document 010213 & Evaluation Research	Evaluated
Pipe Insulation (DHW) Savings	TRM v1.0 (section 5.4.1)	Deemed
Programmable Thermostats Savings	Integrys_Master_Measure_Document 010213 & Evaluation Research	Evaluated (previous year value)
Steam Traps Savings	TRM v1.0 (section 4.4.15)	Deemed

Illinois_Statewide_TRM_Effective_060112_Final_091412_Clean
Navigant analysis of Integrys_Master_Measure_Document 010213

2.1.3 Verified Gross Program Savings Analysis Approach

Navigant reviewed the programs' tracking systems and procedures to verify that the program accurately reported measure counts. The majority of the C&I Prescriptive program tracking system lookup unit savings were verified to be based on deemed values and algorithms from the Illinois TRM, with some exceptions for measures that were not included in the applicable Illinois TRM version. For non-deemed C&I measures, including programmable thermostats, Navigant relied on previous year's non-deemed values to verify the claimed savings. Navigant conducted research to validate engineering assumptions and ex ante savings for steam pipe and hot water pipe insulation measures provided by the implementation contractor. The detail of Navigant's engineering review is provided in Section 3.3. The verified gross savings are the product of verified per unit savings and verified measure quantities.

2.1.4 Verified Net Program Savings Analysis Approach

Net to gross (NTG) research methods in GPY2 combine participant and trade ally survey results, based on the self-report method. The approach focused on capturing a broader market representation of free ridership and spillover. Participant's actions in the absence of the program along with the

presence of any spillover installations were analyzed, along with participating trade ally and non-participating trade ally spillover analysis. Navigant conducted a stratified sampling to target 70 participants but we were only able to complete 58 interviews for participant free ridership and spillover analysis. Samples of 10 participant trade allies and 10 non-participant trade allies were also targeted for completed interviews. Sampling for the NTG analysis was designed to achieve a 90/10 confidence and precision level. In order to achieve the designed confidence and precision on the participant trade ally sample, Navigant attempted a census of the contractors that generated the largest portion of program savings. Contractors that contribute a smaller proportion of the savings were also sampled in order to achieve a balanced perspective.

The overall program NTG is calculated by using the participating customer free-ridership rate, and then adding the participant and trade ally participant and non-participating spillover results, as follows:

$$NTG_{Program} = 1 - (Participating\ Customer\ Free\ Rider\ Score) + Participant\ Spillover + Trade\ Ally\ Participant\ and\ Non\ Participant\ Spillover$$

Navigant examined the spillover results to identify and eliminate double counting of spillover resulting from overlap between the participants and the trade allies. The GPY2 research findings net energy savings for Peoples Gas and North Shore Gas C&I Prescriptive programs were calculated by multiplying the verified gross savings estimates by the estimated net-to-gross ratio. The calculation results are summarized in Appendix 7.2.2.

2.1.4.1 Free-Ridership

Participant Free Ridership

The participant free ridership was assessed using a customer self-report method. This method calculates free-ridership using data collected during participant telephone interviews covering the three scoring items of Timing and Selection Score (reflects the influence of the most important of various program and program-related elements in the customer's decision to select a specific program measure at the time); Program Influence Score (captures the perceived importance of the program whether rebate, recommendation, or other program intervention); and No-Program Score (captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available). Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure. The rationale for using the maximum value is to capture the most important element in the participant's decision making.

The algorithm for determining participant free ridership is shown below. Detail of the scoring and weighting of the three main participant free-ridership is summarized in the Appendix 7-2.

$$Participant\ Free\ Ridership = Average[(Timing\ \&Selection\ Score + Program\ Influence\ Score + No\ Program\ Influence\ Score)]$$

2.1.4.2 Spillover

Participant Spillover

Participant spillover is calculated using the following algorithm:

$$Participant\ SO = [(Savings\ Associated\ with\ Additional\ High\ Efficiency\ Measures \\ /Total\ Participant\ Savings\ x\ \ Program\ Influence\ Score)]$$

The savings values associated with the additional high efficiency measures were taken from the Illinois TRM when available, and from other third party industry documents if not in the Illinois TRM.

Trade Ally Participant Spillover

The trade allies and other contractors were asked about their total sales. This number was used to weight the trade ally responses to calculate an overall increase in the sales of program qualified measures. For participating trade allies, their total sales were compared to the program sales, to calculate an estimated savings from the additional measures installed outside of the program. Trade ally spillover was calculated using the following algorithm:

$$Trade\ Ally\ PSO = [(Percentage\ of\ Program\ Qualified\ Sales \\ - Percentage\ of\ Program\ Sales)\ x\ (Program\ Influence\ Score)]$$

Non-Participating Trade Ally Spillover

Five non-participating trade ally interviews were completed with quantifiable spillover. The spillover measures identified were furnace, boilers, boiler controls, and water heater measures. To estimate the spillover, Navigant used the trade ally sales that can be credited to the program, and used the therms per cost of similar equipment found in the program tracking system to calculate estimated spillover therms savings that can be credited to the program. The non-participant TA survey could not distinguish which program, C&I Prescriptive or C&I Custom, influenced the non-participant trade allies, so the non-participant spillover savings were credited to the Prescriptive program because they were similar to prescriptive measures.

Non-participating and drop-out trade ally spillover was calculated using the following algorithm:

$$Non\ Participant\ Trade\ Ally\ SO \\ = [(Percentage\ of\ High\ Efficiency\ Sales\ After\ Program\ Participation \\ /Training - Percentage\ of\ High\ Efficiency\ Sales\ Before\ Program\ Participation \\ /Training)\ x\ (Program\ Influence\ Score)]$$

2.1.5 Process Evaluation

The GPY2 process evaluation activities assessed the effectiveness of program implementation and design through in-depth interviews with program staff and the implementation contractor. The evaluation examined what went well or not so well in GPY2 and what changes have been made in GPY2 that are expected to impact customer and trade ally participation and satisfaction. Navigant interviewed participants about their satisfaction with the program, including the program's

application and approval process, program incentives and customer interactions with program staff. We asked questions about sources of program awareness and effectiveness of program marketing and outreach materials. Navigant conducted interviews with 58 participants and nine trade ally participants for the process evaluation.

3. Gross Impact Evaluation

Navigant estimated that the Peoples Gas C&I Prescriptive program achieved verified gross savings of 4,651,497 Therms and a 1.00 verified gross realization rate. The GPY2 North Shore Gas program achieved verified gross savings of 207,059 Therms and a 1.00 verified gross realization rate. The verified savings were calculated by multiplying the quantity of measures installed by the verified measure unit savings. The program verified gross realization rate was determined by the ratio of the verified savings and the tracking ex ante savings.

3.1 Tracking System Review

Over the course of the GPY2 program year, Navigant and the program implementation contractor maintained close contact regarding the program tracking system (Bensight Data Management platform) updates to follow up from previous program evaluation recommendations. The implementation contractor granted Navigant direct access to the program tracking system, enabling Navigant to obtain real-time information from the tracking system. Navigant used an extract from the program's tracking system (September 24, 2013 data extract) to verify the GPY2 program ex ante inputs including measure counts and ex ante savings. Navigant verified that the Peoples Gas and North Shore Gas C&I Prescriptive program tracking system continued to capture relevant data required to track the program's actions for reporting and evaluation activities. Navigant found that the programs had implemented quality assurance and quality control procedures to minimize the likelihood of data entry errors and that the programs continued to maintain or improve upon these procedures.

In addition to the tracking database, Franklin Energy provided to Navigant a spreadsheet of measure savings[9] derived from the Illinois TRM for the deemed measures or from other engineering estimates. The evaluation team commends efforts of Franklin Energy for providing this useful document. It is convenient for verifying program compliance with the TRM algorithm and assumptions, and clarifies other engineering assumptions for non-deemed ex ante savings in the tracking system.

Listed below are additional findings and/or recommendations to improve the program tracking system.

1. Navigant found that the tracking system is not automatically setup to update with measure lookup unit savings whenever the *"Master Measure Document"* is revised with new measure assumptions and savings calculation. Navigant found instances where the tracking unit savings do not match with the values in the master list. Navigant adjusted the claimed savings from the tracking system for furnaces, kitchen and bathroom aerators, to comply with the TRM requirements.
2. The tracking system does not provide adequate information about steam trap installations. Navigant did not find information indicating which steam trap projects received inspection prior to replacement or where there were possible instances of mass replacements. Navigant requested additional clarification on this matter from the program implementation contractor to make an informed decision on TRM compliance and verified savings. Navigant

[9] Integrys_Master_Measure_Document 010213

recommends that such information should be made readily available in the tracking system to aid IC quality control procedures and the evaluation and verification efforts.

3.2 Program Volumetric Findings

Overall, the PGL and NSG C&I Prescriptive programs performed very well in GPY2 compared to the previous year, due in part to program changes and additional measures introduced in GPY2. Peoples Gas implemented 732 projects (including 20 direct install projects) from 459 participants who installed different kinds of energy efficient equipment. North Shore Gas implemented 61 projects (including 2 direct install projects) from 48 participants.

The market segmentation of the C&I Prescriptive programs in GPY2 is illustrated in Table 3-1 and Table 3-2. The multifamily sector accounted for the bulk of the savings, and the total number of installed projects and participation for Peoples Gas. For North Shore Gas, the medical sector accounted for the bulk of the savings, but the multifamily sector had more projects and participation.

Table 3-1. Peoples Gas GPY2 Program Market Segmentation and Gross Savings

Sector	Projects		Business Participants		Projects / Part.	Ex Ante Gross Savings		Therm / Project
	Count	%	Count	%		Therms	%	
College / University	56	8%	12	3%	4.67	720,525	15%	12,867
Hotel/Motel	10	1%	7	2%	1.43	177,800	4%	17,780
Medical	35	5%	17	4%	2.06	575,522	12%	16,443
Multi-Family	465	64%	311	68%	1.50	1,764,979	38%	3,796
Grocery	2	0%	2	0%	1.00	1,628	0%	814
Retail/Service	26	4%	21	5%	1.24	196,570	4%	7,560
Church	40	5%	15	3%	2.67	213,286	5%	5,332
Office	38	5%	22	5%	1.73	511,461	11%	13,459
K-12 School	9	1%	5	1%	1.80	57,948	1%	6,439
Manufacturing	17	2%	15	3%	1.13	292,298	6%	17,194
Non-Profit	3	0%	2	0%	1.50	7,375	0%	2,458
Restaurant	8	1%	8	2%	1.00	3,985	0%	498
Warehouse	2	0%	2	0%	1.00	71,091	2%	35,546
Other	21	3%	20	4%	1.05	61,841	1%	2,945
TOTAL	**732**		**459**		**1.59**	**4,656,309**		**6,361**

Source: Navigant Evaluation Team Analysis of Tracking Data

Table 3-2. North Shore Gas GPY2 Program Market Segmentation and Gross Savings

Sector	Projects		Business Participants		Projects / Part.	Ex Ante Gross Energy Savings		Therm / Project
	Count	%	Count	%		Therms	%	
College / University	3	5%	2	4%	1.50	7,859	4%	2,620
Medical	8	13%	8	17%	1.00	71,758	35%	8,970
Multi-Family	24	39%	15	31%	1.60	17,348	8%	723
Retail/Service	6	10%	6	13%	1.00	28,524	14%	4,754
Church	3	5%	2	4%	1.50	9,432	5%	3,144
Office	3	5%	2	4%	1.50	11,620	6%	3,873
K-12 School	4	7%	3	6%	1.33	11,752	6%	2,938
Manufacturing	4	7%	4	8%	1.00	34,459	17%	8,615
Non-Profit	1	2%	1	2%	1.00	1,959	1%	1,959
Restaurant	1	2%	1	2%	1.00	1,014	0%	1,014
Other	4	7%	4	8%	1.00	11,501	6%	2,875
TOTAL	**61**		**48**		**1.27**	**207,226**		**3,397**

Source: Navigant Evaluation Team Analysis of Tracking Data

Key findings include:

1. Significant savings were realized from industrial/process steam trap replacements, accounting for about 20% of total verified gross savings for Peoples Gas and 32% for North Shore Gas. Commercial steam traps for spacing heating applications accounted for 31% and 7% savings respectively for Peoples Gas and North Shore Gas. Overall, steam traps accounted for 51% of verified GPY2 program savings for Peoples Gas and 40% for North Shore Gas.

2. A total of 112,117 linear feet of pipe insulation from domestic hot water systems, steam boilers and hot water boilers were installed by Peoples Gas and accounted for about 17% of the verified program gross savings for Peoples Gas. A total of 5,682 linear feet of pipe insulation were installed for North Shore Gas and contributed 6% of the North Shore Gas program verified savings.

3. The majority of C&I Prescriptive projects in GPY2 were installed in multifamily buildings for both Peoples Gas and North Shore Gas. Peoples Gas in GPY2 installed boiler combustion management upgrades – performed single pipe steam boiler averaging controls and steam system balancing and improved venting in 4,221 multifamily living units. These measures accounted for 4% of total verified savings for the Peoples Gas program.

4. Overall, approximately 41 percent of research findings net energy savings from the Peoples Gas C&I Prescriptive program were from new measures introduced into the program in GPY2, such as industrial/process steam traps, hot water and steam pipe insulations, and boiler combustion management upgrades. Similarly, pipe insulation and industrial steam traps contributed 38 percent of the net savings for North Shore Gas.

5. Comparing year-to-year volumetric results from GPY1 and GPY2, the performance of the Peoples Gas C&I Prescriptive program in GPY2 increased over 700% in terms of verified gross energy saving, and increased nearly 600% in installed projects. The North Shore Gas has a 500% increase in verified gross savings and almost 100% increase in installed projects.

6. Peoples Gas installed 3,021 direct install showerheads, aerators and pre rinse sprayers free of charge to interested program participants. These measures contributed about 1% of the total verified gross savings for Peoples Gas. North Shore Gas installed 23 aerators and pre rinse sprayers, with about 0.1% of the total verified savings.

3.3 Gross Program Impact Parameter Estimates

As described in Section 2, ex ante energy savings were verified using the assumptions and algorithms as specified in the Illinois TRM or through engineering analysis for non-deemed measures. Navigant conducted research to validate engineering assumptions for parameter values not specified in the Illinois TRM, including steam boiler and hot water boiler pipe insulation measures, which were supplied by the program's implementation contractor.[10] Navigant reviewed the implementation contractor's engineering input assumptions and determined that these engineering assumptions were reasonable, as shown in Appendix 7.2.1. While Navigant made no adjustments to ex-ante savings for hot water and steam pipe insulation measures, Navigant recommends the IC should further research to validate engineering assumptions, as documented in this report's findings and recommendations.

Table 3-3 indicates the input parameters used to estimated verified savings.

[10] Integrys_Master_Measure_Document 010213 (see spreadsheet Tab 24: Boiler Pipe Insulation).

Table 3-3. Verified Gross Savings Parameters

Input Parameters	Value	Deemed or Evaluated?
Quantity of Measure Installed	Varies with measure type	Evaluated
Gross Realization Rate (PGL/NSG)	PG=1.00, NSG=1.00	Evaluated
HVAC Steam Traps	330.2	Deemed TRM v1.0
Programmable Thermostat	178.0	Deemed TRM v1.0
Bathroom & Kitchen Aerator	5.1 (bath) 4.3 (kitchen)	Deemed TRM v1.0 V01
Showerhead	13.5	Deemed TRM v1.0 V01
Furnace <225 MBH > 95% AFUE	229.5	Deemed TRM v1.0
Furnace <225 MBH > 92% AFUE	189.6	Deemed TRM v1.0
Industrial Steam Traps (varying psig)	Vary by psig	Deemed TRM v1.0
Commercial Dry Cleaner Steam Trap	514.0	Deemed TRM v1.0
Commercial Kitchen Equipment	All verified as acceptable	Deemed TRM v1.0
Tankless Water Heater	244.2	Deemed TRM v1.0
Indirect Water Heater	188.1	Evaluated
Gas Water Heater > .67 EF PY2	147.9	Deemed TRM v1.0
Pre Rinse Sprayers	117.9	Deemed TRM v1.0
Boiler Cutout/Reset Controls	Vary with building type	Deemed TRM v1.0
Boiler Tune-up (Heating)	Vary with building type	Deemed TRM v1.0
Energy Efficient Boilers	Vary with building type	Deemed TRM v1.0
Industrial Burner Tune-up	0.6	Deemed TRM v1.0
Infrared Heaters	3.0	Deemed TRM v1.0
Large Gas Water Heater	251.2	Evaluated
Single-Pipe Steam System Averaging, Balancing/Improved Venting Controls	55.8	Evaluated
Single-Pipe Steam System Balance and Improved Vent	23.5	Evaluated
Pipe Insulation (DHW/)	0.91	Deemed TRM v1.0
Pipe Insulation (Steam/HW Boiler)	Vary with pipe size	Integrys_Master_Measure_Document 010213 & Evaluation Research

Source: Utility tracking data and Navigant analysis
Source: Illinois TRM (version 1.0)

Savings from bathroom and kitchen aerators and furnaces (92% and 95% AFUE Residential applications) were adjusted to comply with Illinois TRM requirements, as shown in Table 3-4.

Table 3-4. Evaluation Verified Unit Savings

Measure Type	Ex Ante Unit Therms Savings	Verified Unit Therms Savings	Gross Realization Rate	Evaluator Comments
Bath Aerator	7.2	5.1	71%	Corrected ex ante to comply with TRM (v1.0 V01) assumptions and calculation
Kitchen Aerator	15.0	4.3	29%	Corrected ex ante to comply with TRM (v1.0 V01) assumptions and calculation
Furnace < 225 MBtu > 95% AFUE Res	279.0	229.5	82%	Corrected ex ante to comply with TRM (v1.0) assumptions and calculation
Furnace < 225 MBtu > 92% AFUE Res	200.0	189.6	95%	Corrected ex ante to comply with TRM (v1.0) assumptions and calculation

Source: Utility tracking data and Navigant analysis

The approved Technical Reference Manual (TRM)[2] Version 1.0 unit savings for C&I aerators and showerheads were reviewed by the TRM Technical Advisory Committee and found to have been derived using algorithms containing an error. The errata are corrected by removing the redundant GPM factor from the algorithms for aerators and showerheads, with the resulting difference shown in Table 3-5. The errata correction (CI-HW_-LFFA-V02-120601) was identified on page 9 in Table 1.4 of the IL-TRM Version 2.0 dated June 7th, 2013 that was approved in Commission's Final Order in ICC Docket No. 13-0437 on November 6, 2013. The evaluation verified savings in Table E-1 of this report is shown using both the uncorrected algorithms ("ICC approved TRM Unit Savings") as well as the corrected algorithms ("Corrected TRM Algorithm"). The remaining tables in the report are based on the ICC approved TRM Unit Savings.

[2] State of Illinois Energy Efficiency Technical Reference Manual. Final as of September 14th, 2012. Effective June 1st, 2012.

Table 3-5. Impact Estimate for Measures with Known Errata in the v1.0 TRM

Measure Description	Ex Ante Default Unit Savings (Therms/unit)	ICC Approved TRM (v1.0 V01) Unit Savings (Gross Realization Rate %)	Corrected TRM Algorithm (v1.0 V02) Unit Savings (Gross Realization Rate %)
Bathroom Aerator	7.2	5.1 (71%)	18.0 (250%)
Kitchen Aerator	15.0	4.3 (29%)	15.0 (100%)
Showerhead	13.5	13.5 (100%)	21.64 (160%)

Illinois_Statewide_TRM_Effective_060112_Final_091412_Clean.
This value is calculated for miscellaneous business category. It may vary per business category.

3.3.1 Development of the Verified Gross Realization Rate

The program verified gross realization rate was determined by calculating the ratio of the verified gross savings and the tracking ex ante gross savings. Verified gross realization rates by end-use group were calculated for Peoples Gas and North Shore Gas as shown in Table 3-6 and Table 3-7. The results were also disaggregated to calculate the gross savings realization rates from direct install measures versus contractor installed program options. The results are shown in shown in Table 3-8 and Table 3-9.

Table 3-6. Peoples Gas GPY2 Gross Realization Rate by End-use Category

End-use Category	Peoples Gas			
	Ex Ante Gross Savings (Therms)	Realization Rate	Verified Gross Savings (Therms)	Percent of Verified Gross Savings
Space Heating Hot Water Boiler Cutout and Reset Controls	40,384	1.00	40,391	0.9%
Boiler Tune-Ups	640,178	1.00	640,006	13.8%
Space Heating Hot Water Boilers	215,754	1.00	215,780	4.6%
Commercial Kitchen Equipment	6,781	1.00	6,781	0.1%
Direct Install Water Efficiency Device	32,179	0.87	27,907	0.6%
Space Heating Furnaces	50,860	0.99	50,304	1.1%
Natural Gas Water Heaters	8,086	1.00	8,086	0.2%
Heating Energy Management Systems – Multifamily Building with Single Pipe Steam Boiler	189,397	1.00	189,397	4.1%
Pipe Insulation	782,009	1.00	782,162	16.8%
Programmable Thermostats	325,474	1.00	325,474	7.0%
HVAC Steam Trap Repairs or Replacements	1,450,051	1.00	1,450,053	31.2%
Industrial/Process Steam Traps	915,156	1.00	915,156	19.7%
PG Program Total	**4,656,309**	**1.00**	**4,651,497**	**100%**

Source: Utility tracking data and Navigant analysis

Table 3-7. North Shore Gas GPY2 Gross Realization Rate by End-use Category

End-use Category	North Shore Gas			
	Ex Ante Gross Savings (Therms)	Realization Rate	Verified Gross Savings (Therms)	Percent of Verified Gross Savings
Space Heating Hot Water Boiler Cutout and Reset Controls	10,727	1.00	10,729	5.2%
Boiler Tune-Ups	49,965	1.00	49,988	24.1%
Space Heating Hot Water Boilers	41,187	1.00	41,195	19.9%
Commercial Kitchen Equipment	5,893	1.00	5,893	2.8%
Direct Install Water Efficiency Device	440	0.48	213	0.1%
Space Heating Furnaces	3,593	1.00	3,593	1.7%
Natural Gas Water Heaters	188	1.00	188	0.1%
Pipe Insulation	12,452	1.00	12,478	6.0%
Programmable Thermostats	890	1.00	890	0.4%
HVAC Steam Trap Repairs or Replacements	14,860	1.00	14,860	7.2%
Industrial/Process Steam Traps	67,033	1.00	67,033	32.4%
NSG Program Totals	**207,226**	**1.00**	**207,059**	**100%**

Source: Utility tracking data and Navigant analysis

Table 3-8. Peoples Gas GPY2 Gross Realization Rate by Program Delivery

Install Type	Projects	Ex Ante Gross Energy Savings	Realization Rate	Verified Gross Energy Savings	Percent Verified Gross Savings
Contractor Installed Measures	714	4,624,130	1.00	4,623,590	99%
Direct Install Measures	20	32,179	0.87	27,907	1%
PG Program Total	**732**	**4,656,309**	**1.00**	**4,651,497**	**100%**

Source: Utility tracking data and Navigant analysis

Table 3-9. North Shore Gas GPY2 Gross Realization Rate by Program Delivery

Install Type	Projects	Ex Ante Gross Energy Savings	Realization Rate	Verified Gross Energy Savings	Percent Verified Gross Savings
Contractor Installed Measures	59	206,787	1.00	206,846	99.9%
Direct Install Measures	2	440	0.48	213	0.10%
NSG Program Totals	**61**	**207,226**	**1.00**	**207,059**	**100%**

Source: Utility tracking data and Navigant analysis

As noted in Table 3-4, the ex-ante savings for the direct install showerheads and bath/kitchen aerators were adjusted to comply with TRM (v1.0 measure code version V01) assumptions and calculations. Although the adjustments affected the gross savings realization rates for these measures or end use, the impact was too small to significantly affect the overall program verified gross savings realization rate of 1.00 for both PG and NSG. The impact on direct install measures was less for Peoples Gas due to the mix of measures – Peoples Gas direct installs included a large percentage of showerheads that received no adjustment.

3.4 Verified Gross Program Impact Results

The verified gross impact results were disaggregated for the direct install versus the contractor installed options as shown in Table 3-10 and Table 3-11. The resulting total program verified gross savings is 4,651,497 Therms for Peoples Gas and 207,059 Therms for North Shore Gas.

Table 3-10. Peoples Gas GPY2 Verified Gross Impact Savings Estimates by Program Delivery

Program Delivery	Sample	Gross Energy Savings (Therms)	90/10 Significance?
Contractor Installed Measures			
Ex-Ante GPY2 Gross Savings	NA	4,624,248	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		4,623,708	
Direct-Installed Measures			
Ex-Ante GPY2 Gross Savings	NA	32,061	NA
Verified Gross Realization Rate		0.87	
Verified Gross Savings		27,789	
Peoples Gas GPY2 Total			
Ex-Ante GPY2 Gross Savings	NA	4,656,309	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		4,651,497	

Source: Evaluation Team analysis.

Table 3-11. North Shore Gas GPY2 Verified Gross Impact Savings Estimates by Program Delivery

Program Delivery	Sample	Gross Energy Savings (Therms)	90/10 Significance?
Contractor Installed Measures			
Ex-Ante GPY2 Gross Savings	NA	206,787	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		206,846	
Direct-Installed Measures			
Ex-Ante GPY2 Gross Savings	NA	440	NA
Verified Gross Realization Rate		0.48	
Verified Gross Savings		213	
North Shore Gas GPY2 Total			
Ex-Ante GPY2 Gross Savings	NA	207,226	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings		207,059	

Source: Evaluation Team analysis.

4. Net Impact Evaluation

As noted in Section 2, free-ridership and participant spillover were estimated through the implementation of a participating customer survey. Navigant calculated net-of free-ridership for each interview and then savings-weighted net-of-free-ridership for the program. Navigant completed 58 participating customer interviews. Nine participating trade ally interviews were used to estimate spillover, along with an additional five interviews with non-participant trade allies to estimate spillover. Both non-participant and participant trade ally spillover estimates were combined to determine the overall net to gross.

The overall program net to gross estimate was 0.63 (used in the main report) with a 90/9 confidence interval and precision level based on the participating customer survey, as shown in Table 4-1. Reasonable attempts were made to contact additional customers and trade ally participants and non-participants, but they either did not respond to the request for an interview or they refused the interview.

Details of the free ridership estimation and spillover analysis are provided in the Section 7.2.2.

Table 4-1. GPY2 Verified Net-to-Gross Estimate

Interview Type	Research Estimated Values
Participant Free-ridership Score (P)	0.41
Participant Spillover (PSO)	0.001
Participating Trade Ally Spillover (TSO)	0.02
Trade Ally Non-Participant Spillover (TNSO)	0.02
Net-to-Gross (1-(P)+PSO+TSO+TNSO), used in main report	0.63
NTGR Rel. Precision at 90% Confidence Interval (based on participant survey)	9%

Source: Evaluation Team analysis.

Using the estimated NTG of 0.63, the evaluation team calculated research findings net savings of 2,930,443 Therms for Peoples Gas as shown in Table 4-2. The evaluation calculated verified net savings for North Shore Gas is 130,447 Therms as shown in Table 4-3. The tables present savings at the measure group level including end-use groups where the estimate is not statistically significant at the 90/10 level, and the program level savings at 90/9 confidence interval and precision level.

Table 4-2. Peoples Gas GPY2 Verified Net Impact Savings Estimates by End-use Category

Category	Sample	Energy Savings (Therms)	90/10 Significance?
HVAC Applications			
Ex-Ante GPY2 Gross Savings	NA	2,912,098	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		2,911,405	
Pipe Insulation			
Ex-Ante GPY2 Gross Savings	NA	782,009	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		782,162	
Water Efficiency Device/Water Heater			
Ex-Ante GPY2 Gross Savings	NA	40,265	NA
Verified Gross Realization Rate		0.89	
Verified Gross Savings‡		35,993	
Industrial/Process Steam Traps			
Ex-Ante GPY2 Gross Savings	NA	915,156	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		915,156	
Commercial Kitchen Appliance			
Ex-Ante GPY2 Gross Savings	NA	6,781	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		6,781	
Peoples Gas GPY2 Total			
Ex-Ante GPY2 Gross Savings	NA	4,656,309	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		**4,651,497**	
Spillover (Participating Customer, PSO) ‡	58	0.001	Yes
Spillover (Participating TA, TSO) ‡	9	0.02	
Spillover (Non-Participating TA, TNSO) ‡	5	0.02	NA
Free ridership (Participating Customer) ‡	58	0.41	Yes
Spillover Total (PSO + TSO + TNSO) ‡	**NA**	**0.04**	
Free ridership (Evaluation Reporting) ‡	**NA**	**0.41**	**Yes**
Net-to-Gross Ratio (NTGR)‡	**NA**	**0.63**	
Research Findings Net Savings ‡	**NA**	**2,930,443**	**Yes**

Source: Utility tracking data and Navigant analysis.
‡ Based on evaluation research
Evaluation Reporting: NTGR = 1-Participating Customer Free-ridership +PSO+TSO+TNSO

Table 4-3. North Shore Gas GPY2 Verified Net Impact Savings Estimates by End-use Category

Category	Sample	Energy Savings (Therms)	90/10 Significance?
HVAC Applications			
Ex-Ante GPY2 Gross Savings	NA	121,221	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		121,255	
Pipe Insulation			
Ex-Ante GPY2 Gross Savings	NA	12,452	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		12,478	
Water Efficiency Device/Water Heater			
Ex-Ante GPY2 Gross Savings	NA	628	NA
Verified Gross Realization Rate		0.64	
Verified Gross Savings‡		401	
Industrial/Process Steam Traps			
Ex-Ante GPY2 Gross Savings	NA	67,033	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		67,033	
Commercial Kitchen Appliance			
Ex-Ante GPY2 Gross Savings	NA	5,893	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		5,893	
North Shore Gas GPY2 Total			
Ex-Ante GPY2 Gross Savings	NA	207,226	NA
Verified Gross Realization Rate		1.00	
Verified Gross Savings‡		**207,059**	
Spillover (Participating Customer, PSO) ‡	58	0.001	Yes
Spillover (Participating TA, TSO) ‡	9	0.02	
Spillover (Non-Participating TA, TNSO) ‡	5	0.02	NA
Free ridership (Participating Customer) ‡	58	0.41	Yes
Spillover Total (PSO + TSO + TNSO) ‡	**NA**	**0.04**	
Free ridership (Evaluation Reporting) ‡	**NA**	**0.41**	**Yes**
Net-to-Gross Ratio (NTGR)‡	**NA**	**0.63**	
Research Findings Net Savings ‡	**NA**	**130,447**	**Yes**

Source: Utility tracking data and Navigant analysis.
‡ Based on evaluation research
Evaluation Reporting: NTGR = 1-Participating Customer Free-ridership +PSO+TSO+TNSO

4.1.1 Program Planned and Actual Accomplishments

As shown in Table 4-4, the Peoples Gas C&I Prescriptive program exceeded planned GPY2 net energy savings targets by 91 percent. North Shore Gas did not meet its planned target, but achieved 51 percent of its savings target in GPY2.

Table 4-4. GPY2 C&I Prescriptive Program Planned and Actual Accomplishments

Detail	Ex Ante Net Savings (Therms)	Verified Net Savings (Therms)	Planned GPY2 Net Savings	% Planned Net Savings Achieved
Peoples Gas	2,002,361	2,930,443	1,536,793	191%
North Shore Gas	89,107	130,447	257,974	51%

Source: PG_NSG GPY2 Preliminary ICC report 2013-07-11;
Navigant analysis of GPY2 program tracking data

Table 4-5 and Table 4-6 below provide comparison of GPY2 Peoples Gas and North Shore Gas C&I Prescriptive program findings versus GPY1 findings. The Peoples Gas GPY2 program achieved over a thousand percent more of research findings net savings compared to GPY1. North Shore Gas tripled net savings in GPY2.

Table 4-5. Peoples Gas C&I Prescriptive Program Yearly Comparison

Program Result	GPY1	GPY2	Year-to-Year Ratio (GPY2/GPY1)
Ex Ante Gross Savings (Therms)	529,545	4,656,309	879%
Verified Gross Realization Rate	1.00	1.00	
Verified Gross Savings (Therms)	528,485	4,651,497	880%
Net to Gross Ratio	0.43	0.63	
Research Findings Net Savings (Therms)	227,249	2,930,443	1,290%
Installed Projects	106	732	691%

Navigant analysis of GPY2 C&I Prescriptive Program tracking data (September 24, 2013 data extract)
GPY1 C&I Prescriptive Program Evaluation Report_Final

Table 4-6. North Shore Gas C&I Prescriptive Program Yearly Comparison

Program Result	GPY1	GPY2	Year-to-Year Ratio (GPY2/GPY1)
Ex Ante Gross Savings (Therms)	99,134	207,226	209%
Verified Gross Realization Rate	1.00	1.00	
Verified Gross Savings (Therms)	98,936	207,059	209%
Net to Gross Ratio	0.43	0.63	
Research Findings Net Savings (Therms)	42,542	130,447	307%
Installed Projects	31	61	197%

Navigant analysis of GPY2 C&I Prescriptive Program tracking data (September 24, 2013 data extract)
GPY1 C&I Prescriptive Program Evaluation Report_Final

5. Process Evaluation

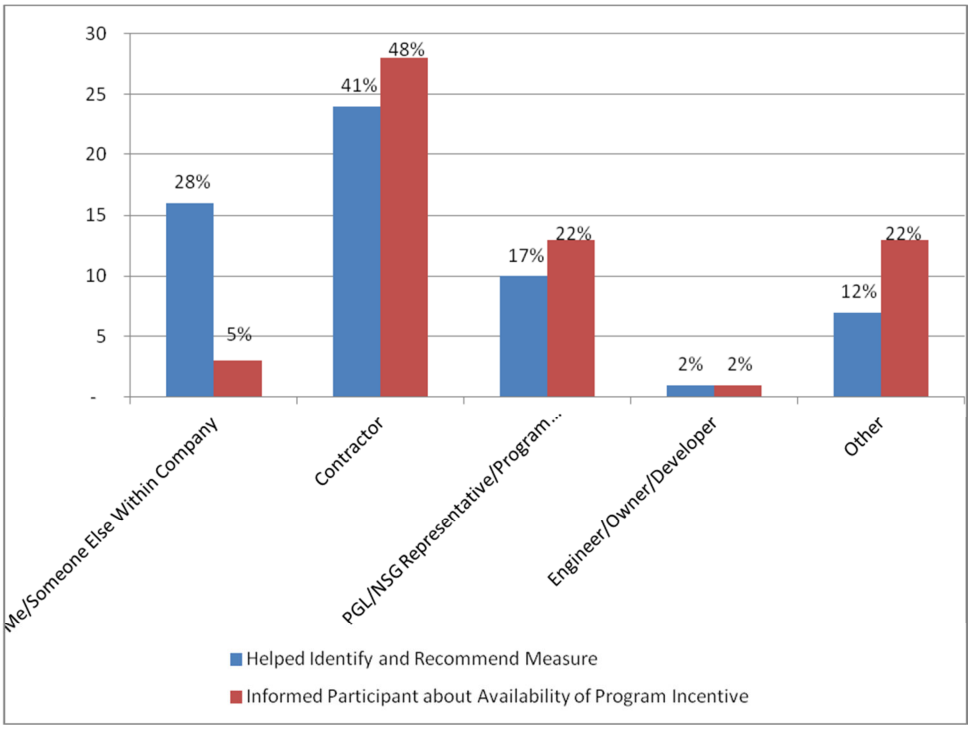
The process evaluation findings of the C&I Prescriptive Program are organized by the process research questions outlined in Section 1 of this report.

Participant Survey Results

Navigant completed interviews with 58 participating customers out of the 70 participant sample target. The interview asked customers about their satisfaction with the program, including the program's application and approval process, program incentives and customer interactions with program staff.

The implementation contractor provided a great deal of support throughout the survey process. Navigant's targeted sample size for both the participant customer and trade allies and non-participant trade allies required a great deal of coordination between all parties. Support was provided to Navigant by reaching out to potential survey participants and encouraging them to complete the survey. Navigant believes the efforts put forth by the IC increased the overall success rate of a difficult subset of respondents.

Figure 5-1. Method of Initial Introduction to Program



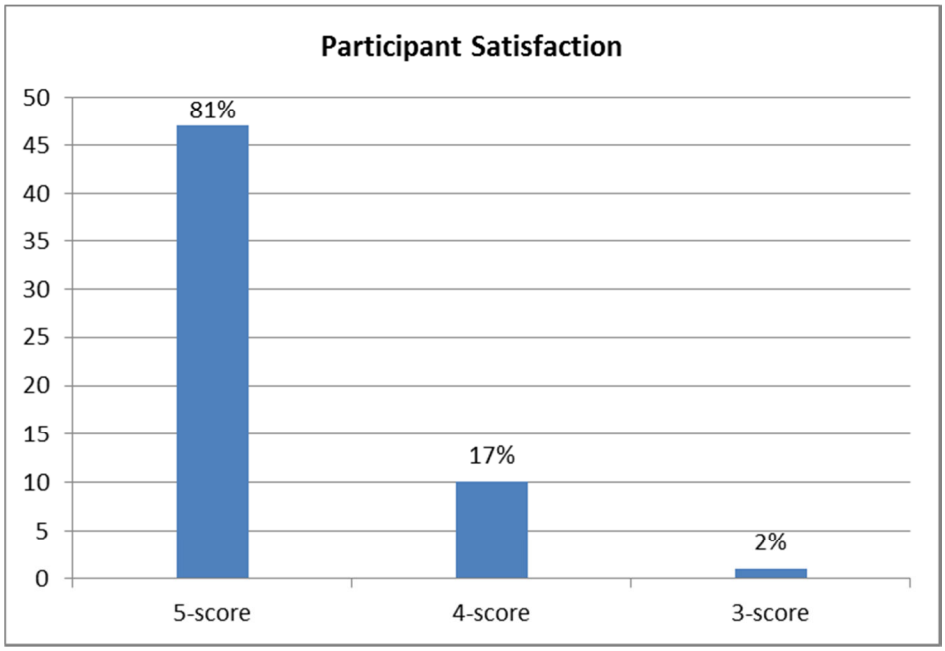
Source: Evaluation Team analysis

As shown in Figure 5-1, participants were asked to indicate who identified and recommended the type of measure that they installed and who informed them about the incentive through the C&I Prescriptive Program. Twenty-four of the fifty-eight respondents (41%) reported that a contractor

helped them to identify and recommend the measure they installed, but twenty-eight respondents (48%) said contractors informed them about the availability of incentive through the C&I Prescriptive Program. An additional sixteen respondents (28%) identified themselves or someone within their company recommended the measure, but only three (5%) said they learned about the incentive benefit themselves or within their company. Additionally, ten participants (17%) reported that the utility account manager or PGL/NSG representative helped identify and recommend a measure, and seven respondents (12%) said they learned about the program incentives through "Other" representatives. Of those who gave "Other" as a response, the majority mentioned the assistance of PGL/NSG program affiliates. Five respondents mentioned the Center for Neighborhood Technology, one mentioned a vendor distributor and two mentioned the facilities construction office as being instrumental in recommending measures and program incentives to participants.

Participants were asked whether they filled out the application forms for the project (either the initial or the final program application), and whether the application forms clearly explain the program requirements and how to participate. Of the fifty-eight (58) respondents, thirty respondents (52%) said they filled out the application themselves, and that the application forms clearly explain the program requirements and how to participate.

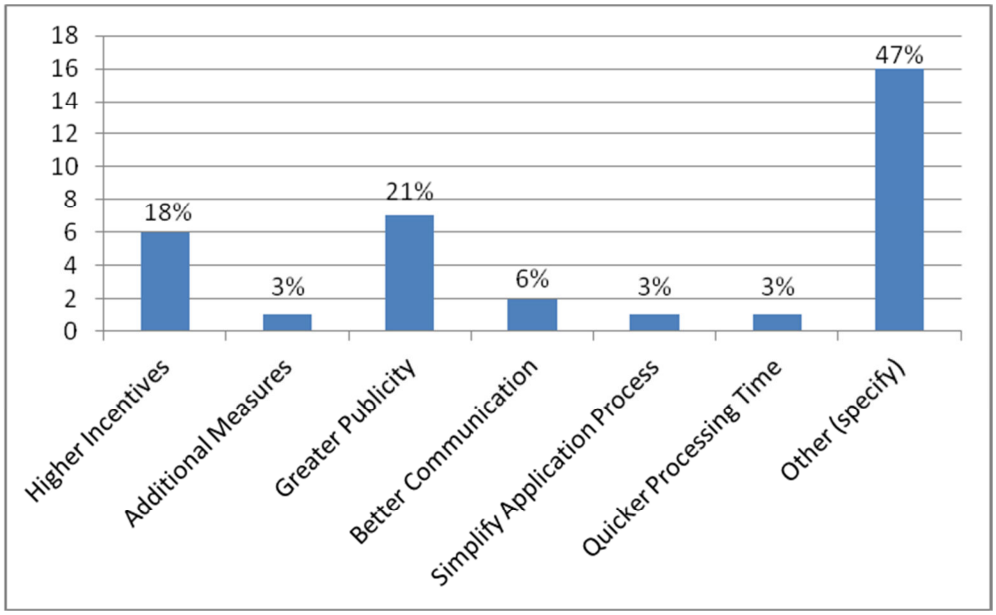
Figure 5-2. Participant Satisfaction



Source: Evaluation Team analysis

Figure 5-2 shows a summary of participant satisfaction. Participants were asked to rate their overall satisfaction with the program, on a scale of 0 to 5 where 0 is "not at all satisfied" and 5 is "very satisfied". Participants indicated very strong satisfaction with the program, and no participant gave a score below 3. Overall, forty-seven respondents (81%) gave a score of 5, and additional ten respondents (17%) gave a score of 4. One respondent gave a score of 3.

Figure 5-3. Participant Recommendations for Program Improvement



Source: Evaluation Team analysis

As shown in Figure 5-3, when asked if they had any suggestions for improving the program, thirty-four participants (59%) responded with various suggestions. Among those who gave specific suggestions, seven respondents (21%) suggested increasing the publicity that the program receives. Six respondents (18%) recommended increasing the incentive levels and two respondents (6%) recommended improving information about the program. Only one participant mentioned simplifying the application process as a suggestion, and one participant suggested a quicker rebate processing time. Among the "Other" suggestions, included the program should extend the implementation period for the next five years, because things went smoothly for the program; the program should allow more time to collect and fill out the paper work and submission of applications; and the program should provide prescriptive rebates for other measures like thermostatic radiator valves, window and insulation measures.

Trade Ally Survey Results

Participant Trade Allies

Navigant completed interviews with nine participant trade allies out of the 10 trade ally sample target, and five non-participant trade allies out of a sample target of 10. Overall, participant trade allies and contractors are very familiar and satisfied with the Peoples Gas and North Shore Gas C&I Prescriptive program.

Trade allies were asked a series of questions regarding participation, satisfaction with the program and marketing effectiveness, and suggested changes to reach a targeted audience. Eight out of the nine respondents (89%) gave a score of five or four of their familiarity with the program, and one respondent gave a score of two (on a scale from zero to five, where zero is not at all familiar and five is very familiar). On the question of satisfaction, trade allies indicated their strong satisfaction with the program. Seven respondents (78%) gave a score between 4 and 5, and one respondent gave a score of two and another gave a score of three. When respondents were asked whether they have attended any Peoples Gas and North Shore Gas training sessions and how they will rank the overall

effectiveness of the training session, seven respondents gave a score of five or four, and one gave a score of two, and one with no score.

Non-Participant Trade Allies

Responses from non-participants trade allies on reasons for not participating and recommendations to improve relations with trade allies are illustrated in Table 5-1. Generally, the non-participant trade allies view streamlining the application process and coordination with other utilities as key to win more trade allies to participate in the PG/NSG program.

Table 5-1. Non-Participant Trade Ally Survey Results

Survey Questions	Non-Participant Trade Ally Response
Why have you not yet participated or submitted any project applications to the PG/NSG program?	▪ Two respondents indicated lack of knowledge of application process or where to submit. One said part of the application had PG/NSG information, and part had Nicor information. The other mentioned lack of time to drill through PG/NSG information and get to the right contact. ▪ Two respondents mentioned they rather work with Nicor Gas, and indicated that in-person visits from Nicor Gas to address their customers are helpful. ▪ One respondent said as a consulting company without a business license, they cannot work with PG/NSG, and its customers did not apply. ▪ Another respondent said its customers had already allocated budget for the project, and may rather participate in PG/NSG program next year.
Is there anything the PG / NSG can do to help you complete the program applications or any recommendation?	▪ Help us with the form. Probably a name and number that act as a liaison to help us go through these. ▪ Keep the application form simple and short. Clear and concise is a lot better than page after page of legal stuff. ▪ PG/NSG should come and address the customers in person or more onsite training. Get the word out more; E-mails and brochures. ▪ Have another category for energy contractors with other requirements such as business license of subcontractors. ▪ Split the incentives. The building owner doesn't reap the benefits of the saved energy costs, but has to pay the capital cost. Suggests getting the two parties involved to split the bill. ▪ Getting all of the programs in the same geographical region in line with each other (e.g., Nicor, PG, NSG, etc.) makes it much easier for the contractors to understand and participate. Many other states have a single program for the entire state.
Have you received any promotional materials or looked at the program website to find information?	▪ Only two respondents said "Yes" they checked the website or received promotional materials through emails for upcoming event or brochures from trade shows, and frequently forward these emails to their customers. ▪ One of these respondents said other than for downloading application forms, the PG/NSG website had very minimal information, and that the NSG/PG website is the most lacking of all EE program websites they know.

Source: Evaluation Team analysis of survey results.

It should be noted that the population of non-participant trade allies provided to Navigant contained both residential and non-residential trade allies. Of the 243 non-participants, approximately 18% of the contacts provided did not qualify for the survey. The provided population contained distributors, manufacturers, manufacturer representatives, and residential sector contacts. Considerable time was spent vetting contacts. Navigant recommends that the implementation contractor develop a commercial and industrial specific list of non-participating trade allies. By identifying potential trade allies, the implementation contractor will be better able to target new contractors to further increase program participation and savings.

6. Conclusions and Recommendations

This section summarizes the key impact and process findings and recommendations. Overall, the GPY2 Peoples Gas and North Shore Gas C&I Prescriptive programs built on a solid foundation from GPY1 to substantially expand their impacts. The Peoples Gas program increased participation year over year and exceeded planned energy savings targets in GPY2 compared to GPY1. The North Shore Gas program increased participation year-over-year but did not achieve their planned savings target in GPY2, although it increased its savings significantly compared to GPY1. The programs' tracking system is accurately recording measure counts and measure savings, contributing to GPY2 gross realization rates of 1.00 for both Peoples Gas and North Shore Gas. In GPY2, the program-level research finding Net-to-Gross Ratio of 0.63 was a significant increase from the GPY1 value of 0.43.

Program Savings Goals Attainment

Finding 1.[11] The Peoples Gas GPY2 program achieved evaluation research findings net savings of 2,930,443 Therms, which is 191 percent of the program's net savings goal of 1,536,793 Therms. Compared to GPY1, the Peoples Gas program increased net energy savings by more than 1,200 percent. The North Shore Gas GPY2 program achieved evaluation research findings net savings of 130, 447 Therms which is 51 percent of the program's net savings goal of 257,974 Therms. Compared to GPY1, the North Shore Gas program increased energy savings by 300 percent. Steam traps and pipe insulation were a significant factor in the savings increase of both programs in GPY2.

Recommendation 1. To better achieve program savings goals, the program should continue to identify opportunities and encourage program trade allies and contractors to recommend steam traps and pipe insulation measures to customers. Trade allies should identify businesses or projects or insulation materials that would be more cost effective, while ensuring program rules and guidelines for pipe insulations meet the TRM requirements.

Net-to-Gross Ratio

Finding 2. The NTG ratio found in this evaluation is 0.63, derived from evaluation estimates of participant free ridership and spillover and participating and non-participating trade ally spillover. Further, measures with lower free-ridership scores were added and eligibility for boiler tune-up services was tightened in GPY2. The GPY2 NTGR is a substantial increase over the GPY1 NTG ratio of 0.43, which did not include spillover and was based on a more limited set of measures offered in GPY1.

Recommendation 2. No recommendation, NTG is deemed for GPY3.

Finding 3. Free ridership among program measures vary depending on the customer or project specific characteristics and the market segment. Overall, 36 percent (21 out of 58 participants) indicated extreme likelihood of installing the same equipment without the program, mostly citing standard practice, condition of the old equipment and maintenance issues as strong basis for implementing measure, with moderate indication

[11] Findings and Recommendations numbered 1, 2, 3, 4, 5,and 6 appear in the Executive Summary.

of program influence. Although, it appears participants with pipe insulation, industrial steam traps and boiler tune-ups contributed to the increase in program participant NTG, It should be noted that the sample sizes for any category except the combined PG and NSG population will not provide statistically significant conclusions regarding individual measures and should be used with caution.

Recommendation 3. Navigant does not recommend removal of any measure from the program in GPY3, but suggests that the IC should encourage trade allies and contractors to improve on the customer application screening process to minimize free ridership.

Verified Gross Realization Rates

Finding 4. Appropriate quality control and quality assurance procedures are in place. With minor exceptions as identified in the report, the program tracking system is accurately recording measure savings estimates based on deemed or partially deemed values from the State of Illinois Energy Efficiency Technical Reference Manual (Illinois TRM) [12]. The ex ante per unit savings for furnaces, showerheads, and aerators were adjusted to comply with the TRM, producing a reduction of 4,812 Therms for PGL and 167 therms for NSG compared to the verified gross energy savings. The GPY2 Peoples Gas program verified gross realization rate was 1.00. The GPY2 North Shore Gas program verified gross realization rate was 1.00.

Recommendation 4. The implementation contractor should update ex-ante per unit measure savings for furnaces, showerheads, and aerators, as detailed in this report.

Savings Estimates

Finding 5. Approximately 41 percent of verified net energy savings from the Peoples Gas C&I Prescriptive program were from new measures introduced into the program in GPY2, such as industrial/process steam traps, hot water and steam pipe insulations, and boiler combustion management upgrades. Similarly, pipe insulation and industrial steam traps contributed 38 percent of the verified savings for North Shore Gas. The implementation contractor's steam pipe insulation measure savings estimates, while reasonable and not requiring an adjustment at this time, stand to benefit from additional engineering research into applicable heat loss correction factors (i.e. heat lost through the insulation system of conditioned space into unconditioned space, sometimes referred to as thermal regain).

Recommendation 5. The program should continue to identify opportunities and encourage program trade allies and contractors to recommend steam trap measures to customers. The implementation contractor should conduct research to validate engineering assumptions for the heat loss correction factor used in estimating ex-ante savings values for hot water or steam pipe insulation measures installed for space heating applications.

Program Participation

Finding 6. Overall, PGL and NSG C&I Prescriptive program participation increased significantly in GPY2 compared to the previous year, due in part to program changes and additional measures introduced in GPY2. Peoples Gas implemented 732 projects

[12] Illinois Statewide Energy Efficiency Technical Reference Manual (TRM), Version 1.0; Illinois_Statewide_TRM_Effective_060112_Final_091412_Clean.

(including 20 direct install projects) which was nearly a 600 percent increase from GPY1 results. North Shore Gas implemented 61 projects (including 2 direct install projects) which was approximately double the number from GPY1 results. The multifamily sector accounted for the bulk of the savings (38 percent), and the total number of installed projects and participation for Peoples Gas. For North Shore Gas, the medical sector accounted for the bulk of the savings (35 percent), but the multifamily sector had more projects and participation. Overall, participants indicated strong satisfaction with the program, with 89 percent indicating they were very satisfied with the program.

Recommendation 6. The program should consider expanding and diversifying offerings to the other business sectors.

Trade Ally Satisfaction and Other Participation.

Finding 7. Trade allies were generally very satisfied with the program, as seven respondents (78%) gave a score between four and five (highest), and one respondent gave a score of two and another gave a score of three. Regarding familiarity with the program, eight out of the nine respondents (89%) gave a score of five or four of their familiarity with the program, and one respondent gave a score of two (on a scale from zero to five, where zero is not at all familiar and five is very familiar).

Recommendation 7. The IC should continue to market the program to participating trade allies but also encourage non-participating trade allies to actively pursue and submit projects to the program.

Review Process.

Finding 8. The population of non-participant trade allies provided to Navigant contained both residential and non-residential trade allies. Of the 243 non-participants, approximately 18% of the contacts provided did not qualify for the survey. The provided population contained distributors, manufacturers, manufacturer representatives, and residential sector contacts. Considerable time was spent vetting contacts.

Recommendation 8. Navigant recommends that the implementation contractor develop a commercial and industrial specific list of non-participating trade allies. By identifying potential trade allies, the implementation contractor will be better able to target new contractors to further increase program participation and savings.

Finding 9. Twenty-four of the fifty-eight (41%) respondents of the participant survey reported that a contractor helped them to identify and recommended the measure they installed, but twenty-eight respondents (48%) said contractors informed them about the availability of incentives through the C&I Prescriptive Program.

Recommendation 9. From the participant survey, contractors continue to be a crucial part in the acquisition of new customers to the program and the flow of information to potential participants. The IC should continue to foster their relationship with existing trade allies and establish new connections with non-participant trade allies.

Finding 10. It appears the provision of bonus incentives to customers for replacing or retrofitting specific measures including HVAC heating equipment, pipe insulations and industrial steam traps, the program were able to increase program participation in GPY2.

Recommendation 10. The program should extend this promotional offer to trade allies, and provide incentives to trade allies for specific promotions. This could be a driving factor to win more non-participating trade allies into the program in GPY3 and beyond.

Finding 11. From the non-participant trade ally survey results, trade allies continue to find the application process cumbersome and indicated that there is lack of coordination among utilities to improve communication to the trade allies.

Recommendation 11. The IC should revisit the concerns and recommendations raised by non-participant trade allies as elaborated in Table 5-1, to improve on the dissemination of information to both program trade allies and those potential trade allies working with other utilities.

7. Appendix

7.1 ComEd, Nicor Gas, Peoples Gas, and North Shore Gas EM&V Reporting Glossary. December 17, 2013

High Level Concepts

Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 through May 31, 2009, EPY2 is June 1, 2009 through May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 through May 31, 2012, GPY2 is June 1, 2012 through May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY5/GPY2 the Illinois TRM was in effect and was the source of most deemed parameters. Some of the PGL, NSG, Nicor Gas and ComEd deemed parameters were defined in filings with the ICC but the TRM takes precedence when parameters were in both documents.

Application: When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retro-commissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

Application: When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retro-commissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ "Energy" and "Demand" may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.
† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.
§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the "Terms to be Used in Reports" column).

Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

Deemed Value – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or PGL and NSG's approved deemed values.

Non-Deemed Value – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or PGL and NSG's approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript "E" for "evaluated" (e.g., delta watts^{E}, HOU-Residential^{E}).

Default Value – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript "DV" as in X^{DV} (meaning "Default Value").

Adjusted Value – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript "AV" as in X^{AV}

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012[13].

Evaluation: Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification*, *measure level research*, and *program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

Synonym: **Evaluation, Measurement and Verification (EM&V)**

[13] IL-TRM_Policy_Document_10-31-12_Final.docx

Measure Level Research: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

Program Level Research: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

Measure Type: Measures are categorized into two subcategories: custom and prescriptive.

Custom: Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

Prescriptive: The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

Fully Deemed: Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

Partially Deemed: Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

> **Customized basis:** Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings.

7.2 Detailed Impact Research Findings and Approaches

7.2.1 Gross Impact Results

Table 7-1 provides the measure breakdown for the end-use categories used in Table 4-2 and Table 4-3.

Table 7-1. GPY2 Installed Measures by End-use Category

End-use Category	Measures
HVAC Application	HVAC Steam Traps
	Boiler Cutout/Reset Controls
	Boiler Tune-up (Heating)
	Furnace <225 MBH > 95% AFUE
	Other Residential Measures
	MF Single-Pipe Steam Boiler Averaging Controls
	Furnace <225 MBH > 92% AFUE
	MF Single-Pipe Steam System Balancing and Improved Venting
	Energy Efficient Boilers
	Programmable Thermostat
	Industrial Burner Tune-up
	Infrared Heaters
Pipe Insulation	Steam Boiler Pipe Insulation
	Pipe Insulation (HW Boiler)
	Pipe Insulation (DHW)
Water Efficiency Device/Water Heater	Bathroom Aerator
	Kitchen Aerator
	Showerhead
	Pre Rinse Sprayers
	Tankless Water Heater
	Indirect Water Heater
	Large Gas Water Heater
	Gas Water Heater > .67 EF PY2
Industrial/Process Steam Traps	Industrial Steam Traps (varying psig)
	Commercial Dry Cleaner Steam Trap
Commercial Kitchen Appliance	Combination Oven
	Infrared Salamander Broiler
	Energy Star Fryer
	Infrared Charbroiler
	Energy Star Convection Oven

Source: Navigant Evaluation Team Analysis of Tracking Data

Table 7-2 and Table 7-3 show the measure level quantities and verified savings in GPY2.

Table 7-2. Peoples Gas GPY2 Verified Gross Savings by Measure Type

Measure Type	Peoples Gas				
	Measure Unit	Ex Ante Installed Quantity	Verified Installed Quantity	Ex Ante Unit Gross Savings (Therms)	Verified Gross Unit Savings (Therms)
HVAC Steam Traps	Unit	4,391	4,391	330.2	330.2
Programmable Thermostat	Unit	1,829	1,829	178.0	178.0
Bathroom Aerator	Unit	1,686	1,686	7.2	5.1
Kitchen Aerator	Unit	73	73	15.0	4.3
Showerhead	Unit	1,244	1,244	13.5	13.5
Furnace <225 MBH > 95% AFUE	Unit	97	97	229. 54 or 279.07	229.5
Furnace <225 MBH > 92% AFUE	Unit	13	13	220.0	189.6
Industrial Steam Traps (varying psig)	Unit	504	504	varies with trap psig	acceptable
Commercial Steam Trap	Unit	20	20	514.0	514.0
Food Service Appliances	Unit	14	14	varies	acceptable
Tankless Water Heater	Unit	6	6	244.2	244.2
Indirect Water Heater	Unit	6	6	188.1	188.1
Gas Water Heater > .67 EF PY2	Unit	5	5	147.9	147.9
Pre Rinse Sprayers	Unit	18	18	117.9	117.9
Boiler Cutout/Reset Controls	MBH	34,730	34,730	varies	acceptable
Boiler Tune-up (Heating)	MBH	1,672,192	1,672,192	varies	acceptable
Energy Efficient Boilers	MBH	97,221	97,221	varies	acceptable
Industrial Burner Tune-up	MBH	31,383	31,383	0.6	0.6
Infrared Heaters	MBH	8,525	8,525	3.0	3.0
Large Gas Water Heater	MBH	18	18	251.2	251.2
Single-Pipe Steam Boiler Averaging Controls	Living Unit	2,792	2,792	55.8	55.8
Single-Pipe Steam System Balance and Improved Vent	Living Unit	1,429	1,429	23.5	23.5
Pipe Insulation (DHW/HW Boiler)	Linear Foot	18,975	59,361	0.91(DHW) 3.4 (HWB)	0.91(DHW), 3.4 (HWB)
Steam Boiler Pipe Insulation	Linear Foot	52,756	52,756	varies with pipe size	acceptable
Residential Measures paid through C&I Program	Unit	8	8	varies	acceptable

Source: Navigant Evaluation Team Analysis of Tracking Data and Deemed Savings Review

Table 7-3. North Shore Gas GPY2 Verified Gross Savings by Measure Type

Measure Type	North Shore Gas				
	Measure Unit	Ex Ante Installed Quantity	Verified Installed Quantity	Ex Ante Unit Gross Savings (Therms)	Verified Gross Unit Savings (Therms)
HVAC Steam Traps	Unit	45	45	330.2	330.2
Programmable Thermostat	Unit	5	5	178.0	178.0
Bathroom Aerator	Unit	1	1	7.2	5.1
Kitchen Aerator	Unit	21	21	15.0	4.3
Furnace <225 MBH > 95% AFUE	Unit	14	14	229. 5 or 279.1	229.5
Furnace <225 MBH > 92% AFUE	Unit	2	2	220.0	189.6
Industrial Steam Traps (varying psig)	Unit	29	29	varies with trap psig	acceptable
Commercial Dry Cleaner Steam Trap	Unit	51	51	514.0	514.0
Food Service Appliance	Unit	10	10	varies	acceptable
Indirect Water Heater	Unit	1	1	188.1	188.1
Pre Rinse Sprayers	Unit	1	1	117.9	117.9
Boiler Cutout/Reset Controls	MBH	9,225	9,225	varies	acceptable
Boiler Tune-up (Heating)	MBH	93,699	93,699	varies	acceptable
Energy Efficient Boilers	MBH	34,228	34,228	varies	acceptable
Industrial Burner Tune-up	MBH	47,885	47,885	0.6	0.6
Pipe Insulation (HW Boiler)	Linear Foot	2,820	2,820	3.4	3.5
Pipe Insulation (DHW)	Linear Foot	2,837	2,837	0.9	0.9
Steam Boiler Pipe Insulation	Linear Foot	25	25	varies with pipe size	acceptable

Source: Navigant Evaluation Team Analysis of Tracking Data and Deemed Savings Review

Table 7-4 and Table 7-5 show the end-use measure quantities in GPY2.

Table 7-4. Peoples Gas GPY2 Ex-Ante and Verified Measure Count by End-use Type

End-use Type	Peoples Gas		
	Measure Unit	Ex Ante Measure Quantity	Verified Measure Quantity
Space Heating Hot Water Boiler Cutout and Reset Controls	MBH	34,730	34730
Boiler Tune-Ups	MBH	1,703,575	1,703,575
Space Heating Hot Water Boilers	MBH	97,222	97,222
Food Service Equipment	Unit	14	14
Direct Install Water Efficiency Device	Unit	3,021	3,021
Space Heating Furnaces	Unit	8,635	8,635
Natural Gas Water Heaters	Unit	40	40
Single Pipe Steam Heating Controls and Balancing/Venting	Living Unit	4,221	4,221
Pipe Insulation	Linear Foot	112,117	112,117
Programmable Thermostats	Thermostat	1,831	1,831
HVAC Steam Trap Repairs or Replacements	Trap	4,391	4,391
Industrial/Process Steam Traps	Trap	524	524

Source: Utility tracking data and Navigant analysis.

Table 7-5. North Shore Gas GPY2 Ex-Ante and Verified Measure Count by End-use Type

End-use Type	North Shore Gas		
	Measure Unit	Installed Quantity	Installed Quantity
Space Heating Hot Water Boiler Cutout and Reset Controls	MBH	9,225	9225
Boiler Tune-Ups	MBH	141,584	141,584
Space Heating Hot Water Boilers	MBH	34,228	34,228
Food Service Equipment	Unit	10	10
Direct Install Water Efficiency Device	Unit	23	23
Space Heating Furnaces	Unit	16	16
Natural Gas Water Heaters	Unit	1	1
Pipe Insulation	Linear Foot	5,682	5,682
Programmable Thermostats	Thermostat	5	5
HVAC Steam Trap Repairs or Replacements	Trap	45	45
Industrial/Process Steam Traps	Trap	80	80

Source: Utility tracking data and Navigant analysis.

Savings Input Parameters for HW/Steam Pipe Insulation

The following algorithm from the TRM (v2.0)[14] was used to calculate verified gross savings for steam pipe and hot water insulation measures.

$$Verified\ Gross\ Annual\ Therm\ Savings\ per\ Foot = ((Qbase - Qeff) \times HOURS) / (100{,}000 \times \eta Boiler)) \times CF$$

Where:

- Q_{base} = Heat Loss from Bare Pipe (Btu/hr/ft).
- Q_{eff} = Heat Loss from Insulated Pipe (Btu/hr/ft).
- Hours = Annual operating hours (actual or defaults by piping use and building type)
- 100,000 = conversion factor (1 Therm = 100,000 Btu)
- ηBoiler = Efficiency of the boiler being used to generate the hot water or steam in the pipe (=80.7% for steam and 81.9% for hot water boilers)
- CF = Heat loss correction factor of 1.00 (not considered in the TRM but by Franklin Energy, and Navigant agreed this value is reasonable to use in GPY2, but proposes this should be considered by the TRM Technical Committee).

Following the TRM v2.0 description of the steam pipe insulation measure savings input, the heat loss estimates (Qbase and Qeff) provided by Franklin Energy were verified using the 3E Plus v4.0 software program[15]. The energy savings analysis is based on adding 1.5-inch thick insulation around bare pipe. Details of the input parameters to 3E plus are shown in the Table 7-6 below.

[14]State of Illinois Energy Efficiency Technical Reference Manual, Version 2.0, 4.4.14; (Ilinois_Statewide_TRM_Effective_060113_Version_2.0_060713_Clean). Approved for GPY3.

[15] 3E Plus is a heat loss calculation software provided by the NAIMA (North American Insulation Manufacturer Association).

Table 7-6. Steam/HW Pipe Insulation Savings Parameters

Parameter	Value	Data Source
R value of industrial pipe insulation (steam boiler)	5.0 (1.5in. horizontal pipe insulation with K of 0.27- mineral fiber =5.2)	Integrys Master Measure Document
R value of HW pipe insulation (space heating HW boiler)	5.0 (1.5in. insulation with K of 0.259 - flexible polyurethane =5.6)	Integrys Master Measure Document
Linear feet of pipe	1	Standard value
Pipe temperature (steam boiler)	225 F	Proposed value for TRM measure
Pipe temperature (HW boiler)	150 F	Proposed value for TRM measure
Ambient temperature	75F	Engineering assumption
Combustion Efficiency	80.7% (steam), 81.9% (HW)	Proposed TRM v2.0 value
Nominal Pipe Size	Varies (steel for steam and copper for HW)	Engineering assumption/ TRM v2.0 proposal
BTU loss/hr, uninsulated	Varies	Calculation using 3E Plus
BTU loss/hr, insulated	Varies	Using 3E Plus
BTU loss/hr, savings	Varies	Using 3E Plus
Hours of Operation/year	4963 (TRM v2.0 - recirculation heating season)	TMY3 Weather Data from O'Hare Int'l Airport
Heat Loss Correction Factor	0.67 or 1.00	Engineering Assumption
BTU/therm Conversion Factor	100,000	Standard value
Therms/year saved	Varies	Calculation
Nominal Therms/year saved	Varies (Average of all pipe sizes)	Calculation

Source: Navigant analysis of Integrys_Master_Measure_Document 010213

7.2.2 Net Program Impact Results

NTGR Sampling Approach

For the Participant sampling, program-level savings data were analyzed by project size to inform the sample design. Projects were stratified at tracking record level using the ex ante gross therms savings. Records were sorted from largest to smallest prescriptive energy savings claim, and placed into one of three strata such that each contains one-third of the program total ex ante gross energy savings. The 70 participant sample was designed such that the sample represents the final population distribution by stratum. Participant sampling for the NTG analysis was designed to achieve a 90/10 confidence and precision level. Additionally, interviews were completed with 9 participant trade allies and 5 non-participant trade allies. In order to achieve the designed confidence and precision on the participating trade ally sample, Navigant conducted a census of the contractors that generate the

top portion of program savings. Contractors that contributed a smaller proportion of the savings were also sampled in order to achieve a balanced perspective. Although Navigant was unable to reach the targeted number of interview completions due to non-response, the trade allies interviewed represented prominent measures in then program: steam traps, boiler and boiler tune-ups, and pipe insulation.

Table 7-7. C&I Prescriptive Program Sampling Summary

Survey Target	Population	Target Sample	Completed	Planned Confidence/Precision
Participant	793	70	58	90/10
Participant Trade Ally	186	10	9	90/10
Non-Participant Trade Ally	243	10	5	n/a

In an effort to improve the response rate of both the program participant and trade ally surveys, Navigant worked with the implementation contractor to verify the customer contact name and telephone number data in the tracking system was accurate prior to initiating outreach to sampled participants. A reasonable number of attempts were made to complete enough interviews to reach the sample targets but completed interviews fell short due to non-response or refusals.

Research Findings NTGR in Main Report

The overall program NTG is calculated using the customer participant free-ridership rate, and then adding the participant, participating trade ally, and non-participating trade ally spillovers, as follows:

$$NTG_{Program} = 1 - FR_{Part.} + SO_{Part.} + SO_{Part.TA} + SO_{Non-Part.TA}$$

Where $NTG_{Program}$ = Program NTG
$FR_{Part.}$ = Participant Free-Ridership
$SO_{Part.}$ = Participant Spillover
SO_{PartTA} = Participating TA Spillover
$SO_{Non\text{-}PartTA}$ = Non-Participating TA Spillover

The overall program NTG estimate through this calculation was 0.63. The GPY2 research findings net energy savings for Peoples Gas and North Shore Gas C&I Prescriptive program were calculated by multiplying the verified gross savings estimates by the net-to-gross estimation.

Research Calculation of the NTGR Using Responses from Participating Trade Allies in the Estimate of Free-Ridership

An estimate of free-ridership incorporating interview responses from participating trade allies was made by Navigant in the course of conducting GPY2 evaluation research. The participating trade ally free-ridership score is their response to the question "If the program had not existed, approximately what percentage of the rebated measures would your customers have purchased?" Seven out of the nine respondents scored a free ridership between 3% and 25%, and two respondents had free ridership between 50% and 100%. From the analysis of the nine participant trade ally interview

responses, Navigant estimated an overall program trade ally free ridership of 43% weighted by therm savings contributed by the trade ally.

This research estimate of overall program NTG is calculated by averaging the free-ridership rates estimated from participating customer and participating trade ally interviews, and then adding the participant, participating trade ally, and non-participating trade ally spillovers, as follows:

$$NTG_{Program} = 1 - \frac{(FR_{Part.} + FR_{TA})}{2} + SO_{Part.} + SO_{Part.TA} + SO_{Non-Part.TA}$$

Where $NTG_{Program}$ = Program NTG
$FR_{Part.}$ = Participant Free-Ridership
FR_{TA} = Trade Ally Free-Ridership
$SO_{Part.}$ = Participant Spillover
SO_{PartTA} = Participating TA Spillover
$SO_{Non\text{-}PartTA}$ = Non-Participating TA Spillover

The above approach recognizes the influence trade allies may have on the decision making process as both parties exhibit different strengths and weaknesses. Trade allies have a broader understanding of the market in general, while program participants understand internal behavioral characteristics. The average of $FR_{Part.}$ (0.41) and FR_{TA} (0.43) was 0.42, one point higher than the free-ridership for participating customers only. The overall program NTG estimate through this calculation was 0.62, a 0.01 decrease. The free-ridership estimate from PGL and NSG participating trade allies was a research effort and was not used in GPY2 for evaluation reporting of verified net savings results. The approach may be considered for future use.

7.2.2.1 Free-Ridership

Participant Free Ridership Research Findings

The participant free ridership was assessed using a customer self-report approach method. This method calculates free-ridership using data collected during participant telephone interviews covering the following items:

1. Timing and Selection. This score reflects the influence of the most important of various program and program-related elements in the customer's decision to select a specific program measure at this time;

2. Program Influence. This score captures the perceived importance of the program (whether rebate, recommendation, or other program intervention) relative to non-program factors in the decision to implement the specific measure that is eventually adopted or installed. This score is cut in half if they learned about the program after they decided to implement the measures; and

3. No-Program. This score captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts

for deferred free ridership by incorporating the likelihood that the customer would have installed program-qualifying measures at a later date if the program had not been available.

Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure. The rationale for using the maximum value is to capture the most important element in the participant's decision making.

Participants are asked to rate the importance of a variety of factors that influenced their decision to adopt the energy efficiency measure. These factors include age of equipment, availability of incentive, and recommendations from contractors, among others. Participants are also asked to rate any "other" factors that may have influenced their decision to install the specified measure. If the participant indicates "other" factors influenced their decision, they are asked to rate the influence on a scale of 0 to 5 (where 0 means not at all important and 5 means extremely important). The "other" influences will be included within the influence scores.

Table 7-8 below summarizes the scoring and weighting of the three main free-ridership elements.

Table 7-8. C&I Prescriptive Participant Net-to-Gross Scoring Algorithm

Scoring Element	Calculation
Timing and Selection score. The maximum score (on a scale of 0 to 5 where 0 equals not at all influential and 5 equals very influential) among the self-reported influence level the program had for: A. Availability of the program incentive [N3b] B. Recommendation from utility or program staff [N3f] C. Information from utility or program marketing materials [N3h] D. Endorsement or recommendation by a utility account rep [N3k]	Maximum of A, B, C, and D
Program Influence score [N3p]. "If you were given a TOTAL of 100 points that reflect the importance in your decision to implement the <ENDUSE>, and you had to divide those 100 points between: 1) the program and 2) other factors, how many points would you give to the importance of the PROGRAM?"	Points awarded to the program Divide by 2 if the customer learned about the program AFTER deciding to implement the measure that was installed
No-Program score [N5]. "Using a likelihood scale from 0 to 5, where 0 is "Not at all likely" and 5 is "Extremely likely", if the utility program had not been available, what is the likelihood that you would have installed exactly the same equipment?" <u>Adjustments to the "likelihood score" are made for timing</u>: "Without the program, when do you think you would have installed this equipment?" [N7/N7a] Free-ridership diminishes as the timing of the installation without the program moves further into the future.	Interpolate between No Program Likelihood Score and 5 where "At the same time" or within 6 months equals No Program score, and 48 months later equals 10 (no free-ridership)
Project-level Free-ridership (ranges from 0.00 to 1.00)	1 – Sum of scores (Timing and Selection, Program Influence, No-Program)/15
GPY2 Project level Net-to-Gross Ratio (ranges from 0.00 to 1.00)	1 – Project level Free-ridership + Participant Spillover
Apply score to other projects of the same end-use?	If yes, assign score to same end-use of the additional projects

Table 7-9 below provides the results of the participant NTG analysis and relative precision. The analysis took into account participants who installed multiple projects and indicated during the interview that they were all affected by the same decision to implement (making a total of 127 projects for NTG analysis). The mean participant NTG ratio was 59% (41% free ridership) at a 90 percent confidence interval and ±9% precision.

Table 7-9. Participant NTG Ratio and Relative Precision at 90% Confidence Level

Sample Strata	Population (N=793)	NTG Interviews (n=58)	NTG Sample (n=127)	Relative Precision ± %	Low	NTGR Mean	High
1	20	10	12	15%	0.42	0.49	0.56
2	57	27	33	7%	0.55	0.60	0.64
3	716	21	82	18%	0.56	0.68	0.81
Total	**793**	**58**	**127**	**9%**	**0.54**	**0.59**	**0.64**

Source: Navigant analysis

Participants who installed pipe insulation, boiler tune-ups and steam traps were predominant in the NTG survey. Table 7-10 provides the unweighted NTG average for end-use categories. Thirteen participants with pipe insulation had an average NTG of 0.69. Fifteen participants with HVAC steam traps had an average NTG of 0.62, while eight participants with industrial steam traps had a NTG of 0.56. The majority of participants with low free ridership are found in market segments including the church, college, medical, and manufacturing sectors. Overall, 36 percent (21 out of 58 participants) indicated extreme likelihood of installing the same equipment without the program, mostly citing standard practice, condition of the old equipment and maintenance issues as strong basis for implementing measure, with moderate indication of program influence. Although, it appears participants with pipe insulation, industrial steam traps and boiler tune-ups contributed to the increase in program participant NTG, It should be noted that the sample sizes for any category except the combined PG and NSG population will not provide statistically significant conclusions regarding individual measures and should be used with caution. Navigant does not recommend removal of any measure from the program in GPY3, but recommends that the IC should encourage trade allies and contractors to improve on the customer application screening process to minimize free riders.

Table 7-10. Participant NTG Ratio by End-use Type

End-use	Sample Size	NTGR (Unweighted Average)
Boiler Combustion Management Upgrades	2	0.66
Boiler Tune-Ups	13	0.56
HVAC Steam Trap Repairs or Replacements	15	0.62
Industrial/Process Steam Traps	8	0.56
Pipe Insulation	13	0.69
Programmable Thermostats	2	0.60
Space Heating Hot Water Boilers[16]	2	0.35

Source: Navigant analysis

[16] Sample size is small to draw meaningful conclusion. The lower NTG is due to project or customer specific free ridership but not on the measure.

7.2.2.2 *Spillover*

Participant Spillover Findings

The evidence of spillover from the CATI participant survey for the Prescriptive program is presented in Table 7-11 below. These findings suggested that participant spillover effects for GPY2 are evident, and an effort was made to quantify them. One participant identified window replacement in a multifamily facility that we were able to quantify as spillover. This project gave a score of five to the PG/NSG program influence. The impact of participant spillover was too small to make any major impact (0.1%) compare to the trade ally participant spillover, which was predominant in the NTGR analysis.

Table 7-11. GPY2 C&I Prescriptive Program Spillover Evidence from Participant Telephone Survey

Spillover Question	Evidence of Spillover
Since your participation in the program, have you implemented any additional energy efficiency measures at this facility or at your other facilities within Peoples Gas / North Shore Gas' service territory?	Of the 58 survey respondents, 30 said "Yes."
[SP2] Did you receive a rebate or incentive for this measure? This could have been a rebate from Peoples Gas / North Shore Gas as a part of another EE program, or any other utility or government agency.	Scoring is as follows: 24 said "Yes" 5 said "No" 1 said "Don't Know"
[SP5] I have a couple of questions about the <SP2 Response> that you installed. How influential was your experience participating in the Program on your decision to implement this measure, using a scale of 0 to 5, where 0 is not at all influential and 5 is extremely influential?	Scoring is as follows: (3) "Blank" (2) Rating between 4 and 5
Spillover Candidates (influence 4 or higher)	2 participants
Among the 2 candidates, what type of energy efficiency measures were installed without an incentive?	(1) Window Replacement (1) Lighting upgrade
Spillover candidate with gas measures with quantifiable spillover	1 of 2 participants
Candidate, with quantifiable spillover	1 participants with estimated savings:: • 1,437 therms estimated • Estimated participant spillover value is 0.1%

Source: Evaluation analysis

Participant Trade Ally Spillover

Participant trade ally spillover was estimated as 2%, using the following algorithm:

Trade Ally SO = (Percentage of Program Qualified Sales – Percentage of Program Sales) * Program Influence Score

Below is a sample of the spillover questions that were used to obtain the above algorithm:

1. Approximated what percentage of your total sales were rebated measure sales? Was it more than 50% or less than 50%? More or less than 75% or 25%? Etc.

2. On a scale from zero to five, where zero is not at all influential and five is very influential, how influential was participating in the program on your decision to increase the frequency that you recommended measures that would qualify for the Program to your customers?

3. Since you participated in the program, what percentage of your sales was for measures that would qualify for the Program?

4. Using a 0 to 5 likelihood scale where 0 is not all likely and 5 is extremely likely, if the program, including incentives as well as program services and information, had not been available, what is the likelihood that you would have sold the same percentage of measures that would qualify for the Program to your customers?

Trade allies were asked to estimate what percentage of their sales were high efficiency (program qualified) and the percentage of sales that were rebated program sales. The trade allies were asked to rate the influence of the program on the quantity of program qualified sales. The influence of the program was rated on a zero to five scale, where zero is not at all influential, and five is extremely influential. The trade allies were also asked the likelihood that the same quantity of program qualified sales would have been sold had the program not been available, also using a zero to five scale.

The difference between program qualified sales and program sales is potential spillover. This difference was discounted based on the level of influence of the program. The program influence score was calculated using the following formula:

$$Program\ Influence\ Score = Average\left[\left(1 - \frac{Likelihood\ Score}{5}\right), \frac{Influence\ Score}{5}\right] * 100\%$$

Non-Participating Trade Ally Spillover

Five non-participating trade ally interviews were completed with quantifiable spillover. The spillover measures identified were furnace, boilers, boiler controls, and water heater measures. To estimate the spillover, Navigant used the trade ally sales that can be credited to the program, and used the therms per cost of similar equipment found in the program tracking system to calculate estimated spillover therm savings that can be credited to the program. Comparing this with program overall verified gross savings Navigant estimated non-participating trade ally spillover of 2%. The non-participant

survey could not distinguish which program influenced the non-participant trade allies, so the non-participant spillover savings were credited to the prescriptive because they were similar to prescriptive measures.

Below is a sample of the spillover questions that were asked that apply to the above algorithm:

1. Before you participated in the program/attended the program training session, how often did you recommend that your customers purchase high efficiency measures that would qualify for the program? Was it more than 50% or less than 50%? More or less than 75% or 25%? Etc.

2. Before you participated in the program/attended the program training, what percentage of your sales were for high efficiency measures that would qualify for the program? Was it more than 50% or less than 50%? More or less than 75% or 25%?

3. Since participating in the program/attending the program training, have you recommended high efficiency measures to your customers more often, less often, or the same amount?

4. What do you think the percentage of measures that would qualify for the Program would have been?

5. Using a 0 to 5 likelihood scale where 0 is not all likely and 5 is extremely likely, if the program, including incentives as well as program services and information, had not been available, what is the likelihood that you would have sold the same percentage of measures that would qualify for the Program to your customers?

6. Please select one of the following which best describes your typical average annual sales in dollars?
    a. <$100,000
    b. Greater than $100,000 but less than $250,000
    c. Greater than $250,000, but less than $500,000
    d. Greater than $500,000, but less than $1 Million
    e. Greater than $1 Million

7.3 Survey Data Collection Instruments

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