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To: Erin Daughton, ComEd
CC: Jennifer Morris, ICC Staff; Jeff Erickson, Randy Gunn, Rob Neumann, Laura Agapay-Read, Navigant
From: Sharon Mullen, Wayne Leonard, Navigant
Date: October 1, 2019
Re: Net-to-Gross Research Results for the ComEd LED Street Light Offer, CY2018

EXECUTIVE SUMMARY

This memo presents the findings of the CY2018 net-to-gross (NTG) study of the ComEd LED Street Light Offering for municipal participants. The CY2018 NTG calculations are based on the NTG algorithms specified in the Illinois Technical Reference Manual (TRM) version 7.0 and rely on the self-report approach for estimating free ridership. Findings are based on on-line survey responses completed by 21 similarly-sized municipal participants (out of a population of 62 unique participants for a 36 percent response rate) and four interviews for one large municipality.

Approximately 20 percent of the street lights in the ComEd service territory are owned by ComEd. Since ComEd owns those lights, the beneficiaries of those lights have no ability to decide to update them. As a result, this decision rests solely with ComEd, and the EM&V team has concluded that the NTG value should be 1.0. SAG agreed to this value in CY2018, and it remains our recommendation.

Navigant found free ridership of 0.19 among municipal participants, which produces a NTG ratio of 0.81 (see Table 1).Navigant did not research spillover.

These results will be included in Navigant's draft recommendations to the Illinois Stakeholders Advisory Group (SAG) of NTG values to be used for CY2020.

ComEd-owned poles account for 20% of the CY2018 savings and municipal polls 80% of the savings.

Table 1. NTG for ComEd LED Street Lighting Program

Overall Program	Savings Type	Free Ridership	Participant Spillover	NTG ratio	Source
Municipality-owned	kWh	0.19	NA	0.81	CY2018 EM&V research
ComEd-Owned Poles	kWh		NA	1.0	SAG approved value for CY2018

Source: Navigant analysis

Free ridership was driven primarily by community initiatives to implement efficient street lighting, with a respondent commenting that the community "was converting existing lighting to LED long before DCEO or ComEd offered grants/incentives. While the incentives are helpful, the [community] program likely would have continued without it." This respondent rated the likelihood of implementing their project absent the program a 9 on a scale of 0-10 (zero is not at all likely and 10 is extremely likely).

The program incentive was influential, even with a community mandate to implement the upgrades, with another municipality's respondent saying, "The [municipality] wanted all streets lights replaced to LEDs, the incentive allowed us to complete the project sooner eliminating future phases of the project." The likelihood of implementing the project absent the program was rated a 10 for this municipality.

Assistance from the program was influential for some participants as well, with one saying, "I don't think the city could have filled out those applications on our own. You needed to have somebody with expertise

and the ability to Elevate brought to the table. Because if we would have had to navigate the applications on our own, it would have really curtailed the number of rebates we could have processed."

More than half the respondents had a free ridership of less than 10%. With a likelihood of implementing their project rated a 5 on a scale of 0-10, a municipality respondent commented, "We typically upgrade a few lights per year, with the incentive we were able to do more lights than originally planned." Another, rating the likelihood of implementing the project absent the program at a 0, responded, "Plain and simple, [the program's incentive] made the project doable from a cost perspective."

Some municipalities are dependent upon the program to upgrade their street lights, with one commenting, "Because the [municipality] would not be able to afford the project without [the program] as we have to pay a contractor for the installation of the street light luminaires as we do not have the capabilities to install them using in-house staff. We would not have done the project if the incentive didn't cover so much of the purchase costs. Additionally, the [municipality] would do more projects, but the incentive seems to be going down every year."

FREE RIDERSHIP SURVEY DISPOSITION

Navigant conducted the study via offering an on-line survey to key decisionmakers for each sampled project and achieved 20 completed responses[1]. The survey followed the standard NTG question structure. Table 2 reports the survey disposition for free ridership.

Table 2. Free Ridership Decision Maker Survey Disposition

Measure	Municipal Projects	Sample of Municipal Participants	Target Completes	Actual Completes
Municipality-owned*	223	62	20	20

* Excluding the large municipality.
Source: Navigant analysis

FREE RIDERSHIP PROTOCOLS

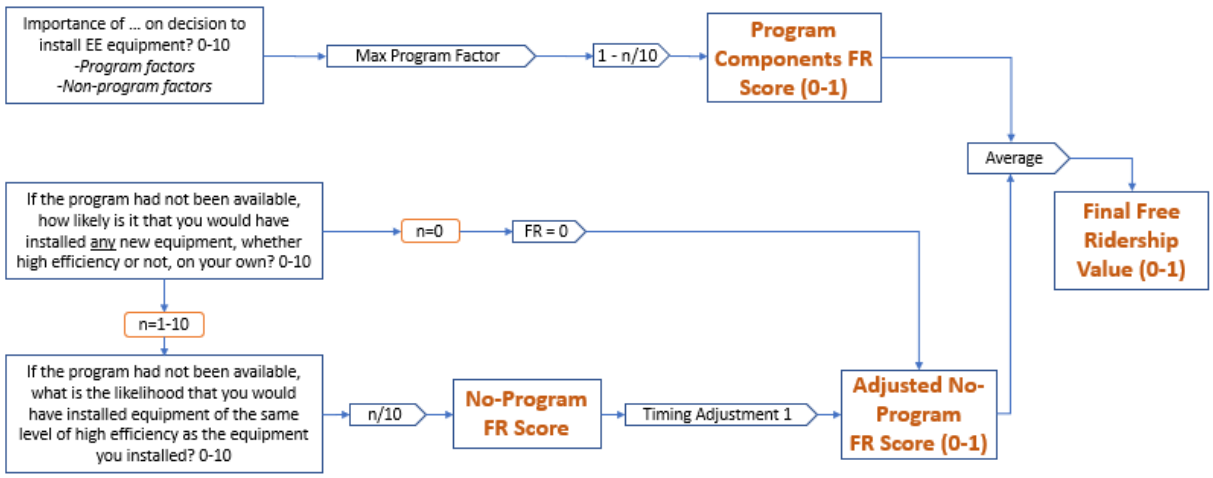
Navigant applied the relevant free ridership protocol from the TRM. The Illinois NTG Working group developed the NTG protocols in version 7.0 of the TRM in their deliberations during the summer and fall of 2018. For free ridership, the protocols provide two options for combining three sub-scores. These two options use different specifications to account for the impact that the program had on project timing (referred to as "deferred free ridership"). Evaluators are advised to calculate free ridership using both options and to select one option for purposes of calculating the net energy savings for comparing to the legislated goal.

Navigant's preferred algorithm specification is **Core Free Ridership Algorithm 1**, shown graphically in Figure 1. The majority of NTG findings discussed below are based on this version. The other option, Core Free Ridership Algorithm 2 (Figure 2) has also been analyzed, and those findings are presented as a sensitivity case later in this memo. The rationale for selecting Algorithm 1 over Algorithm 2 is that Algorithm 1 provides for equal weighting of each of the three sub-scores, which represent different ways of determining whether or not the savings would have occurred in absence of the program. In contrast, Algorithm 2 applies a 50 percent weight to the program's effect on the timing of the project, which we

[1] Twenty-two surveys were started, excluding the large municipality; two were not included in the NTG analysis due to incomplete responses / not finishing the survey.

believe is too high. Such a high weighting essentially discounts the effect of the other factors that drive program influence, which in our view is inappropriate.

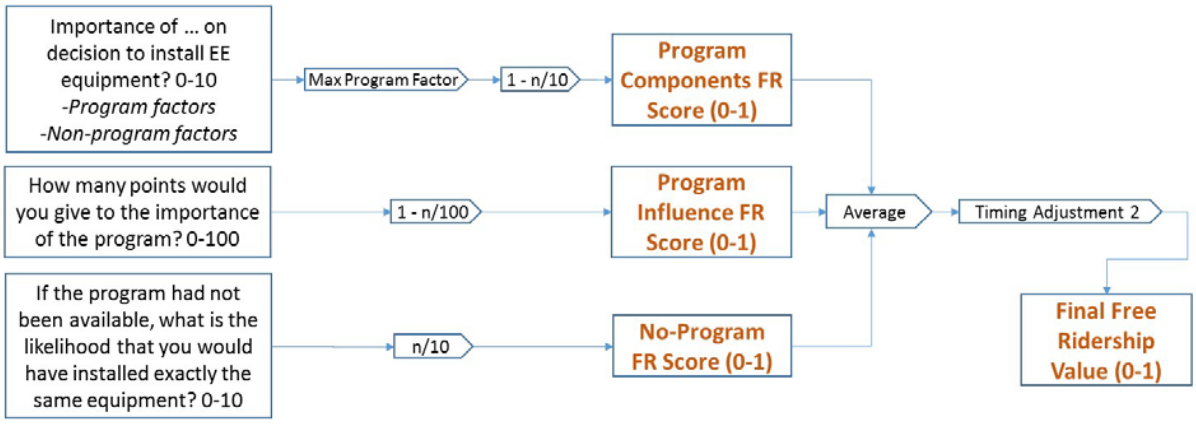
Figure 1. Core Participant Free Ridership Algorithm 1



Source: Illinois TRM, version 7.0

Figure 2: Core Participant Free Ridership Algorithm 2

((Program Components FR Score + Program Influence FR Score + No-Program FR Score) / 3) * Timing Adjustment 2



Source: Illinois TRM, version 7.0

DETAILED NTG RESULTS

Free Ridership Consistency Check Analysis

Navigant did not exclude any responses from the analysis because of inconsistencies or non-response, excluding only those who did not complete the survey, as reported in Table 4.

Table 3. Free Ridership Consistency Check Disposition

Project-Level Response Disposition	All projects
Projects covered by interviews*	23
Excluded: Ineligible project	0
Excluded: Incomplete response	2
Excluded: Triggered and Failed Consistency Check	0
Total of Excluded Responses	2
Analyzed Sample	21
Evaluated to Require no Exclusion	21
Evaluated to Exclude NP Score	0
Evaluated to Exclude PC Score	0

NP = No Program; PC = Program Components
* Excluding the large municipality.
Source Navigant analysis

APPENDIX 1: COMPARISON OF FREE-RIDERSHIP ALGORITHM 1 VERSUS ALGORITHM 2

Cronbach's Alpha is a measure of internal consistency or reliability. It is used to assess how closely related a set of items are as a group. In this memo, Cronbach's Alpha is used to assess how closely related the items going into the NTG score are to each other. In general, the higher the measured Cronbach's Alpha value, the greater the internal consistency of the items. However, given the small number of items (i.e., the three sub-scores) being considered in this application of Cronbach's Alpha, a high alpha value is not expected. Realistically, Alpha values ranging from 0.4 to 0.6 are considered an acceptable measure of reliability for this analysis given the small number of items being analyzed.

We used the Standardized Cronbach's Alpha calculation as specified below:

$$\alpha = \frac{N \cdot \bar{r}}{1 + (N - 1) \cdot \bar{r}}$$

Where:

N = the number of items

$\bar{r}$ = the average correlation

We calculated the Cronbach Alpha for the two algorithm variations discussed previously.

Table 9 presents free ridership results, free ridership precision, and the Cronbach's Alpha for the two NTG ratio algorithm variations for the 2018 LED Street Light Program. Overall, Cronbach's Alpha values for 2018 are high, 0.86 for Algorithm 1 and 0.78 for Algorithm 2.

Table 4. Comparison of Algorithm 1 and 2 (n= 20)

Category	Free-Ridership Value	Precision at 90% Confidence Interval	Cronbach's Alpha
	Algorithm 1		
Municipal Street Lights	0.19	7.9%	0.84
	Algorithm 2		
Municipal Street Lights	0.15	8.6%	0.70

Source: Navigant analysis

Together, the Cronbach's Alpha results suggest that both sets of free ridership sub-scores (those from Algorithm 1 and those from Algorithm 2) have high internal consistency. However, this does not change our fundamental preference for Algorithm 1 over Algorithm 2 for the reasons stated earlier. Because the free ridership questions are set up to estimate opposing biases from the respondents, Navigant does not view internal consistency is an appropriate mechanism to place value on one algorithm over another.

APPENDIX 2: LED STREET LIGHTS PROGRAM NTG HISTORY

	LED Street Lights Offer
CY2018	NTG: 1.0
CY2019	NTG: 1.0, Will conduct primary NTG research in CY2018 on municipally-owned lights

Source: http://ilsagfiles.org/SAG_files/NTG/2019_NTG_Meetings/Corrected_NTG_Values/ComEd_NTG_History_and_CY2019_Recommendations_Aerator_and_Showerhead_Correction_2019-04-12.pdf