**R1983 NTG MEMORANDUM**

**To:** Lisa Skumatz, Bob Wirtshafter, and Ralph Prahl, Evaluation Committee

**From:** NMR Group

**Date:** July 1, 2022

**Re:** R1983 Savings-Weighted NTG Results

This memo presents measure-specific savings-weighted free-ridership, spillover, and installation rate values from the R1983 evaluation of the Home Energy Solutions program. High-level methodology is included here for context. Additional details and context will be provided in the final report.

The NMR team recommends the measure-level free-ridership (FR) values and installation rates, along with a program-level participant spillover (SO) rate of 8.2%, as shown in Table 1.

Table 1: Summary of Recommended NTG Values and Installation Rates (HES)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | FR | SO | NTG  (100%-FR)+SO | Installation rate |
| Door and window weatherization | 28% | 8% | 80% | 92% |
| Duct sealing | 14% | 8% | 94% | 100% |
| Water-saving faucet aerators | 20% | 8% | 88% | 85% |
| Water-saving showerhead | 20% | 8% | 88% | 82% |
| Blower-door-guided air sealing | 11% | 8% | 97% | 100% |
| Water heater pipe wrap or insulation | 28% | 8% | 80% | 97% |
| Energy-efficient LED light bulbs | 36% | 8% | 72% | 98% |
| Insulation | 23% | 8% | 85% | 100% |
| WiFi-enabled smart thermostat | 34% | 8% | 74% | 96% |
| Energy-efficient windows | 33% | 8% | 75% | 98% |
| Central air conditioning system | 38% | 8% | 70% | 100% |
| Ductless heat pump(s) | 38% | 8% | 70% | 98% |
| Geothermal or ground-source heat pump | 38% | 8% | 70% | 100% |
| Air-source heat pump | 38% | 8% | 70% | 100% |
| Freezer | 47% | 8% | 61% | 100% |
| Refrigerator | 47% | 8% | 61% | 97% |
| Clothes washer | 42% | 8% | 66% | 96% |
| Dehumidifier | 43% | 8% | 65% | 100% |

# Net-to-Gross Findings

This study estimated net-to-gross (NTG) ratios for the Home Energy Solutions (HES) program using findings from participant surveys and in-depth interviews from program vendors. NTG ratios are estimated using free-ridership (FR) and spillover (SO) rates that are weighted and input into this formula:

The free-ridership rate is the fraction of gross program savings that would have occurred in the absence of a program. Spillover measures savings attributable to a program in addition to the program’s gross savings. Spillover includes the effects of participants who install additional energy-efficient measures as a result of what they learned in the program or non-participants who install or influence the installation of energy-efficient measures as a result of being influenced by the program.[[1]](#footnote-2)

In Connecticut, NTG serves as a component of the net realization rate that is calculated using the following equation:

The evaluation measured free-ridership and spillover for HES participants and non-participant spillover (NPSO) for HES vendors. This study used the Massachusetts Residential Self Report Net-to-Gross Method (MA NTG) and further built upon the algorithm by developing scoring schemes that incorporated the Labeled Affective Magnitude (LAM) scale in place of the linearly scored elements of the MA NTG algorithm.[[2]](#footnote-3),[[3]](#footnote-4)

## Methodology

The NMR team conducted a survey with 932 HES participants and 276 HES-IE participants. The study period included respondents who participated in HES from 2017 to 2020. As the NTG for the HES-IE program is assumed to be 1.0, the survey only asked NTG questions of HES participants. The survey was fielded November 2021 – February 2022. HES participants were invited to participate by postcards and given the option of completing the survey via the web or telephone.

The NMR team presents NTG results unweighted and weighted by program savings. Savings weights were derived from the program tracking database and converted into MMBtu. Each NTG response was weighted by the savings recorded in the tracking data for that measure installed in that respondent’s home. The NMR team recommends using free-ridership and spillover rates that are savings-weighted as they more accurately reflect the full population of program savings than unweighted results.

## Free Ridership

The participant survey asked 932 HES participants about measures they had installed through the program. The NMR team obtained usable responses from 925 HES participants, representing 9,721 MMBTU/year in gross savings across 17 different measure types.[[4]](#footnote-5) Each respondent answered free-ridership questions about up to two measures.[[5]](#footnote-6)

To estimate the HES free ridership rate, the analysis used the product of two scores, as illustrated in Figure 1:

* **Influence.** Participants were asked to consider how influential program elements were on their decision to install the program measure. The survey asked respondents to consider the following program elements: the program rebate available from the utility; financing options available to help pay for the upgrade; information provided by the technician during the home energy assessment; information provided by the respondent’s utility or Energize ConnecticutSM; and marketing materials provided by the contractor.[[6]](#footnote-7) The free-ridership algorithm used the maximum influence score from all program elements rated by each respondent.
* **Intent**, which itself contains three scores:
  + **Timing**. Participants were asked about the likelihood of installing the measure at the same time that they did if the rebate, financing, and/or program support had not been available. If the measure was mechanical equipment or an appliance, respondents also indicated whether it was new or installed to replace an existing piece of equipment.
  + **Quantity**. Respondents were asked to indicate the likelihood of their installing the same number of units (in the case of mechanical equipment, appliances, lighting, thermostats, or windows) or amount/percent of the measure (in the case of air sealing, duct sealing, weatherization, and insulation).
  + **Efficiency.** Respondents indicated their likelihood of installing a measure with the same level of efficiency as the program-supported measure. This question was asked about all add-on measures. For core measures, the survey only asked about lighting because efficiency levels for services such as air sealing, duct sealing, door and window weatherization, and water-saving measures do not have meaningful variations in efficiency.

Table 2 shows free-ridership rates for core measures installed during the energy assessment at the participant’s home. Among core measures, blower door-guided air sealing and duct sealing had the lowest free-ridership rate (11% and 14%, respectively). LEDs had the highest free-ridership rate (36%) among the core measures offered during the assessment.[[7]](#footnote-8)

Table 3: HES Free Ridership – Core Measures

|  |  |  |  |
| --- | --- | --- | --- |
| Measure | n | Unweighted FR | Savings-Weighted FR |
| Door and/or window weatherization | 224 | 28% | 28%1 |
| Duct sealing | 204 | 20% | 14% |
| Water-saving measures2 | 191 | 20% | 20% |
| Blower-door-guided air sealing | 107 | 13% | 11% |
| Pipe/tank insulation | 82 | 28% | 28% |
| LEDs | 80 | 41% | 36% |
| 1 Unweighted due to lack of savings for this measure in program data; savings for door and/or window weatherization measures were presumed to be included with air sealing savings. 2 For consistency with the previous study, we consolidate water-saving aerators and showerheads into a single “Water-saving measure” category. | | | |

Table 3 shows free-ridership rates for four add-on measures: insulation, smart thermostats, windows, and central air conditioners.

Table 4: HES Free-Ridership – Additional Measures

|  |  |  |  |
| --- | --- | --- | --- |
| Measure | n | Unweighted FR | Savings-Weighted FR |
| Insulation | 201 | 23% | 23% |
| Smart thermostat | 153 | 33% | 34% |
| Windows | 25 | 30% | 33% |
| Central AC | 8 | 44% | 38% |

Table 4 shows savings-weighted free-ridership rate for rebated heat pumps installed by HES participants. As heat pumps had a relatively low incidence among the population, we show free-ridership rates by type of heat pump (37% to 47%) and overall (38%). The NMR team recommends using the overall heat pump value of 38%, given low sample sizes for individual heat pump types.

Table 5: HES Heat Pump Free Ridership

|  |  |  |  |
| --- | --- | --- | --- |
| Heat Pump Type | n | Unweighted FR | Savings-Weighted FR |
| Ductless heat pump | 31 | 39% | 37% |
| Geothermal heat pump | 2 | 40% | 40% |
| Air source heat pump | 1 | 47% | 47% |
| **Any heat pump** | **34** | **40%** | **38%** |

Table 5 shows savings-weighted free-ridership rate for rebated appliances installed by HES participants. As appliances had a relatively low incidence among the population, we show free-ridership rates by appliance category (43% to 48%) and overall (45%).

Table 6: HES Appliance Free-Ridership

|  |  |  |  |
| --- | --- | --- | --- |
| Appliance Type | n | Unweighted FR | Savings-Weighted FR |
| Refrigerator / Freezer | 39 | 48% | 47% |
| Clothes washer | 27 | 43% | 42% |
| Dehumidifier | 13 | 45% | 43% |
| **Appliances (combined)** | **79** | **45%** | **45%** |

### Benchmarking

Table 5 shows free-ridership values from other NTG studies in the mid-Atlantic and Northeast that estimated NTG by measure. For the purposes of comparison to past Connecticut HES studies, we note that the R4 study had a different NTG approach than the R1983 study, which used the Massachusetts NTG algorithm with a LAM-adjusted scale. Due to the similarities in NTG methodology and program design, the Massachusetts values are likely the closest benchmark for the measure-level free-ridership reported in R1983.

Table 7: Free-Ridership Benchmark Values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Measure | R1983 Savings-Weighted FR | Benchmark | | |
| **FR Value** | **Year** | **State** |
| Door and/or window weatherization | 28%1 | -- | -- | -- |
| Duct sealing | 14% | 18% | 2014 | CT3 |
| Water-saving measures2 | 20% | 20% | 2014 | CT3 |
| Blower-door-guided air sealing | 11% | 25% | 2014 | CT3 |
| 12% | 2019 | MA4 |
| Pipe/tank insulation | 28% | 28% | 2014 | CT3 |
| 21%8 | 2018-19 | PA (PECO)6 |
| LEDs2 | 36% | 55% | 2014 | CT3 |
| 53-58% | 2018-19 | PA (PECO)6 |
| Insulation | 23% | 6% | 2014 | CT3 |
| 20% | 2019 | MA4 |
| Smart thermostat | 34% | 26% | 2019 | MA4 |
| 40% | 2019-20 | PA (DLC)7 |
| Windows | 33% | 5% | 2014 | CT3 |
| Central AC | 38% | 17% | 2014 | CT3 |
| 35% | 2019 | MA4 |
| 56% | 2019-20 | PA (DLC)7 |
| Heat pumps (any) | 38% | 31%-34% | 2019 | MA4 |
| 25%9 | 2014 | CT3 |
| 40%-42% | 2018-19 | PA (PECO)6 |
| 63% | 2019-20 | PA (DLC)7 |
| Refrigerator/freezer | 47% | 31%-48% | 2014 | CT3 |
| 52% | 2018-19 | PA (PECO) |
| 68% | 2019-20 | PA (DLC)7 |
| Clothes washer | 42% | 65% | 2018-19 | PA (PECO)6 |
| Dehumidifier | 43% | 42% | 2019 | MA5 |
| 48% | 2019-20 | PA (DLC)7 |
| 1 Unweighted due to lack of savings for this measure in program data; savings for door and/or window weatherization measures were presumed to be included with air sealing savings.  2 LED free-ridership values and benchmarks are shown for informational purposes only; the workplan specifies that the study will interpret the result of the billing analysis for lighting as net savings.  3 NMR Group, Inc. April 13, 2016. “Project R4 HES/HES-IE Process Evaluation and R31 Real-time Research.” [Microsoft Word - R4HES-HESIE\_Process\_Eval2016\_0413\_Final (energizect.com)](https://www.energizect.com/sites/default/files/R4_HES-HESIE%20Process%20Evaluation,%20Final%20Report_4.13.16.pdf).  4 Guidehouse Inc. October 8, 2021. “Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures.” [MA20R28-B-NTGRCDP Report (ma-eeac.org)](https://ma-eeac.org/wp-content/uploads/MA20R28-B-NTGRCDP_Final-Report_08Oct2021.pdf).  5 NMR Group, Inc. and DNV, Inc. June 8, 2021. “Residential Products Net-to-Gross Study (MA20X04-E-PRODNTG). [MA20X04-E-PRODNTG\_Res-Products-NTG-Report\_FINAL\_2021.06.08.pdf (ma-eeac.org)](https://ma-eeac.org/wp-content/uploads/MA20X04-E-PRODNTG_Res-Products-NTG-Report_FINAL_2021.06.08.pdf).  6 Guidehouse, Inc. November 15, 2019. “Final Annual Report to the Pennsylvania Public Utility Commission Phase III of Act 129. Program Year 10 (June 1, 2018 – May 31, 2019). Prepared for PECO.”  7 Guidehouse, Inc. February 15, 2021. “Final Annual Report to the Pennsylvania Public Utility Commission Phase III of Act 129. Program Year 11 (June 1, 2019—May 31, 2020). Prepared for Duquesne Light Company.”  8 This FR value was for the entire Whole Home Solution, which included pipe wrap as a direct-install measure.  9 The free-ridership value of 25% was for ductless mini-split heat pumps only. | | | | |

## Spillover

The second input into the net-to-gross ratio is the spillover rate.

### HES – Participant Spillover

Participant spillover (PSO) contains the following elements:

* **Non-rebated measures.** HES participants were asked in the survey whether they had made any energy-efficiency purchases or changes for which they had not received a rebate or financing from their utility since participating in the program. The survey also asked whether their participation in the HES program influenced their decision to take these actions. Respondents then indicated which non-rebated measure(s) or upgrade(s) they installed. For each measure identified, respondents indicated how they knew the measure was energy-efficient, the energy-efficiency rating, if applicable (e.g., ENERGY STAR status, SEER, HPSF, AFUE, and/or EF values), and how many of each measure they installed.
* **Program influence level.** After describing the energy-efficiency and quantity of the non-rebated measure(s) installed after participating in the HES program, respondents rated the importance of their experience of the HES program on each measure and their likelihood of installing the measure if they had not participated in the HES program. Scores from these two influence questions were combined to calculate the participant spillover score for each measure.
* **Weighting by savings.** The analysis weighted for savings by dividing the total spillover savings by the total savings for each respondent (including those who did not claim any spillover.) Spillover savings for each measure were calculated from the average savings in the program database or the 2021 Connecticut Program Savings Document (PSD).[[8]](#footnote-9)

The study arrived at a spillover rate of 8.2% for HES based on participant survey responses.

Spillover (SO) refers to energy-saving upgrades or installs performed after participating in the HES program that did not receive a rebate or utility financing. Of the 925 HES participants surveyed, 13% reported that they were influenced by the HES program to install an energy-saving measure that met these conditions. As Table 6 shows, these respondents reported 303 eligible SO measures in total, the most common being thermostats (4% of respondents) and dehumidifiers (3%).

Table 8: HES Participant Spillover Measures

|  |  |  |
| --- | --- | --- |
| Program-Influenced Measure Installed Outside of Program | % of Respondents, Unweighted (n=925) | Average Gross Savings (MMBtu/yr)1 |
| Thermostat | 4% | 7.8 |
| Dehumidifier | 3% | 1.0 |
| Window replacement | 2% | 21.3 |
| Insulation | 2% | 12.2 |
| Air sealing | 2% | 10.2 |
| LED Light bulbs/light fixtures2 | 2% | 2.1 |
| Clothes washer | 2% | 1.0 |
| Refrigerator | 2% | 0.9 |
| Central air conditioning system | 2% | 0.7 |
| Furnace | 1% | 20.8 |
| Ductless heat pump | 1% | 12.5 |
| Heating or cooling system tune-up/maintenance | 1% | 4.9 |
| Water heater | 1% | 2.6 |
| Air purifier | 1% | 0.8 |
| Water pipe wrap | 1% | 0.5 |
| Freezer | 1% | 0.4 |
| Clothes dryer | 1% | 0.3 |
| Dishwasher | 1% | <0.05 |
| Boiler | <0.5% | 56.9 |
| Air source heat pump | <0.5% | 18.6 |
| Geothermal heat pump | <0.5% | 12.0 |
| Heat pump water heater | <0.5% | 3.3 |
| Duct sealing | <0.5% | 4.4 |
| Water-saving measures | <0.5% | 0.6 |
| **Total3** | **12.7%** | **1,860** |
| 1 Average savings in the program database associated with each measure. Electric, gas, oil, and propane savings have been converted into MMBtu/year. The source of average savings for eligible spillover equipment not present in the program database is the 2021 PSD.  2 After discounting by 70% to account for upstream lighting rebates, average LED savings is 0.6.  3 Multiple spillover measures for some respondents; “total” represents the number of respondents with at least one spillover measure and total MMBtu for all spillover measures. | | | |

Weighted spillover for the HES program is 8.2% with a 90% confidence interval (5.7%, 10.8%). This score represents a weighted average of the percent of respondents who reported eligible SO measures, where the weights for each spillover measure are the annual average gross savings shown in Table 6.

The NMR team performed several sensitivity analyses on the spillover estimate:

**Lighting.** In Connecticut, LEDs were discounted at retailers through an upstream lighting program until 2021, when the program supported only reflector lighting incentives in hard-to-reach markets.[[9]](#footnote-10) The likelihood is high that HES participants who purchased LEDs before 2021 obtained an upstream program-incented bulb even if they did not realize it. Furthermore, the free-ridership rate for non-HTR (hard-to-reach) upstream LEDs in the 2022 Connecticut PSD is 70%. As such, the NMR team decided to discount lighting savings by 70% and count 30% of the savings from lighting towards spillover (reducing the average savings from 2.11 to 0.63). This adjustment did not have a substantial effect on overall SO value; if SO savings from lighting was not adjusted, overall spillover would increase slightly from 8.2% to 8.5%. We recommend using a spillover value of 8.2%, particularly because we are not recommending adjusting to exclude people who reported similar spillover measures to those they received through the program, as described below.

**Tracking data cross-check.** Fewer than one in ten respondents (7%) identified spillover measures that they had also verified as receiving through their participation in the HES program. The most conservative approach would be to assume these respondents misunderstood the spillover battery and exclude these measures from the spillover analysis. Total spillover with these measures excluded is 7.1%, compared to 8.2% with these measures included (and the discount rate for LED lighting SO as described above). Therefore, the effect of potential double-counting of SO measures is limited and we recommend using the 8.2% value.

**Benchmarking.** The Massachusetts residential coordinated delivery (RCD) reports a participant spillover value of 12% at the program level.[[10]](#footnote-11) Similar to the Connecticut HES program, residential customers receive an energy assessment and have an opportunity to adopt deeper savings measures. Program-level participant spillover for this study also includes multi-family households and other program tracks, so while the Massachusetts study is not a direct comparison, the NMR team feels comfortable recommending an 8.2% participant spillover value for the R1983 HES study.

### Non-Participant Spillover (NPSO)

Non-participant spillover estimates the impact of the program on a trade ally’s non-participant customers. The Massachusetts Residential NTG Measurement algorithm specifies that trade ally surveys should assess the following elements to quantify non-participant spillover: the number of program-qualified measures sold or installed, the percentage of measures that received rebates, and the influence of the program on the sales of program-qualified but not rebated measures. The R1983 interview guide was unable to collect this granular information on NPSO for the reasons outlined below. Therefore, the NMR team offers a qualitative assessment of non-participant spillover which we believe supports the findings from the participant spillover calculation.

The NMR team conducted in-depth interviews with seventeen HES and HES-IE program vendors. Most of the vendors indicated that most or all of their residential work came through the HES program or related services (e.g., insulation or HVAC installation). The few respondents whose companies had residential work outside the program had difficulty estimating the program impact on their non-program practices. In addition, sometimes the non-program installations occurred in other departments of the company, and the vendors could not speak confidently about work done in other departments. For these reasons, the NMR team was unable to quantify non-participant spillover, but gleaned the following qualitative findings from vendor interviews:

* **Energy assessments conducted outside the program**. Due to their familiarity with the program, respondents referred non-participant customers through the program so that the customers could gain program benefits and receive an assessment for the cost of the program co-pay. One vendor said that some of their solar customers were not eligible to participate in HES again due to recent program participation; in these cases, the company performed a “clipboard audit”[[11]](#footnote-12) to move them through the solar installation process.
* **High-efficiency equipment recommended to non-participant customers.** Similar to questions about non-program energy assessments, respondents indicated that they encouraged customers to participate in the program to access program incentives. Vendors with non-participant customers elaborated on their business practices:
  + One vendor who estimated that only 30% of their company’s residential work came through the HES program said that they recommended high-efficiency equipment to their customers, depending on their fuel systems and budget. Generally, the vendor noted that customers were willing to go along with their recommendations.
  + One vendor said that they made the same recommendations on equipment to non-participating customers that they would to HES participants, even if the non-participants are not eligible for any incentives. The majority of the respondent’s customers were program participants. This vendor expressed that the program has been very influential on their business practices and the program affiliation affords the company credibility to all of its customers.
  + Another vendor with non-participant residential new construction customers said that it was the responsibility of the new construction project’s architect or general contractor to recommend equipment, rather than an energy auditor at the respondent’s company.

## Installation Rate

The installation rate represents the percentage of incented measures that program participants ultimately installed. For each measure associated with their household in the program tracking data, HES participant survey respondents were asked to confirm which of the measures were still installed in their homes, installed then removed, or never installed.[[12]](#footnote-13)

Table 6 lists two installation rates for each measure; the first is unweighted (i.e., a tally of responses), whereas the second is weighted by respondents’ measure-specific savings. For example, the weighted installation rate for pipe wrap represents the percentage of all respondents’ pipe wrap savings associated with those who reported installing it. Savings associated with respondents who never installed the pipe wrap count against the installation rate, but not those who answered, “I’m not sure”.

As the installation rate for windows in the 2022 PSD was 100%, and this estimate (93%) could be skewed by a small sample size, we recommend averaging the two installation rates (100% and 93%) for a window installation rate of 97.5% (98%).

Table 9: Installation Rate by Measure

|  |  |  |  |
| --- | --- | --- | --- |
| Measure | n | Installation rate, unweighted (%) | Installation rate, weighted (%) |
| Energy-efficient LED light bulbs | 755 | 98% | 98% |
| Door and window weatherization | 455 | 92% | 92% |
| Water-saving showerhead | 274 | 81% | 82% |
| Insulation | 203 | 100% | 100% |
| WiFi-enabled smart thermostat | 166 | 96% | 96% |
| Water-saving faucet aerators | 150 | 86% | 85% |
| Water heater pipe wrap or insulation | 150 | 97% | 97% |
| Refrigerator | 37 | 97% | 97% |
| Ductless heat pump(s) | 31 | 97% | 98% |
| Clothes washer | 28 | 96% | 96% |
| Energy-efficient windows1 | 26 | 96% | 93% |
| Dehumidifier | 13 | 100% | 100% |
| Central air conditioning system | 7 | 100% | 100% |
| Freezer | 3 | 100% | 100% |
| Geothermal or ground-source heat pump | 2 | 100% | 100% |
| Air-source heat pump | 1 | 100% | 100% |
| 1 One respondent reported that the windows associated with their address in the program tracking data were “never installed;” this was a high-savings project and as such the weighted installation rate for windows is reduced accordingly. The NMR team recommends averaging this installation rate with the installation rate in the 2022 PSD for an installation rate of 98%. | | | |

1. Connecticut’s 2021 Program Savings Document. *Section 1.7 Glossary*. <https://www.energizect.com/sites/default/files/2021-03/Final%202021%20PSD%20%28Filed%203-01-2021%29.pdf>. Accessed June 14, 2022. [↑](#footnote-ref-2)
2. NMR Group, Inc. and Tetra Tech, Inc. May 28, 2020. “Consistent Methodology for Self-Reported Residential Net-to-Gross Measurement (MA19X03-B-RSRNTG). <https://ma-eeac.org/wp-content/uploads/MA19X03-B-RSRNTG_Residential-SR-NTG-Report_FINAL_2020.5.28.pdf>. [↑](#footnote-ref-3)
3. The methodology for converting the linearly scored elements of the Massachusetts Residential Self-Report NTG Method to a Labeled Affective Magnitude scale was outlined in a memo to the EA team on April 28, 2021 and was based off the D’Souza and Skumatz (SERA) draft paper for ECEEE. [↑](#footnote-ref-4)
4. The seven removed respondents either displayed inconsistency across survey verification questions or did not pass quality control checks after the survey’s completion. [↑](#footnote-ref-5)
5. The sampling defaulted to asking respondents about add-on measures wherever possible to maximize response rates for high savings, low-incidence measures. A respondent only received free-ridership questions about measures in the tracking database that respondents verified receiving and that were installed. The savings come from the program database; electric, gas, oil, and propane savings have been converted into MMBtu/year. [↑](#footnote-ref-6)
6. Respondents were only asked to rate the influence of program rebates or financing if they previously indicated they were aware of or applied for them. Likewise, only respondents answering the free-ridership battery about an add-on measure were asked about the influence of their contractor. [↑](#footnote-ref-7)
7. The R1983 workplan specified that we intended to interpret the results of the billing analysis as net savings values for certain measures, including lighting. However, we recommend using the free-ridership value estimated by the participant survey as net savings values are not yet defined for R1983. The NMR team notes that NTG and installation rate are not relevant for the billing analysis for lighting. [↑](#footnote-ref-8)
8. Connecticut’s 2022 Program Savings Document. Filed on March 1, 2022.  [[Connecticut’s 2022 Program Savings Document (energizect.com)](https://energizect.com/sites/default/files/2022-03/Final%202022%20PSD%20FILED%20%2803-01-2022%29.pdf)](https://www.energizect.com/sites/default/files/2021-03/Final%202021%20PSD%20%28Filed%203-01-2021%29.pdf). Accessed June 14, 2022. [↑](#footnote-ref-9)
9. “2021 Plan Update to the 2019-2021 Conservation & Load Management Plan.” Filed March 1, 2021. <https://www.energizect.com/sites/default/files/2021-04/Final%202021%20Plan%20Update%20%28Refiled%203-15-21%29.pdf>. Accessed June 14, 2021. [↑](#footnote-ref-10)
10. Guidehouse Inc. October 8, 2021. “Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures.” [MA20R28-B-NTGRCDP Report (ma-eeac.org)](https://ma-eeac.org/wp-content/uploads/MA20R28-B-NTGRCDP_Final-Report_08Oct2021.pdf). Accessed June 30, 2022. [↑](#footnote-ref-11)
11. The vendor did not provide clarification on this term, but the NMR team interpreted it to mean a less intensive energy assessment that would fulfill the requirements for installing solar, as the customer had previously received an assessment through the HES program. [↑](#footnote-ref-12)
12. The NMR team did not ask whether blower-door guided air sealing and/or duct sealing measures were still installed in the household, as these measures would be nearly impossible to uninstall and may have created unnecessary confusion for the survey respondent. [↑](#footnote-ref-13)