

To: Vince Gutierrez, ComEd
CC: Jennifer Morris, ICC; Randy Gunn, Jeff Erickson, Nishant Mehta, Laura Agapay-Read, Navigant
From: Christy Zook, Navigant
Date: August 30, 2019
Re: Net-to-Gross Research Results for the ComEd Weatherization Rebates Program PY9 and CY2018

EXECUTIVE SUMMARY

This memo presents researched free ridership and spillover results from a telephone survey that the evaluation team administered to ComEd PY9 and CY2018 Weatherization Rebates Program participants. Navigant conducted the net-to-gross (NTG) research in Fall 2018 with PY9 and CY2018 participants and in Spring 2019 with only CY2018 duct sealing participants. We conducted telephone surveys with 100 PY9 participants to assess program spillover as well as 220 PY9 and CY2018 participants to assess free ridership of specific measures: attic insulation, air sealing, and duct sealing. The PY9 participant spillover and PY9 and CY2018 free ridership results provide updated findings relative to the previous NTG research we conducted in EPY4 and EPY5 for this program. We designed the survey instrument in accordance with Illinois Technical Reference Manual version 7.0 (TRM) protocol 4.4, Prescriptive Rebate (with no audit).

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

Navigant recommends the researched free ridership rates and spillover rate shown in Table 1.

Table 1. NTG Research Results for Weatherization Rebates PY9 and CY2018

Measure	Free Ridership	Participant Spillover	NTG Ratio
Attic Insulation (without Air Sealing)*	0.40		0.62
Air Sealing (without Attic Insulation)	0.24		0.78
Duct Sealing	0.14		0.88
Wall Insulation†	0.22		0.80
Program		0.02	

* Free ridership for this measure is provided for informational purposes only because per program requirements, participants must have air sealing done at the same time as attic insulation in order to qualify for the rebate.

† At the time the free ridership survey was designed, the update to the TRM stating all scenarios of air sealing plus attic insulation installed in the same project will not receive further free ridership or spillover adjustments was not in effect so Navigant asked about these measures separately.

† Because the magnitude of savings and level of participation for wall insulation are too low to warrant primary research on free ridership, Navigant recommends using our most recent recommendation of 0.22 for free ridership for this measure.

Source: Navigant PY9 and CY2018 Research

FREE RIDERSHIP AND SPILLOVER SURVEY DISPOSITION

Navigant conducted the PY9 and CY2018 free ridership and spillover research following a customer self-report approach through a telephone survey with 320 participants (100 participants for the spillover research and 220 participants for the free ridership research). In Fall 2018 we contacted customers that participated in the program between April 2017 and September 2017 for the spillover research and customers that participated between October 2017 and June 2018 for the free ridership research. To achieve the target number of completes for duct sealing, we continued the free ridership research for this measure in Spring 2019, contacting customers who had duct sealing done to their homes between July

and December 2018. Of the 220 measure-level responses, the evaluation team removed six responses in data cleaning due to data quality issues and removed six responses as part of the TRM-guided consistency check process. This resulted in 208 analytically viable completes. 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	Population	Target Completes	Actual Completes	Analyzed Completes
Overall Program	6,968	210	220	208
Attic Insulation	2,778	70	64	61
Air Sealing	2,531	70	72	68
Duct Sealing	1,659	70	84	79

Source: Navigant Research PY9 and CY2018

Table 3. Participant Spillover Survey Disposition

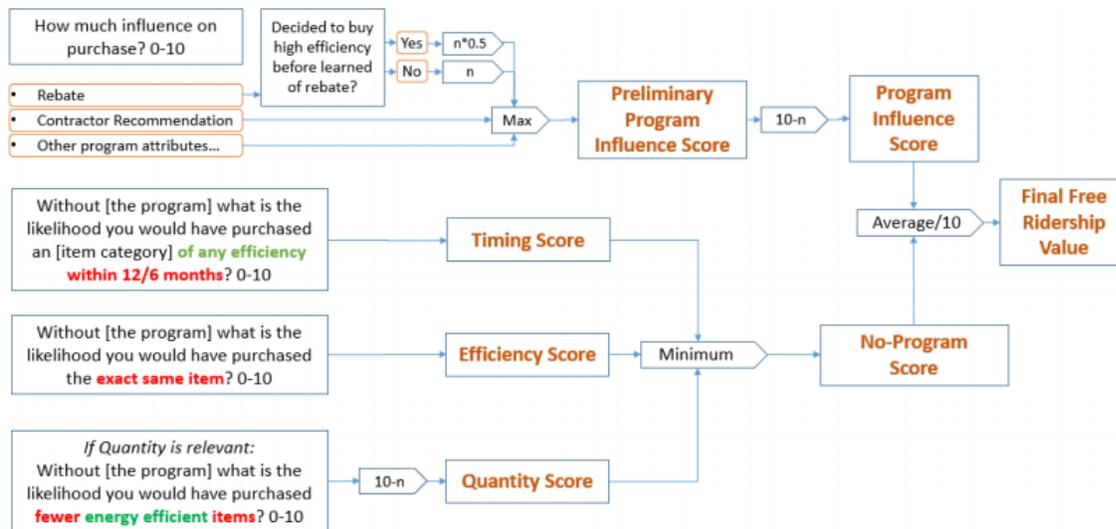
Measure	Target Completes	Actual Completes	Made Additional Efficiency Improvements	Qualified for Spillover
Overall Program	100	100	40	9

Source: Navigant Research PY9 and CY2018

FREE RIDERSHIP PROTOCOL

The evaluation team conducted the research according to free ridership protocol 4.4, Prescriptive Rebate (with no audit) from the TRM. This is shown graphically in Figure 1 below.

Figure 1. Residential Prescriptive Rebate (With No Audit) Free Ridership



Source: IL TRM 7.0 Figure 4-6

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 the telephone survey if they made additional energy efficiency improvements to reduce energy consumption since participating in the Program. Navigant included 25 questions to identify spillover candidates and estimate savings. These questions addressed three general aspects, paraphrased below:

1. Since you participated in the Weatherization Rebates 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 Weatherization program and instant rebate on your decision to make additional energy efficiency improvements outside of 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 Weatherization Program and received an instant rebate, 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 Weatherization program and received the instant rebate? [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 Weatherization Rebates 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

As the TRM specifies, our survey asked an open-ended question concerning the extent of program influence if the program influence score and the no-program score were inconsistent (i.e., if they were both less than or equal to three¹, or both greater than or equal to seven²). The inconsistency triggered this question for 43 respondents. Of the 214 unique completes left after data cleaning, the evaluation team excluded six of the 43 inconsistent respondents. Of the six, the team excluded two because they did not answer the open-ended question prompted by the inconsistency. Consequently, independent reviewers were unable to ascertain program influence. The evaluation team excluded the remaining four respondents because their responses indicated they were only satisficing to complete the survey quickly (e.g, they answered every question with "10").

The evaluation team analyzed the remaining 37 verbatim responses to the consistency check question. Of the 37 respondents, Navigant found that, for 15, the verbatim response reflected the duality of the respondent's numeric responses (most commonly indicating that the rebate had a high influence on them

¹ This would suggest low program influence and a low likelihood that they would have purchased the energy efficient equipment absent the program.

² This would suggest high program influence and a high likelihood that they would have purchased the energy efficient equipment absent the program.

and that they would have bought the energy efficient unit absent the program). Thus, for these 15 respondents, the evaluation team used both the Program Influence score and the Non-Program score to calculate free ridership. For 13 respondents, Navigant found that their verbatim response reflected strong program influence (and, sometimes, confusion with the no-program questions). Thus, for these 13 respondents, the evaluation team excluded their conflicting no-program score in the calculation of their free ridership. For the remaining nine respondents, the evaluation team found that their verbatim response reflected that they would have purchased the efficient equipment absent the program (most commonly mentioning environmental benefits or energy savings but not elements of the program). Thus, for these nine, Navigant excluded their conflicting program influence score from the calculation of their free ridership. The table below lists the disposition of Navigant's analysis of inconsistent responses.

Table 4. Free Ridership Consistency Check Disposition for Direct Install Measures

Measure Response Disposition	Attic Insulation	Air Sealing	Duct Sealing	Total
Measure installations covered by interviews	64	69	81	214
Excluded: Non-response	0	0	2	2
Excluded: Triggered and Failed Consistency Check	3	1	0	4
Total of Excluded Responses	3	1	2	6
Analyzed Sample	61	68	79	208
Evaluated to Require No Change	13	8	2	15
Evaluated to Exclude NP Score	2	5	5	13
Evaluated to Exclude PC Score	0	0	2	9

Source: Navigant Research PY9 and CY2018.

Spillover Estimation

Navigant attributes a respondent's savings from non-rebated energy efficiency improvements to the Weatherization Rebates 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 100 spillover survey respondents, 40 installed additional energy efficient equipment, but only 16 indicated that participating in the Weatherization Rebates Program influenced them to make these additional purchases. For nine of the 16 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 non-rebated energy efficient improvements included insulation, weather stripping, CFL light bulbs, windows, clothes washers, and clothes dryers.

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 rates were calculated by dividing the kWh and kW spillover by the Weatherization Rebates savings for the 100 respondents that completed the spillover phone interview, 66,025 kWh and 21.7 kW, respectively.

Table 5. Spillover Research Results by Measure

Measure	Spillover kWh	Spillover Rate for kWh	Spillover kW	Spillover Rate For kW	Participants Contributing to Spillover
CFL	280.0	0.4%	0.03	0.1%	1
Insulation	688.3	1.0%	0.28	1.3%	2
Windows	255.2	0.4%	<0.01	<0.1%	3
Clothes Dryer	24.8	<0.1%	<0.01	<0.1%	1
Clothes Washer	34.3	0.1%	<0.01	<0.1%	1
Weather Stripping	312.0	0.5%	<0.01	<0.1%	1
Total	1,594.6	2.4%	0.31	1.4%	9

Source: Navigant PY9 Weatherization Rebates Program Spillover Survey data, program tracking data, and Navigant team analysis.

Table 6 shows the distribution of electric spillover savings among the nine respondents who indicated any spillover. More than 60% of the savings was achieved by the installation of insulation and weather stripping by three respondents; the remainder was achieved by the installation of CFLs, high efficiency windows, clothes washer, and dryer.

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	Insulation	344.2	22%	0.14	45%
Respondent 2	Insulation	344.2	22%	0.14	45%
Respondent 3	Weather Stripping	312.0	20%	0.00*	0%
Respondent 4	CFL	280.0	18%	0.03	9%
Respondent 5	Window	85.1	5%	<0.01	<1%
Respondent 6	Window	85.1	5%	<0.01	<1%
Respondent 7	Window	85.1	5%	<0.01	<1%
Respondent 8	Clothes Dryer	24.8	2%	<0.01	1%
Respondent 9	Clothes Washer	34.3	2%	<0.01	<1%
Total	-	1,594.6	-	0.31	-

* Weather stripping does not produce demand savings.

Source: Navigant PY9 Weatherization Rebates Program Spillover Survey data, program tracking data, and Navigant team analysis.

Free Ridership and Spillover to Create Program Net-to-Gross Ratio

The NTG research results for the Weatherization Rebates Program are summarized in Table 7 below.

Table 7. Free Ridership and Participant Spillover for Weatherization Rebates Program Measures

Measure	Free Ridership	Participant Spillover	NTG	Free Ridership Source
Air Sealing with Attic Insulation	NA	NA	NA	1
Air Sealing (without Attic Insulation)	0.24		0.78	2
Duct Sealing	0.14		0.88	3
Wall Insulation	0.22		0.80	4
Population Roll-up		0.02		

Source: The participant spillover value of 0.02 is from the PY9 Weatherization Rebates survey with 100 PY9 participants

Free Ridership Sources

1. All scenarios of Air Sealing plus Attic Insulation installed in the same project (with or without additional measures installed in the same project) do not receive further free ridership or spillover adjustment. This applies only if the savings are estimated using the Illinois TRM Version 7.0, Section 5.6.1 (Air Sealing) and Section 5.6.5 (Ceiling/Attic Insulation) adjustment factor of that was derived from air sealing and insulation research. The adjustment factor was derived from a consumption data regression analysis with an experimental design that does not require NTG adjustment.
2. Free ridership is based on a survey of PY9 and CY2018 participants of the Weatherization Rebates Program that participated between October 2017 and June 2018.
3. Free ridership is based on a survey of PY9 and CY2018 participants of the Weatherization Rebates Program that participated between October 2017 and December 2018.
4. Free ridership is a program-level weighted average value based on this current research with PY9 and CY2018 participants.

NTG Comparison with Previous Research

For comparison, the free ridership and spillover values and NTG ratios that were approved by SAG for this program for use in CY2019 are presented in the table below.

Table 8. NTG for Weatherization Program CY2019

Year of Research Subjects' Participation	Measure	Free Ridership	Participant Spillover	NTG
EPY4 and EPY5*	All Weatherization Measures except Attic Insulation with Air Sealing	0.10	0.11	1.01
CY2018	Attic Insulation with Air Sealing	NA	NA	NA

*PY7 SAG consensus value for the Home Energy Assessment program, which was based on participant surveys in EPY4 and EPY5 and trade ally surveys in EPY5

Source: Navigant team analysis

APPENDIX: HEATING, COOLING AND WEATHERIZATION REBATES NTG HISTORY

	<p style="text-align: center;">Heating, Cooling and Weatherization Rebates</p>
<p>CY2018</p>	<p>Heating and Cooling NTG Central AC: 0.69 Free-Ridership Central AC: 0.43 TA Spillover (Participant) Central AC: 0.12</p> <p>NTG Source for Central AC: Free-Ridership: PY8 participant self-report survey TA Spillover (Participant): PY7 SAG consensus value for CSR</p> <p>PY7 SAG consensus value for non-participant spillover for CSR is not applicable here because those savings are likely now captured by the new stand-alone CAC program. Navigant interviewed participating trade allies as part of the CSR evaluation and found the non-participant spillover was from ComEd customers who needed and got a new high efficiency CAC but did not need or get a new furnace, thus they did not do a “complete system replacement” and were not eligible for the incentive. The trade allies reported a substantial share of sales in high efficiency CAC that did not get an incentive because the customer did not do a CSR. We counted that as spillover. Now, however, with the Heating, Cooling, and Weatherization Program, ComEd customers can get an incentive when they replace just the CAC, and thus the NPSO we found for the old CSR program is probably being captured by the new program.</p> <p>NTG Advanced Thermostat: NA The savings value in the IL TRM is based on regression analysis on consumption data and thus is a net savings number.</p> <p>NTG Air Source Heat Pump: 0.57, based upon 2013 Navigant research for Duke. NTG Ductless Mini-Split: 0.68, based upon average for 5 utilities cited in 2016 study for Wisconsin Focus on Energy. NTG ECM Furnace Motor – with Furnace Upgrade: 0.68, based upon GPY5 Navigant research for Nicor Gas NTG ECM Furnace Motor – without Furnace Upgrade: 0.80, default value NTG Geothermal Heat Pump: 0.59, based upon 2013 Ameren IL Study, Res Home Rebate Program NTG Heat Pump Water Heater: 0.76, based upon 2013 Navigant research for Duke</p> <p>"2013 EM&V Report for the Home Energy Improvement Program" Duke Energy, July 2015. http://starw1.ncuc.net/NCUC/ViewFile.aspx?id=b94770a2-2d4a-427d-9c50-b09fd11096ed</p> <p>"Ductless Mini-Split Heat Pump Market Assessment and Savings Review Report" for Wisconsin Focus on Energy, December 30, 2016. https://focusonenergy.com/sites/default/files/research/Focus%20EERD%20DMSHP%20Final%20Report_30Dec2016.pdf</p>

	<p>Heating, Cooling and Weatherization Rebates</p>
	<p>Weatherization NTG: 1.01 Free-Ridership: 0.10 Participant Spillover: 0.11 NTG Source: Free-Ridership: PY7 SAG consensus value for the Home Energy Assessments program, which was based on participant surveys in EPY4 and EPY5 and trade ally surveys in EPY5.</p>
<p>CY2019</p>	<p>Heating and Cooling NTG Central AC: 0.65 Free-Ridership Central AC: 0.43 Participant Central AC: 0.08</p> <p>NTG Source for Central AC: Free-Ridership: PY8 participant self-report survey Spillover: PY8 participant self-report survey</p> <p>NTG Advanced Thermostat: NA The savings value in the IL TRM is based on regression analysis on consumption data and thus is a net savings number.</p> <p>NTG Air Source Heat Pump: 0.57, based upon SAG consensus value. NTG Ductless Mini-Split: 0.68, based upon SAG consensus value. NTG ECM Furnace Motor – with Furnace Upgrade: 0.68, based upon SAG consensus value. NTG ECM Furnace Motor – without Furnace Upgrade: 0.80, based upon SAG consensus value. NTG Geothermal Heat Pump: 0.59, based upon SAG consensus value. NTG Heat Pump Water Heater: 0.76, based upon SAG consensus value.</p> <p>"2013 EM&V Report for the Home Energy Improvement Program" for Duke Energy, July 2015. http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=b94770a2-2d4a-427d-9c50-b09fd11096ed</p> <p>"Ductless Mini-Split Heat Pump Market Assessment and Savings Review Report" for Wisconsin Focus on Energy, December 30, 2016. https://focusonenergy.com/sites/default/files/research/Focus%20EERD%20DMSHP%20Final%20Report_30Dec2016.pdf</p> <p>Weatherization NTG: 1.01 Free-Ridership: 0.10 Participant Spillover: 0.11 Attic insulation and Air Sealing Only NTG: N/A NTG Source: Free-Ridership: PY7 SAG consensus value for the Home Energy Assessments program, which was based on participant surveys in EPY4 and EPY5 and trade ally surveys in EPY5. Spillover: SAG consensus value</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