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**Date:** August 23, 2018 (Initial Draft)  
September 13, 2018 (Interim Revision)  
September 19, 2018 (Second Revision)

**Re:** Net-to-Gross Research Results from GPY6 for the Peoples Gas and North Shore Gas Home Energy Jumpstart Program and Recommendations for CY2019

This memo presents our free ridership and spillover research results for the GPY6 Peoples Gas (PGL) and North Shore Gas (NSG) Home Energy Jumpstart (HEJ) Program using the Illinois TRM version 6.0 methodologies.<sup>1</sup> The net-to-gross (NTG) survey was fielded in Spring 2018. The focus of the GPY6 research was capturing a representative sample of participants that installed efficient showerhead,<sup>2</sup> programmable thermostat and re-programming thermostat measures that dominate the program's gross therm savings.<sup>3</sup> The GPY6 participant free ridership and spillover results provide updated findings relative to prior NTG research for this program which was conducted on GPY2 participants.<sup>4</sup> Navigant's

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<sup>1</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 6.0, Volume 4: Cross-Cutting Measures and Attachments, effective January 1<sup>st</sup>, 2018.

<sup>2</sup> At the time the research was conducted, showerheads required a free ridership adjustment.

<sup>3</sup> The TRM-derived gross savings for Smart thermostats installed through the program do not require NTG adjustment and were excluded from the GPY6 NTG research. Illinois TRM version 7.0 specifies that the free ridership for faucet aerators and showerheads be set at zero when estimating gross savings using the TRM specified baseline average water flow rate. Excluding Smart thermostats, showerheads and aerators, programmable thermostat and re-programming thermostat measures combined saved 96 percent of the PGL gross therms NTG research population, 93 percent of the NSG gross therms NTG research population, and 95 percent for the combined populations (the other measures are boiler pipe insulation and domestic hot water pipe insulation).

<sup>4</sup> Statewide NTG protocols were not established when the research on GPY2 participants was conducted.

recommended free ridership, participant spillover, and NTG values for the PGL and NSG Home Energy Jumpstart Program for CY2019 are summarized in Table 4.

Table 1 below provides a summary of the Home Energy Jumpstart Program GPY6 participant free ridership and spillover research findings. The findings represent a combined population of PGL and NSG participation from GPY6, excluding Smart Thermostats. In total, 110 interviews were completed with GPY6 PGL and NSG participants. Participant free ridership scores were averaged to yield a measure-level free ridership estimates. Illinois TRM version 7.0<sup>5</sup> specifies that the free ridership for faucet aerators and showerheads be set at zero when estimating gross savings using the TRM specified baseline average water flow rate. The free ridership value for showerheads shown in Table 1 is for reporting survey findings only.

**Table 1. Participant Free Ridership and Spillover Survey Results (GPY6 Participants)**

Program	Measure	Participant Spillover (PSO)	Participant Average Free Ridership (FR)	Relative Precision for Net Savings @ 90% CI*
PGL and NSG HEJ	Showerhead†		0.14	11%
	Programmable Thermostat		0.14	9%
	Re-programming Thermostat		0.28	13%
	Population Spillover	0.02		12%

Source: Navigant analysis of data from a computer-assisted telephone survey conducted with PGL and NSG GPY6 Home Energy Jumpstart Program participants.

\*The precision estimate is relative to net savings adjusted for the free ridership result (1 – free ridership).

† TRM version 7.0 specifies that the free ridership for faucet aerators and showerheads be set at zero when estimating gross savings using the TRM specified baseline average water flow rate. The free ridership value shown here is for reporting survey findings only.

For comparison, the GPY6 deemed net to gross value is presented below.

**Table 2. GPY6 Deemed NTG Values**

Measure Category	FR	PSO	NTG
Overall HEJ Program	0.08	0.04	0.96

Source: Peoples Gas (PGL) and North Shore Gas (NSG) Summary of Deemed NTG Values for GPY1 through GPY7 Updated to include Final NTG Values for GPY7. March 1, 2017.

These values are based on evaluation research conducted with GPY2 participants and have been the SAG-approved NTG ratio and component values for the Home Energy Jumpstart Program since then, including GPY7 (2018). Statewide NTG protocols were not established when the research was conducted with GPY2 participants.

<sup>5</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 7.0, effective January 1<sup>st</sup>, 2019.

## GPY6 Free Ridership and Spillover Research Data Collection

The GPY6 free ridership and spillover research was conducted using a customer self-report approach through a computer-assisted telephone interviewing (CATI) survey with 110 participants from a randomized sample of 9,424 PGL and NSG GPY6 HEJ participants. The counts for the completed participant interviews and sample design are outlined in Table 3. Participants that installed multiple measures were interviewed for up to three measures. Most participants interviewed for thermostat measures also had showerheads as a second measure. Therefore, the 110 interviews covered 164 installed measures. After reviewing the response data, Navigant excluded 35 measure installations from the free ridership sample because of failed consistency checks or lack of required data to conduct the free ridership analysis. The free ridership was estimated from the remaining 129 measure installation responses (164 minus 35). A detailed discussion of Navigant’s approach to consistency checks and disposition for the free ridership sample is provided in the Appendix at the end of this memo. All 110 interviews were included in the spillover sample.

**Table 3. Free Ridership and Spillover Research Sample and Disposition**

NTG Component	Measure	Number of Usable Contacts	Target Completes	Measure Installations Covered by Completed Interviews*	Dropped from the Analysis	Analyzed Completes†
<b>Free Ridership</b>						
	Showerhead	3,716	40	92	12	80
	Programmable Thermostat	3,028	35	36	8	28
	Re-Programming Thermostat	2,680	35	36	15	21
	<b>Total</b>	<b>9,424</b>	<b>110</b>	<b>164</b>	<b>35</b>	<b>129</b>
<b>Spillover</b>		<b>9,424</b>	<b>110</b>			<b>110</b>

*Source: PGL and NSG Home Energy Jumpstart Program GPY6 tracking data, survey response data, and evaluation analysis.*

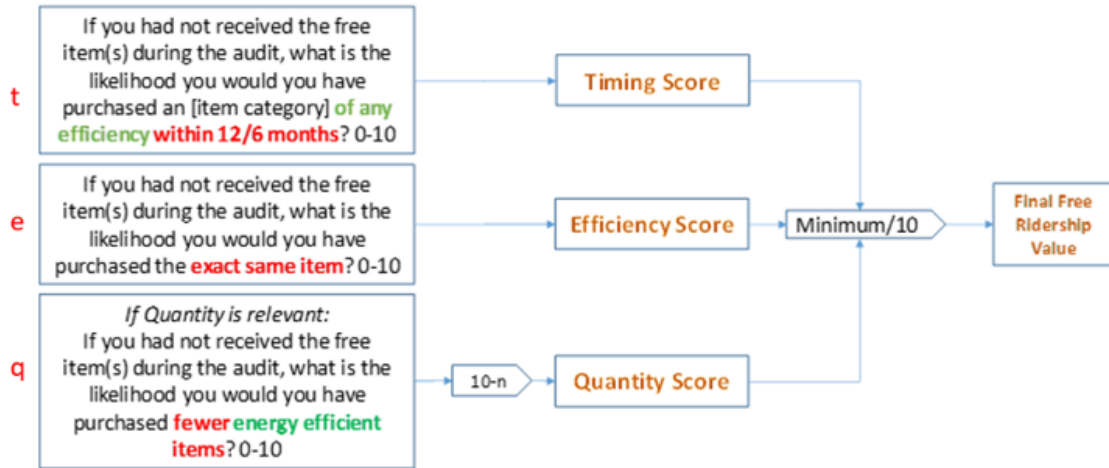
\* The call center completed interviews with 110 participants. Participants that installed multiple measures were interviewed for up to three measures, and each measure installation is counted in the 164 total.

† Analyzed Completes provides the interview count used to develop the free ridership and spillover estimates. Analyzed Completes excludes responses that failed consistency checks or lacked required data (discussed in the Appendix below).

## Free Ridership Estimates Using Algorithms in the TRM Version 6.0

The following diagram describes the IL TRM v6.0 free ridership algorithm for residential single family, no-cost, direct install programs (protocol 4.5).

Figure 1. Protocol for Residential No-Cost, Direct Install Free Ridership



Source: Illinois TRM Version 6, Volume 4. Cross-Cutting Measures and Attachments, final February 8, 2017, effective January 1st, 2018.

Navigant applied the algorithm prescribed by the TRM version 6.0 flow diagram to the data we collected from 110 GPY6 Home Energy Jumpstart Program participants.

### Participant Spillover Estimation

The respondents were asked in the telephone survey if they had installed any additional natural gas saving measures to reduce energy consumption since participating in the Home Energy Jumpstart Program. Navigant included 19 questions to identify spillover candidates and estimate savings.<sup>6</sup> These questions addressed three general aspects, paraphrased below:

1. Since participating in the program, did you make additional energy efficiency improvements that were not rebated by a utility program?
2. How much influence did your participation in the program have on your making additional energy efficiency improvements?
  - a. On a zero to ten scale, where zero is not at all important and ten is extremely important, how important was your participation in the Home Energy Jumpstart Program on your decision to make additional energy efficiency improvements outside of a utility program? [Attribution Score 1.]
  - b. If you had not participated in the Home Energy Jumpstart Program, how likely is it that you would have made additional energy efficiency improvements? Please use a zero to ten scale, where zero means that you definitely would not have made additional energy

<sup>6</sup> Respondents do not answer all 19 questions – follow-up questions are skipped depending on earlier responses.

efficiency improvements and ten means that you definitely would have made them?  
[Attribution Score 2.]

3. What were details of the energy efficiency improvements (efficiency level, quantity, etc.)?

Spillover was considered to be attributable to the Home Energy Jumpstart Program if the following condition is met: the average of Attribution Score 1 and (10 minus Attribution Score 2) must exceed 5.0.<sup>7</sup> Of the 110 survey respondents, 22 reported that they installed additional energy efficient equipment, but only 12 of them indicated that participating in the Home Energy Jumpstart Program influenced them to make these additional purchases. Navigant determined that only nine of those 12 had spillover averaged attribution scores greater than five. Finally, only four of those nine installed equipment with quantifiable natural gas savings,<sup>8</sup> which included a low flow showerhead, a gas clothes dryer, energy efficient windows, and a programmable thermostat. Together, the therm savings from these improvements amounted to 2 percent of program savings for the 110 respondents in the spillover sample. Because the 110 were selected as a simple random sample, their spillover savings rate is representative of the population of GPY6 program participants.

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<sup>7</sup> The spillover methodology is guided by NTG protocols in the Illinois TRM Version 6, Volume 4. Cross-Cutting Measures and Attachments, final February 8, 2017, effective January 1st, 2018.

<sup>8</sup> Electric-saving spillover actions are not credited to the natural gas spillover.

## NTG Recommendations for CY2019

Navigant’s recommended free ridership, participant spillover, and NTG values for the PGL and NSG Home Energy Jumpstart Program for CY2019 are summarized in Table 4. Two measures – boiler pipe insulation and pipe insulation domestic hot water (DHW) outlet – had low participation in GPY6 (about 3 percent of overall program savings combined) and were not represented in the HEJ survey research. Navigant recommends a free ridership of 0.14 for those measures, matching the findings for showerheads and programmable thermostats, because they are equipment measures whereas re-programming thermostats is a service measure.

**Table 4. Summary of Free Ridership, Spillover and NTG Values for the HEJ Program for CY2019**

Measure	FR	PSO	NTG
Smart Thermostat - Manual Baseline (Condo)	NA*	NA*	NA*
Smart Thermostat - Manual Baseline (SF)	NA*	NA*	NA*
Smart Thermostat - Programmable Baseline (Condo)	NA*	NA*	NA*
Smart Thermostat - Programmable Baseline (SF)	NA*	NA*	NA*
Faucet Aerator – Bathroom†	0	0.02	1.02
Faucet Aerator – Kitchen†	0	0.02	1.02
Showerhead†	0	0.02	1.02
Boiler Pipe Insulation‡	0.14	0.02	0.88
Pipe Insulation - DHW Outlet‡	0.14	0.02	0.88
Thermostat - Programmable Boiler/Furnace	0.14	0.02	0.88
Thermostat - Re-Programming Boiler/Furnace	0.28	0.02	0.74

Source: Navigant analysis of data from a CATI survey conducted with 110 GPY6 PGL and NSG Home Energy Jumpstart Program participants.

\* The savings for natural gas heating provided in Illinois TRM Version 6.0, Section 5.3.16 were derived from a billing regression analysis with an experimental design that does not require further net savings adjustment.

† TRM version 7.0 specifies that the free ridership for faucet aerators and showerheads be set at zero when estimating gross savings using the TRM specified baseline average water flow rate.

‡ Measures were not included in GPY6 HEJ NTG survey research. Free ridership is based on evaluation judgment.

FR = Participant Free Ridership; PSO = Participant Spillover

$NTGR = 1 - FR + PSO$

## APPENDIX – Free Ridership Sample Disposition and Consistency Check Analysis

Of the 164 measures installed and captured in the raw interview data, ten measure installations were dropped from the free ridership sample because the respondent only answered one of three crucial program component score questions (quantity score, timing score and efficiency score). Additionally, 15 measure installations were dropped from the analysis for non-response on any of the free ridership scoring data.

Of the remaining responses, 26 corresponded to consistency check failures, whereby respondents answered questions indicating that the program was both highly influential and inconsequential to their decision to install a measure through the program. The consistency check remediation methodology relied on having two independent reviewers assign 'likely high/low program influence' or 'inconclusive program influence' based on the respondents' program component answers and their answer to an open-ended probing question triggered by a consistency check failure. Measure-level responses were dropped from the analysis if respondents lacked a response to the open-ended question or if both independent reviewers assigned 'inconclusive program influence.' This resulted in a total of seven measures dropped due to a lack of open ended question responses and three measures dropped due to inconclusive influence explanations (10 drops total out of 26 consistency check failures).

Among the remaining 16 inconsistent responses, there was a common pattern in the responses: the program influence sub-scores and open-ended responses reflected a high program influence, but the no-program scores indicated a high likelihood of purchasing and installing the measure if the program did not exist. In these cases we interpreted the program influence and open-ended scores as representative. On the basis of this analysis of multiple data points per respondent, the adjustment made to the remaining 16 free ridership scores employed the following formula: Free ridership =  $1 - (\text{Program Influence Score}/10)$ .

As summarized in the table below, Navigant's survey of 110 participants covered 164 measure installations, of which 35 were dropped for missing or inconsistent data. Navigant's recommended free ridership estimates are based on the remaining 129 responses (164 minus 35), noting that 16 of the 129 responses apply the consistency check adjustment.

**Table 5. Free Ridership Survey Disposition**

Measure Response Disposition	Showerhead	Programmable Thermostat	Re-Programming Thermostat	Total
<b>Measure installations covered by interviews</b>	<b>92</b>	<b>36</b>	<b>36</b>	<b>164</b>
Excluded: Non-response	2	2	11	15
Excluded: Had only one scoring factor	3	0	3	6
Excluded: Had only one scoring factor but also failed consistency check	1	3	0	4
Excluded: Failed consistency check and no open-ended response	5	1	1	7
Excluded: Failed consistency check but inconclusive open-ended response	1	2	0	3
<b>Total of Excluded Responses</b>	<b>12</b>	<b>8</b>	<b>15</b>	<b>35</b>
<b>Analyzed Sample</b>	<b>80</b>	<b>28</b>	<b>21</b>	<b>129</b>
Included in Analyzed Sample: Failed consistency check but open-ended response supported an adjusted score	7	6	3	16

Source: PGL and NSG Home Energy Jumpstart Program GPY6 survey response data and evaluation analysis.

Table 6 below shows free ridership results for each measure with and without adjustments made as a result of the consistency check analysis. The sample prior to consistency check analysis was 149 measures installed, after excluding the 15 non-responsive interviews from the original 164. The sample after further analysis to exclude 20 measure installations was 129 measures installed, and 16 of the 129 measure installations received consistency check adjustments. If we had removed the 16 inconsistent responses we adjusted from the analysis, the remaining 113 responses would result in the free ridership values shown in the furthest right column below.

**Table 6. Free Ridership with and without Consistency Check Updates**

Program	Measure	Population Weights FR	Participant Average FR Score (without Consistency Check Adjustments) (n=149)	Participant Average FR Score (with Consistency Check Adjustments) (n=129)	Participant Average FR Score (Removing all Inconsistent Responses) (n=113)
PGL and NSG HEJ	Showerhead	0.313	0.21	0.14	0.14
	Programmable Thermostat	0.364	0.36	0.14	0.17
	Re-programming Thermostat	0.323	0.40	0.28	0.33



## Free Ridership Component Scores

To estimate free ridership for direct install measures according to the TRM, the evaluation team took the minimum of three component scores (timing, efficiency, and quantity) and divided it by 10, as shown in Figure 1. Table 7 below shows the average for each component score as well as the average FR score, for each direct install measure. The free ridership algorithm is applied to individual respondents, and then those respondent free ridership values are averaged for the measure-level free ridership.

**Table 7. Free Ridership Component**

Program	Measure	Participant Average Timing (t) Score	Participant Average Efficiency (e) Score	Participant Average Quantity (10-q) Score	Participant Average FR Score
PGL and NSG HEJ	Showerhead	4.1	4.1	5.2	0.14
	Programmable Thermostat	4.4	3.6	NA	0.14
	Re-program Thermostat	5.3	4.6	NA	0.28