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**From:** Jennifer Fagan and Kumar Chittory, Verdant Associates

**Date:** August 20, 2021

**Re:** Net-to-Gross Research Results for the ComEd Industrial Systems Program

## Executive Summary

This memo presents the findings from the net-to-gross (NTG) study of the ComEd Industrial Systems program. The NTG calculations rely on the Free Ridership (FR) algorithms agreed to by the Illinois Stakeholder Advisory Group (SAG) Nonresidential NTG Working Group earlier this year and use the self-report approach for estimating free ridership and spillover. These results will inform Guidehouse's September 2021 recommendations to the Illinois SAG of NTG values to be used for this program in CY2022.

The findings are based on in-depth telephone interviews with customers who participated in the program in CY2018, CY2019, and CY2020. The interviews were conducted after the completion of those program years and researched free ridership and spillover effects. The NTG findings are based on the results of in-depth interviews completed on 22 projects over the three program years and represent 13% of the ex ante savings from the population of 857 Industrial Systems projects for all 3 years combined.

The FR research produced a savings weighted NTG value of 0.77, based on the research during CY2018, CY2019, and CY2020. This value is identical to the previous PY8/PY9 NTG ratio of 0.77. These results indicate continuing strong program influence within each year and across program years. Contributing factors include the program incentive, the free study by the service provider that identifies and quantifies energy savings opportunities, and key information provided by the program representative.

Table 1 details the combined NTG research results for energy and demand savings types.

**Table 1. Combined Net-to-Gross Research Results for ComEd Industrial Systems Projects**

Measure	Savings Type	Free Ridership	Relative Precision at 90% CI	Participant Spillover	NTG Ratio
Overall Program	kWh	0.23	7%	0	0.77
Overall Program	kW	0.23	8%	0	0.77

Source: Evaluation Team Analysis

## Free Ridership and Spillover Research Representation

The evaluation team conducted in-depth telephone interviews with key decision makers for sampled projects during each of the 3 years (CY2018, CY2019, and CY2020). For Industrial Systems projects, the team completed 22 interviews. The survey interview guides followed the standard NTG question structure, but the in-depth format allowed for more flexibility for follow-up probing and consistency checking. Table 2 reports survey representation for free ridership and spillover question batteries.

**Table 2. Industrial Systems Projects Free Ridership and Spillover Research Representation**

Project Type	Population	Target Completes	Actual Completes	Analyzed Completes †	Share of Program Savings Represented by Analyzed Completes ±	Qualified for Spillover
CY2018	109	10	6	6	14%	0
CY2019	361	10	7	7	4%	0
CY2020	387	10	9	9	22%	0
Combined	857	30	22	22	13%	0

† Analyzed completes is the count of responses used to develop the free ridership and spillover estimates. It excludes responses that failed consistency checks or lacked required data.

± Note that although the share of total savings represented by the completed interviews is small, the relative precision values Table 1 reports are good.

Source: Evaluation Team Analysis

For CY2018, CY2019, and CY2020, the original sample design consisted of 10 sample points for each program year that overlapped with the gross impact measurement and verification sample. However, customers were less willing to participate in the interview process compared to previous years. Because of this, the final net samples did not fully match the gross samples. During CY2018, the team completed telephone interviews for six projects. For CY2019, seven telephone interviews were completed, while CY2020 yielded nine completed interviews. During

CY2019, response rates were adversely affected by the COVID-19 pandemic, which led to a nearly year-long suspension of the interview process.

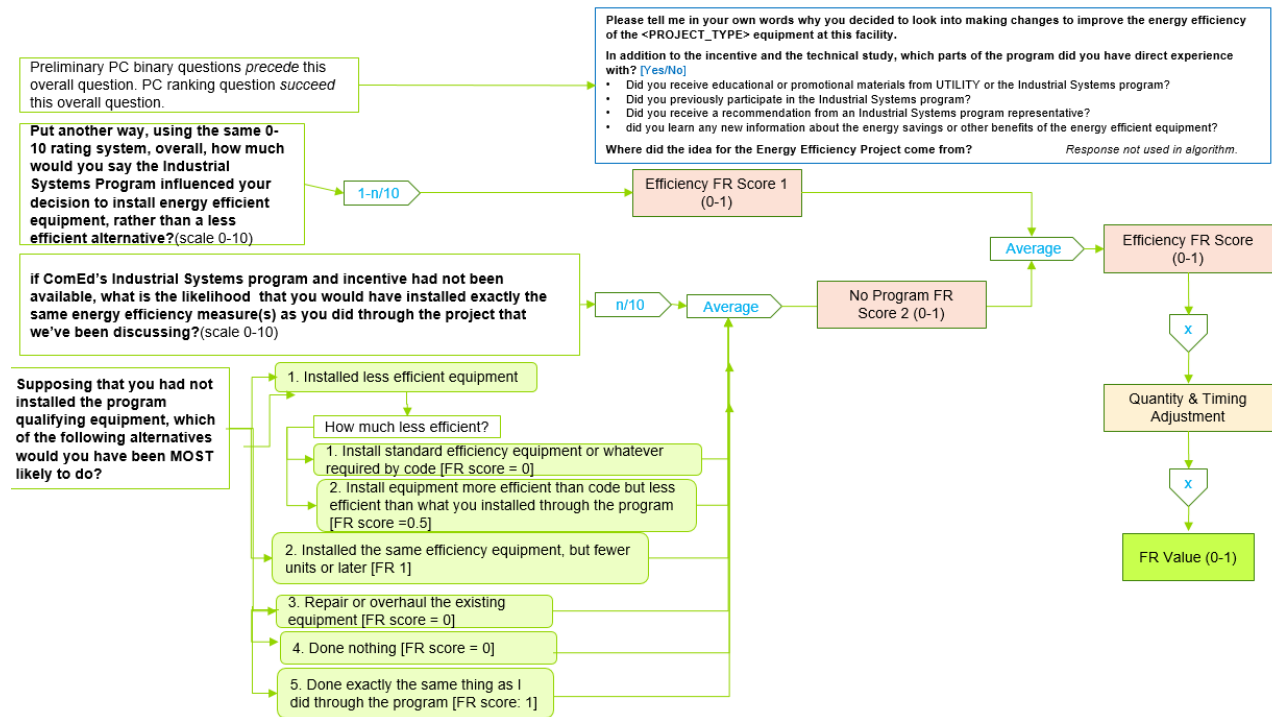
## Free Ridership and Spillover Protocols

The evaluation team applied the relevant free ridership and spillover protocols agreed to by the Illinois SAG Nonresidential NTG Working Group earlier this year.

### Participant Free Ridership Estimation

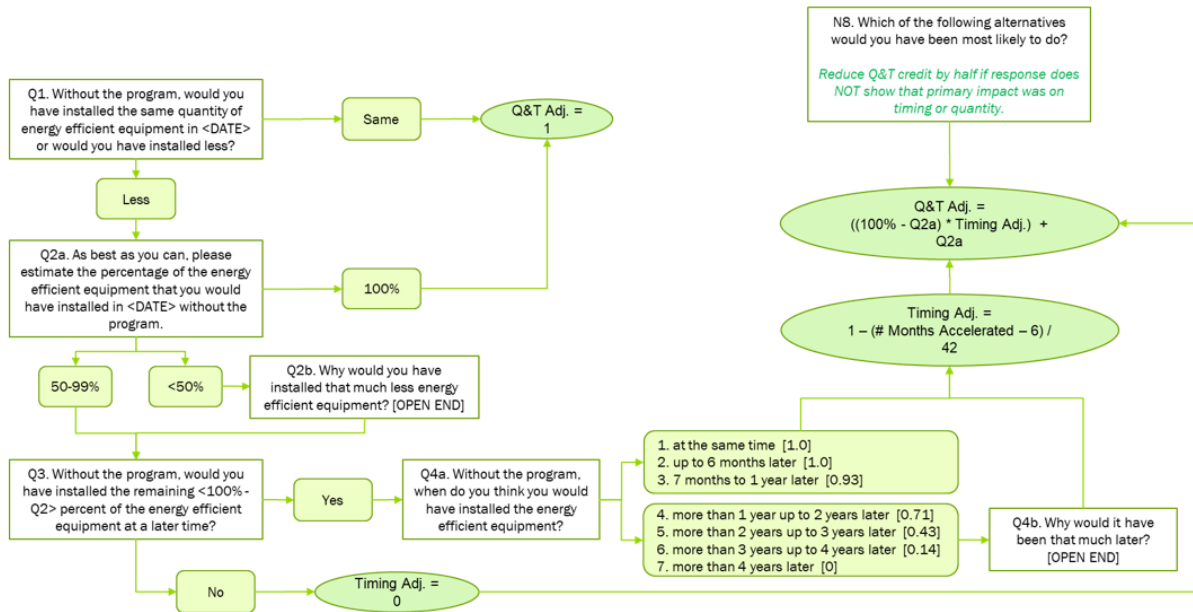
Figure 1 describes the Illinois SAG NTG Working Group algorithm that Guidehouse used to calculate the level of FR for the Industrial Systems Projects. The questions and analysis are based on the TRM v9.0 Core Non-Residential Free Ridership algorithm, with updates based on the Illinois SAG NTG Working Group consensus in 2020.

**Figure 1. Core Non-Residential Free Ridership – Overview**



Source: Based on Illinois SAG Nonresidential NTG Working Group consensus algorithms for the 2020 evaluation.

**Figure 2. Quantity and Timing Adjustment**

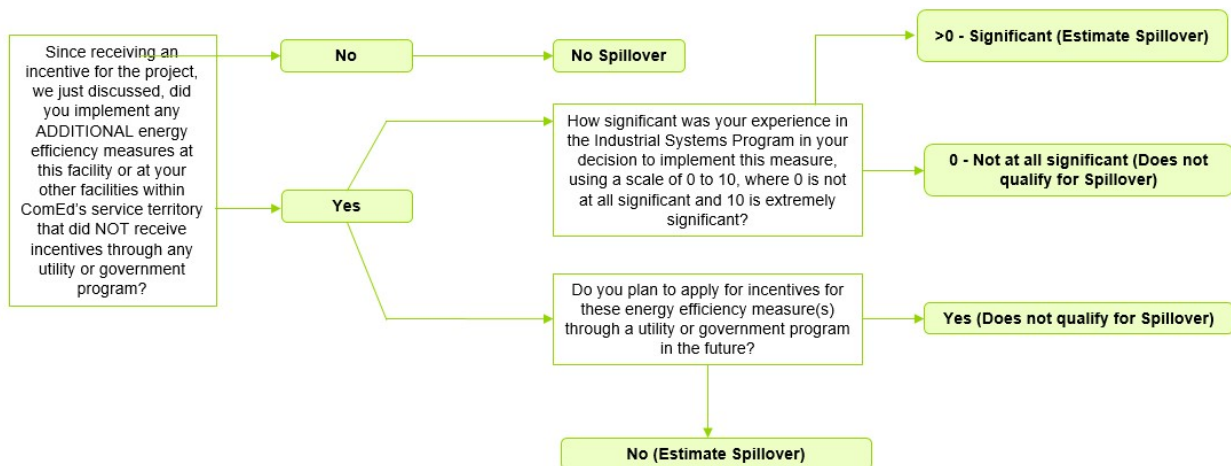


Source: Based on Illinois SAG Nonresidential NTG Working Group consensus algorithms for the 2020 evaluation.

## Participant Spillover Estimation

The evaluation team used the Core Participant Spillover protocol as specified in TRM v9.0 to qualify non-rebated energy efficiency improvements as spillover. This protocol is applicable to most commercial, industrial, and public sector programs. Figure 3 illustrates the spillover qualification screening process to estimate qualified spillover for Industrial Systems projects.

**Figure 3. Qualified Spillover for Industrial Systems Projects**



Source: Participant Spillover protocol as specified in TRM v9.0

## Detailed NTG Results

Table 3 summarizes FR and NTG ratios for Industrial Systems projects across the three sampling size strata. Note that Stratum 1 represents the largest projects, Stratum 2 consists of medium projects, and Stratum 3 contains the smallest projects. Appendix A provides a breakdown by sampling strata for each program year.

**Table 3. Industrial Systems Projects Breakdown by Sampling Strata**

Sampling Stratum	Number of Projects	Ex Ante kWh in Sample	Ex Ante kWh in Population	Percent of Savings	FR	NTG
Stratum 1 – Large Projects	7	10,688,260	37,494,266	29%	0.18	0.82
Stratum 2 – Medium Projects	7	4,147,975	39,458,340	11%	0.33	0.67
Stratum 3 – Small Projects	8	652,982	38,460,429	2%	0.22	0.78
<b>All Projects</b>	<b>22</b>	<b>15,489,217</b>	<b>115,413,035</b>	<b>13%</b>	<b>0.23</b>	<b>0.77</b>

Source: Evaluation Team Analysis

- The seven evaluated projects in Stratum 1 had FR that ranged from 0 to 0.37
- The seven evaluated Stratum 2 projects had FR that ranged from 0.1 to 0.75
- The eight evaluated Stratum 3 projects had FR that ranged from 0 to 0.6
  - Across all three strata, among the most important decision factors were the program incentive (including the recent increase in the incentive level), the study by the service provider, and information from the program representatives that made participants aware of energy efficiency opportunities and quantified the associated savings. Lack of capital and lack of information on energy efficiency measures and associated savings were commonly cited as barriers across all project sizes.
  - One Strata 2 project had a very high FR (0.75). The decision maker for that project said that the program incentive was not important and they would have installed the same equipment at the same time in the absence of the program.
  - Many of the Stratum 3 projects involved free leak detection and repairs. Decision makers cited the service provider study as critical to helping them identify leaks that they were previously unaware of. They also acknowledged that the availability of free leak repairs eliminated any barriers on their part to having the work done. Even without the program, most revealed they would have eventually had the leaks detected and repaired but it would have been much later.

## Participant Spillover Results

None of the participants interviewed reported any non-rebated energy efficiency improvements that qualified as spillover, so the spillover savings are zero. The rate of spillover incorporated into the NTG is zero.

## Final NTG Results and Recommendations

The savings weighted FR value from this new research is 0.23. The evaluation team recommends this value for CY2022 projects. We recommend the three-year value as it is based on a larger and more representative sample and it reflects the latest available information from the evaluation effort. Appendix B provides the program-level NTG ratio for each year.

Table 4 summarizes Guidehouse's draft recommendations for the Industrial Systems program to be used in CY2022.

**Table 4. Recommended Industrial Systems NTG and FR**

Measure	Savings Type	Free Ridership	Spillover	NTG Ratio
Overall Program	kWh	0.23	0.00	0.77
Overall Program	kW	0.23	0.00	0.77

Source: Evaluation team analysis

Using the TRM v9 Algorithm 1 and 2, the participant free ridership for the Industrial Systems program would have been 0.21 and 0.16 respectively (for kWh and kW savings).

## Appendix A. Breakdown for each Program Year by Sampling Strata

Table 5, Table 6 and Table 7 summarize the number of completed telephone surveys for each program year and the percent of ex ante kWh claims represented by stratum.

**Table 5. CY2018 Industrial Systems Projects Breakdown by Sampling Strata**

Sampling Stratum	Number of Projects	Ex Ante kWh in Sample	Ex Ante kWh in Population	Percent of Savings
Stratum 1 – Large Projects	0	0	8,653,232	0%
Stratum 2 – Medium Projects	3	3,316,717	9,595,357	35%
Stratum 3 – Small Projects	3	677,034	9,343,206	7%
<b>All Projects</b>	<b>6</b>	<b>3,993,751</b>	<b>27,591,795</b>	<b>14%</b>

Source: Evaluation Team Analysis

**Table 6. CY2019 Industrial Systems Projects Breakdown by Sampling Strata**

Sampling Stratum	Number of Projects	Ex Ante kWh in Sample	Ex Ante kWh in Population	Percent of Savings
Stratum 1 – Large Projects	2	1,331,810	14,495,223	9%
Stratum 2 – Medium Projects	2	412,068	14,340,084	3%
Stratum 3 – Small Projects	3	111,314	14,221,827	1%
<b>All Projects</b>	<b>7</b>	<b>1,855,192</b>	<b>43,057,134</b>	<b>4%</b>

Source: Evaluation Team Analysis

**Table 7. CY2020 Industrial Systems Projects Breakdown by Sampling Strata**

Sampling Stratum	Number of Projects	Ex Ante kWh in Sample	Ex Ante kWh in Population	Percent of Savings
Stratum 1 – Large Projects	5	8,025,780	14,345,811	56%
Stratum 2 – Medium Projects	3	1,591,171	15,522,899	10%
Stratum 3 – Small Projects	1	23,323	14,895,396	<1%
<b>All Projects</b>	<b>9</b>	<b>9,640,274</b>	<b>44,764,106</b>	<b>22%</b>

Source: Evaluation Team Analysis

Table 8 provides program-level energy and demand NTGRs, relative precision, and spillover for CY2018, CY2019, and CY2020. For CY2020 projects, two projects with high FR led to high relative precision compared to previous years.

**Table 8. NTG and FR Results and Relative Precision at 90% Confidence Level**

Program Year	Savings Type	NTG Ratio	Free Ridership	Relative Precision at 90% CI	Spillover
CY2018	kWh	0.77	0.23	9%	0.00
CY2019	kWh	0.81	0.19	6%	0.00
CY2020	kWh	0.67	0.33	30%	0.00
CY2018	kW	0.74	0.26	11%	0.00
CY2019	kW	0.80	0.20	3%	0.00
CY2020	kW	0.75	0.25	24%	0.00

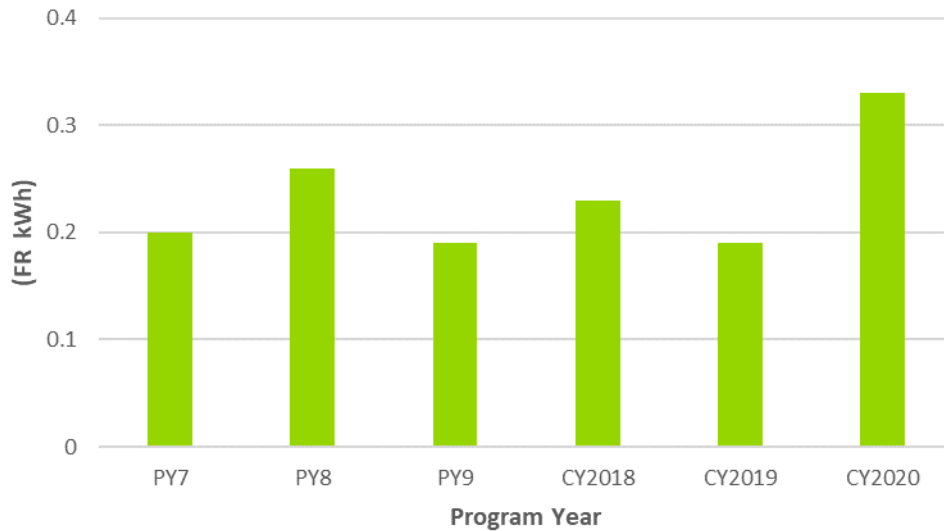
Source: Evaluation Team Analysis

## Appendix B. Comparison of FR over the Program Years

As Figure 4 shows, Industrial Systems’ project FRs have been consistent over the past 6 years, and the overall program FR has fluctuated between 0.19 and 0.33. The FR for CY2020 is slightly higher compared to the previous year’s mainly because of one large project with high FR. The current FR of 0.23 indicates strong program influence and falls within this range. Given that the current results are consistent across many years, we propose that NTG analysis continue to be performed every 3-4 years instead of annually.



**Figure 4. Comparison of Industrial Systems Project Evaluated NTGR Over Program Years<sup>1</sup>**



Source: Evaluation Team Analysis

## Appendix C. Industrial Systems Program NTG History

Industrial Systems	
EPY1	Program did not exist
EPY2	Program did not exist
EPY3	Program did not exist
EPY4	<b>Retroactive application of NTG:</b> 0.67 for kWh and 0.72 for kW (EPY4 Compressed Air) <b>Free Ridership:</b> 33% kWh and 0.28 kW <b>Spillover:</b> 0% <b>Method:</b> Customer self-report. Seven surveys completed from a population of 9.

<sup>1</sup> These values are based on the researched program year and thus differ from the deemed values in the appendices.

## Industrial Systems

EPY5 **Illinois SAG Consensus:**  
**NTG: 0.67**

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EPY6 **Illinois SAG Consensus:**  
**NTG: 0.67**

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EPY7 **NTG: 0.68**  
**Free Ridership: 0.33**  
**Participant Spillover: 0.01**  
**Nonparticipant Spillover: Negligible**  
**Method:** Free ridership and participant spillover was measured in a participant survey on 35 projects. Interviews were completed with five of 11 Industrial System projects.

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EPY8 **NTG, kWh: 0.74**  
**Free Ridership, kWh: 0.26**  
**Spillover, kWh: Negligible**  
**NTG, kW: 0.83**  
**Free Ridership, kW: 0.17**  
**Spillover, kW: Negligible**  
**Method:** NTG research methods in PY6 consisted of participant and technical service provider survey data collection and analysis (n=17).  
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.

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EPY9 **Industrial Systems NTG: 0.80**  
**Industrial Systems Free Ridership: 0.20**  
**Industrial Systems Spillover: Negligible**  
**NTG Research Source:**  
Free Ridership: PY7 participant and vendor self-report data  
Spillover: PY7 participant and vendor self-report data

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CY2018 **Industrial Systems NTG kWh: 0.80**  
**Industrial Systems NTG kW: 0.81**  
**Industrial Systems Free Ridership kWh: 0.20**  
**Industrial Systems Free Ridership kW: 0.19**  
**Industrial Systems Spillover: Negligible**  
**NTG Research Source:**  
Free-Ridership: PY7 Participant and vendor self-report data  
Spillover: PY7 Participant and vendor self-report data  
**Method:** The evaluation team performed telephone surveys in PY8, but the analysis will be performed and combined with PY9 findings.

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## Industrial Systems

CY2019 **Industrial Systems NTG kWh: 0.77**  
**Industrial Systems NTG kW: 0.78**  
**Industrial Systems Free Ridership kWh: 0.23**  
**Industrial Systems Free Ridership kW: 0.22**  
**Industrial Systems Spillover: Negligible**  
**NTG Research Source:**  
Free-Ridership: PY8 and PY9 Participating customer surveys  
Spillover: PY8 and PY9 Participating customer surveys  
**Method:** The evaluation team performed telephone surveys in PY8, but deferred analysis until PY9. The recommended values are based on the combined PY8/9 results.

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CY2020 **Industrial Systems NTG kWh: 0.77**  
**Industrial Systems NTG kW: 0.78**  
**Industrial Systems Free Ridership kWh: 0.23**  
**Industrial Systems Free Ridership kW: 0.22**  
**Industrial Systems Spillover: Negligible**  
**NTG Research Source:**  
Free-Ridership: PY8 and PY9 Participating customer surveys  
Spillover: PY8 and PY9 Participating customer surveys

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CY2021 **Unchanged from CY2020**  
**Industrial Systems NTG kWh: 0.77**  
**Industrial Systems NTG kW: 0.78**  
**Industrial Systems Free Ridership kWh: 0.23**  
**Industrial Systems Free Ridership kW: 0.22**  
**Industrial Systems Spillover: Negligible**  
**NTG Research Source:**  
Free-Ridership: PY8 and PY9 Participating customer surveys  
Spillover: PY8 and PY9 Participating customer surveys

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