



# Home Energy Jumpstart Impact Evaluation Report

**Energy Efficiency Plan: Plan Year 6 (PY6)  
(6/1/2016-12/31/2017)**

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

**Final - Revised**

September 4, 2018

The May 4, 2018 final report version was revised September 4, 2018 to remove a net-to-gross factor of 0.96 that was applied to the verified net savings estimate for Smart thermostat measures. The savings for natural gas heating provided in Illinois TRM Version 5.0, Section 5.3.16 were derived from a billing regression analysis with an experimental design that does not require further net savings adjustment. As a result of this change, the verified net savings increased by 2,019 therms for PGL, and 926 therms for NSG.

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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) PY6 Home Energy Jumpstart (HEJ) program. It presents a summary of the energy impacts for the total program and broken out by relevant measure and program structure details, for each utility. The appendix presents the impact analysis methodology. PY6 covers June 1, 2016 through December 31, 2017.

## 2. PROGRAM DESCRIPTION

The PY6 Home Energy Jumpstart (HEJ) program is an assessment and direct install program jointly implemented by ComEd and Peoples Gas and North Shore Gas (PGL/NSG) with Franklin Energy Services (Franklin Energy) operating as implementer of the program. This report focuses solely on the natural gas savings from the program. Savings from electric measures are included in a separate evaluation report delivered to ComEd.

The HEJ program seeks to secure energy savings through direct installation of low-cost efficiency measures, such as: water efficient showerheads and faucet aerators, pipe insulation, and programmable thermostats at eligible single-family residences. The program also secures energy savings through installation of smart thermostats with co-pays. In addition, the program performs an assessment of the major retrofit opportunities (e.g., furnace, boiler, air conditioning, insulation, and air sealing) and heightens awareness of the homeowners about available additional efficiency programs offered by ComEd, Peoples Gas and North Shore Gas.

The PGL program reached 10,286 participant sites in PY6 (including those that received an assessment or other program services but did not result in claimed natural gas energy savings), and completed gas energy saving projects at 9,250 unique sites as shown in the following table.

**Table 2-1. PY6 Volumetric Summary for PGL**

Participation	Total
All Participants †	10,286
Participants with Gas Energy Saving Projects ‡	9,250

*Source: Peoples Gas tracking data (February 6, 2018) and Navigant team analysis.*

*† Participants are defined as all unique site addresses, including sites that received an assessment or other program services but did not have natural gas energy savings.*

*‡ Participants with Gas Energy Saving Projects are defined as unique site addresses with claimed natural gas energy savings.*

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

**Table 2-2. PY6 Installed Measure Quantities for PGL**

Measure	Quantity Unit	Installed Quantity
Boiler Pipe Insulation	Linear Feet	846
Faucet Aerator - Bathroom	Each	7,553
Faucet Aerator - Kitchen	Each	4,215
Pipe Insulation - DHW Outlet	Linear Feet	15,437
Showerhead	Each	10,276
Smart Thermostat - Manual Baseline (Condo)	Each	71
Smart Thermostat - Manual Baseline (SF)	Each	304
Smart Thermostat - Programmable Baseline (Condo)	Each	70
Smart Thermostat - Programmable Baseline (SF)	Each	301
Thermostat - Programmable Boiler/Furnace	Each	2,819
Thermostat - Re-Programming Boiler/Furnace	Each	2,549

Source: Peoples Gas tracking data (February 6, 2018) and Navigant team analysis.

The NSG program reached 2,507 participant sites in PY6 (including those that received an assessment or other program services but did not result in claimed natural gas energy savings), and completed gas energy saving projects at 2,105 unique sites as shown in the following table.

**Table 2-3. PY6 Volumetric Summary for NSG**

Participation	Total
All Participants †	2,507
Participants with Gas Energy Saving Projects ‡	2,105

Source: North Shore Gas tracking data (February 6, 2018) and Navigant team analysis.

† Participants are defined as all unique site addresses, including sites that received an assessment or other program services but did not have natural gas energy savings.

‡ Participants with Energy Saving Projects are defined as unique site addresses with claimed natural gas energy savings.

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

**Table 2-4. PY6 Installed Measure Quantities for NSG**

Measure	Quantity Unit	Installed Quantity
Boiler Pipe Insulation	Linear Feet	117
Faucet Aerator - Bathroom	Each	3,109
Faucet Aerator - Kitchen	Each	432
Pipe Insulation - DHW Outlet	Linear Feet	3,672
Showerhead	Each	2,973
Smart Thermostat - Manual Baseline (Condo)	Each	6
Smart Thermostat - Manual Baseline (SF)	Each	137
Smart Thermostat - Programmable Baseline (Condo)	Each	6
Smart Thermostat - Programmable Baseline (SF)	Each	186
Thermostat - Programmable Boiler/Furnace	Each	388
Thermostat - Re-Programming Boiler/Furnace	Each	398

Source: North Shore Gas tracking data (February 6, 2018) and Navigant team analysis.

## 3. PROGRAM SAVINGS SUMMARY

Table 3-1 summarizes the energy savings the PGL Home Energy Jumpstart program achieved in PY6.

**Table 3-1. PY6 Annual Energy Savings Summary for PGL**

Program	Ex Ante Gross Savings (Therms)*	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Total	547,149	107%	586,632	Varies	565,186

Source: Peoples Gas tracking data (February 6, 2018) and Navigant team analysis.

\* Franklin Energy reported net savings in the "Therm Savings" field in the final tracking data. Ex Ante Gross Savings were calculated by dividing "Therm Savings" by the adjusted net-to-gross (NTG) value found in Franklin Energy's MMDB. The adjusted NTG value for PGL was the product of the program's realization rate for PGL in PY5, 99 percent, and the NTGR for the program, 0.96.

† 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 NTGR is a deemed value. Source: PG-NSG\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

Table 3-2 summarizes the energy savings the NSG Home Energy Jumpstart program achieved in PY6.

**Table 3-2. PY6 Annual Energy Savings Summary for NSG**

Program	Ex Ante Gross Savings (Therms)*	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Total	111,873	110%	123,297	Varies	119,291

Source: North Shore Gas tracking data (February 6, 2018) and Navigant team analysis.

\* Franklin Energy reported net savings in the "Therm Savings" field in the final tracking data. Ex Ante Gross Savings were calculated by dividing the "Therm Savings" field in the final tracking data by the adjusted net-to-gross (NTG) value found in Franklin Energy's MMDB. The adjusted NTG value for NSG was the product of the program's realization rate for NSG in PY5, 98 percent, and the NTGR for the program, 0.96.

† 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 NTGR is a deemed value. Source: PG-NSG\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

## 4. PROGRAM SAVINGS BY MEASURE

The PGL program includes 11 measures as shown in the following table. Programmable thermostats, re-programming thermostats, and showerheads contributed the most savings at 33, 28, and 25 percent of overall savings, respectively.

**Table 4-1. PY6 Annual Energy Savings by Measure for PGL**

Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Boiler Pipe Insulation	347	101%	352	0.96	338
Faucet Aerator - Bathroom	6,596	100%	6,595	0.96	6,331
Faucet Aerator - Kitchen	12,019	100%	12,014	0.96	11,533
Pipe Insulation - DHW Outlet	15,268	100%	15,302	0.96	14,690
Showerhead	104,771	138%	144,310	0.96	138,538
Smart Thermostat - Manual Baseline (Condo)	4,081	100%	4,082	NA*	4,082
Smart Thermostat - Manual Baseline (SF)	26,885	100%	26,886	NA*	26,886
Smart Thermostat - Programmable Baseline (Condo)	2,561	100%	2,561	NA*	2,561
Smart Thermostat - Programmable Baseline (SF)	16,941	100%	16,940	NA*	16,940
Thermostat - Programmable Boiler/Furnace	190,839	100%	190,781	0.96	183,150
Thermostat - Re-Programming Boiler/Furnace	166,841	100%	166,810	0.96	160,138
<b>Total</b>	<b>547,149</b>	<b>107%</b>	<b>586,632</b>	<b>Varies</b>	<b>565,186</b>

Source: Peoples Gas tracking data (February 6, 2018) and Navigant team analysis.

Values in table may not sum due to rounding.

\* The Illinois TRM version 5.0 algorithm for smart thermostats calculates net savings – no further NTG adjustment is required.

† 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 NTGR is a deemed value. Source: PG-NSG\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

The NSG program includes 11 measures as shown in the following table. Showerheads, programmable thermostats, and re-programming thermostats contributed the most savings at 34, 21, and 21 percent of overall savings, respectively.

**Table 4-2. PY6 Annual Energy Savings by Measure for NSG**

Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR†	Verified Gross Savings (Therms)	NTGR‡	Verified Net Savings (Therms)
Boiler Pipe Insulation	49	100%	49	0.96	47
Faucet Aerator - Bathroom	2,710	100%	2,715	0.96	2,606
Faucet Aerator - Kitchen	1,231	100%	1,231	0.96	1,182
Pipe Insulation - DHW Outlet	3,630	100%	3,640	0.96	3,494
Showerhead	30,337	138%	41,751	0.96	40,081
Smart Thermostat - Manual Baseline (Condo)	345	100%	345	NA*	345
Smart Thermostat - Manual Baseline (SF)	12,116	100%	12,116	NA*	12,116
Smart Thermostat - Programmable Baseline (Condo)	220	100%	219	NA*	219
Smart Thermostat - Programmable Baseline (SF)	10,468	100%	10,468	NA*	10,468
Thermostat - Programmable Boiler/Furnace	25,491	100%	25,487	0.96	24,468
Thermostat - Re-Programming Boiler/Furnace	25,277	100%	25,276	0.96	24,265
<b>Total</b>	<b>111,873</b>	<b>110%</b>	<b>123,297</b>	<b>Varies</b>	<b>119,291</b>

Source: North Shore Gas tracking data (February 6, 2018) and Navigant team analysis.

Values in table may not sum due to rounding.

\* The Illinois TRM version 5.0 algorithm for smart thermostats calculates net savings – no further NTG adjustment is required.

† 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 NTGR is a deemed value. Source: PG-NSG\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.



## 5. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

### 5.1 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 savings to the ex ante savings. Following the table, we provide findings and recommendations, including discussion of all measures with realization rates above or below 100 percent. Data sources for verification of measure savings in the PY6 HEJ program are defined in the Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0 (IL TRM). 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 Source(s) *
Boiler Pipe Insulation, PGL	Linear Feet	0.4104	0.4155	101%	IL TRM v5.0 - Section 5.3.2
Boiler Pipe Insulation, NSG	Linear Feet	0.4155	0.4155	100%	IL TRM v5.0 - Section 5.3.2
Faucet Aerator - Bathroom	Each	0.87	0.87	100%	IL TRM v5.0 - Section 5.4.4
Faucet Aerator - Kitchen	Each	2.85	2.85	100%	IL TRM v5.0 - Section 5.4.4
Pipe Insulation - DHW Outlet	Linear Feet	0.99	0.99	100%	IL TRM v5.0 - Section 5.4.1
Showerhead	Each	10.20	14.04	138%	IL TRM v5.0 - Section 5.4.5
Smart Thermostat - Manual Baseline (Condo)	Each	57.48	57.49	100%	IL TRM v5.0 - Section 5.3.16
Smart Thermostat - Manual Baseline (SF)	Each	88.44	88.44	100%	IL TRM v5.0 - Section 5.3.16
Smart Thermostat - Programmable Baseline (Condo)	Each	36.58	36.58	100%	IL TRM v5.0 - Section 5.3.16
Smart Thermostat - Programmable Baseline (SF)	Each	56.28	56.28	100%	IL TRM v5.0 - Section 5.3.16
Thermostat - Boiler Prog/Re-Prog	Each	92.20	92.09	100%	IL TRM v5.0 - Section 5.3.11
Thermostat - Furnace Prog/Re-Prog	Each	62.31	62.31	100%	IL TRM v5.0 - Section 5.3.11

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

The following summarizes Navigant’s findings and recommendation for the Home Energy Jumpstart program.

#### 5.1.1 Boiler Pipe Insulation

Navigant’s per unit verified gross savings of 0.4155 therms per linear foot exactly matches Franklin Energy’s Master Measure Database (MMDB)<sup>1</sup> ex ante calculation. In the MMDB, the per unit ex ante net savings is calculated as 0.4155 gross therms times the NTGR of 0.96 times the built-in realization rate of 0.99 to equal 0.3949 therms. The ex ante net savings from the tracking data indicates a rounded value of 0.3900 therms was used for per unit ex ante net savings, which yields an implied ex ante gross per unit savings of 0.4104 therms. This rounding difference was found only for PGL measures which resulted in a realization rate of 101 percent.

<sup>1</sup> File name: PGNSG MMDB Y6-Navigant013017, produced by Franklin Energy.

**Recommendation 1.** Franklin should consider revising the per unit net savings value used in the tracking system, although truncating the per unit savings is an acceptable, conservative approach.

### 5.1.2 Showerheads

The reason for the showerhead realization rate of 138 percent lies in the value for GPM\_base, the baseline water flow rate for showerheads. The IL TRM value listed for Single Family Direct Install program scenarios is 2.67 gallons per minute (gpm, but Franklin Energy's MMDB lists the value as 2.35 gpm. The IL TRM does not allow for custom GPM\_base values so Navigant calculated verified gross savings using the IL TRM-deemed value for GPM\_base. The 138 percent realization rate reflects the ratio of the water usage reduction – baseline gpm minus efficient gpm. The efficient low-flow water use is 1.50 gpm; therefore, Franklin Energy estimated ex ante energy savings using a 0.85 gpm reduction (2.35 – 1.50), whereas Navigant used a flow reduction of 1.17 gpm (2.67 – 1.50) for the verified energy savings using IL TRM assumptions. The ratio of 1.17 gpm to 0.85 gpm is 138 percent.

**Recommendation 2.** Navigant recommends using the IL TRM-deemed GPM\_base value to calculate verified savings for showerheads until the IL TRM allows the use of custom values.

## 5.2 Recommended TRM Updates

### 5.2.1 Showerheads

Franklin Energy brought to our attention<sup>2</sup> that there is an eligibility gap in the IL TRM, Section 5.4.4 for showerheads:

- For Direct-install programs, the baseline condition in the IL TRM is assumed to be a standard showerhead rated at 2.5 gpm or greater.
- Field research by Franklin Energy has revealed that the IL TRM does not address a large section of opportunities for showerhead savings, those rated at *greater or equal to 2.0 gpm and less than 2.5 gpm*. Replacing these showerheads with 1.5 gpm units delivers a favorable Total Resource Cost and should be offered.
- Measured flow data collected by Franklin Energy represents average, Chicagoland area, base 'full throttle flow' for showerheads rated *greater than or equal to 2.0 gpm*. The average is 2.24 gpm.
- Franklin Energy proposes that this measured value be used to develop a prescriptive IL TRM measure that includes all showerheads rated *greater than or equal to 2.0 gpm* (assuming 1.0 throttling factor for showers).

Navigant recognizes and agrees that the IL TRM leaves out a deemed GPM\_base for showerheads rated between 2.0 gpm and 2.5 gpm. Navigant reviewed and commented on the proposed solution from Franklin Energy<sup>3</sup>, and supports an update to the IL TRM.

**Recommendation 3.** Navigant recommends Franklin Energy develop an IL TRM workpaper for showerheads rated greater than 2.0 gpm. Navigant will review and comment on the draft workpaper.

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<sup>2</sup> Adam Roche, Franklin Energy, October 10, 2017.

<sup>3</sup> Email from Charles Ampong, October 25, 2017.

## 6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

Navigant compared the savings calculation method in the PY6 tracking data to Franklin Energy's "Master Measure Database" file (MMDB)<sup>4</sup>, 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 TRM<sup>5</sup>.

Navigant reviewed the program tracking data drawn from a February 6, 2018 extract to substantiate the type and quantity of measures installed. Verified gross realization rates are calculated by dividing the verified gross savings by the ex ante gross savings.

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<sup>4</sup> File name: PGNSG MMDB Y6-Navigant013017, produced by Franklin Energy.

<sup>5</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0 from <http://www.ilsag.info/technical-reference-manual.html>

## 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 includes cost-effectiveness analysis inputs available at the time of finalizing the PY6 HEJ 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 savings and program data, are subject to change and are not final.

**Table 7-1. Total Resource Cost Savings Summary for PGL**

Measure	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Boiler Pipe Insulation	Linear Feet	846	15	347	352	338
Faucet Aerator - Bathroom	Each	7,553	9	6,596	6,595	6,331
Faucet Aerator - Kitchen	Each	4,215	9	12,019	12,014	11,533
Pipe Insulation - DHW Outlet	Linear Feet	15,437	15	15,268	15,302	14,690
Showerhead	Each	10,276	10	104,771	144,310	138,538
Smart Thermostat - Manual Baseline (Condo)	Each	71	10	4,081	4,082	4,082
Smart Thermostat - Manual Baseline (SF)	Each	304	10	26,885	26,886	26,886
Smart Thermostat - Programmable Baseline (Condo)	Each	70	10	2,561	2,561	2,561
Smart Thermostat - Programmable Baseline (SF)	Each	301	10	16,941	16,940	16,940
Thermostat - Prog Boiler/Furnace	Each	2,819	5	190,839	190,781	183,150
Thermostat - Re-Prog Boiler/Furnace	Each	2,549	2	166,841	166,810	160,138
<b>Total/Weighted Average</b>		<b>44,441</b>	<b>6</b>	<b>547,149</b>	<b>586,632</b>	<b>565,186</b>

Source: Peoples Gas tracking data (February 6, 2018) and Navigant team analysis.

**Table 7-2. Total Resource Cost Savings Summary for NSG**

Measure	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Boiler Pipe Insulation	Linear Feet	117	15	49	49	47
Faucet Aerator - Bathroom	Each	3,109	9	2,710	2,715	2,606
Faucet Aerator - Kitchen	Each	432	9	1,231	1,231	1,182
Pipe Insulation - DHW Outlet	Linear Feet	3,672	15	3,630	3,640	3,494
Showerhead	Each	2,973	10	30,337	41,751	40,081
Smart Thermostat - Manual Baseline (Condo)	Each	6	10	345	345	345
Smart Thermostat - Manual Baseline (SF)	Each	137	10	12,116	12,116	12,116
Smart Thermostat - Programmable Baseline (Condo)	Each	6	10	220	219	219
Smart Thermostat - Programmable Baseline (SF)	Each	186	10	10,468	10,468	10,468
Thermostat - Prog Boiler/Furnace	Each	388	5	25,491	25,487	24,468
Thermostat - Re-Prog Boiler/Furnace	Each	398	2	25,277	25,276	24,265
<b>Total/Weighted Average</b>		<b>11,424</b>	<b>7</b>	<b>111,873</b>	<b>123,297</b>	<b>119,291</b>

Source: North Shore Gas tracking data (February 6, 2018) and Navigant team analysis.