

To: Randy Opdyke, Bruce Liu, Mike King, Kari McCue, Scott Dimetrosky, Katie Parkinson, Nicor Gas; Jennifer Morris, ICC Staff

From: Christy Zook, Peter Vigilante, Mike Freed, Navigant

CC: Kevin Grabner, Laura Agapay-Read, Randy Gunn, Navigant

Date: September 6, 2018

Re: Net-to-Gross Research Results from GPY6 and CY2018 for the Nicor Gas Home Energy Savings Program

This memo presents our free ridership and spillover research results for the GPY6 and CY2018 Nicor Gas Home Energy Savings (HES) Program using the Illinois TRM version 6.0 methodologies.¹ The net-to-gross (NTG) surveys were fielded in Summer 2018. Navigant conducted telephone surveys with 100 GPY6 participants that participated in the program between June 2016 and July 2017 to assess spillover as well as 213 GPY6 and CY2018 participants that participated in the program between August 2017 and June 2018 to assess free ridership. The GPY6 and CY2018 participant free ridership and spillover results provide updated findings relative to prior NTG research for this program which was conducted in GPY1 and GPY2.

Table 1 below provides a summary of the Home Energy Savings Program GPY6 and CY2018 participant free ridership and GPY6 spillover research findings. Navigant estimated free ridership for each program measure, excluding advanced thermostats². Together the researched measures comprise almost 90 percent of the GPY6 evaluated program savings. In total, 313 interviews were completed with GPY6 and CY2018 Nicor Gas participants. Participant free ridership scores were averaged to yield a measure-level free ridership estimate, and the measure-level estimates were weighted by GPY6 verified gross therms to the program level. Navigant estimated a program-level free ridership rate of 0.25 and spillover rate of 0.07 for the HES Program.

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

² Advanced thermostats were excluded from this NTG research as the TRM-derived savings estimates for advanced thermostats installed through the program are net savings and do not require NTG adjustment.

Table 1. Participant Free Ridership and Spillover Results (GPY6 and CY2018 Participants)

| Program Path | Measure | Population Weights FR | Participant Average FR Score | Relative Precision @ 90% CI | Participant SO |
|---------------------------------|----------------------------------|-----------------------|------------------------------|-----------------------------|----------------|
| Direct Install (DI) | Showerhead | 0.22 | 0.12 | 31% | |
| | Kitchen Aerator | 0.02 | 0.22 | 23% | |
| | Bathroom Aerator | 0.01 | 0.10 | 35% | |
| | Programmable Thermostat | 0.13 | 0.26 | 21% | |
| | Re-Programming Thermostat | 0.11 | 0.44 | 13% | |
| | Hot Water Pipe Insulation | 0.02 | 0.08 | 35% | |
| | Water Heater Temperature Setback | 0.01 | 0.09 | 31% | |
| DI Population Roll-up | | | 0.23 | | |
| Air Sealing & Insulation (ASI) | Attic Insulation | 0.19 | 0.31 | 12% | |
| | Wall Insulation | 0.01 | 0.25 | NA | |
| | Basement/Sidewall Insulation | 0.01 | 0.25 | 0% | |
| | Air Sealing | 0.24 | 0.25 | 15% | |
| | Duct Sealing | 0.03 | 0.35 | NA | |
| | ASI Roll-up | | | 0.27 | |
| Total Population Roll-up | | 1.00 | 0.25 | 17% | 0.07 |

Source: Navigant analysis of data from a CATI surveys conducted with Nicor Gas GPY6 and CY2018 Home Energy Savings Program participants. FR = Free Ridership; SO = Spillover

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

Table 2. GPY6 Deemed NTG Values

| Measure Category | FR | SO | NTG |
|---------------------|------|------|------|
| Overall HES Program | 0.09 | 0.14 | 1.05 |

Source: Nicor Gas Energy Efficiency Programs 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 in GPY1 and GPY2. Statewide NTG protocols were not established when the research was conducted in GPY1 and GPY2.

Free Ridership and Spillover Research Data Collection

The free ridership research was conducted using a customer self-report approach through a computer-assisted telephone interviewing (CATI) survey with 213 participants from a census of 3,582 Nicor Gas

GPY6 and CY2018 participants. The spillover research was also conducted using a customer self-report approach through a CATI survey with 100 participants from a random sample of 4,643 GPY6 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 two measures, and the 213 free ridership interviews covered 362 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 327 measure installation responses. A detailed discussion of Navigant’s analysis of responses that triggered the free ridership consistency checks as well as survey sample disposition are provided in the Appendix at the end of this memo. All 100 spillover interviews were included in the spillover analysis.

Table 3. Free Ridership and Spillover Research Decision Maker Survey Disposition

| NTG Component | Measure | Number of Usable Contacts | Target Completes | Measure Installations Covered by Completed Interviews* | Excluded from the Analysis | Analyzed Completes† |
|-----------------------|----------------------------------|---------------------------|------------------|--|----------------------------|---------------------|
| Free Ridership | | | | | | |
| | Showerhead | 655 | 70 | 90 | 7 | 83 |
| | Kitchen Aerator | 294 | 70 | 23 | 2 | 21 |
| | Bathroom Aerator | 547 | 70 | 67 | 4 | 63 |
| | Programmable Thermostat | 395 | 70 | 31 | 2 | 29 |
| | Re-Programming Thermostat | 257 | 70 | 16 | 4 | 12 |
| | Hot Water Pipe Insulation | 354 | 70 | 24 | 5 | 19 |
| | Water Heater Temperature Setback | 241 | 70 | 18 | 0 | 18 |
| | Attic Insulation | 380 | 70 | 45 | 3 | 42 |
| | Wall Insulation | 42 | 42 | 1 | 0 | 1 |
| | Basement/Sidewall Insulation | 17 | 17 | 3 | 1 | 2 |
| | Air Sealing | 356 | 70 | 42 | 6 | 36 |
| | Duct Sealing | 44 | 44 | 2 | 1 | 1 |
| | Overall Population | 3,582 | 733 | 362 | 35 | 327 |
| Spillover | | 4,643 | 100 | | | 100 |

Source: Navigant analysis of data from CATI surveys conducted with GPY6 and CY2018 Nicor Gas Home Energy Savings program participants.

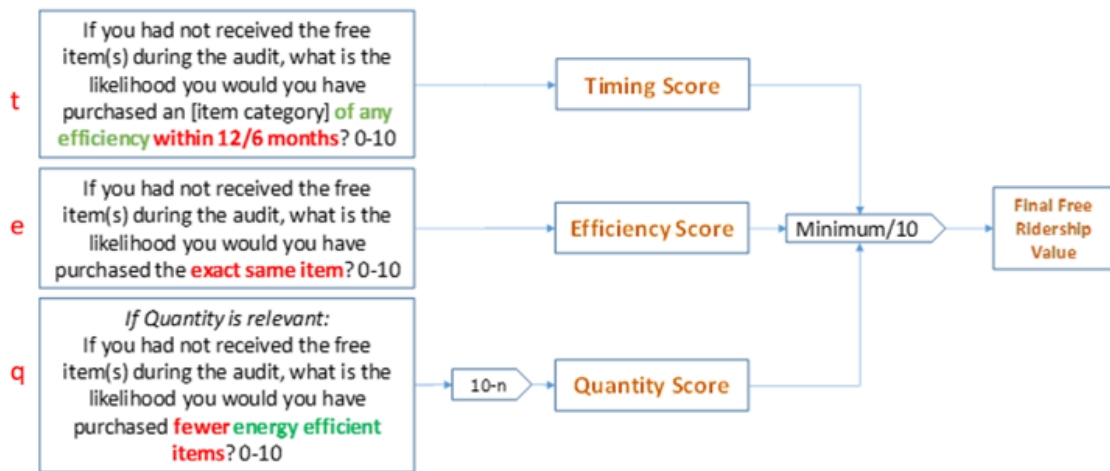
*The call center completed free ridership interviews 213 participants. Participants that installed multiple measures were interviewed for up to two measures, and each measure installation is counted in the 362 total.

† 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

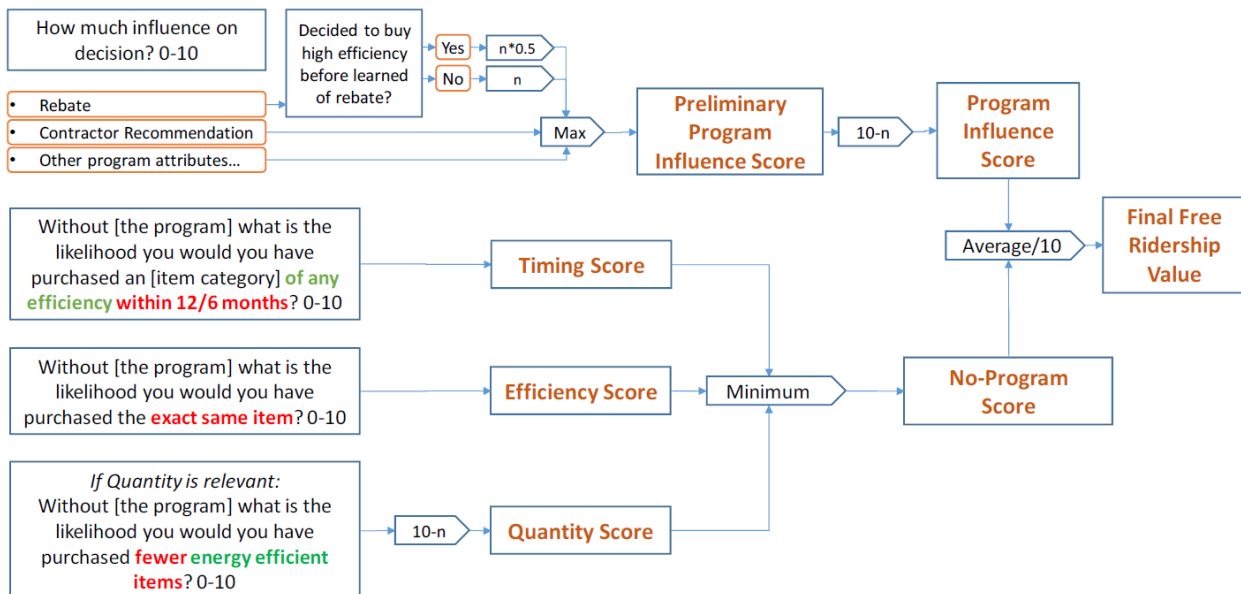
The following diagrams describes the IL TRM v6.0 free ridership algorithms for residential single-family home energy audit programs (protocol 4.5) and residential prescriptive rebate with no audit programs (protocol 4.4).

Figure 1. Residential Single-Family Home Energy Audit Free Ridership – No Cost Measures



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

Figure 2. Residential Prescriptive Rebate (With No Audit) 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 free ridership algorithms from the Prescriptive Rebate (With No Audit) Protocol and the Single-Family Home Energy Audit Protocol in the IL TRM version 6.0 document.³ Free ridership estimates for the direct install measures were calculated using the algorithm for no cost measures shown in Figure 1 above, and free ridership estimates for air sealing and insulation measures were calculated using the algorithm for prescriptive measures shown in Figure 2 above.

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 Savings Program. Navigant included 19 questions to identify spillover candidates and estimate savings.⁴ 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 Savings 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 Savings program, how likely is 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 efficiency improvements and ten means that you definitely would have made them? [Attribution Score 2.]
3. What were details of the energy efficiency improvements (equipment, efficiency level, quantity, etc.)?

The evaluation attributed spillover to the Home Energy Savings Program if the following condition is met: the average of Attribution Score 1 and (10 minus Attribution Score 2) must exceed 5.0.⁵ Of the 100 survey respondents, 33 reported that they installed additional energy efficient equipment, and 21 of them indicated that participating in the Home Energy Savings Program influenced them to make these additional purchases. Navigant determined that 17 of those 21 had spillover averaged attribution scores greater than five. Five of those 17 installed natural gas measures, but only four installed equipment with

³ The referenced TRM document can be accessed here: http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_6/Final/IL-TRM_Effective_010118_v6.0_Vol_4_X-Cutting_Measures_and_Attach_020817_Final.pdf.

⁴ Respondents do not answer all 19 questions – follow-up questions are skipped depending on earlier responses.

⁵ 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.

quantifiable natural gas savings,⁶ which included an advanced thermostat, programmable thermostat, high efficiency gas water heater, and high efficiency furnace as shown in Table 4 below.

Table 4. Distribution of Reported Energy Savings by Respondent

| Participant | Measure Installed | Spillover therms | Proportion of Total Spillover therms |
|---------------------------|----------------------------------|------------------|--------------------------------------|
| Respondent 1 | Advanced Thermostat | 74.37 | 24% |
| Respondent 2 | Programmable Thermostat | 62.31 | 20% |
| Respondent 3 | High Efficiency Gas Water Heater | 12.99 | 4% |
| Respondent 4 | High Efficiency Furnace | 158.37 | 51% |
| Overall Population | | 308.04 | 100% |

Source: Navigant analysis of data from CATI spillover telephone surveys conducted with GPY6 Home Energy Savings Program participants

Together, the therm savings from these improvements amounted to seven percent of program savings for the 100 respondents. Because the 100 were selected as a simple random sample, their spillover savings rate is representative of the population of GPY6 program participants.

NTG Results

The NTG research results for Nicor Gas Home Energy Savings GPY6 and CY2018 participants are summarized in Table 5.

⁶ Electric-saving spillover actions are not credited to the natural gas spillover.

Table 5. Summary of Free Ridership, Spillover and NTG Research Results for the HES Program

| Measure | FR | PSO | NTG |
|----------------------------------|-------------|-------------|-------------|
| Showerhead | 0.12 | | |
| Kitchen Aerator | 0.22 | | |
| Bathroom Aerator | 0.10 | | |
| Programmable Thermostat | 0.26 | | |
| Re-Programming Thermostat | 0.44 | | |
| Hot Water Pipe Insulation | 0.08 | | |
| Water Heater Temperature Setback | 0.09 | | |
| Attic Insulation | 0.31 | | |
| Wall Insulation | 0.25 | | |
| Basement/Sidewall Insulation | 0.25 | | |
| Air Sealing | 0.25 | | |
| Duct Sealing | 0.35 | | |
| Population Roll-up | 0.25 | 0.07 | 0.25 |

Source: Navigant analysis of data from CATI surveys conducted with GPY6 and CY2018 Nicor Gas Home Energy Savings Program participants.

FR = Participant Free Ridership; PSO = Participant Spillover

$NTG = 1 - FR + PSO$

APPENDIX – Free Ridership Sample Disposition

Of the 362 measure installations captured in the raw interview data, 25 measure installations were excluded from the free ridership calculation due to non-response on required free ridership scoring data.

Of the remaining responses, 62 (41 direct install and 21 air sealing and insulation) triggered consistency checks. These 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 methodology involved having two independent reviewers examine these respondents’ numeric responses and their responses to open-ended probing questions which were triggered by their inconsistent numeric responses. Responses were excluded from the free ridership calculation if both reviewers found that the open-ended response was inconsistent with the numeric responses. This resulted in a total of 10 (six direct install and four air sealing and insulation) measure installations excluded due to inconclusive influence explanations (10 exclusions total out of 62 consistency checks).

As summarized in the tables below, Navigant’s survey of 213 free ridership participants covered 362 measure installations (269 direct install and 93 air sealing and insulation measures), of which 35 (24 direct install and 11 air sealing and insulation measures) were excluded for missing or inconsistent data. Navigant’s recommended free ridership estimates are based on the remaining 327 responses (362 minus 35).

Table 6. Free Ridership Survey Disposition for Direct Install Measures

| Measure Response Disposition | Showerhead | Kitchen Aerator | Bathroom Aerator | Pgm. T-stat | RePgm. T-stat | Pipe Insulation | Water Heater Temp. Setback | Total |
|---|------------|-----------------|------------------|-------------|---------------|-----------------|----------------------------|------------|
| Measure installations covered by interviews | 90 | 23 | 67 | 31 | 16 | 24 | 18 | 269 |
| Excluded: Non-response | 4 | 2 | 4 | 1 | 4 | 3 | 0 | 18 |
| Excluded: Triggered and Failed Consistency Check | 3 | 0 | 0 | 1 | 0 | 2 | 0 | 6 |
| Total of Excluded Responses | 7 | 2 | 4 | 2 | 4 | 5 | 0 | 24 |
| Analyzed Sample | 83 | 21 | 63 | 29 | 12 | 19 | 18 | 245 |
| Included in Analyzed Sample: Triggered and Passed Consistency Check | 14 | 2 | 5 | 8 | 4 | 2 | 0 | 35 |

Source: Navigant analysis of data from CATI surveys conducted with GPY6 and CY2018 Nicor Gas Home Energy Savings Program participants.

Table 7. Free Ridership Survey Disposition for Air Sealing and Insulation Measures

| Measure Response Disposition | Attic Insulation | Wall Insulation | Basement Insulation | Air Sealing | Duct Sealing | Total |
|---|------------------|-----------------|---------------------|-------------|--------------|-----------|
| Measure installations covered by interviews | 45 | 1 | 3 | 42 | 2 | 93 |
| Excluded: Non-response | 0 | 0 | 1 | 5 | 1 | 7 |
| Excluded: Triggered and Failed Consistency Check | 3 | 0 | 0 | 1 | 0 | 4 |
| Total of Excluded Responses | 3 | 0 | 1 | 6 | 1 | 11 |
| Analyzed Sample | 42 | 1 | 2 | 36 | 1 | 82 |
| Included in Analyzed Sample: Triggered and Passed Consistency Check | 8 | 0 | 0 | 8 | 1 | 17 |

Source: Navigant analysis of data from CATI surveys conducted with GPY6 and CY2018 Nicor Gas Home Energy Savings Program participants.