1 Proposed Method for Estimating the Net-to-Gross Ratio for Residential and Small Commercial Customers

1.1 Background

A central objective of the California energy efficiency program evaluations is to identify that portion of the gross load impacts associated with a program-supported measure installation or behavior change that would not have been accomplished in the absence of the program. That portion is the net load impacts. In certain situations, like the 1998 Protocols, the 2006 Protocols allow for the use of the self-report approach (SRA) to estimate the net-to-gross ratio (NTGR) for the basic, standard, and enhanced levels of rigor.

Before describing the SRA in greater detail, we discuss how the SRA differs from other scientific approaches for assessing causality in the social world, i.e., the extent to which a given program caused the participants to adopt energy efficient measures and behaviors. An optimum approach to assessing causality is to conduct an experiment or quasi-experiment\(^1\) in which data are collected from both participants and nonparticipants with the data being subjected to a variety of statistical analyses (Shadish, Cook, and Campbell, 2002). However, in the early 1970s, many began to realize that such evaluation designs were not always desirable or possible (Weiss, 1972; Weiss and Rein, 1972). As a result, many evaluators began to explore alternatives that would allow them to generate causal conclusions (Guba, 1981, 1990; Cronbach, 1986). Such approaches as the modus operandi method (Scriven, 1976), intensive case studies (Yin, 1994), and mixed methods (Tashakkori and Teddlie, 1998) have been explored as alternative ways to generate causal conclusions. The SRA fits well with this tradition.

The social sciences literature provides strong support for use of the SRA method. As the Guidelines\(^2\) notes:

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\text{\ldots the SRA is a mixed method approach that involves asking one or more key participant decision-makers a series of structured and open-ended questions about whether they would have installed the same EE equipment in the absence of the program as well as questions that attempt to rule out rival explanations for the installation (Weiss, 1972; Scriven, 1976; Shadish, 1991; Wholey et al., 1994; Yin, 1994; Mohr, 1995). In the simplest case (e.g., residential customers), the SRA is based primarily on quantitative data while in more complex cases the SRA is strengthened by the inclusion of additional quantitative and qualitative data which}
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\(^1\) In the literature, evaluations of energy efficiency and conservation programs that involve the use of a true experimental design are very rare.

\(^2\) This refers to the document prepared by the Energy Division of the California Public Utility Commission and their Master Evaluation Contract Team (MECT), Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches in October 2007, to provide more detailed guidelines than was available in the California Evaluator’s Protocols in order to ensure best practices.
can include, among others, in-depth, open-ended interviews, direct observation, and review of program records. Many evaluators believe that additional qualitative data regarding the economics of the customer’s decision and the decision process itself can be very useful in supporting or modifying quantitatively-based results (Britan, 1978; Weiss and Rein, 1972; Patton, 1987; Tashakkori and Teddlie, 1998).³

In many evaluations of energy efficiency programs, the SRA has become quite useful. For example, in some cases, the expected magnitude of the savings for a given program might not warrant the investment in an expensive evaluation design that could involve a billing analysis of both participants and nonparticipants. Or, key stakeholders might not want to wait for a billing analysis to be completed. Also, if the relationship of the savings to the normal monthly variation in energy use is too small, then a billing analysis should not even be attempted owing to a lack of statistical power. Or, a discrete choice model might not be expected to detect small differences between participants and nonparticipants. Finally, in some cases, it might not be possible to identify a group of customers to serve as a comparison group since they have been exposed through prior participation or are in some other ways contaminated. So, for budgetary, timing, statistical, and research design issues, the optimal experimental and quasi-experimental research designs and analyses must sometimes be replaced with the SRA.

1.2 Approach

1.2.1 Free-ridership

The methods described in this section were developed to address the unique needs of residential and small commercial projects developed through energy efficiency programs offered by investor-owned utilities and third-parties. These methods rely exclusively on the SRA to estimate project and program-level free ridership, since other available methods and research designs are generally not feasible for a variety of reasons for residential and small commercial customer programs. These methods provide a standard framework for the calculation of the net-to-gross ratio⁴ in a systematic and consistent manner. Use of these common methods will help ensure uniformity in evaluation techniques across programs, utilities and contractors and will provide for greater transparency and reliability. The proposed approach is designed to fully comply with the Evaluator Protocols and the MECT’s Guidelines for Estimating Net-To-Gross Ratios Using the Self-Report Approaches, as demonstrated in Appendix 4.

It is important to note that the NTGR approach described in this section is a general framework, designed to address all residential and small commercial programs. In order to implement this approach on a program-specific basis, it will need to be substantially customized to reflect the unique nature of the individual programs that are addressed by these contract groups. Several of the elements that will need to be changed according to

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⁴ Currently, ALJ decisions specify the California net impacts as net of free-riders and do not include either participant or non-participant spillover.
the characteristics of each program and measure are indicated in the general script. A set of instructions for all of the impact evaluation contractors will be developed following the finalization and approval of this general method on its use. These instructions will include parameters and guidelines concerning customization. This customization will take place, through the development of program-specific NTGR survey instruments and associated documents.

Using the survey instrument in Appendix 1, participants who were involved in the decision-making process at each participating household or small commercial site will be interviewed. The survey obtains highly structured responses concerning the probability that the household or firm would have installed the same measure in the absence of the program. The survey also includes open-ended questions that focus on the household’s or firm’s motivation for installing the efficiency measure, as well as the context of the decision.

The algorithm derives multiple measurements of free-ridership from different inquiry routes. Then these are averaged to derive the final free-ridership estimate. There is a measurement of free-ridership based on a combination of sequential yes/no questions. There are multiple FR measurements based on responses on 0-10 scales concerning statements. The array of these cover all the requirements provided in the Guidelines, such as multiple questions; efficiency level, likelihood of adoption, timing and quantity; consistency checks and others. The algorithm is presented in Appendix 2. It is designed to transparency in the free-ridership measurements and their overall algorithm.

1.2.2 Spillover

Spillover is defined as:

Reductions in energy consumption and/or demand in a utility’s service area caused by the presence of the DSM [efficiency] program, beyond program-related gross savings of participants. These effects could result from: (a) additional energy efficiency actions that program participants take outside the program as a result of having participated; (b) changes in the array of energy-using equipment that manufacturers, dealers, and contractors offer all customers as a result of program availability; and (c) changes in the energy use of non-participants as a result of utility programs, whether direct (e.g., utility program advertising) or indirect (e.g., stocking practices such as (b) above, or changes in consumer buying habits).\(^5\)

Part “a” of the above definition is referred to as participant spillover. The survey questions to measure participant spillover are provided within this general method.

For example, consider a participant that received financial assistance from a program to install T-8 fluorescent fixtures. After experiencing and documenting to his own

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satisfaction the energy efficiency benefits of the retrofit, this participant proceeds to retrofit the remainder of the facility at his own expense. These additional installations are considered benefits that spilled over from the original program experience. When taken into account, such net spillover increases net energy and demand impacts of a program.\(^6\)

Although the CPUC has ruled that spillover cannot be counted toward utility goals, we will attempt to estimate participant spillover. The questions for estimating participant spillover are listed in Appendix 3. Spillover questions for measures similar to those installed through the program will only be asked for measures within the lighting end use for residential customers since it is the most likely end use where such spillover might occur. A series of spillover questions will be asked covering those end uses for which a given customer did not install any measures through the program. Such spillover is referred to as “unlike” spillover.

Note that the algorithm for calculating the influence of the program on both like and unlike spillover is being developed as are the specifics of how customer claims of spillover installations will be verified.

### 1.3 NTG Interview Process

The NTG surveys will be conducted via telephone interviews or during site visits. Highly-trained professionals with experience levels that are commensurate with the interview requirements will perform these interviews. All telephone interviews will be conducted using computer-aided telephone interview (CATI) software. Use of a CATI approach has several advantages: (1) the surveys can be customized to reflect the unique characteristics of each program, and associated program descriptions, response categories, and skip patterns; (2) it drastically reduces inaccuracies associated with the more traditional paper and pencil method; and (3) the process of checking for inconsistent answers can be automated, and with follow-up prompts triggered when inconsistencies are found.\(^7\)

### 1.4 Compliance with Self-Report Guidelines


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\(^7\) Specific consistency checks will be identified and included in the final approved general method.
Appendix 1

Proposed Residential and Small Commercial Self-Report NTGR Survey
Free-Ridership Questions

FR1. At the time that you first heard about the [assistance] from [utility] for [end use/measure], had you…? {READ LIST}
   1. Already been thinking about purchasing [product type]?
   2. Already begun collecting information about [product type]?
   3a. {FOR INCREMENTAL EFFICIENCY MEASURES} Already selected the particular [product type] you were going to get?
   3b. {FOR EFFICIENCY ENHANCEMENT MEASURES} Already decided to buy the [product type]?
   4. Already installed the energy efficient [measure]? {SKIP TO FR4}
   5. Or, did you hear about the [assistance] first?
   6. {DON'T READ} Other: __________________
      -98. {DON'T READ} Don't Know
      -99. {DON'T READ} Refused

FR2. To be clear, did you have specific plans to install a(n) [product type] before learning about the [assistance] available through the [program]?
   1. Yes
   2. No {SKIP TO FR4}
      -98. Don't Know {SKIP TO FR4}
      -99. Refused {SKIP TO FR4}

FR3. Did you have to make any changes to your existing plans in order to receive this [assistance] through the [program]?
   1. Yes
   2. No
      -98. Don't Know
      -99. Refused

FR4. {REPEAT AS NEEDED FOR FR4 PARTS A – D} If the [assistance] from the [utility] [program] had not been available, would you still have:

FR4A. Purchased the same type of equipment or product?
   1. Yes
   2. No
      -98. Don’t Know
      -99. Refused
FR4B. Purchased the equipment at the same time as you did?
   1. Yes {SKIP TO FR4C}
   2. No
   -98. Don’t Know {SKIP TO FR4C}
   -99. Refused {SKIP TO FR4C}

FR4B1. Bought the [product type] earlier than you did, or later?
   1. Earlier
   2. Same Time {REPEAT QUESTION FR4B}
   3. Later
   -98. Don’t Know {SKIP TO FR4C}
   -99. Refused {SKIP TO FR4C}

FR4B2. How much [earlier/later] would you have bought the [product type]?
   ______ Years {AND/OR} ______ Months
   -98. Don’t Know
   -99. Refused

FR4C. {IF PURCHASED MULTIPLE UNITS THROUGH THE PROGRAM, OR MEASURE IS OF VARIABLE AMOUNT} Without the program, would you have purchased the same quantity as you did?
   1. Yes {SKIP TO FR4D}
   2. No
   -98. Don’t Know {SKIP TO FR4D}
   -99. Refused {SKIP TO FR4D}

FR4C1. How many/much would you have purchased without the program?
   __________ {RECORD NUMBER}
   -98. Don’t Know
   -99. Refused
FR4D.  **(FOR INCREMENTAL EFFICIENCY MEASURES)** Purchased the same efficiency of [product type]?

1. Yes
2. No
-98. Don’t Know
-99. Refused

FR4E. If the [assistance] from the [utility] [program] had not been available, would you have done anything else differently?

1. Yes
2. No {SKIP TO FR5}
-98. Don’t Know {SKIP TO FR5}
-99. Refused {SKIP TO FR5}

FR4E1 What would you have done differently?

{RECORD RESPONSE}: _______________________

NOTE: TWO INSTRUMENTS WILL BE CREATED DURING PRE-TESTING. ONE AT A 5-POINT SCALE AND ONE AT A 10-POINT SCALE TO DETERMINE WHICH SEEMS LESS CONFUSING TO CUSTOMERS AND IF THERE IS AN EFFECT ON TIME TO COMPLETE

NOTE: FOR **INCREMENTAL EFFICIENCY MEASURES**, RESPONDENT WILL BE RANDOMLY ASSIGNED TO BE READ EITHER FR5 OR FR6. FOR **EFFICIENCY ENHANCEMENT MEASURES**, ALL RESPONDENTS WILL BE ASKED FR5.

FR5. On a 0 to 10 scale, with 0 being not at all likely and 10 being very likely, how likely is it that you would have bought the same [product type] if you had not received any [assistance] from the program?

{RECORD RESPONSE (0-10)} ________ {SKIP TO FR7}
-98. Don’t Know {SKIP TO FR7}
-99. Refused {SKIP TO FR7}

FR6. On a 0 to 10 scale, with 0 being not at all likely and 10 being very likely, how likely is it that you would have bought a less efficient [product type] if you had not received any [assistance] from the program?

{RECORD RESPONSE (0-10)} ________
-98. Don’t Know
-99. Refused
{SKIP TO FR10 IF PROGRAM DOES NOT PROVIDE A FINANCIAL INCENTIVE/SUBSIDY}

FR7. Our records indicate you received about [amount of program incentive/subsidy] from the [utility] [program] either directly or at the time of purchase to offset the cost of the [product type]. Does this sound about right?
   1. Yes {SKIP TO FR9}
   2. No
   -98. Don’t Know {SKIP TO FR9}
   -99. Refused {SKIP TO FR9}

FR8. What would you estimate to be the actual amount?
   {RECORD RESPONSE} ________ {SET = NEW AMOUNT OF PROGRAM INCENTIVE/SUBSIDY}
   -98. Don’t Know
   -99. Refused

I’m going to read several statements about how you came to choose your [product type]. On a scale of 0 to 10, where 0 is strongly disagree and 10 is strongly agree, how much do you agree with each statement?

FR9. If I had not had any assistance from the program, I would have paid the additional [amount of program incentive/subsidy] to buy the [measure] on my own?
   {RECORD RESPONSE (0-10)} __________
   -98. Don’t Know
   -99. Refused

{READ ONLY IF FR7-FR9 WAS SKIPPED}: I’m going to read several statements about how you came to choose your [product type]. On a scale of 0 to 10, where 0 is strongly disagree and 10 is strongly agree, how much do you agree with each statement?

FR10. The [assistance] from the [utility] [program] was a critical factor in my decision to purchase the high efficiency/energy efficient product.
   {RECORD RESPONSE (0-10)} __________
   -98. Don’t Know
   -99. Refused
FR11. I would have bought a(n) [product type] within [a year/2 years] of when I did with or without the [assistance] from the [utility] [program].

{RECORD RESPONSE (0-10)} ________
-98. Don't Know
-99. Refused

FR12A. {FOR INCREMENTAL EFFICIENCY MEASURES} The [assistance] from the [utility] [program] was not necessary to cause me to purchase the higher efficiency product when I bought my new [product type].

{RECORD RESPONSE (0-10)} ________
-98. Don't Know
-99. Refused

FR12B. {FOR EFFICIENCY ENHANCEMENT MEASURES} The [assistance] from the [utility] [program] was not necessary to cause me to purchase the new [product type].

{RECORD RESPONSE (0-10)} ________
-98. Don't Know
-99. Refused

Consistency Check & Resolution

DEVELOPING PROGRAMMING TO TEST FOR INCONSISTENCIES BETWEEN RESPONSES IN THE FREE-RIDERSHIP BATTERY, C1 WILL TAKE PRECEDENCE OVER INCONSISTENT RESPONSES.

C1. In the questions above, I recorded that you said [fill with inconsistency 1], however, for another question I recorded that you said [fill with inconsistency 2]. In order to help me make sure I have this correct, would you tell me in your own words what influence, if any, the program had on your decision to purchase and install the specific [product type] at the time you did?

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________
Appendix 2

Free-Ridership Algorithm
Free-Ridership Algorithm

A. MEASURES BASED ON YES/NO QUESTIONS

1. If FR1 = 4 (already installed the measure before learning of program),
   **CALCULATE FR[Y/N] HERE:**
   
   FR[Y/N] = 1
   
   GO TO PART B

2. ELSE CALCULATE EFFICIENCY, QUANTITY, TIMING FACTORS

   *Efficiency Factor*

   If FR4d = NO (wouldn’t have bought high efficiency without the program)
   
   F0 = 0
   
   If FR4d = DK, REF
   
   F0 = .5
   
   If FR4d = YES, (would have bought high efficiency without program)
   
   F0 = 1

   *Quantity Factor*

   If FR4c = YES or INAPPLICABLE/SKIPPED (no change to quantity)
   
   FQ = 1,
   
   IF FR4c = DK
   
   FQ = .5
   
   If FR4c = NO (increased quantity because of the program)
If FR4c1 nonmissing

\[ FQ = \text{[RATIO OF QUANTITY FROM FR4c1 TO QUANTITY FROM PROGRAM]} \]

If FR4c1 = DK

\[ FQ = 0.5 \]

**Timing/Acceleration Factor**

If FR4b = YES (would have bought at same time without the program)

\[ FA = 1 \]

If FR4b = DK, REF

\[ FA = 0.5 \]

If FR4b = NO (would have bought at different time without the program)

\[ \text{If FR4b1 = EARLIER (would have bought earlier without the program)} \]

\[ FA = 1 \]

\[ \text{If FR4b1 = LATER (would have bought later without the program)} \]

**IF FR2 = YES (already had specific plans)**

**AND FR3 = YES (changed plans because of program)**

\[ FA = 1 - \min(A/A^* , 1) , \]

where

\[ A = \text{# years from FR4b2} \]

\[ A^* = 2 \text{ to } 4 \text{ years, specified by the evaluator for the program and measure} \]

**ELSE (I.E. IF FR2 = NO, DK, REF (no specific plans before program) OR FR3 = NO, DK, REF (didn’t change specific plans because of the program))**
If FR4b2 ≤ [1 year/2 years]
    FA = 1
If FR4b2 > [1 year/2 years]
    FA = 0

3. **FR score combining efficiency, quantity, acceleration factors**

   \[ F[Y/N] = F_0 \times F_Q \times F_A \]

**B. MEASURES BASED ON 0-10 SCALES**

1. **Timing/Acceleration Factor** (to be applied with each of the scalar efficiency factors)

   \[ F_T = 10 \times FR11 \text{ response} \]

2. **Quantity Factor**

   Calculate FQ as in Part A.2.

3. **Efficiency Factors**

   \[ [FR56]. \text{ Note: Each respondent is asked one or the other of these two. Measure FR56 uses whichever was asked. (likelihood of buying as efficient / less efficient without the program)} \]

   **CALCULATE FR MEASURE [FR56]**

   IF FR5 ANSWERED

   a. \[ F_{056} = 10 \times FR5 \text{ response} \]

   IF FR6 ANSWERED
b. \( F_{56} = 10 \times (10 - \text{FR6 response}) \)

\[
F[FR56] = F_{56} \times FT \times FQ
\]

**CALCULATE FR MEASURES [FR10], [FR9], [FR12]**

**[FR10]**

\[
F_{10} = 100 - 10 \times \text{FR10 response}
\]

\[
F[FR10] = F_{10} \times FT \times FQ
\]

**[FR9]**

IF ASSISTANCE INCLUDED INCENTIVE $

\[
F_{9} = 10 \times \text{FR9 response}
\]

\[
F[FR9] = F_{9} \times FT \times FQ
\]

**[FR12]**

\[
F_{12} = 10 \times \text{FR12 response}
\]

\[
F[FR12] = F_{12} \times FT \times FQ
\]

**4. CALCULATE THE FINAL COMBINED FR ESTIMATE FROM PARTS A AND B**

Use all the non-missing FR values that could be calculated

\[
F[FINAL] = \text{average}(F[FR56], F[FR10], F[FR9], F[FR12], F[Y/N])
\]
Appendix 3

Participant Like and Unlike Spillover Questions
LSP1. Since you received [assistance] through [program] have you purchased and installed any efficient lighting on your own without any assistance from the [utility] [program] or another utility program {READ THE FOLLOWING ONLY FOR SMALL COMMERCIAL: either at this facility or at other locations}?

1. Yes, only at this home/facility
2. Yes, only at other locations {SMALL COMMERCIAL ONLY}
3. Yes, at this facility and other locations
4. No {SKIP TO NSP1}
-98. Don't Know {SKIP TO NSP1}
-99. Refused {SKIP TO NSP1}

LSP2. How many more high efficiency lighting products did you buy on your own, compared to what you got through the program {READ THE FOLLOWING ONLY FOR SMALL COMMERCIAL: at this facility and/or at another locations}?

{PROBE FOR PERCENT OR SHARE OF PROGRAM EQUIPMENT. READ THE FOLLOWING IF NEEDED} For example, was it about one-fourth (25%) of what you installed through the program, one-half (50%) of what your installed through the program, the same amount as what you installed though the program (100%), twice as much as what you installed through the program (200%), or some other amount?

_____% at this home/facility
_____% at another facility {SMALL COMMERCIAL ONLY}
-98. Don’t Know
-99. Refused

LSP3. I’m going to read a statement about this equipment that you purchased on your own, without any assistance from your utility. On a scale from 1-10, with 0 indicating that you strongly disagree, and 10 indicating that you strongly agree, please rate the following statement


{RECORD RESPONSE (0-10)} _________
-98. Don’t Know
-99. Refused
LSP4. Why did you purchase this lighting without the financial assistance available from the utility program? {DO NOT READ; INDICATE ALL THAT APPLY}

1. Too much paperwork
2. Takes too long to get approval
3. No time to participate, needed equipment immediately
4. The program had ended
5. The equipment would not qualify {PROBE: WHY NOT?} ________
6. The amount of the rebate wasn’t important enough
7. Other {SPECIFY} ________
-98. Don’t Know
-99. Refused

Other Spillover {ONLY ASK ONCE/FOR ONE MEASURE}

NSP1. Since you participated in program have you purchased and installed purchased any other type of high efficiency equipment or made energy efficiency improvements {READ THE FOLLOWING ONLY FOR SMALL COMMERCIAL: at this facility or at other locations}?

1. Yes, only at this home/facility
2. Yes, only at other locations {SMALL COMMERCIAL ONLY}
3. Yes, at this facility and other locations
4. No
-98. Don’t Know
-99. Refused

NSP2. What type and quantity of high efficiency equipment did you install on your own? {PROBE TO GET EXACT TYPE AND QUANTITY AND LOCATION/BUILDING IF SMALL COMMERCIAL}

Type 1: ____________ Quantity 1: ________ Location 1: ____________
Type 2: ____________ Quantity 2: ________ Location 2: ____________
Type 3: ____________ Quantity 3: ________ Location 3: ____________
Type 4: ____________ Quantity 4: ________ Location 4: ____________

NSP3. {ASK FOR EACH TYPE OF EQUIPMENT IN NSP2} How do you know that this equipment is high efficiency? {PROBE: WAS IT ENERGY STAR® RATED?}

Type 1: ______________________________________________________
Type 2: ______________________________________________________
NSP4. I’m going to read a statement about this equipment that you purchased on your own. On a scale from 1-10, with 0 indicating that you strongly disagree, and 10 indicating that you strongly agree, please rate the following statement.

My experience with the [utility] [program] in [2006, 2007, 2008] influenced my decision to install different types of high efficiency equipment on my own.

(RECORD RESPONSE (0-10)) ________
-98. Don’t Know
-99. Refused

NSP5. Why did you purchase this high efficiency equipment without going through a [utility] program? (DO NOT READ; INDICATE ALL THAT APPLY)

1. Too much paperwork
2. Takes too long to get approval
3. No time to participate, needed equipment immediately
4. The program had ended
5. The equipment would not qualify (PROBE: WHY NOT?) ________
6. The amount of the rebate wasn’t important enough
7. Did not know program was available
8. There was no program available
9. Other (SPECIFY) ________
-98. Don’t Know
-99. Refused
Appendix 4

Demonstration of Compliance with the CPUC/ED and MECT Guidelines
1. Timing of the Interview

Given the time schedule for Evaluation activities, measures installed in 2006 may be up to 18 months old before the interview is conducted. To mitigate the problem of recall, every effort will be made to conduct the NTGR interview as close to measure installation as possible. Most evaluation plans have at least two rounds of NTGR interviews, one in 2008 and another in 2009.

2. Identifying the Correct Respondent

The survey form will include some initial probing to confirm the respondent’s involvement in the decision to implement the energy efficiency measures. In the unfortunate circumstance where the key decision-maker is unavailable, that sample point will be discarded and replaced.

3. Set Up Questions

The overall survey includes a series of warm-up questions that will serve to remind the respondent about the circumstances and motivations surrounding the decision to participate in the program and install the energy efficient measures.

4. Use of Multiple Questions

The NTGR scoring algorithm relies on responses from several questions to determine the final NTG score. The scoring is a function of:

- The timing of their program awareness relative to their decision to implement the installed measure
- The importance of program versus non-program influences in their decision making
- The importance of specific influences in the participant’s general decision to implement the measure and that led them to implement the specific measure at the time they did rather than an alternative
- Without the program, the probability of alternative actions to implementing the selected measure

5. Validity and reliability

The proposed NTG method is designed to produce valid and reliable NTGR results, based on the use of:

- “Tried and true” questions that manifest a high degree of face validity. Many of the core questions used in NTG scoring are substantially the same as those that have been used extensively in previous residential and small commercial program evaluations. While the question
construct is somewhat different from in the past, the wording used is essentially the same as has been used previously.

- **Multiple questions will be asked to increase the reliability of the NTGR.**

6. **Consistency checks**

A comparison of responses to the different questions used within the NTG battery will be checked for inconsistent responses. These include questions regarding the program’s reported importance in the decision to implement the specified measure, alternative actions in the program’s absence, questions reporting the motivations for doing the project, as well as any closely related supplemental questions. The CATI software will be specifically programmed to flag inconsistencies, and will include follow-up prompts when they are found. Interviewers will be instructed how to administer these follow-up questions to resolve these inconsistencies. We will make every effort to resolve any inconsistencies before concluding the interview.

7. **Making the Questions Measure-Specific**

In general, most projects involve one type or class of measure. However, there are a few instances where the project consists of multiple types of measures, but usually, one measure predominates. In such cases, the interview will be conducted around the dominant measure with the greatest share of savings. If there are projects with multiple types of measures and no one measure class predominates, the NTGR sequence will be repeated for each significant measure class (e.g., once for lighting and once for insulation measures). At the beginning of each interview, there will be a prompt with a description of the measure class that the questions pertain to so that it is clear in the minds of the respondent which measures they are being asked about.

8. **Partial free-ridership**

There are many questions within this general method that address efficiency level. Question FR4c addresses quantity of efficient products that would have occurred without the program. The information collected will be used in the algorithm described above to develop the adjustment for partial free-ridership. Participants who would have installed some but not all of the efficiency measure(s) on their own receive a free-ridership score between 0 and 100%.

9. **Deferred free-ridership**

Questions FR4B and FR11 address deferred free ridership, the program’s ability to accelerate efficiency investments that would have been made later without its assistance. The NTGR algorithm text fully explains the specifics of this adjustment.

10. **Scoring algorithms**
The methodology includes a specific transparent algorithm for developing a NTGR ratio based on responses received. A description of the scoring algorithm is provided in Appendix 2.

11. Handling non-responses and “don’t know”
Every effort will be made to discourage non-responses (i.e., dropouts) by pointing out that the program requires the project to be evaluated as a condition of participation. In the event this strategy is not successful, the non-responding customer will be replaced by another customer in the same stratum of the sample frame. Likewise, interviewers will be instructed to try to draw the respondent into the interview so as to minimize “don’t knows”, however obtaining responses for every question will not be forced so as not to induce biased responses.

12. Weighting the NTGR
Sample population weights will be applied to NTGR results to develop a population-level NTGR.

13. Ruling out Rival Hypotheses
The warm-up questions will work to induce greater recall by the respondent of the circumstances and factors considered when they made the decision to install the efficient equipment and participate in the program. This is done to ensure that when the participant is asked directly about the influence of the program, whether it was critical and how it may a difference in what they would have done, that this is for the program effect only and not the other factors or circumstances. Creating this mind-set can allow the respondent themselves to answer for only the program effect rather than rival hypotheses.

14. Precision of the NTGR
A target of 90 percent level of confidence +/- 10 percent has been established for NTGR estimates.

15. Pre-testing the Questionnaire
The NTG survey will be carefully and extensively pre-tested and adjusted in response to pre-test findings before it is fielded.

16. Qualified Interviewers
The NTG surveys will be fielded by experienced interviewers. A CATI approach will be used for all telephone surveys, assisting in the consistent operation of these inquiries. All site visit interviews will be conducted by highly experienced professionals in conducting surveys of this type on site. All interviewers will be trained for the specific survey to be used.
Appendix 5

References


