

# VISUALIZING NET-TO-GROSS: WHERE'S MY GOOGLE MAP?

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## Introduction

Evaluators and program administrators agree that net-to-gross (NTG) can be a murky topic which requires accounting for varying perspectives that must be considered individually and in aggregate. NTG studies typically go through many turns, twists, and detours before ultimately finding a route to measuring and calculating NTG to which all stakeholders can agree. Often the route is complicated and can be hard to follow. Unfortunately, Google Maps cannot give NTG directions – but wouldn't it be helpful to have a map? Using residential HVAC NTG based on self-reported surveys with installation contractors and participants, this poster provides an example of how visual guides can make a complex assessment of NTG seem relatively straightforward and simple. The “maps” on this poster guide viewers through an example of how one study accounted for the varying dynamics that play into calculating NTG and communicated a complex NTG calculation in a visual way.

The study on which this poster is based (NMR Group, Inc. & Tetra Tech 2018) estimated measure-level retrospective and prospective NTG ratios for residential HVAC and water heating equipment rebated by the Mass Save program, which is administered by the electric and gas program administrators of Massachusetts. The rebated equipment comprised heat pump water heaters, central heat pumps, central air conditioners, ductless mini-split heat pumps, gas furnaces, and gas boilers.

## Poster Narrative

To assess NTG the evaluation team fielded mixed-mode (web and telephone) surveys to 346 customers and 166 contractors. The surveys measured customer (i.e. participant) and contractor free-ridership (FR) and participant and non-participant spillover (SO). After collecting the data, the evaluation team checked for the consistency of each individual respondent's answers to the NTG batteries and reconciled them if needed. After balancing answers to NTG questions from the customer and contractor surveys, the team relied on a consensus group to develop and recommend the final NTG ratios.

As the **customer free-ridership algorithm map** shows, participant customer FR was a function of three credits: the effect of the rebate on the efficiency of the equipment installed, the timing of the installation, and the number of units installed. Participant FR also accounted for the influence of salesperson or contractor recommendations and program marketing materials. The values of the credits range from 0% to 100%, where 0% is associated with the highest FR and 100% is associated with the lowest FR. (These fractions are inversed in the FR calculations themselves.) The survey asked about program influence in multiple ways. When participants gave conflicting ratings of program importance, respondents were asked why they gave these scores, and the evaluation team revised their FR estimates as appropriate based on their open-ended responses. The **Example of Participant FR Adjustment** table illustrates some of the adjustments the team made to participant FR based on open-ended comments.

The **contractor free-ridership algorithm map** shows that to estimate FR among participating contractors, after confirming their 2016 program sales the survey asked contractors to estimate the percentage of program sales that would have occurred had program rebates not been offered. Some contractors struggled to interpret these questions; the team excluded these contractors from the NTG analysis or revised their FR if needed and appropriate but due to space limitations the poster does not show examples of these revisions.

Since contractor FR was notably higher than customer FR and customers' responses emphasized the importance of contractors' recommendations to the customers' decision-making processes, the team explored adjusting participant FR by contractor FR using a total of six different methods that juggled averaging contractor and customer FR and replacing customer FR with contractor FR. All six methods are shown on the **reconciling competing free-ridership factors map**. From these methods, the Consensus Group selected Adjusted FR Option

3, on the far right of the map. This is option was created by averaging two of the six methods, thus balancing participant and contractor perspectives.

Non-participant Spillover (NPSO) is a function of the number of non-program sales (i.e., total high-efficiency unit sales that did not receive program rebates) reported by contractor respondents and the level of influence that the program had on the non-program sales. The **non-participant spillover algorithm map** shows how the contractors' responses produced three scores: (1) Influence of Recommendations – a function of the program's influence on the frequency with which contractors recommend high-efficiency equipment and the influence of their own recommendations on their high-efficiency non-program sales; (2) Program Influence on Installations – the level of influence on their sales that contractors report is from program rebates and support, such as marketing, and (3) Spillover Influence – either the maximum or average of the previous scores. The NPSO methodology relied on contractor self-reported program-eligible non-program sales attributable to the program. Some contractors appeared to struggle to interpret these questions, so the team excluded these contractors from the analysis or revised their responses after asking for additional information. Due to space limitations the poster does not show examples of these revisions.

The evaluation team followed the approach outlined in the 2017 Illinois Technical Reference Manual (State of Illinois 2017) to account for like and unlike retrospective Participant Spillover (PSO) among participants. As the **participant spillover algorithm map** shows, this approach involved two steps: (1) summing the savings associated with SO-eligible measures and (2) dividing that by the sum of savings associated with the installed measures in the survey sample. After identifying unrebated measures that were potentially influenced by the program, the survey asked two influence questions. For a measure to be SO-eligible, two qualifications needed to be met: (1) non-rebated measures either meeting program specifications or being more efficient than federal standards and (2) ratings for level of program importance and likelihood of installing the measure in absence of the program meeting certain thresholds.

## References

State of Illinois. 2017. *Illinois Statewide Technical Reference Manual for Energy Efficiency, Version 6.0*, s.v. "4.1.2 Participant Spillover," February 8, 2017. Accessed July 18, 2019 from [http://ilsagfiles.org/SAG files/Technical Reference Manual/Version 6/Final/IL-TRM Version 6.0 dated February 8 2017 Final Volumes 1-4 Compiled.pdf](http://ilsagfiles.org/SAG_files/Technical%20Reference%20Manual/Version%206/Final/IL-TRM%20Version%206.0%20dated%20February%208%202017%20Final%20Volumes%201-4%20Compiled.pdf).

NMR Group, Inc. & Tetra Tech. 2018. *Massachusetts Residential HVAC Net-to-Gross and Market Effects Study*. Accessed July 18, 2019 from [http://ma-eeac.org/wordpress/wp-content/uploads/TXC 34 Report 27JUL2018 Final.pdf](http://ma-eeac.org/wordpress/wp-content/uploads/TXC_34_Report_27JUL2018_Final.pdf).

346 customers  
166 contractors

## Examples of Adjustments

"It was such a small amount for the rebate, I still would have done it."	0.35	1.00
"The rebate sealed the deal. It was important to which model we purchased."	0.25	0.10
"It was money back on a system that I had to purchase."	0.00	0.80
"The rebate was influential in terms of <i>which</i> furnace to install. Ours was going to need to be replaced, but the rebate allowed us to purchase a more efficient and slightly more expensive furnace."	0.38	0.20

### Free-Ridership Results

Heat pump water heater	0.17	0.02	0.12
Central air conditioning	0.40	0.58	0.48
Central heat pump	0.43	0.58	0.49
Warm air furnace	0.29	0.53	0.42
Boiler	0.21	0.41	0.35

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graph TD
    A[Our records show that in 2016 your company installed <QUANTITY> of residential <MEASURE> that received Standard rebates from Mass Save. Does this sound right?] -- No --> B[About how many residential <MEASURE> that received Standard rebates from Mass Save did your company install in 2016?]
    A -- Yes --> C([Confirmed or revised quantity = Program sales (PS)])
    B --> D[FR1: If Mass Save had not offered rebates in 2016, about what percentage of the <PS> <MEASURE> that received Standard residential rebates would you have still installed that year?]
    D --> E[To confirm, you are estimating that in 2016, your company likely would have still installed <PS>(<FR1>00%) <MEASURE> of the <PS> you installed if Mass Save had not offered the Standard rebates?]
    E -- Yes --> F([Free-ridership = FR1])
    E -- No --> G[FR1: Could you provide your best estimate of about how many of the <PS> <MEASURE> your company would have still installed in 2016, if Mass Save had not offered the Standard rebates?]
    G --> H([Free-ridership = FR/SPS])
    
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The flowchart illustrates the calculation of Free-ridership (FR) and Free-ridership as a percentage of sales (FRSPS). It begins with a question about the quantity of residential measures installed in 2016 that received standard rebates from Mass Save. If the answer is 'No', the user is asked to estimate the quantity installed in 2016. If the answer is 'Yes', the quantity is confirmed or revised, and the program sales (PS) are determined. The next step is to estimate the percentage of measures that would have been installed in 2016 if Mass Save had not offered rebates (FR1). This is confirmed by asking if the company would have still installed a certain percentage of measures. If 'Yes', the free-ridership is calculated as FR1. If 'No', the user is asked to provide a best estimate of the quantity of measures that would have been installed in 2016 if Mass Save had not offered rebates. Finally, the free-ridership is calculated as FR/SPS.

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