



Income Eligible Programs 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) Income Eligible (IE) programs operated during the PY6 “Bridge Period” (PY6-BP). 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-BP covers June 1, 2017 through December 31, 2017.

2. PROGRAM DESCRIPTION

The Income Eligible programs provide energy efficiency upgrades to customers in the PGL and NSG territories. The programs are categorized by five program paths: Illinois Home Weatherization Assistance Program (IHWAP), Single-Family Income Eligible Program, Income Eligible Multi-Family Program, Affordable Housing New Construction, and Multi-Family Public Housing Authority (PHA) Program.

The PY6-BP IHWAP Program was jointly implemented by Commonwealth Edison (ComEd), Peoples Gas and North Shore Gas (PGL/NSG), and Nicor Gas with Franklin Energy operating as the implementer of the program. The natural gas measures in the IHWAP included attic insulation, sidewall insulation, air sealing, high efficiency furnace, and efficient gas water heater.

The PY6-BP Single-Family Income-Eligible (SFIE) Pilot Program was jointly implemented by ComEd and PGL with Franklin Energy operating as the implementer of the program. The SFIE Pilot Program provides energy efficiency upgrades including natural gas measures such as air sealing, insulation, direct-installed low-flow showerheads and faucet aerators, direct-installed pipe insulation, programmable thermostats, and thermostat reprogramming.

The PY6-BP Income-Eligible Multi-Family (IEMF) Pilot Program was jointly implemented by ComEd and PGL with Franklin Energy and Elevate Energy operating as the implementer of the program. The IEMF Pilot Program serves income-eligible designated customers in multi-family facilities. Income-qualified customers are defined as below the 80 percent Area Median Income (AMI) level, as defined by geography/location of the building. Eligible natural gas measures include in-unit and common area measures such as direct-installed low-flow showerheads and faucet aerators, direct-installed pipe insulation, programmable thermostats, boiler reset controls, and steam pipe averaging controls.

The PY6-BP PHA Program was jointly implemented by ComEd, PGL/NSG, and Nicor Gas. The program provides incentives for Illinois public housing authorities to implement energy efficiency improvements, including retrofit, new construction, and custom projects.

The Affordable Housing New Construction Program was active during the bridge period but did not generate therm savings for PGL or NSG.

This report focuses solely on the natural gas savings from the programs for PGL and NSG. Savings for other utilities are included in separate evaluation reports delivered to respective utilities.

The PGL program had 604 participants and completed 1,948 projects as shown in the following table.

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

Participation	IHWAP	SFIE	IEMF	PHA	Total
Participants*	48	460	95	1	604
Installed Projects†	48	677	1,220	3	1,948

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 PGL

Program Path	Measure	Quantity Unit	Installed Quantity	
IHWAP	Gas High Efficiency Furnace	Home	38	
	Air Sealing	Home	38	
	Sidewall Insulation	Square Feet	56,417	
	Attic Insulation	Square Feet	31,800	
SFIE	Tstat - Programmable Boiler	Each	13	
	Tstat - Programmable Furnace	Each	45	
	Tstat - Reprogram Boiler	Each	5	
	Tstat - Reprogram Furnace	Each	73	
	Boiler Pipe Insulation	Linear Feet	6	
	Pipe Insulation - DHW Outlet	Linear Feet	285	
	Faucet Aerator - Bathroom	Each	101	
	Faucet Aerator - Kitchen	Each	72	
	Showerhead	Each	171	
	Air Sealing	CFM	957,830	
	Foundation Wall Insulation	Square Feet	11,871	
	Crawlspace Insulation	Square Feet	12,529	
	Attic Insulation	Square Feet	375,384	
	Wall Insulation	Square Feet	463,989	
	IEMF	DHW Storage Tank Insulation (Common Area)	Square Feet	45
		Other (Common Area)	Each	2,771
Steam Pipe Averaging Controls (Common Area)		Each	28	
Air Sealing (Common Area)		CFM_50	42,483	
Attic Insulation (Common Area)		Square Feet	3,507	
Bathroom Aerator (Common Area)		Each	43	
Bathroom Aerator (In-Unit)		Each	1,006	
Boiler Reset Controls (Common Area)		MBH	2,020	
DHW Pipe Insulation (Common Area)		Linear Feet	9,608	
High Efficiency Steam Boiler (Common Area)	MBH	7,139		

Program Path	Measure	Quantity Unit	Installed Quantity
IEMF (cont.)	High Efficiency Water Heater (Common Area)	MBH	329
	HW Pipe Insulation (Common Area)	Linear Feet	480
	Kitchen Aerator (Common Area)	Each	1
	Kitchen Aerator (In-Unit)	Each	791
	Programmable Thermostat (Common Area)	Each	5
	Programmable Thermostat (In-Unit)	Each	12
	Showerhead (Common Area)	Each	1
	Showerhead (In-Unit)	Each	739
	Steam Pipe Insulation Fitting (Common Area)	Each	77
	Steam Pipe Insulation (Common Area)	Linear Feet	21,946
PHA	Space Boiler	MBH	9,964
	DHW Boiler	MBH	252

Source: Peoples Gas tracking data and Navigant team analysis.

The NSG program had 24 participants in PY6-BP and completed 24 projects as shown in the following table.

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

Participation	IHWAP	PHA	Total
Participants*	23	1	24
Installed Projects†	23	1	24

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 NSG

Program Path	Measure	Quantity Unit	Installed Quantity
IHWAP	Gas High Efficiency Furnace	Home	21
	Air Sealing	Home	21
	Sidewall Insulation	Square Feet	2,640
	Attic Insulation	Square Feet	15,540
PHA	Space Boiler	MBH	3,000
	DHW Boiler	MBH	798
	Boiler Reset Control	MBH	3,000

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

3. PROGRAM SAVINGS SUMMARY

Table 3-1 summarizes the energy savings the PGL Income Eligible Programs achieved by path in PY6-BP.

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

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
IHWAP	29,823	76%	22,754	1.0	22,754
SFIE	195,004	73%	141,700	1.0	141,700
IEMF	119,293	104%	123,720	1.0	123,720
PHA	26,927	102%	27,349	1.0	27,349
Total	371,047	85%	315,523	1.0	315,523

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 NTGR is a deemed value established by TRM version 5.0.

Table 3-2 summarizes the energy savings the NSG Income Eligible Programs achieved by path in PY6-BP.

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

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
IHWAP	12,876	78%	10,020	1.0	10,020
PHA	17,470	79%	13,884	1.0	13,884
Total	30,346	79%	23,904	1.0	23,904

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 NTGR is a deemed value established by TRM version 5.0.

4. PROGRAM SAVINGS BY MEASURE

The PGL Income Eligible Programs include measures outlined in the following table.

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

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
IHWAP	Gas High Efficiency Furnace	9,917	63%	6,255	1.00	6,255
	Air Sealing	7,196	105%	7,587	1.00	7,587
	Sidewall Insulation	6,319	64%	4,052	1.00	4,052
	Attic Insulation	6,392	76%	4,860	1.00	4,860
	IHWAP Total	29,823	76%	22,754	1.00	22,754
SFIE	Tstat - Programmable Boiler	1,199	100%	1,197	1.00	1,197
	Tstat - Programmable Furnace	2,804	100%	2,804	1.00	2,804
	Tstat - Reprogram Boiler	312	148%	460	1.00	460
	Tstat - Reprogram Furnace	4,549	100%	4,549	1.00	4,549
	Boiler Pipe Insulation	3	99%	2	1.00	2
	Pipe Insulation - DHW Outlet	282	100%	283	1.00	283
	Faucet Aerator - Bathroom	88	100%	88	1.00	88
	Faucet Aerator - Kitchen	205	100%	205	1.00	205
	Showerhead	1,744	138%	2,401	1.00	2,401
	Air Sealing	83,331	100%	83,557	1.00	83,557
	Foundation Wall Insulation	5,308	14%	727	1.00	727
	Crawlspace Insulation	1,888	29%	551	1.00	551
	Attic Insulation	39,728	73%	29,069	1.00	29,069
	Wall Insulation	53,564	30%	15,805	1.00	15,805
	SFIE Total	195,004	73%	141,700	1.00	141,700
IEMF	DHW Storage Tank Insulation (Common Area)	241	100%	241	1.00	241
	Other (Common Area)	2,771	100%	2,771	1.00	2,771
	Steam Pipe Averaging Controls (Common Area)	1,711	100%	1,711	1.00	1,711
	Air Sealing (Common Area)	17,673	125%	22,091	1.00	22,091
	Attic Insulation (Common Area)	5,948	100%	5,947	1.00	5,947
	Bathroom Aerator (Common Area)	262	100%	263	1.00	263
	Bathroom Aerator (In-Unit)	1,579	100%	1,581	1.00	1,581
	Boiler Reset Controls (Common Area)	2,586	100%	2,578	1.00	2,578

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
IEMF (cont.)	DHW Pipe Insulation (Common Area)	27,018	100%	27,008	1.00	27,008
	High Efficiency Steam Boiler (Common Area)	4,355	99%	4,325	1.00	4,325
	High Efficiency Water Heater (Common Area)	174	135%	236	1.00	236
	HW Pipe Insulation (Common Area)	1,690	100%	1,688	1.00	1,688
	Kitchen Aerator (Common Area)	7	100%	7	1.00	7
	Kitchen Aerator (In-Unit)	2,065	100%	2,065	1.00	2,065
	Programmable Thermostat (Common Area)	630	100%	630	1.00	630
	Programmable Thermostat (In-Unit)	272	100%	272	1.00	272
	Showerhead (Common Area)	22	100%	22	1.00	22
	Showerhead (In-Unit)	9,607	100%	9,608	1.00	9,608
	Steam Pipe Insulation Fitting (Common Area)	1,635	100%	1,634	1.00	1,634
	Steam Pipe Insulation (Common Area)	39,048	100%	39,042	1.00	39,042
	IEMF Total		119,293	104%	123,720	1.00
PHA	Space Boiler	24,910	103%	25,758	1.00	25,758
	DHW Boiler	2,016	79%	1,592	1.00	1,592
	PHA Total	26,926	102%	27,349	1.00	27,349
Income Eligible Total		371,047	97%	315,523	1.00	315,523

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 NTGR is a deemed value established by TRM version 5.0.

The NSG Income Eligible Programs include the measures outlined in the following table.

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

Program Path	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
IHWAP	Gas High Efficiency Furnace	5,480	63%	3,457	1.00	3,457
	Air Sealing	3,977	93%	3,699	1.00	3,699
	Sidewall Insulation	296	144%	426	1.00	426
	Attic Insulation	3,124	78%	2,439	1.00	2,439
	IHWAP Total	12,876	78%	10,020	1.00	10,020
PHA	Space Boiler	11,436	67%	7,624	1.00	7,624
	DHW Boiler	2,646	100%	2,646	1.00	2,646
	Boiler Reset Control	3,389	107%	3,614	1.00	3,614
	PHA Total	17,470	79%	13,884	1.00	13,884
Total	30,346	79%	23,904	1.00	23,904	

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 NTGR is a deemed value established by TRM version 5.0.

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 savings to the ex ante 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

Program Path	Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	RR	Data Sources
IHWAP (PGL/NSG)	Gas High Efficiency Furnace	Home	260.96	164.61	63%	IL TRM v5.0*, Section 5.3.7
	Air Sealing	Home	189.38	191.28	101%	IL TRM v5.0*, Section 5.6.1
	Sidewall Insulation	Square Feet	0.11	0.09	68%	IL TRM v5.0*, Section 5.6.2
	Attic Insulation	Square Feet	0.20	0.15	77%	IL TRM v5.0*, Section 5.6.4
SFIE (PGL)	Tstat - Programmable Boiler	Each	92.21	92.09	100%	IL TRM v5.0*, Section 5.3.11
	Tstat - Programmable Furnace	Each	62.31	62.31	100%	IL TRM v5.0*, Section 5.3.11
	Tstat - Reprogram Boiler	Each	62.31	92.09	148%	IL TRM v5.0*, Section 5.3.11
	Tstat - Reprogram Furnace	Each	62.31	62.31	100%	IL TRM v5.0*, Section 5.3.11
	Boiler Pipe Insulation	Linear Feet	0.42	0.42	99%	IL TRM v5.0*, Section 5.3.2
	Pipe Insulation - DHW Outlet	Linear Feet	0.99	0.99	100%	IL TRM v5.0*, Section 5.4.1
	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
	Showerhead	Each	10.20	14.04	138%	IL TRM v5.0*, Section 5.4.5
	Air Sealing	CFM	0.09	0.09	100%	IL TRM v5.0*, Section 5.6.1
	Foundation Wall Insulation	Square Feet	0.43	0.06	14	IL TRM v5.0*, Section 5.6.2
	Crawlspace Insulation	Square Feet	0.15	0.04	29%	IL TRM v5.0*, Section 5.6.3
	Attic Insulation	Square Feet	0.11	0.08	73%	IL TRM v5.0*, Section 5.6.4
	Wall Insulation	Square Feet	0.12	0.03	30%	IL TRM v5.0*, Section 5.6.4
	IEMF (PGL)	DHW Storage Tank Insulation (Common Area)	Square Feet	5.35	5.35	100%
Other (Common Area)		Each	1.00	1.00	100%	FES Workpaper
Steam Pipe Averaging Controls (Common Area)		Each	61.09	61.09	100%	FES Workpaper, IL TRM v5.0*, Section 4.4.36

Program Path	Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	RR	Data Sources
IEMF (PGL)	Air Sealing (Common Area)	CFM_50	0.42	0.52	125%	IL TRM v5.0*, Section 5.6.1
	Attic Insulation (Common Area)	Square Feet	1.70	1.70	100%	IL TRM v5.0*, Section 5.6.4
	Bathroom Aerator (Common Area)	Each	6.10	6.10	100%	IL TRM v5.0*, Section 4.3.2
	Bathroom Aerator (In-Unit)	Each	1.57	1.57	100%	IL TRM v5.0*, Section 5.4.4
	Boiler Reset Controls (Common Area)	MBH	1.28	1.28	100%	IL TRM v5.0*, Section 4.4.4
	DHW Pipe Insulation (Common Area)	Linear Feet	3.44	3.44	100%	IL TRM v5.0*, 4.4.14
	High Efficiency Steam Boiler (Common Area)	MBH	0.61	0.61	99%	IL TRM v5.0*, Section 4.4.10
	High Efficiency Water Heater (Common Area)	MBH	0.53	0.72	135%	IL TRM v5.0*, Section 4.3.7
	HW Pipe Insulation (Common Area)	Linear Feet	5.41	5.41	100%	IL TRM v5.0*, 4.4.14
	Kitchen Aerator (Common Area)	Each	7.44	7.44	100%	IL TRM v5.0*, Section 4.3.2
	Kitchen Aerator (In-Unit)	Each	2.61	2.61	100%	IL TRM v5.0*, Section 5.4.4
	Programmable Thermostat (Common Area)	Each	126.07	126.07	100%	IL TRM v5.0*, Section 4.4.18
	Programmable Thermostat (In-Unit)	Each	22.68	22.68	100%	IL TRM v5.0*, Section 5.3.11
	Showerhead (Common Area)	Each	21.73	21.73	100%	IL TRM v5.0*, Section 4.3.3
	Showerhead (In-Unit)	Each	13.00	13.00	100%	IL TRM v5.0*, Section 5.4.5
	Steam Pipe Insulation Fitting (Common Area)	Each	21.62	21.62	100%	IL TRM v5.0*, 4.4.14
	Steam Pipe Insulation (Common Area)	Linear Feet	9.14	9.14	100%	IL TRM v5.0*, 4.4.14
PHA (PGL)	Space Boiler	MBH	Varies	Varies	103%	IL TRM v5.0*, Section 4.4.10
	DHW Boiler	MBH	Varies	Varies	79%	IL TRM v5.0*, Section 4.3.7
PHA (NSG)	Space Boiler	MBH	Varies	Varies	67%	IL TRM v5.0*, Section 4.4.10
	DHW Boiler	MBH	Varies	Varies	100%	IL TRM v5.0*, Section 4.3.7
	Boiler Reset Control	MBH	2.26	2.41	107%	IL TRM v5.0*, Section 4.4.4

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

IHWAP Findings and Recommendations

Tracking Data Reported Savings

The implementation contractor tracked all necessary inputs to calculate custom savings using IL TRM algorithms listed in Table 5-1 for each project. However, the implementation contractor reported ex ante savings using an average for each measure based on GPY5 results. For high efficiency furnaces, efficient gas water heaters, and air sealing, reported savings was an average per project. For attic and wall insulation, reported savings was an average per square foot. The cited document for these averages was the ADM Associates, Inc. draft report “Evaluation of Low Income Residential Retrofit Program, June 2015 through May 2016” prepared for IL DCEO¹. Navigant was unable to replicate the average savings based on results shown in this draft report.

Recommendation 1. Navigant recommends the implementation contractor calculate unique ex ante savings for each project based on collected project data and appropriate IL TRM algorithms listed in Table 5-1.

Project Tracking Data

The implementation contractor’s workbook lacked project data for three projects IDs: 3169779, 3167198, and 3167569. Navigant assumed an average measure realization rate for these projects to calculate verified savings.

Recommendation 2. Navigant recommends the implementation contractor track project data for every project.

SFIE Findings and Recommendations

Thermostat – Reprogram Boiler

The realization rate for boiler thermostat reprogramming is 148 percent. The reason is that the tracking data savings for this measure was 62.31 therms per unit, which is the savings for the programmable or reprogram furnace thermostat measure. The difference in savings is due to the Gas Heating Consumption input, which is 1,052 for furnace thermostats and 1,485 for boiler thermostats. The master measure database (MMDB) file has the correct value of 92.09 therms per unit for the reprogram boiler thermostats measure.

Recommendation 3. Navigant recommends Franklin ensure that savings for reprogram boiler thermostats are properly transferred from the MMDB to the tracking data to avoid applying furnace thermostat savings to boiler thermostat measures.

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 TRM value listed is 2.67 gpm for Single Family Direct Install program scenarios, but Franklin Energy’s MMDB lists the value as 2.35 gpm. The TRM version 5.0 does not allow for custom GPM_base values so Navigant calculated verified gross savings using the TRM-deemed value of GPM_base.²

¹ Available at: http://www.ilsag.info/draft_evaluation_reports.html

² If necessary, there is an exception procedure that implementers may follow, described in the Illinois TRM Policy Document available at: <http://www.ilsag.info/technical-reference-manual.html>

Recommendation 4. Navigant recommends using the TRM-deemed GPM_base value to calculate verified savings for showerheads when the TRM does not allow for custom GPM_base values.

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)³ 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 was found only for PGL measures which resulted in a realization rate of 101 percent.

Recommendation 5. Franklin should consider revising the per unit net savings value used in the tracking system for boiler pipe insulation, although truncating the per unit savings is an acceptable, conservative approach.

Shell Insulation

The realization rates for foundation wall, crawlspace, attic, and wall insulation are 14, 29, 73, and 30 percent, respectively. The verified savings were based on measure records with "incentive" in the measure name, which identified the insulation measure quantities in square feet. We then calculated verified savings in terms of therms per square foot following the IL TRM (v5) algorithms. The ex ante savings and the MMDB algorithm estimated savings using a therms/kWh conversion ratio, which was an indirect calculation not consistent with the TRM. The ex ante calculation allows errors in the electric kWh savings estimate carry over to the natural gas estimate. The TRM uses algorithms with multiple inputs that are specific to the natural gas savings estimate. Using the square feet values provided in the tracking system, we calculated the ex ante therms per square foot and determined the gross realization rates values shown above.

Recommendation 6. Navigant recommends that Franklin Energy estimate savings using the TRM algorithms and inputs that are specific to the natural gas estimate for shell measures. The tracking system or supplemental notes should provide the unit of savings measurement (e.g., square feet of insulation) if TRM algorithms are simplified (e.g., therms per square feet) with standard assumptions.

A minor cause of lower realization rates was the implementer's use of a 100,000 BTU per therm conversion factor instead of the TRM-deemed 100,067 BTU per therm to estimate gas savings from shell measures. While the 100,000 value is used elsewhere in the TRM, the deemed value for the building shell measures is 100,067.

Recommendation 7. Navigant recommends the implementer uses the TRM-deemed value of 100,067 for the conversion of therms to BTU for shell measures. Navigant will make recommendations to the IL TRM Technical Advisory Committee (TAC) to consider whether the 100,000 (or 100,067) value should be consistent across the TRM gas heating measures.

³ File name: PGNSG MMDB Y6-Navigant013017, produced by Franklin Energy

Income Eligible Multi-Family Findings and Recommendations

Air Sealing

Air sealing has a realization rate of 125 percent but accounts for less than 0.5 percent of savings for the program. The savings Navigant calculated from the inputs given in the tracking data match those found in the MMDB sheet provided to Navigant.

Water Heaters

High efficiency water heaters have a realization rate of 135 percent and account for about 0.5 percent of savings. The savings Navigant calculated from the inputs given in the tracking data match those found in the MMDB sheet provided to Navigant.

Steam Boilers

Steam boilers have a realization rate of 99 percent and account for about 0.5 percent of savings. The savings Navigant calculated from the inputs given in the tracking data match those found in the MMDB sheet provided to Navigant.

Recommendation 8. Navigant recommends the implementation contractor calculate unique ex ante savings for each project based on gathered project data and appropriate IL TRM algorithms listed in Table 5-1.

PHA Findings and Recommendations

Space Boilers

For PGL, space boilers have a realization rate of 103 percent. The implementer calculated input capacity of the boiler, a TRM parameter for space heating boiler savings, by dividing MBH_input by the efficiency of the boiler. The TRM indicates that MBH_input should be strictly the input capacity of the boiler. Navigant used MBH_input as the input capacity, which also changed the baseline from 82 percent to 80 percent and increased verified savings.

Recommendation 9. Navigant recommends the implementer use input capacity to calculate savings for space boilers.

For NSG, space boilers have a realization rate of 67 percent. In the single NSG space boiler project, the implementer reported savings for three boilers, but the post inspection showed that only two had been installed.

Recommendation 10. Navigant recommends the implementer use post inspection data to claim savings only for the quantity of boilers installed in a building.

DHW Boiler

DHW boilers have a realization rate of 79 percent for PGL and 100 percent for NSG and represent 10 percent of overall program savings. The DHW boilers replaced in two multi-family buildings were early replacement measures, and the implementer reported ex ante savings using an average of savings for the remaining life of the existing boilers and new boiler weighted by measure life. Savings should be reported as first year savings of the measure. Navigant calculated verified savings as savings from early replacement of the existing boiler. For a PGL project, the existing unit's efficiency (84 percent) was higher

than TRM-deemed baseline efficiency (80 percent) that was used for the savings for the remaining life, thus rendering the early replacement savings lower with realization rate below 100 percent.

Recommendation 11. Navigant recommends the implementer claim first year savings for early replacement DHW boilers.

Boiler Reset Controls

For NSG, boiler reset controls have a realization rate of 107 percent and represent nine percent of overall program savings. There was only one boiler reset control project in PY6-BP. The discrepancy between ex ante and verified energy savings mainly comes from the Savings Factor input. The implementer used five percent as the savings factor for a residential single-family home, but the measure was installed in a mid-sized multi-family apartment complex. Navigant used eight percent as the savings factor for multi-family homes, according to the IL TRM (v5)⁴.

Recommendation 12. Navigant recommends the implementer use the multi-family savings factor to calculate savings for boiler reset controls installed in multi-family homes.

The implementer also claimed boiler reset control savings for the equivalent of three boilers, but the post inspection indicated that only two were installed in the building.

Recommendation 13. Navigant recommends the implementer use post inspection data to claim savings only for the quantity of boilers installed in a building.

⁴ Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0 from <http://www.ilsag.info/technical-reference-manual.html>

6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

IHWAP, SFIE, and IEMF

For the IHWAP, SFIE, and IEMF Program paths, Navigant compared the savings calculation method in the PY6-BP tracking data to Franklin Energy's "Master Measure Database" file (MMDB),⁵ 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.⁶

Public Housing Authority

For the MF PHA Path, Navigant conducted a file review of all projects completed. The file review included project applications, product specification sheets, post-inspection reports, and the implementer's savings calculators.

⁵ File name: PGNSG MMDB Y6-Navigant013017, produced by Franklin Energy.

⁶ 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-BP Income Eligible 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 PGL

Measure	Units	Quantity	Effective Useful Life (Years)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Gas High Efficiency Furnace	Home	38	20	9,917	6,255	6,255
Air Sealing	Home	38	15	7,196	7,587	7,587
Sidewall Insulation	Square Feet	56,417	25	6,319	4,052	4,052
Attic Insulation	Square Feet	31,800	25	6,392	4,860	4,860
Tstat - Programmable Boiler	Each	13	5	1,199	1,197	1,197
Tstat - Programmable Furnace	Each	45	5	2,804	2,804	2,804
Tstat - Reprogram Boiler	Each	5	2	312	460	460
Tstat - Reprogram Furnace	Each	73	2	4,549	4,549	4,549
Boiler Pipe Insulation	Linear Feet	6	15	3	2	2
Pipe Insulation - DHW Outlet	Linear Feet	285	15	282	283	282
Faucet Aerator - Bathroom	Each	101	9	88	88	88
Faucet Aerator - Kitchen	Each	72	9	205	205	205
Showerhead	Each	171	10	1,744	2,401	2,401
Air Sealing	CFM	957,830	15	83,331	83,557	83,557
Foundation Wall Insulation	Square Feet	12,408	25	5,308	727	727
Crawlspace Insulation	Square Feet	12,529	25	1,888	551	551
Attic Insulation	Square Feet	375,384	25	39,728	29,069	29,069
Wall Insulation	Square Feet	463,989	25	53,564	15,805	15,805
DHW Storage Tank Insulation (Common Area)	Square Feet	45	15	241	241	241
Other (Common Area)	Each	2,771		2,771	2,771	2,771
Steam Pipe Averaging Controls (Common Area)	Each	28	15	1,711	1,711	1,711
Air Sealing (Common Area)	CFM_50	42,483	15	17,673	22,091	22,091
Attic Insulation (Common Area)	Square Feet	3,507	25	5,948	5,947	5,947
Bathroom Aerator (Common Area)	Each	43	9	262	263	263
Bathroom Aerator (In-Unit)	Each	1,006	9	1,579	1,581	1,581
Boiler Reset Controls (Common Area)	MBH	2,020	20	2,586	2,578	2,578
DHW Pipe Insulation (Common Area)	Linear Feet	9,608	15	27,018	27,008	27,008
High Efficiency Steam Boiler (Common Area)	MBH	7,139	20	4,355	4,325	4,325

Measure	Units	Quantity	Effective Useful Life (Years)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
High Efficiency Water Heater (Common Area)	MBH	329	15	174	236	236
HW Pipe Insulation (Common Area)	Linear Feet	480	15	1,690	1,688	1,688
Kitchen Aerator (Common Area)	Each	1	9	7	7	7
Kitchen Aerator (In-Unit)	Each	791	9	2,065	2,065	2,065
Programmable Thermostat (Common Area)	Each	5	4	630	630	630
Programmable Thermostat (In-Unit)	Each	12	5	272	272	272
Showerhead (Common Area)	Each	1	10	22	22	22
Showerhead (In-Unit)	Each	739	10	9,607	9,608	9,608
Steam Pipe Insulation Fitting (Common Area)	Each	77	15	1,635	1,634	1,634
Steam Pipe Insulation (Common Area)	Linear Feet	21,946	15	39,048	39,042	39,042
Space Boiler	MBH	9,964	20	24,910	25,758	25,758
DHW Boiler	MBH	252	15	2,016	1,592	1,592

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 (Years)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Gas High Efficiency Furnace	Home	21	20	5,480	3,457	3,457
Air Sealing	Home	21	15	3,977	3,699	3,699
Sidewall Insulation	Square Feet	2,640	25	296	426	426
Attic Insulation	Square Feet	15,540	25	3,124	2,439	2,439
Space Boiler	MBH	3,000	20	11,436	7,624	7,624
DHW Boiler	MBH	798	15	2,646	2,646	2,646
Boiler Reset Control	MBH	3,000	20	3,389	3,614	3,614

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