Guidehouse

To: Erin Daughton, ComEd

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From: Amy Buege, Ben Cheah, Verdant Associates

Date: August 20, 2021

Re: Net-to-Gross Research Results for the ComEd Instant Discounts Program

Executive Summary

This memo presents the findings of the net-to-gross (NTG) study of the ComEd Instant Discounts Program. The NTG results for this program are based on free ridership (FR) and spillover research gathered via on-line surveys with Instant Discounts Program purchasers to assess the participant perspective and on-line surveys with Instant Discounts Program distributors to assess the trade ally[1] perspective.

The final proposed NTG results were derived separately for the three primary measures sold through the program (LED bulbs, Linear LEDs [TLEDs], and LED Fixtures). These results will inform Guidehouse's September 2021 recommendations to the Illinois Stakeholder Advisory Group (SAG) of NTG values to be used for this program in CY2022.

Table 1 summarizes the Instant Discount Program free ridership (FR) and participant spillover (SO) research findings based on the participant and trade ally research. The draft recommended NTG ratios are blended participant and trade ally results.

Table 1. Net-to-Gross Research Results for Instant Discounts CY2020/CY2021

Measure	Free Ridership	Participant Spillover*	NTG Ratio
LED Lamps	0.30	0.14	0.84
Linear LEDs (TLEDs)	0.35	0.14	0.79
LED Fixtures	0.33	0.14	0.81

Source: Evaluation Team Analysis

Free Ridership and Spillover Research Representation

The participant and trade ally web surveys were fielded by Guidehouse using Qualtrics on-line survey software. Three waves of survey invitations were emailed to Instant Discounts lighting purchasers who bought Instant Discounts Program LED lamps, TLEDs, and LED Fixtures in the

[1] In this memo we use the terms "trade ally" to refer to the distributors who help deliver the program. ComEd also refers to these distributors as Energy Efficiency Service Providers (EESP).

second half of 2020 and the first quarter of 2021. The first wave included purchasers who bought Instant Discounts Program bulbs between June and mid-September 2020. The second wave included purchasers who bought Instant Discounts Program bulbs between mid-September and December 2020. And the third and final wave included purchasers who bought Instant Discounts Program bulbs between January and April 2021. On-line survey invitations were emailed to all Instant Discounts lighting distributors who sold program LEDs, TLEDs, or LED Fixtures in CY2020. This was the first year that NTG research was conducted for LED Fixtures.

A census was conducted for both the participant and trade ally surveys. Across the three waves of participant surveys, we completed 422 interviews representing 7% of the population and 5% of LED, TLED, and LED Fixture energy savings for the June 2020 through April 2021 Instant Discounts Program period (the period included in the three waves of data collection). An additional 154 surveys were partially completed by respondents, but there was not sufficient FR or spillover data to utilize these respondents in the NTG analysis. To maximize survey response rates, ComEd emailed all customers included in the purchaser survey samples prior to the survey emailing to alert them to the data collection activity and request their cooperation completing the survey. After the first survey emailing for each wave, two additional reminders were emailed to encourage completion of the web survey.

Out of a census of 103 unique trade allies (distributors), we completed 77 on-line surveys representing 75% of the population of CY2020 program trade allies who sold measures that accounted for 80% of CY2020 kWh savings. Table 2 presents the research representation for the two categories of on-line surveys.

Table 2. Free Ridership and Spillover Research Representation

Category	Population	Sample	Actual Completes	Response Rate	Respondent Share of Program Savings (kWh)
Participant	5,678	Census	422	7%	5%
Trade Ally	103	Census	77	75%	80%

Source: Evaluation Team NTG Research

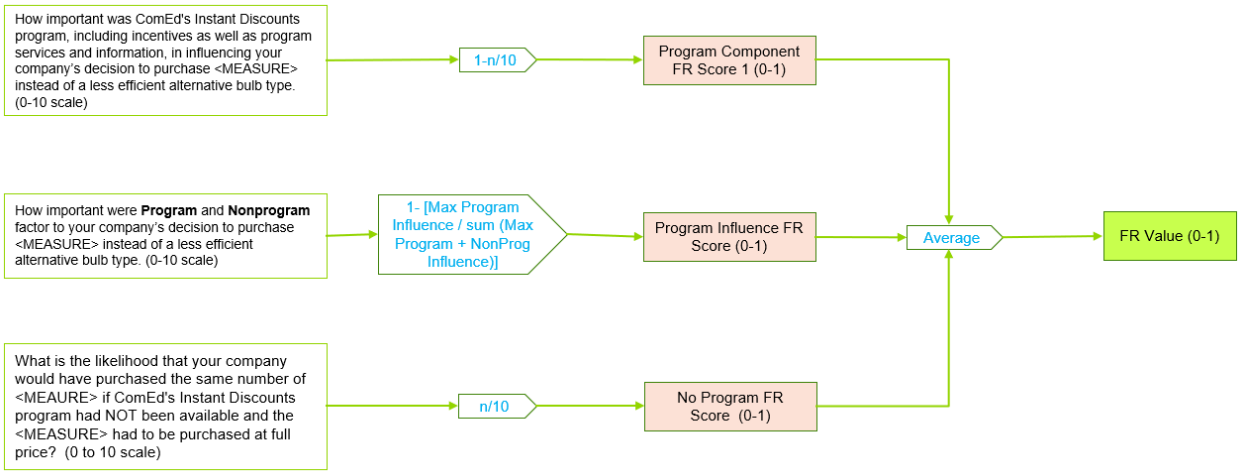
Free Ridership and Spillover Protocols

The evaluation team applied the participant FR protocols from the TRM v9.0 to the data collected during wave 1 and the FR protocols recently developed by the Illinois SAG NTG Working Group to the waves 2 and 3 data. The team used the two protocols because the new Illinois SAG NTG Working Group FR algorithm had not been finalized when the wave 1 surveys were deployed. The results from the three waves of surveys were combined using bulb type (LED, TLED, LED Fixtures) energy savings weights that represented the portion of the Instant Discounts Program year that the survey responses represented. Trade ally FR and participant and trade ally spillover were calculated using the protocols from the TRM v9.0. The team combined participant and trade ally perspectives on FR via TRM v9.0 Section 5.1, “Combining Participant and Trade Ally Free Ridership Scores.”

Participant Free Ridership Estimation

Figure 1 describes the Core Free Ridership Algorithm 1 from the TRM v9.0 that the evaluation team used to calculate FR for wave 1 of the Instant Discounts purchaser surveys.

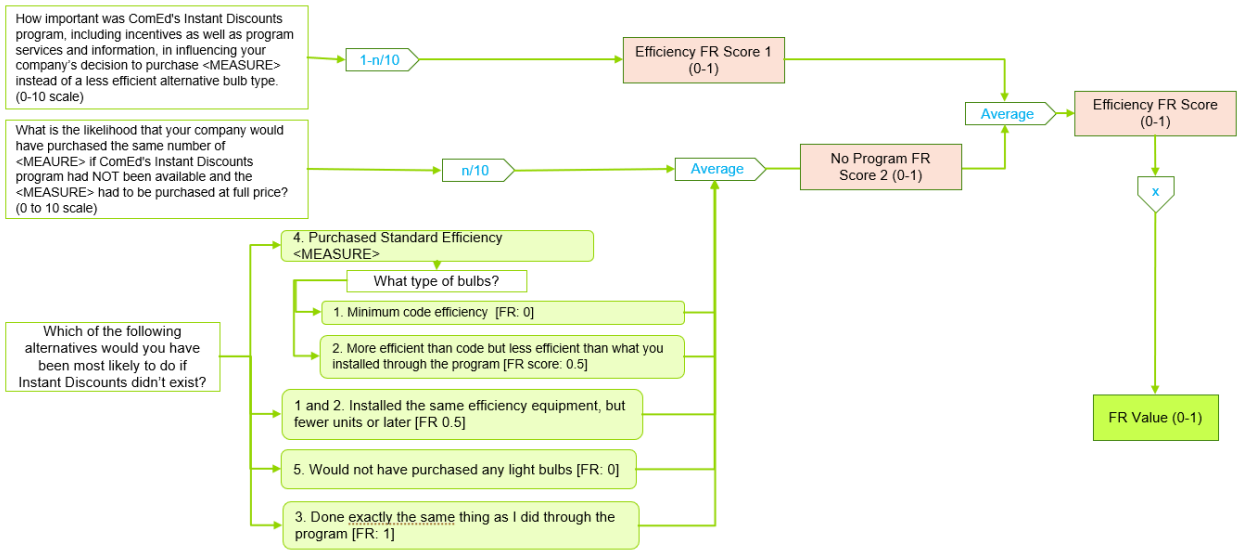
Figure 1. Instant Discounts Core Free Ridership Algorithm used for Wave 1



Source: Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 9.0, Volume 4: Cross-Cutting Measures and Attachments

Figure 2 describes the Illinois SAG NTG Working Group algorithm that the team used to calculate FR for waves 2 and 3 of the purchaser surveys. The questions and analysis are based on the TRM v9.0 Core Non-Residential algorithm, with updates based on the Illinois SAG NTG Working Group consensus in 2020.

Figure 2. Instant Discounts Illinois SAG NTG Working Group Free Ridership Algorithm Used for Waves 2 and 3

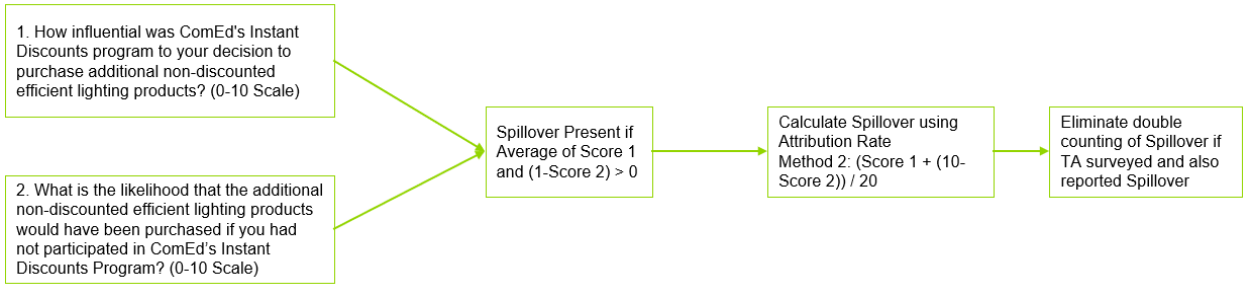


Source: Evaluation Team adjustment of Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 9.0 Core Non-Residential, with updates based on Illinois SAG NTG Working Group consensus in 2020

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"



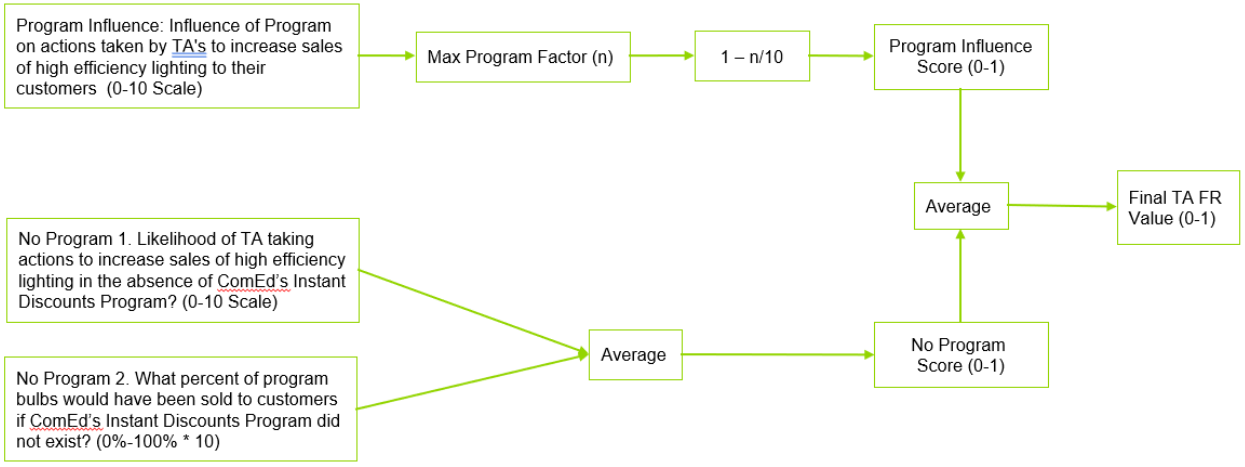
Source: Evaluation Team Representation of Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 9.0, Volume 4: Cross-Cutting Measures and Attachments

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 be developed for future versions of the TRM. For this study, Guidehouse developed the following method to assess participant FR 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 4 diagrams:

- A Program Influence (PI) score: an estimate of the Instant Discount Program's influence on the trade ally
    - Influence of Instant Discount Program on the actions taken by a trade ally to increase the sales of high efficiency lighting measures to their customers
- A No Program (NP) score: an estimate of the percentage of measures they would have sold to their customers if the program did not exist
    - Likelihood of taking actions reported to increase the sales of high efficiency lighting if the program did not exist
    - Percent of program bulbs sold that would have been sold to customers if program did not exist

Figure 4. Trade Ally Free Ridership Protocol

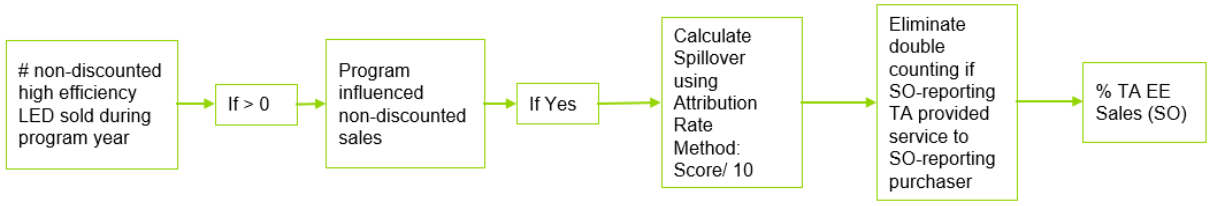


Source: Guidehouse 2020 (image and content)

Trade Ally Spillover Estimation

Guidehouse estimated spillover that occurs among trade allies according to the TRM v9.0. We assessed trade ally spillover by estimating the increase of sales of high efficiency lighting measures that are not rebated, as Figure 5 shows.

Figure 5. Trade Ally Spillover Protocol



Source: Guidehouse illustration of TRM v9.0

The process to calculate trade ally spillover contains multiple steps (as defined in the TRM v9.0):

1. Calculate the percentage of an individual trade ally's high efficiency equipment sales that received an incentive, adjusted for measure savings (Size Adjustment)

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

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

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

3. Develop the spillover ratio for sampled trade allies by summing individual trade ally spillover savings and dividing that total by Instant Discount Program-tracked savings achieved by the sampled trade allies
4. Develop spillover savings for the population of active trade allies by applying the spillover ratio from step 3 to all Instant Discount Program savings associated with active trade allies
5. Develop the overall spillover ratio for active trade allies by dividing the trade ally spillover estimate from step 4 by total Instant Discount Program savings

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

Participant and Trade Ally Free Ridership Results

Using the protocols detailed above, participant and trade ally FR results were calculated for each of the program measures researched (LED, TLED and LED fixtures). Table 3 below presents the FR estimates and the relative precision of the estimate by measure for the two populations. As this table shows, the FR estimates were similar across measures and populations, ranging from a low of 0.30 to a high of 0.37. Within a measure, the maximum difference in FR between the two populations was 0.04 for TLEDs.

Table 3. Participant Free Ridership Research Results

Measure	Population	Free Ridership	Relative Precision @90% CI
LED Lamps	Participant	0.31	0.14
	Trade Ally	0.30	0.09
Linear LEDs (TLEDs)	Participant	0.33	0.13
	Trade Ally	0.37	0.07
LED Fixtures	Participant	0.34	0.12
	Trade Ally	0.33	0.10

Source: Evaluation Team Analysis

Combining Participant and Trade Ally Free Ridership

Guidehouse calculated a weighted average of the participant and trade ally FR utilizing the triangulation approach (from TRM v9.0 Section 5.1 Volume 4) shown in Table 3 to arrive at one recommended FR score for Instant Discounts. 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."

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 calculated the participant and trade ally portions (40% and 60%, respectively) based on a comparison of the relative precision (RP) associated with the participant and trade ally FR estimates. Each share was calculated as:

   Participant or Trade Ally RP/sum of (Participant RP + Trade Ally RP)

2. How valid are the data collected and analysis?
   a. We assigned the participant portion a score of 80% because we followed the TRM approach. However, the 7% response rate may have produced some non-response bias.
   b. We assigned the trade ally portion a score of 50%. While the response rate was very high at 75%, the responses provided by the trade ally portion are quantitative estimates that rely on best estimates covering an entire program year made at the time the survey was completed rather than historical record keeping.
3. How representative is the sample?
   a. We assigned the participant portion a score of 5.3%, which is the percentage of Instant Discounts Program savings represented by the participants who responded to the purchaser survey.
   b. We assigned the trade ally portion a score of 68%, which is the percentage of program savings represented by the trade allies who responded to the distributor survey.

Table 4 summarizes the estimates going into the triangulation weights.

Table 4. Free Ridership Triangulation Weighting Approach for Instant Discounts Program

Free Ridership Triangulation Data and Analysis	Participant	Trade Ally
How likely is this approach to provide an accurate estimate of free ridership?	40%	60%
How valid is the data collected/analysis?	80%	50%
How representative is the sample?	5%	68%
Average Score	42%	59%
Sum of Averages	101%	
Weight	41%	59%

Source: Evaluation Team analysis

Applying these participant and trade ally weights to the FR estimates yields the blended FR estimates shown in Table 5 below.

Table 5. Blended Free Ridership Results

Measure	Participant Free Ridership	Participant Weight	Trade Ally Free Ridership	Trade Ally Weight	Blended Free Ridership
LED Bulbs	0.31	41%	0.30	59%	0.30
Linear LEDs (TLEDs)	0.33	41%	0.37	59%	0.35
LED Fixtures	0.34	41%	0.33	59%	0.33

Source: Evaluation Team analysis

Participant and Trade Ally Spillover Results

Of the 77 distributor survey respondents included in the distributor analysis, 58 responded to the spillover questions. Of those 58, 22 reported that they had sold additional energy efficient lighting measures. Twelve of these 22 passed all spillover screening criteria. From these 12, Guidehouse quantified 2,390,705 gross kWh savings from non-program efficiency lighting measures. The sample of 58 distributor respondents saved 123,087,982 gross kWh from these measures, resulting in a distributor spillover of 2%.

Of the 422 participant survey respondents included in the participant spillover analysis, 125 reported that they had installed additional energy efficient lighting measures. Ninety of these 125 passed all spillover screening criteria. From these 90, Guidehouse quantified 1,425,595 gross kWh savings from non-program efficiency lighting measures. The sample of 422 participant respondents saved 9,385,683 gross kWh, resulting in a participant spillover of 12%.

To avoid double counting of spillover across the distributor and participant samples, the evaluation team reviewed all participants who reported spillover and removed any participants who purchased spillover bulbs at a distributor who had also reported spillover bulb sales.

Table 6 presents the participant and trade ally spillover results, as well as the total spillover calculated (additive) that is being applied to all research measures to estimate the NTG ratio.

Table 6. Participant Spillover Research Results

Population	Spillover Results
Participant Spillover	0.12
Trade Ally Spillover	0.02
Total Additive Spillover	0.14

Source: Evaluation Team Analysis

Final NTG Results and Recommendations

Table 7 summarizes Guidehouse's draft recommendations for the Instant Discounts Program to be used in 2022 based on the research presented in this memo.

Table 7. Summary of Free Ridership, Spillover, and NTG Research Results for the Instant Discounts Program

Measure	Free Ridership	Participant Spillover	Trade Ally Spillover	NTG
LED Bulbs	0.30	0.12	0.02	0.84
Linear LEDs (TLEDs)	0.35	0.12	0.02	0.79
LED Fixtures	0.33	0.12	0.02	0.81

NTG = 1 – FR + Participant Spillover + Trade Ally Spillover

Source: Evaluation Team analysis

Using the TRM v9, the participant free ridership would have been 0.32 for LED Bulbs, 0.37 for TLEDs, and 0.35 for LED Fixtures.

Appendix A. Detailed NTG Results

A.1 Spillover Estimation

Spillover was calculated based on the data collected from participants (via the purchaser web surveys) and trade allies (via the distributor web surveys). To ensure that spillover from these two sources did not lead to double counting, the evaluation team excluded any reported spillover transactions from participants who purchased their bulbs from a lighting distributor who reported spillover.

Table 6 presents the number of participant and trade ally surveys completed, the number of survey respondents (of both types) that reported purchasing additional high efficiency lighting measures, the number of survey respondents (of both types) who met the spillover attribution threshold, the number of spillover measures for which savings were quantified, and the resulting spillover savings estimates. These two estimates were additive; thus, the overall spillover rate applied to estimate the final NTG estimate was 14%.

Table 8. Spillover Research Results

Category	Surveys Completed	Respondents that Purchased/Sold Non-Program Lighting Measures	Respondents that Met Spillover Attribution	Respondent Spillover Measures	Spillover Rate
Participants	422	125	90	11,331	12%
Trade Allies	77	22	12	16,870	2%

Source: Evaluation team analysis

The evaluation team believes nonparticipant spillover is captured in the participant spillover results presented above (resulting from the distributor surveys). The Instant Discounts Program distributors include the majority of lighting distributors in the ComEd service territory. Thus, the estimate of spillover sales (non-incentivized high efficiency bulb sales that were influenced by the Instant Discounts Program) that these distributors provided encompassed bulbs sold to both participating and non-participating customers.

Appendix B. Instant Discounts NTG History

	Business Instant Discounts Program
PY1	NA No Program
PY2	NA No Program
PY3	NA Pilot Program – no data collection
PY4	**Retroactive application of NTG of 0.63** **Free Ridership** 39% **Spillover** 2% **Method**: Customer self-report. Fifty-one surveys completed from a population of about 5,000 (contact information available for only a small subset of participants). Eleven trade ally surveys were also conducted, resulting in an NTG of 0.56, but this result was not factored into the customer free ridership calculation.
PY5	Illinois SAG Consensus: **NTG: 0.74**
PY6	Illinois SAG Consensus: **NTG: 0.63**

	Business Instant Discounts Program
PY7	**NTG CFL: 0.64** (EPY4 and EPY5 weighted average. EPY5 CFL NTG is 0.66.) **NTG LED/HID: 0.70** **NTG Linear FL: 0.56** **NTG Other: 0.67** Free Ridership: CFLs 0.41; LEDs 0.38; Linear Fluorescents 0.47; Other 0.40. Participant Spillover: CFLs 0.07; LEDs 0.08; Linear Fluorescents 0.03; Other 0.07. Nonparticipant Spillover: Negligible. There are very few (perhaps as few as one or two) midstream lighting programs offered around the country, and the others are very small and new, have not yet been evaluated, and thus provide no research on nonparticipant spillover. Given how this program is administered, it is likely that nonparticipant spillover would be very small. Source: PY5 participant and distributor self-report surveys. Notes: In PY5, Midstream Incentive Lighting was renamed BILD.
PY8	**Recommendation (based upon PY6 research):** **NTG CFL: 0.68** **NTG LED/HID: 0.77** **NTG Linear FL: 0.61** **NTG Other: 0.68** **Research NTG ratios calculated from PY6 participants:** PY6 NTG CFL: 0.68, Free Ridership: 0.39, Spillover: 0.07 PY6 NTG LED/HID: 0.77, Free Ridership: 0.30, Spillover: 0.07 PY6 NTG Linear FL: 0.61, Free Ridership: 0.45, Spillover : 0.07 PY6 NTG Other: 0.67, Free Ridership: 0.40, Spillover: 0.07 **Method**: In PY6, two primary methods were used to estimate the NTG ratio: 1. Customer self-report approach based on the end-user telephone surveys of 282 participants and in-depth interviews with nine BILD end-user participants. 2. Supplier self-reports based on in-depth interviews with program lighting distributors.
PY9	**NTG CFL:** 0.64, Free Ridership: 0.46, Spillover: 0.10 **NTG LED:** 0.78, Free Ridership: 0.32, Spillover: 0.10 **NTG Linear FL:** 0.75, Free Ridership: 0.35, Spillover: 0.10 **NTG Other:** 0.78, Free Ridership: 0.32, Spillover: 0.10 **NTG Research Sources:** PY7 Research – Free Ridership and Spillover: Customer self-report research via telephone and web surveys, plus web surveys sent to all participating distributors. Note: Recommended values are PY7 researched values (not 3-year averages).

	Business Instant Discounts Program
CY2018	**NTG LED Lamps and Fixtures:** 0.78, Free Ridership: 0.32, Spillover: 0.10 **NTG Linear FL:** 0.75, Free Ridership: 0.35, Spillover: 0.10 **LED Exit Signs, Linear LED, Battery Chargers, and all "Other":** NTG of the default value of 0.80 until research can be done. **NTG Research Sources:** For LED Lamps and Fixtures and for Linear FL: PY7 Research – Free Ridership and Spillover: Customer self-report research via telephone and web surveys, plus web surveys sent to all participating distributors.
CY2019	**NTG LED Lamps and Fixtures:** 0.83, Free Ridership: 0.31, Spillover: 0.14 **NTG Linear FL:** 0.67, Free Ridership: 0:47, Spillover: 0.14 **LED Exit Signs, Linear LED, Battery Chargers, and all "Other":** NTG of the default value of 0.80 until research can be done. **NTG Research Sources:** For LED Lamps and Fixtures and for Linear FL: PY9 Research – Free Ridership and Spillover: Customer self-report research via purchaser surveys and participating distributor surveys.
CY2020	**NTG LED Lamps and Fixtures:** 0.83, Free Ridership: 0.31, Spillover: 0.14 **NTG Linear FL:** 0.67, Free Ridership: 0:47, Spillover: 0.14 **LED Exit Signs, Linear LED, Battery Chargers, and all "Other":** NTG of the default value of 0.80 until research can be done. **NTG Research Sources:** For LED Lamps and Fixtures and for Linear FL: PY9 Research – Free Ridership and Spillover: Customer self-report research via purchaser surveys and participating distributor surveys.
CY2021	**NTG LED Lamps:** 0.72, Free Ridership: 0.43, Spillover: 0.15 **NTG Linear FL:** 0.67, Free Ridership: 0:48, Spillover: 0.15 **NTG Linear LED:** 0.76, Free Ridership: 0:39, Spillover: 0.15 **LED Fixtures, Exit Signs, Battery Chargers, and all "Other":** NTG of the default value of 0.80 until research can be done. **NTG Research Sources:** For LED Lamps, Linear LEDs, and Linear FL: CY2019 Research – Free Ridership and Spillover: Customer self-report research via purchaser surveys.

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