

**To:** Vince Gutierrez, ComEd  
**CC:** Jennifer Morris, ICC; Randy Gunn, Jeff Erickson, Nishant Mehta, Sagar Deo, Sagar Phalke, Laura Agapay-Read, Navigant  
**From:** Michael Freed, Navigant  
**Date:** September 12, 2019  
**Re:** Net-to-Gross Research Results for ComEd Multi-Family Market Rate Program PY9 and CY2018

## EXECUTIVE SUMMARY

This memo presents researched free ridership and spillover results from telephone surveys that the evaluation team administered to ComEd PY9 and CY2018 Multi-Family Market Rate Program participants. Navigant conducted the net-to-gross (NTG) research in Spring 2019 with PY9 participants for spillover and CY2018 participants for free ridership. Each survey contained questions about both electric and gas measures since the program is a joint offering from between ComEd, Nicor Gas, People’s Gas and North Shore Gas; the survey sampling and logic allowed us to survey participants who installed only electric measures, only gas measures or a combination of both. We conducted telephone surveys with a population of 1,609 (1,283 from ComEd, the rest from Nicor Gas, People’s Gas, and North Shore Gas) PY9 participants to assess program spillover. For free ridership we surveyed from a population of 669 (390 for ComEd measures) CY2018 participants. This involved questions for the measures that achieved most of the program savings in PY9: advanced power strips, linear LEDs, omnidirectional LEDs, specialty LEDs, and programmable thermostats. The PY9 participant spillover and CY2018 free ridership results provide updated findings relative to the previous NTG research we conducted in EPY6 for this program.

The results, shown in Table 1 below, will inform our September 2019 recommendations to the Stakeholder Advisory Group (SAG) of NTG values to be used for this program in CY2020 (as detailed in Table 7).

**Table 1. NTG Research Results for Multi-Family Market Rate PY9 and CY2018**

Measure	Free Ridership	Participant Spillover	NTG Ratio
Advanced Power Strips (Tier 1)	0.09		0.94
LED Linear (CA)	0.07		0.96
LED Omnidirectional	0.36		0.67
LED Specialty	0.21		0.82
Programmable Thermostat (Direct Install)*	0.17	0.03	0.86
Programmable Thermostat (Comprehensive)*	0.18		0.85
All Other Measures**	0.20		0.83

\* For ComEd measures producing both therm and kWh savings, Navigant recommends the free ridership values resulting from the gas free ridership surveys done for this program in CY2018. Navigant conducted free ridership research on programmable thermostats as part of the gas evaluation because they achieved a large portion of program savings in GPY6. See the gas utility Multi-Family NTG memo for details on derivation.

\*\* Program level free ridership based on CY2018 researched measure savings weighted average. Free Ridership and Spillover Survey Disposition

Source: Navigant PY9 and CY2018 Research

Navigant conducted the CY2018 free ridership and PY9 spillover research following a customer self-report approach through a computer assisted telephone survey with 2,278 participants (1,609 participants for the spillover research and 669 participants for the free ridership research). In Spring 2019 we contacted customers who participated in the program between April 2017 and December 2017 for the spillover research and customers that participated between January 2018 and December 2018 for the free ridership research. We drew survey samples from different program years to allow time for spillover to occur, to question free ridership closer to the time of decision making, and to avoid overlap and survey fatigue. Of the 141 measure-level responses, the evaluation team removed four responses in data cleaning due to data quality issues and removed 24 responses as part of the TRM-guided consistency check process or 54 responses as part of a comprehensive all-response review consistency check process. This resulted in 113 analytically viable completes using the TRM consistency check method or 83 viable completes using the comprehensive consistency check method (described in the Detailed NTG Results section). The counts for the completed free ridership and spillover participant interviews are shown in Table 2 and Table 3 and below.

**Table 2. Free Ridership Participant Survey Disposition**

Measure	Completes	Analyzed Completes (TRM)	Analyzed Completes (Comprehensive)
<b>Overall Program*</b>	<b>137</b>	<b>113</b>	<b>83</b>
Advanced Power Strips	37	33	24
Linear LEDs	13	12	8
Omnidirectional LEDs	46	36	26
Specialty LEDs	41	32	25

\* For ComEd measures producing both therm and kWh savings (programmable thermostats), Navigant recommends the free ridership values resulting from the gas free ridership surveys done for this program in CY2018. Navigant conducted free ridership research on programmable thermostats as part of the gas evaluation because they achieved a large portion of program savings in GPY6. See the gas utility Multi-Family NTG memo for details on derivation.

Source: Navigant Research CY2018

**Table 3. Participant Spillover Survey Disposition**

Measure	Completes	Made Additional Efficiency Improvements	Qualified for Spillover
Overall Program	65	23	6

Source: Navigant Research PY9

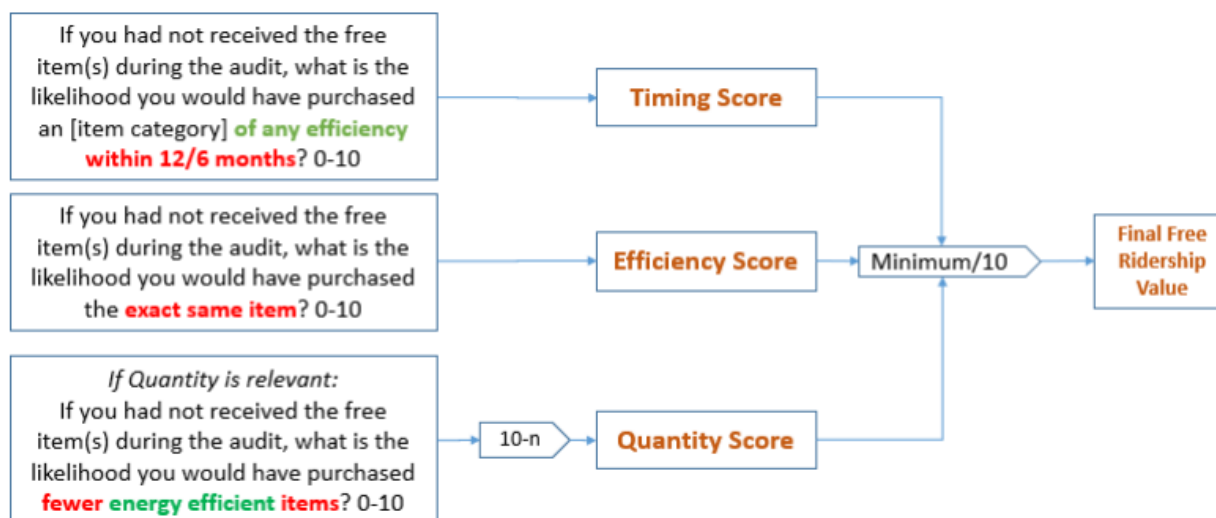
## FREE RIDERSHIP PROTOCOL

The evaluation team conducted the research according to protocol 4.5, Single Family Home Energy Audit (as opposed to 4.6 Multifamily Protocol because the latter applies to only rebated, direct install measures while the former applies to no cost measures with audit). Section 4.6.1 of the IL TRM 7,0 explains, "Estimating NTG for rebated measures requires a more rigorous process than estimating NTG for free

direct-install measures. In particular, the approach integrates an assessment of various program components that may have

influenced the participant's installation of the measures." Given the ComEd (electric) measures chosen for our survey were all provided at no cost to participants, we opted for the algorithm which applies to programs that use an audit to provide free measures to residential customers. This is shown graphically in Figure 1 below.

**Figure 1. Single-Family Home Energy Audit Free Ridership—No Cost Measures**



Source: IL TRM 7.0 Figure 4-7

## SPILLOVER PROTOCOL

Navigant estimated spillover consistent with the method in the Residential Cross-Cutting Approaches: Participant Spillover section of the TRM. Respondents were asked in this telephone survey if they made additional energy efficiency improvements to reduce energy consumption since participating in the Program. Navigant included an extensive battery of questions to identify spillover candidates and estimate savings. These questions addressed three general aspects, paraphrased below:

1. Since you participated in the Multi-Family Market Rate Program, have you purchased and installed any other energy efficient equipment or products outside a utility program?
2. Did the program influence you in any way to make to make additional energy efficiency improvements?
  - a. How important was the ComEd Multi-Family program on your decision to make additional energy efficiency improvements outside of a utility program? Please rate on a scale of 0 to 10, where 10 is extremely important and 0 is not at all important. [Attribution Score 1.]
  - b. If you had not participated in the Multi-Family Program, how likely is it that you would have made additional energy efficiency improvements? Please rate on a scale of 1 to 10, where 0 means that you definitely would not have made additional energy efficiency improvements and 10 means that you definitely would have purchased them, even if you had not participated in the Multi-Family program? [Attribution Score 2.]
3. What were details of the energy efficiency improvements (equipment, efficiency level, quantity, etc.)?

Navigant attributes a respondent's savings from non-rebated energy efficiency improvements to the Multi-Family Market Rate Program if the following condition is met: the respondent's average of Attribution Score 1 and (10 minus Attribution Score 2) must exceed 5.0.

## DETAILED NET TO GROSS RESULTS

### Free Ridership Consistency Check Analysis

To address the possibility of conflicting responses, the TRM specifies consistency checks that ask participants open ended questions to address a program's influence. This survey included two open-ended questions to address the possibility of conflicting responses. The survey asked the first question to all participants:

"In your own words, how did the Multi-Family program affect your decision to install the [measure]?"

The survey asked the second question (which had two forms) only to those participants whose responses were inconsistent<sup>1</sup>:

"Given that you had purchased [measure] before receiving the audit, why didn't you purchase additional [measure] on your own without the program?"

"Given that you have not purchased [measure] before, why were you likely to purchase [measure] on your own without the program?"

The TRM recommends using the responses to the open-ended questions to resolve inconsistencies in the numeric scores for those respondents who triggered this consistency check; this will be referred to as the TRM method. Forty-five respondents (33%) gave responses that triggered the TRM consistency check. Given this high rate of inconsistency, Navigant conducted an additional evaluation of all responses. This involved manually comparing verbatim and numeric responses relevant to program influence of all 137 unique completes; this will be referred to as the "comprehensive method". In both the comprehensive method and the TRM method, for each respondent, Navigant excluded from the free ridership calculation the component scores that were inconsistent with the verbatim responses; if a respondent's numeric responses were inconsistent and could not be resolved by the open-ended response, Navigant excluded that respondent's responses. For both methods, for respondents whose scores and verbatim reflected a duality (generally that the program influence was high and that the likelihood of implementing the efficiency improvements absent the program was also high), we used all scores to calculate their free ridership. The main difference between the TRM method and the comprehensive method is that the TRM method involved manually evaluating the responses of only those respondents who triggered the consistency check whereas the comprehensive method involved doing so for all respondents.

We developed the comprehensive method in response to a high incidence of respondent confusion with the free ridership questions and a large number of inconsistent responses that could not be resolved by the open-ended responses<sup>2</sup>. Of the 137 unique completes left after data cleaning, the evaluation team, using the TRM method, excluded 24 of the 43 respondents that triggered the consistency check; using the comprehensive method, the team excluded an additional 30 responses. The comprehensive method results in a total of 54 of the 137 (39% of respondents) being excluded because the NTG component scores were inconsistent and the open-ended response did not resolve the inconsistency. The summary of adjustments for both the TRM method and the comprehensive method are shown in Table 4 below.

---

<sup>1</sup> Inconsistent because they reported either that they had purchased the measure before the program but were unlikely to purchase the measure absent the program or that they had not purchased the measure before the program but were likely to purchase the measure absent the program.

<sup>2</sup> To address this, Navigant will recommend changes to this battery of free ridership questions in the 2019/2020 Illinois SAG NTG Working Group meetings.

**Table 4. Free Ridership Consistency Check Disposition for Direct Install Measures – Comprehensive and (TRM)**

Measure Response Disposition*	Adv Power Strips	Linear LEDs	Omnidirectional LEDs	Specialty LEDs	Total
Measure installations covered by interviews	37	13	46	41	137
Excluded: Triggered and Failed Consistency Check	13 (4)	5 (1)	20 (10)	16 (9)	54 (24)
<b>Analyzed Sample</b>	<b>24 (33)</b>	<b>8 (12)</b>	<b>26 (36)</b>	<b>25 (32)</b>	<b>83 (113)</b>
Evaluated to Require No Change	13 (1)	3	11	10	37 (1)
Evaluated to Exclude Timing Score	0	2	2	0	4
Evaluated to Exclude Efficiency Score	0	0	0	1	1
Evaluated to Exclude Quantity Score	9 (1)	1	4	5	19
Evaluated to Exclude Timing and Efficiency Scores	2 (1)	1	3 (3)	4	10 (4)
Evaluated to Exclude Timing and Quantity Scores	0	1	4	3	8 (1)
Evaluated to Exclude Efficiency and Quantity Score	0	0	2	2	4
<b>Resulting Weighted FR Value</b>	<b>0.09 (0.09)</b>	<b>0.07 (0.16)</b>	<b>0.36 (0.17)</b>	<b>0.21 (0.16)</b>	<b>0.22 (0.14)</b>

\* For ComEd measures producing both therm and kWh savings, Navigant recommends the free ridership values resulting from the gas free ridership surveys done for this program in CY2018. Navigant conducted free ridership research on programmable thermostats as part of the gas evaluation because they achieved a large portion of program savings in GPY6. See the gas utility Multi-Family NTG memo for details on derivation.

Source: Navigant Research CY2018.

## Spillover Estimation

Navigant attributes a respondent's savings from non-rebated energy efficiency improvements to the Multi-Family Market Rate Program if the following condition is met: the respondent's average of Attribution Score 1 and (10 minus Attribution Score 2) must exceed 5.0.

Of the 65 spillover survey respondents, 23 installed additional energy efficient equipment, but only 12 indicated that participating in the Multi-Family Market Rate Program influenced them to make these additional purchases. For six of the 23 spillover candidates, Navigant determined that the average of their two attribution scores was greater than 5.0 and that they installed equipment with electric savings that were quantifiable. The spillover improvements included LED bulbs, LED fixtures, thermostats, an Energy Star refrigerator, and a unit air conditioner.

Table 5 outlines energy efficiency improvements that respondents made that were influenced but not rebated by the program and how the improvements contributed to total program spillover. The spillover

rate was calculated by dividing the kWh spillover (5,081 kWh) by the Multi-Family Market Rate savings for the 65 respondents that were surveyed through the spillover telephone interview.

**Table 5. Spillover Research Results by Measure**

Measure	Spillover kWh	Spillover Rate for kWh	Projects Contributing to Spillover
<b>LED Bulbs</b>	2,448.65	1.56%	2
<b>LED Fixtures</b>	1,376.80	0.88%	1
<b>Lighting Unknown</b>	0.00		1
<b>Programmable Thermostat</b>	1,181.34	0.75%	1
<b>Energy Star Refrigerator</b>	61.80	0.04%	1
<b>Unit Air Conditioner</b>	12.50	0.01%	1
<b>Total</b>	<b>5,081</b>	<b>3.24%</b>	<b>7</b>

*Source: Navigant PY9 Multi-Family Market Rate Program Spillover Survey data, program tracking data, and Navigant team analysis.*

Table 6 shows the distribution of electric spillover savings among the six respondents who indicated any spillover (one respondent reported two spillover projects). More than 70% of the savings were achieved by the installation of LED Bulbs and LED Light Fixtures by two respondents; the remainder was achieved by the installation of Thermostats, Energy Star Refrigerator and Unit Air Conditioner.

**Table 6. Spillover Research Results by Respondent**

Participant	Measure Installed	Spillover kWh	Share of Total kWh Spillover	Spillover kW	Share of Total kW Spillover
Respondent 1	LED Bulbs	201.79	3.97%	0.02	4.95%
Respondent 2	LED Bulbs	2,246.86	44.22%	0.23	57.85%
Respondent 3	Lighting - Unknown	0.00	0.00%	0.00	0.00%
Respondent 4	LED Light Fixtures	1,376.80	27.10%	0.13	33.74%
Respondent 5	Programmable Thermostat	1,181.34	23.25%	0.00	0.00%
Respondent 6	Energy Star Refrigerator, Unit Air Conditioner	74.30	1.46%	0.01	3.46%
<b>Total</b>	-	<b>5,081</b>	-	<b>0.39</b>	-

*Source: Navigant PY9 Multi-Family Market Rate Program Spillover Survey data, program tracking data, and Navigant team analysis.*

## Free Ridership and Spillover to Create Program NTG Ratio

The NTG research results and recommendations for CY2020 for the Multi-Family Market Rate Program are summarized in Table 7 below.

**Table 7. Free Ridership and Participant Spillover for Multi-Family Market Rate Program Measures**

Measure	Free Ridership	Participant Spillover	NTG	Free Ridership Source
Advanced Power Strips (Tier 1)	0.09		0.94	1
Bathroom Faucet Aerators	0		1.03	2
Controls (IU)	0.20		0.83	3
Fluorescent Delamping (CA)	0.20		0.83	3
Kitchen Faucet Aerator	0		1.03	2
LED Exit	0.20		0.83	3
LED Linear (CA)	0.07		0.96	1
LED Omnidirectional	0.36	0.03	0.67	1
LED Specialty	0.21		0.82	1
Programmable Thermostat (Direct Install)	0.17		0.86	1
Programmable Thermostat (Comprehensive)	0.18		0.85	1
Showerhead	0		1.03	2
Vending Miser	0.20		0.83	3
Occupancy Sensor	0.20		0.83	3

*Source: The participant spillover value of 0.03 is from the PY9 Multi-Family Market Rate survey with 65 PY9 participants*

**Free Ridership Sources**

1. Free ridership is based on a survey of PY9 and CY2018 participants of the Multi-Family Market Rate Program that participated between October 2017 and December 2018.
2. Version 7.0 of the TRM specifies that the free ridership for high efficiency showerheads and kitchen and bathroom faucet aerators be set at zero when estimating gross savings using the TRM specified baseline average water flow rate.
3. Because the magnitude of savings and level of participation for this measure are low, Navigant did not conduct primary research on free ridership for this measure. We recommend the program savings weighted free ridership value based on the sum of verified savings for researched measures from the CY2018 program tracking data.

**APPENDIX: MULTI-FAMILY MARKET RATE NTG HISTORY**

	<b>Multi-Family Market Rate</b>				
EPY1	<b>NTG 0.80</b> <b>Free ridership n/a</b> <b>Spillover n/a</b> <b>Method:</b> ComEd planning documents. (No EMV NTG analysis).				
EPY2	<b>Program NTG 0.88</b> <b>Measure Specific:</b> <b>CFLs NTG 0.81</b> <b>CFLs Free Ridership 27%</b> <b>CFLs Spillover 18%</b> <b>Water Efficient Showerheads NTG 0.93</b> <b>Water Efficient Showerheads Free Ridership 9%</b> <b>Water Efficient Showerheads Spillover 2%</b> <b>Water Efficient Aerators NTG 0.94</b> <b>Water Efficient Aerators Free Ridership 6%</b> <b>Water Efficient Aerators Spillover 0%</b> <b>Method:</b> Participant Self-Report. CATI telephone survey with 75 participating tenants (90/9).				
EPY3	<b>Program NTG 0.90</b> <b>Measure Specific:</b> <b>CFLs NTG 0.81</b> <b>CFLs Free Ridership 20%</b> <b>CFLs Spillover 1%</b> <b>Water Efficient Showerheads NTG 0.93</b> <b>Water Efficient Showerheads Free Ridership 7%</b> <b>Water Efficient Showerheads Spillover 0%</b> <b>Water Efficient Aerators NTG 0.94</b> <b>Water Efficient Aerators Free Ridership 6%</b> <b>Water Efficient Aerators Spillover 0%</b> <b>Method:</b> Participant self-report. CATI telephone survey with 140 participating tenants (90/10).				
EPY4	<b>Deemed using EPY2 values:</b> <b>Program NTG 0.83</b> <b>Measure Specific:</b> <b>CFLs NTG 0.81</b> <b>Water Efficiency Measures (Aerators + Showerheads) NTG 0.93</b> <b>Verification Method:</b> Applied EPY2 evaluation findings according to NTG Framework. <b>EPY4 Research Findings:</b> <b>Program NTG 0.97</b> <b>CFLs NTG 0.98</b> <b>Water Efficiency Measures (Aerators + Showerheads) NTG 0.92</b> <b>Water Efficient Showerheads NTG 0.91</b> <b>Water Efficient Aerators NTG 0.93</b> <b>Research Method:</b> Participant self-report. CATI telephone survey with participating decision-makers (37 property managers)				
EPY5	<b>SAG Consensus:</b> <table border="1" data-bbox="329 1816 906 1900"> <tbody> <tr> <td>Multi-Family – Lighting</td> <td>0.81</td> </tr> <tr> <td>Multi-Family – Water Measures</td> <td>0.93</td> </tr> </tbody> </table>	Multi-Family – Lighting	0.81	Multi-Family – Water Measures	0.93
Multi-Family – Lighting	0.81				
Multi-Family – Water Measures	0.93				



	<b>Multi-Family Market Rate</b>						
EPY6	<p>SAG Consensus:</p> <table border="1"> <tr> <td>Multi-Family – CFLs</td> <td>0.98</td> </tr> <tr> <td>Multi-Family – Showerhead</td> <td>0.92</td> </tr> <tr> <td>Multi-Family – Common Areas</td> <td>0.80</td> </tr> </table>	Multi-Family – CFLs	0.98	Multi-Family – Showerhead	0.92	Multi-Family – Common Areas	0.80
Multi-Family – CFLs	0.98						
Multi-Family – Showerhead	0.92						
Multi-Family – Common Areas	0.80						
EPY7	<p><b>Evaluation used EPY4 research findings:</b>  <b>Program NTG 0.98</b>  <b>CFLs NTG 0.98</b>  <b>Water Efficient – Showerheads NTG 0.92</b>  <b>Water Efficient – Bath Aerators NTG 0.94</b>  <b>Water Efficient – Kitchen Aerators NTG 1.00</b>  <b>Other measures: 0.95</b> (programmable thermostats and water temperature turndown)</p> <p><b>Participant spillover:</b> Comprehensive spillover is in the estimated NTG. Other measures: No participant spillover is likely for any measures given the program approach and program theory.</p> <p><b>Nonparticipant spillover:</b> No nonparticipant spillover is likely for any measures given the program approach and program theory.</p> <p><b>Research Method:</b> Participant self-report. CATI telephone survey with participating decision-makers (37 property managers).</p> <p>For EPY7 comprehensive projects, Navigant recommends a NTGR of 0.95. These are new measures, and Navigant's research indicates that the target market for this program is unlikely to install these measures without the existence of the program, similar to PY4 ComEd Small Business Energy Savings program evaluation research findings.</p> <p>For EPY7 CFL direct install Free ridership, Navigant recommends the PY4 evaluation research finding NTGR of 0.98, based on survey self-report data from participating property managers. Navigant recommends the PY4 values for each of the water efficient measures (showerheads, bath aerators and kitchen aerators).</p>						
EPY8	<p><b>Recommendation (based upon PY7 NTG recommended values):</b>  <b>NTG Direct Install CFLs and LED Lighting: 0.98</b>  <b>NTG Hot Water Measures (showerhead, bath aerators, kitchen aerator): 0.92, 0.94 and 1.00</b>  <b>NTG Unit Measures: 0.95</b>  <b>NTG Common Areas Measures: 0.95</b>  <b>NTG Thermostat: 0.90</b></p> <p>EPY6 research on thermostat NTG was based on secondary research. There was no EPY6 research for other measures, thus the evaluation team recommends using the EPY7 values – see detail above for EPY7.</p>						
EPY9	<p>NTG Direct Install CFLs: 0.98  NTG Hot Water Measures (showerhead, bath aerators, kitchen aerator): 0.92, 0.94 and 1.00  NTG Unit Measures: 0.95  NTG Common Areas Measures: 0.95  NTG Thermostat: 0.90  FR DI CFL: 0.02</p>						

	<b>Multi-Family Market Rate</b>
	<p>FR Hot Water Measures: 0.08, 0.06 &amp; 0.0, showerhead, bath &amp; kitchen aerators, respectively                      FR Unit: 0.05                      FR Common Areas: 0.05                      FR Thermostats (based upon evaluation secondary research)                      SO Was not found in this program.</p> <p>NTG Source:                      PY7 SAG consensus values (no new research)</p>
CY2018	<p>NTG Direct Install CFLs: 0.98                      NTG Hot Water Measures (showerhead, bath aerators, kitchen aerator): 0.92, 1.00 and 1.00                      NTG Unit Measures: 0.95                      NTG Common Areas Measures: 0.95                      NTG Thermostat: 0.90                      FR DI CFL: 0.02                      FR Hot Water Measures: 0.08, 0.00 &amp; 0.0, showerhead, bath &amp; kitchen aerators, respectively                      FR Unit: 0.05                      FR Common Areas: 0.05                      FR Thermostats (based upon evaluation secondary research)                      SO Was not found in this program.</p> <p>NTG Source:                      For faucet aerators: TRM version 6.0 specifies that the free ridership for faucet aerators be set at zero when estimating gross savings using the TRM specified baseline average water flow rate. For all other measures: PY7 SAG consensus values (no new research)</p>
CY2019	<p>NTG Direct Install CFLs: Not active CY2019                      NTG Direct Install LED bulbs: 0.84                      NTG Hot Water Measures (showerhead, bath aerators, kitchen aerator): 1.00                      NTG Programmable and Reprogram Thermostat: 0.90                      NTG Other Unit Measures: 0.95                      NTG Common Areas (including other LED lighting): 0.95</p> <p>FR Hot Water Measures: 0.0                      FR Unit: 0.05                      FR Common Areas: 0.05                      FR Thermostats (based upon evaluation secondary research)</p> <p>SO Was not found in this program.</p> <p>NTG Source:                      For DI LED: HEA PY9 participating customer survey                      For faucet aerators and showerheads: TRM version 7.0 specifies that the free ridership for faucet aerators and showerheads be set at zero when estimating gross savings using the TRM specified baseline average water flow rate.                      For all other: PY7 SAG consensus values (no new research)</p>

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](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)