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National Grid, NSTAR, Western Massachusetts Electric Company, Unitil, and Cape Light Compact

2013 Commercial and Industrial Electric Programs Free-ridership and Spillover Study

February 17, 2015

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1. EXECUTIVE SUMMARY

This Executive Summary summarizes the findings of the Free-ridership and Spillover Study conducted for the Massachusetts Program Administrators (PAs) for their 2013 Commercial and Industrial (C&I) electric programs. The purpose of this study was to assess program free-ridership and spillover for the electric programs offered by National Grid, NSTAR, Western Massachusetts Electric Company (WMECO), Unitil, and Cape Light Compact. These programs include both Custom and Prescriptive programs for both new construction and retrofit projects.

1.1 STUDY OBJECTIVES

The primary objective of the 2013 program year Free-ridership and Spillover Study was to assist the Massachusetts PAs in quantifying the net impacts of their commercial and industrial electric energy efficiency programs by estimating the extent of:

- Program free-ridership
- Early participant "like" and "unlike" spillover
- Nonparticipant "like" spillover.

A secondary objective of the study was to assess how free-ridership varies between Green Communities and non-Green Communities.

This executive summary first provides a summary of the study methodology. It also includes the free-ridership, participant like spillover estimates, and nonparticipant like spillover estimates at the program, measure type, and statewide levels. Following this summary, we present the results for each individual PA at the measure type and program levels. Early observations of participant "unlike" spillover are included in the full report.

1.2 STUDY METHODOLOGY

The methodology used for this study follows the standardized methodology developed in 2010 and 2011 for the Massachusetts PAs for use in situations where end-users are able to report on program impacts via self-report methods. [1]

To accomplish the study objectives, telephone surveys were conducted with 2013 program participants in each of the PA's C&I electric programs and with design professionals and equipment vendors involved in these 2013 installations. The program participant sample consisted of unique electric *accounts*[2], not unique customer names. The same customer name, or business identity, can have multiple accounts in multiple locations, but program technical support and incentives are provided on behalf of an individual account. Thus, for the purposes of

[1] "Cross-Cutting C&I Free-Ridership and Spillover Methodology Study Final Report", prepared for the Massachusetts Program Administrators by Tetra Tech, KEMA, and NMR, May 20, 2011.

[2] Each account could include multiple applications for efficiency projects. For example, if one account has five lighting applications and one HVAC application, this account would show up twice in the sample frame; once for lighting (aggregating all the lighting applications) and once for HVAC.

this study, a customer or participant is defined as a unique account[3].

The 2013 Free-ridership and Spillover studies ran concurrently for National Grid, NSTAR, Western Massachusetts Electric Company, Unitil, and Cape Lighting Compact. The majority of the telephone interviews were completed with program participants between June 4 and August 22, 2014. The duration of interviews with program participants averaged 19 minutes. All participating customers were mailed a letter on PA letterhead prior to the first telephone attempt. This letter explained the purpose of the call, informed customers that someone from Tetra Tech would be calling them in the next couple of weeks to ask them some questions about their experiences with the programs, and thanked them for their cooperation in advance. This letter and repeated call attempts (an average of over eight call attempts was made to reach sampled customers during the calling period) resulted in an overall cooperation rate of 58 percent.

The number of survey completions for some measure types is low because the number of installations within these measure categories for program year 2013 was small (e.g., less than 50). Thus, some caution should be used when interpreting these results for specific measure types.

In addition to the customer surveys, additional surveys were conducted with:

- Design professionals and vendors identified by customers as being the most responsible about the decision to install the energy efficient equipment through the PAs' programs—These surveys were used to estimate free-ridership for those installations where customers said the design professional/equipment vendor was more influential in the decision than the customer.
- Design professionals and equipment vendors who had recommended, sold and/or installed equipment through the PAs' new construction and medium to large C&I retrofit programs—These surveys were used for estimating the extent of nonparticipant "like" spillover at a statewide level for all the PAs' electric programs.

1.2.1 Participant free-ridership methodology

A program's *free-ridership rate* is the percentage of program savings attributed to free-riders. A *free-rider* refers to a program participant who received an incentive or other assistance through an energy efficiency program who would have installed the same high efficiency measure type[4] on their own at that same time if the program had not been offered. For free-riders, the program is assumed to have had no influence or only a slight influence on their decision to install or implement the energy efficient measure type. Consequently, none or only some of the energy savings from the energy efficient measure installed or performed by this group of customers should be attributable to the energy efficiency program.

In addition to simply identifying free-riders, it is important to estimate the *extent* of free-ridership for each customer. Pure free-riders (100%) would have adopted exactly the same energy efficient measure type at that time in the absence of the program. Partial free-riders (1–99%) are

[3] Unique accounts with two or more measure types were asked about the two largest saving measures during one interview.

[4] For purposes of this discussion, an "energy efficient measure type" includes high efficiency equipment, an efficiency measure type such as building envelope improvements, or an energy efficient practice such as boiler tune-ups.

those customers who would have adopted some measure type on their own, but of a lesser efficiency or a lesser quantity, or at a later time. Thus, the program had some impact on their decision. Non-free-riders (0%) are those who would not have installed or implemented any energy efficient measure type (within a specified period of time) absent the program services.

For programs that offer monetary incentives for multiple measure categories (e.g., hot water heating, HVAC), it is important to estimate free-ridership by specific measure type. Category-specific estimates produce feedback on the program at the level at which it actually operates and allows for cost-effectiveness testing by measure category. In addition, for commercial and industrial incentive programs, free-ridership has often been found to be highly variable among measure categories, making it essential to produce measure specific estimates. The ability to provide reliable estimates by measure type is dependent on the number of installations within that measure type—the fewer installations, the less reliable the estimate.

Once calculated, each individual's free-ridership rate is then applied to the measure savings associated with that project. The total free-ridership estimates in this report include pure, partial, and non-free-riders.

Our approach to estimating free-riders follows the approach used in the 2011 Cross-Cutting C&I Free-Ridership and Spillover Methodology Study Final Report, which consists of a sequential question technique to identify free-riders. This sequential approach asks program participants about the actions they would have taken if the program services had not been offered. This approach addresses the program's impact on project timing, measure quantity, and efficiency levels while explicitly recognizing that the cost of energy-efficient equipment can be a barrier to installation in the absence of PA-sponsored energy efficiency programs. This method walks survey respondents through their decision process with the objective of helping them recall the program's impact upon all aspects of project decision-making.

Note that program total free-ridership (pure and partial) rates illustrated in the tables in the Results Summary section of this Executive Summary are weighted by measure kWh savings. Weighting by kWh savings ensures that overall measure savings are considered in the overall results. For programs where we were unable to complete any interviews for a given measure type, we were unable to weight by all measure types for that program. In these situations, results do not include those measure types.

In addition to weighting by kWh savings, weighting by the disproportionate probability of being surveyed accounts for any oversampling of a specific measure type as part of our calling effort. When reviewing the measure type free-ridership rates it is important to consider the number of survey completions that the estimate is based upon.

1.2.2 Spillover methodology

Spillover refers to additional energy efficient measures adopted by a customer due to program influences, but without any financial or technical assistance from the program. *Participant "like" spillover* refers to the situation where a customer installed energy efficient measures through the program, and then installed additional measures of the same type due to program influences. *Participant "unlike" spillover* is where the customer installs other types of energy efficient measures than those offered through the program, but are influenced by the program to do so.

Survey free-ridership questions were followed by questions designed to estimate "like" and "unlike" spillover. These questions asked about recent purchases (since program participation in

2013) of any additional energy-efficient equipment that were made without any additional technical or financial assistance from the PA. These early "unlike" spillover observations are included in the full report.

A. Early "like" spillover

A "like" spillover estimate was computed based on how much more of the same energy-efficient equipment the participant installed outside the program and did so because of their positive experience with the program.

One of the issues with attempting to quantify spillover savings is how to value the savings of measures installed or conducted outside the program since we are relying on customer self-reports of the quantity and efficiency of any measure type installed. Estimating early "like" spillover uses a conservative approach and reports only those measures installed outside the program that were of exactly the same type and efficiency as the ones installed through the program. This conservative approach allows customers to be more certain about whether the equipment they installed outside the program was the same type as the program equipment. This, in turn, makes it possible for us to use the estimated program savings for that measure to calculate the customer's "like" spillover savings. Program-eligible measures that were installed by the participant but were not of the same type as what was installed through the program are excluded from "like" spillover estimates. These measures would be included in any "unlike" spillover analysis (see discussion below).

Note that the "like" spillover rates illustrated in the Results Summary section of this Executive Summary are weighted by measure category kWh savings and the disproportionate probability of being surveyed. When reviewing the measure category "like" spillover, it is important to consider the number of survey completions that the estimate is based upon. The number of survey completions for some measure categories is low because very few customers in the sample installed the measure type.

Customers who indicated that they purchased 'like' lighting equipment without a PA incentive were provided to DNV GL to cross check against the commercial upstream lighting data. DNV GL used two checks to identify which spillover accounts may have participated in an upstream program. The first was to use the phone number and identify participants in the upstream datasets that match and then manually verify the customer's name and address for matched records. This returned a series of matches, but the manual verification identified that in many situations the phone number and customer matched but the location identified was not a match.

A second identification check was executed by loading the spillover account locations to a geographic information system, cleaning and standardizing the addresses, and then matching which locations from the spillover accounts also occurred in the upstream datasets. This returned a larger series of matches, which included some of the phone matches. Validation checks were manually conducted to verify that the customers and addresses were consistent. For records that did not have an address match (e.g. only a zip code matched) an additional check was conducted.

Records that came back as a match had their upstream lighting kWh savings subtracted from the like spillover savings. This resulted in 21 records that had spillover savings adjusted.

B. Early "unlike" spillover

The evaluation team included questions to address "unlike" spillover – energy efficient equipment installed by a participant due to program influence that is not identical to the equipment they received through the program. However, given the difficulties in estimating savings for these installations, we present only observations of "unlike" spillover and not savings estimates.

C. Nonparticipant spillover estimates

Free-drivers, or nonparticipant spillover, refers to energy efficient measures adopted by program nonparticipants due to the program's influence. The program can have an influence on design professionals and vendors as well as an influence on product availability or practices, product or practice acceptance, customer expectations, and other market effects. All of these may induce nonparticipants to implement energy efficient measures. *Nonparticipant "like" spillover* refers to additional measures of the same type as offered through the program that are adopted due to the program's influence.

The methodology for the 2013 study estimated only a portion of nonparticipant like-measure type spillover based on responses from design professionals and vendors participating in the PAs' programs.[5]

The data for the analysis could have been collected from nonparticipants directly or from the design professionals and vendors who recommended, and/or installed qualifying high efficiency equipment. We chose to survey the design professionals and vendors primarily because they could typically provide much more accurate information about the efficiency level of installed equipment than could the nonparticipants. Experience has shown that most customers cannot provide enough data to a telephone interviewer about the new equipment they have installed to allow for accurate estimates of the energy savings achieved from the equipment. While they usually can report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to allow us to determine whether the equipment is "program-eligible." On the other hand, design professionals and equipment vendors who have worked with the program are typically more knowledgeable about equipment and are familiar with what is and is not "program-eligible."

Another argument in favor of using design professionals and equipment vendors to estimate nonparticipant spillover was that we could use data in the program tracking system database to attach kWh savings estimates to nonparticipant spillover. In the program tracking system database, measure type-specific program kWh savings are associated with each design professional and vendor who participated in the program in 2013.

To determine nonparticipant spillover, design professionals and equipment vendors were asked (by measure type they installed through the program in 2013) what percent of their sales were program-eligible and what percent of these sales did not receive an incentive through the programs. They were then asked about the program's impact on their decision to

[5] Nonparticipant spillover for small business programs was not estimated because of the small number of vendors involved in delivering the program.

recommend/install this efficient equipment outside the program. Using the survey responses and measure type savings data from the program tracking system, the participating vendor nonparticipant “like” spillover savings could be estimated for each design professional/vendor and the results extrapolated to the total savings for all programs.

This method of estimating nonparticipant spillover is a *conservative* estimate for two reasons. First, not all design professionals and equipment vendors who are familiar with the programs specified and/or installed equipment through the program in 2013. Thus, we miss any nonparticipant spillover that is associated with these other design professionals/vendors (although it is less likely these design professionals/vendors had nonparticipant spillover if they were not involved with the program in 2013).

Second, this method only allows us to extrapolate nonparticipant spillover for those same measure type categories that a particular design professional/vendor was associated with for the 2013 programs. Thus, if a vendor installed program-eligible equipment in other measure type categories in the year 2013 outside the program, but none through the program, we did not capture nonparticipant spillover savings with that particular type of equipment. In essence, we measured only "like" nonparticipant spillover; that is, spillover for measure types like those installed through the program in 2013.

It is important to note that nonparticipant spillover was analyzed at a statewide level by measure type. These estimates were then applied to each PA program that offered that measure type. Once the identified participant spillover savings were removed from the nonparticipant estimate (to avoid double-counting spillover projects), there was only a small amount of nonparticipant spillover savings found. In cases where a given PA had more participant like spillover than vendor reported spillover rate, the participant like spillover rate represents the like spillover estimate for that PA.

1.3 RESULTS SUMMARY

This section presents the results of the 2013 C&I electric free-ridership and spillover study. First, we present summary tables that include statewide figures at the program level for each PA and an overall statewide figure. Following the summary tables, we present detailed results for each PA. The detailed results include free-ridership and spillover rates by program and measure category, along with corresponding error margins, where applicable. All savings are presented as kWh.

Table 1-1 summarizes the free-ridership and spillover estimates by PA and program. The statewide free-ridership rate is 11.9 percent, the participant spillover "like" rate is 6.9 percent, and the nonparticipant spillover rate is 1.2 percent, resulting in a statewide net-to-gross rate (NTGR) of 96.1 percent.

Overall, the statewide NTGRs were relatively stable among 2010 and 2013 participants (96 and 98 percent, respectively). However, NTGRs varied dramatically by end use both between evaluation years and among PAs for a given year. Two factors driving this variability that we were able to observe were: 1) the categorization of measures into end uses varied between PAs and over time, and 2) some end uses and PAs had a small number of participants that make the estimates more volatile.

End uses such as Process, Motors & Drives and Lighting were the most stable across the two evaluation years with NTGRs above 90 percent.

Table 1-1. 2013 C&I Electric Free-ridership and Spillover Results Summary

PA	Program Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Cape Light Compact	C&I New Construction	7	21	1,042,806	67.7%	NA	2.0%	NA	3.7%	37.9%
	C&I Prodcuts and Services	7	20	87,327	8.5%	NA	0.0%	NA	1.8%	93.3%
	Government New Construction	0	1	17,206	NA	NA	NA	NA	0.8%	NA
	Medium and Large C&I Retrofit	3	33	1,642,734	4.9%	NA	0.0%	NA	9.6%	104.7%
	Medium and Large Government Retrofit	2	11	201,776	0.0%	NA	76.7%	NA	0.7%	177.5%
	Small C&I Retrofit	103	322	2,962,411	9.2%	3.8%	10.4%	12.6%	1.6%	102.8%
	Small Government Retrofit	26	108	1,532,181	8.9%	NA	19.4%	NA	0.1%	110.5%
	Total	**148**	**516**	**7,486,441**	**16.4%**	**3.8%**	**11.4%**	**9.0%**	**3.2%**	**98.1%**

PA	Program Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
National Grid	Design 2000plus	116	481	38,668,804	25.1%	5.7%	28.4%	5.3%	0.5%	103.8%
	Energy Initiative	218	1,107	132,692,918	7.8%	3.0%	3.4%	1.4%	0.0%	95.6%
	Small Business	151	1,649	36,441,497	6.6%	2.2%	2.7%	2.7%	0.2%	96.4%
	Total	**485**	**3,237**	**207,803,219**	**10.8%**	**2.2%**	**7.9%**	**1.6%**	**0.1%**	**97.2%**
NSTAR	Direct Install	234	2,613	49,040,289	5.0%	2.4%	5.5%	2.2%	0.2%	100.8%
	New Construction	109	432	50,205,545	26.8%	5.6%	2.6%	3.0%	1.7%	77.5%
	Retrofit	167	966	179,831,020	8.9%	2.9%	7.1%	5.9%	0.5%	98.7%
	Total	**510**	**4,011**	**279,076,854**	**11.4%**	**2.0%**	**6.0%**	**2.3%**	**1.9%**	**96.6%**
Unitil	C&I Large Retrofit	4	12	3,287,424	66.0%	NA	8.4%	NA	4.6%	47.0%
	C&I New Construction	2	2	61,464	96.9%	NA	1.5%	NA	0.0%	4.6%
	C&I Small Retrofit	31	67	1,534,155	8.7%	NA	1.6%	NA	0.4%	93.3%
	Total	**37**	**81**	**4,883,043**	**34.2%**	**9.4%**	**4.4%**	**6.4%**	**0.5%**	**70.7%**
Western Massachusetts Electric Company	New Construction	57	135	10,641,980	21.0%	NA	1.2%	NA	3.5%	83.7%
	Retrofit	76	192	24,789,814	27.7%	NA	2.8%	NA	2.6%	77.6%
	Small Business Energy Advantage	94	612	16,372,181	5.2%	2.6%	14.3%	18.8%	0.0%	109.1%
	Total	**227**	**939**	**51,803,975**	**18.1%**	**3.3%**	**6.6%**	**8.5%**	**0.7%**	**89.2%**
MA Overall		**1,407**	**8,784**	**551,053,532**	**11.9%**	**1.3%**	**6.9%**	**1.9%**	**1.2%**	**96.1%**

* Error margins do not apply when a census of records were sampled

Table 1-2 presents statewide free-ridership and spillover rates for each measure type combined across all PAs and programs. The CHP measure type has the lowest level of free-ridership (0.7 percent) although results are based on two respondents. The unitary HVAC measure type has the highest free-ridership rate (36.2 percent).

Table 1-2. 2013 Statewide C&I Electric Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	1	4	88,802	25.0%	NA	0.0%	NA	NA	75.0%
CHP	2	7	45,880,066	0.7%	NA	0.0%	NA	NA	99.3%
Comprehensive	17	46	22,718,999	15.8%	NA	0.0%	NA	0.0%	84.2%
Compressed Air	79	206	10,454,965	32.0%	6.9%	2.5%	3.5%	2.1%	72.6%
Custom	99	498	97,353,438	9.5%	4.5%	10.6%	5.9%	0.0%	101.2%
Hot Water	11	33	209,411	11.3%	NA	0.0%	NA	NA	88.7%
HVAC	134	460	77,537,351	19.3%	5.0%	7.1%	6.7%	0.0%	87.7%
Lighting	649	5,974	211,810,103	11.9%	1.7%	9.3%	2.7%	0.0%	97.3%
Motors/Drives	122	389	22,950,851	14.8%	4.1%	3.1%	4.9%	24.1%	112.5%
Non-lighting	66	352	6,399,756	2.5%	2.8%	7.2%	5.1%	NA	104.7%
Non-unitary HVAC	7	50	1,216,491	1.5%	NA	0.0%	NA	0.0%	98.5%
Other	0	1	9,688	NA	NA	NA	NA	NA	NA
Process	32	61	9,873,287	6.5%	NA	2.3%	NA	0.0%	95.8%
Refrigeration	115	488	11,016,314	11.6%	3.4%	1.3%	14.5%	0.0%	89.7%
Unitary HVAC	14	72	267,391	36.2%	NA	0.6%	NA	0.0%	64.4%
VFD	59	143	33,266,618	8.0%	NA	0.0%	NA	0.0%	92.0%
Total	**1,407**	**8,784**	**551,053,532**	**11.9%**	**1.3%**	**6.9%**	1.9%	**1.2%**	**96.1%**

* Error margins do not apply when a census of records were sampled

1.4 DETAILED PA RESULTS

Results for each PA are presented for each measure and program. The measure type categories were chosen by the PAs, and measure type was assigned based on the equipment installed. Table 1-3 details which equipment were assigned to which measure type classification.

Table 1-3. Breakdown of Equipment in Measure Type Categories

Measure Type	Equipment
Building Envelope	Windows, insulation, air sealing
CHP	Combined heat and power
Comprehensive	CDA
Compressed Air	VSD compressors, Load/no load compressor, VSDs
Custom	Lighting, Motors, Chillers, Controls, Doors, System upgrades

Measure Type	Equipment
HVAC	HVAC equipment and systems, EMS, Heat Pump, Thermostat, A/C unit, Furnace, Snack and beverage vending machines, Occupancy sensors, Building shell
Hot Water	Spray valves
Lighting	LED fixtures and bulbs, Occupancy sensors, CFLs, Daylight dimming
Motors & Drives/VFD	Variable frequency drives, Evaporative fan ECM, Controls for pump, Fans, Water pump
Non-lighting	LED Coolers, ECMs, Vending machines, Refrigeration, Controls, Motors and drives
Non-unitary HVAC	Air cooled chiller, ECM motors, Demand control ventilation
Other	Combi-oven
Process	Electric oven, Water pumping equipment, Injection molding machine
Refrigeration	Cooler miser, Cooler night cover, Cooler controls, Snack miser, Economizer
Unitary HVAC	AC equipment, Air to air heat pump system

1.4.1 Cape Light Compact results

Table 1-4 presents Cape Light Compact's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 98.1 percent. The Small C&I Retrofit program, which had the highest participation, had a free-ridership rate of 9.2 percent and participant spillover of 10.4 percent. The Small Government Retrofit program had a free-ridership rate of 8.9 percent and 19.4 percent participant like spillover. The remaining programs had low participation and limited respondent results.

Table 1-4. Cape Light Compact C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
C&I New Construction	HVAC	2	3	383,333	96.7%	NA	0.0%	NA	0.8%	4.1%
	Lighting	3	12	420,639	35.5%	NA	4.2%	NA	0.0%	68.7%
	Motors & Drives	0	1	130,484	NA	NA	NA	NA	27.2%	NA
	Process	2	4	96,047	93.2%	NA	0.0%	NA	0.0%	6.8%
	Refrigeration	0	1	12,303	NA	NA		NA	0.0%	NA
	Total	**7**	**21**	**1,042,806**	**67.7%**	**NA**	**2.0%**	**NA**	**3.7%**	**37.9%**
C&I Prodcuts and Services	HVAC	5	17	74,793	8.6%	NA	0.0%	NA	0.8%	92.2%
	Lighting	1	2	9,666	10.0%	NA	0.0%	NA	2.0%	92.0%
	Motors & Drives	1	1	2,868	0.0%	NA	0.0%	NA	27.2%	127.2%
	Total	**7**	**20**	**87,327**	**8.5%**	**NA**	**0.0%**	**NA**	**1.8%**	**93.3%**
Government New Construction	HVAC	0	1	17,206	NA	NA	NA	NA	0.8%	NA
	Total	**0**	**1**	**17,206**	**NA**	**NA**	**NA**	**NA**	**0.8%**	NA
Medium and Large C&I Retrofit	Builidng Envelope	0	1	87,535	NA	NA	NA	NA	NA	NA
	HVAC	2	2	395,487	11.0%	NA	0.0%	NA	0.8%	89.8%
	Lighting	0	20	637,459	NA	NA	NA	NA	2.0%	NA
	Motors & Drives	1	9	489,596	0.0%	NA	0.0%	NA	27.2%	127.2%
	Refrigeration	0	1	32,657	NA	NA	NA	NA	0.0%	NA
	Total	**3**	**33**	**1,642,734**	**4.9%**	**NA**	**0.0%**	**NA**	**9.6%**	**104.7%**
Medium and Large Government Retrofit	HVAC	0	1	14,010	NA	NA	NA	NA	0.8%	NA
	Lighting	2	6	159,255	0.0%	NA	76.7%	NA	0.0%	176.7%
	Motors & Drives	0	2	5,094	NA	NA	NA	NA	27.2%	NA
	Refrigeration	0	2	23,417	NA	NA	NA	NA	0.0%	NA
	Total	**2**	**11**	**201,776**	**0.0%**	**NA**	**76.7%**	**NA**	**0.7%**	**177.5%**

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Small C&I Retrofit	Builidng Envelope	0	1	388	NA	NA	NA	NA	NA	NA
	Hot Water	1	1	37,960	0.0%	NA	0.0%	NA	NA	100.0%
	HVAC	2	6	57,739	66.7%	NA	0.0%	NA	0.8%	34.1%
	Lighting	68	226	2,416,645	7.3%	4.1%	12.0%	19.0%	0.0%	104.8%
	Motors & Drives	15	38	224,780	5.8%	NA	2.7%	NA	24.6%	121.4%
	Refrigeration	17	50	224,899	20.3%	NA	5.1%	NA	0.0%	84.9%
	Total	**103**	**322**	**2,962,411**	**9.2%**	**3.8%**	**10.4%**	**12.6%**	**1.6%**	**102.8%**
Small Government Retrofit	Builidng Envelope	1	2	879	25.0%	NA	0.0%	NA	NA	75.0%
	HVAC	3	5	71,710	6.0%	NA	0.0%	NA	0.8%	94.8%
	Lighting	22	89	1,421,894	9.1%	NA	20.3%	NA	0.0%	111.3%
	Motors & Drives	0	5	7,942	NA	NA	NA	NA	27.2%	NA
	Refrigeration	0	7	29,756	NA	NA	NA	NA	0.0%	NA
	Total	**26**	**108**	**1,532,181**	**8.9%**	**NA**	**19.4%**	**NA**	**0.1%**	**110.5%**
Total		**148**	**516**	**7,486,441**	**16.4%**	**3.8%**	**11.4%**	**9.0%**	**3.2%**	**98.1%**

* Error margins do not apply when a census of records were sampled

1.4.2 National Grid results

Table 1-5 presents National Grid's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 97.2 percent. The Small Business program had the lowest free-ridership rate at 6.6 percent. Design 2000plus had the highest free-ridership rate (25.1 percent) but also had the highest spillover rate (28.4 percent for participants and 0.5 percent for nonparticipants) which resulted in a net-to-gross rate of 103.8 percent.

Table 1-5. National Grid C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Design 2000plus	Compressed Air	42	124	4,254,886	46.4%	NA	0.0%	NA	4.6%	58.2%
	Custom	31	129	28,488,664	22.9%	NA	34.6%	NA	0.0%	111.7%
	Lighting	20	88	3,279,579	19.1%	NA	34.2%	NA	0.0%	115.1%
	Non-unitary HVAC	7	50	1,216,491	1.5%	NA	0.0%	NA	0.0%	98.5%
	Other	0	1	9,688	NA	NA	NA	NA	NA	NA
	Unitary HVAC	14	72	267,391	36.2%	NA	0.6%	NA	0.0%	64.4%
	VFD	2	17	1,152,104	41.5%	NA	0.0%	NA	0.0%	58.5%
	Total	**116**	**481**	**38,668,804**	**25.1%**	**5.7%**	**28.4%**	**5.3%**	**0.5%**	**103.8%**

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Energy Initiative	Custom	68	369	68,864,774	3.9%	4.1%	0.7%	2.2%	0.0%	96.8%
	HVAC	15	52	3,336,424	37.7%	NA	23.9%	NA	0.0%	86.2%
	Lighting	78	560	28,377,206	14.8%	4.3%	11.1%	2.8%	0.0%	96.4%
	VFD	57	126	32,114,514	6.8%	NA	0.0%	NA	0.0%	93.2%
	Total	**218**	**1,107**	**132,692,918**	**7.8%**	**3.0%**	**3.4%**	**1.4%**	**0.0%**	**95.6%**
Small Business	Lighting	85	1,297	30,041,741	7.4%	3.4%	1.8%	2.6%	0.2%	94.6%
	Non-lighting	66	352	6,399,756	2.5%	2.8%	7.2%	5.1%	NA	104.7%
	Total	**151**	**1,649**	**36,441,497**	**6.6%**	**2.2%**	**2.7%**	**2.7%**	**0.2%**	**96.4%**
Total		**485**	**3,237**	**207,803,219**	**10.8%**	**2.2%**	**7.9%**	**1.6%**	**0.1%**	**97.2%**

* Error margins do not apply when a census of records were sampled

1.4.3 NSTAR results

Table 1-6 presents NSTAR's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 96.6 percent. The Direct Install program had the lowest free-ridership rate (5.0 percent) and a participant spillover rate of 5.5 percent which resulted in a NTG rate of 100.8 percent. The New Construction program had the highest free-ridership rate at 26.8 percent and the lowest participant spillover rate (2.6 percent).

Table 1-6. NSTAR C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Direct Install	Hot Water	8	30	163,126	14.5%	NA	0.0%	NA		85.5%
	HVAC	22	53	1,438,907	1.5%	NA	5.8%	NA	0.0%	104.3%
	Lighting	99	2,084	43,239,813	4.4%	2.6%	6.1%	5.1%	0.0%	101.7%
	Motors/Drives	34	138	633,481	10.1%	NA	0.0%	NA	27.2%	117.2%
	Process	4	5	24,615	21.8%	NA	0.0%	NA	0.0%	78.2%
	Refrigeration	67	303	3,540,347	12.1%	NA	0.0%	NA	0.0%	87.9%
	Total	**234**	**2,613**	**49,040,289**	**5.0%**	**2.4%**	**5.5%**	**2.2%**	**0.2%**	**100.8%**
New Construction	Comprehensive	15	41	22,214,831	16.2%	NA	0.0%	NA	0.0%	83.8%
	Compressed Air	15	39	1,366,960	46.3%	NA	9.6%	NA	0.0%	63.3%
	HVAC	16	58	11,999,313	37.6%	NA	0.0%	NA	0.8%	63.2%
	Lighting	46	222	8,915,137	41.6%	9.3%	12.5%	4.6%	0.0%	70.9%
	Motors/Drives	14	50	2,854,109	13.7%	NA	0.0%	NA	27.2%	113.5%
	Process	3	12	1,177,446	14.1%	NA	0.0%	NA	0.0%	85.9%
	Refrigeration	0	10	1,677,749	NA	NA	NA	NA	0.0%	NA
	Total	**109**	**432**	**50,205,545**	**26.8%**	**5.6%**	**2.6%**	**3.0%**	**1.7%**	**77.5%**

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Retrofit	CHP	2	5	39,723,964	0.7%	NA	0.0%	NA	NA	99.3%
	Compressed Air	5	9	2,290,651	13.0%	NA	0.0%	NA	4.6%	91.6%
	HVAC	45	191	51,616,571	13.3%	NA	8.7%	NA	0.0%	95.4%
	Lighting	48	592	65,031,524	9.9%	4.7%	11.8%	7.9%	0.0%	101.9%
	Motors/Drives	45	112	14,855,513	12.5%	NA	3.6%	NA	23.6%	114.7%
	Process	10	18	3,644,840	1.7%	NA	3.6%	NA	0.0%	101.9%
	Refrigeration	12	39	2,667,957	10.5%	NA	0.0%	NA	0.0%	89.5%
	Total	**167**	**966**	**179,831,020**	**8.9%**	**2.9%**	**7.1%**	**5.9%**	**0.5%**	**98.7%**
Total		**510**	**4,011**	**279,076,854**	**11.4%**	**2.0%**	**6.0%**	**2.3%**	**1.9%**	**96.6%**

* Error margins do not apply when a census of records were sampled

1.4.4 Unitil results

Table 1-7 presents Unitil's free-ridership and spillover rates by measure. The net-to-gross rate is 70.7 percent. The New Construction and Large Retrofit programs had the highest free-ridership rates (60 percent or more) but also had the lowest participation and subsequent survey results. The Small Retrofit program had a free-ridership rate of 8.7 percent. We should note that all programs had low participation and limited respondent results; therefore care should be taken when using these results.

Table 1-7. Unitil C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
C&I Large Retrofit	Compressed Air	0	1	129,109	NA	NA	NA	NA	4.6%	NA
	HVAC	0	2	1,632,743	NA	NA	NA	NA	0.8%	NA
	Lighting	3	7	1,016,252	62.9%	NA	0.0%	NA	2.0%	39.1%
	Motors & Drives	0	1	416,070	NA	NA	NA	NA	27.2%	NA
	Process	1	1	93,250	100.0%	NA	100.0%	NA	0.0%	100.0%
	Total	**4**	**12**	**3,287,424**	**66.0%**	**NA**	**8.4%**	**NA**	**4.6%**	**47.0%**
C&I New Construction	Compressed Air	1	1	1,896	0.0%	NA	50.0%	NA	0.0%	150.0%
	Process	1	1	59,568	100.0%	NA	0.0%	NA	0.0%	0.0%
	Total	**2**	**2**	**61,464**	**96.9%**	**NA**	**1.5%**	**NA**	**0.0%**	**4.6%**
C&I Small Retrofit	Lighting	31	66	1,529,622	8.7%	NA	1.6%	NA	0.4%	93.3%
	Refrigeration	0	1	4,533	NA	NA	NA	NA	0.0%	NA
	Total	**31**	**67**	**1,534,155**	**8.7%**	**NA**	**1.6%**	**NA**	**0.4%**	**93.3%**
Total		**37**	**81**	**4,883,043**	**34.2%**	**NA**	**NA**	**NA**	NA	**70.7%**

* Error margins do not apply when a census of records were sampled

1.4.5 Western Massachusetts Electric Company results

Table 1-8 presents Western Massachusetts Electric Company's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 89.2 percent. The Small Business Energy Advantage program had the lowest free-ridership rate (5.2 percent) and the highest participant spillover, which resulted in a net-to-gross rate of 109.1 percent. Both New Construction and Retrofit programs had free-ridership rates around 21 percent and both had limited participant and nonparticipant spillover.

Table 1-8. Western Massachusetts Electric Company C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
New Construction	Comprehensive	2	5	504,168	0.0%	NA	0.0%	NA	0.0%	100.0%
	Compressed Air	14	28	2,145,442	13.3%	NA	5.8%	NA	0.0%	92.6%
	HVAC	12	36	1,473,434	58.8%	NA	0.4%	NA	0.4%	41.9%
	Lighting	18	43	2,608,259	32.0%	NA	0.0%	NA	2.0%	70.0%
	Motors/Drives	2	7	1,152,980	0.0%	NA	0.0%	NA	27.2%	127.2%
	Process	8	12	1,414,414	11.5%	NA	0.0%	NA	0.0%	88.5%
	Refrigeration	1	4	1,343,283	6.3%	NA	0.0%	NA	0.0%	93.8%
	Total	**57**	**135**	**10,641,980**	**21.0%**	**NA**	**1.2%**	**NA**	**3.5%**	**83.7%**
Retrofit	CHP	0	2	6,156,102	NA	NA	NA	NA	NA	NA
	Compressed Air	2	4	266,021	42.5%	NA	0.0%	NA	4.6%	62.1%
	HVAC	6	19	4,669,774	15.2%	NA	0.0%	NA	0.8%	85.5%
	Lighting	53	127	7,407,681	43.2%	NA	4.9%	NA	0.0%	61.7%
	Motors/Drives	10	25	2,177,934	45.0%	NA	7.1%	NA	20.1%	82.2%
	Process	3	8	3,363,107	0.0%	NA	0.0%	NA	0.0%	100.0%
	Refrigeration	2	7	749,195	21.8%	NA	0.0%	NA	0.0%	78.2%
	Total	**76**	**192**	**24,789,814**	**27.7%**	**NA**	**2.8%**	**NA**	**2.6%**	**77.6%**
Small Business Energy Advantage	Hot Water	2	2	8,325	0.7%	NA	0.0%	NA	NA	99.3%
	HVAC	4	14	355,907	0.0%	NA	0.0%	NA	0.8%	100.8%
	Lighting	72	533	15,297,731	5.1%	3.1%	14.6%	8.9%	0.0%	109.5%
	Refrigeration	16	63	710,218	9.9%	NA	15.1%	NA	0.0%	105.2%
	Total	**94**	**612**	**16,372,181**	**5.2%**	**2.6%**	**14.3%**	**18.8%**	**0.0%**	**109.1%**
Total		**227**	**939**	**51,803,975**	**18.1%**	**3.3%**	**6.6%**	**8.5%**	**0.7%**	**89.2%**

* Error margins do not apply when a census of records were sampled

2. INTRODUCTION

This report summarizes the findings of the free-ridership and spillover study conducted for the Massachusetts Program Administrators (PAs) for their 2013 Commercial and Industrial (C&I) electric programs. The purpose of this study was to assess program free-ridership and spillover for the electric programs offered by National Grid, NSTAR, Western Massachusetts Electric Company (WMECo), Unitil, and Cape Light Compact. These programs include both Custom and Prescriptive for new construction and retrofit projects conducted in 2013.

One important concept affecting the interpretation of the free-ridership and spillover estimates is the ability to generalize the results. The results of this study can be generalized to the population of 2013 program year participants, and the design professionals and equipment vendors who were active in the 2013 program year. Essentially, the current study is a performance audit of the year 2013 programs using survey research methods to estimate the free-ridership and spillover rates.

2.1 ORGANIZATION OF THIS REPORT

In this introductory chapter of the report, we review the study's objectives and methodology. Chapter 3 summarizes the survey questions used to identify the key decision-maker and the questions designed to serve as project review for the respondent. Chapter 3 also describes the questions and approach used to estimate the extent of participant free-ridership, participant "like" spillover, and participant ""unlike" spillover. Chapter 4 presents the questions used for the influential vendor survey and approach used to estimate nonparticipant "like" spillover. In Chapter 5, we present the free-ridership and spillover results at the state level, as well as at the individual PA level. In Chapter 6, we present the results broken down by Green Community designation.

Appendix A details the sampling plans for the participant surveys for each PA. Appendix B documents the weighting methodology used to produce the participant free-ridership and "like" spillover estimates. Appendix C contains the survey instruments and Appendix D details response rate and program savings coverage. Appendix E contains an example of the Design Professional and Vendor spillover calculation, and Appendix F charts how the free-ridership and spillover scoring was done.

2.2 STUDY OBJECTIVES

The primary objective of the 2013 program year free-ridership and spillover study was to assist the Massachusetts PAs in quantifying the net impacts of their commercial and industrial electric energy efficiency programs by estimating the extent of:

- Program free-ridership
- Early participant "like" and "unlike" spillover
- Nonparticipant "like" spillover.

At this point, it is helpful to define free-ridership and spillover. A program's *free-ridership rate* is the percentage of program savings attributed to free-riders. A *free-rider* refers to a program participant who received an incentive or other assistance through an energy efficiency program

who would have installed the same high efficiency equipment[6] on their own at that same time if the program had not been offered. For free-riders, the program is assumed to have had no influence or only a slight influence on their decision to install or implement the energy efficient equipment. Consequently, none or only some of the energy savings from the energy efficient equipment taken by this group of customers should be credited to the energy efficiency program.

In addition to simply identifying free-riders, it is important to estimate the *extent* of free-ridership for each customer. Pure free-riders (100%) would have adopted exactly the same energy efficient equipment at that time in the absence of the program. Partial free-riders (1–99%) are those customers who would have adopted some equipment on their own, but of a lesser efficiency or a lesser quantity, or at a later time. Thus, the program had some impact on their decision. Non-free-riders (0%) are those who would not have installed or implemented any energy efficient equipment (within a specified period of time) absent the program services.

In contrast, spillover adds benefits to the program, increasing the program benefits and benefit–cost ratio. *Spillover* refers to additional energy efficient equipment adopted by a customer due to program influences, but without any financial or technical assistance from the program. *Participant "like" spillover* refers to the situation where a customer installed energy efficient equipment through the program, and then installed additional measures of the same type due to program influences. *Participant "unlike" spillover* is where the customer installs energy efficient equipment different from those installed through the program, but are influenced by the program to do so.

Free-drivers, or nonparticipant spillover, refers to energy efficient equipment adopted by program nonparticipants due to the program's influence. The program can have an influence on design professionals and vendors as well as an influence on product availability or practices, product or practice acceptance, customer expectations, and other market effects. All of these may induce nonparticipants to instal energy efficient equipment. *Nonparticipant "like" spillover* refers to additional equipment of the same type as offered through the program that is adopted due to the program's influence.

2.3 STUDY METHODOLOGY

The methodology used for this year's study follows the standardized methodology developed in 2010 and 2011 for the Massachusetts PAsfor use in situations where end-users are able to report on program impacts via self-report methods. [7]

To accomplish the study objectives, telephone surveys were conducted with samples of 2013 program participants in each of the PAs' C&I electric programs and with design professionals and equipment vendors involved in these 2013 installations. The following PA electric C&I programs were included in the 2013 study:

[6] For purposes of this discussion, equipment includes high efficiency equipment, an efficiency measure type such as building envelope improvements, or an energy efficient practice such as boiler tune-ups.

[7] "Cross-Cutting C&I Free-Ridership and Spillover Methodology Study Final Report," prepared for the Massachusetts Program Administrators by Tetra Tech, KEMA, and NMR, May 20, 2011.

Cape Light Compact programs

- New Construction (large and small), Government and non-Government
- Retrofit (large and small)
- C&I Products and Services

National Grid programs

- New Construction (Design 2000plus)
- Retrofit (Energy Initiative)
- Small Business

NSTAR programs

- New Construction
- Retrofit
- Direct Install

Unitil programs

- Retrofit (small and large)
- New Construction

Western Massachusetts Electric Company programs

- New Construction
- Retrofit
- Small Business Energy Advantage.

2.3.1 Participant free-ridership, "like," and "unlike" spillover surveys

The program participant sample consisted of unique electric *accounts*[8], not unique customer names. The same customer name, or business identity, can have multiple accounts in multiple locations, but program technical support and incentives are provided on behalf of an individual account. Thus, for the purposes of this study, a customer or participant is defined as a unique account[9]. Table 2-1 presents the number of participant accounts sampled for the 2013 study, as well as the number of telephone surveys completed for each PA program.

The 2013 Free-ridership and Spillover studies ran concurrently for National Grid, NSTAR, Western Massachusetts Electric Company, Unitil, and Cape Light Compact. The majority of the

[8] Each account could include multiple applications for efficiency projects. For example, if one account has five lighting applications and one VSD application, this account would show up twice in the sample frame; once for lighting (aggregating all the lighting applications) and once for VSD.

[9] Unique accounts with two or more measures were asked about the two largest saving measures during one interview.

telephone interviews were completed with program participants between June 4 and August 22, 2014. The duration of interviews with program participants averaged 19 minutes. Prior to the calling, all participating customers were mailed a letter on PA letterhead. This letter explained the purpose of the call, informed customers that someone from Tetra Tech would be calling them in the next couple of weeks to ask them some questions about their experiences with the programs, and thanked them for their cooperation in advance. This letter and repeated call attempts (an average of over eight call attempts was made to reach sampled customers during the calling period) resulted in an overall cooperation rate of 58 percent.

The number of survey completions for some measure types is low because the number of installations within these measure categories for program year 2013 was small (e.g., less than 50). Thus, some caution should be used when interpreting these results for specific measure types.

In addition to the customer surveys, additional surveys were conducted with:

- Design professionals and vendors identified by customers as being the most responsible about the decision to install the energy efficient equipment through the PAs' programs—These surveys were used to estimate free-ridership for those installations where customers said the design professional/equipment vendor was more influential in the decision than the customer.
- Design professionals and equipment vendors who had recommended, sold and/or installed equipment through the PAs' new construction and medium to large C&I retrofit programs—These surveys were used for estimating the extent of nonparticipant "like" spillover at a statewide level for all the PAs' electric programs.

Table 2-1. 2013 C&I Electric Participant Free-ridership and Spillover Survey Cooperation and Response Rates

Status	Cape Light Compact	National Grid	NSTAR	Unitil	Western Massachusetts Electric	Grand Total
Starting Sample	**328**	**916**	**930**	**74**	**408**	**2,656**
Bad phone number	29	22	37	2	10	100
No knowledgeable respondent	13	18	34	1	13	79
Ineligible – other*	39	127	105	14	49	334
Language barrier	0	8	8	0	4	20
Adjusted Sample	**247**	**741**	**746**	**57**	**332**	**2,123**
Refusal	29	40	42	3	10	124
Active sample	93	270	281	16	114	774
Completed Interviews	**125**	**431**	**423**	**38**	**208**	**1,225**
Cooperation Rate	**51%**	**58%**	**57%**	**67%**	**63%**	**58%**
Response Rate	**38%**	**47%**	**45%**	**51%**	**51%**	**46%**

*Dispositions included in this group are: "Deceased", "Incapable/Incoherent", "Ineligible - Did not participate", "Vendor/Contractor", "Ineligible - Installed different measure", "Ineligible - Project not yet completed", "Ineligible - More than 12 attempts".

2.3.2 Nonparticipant spillover surveys

In addition to the customer surveys, surveys were conducted with design professionals and equipment vendors who had installed equipment through the PAs' electric C&I programs in 2013. This survey was used for estimating the extent of nonparticipant spillover for the programs.

The program tracking system databases contained the names of design professionals and vendors for some of the projects. After removing names that did not appear to be actual vendors (for example, some "vendors" were actually customers such as schools) and duplicate names, 624 design professionals and vendors remained. We selected vendors with the top 5 percent of kWh savings and randomly sampled from the remaining vendors.

Table 2-2 presents the number of designers/vendors in the population, the number sampled, and the number surveyed. Multiple attempts (on different days of the week, and different weeks) were made to complete interviews with these designers and vendors in August and September 2014.

Table 2-2. 2013 Cooperation and Response Rates to the Vendor Nonparticipant Spillover Survey

	Total
Starting Sample	**172**
Bad phone number	6
No knowledgeable respondent	1
Ineligible – other*	23
Language barrier	0
Adjusted Sample	**142**
Refusal	2
Active sample	84
Completed Interviews	**56**
Cooperation Rate	**39%**
Response Rate	**33%**

* Dispositions included in this group are: "Deceased", Incapable/Incoherent", "Ineligible - Did not participate", "Ineligible - No one here responsible", "Ineligible - Do not sell/specify/recommend/install equipment".

In conjunction with the nonparticipant vendor spillover survey, interviews were completed with 62 of the 216 design professionals and equipment vendors mentioned by customers during the participant surveys as being influential in the decision to install the efficient measures. This effort resulted in a 29 percent response rate.

3. PARTICIPANT SURVEY QUESTIONS

This chapter summarizes the survey questions used to identify the primary decision maker and put the decision making in context by reviewing the project, and the questions used to estimate the extent of free-ridership and participant spillover. Particularly for the free-ridership questions, the skip patterns (which are dependent upon the response to one or more questions) are complex. To simplify discussion of the questions, we have only shown the questions and not the potential response categories or skip patterns. Appendix C of this document contains the detailed free-ridership survey questions for participants. Appendix C also contains the participant "like" spillover survey questions, a parallel version of the free-ridership survey suitable for designers/vendors who are the decision makers, and the nonparticipant designer/vendor spillover survey.

Prior to discussing the specific questions used to identify the key decision-maker and questions used to review the decision-making process, we discuss the format of the survey.

3.1 FORMAT

The survey for free-ridership (and spillover) contains a number of complex skip patterns, and repeat questions for each measure category installed. The surveys also automatically incorporate information about each participant's project (i.e., measures installed, incentive amount, participation date) into the appropriate questions.

The survey averaged 19 minutes in length depending on the customer surveyed and number of measures installed. Many customers, especially the smaller ones, skipped directly to the consistency questions because they were initially 0 percent free-riders. Others skipped questions if they had not had a technical assessment study done or if they had not participated in the programs in previous years.

Given that the same survey instrument was used for all PAs for the different programs, the survey instrument contains a number of areas where fills were used to customize the instrument. These fills are listed and explained in the table below:

Table 3-1. Survey Fills and Explanations

Fill	Explanation
PA	Program administrator
Address	Street address of project
City	City of project
Date	Date project was completed
Customer	Name of PA customer
Measure Category 1	First measure installed through program
Measure Category 2	Second measure installed through program
All program assistance	All assistance provided by the program included rebates and technical assistance, as well as financing
Study	Indicator of whether the customer received a study funded by the program
Finance	Indicator of whether the customer received financing assistance from the program
Incentive	Amount of financial incentive
Project Cost	Total cost of project for customer

3.2 SUMMARY OF THE 2013 SURVEY QUESTIONS

In order to estimate free-ridership and spillover, the participant survey instrument contains nine key sections. These same questions were used in the study for 2010 electric and gas programs completed in 2011, with the exception of the influence of installing electric equipment at the same time. In 2012, there was concern that customers may think about the electric portion of a combination project when we were interested only in the gas portion. Therefore, we added two questions to better understand how influential the electric portion of the project was in the decision to implement natural gas saving equipment at the same time. This same approach was followed for the 2013 electric study—customers were asked about the gas equipment and if it had any impact on the electric project.

- Identification of key decision maker(s)
- Project and decision-making review
- Initial free-ridership questions
- Consistency check questions
- Influence of technical assessment (if applicable)
- Influence of installing electric equipment at the same time (if applicable)
- Influence of past program participation
- Participant “like” spillover questions
- Participant “unlike” spillover questions.

3.2.1 Identification of key decision maker(s)

Identifying and surveying the key decision-maker(s) is critical for collecting accurate information on free-ridership and spillover. Therefore, the first part of the survey is devoted to identifying the appropriate decision-maker within the organization by asking if participants were involved in the decision to purchase the incentivized equipment and asking about the roles of others within or outside the organization that may have been involved.

If the listed contact person was not the primary decision-maker, information is collected on the person within or outside the company who was the primary decision-maker and the survey is conducted with that individual. In cases where the customer tells the interviewer that a designer/vendor was the key decision-maker, the interviewer collected contact information for the designer/vendor. In these cases, the survey was still completed with the customer, although attempts were made to complete the designer/vendor survey with the designer/vendor. In cases where the designer/vendor agreed they were the most influential, their responses were used to estimate free-ridership for that customer. If the designer/vendor did not agree that they were the most influential or if attempts to survey the designer/vendor failed, the customer's responses were used to estimate free-ridership.

Once the appropriate respondent was identified, they were assured their responses would be kept confidential by Tetra Tech and the PAs.

The questions used to identify the key decision-maker(s) are detailed below.

I1 Are you the person who was most involved in making the decision to get <ALL ASSISTANCE> through the <PA> program in <DATE> at <ADDRESS> in <CITY>? [IF GAS PROJECT DONE: Our records indicate they may have been done alongside a natural gas project.]

I1A Who was primarily responsible for making the decision to get <ALL ASSISTANCE> through the program?

I2 Are you employed by <CUSTOMER> or are you a contractor who provides design and/or installation services for <CUSTOMER>?

R1a Were you involved in the decision-making process when the [EFFICIENCY IS APPLICABLE: energy efficient] <MEASURE CATEGORY 1> or <MEASURE CATEGORY 2> was being considered for this facility?

R1b Aside from yourself, who else within your company or outside your company was involved in the decision of whether or not to purchase the [EFFICIENCY IS APPLICABLE: energy efficient] <MEASURE CATEGORY 1> or <MEASURE CATEGORY 2> through the program?

3.2.2 Project and decision-making review

The interview then asks about corporate purchasing policies, important factors that the respondent considers when purchasing any new equipment, and important factors for the specific incentivized project. New in 2014 were questions about being part of a Green Community. This section is intended to "prime" the participant by asking them to recall all the

various factors that may have been important in the purchase decision. The question text is listed below.

GC1 [if a municipal building and in a Green Community] According to our records, your municipality is part of a Green Community initiative. One criteria of being a Green Community means your municipality commits to reducing its energy use by 20 percent within five years.

Were you aware that your municipality was part of a Green Community when you decided to install the energy efficient <MEASURE CATEGORY 1 and MEASURE CATEGORY 2> through the <PROGRAM>?

R3 Does your organization have any formal requirements or informal guidelines for the purchase, replacement, or maintenance of energy-using equipment?

R4 Which of the following best describes these requirements or guidelines: purchase energy efficient measures regardless of cost, purchase energy efficient measures if it meets payback or return on investment criteria, purchase standard efficiency measures that meet code, or something else?

R4ba [If Green Community] Were these guidelines in place before you became a Green Community or, were they established or modified as a result of you becoming a Green Community?

FR0 Please think back to the time when you were considering implementing the specific savings <MEASURE CATEGORY 1 and MEASURE CATEGORY 2> projects in <YEAR>. What factors motivated your business to consider implementing new <MEASURE CATEGORY 1 and MEASURE CATEGORY 2> equipment? What other factors did you consider?

3.2.3 Initial free-ridership questions

The instrument then asks what influence, if any, the program had on the decision to install equipment through the program. As there are several dimensions to the decision to purchase and install new equipment[10], the battery discusses the timing of the installation, the quantity and the efficiency level of the equipment installed. These questions reference both the overall effect of the program (including staff recommendations and any technical assistance) and the specific effect of the financial incentive. The questions are listed below. Please note that these questions are measure-specific and are repeated for up to two measure categories.

FR5 I'd like to go over all the assistance you received from <PA> for the electric <MEASCAT1 and MEASCAT2> equipment. According to our records, the total cost for the project implemented at your facility in <DATE> through the <PROGRAM> was about <TOTAL PROJECT COST>. <PROGRAM ADMINISTRATOR> paid about <INCENTIVE> of the total cost of the [IF EFFICIENCY APPLIES: ENERGY EFFICIENT] <MEASURE CATEGORY> project implemented through the program.

[10] The instrument is designed to handle both rebated equipment (e.g., HVAC equipment) and rebated services (e.g., boiler tune-ups). However, as this study only addresses equipment, the memo does not include any references to rebated services.

[IF NO <STUDY>: You may have also received some technical assistance from a <PROGRAM ADMINISTRATOR> rep, engineer, or equipment vendor.]

[IF <STUDY>: As I previously mentioned, <PA> also paid <TACOST> for a <STDYTYPE>.]

[IF <FINANCE> = Yes] <PA> also provided interest-free financing for up to 24 months for your portion of the project costs.

If <PROGRAM ADMINISTRATOR> had not paid a portion of the implementation cost OR provided any technical assistance or education [IF <FINANCE> = Yes: OR provided interest-free financing], [IF <GASPROJ=1>: or you had not received utility funding for the gas saving equipment], would your business have implemented any type of <MEASURE CATEGORY> project at the same time?

FR6A Would you have implemented the <MEASURE CATEGORY> project earlier than you did, at a later date, or never?

FR6B How much [EARLIER/LATER] would you have implemented the <MEASURE CATEGORY> project?

FR7A Without the program incentive and technical assistance or financing, would your business have implemented the exact same quantity of <MEASURE CATEGORY> equipment [IF FR5=YES OR DK: AT THAT SAME TIME; IF FR5=2: WITHIN (TIMEFRAME IN FR6B)]?

FR7B Compared to the amount of <MEASURE CATEGORY> equipment that you implemented through the <PA> program, what percent of the [IF GAS PROJECT: electric savings portion of the] project do you think your business would have purchased on its own during that timeframe?

FR8A You said your business would have installed [IF FR7A=YES: all; IF FR7A= NO: (FILL WITH FR7B %), IF FR8 = DK/R, FILL IN WITH "SOME"] of the equipment on its own if the program had not been available.

Thinking about the <MEASURE CATEGORY> equipment you would have installed on your own, what percent of this equipment would have been in each of the following categories which should sum to 100%: same high efficiency as what was installed through the program?

FR8B (What percent would have been of) lower efficiency than what was purchased but higher than standard efficiency or code?

FR8C[11] And of standard efficiency or code?

[11] For measures where quantity is not applicable but efficiency levels do vary, this question is combined into one item: FR8D.

3.2.4 Consistency check questions

The instrument also included questions that would identify and correct inconsistent responses. For example, if participants reported that they were likely to install the equipment without the program but also reported that they would not have installed the energy efficient equipment within four years, the interviewer asked them to confirm which statement was more accurate. These questions are listed below.

FR1 On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have implemented the same [IF QUANTITY VARIES: QUANTITY AND] [IF EFFICIENCY APPLIES: EFFICIENCY OF] <MEASURE CATEGORY> at that same time if the <PROGRAM ADMINISTRATOR> had not provided the <ALL ASSISTANCE>?

C3 On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did the <INC> you received from <PROGRAM ADMINISTRATOR> have on your decision to implement the [IF EFFICIENCY APPLIES: HIGH EFFICIENCY] <MEASURE CATEGORY> project?

C4A Now I want to focus on what it would have cost your business to install this equipment on its own without the program. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have paid the additional <INC> on top of the amount you already paid, to implement the same quantity and efficiency of <MEASURE CATEGORY> equipment at that same time?

C8 [ASK IF FR1 > 3 AND FR6b >24/48 MONTHS OR NEVER] Earlier in the interview, you said there was a [FR1 SCORE] in 10 likelihood that you would have implemented the same quantity and efficiency of <MEASURE CATEGORY> equipment at that same time in the absence of the program assistance. But you also said you would not have implemented the <MEASURE CATEGORY> project within 2/4 years of when you did. Which of these is more accurate?

C9 I'd like to better understand your purchase decision. In your own words, please describe what impact, if any, all the assistance you received through the program had on your decision to install the energy efficient <MEASURE CATEGORY> equipment at the time you did and in the quantity you did?

As inputs into the algorithm, Tetra Tech constructed a scoring system based on the influence and consistency check questions above. The scoring calculates two scores: a quantity score and an efficiency score. The quantity score represents the percentage of the incentivized equipment that would have been installed in absence of the program. The efficiency score is the percentage of savings *per unit installed* that would have occurred without the program. For equipment that is reported to be more efficient than standard but less efficient than what was installed through the program, we assume 50 percent of the savings for those measures. Multiplying these two scores together gives the percent of the incentivized savings that would have occurred without the program. This percentage is the raw free-ridership estimate. Table 3-2 details these calculations.

Table 3-2. Quantity and Efficiency Scores

Score	Responses	Result
Quantity Score (FR_QTY)	If would have installed same quantity without program (FR7A = YES)	FR_QTY = 1
	If would have installed fewer quantity without program (FR7A = NO)	FR_QTY = FR7B
	If never would have installed (FR6A = never)	FR_QTY = 0
Efficiency Score (FR_EFF)	If would have installed at least some equipment on their own	FR_EFF = FR8A + (FR8B*.50)
	If never would have installed (FR6A = never)	FR_EFF = 0
	If insulation and would not have installed same R value	FR_EFF = RVL2
Initial Free-ridership Score	The percent of the rebated savings that would have occurred without the program.	FR_EFF * FR_QTY

The product of these two scores is then adjusted by a timing factor. The timing factor adjusts the raw free-ridership estimate downward for all or part of the savings that would have occurred without the program, but not until much later. By doing so, the program is given credit for accelerating the installation of energy efficient equipment. For example, if the participant states that he or she would have installed equipment at the same time regardless of the program, the quantity-efficiency factor is not adjusted. However, if the participant states that, without the program, they would have completed the project more than six months later than they actually did, any free-ridership identified in the quantity-efficiency factor is adjusted downward[12]. The degree of the adjustment depends on the program. As the equipment planning schedule for small businesses is likely shorter than the planning schedule for large businesses, small business programs receive a greater acceleration benefit. This reduced adjustment for small businesses reflects the increased effect the program has on the planning schedule. This adjustment is detailed in Table 3-3 and visualized in Figure 3-1.

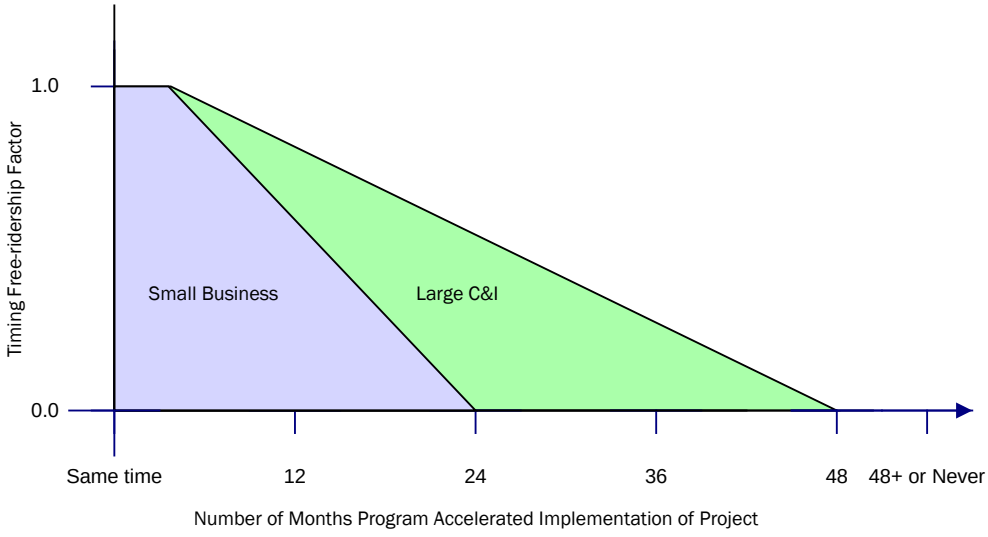
Table 3-3. Timing Factor Adjustment

Score	Responses	*Result*
Timing Factor—Small Business Programs (FR_TIMING)	Would have installed at the same time without the program (FR5 = Yes)	*FR_TIMING = 1*
	Would have installed within six months of when participant actually did without the program (FR6b <= 6 months)	*FR_TIMING = 1*
	Would have installed sometime between 7 and 24 months of when participant actually did without the program (FR6b > 6 months & < 24 months)	*FR_TIMING = 1-((FR6B-6) * .056)*

[12] Projects that were accelerated by fewer than 6 months are not adjusted. As installation timelines are subject to shifting, we assume these projects are just as likely to have been installed at the same time.

Score	Responses	*Result*
	Would have installed sometime after 24 months of when participant actually did without the program (FR6b > 24 months)	*FR_TIMING = 0*
	Would have never installed without the program (FR6A = Never)	*FR_TIMING = 0*
Timing Factor—Large Business Programs (FR_TIMING)	Would have installed at the same time without the program (FR5 = Yes)	*FR_TIMING = 1*
	Would have installed within six months of when participant actually did without the program (FR6b ≤ 6 months)	*FR_TIMING = 1*
	Would have installed sometime between 7 and 48 months of when participant actually did without the program (FR6b > 6 months & < 48 months)	*FR_TIMING = 1-((FR6B-6 * .024)*
	Would have installed sometime after 48 months of when participant actually did without the program (FR6b > 48 months)	*FR_TIMING = 0*
	Would have never installed without the program (FR6A = Never)	*FR_TIMING = 0*
Adjusted Free-ridership Score	*The raw free-ridership estimate adjusted for all or part of the savings that would have occurred without the program, but not until much later*	*FR_TIMING * Initial Free-ridership Score*

Figure 3-1. Timing Free-ridership Factor by Number of Months the Program Accelerated Implementation



This adjusted score is reviewed for consistency and, if applicable, for vendor influence via a follow-up interview with vendors that are rated influential by participants. Questions FR4 and C1

(below) are used to assess vendor influence. Details regarding the Influential Vendor survey are discussed in the next section.

FR4 Who was MOST responsible for actually recommending or specifying the [IF EFFICIENCY IS APPLICABLE: high efficiency] <MEASURE CATEGORY> project that was implemented through the <PROGRAM>?

C1 On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did (FR4 response) have on your company's decision to implement the [IF EFFICIENCY IS APPLICABLE; high efficiency] <MEASURE CATEGORY> project so that it would qualify for the program?

3.2.5 Influence of technical assessment

The initial free-ridership score is further adjusted by the influence of any program-sponsored technical assistance or audit, the influence of the gas project and by the influence of previous program participation. If a participant rates the influence of the technical assistance as high (7 or greater on a scale of 0-10), the free-ridership score is reduced by half. This reduction is necessary because the previous factors focus on the specific effect of the program incentive and the overall effect of the program. Without this adjustment, the influence of the technical assessment is under-represented.

C2 On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did the information provided by the <STUDY> have on your decision to implement the [IF EFFICIENCY IS APPLICABLE*:* high efficiency] <MEASURE CATEGORY> project?

3.2.6 Influence of natural gas project

A further adjustment is made for the influence of having installed gas equipment at the same time. If a participant rates the influence of the gas project as high (7 or greater on a scale of 0 to 10), the free-ridership score remains the same. If the participant rated the influence of the gas project a six or less, the free-ridership score is reduced by half. Similar to the technical assessment, this reduction is necessary because the previous factors focus on the specific effect of the program incentive and the overall effect of the program. Without this adjustment, the influence of providing a comprehensive project (one that includes both gas and electric) is understated.

FR5a You said you also had some gas equipment installed through a Massachusetts utility program. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have implemented the same <IF QUANTITY IS APPLICABLE: quantity> < IF EFFICIENCY IS APPLICABLE: and efficiency of> electric savings <MEASURE CATEGORY> at the same time if <PA> had not also provided funding for gas savings equipment at about that same time?

3.2.7 Influence of past program participation

Likewise, if a participant has previously participated in the program, they are asked about the influence of that past participation on their perceptions and behaviors. Participants are asked to state whether they agree or disagree with four statements about the effect past participation has had on their decision-making. Based on the number of statements with which they agree, their

free-ridership is reduced by 75 percent, 37.5 percent, or not reduced at all. This reduction is done to account for the influence positive program experiences have had on participants' purchasing decision—with the program administrators, implementers, or the equipment incented.

PP3 I'm going to read you several statements. For each statement, please tell me whether you agree or disagree that this statement applies to your business. There are no right or wrong answers; we just want your honest opinion.

Our previous experience implementing energy efficient projects through the <PA> program. . . .

a. Has made our firm more likely to consider energy efficient equipment
b. Has made our firm more likely to install energy efficient equipment
c. Has given us more confidence in the financial benefits of energy efficient equipment
d. Has given us more confidence in the nonfinancial benefits of energy efficient equipment

As mentioned previously, the previous program participation adjustment is made to account for the market effects associated with over 20 years of energy efficiency programs in Massachusetts. These market effects will result in net savings estimates that do not capture the full cumulative effect of the program. This methodology attempted to capture some of these market effects by making this adjustment for previous program participation. While it could be argued that the influence of previous participation should count as spillover rather than reduced free-ridership, the traditional definition of spillover does not count measures installed through a program as spillover. Table 3-4 details these adjustments.

Table 3-4. Adjustments for the Influence of Technical Assessments, Electric Project, and Previous Participation

Adjustment	Responses	Result
Technical Assessment Adjustment	No technical assessment, audit, or study conducted	No adjustment
	Participant would have performed assessment, audit, or study without program assistance or it was not influential (C2 ≤ 6)	No adjustment
	Participant **would not** have performed assessment, audit, or study without program assistance and it was influential (C2 > 6)	Adjusted Free-ridership Score * .5
Gas Impact Adjustment	No electric equipment installed at the same time	No adjustment
	Participant **was not likely** to have installed electric equipment without gas equipment (FR5a <= 6)	Adjusted Free-ridership Score * .5
	Participant **was likely** to have installed electric equipment without gas equipment (FR5a > 6)	No adjustment
	No previous participation in program	No adjustment

Adjustment	Responses	Result
Previous Participation Adjustment	Agrees with four statements regarding the positive influence of past participation (PP3)	Adjusted Free-ridership Score * .25
	Agrees with three statements regarding the positive influence of past participation (PP3)	Adjusted Free-ridership Score * .625
	Agrees with two or fewer statements regarding the positive influence of past participation (PP3)	No adjustment

Flowchart diagrams detailing these calculations have been included in Appendix F of this report.

3.2.8 Participant "like" spillover

The "like" spillover estimates are computed based on how much more of the same energy-efficient equipment the participant installed outside the program that were, in fact, influenced by the program. The following questions, in conjunction with the savings assigned to that same equipment by the program, are used to estimate possible spillover savings:

S1A Now I'd like you to think of the time since you participated in the <PROGRAM> in <DATE>. Has your company implemented any <MEASURE CATEGORY> projects for this or other facilities in Massachusetts **on your own,** that is without a rebate from <PA>?

S1B Was this equipment of the same efficiency level or a higher level of efficiency as the equipment you installed through the program?

S1C Was this equipment more energy efficient than standard efficiency or code equipment?

S2A Thinking of the <MEASURE CATEGORY> equipment that you installed on your own, was this more, less or the same amount of <MEASCAT 1, MEASCAT 2> equipment as what you installed through the program?

For respondents that answer "Yes" to S1A and S1B, spillover savings are calculated as the measure-specific savings identified by the program multiplied by the quantity identified in S2A. For respondents that answer "Yes" to S1A and S1C, spillover savings are calculated as 50 percent the measure-specific savings identified by the program multiplied by the quantity identified in S2A. If the respondent answers "No" to S1A or S1C, there are no identifiable "like" spillover savings.

For those measures, a program-attributable spillover rate is then calculated based on the following questions:

S3A Did a recommendation by the contractor, engineer, or designer who you worked with under the <PROGRAM> influence your decision to implement some or all of this [IF EFF = 1: EFFICIENT] <MEASURE CATEGORY> equipment on your own?

S3B Did your experience with the energy efficient projects implemented through the <PROGRAM> influence your decision to implement some or all of this [IF EFF = 1: EFFICIENT] <MEASURE CATEGORY> equipment on your own?

S3C Did your participation in any past program offered by <PROGRAM ADMINISTRATOR> influence your decision to implement some or all of this [IF EFF = 1: EFFICIENT] <MEASURE CATEGORY> equipment on your own?

S3D On a scale of 0 to 10, where 0 is "no influence at all" and 10 is "a great deal of influence", how much influence did your participation in the <PA> program have on your decision to install this equipment without an incentive?

S4a Why didn't you implement this <MEASURE CATEGORY> project through a <PA> program?

S4b [IF THE EQUIPMENT WOULD NOT QUALITY] Why wouldn't the equipment qualify?

If the respondent reports that the contractor influenced their decision to install the like equipment on their own, we attribute the program with 50 percent of those savings based on the influence the program has on the trade allies. If the respondent reports that either their experience with the program-sponsored project or past programs influenced their decision to implement the like equipment, we attribute the program with 100 percent of the spillover savings.

To summarize:

If (S3A=yes AND (S3B = no AND S3C = no)), spillover rate = 50%.

If (S3B=yes OR S3C = yes), spillover rate = 100%.

That rate, applied to the estimated spillover savings, results in the program-attributable spillover savings for that participants.

Customers who indicated that they purchased 'like' lighting equipment without a PA incentive were provided to DNV GL to cross check against the commercial upstream lighting data. DNV GL used two checks to identify which spillover accounts may have participated in an upstream program. The first was to use the phone number and identify participants in the upstream datasets that match and then manually verify the customer's name and address for matched records. This returned a series of matches, but the manual verification identified that in many situations the phone number and customer matched but the location identified was not a match.

A second identification check was executed by loading the spillover account locations to a geographic information system, cleaning and standardizing the addresses, and then matching which locations from the spillover accounts also occurred in the upstream datasets. This returned a larger series of matches, which included some of the phone matches. Validation checks were manually conducted to verify that the customers and addresses were consistent. For records that did not have an address match (e.g. only a zip code matched) an additional check was conducted.

Records that came back as a match had their upstream lighting kWh savings subtracted from the like spillover savings. A total of 21 records with spillover savings were adjusted .

3.2.9 Participant “unlike” spillover

In addition to “like” spillover, the 2014 study also measured “unlike” spillover (i.e., measures outside of those installed through the program). To establish spillover savings, program eligibility was used as a proxy for energy efficiency. The following questions were used to identify “unlike” spillover.

S5 Since participating in the <PROGRAM>, had your company purchased, installed, or implemented any other type of energy efficient equipment on your own, that is without a rebate from <PA>?

S6 What type of energy efficient equipment did you install on your own?

What quantity of energy efficient equipment did you install?

What size or capacity of energy efficient equipment did you install?

S7A Would this project have qualified for an incentive through the <PROGRAM>?

Once identified, program influence needs to be established. Using the same methodology as with “like” spillover, we ask a series of questions to determine if the spillover is program-attributable spillover:

S7B Did a recommendation by the contractor, engineer, or designer who you worked with under the <PROGRAM> influence your decision to implement some or this equipment on your own?

S7C Did your experience with the energy efficient projects implemented through the <PROGRAM> influence your decision to implement some or this equipment on your own?

S7D Did your participation in any past program offered by <PA> influence your decision to implement some or all of this equipment on your own?

As with “like” spillover, if the respondent reports that the contractor influenced their decision to install the like equipment on their own, we attribute the program with 50 percent of those savings based on the influence the program has on the trade allies. If the respondent reports that either their experience with the program-sponsored project or past programs influenced their decision to implement the “unlike “equipment, we attribute the program with 100 percent of the spillover savings.

However, given the difficulties in estimating savings for these installations using regular telephone interviews, we present only observations of “unlike” spillover and not savings estimates.

4. VENDOR/DESIGN PROFESSIONAL SURVEY QUESTIONS

4.1 OVERVIEW OF INFLUENTIAL VENDOR SURVEY QUESTIONS

As mentioned earlier, we attempted to contact vendors and design professionals identified by program participants as being most influential in their decision to install the electric saving measures through the program (Questions FR4 and C1 discussed above). A separate survey tailored to these designers/vendors was administered for the purposes of estimating free-ridership (see Appendix C).

Design professionals'/vendors' responses to the free-ridership questions replaced participants' responses if the designer/vendor agreed they were most influential (VA3 = 4 or 5). If the designer/vendor did not agree they were the most influential (VA3 is less than 4), or if attempts to survey the designer/vendor failed, the customer's responses were used to estimate free-ridership.

4.1.1 Design professional/vendor's identification of decision maker

Participant-identified design professionals/vendors were first asked a series of introductory questions designed to verify that they were influential in the decision to install the equipment (V1a > 6). The questions are shown below:

Table 4-1. Design Professional/Vendor's Identification of Decision-maker

Item	Text
V1A	First I'd like to ask you about your decisions to recommend <MEASURE CATEGORY> project through the program. Were you involved in the decision-making process at the design stage when the <MEASURE CATEGORY> project was specified and agreed upon for this facility?
V1B	*(IF NO)* At what point in the process did you become involved?
V1C	What was your role?
VA1	On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did your firm have on specifying the efficiency levels or features of <MEASURE CATEGORY> project so that it would qualify for the program?

4.1.2 Design professional/vendor free-ridership questions

The design professional/vendor free-ridership survey questions are a parallel version of the customer survey questions and are not discussed here. Questions from the customer version of the survey that are inappropriate for designers/vendors were not asked.

4.2 OVERVIEW OF NONPARTICIPANT SPILLOVER SURVEY QUESTIONS

Nonparticipant ***spillover*** refers to energy efficient equipment installed by program nonparticipants due to the program's influence. The program can have an influence on design professionals and vendors as well as an influence on product availability, product acceptance,

customer expectations, and other market effects, all of which may induce nonparticipants to buy high efficiency products.

An important issue related to the quantification of nonparticipant spillover savings is how to value the savings of equipment installed outside the program. Experience has shown that many customers cannot provide adequate equipment-specific data on new equipment installed either through or outside a program to a telephone interviewer. Although they are usually able to report what type of equipment was installed, they typically cannot provide sufficient information about the quantity, size, efficiency, and/or operation of that equipment to make a determination about its program eligibility.

Thus, it was decided to survey design professionals and equipment vendors who were more knowledgeable about equipment and who were familiar with what is/is not program-eligible. Since there were electric savings associated with design professionals or vendors (by measure category) in the program tracking system database for the PAs included in the study, we knew for each design professional/vendor the savings attributable to them for eligible equipment installed through the program.

To determine nonparticipant spillover, design professionals and equipment vendors were asked (by measure category) what percent of their sales to the customers of the PAs participating in the nonparticipant component of the study met or exceeded the program standards for each program measure category installed through the program(s) and what percent of these sales did not receive an incentive. They were then asked several questions about the program's impact on their decision to recommend/install this efficient equipment outside the program. Using the survey responses and measure savings data from the program tracking system, the potential nonparticipant spillover savings could be estimated for each design professional/vendor and the results extrapolated to the total program savings.

This method of estimating nonparticipant spillover is a *conservative* estimate for two reasons. First, not all design professionals and equipment vendors who are familiar with the programs will have specified and/or installed equipment through the program during the study period. Thus, we miss any nonparticipant spillover that is associated with these other design professionals/vendors (although it is less likely these design professionals/vendors had nonparticipant spillover if they are not involved with the programs).

Second, this method only allows extrapolation of nonparticipant spillover ***for those same measure categories that a particular design professional/vendor is associated with in the program database***. Thus, if a vendor installed program-eligible equipment in other equipment categories outside the program, but none through the program, this method does not capture nonparticipant spillover savings for that particular type of equipment. In essence, this method measures only "like" nonparticipant spillover; that is, spillover for measures like those installed through the program during the study period.

Four steps were used to determine nonparticipant "like" spillover:

1. For each design professional/vendor, the survey determined the percentage of all program-eligible equipment sold/installed outside the program in utilities' territories.
2. For each design professional/vendor, the survey determined whether the sale or installation of program-eligible equipment outside the program was due to the program (nonparticipant spillover).

3. For each design professional/vendor, savings associated with this "nonparticipant spillover" equipment were determined by examining the participant database and quantities installed.
4. Nonparticipant spillover savings were then extrapolated from the survey to the total program savings in the year.

Each of these steps is discussed in more detail below.

4.2.1 Step 1: Determine the percentage of all program-eligible equipment installed outside the program

Using the program database, we identified which equipment design professionals/vendors installed, and how that equipment fit into measure categories. For measure categories they installed through the program, design professionals/vendors were asked what percent of the equipment would have been eligible for the programs and what percent of that eligible equipment did not receive an incentive through the programs. Those who said some of the eligible equipment did not receive an incentive through the programs are included in Step 2 of the nonparticipant spillover analysis.

VNP1a Our records show that your firm specified, sold, and/or installed <MEASURE CATEGORY> to Commercial and Industrial customers in 2013 through <PROGRAM>. This includes equipment such as <DETAILED DESCRIPTION>. Is that correct?

VNP2 Please think about all the program-eligible <MEASURE CATEGORY> you specified, sold and/or installed for <PA> customers in 2013. Did you specify, sell, and/or install any of this program-eligible <MEASURE CATEGORY> to customers of <PA> ***without*** the customer participating in a <PA> program?

VNP3 (IF VNP2 = Yes) What percent of all of this program-eligible <MEASURE CATEGORY> you specified, sold and/or installed for <PA> customers in 2013 did <u>not</u> receive an incentive through a <PA> program?

4.2.2 Step 2: Determine whether the program-eligible equipment specified/installed outside the program was due to the program

A number of additional questions were asked of design professionals/vendors who had program kWh savings associated with the types of program-eligible equipment specified/installed outside the program. These questions measured the causal effect of the program on design professionals/vendors actions. These questions and the preliminary nonparticipant “like” spillover rate are shown below.

VNP5 I’m going to read you 3 statements. For each statement, please tell me whether you agree or disagree that this statement applies to your company. There are no right or wrong answers; we just want your honest opinion.

Our past experience specifying or installing <MEASURE CATEGORY> through energy-efficiency programs has convinced us that this equipment is cost effective or beneficial even without a program incentive.

VNP6 We are better able to identify opportunities to improve energy efficiency by using high efficiency <MEASURE CATEGORY> because of our previous experience with the performance of energy efficient equipment installed through energy efficiency programs, and what we learned through working with <PA>.

VNP7 We are more likely to discuss energy efficient options with all of our customers when developing project plans for <MEASUARE CATEGORY> because of our previous experience with the performance of energy efficient equipment installed through energy efficiency programs, and what we learned through working with <**PA**>.

Based on these responses, we calculated a preliminary nonparticipant "like" spillover rate, as shown in the table below.

Table 4-2. Preliminary Nonparticipant "Like" Spillover Rate

# of Agreements to VNP5–VNP7	Preliminary Nonparticipant "Like" Spillover Rate
3	**100%**
2	**50%**
1 or 0	**0%**

A. Nonparticipant spillover consistency checks

To improve the reliability of the nonparticipant spillover estimates, two consistency check questions were also asked:

VNP4 In 2013, you mentioned that about [VNP3] of the <MEASURE CATEGORY> you specified, and/or installed would have been eligible for an incentive through a <PA> program, but did not receive an incentive.

What are the main reasons why your firm did not request a customer incentive from a utility for this energy saving equipment you specified/installed?

VNP8 Please describe what impact, if any, the <PROGRAM> had on your decision to specify or install energy efficient <MEASURE CATEGORY> outside of the program.

Note that in the preliminary "like" spillover questions, we asked the respondent to refer to program-eligible equipment. Therefore, we ideally would have no cases that provide the response "did not qualify" to VNP4. However, in the event this response was provided, the preliminary nonparticipant estimate is reduced by 50 percent. We did not completely exclude "did not qualify" measures as nonparticipant spillover since this response only suggested some uncertainty about the eligibility requirements.

The final consistency question was asked to ensure that the responses given to the first set of nonparticipant spillover questions were consistent. The response to this last question was visually examined by the evaluator. If the response to the last question contradicted the other responses, the adjusted nonparticipant spillover rate was reduced by one-half or doubled. For example, if a vendor agreed with all three statements about the impact of their past experience with the program on the installation of program-eligible equipment outside the program, they received a preliminary nonparticipant spillover estimate of 100 percent. If the main reason why they did not have the customer apply for the incentive was something other than "didn't qualify"

(e.g., wasn't worth the paperwork hassle), the adjusted nonparticipant spillover rate remained at 100 percent. If, however, in the open-ended question the vendor said, “I would say that, let's see, it really didn't impact the business because our business is driven by more than rebates” or “I don't think it's had much” or “almost no” impact, the final nonparticipant spillover rate was reduced to 50 percent. These responses may indicate that the program influenced a number of installations/sales but the customer/vendor did not want to prepare the paperwork to get the incentive.

4.2.3 Step 3: Determine the savings associated with this nonparticipant spillover equipment

At the end of Step 2, respondents with nonparticipant spillover were assigned a nonparticipant spillover percent for one or more measure categories. As illustrated in the footnote at the bottom of this page, the third step associated kWh savings with each nonparticipant spillover measure for each respondent.[13]

For example, assume a vendor had 2,000 kWh savings in the program tracking system database attributable to lighting measures. If that vendor said that 25 percent of all their program-eligible motors were sold outside the program, the potential nonparticipant spillover savings would be (2,000 kWh * 0.25/(1–0.25) = 667 kWh). If this vendor was assigned (in Step 2) a nonparticipant spillover rate of 100 percent for motors, the nonparticipant spillover kWh savings for that vendor remains at 667 kWh. But if that same vendor was assigned (in Step 2) a nonparticipant spillover rate of only 50 percent for program-eligible motors, the nonparticipant spillover kWh savings for that vendor was 667 * 0.5 = 334 kWh. This type of calculation was made by measure category for each design professional and vendor who had a nonparticipant spillover rate of more than 0 percent.

As discussed earlier under the measurement of participant spillover, the participating customer survey and analysis included calculations of “like” spillover. “Like” spillover was defined as measures exactly like the participant’s measures installed through the program that the participant installed at a later time *and* for which they did not receive an incentive even though

[13] The formula for calculating kWh savings for each measure was derived as follows:

Definitions:

a = Gross kWh in program tracking system database (measures that received an incentive)
b = Percent of program-eligible equipment that received no incentive (survey question)
x = kWh nonparticipant spillover (spillover reported by design professional/vendor—”like” spillover by participants associated with design professional/vendor)

Solve for x:

Total kWh for all program-eligible equipment= kWh savings for efficient equipment sold through program + kWh savings for efficient equipment sold outside the program = a+x
b = nonparticipant spillover/total kWh = x/(a+x)

Therefore:

b = x/(a+x)
solving for x yields
x = b*a/(1-b)

Nonparticipant spillover = fraction of equipment receiving no incentive * kWh in database/(1 - fraction of equipment receiving no incentive).

they said the program influenced their decision. To avoid double-counting the spillover for the same measures reported by both participants and their design professionals/vendors, we eliminated any savings that had been identified as "like" spillover by participants and that were also associated with a design professional or vendor who had demonstrated nonparticipant spillover for the same measure category. This conservative approach was based on the assumption that the same design professional or vendor was involved in the participant's "like" spillover project.

4.2.4 Step 4: Extrapolate the survey nonparticipant spillover savings to the total vendor population savings during the study period

The last step in the nonparticipant spillover estimation involved extrapolating the results to all vendors in the program tracking system database for each measure category. This was done by first calculating the ratio of nonparticipant spillover as determined from the vendor survey. This ratio (the estimated spillover percent) was then applied to the kWh savings represented by vendors in the program tracking system database.

For example, if the survey covered a total of 857,814 kWh in measure category savings and the surveyed nonparticipant spillover totals 62,221 kWh for that measure category, surveyed nonparticipant spillover divided by the surveyed total kWh savings is 7.3 percent. This identified nonparticipant spillover savings was extrapolated to all vendors related to the programs by proportionally applying the identified savings to each program at the measure-level. In cases where a given PA had more participant like spillover than the vendor reported spillover rate, the participant like spillover rate represents the like spillover estimate for that PA.

5. FREE-RIDERSHIP AND SPILLOVER STUDY RESULTS

This section presents the results of the 2013 electric free-ridership and spillover study. First, we present summary tables that include statewide figures. Following the summary tables, we present detailed results for each PA. The detailed results include free-ridership and spillover rates by measure type and by program, along with corresponding error margins. We then present observations of participant "unlike" spillover for each PA. All savings are presented as kWh.

Nonparticipant spillover was assessed at the statewide level, resulting in statewide estimates by measure type. These estimates were then applied to each PA program that offered that measure type. As previously mentioned, in cases where a given PA had more participant like spillover than the vendor reported spillover rate, the participant like spillover rate represents the like spillover estimate for that PA.

5.1 STATEWIDE RESULTS

Table 5-1 summarizes the free-ridership and spillover estimates by PA and program. The statewide free-ridership rate is 11.9 percent, the participant spillover "like" rate is 6.9 percent, and the nonparticipant like spillover rate is 1.2 percent, resulting in a statewide net-to-gross rate (NTGR) of 96.1 percent.

Overall, the statewide NTGRs were relatively stable among 2010 and 2013 participants (96 and 98 percent, respectively). However, NTGRs varied dramatically by end use both between evaluation years and among PAs for a given year. Two factors driving this variability that we were able to observe were: 1) the categorization of measures into end uses varied between PAs and over time, and 2) some end uses and PAs had a small number of participants that make the estimates more volatile.

Across time, end uses such as Process, Motors & Drives and Lighting were the most stable across the two evaluation years with NTGRs above 90 percent.

Table 5-1. 2013 C&I Electric Free-ridership and Spillover Results Summary

PA	Program	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate
Cape Light Compact	C&I New Construction	7	21	1,042,806	67.7%	NA	2.0%	NA	3.7%	37.9%
	C&I Prodcuts and Services	7	20	87,327	8.5%	NA	0.0%	NA	1.8%	93.3%
	Government New Construction	0	1	17,206	NA	NA	NA	NA	0.8%	NA
	Medium and Large C&I Retrofit	3	33	1,642,734	4.9%	NA	0.0%	NA	9.6%	104.7%
	Medium and Large Government Retrofit	2	11	201,776	0.0%	NA	76.7%	NA	0.7%	177.5%
	Small C&I Retrofit	103	322	2,962,411	9.2%	3.8%	10.4%	12.6%	1.6%	102.8%
	Small Government Retrofit	26	108	1,532,181	8.9%	7.9%	19.4%	10.2%	0.1%	110.5%
	Total	**148**	**516**	**7,486,441**	**16.4%**	**3.8%**	**11.4%**	**9.0%**	**3.2%**	**98.1%**

PA	Program	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate
National Grid	Design 2000plus	116	481	38,668,804	25.1%	5.7%	28.4%	5.3%	0.5%	103.8%
	Energy Initiative	218	1,107	132,692,918	7.8%	3.0%	3.4%	1.4%	0.0%	95.6%
	Small Business	151	1,649	36,441,497	6.6%	2.2%	2.7%	2.7%	0.2%	96.4%
	Total	**485**	**3,237**	**207,803,219**	**10.8%**	**2.2%**	**7.9%**	**1.6%**	**0.1%**	**97.2%**
NSTAR	Direct Install	234	2,613	49,040,289	5.0%	2.4%	5.5%	2.2%	0.2%	100.8%
	New Construction	109	432	50,205,545	26.8%	5.6%	2.6%	3.0%	1.7%	77.5%
	Retrofit	167	966	179,831,020	8.9%	2.9%	7.1%	5.9%	0.5%	98.7%
	Total	**510**	**4,011**	**279,076,854**	**11.4%**	**2.0%**	**6.0%**	**2.3%**	**1.9%**	**96.6%**
Unitil	C&I Large Retrofit	4	12	3,287,424	66.0%	NA	8.4%	NA	4.6%	47.0%
	C&I New Construction	2	2	61,464	96.9%	NA	1.5%	NA	0.0%	4.6%
	C&I Small Retrofit	31	67	1,534,155	8.7%	NA	1.6%	NA	0.4%	93.3%
	Total	**37**	**81**	**4,883,043**	**34.2%**	**NA**	**4.4%**	**NA**	**0.5%**	**70.7%**
Western Massachusetts Electric Company	New Construction	57	135	10,641,980	21.0%	NA	1.2%	NA	3.5%	83.7%
	Retrofit	76	192	24,789,814	27.7%	NA	2.8%	NA	2.6%	77.6%
	Small Business Energy Advantage	94	612	16,372,181	5.2%	2.6%	14.3%	18.8%	0.0%	109.1%
	Total	**227**	**939**	**51,803,975**	**18.1%**	**3.3%**	**6.6%**	**8.5%**	**0.7%**	**89.2%**
MA Overall		**1,407**	**8,784**	**551,053,532**	**11.9%**	**1.3%**	**6.9%**	**1.9%**	**1.2%**	**96.1%**

* Error margins do not apply when a census of records were sampled

Table 5-2 presents statewide free-ridership and spillover rates for each measure type combined across all PAs and programs. The CHP measure type has the lowest level of free-ridership (0.7 percent) although results are based on two respondents. The unitary HVAC measure type has the highest free-ridership rate (36.2 percent).

Table 5-2. 2013 Statewide C&I Electric Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	1	4	88,802	25.0%	NA	0.0%	NA	NA	75.0%
CHP	2	7	45,880,066	0.7%	NA	0.0%	NA	NA	99.3%
Comprehensive	17	46	22,718,999	15.8%	NA	0.0%	NA	0.0%	84.2%
Compressed Air	79	206	10,454,965	32.0%	6.9%	2.5%	3.5%	2.1%	72.6%
Custom	99	498	97,353,438	9.5%	4.5%	10.6%	5.9%	0.0%	101.2%
Hot Water	11	33	209,411	11.3%	NA	0.0%	NA	NA	88.7%
HVAC	134	460	77,537,351	19.3%	5.0%	7.1%	6.7%	0.0%	87.7%
Lighting	649	5,974	211,810,103	11.9%	1.7%	9.3%	2.7%	0.0%	97.3%
Motors/Drives	122	389	22,950,851	14.8%	4.1%	3.1%	4.9%	24.1%	112.5%

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate
Non-lighting	66	352	6,399,756	2.5%	2.8%	7.2%	5.1%	NA	104.7%
Non-unitary HVAC	7	50	1,216,491	1.5%	NA	0.0%	NA	0.0%	98.5%
Other	0	1	9,688	NA	NA	NA	NA	NA	NA
Process	32	61	9,873,287	6.5%	NA	2.3%	NA	0.0%	95.8%
Refrigeration	115	488	11,016,314	11.6%	3.4%	1.3%	14.5%	0.0%	89.7%
Unitary HVAC	14	72	267,391	36.2%	NA	0.6%	NA	0.0%	64.4%
VFD	59	143	33,266,618	8.0%	NA	0.0%	NA	0.0%	92.0%
Total	**1,407**	**8,784**	**551,053,532**	**11.9%**	**1.3%**	**6.9%**	1.9%	**1.2%**	**96.1%**

* Error margins do not apply when a census of records were sampled

5.2 DETAILED PA RESULTS

Results for each PA are presented for each measure type and program. The measure type categories were chosen by the PAs, and measure type was assigned based on the equipment installed. Table 5-3 details which equipment were assigned to which measure type classification.

Table 5-3. Breakdown of Equipment in Measure Type Categories

Measure Type	Equipment
Building Envelope	Windows, Insulation, Air sealing
CHP	Combined heat and power
Comprehensive	CDA
Compressed Air	VSD compressors, Load/no load compressor, VSDs
Custom	Lighting, Motors, Chillers, Controls, Doors, System upgrades
HVAC	HVAC equipment and systems, EMS, Heat Pump, Thermostat, A/C unit, Furnace, Snack and beverage vending machines, Occupancy sensors, Building shell
Hot Water	Spray valves
Lighting	LED fixtures and bulbs, Occupancy sensors, CFLs, Daylight dimming
Motors & Drives/VFD	Variable frequency drives, Evaporative fan ECM, Controls for pump, Fans, Water pump
Non-lighting	LED Coolers, ECMs, Vending machines, Refrigeration, Controls, Motors and drives
Non-unitary HVAC	Air cooled chiller, ECM motors, Demand control ventilation
Other	Combi-oven
Process	Electric oven, Water pumping equipment, Injection molding machine
Refrigeration	Cooler miser, Cooler night cover, Cooler controls, Snack miser, economizer
Unitary HVAC	AC equipment, Air to air heat pump system

5.2.1 Cape Light Compact results

Table 5-4 presents Cape Light Compact's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 98.1 percent. The Small C&I Retrofit program, which had the highest participation, had a free-ridership rate of 9.2 percent and participant spillover of 10.4 percent. The Small Government Retrofit program had a free-ridership rate of 8.9 percent and 19.4 percent participant like spillover. The remaining programs had low participation and limited respondent results.

Table 5-4. Cape Light Compact Electric C&I Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
C&I New Construction	HVAC	2	3	383,333	96.7%	NA	0.0%	NA	0.8%	4.1%
	Lighting	3	12	420,639	35.5%	NA	4.2%	NA	0.0%	68.7%
	Motors & Drives	0	1	130,484	NA	NA	NA	NA	27.2%	NA
	Process	2	4	96,047	93.2%	NA	0.0%	NA	0.0%	6.8%
	Refrigeration	0	1	12,303	NA	NA	NA	NA	0.0%	NA
	Total	**7**	**21**	**1,042,806**	**67.7%**	**NA**	**2.0%**	**NA**	**3.7%**	**37.9%**
C&I Prodcuts and Services	HVAC	5	17	74,793	8.6%	NA	0.0%	NA	0.8%	92.2%
	Lighting	1	2	9,666	10.0%	NA	0.0%	NA	2.0%	92.0%
	Motors & Drives	1	1	2,868	0.0%	NA	0.0%	NA	27.2%	127.2%
	Total	**7**	**20**	**87,327**	**8.5%**	**NA**	**0.0%**	**NA**	**1.8%**	**93.3%**
Government New Construction	HVAC	0	1	17,206	NA	NA	NA	NA	0.8%	NA
	Total	**0**	**1**	**17,206**	**NA**	**NA**	**NA**	**NA**	**0.8%**	NA
Medium and Large C&I Retrofit	Builidng Envelope	0	1	87,535	NA	NA	NA	NA	NA	NA
	HVAC	2	2	395,487	11.0%	NA	0.0%	NA	0.8%	89.8%
	Lighting	0	20	637,459	NA	NA	NA	NA	2.0%	NA
	Motors & Drives	1	9	489,596	0.0%	NA	0.0%	NA	27.2%	127.2%
	Refrigeration	0	1	32,657	NA	NA	NA	NA	0.0%	NA
	Total	**3**	**33**	**1,642,734**	**4.9%**	**NA**	**0.0%**	**NA**	**9.6%**	**104.7%**
Medium and Large Government Retrofit	HVAC	0	1	14,010	NA	NA	NA	NA	0.8%	NA
	Lighting	2	6	159,255	0.0%	NA	76.7%	NA	0.0%	176.7%
	Motors & Drives	0	2	5,094	NA	NA	NA	NA	27.2%	NA
	Refrigeration	0	2	23,417	NA	NA	NA	NA	0.0%	NA
	Total	**2**	**11**	**201,776**	**0.0%**	**NA**	**76.7%**	**NA**	**0.7%**	**177.5%**
Small C&I Retrofit	Builidng Envelope	0	1	388	NA	NA	NA	NA	NA	NA
	Hot Water	1	1	37,960	0.0%	NA	0.0%	NA	NA	100.0%
	HVAC	2	6	57,739	66.7%	NA	0.0%	NA	0.8%	34.1%
	Lighting	68	226	2,416,645	7.3%	4.1%	12.0%	19.0%	0.0%	104.8%
	Motors & Drives	15	38	224,780	5.8%	NA	2.7%	NA	24.6%	121.4%
	Refrigeration	17	50	224,899	20.3%	NA	5.1%	NA	0.0%	84.9%
	Total	**103**	**322**	**2,962,411**	**9.2%**	**3.8%**	**10.4%**	**12.6%**	**1.6%**	**102.8%**

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Small Government Retrofit	Builidng Envelope	1	2	879	25.0%	NA	0.0%	NA	NA	75.0%
	HVAC	3	5	71,710	6.0%	NA	0.0%	NA	0.8%	94.8%
	Lighting	22	89	1,421,894	9.1%	NA	20.3%	NA	0.0%	111.3%
	Motors & Drives	0	5	7,942	NA	NA	NA	NA	27.2%	NA
	Refrigeration	0	7	29,756	NA	NA	NA	NA	0.0%	NA
	Total	**26**	**108**	**1,532,181**	**8.9%**	**NA**	**19.4%**	**NA**	**0.1%**	**110.5%**
Total		**148**	**516**	**7,486,441**	**16.4%**	**3.8%**	**11.4%**	**9.0%**	**3.2%**	**98.1%**

* Error margins do not apply when a census of records were sampled

The Hot Water and Motors & Drives measure types had the lowest free-ridership rate (0.0 percent and 1.8 percent, respectively). The Process measure type had the highest free-ridership rate at 93.2 percent (based on 2 respondents) followed by the HVAC measure type (47.1 percent). The Lighting measure type had the highest participant like spillover (16.3 percent).

Table 5-5. Cape Light Compact Electric C&I Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	1	4	88,802	25.0%	NA	0.0%	NA	NA	75.0%
Hot Water	1	1	37,960	0.0%	NA	0.0%	NA	NA	100.0%
HVAC	14	35	1,014,278	47.1%	NA	0.0%	NA	0.8%	53.7%
Lighting	96	355	5,065,558	10.3%	3.6%	16.3%	13.7%	0.0%	106.0%
Motors & Drives	17	56	860,764	1.8%	NA	0.8%	NA	26.4%	125.4%
Process	2	4	96,047	93.2%	NA	0.0%	NA	0.0%	6.8%
Refrigeration	17	61	323,032	20.3%	NA	5.1%	NA	0.0%	84.9%
Total	**148**	**516**	**7,486,441**	**16.4%**	**3.8%**	**11.4%**	**9.0%**	**3.2%**	**98.1%**

* Error margins do not apply when a census of records were sampled

5.2.2 National Grid results

Table 5-6 presents National Grid's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 97.2 percent. The Small Business program had the lowest free-ridership rate at 6.6 percent. Design 2000plus had the highest free-ridership rate (25.1 percent) but also had the highest spillover rate (28.4 percent for participants and 0.5 percent for nonparticipants) which resulted in a net-to-gross rate of 103.8 percent.

Table 5-6. National Grid C&I Electric Free-ridership and Spillover Detailed Results

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Design 2000plus	Compressed Air	42	124	4,254,886	46.4%	NA	0.0%	NA	4.6%	58.2%
	Custom	31	129	28,488,664	22.9%	NA	34.6%	NA	0.0%	111.7%
	Lighting	20	88	3,279,579	19.1%	NA	34.2%	NA	0.0%	115.1%
	Non-unitary HVAC	7	50	1,216,491	1.5%	NA	0.0%	NA	0.0%	98.5%
	Other	0	1	9,688	NA	NA	NA	NA	NA	NA
	Unitary HVAC	14	72	267,391	36.2%	NA	0.6%	NA	0.0%	64.4%
	VFD	2	17	1,152,104	41.5%	NA	0.0%	NA	0.0%	58.5%
	Total	**116**	**481**	**38,668,804**	**25.1%**	**5.7%**	**28.4%**	**5.3%**	**0.5%**	**103.8%**
Energy Initiative	Custom	68	369	68,864,774	3.9%	4.1%	0.7%	2.2%	0.0%	96.8%
	HVAC	15	52	3,336,424	37.7%	NA	23.9%	NA	0.0%	86.2%
	Lighting	78	560	28,377,206	14.8%	4.3%	11.1%	2.8%	0.0%	96.4%
	VFD	57	126	32,114,514	6.8%	NA	0.0%	NA	0.0%	93.2%
	Total	**218**	**1,107**	**132,692,918**	**7.8%**	**3.0%**	**3.4%**	**1.4%**	**0.0%**	**95.6%**
Small Business	Lighting	85	1,297	30,041,741	7.4%	3.4%	1.8%	2.6%	0.2%	94.6%
	Non-lighting	66	352	6,399,756	2.5%	2.8%	7.2%	5.1%	NA	104.7%
	Total	**151**	**1,649**	**36,441,497**	**6.6%**	**2.2%**	**2.7%**	**2.7%**	**0.2%**	**96.4%**
Total		**485**	**3,237**	**207,803,219**	**10.8%**	**2.2%**	**7.9%**	**1.6%**	**0.1%**	**97.2%**

* Error margins do not apply when a census of records were sampled

The Non-unitary HVAC measure type had the lowest free-ridership rate (1.5 percent) followed by the non-lighting measure type (2.5 percent). The Compressed Air measure type had the highest free-ridership rate at 46.4 percent. The HVAC measure type had a free-ridership rate of 37.7 percent and high participant like spillover (23.9 percent).

Table 5-7. National Grid C&I Electric Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Compressed Air	42	124	4,254,886	46.4%	NA	0.0%	NA	4.6%	58.2%
Custom	99	498	97,353,438	9.5%	4.5%	10.6%	5.9%	0.0%	101.2%
HVAC	15	52	3,336,424	37.7%	NA	23.9%	NA	0.0%	86.2%
Lighting	183	1,945	61,698,526	11.4%	2.9%	7.8%	2.0%	0.0%	96.4%
Non-lighting	66	352	6,399,756	2.5%	2.8%	7.2%	5.1%	NA	104.7%
Non-unitary HVAC	7	50	1,216,491	1.5%	NA	0.0%	NA	0.0%	98.5%
Other	0	1	9,688	NA	NA	NA	NA	NA	NA
Unitary HVAC	14	72	267,391	36.2%	NA	0.6%	NA	0.0%	64.4%
VFD	59	143	33,266,618	8.0%	NA	0.0%	NA	0.0%	92.0%
Total	**485**	**3,237**	**207,803,219**	**10.8%**	**2.2%**	**7.9%**	**1.6%**	**0.1%**	**97.2%**

* Error margins do not apply when a census of records were sampled

5.2.3 NSTAR results

Table 5-8 presents NSTAR's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 96.6 percent. The Direct Install program had the lowest free-ridership rate (5.0 percent) and a participant spillover rate of 5.5 percent, which resulted in a NTG rate of 100.8 percent. The New Construction program had the highest free-ridership rate at 26.8 percent and the lowest participant spillover rate (2.6 percent).

Table 5-8. NSTAR Electric C&I Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Direct Install	Hot Water	8	30	163,126	14.5%	NA	0.0%	NA	NA	85.5%
	HVAC	22	53	1,438,907	1.5%	NA	5.8%	NA	0.0%	104.3%
	Lighting	99	2,084	43,239,813	4.4%	2.6%	6.1%	5.1%	0.0%	101.7%
	Motors/Drives	34	138	633,481	10.1%	NA	0.0%	NA	27.2%	117.2%
	Process	4	5	24,615	21.8%	NA	0.0%	NA	0.0%	78.2%
	Refrigeration	67	303	3,540,347	12.1%	NA	0.0%	NA	0.0%	87.9%
	Total	**234**	**2,613**	**49,040,289**	**5.0%**	**2.4%**	**5.5%**	**2.2%**	**0.2%**	**100.8%**
New Construction	Comprehensive	15	41	22,214,831	16.2%	NA	0.0%	NA	0.0%	83.8%
	Compressed Air	15	39	1,366,960	46.3%	NA	9.6%	NA	0.0%	63.3%
	HVAC	16	58	11,999,313	37.6%	NA	0.0%	NA	0.8%	63.2%
	Lighting	46	222	8,915,137	41.6%	9.3%	12.5%	4.6%	0.0%	70.9%
	Motors/Drives	14	50	2,854,109	13.7%	NA	0.0%	NA	27.2%	113.5%
	Process	3	12	1,177,446	14.1%	NA	0.0%	NA	0.0%	85.9%
	Refrigeration	0	10	1,677,749	NA	NA	NA	NA	0.0%	NA
	Total	**109**	**432**	**50,205,545**	**26.8%**	**5.6%**	**2.6%**	**3.0%**	**1.7%**	**77.5%**
Retrofit	CHP	2	5	39,723,964	0.7%	NA	0.0%	NA	NA	99.3%
	Compressed Air	5	9	2,290,651	13.0%	NA	0.0%	NA	4.6%	91.6%
	HVAC	45	191	51,616,571	13.3%	NA	8.7%	NA	0.0%	95.4%
	Lighting	48	592	65,031,524	9.9%	4.7%	11.8%	7.9%	0.0%	101.9%
	Motors/Drives	45	112	14,855,513	12.5%	NA	3.6%	NA	23.6%	114.7%
	Process	10	18	3,644,840	1.7%	NA	3.6%	NA	0.0%	101.9%
	Refrigeration	12	39	2,667,957	10.5%	NA	0.0%	NA	0.0%	89.5%
	Total	**167**	**966**	**179,831,020**	**8.9%**	**2.9%**	**7.1%**	**5.9%**	**0.5%**	**98.7%**
Total		**510**	**4,011**	**279,076,854**	**11.4%**	**2.0%**	**6.0%**	**2.3%**	**1.9%**	**96.6%**

* Error margins do not apply when a census of records were sampled

The CHP and Process measure types had the lowest free-ridership rates (0.7 percent and 4.8 percent, respectively) while the Compressed Air measure type had the highest free-ridership rate (25.5 percent). The Lighting measure type had the highest participant like spillover at 9.7 percent.

Table 5-9. NSTAR Electric C&I Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
CHP	2	5	39,723,964	0.7%	NA	0.0%	NA	NA	99.3%
Comprehensive	15	41	22,214,831	16.2%	NA	0.0%	NA	0.0%	83.8%
Compressed Air	20	48	3,657,611	25.5%	NA	3.6%	NA	1.0%	79.2%
Hot Water	8	30	163,126	14.5%	NA	0.0%	NA	NA	85.5%
HVAC	83	302	65,054,791	17.5%	NA	7.0%	NA	0.0%	89.5%
Lighting	193	2,898	117,186,474	10.3%	3.2%	9.7%	3.4%	0.0%	99.4%
Motors/Drives	93	300	18,343,103	12.6%	NA	2.9%	NA	24.3%	114.6%
Process	17	35	4,846,901	4.8%	NA	2.7%	NA	0.0%	97.9%
Refrigeration	79	352	7,886,053	11.4%	NA	0.0%	NA	0.0%	88.6%
Total	**510**	**4,011**	**279,076,854**	**11.4%**	**2.0%**	**6.0%**	**2.3%**	**1.9%**	**96.6%**

* Error margins do not apply when a census of records were sampled

5.2.4 Unitil results

Table 5-10 presents Unitil's free-ridership and spillover rates by program and measure type. The net-to-gross rate is 70.7 percent. The New Construction and Large Retrofit programs had the highest free-ridership rates (60 percent or more) but also had the lowest participation and subsequent survey results. The Small Retrofit program had a free-ridership rate of 8.7 percent. We should note that all programs had low participation and limited respondent results; therefore, care should be taken when using these results.

Table 5-10. Unitil C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
C&I Large Retrofit	Compressed Air	0	1	129,109	NA	NA	NA	NA	4.6%	NA
	HVAC	0	2	1,632,743	NA	NA	NA	NA	0.8%	NA
	Lighting	3	7	1,016,252	62.9%	NA	0.0%	NA	2.0%	39.1%
	Motors & Drives	0	1	416,070	NA	NA	NA	NA	NA	NA
	Process	1	1	93,250	100.0%	NA	100.0%	NA	0.0%	100.0%
	Total	**4**	**12**	**3,287,424**	**66.0%**	**NA**	**8.4%**	**NA**	**4.6%**	**47.0%**
C&I New Construction	Compressed Air	1	1	1,896	0.0%	NA	50.0%	NA	0.0%	150.0%
	Process	1	1	59,568	100.0%	NA	0.0%	NA	0.0%	0.0%
	Total	**2**	**2**	**61,464**	**96.9%**	**NA**	**1.5%**	**NA**	**0.0%**	**4.6%**
C&I Small Retrofit	Lighting	31	66	1,529,622	8.7%	NA	1.6%	NA	0.4%	93.3%
	Refrigeration	0	1	4,533	NA	NA	NA	NA	0.0%	NA
	Total	**31**	**67**	**1,534,155**	**8.7%**	**NA**	**1.6%**	**NA**	**0.4%**	**93.3%**
Total		**37**	**81**	**4,883,043**	**34.2%**	**NA**	**NA**	**NA**	**0.5%**	**70.7%**

* Error margins do not apply when a census of records were sampled

The Lighting measure type had the highest participation and had a free-ridership rate of 30.3 percent. The Process measure type had a high free-ridership rate (100.0 percent) but also high participant like spillover (61.0 percent).

Table 5-11. Unitil C&I Electric Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Compressed Air	1	2	131,005	0.0%	NA	50.0%	NA	0.0%	150.0%
HVAC	0	2	1,632,743	NA	NA	NA	NA	0.0%	NA
Lighting	34	73	2,545,874	30.3%	NA	1.0%	NA	1.0%	71.7%
Motors & Drives	0	1	416,070	NA	NA	NA	NA	0.0%	NA
Process	2	2	152,818	100.0%	NA	61.0%	NA	0.0%	61.0%
Refrigeration	0	1	4,533	NA	NA	NA	NA	0.0%	NA
Total	**37**	**81**	**4,883,043**	**34.2%**	**NA**	**4.4%**	**NA**	**0.5%**	**70.7%**

* Error margins do not apply when a census of records were sampled

5.2.5 Western Massachusetts Electric Company results

Table 5-12 presents Western Massachusetts Electric Company's free-ridership and spillover rates for each measure type by program. The net-to-gross rate is 89.2 percent. The Small Business Energy Advantage program had the lowest free-ridership rate (5.2 percent) and the highest participant spillover, which resulted in a net-to-gross rate of 109.1 percent. Both New Construction and Retrofit programs had free-ridership rates around 21 percent and both had limited participant and nonparticipant spillover.

Table 5-12. Western Massachusetts Electric Company C&I Electric Free-ridership and Spillover Results by Program and Measure Type

Program	Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
New Construction	Comprehensive	2	5	504,168	0.0%	NA	0.0%	NA	0.0%	100.0%
	Compressed Air	14	28	2,145,442	13.3%	NA	5.8%	NA	0.0%	92.6%
	HVAC	12	36	1,473,434	58.8%	NA	0.4%	NA	0.4%	41.9%
	Lighting	18	43	2,608,259	32.0%	NA	0.0%	NA	2.0%	70.0%
	Motors/Drives	2	7	1,152,980	0.0%	NA	0.0%	NA	27.2%	127.2%
	Process	8	12	1,414,414	11.5%	NA	0.0%	NA	0.0%	88.5%
	Refrigeration	1	4	1,343,283	6.3%	NA	0.0%	NA	0.0%	93.8%
	Total	**57**	**135**	**10,641,980**	**21.0%**	**NA**	**1.2%**	**NA**	**3.5%**	**83.7%**
Retrofit	CHP	0	2	6,156,102	NA	NA	NA	NA	NA	NA
	Compressed Air	2	4	266,021	42.5%	NA	0.0%	NA	4.6%	62.1%
	HVAC	6	19	4,669,774	15.2%	NA	0.0%	NA	0.8%	85.5%
	Lighting	53	127	7,407,681	43.2%	NA	4.9%	NA	0.0%	61.7%
	Motors/Drives	10	25	2,177,934	45.0%	NA	7.1%	NA	20.1%	82.2%
	Process	3	8	3,363,107	0.0%	NA	0.0%	NA	0.0%	100.0%
	Refrigeration	2	7	749,195	21.8%	NA	0.0%	NA	0.0%	78.2%
	Total	**76**	**192**	**24,789,814**	**27.7%**	**NA**	**2.8%**	**NA**	**2.6%**	**77.6%**
Small Business Energy Advantage	Hot Water	2	2	8,325	0.7%	NA	0.0%	NA	NA	99.3%
	HVAC	4	14	355,907	0.0%	NA	0.0%	NA	0.8%	100.8%
	Lighting	72	533	15,297,731	5.1%	3.1%	14.6%	8.9%	0.0%	109.5%
	Refrigeration	16	63	710,218	9.9%	NA	15.1%	NA	0.0%	105.2%
	Total	**94**	**612**	**16,372,181**	**5.2%**	**2.6%**	**14.3%**	**18.8%**	**0.0%**	**109.1%**
Total		**227**	**939**	**51,803,975**	**18.1%**	**3.3%**	**6.6%**	**8.5%**	**0.7%**	**89.2%**

* Error margins do not apply when a census of records were sampled

The free-ridership rates were the lowest among the Comprehensive, Hot Water and Process measure types (0.0 percent, 0.7 percent and 3.4 percent, respectively). The Motors & Drives measure type had the highest free-ridership rate at 29.4 percent. The highest participant like spillover was from the Lighting measure type (10.3 percent).

Table 5-13. Western Massachusetts Electric Company C&I Electric Free-ridership and Spillover Results by Measure Type

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
CHP	0	2	6,156,102	NA	NA	NA	NA	NA	NA
Comprehensive	2	5	504,168	0.0%	NA	0.0%	NA	0.0%	100.0%
Compressed Air	16	32	2,411,463	16.5%	NA	5.2%	NA	0.0%	88.7%
Hot Water	2	2	8,325	0.7%	NA	0.0%	NA	NA	99.3%
HVAC	22	69	6,499,115	24.3%	NA	0.1%	NA	0.7%	76.5%
Lighting	143	703	25,313,671	19.0%	4.1%	10.3%	6.1%	0.0%	91.2%
Motors/Drives	12	32	3,330,914	29.4%	NA	4.6%	NA	22.6%	97.8%
Process	11	20	4,777,521	3.4%	NA	0.0%	NA	0.0%	96.6%
Refrigeration	19	74	2,802,696	11.3%	NA	3.8%	NA	0.0%	92.5%
Total	**227**	**939**	**51,803,975**	**18.1%**	**3.3%**	**6.6%**	**8.5%**	**0.7%**	**89.2%**

* Error margins do not apply when a census of records were sampled

5.3 "UNLIKE" SPILLOVER OBSERVATIONS

The evaluation team included questions to address "unlike" spillover—energy efficient equipment installed by a participant due to program influence that is not identical to the equipment they received through the program. However, given the difficulties in estimating savings for these installations using regular telephone interviewers, we present only observations of unlike spillover and not savings estimates.

5.3.1 Cape Light Compact

Four Cape Light Compact respondents reported that they installed "unlike" energy efficient equipment outside of any utility program. Below we list out the different types of equipment identified and any additional information the respondent could provide about the equipment.

- 20 flood lamp LEDs and 13 LEDs
- Installed about $100,000 worth of HVAC controls, VFDs and more efficient mechanical equipment
- A commercial size single demand hot water unit
- Two air conditioning compressors (1-ton and 2-ton).

5.3.2 National Grid

Twelve National Grid respondents reported that they have installed energy efficient equipment outside of a National Grid program and that National Grid's programs were influential in the installation. Below we list out the different types of equipment identified and any additional information provided about the equipment:

- A dozen T-12 lights
- Three high LED lighting fixtures
- Installed approximately 50-60 lighting fixtures (the majority were 2x4 while some were 2x2)
- Replaced 80 ceramic metal halides with 32-watt LEDs
- Upgraded about 20 percent of their lighting to 35-watt
- Installed five 10x10 speed doors and 60-80 exterior flood lights
- One more energy efficient A/C unit
- One 200-HP VFD and one 125-HP high efficient motor
- Three motor machines (two 150-ton and one 200-ton)
- A number of projects that consistent of the following: about 2 megawatts solovoltaics, condensing furnaces and boilers, cogeneration, trigeneration, wind turbines, fuel cells, LED street lighting, building envelope improvements, energy efficient motors, VSDs.
- Installed two high-efficient washing machines and 300 5-watt LED lights
- Two 850,000 BTU boilers, 500 LED exterior fixtures (86-watt and 30-watt), one energy management system, 5 motion sensors and 5 motors that were less than ½ HP.

5.3.3 NSTAR

Respondents for 14 projects reported that they installed energy efficient equipment outside of a NSTAR program and that NSTAR's programs were influential in the installation. Below we list out the different types of equipment identified and any additional information the respondent could provide about the equipment.

- 200 2x2 LED lighting fixtures
- Approximately 200 28-watt T8 lights
- Hundreds of 5-watt LED to 50-watt LEDs
- Approximately $50,000 worth of lighting upgrades of varying kinds
- A lot of lighting equipment
- 4-ton AC unit
- One energy efficient convection oven
- Six pieces of high efficiency kitchen equipment
- At least 6 to 12 large motors and hundreds of LED lights
- One low differential pressure filters project (100,000 cfm)
- New fan and compressor that consisted of three pieces
- A variety of project consisting of lighting, pumps, VFDs and other HVAC equipment.
- Replaced high efficiency boilers, water heaters and lighting across 10 different properties. Each property has four boilers for heat, two boilers for domestic hot water and two storage tanks. Dollar value is approximately $1,500,000.
- Installed VFDs that ranged from 20 to 118 hertz, 8 180,000-btu gas condensing boilers and 100 55-watt and 2 90-watt parking lot lights.

5.3.4 Unitil

No respondents reported that they installed "unlike" energy efficient equipment outside of any utility program.

5.3.5 Western Massachusetts Electric Company

Four WMECo respondents reported that they have installed energy efficient equipment outside of a WMECo program and that WMECo's programs were influential in the installation. Below we list out the different types of equipment identified and any additional information the respondent could provide about the equipment.

- Five LED lighting fixtures
- Replaced 32 floodlights with LEDs (65w equivalents)
- Four VFDs and a 60-ton solar HVAC unit
- Boiler and insulation work done of unknown size.

6. GREEN COMMUNITIES

The Green Community designation helps municipalities meet the five criteria required of municipal buildings to reduce their energy use. Municipalities within a Green Community receive technical assistance and financial support to improve energy efficiency and increase the use of renewable energy.

In this chapter we present the results of the 2013 Electric C&I free-ridership and spillover results broken out by subgroups based on Green Community designation to help the Massachusetts PAs understand the impact of having Green Communities included in the study. Tetra Tech worked with the Department of Energy Resources (DOER) to obtain a list of communities designated as being a Green Community. For those communities identified as being a Green Community, their designation date was also included. Tetra Tech used the designation date to flag communities that were green by December 18, 2013. December 18 was the latest date in 2013 in which communities were given green designation; therefore, this date was chosen as the cutoff as it occurred within our study period. Tetra Tech then manually reviewed company names and other sample variables to determine if the record was a municipal building.

6.1 RESULTS BY MUNICIPAL BUILDINGS

The overall statewide net-to-gross results by municipal buildings within a Green Community compared to municipal buildings within non-Green Communites are similar—97.4 percent for non-Green Communities and 94.2 percent for Green Communities. The free-ridership rate was slightly higher for those in a non-Green Community; 15.1 percent compared to 11.4 percent in a Green Community.

Table 6-1. C&I Electric Free-ridership and Spillover Results by Green Communities

Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Municipal buildings in a Green Community	107	485	37,503,505	11.4%	4.3%	4.3%	4.5%	1.2%	94.2%
Municipal buildings in a non-Green Community	93	351	23,073,291	15.1%	5.2%	11.2%	4.1%	1.3%	97.4%

Of the 64 respondents who were the decision maker of a municipal building in a Green Community, just over 80 percent were aware their municipality was part of a Green Community. These respondents were then asked if they received any technical or financial assistance from a source other than the PA for the purchase of the program qualifying equipment. Ten of the 24 Green Community respondents who received additional funding said they received technical or financial assistance from the DOER or the Green Community for purchasing the program qualifying equipment. A subset of these respondents (n=9) were then asked how much influence the technical or financial assistance had on their decision to implement the program equipment. Seven of the nine respondents indicated it was influential, rating the influence as seven or higher on a 0 to 10 scale with 0 being no influence and 10 being a great deal of influence.

Seven of the Green Community respondents indicated their organization's policy on the purchase or replacement of energy-using equipment changed as a result of becoming a Green Community. The description of how their policies changed includes the following:

> *They became more mainstream, crossing departmental lines. It started to affect more departments.*
>
> *We lean heavier towards the energy efficient side, and look at payback. Potentially that takes a little longer for payback.*
>
> *Before, they would ignore energy savings and do whatever was cost least. That's been changed now that we are green designated.*
>
> *Didn't have it in place until the green community.*
>
> *They incorporated energy improvements as part of an overall reduction strategy compared to a base year.*
>
> *They were tightened up, to get to the 20% reduction.*
>
> *Modified. A little stricter.*

6.2 DETAILED RESULTS FOR MUNICIPAL BUILDINGS BY MEASURE CATEGORY

In this section, we report the results broken down by measure category. By doing so, the resulting number of cases is small (specifically for municipal buildings in the non-Green Community) so care should be taken when using the results at this level.

Table 6-2. Statewide By Measure Category for Municipal Buildings in Green Communities

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comprehensive	NA	NA	NA	NA	NA	NA	NA	NA	NA
Compressed Air	2	2	266,528	1.0%	NA	15.9%	NA	0.0%	114.9%
Custom	20	80	4,393,260	29.0%	NA	0.0%	NA	0.0%	71.0%
Hot Water	NA	NA	NA	NA	NA	NA	NA	NA	NA
HVAC	11	50	2,575,651	30.0%	NA	2.6%	NA	0.0%	72.5%
Lighting	48	266	22,467,635	7.7%	5.7%	5.7%	6.7%	0.0%	97.9%
Motors/Drives	9	28	2,438,223	1.8%	NA	8.1%	NA	19.1%	125.4%
Non-lighting	0	8	38,428	NA	NA	NA	NA	NA	NA
Non-unitary HVAC	0	5	23,494	NA	NA	NA	NA	0.0%	NA
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Process	2	6	1,836,616	0.0%	NA	0.0%	NA	0.0%	100.0%
Refrigeration	1	11	95,925	53.5%	NA	0.0%	NA	0.0%	46.5%

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Unitary HVAC	2	4	4,115	25.0%	NA	16.4%	NA	0.0%	91.4%
VFD	12	25	3,363,631	15.0%	NA	0.0%	NA	0.0%	85.0%
Total	**107**	**485**	**37,503,505**	**11.4%**	**4.3%**	**4.3%**	**4.5%**	**1.2%**	**94.2%**

* Error margins do not apply when a census of records were sampled

Table 6-3. Statewide by Measure Category for Municipal Buildings in non-Green Communities

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	1	2	879	25.0%	NA	0.0%	NA	NA	75.0%
CHP	NA	NA	NA	NA	NA	NA	NA	NA	NA
Comprehensive	NA	NA	NA	NA	NA	NA	NA	NA	NA
Compressed Air	1	2	157,648	0.0%	NA	0.0%	NA	4.6%	104.6%
Custom	17	88	9,519,755	8.6%	NA	7.8%	NA	0.0%	99.1%
Hot Water	NA	NA	NA	NA	NA	NA	NA	NA	NA
HVAC	13	25	2,148,431	35.1%	NA	0.0%	NA	0.8%	65.6%
Lighting	32	183	7,860,471	24.0%	6.8%	21.3%	9.7%	0.0%	97.2%
Motors/Drives	6	12	1,046,384	28.1%	NA	0.0%	NA	27.2%	99.1%
Non-lighting	1	7	146,266	0.0%	NA	100.0%	NA	NA	200.0%
Non-unitary HVAC	1	2	1,000	37.5%	NA	0.0%	NA	0.0%	62.5%
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Process	2	2	91,494	0.0%	NA	0.0%	NA	0.0%	100.0%
Refrigeration	0	4	16,138	NA	NA	NA	NA	0.0%	NA
Unitary HVAC	1	3	6,985	100.0%	NA	0.0%	NA	0.0%	0.0%
VFD	18	21	2,077,840	3.9%	NA	0.0%	NA	0.0%	96.1%
Total	**93**	**351**	**23,073,291**	**15.1%**	**5.2%**	**11.2%**	**4.1%**	**1.3%**	**97.4%**

* Error margins do not apply when a census of records were sampled

6.3 DETAILED RESULTS FOR MUNICIPAL BUILDINGS BY PA

The following two tables report results for municipal buildings by Green Community designation by PA. Again, the number of surveyed cases by PA is small so care should be taken when using the results at this level.

Table 6-4. Electric Free-Ridership and Spillover by PA for Municipal Buildings in Green Communities

PA	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Cape Light Compact	11	49	774,482	14.2%	NA	4.6%	NA	0.3%	90.7%
National Grid	49	244	10,403,244	19.6%	7.2%	3.2%	4.1%	0.0%	83.6%
NSTAR	31	151	24,639,682	6.7%	NA	4.8%	NA	1.7%	99.8%
Unitil	6	7	68,558	1.2%	NA	26.7%	NA	0.0%	125.5%
Western Massachusetts Electric Company	10	34	1,617,539	37.1%	NA	0.0%	NA	4.8%	67.7%
Municipal buildings in Green Communities	**107**	**485**	**37,503,505**	**11.4%**	**4.3%**	**4.3%**	**4.5%**	**1.2%**	**94.2%**

* Error margins do not apply when a census of records were sampled

Table 6-5. Electric Free-Ridership and Spillover by PA for Municipal Buildings in non-Green Communities

PA	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Cape Light Compact	17	71	976,681	1.9%	NA	46.3%	NA	0.2%	144.5%
National Grid	49	186	14,890,366	12.0%	6.8%	6.0%	5.6%	0.2%	94.2%
NSTAR	19	70	4,073,133	20.5%	NA	26.5%	NA	6.2%	112.1%
Unitil	5	12	2,584,347	25.3%	NA	0.0%	NA	1.3%	76.0%
Western Massachusetts Electric Company	3	12	548,764	73.5%	NA	0.0%	NA	8.4%	34.9%
Municipal buildings in non-Green Communities	**93**	**351**	**23,073,291**	**15.1%**	**5.2%**	**11.2%**	**4.1%**	**1.3%**	**97.4%**

* Error margins do not apply when a census of records were sampled

6.4 RESULTS BY GREEN COMMUNITY DESIGNATION

The preceeding tables report results for municipal buildings broken out by Green Community designation compared to communities that were not designated as a Green Community. The following three tables report the statewide overall results for all buildings in Green vs. Non-Green communities followed by the breakdown by measure type and PA.

Table 6-6. Electric Free-Ridership and Spillover for All Buildings by Green Communities

Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Green Community	783	4,892	298,983,287	14.8%	1.6%	9.2%	2.1%	1.1%	95.5%
Non-Green Community	624	3,892	252,070,245	9.3%	2.0%	4.6%	3.5%	1.0%	96.3%

Table 6-7. Electric Free-Ridership and Spillover for All Buildings by Measure Type for Green Communities

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	0	1	87,535	NA	NA	NA	NA	NA	NA
CHP	0	3	8,613,241	NA	NA	NA	NA	NA	NA
Comprehensive	16	38	15,539,479	15.5%	NA	0.0%	NA	0.0%	84.5%
Compressed Air	26	86	4,506,212	24.9%	NA	4.7%	NA	0.0%	79.8%
Custom	54	255	43,571,385	12.9%	5.4%	21.7%	10.3%	0.0%	108.7%
Hot Water	9	22	137,550	14.3%	NA	0.0%	NA	NA	85.7%
HVAC	85	325	55,418,864	24.6%	6.0%	10.6%	10.2%	0.0%	86.0%
Lighting	361	3,259	125,679,614	12.6%	2.4%	7.4%	2.9%	0.0%	94.8%
Motors/Drives	76	267	16,435,193	13.2%	4.6%	7.7%	7.5%	19.5%	114.0%
Non-lighting	36	173	3,147,649	1.7%	1.4%	11.2%	8.3%	NA	109.5%
Non-unitary HVAC	3	25	762,435	0.7%	NA	0.0%	NA	0.0%	99.3%
Other	0	1	9,688	NA	NA	NA	NA	NA	NA
Process	21	40	5,545,363	6.4%	NA	2.8%	NA	0.0%	96.3%
Refrigeration	62	293	5,927,876	12.7%	4.3%	0.2%	2.7%	0.0%	87.4%
Unitary HVAC	8	30	76,397	11.5%	NA	1.1%	NA	0.0%	89.6%
VFD	26	74	13,524,806	6.8%	NA	0.0%	NA	0.0%	93.2%
Total	**783**	**4,892**	**298,983,287**	**14.8%**	**1.6%**	**9.2%**	**2.1%**	**1.1%**	**95.5%**

* Error margins do not apply when a census of records were sampled

Table 6-8. Electric Free-Ridership and Spillover for All Buildings by Measure Type for Non-Green Communities

Measure Type	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Building Envelope	1	3	1,267	25.0%	NA	0.0%	NA	NA	75.0%
CHP	2	4	37,266,825	0.7%	NA	0.0%	NA	NA	99.3%
Comprehensive	1	8	7,179,520	25.0%	NA	0.0%	NA	0.0%	75.0%
Compressed Air	53	120	5,948,754	38.9%	NA	0.0%	NA	4.6%	65.7%
Custom	45	243	53,782,053	7.2%	7.6%	1.8%	3.7%	0.0%	94.6%
Hot Water	2	11	71,861	0.0%	NA	0.0%	NA	NA	100.0%
HVAC	49	135	22,118,487	11.4%	NA	3.4%	NA	0.0%	92.0%
Lighting	288	2,715	86,130,489	10.7%	2.3%	11.1%	4.8%	0.0%	100.5%
Motors/Drives	46	122	6,515,658	14.8%	NA	0.5%	NA	26.7%	112.4%
Non-lighting	30	179	3,252,107	3.2%	6.0%	1.5%	5.7%	NA	98.2%
Non-unitary HVAC	4	25	454,056	7.6%	NA	0.0%	NA	0.0%	92.4%
Other	NA	NA	NA	NA	NA	NA	NA	NA	NA
Process	11	21	4,327,924	6.1%	NA	2.3%	NA	0.0%	96.2%
Refrigeration	53	195	5,088,438	12.9%	5.6%	1.4%	31.6%	0.0%	88.5%
Unitary HVAC	6	42	190,994	66.4%	NA	0.0%	NA	0.0%	33.6%
VFD	33	69	19,741,812	7.3%	NA	0.0%	NA	0.0%	92.7%
Total	**624**	**3,892**	**252,070,245**	**9.3%**	**2.0%**	**4.6%**	**3.5%**	**1.0%**	**96.3%**

* Error margins do not apply when a census of records were sampled

Table 6-9. Electric Free-Ridership and Spillover for All Buildings by PA for Green Communities

PA	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Cape Light Compact	73	236	4,192,098	10.0%	5.0%	3.6%	5.1%	4.7%	98.3%
National Grid	224	1,567	92,948,706	11.2%	2.9%	12.1%	3.1%	0.1%	101.0%
NSTAR	325	2,458	165,185,634	16.0%	2.6%	7.8%	3.4%	1.8%	93.6%
Unitil	10	15	314,353	17.9%	NA	7.3%	NA	0.0%	89.3%
Western Massachusetts Electric Company	151	616	36,342,496	19.8%	4.1%	8.6%	6.1%	0.3%	89.2%
Green Community	**783**	**4,892**	**298,983,287**	**14.8%**	**1.6%**	**9.2%**	**2.1%**	**1.1%**	**95.5%**

* Error margins do not apply when a census of records were sampled

Table 6-10. Electric Free-Ridership and Spillover for All Buildings by PA for Non-Green Communities

PA	Surveyed	Population	Population Savings	Free-ridership Rate	90% Margin Error (±)*	Participant "Like" Spillover Rate	90% Margin Error (±)*	Nonparticipant Spillover Rate	Net-to-Gross Rate
Cape Light Compact	75	280	3,294,343	26.0%	5.7%	22.7%	17.1%	1.3%	98.0%
National Grid	261	1,670	114,854,513	10.2%	3.3%	4.1%	1.5%	0.2%	94.1%
NSTAR	185	1,553	113,891,220	7.1%	3.2%	4.8%	1.9%	2.0%	99.6%
Unitil	27	66	4,568,690	36.2%	NA	3.9%	NA	3.7%	71.5%
Western Massachusetts Electric Company	76	323	15,461,478	10.8%	5.5%	4.0%	22.5%	1.5%	94.8%
Non-Green Community	**624**	**3,892**	**252,070,245**	**9.3%**	**2.0%**	**4.6%**	**3.5%**	**1.0%**	**96.3%**

* Error margins do not apply when a census of records were sampled

APPENDIX A: PARTICIPANT SAMPLING PLANS

This appendix presents our sample plans for each PA for the 2013 electric free-ridership and spillover study.

A.1 CAPE LIGHT COMPACT

MEMORANDUM

TO: Phil Moffit

FROM: Carrie Koenig, Steve Drake, and Pam Rathbun

SUBJECT: 2013 Cape Light Compact C&I Free-ridership and Spillover Study Proposed Sample Plan

CC: Gail Azulay

DATE: May 19, 2014

Overview

This memorandum details the sampling procedures and draft sample plan for Cape Light Compact's 2013 Free-Ridership and Spillover Study.

In this document, we discuss the steps to be used in:

- Preparation of the data file and aggregation of the participant data
- Development of the sample plan
- Selection of the sample (including a characterization of the final sample plan)
- Review of sample to identify companies with multiple sampled accounts

Preparation of the Data File and Aggregation of the Participant Data

Cape Light Compact provided Tetra Tech with an Excel[14] file including participant information for the following programs:

- C&I New Construction
- C&I Products and Services
- Government New Construction

[14] 2013 CI work order completion report.xls

- Medium and Large C&I Retrofit
- Medium and Large Government Retrofit
- Small C&I Retrofit
- Small Government Retrofit

Each record in the data represents a measure installed through a program for a particular account. One account may have multiple work orders, and one work order may include measures installed through multiple measure categories or end-uses. Therefore, it is necessary to take steps to collapse – or aggregate – the data through the sampling process, yet retain all the measure-specific information for each account[15].The steps taken to do this are detailed in this section.

1) Identify measure category participation

The study estimates free-ridership at the measure category level. The first step in sample preparation is to assign measures to a measure category. Using the information provided in the data file[16], we identify the measure categories within the following programs:

- C&I New Construction program consists of five measure categories: HVAC, Lighting, Motors & Drives, Process, and Refrigeration.
- C&I Products and Services program consists of three measure categories: HVAC, Lighting, and Motors & Drives.
- Government New Construction program consists of one measure category: HVAC.
- Medium and Large C&I Retrofit program consists of five measure categories: Building Envelope, HVAC, Lighting, Motors & Drives, and Refrigeration.
- Medium and Large Government Retrofit program consists of four measure categories: HVAC, Lighting, Motors & Drives, and Refrigeration.
- Small C&I Retrofit program consists of six measure categories: Building Envelope, Hot Water, HVAC, Lighting, Motors & Drives, and Refrigeration.
- Small Government Retrofit program consists of five measure categories: Building Envelope, HVAC, Lighting, Motors & Drives, and Refrigeration.

Several cases were dropped from the sample frame at this step. All records with zero or negative energy savings values (n=1,145) were removed. An additional 1,442 records that included "Upstream" in the measure description were dropped. Finally, 15 additional records were dropped upon review of the measure description by Tetra Tech and CLC staff.

2) Aggregate the records by Program, Account, and Measure Category

This aggregation sets the file up so that we have one record for each account for each measure category within a program. As we do the aggregation, we sum the kWh savings, cost, and incentive

[15] For sampling purposes, an account was defined as a unique "account_number" in the participant data.
[16] The field "description" was used to identify the measure categories and end-uses within each program. Measure category and end-use assignments were reviewed by CLC staff.

so that the values are represented at an account level. The detailed descriptions, which may be modified slightly to be more readable for the interview, are retained. These descriptions are used when describing to customers what equipment is included in a measure category.

3) Create a flat file with one record per Account and Program

The next step is to create a flat file where one record represents one account within a program (an account may show up more than once in a dataset, but never more than one time in a program). Annual kWh savings, incentive values[17], costs[18], and measure descriptions are retained for each measure category (i.e., kWh1, kWh2, inc1, inc2, etc.).

4) Assign Municipality and Green Community indicators

The final data preparation step is to assign flags to indicate whether each participant 1) is a municipality/government customer, and 2) belongs to a Green Community. These indicators will be used for skip patterns in the survey instrument and cross-sectional analyses. We used the field "shortname" (program) to assign the municipality indicator to all government program participants. City names were cross-referenced with a list of Green Communities provided by Aimee Powelka of the Massachusetts Department of Energy Resources on May 13, 2014 to identify Green Communities.

Development of Sample Plan

When designing the sample plan, we identify which measure categories will be randomly sampled (discussed in the next section). We apply a prioritization scheme when selecting cases within these randomly sampled categories. All accounts flagged priority will be sampled, followed by a random sample of non-priority accounts. Accounts are flagged as priority if:

1) they are considered a multi-measure account (their participation in a program includes installations across more than one measure category), or

2) the kWh savings is within the top ten percentile of kWh savings when it is reviewed by program and measure category.

All randomly sampled (non-priority) accounts are single-measure accounts. For the 2013 study, only lighting measures installed through Small C&I Retrofit program were randomly sampled. The remaining measures under the programs were sampled with certainty.

After determining the number of accounts associated with a measure category, we can develop the sample plan and determine the level of precision at a 90% Confidence Interval. The sample plan describes the population of accounts by measure category, the number of accounts to be surveyed by measure category, and potential number of survey completes assuming a 50 percent response rate.

The results of these steps can be found Table 1 at the end of this document.

[17] Incentive values were taken from the field "clientcost."
[18] Measure costs were computed summing the fields "clientcost" and "customercost."

Selection of the Sample

In general, we always want to pull the accounts identified as priority, and a census of measure categories with less than or equal to 50 accounts associated with them within a program. The interviews discuss no more than two measure categories for each account and program the account participated in. When account contains more than two measure categories, we apply a set of rules to select which categories we want to include in the study.

1) First, select measure categories that are in the top ten percentile of kWh savings for that measure category by program.

2) Second, select rare measure categories. Measure categories deemed rare (less than or equal to 50 accounts with installations in that measure category) are kept. If more than two measure categories are deemed rare, we selected the rarer measure(s).

Nineteen accounts installed equipment associated with three measure categories. Sixteen accounts are within the Small C&I Retrofit program, and in all cases but one where lighting was in the top ten percentile, the lighting measure category was excluded as the least rare measure. Two accounts are within the Small Government Retrofit program, both for which lighting was excluded as the least rare measure. Finally, one account is in the C&I New Construction program, for which lighting was also excluded as the least rare measure.

Table 1 details the sample plan resulting from the process described above. Table 1 also presents the sample details in terms of kWh savings, coverage, and number of accounts. Highlighted measures are sampled.

Table 1: Cape Light Compact 2013 C&I Free-Ridership and Spillover Sample Details

Program	Measure Category	Number of Accounts	Population kWh Savings	Sampled # of Accounts	Sampled kWh Savings	Sampled Coverage (% kWh)	Projected # of Survey Completes[19]
C&I New Construction	HVAC	3	383,333	3	383,333	100%	2
	Lighting	12	420,639	11	411,791	98%	6
	Motors & Drives	1	130,484	1	130,484	100%	1
	Process	4	96,047	4	96,047	100%	2
	Refrigeration	1	12,303	1	12,303	100%	1
	Total	**21**	**1,042,806**	**20**	**1,033,958**	**99%**	**10**
C&I Products and Services	HVAC	17	74,793	17	74,793	100%	9
	Lighting	2	9,666	2	9,666	100%	1
	Motors & Drives	1	2,868	1	2,868	100%	1
	Total	**20**	**87,327**	**20**	**87,327**	**100%**	**10**
Government New Construction	HVAC	1	17,206	1	17,206	100%	1
	Total	**1**	**17,206**	**1**	**17,206**	**100%**	**1**
	Building Envelope	1	87,535	1	87,535	100%	1

[19] Assuming a 50 percent response rate.

Program	Measure Category	Number of Accounts	Population kWh Savings	Sampled # of Accounts	Sampled kWh Savings	Sampled Coverage (% kWh)	Projected # of Survey Completes[19]
Medium and Large C&I Retrofit	HVAC	2	395,487	2	395,487	100%	1
	Lighting	20	637,459	20	637,459	100%	10
	Motors & Drives	9	489,596	9	489,596	100%	5
	Refrigeration	1	32,657	1	32,657	100%	1
	Total	**33**	**1,642,734**	**33**	**1,642,734**	**100%**	**17**
Medium and Large Government Retrofit	HVAC	1	14,010	1	14,010	100%	1
	Lighting	6	159,255	6	159,255	100%	3
	Motors & Drives	2	5,094	2	5,094	100%	1
	Refrigeration	2	23,417	2	23,417	100%	1
	Total	**11**	**201,776**	**11**	**201,776**	**100%**	**6**
Small C&I Retrofit	Building Envelope	1	388	1	388	100%	1
	Hot Water	1	37,960	1	37,960	100%	1
	HVAC	6	57,739	6	57,739	100%	3
	Lighting	226	2,416,645	140	1,810,146	75%	70
	Motors & Drives	38	224,780	38	224,780	100%	19
	Refrigeration	50	224,899	49	222,216	99%	25
	Total	**322**	**2,962,411**	**235**	**2,353,229**	**79%**	**118**
Small Government Retrofit	Building Envelope	2	879	2	879	100%	1
	HVAC	5	71,710	5	71,710	100%	3
	Lighting	89	1,421,894	87	1,376,671	97%	44
	Motors & Drives	5	7,942	5	7,942	100%	3
	Refrigeration	7	29,756	7	29,756	100%	4
	Total	**108**	**1,532,181**	**106**	**1,486,958**	**97%**	**53**
Grand Total		**516**	**7,486,441**	**426**	**6,823,188**	**91%**	**215**

Review of Sample to Identify Contacts with Multiple Sampled Records

Prior to survey implementation, we attempt to identify records that appear in the sample more than one time ("multiples"). Records that appear to potentially be the same facility across multiple programs, the same company, or have the same contact point are grouped and flagged so they are attempted at the same time. We manually sort and review the sample on the following criteria:

- Customer ID / Customer name
- Telephone number
- Account number

All sample records are loaded into the Computer Assisted Telephone Interview (CATI) system. Any cases identified and flagged as "multiples" using the criteria above are put on hold and are handled by specially trained senior interviewers.

A.2 NATIONAL GRID

TO: Kimberly Crossman

FROM: Carrie Koenig

SUBJECT: 2013 National Grid Free-ridership and Spillover Study Proposed Sample Plan

DATE: May 29, 2014

This memorandum presents our proposed sample plan for National Grid's 2013 electric free-ridership and spillover study.

The data file transferred to us by National Grid provides information for Massachusetts participants in the Design 2000plus, Energy Initiative, and Small Business programs. Each record in the data represents a measure installed through a program for a particular location. Seven records with negative savings values[20] were removed from the sample. An account may have multiple applications, and one application may include multiple measure categories. Therefore, it is necessary to take steps to collapse – or aggregate – the data through the sampling process, yet retain all the measure-specific information for each account[21].

In this document we discuss the steps used in:

- Preparation of the data file and aggregation of the participant data
- Selection of the sample
- Preparation of sample for data collection
- Assignment of municipality and green community indicators
- Review of the sample to identify companies with multiple sampled accounts

This is followed by:

- Characterization of the proposed sample plan

The current sample plan estimates 595 completed surveys at the measure level and 505 completed surveys at the account level (some accounts represent multiple measures).

Preparation of the Data File and Aggregation of the Participant Data

1) Identify program and measure category participation. The study estimates free-ridership at the measure category level. The first step in sample preparation is to assign measures to a

[20] The variable "TotalGrosskWh" was used to identify kWh savings.
[21] An account is defined as a unique Billing Account Number

measure category. Using the information provided in the data file[22], we identified the measure categories[23] within the following programs:

a. Design 2000plus program consists of the measure categories: Custom, Unitary HVAC, Non-unitary HVAC, Variable Frequency Drives, Lighting, Compressed Air.

b. Energy Initiative program consists of the measure categories: Custom, HVAC, Variable Frequency Drives, and Lighting.

c. Small Business program consists of the measure categories: Lighting and Non-lighting.

2) Aggregate the records by Program, Account Number, and Measure Category. This aggregation sets the file up so that we have one record for each account for each measure category within a program. As we do the aggregation, we sum the kWh savings, quantity of measures installed, and authorized incentive so that the values are represented at an account level[24]. The detailed measure descriptions are retained. These descriptions are used when describing to customers what equipment is included in a measure category.

Selection of the Sample

In general, we always want to pull a census of measure categories with less than or equal to 50 accounts associated with them within a program. For the National Grid sample, we will pull a census of all accounts for each program with the exception of the Energy Initiative lighting and custom measure types and Small Business lighting and non-lighting measure types. For the following programs and measure types, we selected the top 10 percent of savings, and then randomly selected the remaining cases: Small Business program non-lighting measures, Energy Initiative lighting and custom measures. For the Small Business lighting measures we selected the top 8 percent of savings, and then randomly selected the remaining cases.

In the interviews, we discuss no more than two measure categories for each account and program the account participated in. There were a number of accounts that had measures installed in more than two measure types. In these instances, we apply a set of rules to select which measure types we want to include in the study.

1) First select measure types in the top 10 percentile of savings for that specific program and measure type ("priority" category).

2) Select rare measure types, defined as the measure type with the least number of records. There were a few exceptions where we selected the non-rare measure type because it represented a large share of the program's savings.

[22] The fields used to identify measure type categories are SubProgram, InstalledMsrRptGrp.IdLCICat.CodeSBS, UnitaryNonUnitaryHVACCoolChoiceonly, and MeasureDescription.

[23] In addition to the MeasureType categories, the variable EndUse was computed for reporting purposes. The variables used to create EndUse included Program, InstalledMeasureCodeId, InstalledMsrRptGrp.IdLCICat.CodeSBS and MeasureDescription through discussions with National Grid.

[24] We used "InstalledQuantity", "IncentiveAmtLCIonly" and "CopayAmtSBSonly", "CostofInstalledECMs" and "TotalGrosskWh". Those who received technical assistance were flagged using the variable "Vendor Service," "PayableESRAmount," or "ESR Activity".

These prioritization steps resulted in the removal of 50 measures that were included in the sample as part of the measure category census.

Preparation of Sample for Data Collection

The next step is to restructure the sample file so that one record represents one project within a program (a project may show up more than once in the dataset but never more than one time in a program). Each measure type sampled for a given project is represented in a separate column in this new data file (i.e., MeasureCategory1, MeasureCategory2). Correspondingly, measure category kWh savings, incentives and detailed descriptions are represented in associated columns (e.g., kWh1, kWh2, incentive1, incentive2).

Using this file structure, participants will be taken through the net-to-gross questions for each measure type sampled for that project. This approach allows us to assess free-ridership and like-spillover for each measure type.

Assign Municipality and Green Community Indicators

The final data preparation step is to assign flags to indicate whether each participant: 1) is a municipality/government customer, and 2) belongs to a Green Community. These indicators will be used for skip patterns in the survey instrument and cross-sectional analyses. We use the fields "FacilityDescription," "CustomerName," and "Company_name" to assign the municipality indicator. City names were cross-referenced with a list of Green Communities provided by Aimee Powelka of the Massachusetts Department of Energy Resources on May 13, 2014 to identify Green Communities.

Review of Sample to Identify Companies with Multiple Sampled Accounts

Prior to survey implementation, we attempt to identify records that appear in the sample more than one time ("multiples"). Records that appear to potentially be the same facility, the same company, or have the same contact point are grouped and flagged so they are attempted at the same time. We manually sort and review the sample on the following criteria:

- Facility / Company name
- Contact name
- Telephone number

All sample records are loaded into the Computer Assisted Telephone Interview (CATI) system. Any cases identified and flagged as "multiples" using the criteria above are put on hold. Senior interviewers are specially trained on how to deal with these multiples. Once we are a few days into the calling, our senior interviewers are responsible for calling multiples.

During our initial contact with the respondent, our first step is to verify whether the respondent is the appropriate person to provide information for each of the accounts. If not, we determine which accounts should be assigned to that respondent, and which should be discussed with someone else.

For contact persons associated with multiple accounts, we will ask these contacts about up to 2 measures per account for each program they participate in. Therefore, the interview may be slightly longer for these contacts.

Characterization of the Proposed Sample Plan and Sample

Table 1 outlines the sampling plan for National Grid's 2013 study.

Table 1: National Grid Proposed Sample Plan

Program	Measure Type	Population of Measures	Sample of Measures	Population kWh Savings	% of program kWh	Sampled kWh Savings	Coverage (sampled savings / program population savings)	Expected Completed Measures from Survey **	+/- 90% Confidence Interval at Measure Level ***
Design 2000plus	Compressed Air	124	123	4,254,886	11%	4,253,054	11.0%	62	NA
	Custom	129	119	28,488,664	74%	26,747,194	69.2%	60	NA
	Lighting	88	81	3,279,579	8%	3,053,576	7.9%	41	NA
	Non-unitary HVAC	50	49	1,216,491	3%	1,205,198	3.1%	25	NA
	Other	1	1	9,688	0%	9,688	0.0%	1	NA
	Unitary HVAC	72	69	267,391	1%	255,269	0.7%	**35**	NA
	VFD	17	17	1,152,104	3%	1,152,104	3.0%	9	NA
	Total	**481**	**459**	**38,668,804**		**36,676,082**	**94.8%**	**230**	
Energy Initiative	Custom	369	133	68,864,774	52%	51,350,121	38.7%	67	8.9%
	HVAC	52	52	3,336,424	3%	3,336,424	2.5%	26	NA
	Lighting	560	139	28,377,206	21%	17,597,702	13.3%	70	9.3%
	VFD	126	125	32,114,514	24%	32,103,532	24.2%	63	NA
	Total	**1,107**	**449**	**132,692,918**		**104,387,778**	**78.7%**	**225**	
Small Business	Lighting	1,297	140	30,041,741	82%	12,958,070	35.6%	70	9.6%
	Non-lighting	352	140	6,399,756	18%	3,775,763	1.8%	70	8.8%
	Total	**1,649**	**280**	**36,441,497**		**16,733,833**	**45.9%**	**140**	
Total		**3,237**	**1,188**	**207,803,219**		**157,797,693**	**75.9%**	**594**	

* Sampled savings / Population savings
** Assumes a 50 percent response rate. We will strive for a higher response rate, but given our experience we have chosen to be conservative in our estimate.
*** When you take a census of the population, confidence intervals do not apply.

A.3 NSTAR

MEMORANDUM

TO: Erik Mellen

FROM: Carrie Koenig and Pam Rathbun

SUBJECT: 2013 NSTAR Free-ridership and Spillover Study Proposed Sample Plan

DATE: June 5, 2014

This memorandum presents our proposed sample plan for NSTAR's 2013 electric free-ridership and spillover study.

The data file transferred to us by NSTAR provides information for Massachusetts participants in the New Construction, Retrofit and Direct Install programs. Each record in the data represents a measure installed through a program for a particular location. 1,497 upstream records[25] were removed from the sample frame as upstream projects will not be included in the free-ridership and spillover study.

Each record in the data represents a measure installed through a program for a particular location. One account or project may have multiple measures categories. Therefore, it is necessary to take steps to collapse – or aggregate – the data through the sampling process, yet retain all the measure-specific information for each account or project[26].

In this document we discuss the steps to be used in:

- Preparation of the data file and aggregation of the participant data
- Selection of the sample
- Preparation of sample for data collection
- Assign Municipality and Green Community indicators
- Review of the sample to identify companies with multiple sampled locations

This is followed by a characterization of the proposed sample plan.

Preparation of the Data File and Aggregation of the Participant Data

[25] The variable MeasureType was used to identify upstream records (MeasureType = HVAC Controls, ECM Motors, Small HVAC Packaged Unit, Upstream HVAC A/C, Upstream HVAC DCV, Upstream HVAC DEEC, Upstream HVAC ECM, Upstream HVAC HP, Upstream LED A-line, Upstream LED Decoratives, Upstream LED Lamp, Upstream RW T5 Lamp, or Upstream RW T8 Lamp).

[26] An account is defined as a unique account number ("AccountNumber" or "ElectricAccount") and program is defined by "program_name" and "program". We aggregate by project using the variables "Project" or "JobID."

1) Identify program and measure category participation. The study estimates free-ridership at the measure category level. The first step in sample preparation is to assign measures to a measure category. Using the information provided in the data files[27], we identify the measure categories within the following programs:

a. The Retrofit program consists of the measure categories: CHP, compressed air, HVAC, process, lighting, motors/drives[28], and refrigeration[29].

b. The New Construction program consists of the measure categories: comprehensive[30], compressed air, HVAC, process, lighting, motors/drives[31], and refrigeration.

c. The Direct Install program consists of the measure categories: hot water, HVAC, process, lighting, motors/drives, and refrigeration.

2) Aggregate the records by Program, ProjectID, and Measure Category. This aggregation sets the file up so that we have one record for each account for each measure category within a program. As we do the aggregation, we sum the kWh savings, quantity of measures installed, and authorized incentive[32] so that the values are represented at a project level. The detailed measure descriptions are retained. These descriptions are used when describing to customers what equipment is included in a measure category.

Selection of the Sample

In general, we always want to pull a census of measure categories with less than or equal to 50 accounts associated with them within a program. For the NSTAR sample, we will pull a census of all accounts for each program with the exception of the Direct Install refrigeration and lighting measures, New Construction lighting measures, and Retrofit lighting and HVAC measures. For the following programs and measure types, we selected the top 10 percent with certainty and then randomly selected the remaining cases: Direct Install refrigeration measures, New Construction lighting measures, and Retrofit lighting and HVAC measures. For the Direct Install program lighting measures we selected the top 5 percent with certainty and then randomly selected the remaining cases.

In the interviews, we discuss no more than two measure categories for each project and program that the account participated in. There were a number of projects that had measures installed for

[27] The fields “EndUse”, “ApplicationType”, “MeasureType”, and “ProductDescription” were used to determine the end use and measure categories.
[28] Includes VSDs originally categorized under the “HVAC” and “Industrial Processing” end uses in the participant data.
[29] Includes “vending” cases originally categorized under “Lighting” end use in the participant data.
[30] Includes custom comprehensive design and building shell projects originally categorized under the “HVAC” end use.
[31] Includes VSDs originally categorized under “HVAC” and “Industrial Processing” end uses in the participant data.
[32] We used “FinalQuantity,” “quantity”, “ElectricFinalIncentive”, “IncentiveAmount,” and “FinalAnnualkWh,” “AnnualkWhSavings” to identify quantity installed, the total rebate amount, and the total kWh savings associated with that measure respectively. Those who received technical assistance were flagged using the variable “ProductCode” = TA-CUST or having an “AuditDate”.

more than two measure types. In these instances, we apply a set of rules to select which measure types we want to include in the study.

1) First select "priority" measure categories in the top 10 percentile of savings for that specific program and measure type (or top 5 percentile for Direct Install lighting).

2) Select rare measure types, defined as the measure type with the least number of records. There were a few exceptions where we selected the non-rare measure type because it represented a large share of the program's savings.

These prioritization steps resulted in the removal of 46 measures from the sample as part of the measure category census.

Preparation of Sample for Data Collection

The next step is to restructure the sample file so that one record represents one project within a program (a project may show up more than once in the dataset but never more than one time in a program). Each measure type sampled for a given project is represented in a separate column in this new data file (i.e., MeasureCategory1, MeasureCategory2). Correspondingly, measure category kWh savings, incentives and detailed descriptions are represented in associated columns (e.g., kWh1, kWh2, incentive1, incentive2).

Using this file structure, participants will be taken through the net-to-gross questions for each measure category sampled for that project. This approach allows for us to assess free-ridership and like-spillover for each measure type.

Assign Municipality and Green Community Indicators

The final data preparation step is to assign flags to indicate whether each participant: 1) is a municipality/government customer, and 2) belongs to a Green Community. These indicators will be used for skip patterns in the survey instrument and cross-sectional analyses. We use the fields "MuniPgm" and "ProjectName" and "LastName" to assign the municipality indicator. City names were cross-referenced with a list of Green Communities provided by Aimee Powelka of the Massachusetts Department of Energy Resources on May 13, 2014 to identify Green Communities.

Review of Sample to Identify Companies with Multiple Sampled Accounts

Prior to survey implementation, we attempt to identify records that appear in the sample more than one time ("multiples"). Records that appear to potentially be the same facility, the same company, or have the same contact point are grouped and flagged so they are attempted at the same time. We manually sort and review the sample on the following criteria:

- Company name
- Contact name
- Telephone number
- Address

All sample records are loaded into the Computer Assisted Telephone Interview (CATI) system. Any cases identified and flagged as "multiples" using the criteria above are put on hold. Senior

interviewers are specially trained on how to deal with these multiples. Once we are a few days into the calling, our senior interviewers are responsible for calling multiples.

During our initial contact with the respondent, our first step is to verify whether the respondent is the appropriate decision maker who can provide information for each of the accounts. If not, we determine which accounts should be assigned to that respondent, and which should be discussed with someone else.

For contact persons associated with multiple accounts, we will ask these contacts about up to 2 measures per account for each program they participate in. Therefore, the interview may be slightly longer for these contacts.

Characterization of the Proposed Sample Plan and Sample

Table 1 outlines the sampling plan for NSTAR's 2013 electric study.

Table 1: NSTAR Proposed Sample Plan

Program	Measure Type / End Use	Population of Measures	Sample of Measures	Population kWh Savings	Sampled kWh Savings	Expected Completed Measures from Survey *	+/- 90% Confidence Interval at Measure Level **
Direct Install	Hot Water	30	30	163,126	163,126	15	NA
	HVAC	53	51	1,438,907	1,426,097	26	NA
	Lighting	2,084	140	43,239,813	16,214,271	70	9.7%
	Motors/Drives	138	138	633,481	633,481	69	NA
	Process	5	5	24,615	24,615	3	NA
	Refrigeration	303	140	3,540,347	2,307,583	70	8.6%
	Total	**2,613**	**504**	**49,040,289**	**20,769,173**	**253**	**4.9%**
New Construction	Comprehensive	41	41	22,214,831	22,214,831	21	NA
	Compressed Air	39	39	1,366,960	1,366,960	20	NA
	HVAC	58	56	11,999,313	11,199,388	28	NA
	Lighting	222	133	8,915,137	7,203,772	67	8.4%
	Motors/Drives	50	49	2,854,109	2,815,129	25	NA
	Process	12	12	1,177,446	1,177,446	6	NA
	Refrigeration	10	10	1,677,749	1,677,749	5	NA
	Total	**432**	**340**	**50,205,545**	**47,655,275**	**172**	**4.9%**
Retrofit	CHP	5	5	39,723,964	39,723,964	3	NA
	Compressed Air	9	9	2,290,651	2,290,651	5	NA
	HVAC	191	138	51,616,571	43,112,848	69	7.9%
	Lighting	592	138	65,031,524	45,269,643	69	9.3%
	Motors/Drives	112	110	14,855,513	14,462,831	55	NA
	Process	18	18	3,644,840	3,644,840	9	NA
	Refrigeration	39	38	2,667,957	2,649,859	19	NA
	Total	**966**	**456**	**179,831,020**	**151,154,636**	**229**	**4.8%**
Total		**4,011**	**1,300**	**279,076,854**	**219,579,084**	**654**	**3.0%**

* Assumes a 50 percent response rate. We will strive for a higher response rate, but given our experience we have chosen to be conservative in our estimate.

** Confidence intervals do not apply for census samples.

A.4 UNITIL

MEMORANDUM

TO: Mary Downes

FROM: Carrie Koenig, Steve Drake, and Pam Rathbun

CC: Lisa Glover

SUBJECT: 2013 Unitil Free-ridership and Spillover Study Proposed Sample Plan

DATE: May 14, 2014

Overview

This memorandum details the sampling procedures and draft sample plan for Unitil's 2013 Free-Ridership and Spillover Study.

In this document, we discuss the steps to be used in:

- Preparation of the data file and aggregation of the participant data
- Development of the sample plan
- Review of Sample to Identify Companies with Multiple Sampled Accounts

Preparation of the Data File and Aggregation of the Participant Data

The sample source is an Excel data file[33] sent to KEMA by Unitil and forwarded to Tetra Tech. This file provides information for participants in the following programs:

- C&I Large Retrofit
- C&I New Construction
- C&I Small Retrofit

Each record in the data represents a measure or set of measures within a specified end-use installed through a program for a particular account[34]. One account may have multiple work orders, and one work order may include measures installed through multiple end-uses. Therefore, it is necessary to take steps to collapse – or aggregate – the data through the sampling process, yet retain all the measure-specific information for each account. The steps taken to do this are detailed in this section.

[33] "FGE 2013 CI tracking data.xlsx".
[34] For sampling purposes, an account was defined as a unique "locationid" in the participant data.

1) Identify measure category participation

The study estimates free-ridership at the measure category level. The first step in sample preparation is to assign measures to a measure category. Following the 2010 free-ridership and spillover study, we used the fields labeled “End Use” to identify measure category for each program:

- C&I Large Retrofit program consists of five measure categories: Compressed Air, HVAC, Lighting, Motors and Drives, and Process.
- C&I New Construction program consists of two measure categories: Compressed Air and Process.
- C&I Small Retrofit program consists of two measure categories: Lighting and Refrigeration.

Eighty-four New Construction program prescriptive track records, which included “upstream” in the customer name, were removed from the sample frame at this point.

2) Aggregate the records by Program, Account, and Measure Category

This aggregation sets the file up so that we have one record for each account for each measure category within a program. As we do the aggregation, we sum the kWh savings, cost, and incentive so that the values are represented at the account and program level. The detailed measure descriptions, which were modified slightly to eliminate duplication, are retained. These descriptions are used when describing to customers what equipment is included in a measure category.

3) Create a flat file with one record per Account and Program

The next step is to create a flat file where one record represents one account within a program (an account may show up more than once in a dataset, but never more than one time in a program). Annual kWh savings, incentive values, costs, and measure descriptions are retained for each measure category (i.e., kWh1, kWh2, inc1, inc2, etc.).

4) Assign Municipality and Green Community indicators

The final data preparation step is to assign flags to indicate whether each participant 1) is a municipality/government customer, and 2) belongs to a Green Community. These indicators will be used for skip patterns in the survey instrument and cross-sectional analyses. We use the fields “NAICSCode” and “CustomerName” to assign the municipality indicator. City names were cross-referenced with a list of Green Communities provided by Aimee Powelka of the Massachusetts Department of Energy Resources on May 13, 2014 to identify Green Communities.

Development of Sample Plan

Given the small number of participants in these three programs, we will be surveying a census of participants (80 unique participants by program). Seventy-seven participants installed one measure category and 3 participants installed two different measure categories (none had more than two different measure categories).

Table 1 details the sample plan. Table 1 also presents the sample details in terms of kWh savings and number of accounts.

Table 1: Unitil Free-Ridership / Spillover Sample Details

Program	Measure Category	Number of Accounts	Population kWh Savings	Sampled # of Accounts	Projected # of Survey Completes[35]
C&I Large Retrofit	Compressed Air	2	596,502	2	1
	HVAC	2	1,632,743	2	1
	Lighting	7	1,016,252	7	4
	Motors & Drives	1	416,070	1	1
	Process	1	93,250	1	1
	Total	**13**	**3,754,817**	**13**	**8**
C&I New Construction	Compressed Air	1	1,896	1	1
	Process	2	177,168	2	1
	Total	**3**	**179,064**	**3**	**2**
C&I Small Retrofit	Lighting	66	1,529,622	66	33
	Refrigeration	1	4,533	1	1
	Total	**67**	**1,534,155**	**67**	**34**
Grand Total		**83**	**5,468,036**	**83**	**44**

Review of Sample to Identify Contacts with Multiple Sampled Records

Prior to survey implementation, we attempt to identify records that appear in the sample more than one time ("multiples"). Records that appear to potentially be the same facility across multiple programs, the same company, or have the same contact point are grouped and flagged so they are attempted at the same time. We manually sort and review the sample on the following criteria:

- Customer ID / Customer name
- Contact name
- Telephone number
- Location ID

All sample records are loaded into the Computer Assisted Telephone Interview (CATI) system. Any cases identified and flagged as "multiples" using the criteria above are put on hold and are handled by specially trained senior interviewers.

[35] Assuming a 50 percent response rate.

A.5 WESTERN MASSACHUSETTS ELECTRIC COMPANY

M E M O R A N D U M

TO: Erik Mellen

FROM: Carrie Koenig, Steve Drake, and Pam Rathbun

SUBJECT: 2013 WMECO Free-ridership and Spillover Study Proposed Sample Plan

DATE: June 18, 2014

This memorandum presents our proposed sample plan for Western Massachusetts Electric Company's (WMECO) 2013 electric free-ridership and spillover study.

The data file transferred to us by WMECO provides information for Massachusetts participants in the New Construction, Retrofit and Small Business Energy Advantage programs. Each record in the data represents a measure installed through a program for a particular location. The evaluation team removed 268 upstream records[36] from the sample frame as upstream projects will not be included in the free-ridership and spillover study.

Each record in the data represents a measure installed through a program for a particular location. One account or project may have multiple measures categories. Therefore, it is necessary to take steps to collapse – or aggregate – the data through the sampling process, yet retain all the measure-specific information for each account or project[37].

In this document we discuss the steps to be used in:

- Preparation of the data file and aggregation of the participant data
- Selection of the sample
- Preparation of sample for data collection
- Assign Municipality and Green Community indicators
- Review of the sample to identify companies with multiple sampled locations

This is followed by a characterization of the proposed sample plan.

Preparation of the Data File and Aggregation of the Participant Data

1) Identify program and measure category participation. The study estimates free-ridership at the measure category level. The first step in sample preparation is to assign measures to a

[36] The variables "workflow" and "MeasureType" were used to identify upstream records.

[37] An account is defined as a unique account number ("C2_Bill_Account") and program is defined by "program_name" and "program". We aggregate by project using the variables "Project" or "Project_number."

measure category. Using the information provided in the data files[38], we identify the measure categories within the following programs:

- The Retrofit program consists of the measure categories: CHP, compressed air, HVAC, lighting, motors/drives[39], process, and refrigeration.
- The New Construction program consists of the measure categories: comprehensive[40], compressed air, HVAC, lighting, motors/drives[41], process, and refrigeration.
- The Small Business Energy Advantage program consists of the measure categories: hot water, HVAC, lighting, and refrigeration.

At this stage, four records from the Small Business Energy Advantage program that had a description indicating equipment was removed were dropped from the survey sample frame as these measures are not applicable for the free-ridership and spillover survey.

2) Aggregate the records by Program, ProjectID, and Measure Category. This aggregation sets the file up so that we have one record for each project for each measure category within a program. As we do the aggregation, we sum the kWh savings, quantity of measures installed, and authorized incentive[42] so that the values are represented at a project level. The detailed measure descriptions are retained. These descriptions are used when describing to customers what equipment is included in a measure category.

Selection of the Sample

In general, we always want to pull a census of measure categories with less than or equal to 50 accounts associated with them within a program. For the WMECO sample, we will pull a census of all accounts for each program with the exception of the Small Business Energy Advantage lighting measure category. For this measure category, we selected the top 10 percent with certainty and then randomly selected from the remaining accounts for the survey.

In the interviews, we discuss no more than two measure categories for each project and program. Five projects (three New Construction projects and two Small Business Energy Advantage projects) had more than two measure categories installed. In these instances, we apply a set of rules to select which measure types we want to include in the study.

1) First select “priority” measure categories in the top 10 percentile of savings for that specific program and measure type.

[38] The fields “EndUse”, “ApplicationType”, “MeasureType”, and “MeasureDescription” were used to determine the end use and measure categories.

[39] Includes VSDs originally categorized under the “HVAC” and “Industrial Processing” end uses in the participant data.

[40] Includes custom comprehensive design and building shell projects originally categorized under the “HVAC” end use.

[41] Includes VSDs originally categorized under the “HVAC” end use in the participant data.

[42] We used “FinalQuantity,” “Number_Units_Installed”, “ElectricFinalIncentive”, “FinalIncentive,” “Electric_Incentive_Amt,” “FinalAnnualkWh,” “annual_savings” to identify quantity installed, the total rebate amount, and the total kWh savings associated with that measure respectively. Those who received technical assistance were flagged using the variable “AssociatedEngineeringStudy”. Those who received financing assistance were flagged using the variable “finance_accepted”.

2) Select rare measure types, defined as the measure type with the least number of records.

These prioritization steps resulted in the removal of 9 measure categories from the sample.

Preparation of Sample for Data Collection

The next step is to restructure the sample file so that one record represents one project within a program (a project may show up more than once in the dataset but never more than one time in a program). Each measure type sampled for a given project is represented in a separate column in this new data file (i.e., MeasureCategory1, MeasureCategory2). Correspondingly, measure category kWh savings, incentives and detailed descriptions are represented in associated columns (e.g., kWh1, kWh2, incentive1, incentive2).

Using this file structure, participants will be taken through the net-to-gross questions for each measure category sampled for that project. This approach allows for us to assess free-ridership and like-spillover for each measure type.

Assign Municipality and Green Community Indicators

The final data preparation step is to assign flags to indicate whether each participant: 1) is a municipality/government customer, and 2) belongs to a Green Community. These indicators will be used for skip patterns in the survey instrument and cross-sectional analyses. We use the fields "MuniPgm" and "Project_Name" to assign the municipality indicator. City names were cross-referenced with a list of Green Communities provided by Aimee Powelka of the Massachusetts Department of Energy Resources on May 13, 2014 to identify Green Communities.

Review of Sample to Identify Companies with Multiple Sampled Accounts

Prior to survey implementation, we attempt to identify records that appear in the sample more than one time ("multiples"). Records that appear to potentially be the same facility, the same company, or have the same contact point are grouped and flagged so they are attempted at the same time. We manually sort and review the sample on the following criteria:

- Telephone number
- Contact name
- Company name
- Address

All sample records are loaded into the Computer Assisted Telephone Interview (CATI) system. Any cases identified and flagged as "multiples" using the criteria above are put on hold. Senior interviewers are specially trained on how to deal with these multiples. Once we are a few days into the calling, our senior interviewers are responsible for calling multiples.

During our initial contact with the respondent, our first step is to verify whether the respondent is the appropriate decision maker who can provide information for each of the accounts. If not, we determine which accounts should be assigned to that respondent, and which should be discussed with someone else.

For contact persons associated with multiple accounts, we will ask these contacts about up to 2 measures per account for each program they participate in. Therefore, the interview may be slightly longer for these contacts.

Characterization of the Proposed Sample Plan and Sample

Table 1 outlines the sampling plan for WMECO's 2013 electric study.

Table 1: WMECO Proposed Sample Plan

Program	Measure Type / End Use	Population of Measures	Sample of Measures	Population kWh Savings	Sampled kWh Savings	Expected Completed Measures from Survey *	+/- 90% Confidence Interval at Measure Level **
New Construction	Comprehensive	5	5	504,168	504,168	3	NA
	Compressed Air	28	28	2,145,442	2,145,442	14	NA
	HVAC	36	36	1,473,434	1,473,434	18	NA
	Lighting	43	41	2,608,259	2,531,105	21	NA
	Motors/Drives	7	6	1,152,980	1,069,827	3	NA
	Process	12	12	1,414,414	1,414,414	6	NA
	Refrigeration	4	4	1,343,283	1,343,283	2	NA
	Total	**135**	**132**	**10,641,980**	**10,481,673**	**67**	**NA**
Retrofit	CHP	2	2	6,156,102	6,156,102	1	NA
	Compressed Air	5	5	581,194	581,194	3	NA
	HVAC	19	19	4,669,774	4,669,774	10	NA
	Lighting	129	129	8,319,078	8,319,078	65	NA
	Motors/Drives	25	25	2,177,934	2,177,934	13	NA
	Process	9	9	4,445,599	4,445,599	5	NA
	Refrigeration	7	7	749,195	749,195	4	NA
	Total	**196**	**196**	**27,098,876**	**27,098,876**	**101**	**NA**
Small Business Energy Advantage	Hot Water	2	2	8,325	8,325	1	NA
	HVAC	14	14	355,907	355,907	7	NA
	Lighting	533	140	15,297,731	9,218,617	70	9.2%
	Refrigeration	63	60	710,218	694,293	30	NA
	Total	**612**	**216**	**16,372,181**	**10,277,142**	**108**	**7.2%**
Total		**943**	**544**	**54,113,037**	**47,857,691**	**276**	**4.2%**

* Assumes a 50 percent response rate. We will strive for a higher response rate, but given our experience we have chosen to be conservative in our estimate.

** Confidence intervals do not apply for census samples.

APPENDIX B: WEIGHTING METHODOLOGY

This appendix outlines the steps necessary to prepare the free-ridership data for analysis.

1. Calculating the sample weight (Phase 1 Weight)

Completed surveys must be weighted to represent population savings unless a census of all measures and customers is sampled ***and*** all customers respond to the survey.

The data were first weighted to correct for disproportional sampling and non-response to the survey. These weights—hereafter referred to as measure weights—were applied when analyzing the participant free-ridership and spillover results.

Because our population of interest was technically the savings, we used *measure category savings* to determine the weight that should be applied to each case. The measure category savings were stratified by priority and non-priority cases[43]. Priority cases were sampled at 100%. Including this stratification in the weighting scheme ensured the premises sampled at 100% were not overrepresented, and the sampled premises (sampled at less than 100%) were represented appropriately.

The following table is an example of weights applied to a sample stratified by measure category for a given program. The measure-related savings in the program tracking system database are listed in the population column. The corresponding savings accounted for by completed surveys and weights are listed under the "Surveyed Savings" and "Measure Weight" columns respectively. To calculate the "Measure Weight" for a given measure type, we divided the population of savings by the surveyed savings.

Table 6-11. Examples of Weighting Calculations Using Three Measure Categories

	Strata (priority / non-priority)	Population of savings	Surveyed savings	Measure weight
HVAC	Census	3,336,424	1,046,725	3.19
Lighting	Non-priority	12,842,436	1,527,367	8.41
	Priority	15,534,770	5,460,456	2.84
VFD	Census	32,114,514	8,508,034	3.77

To make sure measure weights are assigned correctly, we apply the weight to the energy savings of each surveyed case and check to make sure the total weighted energy savings for each measure category and overall match the total population savings.

2. Extrapolating the data to the expected savings (Phase 2 Weight)

The next step in preparing for the analysis is extrapolating the weight to the expected savings. To do this, the measure weight is multiplied by the kWh savings per account surveyed. The data are then analyzed taking into account the kWh savings.

[43] As discussed in the sampling plan, priority cases are cases that are considered multi-measure accounts, and accounts that represent the top -10 percentile of measure category savings.

Conducting this next step determines the net free-ridership rate and spillover rates, and ensures the overall free-ridership rates are computed taking into consideration the kWh savings for each individual account. The free-ridership and spillover rates would be skewed if the savings were not taken into account when determining free-ridership. This also means that large energy savers can have significant impacts on the overall free-ridership and spillover rates, particularly when the sample sizes are small.

Below we illustrate the preparation procedures, and effect of the procedures, using two cases.

Case A:	**Case B:**
Situation	
Received lighting measures	Received lighting measures
Flagged as a priority case	Flagged as non-priority
Has a free-ridership rate of 75 percent	Has a free-ridership rate of 25 percent
Recorded a savings of 10,000 kWh	Recorded a savings of 1,000 kWh
Step 1: Compute measure weight (discussed in prior section)	
Measure weight = 8.41	Measure weight =2.84
Step 2: Compute measure category-weighted kWh	
Adjusted kWh =10,000*8.41 = 84,100	Adjusted kWh = 1,000*2.84 = 2,840
Step 3: Calculate kWh associated with the free-ridership based on the measure category weighted kWh, calculated in Step 1	
FR savings = 84,100*.75 = 63,075	FR savings = 2,840*.25 = 710
Step 4: Sum the free-ridership attributed savings and population savings.	
Total FR attributed savings:	63,075 + 710 = 63,785 kWh
Population savings:	84,100 + 2,840 = 86,940 kWh

Step 5: Divide the Total FR attributed savings by population savings to determine free-ridership rate.

Net free-ridership rate = 63,785/86,940 = 73.4 percent

As illustrated above, the net free-ridership rate takes into account the savings of each account. As such, the estimates are *weighted for the disproportionate probability of being surveyed and measure category savings.*

3. Creating a one-stage weighting scheme

Creating two weighting variables introduces the risk of error in reporting the data. To eliminate the risk, the analysis syntax only includes one weighting variable. This variable multiplies the weight calculated in Phase 1 with the kWh associated with that measure and account.

Measure weight = sample weight * individual kWh savings

The measure weight was applied when running any analysis to determine net free-ridership and spillover rates.

APPENDIX C: SURVEY INSTRUMENTS

C.1 MASSACHUSETTS CROSS-CUTTING–FREE-RIDERSHIP AND SPILLOVER SURVEY USING CUSTOMER SELF REPORT APPROACH

Variable List

<INTERVIEWER> Interviewer Name
<CONTACT> Customer Contact Name
<PA> Program Administrator
<PA CONTACT INFORMATION> PA Contact Name and Phone Number.
<CUST> Customer/Facility Name
<CITY> Customer City
<DATE> Date of participation
<YEAR> Year of participation
<FUEL> Fuel type (electric or natural gas)
<ADDR> Service address where measure was installed
<MEASCAT1, MEASCAT2> End-use Category (i.e. lighting)
<QTYFLAG1, QTYFLAG2>
0 quantity is not applicable for this measure category (measure count = 1 or quantity is not relevant as in delamping, recycling)
1 quantity greater than 1
<EFF1, EFF2>
0 efficiency is not applicable for this measure category (e.g., insulation, VFD, delamping, recycling, occupancy sensors)
1 efficiency is applicable
<EQUIP1, EQUIP2>
0 if installed measure is not equipment that is operational (e.g., insulation),
1 if installed measure is operational
<**MEAS1a-MEAS1h**>, <**MEAS2a-MEAS2h**> Detailed measure descriptions
<STUDY> Technical Assessment Study, Technical Feasibility Study, Audit
<INC1, INC2> PA incentive for specific measure categories
<CST1,CST2> Total cost of project for specific measure categories
<ALL ASSISTANCE> Description of all technical assistance, financing, and rebates for measures installed through program
<FINANCE> Project received interest-free financing
<ELECPROJ>
0 No electric project was performed alongside the gas project
1 There was an electric project performed alongside the gas project (where both electric and gas equipment was provided through the same PA)
2 There was an electric project performed alongside the gas project (where electric and gas equipment was provided through different PAs)
<ELEC1a-1h> (NSTAR only) Detailed electric measure description

NOTE:
For all questions, "DON'T KNOW" and "REFUSED" will be coded if offered as a response. Interviewers will probe as needed to minimize the amount of missing data.

For any case where the interview terminates early, respondent doesn't recall measures, measures are not installed, or the contact no longer work at the company and we cannot locate a knowledgeable respondent, the case will be pulled and sent to the PA for review.

Introduction

Hello, my name is <INTERVIEWER>, and I'm calling on behalf of <PA> regarding your firm's participation in their energy efficiency program. May I please speak with <CONTACT>?

1 Yes
2 No [ATTEMPT TO CONVERT. MENTION ADVANCE LETTER THEY SHOULD HAVE RECEIVED REGARDING THE CALL.]

I1 Are you the person who was most involved in making the decision to get <ALL ASSISTANCE> through the <PA> program in <DATE> at <ADDR> in <CITY>?
[IF NSTAR AND ELECPROJ=1 or 2: Our records indicate that this may have been done alongside an electric project which would have included <electric measures>]

1 Yes [SKIP TO I2]
2 No [SKIP TO I1A]
D (DK) [PROBE TO IDENTIFY SOMEONE RESPONSIBLE FOR MAKING DECISIONS ABOUT ENERGY USING EQUIPMENT AT THAT FACILITY; IF DK, THANK AND TERMINATE]
R (REFUSED) [THANK AND TERMINATE]

I1a. Who was primarily responsible for making the decision to get <ALL ASSISTANCE> through the program?

[RECORD NAME AND DISPOSITION]

1 Transfers you
2 Can only give contact information [RECORD CONTACT INFO; THANK AND TERMINATE]
D (DK) [THANK AND TERMINATE]
R (REFUSED) [THANK AND TERMINATE]

I2. Are you employed by <CUST> or are you a contractor who provides design and/or installation services for <CUST>?
(INTERVIEWER NOTE: CODE UNPAID MEMBERS OF AN ADVISORY BOARD OR COMMITTEE AS EMPLOYEES)

1 Work directly for company/Employee/Volunteer
2 Vendor/Contractor [TERMINATE and USE VENDOR SURVEY]

INTRO1.
I'm with Tetra Tech, an independent research firm. On behalf of <PA>, we are following up with customers who participated in an energy efficiency program in 2011 to learn about their experiences. You or someone at your facility may have received a letter from <PA> letting you know to expect this call. I'm not selling anything, I'd just like to ask about the energy efficiency project you implemented through this program at <ADDR>. Your individual

responses will be kept confidential by Tetra Tech and <PA> This should take about 15 minutes.

Before we start, I would like to inform you that for quality control purposes, this call will be recorded and monitored.

READ FOLLOWING ONLY AS NEEDED:
(Sales concern: I am not selling anything; I simply want to understand what factors were important to your company when deciding to implement this new energy efficiency project and receive an incentive through this program. Your responses will be kept confidential by our firm and <PA>. If you would like to talk with someone from <PA>, you can call <PA CONTACT INFORMATION>.)

(Who is doing this study: <PA> has hired our firm to evaluate the program. As part of the evaluation, we're talking with customers that participated in the program to better understand their experiences with the program.)

(Why are you conducting this study: Studies like this help <PA> better understand customers' need for and interest in energy efficiency programs and services, and to improve the effectiveness of their programs.)

(Timing: This survey should take about 15 minutes of your time. Is this a good time for us to speak with you? IF NOT, SET UP CALL BACK APPOINTMENT OR OFFER TO LET THEM CALL US BACK AT 1-800-454-5070.)

Decision Making

INTRO2.

In the remainder of this interview, I'd like to focus on the <MEASCAT1, MEASCAT2> you implemented through the program.

REPEAT R1A THROUGH R1D FOR MEASCAT1 AND MEASCAT2.

R1a. According to our records, the [EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): energy efficient] <MEASCAT1, MEASCAT2> project you implemented through <PA>'s program included <MEAS1a-MEAS1h, MEAS2a-MEAS2h>.

[IF ELECPROJ=1 or 2: There were also electric saving equipment implemented that included <ELECa-h>]

Were you involved in the decision-making process when the [EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): energy efficient] <MEASCAT1, MEASCAT2> was being considered for this facility?

1 Yes
2 No
D (DK)
R (REFUSED)

R1b. Aside from yourself, who else within your company or outside your company was involved in the decision of whether or not to purchase the [EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): energy efficient] <MEASCAT1, MEASCAT2> through <PA>'s program?

(PROBE: IF MORE THAN ONE DECISION MAKER, ASK R WHO WAS RESPONSIBLE FOR MAKING THE ULTIMATE DECISION)

1 No one else
2 (SPECIFY):

Name	Title	Phone number	Probe for role:

R1c. Are the natural gas saving <MEASCAT1, MEASCAT2> equipment installed through <PA>'s program still at least partially installed [IF INSTALLED MEASURE IS OPERATIONAL; (IF EQUIP1, EQUIP2=1): and operating] at this facility?

1 Yes [SKIP TO NEXT MEASURE]
2 No
D (DK)
R (REFUSED)

R1d. Why is the <MEASCAT1, MEASCAT2> equipment no longer installed [IF INSTALLED MEASURE IS OPERATIONAL; (IF EQUIP1, EQUIP2=1): or no longer operating] at this facility?

(RECORD VERBATIM RESPONSE)

(IF RESPONDENT WAS MOST INVOLVED IN THE DECISION AND MEASURE IS STILL OPERATING, ASK FREE RIDERSHIP QUESTIONS RELATED TO MEASCAT1, MEASCAT2)

(IF NOT PRIMARY DECISION MAKER FOR EITHER MEASURE, SKIP TO I1 AND DIAL THE MAIN DECISION MAKER IN R1b)

R1bb. [IF NOT INDICATOR OF ELECTRIC MEASURES FOR THAT PA] Did your firm also have some electric measures installed through a program at around that same time? (PROBE: who provided the incentive for the electric measures?)

1 Yes, through a <PA> program (SPECIFY WHAT DONE)
2 Yes, but through another PA program (SPECIFY PA)
3 No
D (DK)
R (REFUSED)

IF R1BB=1, ELECPROJ=1 (same program administrator)
IF R1BB=2, ELECPROJ=2 (another program administrator)

R3. Does your company have any corporate policies related to energy efficiency standards that you need to consider when purchasing new equipment or making improvements to this facility?

1	Yes	
2	No	[SKIP TO R6]
D	(DK)	[SKIP TO R6]
R	(REFUSED)	[SKIP TO R6]

R4. Which of the following best describes this policy? (READ LIST)

1	Purchase energy efficient measures regardless of cost
2	Purchase energy efficient measures if it meets payback or return on investment criteria
3	Purchase standard efficiency measures that meet code
4	Something else (SPECIFY)
D	(DK)
R	(REFUSED)

R6i. [IF PA=NSTAR or Study=No] Did your company receive a technical assessment as part of your participation in the program?

1	Yes [STUDY = Yes, STUDYTYPE = “technical assessment”]
2	No
D	(DK)
R	(REFUSED)

[IF NO <STUDY>, SKIP TO R9]

R6. If <PA> had not paid a portion of the cost, would your company have paid to have a similar <STUDY> done at that same time?

1	Yes	[SKIP TO R9]
2	No	
D	(DK)	[SKIP TO R9]
R	(REFUSED)	[SKIP TO R9]

R7. Would you have paid to have the study done earlier than you did, at a later date, or never?

1	Earlier
2	Same time (REPEAT R6)
3	Later
4	Never
D	(DK)
R	(REFUSED)

R8. [IF R7 = EARLIER OR LATER (IF R7 = 1 OR 3)] How much [earlier/later] would you have had the study done?

___ YEARS (AND/OR) ___ MONTHS

D DK
R (REFUSED)

C2. [IF <PA> HAD NOT PAID A PORTION OF THE COST OF THE <STUDY>, COMPANY WOULD HAVE PAID FOR STUDY (R6=NO)] On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did the information provided by the <STUDY> have on your decision to implement the [IF EFFICIENCY IS APPLICABLE; *IF EFF1, EFF2 = 1:* high efficiency] <MEASCAT1,MEASCAT2> project? (REPEAT FOR EACH MEASURE)

_____ (ENTER INFLUENCE RANKING)

D (DK)
R (REFUSED)

R9. Did you receive interest-free financing from <PA> which allowed you to pay for your portion of the project cost over time?

1 Yes
2 No
D DK

Free-Ridership

FR0. Please think back to the time when you were considering implementing the specific natural gas saving <MEASCAT1 and MEASCAT2> projects in <YEAR>.

What factors motivated your business to consider implementing new <MEASCAT1 and MEASCAT2> equipment through <PA>'s program? (PROBE: What other factors did you consider?)

DO NOT READ LIST. PLEASE CHOOSE ALL THAT APPLY.

1 (Old equipment failed)
2 (Old equipment working poorly)
3 (Old equipment scheduled for replacement)
4 (Wanted to reduce maintenance costs)
5 (The incentive being offered through the program)
6 (The technical assistance offered through the program)
7 (Wanted to reduce energy bills)
8 (Wanted to save energy)
9 (Recommendation of third party contractor/engineer/design professional)
10 (Recommendation of <PA> staff)
11 (Recommendation of internal staff)
12 (Past experience with the program)
13 (Other - specify)
14 (DK)
15 (REFUSED)
16 (Because we were having electric equipment installed at the same time)
*17 Motivating factors to consider implementing - switching from oil to gas
*18 Motivating factors to consider implementing - environmental concerns
*19 Motivating factors to consider implementing - improve reliability/safety of equipment
*20 Motivating factors to consider implementing - comfort
*21 Motivating factors to consider implementing - implemented alongside another project
*22 Motivating factors to consider implementing - ROI/Payback
*23 Motivating factors to consider implementing - availability of financing
*24 Motivating factors to consider implementing - improve efficiency-level of equipment
*25 Motivating factors to consider implementing - cost savings - unspecified

START OF MEASURE LOOP
FR1-C9 will be asked of each measure category recalled that are still installed and operating - up to TWO measure categories.

INTRO3a

Now, I'd like to ask you about your decision to implement the <MEASCAT1> project through <PA>'s program. [IF THERE IS ALSO A SECOND MEASURE: Then, I'll repeat these questions for <MEASCAT2>].

INTRO3b

[IF SECOND MEASURE] Now I'd like to review the <MEASCAT2> project you implemented.

FR1. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have implemented the same [IF QUANTITY IS GREATER THAN (IF QTYFLAG1, QTYFLAG2 = 1): quantity] [IF EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): and efficiency of] <MEASCAT1, MEASCAT2> at that same time if the <PA> had not provided the <ALL ASSISTANCE>?

___ (0 TO 10)
D (DK)
R (REFUSED)

FR2. Did your company have any funds allocated to implement the <MEASCAT1, MEASCAT2> project before you talked with anyone about the program?

1	Yes	
2	No	[SKIP TO FR4]
D	(DK)	[SKIP TO FR4]
R	(REFUSED)	[SKIP TO FR4]

FR3a. Was it necessary to change the timing of the implementation, [IF QUANTITY IS GREATER THAN 1 (if QTYFLAG1, QTYFLAG2 = 1): the quantity of equipment] [IF EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): or the efficiency level] of the <MEASCAT1, MEASCAT2> in order to qualify for the program?

1	Yes	
2	No	[SKIP TO FR4]
D	(DK)	[SKIP TO FR4]
R	(REFUSED)	[SKIP TO FR4]

FR3b. What changes were necessary? [DO NOT READ; SELECT ALL THAT APPLY]

1 (Installation occurred SOONER than planned)
2 (Installation occurred LATER than planned)
3 (Installed MORE equipment than planned)
4 (Installed LESS equipment than planned)
5 (Equipment was MORE efficient than planned)
6 (Equipment was LESS efficient than planned)
7 (Removed MORE equipment than planned)
8 (Removed LESS equipment than planned)
9 (Other) (SPECIFY)
D (DK)
R (REFUSED)

FR4. Who was MOST responsible for actually recommending or specifying the [IF EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): high efficiency] <MEASCAT1, MEASCAT2> project that was implemented through the program?

DO NOT READ LIST, RECORD ONLY ONE

1 Respondent
2 Someone else in company (SPECIFY AND PROBE TO SEE IF SHOULD BE SPEAKING WITH THIS R)
3 Third-party design professional
4 Third-party engineer
5 Contractor
6 Manufacturer's representative
7 <PA> account manager
8 Someone else (SPECIFY)
D (DK)
R (REFUSED)

C1. [IF FR4= THIRD-PARTY DESIGN PROFESSIONAL, THIRD-PARTY ENGINEER, CONTRACTOR MANUFACTURER'S REPRESENTATIVE, OR <PA> ACCOUNT MANAGER (IF FR4=3, 4, 5, 6 OR 7)]

On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did (FR4 response) have on your company's decision to implement the [IF EFFICIENCY IS APPLICABLE; *IF EFF1, EFF2 = 1:* high efficiency] <MEASCAT1,MEASCAT2> project so that it would qualify for the program?

_____ (ENTER INFLUENCE RANKING)
D (DK)
R (REFUSED)

FR5a. [IF ELECPROJ=1: You said you also had some electric equipment installed through a <PA> program. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have implemented the same [IF QUANTITY IS GREATER THAN (IF QTYFLAG1, QTYFLAG2 = 1): quantity] [IF EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): and efficiency of] natural gas saving <MEASCAT1, MEASCAT2> at that same time if <PA> had not also provided funding for electric saving equipment at about that same time?
[IF ELECPROJ=2: You said you also had some electric equipment installed through another program other than <PA>. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have implemented the same [IF QUANTITY IS GREATER THAN (IF QTYFLAG1, QTYFLAG2 = 1): quantity] [IF EFFICIENCY IS APPLICABLE (IF EFF1, EFF2 = 1): and efficiency of] natural gas saving

<MEASCAT1, MEASCAT2> at that same time if <other PA from R1bb> had not also provided funding for electric saving equipment?

___ (0 TO 10)
D (DK)
R (REFUSED)

FR5. I'd like to go over all the assistance you received from <PA>.

[if ELECPROJ=2] This would not include the electric equipment you received at that same time through <other PA from R1bb>.

According to our records:

(IF CST > 0) the total cost for the project implemented at your facility in <DATE> through the program was about <CST>. <PA> paid about <INC1, INC2> of the total cost of the [IF EFFICIENCY IS APPLICABLE; *IF EFF1, EFF2 = 1:* energy efficient] <MEASCAT1, MEASCAT2> project implemented through the program.

(IF CST = 0) <PA> paid a portion of the total cost of the [IF EFFICIENCY IS APPLICABLE; *IF EFF1, EFF2 = 1:* energy efficient] <MEASCAT1, MEASCAT2> project implemented through the program.

[IF <STUDY>: In addition, as I previously mentioned, <PA> paid a portion of the cost for a <STUDY>.]
[IF <FINANCE> = Yes] <PA> also provided interest-free financing for up to 24 months for your portion of the project costs.

If <PA> had not paid a portion of the implementation cost OR provided any technical assistance or education [IF <FINANCE> = Yes: OR provided interest-free financing] [IF <ELECPROJ=1>: or paid a portion of the cost for the electric saving equipment], would your business have implemented <u>any</u> <u>type</u> of <MEASCAT1, MEASCAT2> project <u>at the same time</u>?

1 Yes [SKIP TO FR7a]
2 No
D (DK)
R (REFUSED)

FR6a. Would you have implemented the <MEASCAT1, MEASCAT2> project earlier than you did, at a later date, or never?

1 Earlier
2 Same time [REPEAT FR5]
3 Later
4 Never [SKIP TO C3]
D (DK) [SKIP TO C3]
R (REFUSED) [SKIP TO C3]

FR6b. How much [earlier/later] would you have implemented the <MEASCAT1, MEASCAT2> project?

___ YEARS
___ MONTHS
D DK [SKIP TO C3]
R (REFUSED)

[IF QUANTITY IS NOT APPLICABLE FOR THIS MEASURE CATEGORY (IF QTYFLAG1, QTYFLAG2 = 0), SKIP TO FR8D]

FR7a. Without the program incentive, technical assistance, or financing, would your business have implemented the exact same quantity of <MEASCAT1, MEASCAT2> equipment [IF FR5=YES or DK: at that same time; IF FR5=2: within (TIMEFRAME IN FR6b)]?

1 Yes [SKIP TO FR8]
2 No
D (DK) [SKIP TO FR8]
R (REFUSED) [SKIP TO FR8]

FR7b. Compared to the amount of <MEASCAT1, MEASCAT2> that you implemented through the <PA> program, what percent of the [if ELECPROJ = 1 or 2, natural gas savings portion of the] project do you think your business would have purchased on its own during that timeframe?

(PROBE: Would you have purchased about one- fourth (25%), one-half (50%), three fourths (75%) of what you installed through the <PA> program?)

____ (ENTER PERCENTAGE: 1-99%)
D (DK) [SKIP TO C3]
R (REFUSED) [SKIP TO C3]

[IF EFFICIENCY IS NOT APPLICABLE FOR THIS MEASURE CATEGORY (IF EFF1, EFF2 = 0), SKIP TO RVL1]

FR8. You said your business would have installed [IF FR7A=YES: all; IF FR7A= NO: (FILL WITH FR7B %); IF (FR7B=DK/RF), fill with "some"] of the equipment on its own if the <PA> program had not been available. [ALL] Thinking about the <MEASCAT1, MEASCAT2> equipment you would have installed on your own, what percent of this equipment would have been . . . ?

(PROBE: Would about one-fourth (25%), one-half (50%), three fourths (75%) been of equal efficiency?)

a. of the same high efficiency as what was installed through the <PA> program?

____ (ENTER PERCENTAGE: 0-100%)
D (DK)

b. lower efficiency than what was purchased but higher than standard efficiency or code?
____ (ENTER PERCENTAGE: 0-100%)
D (DK)

c. standard efficiency or code
____ (ENTER PERCENTAGE: 0-100%)
D (DK)

(CHECK THAT THE THREE % SUM TO 100%; PROBE TO CLARIFY).

[IF QUANTITY IS GREATER THAN 1 (IF QTYFLAG1, QTYFLAG2 = 1), SKIP TO C3]

FR8d. Thinking about the <MEASCAT1, MEASCAT2> project you would have implemented on your own if the <PA> program had not been available, would it have been of the same high efficiency as what was installed through the program, lower efficiency than what was purchased but higher than standard efficiency, or standard efficiency or code?

1 Of the same high efficiency as what was installed through the <PA> program?
2 Lower efficiency than what was purchased but higher than standard efficiency
3 Standard efficiency or code
D (DK)
R (REFUSED)

RVL1 **[ASK IF measure type=Insulation]** Thinking about the insulation project you would have implemented on your own if the <PA> program had not been available, would it have been of the same R Value as what was installed through the program?

1 Yes [SKIP TO C3]
2 No
D (DK)
R (REFUSED)

RVL2 **[ASK IF measure type=Insulation]** Compared to what you installed through the <PA> program, what R Value would you have installed? (PROBE: "For example, would it have been 50% as much as what was installed through the <PA> program?")

__ [1-99%]
D (DK)
R (REFUSED)

C3. On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did the <INC1,INC2> you received from <PA> have on your decision to implement the [IF EFFICIENCY IS APPLICABLE; *IF EFF1, EFF2 = 1:* high efficiency] <MEASCAT1,MEASCAT2> project?

_____ (ENTER INFLUENCE RANKING)
D (DK)
R (REFUSED)

Consistency Check Prompts

100% Free Ridership Consistency Check
[IF WOULD HAVE PURCHASED AT THE SAME TIME, IN THE SAME QUANTITY, AND OF THE SAME EFFICIENCY LEVEL; *IF FR5=1 AND FR7a=1 AND (FR8a=100% or FR8d = 1), ASK C4a-C7c*, ELSE SKIP TO C8]

C4a. Now I want to focus on what it would have cost your business to install this natural gas equipment on its own without the <PA> program. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely is it that your business would have paid the additional (IF INC1, INC2 > 0: "<INC1,INC2>", ELSE "cost of the equipment") on top of the amount you already paid, to implement the same quantity and efficiency of <MEASCAT1,MEASCAT2> equipment at that same time?

___ (0 TO 10)
D (DK)
R (REFUSED)

C4b. (ASK IF C4a < 8) You said that you would have installed the same quantity and efficiency of natural gas equipment at that same time, but you also just said that there was a (FILL WITH C4a SCORE) in 10 likelihood of you paying the additional incentive provided by the <PA> program. Which of these is more accurate?

1 Installed same quantity & efficiency at same time [SKIP TO C9]
2 Likelihood of installing this without the program assistance was (C4a SCORE)
3 Something else (SPECIFY)

C5. How would [if ELECPROJ = 1 or 2, the natural gas portion of] your project have changed if <PA> had not contributed to the cost of the <MEASCAT1, MEASCAT2>? (INDICATE ALL THAT APPLY) (DO NOT READ)

1 (Would not have changed) [SKIP TO C8A]
2 (Would have postponed the project) (SPECIFY # MONTHS)
3 (Would have cancelled the project altogether)
4 (Would have repaired existing equipment)
5 (Kept using existing equipment)
6 (Purchased less efficient equipment) (ASK C7)
7 (Purchased fewer quantity) (ASK C6)
8 (Installed DIFFERENT type of equipment than planned) (SPECIFY)
9 (Other) (SPECIFY)
D (DK)
R (REFUSED)

C6. [IF C5=PURCHASED FEWER QUANTITY; *IF C5=7*) Compared to the amount of <MEASCAT1, MEASCAT2> that you implemented through the <PA> program, what percent do you think your business would have purchased on its own at that same time? (PROBE: Would you have purchased about one- fourth (25%), one-half (50%), three fourths (75%) of what you installed through the <PA> program?)

____ (ENTER PERCENTAGE: 1-99%)
D (DK)
R (REFUSED)

C7. [IF C5=PURCHASED LESS EFFICIENT EQUIPMENT; *IF C5=6*) Thinking about the natural gas equipment you would have implemented on your own, what percent of this equipment would have been . . . ?

(PROBE: Would about one-fourth (25%), one-half (50%), three fourths (75%) been of equal efficiency?)

a. of the same high efficiency as what was installed through the <PA> program?

____ (ENTER PERCENTAGE: 0-100%)
D (DK)

b. lower efficiency than what was purchased but higher than standard efficiency or code?

____ (ENTER PERCENTAGE: 0-100%)
D (DK)

c. standard efficiency or code

____ (ENTER PERCENTAGE: 0-100%)
D (DK)

(CHECK THAT THE THREE % SUM TO 100%; PROBE TO CLARIFY).

0% Free Ridership Consistency Check

C8A (IF SMALL BUSINESS - ASK IF AT LEAST SOMEWHAT LIKELY TO HAVE INSTALLED THE MEASURE WITHOUT THE PROGRAM BUT LATER STATES WOULD HAVE WAITED AT LEAST TWO YEARS (FR1 > 3 AND FR6b > **24** MONTHS OR NEVER) and FR5<>1)

Earlier in the interview, you said there was a (FR1 SCORE) in 10 likelihood that you would have implemented the same quantity and efficiency of <MEASCAT1, MEASCAT2>equipment at that same time in the absence of the <PA> program assistance. But you also said you would not have implemented the <MEASCAT1, MEASCAT2> project within 2 years of when you did. Which of these is more accurate?

1 The likelihood of installing this without the program assistance was (FR1 SCORE)
2 Would not have installed anything within 2 years
3 Something else (SPECIFY)
D (DK)
R (REFUSED)

C8B (IF MED/LARGE C&I - ASK IF AT LEAST SOMEWHAT LIKELY TO HAVE INSTALLED THE MEASURE WITHOUT THE PROGRAM BUT LATER STATES WOULD HAVE WAITED AT LEAST FOUR YEARS (FR1 > 3 AND FR6b > 48 MONTHS OR NEVER) and FR5<>1)

Earlier in the interview, you said there was a (FR1 SCORE) in 10 likelihood that you would have implemented the same quantity and efficiency of <MEASCAT1, MEASCAT2>equipment at that same time in the absence of the <PA> program assistance. But you also said you would not have implemented the <MEASCAT1, MEASCAT2> project within 4 years of when you did. Which of these is more accurate?

1 The likelihood of installing this without the program assistance was (FR1 SCORE)
2 Would not have installed anything within 4 years
3 Something else (SPECIFY)
D (DK)
R (REFUSED)

Additional Consistency Check

C9. (IF 100% FREE-RIDER; *IF FR5=1 AND FR7a=1 AND (FR8a=100% or FR8d = 1) AND C4b = 1 AND (C2 > 6 OR C3 > 6*)) **PROMPT**: "Previously you stated that you would have installed the exact same natural gas equipment at the same time without the <PA> program. But, you also stated that the …

(IF C2 > 6 FILL: program-sponsored study)
(IF C3 > 6 FILL: program incentive and financing options)
(IF C2 > 6 & C3 > 6 FILL: program-sponsored study, incentive, and financing options)

… was influential in your decision.)

(IF 0% FREE-RIDER: *IF FR6a = NEVER OR DK AND (C2 < 5 OR C3 < 5)* **PROMPT**: "Previously you stated that you would not have installed any natural gas equipment without the <PA> program. You also stated that the …

(IF C2 < 5 FILL: program-sponsored study)
(IF C3 < 5 FILL: program incentive and financing options)
(IF C2 < 5 & C3 < 5 FILL: program-sponsored study, incentive, and financing options)

… was not influential in your decision.)

(ASK OF ALL) I'd like to better understand your purchase decision. In your own words, please describe what impact, if any, all the assistance you received through the <PA> program had on your decision to install the amount of energy efficient <MEASCAT1, MEASCAT2> equipment at the time you did?

(RECORD VERBATIM RESPONSE)

SKIP1

(REPEATS QUESTIONS BEGINNING FROM INTRO3B FOR SECOND MEASURE – IF NO OTHER MEASURES – CONTINUE)

[IF MEAS2 = 1 GO TO INTRO3B]
[IF MEAS2 = 0 GO TO PP1]

Impact of Previous Program Participation

[IF NEVER WOULD HAVE INSTALLED OR ALL EQUIPMENT WOULD HAVE BEEN OF STANDARD EFFICIENCY AND UNLIKELY TO HAVE PURCHASED WITHOUT PROGRAM ((IF FR6A = NEVER OR FR8A = 0% OR FR8D <> 1) AND FR1 < 4) SKIP TO COM]

PP1. Had your business participated in <PA>'s program before you implemented the energy efficient project in <DATE>?

1 Yes
2 No [SKIP TO S1a]
D (DK) [SKIP TO S1a]
R (REFUSED) [SKIP TO S1a]

PP2. On a scale of 0 to 10, with 0 being 'not at all important and 10 being 'very important', how important was your previous experience with a <PA> program when making the decision to implement the <MEASCAT1, MEASCAT2> project at this facility around <DATE>?

____ 0 – 10
D (DK)

PP3. I'm going to read you several statements. For each statement, please tell me whether you agree or disagree that this statement applies to your business. There are no right or wrong answers; we just want your honest opinion.
(REPEAT IF NECESSARY)

1 Agree
2 Disagree
D (DK)
R (REFUSED)

Our previous experience implementing energy efficient projects through the <PA> program . . .

a. Has made our firm more likely to consider energy efficient equipment
b. Has made our firm more likely to install energy efficient equipment
c. Has given us more confidence in the financial benefits of energy efficient equipment
d. Has given us more confidence in the nonfinancial benefits of energy efficient equipment

Like Spillover[44]

START OF MEASURE LOOP
S1a-S4b will be asked of each measure category recalled - up to TWO measure categories.

S1a. Now I'd like you to think of the time since you participated in the <PA> program in <DATE>.

Has your company implemented any <MEASCAT1, MEASCAT2> projects for this or other facilities in Massachusetts **on your own,** that is without a rebate from <PA>?

1 Yes
2 No [SKIP TO SKIP2]
D (DK) [SKIP TO SKIP2]

[IF EFFICIENCY IS NOT APPLICABLE; IF EFF1, EFF2 = 0, SKIP TO S2a]

S1b. Was this equipment of **the same efficiency level or a higher level of efficiency** as the equipment you installed through the program?

1 Yes [SKIP TO S2a]
2 No
D (DK)

S1c. Was this equipment more energy efficient than standard efficiency or code equipment?

1 Yes
2 No [SKIP TO SKIP2]
D (DK) [SKIP TO SKIP2]

[44] As these surveys are being conducted soon after implementation, estimates of like and unlike spillover are likely to be limited as participants have not had adequate time to install additional equipment.

S2a. Thinking of the <MEASCAT1, MEASCAT2> equipment that you installed on your own, how does the quantity compare to what you installed through the program? Did you install more, less or the same amount of <MEASCAT1, MEASCAT2>?

(PROBE: We're looking for a percent compared to the amount installed through the program. For example, was it about one- fourth of what you installed through the program, one-half of what you installed through the program, the same (100%) amount as you installed through the program, twice as much as what you installed through the program (200%) or some other amount?)

1 More (How much more? Enter percentage: 1-1000%)
2 Less (How much less? Enter percentage: 1-99%)
3 Same
D (DK)

S2b. [IF S2a <> SAME AMOUNT OF <MEASCAT1, MEASCAT2>; *IF S2a <> 3 and S2a<>DK*] So the additional energy efficient equipment you bought on your own was <percentage from S2a> as much as you got through the program?

1 Yes
2 No [correct S2a]

S3a. Did a recommendation by the contractor, engineer, or designer who you worked with under the <PA> program influence your decision to implement some or all of this [IF EFFICIENCY IS APPLICABLE; (IF EFF1, EFF2 = 1): efficient] <MEASCAT1, MEASCAT2> equipment on your own?

1 Yes
2 No
D (DK)
R (REFUSED)

S3b. Did your experience with the energy efficient projects implemented through the program influence your decision to implement some or all of this [IF EFFICIENCY IS APPLICABLE; (IF EFF1, EFF2 = 1): efficient] <MEASCAT1, MEASCAT2> equipment on your own?

1 Yes
2 No
D (DK)
R (REFUSED)

S3c. Did your participation in any past program offered by <PA> influence your decision to implement some or all of this [IF EFFICIENCY IS APPLICABLE; (IF EFF1, EFF2 = 1): efficient] <MEASCAT1, MEASCAT2> equipment on your own?

1 Yes
2 No
D (DK)
R (REFUSED)

S3d. On a scale of 0 to 10, where 0 is "no influence at all" and 10 is "a great deal of influence", how much influence did your participation in the <PA> program have on your decision to install this equipment without an incentive?

__ 0-10 rating
D (DK)

S4a. Why didn't you implement this <MEASCAT1, MEASCAT2> project through a <PA> program?

[DO NOT READ - SELECT ALL THAT APPLY]

1 (Too much paperwork)
2 (Cost savings not worth the effort of applying)
3 (Takes too long for approval)
4 (The equipment would not qualify)
5 (Vendor does not participate in program)
6 (Outside <PA>'s service territory)
7 (No time - needed equipment immediately)
8 (Thought the program ended)
9 (Didn't know the equipment qualified under another program)
10 (Just didn't think of it)
11 (Unable to get rebate--unsure why)
12 (Other) (SPECIFY)
D (DK)

S4b. [IF S4a = THE EQUIPMENT WOULD NOT QUALIFY; IF S4a = 4) Why wouldn't the equipment qualify?

(RECORD VERBATIM RESPONSE)

SKIP2

(REPEATS SPILLOVER QUESTIONS FOR SECOND MEASURE – IF NO OTHER MEASURES – CONTINUE)

[IF MEAS2 = 1 GO TO S1A]
[IF MEAS2 = 0 GO TO S5]

Unlike Spillover

S5. Since participating in the program, had your company purchased, installed, or implemented any other type of energy efficiency equipment **on your own,** that is without a rebate from <PA>?

1 Yes
2 No [SKIP TO NE1]
D (DK) [SKIP TO NE1]

S6. What did you install?

Record type: _____
Record quantity: _____
Record size or capacity: _____

S7a. Would this project have qualified for an incentive through the program?

1 Yes
2 Yes, implemented through a program [SKIP TO NE1]
3 No [SKIP TO NE1]
D (DK) [SKIP TO NE1]

S7b. Did a recommendation by the contractor, engineer, or designer who you worked with under the <PA> program influence your decision to implement some or this equipment on your own?

1 Yes
2 No
D (DK)
R (REFUSED)

S7c. Did your experience with the energy efficient projects implemented through the <PA> program influence your decision to implement some or this equipment on your own?

1 Yes
2 No
D (DK)
R (REFUSED)

S7d. Did your participation in any past program offered by <PA> influence your decision to implement some or all of this equipment on your own?

1 Yes
2 No
D (DK)
R (REFUSED)

S7e. On a scale of 0 to 10, where 0 is “no influence at all” and 10 is “a great deal of influence”, how much influence did your participation in the <PA> program have on your decision to install this equipment without an incentive?

__ 0-10 rating
D (DK)

S8a. Why didn't you implement this project through a <PA> program?

DO NOT READ - SELECT ALL THAT APPLY

1 (Too much paperwork)
2 (Cost savings not worth the effort of applying)
3 (Takes too long for approval)
4 (The equipment would not qualify)
5 (Vendor does not participate in program)
6 (Outside <PA>’s service territory)
7 (No time - needed equipment immediately)
8 (Thought the program ended)
9 (Didn't know the equipment qualified under another program)
10 (Just didn't think of it)
11 (Unable to get rebate--unsure why)
12 (Other) (SPECIFY)
D (DK)

S8b. [IF S8a = EQUIPMENT WOULD NOT QUALIFY (IF S8a = 4)] Why wouldn't the project qualify?

(RECORD VERBATIM RESPONSE)

Expected NEI

NE1. Prior to participating in the program, did you expect any impacts other than energy savings?

1 Yes
2 No [SKIP TO COM]
D (DK) [SKIP TO COM]

NE2. Did you view these effects as a negative or positive benefit?

1 Negative [SKIP TO COM]
2 Positive
D (DK)

NE3. What were the positive benefits? (SELECT ALL THAT APPLY)

1 Sales
2 Production/productivity
3 Equipment life
4 Maintenance costs
5 Waste generation
6 Personnel needs
7 Injury or illness
8 Other (SPECIFY)

NE4. [IF POSITIVE BENEFIT, *NE2 = 2*] Did the expected positive benefits influence your decision to participate in the program?

1 Yes
2 No
D (DK)

NE5. Did the program influence your expectations of the positive benefits?

1 Yes
2 No
D (DK)

Wrap-up

COM. Do you have any comments or suggestions for the program?

(RECORD VERBATIM RESPONSE)

QRNAME.
For verification purposes, would you spell your first and last name for me?

(RECORD VERBATIM RESPONSE)

CLARIFY.

If we would need to clarify some of the information I asked you, would it be alright if we called you back?

1 Yes
2 No

A4. [ASK IF C1 > 6]

We would like to talk to the person who was most influential in recommending or specifying the efficient <MEASCAT1, MEASCAT2> equipment to install through the program. Earlier you mentioned that this was [FILL WITH FR4 RESPONSE]. Could you give me the name and telephone number of this person?

1 Yes (Record contact information)
2 No, REFUSED to give this information
3 No, no outside advisor involved
4 [IF SECOND MEASURE] (SAME CONTACT INFO AS PREVIOUS MEASURE)
D (DK)

END

Those are all the questions I have for you. I'd like to thank you for your time with this important evaluation.

C.2 INFLUENTIAL DESIGN PROFESSIONAL/VENDOR FREE-RIDERSHIP SURVEY

Variable List	
<FIRSTNAME>	Customer Contact First Name
<LASTNAME>	Customer Contact Last Name
<R_ADDR>	Customer Address
<R_COMP>	Customer Company
<FIRMNAME>	Company
<VFRID>	Vendor ID
<CASEID>	Case ID
<CUST>	Customer/Facility Name
<ADDR>	Service address where equipment was installed
<MEASCAT1, MEASCAT2>	End-use Category (i.e. lighting)
<MEASDES1-MEASDES2>	Detailed measure descriptions
<INC1, INC2>	Utility/sponsor incentive for Measure categories
<QTYFLAG1, QTYFLAG2>	0=quantity is not applicable for this measure category (measure qty = 1 or quantity is not relevant as in delamping, recycling), 1=quantity greater than 1
<EFF1, EFF2>	0=efficiency is not applicable for this measure category (e.g., insulation, VFD, delamping, recycling), 1=efficiency is applicable
<EQUIP1, EQUIP2>	0 if installed measure isn't equipment that is operational (e.g., insulation), 1=if installed measure is operational
<CST1, CST2>	Total project cost (customer cost+utility cost) for an account (by program)
<PROGRAM>	Utility/sponsor programs the vendor has been involved with
<PA>	Utility/sponsor name
<TOTMEAS>	Total number of measures customer said influential for
<STUDY>	0=did not receive technical assessment, 1=received technical assessment

Procedure

The customer-identified vendors will be exported from each PA study and combined into a single sample file. This file will be checked for missing contact information and we will fill in phone numbers where possible. Cases will then be sorted by company, contact, and phone number to identify "multiples". Cases with the same contact names will be called together and the contact will be alerted that they have been referred by more than one customer. This set of sample cases will receive the free-rider questions only.

Introduction

INTRO
Hello, my name is __, and I am calling on behalf of <**PA** >. We are talking with some of the design professionals and contactors who were involved with the <**PROGRAM**> in 2013. I'm not selling anything; I'd just like to ask you about the types of equipment that your firm recommended, sold, or installed through this/these program(s) in 2013.

Before we start, I would like to inform you that for quality control purposes, this call will be recorded and monitored.

(Timing: This survey will take less than 20 minutes of your time. IF NOT A GOOD TIME, SET UP CALL BACK APPOINTMENT OR OFFER TO LET THEM CALL US BACK AT 1-800-454-5070)

(Sales concern: I am not selling anything. Your responses will be kept confidential by our firm and the <**PA**>. If you would like to talk with someone from there, you can call [CONTACT NAME AND PHONE NUMBER FOR SPONSORS INCLUDED IN THIS CALL].

Free-Ridership Questions

INTRO2
I'd like to review the <**MEASCAT1**, **MEASCAT2**> you recommended or specified through the <**PROGRAM**> for <**PA**>.

VR1 Do you recall recommending <**MEASCAT1**> project, which included <**DESC1**> for <**CUST**> at <**ADDR**> through the <**PROGRAM**> in 2013?

1 Yes [SKIP TO V1a]
2 No
3 This equipment was never installed [IF NUMBER OF MEASURE CATEGORIES=2, SKIP TO VR2; ELSE SKIP TO END]
D (DK)
R (Refused)

VR1a Is there someone else at your firm who would be more familiar with this project?

1	Yes - Continue (Specify)	[ENTER CONTACT INFO & TRANSFER]
2	Yes – Not available (Specify)	[ENTER CONTACT INFO & EXIT]
3	No	[SKIP TO NEXT MEASURE/END]
4	Contact no longer with the company	[SKIP TO NEXT MEASURE/END]

V1a First I'd like to ask you about your decisions to recommend the <**MEASCAT1**> project through the <**PROGRAM**>. Were you involved in the decision-making process at the design stage when the <**MEASCAT1**>project was specified and agreed upon for this facility?

1	Yes [IF # OF MEASURE CATEGORIES = 2, SKIP TO VR2, ELSE SKIP TO VP0a]
2	No
D	(DK)

V1b At what point in the process did you become involved?

(RECORD VERBATIM RESPONSE)
(DK)
(REFUSED)

V1c What was your role?

(RECORD VERBATIM RESPONSE)
(DK)
(REFUSED)

[IF NO SECOND MEASURE, SKIP TO VP0a]

VR2 Do you recall recommending the <**MEASCAT2**> project which included <**DESC2**> for <**CUST**> at <**ADDR**> through the <**PROGRAM**> in 2013?

1	Yes [SKIP TO V2a]
2	No
3	This equipment was never installed [SKIP TO VP0a IF VR1=1; ELSE SKIP TO END]
D	(DK)
R	(REFUSED)

VR2a Is there someone else at your firm who would be more familiar with this project?

1	Yes - Continue (Specify)	[ENTER CONTACT INFO & TRANSFER]
2	Yes – Not available (Specify)	[ENTER CONTACT INFO & EXIT]
3	No	[SKIP TO VP0a/END]
4	Contact no longer with the company	[SKIP TO VP0a/END]

[IF DIDN'T RECALL MEASURES 1 AND 2, MEASURES 1 AND 2 WERE NOT INSTALLED, OR R WAS NOT THE CONTACT FOR MEASURES 1 AND 2, SKIP TO END; ELSE SKIP TO VP0a AND ONLY ASK QUESTIONS FOR MEASURE 1]

V2a Were you involved in the decision-making process at the design stage when the <**MEASCAT2**> project was specified and agreed upon for this facility?

1 Yes [SKIP TO VP0a]
2 No
D (DK)

V2b At what point in the process did you become involved?

(RECORD VERBATIM RESPONSE)
(DK)
(REFUSED)

V2c What was your role?

(RECORD VERBATIM RESPONSE)
(DK)
(REFUSED)

[IF STUDY=0 SKIP TO VR9]

VP0a According to our records, <**PA**> paid a portion of the cost to conduct a technical assessment for <**CUST**> to determine the cost-effectiveness of installing the <**MEASCAT1**, **MEASCAT2**> equipment.

If <**PA**> had not paid a portion of the cost, do you think <**CUST**> would have paid that portion of the cost to have a similar <**STUDY**> done at the same time?

1 Yes
2 No
D (DK)

VC2 [IF VP0a = No, DK] On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did the information provided by the technical assessment have on your decision to recommend the [IF **EFF1**, **EFF2** = 1: high efficiency] <**MEASCAT1**,**MEASCAT2**> project?

_____ (ENTER INFLUENCE RANKING)
88 (DK)
99 (REFUSED)

VR9 To the best of your knowledge, did <CUSTOMER> receive interest-free financing from <PA> which allowed him/her to pay for their portion of the project cost over time?

1 Yes
2 No

[INTERVIEWER: START OF MEASURE LOOPS. VA1 THROUGH VF9 WILL BE ASKED OF EACH MEASURE CATEGORY RECALLED - UP TO TWO MEASURES.]

INTRO3a [FIRST MEASURE]
Now, I'd like to ask you some questions about your decision to recommend <**MEASCAT1**> project. [IF THERE IS ALSO A SECOND MEASURE: Then, I'll repeat these questions for <**MEASCAT2**> equipment.]

INTRO3b [IF SECOND MEASURE]
Now I'd like to review the <**MEASCAT2**> project you recommended.

VA1 On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did your firm have on specifying the efficiency levels or features of the <**MEASCAT1, MEASCAT2**> project so that it would qualify for the program?

__ (0-10)
88 (DK)

(IF VA1 < 7 OR VA1=DK AND NO OTHER MEASURE, SKIP TO END; IF VA1<7 OR VA1=DK AND ANOTHER MEASURE CATEGORY, REASK VA1 OF SECOND MEASURE CATEGORY)

FR The next set of questions ask about <**CUST**>'s planning and installation decisions through the <**PROGRAM**> in 2013.

VP1a As far as you know, did <**CUST**> have funds allocated to install any of this equipment before you talked with them about the program?

1	Yes	
2	Yes, but don't remember specifics	[SKIP TO ATXT3]
3	No	[SKIP TO ATXT3]
D	(DK)	[SKIP TO ATXT3]
R	(Refused)	[SKIP TO ATXT3]

VP1b (IF YES) What plans existed?

(RECORD VERBATIM RESPONSE)
(DK)
(REFUSED)

VP2a Was it necessary to change the timing of the installation, the quantity of equipment installed or the efficiency level of the <**MEASCAT1**, **MEASCAT2**> equipment installed in order to qualify for the <**PROGRAM**>?

1	Yes	
2	Yes, but don't remember specifics	[SKIP TO ATXT3]
3	No	[SKIP TO ATXT3]
D	(DK)	[SKIP TO ATXT3]
R	(Refused)	[SKIP TO ATXT3]

VP2b What changes were necessary? [INDICATE ALL THAT APPLY]

1	(Installation occurred SOONER than planned)
2	(Installation occurred LATER than planned)
3	(Installed MORE equipment than planned)
4	(Installed LESS equipment than planned)
5	(Equipment was MORE efficient than planned)
6	(Equipment was LESS efficient than planned)
7	(Other - specify)
8	(Don't know)
9	(Refused)

ATXT3
<**PA**> paid a portion of the total cost of the <**MEASCAT1,MEASCAT2**> project.<**CUST**> may have also received some technical assistance from <**PA**> or a contribution toward the cost of a technical assessment study.

VF1 If <**PA**> had not paid a portion of the implementation cost, would your company have recommended or specified any type of <**MEASCAT1**, **MEASCAT2**> equipment to <**CUST**> at the same time?

1	Yes
2	No [SKIP TO VC3]
D	(DK) [SKIP TO VC3]

[IF QTYFLAG1, QTYFLAG2 = 0, SKIP TO VF3d]

VF2a Without the program incentive, technical assistance, or education, would your company have recommended or specified the exact same quantity of <**MEASCAT1**, **MEASCAT2**> for <**CUST**> at the same time?

1	Yes [SKIP TO VF3]
2	No
D	(DK)

VF2b Compared to the amount that you recommended through the program, what percentage of the overall quantity of <**MEASCAT1**, **MEASCAT2**> equipment do you think your company would have recommended or specified without assistance from <**PA**>?

(PROBE: Would you have recommended/specified about one-fourth (25%), one-half (50%), three-fourths (75%) of what was installed through the program?)

____ ENTER PERCENTAGE (0-100%, 888=DK)

[IF VF2b = 0, SKIP TO VC3]
[IF MEASCAT = "Insulation" SKIP TO VRVL1]
[IF EFF1, EFF2 = 0, SKIP TO VC3]

VF3 You said you would have recommended or specified [IF VF2a=1: all the] [IF VF2a=2 OR DK SHOW: at least some] <**MEASCAT1**, **MEASCAT2**> for <**CUST**> if the program had not been available.

What percent of the equipment that you would have recommended would have been…

a. of the same high efficiency as what was installed through the program?
____ (ENTER PERCENTAGE: 0-100%)
888 (DK)

b. lower efficiency than what was purchased but higher than standard efficiency or code?
____ (ENTER PERCENTAGE: 0-100%)
888 (DK)

c. standard efficiency or code?
____ (ENTER PERCENTAGE: 0-100%)
888 (DK)

[IF QTYFLAG1, QTYFLAG2 = 1, SKIP TO VC3]
[IF EFF1, EFF2 = 0, SKIP TO VRVL1]

VF3d Thinking about the <**MEASCAT1**, **MEASCAT2**> equipment you would have recommended if the program had not been available, would it have been of the same high efficiency as what was installed through the program, lower efficiency than what was purchased but higher than standard efficiency, or standard efficiency or code?

1 Of the same high efficiency as what was installed through the program?
2 Lower efficiency than what was purchased but higher than standard efficiency
3 Standard efficiency or code
D (DK)
R (REFUSED)

[IF MEASCAT <> "Insulation" SKIP TO VC3]

VRVL1 Thinking about the insulation project you would have recommended if the program had not been available, would it have been of the same R Value as what was installed through the program?

1 Yes [SKIP TO VC3]
2 No
D (DK)
R (REFUSED)

VRVL2 Compared to what you recommended through the program, what R Value would you have recommended? (PROBE: "For example, would it have been 50% as much as what was installed through the program?")

__ [1-99%]
88 (DK)
99 (REFUSED)

VC3 On a scale of 0 to 10, with 0 being no influence and 10 being a great deal of influence, how much influence did the [IF INC=0, "rebate that", else <**INC1**,**INC2**>] received from <**PA**> have on your decision to recommend the [IF **EFF1**, **EFF2** = 1:high efficiency] <**MEASCAT1**,**MEASCAT2**> project?

_____ (ENTER INFLUENCE RANKING)
88 (DK)
99 (REFUSED)

(IF VF1=1 AND VF2a=1 AND VF3=100%, ASK VF4-VF7; ELSE SKIP TO VF8)

VF4 Now I want to focus on what it would have cost <**CUST**> to install this equipment on its own without the program. On a scale of 0 to 10, with 0 being not at all likely and 10 being very likely, how likely would he/she have been to pay the additional [IF INC=0, "rebate amount", else <**INC1**,**INC2**>] on top of the amount he/she already paid, to implement the same quantity and efficiency of <**MEASCAT1**, **MEASCAT2**> equipment at that same time?

___ (0 TO 10)
88 (DK)
99 (REFUSED)

(IF VF4 > 7 AND VF4 <> 88, SKIP TO VF8)

VF5 How would their project have changed if the <**PROGRAM**> had not contributed to the cost of the <**MEASCAT1**, **MEASCAT2**> project?
(INDICATE ALL THAT APPLY) (DO NOT READ)

1 Would not have changed [SKIP TO VF8]
2 (Would have postponed the project) (SPECIFY # MONTHS)
3 (Would have cancelled the project altogether)
4 (Would have repaired existing equipment)
5 (Kept using existing equipment)
6 (Purchased less efficient equipment) (ASK VF7)
7 (Purchased fewer quantity) (ASK VF6)
8 (Installed DIFFERENT type of equipment than planned) (SPECIFY)
9 (Other) (SPECIFY)
10 (DK)
11 (REFUSED)

VF6 (IF VF5=7) Compared to the amount of <**MEASCAT1**, **MEASCAT2**> that <**CUST**> implemented through the program, what percent do you think he/she would have purchased on their own at that same time?

(PROBE: Would you have purchased about one- fourth (25%), one-half (50%), three-fourths (75%) of what you installed through the program?)

____ (ENTER PERCENTAGE: 0-99%)
88 (DK)
99 (REFUSED)

[IF VF6 = 0 SKIP TO VF8]
[IF QTYFLAG1, QTYFLAG2 = 0 SKIP TO VF8]

VF7 (IF VF5=6) Thinking about the equipment <**CUST**> would have implemented on their own, what percent of this equipment would have been . . . ?

(PROBE: Would about one-fourth (25%), one-half (50%), three-fourths (75%) been of equal efficiency?)

a. of the same high efficiency as what was installed through the program?
____ (ENTER PERCENTAGE: 0-100%)
888 (DK)

b. lower efficiency than what was purchased but higher than standard efficiency or code?
____ (ENTER PERCENTAGE: 0-100%)
888 (DK)

c. standard efficiency or code
____ (ENTER PERCENTAGE: 0-100%)
888 (DK)

(CHECK THAT THE THREE % SUM TO 100%; PROBE TO CLARIFY).

VF8 On a scale of 0 to 10, with 0 being 'not at all important and 10 being 'very important', how important was your previous experience with a <**PA**> program when making the decision to recommend or install <**MEASCAT1**, **MEASCAT2**>for this customer?

_____
77 NA – No previous program experience
88 (DK)
99 (Refused)

VF9 (IF VF1=1 AND VF2a=1 AND (VF3=100% or VF3d = 1) AND VF5 = 1 AND (VC2 > 6 OR VC3 > 6) PROMPT: "Previously you stated that you would have recommended the exact same equipment at the same time without the program. But, you also stated that the …

(IF VC2 > 6 FILL: program-sponsored study)
(IF VC3 > 6 FILL: program incentive)
(IF VC2 > 6 & VC3 > 6 FILL: program-sponsored study and incentive)

… was influential in your decision to make the recommendations that you did.)

(IF VF1 = NO OR DK AND (VC2 < 5 OR VC3 < 5) PROMPT: "Previously you stated that <**CUST**> would not have installed any equipment without the program. You also stated that the …
(IF VC2 < 5 FILL: program-sponsored study)
(IF VC3 < 5 FILL: program incentive)
(IF VC2 < 5 & VC3 < 5 FILL: program-sponsored study and incentive)

… was not influential in his/her decision.)

I'd like to better understand <**CUST**>'s purchase decision. Please describe what impact, if any, the program had <**CUST**>'s decision to install the energy efficient <**MEASCAT1**,**MEASCAT2**> equipment at the time he/she did?

(RECORD VERBATIM RESPONSE)
(DK)
(REFUSED)

END We are almost finished calling customers about their experience with the program. If another customer identifies you as being influential in their decision to install energy efficient equipment, would it be alright for us to call you back for just a couple of questions?

1 Yes
2 No

VRNAME For verification purposes, would you spell your first and last name for me?

(RECORD VERBATIM RESPONSE)

COMMENTS That is all the questions I have for you. Thank you for your participation. Do you have any comments?

1 Yes (RECORD COMMENTS VERBATIM)
2 No

C.3 DESIGN PROFESSIONAL/VENDOR NONPARTICIPANT SPILLOVER SURVEY

Variable List

<FIRSTNAME>	Vendor First Name
<LASTNAME>	Vendor Last Name
<V_ADDR>	Vendor Address
<V_ID>	Vendor ID
<CUST>	Customer/Facility Name
<PA>	Sponsors the vendor has worked with on energy efficiency projects
<PROGRAM>	Utility/sponsor programs the vendor has been involved with
<ME1-ME15>	Types of equipment specified/sold as part of spillover questions
<DESC>	Types of equipment specified/sold as part of spillover questions

Procedure

The vendors identified in the sponsor databases will be asked the nonparticipant spillover questions. We will focus on reaching the contacts listed in the database.

Introduction

INTRO4 Hello, my name is _____, and I am calling from Tetra Tech on behalf of <**PA**>. We are talking with some of the design professionals and contactors who were involved with the <**PROGRAM**> in 2013. I'm not selling anything; I'd just like to ask you about the types of equipment that your firm recommended, sold, or installed through this/these program(s) in 2013.

Before we start, I would like to inform you that for quality control purposes, this call will be recorded and monitored.

(Timing: This survey will take less than 15 minutes of your time. IF NOT A GOOD TIME, SET UP CALL BACK APPOINTMENT OR OFFER TO LET THEM CALL US BACK AT 1-800-454-5070)

(Sales concern: I am not selling anything. Your responses will be kept confidential by our firm and <**PA**>. If you would like to talk with someone from there, you can call [CONTACT NAME AND PHONE NUMBER FOR SPONSORS INCLUDED IN THIS CALL].

[VNP1a-VNP8 WILL BE ASKED FOR EACH MEASURE WHERE MEx=1 where x=measure category number defined above].

VNP1a Our records show that your firm specified, sold, and/or installed <**MEx**> to commercial and industrial customers in 2013 through the <**PROGRAM**>. This includes equipment such as <**DESC**>.
Is that correct?
[INTERVIEWER: PLEASE VERIFY EACH TYPE OF EQUIPMENT THAT SHOWS FOR THE VENDOR]

1 Yes
2 No [SKIP TO NEXT CATEGORY]
D Don't know [SKIP TO NEXT CATEGORY]
R Refused [SKIP TO NEXT CATEGORY]

Note: The measure categories *listed above will closely match measure categories as defined in the customer sample. When asking vendors about each measure category, we will* reference the specific measure-level descriptions noted in the database.

VNP1b Prior to participating in the <PA> program, in what percentage of your commercial projects did you install high efficiency <MEx>?

___ [ENTER PERCENTAGE 0-100]
888 Don't know
999 Refused

VNP1c And during the past year, in what percentage of your commercial projects did you install high efficiency <**MEx**>?

___ [ENTER PERCENTAGE 1-100]
888 Don't know
999 Refused

VNP2 Please think about all the program-eligible <**MEx**> you specified, sold and/or installed for <**PA**> customers in 2013.

Did you specify, sell and/or install any of this program-eligible <**MEx**> to customers of <**PA**> <u>without</u> the customer participating in a <**PA**> program??

1 Yes
2 No [SKIP TO NEXT CATEGORY]
D Don't know [SKIP TO NEXT CATEGORY]
R Refused [SKIP TO NEXT CATEGORY]

VNP3 (IF VNP2 = Yes) Again, thinking about all the program-eligible <**MEx**> you specified, sold and/or installed for <**PA**> customers in 2013, what percent did not receive an incentive through a <**PA**> program?

___ [ENTER PERCENTAGE 0-100]
888 Don't know
999 Refused

(ASK VNP4-VNP8 OF EACH MEASURE WHERE VNP3 >0%)

VNP4 In 2013, you mentioned that about [___%] of the <**MEx**> you specified and/or installed would have been eligible for an incentive through a <**PA**> program, but did not receive an incentive.

What are the main reasons why your firm did not request a customer incentive for this energy saving equipment you specified/installed?

(DO NOT READ—INDICATE ALL THAT APPLY; PROBE, WHAT ELSE?)

1 Not worth the paperwork for our firm to help the customer apply for the incentive
2 Customer did not want the hassle of applying for the incentive
3 Takes too long for approval
4 Reached the maximum amount I could install through the program
5 The equipment would not qualify→ [Why not? *(SPECIFY)*]
6 Vendor does not participate in program
7 Outside [retail company] service territory
8 No time – needed equipment immediately
9 Thought the program ended
10 Didn't know the equipment qualified under another program
11 Just didn't think of it
12 Unable to get rebate (unsure why)
13 Other *(SPECIFY)*
14 Don't know

VNP5 I'm going to read you 3 statements. For each statement, please tell me whether you agree or disagree that this statement applies to your company. There are no right or wrong answers; we just want your honest opinion.

Our past experience specifying or installing <**MEx**> through energy efficiency programs has convinced us that this equipment is cost effective or beneficial even without a program incentive.

0 Agree
1 Disagree

VNP6 We are better able to identify opportunities to improve energy efficiency by using high efficiency <**MEx**> because of our previous experience with the performance of energy efficient equipment installed through energy efficiency programs, and what we learned through working with <PA>.

0 Agree
1 Disagree

VNP7 We are more likely to discuss energy efficient options with all of our customers when developing project plans for <**MEx**> because of our previous experience with the performance of energy efficient equipment installed through energy efficiency programs, and what we learned through working with <**PA**>.

0 Agree
1 Disagree

VNP8 Please describe what impact, if any, the <**PROGRAM**> had on your decision to specify or install energy efficient <**MEx**> outside of the program.

[PROBE IF NECESSARY: "Can you please elaborate on that?", "What do you mean by...", "Anything else?"]

[RECORD VERBATIM RESPONSE]

END We are almost finished calling customers about their experience with the program. If a customer identifies you as being influential in their decision to install energy efficient equipment, would it be alright for us to call you back for just a couple of questions?

1 Yes
2 No

VRNAME For verification purposes, would you spell your first and last name for me?

COMMENTS Those are all the questions I have for you. Thank you for your participation. Do you have any comments?

1 Yes [RECORD VERBATIM COMMENTS]
2 No

APPENDIX D: CUSTOMER ACCOUNT AND PROGRAM SAVINGS COVERAGE

D.1 DETAILED RESPONSE RATES

Table D-1. Cape Light Compact Response Rate

	C&I New Construction	C&I Products and Services	Government New Construction	Medium and Large C&I Retrofit	Medium and Large Government Retrofit	Small C&I Retrofit	Small Government Retrofit	Total
Starting Sample	**15**	**16**	**1**	**13**	**6**	**212**	**65**	**328**
Bad Phone Number	1	4	0	2	2	19	1	29
No Knowledgeable Respondent	1	0	0	1	0	7	4	13
Ineligible - Other	1	2	1	4	1	23	7	39
Language Barrier	0	0	0	0	0	0	0	0
Adjusted Sample	**12**	**10**	**0**	**6**	**3**	**163**	**53**	**247**
Refusal	0	2	0	2	0	11	14	29
Active Sample	6	2	0	2	1	69	13	93
Completed Interviews	6	6	0	2	2	83	26	125
Cooperation Rate	**50.0%**	**60.0%**	**0.0%**	**33.3%**	**66.7%**	**50.9%**	**49.1%**	**50.6%**
Response Rate	**40.0%**	**37.5%**	**0.0%**	**15.4%**	**33.3%**	**39.2%**	**40.0%**	**38.1%**

Table D-2. National Grid Response Rate

	Design 2000plus	Energy Initiative	Small Business	Total
Starting Sample	**255**	**329**	**332**	**916**
Bad Phone Number	6	5	11	22
No Knowledgeable Respondent	8	8	2	18
Ineligible - Other	47	38	42	127
Language Barrier	1	0	7	8
Adjusted Sample	**193**	**278**	**270**	**741**
Refusal	11	18	11	40
Active Sample	75	72	123	270
Completed Interviews	107	188	136	431
Cooperation Rate	**55.4%**	**67.6%**	**50.4%**	**58.2%**
Response Rate	**42.0%**	**57.1%**	**41.0%**	**47.1%**

Table D-3. NSTAR Response Rate

	Direct Install	New Construction	Retrofit	Total
Starting Sample	**414**	**226**	**290**	**930**
Bad Phone Number	20	10	7	37
No Knowledgeable Respondent	16	11	7	34
Ineligible - Other	41	28	36	105
Language Barrier	8	0	0	8
Adjusted Sample	**329**	**177**	**240**	**746**
Refusal	28	3	11	42
Active Sample	126	82	73	281
Completed Interviews	175	92	156	423
Cooperation Rate	**53.2%**	**52.0%**	**65.0%**	**56.7%**
Response Rate	**42.3%**	**40.7%**	**53.8%**	**45.5%**

Table D-4. Unitil Response Rate

	C&I Large Retrofit	C&I New Construction	C&I Small Retrofit	Total
Starting Sample	**10**	**3**	**61**	**74**
Bad Phone Number	1	0	1	2
No Knowledgeable Respondent	0	0	1	1
Ineligible - Other	2	0	12	14
Language Barrier	0	0	0	0
Adjusted Sample	**7**	**3**	**47**	**57**
Refusal	0	0	3	3
Active Sample	3	0	13	16
Completed Interviews	4	3	31	38
Cooperation Rate	**57.1%**	**100.0%**	**66.0%**	**66.7%**
Response Rate	**40.0%**	**100.0%**	**50.8%**	**51.4%**

Table D-5. Western Massachusetts Electric Company Response Rate

	New Construction	Retrofit	Small Business Energy Advantage	Total
Starting Sample	**94**	**131**	**183**	**408**
Bad Phone Number	1	2	7	10
No Knowledgeable Respondent	0	7	6	13
Ineligible - Other	14	16	19	49
Language Barrier	0	0	4	4
Adjusted Sample	**79**	**106**	**147**	**332**
Refusal	3	3	4	10
Active Sample	22	25	67	114
Completed Interviews	54	78	76	208
Cooperation Rate	**68.4%**	**73.6%**	**51.7%**	**62.7%**
Response Rate	**57.4%**	**59.5%**	**41.5%**	**51.0%**

D.2 DETAILED SAVINGS COVERAGE

PA	Program	Measure	Population kWh	Surveyed kWh	kWh Coverage	Population	Surveys
CLC	C&I New Construction	HVAC	383,333	294,736	76.9%	3	2
		Lighting	420,639	22,835	5.4%	12	3
		Motors & Drives	130,484	0	0.0%	1	0
		Process	96,047	79,005	82.3%	4	2
		Refrigeration	12,303	0	0.0%	1	0
	C&I Products and Services	HVAC	74,793	20,469	27.4%	17	5
		Lighting	9,666	7,944	82.2%	2	1
		Motors & Drives	2,868	2,868	100.0%	1	1
	Government New Construction	HVAC	17,206	0	0.0%	1	0
	Medium and Large C&I Retrofit	Building Envelope	87,535	0	0.0%	1	0
		HVAC	395,487	395,487	100.0%	2	2
		Lighting	637,459	0	0.0%	20	0
		Motors & Drives	489,596	366,383	74.8%	9	1
		Refrigeration	32,657	0	0.0%	1	0
	Medium and Large Government Retrofit	HVAC	14,010	0	0.0%	1	0
		Lighting	159,255	97,449	61.2%	6	2
		Motors & Drives	5,094	0	0.0%	2	0
		Refrigeration	23,417	0	0.0%	2	0
	Small C&I Retrofit	Building Envelope	388	0	0.0%	1	0
		Hot Water	37,960	37,960	100.0%	1	1
		HVAC	57,739	3,384	5.9%	6	2
		Lighting	2,416,645	867,540	35.9%	226	69
		Motors & Drives	224,780	119,090	53.0%	38	15
		Refrigeration	224,899	92,519	41.1%	50	19
	Small Government Retrofit	Building Envelope	879	23	2.6%	2	1
		HVAC	71,710	50,619	70.6%	5	3
		Lighting	1,421,894	514,518	36.2%	89	22
		Motors & Drives	7,942	0	0.0%	5	0
		Refrigeration	29,756	2,114	7.1%	7	1
National Grid	Design 2000plus	Compressed Air	4,254,886	1,003,202	23.6%	124	42
		Custom	28,488,664	6,656,944	23.4%	129	31
		Lighting	3,279,579	581,163	17.7%	88	21
		Non-unitary HVAC	1,216,491	471,062	38.7%	50	8
		Other	9,688	0	0.0%	1	0
		Unitary HVAC	267,391	31,571	11.8%	72	14
		VFD	1,152,104	62,337	5.4%	17	2
	Energy Initiative	Custom	68,864,774	16,311,730	23.7%	369	70
		HVAC	3,336,424	1,046,725	31.4%	52	15
		Lighting	28,377,206	7,001,185	24.7%	560	79
		VFD	32,114,514	9,237,666	28.8%	126	59
	Small Business	Lighting	30,041,741	6,171,075	20.5%	1,297	85
		Non-lighting	6,399,756	1,541,744	24.1%	352	69

PA	Program	Measure	Population kWh	Surveyed kWh	kWh Coverage	Population	Surveys
NSTAR	Direct Install	Hot Water	163,126	55,717	34.2%	30	10
		HVAC	1,438,907	1,021,973	71.0%	53	24
		Lighting	43,239,813	7,554,557	17.5%	2,084	99
		Motors/Drives	633,481	212,026	33.5%	138	38
		Process	24,615	10,351	42.1%	5	4
		Refrigeration	3,540,347	1,126,642	31.8%	303	70
	New Construction	Comprehensive	22,214,831	6,072,241	27.3%	41	15
		Compressed Air	1,366,960	439,113	32.1%	39	15
		HVAC	11,999,313	2,857,007	23.8%	58	16
		Lighting	8,915,137	2,766,869	31.0%	222	47
		Motors/Drives	2,854,109	1,015,799	35.6%	50	15
		Process	1,177,446	376,784	32.0%	12	3
		Refrigeration	1,677,749	0	0.0%	10	0
	Retrofit	CHP	39,723,964	13,824,974	34.8%	5	2
		Compressed Air	2,290,651	1,149,928	50.2%	9	5
		HVAC	51,616,571	11,921,386	23.1%	191	45
		Lighting	65,031,524	16,957,545	26.1%	592	48
		Motors/Drives	14,855,513	6,678,032	45.0%	112	46
		Process	3,644,840	1,584,193	43.5%	18	10
		Refrigeration	2,667,957	626,085	23.5%	39	12
Unitil	C&I Large Retrofit	Compressed Air	596,502	467,393	78.4%	2	1
		HVAC	1,632,743	1,441,314	88.3%	2	1
		Lighting	1,016,252	420,990	41.4%	7	3
		Motors & Drives	416,070	0	0.0%	1	0
		Process	93,250	93,250	100.0%	1	1
	C&I New Construction	Compressed Air	1,896	1,896	100.0%	1	1
		Process	177,168	177,168	100.0%	2	2
	C&I Small Retrofit	Lighting	1,529,622	1,063,617	69.5%	66	31
		Refrigeration	4,533	0	0.0%	1	0
WMECo	New Construction	Comprehensive	504,168	219,708	43.6%	5	2
		Compressed Air	2,145,442	668,134	31.1%	28	14
		HVAC	1,473,434	283,283	19.2%	36	12
		Lighting	2,608,259	1,469,340	56.3%	43	18
		Motors/Drives	1,152,980	785,159	68.1%	7	2
		Process	1,414,414	1,202,464	85.0%	12	8
		Refrigeration	1,343,283	1,186,973	88.4%	4	1
	Retrofit	CHP	6,156,102	0	0.0%	2	0
		Compressed Air	581,194	379,306	65.3%	5	3
		HVAC	4,669,774	541,744	11.6%	19	6
		Lighting	8,319,078	3,667,555	44.1%	129	55
		Motors/Drives	2,177,934	625,265	28.7%	25	10
		Process	4,445,599	2,311,932	52.0%	9	4
		Refrigeration	749,195	346,611	46.3%	7	2
	Small Business Energy Advantage	Hot Water	8,325	8,325	100.0%	2	2
		HVAC	355,907	74,491	20.9%	14	4
		Lighting	15,297,731	4,157,918	27.2%	533	73
		Refrigeration	710,218	272,068	38.3%	63	19

APPENDIX E: EXAMPLE OF THE DESIGN PROFESSIONAL AND VENDOR SPILLOVER CALCULATION

As an example, assume a vendor had 2,000 kWh savings in the program tracking system database attributable to lighting equipment. If that vendor said that 25 percent of all their energy efficiency Lighting equipment were sold outside the program, the potential nonparticipant spillover savings would be (2,000 kWh * 0.25/(1–0.25) = 667 kWh). If this vendor was assigned a nonparticipant spillover rate of 100 percent for Lighting equipment, the nonparticipant spillover kWh savings for that vendor was 667 kWh. If that same vendor was assigned a nonparticipant spillover rate of only 50 percent for Lighting equipment, the nonparticipant spillover kWh savings for that vendor was 667 * 0.5 = 334 kWh. This type of calculation was made for each design professional and equipment vendor (by measure category) who had a nonparticipant spillover rate of more than 0 percent.

Table E-1. Nonparticipant Lighting Spillover Rate Calculation

% Sold Outside Program (A)	Savings from program tracking system database (B)	Assigned Spillover Rate (C)
25%	2,000	50%

Potential nonparticipant spillover savings = B * A/(1 – A)

= 2,000 kWh *0.25/(1–0.25)

= 667 kWh

Nonparticipant spillover savings = potential savings * C

= 667 * 0.5

= 334 kWh

APPENDIX F: SCORING FLOWCHARTS

Figure F-1. 2013 Free-Ridership Scoring

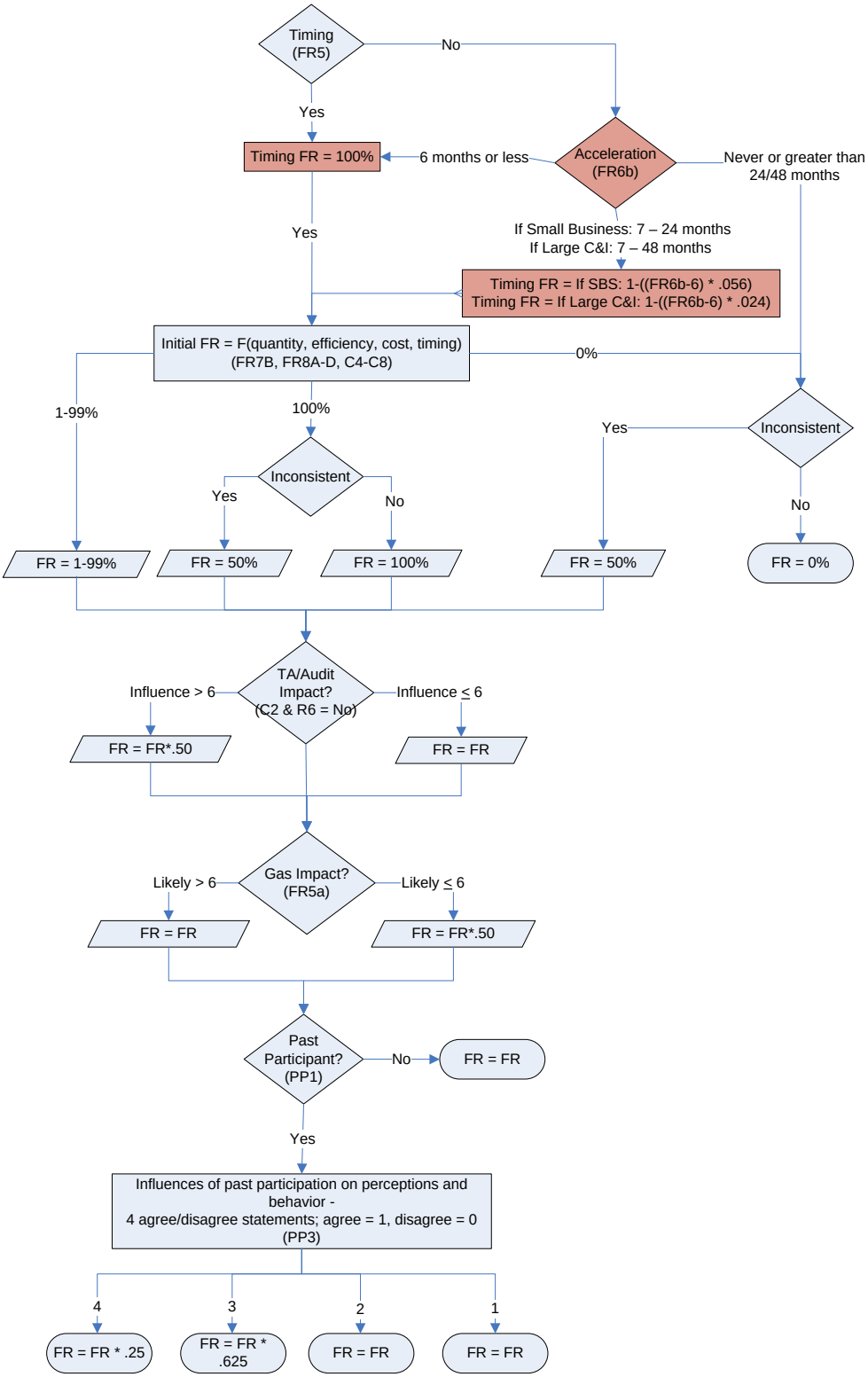


Figure F-2. 2013 Free-Ridership Consistency Checks

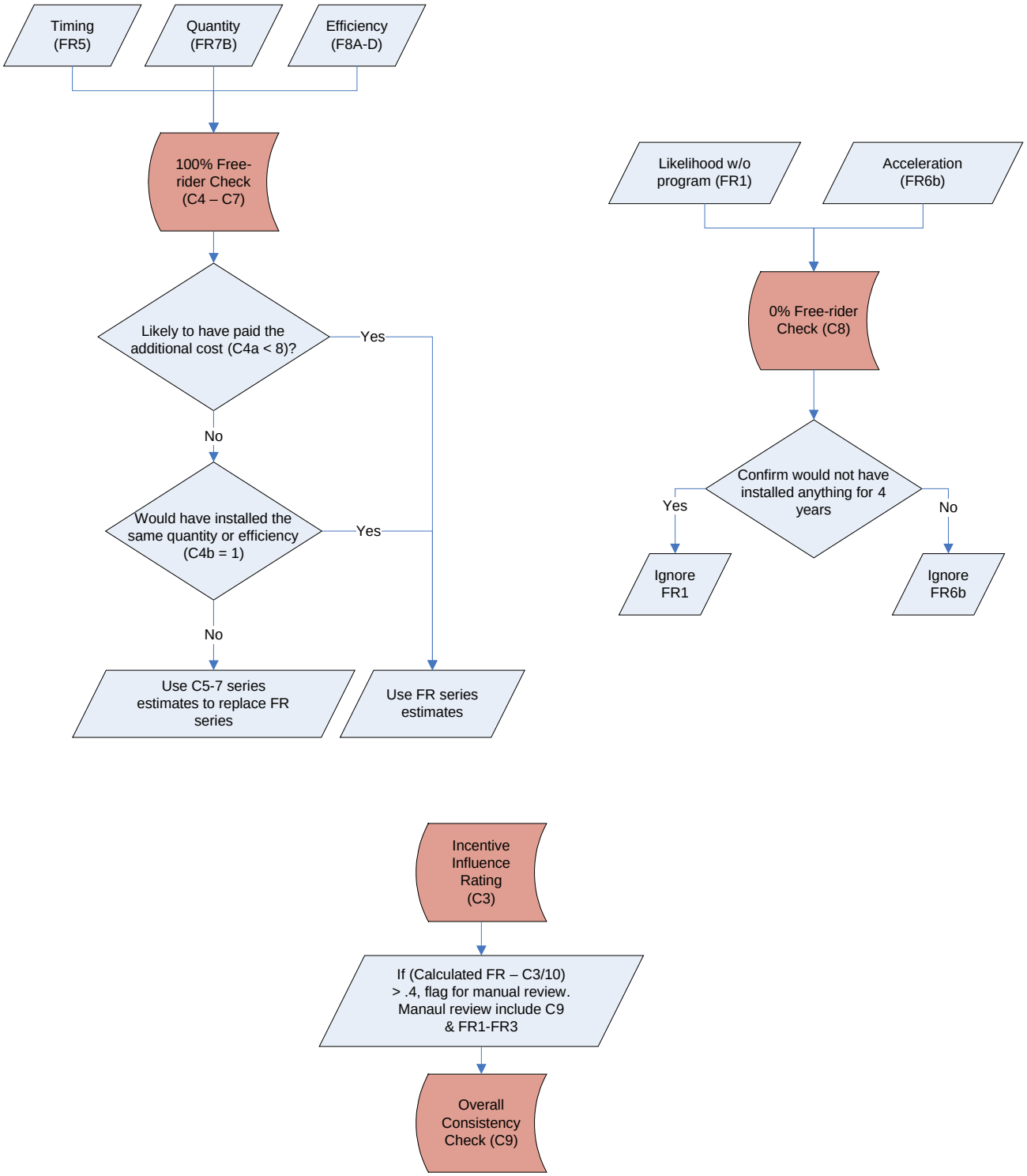


Figure F-3. Vendor Trigger for Free-Ridership Survey

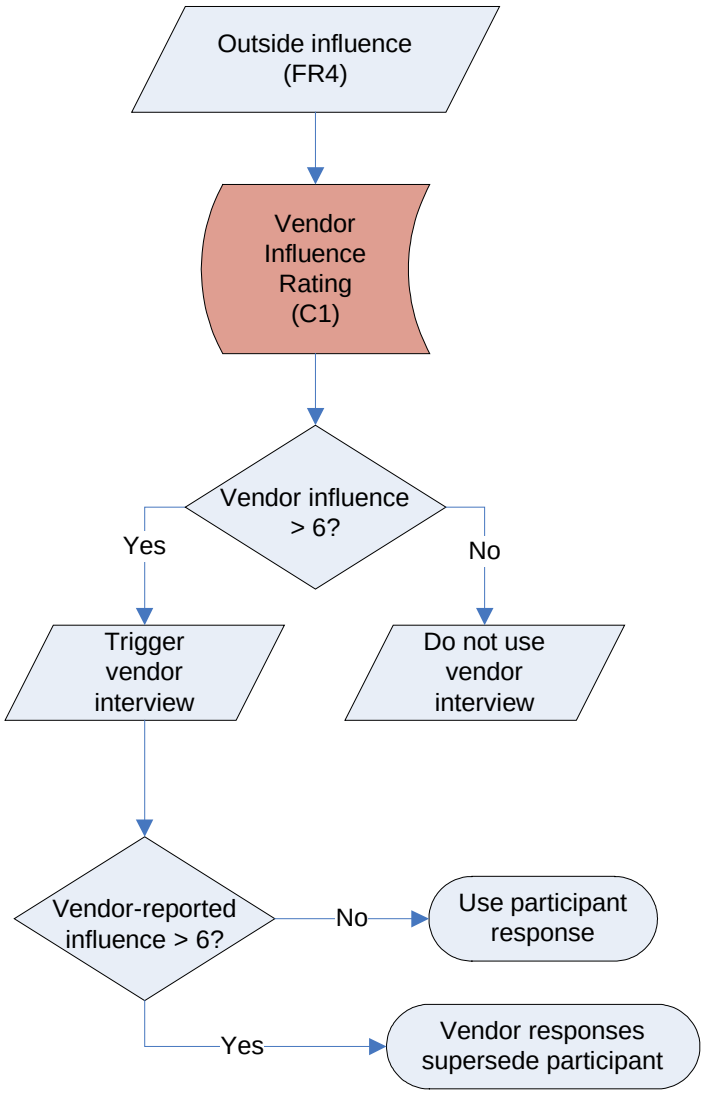


Figure F-4. Nonparticipant Spillover Scoring