



Public Sector Impact Evaluation Report

**Energy Efficiency Plan: Plan Year 6 Bridge Period (PY6-BP)
(6/1/2017-12/31/2017)**

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

Final

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1. INTRODUCTION

This report presents the results of the impact evaluation of the Peoples Gas (PGL) and North Shore Gas (NSG) Public Sector programs operated during the PY6 “Bridge Period” (PY6-BP). PY6-BP covers June 1, 2017 through December 31, 2017, when responsibility for delivering the Illinois Department of Commerce and Economic Opportunity (DCEO) energy efficiency programs was transferred to Illinois gas and electric utilities. The report presents a summary of the energy impacts for the total Public Sector, broken out by relevant measure and program structure details, for each utility. The appendix presents the impact analysis methodology.

2. PROGRAM DESCRIPTION

The Public Sector programs provided energy efficiency upgrades to public facilities in the ComEd/Peoples Gas and North Shore Gas service territories. The programs provided incentives for custom projects, new construction projects, and boiler upgrades through a prescriptive path, and hot water measures through the Savings Through Efficient Products (STEP) program. Hot water measures included low-flow faucets aerators, low-flow showerheads, and kitchen pre-rinse spray valves. Franklin Energy Services (Franklin Energy) administered the custom, new construction, and prescriptive paths and Midwest Energy Efficiency Alliance (MEEA) operated as the implementer for the STEP program. This report focuses solely on the natural gas savings from the programs. Savings from electric measures are included in a separate evaluation report delivered to ComEd.

The PGL Public Sector programs had 93 participants in PY6-BP and completed 95 projects as shown in the following table.

Table 2-1. PY6-BP Volumetric Summary for the PGL Public Sector

Participation	Prescriptive	STEP	Custom	New Construction	Total
Participants †	25	67	1	0	93
Installed Projects ‡	25	69	1	0	95

Source: Peoples Gas tracking data and Navigant team analysis.

† Participants are defined as unique site addresses

‡ Installed Projects are defined as unique project IDs

Table 2-2 summarizes the installed measure quantities that are the basis for PGL verified energy savings.

Table 2-2. PY6-BP Installed Measure Quantities for the PGL Public Sector

Measure	Quantity Unit	Installed Quantity
Boiler Tune Up - Process	MBH	3,348
Boiler Tune Up - Space Heating	MBH	240,187
Aerator - Bathroom	Each	410
Showerhead	Each	239
Custom - Building Automation System	Each	1

Source: Peoples Gas tracking data and Navigant team analysis.

The NSG Public Sector programs had 17 participants in PY6-BP and completed 17 projects as shown in the following table.

Table 2-3. PY6-BP Volumetric Summary for the NSG Public Sector

Participation	Prescriptive	STEP	Custom	New Construction	Total
Participants †	3	12	0	2	17
Installed Projects ‡	3	12	0	2	17

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

† Participants are defined as unique site addresses

‡ Installed Projects are defined as unique project IDs

Table 2-4 summarizes the installed measure quantities that are the basis for NSG verified energy savings.

Table 2-4. PY6-BP Installed Measure Quantities for the NSG Public Sector

Measure	Quantity Unit	Installed Quantity
Boiler Tune Up - Space Heating	MBH	21,000
High Efficiency Boiler	MBH	12,737
Aerator - Bathroom	Each	63
Aerator - Kitchen	Each	1
Aerator - Unknown	Each	1
Pre-Rinse Spray Valve	Each	2
Showerhead	Each	26
HVAC Boiler – New Construction	Each	2

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

3. PROGRAM SAVINGS SUMMARY

Table 3-1 summarizes the energy savings the PGL Public Sector programs achieved by path in PY6-BP.

Table 3-1. PY6-BP Annual Energy Savings Summary for the PGL Public Sector

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Prescriptive	89,011	100%	89,121	0.46	40,995
STEP	18,985	98%	18,513	0.90	16,662
Custom	7,778	67%	5,238	0.74	3,876
Total	115,774	97%	112,872	Varies	61,533

Source: Peoples Gas tracking data and Navigant team analysis.

† Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

‡ Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGRs are the most recent NTG ratios (without the free ridership adjustment of a “plans score” where available) calculated by DCEO’s evaluator, ADM Associates, Inc (ADM) available on the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) web site.

Table 3-2 summarizes the energy savings the NSG Public Sector programs achieved by path in PY6-BP.

Table 3-2. PY6-BP Annual Energy Savings Summary for the NSG Public Sector

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Prescriptive	20,398	100%	20,374	0.46	9,372
STEP	2,379	98%	2,333	0.90	2,099
New Construction	40,551	100%	40,551	0.65	26,358
Total	63,328	100%	63,258	Varies	37,829

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

† Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

‡ Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGRs are the most recent NTG ratios (without the free ridership adjustment of a “plans score” where available) calculated by DCEO’s evaluator, ADM Associates, Inc (ADM) available on the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) web site.

4. PROGRAM SAVINGS BY MEASURE

The PGL Public Sector programs include five measures as shown in the following table. Space heating boiler tune ups contributed 80 percent of the savings.

Table 4-1. PY6-BP Annual Energy Savings by Measure for the PGL Public Sector

Program/Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Prescriptive	Boiler Tune Up - Process	2,790	100%	2,790	0.46	1,283
	Boiler Tune Up - Space Heating	86,221	100%	86,331	0.46	39,712
	Subtotal	89,011	100%	89,121	0.46	40,995
STEP	Aerator - Bathroom	3,156	95%	3,001	0.90	2,701
	Showerhead	15,829	98%	15,512	0.90	13,961
	Subtotal	18,985	98%	18,513	0.90	16,662
Custom	Building Automation System (BAS)	7,778	67%	5,238	0.74	3,876
	Total	115,774	97%	112,872	Varies	61,533

Source: Peoples Gas tracking data and Navigant team analysis.

† Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

‡ Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGRs are the most recent NTG ratios (without the free ridership adjustment of a "plans score" where available) calculated by DCEO's evaluator, ADM Associates, Inc (ADM) available on the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) web site.

The NSG Public Sector programs include eight measures as shown in the following table. High efficiency boilers contributed 96 percent of the savings.

Table 4-2. PY6-BP Annual Energy Savings by Measure for the NSG Public Sector

Program/Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Prescriptive	Boiler - HW <=300MBtu, >=88% AFUE (COM)	1,608	100%	1,608	0.46	740
	Boiler - HW >=300MBtu, >88% TE	11,218	100%	11,218	0.46	5,160
	Boiler Tune Up - Space Heating	7,572	100%	7,548	0.46	3,472
	Subtotal	20,398	100%	20,374	0.46	9,372
STEP	Aerator - Bathroom	315	95%	299	0.90	269
	Aerator - Kitchen	8	88%	7	0.90	7
	Aerator - Unknown	7	100%	7	0.90	6
	Pre-Rinse Spray Valve	327	102%	332	0.90	298
	Showerhead	1,722	98%	1,688	0.90	1,519
	Subtotal	2,379	98%	2,333	0.90	2,099
New Construction	HVAC Boiler System	40,551	100%	40,551	0.65	26,358
	Total	63,328	100%	63,258	Varies	37,829

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

† Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

‡ Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGRs are the most recent NTG ratios (without the free ridership adjustment of a "plans score" where available) calculated by DCEO's evaluator, ADM Associates, Inc (ADM) available on the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) web site.

5. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

Impact Parameter Estimates

Table 5-1 shows the unit therm savings and realization rate findings by measure from our review. The realization rate is the ratio of the verified gross savings to the ex ante gross savings. Following the table, we provide findings and recommendations, including discussion of measures with realization rates above or below 100 percent. Appendix 1 provides a description of the impact analysis methodology.

Table 5-1. Verified Gross Savings Parameters

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	Realization Rate	Data Sources
High Efficiency Boiler >= 300 MBtu	MBH	1.12	1.12	100%	PTD* and IL TRM v5.0, Section 4.4.10†
High Efficiency Boiler < 300 MBtu	MBH	0.59	0.59	100%	PTD* and IL TRM v5.0, Section 4.4.10†
Boiler Tune Up - Space Heating	MBH	0.36	0.36	100%	PTD* and IL TRM v5.0, Section 4.4.2†
Boiler Tune Up - Process	MBH	0.83	0.83	100%	PTD* and IL TRM v5.0, Section 4.4.3†
Aerator - Bathroom	Each	Varies	Varies	95%	PTD* and IL TRM v5.0, Section 4.3.2†
Aerator - Kitchen	Each	7.83	7.44	95%	PTD* and IL TRM v5.0, Section 4.3.2†
Aerator - Unknown	Each	7.43	7.06	95%	PTD* and IL TRM v5.0, Section 4.3.2†
Showerhead	Each	66.23	64.9	98%	PTD* and IL TRM v5.0, Section 4.3.3†
Pre-Rinse Spray Valve	Each	163.73	165.78	101%	PTD* and IL TRM v5.0, Section 4.2.11†
BAS	Each	7,778	5,238	67%	PTD* and Evaluation Research
New Construction HVAC	Each	Vary	Vary	100%	PTD* and Evaluation Research

* Program Tracking Data (PTD) provided by Peoples Gas and North Shore Gas, extract dated January 29, 2018.

† State of Illinois Technical Reference Manual version 5.0 from <http://www.ilsag.info/technical-reference-manual.html>.

Prescriptive Path

High Efficiency Boiler <= 300 MBtu

High efficiency boilers have a realization rate of 100 percent. Navigant noted that the tracking data savings do not match the implementers value in Franklin Energy’s Master Measure Database document (MMDB)¹. The tracking data savings used a custom value for the efficiency of the new boiler that was not documented in the tracking data. The TRM allows for custom values for efficient boiler efficiency rating and Navigant judged the custom value as acceptable.

Recommendation 1. Navigant recommends the implementer track custom inputs for efficient boiler efficiency rating.

¹ File name: PGNSG MMDB PY6-Navigant013017, produced by Franklin Energy.

STEP Path

Faucet Aerators and Showerheads

Faucet aerators and showerheads have realization rates of 95 percent and 98 percent, respectively, due to differences in the value of in-service rate (ISR). The implementer used 1 as the ISR for aerators and showerheads. Navigant used the TRM-deemed values of 0.95 and 0.98 for aerators and showerheads, respectively.

Recommendation 2. Navigant recommends the implementer use TRM-deemed values for ISR.

Pre-Rinse Spray Valve

Pre-rinse spray valves have a realization rate of 102 percent. Navigant used TRM-deemed inputs, and without information on the application of the spray valve, Navigant averaged the HOURSday for “small, quick service restaurant” and “medium-sized casual dining restaurants.”

Recommendation 3. Navigant recommends the implementer include custom inputs for pre-rinse spray valves if custom inputs were used to calculate tracking data savings.

Custom Path

Custom project 2351950 involved the installation of a building automation system (BAS). The ex ante savings estimate is based on an engineering calculation which models the energy usage before and after the installation of the BAS. The calculation uses an annual gas usage value of 57,972 therms per year, which originates from the implementer’s tracking system but does not provide details on the basis for that value. The ex ante calculation also provides an annual normalized gas usage of 39,038 therms per year, which is based on an analysis of monthly usage data. The monthly utility history was considered more representative of facility annual space heating gas usage. A ratio of the usage data sources ($39,038 / 57,972 = 0.673$) was applied to the ex ante savings to estimate the verified savings. This adjustment resulted in a realization rate of 67%.

Recommendation 4. Navigant recommends using the monthly utility history when referencing a customer’s gas usage unless documentation can be provided that supports another source of usage data. An example of acceptable documentation is an email from the utility stating that a customer has unreliable usage history.

Recommendation 5. Navigant recommends that calculations which estimate baseline usage be calibrated to match the calculation’s baseline usage with the customer’s historical usage.

Recommendation 6. Navigant recommends that when values are hard-coded in the calculation files, such as in the ex ante annual usage, documentation be provided that explains the value and its origins.

New Construction Path

Navigant reviewed two new construction public sector projects involving a high school campus and a botanical garden. The measures implemented were heating plant gas-fired hot water boilers with 30,245 therms and 10,306 therms savings respectively. Navigant reviewed the data provided and applied engineering judgment where site-specific data was not available. We determined that the claimed savings do not need to be adjusted for these two bridge period projects. However, more thorough site-specific

information about the building plan and energy model employed will be requested for future program evaluation.

Recommendation 7. Navigant requires the following detailed information in the future to accurately evaluate site-specific savings of public sector new construction projects.

- Construction drawings – Lighting plans and schedules, mechanical plans and schedules, building envelope plans and details, window details, specifications, etc. This information is needed to determine if the energy model matches the constructed building.
- Inputs and outputs of the energy model. These are needed to determine whether the inputs match the baseline code and the construction drawings.
- COMcheck files, which summarize code compliance
- Details of the tool or program used to conduct the energy model.
- Any assumptions made regarding the building code.
- Specifications of equipment (e.g., efficiency assumptions).

6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

For the prescriptive and STEP paths, Navigant compared the savings calculation method in the PY6-BP tracking data to Franklin Energy's "Master Measure Database" file (MMDB)², which feeds into calculating the tracking data savings, and to IL TRM-based savings values. Navigant verified that the IL TRM algorithms were correctly applied in the MMDB. Navigant checked that measure inputs matched deemed IL TRM inputs and validated custom inputs. To be eligible, an IL TRM measure must meet the physical, operational, and baseline characteristics as defined in the applicable version of the IL TRM³.

For the custom and new construction paths, Navigant conducted a file review of all projects completed. The file review included project applications, product specification sheets, post-inspections, and the implementers savings calculators. We reviewed the energy code compliance requirements, construction documents and documents of proposed energy models used to develop the gross savings.

Navigant reviewed one public sector custom project (#2351950), which was a building automation system for an air handling system. For the two new construction projects, both proposed and baseline building energy models were developed according to the requirements of ASHRAE 90.1-2007 *Informative Appendix G Performance Rating Method*. The modelling report states conditions and methods come from the project documents: Construction drawings, Project Manual, Energy Model Reports, and LEED submittals. Due to limitations in the new construction documentation as outlined above, Navigant applied engineering judgement where site-specific data was not available, and determined the claimed savings were reasonable for the new construction projects.

The most recent NTG ratios (without the free ridership adjustment of a "plans score" where available) calculated by DCEO's evaluator, ADM Associates, Inc (ADM) available on the Illinois Energy Efficiency Stakeholder Advisory Group (SAG) web site were used to calculate net savings for the former DCEO Public-Sector programs in the bridge period. Navigant presented the NTGR recommendations in a January 25, 2018 memo, summarized in Table 6-1 below.

² File name: PGNSG MMDB Y6-Navigant013017, produced by Franklin Energy.

³ Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0 from <http://www.ilsag.info/technical-reference-manual.html>

Table 6-1. Navigant Recommended NTG ratios for Natural Gas for Public-Sector and Income-Eligible Bridge Period Programs Offered by PGL and NSG

Public-Sector and Income-Eligible Programs	Recommended Bridge Period NTG Ratios (Therms)	Source ⁴ for Recommendation
Custom and Standard	Custom: 0.74 Standard: 0.46	Evaluation of Illinois Energy Now Public Sector Custom, Standard, and New Construction Incentives Programs: June 2014 through May 2015 ⁵
New Construction	NC: 0.65	
Public Sector Natural Gas Boiler System Efficiency Program	0.87	Evaluation of Illinois Energy Now Public Sector Natural Gas Boiler System Efficiency Program: June 2014 through May 2015. ⁶
Savings Through Efficient Products (STEP)	0.90	Evaluation of Illinois Energy Now Savings Through Efficient Products Program: June 2014 through May 2015 ⁷
Public Sector Retro-Commissioning Program	0.94	Evaluation of Illinois Energy Now Public Sector Retro-Commissioning Program: June 2014 through May 2015 ⁸
Energy Efficient Affordable Housing Construction Program	1.00	Value provided in the TRM ⁹
Low Income Residential Retrofit Program	1.00	
PHA Efficient Living Program	1.00	

Source: Navigant research and analysis

⁴ Available at: <http://www.ilsag.info/evaluation-documents.html>

⁵ Department_of_Commerce_Public_Sector_CS_NC_Programs_EPY7-GPY4_Final.pdf. Navigant used the EPY7-GPY4 results because the EPY8-GPY5 evaluation completed only one gas NTG interview and the type of projects covered was not provided (Department_of_Commerce_Public_Sector_CS_Programs_EPY8_GPY5_Draft.docx). Navigant recommended NTGs do not include the “plans score” adjustment.

⁶ DCEO_Public_Sector_Boiler_System_Efficiency_EPY7_GPY4_Final_REVISED_10-04-16.pdf. A draft report is not available for EPY8/GPY5.

⁷ DCEO_STEP_Program_EPY7_GPY4_Final_Report.pdf. Navigant selected the most current NTG ratios from ADM's evaluation of STEP in EPY7/GPY4. NTG was not calculated in EPY8/GPY5 due to limited participation.

⁸ Department_of_Commerce_Public_Sector_Retro-Commissioning_EPY7_GPY4_Final.pdf. A draft NTG result for Retro-Commissioning is not available for EPY8/GPY5. Navigant recommended NTG does not include the “plans score” adjustment.

⁹The TRM NTG section recommends a NTG ratio of 1.00 for the low-income (income-eligible) sector per Attachment A: Illinois Statewide Net-to-Gross Methodologies, Section 4.

7. APPENDIX 2. TOTAL RESOURCE COST DETAIL

Table 7-1 and Table 7-2, the Total Resource Cost (TRC) variable tables for PGL and NSG, respectively, only include cost-effectiveness analysis inputs available at the time of finalizing the PY6-BP Public Sector impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to evaluation later. Detail in this table (e.g., EULs), other than final PY6-BP savings and program data, are subject to change and are not final.

Table 7-1. Total Resource Cost Savings Summary for the PGL Public Sector

Measure	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Boiler Tune Up - Process	MBH	3,348	3	2,790	2,790	1,283
Boiler Tune Up - Space Heating	MBH	240,187	3	86,221	86,331	39,712
Prescriptive Total/Weighted Average		243,535	3	89,011	89,121	40,995
Aerator - Bathroom	Each	410	9	3,156	3,001	2,701
Showerhead	Each	239	10	15,829	15,512	13,961
STEP Total/Weighted Average		649	10	18,985	18,513	16,662
Custom BAS	Each	1	15	7,778	5,238	3,876

Source: Peoples Gas tracking data and Navigant team analysis.

Table 7-2. Total Resource Cost Savings Summary for the NSG Public Sector

Measure	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Boiler - HW <=300MBtu, >=88% AFUE (COM)	MBH	2,737	20	1,608	1,608	740
Boiler - HW >=300MBtu, >88% TE	MBH	10,000	20	11,218	11,218	5,160
Boiler Tune Up - Space Heating	MBH	21,000	3	7,572	7,548	3,472
Prescriptive Total/Weighted Average		33,737	14	20,398	20,374	9,372
Aerator – Bathroom	Each	63	9	315	299	269
Aerator – Kitchen	Each	1	9	8	7	7
Aerator – Unknown	Each	1	9	7	7	6
Pre-Rinse Spray Valve	Each	2	5	327	332	298
Showerhead	Each	26	10	1,722	1,688	1,519
STEP Total/Weighted Average		93	9	2,379	2,333	2,099
New Construction HVAC	Each	2	17.4	40,551	40,551	26,358

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