Guidehouse

**To:** ComEd, Peoples Gas, North Shore Gas, and Nicor Gas

**From:** Cherlyn Seruto, Guidehouse

**CC:** Jeff Erickson, Rob Neumann, Kevin Grabner, Laura Agapay-Read, Guidehouse
Jennifer Morris, ICC Staff

**Date:** August 28, 2021

**Re:** Illinois Coordinated 2021 RCx NTG Research Results

## Executive Summary

The Retro-Commissioning (RCx) Program net-to-gross (NTG) research asked both free ridership (FR) and spillover (SO) questions in two telephone surveys: one gathering the participant perspective and the other gathering the energy efficiency service provider (EESP) perspective. Guidehouse crafted the survey questions following the free ridership protocol algorithm recently developed from the Illinois Technical Reference Manual version 9.0 (TRMv9.0) by the Illinois Stakeholder Advisory Group (SAG) NTG Working Group.

These results will inform Guidehouse's September 2021 recommendations to SAG about NTG values to be used for this program in CY2022.

Table 1 summarizes the RCx Program FR and SO research findings.

**Table 1. Net-to-Gross Research Results for Retro-Commissioning Program**

| Population | Free Ridership | Relative Precision @90% CI | Spillover |
|---|---|---|---|
| Participant (kWh) | 0.19 | 7% | 0.02 |
| Participant (therms) | 0.16 | 10% | 0.05 |
| EESP (kWh) | 0.05 | 8% | 0.02 |
| EESP (therms) | 0.01 | | <0.01 |

*Source: Guidehouse*

## Free Ridership and Spillover Survey Disposition

The participant and EESP telephone surveys were fielded by Blackstone through computer assisted telephone interviewing software during 3Q 2020. Out of a total census of 25 unique EESPs, we completed 10 surveys representing 42% of the population and 33% of EESP kWh savings (15% of therm savings). Out of a total census of 132 unique participants, we completed 17 surveys representing 14% of the population and 12% of participant kWh savings (11% of therm savings). We combined the participant and EESP perspective of FR and SO using Section 5.1 of TRM v9.0. Table 2 presents the representativeness of completes for each survey.

**Table 2. NTG Research Completes and Representation**

| Category | Population | Sample | Actual Completes | Response Rate | Respondent Share of Program Savings (kWh) | Respondent Share of Program Savings (therms) |
|---|---|---|---|---|---|---|
| Participants | 132 | Census | 17 | 14% | 12% | 11% |
| EESPs | 25 | Census | 10 | 42% | 33% | 15% |

*Source: Guidehouse Research*

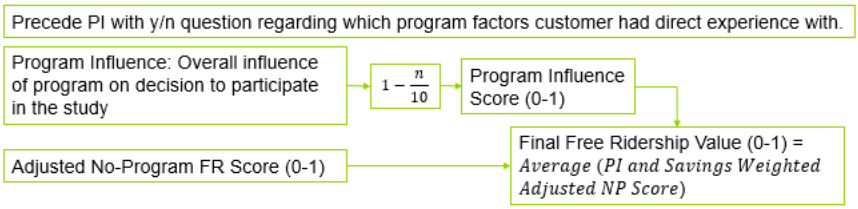
## Free Ridership and Spillover Protocols

The evaluation team applied the relevant FR and SO protocols from TRM v9.0. The team combined participant and EESP perspectives on NTG via TRM v9.0 Section 5.1, “Combining Participant and Trade Ally Free Ridership Scores.”

## Participant Free Ridership Estimation

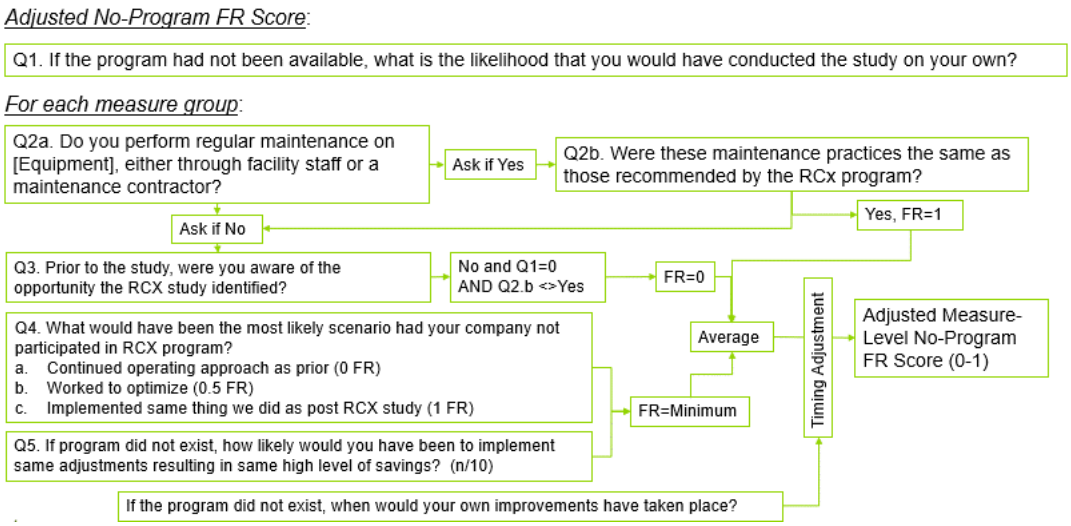
Figure 1 describes the Illinois SAG NTG Working Group algorithm that Guidehouse used to calculate the FR for the Retro-Commissioning Program. The questions and analysis are based on the TRM v9.0 Study-Based Free Ridership algorithm, with updates based on the Illinois SAG NTG Working Group consensus in 2020.

### Figure 1. RCx Free Ridership Overview




*Source: Guidehouse adjustment of TRM v9.0 Study-Based Free Ridership Score Overview (TRM V9 Figure 3.4, page 59), with updates based on Illinois SAG NTG Working Group consensus in 2020*

### Figure 2. RCx Free Ridership No-Program FR Score




*Source: Guidehouse adjustment of TRM v9.0 Study-Based Free Ridership Score Option #2 (TRM v9 figure 3.5, page 60), with question wording updates based on Illinois SAG NTG Working Group consensus in 2020*

The survey screened respondents and collected information on title and project role to ensure we surveyed project decision makers. To explore the possibility of response bias among decision makers who are responsible for reducing energy consumption, we compared the average FR by respondent title and role. The results, in Table 3 below, do not suggest significantly higher FR among building engineers and project managers (typically responsible for reducing energy consumption) than building managers and financial decision makers.

**Table 3. Free ridership results* by respondent tile and role**

| Category | Response | Count | Average FR |
|---|---|---|---|
| Title | Energy / Building Manager | 32 | 0.25 |
| | Energy / Building Engineer | 5 | 0.15 |
| Role | Decision Maker | 25 | 0.27 |
| | Project Manager | 9 | 0.18 |

Based on simple averages at the measure level

*Source: Guidehouse Research*

As indicated in Figure 2, follow-up questions and timing responses are combined as per IL TRM v9.0 by fuel type to create the adjusted no-program score at the participant level, savings-weighted by measure. The participant level responses are then savings-weighted by total participant savings to create the program level FR value.

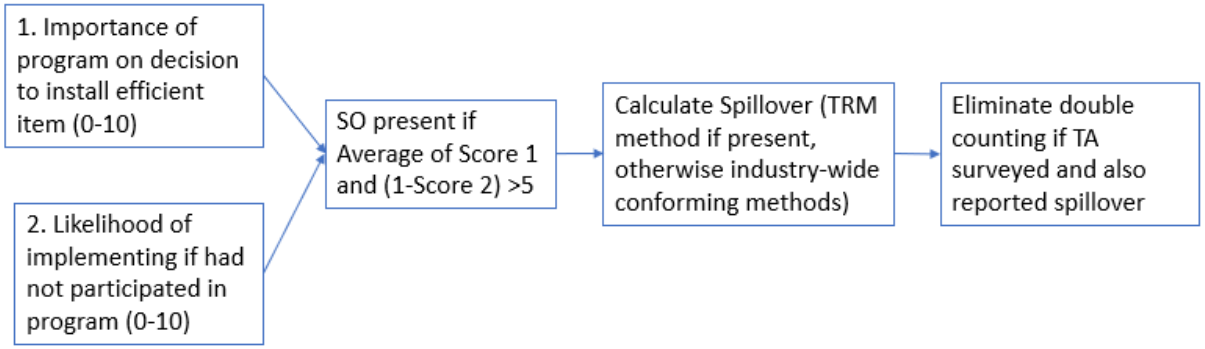
**Table 4. Participant level free ridership results post savings weighting**

| Fuel Type | N‡ | Average PI Score | Average NP Score | Average Timing Adjusted NP Score | Average FR |
|---|---|---|---|---|---|
| Electric | 17 | 0.11 | 0.37 | 0.26 | 0.19 |
| Natural Gas | 10 | 0.31 | 0.22 | 0.08 | 0.16 |

## Participant Spillover Estimation

Guidehouse calculated spillover based on TRM v9.0 Section 3.2.1, "Core Non-Residential Participant Spillover Protocol," summarized in Figure 3..

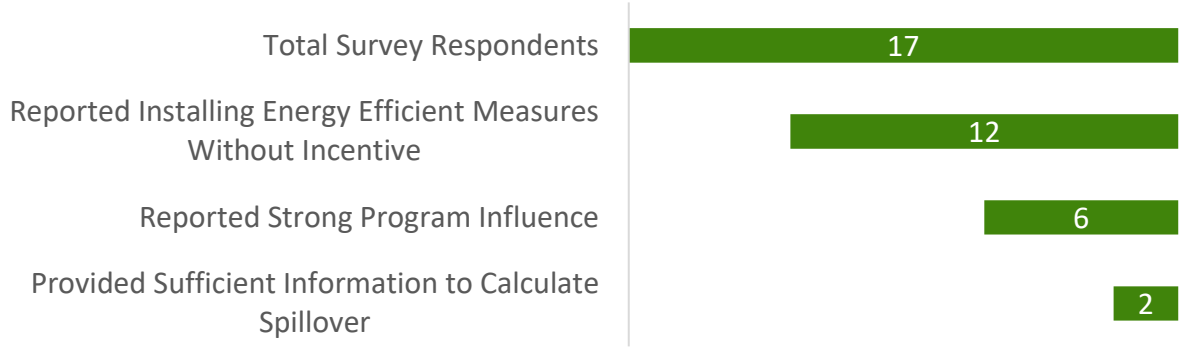
**Figure 3. TRM v9.0 Section 3.2.1 "Core Non-Residential Participant Spillover Protocol"**




*Source: Guidehouse Representation of TRM v9.0 Study*

Of the 17 survey respondents, 12 reported that they completed additional energy efficient upgrades. Six of the 12 passed the spillover screening criteria, and the evaluation team was able to verify and calculate related energy savings for two[1] of the six respondents, resulting in 2% spillover for electric projects, and 5% spillover for natural gas projects. These numbers are based on survey responses that confirmed the improvements were implemented, were not a part of an incentive program, and were highly influenced by the participants' experience with the program.

**Figure 4 Respondents qualifying for spillover savings quantification**



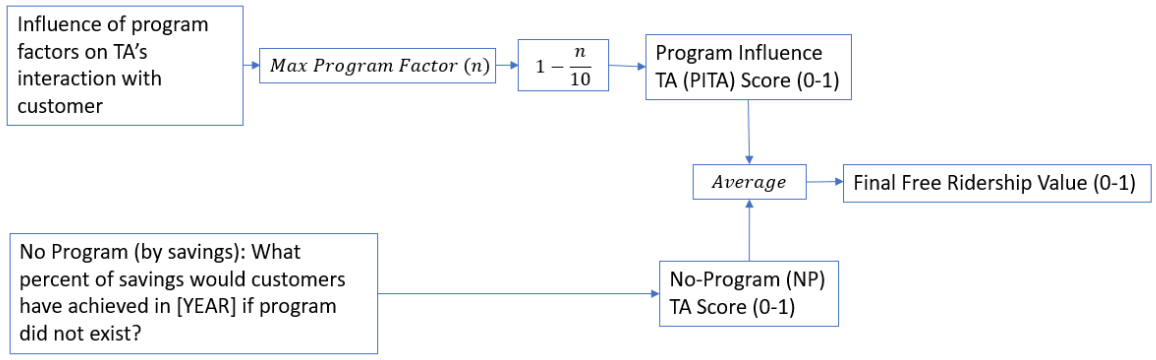

[1] We followed up with all 6 respondents that reported spillover and strong program influence. During those calls, the additional information provided by respondents indicated that the items they had reported as spillover were either already rebated and claimed by the program or were not in ComEd territory.

## Trade Ally Free Ridership Estimation

TRM v9.0 does not specify an approach for measuring the trade ally perspective of participant FR, though Guidehouse proposes that an approach should be developed for future versions of the TRM. For this study, Guidehouse developed the following method to assess participant free ridership from a trade ally perspective. We designed the method to align with the approach of the TRM's participant FR algorithms, and it includes the following trade ally perspectives, as Figure 5 diagrams:

- An estimate of the Program's influence on the Trade Ally (the PITA score)
    - Influence of Program factors on trade ally's interaction with customer
- A No-Program (NP) score: Trade Allies estimate the percentage of savings that their customers would have achieved if the program did not exist

**Figure 5. Trade Ally Free Ridership Protocol**

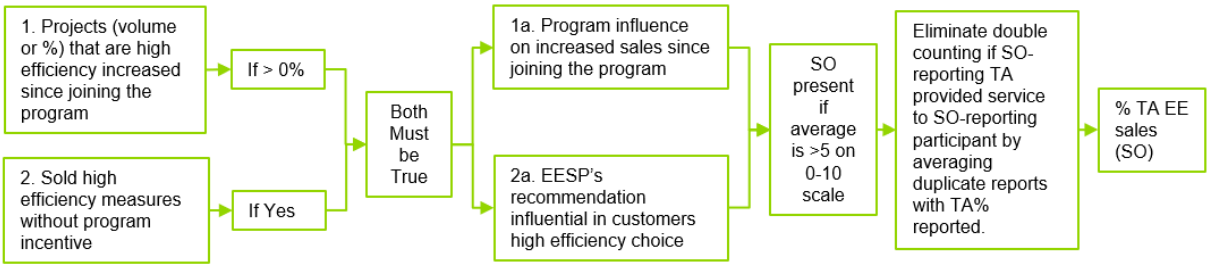



*Source: Guidehouse*

## Active Trade Ally Spillover Estimation

Guidehouse estimated SO that occurs among active trade allies according to the TRM v9.0. We assessed active trade ally SO by estimating the increase of sales of high efficiency products or services that are not rebated, as Figure 6shows.

**Figure 6. EESP (Synonymous with Trade Ally) Spillover Protocol**




*Source: Guidehouse illustration of TRM v9.0*

The process to calculate trade ally SO contains multiple steps (as defined in the TRM):

1. Calculate the percentage of an individual trade ally's high efficiency equipment sales that received an incentive

$$= \frac{\%\ of\ Total\ Sales\ that\ are\ HE,\ \ received\ incentive}{(\%\ of\ Total\ Sales\ that\ are\ HE, received\ incentive + HE\ \%\ that\ did\ NOT\ receive\ incentive)}$$

2. Calculate the energy savings of the high efficiency equipment sales that did not receive an incentive

$$= \frac{\sum TA\ savings\ from\ Program\ Database}{1)\ \%\ of\ TA's\ HE\ Sales\ that\ received\ an\ incentive} - \sum TA\ savings\ from\ Program\ Database * Size\ Adjustment$$

3. Develop the SO ratio for sampled trade allies by summing individual trade ally SO savings and dividing that total by program-tracked savings achieved by the sampled trade allies

4. Develop SO savings for the population of active trade allies by applying the SO ratio from step 3 to all Program savings associated with active trade allies

5. Develop the overall SO ratio for active trade allies by dividing the trade ally SO estimate from step 4 by total program savings

$$= \frac{4)\ Total\ TA\ tracked\ program\ savings * 3) \frac{2)\ \sum_1^n TA\ reported\ spillover\ savings}{\sum_1^n TA\ sample\ tracked\ program\ savings}}{5)\ Total\ Program\ Savings}$$

Of the 10 EESPs that responded to the survey, three reported potential spillover customers, and of the three two passed the screening criteria. Of the two, one EESP responded to questions enabling the calculation of a spillover value for electric measures. The reported spillover for natural gas measures was negligible.

**Table 5. EESP Spillover Calculation**

| Fuel Type | Total EESP tracked program savings* | EESP reported spillover savings | EESP respondent tracked program savings | Spillover % |
|---|---|---|---|---|
| kWh | 64,543,430 | 712,488 | 20,731,903 | 0.03 |
| Therms | 1,399,338 | 605 | 278,131 | <0.01 |

**ex ante gross, 2019 and 2020*

## Combining Participant and Trade Ally Free Ridership

Guidehouse calculated a weighted average of the participant and trade ally FR utilizing the triangulation approach[2] shown in Table 6 to arrive at a single FR score for the RCx program. Guidehouse rated the survey data on three aspects: accuracy, validity, and representativeness, using a scale where 100% means "extremely so" and 0% means "not at all." Participant FR as reported by trade allies is 0.05 (kWh) and 0.01 (therms) while the FR as reported by participants is 0.24 (kWh) and 0.21 (therms).

We weighted the following items according to our analysis of the results:

1. How likely is the approach to provide an accurate estimate of FR?
    a. We assigned the participant response a value of 90% because we followed the TRM approach, which was considered the most appropriate approach at the time of development based on the IL NTG Working Group and SAG perspectives. There is always slight uncertainty with the customer self-reporting approach, which is the reason for the 90%.
    b. We assigned the EESPs a value of 60% because the TRM does not currently contain a standardized approach for measuring FR from trade allies. Guidehouse has used this approach for several years now, and it should be refined and finalized in a future iteration of the TRM via the NTG Working Group process.
2. How valid are the data collected and analysis?
    a. We assigned the participant response a value of 60% because we followed the TRM approach. However, there was a sample frame bias because we did not have telephone contact information for all participants. The 14% response rate may have produced some non-response bias, and earlier participants may have recall bias for a survey fielded in 3Q 2021.
    b. We assigned the trade ally results a value of 95% since the response rate is high at 42%. Factors that lower this score are potential non-response bias and quantitative estimates from EESPs that rely on best estimates made at the time of the call rather than historical record keeping.
3. How representative is the sample?

[2] TRM section 5.1

a. We assigned the participant results a rank of 12% (kWh value) and 11% (therms value) because this is the amount of program savings represented by the responding participants.

b. We assigned the trade ally results a rank of 33% (kWh value) and 15% (therms value) because this is the amount of program savings represented by the responding EESPs.

Table 6 summarizes the weighting values and results.

**Table 6. Free Ridership Triangulation Weighting Approach**

| Free Ridership Triangulation Data and Analysis | Participants (kWh) | EESPs (kWh) | Participants (therms) | EESPs (therms) |
|---|---|---|---|---|
| **FR Value** | **0.19** | **0.05** | **0.16** | **0.01** |
| How likely is this approach to provide an accurate estimate of free ridership? | 80% | 40% | 60% | 90% |
| How valid are the data collected and analysis? | 60% | 95% | 50% | 95% |
| How representative is the sample? | 12% | 33% | 11% | 15% |
| Average Score | 51% | 56% | 40% | 67% |
| **Weighted Average FR Value** | **0.11** | | **0.07** | |

*Source: Guidehouse*

# Final NTG Results and Recommendations

Table 7 summarizes Guidehouse's recommendations for the Retro-Commissioning Program to be used in CY 2022. The spillover values for EESPs and participants are additive as there is no overlap between the participants and EESPs reporting spillover.

**Table 7. Summary of Free Ridership, Spillover, and NTG Research Results for Retro-Commissioning Program**

| Fuel Type | FR | PSO | ATSO | NTG |
|---|---|---|---|---|
| kWh | 0.11 | 0.02 | 0.03 | 0.94 |
| Therms | 0.07 | 0.05 | < 0.01 | 0.98 |

FR = Free Ridership; PSO = Participant Spillover; ATSO = Active Trade Ally Spillover.
*NTG = 1 – FR + PSO + ATSO*
*Source: Guidehouse primary research*

# Appendix A. : Retro-Commissioning NTG History - ComEd

| | Retro-Commissioning |
|---|---|
| EPY1 | **NTG:** 0.8<br>**Free ridership:** 0%<br>**Spillover:** 0%<br>**Method:** Program *ex ante* assumption.<br>Customer self-report. Two completed surveys from a population of four participants bracketed the assumed NTG. Basic method. |
| EPY2 | **NTG:** 0.916<br>**Free ridership:** 8.4%<br>**Spillover:** 0%<br>**Method:** Customer self-report. Five surveys completed from an attempted census of a population of 13. Basic method. |
| EPY3 | **NTG:** 0.71<br>**Free ridership:** 28.7%<br>**Spillover:** 0%<br>**Method:** Customer self-report. Eight surveys completed from an attempted census of a population of 34 participants. Basic method. |
| EPY4 | **Deemed NTG from EPY2:** 0.916<br>**Research NTG:** 1.04<br>**Free ridership:** 0.097<br>**Spillover:** 0.136<br>**Method:** Program *ex ante* assumption and stipulated for EPY4. NTG based on EPY2 research. EPY3 research rejected due to small ratio of completed surveys. |
| EPY5 | **SAG Consensus:** 0.71 |
| EPY6 | **SAG Consensus:** 1.04 |
| EPY7 | **NTG:** 1.04<br>There was no new NTG research in EPY5. The most recent NTG research is from PY4.<br>**Free ridership:** 0.10. The PY4 free ridership ratio is an equally weighted average of savings-weighted participant and service provider free ridership scores.<br><br>**Participant spillover:** 0.14. Source: Participant and trade ally surveys.<br>(Includes spillover from trade allies that account for 94% of program participation)<br><br>**Nonparticipant spillover:** negligible. There is no evidence of nonparticipant spillover. Service providers are dropped from the program if they are not generating projects. If they are not generating projects in the program, they are probably not generating them outside of the program. |
| EPY8 | **Recommendation (based upon PY6 research):**<br>**NTG:** 0.95 (electric)<br>**Free ridership:** 0.09 (electric)<br>**Spillover:** 0.04 (electric) |

| | Retro-Commissioning |
|---|---|
| | Spillover and free ridership were calculated from self-report interviews with participants and service providers (n=18). The final EPY6 free ridership ratio is an equally weighted average of savings-weighted participant and RSP free ridership. Interviewed service providers account for 92% of electric savings.<br><br>NTG research was not conducted for the gas companies. |
| EPY9 | **NTG:** 0.95 (electric)<br>**Free ridership:** 0.09 (electric)<br>**Spillover:** 0.04 (electric)<br><br>**NTG Source:**<br>Free ridership and Spillover: PY6 NTG Research |
| CY2018 | **NTG:** 0.95 (electric)<br>**Free ridership:** 0.09 (electric)<br>**Spillover:** 0.04 (electric)<br><br>**NTG Source:**<br>Free ridership and Spillover: PY6 NTG Research<br>Due to the limited sample size of PY8 NTG research, EPY8 results will be included in EPY9 research and analysis. |
| CY2019 | **NTG:** 0.94 (electric)<br>**Free ridership:** 0.06 (electric)<br>**Spillover:** 0.00<br><br>**NTG Source:**<br>Free ridership and Spillover: PY9 participating customer surveys and PY9 service provider surveys<br>Note: Applies to all program paths. |
| CY2020 | **Unchanged from CY 2019**<br>**NTG:** 0.94 (electric)<br>**Free ridership:** 0.06 (electric)<br>**Spillover:** 0.00<br><br>**NTG Source:**<br>Free ridership and Spillover: PY9 participating customer surveys and PY9 service provider surveys<br>Note: Applies to all program paths. |

*Source: https://ilsag.s3.amazonaws.com/ComEd-NTG-History-and-CY2021-Recs-2020-09-30-Final.pdf*

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# Appendix B. Retro-Commissioning NTG History: Nicor Gas

| | Business and Public Sector Retro-Commissioning |
|---|---|
| GPY1 | **NTG:** 1.02<br>**Free ridership:** 9%<br>**Spillover:** 11%<br>**Method:** Customer and service provider self-report.<br>NTG based on GPY1 research: 11 participants with gas savings and eight out of nine service providers surveyed. Enhanced method. Participant and Service Provider spillover researched. |
| GPY2 | **NTG:** 1.02<br>**Free ridership:** 9%<br>**Spillover:** 11%<br>**Method:** SAG deemed NTG ratio based on GPY1 evaluation research. |
| GPY3 | **NTG:** 1.02<br>**Free ridership:** 9%<br>**Spillover:** 11%<br>**Method:** SAG deemed NTG ratio based on GPY1 evaluation research. |
| GPY4 | **NTG:** 1.02<br>**Free ridership:** 9%<br>**Spillover:** 11%<br>**Method:** NTG values for GPY4 were deemed using values from GPY3 and reported in Table 14 of the Nicor Gas filed Energy Efficiency Plan for GPY4-GPY6. |
| GPY5 | **NTG:** 1.02<br>**Free ridership:** 9%<br>**Spillover:** 11%<br>**Method:** No new research. Values based on GPY1 evaluation research. |
| GPY6 | **NTG:** 1.02<br>**Free ridership:** 9%<br>**Spillover:** 11%<br>**Method:** No new research. Values based on GPY1 evaluation research. |
| 2018 (GPY7) | **NTG:** 1.02<br>**Method:** No new research. Retained GPY6 final value. |

| | Business and Public Sector Retro-Commissioning |
|---|---|
| 2019 | **NTG:** 0.94<br>**Free ridership:** 0.06<br>**No spillover identified**<br>**Method:** Evaluation research conducted in 2017 and 2018 with GPY6/EPY9 project participants resulted in a NTG of 0.94 for gas. Memo: *Net-to-Gross Research Results from EPY9/GPY6 for the Coordinated Utility Retro-Commissioning Program*, Navigant (now Guidehouse), 8/25/18, revised 9/14/18. FR results weighted 36% for participants (FR=0.13) and 64% for service providers (FR=0.025). No spillover identified. |
| 2020 | **NTG:** 0.94<br>**Free Ridership:** 0.06<br>**No spillover identified**<br>**Method:** No new research. Evaluation research conducted 2017 and 2018 with GPY6/EPY9 project participants resulted in an NTG of 0.94 for gas. Memo: *Net-to-Gross Research Results from EPY9/GPY6 for the Coordinated Utility Retro-Commissioning Program*, Navigant, 8/25/18, revised 9/14/18. FR results weighted 36% for participants (FR=0.13) and 64% for service providers (FR=0.025). No spillover identified. |

*Source: https://ilsag.s3.amazonaws.com/Nicor_Gas_NTG_History_and_2021_Values_Final-9-30-20.pdf*

# Appendix C. Retro-Commissioning NTG History: Peoples Gas and North Shore Gas

| | Business and Public Sector Retro-Commissioning |
|---|---|
| GPY1 | **NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**Method and source:** Evaluation research consisting of GPY1 participating customer and Retro-Commissioning Service Provider self-reports. Interviews conducted with nine of 15 participants from Peoples Gas and North Shore Gas and eight of nine service providers. Participant and service provider spillover researched. |
| GPY2 | **Peoples Gas**<br>**Deemed NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**North Shore Gas**<br>**Deemed NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**Method and source:** Deemed by SAG consensus from GPY1 evaluation research. |
| GPY3 | **Peoples Gas**<br>**Deemed NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**North Shore Gas**<br>**Deemed NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**Method and source**: Deemed by SAG consensus from GPY1 evaluation research. |
| GPY4 | **NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**Method and source:** Deemed by SAG consensus. Values based on GPY1 evaluation research. |
| GPY5 | **NTG:** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**Method and source:** No new research. Values based on GPY1 evaluation research. |

| Business and Public Sector Retro-Commissioning | |
|---|---|
| GPY6 | **NTG** 1.02<br>**Free ridership:** 0.09<br>**Participant spillover:** 0.11<br>**Method and source**: No new research. Values based on GPY1 evaluation research. |
| 2018 (GPY7) | **NTG:** 1.02<br>**Method:** No new research. Retained GPY6 final value. |
| 2019 | **NTG:** 0.94<br>**Free Ridership:** 0.06<br>**PSO and NPSO:** 0.00<br>**Method:** Evaluation research conducted 2017 and 2018 with GPY6/EPY9 project participants resulted in an NTG of 0.94 for gas. Memo: Net-to-Gross Research Results from EPY9/GPY6 for the Coordinated Utility Retro-Commissioning Program, Navigant, 8/25/18, revised 9/14/18. FR results weighted 36% for participants (FR=0.13) and 64% for service providers (FR=0.025). No spillover identified. |
| 2020 | **NTG:** 0.94<br>**Free ridership:** 0.06<br>**PSO and NPSO:** 0.00<br>**Method:** No new research. Evaluation research conducted 2017 and 2018 with GPY6/EPY9 project participants resulted in a NTG of 0.94 for gas. Memo: Net-to-Gross Research Results from EPY9/GPY6 for the Coordinated Utility Retro-Commissioning Program, Navigant, 8/25/18, revised 9/14/18. FR results weighted 36% for participants (FR=0.13) and 64% for service providers (FR=0.025). No spillover identified. |

*Source: https://ilsag.s3.amazonaws.com/PGL_NSG_NTG_History_and_2021_Values_Final-9-30-20.pdf*