NAVIGANT

Itron

230 Horizon Drive,
Suite 101-B
Verona, WI 53593

Memorandum

To: Erin Daughton, ComEd

CC: Milos Stefanovic, ComEd
Jennifer Morris, ICC Staff

From: Jennifer Fagan, Itron
Jeff Erickson, Randy Gunn, Rob Neumann, Laura Agapay-Read, Navigant

Date: September 17, 2018

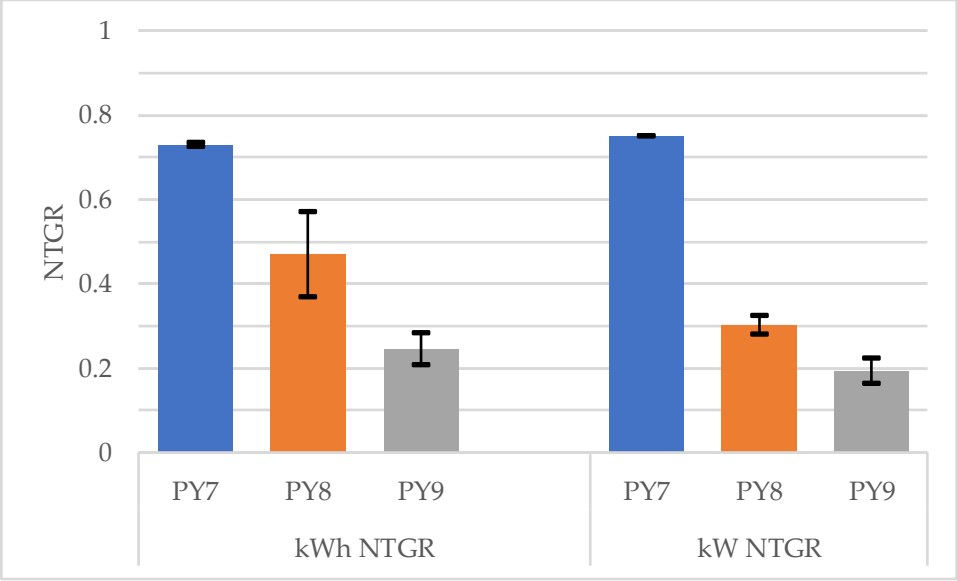
Re: Net-to-Gross Research Results from the PY8 and PY9 ComEd Data Centers Efficiency Program

SUMMARY OF FINDINGS

This memo presents the findings of the PY6 and PY9 net-to-gross ratios (NTGR) study of the ComEd Data Centers Program.

The Evaluation Research findings energy and demand-weighted NTGRs for PY7, PY8, and PY9, are presented below in
Figure 1**Error! Reference source not found.**. The overall trend in the NTGRs has been sharply downward.

Figure 1. Evaluated NTGR by Program Year with 90% Confidence Interval



The EM&V team also calculated a combined PY8 and PY9 NTGR. The team developed this value using savings weighted NTGRs from PY8 and PY9 and computing a weighted average value. The combined PY8/9 value of 0.31 is much lower than the PY7 NTGR of 0.68.

Finally, given the dramatic difference found between co-location and non-co-location NTGRs, the EM&V team calculated separate combined PY8/9 values for these segments. The combined PY8/9 NTGR for co-locations is 0.25, while the PY8/9 NTGR for non-co-locations is 0.71. The evaluation team also found significant NTGR variation within the co-location segment for new construction vs. retrofit projects, with new construction project NTGRs much lower than retrofit project NTGRs. The combined PY8/9 new construction project NTGR is 0.20, while the retrofit project NTGR value is 0.72. *The EM&V team recommends that the combined PY8/9 values for co-location* new construction projects of 0.20, for co-location retrofit projects *of 0.72, and for non-co-locations of 0.71 be used to compute program-verified savings for CY2019 projects going forward.*

INTRODUCTION

This memorandum presents the evaluation's PY8 and PY9 net-to-gross ratio (NTGR) estimates for ComEd's Data Centers Efficiency program. The evaluation team completed NTG interviews with participants for both PY8 and PY9. The analysis of the PY8 data was postponed until the conclusion of the PY9 evaluation. Thus, this memo reports findings for PY8, PY9 and pooled PY8/PY9 NTGR results.

EVALUATION RESEARCH NET IMPACT FINDINGS

NTG Algorithm Specifications

The PY8 and PY9 NTGR calculations were based on the NTG algorithms specified in the Illinois TRM version 6.0. Approval to use version 6.0 was provided by the Illinois Stakeholder Advisory Group and Illinois Commerce Commission staff via an email seeking permission dated April 2, 2018 and their lack of objections by April 16, 2018, which was interpreted as consensus. The NTG protocols in version 6.0 were developed by the Illinois Net-to-Gross Working Group in their deliberations during the summer and fall of 2017.

The protocols provide two options for combining the three scores. These two options use different specifications to account for the impact of the program on project timing (referred to as "deferred free ridership"). Evaluators are to calculate free ridership using both options and to select one option for purposes of calculating the annual incremental energy savings for comparing to the legislated goal.

The evaluation team's preferred algorithm specification **is Core Free Ridership Algorithm 1**, shown graphically below (Figure 2). The majority of NTG findings discussed below are based on this version. The second option, Core Free Ridership Algorithm 2 (Figure 3) has also been analyzed, and those findings will be 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 scores, which represent different ways of determining program influence. In contrast, Algorithm 2 applies a 50% weight to the program's effect on the timing of the project, which we believe is too high. Such a high weighting essentially discounts the effect of the other factors affecting program influence, which in our view is inappropriate.

Figure 2. Core Free Ridership Algorithm 1

(Program Components FR Score + Program Influence FR Score + (No-Program FR Score * Timing Adjustment 1)) / 3

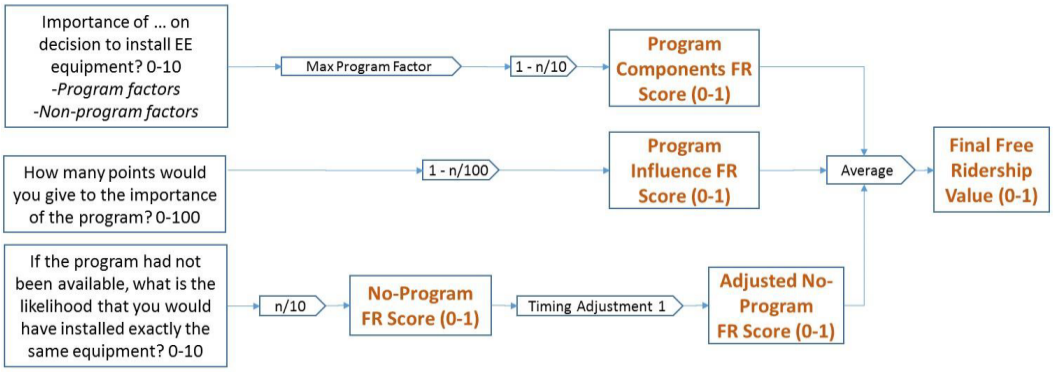
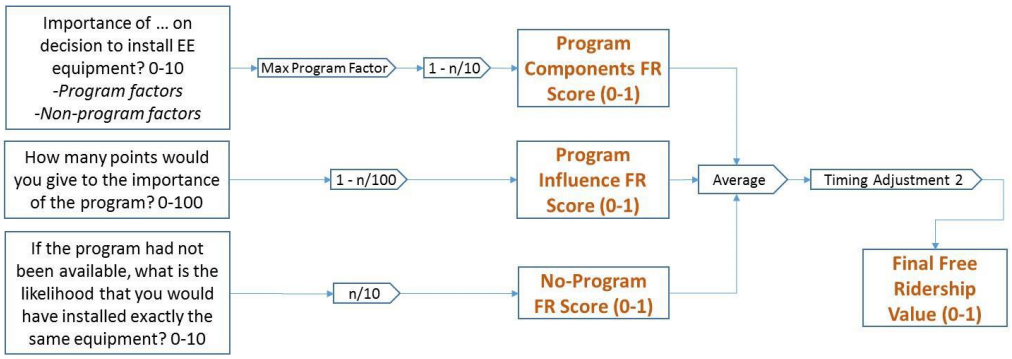


Figure 3: Core Free Ridership Algorithm 2

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



NTGR Calculation

The calculation of both the free ridership rate and each project's net-to-gross ratio (NTGR) is a multi-step process. Responses from the telephone survey are used directly to calculate a timing and selection score, a program influence score and a no-program score for each project (as outlined in Table 0-1 below for both versions of the NTGR algorithm). These three scores can take values of 0 to 10 where a lower score indicates a higher level of free-ridership. The calculation then averages those three scores and incorporates spillover findings to come up with a project-level net-to-gross ratio.

Table 0-1. Net-to-Gross Scoring Algorithms for the PY8 and PY9 Data Centers Program[1]

Scoring Element	Algorithm 1 Calculation	Algorithm 2 Calculation
Timing and Selection Score. The maximum self-reported score (on a 0 to 10 scale of importance) for the following program elements: A. Availability of the program incentive B. Technical assistance from utility or program staff C. Recommendation from utility or program staff D. Information from utility or program marketing materials E. Endorsement or recommendation by utility account rep F. Recommendation from vendor or Technical Service Provider[2].	Maximum of A, B, C, D, E, and F	Maximum of A, B, C, D, E, and F
Program Influence score. From a Total of 10 points, the self-reported number of points assigned to the importance of the Program in their decision to implement the <PROJECT> (as versus other non-program factors.	Points awarded to the program. Reduce by half if decision made BEFORE learning about rebate eligibility	Points awarded to the program. Reduce by half if decision made BEFORE learning about rebate eligibility
No-Program score. If the Program had not been available, the self-reported likelihood (on a 0 to 10 scale, where 0 is "Not at all likely" and 10 is "Extremely likely") that they would have installed exactly the same PROJECT.	Linear adjustment to self-reported No Program Likelihood Score and 10 (maximum score based on deferred installation 48 months or more later).	Self-reported No Program Likelihood.Score.
Timing Adjustment. Timing credit provided for deferred installation absent the Program. Linear adjustment with gradually increasing credit value for each year of deferral of 25% for one year,50% for two years, 75% for three years and 100% for four years or more.	Incorporated into No Program score.	Applied to the average of the Timing and Selection, Program Influence and No-Program scores
Project-level Free-ridership (ranges from 0.00 to 1.00)	1 minus Sum of scores (Timing and Selection, Program Influence, No-Program)/30	1 minus the average of the Timing and Selection, Program Influence and No-Program scores, adjusted for Timing
PY8 and PY9 Project level Net-to-Gross Ratio (ranges from 0.00 to 1.00)	1 minus Project level Free-ridership	1 minus Project level Free-ridership

[1] Based on the NTG algorithm specifications in TRM v.6.0 Attachment A (Illinois Statewide Net-to-Gross Methodologies)
[2] Only applicable for sites that indicated a vendor influence score greater than maximum of the other program element scores or those sites that had a study performed by a Technical Service Provider.

NTG Sample Design and Completed Surveys

During both PY8 and PY9, the NTG sample design consisted of 8 sample points that corresponded to and completely overlapped with the gross impact M&V sample of 8 projects in each year. In both years, telephone surveys were completed for all 8 sample points, across two waves of sample. Therefore, the findings for each year are based on a total of 8 completed interviews to support the calculation of the net-to-gross ratio calculation.

Table 2 and Table 3 below summarize the number of completed telephone surveys in each year, and the percent of ex-ante kWh claims represented. The surveys completed represent 48 percent and 87 percent of ex-ante kWh claims in PY8 and PY9, respectively.

Table 2: Profile of the PY8 Participant Survey Net-to-Gross Sample by Strata

Program Population Summary				NTG Interviews Completed		
Sampling Strata	Number of Records (N)	Ex Ante kWh Impact Claimed	kWh Weights by Strata	N	kWh	% of Population Ex Ante kWh
1	2	6,369,445	0.34	2	6,369,445	100%
2	9	6,432,226	0.35	3	1,935,237	30%
3	18	5,816,088	0.31	3	674,837	12%
TOTAL PY8 DC	**29**	**18,617,759**	**-**	**8**	**8,979,519**	**48%**

Table 3. Profile of the PY9 Participant Survey Net-to-Gross Sample by Strata

Program Population Summary				NTG Interviews Completed		
Sampling Strata	Number of Records (N)	Ex Ante kWh Impact Claimed	kWh Weights by Strata	N	kWh	% of Population Ex Ante kWh
1	1	16,274,747	0.35	1	16,274,747	100%
2	2	19,129,513	0.41	2	19,129,513	100%
3	16	10,896,121	0.24	5	4,758,812	44%
TOTAL PY9 DC	**19**	**46,300,381**	**-**	**8**	**40,163,072**	**87%**

Weighted NTG Results Based on Core Free Ridership Algorithm 1 (Preferred specification)

Weighted results are presented in this section for each sampling size stratum, and for the program overall. To produce an estimate of the net-to-gross ratio (NTGR), the individual NTGRs for each of the projects in the sample were weighted by the size of the ex-ante savings estimates (savings) associated with the project, and the proportion of the total sampling domain savings represented by each sampling stratum. NTGR results are weighted by ex-ante kWh.

PY8 NTG Results

Table 4 shows the PY8 project-specific and stratum level NTGRs. The overall program energy NTGR for PY8 is 0.47, which represents a significant drop from the PY7 result of 0.68. By strata, the mean energy NTGR values are 0.32 for stratum 1 (large-sized projects), 0.41 for stratum 2 (medium-sized projects), and 0.70 for stratum 3 (small sized projects) which indicates the free-ridership level for the largest sized projects in strata 1 and 2 is much higher than the free-ridership of the smaller project sizes in stratum 3. The low NTG values for strata 1 and 2 projects are a key factor for the decline in PY8 NTG results.

Table 4. PY8 NTGR Results for the Data Centers Sample

Project ID*	Sampling Stratum	Project Specific NTGR	Sample-Based Verified kWh NTGR	Sample-Based Verified kW NTGR
PY8 – 01**	1	0.40	0.32	0.17
PY8 – 02**	1	0.05		
PY8 – 03**	2	0.83	0.41	0.02
PY8 – 04**	2	0.00		
PY8 – 05**	2	0.60		
PY8 – 06**	3	0.67	0.70	0.70
PY8 – 07**	3	0.67		
PY8 – 08**	3	0.83		
Total	**N/A**	**NA**	**0.47**	**0.30**

* Actual Project IDs are not provided to protect customer confidentiality
**Overlaps with gross impact sample

By stratum, highlights include the following:

- For the two stratum 1 projects evaluated, the NTGRs were 0.05 and 0.40, respectively, indicating weak program influence. Both projects were for co-location data centers, which are already driven by market forces to drive their operating costs per-unit (also referred to as Power Utilization Effectiveness or PUE) down as low as possible. One decisionmaker explained that they like to deliver an already energy efficient product to prospective clients. With co-location facilities, a lot of the leases include the electric bill, and energy efficient features of the building, which makes them more attractive to clients. Related, they like to earn LEED certification. Both projects appreciated the rebate and it helped the payback, but they were going to do what they did anyway.
- For stratum 2 projects, NTGRs ranged from 0.00 to 0.83, indicating wide variation in project circumstances. One of the three stratum 2 projects (with an NTGR of 0.00) was a co-location new construction project with sufficient motivation already to pursue building an energy efficient facility. Because it was new construction, many decisions on equipment had already been made beforehand. The second project, with an NTGR of 0.60, involved an HVAC retrofit project with an air side economizer to boost energy efficiency and provide redundancy. The program incentive played an important role in moving the project within the company's acceptable payback cutoff point. The third project (with an NTGR of 0.83) involved merging two data centers and installing energy efficient cooling equipment with a much smaller footprint. This new equipment

was much more expensive than conventional equipment, and the program rebate was important to help offset some of that added cost.

- NTGRs for stratum 3 projects ranged from 0.67 to 0.83, indicating moderate free ridership. For two of the projects, the technical assessment study conducted by the program was critical to their equipment choices and decisionmaking. The program incentive, which was also analyzed in the technical studies, was what made the economics work for the project. For the third project, the company's management didn't accept the proposed technology (hot aisle containment) and didn't want to make a change until ComEd's program was brought in. The combination of the program incentive plus the technical study was what changed their mind.

The evaluation team used a ratio estimation technique to estimate the program-level NTGR, based on the steps outlined in the California Evaluation Framework. The evaluation team used the standard error to estimate the error bound around the estimate of the verified evaluation NTGR. The program level kWh and kW NTGR, along with confidence intervals and precision estimates, is shown in Table 5 (kWh impacts) and in Table 6 (kW impacts).

Information regarding participant spillover was also collected, but ultimately did not support a finding of any spillover. Therefore, no spillover was included in the calculation of NTGR for PY8.

Table 5. kWh NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.32	0.32	0.32
2	70%	0.12	0.41	0.70
3	7%	0.65	0.70	0.75
TOTAL PY8 DC	**22%**	**0.37**	**0.47**	**0.57**

Table 6. kW NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.17	0.17	0.17
2	216%	0.00	0.02	0.05
3	7%	0.65	0.70	0.75
TOTAL PY8 DC	**7%**	**0.28**	**0.30**	**0.32**

PY9 NTG Results

The PY9 project-specific and stratum level NTGRs are reported below in **Error! Not a valid bookmark self-reference.**. The program-level PY9 mean energy NTGR averaged 0.25. In general, PY9 mean energy NTGR values are much lower than the PY8 value of 0.47 and significantly lower than the PY7 value of 0.68. Energy NTGR values for the three sampling strata are 0.05 for stratum 1 (large sized projects), 0.23 for stratum 2

(medium sized projects), and 0.57 for stratum 3 (small sized projects). As in PY8, this indicates that the free-ridership level for the largest sized projects (stratums 1 and 2) is much higher than the free-ridership of the small project sizes.

Table 7. PY9 NTGR Results for the Data Centers Sample

Project ID*	Sampling Stratum	Project Specific NTGR	Sample-Based Verified kWh NTGR	Sample-Based Verified kW NTGR
PY9 – 01**	1	0.05	0.05	0.05
PY9 – 02**	2	0.40	0.23	0.23
PY9 – 03**	2	0.05		
PY9 – 04**	3	0.77	0.57	0.42
PY9 – 05**	3	0.71		
PY9 – 06**	3	0.77		
PY9 – 07**	3	0.50		
PY9 – 08**	3	0.00		
Total	**N/A**	**NA**	**0.25**	**0.19**

* Actual Project IDs are not provided to protect customer confidentiality
**Overlaps with gross impact sample

Stratum-level highlights include the following:

- The three projects in stratum 1 and 2 had NTGRs of 0.05, 0.05 and 0.40. All three are co-location data centers, which are already driven by market forces to drive their operating costs per-unit down as low as possible. This is clearly reflected in the very low NTGRs, indicating low or no program influence on decisions.
- Across the smallest projects, stratum 3, NTGRs ranged from 0.00 to 0.77, and averaged 0.57, indicating a medium level of free ridership. It is interesting to note the wide range of results across the 5 projects evaluated. Three projects' NTGRs were clustered around medium-high values (0.71 to 0.77, three projects), another had a mid-range value of 0.50, and one had an extremely low value of 0.00.
    - For the 3 projects with the highest NTGRs, the program rebate was a key influence which helped to accelerate equipment retrofit decisions. Absent the program, the projects would not have been pursued for several years.
    - For the mid-range NTGR project (0.50), key decision factors included the program incentive and technical assistance which were considered critical to making the project viable.
    - The project with the lowest NTGR value (0.00) had already made their decision before they learned about the availability of an incentive through the program. They would have installed the same equipment at the same time absent the program.

The program level kWh and kW NTGR, along with confidence intervals and precision estimates, are shown in Table 8 (kWh impacts) and in Table 9Table 6 (kW impacts).

Information regarding participant spillover was also collected, but ultimately did not support a finding of any spillover. Therefore, a quantification of spillover was not included in the calculation of NTGR for PY9.

Table 8. PY9 kWh NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.05	0.05	0.05
2	0%	0.23	0.23	0.23
3	28%	0.41	0.57	0.73
TOTAL PY9 DC	**15%**	**0.21**	**0.25**	**0.28**

Table 9. PY9 kW NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.05	0.05	0.05
2	0%	0.23	0.23	0.23
3	53%	0.20	0.42	0.64
TOTAL PY9 DC	**15%**	**0.16**	**0.19**	**0.22**

Combined PY8 and PY9 Results

The PY8 and PY9 project-specific NTGRs are plotted in Figure 4 and Figure 5, respectively. Each plot point in the figure represents a sampled project. The plot points are grouped by strata, where stratum 1 is large sized projects, stratum 2 is medium sized projects, and stratum 3 is small sized projects. The green and blue horizontal lines denote the strata-level energy and demand weighted NTGRs, respectively. Note that in PY9, strata 1 and 2 were combined for the demand weighted NTGR, as there was only a single stratum 1 project with demand savings.

Figure 4: PY8 Sample NTGR by Stratum

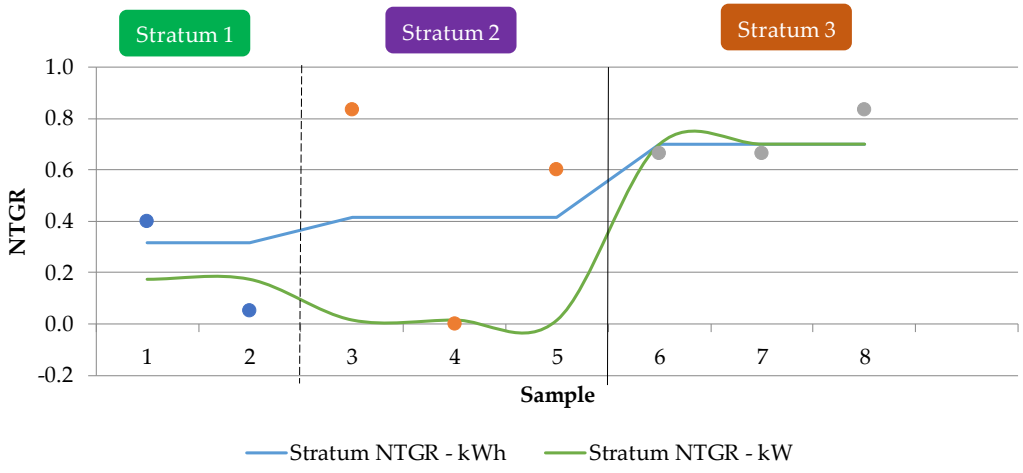
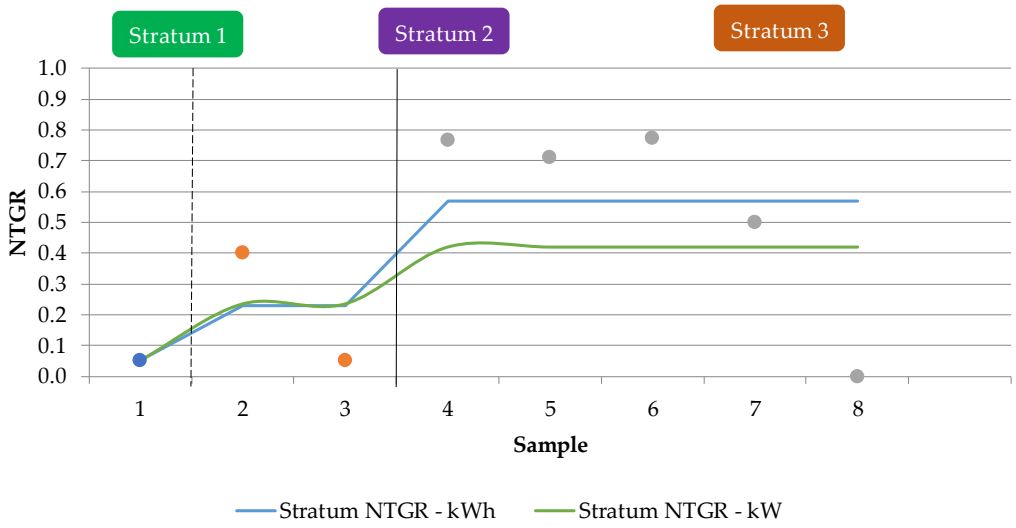


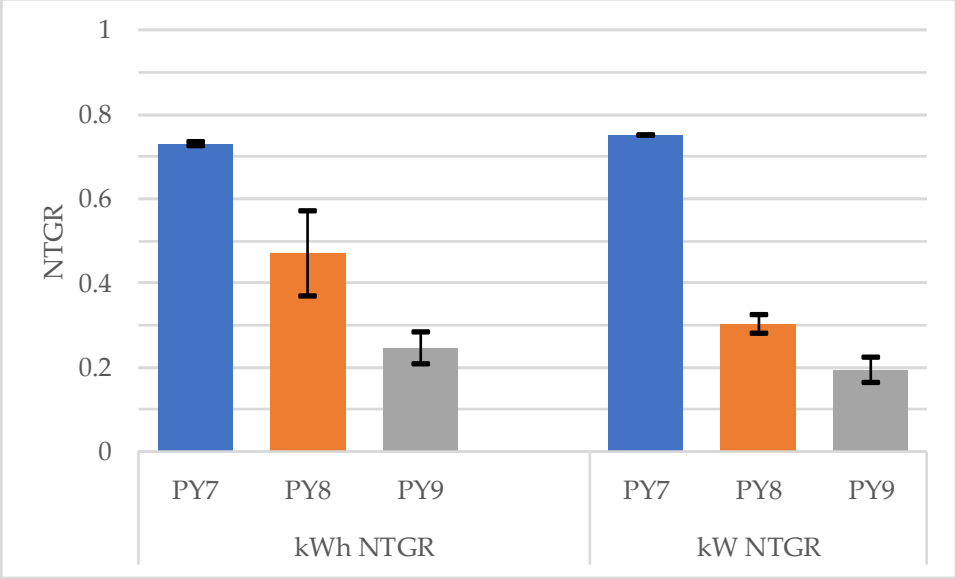
Figure 5: PY9 Sample NTGR by Stratum



The evaluation research findings energy and demand-weighted NTGR by program year, for PY7, PY8, and PY9, are presented below in

Figure 0-6. The overall trend in the kWh NTGR for Data Center projects has been sharply downward.

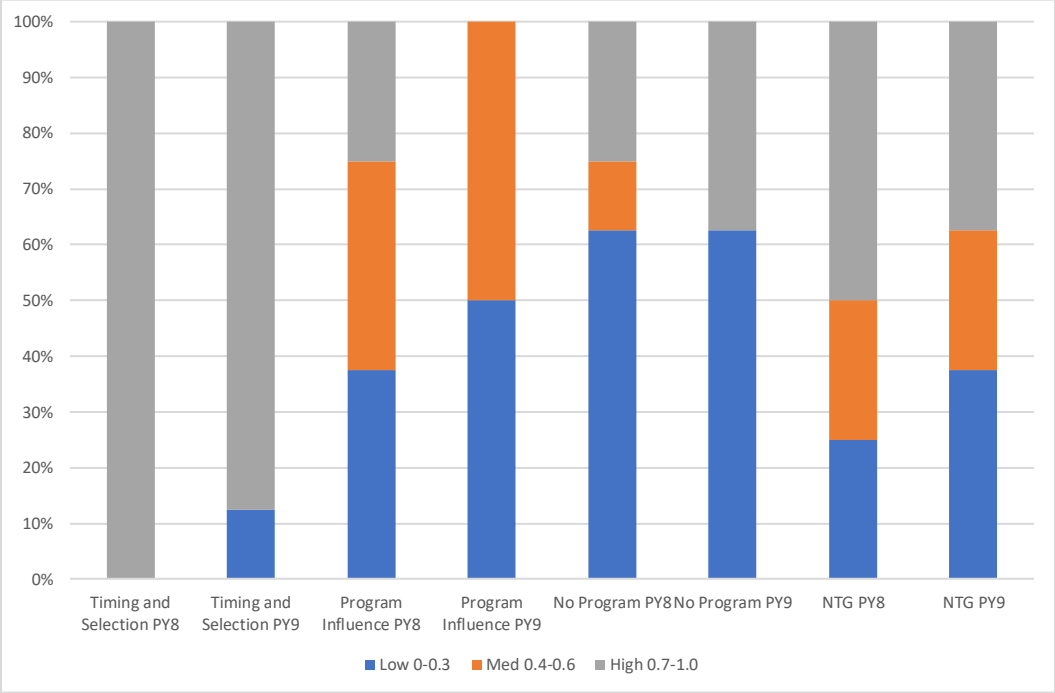
Figure 0-6. Evaluated NTGR by Program Year with 90% Confidence Intervals



A breakdown of NTGR by the three component scores is shown in Figure 0-7. The timing and selection score reflects the importance of various program and program-related elements in the customer's decision and timing of the decision in selecting specific program measures. The program influence score reflects the relative degree of influence the program had on the customer's decision to install the specified measures as versus

non-program factors. The no-program score captures the likelihood of various actions the customer might have taken now and in the future if the program had not been available.

Figure 0-7. NTGR Level by Component Scores



A scan of the PY8 vs. PY9 bars provides additional insight into a key causal factor for the drop in the NTGR value between PY8 and PY9. For all but the last score, the concentration of High values is moderately to significantly higher in PY8 than PY9. As a result, for the overall NTGR, the share of High scores in PY8 exceeds that in PY9 by a wide margin.

Stratum-level causal factors leading to these results were discussed previously. In general, PY9 projects were characterized by program-related factors that were either unimportant or not applicable to the final decisions to do the project.

1.1.1.1 Combined PY8 and PY9 NTGR

The evaluation team calculated a combined PY8 and PY9 NTGR. This value was determined using savings weighted NTGRs from PY8 and PY9 and computing a weighted average value. The combined PY8/9 value of 0.31 is much lower than the PY7 NTGR of 0.68.

Table 10. Combined PY8 and PY9 MWh NTG Ratio

Year	N	kWh	Weight	NTGR	NTG SE
PY8	29	18,617,759	29%	0.47	8%
PY9	19	46,300,381	71%	0.25	3%
DC PY8/PY9	**48**	**64,918,140**	**100%**	**0.31**	**4%**

Finally, given the dramatic difference found between co-location and non- co-location NTGRs, separate combined PY8/9 values were also calculated for these segments. The combined PY8/9 NTGR for co-locations is 0.25, while the PY8/9 NTGR for non-co-locations is 0.71. The evaluation team also found significant NTGR variation within the co-location segment for new construction vs. retrofit projects, with new construction project NTGRs much lower than retrofit project NTGRs. The combined PY8/9 new construction project NTGR is 0.20, while the retrofit project NTGR value is 0.72. *The EM&V team recommends that the combined PY8/9 values for co-location* new construction projects of 0.20, for co-location retrofit projects *of 0.72 , and for non-co-locations of 0.71 be used to compute program-verified savings for CY2019 projects.* This recommendation is consistent with the planned research spelled out in our PY8 and PY9 evaluation plans.

Sensitivity Case - Weighted NTG Results Based on Core Free Ridership Algorithm 2

The evaluation team also performed a sensitivity analysis based on Core Free Ridership Algorithm 2. This algorithm varies from Algorithm 1 with respect to how it treats the effect of timing in the calculation of the NTGR. Algorithm 1 adjusts for Timing within the No-Program score, then averages the 3 scores. Algorithm 2 determines the No-Program Score without a Timing adjustment, averages the 3 scores, then applies a Timing adjustment factor to the 3-score average, based on the formula below:

> **Timing Adjustment Factor (Free Ridership Score)** as equal to:
> 1 - ((Number of Months Expedited - 6)/42)*((10 - Likelihood of Implementing within One Year)/10)

NTG Algorithm 2 –PY8 Weighted NTG Results

The PY8 program level NTGR for version 2 of the algorithm, along with precision estimates, is shown below in Table 11. The overall program NTGR for PY8 is 0.50, which is slightly higher than the Algorithm 1 value of 0.47. This reveals that there is only a slight timing effect on the NTGR for these projects – half of the projects are new facilities and would need to be built at the same time regardless of any program effect.

Table 11. Algorithm 2 PY8 MWh NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.32	0.32	0.32
2	72%	0.13	0.47	0.80
3	13%	0.64	0.73	0.83
DC PY8 Alg 2	**24%**	**0.38**	**0.50**	**0.62**

NTG Algorithm 2 –PY9 Weighted NTG Results

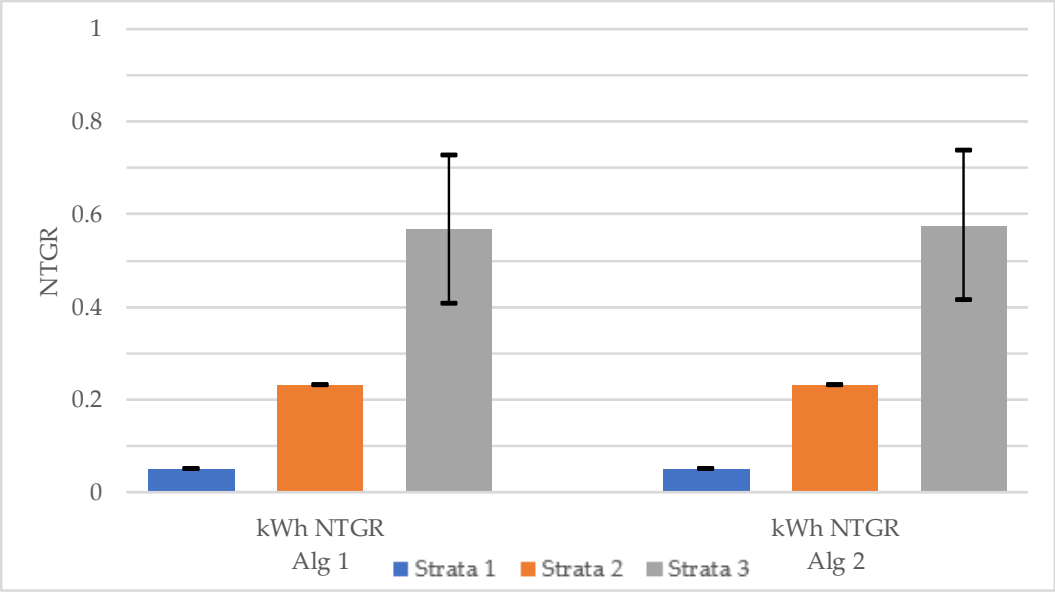
For this second version of the NTG algorithm, the PY9 program level NTGR, along with precision estimates, is shown below in Table 12. The program-level PY9 mean energy NTGR average of 0.25 is identical to the NTG Algorithm 1 value. This reveals that there is virtually no effect of timing on the NTGR for these projects – again, new construction projects (co-location data centers) account for the majority of projects and they would need to be built at the same time regardless of any program effect.

Table 12. Algorithm 2 PY9 kWh NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.05	0.05	0.05
2	0%	0.23	0.23	0.23
3	28%	0.41	0.58	0.74
DC PY9 – Alg 2	**15%**	**0.21**	**0.25**	**0.29**

Figure 8 below compares the PY9 evaluated NTGRs for Algorithms 1 and 2 for each sampling stratum. For PY9, when compared to Algorithm 1, the mean energy NTGR values are unchanged for stratum 1 and stratum 2 (large and medium-sized projects), and 0.58 vs. 0.57 for stratum 3 (small sized projects. The slight improvement in stratum 3 projects is not enough to affect the overall NTGR result. Note the very wide confidence bands around the stratum 3 results in both cases.

Figure 8. Comparison of PY9 Evaluated NTGRs by NTG Algorithm and Stratum



Procedures to Reduce Free Ridership

One way to assess the rate of free ridership likely on a given project is to critically examine the key reasons behind the project **before** the incentive is approved. For example:

- Has the project already been included in the capital or operating budget? Has the equipment already been ordered or installed?
- Is the measure one that the company or other comparable companies in the same industry/segment routinely installs as a standard practice? Is the measure installed in other locations, without co-funding by incentives? Is the measure potentially Industry Standard Practice?
- Is the project being done, in part, to comply with regulatory mandates (such as environmental regulations)?
- Are the project economics already compelling without incentives? Is the rebate large enough to make a difference in whether or not the project is implemented?
- Is the company in a market segment that is ahead of the curve on energy efficiency technology installations? Is it part of a national chain that already has a corporate policy to install the proposed technology?
- Does the proposed measure have substantial non-energy benefits? Is it largely being considered for non-energy reasons (such as improved quality or increased production)?
- Is the project payback quite short even without the incentive?

By conducting a brief interview regarding these issues before the incentive is approved, ComEd can better assess the likely degree of free ridership and may be able to then decide if the project should be excluded or substantially re-scoped to a higher efficiency level. In particular, co-location new construction projects, and other data center projects suspected of high free ridership would be prime candidates for this screening interview.

Spillover

Spillover effects were examined in this evaluation and their magnitude was found to be zero, since none of the participants interviewed in either PY8 or PY9 had installed additional program-qualifying measures outside of any of ComEd's programs. Therefore, spillover was zero for the PY8 and PY9 NTGR.

Cronbach's Alpha Results

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 more consistent and reliable are the results. However, given the small number of items (i.e., the 3 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

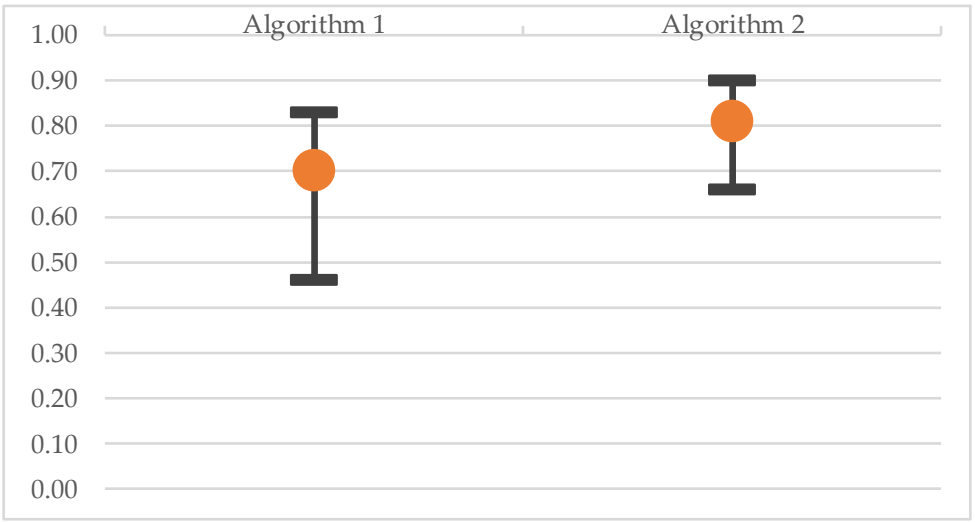
$\bar{r}$ = the average correlation

We calculated the Cronbach Alpha for both program years combined, for each of the algorithm variations discussed previously.

Figure 9 and **Error! Reference source not found.** below present the Cronbach's Alpha and the 90% confidence intervals for the two NTGR algorithm variations for the PY8 and PY9 Data Centers Program, respectively. Overall Cronbach's Alphas range from 0.46 to0.90.

Note that the confidence intervals around Alpha are expected to be quite large due to the small sample sizes. For Algorithm 1, the Alpha value is slightly lower and the confidence bands are wider than for Algorithm 2, although both Algorithm specifications yield wide confidence intervals. Most likely this is due to the small sample size and somewhat diverse project-level NTGR results.

Figure 9: PY8/9 Data Centers Program Cronbach's Alpha and 90% Confidence Intervals for the Two Algorithm Variations (N=16)



APPENDIX: DATA CENTERS PROGRAM NTG HISTORY

	Data Centers
EPY7	**Data Centers NTG: 0.48** **Free-Ridership 0.52** **Participants Spillover: Negligible** **Nonparticipants Spillover: Negligible** **See EPY7 Custom Program**
EPY8	**Recommendation (based upon PY6 research):** **Data Center NTG kWh: 0.61** **Data Center NTG kW: 0.57** **Data Center Free Ridership kWh: 0.39** **Data Center Free Ridership kW:0.43** **Data Center Spillover: Negligible** NTGR results were based on self-reported data from surveys of a census of PY6 projects. For PY6, the net program impacts were quantified solely on the estimated level of Free-Ridership. Information regarding participant spillover was also collected, but ultimately did not support a finding of any spillover – spillover was very small.
EPY9	**Data Center NTG: 0.68** **Data Center Free Ridership: 0.36** **Data Center Spillover: Negligible** **NTG Research Source:** Free-Ridership: PY7 Participant and vendor self-report data Spillover: PY7 Participant and vendor self-report data
EPY10	**Data Center NTG kWh and kW: 0.68** **Data Center Free Ridership kWh and kW: 0.32** **Data Center Spillover: Negligible** **NTG Research Source:** Free-Ridership: PY7 Participant and vendor self-report data Spillover: PY7 Participant and vendor self-report data The evaluation team performed telephone surveys in PY8, but the analysis will be performed and combined with PY9 findings.

Source:
http://ilsagfiles.org/SAG_files/NTG/2017_NTG_Meetings/Final/ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.pdf