

# National Grid Rhode Island

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

**Final Report**

**September 30, 2014**



# National Grid Rhode Island

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

### Final Report

**September 30, 2014**

Copyright © 2014 Tetra Tech, Inc. All Rights Reserved.

---

Tetra Tech  
6410 Enterprise Lane, Suite 300 | Madison, WI 53719  
Tel 608.316.3700 | Fax 608.661.5181  
[www.tetrattech.com](http://www.tetrattech.com)



## TABLE OF CONTENTS

<b>1. Executive Summary</b> .....	<b>1-1</b>
1.1 Study Objective	1-1
1.2 Study Methodology	1-1
1.2.1 Participant free-ridership methodology	1-2
1.2.2 Spillover methodology	1-4
1.3 Categorization of Measure Types	1-6
1.4 Net-To-Gross Results Summary	1-8
1.5 Organization of this Report	1-9
<b>2. Introduction</b> .....	<b>2-1</b>
2.1 Study Objective	2-1
2.2 Study Methodology	2-2
2.2.1 Participant free-ridership, “like” and “unlike” spillover surveys	2-2
2.2.2 Design professional/vendor surveys	2-4
<b>3. Participant Survey Questions</b> .....	<b>3-1</b>
3.1 Format	3-1
3.2 Summary of the 2013 Survey Questions	3-2
3.2.1 Identification of key decision maker(s)	3-2
3.2.2 Project and decision-making review	3-3
3.2.3 Initial free-ridership questions	3-3
3.2.4 Consistency check questions	3-5
3.2.5 Influence of technical assessment	3-9
3.2.6 Influence of past program participation	3-10
3.2.7 Participant “like” spillover	3-11
3.2.8 Participant “unlike” spillover	3-12
<b>4. Vendor/Design Professional Survey Questions</b> .....	<b>4-1</b>
4.1 Overview of Influential Vendor Survey Questions	4-1
4.1.1 Design professional/vendor’s identification of decision maker	4-1
4.1.2 Design professional/vendor free-ridership questions	4-1
4.2 Overview of Nonparticipant Spillover Survey Questions	4-1
4.2.1 Step 1: Determine the percentage of all program-eligible equipment installed outside the program	4-3
4.2.2 Step 2: Determine whether the program-eligible equipment specified/installed outside the program was due to the program	4-3
4.2.3 Step 3: Determine the savings associated with this nonparticipant spillover equipment	4-5
4.2.4 Step 4: Extrapolate the survey nonparticipant spillover savings to the total vendor population savings during the study period	4-6



<b>5. Distributor Survey Questions and Results .....</b>	<b>5-1</b>
5.1 Distributor’s Identification of Decision Maker	5-1
5.2 Distributor Free-ridership Questions	5-1
<b>6. Free-ridership and Spillover Study Results.....</b>	<b>6-1</b>
6.1 Statewide Results	6-1
6.2 Detailed Results	6-2
6.2.1 Detailed program results	6-4
6.2.2 “Unlike” spillover observations	6-9
<b>7. Marketing Results .....</b>	<b>7-1</b>
7.1 Awareness of National Grid Rhode Island Statewide Marketing Campaign	7-1
7.2 Awareness of the Marketing Campaign and Purchase Decisions	7-2
<b>8. Financing Results .....</b>	<b>8-1</b>
8.1 Participation in National Grid Rhode Island’s Interest-Free Financing Option	8-1
8.2 Satisfaction and Importance of the Interest-Free Financing Program	8-1
8.3 Reasons for not Participating in Interest-Free Financing	8-2
8.4 What Incentive Structure is More Appealing?	8-3
<b>APPENDIX A: Participant Sampling Plan.....</b>	<b>A-1</b>
A.1 Preparation of the Data File and Aggregation of the Participant Data	A-2
A.2 Selection of the Sample	A-3
A.3 Preparation of Sample for Data Collection	A-3
A.4 Review of Sample to Identify Companies with Multiple Sampled Accounts	A-4
A.5 Characterization of the Proposed Sample Plan and Sample	A-4
<b>APPENDIX B: Weighting Methodology .....</b>	<b>B-1</b>
<b>APPENDIX C: Survey Instruments .....</b>	<b>C-1</b>
C.1 Free-Ridership and Spillover Survey using Customer Self Report Approach	C-1
C.2 Influential Design Professional/Vendor Free-Ridership Survey	C-36
C.3 Design Professional/Vendor Nonparticipant Spillover Survey	C-46
C.4 Upstream Lighting Distributor Survey	C-50
<b>APPENDIX D: Customer Account and Program Savings Coverage.....</b>	<b>D-1</b>
D.1 Detailed Response Rate	D-1
D.2 Detailed Savings Coverage	D-2
<b>APPENDIX E: Design Professional and Vendor Spillover Calculation .....</b>	<b>E-1</b>
<b>APPENDIX F: Scoring Flowcharts.....</b>	<b>F-1</b>



## 1. EXECUTIVE SUMMARY

---

This executive summary summarizes the findings of the Free-ridership and Spillover Study conducted for National Grid Rhode Island for their 2013 Commercial and Industrial (C&I) gas and electric programs. The purpose of this study was to assess program free-ridership and spillover for the programs. These programs include Custom and Prescriptive programs for both new construction and retrofit projects (gas) and projects completed through the Design 2000plus (electric), Energy Initiative (electric), and Small Business programs (electric and gas), and the upstream lighting program, Bright Opportunities, in 2013.

### 1.1 STUDY OBJECTIVE

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

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

Secondary objectives of the study were to (1) assess the awareness and the influence of 2012-2013 marketing campaign on customers’ decision to install the energy efficient equipment, and to (2) understand the use of on-bill financing and the impact of this financing on the decision to implement the energy efficiency project.

This executive summary first provides a summary of the study methodology. It also includes the free-ridership, participant like spillover, and nonparticipant like spillover estimates at the program, measure type, and statewide levels. The full report provides more detail on the results for each individual program at the measure type level as well as the results of the 2012-2013 marketing campaign and the on-bill financing on customer decision-making. Early observations of participant “unlike” spillover are also included the full report.

### 1.2 STUDY METHODOLOGY

The methodology used for this study follows the 2011 Commercial and Industrial Programs Free-ridership and Spillover Study conducted for National Grid Rhode Island<sup>1</sup>. For the upstream lighting program, the study follows the methodology implemented by KEMA in Massachusetts<sup>2</sup>.

To accomplish the above objective, telephone surveys were conducted with a sample of 2013 program participants in each of the C&I electric and natural gas programs and with design professionals and equipment vendors involved in these 2013 installations. The program

---

<sup>1</sup> These studies followed the methodology presented in the “National Grid Rhode Island 2011 Commercial and Industrial Programs Free-ridership and Spillover Study Final Report” September 6, 2012.

<sup>2</sup> “Process Evaluation of the 2012 Bright Opportunities Program Final Report” prepared by KEMA, Inc., June 14, 2014.



participant sample consisted of unique *accounts*<sup>3</sup>, 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.<sup>4</sup>

The majority of the telephone interviews were completed with program participants between May 20 and July 7, 2014. The duration of interviews with program participants averaged 14 minutes. Prior to the telephone survey, all participating customers were mailed a letter on National Grid 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 ten call attempts was made to reach sampled customers during the calling period) resulted in an overall cooperation rate of 53 percent. This rate is lower than the previous study due to the condensed calling period and the increase in the number of bad telephone numbers. Additionally, there was a larger portion of the sample that was identified as having the same contact name, phone number, or company, which resulted in fewer actual cases to attempt to complete.

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 (i.e., 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 knowledgeable about the decision to install the energy efficient equipment through the 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 C&I programs. These surveys were used for estimating the extent of nonparticipant “like” spillover at a statewide level for all the programs.
- Distributors from the upstream lighting program who sold lighting products at a discounted price. These surveys were used to estimate the free-ridership rate; which is averaged with the participant (end-user) data.

### 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

---

<sup>3</sup> Each account could include multiple applications for efficiency projects. For example, if one account has five hot water heating applications and one HVAC application, this account would show up twice in the sample frame; once for hot water heating (aggregating all the hot water heating applications) and once for HVAC.

<sup>4</sup> Unique accounts with two or more measure types were asked about the two largest saving measures during one interview.



an energy efficiency program who would have installed the same high efficiency measure type<sup>5</sup> 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 same time in the absence of the program. Partial free-riders (1–99%) are 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, 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-ridership consisted 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 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.

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 therm or kWh savings. Weighting by (therm or 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. When reviewing the measure-type free-ridership rates it is important to consider the number of survey completions that the estimate is based upon.

---

<sup>5</sup> 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.



The upstream lighting program follows the same methodology but includes distributor results. Distributors were asked about customer's decision-making process. These results were then averaged with the participant results to come up with an overall free-ridership rate.

### 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 National Grid but were influenced by the program. Surveying customers not long after installation does not allow customers much time to install additional equipment based on their experiences with the program. Therefore, these are *early* indicators of spillover. As time passes, additional equipment may be installed because of their participation in a National Grid program. These early spillover estimates are included in the report tables.

#### 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 the same type and efficiency as the ones installed through the program. 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 therm or 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.



*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 in the main report and not savings estimates.

*C. Nonparticipant “Like” 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 National Grid's programs<sup>6</sup>. 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 surveyed 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 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 therm or kWh savings estimates to nonparticipant spillover. In the program tracking system database, measure type-specific program therm or 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 percentage of their sales were program eligible and what percentage of these sales did not receive an incentive through the programs. They were then asked about the program's impact on their decision to recommend/install this efficient equipment outside the program. Using the survey responses and

---

<sup>6</sup> Nonparticipant spillover for small business programs was not estimated because of the small number of vendors involved in delivering the program.



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 was 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 the statewide level by measure type. These estimates were then applied to each program that offered that measure type. Participant like spillover estimates are removed from the vendor reported spillover to avoid double counting spillover savings.

### 1.3 CATEGORIZATION OF MEASURE TYPES

The measure type categories were chosen by National Grid, and measure type was assigned based on the type of equipment installed. Table 1-1 details which types of equipment were assigned to which measure type classification, combining gas and electric measures.

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

Measure Type	Equipment
Compressed Air	Compressors
Controls	Boiler controls
	EMS
	Hood controls
	Thermostats
Custom	Control system
	EMS
	Lighting project
	Motors
	Pumps
Food Service	Fryer
	Oven
	Steamer



Measure Type	Equipment
HVAC	Boiler
	EMS
	Furnace
	Vending machine
	Water heater/boiler combo
HVAC - Distribution	Steam traps
HVAC - Plant	Boilers (condensing, custom and steam)
	Furnace
HVAC Non-unitary	Chiller
HVAC Unitary	AC equipment
	Dual enthalpy economizer control
	ECM motors
	Economizer/ventilation controls
	Heat pump
Insulation	Air sealing
	Attic insulation
	Pipe insulation
	Windows
Lighting	CFLs
	Custom lighting
	Daylight dimming system
	Fluorescent lights (T8)
	LEDs
	Occupancy sensor
	Pulse start metal halide
Non-lighting	Controls
	Cooler
	Custom compressed air
	Custom hot water
	Fan controls
	HVAC
	Motors/drives
	Vending machine
Other	Other
	Replace thermo oxidizers
	Retro commissioning
	Steam traps
VSD	Fans
	Hot water pump



Measure Type	Equipment
	Motors
	VFDs
Water Heating	Aerator
	Salon nozzle
	Showerhead
	Spray valves
	Pipe insulation
	Tank insulation
	Water Heater

#### 1.4 NET-TO-GROSS RESULTS SUMMARY

Results for the Bright Opportunities program (the upstream lighting program) have been rolled into the Design 2000plus program. The detailed results for each measure within each program can be found in Section 6 of this final report.

Table 1-2 summarizes the free-ridership and spillover estimates for electric measures offered through the programs. The statewide free-ridership rate for electric measures installed through these programs is 18.1 percent, the participant "like" spillover rate is 4.7 percent, and the nonparticipant spillover rate is 0.9 percent, resulting in a statewide net-to-gross rate of 87.5 percent.

**Table 1-2. 2013 C&I Electric Free-ridership and Spillover Results Summary by Program**

Program	Surveyed	Population	Population kWh Savings	Free-ridership Rate	90% Margin Error (±)	Participant "Like" Spillover Rate	90% Margin Error (±)	Nonparticipant "Like" Spillover Rate	Net-to-Gross Rate
Design 2000plus Program	119	3,077	15,239,541	26.7%	4.8%	0.5%	0.0%	4.5%	78.3%
Energy Initiative Program	96	392	41,977,142	19.1%	5.1%	7.0%	3.9%	0.0%	88.0%
Small Business Program	147	1,291	22,019,804	10.2%	2.6%	3.0%	4.8%	0.0%	92.8%
<b>Total</b>	<b>362</b>	<b>4,760</b>	<b>79,236,487</b>	<b>18.1%</b>	<b>2.5%</b>	<b>4.7%</b>	<b>2.3%</b>	<b>0.9%</b>	<b>87.5%</b>

Table 1-3 summarizes the free-ridership and spillover estimates for natural gas measures offered through the programs. The statewide free-ridership rate for natural gas measures installed through these programs is 23.2 percent, the participant spillover "like" rate is 0.4 percent, and the nonparticipant spillover rate is 0.3 percent, resulting in a statewide net-to-gross



rate of 77.5 percent. It should be noted that the nonparticipant spillover is based on responses from only seven vendors, so caution should be exercised when using the results.

**Table 1-3. 2013 C&I Natural Gas Free-ridership and Spillover Results Summary by Program**

Program	Surveyed	Population	Population Therm Savings	Free-ridership Rate	90% Margin Error (±)	Participant “Like” Spillover Rate	90% Margin Error (±)	Nonparticipant Spillover Rate	Net-to-Gross Rate
Large Commercial New Construction	35	164	381,702	28.1%	9.9%	2.3%	4.8%	0.7%	74.9%
Large Commercial Retrofit	42	475	1,610,343	22.4%	7.4%	0.0%	0.0%	0.2%	77.8%
Small Business Program <sup>7</sup>	25	110	28,130	3.4%	5.8%	0.0%	0.0%	0.5%	97.0%
<b>Total</b>	<b>102</b>	<b>749</b>	<b>2,020,174</b>	<b>23.2%</b>	<b>2.8%</b>	<b>0.4%</b>	<b>1.6%</b>	<b>0.3%</b>	<b>77.5%</b>

## 1.5 ORGANIZATION OF THIS REPORT

In Section 2 we review the study’s objectives and methodology. Section 3 summarizes the survey questions used to identify the key decision maker and the questions designed to serve as project review for the respondent. Section 3 also describes the questions and approach used to estimate the extent of participant free-ridership, participant “like” spillover, and participant “unlike” spillover. Section 4 presents the questions and approach for vendors who customers identified as being influential in their decision to participate along with the questions and approach used to estimate nonparticipant “like” spillover. Section 5 presents the questions asked to distributors who sold equipment through the upstream lighting program and how the results were calculated. In Section 6, we present the free-ridership and spillover results at the state level, as well as at the individual program level. Sections 7 and 8 present the results of the secondary objectives of the study in regards to the marketing campaign and financing, respectively.

We also present the following appendices:

- Appendix A details the sampling plans for the participant surveys
- Appendix B documents the weighting methodology used to produce the participant free-ridership and “like” spillover estimates
- Appendix C contains the survey instruments

<sup>7</sup> There was one Small Business Water Heating record that accounted for 56 percent of the savings. This record was a full free-rider that was driving the net-to-gross results. Due to the large influence this one case has on the final results, the team has decided to remove this case from the analysis and report results excluding this record. If this case remained in the analysis, the Small Business program free-ridership rate would be 23.8 percent and net-to-gross would be 92.3 percent.



- Appendix D details response rate and program savings coverage
- Appendix E contains an example of the Design Professional and Vendor spillover calculation
- Appendix F charts how the free-ridership and spillover scoring was done.