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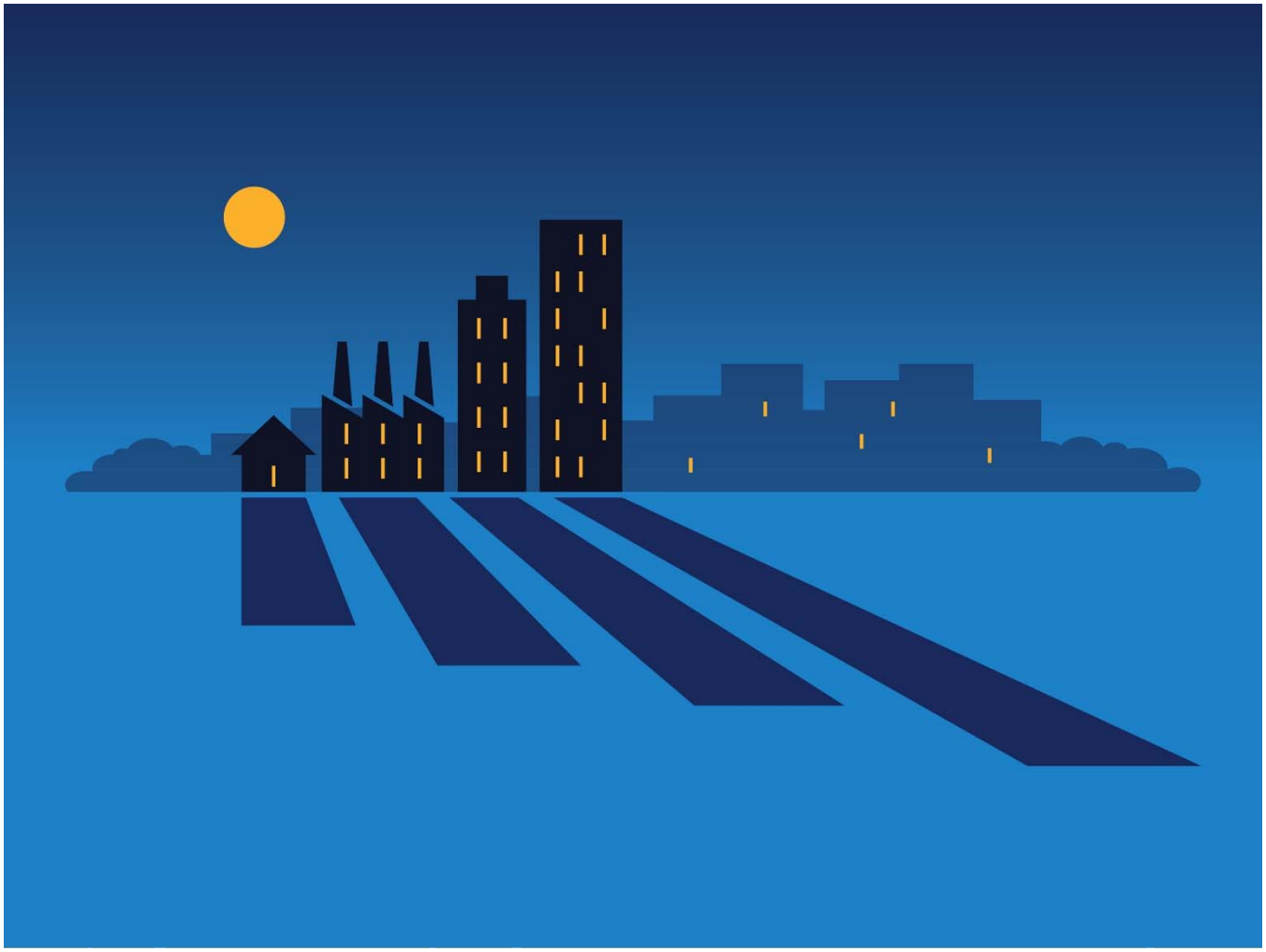

2014 Annual Evaluation Report

Final

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Executive Summary

This report presents evaluation findings for the third year of the Rhode Island System Reliability Procurement (SRP) pilot, conducted by Opinion Dynamics Corporation under contract to National Grid. The SRP pilot was designed to determine whether demand-side management could be an effective method of reducing peak demand on the Tiverton substation, which serves over 5,000 customers in the pilot communities. Starting in March 2012, National Grid increased marketing and outreach to encourage participation in select statewide energy efficiency programs, enrollment in SRP DemandLink offerings (WiFi programmable controllable thermostats and Smart Plug window AC control), and enrollment in SRP-specific energy efficiency offerings (window AC rebates and recycling).

This report presents the results of the various research activities and analyses conducted for the 2014 SRP pilot year. Research activities included three primary data collection efforts: an online survey of EnergyWise participants, a telephone survey of DemandLink participants, and a telephone survey of SRP program leads. We conducted gross impact analyses of 1) measures installed through the EnergyWise Program in the pilot area, 2) 2014 demand response events, and 3) rebated new ENERGY STAR® window AC units and recycled old Window AC units. We also calculated a "take rate" for the EnergyWise Program, which is a measure of net impacts. Finally, we conducted limited process analyses for the DemandLink thermostat and SmartPlug offerings as well as an analysis of the pilot's marketing efforts and of program leads.

Impact Results

We estimate peak demand savings for the 2014 SRP pilot to be 139.3 kW for event days, i.e., days when demand response events were called.[1] Demand response events account for 42% of this total, with 56.0 kW from participating households with central AC and 2.0 kW from participating households with window AC. Measures installed through the EnergyWise Program account for the largest reduction in demand (67.0 kW, or 41%), while savings from window AC rebates and recycling account for 10% (14.3 kW). On non-event days, peak demand impacts are estimated to be 81.3 kW, with EnergyWise measures accounting for 82% of this total.

Table ES-1 summarizes these findings.

[1] For the EnergyWise Program and the Window AC Rebate and Recycling Programs, this estimate includes all installations for the pilot-to-date, i.e., it assumes that all rebated measures are still in place. For the DemandLink demand response analysis, the estimate is based on only those households, where logs indicated functioning equipment on during the summer season.

Table ES-1. Summary of kW SRP Impacts Compared to Targets – as of 2014

Program	Event Days			Non-Event Days		
	Peak Demand Savings (kW)	Target (kW) [a]	% Target	Peak Demand Savings (kW)	Target (kW) [a]	% Target
EnergyWise	67.0	103.0	65%	67.0	103.0	65%
DemandLink- Demand Response Events (Central AC)	56.0	115.0	49%	n/a	n/a	n/a
DemandLink- Demand Response Events (Window AC)	2.0	12.0	17%	n/a	n/a	n/a
Window AC Rebate	1.0	23.0	4%	1.0	23.0	4%
Window AC Recycle	13.3	58.2	23%	13.3	58.2	23%
TOTAL	139.3	311.2	45%	81.3	184.2	44%

[a] Targets do not include efficiency savings from the DemandLink Demand Response Program of 27.8 kW for CAC and 131.8 kW for WAC because this evaluation did not quantify savings for these efforts.

Other Findings

Below, we present other key findings based on the research activities and analyses conducted for the 2014 program year. We present our findings and recommendations by the three main SRP Programs (EnergyWise, DemandLink Thermostats, and Window AC rebate and recycling). In addition, we present findings for the program's marketing efforts, which is a cross-cutting activity that supports all SRP program components.

EnergyWise Evaluation

- In 2014, customers in Tiverton and Little Compton completed 280 audits. Of these, 197 were completed among substation customers in the pilot area. Following a banner year for participation in 2013 (401 total audits and 321 audits on the substation), participation in the pilot area continues to be strong compared to pre-pilot averages and just about met planning projections of 200 substation audits.

- The 2014 evaluation shows a reduction in the take rate, a measure of net impacts, from 53% for the 2012/2013 program to 40% for the 2014 program. We estimate the take rate for the pilot-to-date to be 49%. The reduction in 2014 is in part the result of decreasing audit participation in the pilot area and increasing audit participation in the comparison communities in 2014. In addition, self-reported recall and influence of SRP-specific marketing was also lower compared to the 2012/2013 period.

- 2014 audit participants installed close to 2,000 CFLs and 4,000 LEDs. These two measures account for the majority of new peak load reduction from EnergyWise measures in 2014 (13.8 kW out of 22.9 kW, or 60%). Total peak load reduction from EnergyWise measures for the pilot-to-date is 58.0 kW.

- A total of 580 customers were new leads in the EnergyWise Program in 2014. The majority of these (75%) are at least somewhat familiar with the program, having learned about it most frequently through direct mail (40%) or word-of-mouth (21%). While most leads in the EnergyWise Program (58%) have not taken any further action towards participation since learning about the program, the majority have a high level of interest in the program and consider themselves likely to participate in the program in 2015.

DemandLink WiFi Thermostat and Smart Plug Evaluation

- In 2014, 66 new participants signed up to participate in the DemandLink Programmable Controllable Thermostat Program, bringing the total for the pilot-to-date to 236 participants. 2014 substation participants with central AC installed 39 thermostats and participants with window AC installed 103 SmartPlugs, putting the program behind projected 2014 equipment installations of 70 thermostats among central AC users and 180 SmartPlugs among window AC users for the year. As a result, the program is shy of its cumulative targets for both central AC thermostats (94% of target) and SmartPlugs (83% of target).

- In 2014, the majority of new DemandLink participants (43 of 66, or 65%) use window AC. This represents an increase compared to 2013, where only 42% of participants used window AC.

- Based on results from the DemandLink participant survey, 42% of Smart Plugs are not being used with window ACs. In addition, our analysis of 2014 demand response events showed no summer log activity for 80 out of 110 SmartPlugs, or 73%. This rate is slightly higher for 2013 participants (78%) compared to 2014 participants (67%). For this evaluation, we were not able to credit the program with savings for SmartPlugs that did not show any non-zero activity during the summer of 2014 (including event days). This severely reduced the peak demand savings estimated for this program component.

- Participants have low awareness and comprehension of demand optimization events. Just over half of participants (54%) are aware that National Grid might call demand optimization events and even fewer are aware of the details of these events. Our research suggests that lack of awareness of events might be associated with lower usage of SmartPlugs with window AC units.

- Research with SmartPlug participants indicates that usage of SmartPlugs with window AC units is lower for participants who had the equipment installed in a prior year, suggesting that at least some customers do not plug their window AC units back into the SmartPlugs once the new cooling season begins.

- Participant satisfaction is uniformly high, including among those not aware of demand control events. Eighty-two percent of participants say they are satisfied with the thermostat, while 72% of those with window AC say they are happy with their SmartPlugs.

- Close to 150 customers were new leads in the DemandLink Thermostat Program in 2014. However, many of the interviewed leads (60%) were either unaware of the program or not at all familiar with it. Those familiar with the program were generally aware that Wi-Fi enabled programmable thermostats allow users to remotely control their central or window AC and that National Grid provides these thermostats free of charge. They were less aware of other aspects of the program. Most interviewed leads (7 out of 12) have not taken any further action towards participation since learning about the program.

Window AC Rebate and Recycling Evaluation

- In 2014, 30 unique customers in Tiverton and Little Compton participated in either the window AC rebate or the window AC recycling program components. In total, customers received rebates for purchasing 15 new ENERGY STAR® rated units and for recycling 47 old units. The program thus met 94% of its 2014 target of recycling 50 units and 30% of its target of providing rebates for 50 new ENERGY STAR® rated units to customers on substation feeders.

- Just over 100 customers were new leads in either or both of the window AC programs in 2014. Due to the small overall number of window AC leads, we obtained few responses to our survey. We provide a qualitative assessment of leads in these program components in Section 5.3.3 of this report.

Marketing Effectiveness

- Pilot marketing efforts in 2014 focused heavily on positioning the DemandLink program as beneficial to the local community and included direct mail, digital banner ads, a community event, outbound telemarketing, and e-mail marketing in addition to ongoing statewide marketing. Only 2 out of 10 interviewed leads in the DemandLink thermostat program were aware that the program helps delay the need for an upgrade to a local substation suggesting that the 2014 marketing message of "Good for you. Good for our community. Good for everyone." has not yet fully taken hold among potential program participants.

- SRP-specific direct print mail was most often recalled by EnergyWise participants (60%) and was also most often rated as influential in customers' decision to receive the home energy assessment (50% of those who remembered it; 30% of all who responded). The telemarketing campaign conducted by RAM was only recalled by 31% of interviewed EnergyWise participants but was rated as influential by almost all (80%) who remembered it (25% of all interviewed participants).

- In 2014, 755 pilot community customers expressed interest in the EnergyWise Program or one of the three components of the DemandLink Program. The vast majority (86%) of 2014 SRP leads were interested in the EnergyWise Program. Interest in the other SRP programs was much lower with 23% of leads interested in the DemandLink Thermostat Program, 10% interested in the Window AC Rebate Program, and 9% interested in the Window AC Recycling Program.

- Heightened lead activity and participation has followed increases in marketing efforts, particularly outbound telemarketing, in both 2013 and 2014, suggesting telemarketing has been effective in generating leads and increasing program participation in the EnergyWise and DemandLink offerings.

- Of the 600 customers who were new SRP leads in 2014, 39% participated in one or more programs in 2014. This level of same-year participation is slightly lower than in 2012 and 2013 (both 49%). In addition, a handful of customers who first expressed interest in 2012 or 2013 but had not participated in those years, participated in one or more program in 2014, indicating that for some customers there is a significant lag time between first expressing interest in the program and taking action.

Recommendations

Based on our research and analyses, we provide the following opportunities for program improvement:

- The program should further explore reasons for the large number of SmartPlug logs with missing and zero data and, if possible, take steps to increase the number of SmartPlugs that are used with window AC units and that are properly connected to the WiFi thermostat. This could include the following:
    - A review of SmartPlug log data at the beginning of the cooling seasons to determine early on if SmartPlugs appear to be installed, and if they appear to be installed with window AC units.
    - Increase follow-up with SmartPlug participants from prior years to remind them of the demand response events and to offer them help in reinstalling SmartPlugs at the beginning of the new cooling season.
    - Additional research with SmartPlug participants, including those from prior years, to better understand both short-term and long-term SmartPlug usage patterns and reasons for not using SmartPlugs with window AC units.
- In previous evaluations, we had recommended that the program implementer record the manufacturer, make, and model number of the central AC unit when installing WiFi thermostats at locations with central AC. While this information was not available for this evaluation of the 2014 program, the program began reporting information about the central AC units in 2015. This information will allow us to look up the unit's size, which is a key factor in converting run time impacts to peak demand impacts in our analysis of demand response events for participants with central AC.
- Consider using a randomized control trial for the demand response events. This would include assigning participants to two groups and only calling an event for one of the two groups. This could be done for test events and would allow us to calculate impacts using the difference between the two groups, improving the accuracy and validity of the demand response impact results.
- Consider providing DemandLink participants with information about non-air conditioning behavioral changes that could be taken during demand response events. While National Grid customers in Rhode Island already receive general energy savings tips through the Home Energy Report Program, this information would be specific to event periods. Behavioral changes taken during events might lead to higher demand reduction than is obtainable through air conditioning cycling alone.
- Determine if recycled window AC units are being replaced by other units or are taken off the grid without replacement. This has a significant effect on the estimation of load impacts from

the Window AC Recycling Program. We suggest to collect this information in future waves of the DemandLink participant surveys. However, given the small number of expected survey responses from window AC participants, this information could also be collected as part of the application process (if feasible).

- Collect additional information on recycled window AC units at the time of unit pick-up or as part of the customer application. Useful information to support the impact analysis includes model number, size, and/or efficiency (EER) of the recycled unit.
- Continue the direct mail and outbound telemarketing campaigns. These are the sources through which most participants learn about the SRP offerings and are also named as most influential in customers' decision to conduct a home energy assessment.
- Conduct targeted follow-up with program leads that have not yet converted to participants. Our research shows a high level of interest and likelihood to participate among these leads.

1. Introduction

This report presents evaluation findings for the third year of the Rhode Island System Reliability Procurement (SRP) pilot, conducted by Opinion Dynamics Corporation under contract to National Grid.

1.1 Program Overview

The SRP pilot was designed to determine whether demand-side management could be an effective method of reducing peak demand on the Tiverton substation, which serves over 5,000 customers in the pilot communities of Tiverton and Little Compton.[2] Starting in March 2012, National Grid increased marketing and outreach to encourage participation in select statewide energy efficiency programs as well as three programs that are offered exclusively to customers in the Tiverton and Little Compton pilot area:

- **DemandLink Programmable Controllable Thermostat Program**. The DemandLink Programmable Controllable Thermostat Program provides temperature control devices — WiFi Programmable Controllable Thermostat and Smart Plugs — to customers in Tiverton and Little Compton when they agree to participate in demand optimization events for at least two years. Customers receive an annual bill credit for participating in all demand optimization events. Customers must have a Wi-Fi internet connection and either central air conditioning (central AC) or window air conditioning (window AC) to be eligible. The program supplies all participants with a WiFi-enabled programmable thermostat. Customers with window AC also receive one or more Smart Plugs, which allow the WiFi-enabled thermostat to control their window air conditioners. During 2014, the pilot installed 39 new thermostats and 103 new SmartPlugs at the homes of 66 customers. National Grid called three demand response events on July 23rd, August 27th, and September 3rd.

- **DemandLink Window AC Rebate Program.** Between May 1st and November 1st, 2014 National Grid offered customers in Tiverton and Little Compton a $50 rebate for the purchase of qualifying new window AC units, up to four units. Equipment was required to have an energy efficiency ratio (EER) greater than or equal to 10.8 to qualify. During 2014, the pilot provided rebates for 15 new ENERGY STAR® rated air conditioning units.

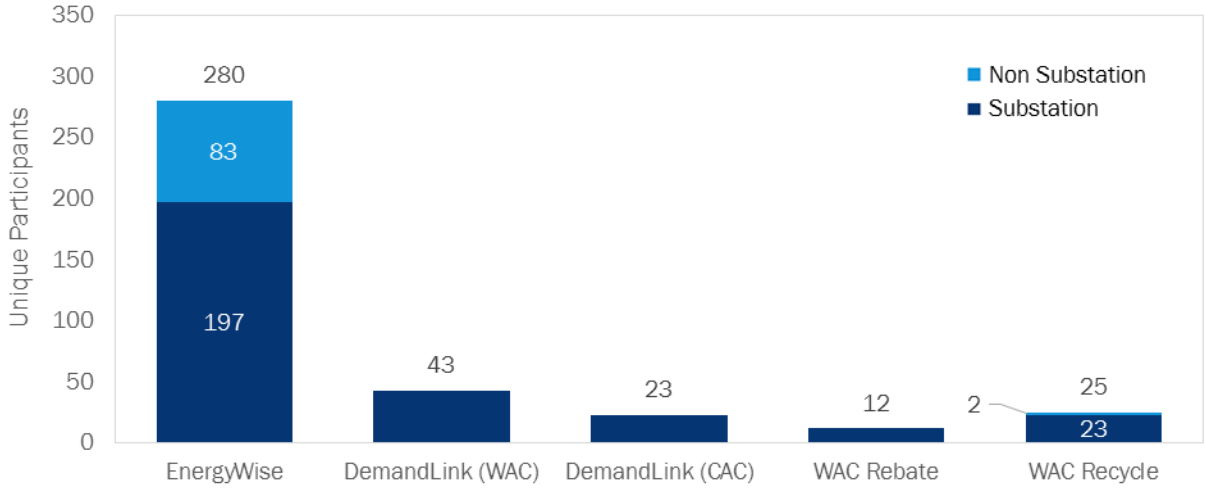
- **DemandLink Window AC Recycling Program.** Between May 1st and November 1st, 2014 National Grid offered customers in Tiverton and Little Compton a $25 rebate for each of up to four window AC units they recycled. During 2014, the pilot provided rebates for 43 recycled units.

In addition to these SRP-specific offerings, the pilot encouraged participation in existing energy efficiency programs that may contribute to pilot savings: the EnergyWise Home Energy Audit Program and the Small Business Direct Install (SBDI) Program. These two programs each perform two functions: 1) they are a platform for determining DemandLink eligibility and encouraging DemandLink participation and 2) they offer direct install energy efficiency measures that can help reduce peak load on the target substation. During 2014, the pilot performed 197 EnergyWise Home Energy Assessments and direct installations in 10 small businesses.

[2] Not all customers in the towns of Tiverton and Little Compton are served by the two sub-feeders (33 and 34) that are the focus of demand reduction efforts. Therefore we make distinctions throughout this report between success metrics for the two towns overall, or specific to customers served by sub-feeders 33-34 (which we refer to as “the Tiverton substation” or “the substation”).

Figure 1-1 summarizes 2014 participation in the four key residential pilot program components: the EnergyWise Program, the DemandLink Thermostat Program, the Window AC Rebate Program, the Window AC Recycling Program.

Figure 1-1. Tiverton and Little Compton Participation (2014)



Note: Based on rate codes, two commercial customers received a rebate for purchasing a new ENERGY STAR® rated window AC and one commercial customers received a rebate for recycling a window AC unit.

The most recent cumulative targets for residential equipment installations of WiFi programmable thermostats (among central AC customers) and Smart Plug installations among customers served by the Tiverton substation through the end of 2014 were filed in November 2013. For planning purposes, SRP pilot program staff also developed projections for 2014 measure installations. The DemandLink Thermostat Program fell slightly below both the annual and cumulative equipment installation targets for both equipment types (see Table 1-1). In addition, while National Grid did not establish cumulative targets for the Window AC Rebate and Recycling programs, these programs did end the year below planning projections.

Table 1-1. Equipment Installations Among Substation Customers Compared to 2014 Planning Projections and Cumulative Targets

Program	Measure	2014 Units		Cumulative Units 2012-2014 [c]	
		# Projected	# Achieved	Target	# Achieved
EnergyWise Program	Energy Audit	200	197	650	625
DL Programmable Controllable Thermostat Program	Thermostats for Central AC customers	70	39	205	193
	Smart Plugs for Window AC customers	180	103	300	250
DL Window AC Rebate and Recycling Program	New ENERGY STAR® Window AC Units	50	15 [a]	300	78 [e]
	Recycled Window AC Units	50	47 [b]	175	106 [e]

[a] This count includes two new ENERGY STAR® Window AC Units purchased by commercial customers

[b] This count includes one Window AC Unit recycled by commercial customers

[c] Source: Table S-6 of 2014 System Reliability Procurement Report. The Narragansett Electric Company. November 2, 2013. Docket number 4453.

1.2 Organization of Report

This report presents the results of the various research activities and analyses conducted for the 2014 SRP pilot. The remainder of this report is organized as follows:

- Section 2 presents the analyses of the **EnergyWise Program**, including an overview of program participation and the analysis of gross and net energy and demand impacts.
- Section 3 presents the analyses of the **DemandLink Thermostat Program**, including an overview of program participation, an analysis of event logs associated with called events, the demand response impact analysis, and an analysis of potential energy efficiency peak demand savings associated with program thermostats and SmartPlugs.
- Section 4 presents the analyses of the **Window AC Rebate and Recycling programs**, including an overview of program participation and the net and gross impact analyses.
- Section 5 presents an analysis of **SRP marketing** efforts and an analysis of program **leads** in the various SRP programs. This section also includes results from a survey with SRP leads.
- Appendix A provides additional detail on the methodology and results for the EnergyWise Program analyses.
- Appendix B provides additional detail on the methodology of the DemandLink demand response analysis.
- Appendix C presents dispositions for the three survey efforts conducted in support of this evaluation: the Online EnergyWise Participant Survey, the Telephone DL Participant Survey, and the Telephone DL and EnergyWise Leads Survey.

This report covers analyses of *residential* SRP efforts only. An analysis of incremental SBDI participation will be provided under separate cover. Findings in this report cover the period January 1, 2014 through December 31, 2014. In some cases, we provide program-to-date values, starting in March 2012.

2. EnergyWise Evaluation

This section presents evaluation results for the EnergyWise Program. The 2014 evaluation included the following analyses, presented in this section:

- A review of participation in the EnergyWise Program
- Estimation of the "take rate" for 2014 and the pilot-to-date
- Development of ex ante gross and net load impacts from the installation of EnergyWise measures

2.1 EnergyWise Participation

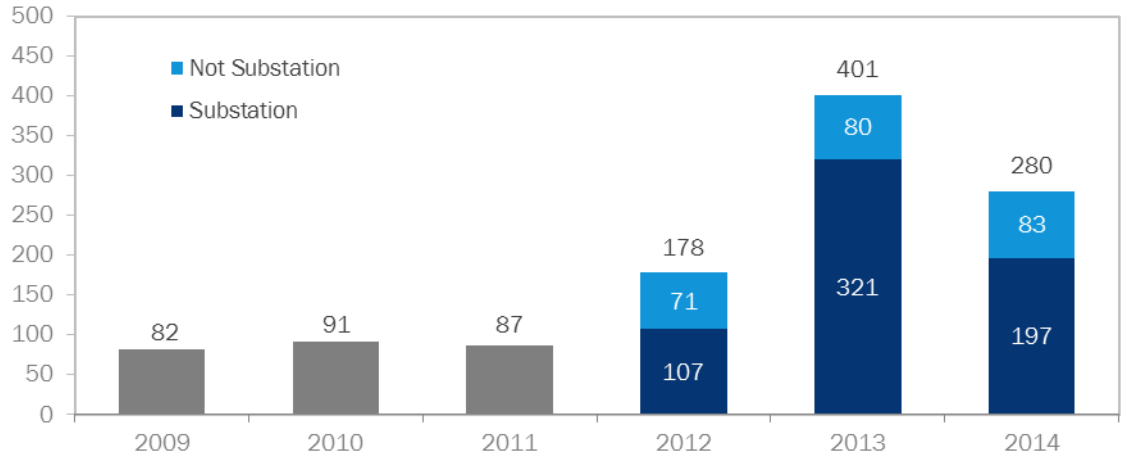
Participation in the EnergyWise Program is a key measure of the pilot's success in marketing EnergyWise and of the pilot's potential to recruit DemandLink participants. For the purpose of this evaluation, we report findings for (a) the pilot communities overall and (b) the subset of Tiverton and Little Compton customers who are on substation feeders 33 and 34. In Section 2.2 we provide comparative analysis of EnergyWise participation rates in the SRP communities and similar, non-pilot towns in the same period.

Figure 2-1 shows annual participation counts in the towns of Tiverton and Little Compton.[3] Participation in the SRP communities was fairly stable in 2009-2011, averaging just under 90 audits per year. Assessment participation picked up in 2012 and continued to increase to a high of 401 in 2013. In 2014, participation decreased slightly, ending the year with 280 audits overall and 197 audits among Tiverton substation customers, right on par with its projection of 200 audits (among substation customers) for the year.

While the total participation for 2014 represents a 30% decrease from 2013 totals, participation remained well above the average participation between 2009 and 2011 (a 3-fold increase). In addition, the proportion of audit participants who are served by the substation remained high in 2014 (70%).

[3] Participation counts are based on the number of facilities with site visits in each year (based on Facility ID), where year is determined by the month in which the site visit occurred, and facilities could have had more than one electric account audited (if multifamily). Visits are assigned to a region based on the town name. A very small number of participants may have commercial rate codes.

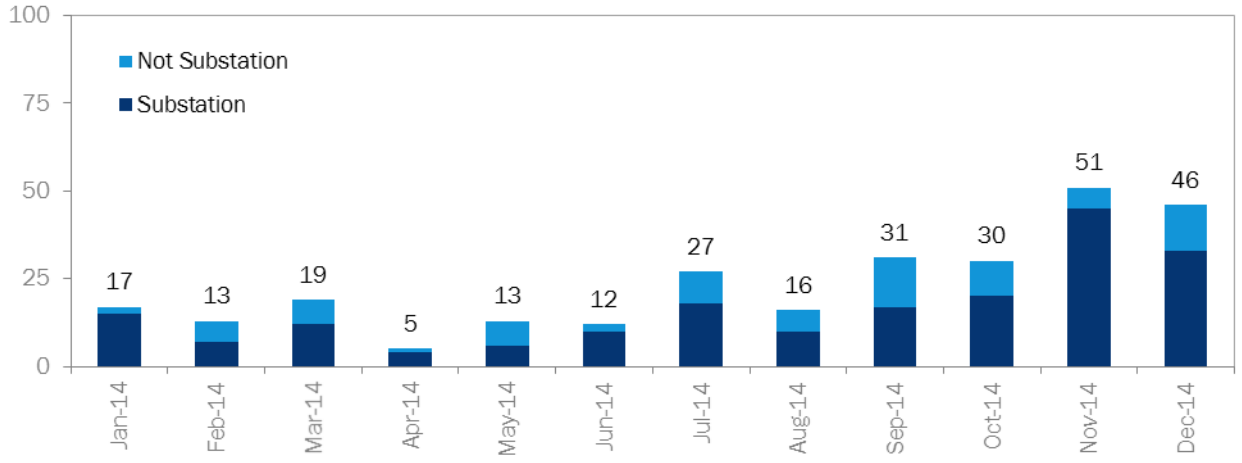
Figure 2-1. EnergyWise Audit Participants in SRP Pilot Communities (2009-2014) [a]



[a] Participant counts are based on the number of unique facilities that participated. More billing accounts may have participated if they were associated with a multifamily facility.

Of the 280 audits completed in 2014, 56% were completed between September and December. November was the busiest month for audits. This timing coincides with direct marketing activities (with some lag expected between marketing activities and completing the audit, due to scheduling).

Figure 2-2. EnergyWise Audits in SRP Pilot Communities by Month (2014)



2.2 EnergyWise Impact Analysis

The EnergyWise impact analysis estimates the coincident peak load impacts of measures installed through the statewide home energy audit program that are attributable to pilot marketing efforts (vs. statewide marketing). To assess peak load impacts, the evaluation uses the same peak kW savings per unit that National Grid uses in its cost-effectiveness tool, and estimates a "take rate" to represent the proportion of activity that would not have occurred without incremental SRP marketing efforts.

The impact evaluation for the EnergyWise Program consists of three main efforts. These efforts are designed to quantify the influence of the pilot on customers' decisions to participate in the EnergyWise Program. We

refer to this influence metric as a "take rate" that can be applied to gross ex ante demand savings among EnergyWise participants in the pilot area (during the pilot period). This analysis was conducted for the program to date (March 2012 through December 2014). Where available, we also present results for 2014.

1. **Estimate the incremental EnergyWise participation rate among Tiverton and Little Compton participants relative to (a) past participants and (b) participants in nearby communities.** We conducted a database analysis of historical and SRP pilot period participation in the EnergyWise Program, to compare participation rates in SRP communities and comparison communities. (See Section 2.2.1: Incremental Participation Rate.) The resulting incremental participation rate is one input into determining the overall "take rate" for the EnergyWise Program.

2. **Estimate SRP attribution from the EnergyWise Participant Survey.** We fielded several waves of an online survey among participants in the EnergyWise program between 2012 and 2014. The survey collected information on participants' recall of SRP and statewide marketing efforts and the influence of those materials on customer participation. Based on survey responses we estimated the level of influence of SRP pilot efforts on participation by estimating the SRP attribution. (See Section 2.2.2: SRP Attribution Based on EnergyWise Participant Surveys.) The estimate of SRP attribution is the second input into the "take rate" for the EnergyWise Program.

3. **Estimate load impacts based on ex ante savings and evaluated "take rate".** During this step we identified, counted, and assigned ex ante gross load impacts (savings) for all measures installed in the pilot area (i.e., among Tiverton substation customers) between March 1, 2012 and December 31, 2014. We then applied the evaluated "take rate" to these ex ante savings. (See Section 2.2.4: Measure Installations and Section 2.2.5: Incremental SRP Load Impacts.)

The following subsections summarize each of these three efforts. We present more details on the methodologies and additional results in Appendix A.

2.2.1 Incremental Participation Rate

Incremental participation is the increase in EnergyWise participation in the pilot area (Tiverton substation customers) that would not have happened without the pilot. The incremental participation rate is one of two approaches to estimating the take rate of the EnergyWise Program.

We applied a difference-in-differences approach to determine incremental participation. First, we compared participation in the SRP pilot area between March 2012 and December 2014 to participation in the pilot area during the baseline period (January 1, 2009 – February 28, 2012). Second, we compared the difference in participation in the pilot area with the difference in participation in a matched comparison region during the same time period.[4] This analysis essentially controls for market trends, i.e., changes in program participation that would have occurred even without the pilot.

Because the pilot and comparison groups are different in terms of (a) the numbers of accounts and (b) their pre-pilot participation rates, the comparisons must be made in terms of a percent increase between the pre-

[4] The matched comparison towns are Narragansett, North Kingstown, South Kingstown (excluding URI), Bristol, Barrington, and Warren. We describe the methodology for selecting these comparison towns in Appendix A.

pilot and pilot periods, rather than a change in the number of participants. We calculated the percentage change in participation as follows:

$$\%\ Change\ in\ Participation = \frac{Annual\ Participation_{Pilot\text{-}to\text{-}Date}}{Annual\ Participation_{Pre\text{-}Pilot}}$$

Based on tracking data for the SRP pilot area and the comparison towns, we calculated an increase in annual participation of 233% for the pilot area and 55% for the comparison towns.

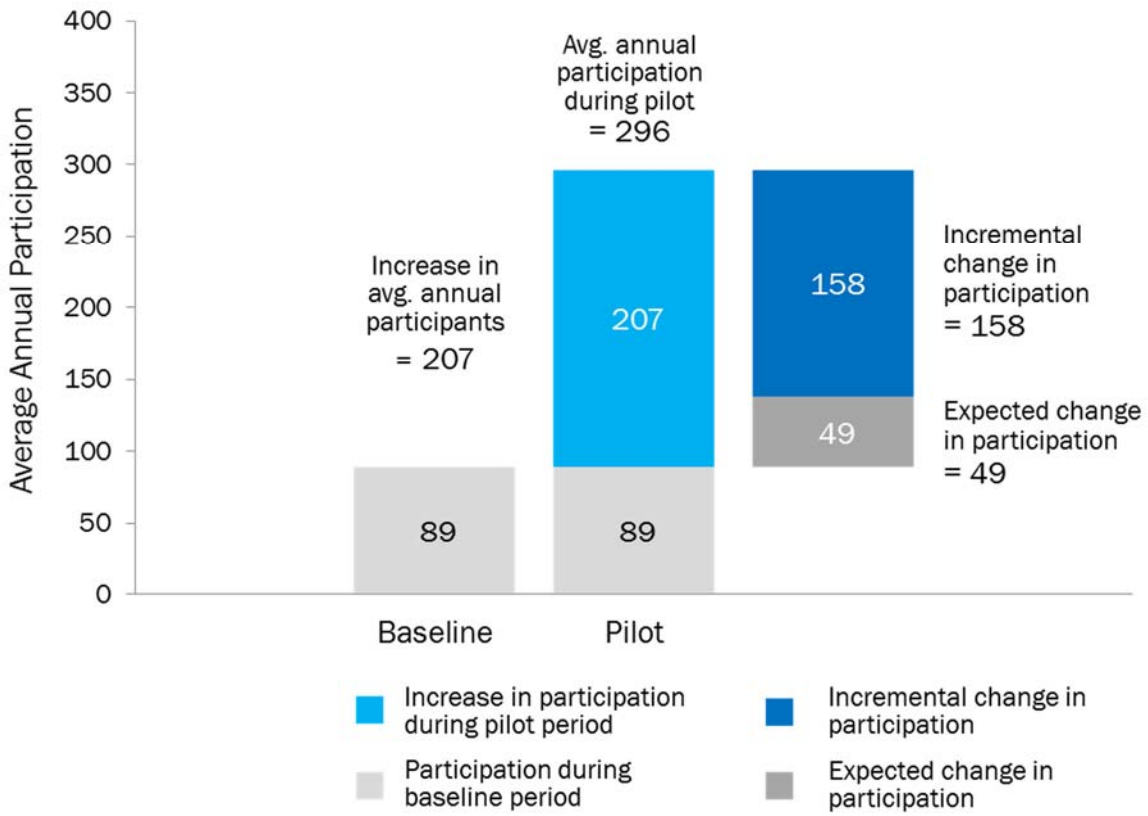
Table 2-1. Increase in Participation – Pilot Area and Comparison Towns

	Pilot Area	Comparison Towns
# Participants Pre-pilot (per year)	89	707
# Participants Pilot-to-Date (per year)	296 [a]	1,096
% Increase	233%	55%

[a] A total of 838 customers in Tiverton and Little Compton participated from March 1, 2012 – December 31, 2014.

The "lift" or incremental change attributable to the pilot is 233% - 55% or a 177% increase. This number can be applied to the pilot area baseline period count (89 participants/year) to show that 158 participants are incremental. Without the pilot, we would have expected to see a 55% increase in participation in the pilot group (or 49 expected audits, for a total of 138 annual audits). Instead we saw 296 audits per year – of these, 158 can be considered incremental, or attributable to the pilot program. We can calculate the "incremental participation rate" as the percentage of audits that are incremental: 158 / 296 = 53%.

Figure 2-3. Incremental Participation in Pilot Communities
(Average Annual Participation, 3/1/2012 – 12/31/2014)



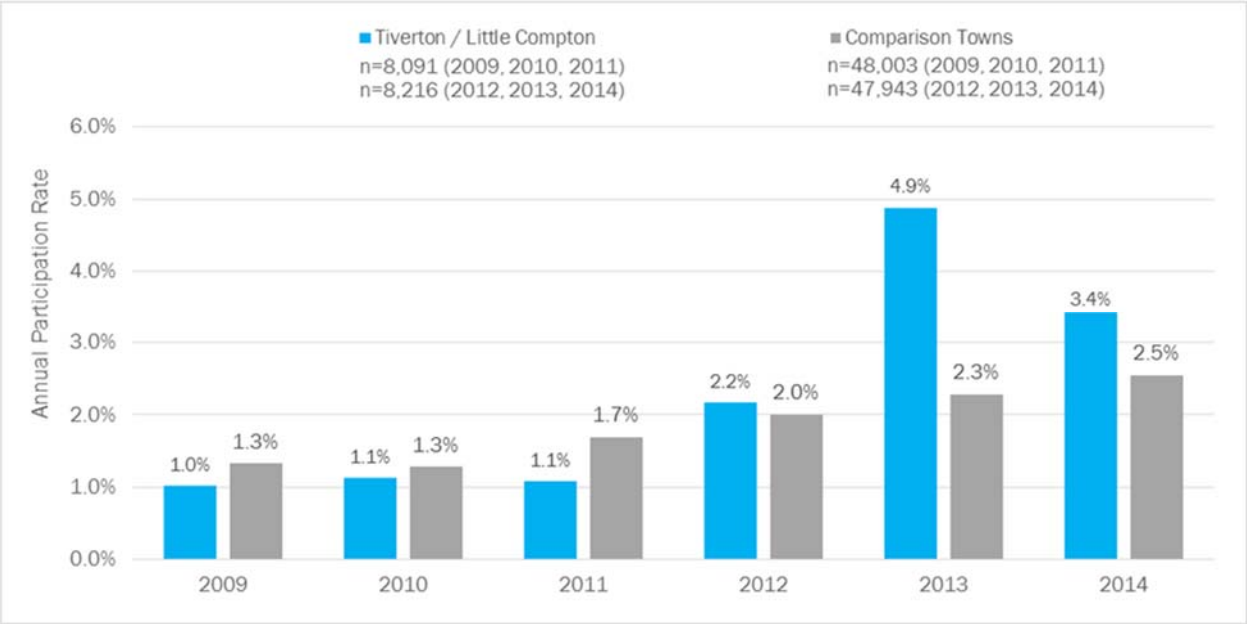
The incremental participation rate calculated for this analysis (53%) is slightly lower than the rate calculated for the pilot through the end of 2013 (57%).[5] This decline is due to a drop in the SRP participation rate in 2014 and an increase in the participation rate in the comparison communities. While the 2014 participation rate in the SRP pilot area is still higher than in the comparison towns (3.4% versus 2.5%), this difference is substantially smaller than in 2013 (4.9% versus 2.3%).[6]

Figure 2-4 below shows participation rates in the pilot communities and the comparison communities for each year of the baseline and pilot periods. As shown in this figure, the comparison communities did not experience the same increase in participation during the pilot as the SRP communities. We also see the drop in the participation rate differential in 2014.

[5] See *National Grid Rhode Island System Reliability Procurement Pilot: 2012-2013 Focused Energy Efficiency Impact Evaluation*, by Opinion Dynamics Corporation, dated May 12th, 2014.

[6] The incremental participation rate for the 2014 program year is 45%. See also Appendix A.

Figure 2-4. EnergyWise Participation Rates[a] in SRP Pilot and Comparison Towns, 2009-2014



[a] Calculated as the number of unique participants in each year divided by the US Census count of occupied housing units. These counts are not fully equivalent to residential customer counts.

2.2.2 SRP Attribution Based on EnergyWise Participant Surveys

The SRP attribution analysis measures the influence of SRP marketing on participants' decision to have an energy assessment conducted at their home. It is the second approach to estimating the take rate of the EnergyWise Program.

The SRP influence rate is based on self-reported information on 1) participant recall of SRP-specific and statewide marketing materials, 2) the influence of marketing materials on participants' decision to have a home energy assessment conducted, and 3) the relative importance of SRP-specific versus statewide marketing materials on participants' decision to have a home energy assessment conducted.

We estimate SRP attribution for the pilot-to-date to be 45%. This is the weighted average of the 2012/2013 attribution rate of 49% (estimated in the 2013 EnergyWise impact analysis) and the 2014 attribution rate of 36%.[7]

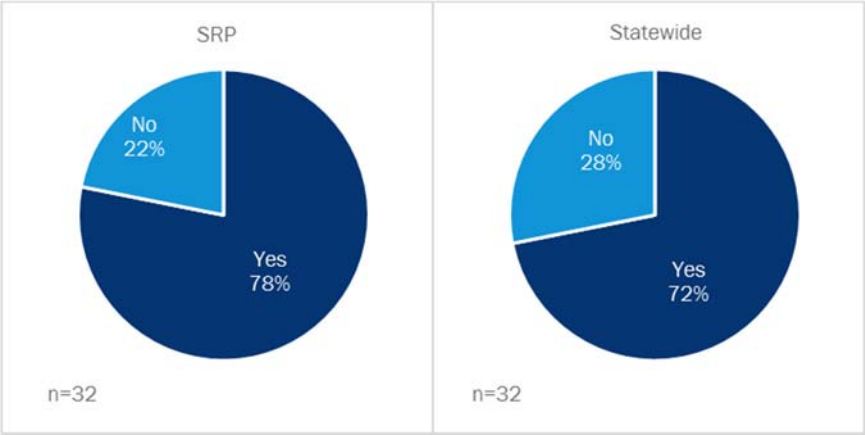
The following subsections present more detail about the 2014 SRP attribution analysis. Appendix A presents a detailed description of the methodology used for this analysis.

[7] Estimated by multiplying the 2014 influence rate of SRP marketing of 37% and the EnergyWise net-to-gross ratio of 0.97 (based on the 2014 Rhode Island TRM).

Recall of SRP-Specific and Statewide Marketing Materials

During the pilot period, customers in the pilot towns were exposed to both SRP-specific and statewide marketing materials. The online survey[8] provided participants with a series of images and descriptions of materials from both marketing campaigns and asked them if they recalled seeing, hearing, or receiving each item. As shown in Figure 2-5, 78% of respondents recall at least one SRP-specific effort while 72% recall at least one statewide effort.

Figure 2-5. Percent of 2014 Participants who Recall at Least One Marketing Effort



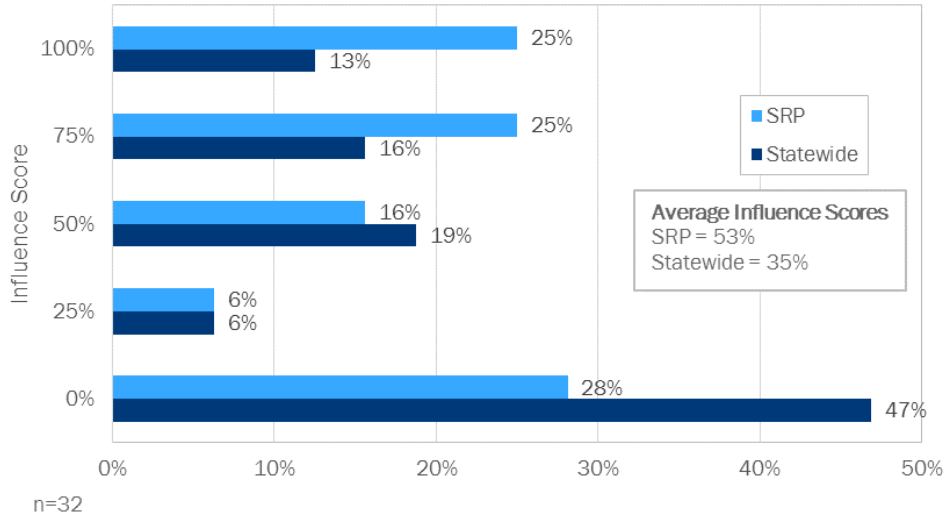
Influence of Marketing Materials on Decision to Have a Home Energy Assessment

If respondents could recall a marketing piece, the online survey asked them to rate the level of influence it had on their decision to complete the home energy assessment (using a scale of 1 to 5 where 1 was "Not at all influential" and 5 "Very influential"). We then converted the highest self-reported influence rating for each campaign into an influence score.[9] The graph below illustrates the distribution of SRP-specific and statewide influence scores among survey respondents. The average influence score for SRP-specific materials among all respondents was 53% while the average influence score for statewide materials was 35%.

[8] The online survey was fielded in December 2014. It was sent to 110 customers who participated in the EnergyWise Program between December 19th, 2013 and September 9th, 2014; 32 participants responded.

[9] Respondents who did not recall any SRP-specific or any statewide materials, received an influence score of 0% for the respective campaigns.

Figure 2-6. 2014 SRP and Statewide Influence Scores



Overall SRP Marketing Influence Based on Relative Importance of SRP-Specific and Statewide Marketing

The *Overall SRP Marketing Influence* score represents the influence of SRP materials, net of the influence of statewide materials, on the respondent's decision to have an energy assessment conducted. This score is calculated by applying the SRP share of marketing influence to the *SRP Influence* score.[10] The table below shows the distribution of the *Overall SRP Marketing Influence* scores among the 32 survey respondents. The table shows that 28% of participants were not at all influenced by SRP-specific marketing (an *Overall Marketing SRP Influence* score of 0%).

The program-wide *Overall SRP Influence* score, 37%, is the average of the *Overall SRP Influence* scores across all respondents.

Table 2-2. 2014 SRP Influence Score to Overall SRP Influence Conversion

Influence Score		SRP Share of Marketing Influence	Overall SRP Influence	Participants	
SRP	Statewide			n	%
100%	0%	100%	100%	2	6%
75%	0%	100%	75%	5	16%
100%	50%	67%	67%	1	3%
100%	75%	57%	57%	1	3%
100%	100%	50%	50%	4	13%

[10] Both statewide and SRP-specific materials could have influenced a participant to have the energy assessment done. We therefore determined the share of overall marketing influence attributable to the SRP-specific marketing materials using the following formula: SRP Share of Marketing Influence = Highest self-reported influence rating for SRP campaign / (Highest self-reported influence rating for SRP campaign + Highest self-reported influence rating for Statewide campaign).

Influence Score		SRP Share of Marketing Influence	Overall SRP Influence	Participants	
SRP	Statewide			n	%
75%	50%	60%	45%	1	3%
75%	75%	50%	38%	2	6%
50%	25%	67%	33%	1	3%
50%	50%	50%	25%	2	6%
25%	0%	100%	25%	1	3%
50%	75%	40%	20%	2	6%
25%	50%	33%	8%	1	3%
0%	0%	0%	0%	7	22%
0%	50%	0%	0%	1	3%
0%	25%	0%	0%	1	3%
Average *Overall SRP Influence* Score:			37%	32	100%

2.2.3 Estimation of the Take Rate

We compared the SRP attribution rate from the combined 2012/2013 and 2014 EnergyWise surveys (45%) and the 2012-2014 incremental participation rate (53%) to develop an overall take rate for the pilot-to-date. Given the benefits and uncertainties of each method, we recommend using the midpoint of these two rates – 49% – to estimate net pilot savings. Specifically, we considered the following tradeoffs between the two methods:

- **Incremental participation analysis:** This method accounts for all participants in the pilot area and comparison communities, making it a comprehensive "population" analysis. However, this method does not control for all non-program factors that may have occurred outside of statewide marketing (e.g., independent, community-based energy efficiency efforts) that may have influenced participation rates in the comparison communities. Additionally, the comparison communities, even as a group, are not perfectly identical to the SRP communities in terms of demographics and pre-pilot participation rates.[11] We therefore might expect slightly different rates of participation growth for each set of communities. By including numerous comparison communities in slightly different geographic areas, yet as close to the pilot area as possible, we attempted to mitigate these effects to the extent possible.

- **EnergyWise participant surveys:** This method represents a direct measurement of the variable of interest: recall of SRP-specific marketing and its influence on participants' decision to have a home energy assessment. However, the method is based on a sample of participants and is therefore subject to potential response bias. In addition, this method uses self-reported information, which can be unreliable. Finally, this method incorporates a net-to-gross ratio based on the RI TRM, which we did not independently verify within the scope of this evaluation.

[11] For a detailed discussion of the selection of comparison communities, see *National Grid Rhode Island System Reliability Procurement Pilot: 2012-2013 Focused Energy Efficiency Impact Evaluation*, by Opinion Dynamics Corporation, dated May 12th, 2014.

The take-rate of 49% for the program to-date is the weighted average of the rates estimated for the 2012/2013 program (53%) and the 2014 program (40%). We will continue to update the EnergyWise take rate in future years, using EnergyWise Program tracking data and ongoing EnergyWise survey results.

Table 2-3 presents the estimated program attribution based on the incremental participation analysis and the EnergyWise participant survey as well as the resulting take rate, for three time periods: 1) 2012/2013, 2) 2014, and 3) the pilot-to-date.

Table 2-3. Summary of EnergyWise Program Attribution

Program Year	Survey Attribution Rate	Incremental Participation Rate	Take Rate
2012/2013	49%	57%	53%
2014	36%	45%	40%
Pilot-to-Date	45%	53%	49%

2.2.4 Measure Installations and Ex Ante SRP Gross Load Impacts

To determine the gross load impacts from the installation of EnergyWise Program measures, we applied National Grid's 2014 Rhode Island-specific impact factors to the quantity of measures installed during the pilot period (March 2012 through December 2014), using the following formula:

*Peak Load Reduction (kW) = Quantity * per Unit kW Reduction * Summer Diversity Factor*

The table below shows the quantities and resulting peak kW load impacts for all installations in the substation area (subfeeders 33-34) during each year of the pilot period as well as for the pilot-to-date. Total impacts for 2014 are 22.9 kW, a 37% reduction from the 36.4 kW estimated for 2013.[12] The majority of 2014 peak demand savings come from LED bulbs, followed by CFLs and smart strips. Total cumulative gross impacts for the pilot-to-date are 67.0 kW.[13]

Table 2-4. Installed Measures and Ex Ante Gross Peak Load Reduction: SRP Pilot Area March 2012-2014 (before applying SRP Pilot take rate)

Measure Category	Total Measure Quantity				Total Peak Load Reduction (kW)			
	2012 [a]	2013	2014	Pilot to Date	2012 [a]	2013	2014	Pilot to Date
CFL	2,382	8,670	1,867	12,919	5.7	20.6	4.4	30.7
LED Bulb	87	998	3,946	5,031	0.2	2.4	9.4	12.0
Indoor Fixture	28	96	25	149	0.1	0.3	0.1	0.5
Outdoor Fixture	1	11	26	38	0.0	0.0	0.0	0.0

[12] Note that 2012 and 2013 impacts have been re-estimated using 2014 impact factors. The results presented in this table are therefore different from those presented in Opinion Dynamics Corporation's 2014 report *National Grid Rhode Island System Reliability Procurement Pilot: 2012-2013 Focused Energy Efficiency Impact Evaluation*.

[13] It should be noted that National Grid established Focused Energy Efficiency goals for the pilot that apply to *all* measure installations in the pilot area, not just incremental savings achieved by the pilot. The cumulative load reduction goal through 2014 was 103 kW of net summer load reduction. Applying a program-level net-to-gross ratio of 0.97 to the ex ante gross load savings of 67.0 kW, net peak kW savings within the SRP area are 65.0 kW. These savings represent about 63% of goal.

Measure Category	Total Measure Quantity				Total Peak Load Reduction (kW)			
	2012 [a]	2013	2014	Pilot to Date	2012 [a]	2013	2014	Pilot to Date
DHW	0	71	15	86	0.0	1.6	0.3	2.0
HPWH 50 Gallon	0	1	0	1	0.0	0.2	0.0	0.2
Refrigerator Rebate	3	6	5	14	0.3	0.6	0.5	1.3
Refrigerator Brush	103	297	191	591	0.5	1.5	1.0	3.0
Smart Strip	60	539	363	962	0.7	6.3	4.2	11.2
Programmable Thermostat (all fuels)	5	41	18	64	0.2	1.5	1.7	3.4
AC Timer	0	0	1	1	0.0	0.0	0.0	0.0
Ventilation [b]	0	28	23	51	0.0	0.0	0.0	0.0
Weatherization (all fuels) [b]	0	31	27	58	0.0	1.4	1.2	2.6
TOTAL	2,669	10,789	6,507	19,965	7.7	36.4	22.9	67.0

[a] 2012 participation period is between 3/1/2012 and 12/31/2012.

[b] Quantities of Ventilation and Weatherization are the accounts of unique participants. All other quantities are measure counts (e.g., count of installed bulbs).

2.2.5 Incremental SRP Load Impacts

The estimated take rate for this evaluation period is 49%, which is the mid-point between SRP attribution based on the EnergyWise surveys (45%) and the incremental participation rate (53%). Applying the two rates to the measure-level results, we estimate that the pilot-to-date has achieved summer peak load savings totaling 32.9 kW, in a range of 30.0 to 35.7 kW. Table 2-5 presents the impact ranges for each measure category.

Table 2-5. 2012-2014 SRP Pilot Load Impacts by Measure Category

Measure Category	3/1/2012 - 12/31/2014	
	Incremental Peak Load Reduction (kW)	Range (kW)
CFL	15.1	(13.8 - 16.4)
LED Bulbs	5.9	(5.4 - 6.4)
Indoor Fixtures	0.2	(0.2 - 0.3)
Outdoor Fixture	0.0	(0 - 0)
DHW	1.0	(0.9 - 1.1)
HPWH 50 Gallon	0.1	(0.1 - 0.1)
Refrigerator Rebate	0.7	(0.6 - 0.7)
Refrigerator Brush	1.4	(1.3 - 1.6)
Smart Strip	5.5	(5 - 6)
Programmable Thermostat	1.7	(1.5 - 1.8)
AC Timer	0.0	(0 - 0)
Ventilation – Other	0.0	(0 - 0)
Weatherization (multiple fuels)	1.3	(1.2 - 1.4)
TOTAL	32.9	(30.0 - 35.7)

3. DemandLink WiFi Thermostat and Smart Plug Evaluation

This section presents evaluation results for the DemandLink WiFi Thermostat and Smart Plug components of the SRP pilot. The 2014 evaluation included the following analyses, presented in this section:

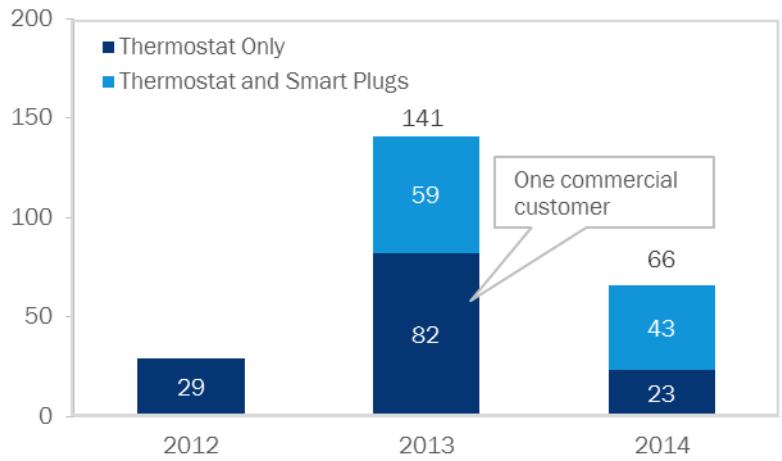
- A review of participation in the DemandLink Thermostat Program
- A limited process analysis
- An analysis of event logs and opt-outs
- A run-time and demand response impact analysis for participants with central air conditioning
- A run-time and demand response impact analysis for participants with window air conditioning
- An analysis of potential WiFi Thermostat and SmartPlug efficiency savings

3.1 Participation Summary

In 2014, 66 new participants signed up to participate in the DemandLink Thermostat Program, bringing the cumulative total to 236 participants. All new 2014 participants were residential customers with account numbers that link to substation feeders. In 2014, almost two-thirds (65%) of new participants installed one or more SmartPlugs for use with window air conditioners, compared to 42% in 2013. In total, substation participants with central AC installed 39 thermostat and participants with window ACs installed 103 SmartPlugs, short of the 2014 planning projections of 70 thermostats among central AC users and 180 SmartPlugs among window AC users.

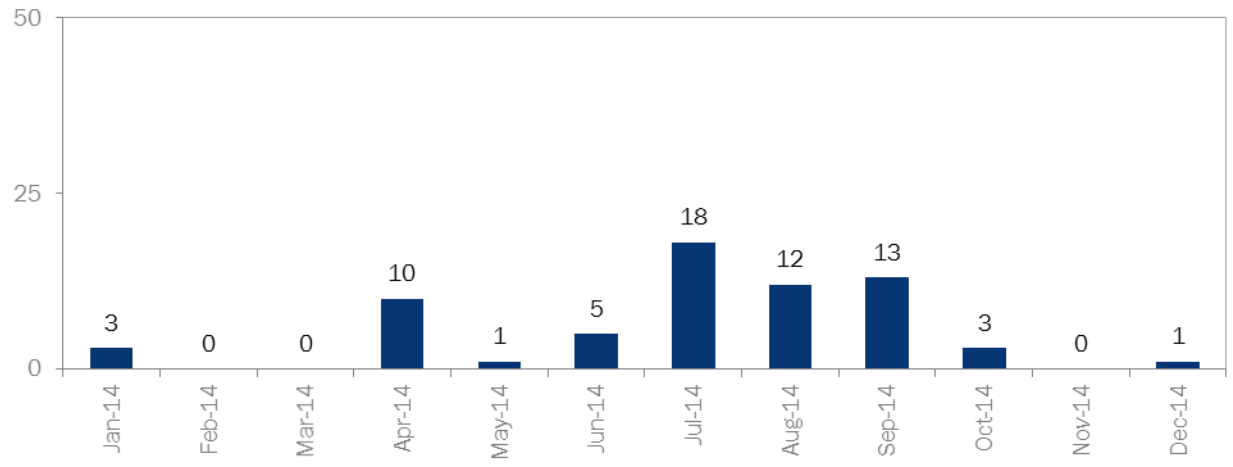
Figure 3-1 summarizes annual participation in the DemandLink Thermostat and SmartPlug program components in the towns of Tiverton and Little Compton, by year of sign up.

Figure 3-1. DemandLink Thermostat Program Participation in SRP Pilot Communities (2012 -2014)



July through September were the busiest months for the program (see Figure 3-2 below). In this three-month period, 65% of 2014 participants (43 customers) entered the program. The month with the most participants was July.

Figure 3-2. DemandLink Thermostat Program Participation in SRP Pilot Communities (2014)



Based on the program tracking database, Central AC participants in SRP pilot communities installed between one and three thermostats each, with an average of 1.7 units per home. Window AC Participants installed up to six Smart Plugs each, with an average of 2.4 plugs per home. The DemandLink participant survey explored how customers are using the Smart Plugs they receive: Of the 2.8 plugs they received on average, survey respondents reported using 1.6 (or 58%) with window air conditioners during the past summer. This means that 42% of Smart Plugs provided to participants were not used with window air conditioners.[14]

3.2 Process Evaluation

The process evaluation is based on a survey with participants in the DemandLink Program. This survey was fielded in two waves, between June and July 2014 and between October and November of 2014.[15] Opinion Dynamics completed phone interviews with 73 participants who received a WiFi-enabled programmable thermostat through the DemandLink Program. The primary purpose of this survey was to collect information needed for the DemandLink impact evaluation; however, the survey also collected limited process-related information about the WiFi-enabled thermostat component of the DemandLink Program, including satisfaction with equipment as well as awareness and perceptions of and participation in Demand Response events.

The following subsections summarize findings from the DemandLink participant survey.

Reasons for Installing Equipment

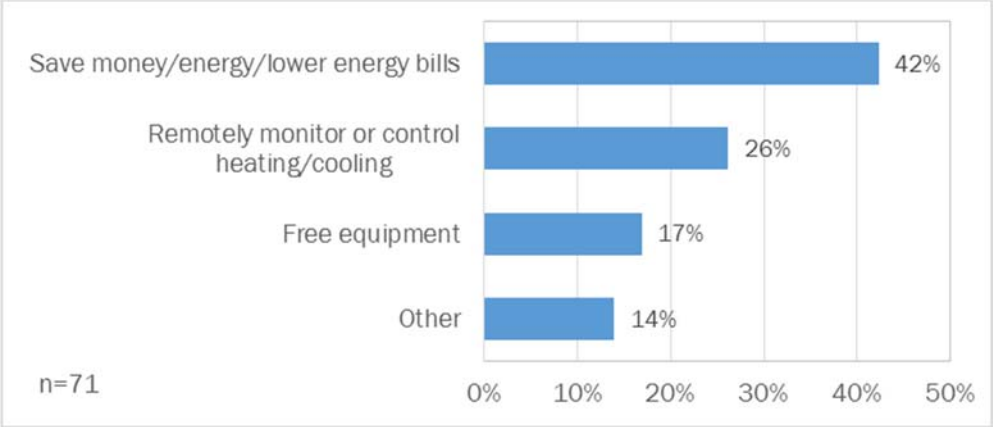
Saving energy, saving money, or lowering energy bills is the primary driver of participants' decision to install DemandLink equipment (42%). Other reasons include the ability to remotely monitor or control heating/cooling (26%) and the opportunity to receive free equipment (17%). All other reasons were cited by three or fewer respondents and included convenience, curiosity, desire to update equipment, and desire for equipment that is more functional. Respondents with central air conditioning are more likely to be motivated by the prospect

[14] It is unclear from survey results whether these Smart Plugs are being used with other devices, or are not being used at all.

[15] The first wave included participants between June 2012 and January 2014; the second wave included participants between June 2012 and September 2014. Respondents who were non-responsive in the first round of fielding were included again in the second wave of fielding.

of remotely monitoring or controlling equipment than respondents with window air conditioning (34% compared to 15%).

Figure 3-3. Reasons for Installing DemandLink Equipment

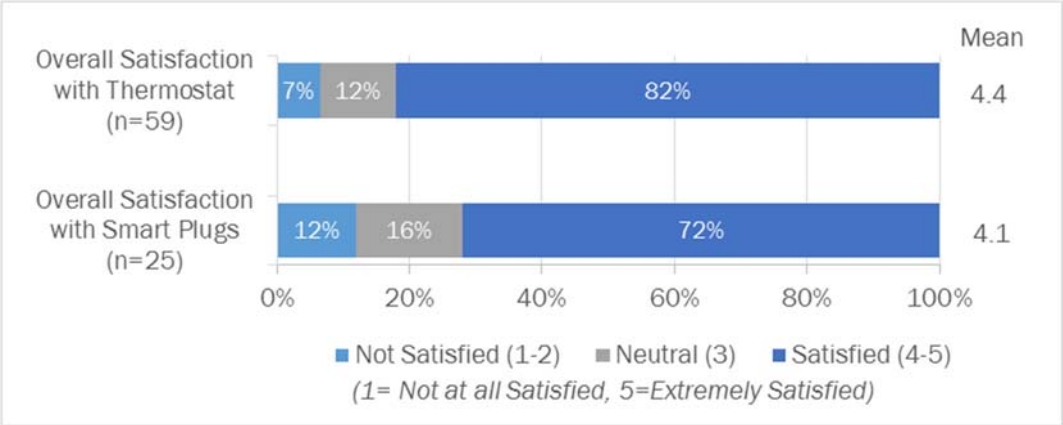


Satisfaction with Equipment

Overall, participants report high satisfaction with the thermostats they installed through the DemandLink Program. Eighty-two percent of participants say they are satisfied (a rating of 4 or 5, on a scale of 1 to 5), with a mean rating of 4.4. Those that are not satisfied (7%) found the equipment difficult to use or did not know how to use it (three respondents) or said that the equipment is not working as expected (one respondent).

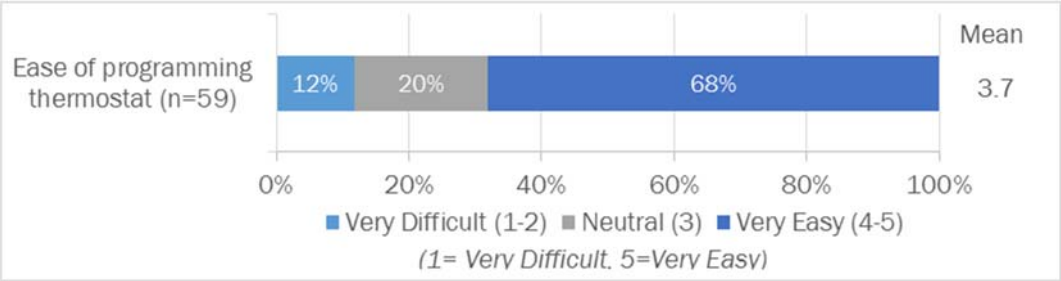
Participants with window air conditioning are also generally happy with the SmartPlugs they received through the program. Nearly three-quarters (72%) of respondents say they are satisfied (a rating of 4 or 5 on a scale of 1 to 5), with a mean rating of 4.1. Similar to those who were not satisfied with their thermostat, the few respondents who were not satisfied with their Smart Plugs had trouble getting them to work (two respondents) or did not know how to use the equipment (one respondent).

Figure 3-4. Overall Satisfaction with DemandLink Thermostat



Just over two-thirds (68%) of participants indicate that the thermostat was easy to program (a rating of 4 or 5 on a scale of 1 to 5) while 12% indicate it was difficult (a rating of 1 or 2). These responses, along with reasons for dissatisfaction with the equipment summarized above, indicate that some participants would benefit from additional education or instructions on how to program and use the new equipment.

Figure 3-5. Ease of Programming Thermostat



Awareness of Demand Optimization Events

A series of focus groups conducted with non-program participants in 2013 showed low awareness and comprehension of demand optimization events, which are central to the DemandLink Program. The 2014 DemandLink participant survey further explored awareness of these events with program participants.

Overall, awareness that National Grid might call demand optimization events is relatively low, 54%, given that respondents are current *participants* in the program. Participants who were aware of these events tend to be highly aware that the events are a required component of participation in the program (88%). They are less familiar with the details of participation – that National Grid notifies customers prior to the start of an event (58%), that they have the option to opt out of an event (58%), and that they will receive an annual bill credit for participating in all events (45%).

Table 3-1. Awareness of Demand Optimization Events

Participation Components	Total	Central Air Conditioning	Window Air Conditioning
	% Aware *(n=73)*	% Aware *(n=44)*	% Aware *(n=29)*
National Grid might call demand optimization events	54%	61%	45%
Of those aware that National Grid might call events	% Aware *(n=40)*	% Aware *(n=27)*	% Aware *(n=13)*
Events are part of participation	88%	85%	92%
National Grid notifies customers prior to the start of an event	58%	48%	**77%**
You have the option to opt out of an event	58%	52%	69%
You receive an annual bill credit for participating in all events	45%	44%	46%

Note: Bolded numbers indicate a statistically significant difference, at 90% confidence, between the two types of air conditioning.

Lack of awareness of events (both generally and specific events that have been called), or the details of participation, are not necessarily of concern – unless it leads to 1) participant dissatisfaction, 2) participants changing temperature settings during an event and unknowingly opting out, or 3) participants permanently disabling or disconnecting their control devices. Our research to-date has not shown that lack of event awareness has led to participant dissatisfaction or to changing of temperature settings during events and inadvertent opt-out:

- Participant satisfaction is uniformly high, including among those not aware of demand control events.

- The incidence of purposeful opt-outs, as reported in the participant survey (approximately 6%; see discussion below), is consistent with the estimated opt-out rate based on event logs (approximately 4%, excluding an unknown number of opt-outs during the first five minutes; see also Section 3.3.2).

For central AC participants, we also found no evidence that the lack of awareness of demand response events is associated with disconnecting the control devices: Only 9% of interviewed central AC customers could not confirm that the thermostat was in place during the summer of 2014. Of these, half were aware of demand control events and half were not. However, among participants with window AC who received SmartPlugs, our research suggests that those not aware of the events are more likely to not plug their window AC(s) into the SmartPlug(s). Overall, survey respondents reported that only 58% of Smart Plugs were being used with window AC units during the past summer. This value is 73% for those aware of events and 48% for those not aware of events. Similarly, while 38% of participants not aware of events reported having no window ACs plugged into their SmartPlugs, this is the case for none of the participants aware of events.[16]

Another notable trend with respect to SmartPlugs not being used with window ACs is that those who first participated in a prior year (i.e., participants who received their SmartPlugs before the summer of 2013 but were interviewed about their 2014 SmartPlug usage) appear to be less likely to use their SmartPlugs with window AC units. Participants who were interviewed about their usage of SmartPlugs in the year of installation reported using 67% of their SmartPlugs with window AC, compared to only 20% of those interviewed about their usage the year after installation. Similarly, the share of participants who reported not having any window AC units plugged into a SmartPlug is 19% for those interviewed during the year of installation, but 75% for those interviewed the year after installation.[17]

These findings suggest that outreach to SmartPlug participants, especially those who first participated in prior years, could be valuable in increasing the rate with which SmartPlugs are being used with window ACs. This is particularly important given the small number of SmartPlug logs we were able to include in our peak demand impact analysis for participants with window AC (see also Section 3.3 below) and the negative result on savings that could be credited to the program.

Participation in Demand Optimization Events

National Grid called demand optimization events on July 23rd, August 27th, and September 3rd 2014 as well as test events on July 18th and August 21st 2013. We asked respondents who were aware that National Grid might call demand optimization events and who had installed their equipment prior to the last event of the summer about their awareness of and experience with the events. Awareness of the demand optimization events called in 2013 and 2014 was moderate. Half (50%; n=24) were aware that National Grid called any of these events. Of these, almost one quarter (25%; n=12) reported that they opted out of at least one event. Among all interviewed participants, this translates into an opt-out rate of approximately 6% (assuming that those who were not aware of events did not opt out).[18] Reasons for opting out included inconvenient timing of

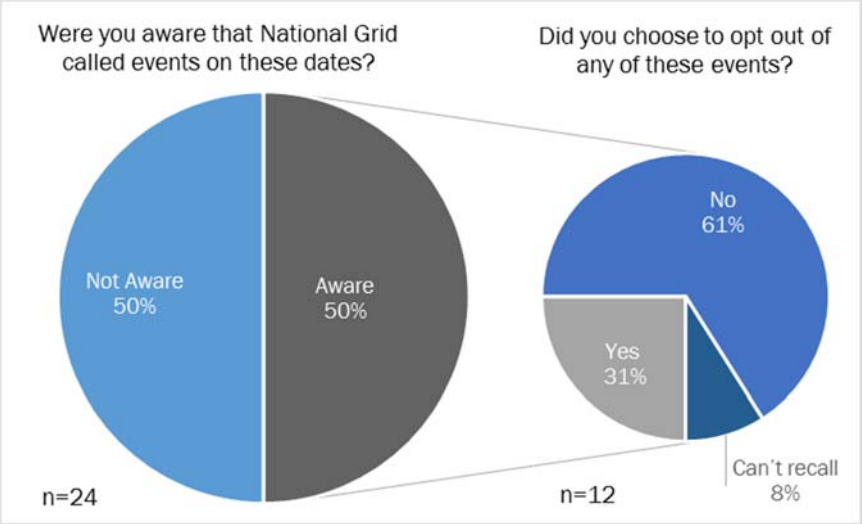
[16] It should be noted that these findings are based on a relatively small number of respondents for whom we collected information about use of their SmartPlugs during the past summer (7 aware of events and 13 not aware of events). The difference in the percentage of SmartPlugs being used with window AC is not statistically significant at a 90% confidence level, but the difference in the percentage of participants with zero SmartPlugs used with window ACs is significant.

[17] While these numbers are based on small sample sizes (16 for same year installation and 4 for prior year installation), both differences are statistically significant at a 90% confidence level.

[18] Note that this rate is consistent with the estimated mean opt-out rate for central AC, 4%, based on our analysis of thermostat event logs (see Section 3.3.2). Based on the event log files, no participant with window AC opted-out of any of the three events. We note,

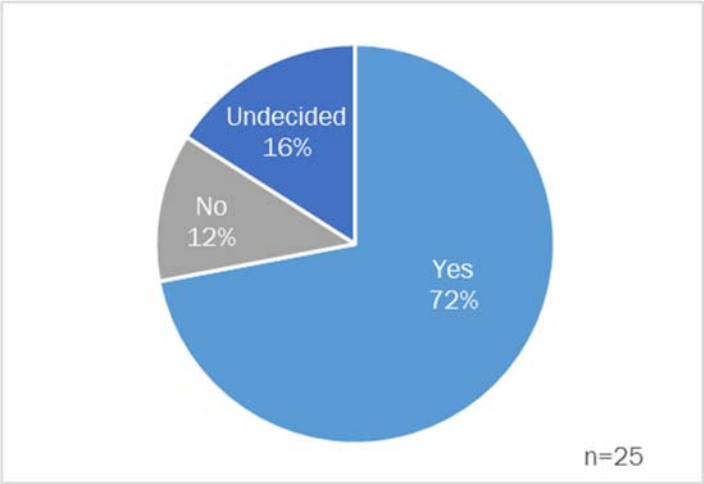
the event (mentioned by two of three who opted out). One respondent noted that the thermostat was defective and was overheating the house.

Figure 3-6. Awareness of and Participation in 2013-2014 Demand Optimization Events



Planned participation in future demand optimization events is high. The majority of respondents (75%) who were able to participate in an event in 2013 or 2014 (based on their installation date) and who were aware that National Grid might call demand optimization events as part of the program indicate they plan to participate in future events; another 17% are undecided. The few participants who do not plan to participate in future events cite changes in eligibility for the program (one no longer lives at the participating address) and discomfort due to the change in temperature during the event (one respondent).

Figure 3-7. Plans to participate in the future events

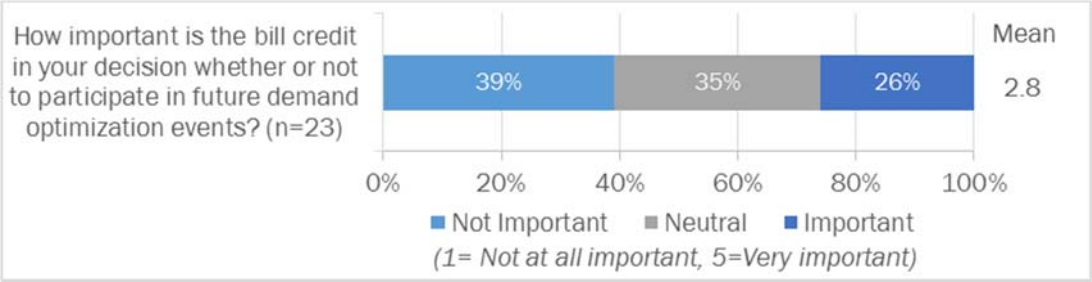


Program participants receive an annual bill credit of for participating in all demand optimization events. We asked participants to rate the importance of the bill credit in their decision whether to participate in future

however, that only 28 out of 110 SmartPlug logs recorded usage data and were usable for the impact analysis. It is therefore possible that window AC participants who opted out of events are among those with unusable log data.

demand optimization events or not. For most participants, the bill credit does not have a strong influence on the decision to participate in demand events. The majority (74%; n=23) either present a neutral attitude towards the bill credit or feel it is unimportant. Just over a quarter (26%) feel the bill credit is important to their decision.

Figure 3-8. Importance of bill credit on future participation



3.3 Analysis of Demand Response Event Logs and Opt-Outs

3.3.1 Thermostat Logs

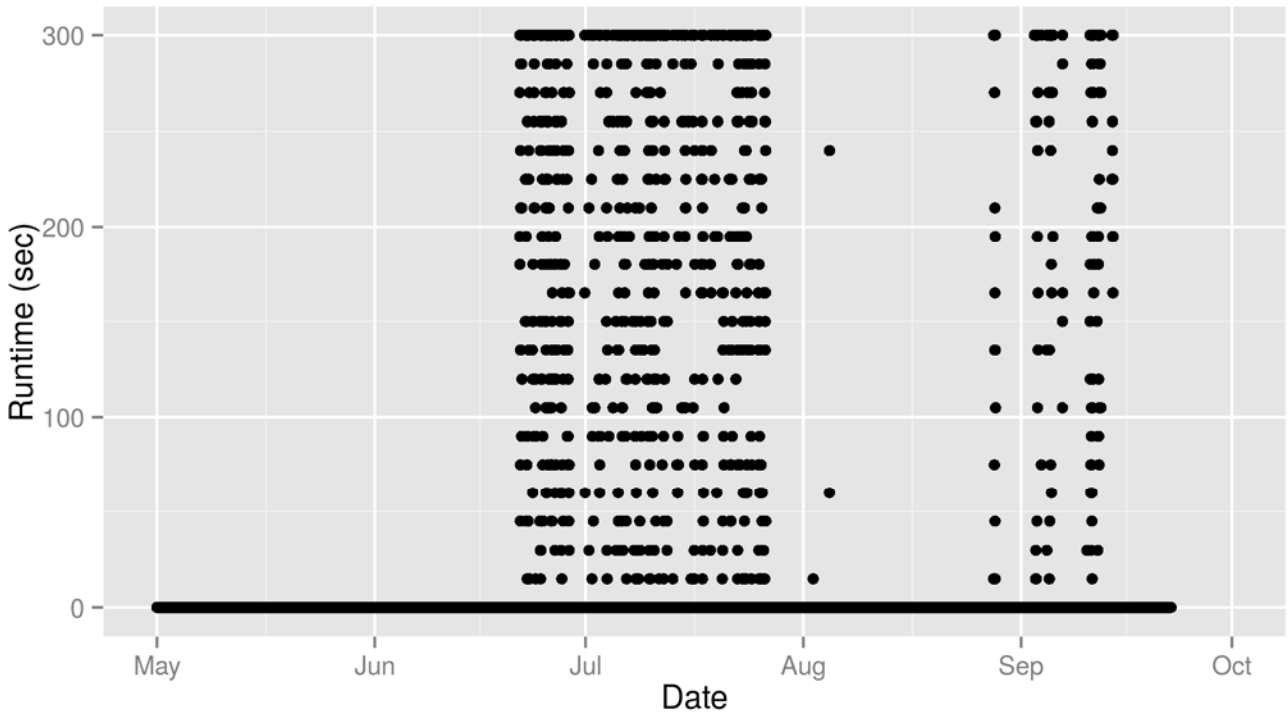
The thermostat logs contain data collected at five-minute intervals covering date, time, thermostat setting (heat or cool), event, thermostat set-points, weather, runtime (in seconds, for central AC), and plug load for up to six plugs (in Watts, for window AC). The thermostat logs came from two separate sources, with slightly different formats. Opinion Dynamics received 180 logs for central AC from Earth Networks and 110 logs for window AC from Ecobee. We examined the thermostat logs thoroughly, as they contain information about AC usage and event opt-outs in addition to the data that is the basis for the impact analyses. We only examined and used log data for the 2014 peak season (May through September) for the impact evaluation.

Central Air Conditioning

The logs for thermostats associated with central AC contain data recorded at five-minute intervals. During each of those intervals, the log records the run-time of the AC unit, the temperature setting, the indoor temperature, an event code, and several other variables. The central AC portion of the impact analysis uses the run-time as dependent (or primary) variable.

Figure 3-9 shows central AC run-time from one of the thermostat logs during the May through September 2014 peak season. Each dot on the chart shows the run-time for a five-minute period. When the plotted run-time is 300 seconds (i.e., five minutes), the AC was running continuously for that period. Based on the data shown in Figure 3-9, the unit was running mainly from late June through late July. It operated for only a few minutes in early August, for one day late in August, and then for a period in September. The points with zero run-time along the base of the plot show that the thermostat was operational until late September, when the log stops. We examined these plots for all thermostats to understand how the thermostats and central AC units operated during the 2014 peak season.

Figure 3-9. Run-Time per 5-Minute Interval for the 2014 Peak Season for One Central AC Unit



Window Air Conditioning

The logs for thermostats associated with window air conditioning also contain data recorded at five-minute intervals. During each of those intervals, the thermostat log records the Watt-hour consumption of up to five window AC units (each plugged into a separate SmartPlug), the temperature setting, the indoor temperature, an event code, and several other variables. The window AC portion of the impact analysis uses the total AC demand in kW as the dependent variable.

Most of the logs for thermostats that are set to control window AC (82 out of 110) did not record any values in the plug usage columns or have blanks interspersed with periods of zero consumption. We understand that a technician installs the SmartPlug during the thermostat installation, and that the technician plugs the window AC units into the SmartPlug so that the thermostats can cycle the window AC power during events. Based on survey results, about four of ten Smart Plugs are not used with window AC units. These are likely to account for some but not all of the logs that show zero consumption or blanks. It is unclear why the remaining logs show no activity during the 2014 peak season.

Figure 3-10. Watt Usage Over Each 5-Minute Interval for the 2014 Peak Season for One Window AC

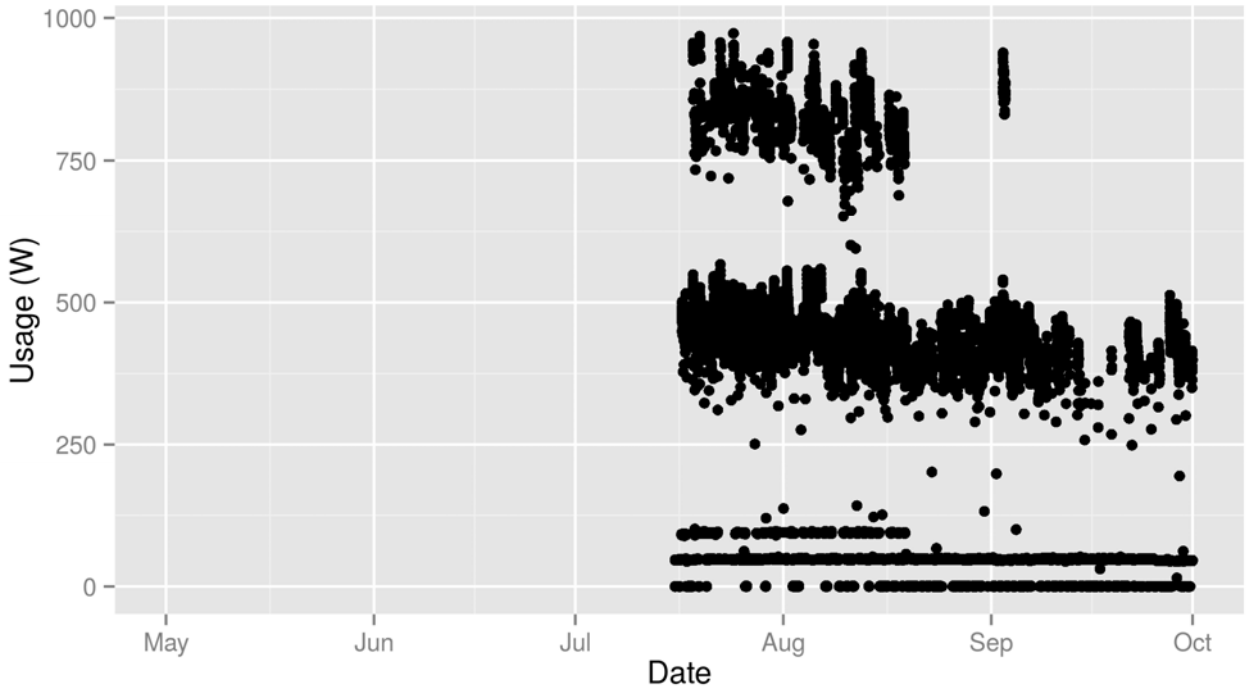


Figure 3-10 shows window AC usage in Watts over each 5-minute interval during the 2014 peak season for one of the 28 thermostats that controlled window AC during the peak season. There is no usage data collected until mid-July; then the log continues without breaks until the end of the season. For the impact analysis, we excluded the logs for 82 of the 110 thermostats that control window AC. These logs seem to indicate operational thermostats, but they have a blank or a zero for window AC usage during the entire peak season, indicating that there was no communication with the SmartPlug (possibly because the SmartPlug was removed by the participant) or that the window AC units were not used at all. We removed two more thermostats with anomalously high consumption readings (readings so high as to be impossible in a residential setting, indicating that the logs are incorrect, perhaps due to incorrect system setup or software failure), leaving a total of 28 thermostats for the window AC analysis.

3.3.2 Demand Response Event Failure and Opt-out Rates

We examined the thermostat logs for each of the three event periods to establish failure and opt-out rates during the events. The counts in this section only include the thermostats that are included in the impact analysis: 176 central AC thermostats and 28 window AC thermostats. We define two different types of failure for this analysis, event failure, where an otherwise operational thermostat does not respond to an event notification, and complete failure, where the thermostat appears to be non-functional or the logs are empty. Table 3-2 shows the event failure and opt-out rates for each 2014 event, by thermostat type. A “Total” count of fewer than 28 window ACs or 176 central AC thermostats reflect thermostats that were installed after the event date.

Table 3-2. Event Failure and Opt-Out Counts and Rates

AC Type	Event	Total	Failures	Failure Rate	Opt-Outs	Opt-Out Rate
Central	July 23	171	20	12%	4	2%
	August 27	176	20	11%	12	7%
	September 3	176	14	8%	7	4%
	Mean	174	18	10%	8	4%
Window	July 23	20	2	10%	0	0%
	August 27	26	1	4%	0	0%
	September 3	28	0	0%	0	0%
	Mean	25	1	4%	0	0%

Failure Rates

Some of the thermostat logs do not show an event at all during the event period. This could happen for two reasons: 1) the thermostat was not functioning or communicating during the event period and therefore did not receive notification of the event or 2) an occupant opted out of the event during the first five minutes. Based on the logs, we cannot differentiate between these two causes, so we count all thermostats that show no record of an event as failures. The mean event failure rate is 4% for window AC thermostats and 10% for central AC thermostats (see Table 3-2).

The overall failure rate, which combines complete thermostat failures and event failures, is 13% for the central AC thermostats, but a much larger 78% for window AC thermostats.[19]

Opt-out Rates

We count a thermostat as having had an occupant opt out of an event if the code in the thermostat log that indicates the event changed to normal operation during the event period. The mean opt-out rate for central AC thermostats is 4%; none of the 28 operational window AC thermostats opted out of any event. For most of the central AC opt-outs, the opt-out occurred in the last hour of the 4-hour event. However, each of the three events show between one and three opt-outs earlier in the event.

3.4 Demand Response Impact Analysis

The installed thermostats control air conditioning load by cycling power to the AC unit. For central AC units, the thermostat cycles the unit on and off during the event period using the thermostat controls. The power to the window AC units is indirectly controlled using SmartPlugs; during an event, the power to the window AC unit is cycled to reduce runtime. There were three events called during the 2014 peak season (May through September). The event hours were slightly different for the window air conditioning and the central air conditioning participants (see Table 3-3).

[19] This rate includes the 80 SmartPlugs with empty logs.

Table 3-3. 2014 Demand Response Events

Date	Central AC		Window AC	
	Start Time	End Time	Start Time	End Time
July 23	4 PM	8 PM	4 PM	6 PM
August 27	3 PM	7 PM	4 PM	6 PM
September 3	3 PM	7 PM	4 PM	6 PM

3.4.1 Impact Methodology

Opinion Dynamics used regression modeling combined with day matching to estimate the demand response load impacts for window AC participants and runtime reduction for central AC participants. The load impact for central AC events are then calculated by multiplying the runtime reduction by the mean full load demand, to arrive at the demand response attributable to the event. We present a detailed description of our impact methodology, including information on model specification, day matching, tracking data and thermostat logs included in the analysis, and incorporation of weather data in Appendix B.

3.4.2 Demand Response Impacts – Central Air Conditioning

This section presents the demand response impact results for participants who have central AC, controlled by a WiFi programmable controllable ("smart") thermostat that cycles the air conditioner during events. Table 3-4 presents the demand response impacts for the three events called in 2014. Each event has nine matched comparison days that we used to develop the modeled baseline. Opinion Dynamics also estimated impacts for an overall event that uses data from all three events and all matched comparison days. Note that the result for the overall event is not a simple average of the three single events: The baseline of the overall event is slightly different because all comparison days are used in the model, so the impact estimate is not exactly the same as if we had averaged the three events.

Table 3-4. Central AC Demand Response Impact

	Thermostat Impact		# of Participating Thermostats	Program Impact
	Runtime Reduction	kW		kW
Overall	8.6%	0.32	176	56
July Event	6.0%	0.22	171	38
August Event	8.9%	0.33	176	58
September Event	8.2%	0.30	172	52

The models estimate percentage of hourly runtime on a per-thermostat level. Event savings are the mean difference between the baseline runtime and the event runtime over the event period, so the kW impact is an average rather than maximum instantaneous demand reduction. We then use an average estimate of full load central AC demand of 3.69 kW at full load to estimate the kW savings per thermostat. Not all thermostats have logs for all of the event periods, so we only apply savings for those thermostats where we can confirm operation. The program total impact is the product of the per-thermostat kW impact averaged over the event period and the number of participating thermostats. All operational thermostats are included in the model, even if the participant opts-out of the event, so the impact estimates include the effect of any participant opt-outs.

Opinion Dynamics calculated the full load kW demand for an average central AC unit in Rhode Island based on Equation 3-1 which uses deemed average equipment cooling capacity (in Btu per hour) and equipment efficiency (EER) values from the RI Technical Reference Manual (TRM). The resulting full load demand per central AC unit is 3,692 watts, or 3.69 kW.

Equation 3-1. Full Load kW for Central AC

$$\text{Full load kW} = \text{Capacity} / \text{EER}$$

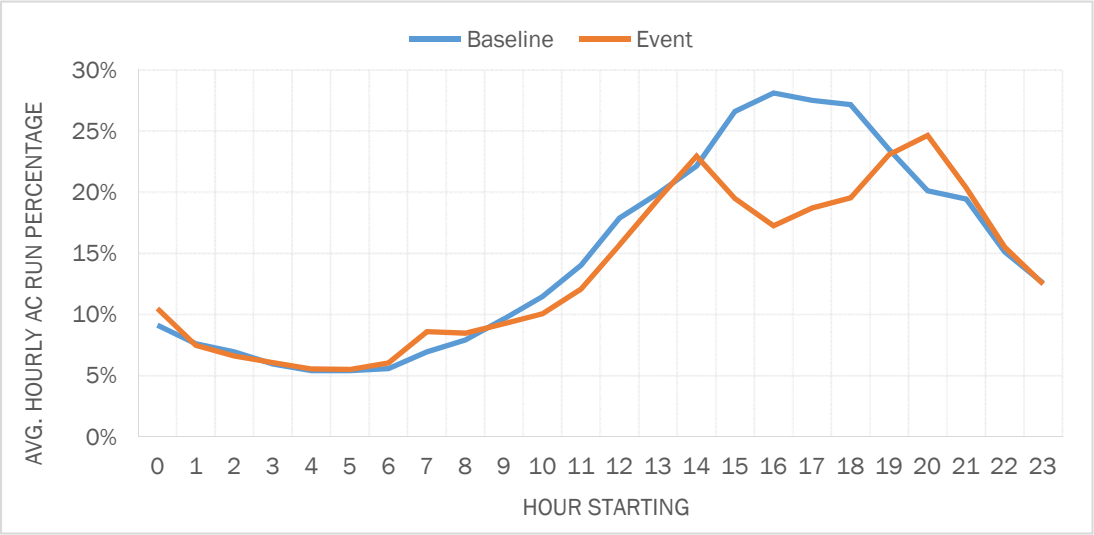
Where:

Capacity = 3 tons or 36,000 Btu/hr[20]

EER (Btu/watt-hr) = 9.75[21]

Figure 3-11 depicts the hourly event usage and baseline usage for the overall average event. The event period shows significant runtime reduction, with a small snapback in the two hours after the event ends. Figure 3-12, Figure 3-13, and Figure 3-14 show the runtime percentage for each of the three event periods, along with the baseline used to calculate demand impact for that event. In all three events, there is significant demand reduction during the event hours followed by a short snapback period of increased demand.[22]

Figure 3-11. Overall Hourly Event Day Usage with Baseline



[20] RI PY2014 TRM Central AC page M-25: Tons = deemed average equipment cooling capacity: 3 tons

[21] The RI PY2014 TRM has measures for traditional AC replacement (page M-25) and early replacement central AC replacement (M-40). The EER used for this analysis assumes an average (i.e., 9.75) between the baseline EER of new equipment (EER = 11: page M-25), and the baseline EER of early replacement equipment (EER = 8.5: page M-40). If we only used the current baseline of new equipment (EER 11) we would be underestimating savings since there are likely older pieces of equipment in use that do not meet current baseline requirements. If we assumed only the early replacement baseline (EER 8.5), we would likely be overestimating savings as there are likely newer pieces of equipment that have a higher efficiency. Taking the average appears to be a more accurate estimate and can be verified through future data collection efforts that analyze the exact capacity and efficiency of the units participating in the program.

[22] We show these hourly demand response impact estimates in Figure 3-11 through Figure 3-14, but not in the results table, Table 3-4, because the uncertainly around the hourly results is high. Comparing the demand impact between hours of each event is not informative as the hourly results have highly overlapping confidence intervals.

Figure 3-12. Event 1, July 23 Hourly Usage with Baseline

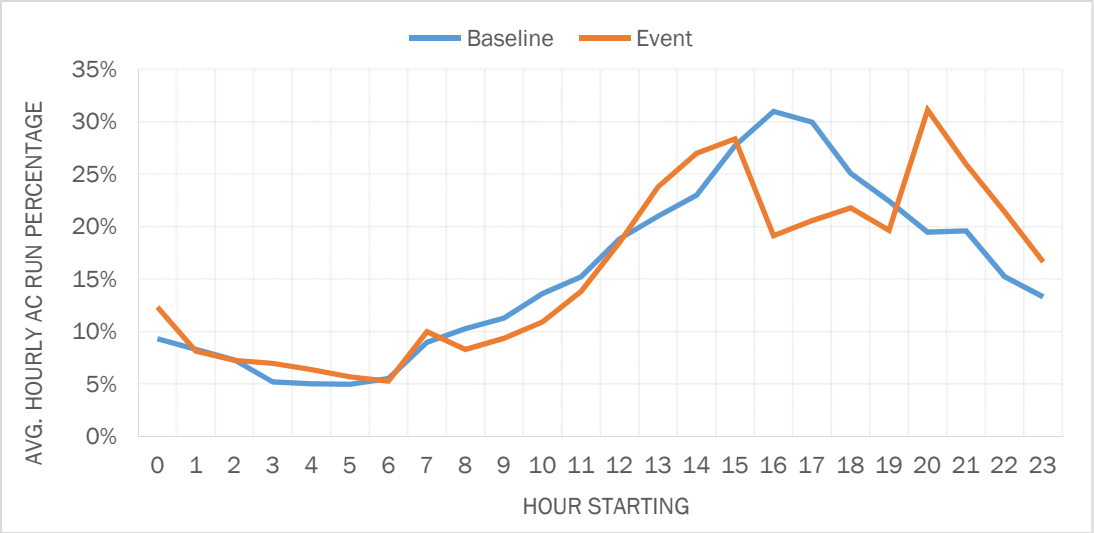


Figure 3-13. Event 2, August 27 Hourly Usage with Baseline

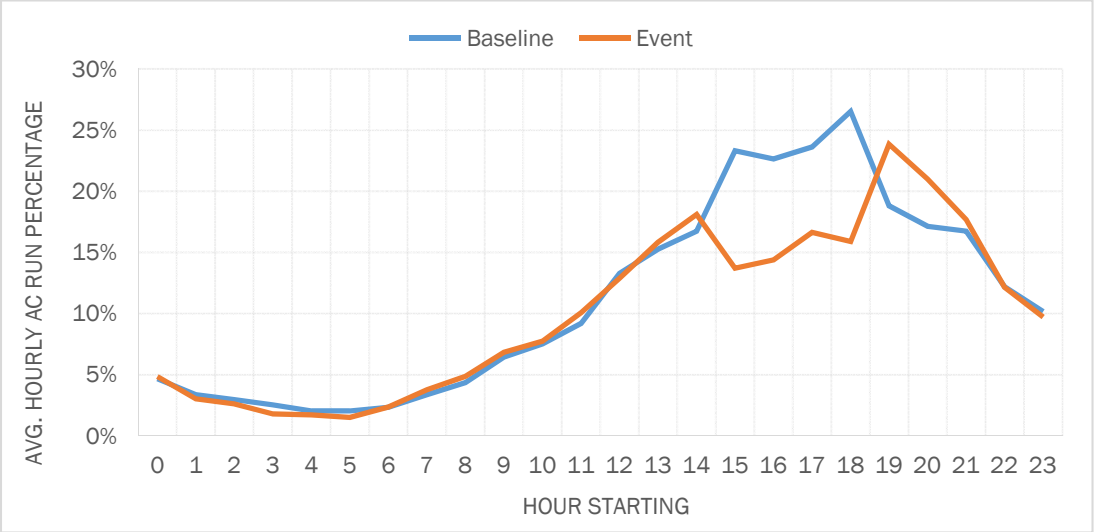
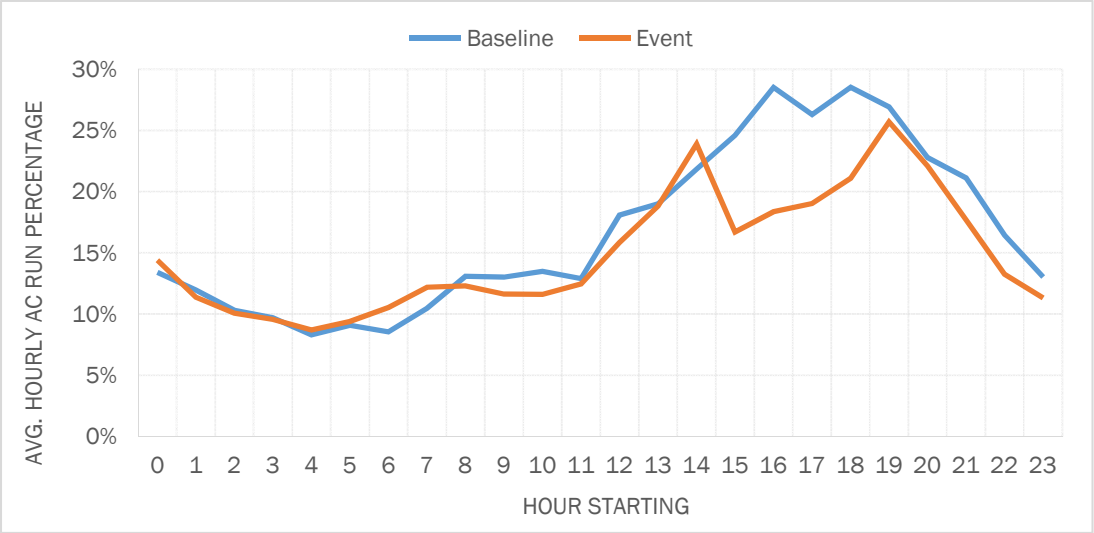


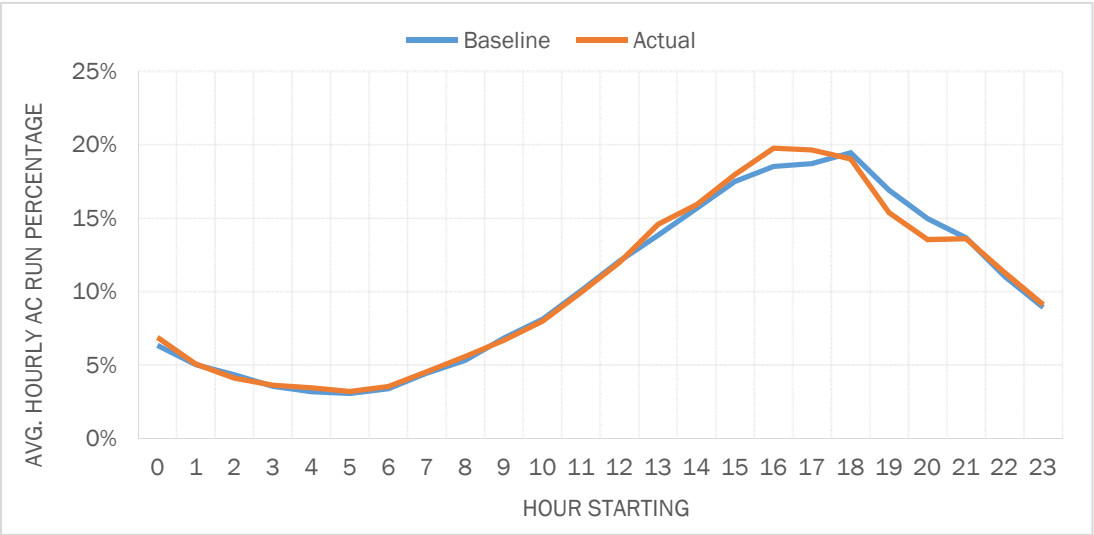
Figure 3-14. Event 3, September 3 Hourly Usage with Baseline



Model Validation

The primary method for evaluating the validity of the linear fixed effects model is to compare actual, logged run time to the baseline runtime predicted by the model. When actual and baseline are similar, especially on non-event days with weather like the event days, it shows that the model is effectively estimating the baseline. The primary reason for the model is to estimate baseline on event days, so matching non-event day usage is the best way to demonstrate model effectiveness. Figure 3-15 shows that the modeled baseline matches the actual baseline to within about 1% runtime percentage for non-event days.

Figure 3-15. Non-event Day Baseline versus Actual AC Run Percentage



3.4.3 Demand Response Impacts – Window Air Conditioning

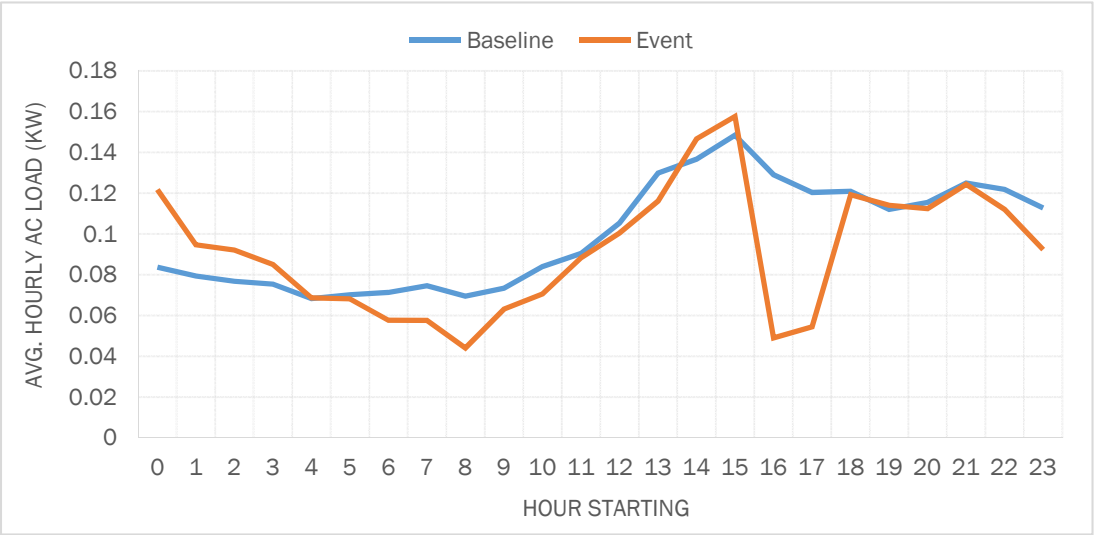
This section presents the demand response impact results for participants who have window AC, controlled by a program thermostat that cycles the air conditioner during events. Table 3-5 presents the average overall demand response impact for the three 2014 events. The overall model uses data from all three events and all matched comparison days. We do not separately present the demand impacts for each of the events because there were only 28 thermostats that participated in the events. The logs from these 28 thermostats do not contain enough data to model baseline usage for the events separately.

Table 3-5. Window AC Demand Response Impact

	Per-Thermostat Reduction (kW)	Participating Thermostats	Program Impact (kW)
Overall Events	0.07	28	2.04

The thermostat logs for the participants with window AC collect energy usage data, so we were able to model demand directly. Figure 3-16 shows the kW load for window AC units during an average event.

Figure 3-16. Overall Hourly Event Day Usage with Baseline

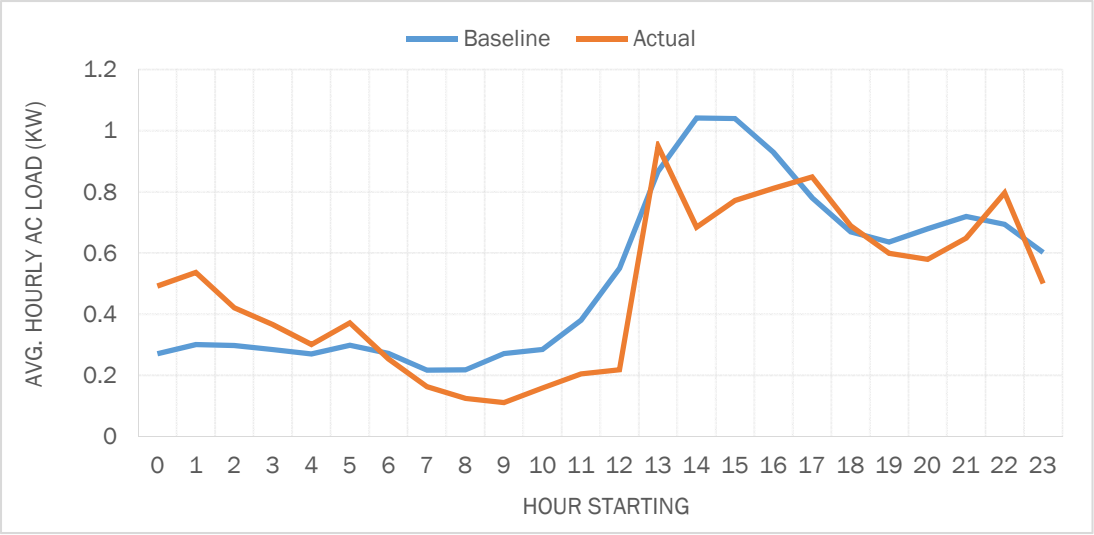


Model Validation

The primary method for evaluating the validity of the linear fixed effects model is to compare actual, logged run time to the baseline runtime predicted by the model. When actual and baseline are similar, especially on non-event days with weather like the event days, it shows that the model is effectively estimating the baseline. The primary reason for the model is to estimate baseline on event days, so matching non-event day usage is the best way to demonstrate model effectiveness. Figure 3-17 shows the actual mean window AC load on a non-event day versus the baseline load estimate from the model. This baseline does not match nearly as well as the one for central AC. The primary reason for this is that logs from the thermostats of 28 participants do not provide enough data. From this graph, and those of other non-event days that are not included here, it appears that the baseline may be overestimating afternoon usage. If this is the case, the demand response impact estimates in Table 3-5 may be biased, resulting in inflated impact estimates. There is not enough data to assess bias in the window AC demand response impacts, but impact estimates are higher per thermostat

than the central AC impacts, when we usually expect the opposite to be true. Future impact evaluations will help establish a firmer estimate for average impact.

Figure 3-17. Non-event Day Baseline versus Actual AC Load



3.5 Analysis of Potential WiFi Thermostat and SmartPlug Efficiency Savings

This analysis explores potential behavior changes by DemandLink participants that might have led to efficiency savings during peak hours. Documentation of behavior changes may enable National Grid to claim additional peak kW savings from participants who installed WiFi thermostats to control their central AC or their window AC (in conjunction with a SmartPlug). Potential behavior changes might include programming or remotely controlling the thermostat to better align with occupancy. Both strategies would allow customers to use higher cooling setpoints when away from home, without sacrificing comfort.

The purpose of this analysis was to explore the *potential* for efficiency savings. The output of this analysis is a recommendation on whether to pursue further impact analysis – to estimate efficiency-related peak load reduction attributable to the installation of DemandLink thermostats and Smart Plugs – under a later task of the 2015 Evaluation Plan.

3.5.1 Efficiency Savings Methodology

Two conditions must be met for efficiency savings to represent a potential peak demand benefit to National Grid:

1. Customers must have changed their cooling usage behaviors in a manner that suggests that equipment is in use less frequently during peak times, following participation in the program.

2. Equipment must be in use during summer peak hours (between 3 p.m. and 8 p.m.), at a level that is high enough to deliver meaningful savings.

This analysis used two data sources: 1) the DemandLink participant survey, administered to program participants in June/July 2014 and October/November 2014 and 2) the thermostat log files, used for the demand response impact analysis.

We analyzed survey data to understand self-reported changes in usage patterns of customers' air conditioning. A series of questions explored their control strategy before and after participation in the DemandLink Program as well as setpoints during different times of the day. We determined the proportion of participants who reported a meaningful change in control strategies or behavior that could likely lead to efficiency savings.

We analyzed the log files for thermostats that control central AC and window AC to determine if equipment is sufficiently in use during peak times.

3.5.2 Efficiency Savings Findings

This section summarizes our findings and recommendations for future analysis of efficiency savings for central AC and window AC.

Central AC

Our comparison of self-reported air conditioning thermostat behavior showed that a majority of participants with central AC and the new smart thermostat (59%) did not change their setpoints on summer weekdays. However, one-third (33%) report using higher setpoints during at least one time period, and 7% report using lower setpoints during one or more time period.[23] Reported changes in setpoints are relatively consistent across the time periods asked about in the survey (see Table 3-6).

Table 3-6. Self-reported Changes in Setpoints – Participants with Central AC

Behavior Change	Overall	9 am - 5 pm	5 pm - 9 pm	9 pm - 9 am	Away for multiple days
No Change	59%	78%	67%	74%	74%
Higher Setpoints	33%	19%	30%	26%	7%
Lower Setpoints	7%	4%	4%	0%	4%
Unknown	0%	0%	0%	0%	15%

Note: Percentages are based on participants who used their DL thermostat for cooling during the prior cooling season and who replaced an existing thermostat (n=27). It excludes two participants who did not use their DL thermostat for cooling and one participant who installed in an area without prior cooling. Due to the small sample size, differences between the various time periods may not be statistically significant.

Most participants (69%) replaced another programmable thermostat when they installed the smart thermostat through the program, while 24% replaced a manual thermostat and 7% installed the new thermostat in an area that did not have a thermostat before. Interestingly, a smaller share of participants who replaced a manual thermostat reported changing their setpoints, compared to customers who replaced a programmable thermostat.[24] Overall, almost half of participants (48%) report adjusting their new thermostat manually, with

[23] This analysis included 27 of 44 survey respondents with central AC. 14 respondents were not asked the usage questions for the new thermostat since their installation took place after the summer period. Another two reported not using the thermostat for cooling, and one reported that the thermostat did not replace a prior thermostat.

[24] Note the small sample sizes (n=20 for participants who replaced a programmable thermostat; n=7 for participants who replaced a manual thermostat) available for this comparison.

44% programming it and 7% keeping it at the same temperature. This distribution is similar for participants who replaced another programmable thermostat and those who replaced a manual thermostat.

Analysis of the thermostat logs found that central ACs are generally in operation during the peak season. Therefore, given the self-reported changes in usage behavior among at least some central AC participants, we believe that there is a potential for efficiency-related peak demand benefits from participants with central AC. We recommend investigating this potential source of savings under Task 2f of the 2015 Evaluation Plan.

Window AC

For customers who installed a thermostat and one or more SmartPlugs to control their window AC, we did not analyze survey responses about potential changes in window AC usage. The analysis of thermostat log files associated with window ACs, summarized in Section 3.3.1 above, showed missing or zero usage for the vast majority of window ACs – only 30 of 110 logs showed non-zero window AC consumption during any part of the 2014 peak season. SmartPlug participants thus do not appear to be using their equipment during peak times, which violates the second condition for a potential peak demand benefit from SmartPlugs.

We recommend not pursuing any further analysis of SmartPlug efficiency savings at this time. However, if future analysis of SmartPlug log files (planned for the fall of 2015) show different usage patterns than observed for 2014, we could revisit this topic. At that time, we would analyze survey responses for all SmartPlug participants to-date, including those interviewed in 2014.

4. Window AC Rebate and Recycling Evaluation

This section presents evaluation results for the DemandLink window AC rebate and recycling components of the SRP pilot. The 2014 evaluation included the following analyses, presented in this section:

- A review of participation in the DemandLink window AC rebate and recycling programs
- A gross impact analysis of rebates for the purchase of new ENERGY STAR® window AC units
- A gross impact analysis of window AC recycling rebates

We also developed a methodology and collected participant survey data to estimate attribution for the window AC rebate and recycling programs. However, due to the small number of participants in these programs and the even smaller number of survey respondents (7 for the window AC rebate and 6 for window AC recycling), we decided against presenting net impact results at this time.[25] We will implement the methodology and conduct the net impact analysis after future waves of the DemandLink participant survey, when more survey responses are available.

4.1 Window AC Participation

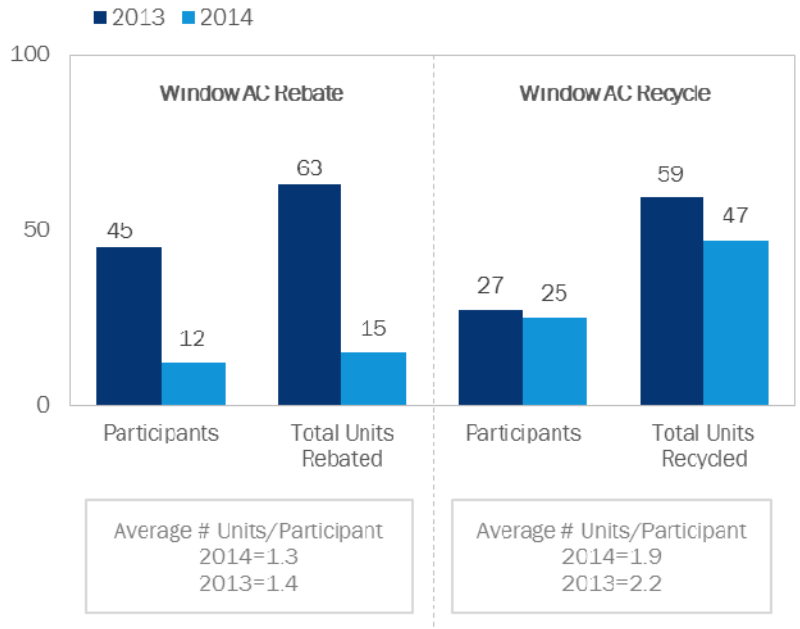
In 2014, the DemandLink Window Air Conditioner Rebate and Recycling programs ran from May 1 to November 1. National Grid offered customers in Tiverton and Little Compton a $50 rebate for the purchase of up to four qualifying new window air conditioning units ("window AC rebate") and a $25 rebate for each of up to four window air conditioner they recycled ("window AC recycling").

Overall, 30 unique customers in Tiverton and Little Compton participated in the window AC programs in 2014, installing 15 new ENERGY STAR® units and recycling 47 old units. All rebate participants were residential customers on sub-feeders; two recycling program participants were not on sub-feeders in 2014.

Figure 4-1 illustrates participation and equipment counts in the towns of Tiverton and Little Compton during the active program period, 2013 and 2014. The programs fell short of 2014 projections to provide rebates for 50 new ENERGY STAR® rated units and 50 recycled units to customers on substation feeders. In addition, participation in both programs was lower in 2014 compared to 2013 although the decline in rebate program participation (-73%) was sharper than the decline for the recycling program (-7%).

[25] Any additional response has the potential to significantly affect our estimates.

Figure 4-1. Window AC Rebate and Recycling Program Participation in SRP Pilot Communities (2013-2014)



National Grid promotes these two programs in tandem, with one application for both rebates. As shown in Table 4-1, the majority (60%) only recycled one or more old units, while just under a quarter (23%) took part in both programs and 17% only received a rebate for an ENERGY STAR® unit. This participation pattern is the reverse of 2013, where almost half (47%) participated in the rebate program only and 39% participated in both programs. On average, customers who participated in both programs recycled more units through the program than they purchased with the rebate.

Table 4-1. Unique Participants, 2014

Program Component	2013				2014			
	Number of Participants	% Participants	Avg. # units rebated	Avg. # units recycled	Number of Participants	% Participants	Avg. # units rebated	Avg. # units recycled
ENERGY STAR® Rebate Only	24	47%	1.2	n/a	5	17%	1.3	n/a
Recycle Only	7	14%	n/a	2.7	18	60%	n/a	2.3
Both	20	39%	1.7	2.0	7	23%	1.4	1.8
Total	51	100%	1.4	2.2	30	100%	1.4	2.0

4.2 Window AC Rebate and Recycling Gross Impact Analysis

Per the evaluation plan, the gross impact analysis for window AC rebates and recycling consisted of a review of assumptions in the Rhode Island TRM, as well as available program tracking data on unit characteristics. We also reviewed and leveraged other relevant TRMs because the Rhode Island TRM does not provide documentation for deemed values for window AC rebates and does not include assumptions for window AC recycling (the program is not currently offered in Rhode Island, outside of the SRP pilot).

Opinion Dynamics took the following steps to estimate gross impact savings for the window AC rebate and recycling programs:

Step 1: Established ex-post per-measure savings algorithms: The Rhode Island TRM includes deemed savings values for window AC rebates and no savings assumptions for window AC recycling. We compared algorithms across multiple sources[26] and applied algorithms from the Mid-Atlantic TRM[27] to calculate ex-post savings for window AC rebates and algorithms from the Indiana TRM[28] to calculate ex-post savings for window AC recycling.

Step 2: Reviewed program tracking data: We identified the quantity of rebated and recycled window AC units. We used actual window AC model numbers to derive the average size (BTUh) of rebated window AC units.

Step 3: Determined coincidence factor: We calculated the coincidence factor for window ACs, using survey responses and compared them to coincidence factors from multiple sources. Because the number of survey responses (n=10, including both window AC rebate and window AC recycling participants) is very small, we chose not to use the survey-based value in our analysis. We applied coincidence factors from a residential room air conditioner study[29] – which is the same source referenced in the Rhode Island TRM – to determine Effective Full Load Hours (EFLH).

Step 4: Compared variable assumptions from various sources: We reviewed several sources to establish efficiency and usage assumptions to calculate ex-post per-measure savings.

Step 5: Identified overlap between rebated and recycled window AC units: Based on the program tracking database, we determined the number of participants who recycled existing window ACs and who also received a rebate for a new ENERGY STAR® unit.

Step 6: Calculated gross energy and demand savings: We calculated ex-post energy and demand savings for rebated ENERGY STAR® window ACs and recycled window ACs, using the inputs generated in the prior steps.

Table 4-2 summarizes the assumptions used in our analysis and the source of each assumption.

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[26] The Evaluation Team reviewed the PY2013 and PY2014 Rhode Island TRMs, Mid-Atlantic TRM, NY TRM, Illinois TRM, and the Indiana TRM.

[27] Mid-Atlantic Technical Reference Manual. Version 4.0. June 2014.

[28] Indiana Technical Resource Manual. Version 1.0. December 2012.

[29] *Final Report: Coincidence Factor Study, Residential Room Air Conditioners*. Prepared for Northeast Energy Efficiency Partnerships' New England Evaluation and State Program Working Group. RLW Analytics. June 23, 2008.

Table 4-2. Rebated Window AC Energy and Demand Variable Assumptions

Variable	Description	Value	Reference
EFLH	Effective Full Load Hours, i.e., the full load cooling hours for Rhode Island	204	Coincidence Factor Study for Residential Room Air Conditioners [a]
BTUh	Capacity of window AC	9,000	Average size of rebated WACs calculated using data from database (N=78). Assumed recycled WACs are similar in size to rebated WACs.
CF	A number between 0 and 1 indicating the percentage of window AC units expected to be in use during the peak summer demand period	0.144	Coincidence Factor Study Residential Room Air Conditioners. June 23, 2008[a]
$EER_{existing}$	Efficiency of existing window AC	7.7	Indiana TRM
EER_{base}	Efficiency of baseline minimum standard window AC	9.8	Rhode Island TRM, NY TRM, Mid-Atlantic TRM, Indiana TRM
EER_{EStar}	Efficiency of ENERGY STAR® window AC	10.8	Rhode Island TRM, Mid-Atlantic TRM

[a] *Final Report: Coincidence Factor Study, Residential Room Air Conditioners*. Prepared for Northeast Energy Efficiency Partnerships' New England Evaluation and State Program Working Group. RLW Analytics. June 23, 2008.

Window AC Rebate

The Rhode Island TRM provides deemed values for window AC rebates of 43 kWh and 0.12 kW, based on a study conducted in 2003.[30] The Evaluation Team chose an algorithmic approach to determine ex-post savings for the DemandLink Window AC Rebate Program because the average size for the window ACs included in the 2003 study is unknown yet capacity is a key variable for savings. Without that value, we are unable to verify that the average window AC size (in BTUh) used to establish the Rhode Island TRM deemed value is comparable to the average size of the SRP-rebated window AC units.

We used the following equations, taken from the Mid-Atlantic TRM, to calculate the per-measure energy and demand savings for rebated ENERGY STAR® window AC units:

Equation 4-1. Energy Savings for Rebated Window ACs

$$kWh\ savings = \frac{EFLH * BTUh * \left(\frac{1}{EER_{base}} - \frac{1}{EER_{EStar}}\right)}{1000}$$

Equation 4-2. Demand Savings for Rebated Window ACs

$$kW\ savings = \frac{BTUh * \left(\frac{1}{EER_{base}} - \frac{1}{EER_{EStar}}\right)}{1000} * CF$$

[30] Evaluation of National Grid's 2003 Appliance Management Program: Room Air Conditioning Metering and Non-Energy Benefits Study.

Applying the values listed in Table 4-2 yields savings of 17.53 kWh and 0.012 kW per rebated window AC unit, or 1,353 kWh and 0.96 kW for the 78 window AC units rebated in 2013 and 2014.

Window AC Recycling

There are no window AC recycling programs offered in Rhode Island; therefore, the Rhode Island TRM does not provide any assumptions that could be used to estimate savings for the DemandLink Window AC Recycling Program. The Mid-Atlantic TRM, which we leveraged for the window AC rebate analysis, also does not have assumptions for window AC recycling. We therefore used equations from the Indiana TRM to calculate the per-measure energy and demand savings for recycled window AC units. We estimate values for two different scenarios:

1) **Recycled without replacement:** The following equations are used for recycled window ACs that are not replaced with new equipment, i.e., the program removes 100% energy consumption from the grid.

Equation 4-3. Energy Savings for Recycled Window ACs – No Replacement

$$kWh\ savings_{No\ replacement} = \frac{EFLH * BTUh * \left(\frac{1}{EER_{existing}}\right)}{1000}$$

Equation 4-4. Demand Savings for Recycled Window ACs – No Replacement

$$kW\ savings_{No\ replacement} = \frac{BTUh * \left(\frac{1}{EER_{existing}}\right)}{1000} * CF$$

2) **Recycled with replacement:** The following equations are used for recycled window ACs that are replaced with new equipment, i.e., the program eliminates some energy consumption from the grid by recycling the old unit but not all due to the operation of new equipment.

Equation 4-5. Energy Savings for Recycled Window ACs – With Replacement

$$kWh\ savings_{With\ replacement} = EFLH * BTUh * \frac{\left(\frac{1}{EER_{existing}}\right) - \left(\frac{1}{EER_{base}}\right)}{1000}$$

Equation 4-6. Demand Savings for Recycled Window ACs – With Replacement

$$kW\ savings_{With\ replacement} = BTUh * CF * \frac{\left(\frac{1}{EER_{existing}}\right) - \left(\frac{1}{EER_{base}}\right)}{1000}$$

We determined whether a recycled unit was replaced by cross-referencing the window AC recycling database with the window AC rebate database. If a participant in the window AC recycling program did not receive a window AC rebate, we assumed that the unit was not replaced.[31]

Applying the values listed in Table 4-2 yields the following savings.

- **No replacement:** 238.44 kWh and 0.168 kW per recycled window AC unit, or 17,168 kWh and 12.12 kW for the 72 window AC units that were recycled without replacement in 2013/2014.
- **With replacement:** 51.09 kWh and 0.036 kW per recycled window AC unit, or 1,737 kWh and 1.23 kW for the 34 window AC units that were recycled with replacement in 2013/2014.

Summary of Per Unit Savings and Total Ex-Post Savings for Window ACs

Table 4-3 summarizes the ex-post per-measure savings for rebated and recycled window ACs as well as total ex-post gross savings for the DemandLink window AC programs in 2013 and 2014 (i.e., for the pilot-to-date). For the 184 incented measures incented to-date, the ex-post gross energy savings are 20.3 MWh and the ex-post gross demands savings are 14.3 kW.

Table 4-3. Ex-post Gross Savings for Recycled and Rebated Window AC Units – 2013/2014

	Per-measure Savings			Total Ex-Post Savings	
Measure	kWh	kW	Quantity	kWh	kW
Rebated Window AC	17.35	0.012	78	1,353	0.96
Recycled Window AC			106	18,905	13.34
Recycled WAC (no replacement)	*238.44*	*0.168*	*72*	*17,168*	*12.12*
Recycled WAC (with replacement)	*51.09*	*0.036*	*34*	*1,737*	*1.23*
Total Window AC			184	20,258	14.30

[31] This is a conservative assumption of the level of replacement; savings from window AC recycling might therefore be overstated. We propose to ask window AC recycling participants in future waves of the DemandLink participant survey if they replaced their recycled unit.

5. Marketing Effectiveness Analysis

5.1 Overview of Outreach Efforts

Pilot marketing efforts in 2014 focused heavily on positioning the DemandLink Program as beneficial to the local community. National Grid launched the LinkUp newsletter in 2014, which grounded DemandLink as a program designed to benefit the community by preventing the need to build additional infrastructure. The newsletter provided updates on participation counts, called non-participants to sign up, and provided current participants with additional tips on using their thermostat and SmartPlugs throughout the year. National Grid distributed the newsletter as direct mail to participants and non-participants in February and October and dispersed special participant-only issues as e-newsletters in June and November. In addition to the newsletter, National Grid posted digital banner ads on the local Patch.com media between February and July, hosted a community event in May, and executed two rounds of outbound telemarketing between May and September.

Figure 5-1. 2014 SRP Marketing Timeline

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LinkUp Newsletter												
Digital Banner Ad												
Community Event												
Outbound Telemarketing												
LinkUp E-Newsletter												

The following is a summary of each of the program's outreach efforts in 2014.

- **Newsletter.** In February, National Grid sent a "LinkUp" newsletter to 5,205 residential and commercial customers in Tiverton and Little Compton. The message of this newsletter presented the DemandLink programs as being beneficial not only to the individual customer but also to the local community using the slogan "Good for you. Good for our community. Good for everyone." In addition, the newsletter outlined components of participation in the DemandLink and EnergyWise programs, and included a phone number and email address directing customers to reach out to the telemarketing team for more information. The newsletter also included an insert for 221 customers who had already participated in the DemandLink Programmable Controllable Thermostat offering. The insert included tips for getting the most out of the thermostat and Smart Plugs and a link to more information on demand response events. In October, National Grid sent an additional newsletter encouraging customers to recycle their old window AC units, rather than store them through the winter. This second newsletter also encouraged participation in the DemandLink WiFi Thermostat Program by promoting the year-round benefits of a WiFi Programmable Thermostat.

- **Digital Banner Ad.** Between February and June, National Grid posted a banner advertisement on the Tiverton-Little Compton Patch.com website and newsletter. This ad positioned DemandLink as being beneficial to the local community in addition to the individual customer, using the message "Tiverton & Little Compton National Grid customers, reduce your utility bills and help your community manage rising energy demand." The banner ad also contained a link to more information about the DemandLink Program.

- **Outbound Telemarketing.** Similar to 2013, National Grid utilized a professional telemarketing team, RAM, in 2014 to conduct two rounds of outbound phone calls to all customers in the qualified areas

of Little Compton and Tiverton. The RAM team utilized a call script to identify qualified leads for the DemandLink Thermostat Program and the Window AC Rebate and Recycling programs. Using the script, RAM callers provided a brief overview of the DemandLink and EnergyWise programs; asked customers about the presence of central AC, window AC and WiFi capabilities; walked customers through offers relevant to them; and collected contact information for interested parties. RAM then passed this information on to RISE Engineering to follow up and set up a time for an installation. Conversely, if the customer was not interested in any of the offerings, the script instructed the caller to obtain the reason(s) for the lack of interest.

Between May and July 2014, RAM made calls to 4,262 phone numbers. The team called each number one time in the first round. In the second round, between July and September, RAM made follow up calls to non-participants with working phone numbers.

- **Community Event.** National Grid hosted an Energy Awareness Day event at the Muddy Moose Café in Tiverton on May 26th, 2014. A postcard mailing invited residents of Tiverton and Little Compton to attend the event to learn about how to save money by participating in DemandLink programs.
- **E-Newsletters.**In June, National Grid sent a "LinkUp" e-newsletter to 2,249 residential and commercial customers in Tiverton and Little Compton who had not yet participated in the DemandLink program and had not completed an audit in the past two years. The e-newsletter promoted the DemandLink and EnergyWise programs by highlighting the types of free LED bulbs available through the energy assessment. In November 2014, National Grid sent another issue of the "LinkUp" e-newsletter to all residential and commercial customers. This issue provided a program update and summarized the purpose of the program, the number of participants in each program component to date, tips for using the thermostat and Smart Plug equipment in the winter for participants, and a call to participation for non-participants. Both newsletters included links to the EnergyWise website, the DemandLink brochure, and the program's frequently-asked-questions page, as well as a phone number and email address directing customers to reach out to the telemarketing team for more information.

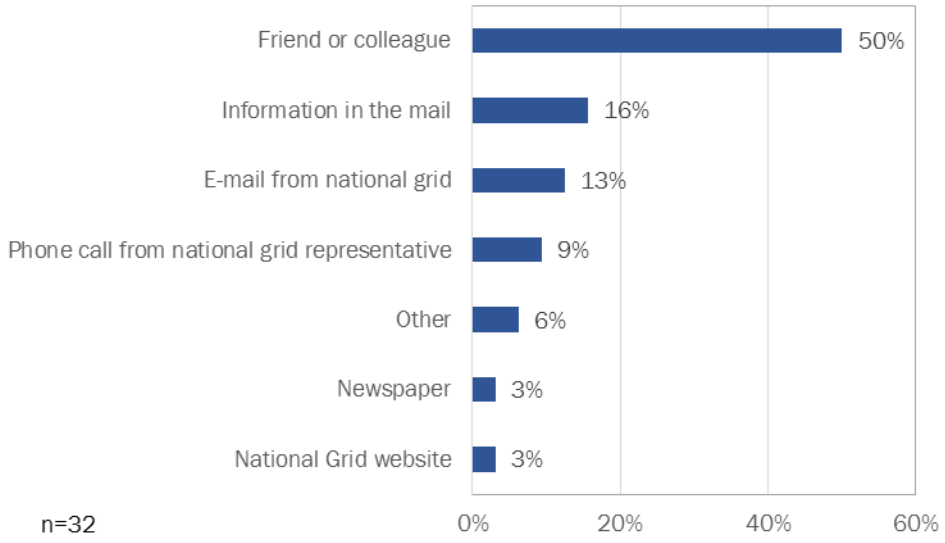
These activities are in addition to ongoing statewide marketing that may advertise or market to customers in the pilot towns.

5.2 Analysis of Marketing Awareness and Influence

The EnergyWise participant survey is an ongoing evaluation effort that provides both process and impact insights. The primary goal of the survey is to determine an SRP marketing influence rate (or "take rate") that is used to estimate incremental participation in the EnergyWise Program. In this section, we present key process-related survey findings to provide National Grid with feedback on marketing awareness, recall, and influence. (The "take rate" analysis is presented in Section 2.2.2.)

EnergyWise participants most commonly learn about the EnergyWise Program via word-of-mouth from a friend or colleague (50%) and through information they received in the mail (16%). (See Figure 5-2.) In 2013, fewer participants (21%) reported first becoming aware of the EnergyWise Program via word-of-mouth, reflecting the increasing number of past program participants in 2014 and suggesting that customers more often talk to one another about the EnergyWise Program than in past years.

Figure 5-2. Source of Awareness of the EnergyWise Home Energy Assessment



The online survey provided participants with images and descriptions of various SRP-specific and statewide marketing efforts and asked them if they recalled seeing, hearing, or receiving each item. Each participant was only asked about marketing efforts that took place in the six months prior to their becoming a lead. Table 5-1 summarizes respondents' recall of 2014 SRP marketing efforts and the influence of each effort on their decision to complete the home energy assessment. Recall of the direct mail pieces associated with the DemandLink Program was the highest of all marketing materials about which we inquired (60%). Other memorable marketing materials included van wrap (52%) and newspaper ads (38%). While RAM's outbound telemarketing campaign only ranked fourth in terms of participants' recall (31%), it was rated second most influential of all marketing efforts, SRP-specific or statewide, in customers' decision to participate in the EnergyWise Program (25% gave an influence rating of 4 or 5 on a scale of 1 to 5). Only direct mail received a higher influence rating, with 30% reporting it was influential.

Table 5-1. Summary of Recall and Influence of 2014 Marketing Materials

Marketing Effort [a]	Dates	Campaign	n	Recall of Marketing Effort	Influence of 4 or 5
				%	%
Direct Mail	Feb 2014	SRP	10	60%	30%
Van Wrap	May 2013-Ongoing	Statewide	23	52%	17%
Newspaper	Jan-July 2014	Statewide	21	38%	14%
Outbound Phone Calls	May-September 2014	SRP	32	31%	25%
Radio	Feb-Mar 2014, Sept-Nov 2014	Statewide	18	28%	11%
Online Ads: GetHouseFit	Jan-Jun 2014	Statewide	20	20%	15%
Online Banner Ads: RI Home	Feb-Jun 2014	Statewide	17	18%	12%
YouTube Video	Jan-Aug 2014	Statewide	20	15%	10%

[a] Awareness and Influence of Email (June 2014) and Energy Awareness Day (May 2014) are not presented in this table due to the low number (<10) of respondents who were asked about those efforts.

Respondents most commonly report the opportunity to save energy or money as the main reason they decided to complete the assessment (81%). Other reasons included general curiosity about the efficiency of their home (13%) and completing the assessment in order to qualify for a HEAT loan (6%).

Detailed tables displaying the recall and influence of each marketing effort based on the EnergyWise participant survey are included in Appendix B.

5.3 SRP Leads Analysis

SRP leads are customers who have expressed interest in one or more SRP program offerings (through inbound requests or outbound telemarketing). This section presents a discussion of SRP leads, based on an analysis of tracking data compiled by RISE and RAM as well as a phone survey with 82 customers who were SRP leads in 2014.

In 2014, 755 pilot community customers expressed interest in the EnergyWise Program or one of the three components of the DemandLink Program.[32] Of these, 600 (80%) were new leads who had not expressed interest in any of the four program components prior to 2014. The majority of these leads (602, or 80%) are served by the Tiverton substation.

The vast majority (86%) of 2014 SRP leads were interested in the EnergyWise Program. Interest in the other SRP programs was much lower with 23% of leads interested in the DemandLink Programmable Controllable Thermostat Program, 10% interested in the Window AC Rebate Program, and 9% interested in the Window AC Recycling Program.

[32] The DemandLink Program includes the Wifi Programmable Controllable Thermostat component, as well as the EnergyStar Window Air Conditioner Rebate and the Window Air Conditioner Recycling Rebate. This count includes five leads from substation customers with a commercial rate code.

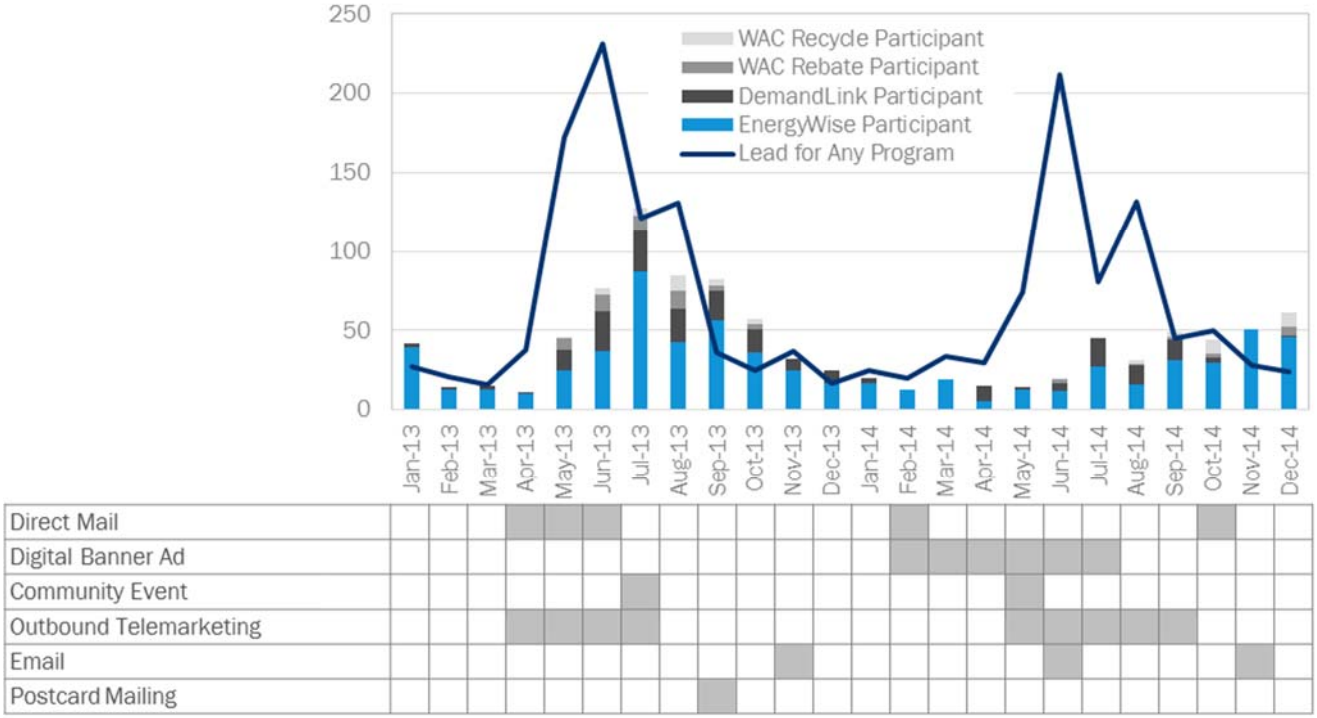
Table 5-2. 2014 Customer Interest by Program

SRP Program	2014 Leads	% [a]
EnergyWise Program	650	86%
DemandLink Programmable Controllable Thermostat Program	173	23%
DemandLink Window AC Rebate Program	77	10%
DemandLink Window AC Recycling Program	71	9%
Total Leads (Any Program)	**755**	

[a] Total sums to more than 100% because customers expressed interest in multiple programs

Heightened lead activity followed increases in marketing efforts, particularly outbound telemarketing, in both 2013 and 2014. Figure 5-3 below shows that May through August 2014 were the busiest months for leads, with 499 customer expressing interest during that period. Lead activity peaked in June with 212 leads (28%) and was followed a month later by a peak in program participation. There was another increase in lead activity in August, followed again by a peak in program participation in September.

Figure 5-3. Program Leads in SRP Pilot Communities (2013-2014)



Of the 600 customers who were new SRP leads in 2014, 39% participated in one or more programs in 2014. This level of same-year participation is slightly lower than in 2012 and 2013 (both 49%). In addition, a handful of customers who first expressed interest in 2012 or 2013 but had not participated in those years, participated in one or more program in 2014, indicating that for some customers there is a significant lag time between first expressing interest in the program and taking action.

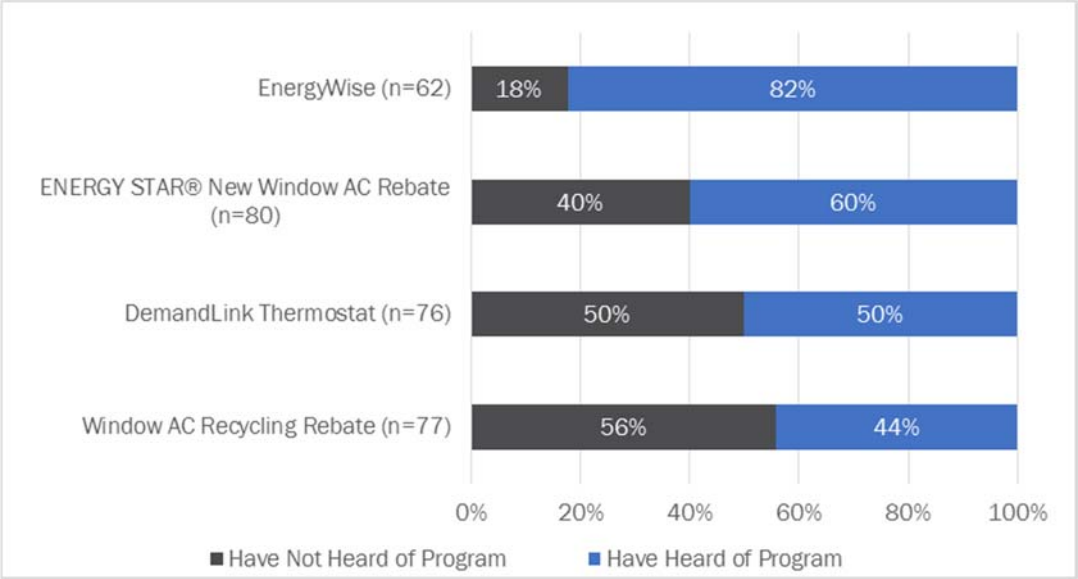
Table 5-3. Conversion Rates Lead for Any Program

Year First Became a Lead for Any Program [a]	Accounts	Participated in One or More Program [b]			
		2012	2013	2014	Not Yet [c]
2012	292	49%	16%	1%	34%
2013	834	-	49%	7%	44%
2014	600	-	-	39%	61%

[a] Conversion rates were calculated counting a customer as lead only in the first year they expressed interest in the program.
[b] Conversion rate calculation uses participant counts based on account number.

The majority of leads who have not yet participated in any part of the SRP pilot are aware that National Grid offers energy efficiency programs to help households save energy (88%). SRP leads most often have heard of the EnergyWise Program (82%), followed by the Window AC Rebate Program (60%), and the DemandLink Thermostat Program (50%) (Figure 5-4). Less than half of 2014 SRP leads (44%) have heard of the Window AC Recycling Program.

Figure 5-4. Awareness of Specific Programs by Non-Participants



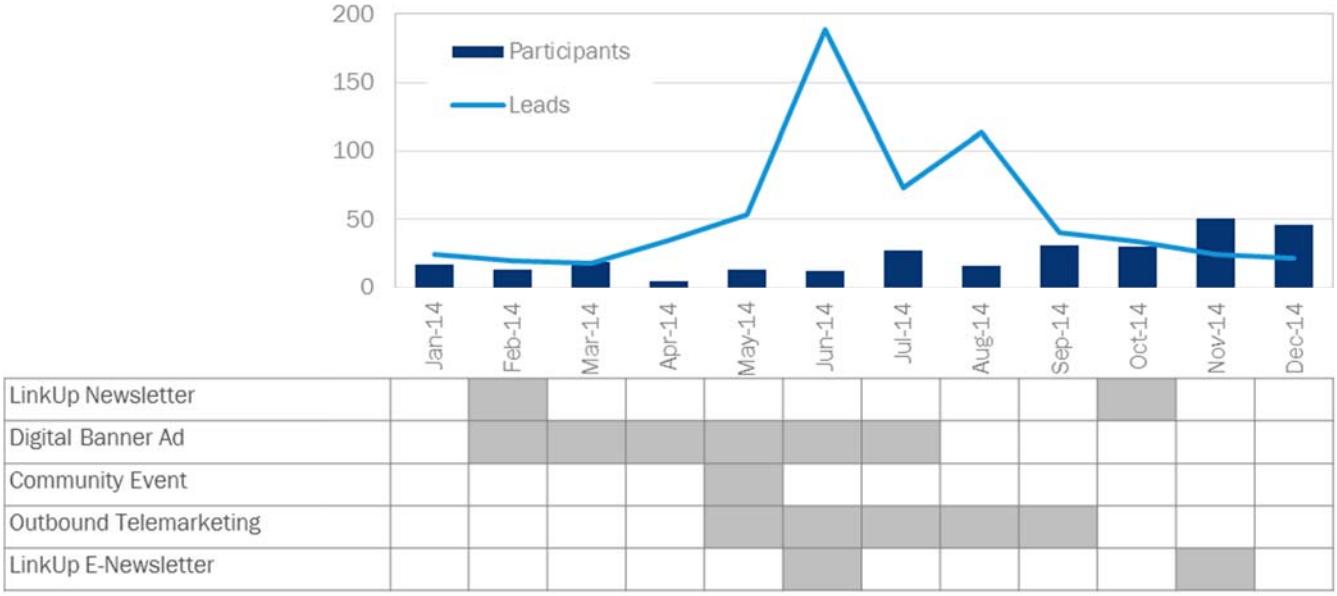
5.3.1 EnergyWise Leads

The vast majority of SRP leads (650, or 86%) are leads for the EnergyWise Program. Most of these leads were new leads in 2014 (89%) and are customers on substation feeders (77%).

Leads Activity and Conversion

June through August were the busiest months for lead activity, with 376 customers expressing interest (58% of the annual total) during that period. Lead activity peaked in June with 189 leads (35%) while participation rates picked up between September and December 2014. The enhanced telemarketing, community event, and e-newsletter – which coincided with the peak rates – appear to have driven the lead activity between June and August 2014.

Figure 5-5. EnergyWise Leads in SRP Pilot Communities (2014)



Of the 580 customers who were new leads in the EnergyWise Program in 2014, 38% participated in the program in 2014, a slightly lower level of same-year participation than in 2012 (47%) and 2013 (48%). In addition, 1% of customers who first expressed interest in the program in 2012 and 7% of those who first expressed interest in the program in 2013 became program participants in 2014.

Table 5-4. EnergyWise Conversion Rate (2012-2014)

Year First Became a Lead for EnergyWise [a]	Account Leads	EW Participant			
		2012	2013	2014	Not Yet
2012	290	47%	17%	1%	34%
2013	724	-	48%	7%	45%
2014	580	-	-	38%	62%

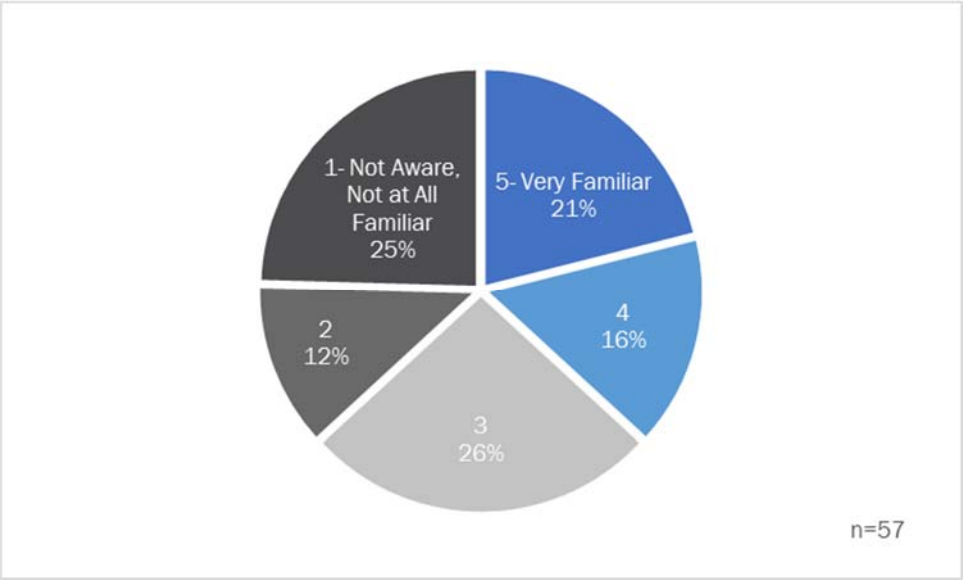
[a] Conversion rates are calculated based on account number, counting a customer as a lead in each year they expressed interest in the program. A single customer could be counted as a lead in multiple years.

Survey Findings

Awareness and Interest

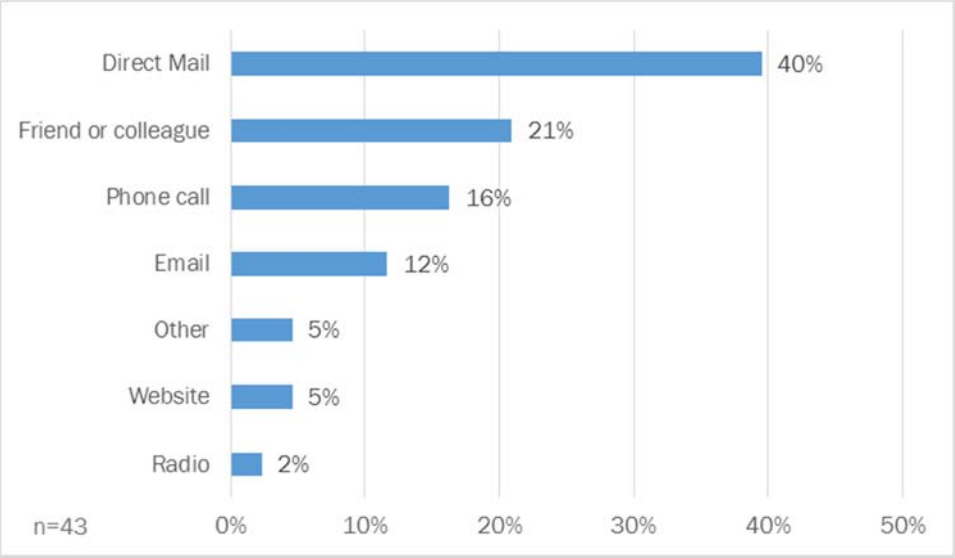
Based on our telephone survey, 25% of EnergyWise leads are either unaware of the program or not at all familiar with it (a rating of 1 on a scale of 1 to 5). Overall, the mean familiarity rating was 3.0; 21% of EnergyWise leads are very familiar with the program (Figure 5-6).

Figure 5-6. Familiarity with EnergyWise Program



EnergyWise leads most often learn about the program through direct mailings from National Grid (40%), followed by friends and colleagues (21%), National Grid outbound phone calls (16%), and emails (12%) (Figure 5-7).[33]

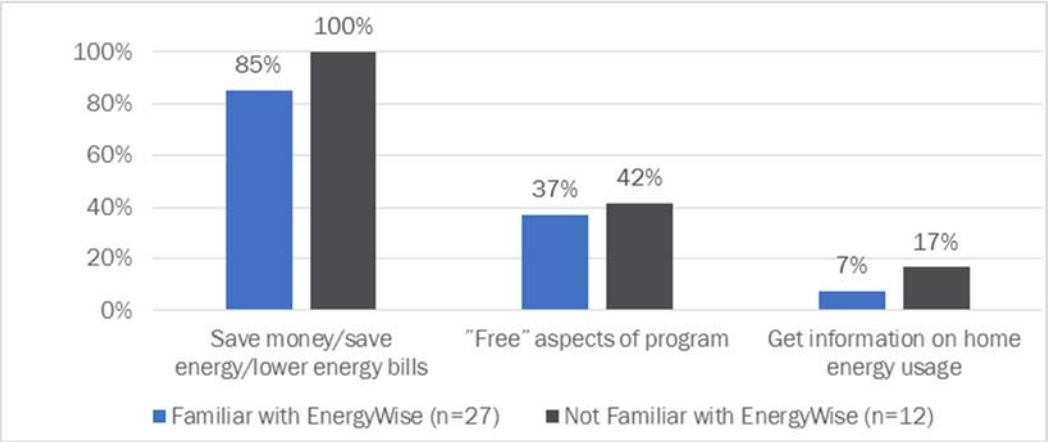
Figure 5-7. Medium through Which Leads Heard About EnergyWise Program



[33] Asked of leads with at least some familiarity with the EnergyWise Program (a rating of 2 or higher, on a scale of 1 to 5).

Overwhelmingly, the opportunity to save energy and money is the most common reason for interest in the EnergyWise Program, mentioned by 82% of those who were already familiar with the program before the survey and mentioned by all not already familiar with the program (but who were read a description of the EnergyWise Program). The "free" aspects of the program, including the audit itself and the free light bulbs, is also attractive to leads both familiar and unfamiliar with the program (37% and 42%, respectively) (Figure 5-8). Getting information on home energy usage is of less interest.

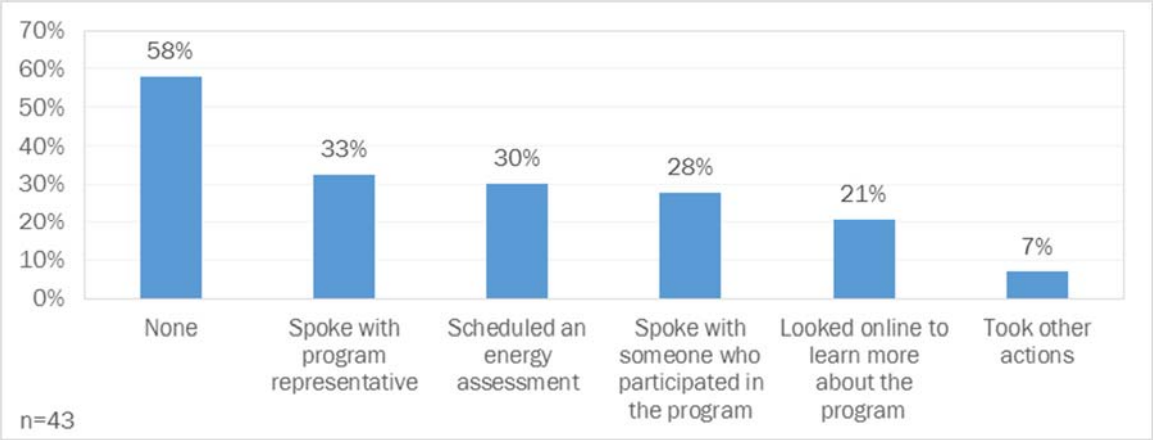
Figure 5-8. What Sparked Lead Interest in the EnergyWise Program



Actions Taken

The majority of the EnergyWise leads (58%) have taken no further action towards receiving an EnergyWise assessment since they first learned about the program. Those who did take action most frequently spoke with a program representative (33%), scheduled an energy assessment (30%), spoke with someone who participated in the program (28%), or looked online to learn more about the program (21%).[34]

Figure 5-9. Type of Actions Taken Since Learning of the EnergyWise Program



[34] Asked of leads with at least some familiarity with the EnergyWise Program (a rating of 2 or higher, on a scale of 1 to 5).

Likelihood to Participate

Six in ten EnergyWise leads familiar with the program state that they are somewhat likely or very likely to participate in the program in 2015 (Figure 5-10). Similarly, the majority of leads not familiar with the program (71%) are either very or extremely interested in the program (Figure 5-11), suggesting a continued market for EnergyWise assessments in the pilot area.

Figure 5-10. Likelihood to Participate in EnergyWise Program in 2015

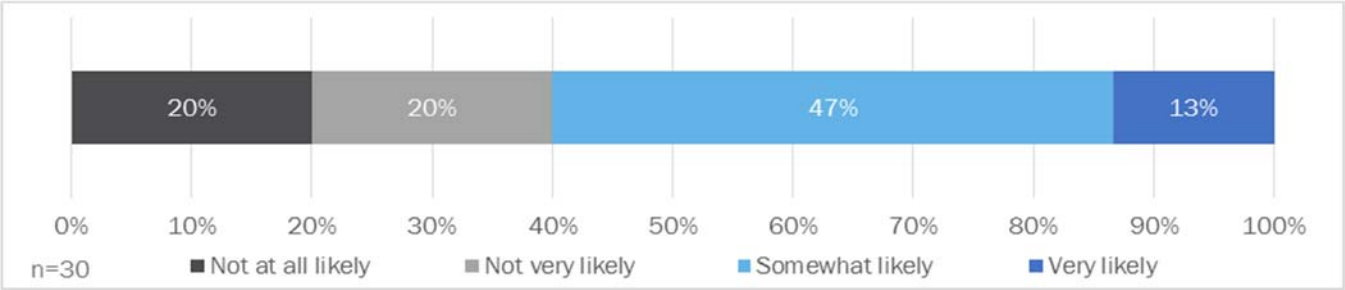
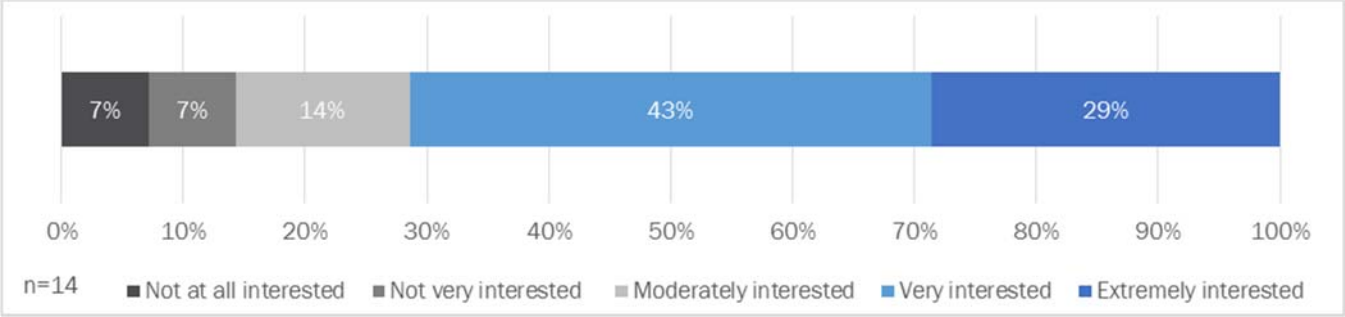


Figure 5-11. Interest Level of Leads Not Familiar with EnergyWise Program



Barriers to Participation

EnergyWise leads familiar with the program were asked to rate their level of agreement with a series of statements regarding barriers to participation in the EnergyWise Program. Leads rated their level of agreement with each statement, on a scale from 1 to 5, where 1 means "I very much disagree" and 5 means "I very much agree".

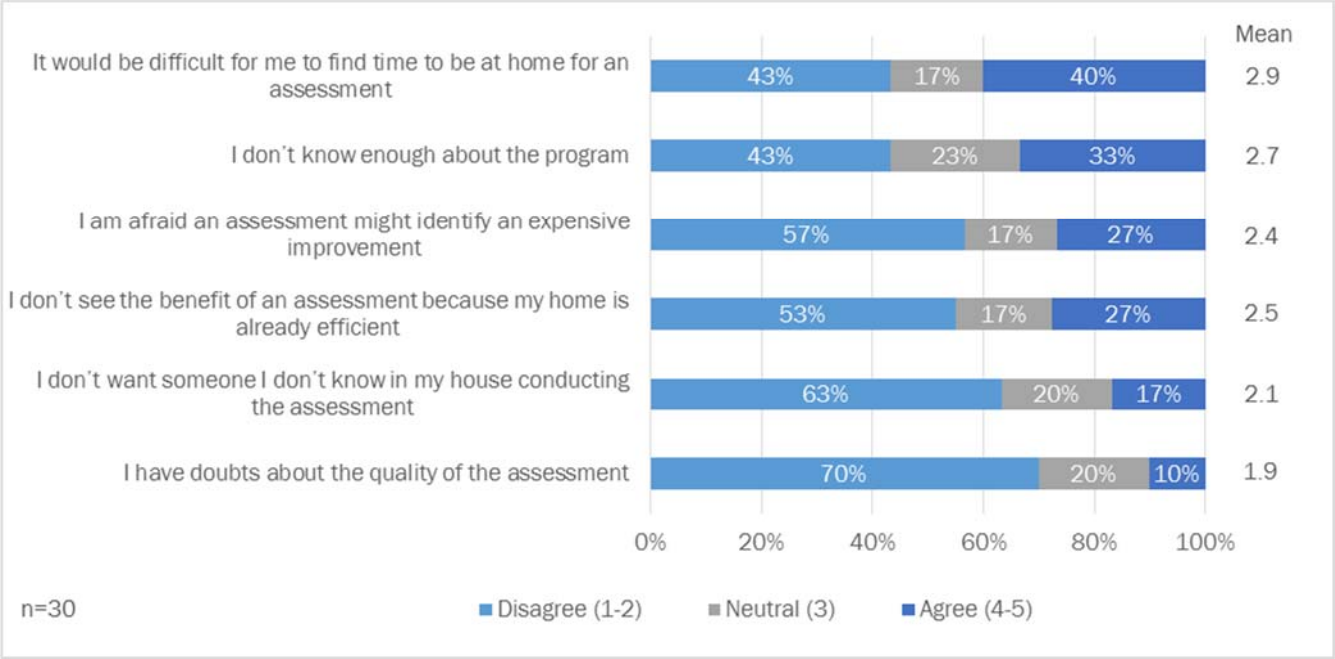
EnergyWise leads most often agree with the statement "it would be difficult for me to find time to be at home for an assessment" (40%).[35] One-third or less agree with the statement "I don't know enough about the program" (33%), "I don't see the benefit of an assessment because my home is already efficient" (27%), and "I am afraid an assessment might identify an expensive improvement" (27%). Reluctance to have a stranger

[35] "Agree" is defined as a rating of 4 or 5, on a scale of 1 to 5.

in their home to conduct the assessment (17%) and doubts about the quality of the assessment (10%) are barriers for few EnergyWise leads (Figure 5-12).

Overall, 67% of interviewed EnergyWise leads strongly agreed (a rating of 5) with at least one of the barrier statements; 87% agreed (a rating of 4 or 5) with at least one statement. Notably, three leads who have tried to schedule an assessment but have not yet completed it all strongly agreed with the statement "I have had difficulty scheduling the assessment with the program representative."

Figure 5-12. Barriers to EnergyWise Program Participation



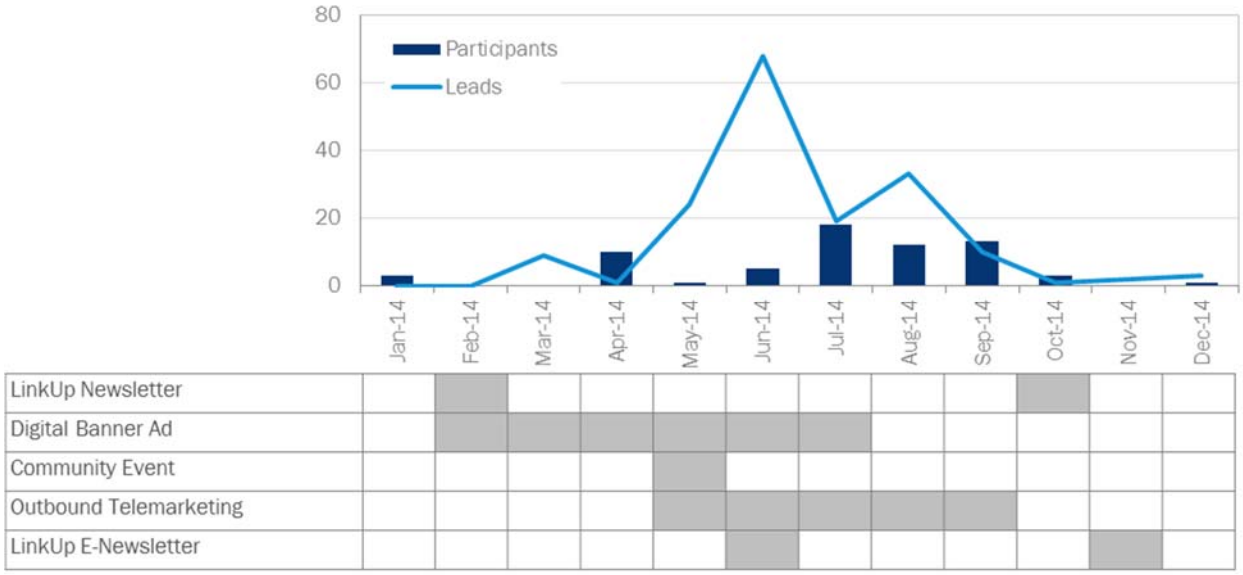
5.3.2 DemandLink Programmable Controllable Thermostat Leads

Almost one quarter of SRP leads (173, or 23%) are leads for the DemandLink Thermostat Program. The majority of these leads were new leads in 2014 (86%) and nearly all are served by the substation (97%).

Leads Activity and Conversion

The busiest months for leads were May through August, with 145 customers (84%) expressing interest during that period. Lead activity peaked in June with 69 leads (40%) and was followed a month later by a peak in participation in the program. The enhanced telemarketing, community event, digital banner ads and e-newsletter – which coincided with the timing of this peak lead activity – appear to have driven the number of leads between May and August.

Figure 5-13. DemandLink Programmable Controllable Thermostat Leads in SRP Pilot Communities (2014)



Of the 148 customers who were new leads in the DemandLink Thermostat Program in 2014, 30% participated in the program in 2014. In addition, 3% of customers who first expressed interest in the program in 2013, participated in 2014.

Table 5-5. DemandLink Programmable Controllable Thermostat Program Conversion Rate (2013-2014)

Year First Became a Lead for DemandLink Programmable Thermostat Program[a]	Account Leads	DemandLink PCT Program Participation Year		
		2013	2014	Not Yet
2013	275	40%	3%	57%
2014	148	-	30%	70%

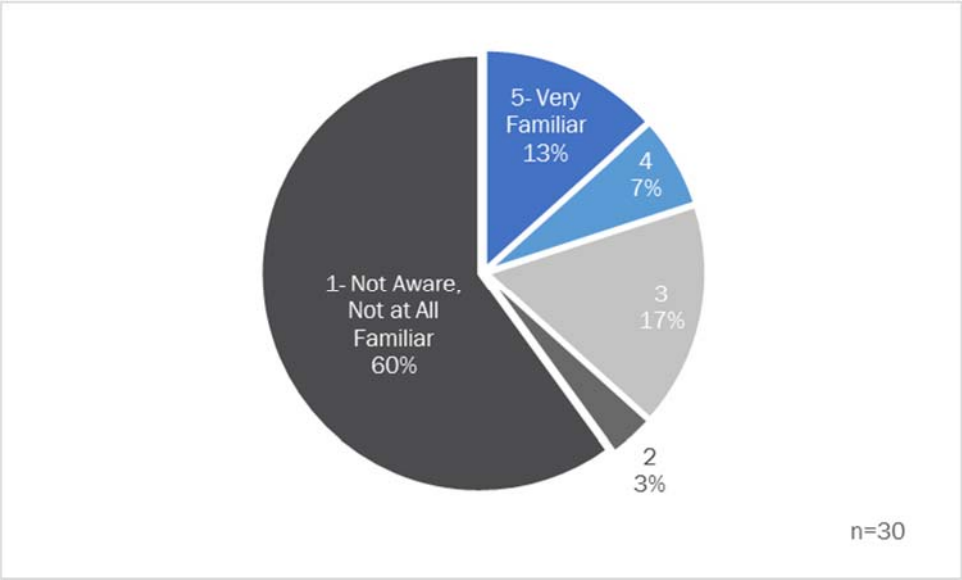
[a] Conversion rates are calculated based on account number, counting a customer as a lead in each year they expressed interest in the program. A single customer could be counted as a lead in multiple years.

Survey Findings

Program Awareness, Understanding, and Interest

Based on our telephone survey, 60% of DemandLink Thermostat leads are either unaware of the program or not at all familiar with it (a rating of 1 on a scale of 1 to 5) (Figure 5-14). Overall, the mean familiarity rating was 2.1. Only 13% of DemandLink Thermostat leads are very familiar with the program.

Figure 5-14. Familiarity with DemandLink Thermostat Program

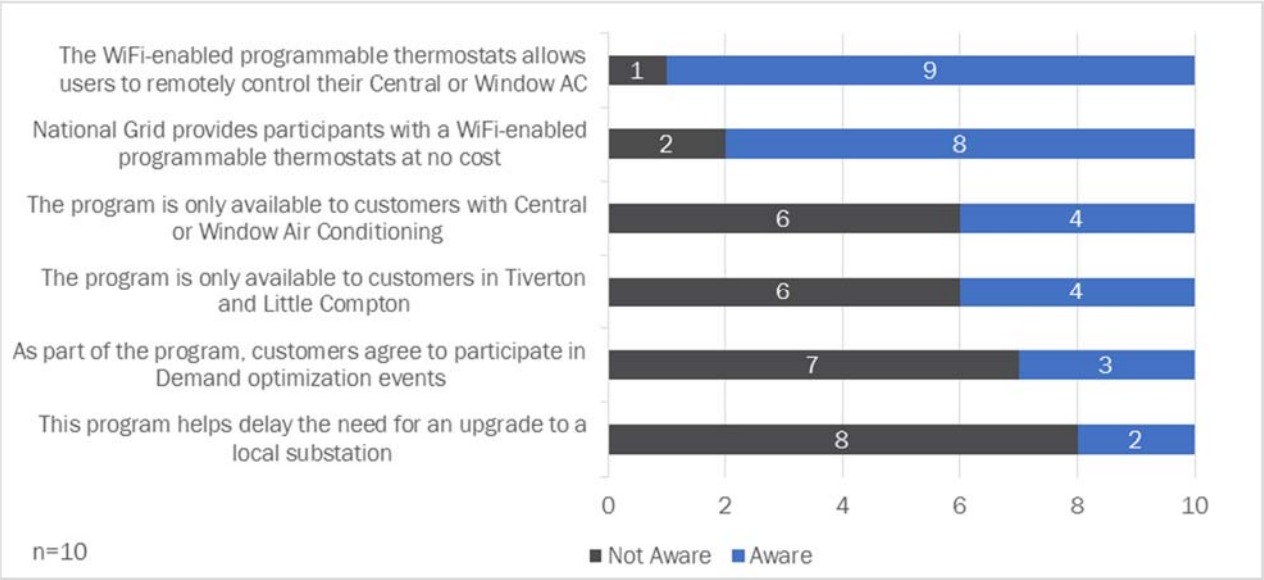


To further explore understanding of the program, we asked DemandLink Thermostat leads who are familiar with the program about their awareness of several key aspects of the pilot program. Most respondents (9 out of 10) are aware that Wi-Fi enabled programmable thermostats allow users to remotely control their central or window AC. Interviewed leads are also highly aware that National Grid provides participants with Wi-Fi-enabled programmable thermostats at no cost (8 out of 10 respondents). Less than half of interviewed leads (4 out of 10 respondents) are aware that the program is only available to customers with central or window AC, or that the program is only available to customers in Tiverton and Little Compton. Out of the program aspects asked about in the survey, customers are least aware that the program helps delay the need for an upgrade to a local substation (2 out of 10 respondents), suggesting that the 2014 marketing message of "Good for you. Good for our community. Good for everyone." has not yet fully taken hold among potential program participants.

Only three out of ten interviewed leads are aware that as part of the program, customers agree to participate in demand optimization events during which National Grid triggers a signal that automatically turns a customer's cooling equipment on and off at 30-minute intervals for the duration of the event. Of these three leads, only one is aware that customers receive a forty dollar annual bill credit for participating in all events called during a summer, and none are aware that National grid notifies customers prior to the start of an event or that customers have the option to opt out of a demand event when one is called.

Figure 5-15 summarizes these findings.

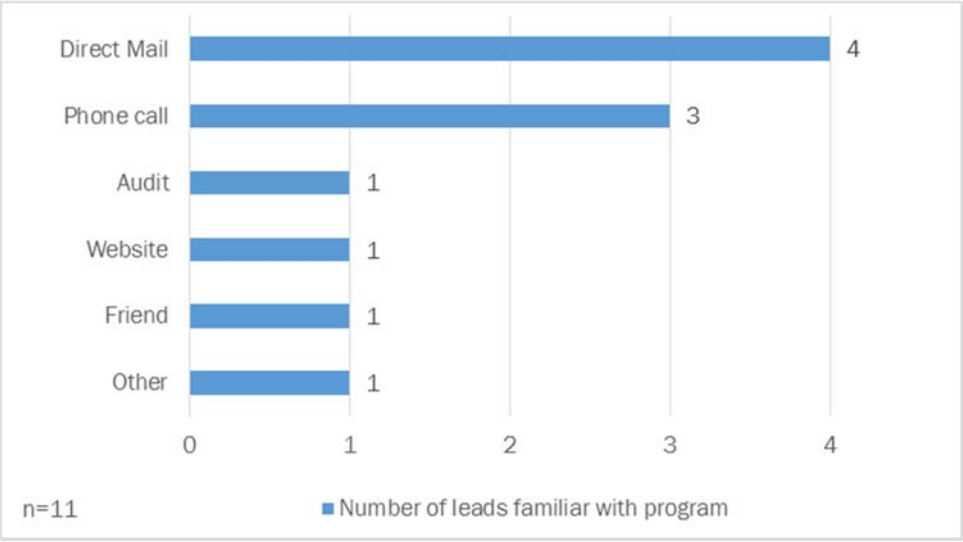
Figure 5-15. Leads' Understanding of DL Thermostat Program



DemandLink Thermostat leads most often learn about the program through National Grid direct mailings (4 of 11 interviewed leads) and outbound phone calls (3 of 11) (see Figure 5-16). Unlike the EnergyWise Program, DemandLink Thermostat leads rarely learn about the program from a friend or colleague (only one of 11 interviewed leads). This is not surprising given the small population of past participants in this program component.[36]

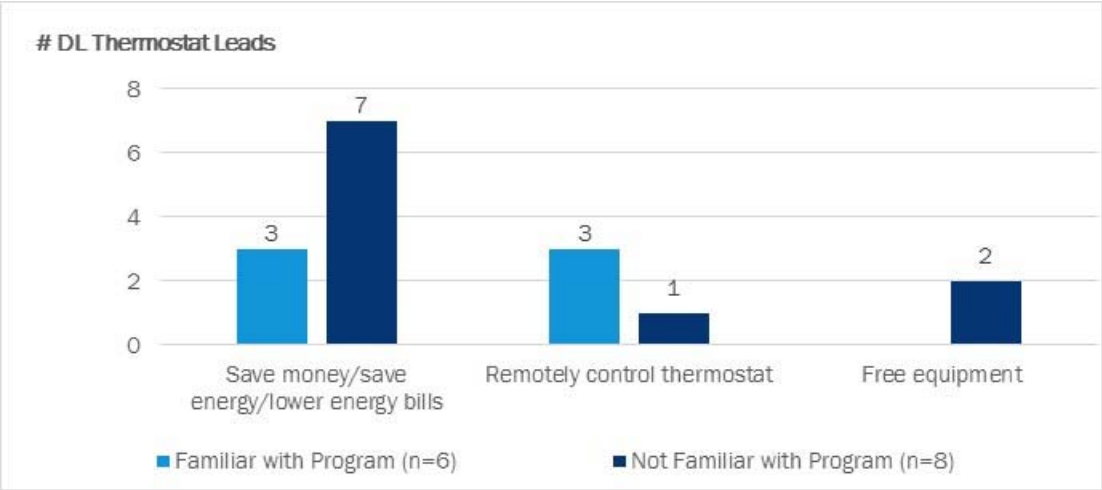
[36] Asked of leads with at least some familiarity with the DemandLink Thermostat Program (a rating of 2 or higher, on a scale of 1 to 5).

Figure 5-16. Medium through Which Customer Heard About DemandLink Thermostat Program



For DemandLink leads familiar with the program, saving money and the ability to remotely control their cooling and heating equipment are equally common reasons for interest, both mentioned by 3 out of 6 respondents. (Figure 5-17). For leads who are unfamiliar with the program (but who were read a description of the program), saving money is the most common response, mentioned by 7 out of 8 respondents, followed by receiving free equipment (2 respondents), and the ability to remotely control their thermostat (1 respondent).

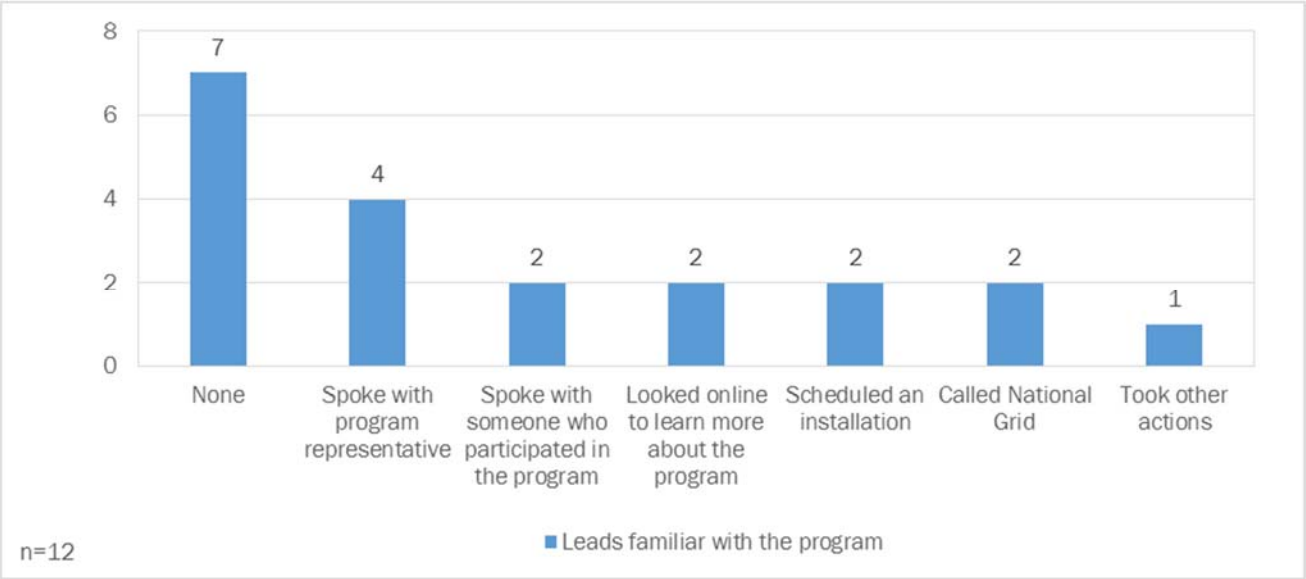
Figure 5-17. What Sparked Customer Interest in the DemandLink Thermostat Program



Actions Taken

The majority of the DemandLink Thermostat leads (7 out of 12 respondents) have taken no further action towards scheduling an installation since they first learned about the program. Those who did take action most frequently spoke with a program representative (4 respondents).

Figure 5-18. Type of Actions Taken Since Learning of the DemandLink Thermostat Program



Likelihood to Participate

Four of nine interviewed DemandLink Thermostat leads familiar with the program reported that they are likely to participate in the program in 2015 (Figure 5-19). In addition, two have already scheduled installation of the equipment. Of those DemandLink Thermostat leads not familiar with the program, only 3 out of 17 are either very interested or extremely interested in the program (Figure 5-20).

Figure 5-19. Likelihood to Participate in DemandLink Thermostat Program in 2015

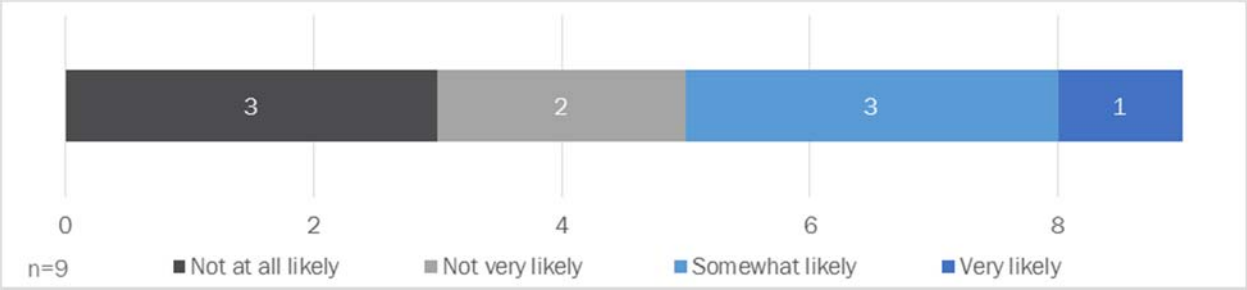
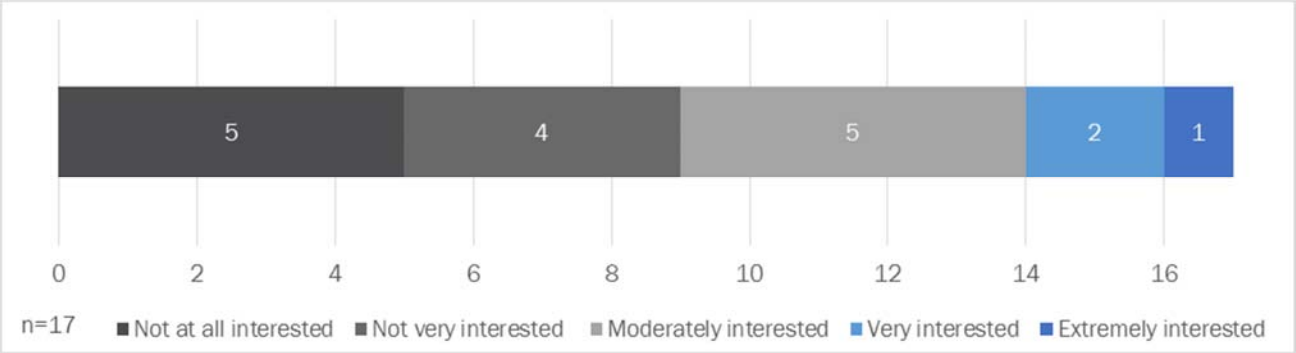


Figure 5-20. Interest Level of Leads Not Familiar with DemandLink Thermostat Program

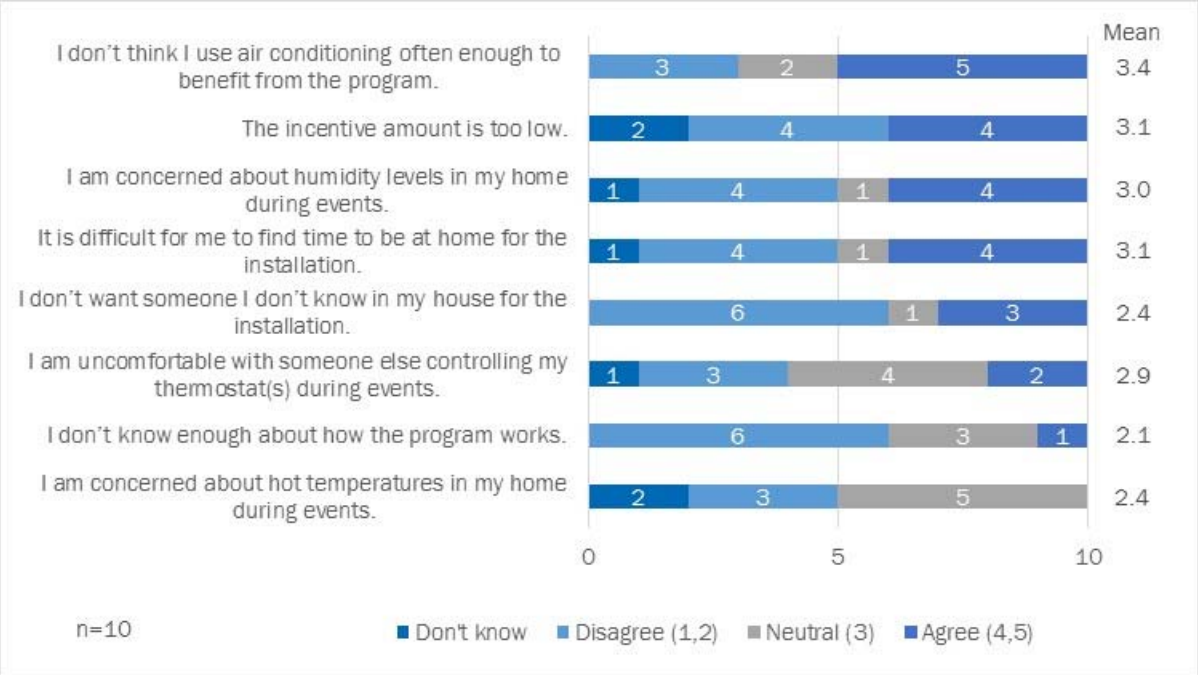


Barriers to Participation

DemandLink Thermostat leads familiar with the program were asked to rate their level of agreement with a series of statements regarding barriers to participation. DemandLink Thermostat leads most often agreed with the statements "I don't think I use air conditioning enough to benefit from the program" (5 of 10 respondents).[37] Four out of ten DemandLink Thermostat leads also agreed with the statements "the incentive amount is too low," "I am concerned about humidity levels in my home during events," and "it is difficult for me to find time to be at home for the installation" (see Figure 5-21). A lack of understanding of the program was a barrier for only one interviewed lead, and none of the interviewed leads were concerned about high temperatures during events. Overall, six out of ten interviewed DemandLink leads strongly agreed (a rating of 5) with at least one of the barrier statements; nine out of ten agreed (a rating of 4 or 5) with at least one statement.

[37] "Agree" is defined as a rating of 4 or 5, on a scale of 1 to 5.

Figure 5-21. Barriers to DemandLink Thermostat Program Participation



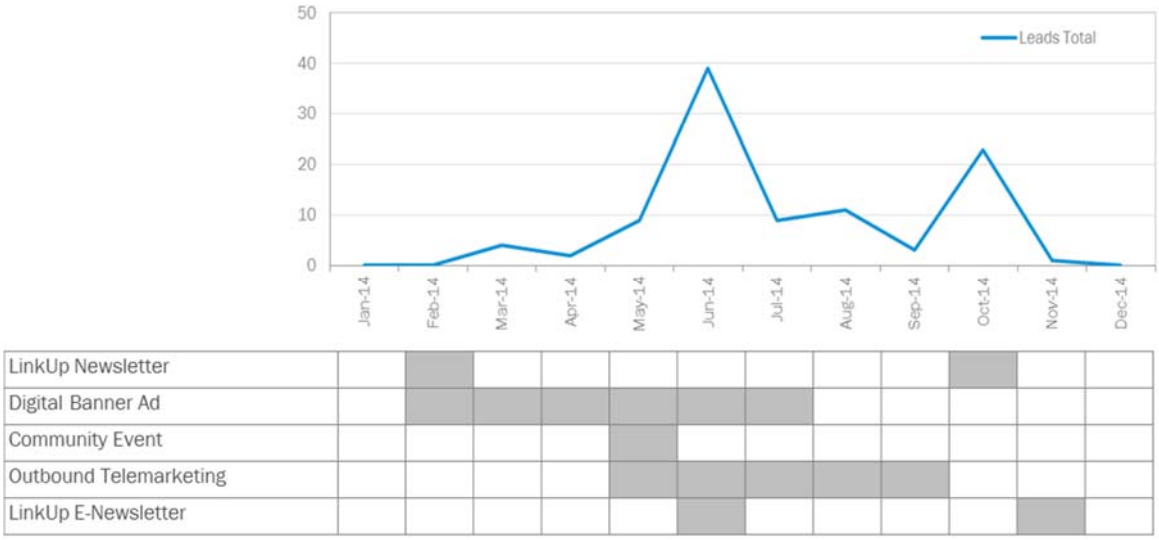
5.3.3 Window AC Rebate and Recycling Leads

In 2014 there were 77 leads for the Window AC Rebate Program and 71 for the Window AC Recycling Program, for a combined total of 148 leads for either of the two programs (down 14% from 173 in 2013). The majority of rebate and recycling leads were customers on substations (97% and 96%, respectively). Almost half of all window AC leads (47 customers) were a lead in both programs, for a total of 101 unique customers interested in one or both of the programs.

Leads Activity and Conversion

May through August were the busiest consecutive months for leads with 68 leads (67%) occurring during that period, coinciding with peak timing of marketing efforts. Lead activity increased again in October (23%), coinciding with the second LinkUp Newsletter, which encouraged recipients to recycle their old Window AC units.

Figure 5-22. Window AC Rebate and Recycling Leads in SRP Pilot Communities (2014)



Of the 77 customers who expressed interest in the Window AC Rebate Program in 2014, 12% also participated in 2014. In addition, 3% of customers who were leads for the program in 2013, participated in 2014. For the Window AC Recycle Program, 28% of the 71 customers who expressed interest in 2014 also participated in 2014. In addition, 4% of customers who were leads in 2013, participated in the recycling program in 2014.

Table 5-6. Window AC Rebate Conversion Rate (2013-2014)

Year Customer Expressed Interest in Window Air Conditioning Program [a]	Account Leads	Window Air Conditioning Program Participation Year		
		2013	2014	Not Yet
Window AC Rebate				
2013	101	24%	3%	73%
2014	77	-	12%	88%
Window AC Recycling				
2013	72	26%	4%	69%
2014	71	-	28%	72%

[a] Conversion rates are calculated based on account number, counting a customer as a lead in each year they expressed interest in the program. A single customer could be counted as a lead in multiple years.

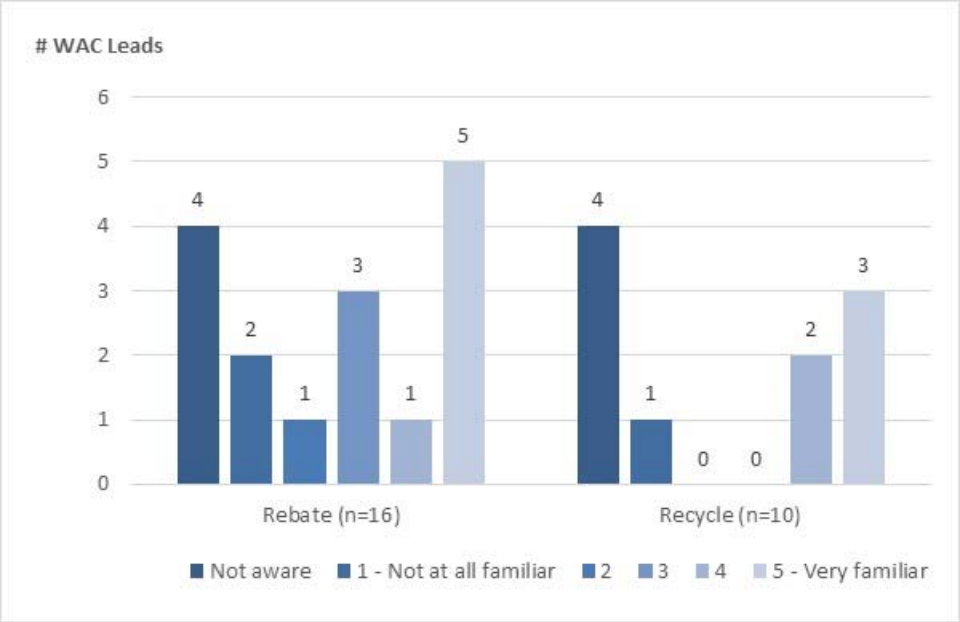
Survey Findings

Only 10% and 9% of all SRP leads are leads for the Window AC Rebate Program and the Window AC Recycling Program, respectively. As a result, few leads in these programs were targeted by our DemandLink leads survey and even fewer responded to it (16 for the rebate program and 10 for the recycling program).

Awareness and Interest

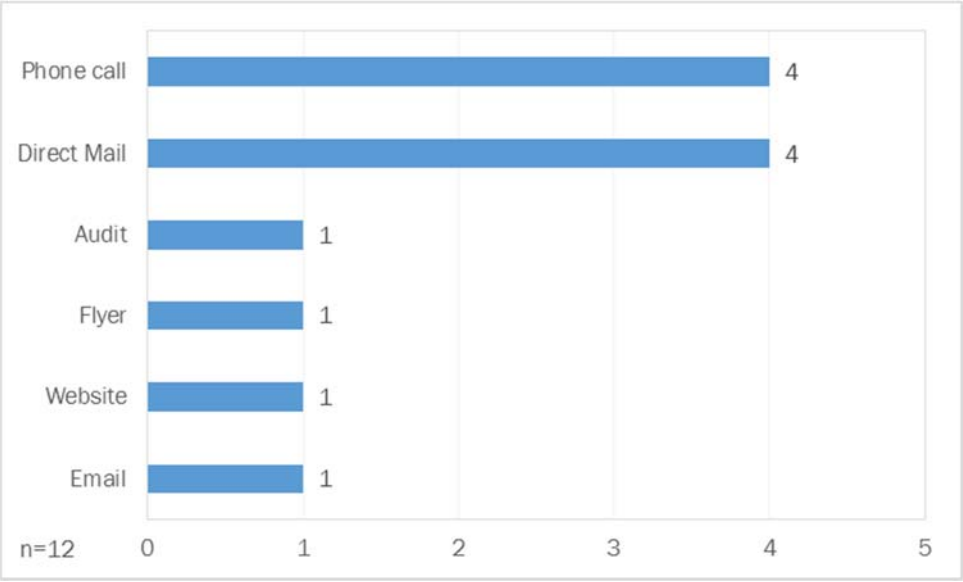
Interviewed leads in the recycling program reported being either fairly familiar with the program (a rating of 4 or 5, on a scale of 1 to 5) or being unaware or not at all familiar. For the rebate program, interviewed leads reported varying levels of familiarity. (Figure 5-23)

Figure 5-23. Awareness/Familiarity with SRP Window AC Programs



Window AC leads most often learn about the program through direct mailings from National Grid and National Grid outbound phone calls (both mentioned by 4 of 12 interviewed leads).

Figure 5-24. Medium through Which Leads Heard About SRP Window AC Programs



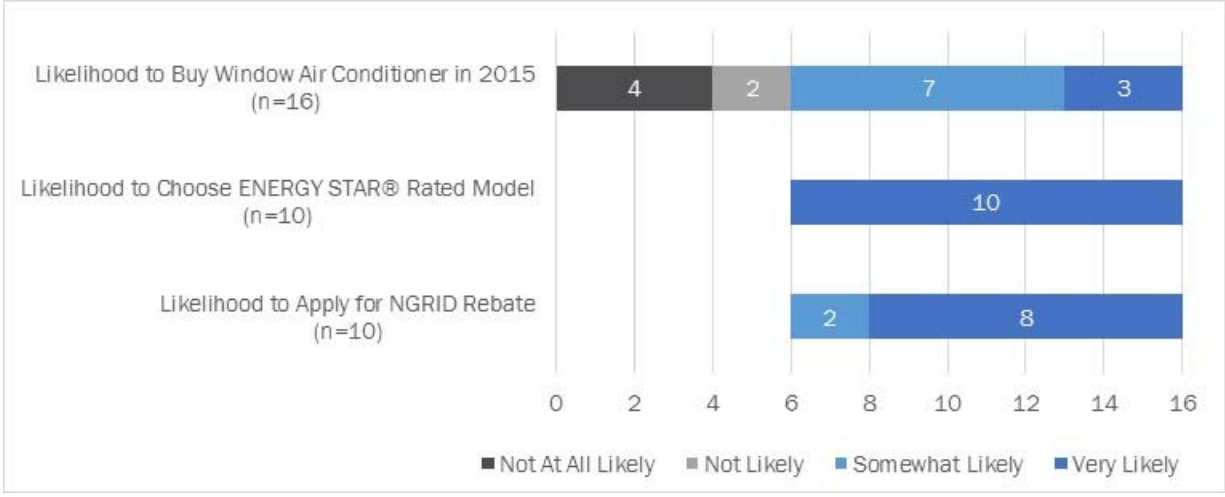
Actions Taken

None of the 10 window AC rebate leads with at least some familiarity with the program (a rating of 2 to 5 on a scale of 1 to 5) have taken any steps to participate in the program, since learning about the rebate. Similarly, of the five interviewed window AC recycling leads with at least some familiarity with the program, only one has taken any steps. This respondent reported speaking with a program representative and looking online to learn more about the rebate.

Likelihood to Participate

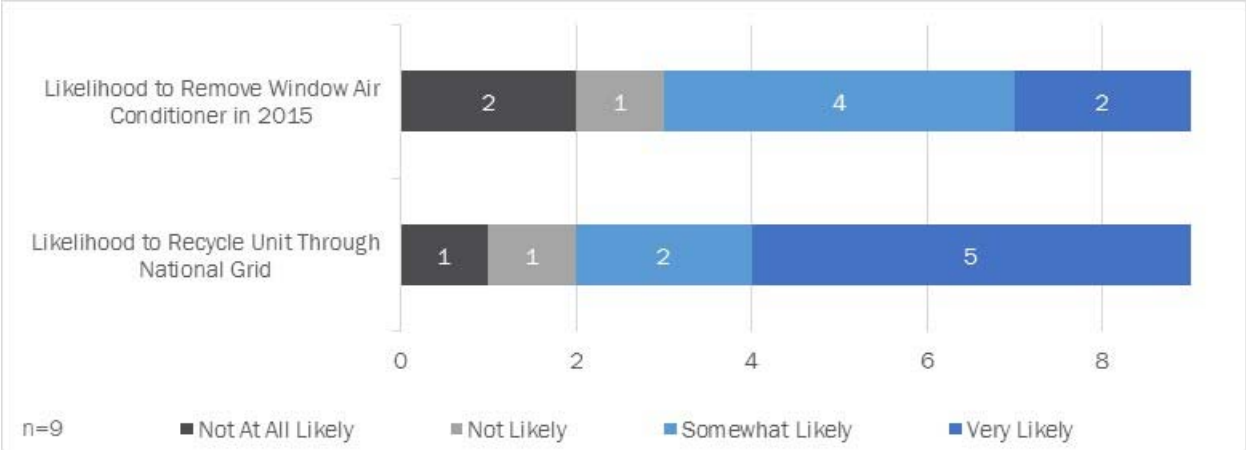
Of the 16 interviewed window AC rebate leads, 10 are either somewhat likely or very likely to purchase a window AC in 2015, and all of these leads reported that this new unit is very likely to be ENERGY STAR® rated. A large majority of these likely buyers (8 of 10) also reported that they are very or somewhat likely to apply for a rebate through National Grid (Figure 5-25).

Figure 5-25. Likelihood of ENERGY STAR® Window Air Conditioner Participation in 2015



Of the 10 interviewed leads in the window AC recycling program, one reported not using window AC and six reported being somewhat likely or very likely to remove a window AC in 2015. In addition, seven out of the nine interviewed window AC users are somewhat or very likely to recycle a unit through the SRP program.[38] (Figure 5-26)

Figure 5-26. Likelihood to Participate in 2015



[38] One respondent who said they were not at all likely to remove a window AC unit in 2015 reported being somewhat likely to recycle a unit through National Grid, after hearing about the program and the incentive.

Appendix A. EnergyWise Evaluation – Additional Details

Incremental Participation Rate for 2014

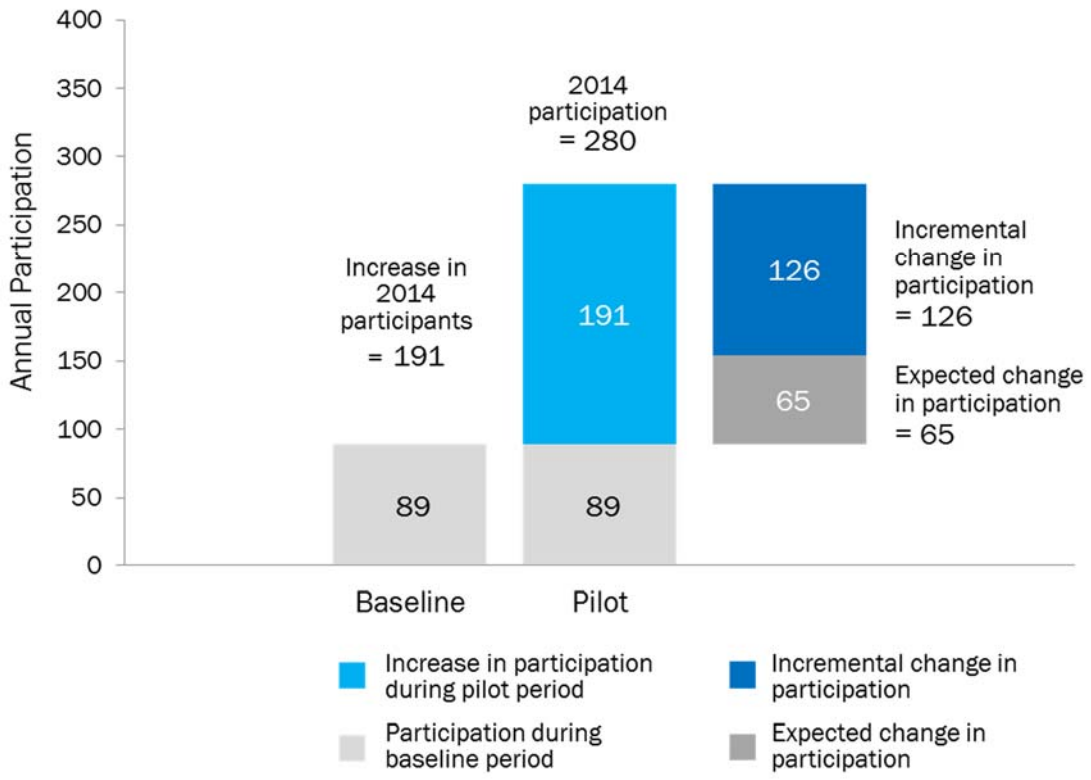
Based on tracking data for the SRP pilot area and the comparison towns, we find an increase in 2014 EnergyWise participation of 215% for the pilot area and 73% for the comparison towns.

Table A-1. Increase in Participation – Pilot Area and Comparison Towns 2014

	Pilot Area	Comparison Towns
# Participants Pre-pilot (per year)	89	707
# Participants 2014	280	1,220
% Increase	215%	73%

The "lift" or incremental change attributable to the pilot is 215% - 73% or a 142% increase. This number can be applied to the pilot area baseline period count (89 participants/year) to show that 126 participants are incremental. Without the pilot, we would have expected to see a 73% increase in participation in the pilot group (or 65 expected audits, for a total of 154 annual audits). Instead we saw 280 audits in 2014 – of these, 126 can be considered incremental, or attributable to the pilot program. We can calculate the "incremental participation rate" as the percentage of audits that are incremental: 126 / 280 = 45%.

Figure A-1. Incremental Participation in Pilot Communities – 2014



SRP Attribution Based on EnergyWise Participant Survey

The formula used to calculate SRP attribution is:

*SRP Attribution = Average SRP Influence * EnergyWise NTG Ratio*

We define the two components of SRP attribution as follows:

- The *Average SRP Influence* factor represents the influence that SRP marketing efforts had on participants' decision to have a home energy assessment conducted. We based this factor on responses to the online survey. We used a multi-step approach to estimating the *Average SRP Influence* factor:
  - Step 1: Determine respondent recall of SRP and statewide marketing materials
  - Step 2: Determine maximum influence scores for SRP and statewide materials on decision to complete the energy assessment (respondent-level)
  - Step 3: Calculate share of influence attributable to SRP marketing versus statewide marketing (respondent-level)
  - Step 4: Calculate overall influence of SRP marketing on decision to have assessment (respondent-level)
  - Step 5: Calculate program-wide *Average SRP Influence* score as the average of the overall SRP influence scores across all respondents
- The *EnergyWise NTG Ratio* represents the share of audit program participants that would not have installed the direct install measures without the audit. It is based on the RI TRM.

By calculating the SRP attribution as the product of these two components we take into account that free-ridership can occur at both steps: 1) some participants would have had the energy assessment independent of SRP-specific marketing and 2) some participants would have installed the direct install measures independent of the energy assessment.

Below, we provide additional detail on each of these five steps and present a few examples of participant responses and the resulting influence scores.

Step 1: Determine recall of SRP-specific and statewide marketing materials

During the pilot period, customers in the pilot towns were exposed to both SRP-specific and statewide marketing materials. The online survey provided participants with a series of images and descriptions of marketing materials from both the SRP-specific and statewide marketing campaigns and asked them if they recalled seeing, hearing, or receiving each item.

Step 2: Determine maximum influence scores for SRP-specific and statewide materials on decision to complete the energy assessment

If respondents could recall a marketing piece, the online survey asked them to rate the level of influence it had on their decision to complete the home energy assessment (using a scale of 1 to 5, where 1 was "Not at all influential" and 5 "Very influential").

We used the highest influence rating a respondent gave to any of the SRP-specific materials to generate the SRP influence rating. Similarly, we used the highest influence rating a respondent gave to any of the statewide materials to generate the statewide influence rating. For example, if a respondent recalled seeing three SRP-specific marketing materials and rated the influence they had on their decision to complete the home energy assessment a two, a three, and a five, respectively, on the five-point scale we assigned the maximum SRP influence of five.

We then converted the highest self-reported influence rating for each campaign into an *SRP Influence Score* using the table below.

Table A-2. Conversion and Influence Rating to % Influence Score

Self-Reported Influence Rating[a]	% Influence Score
1- Not at all Influential	0%
2	25%
3	50%
4	75%
5- Very Influential	100%

[a] Respondents who did not recall any SRP-specific or any statewide materials, respectively, received an influence score of 0%.

The result of this step is an SRP-specific influence score and a statewide influence score for each survey respondent.

Step 3: Calculate share of marketing influence attributable to SRP-specific efforts

Because both statewide and SRP-specific materials could have influenced a participant to have the energy assessment done, we then determined the share of overall marketing influence attributable to the SRP-specific marketing materials.

$$\textit{Share Attributable to SRP} = \frac{\textit{SRP Influence Score}}{\textit{SRP Influence Score} + \textit{Statewide Influence Score}}$$

Step 4: Calculate overall influence of SRP marketing on decision to have energy assessment

In this step, we apply each respondent's SRP share of marketing influence attributable to SRP (developed in Step 3) to the *SRP Influence Score* (developed in Step 2) to calculate the *Overall SRP Marketing Influence* score. This score represents the influence of SRP materials, net of the influence of statewide materials, on the respondent's decision to have an energy assessment conducted.

*Overall SRP Marketing Influence = Share of Influence attributable to SRP * SRP Influence Score*

Step 5: Calculate program-wide *Average SRP Influence* score

We then average the *Overall SRP Marketing Influence* scores developed in Step 4 across all respondents to derive the program-wide *Average SRP Influence* score.

Examples

Below we provide a few scenarios that illustrate the calculation of respondent-level influence scores.

Table A-3. Respondent-Level Influence Score Scenarios

Scenario	Step 2: Influence Score		Step 3: SRP Share of influence	Step 4: Overall SRP Marketing Influence
	SRP	Statewide		
Recalls SRP marketing materials only, or says statewide materials had little or no influence on decision to participate. The entire marketing influence is attributable to SRP-specific efforts. The overall SRP influence is equal to the SRP influence score.	100%	0%	100%	100%
	75%	0%	100%	75%
	50%	0%	100%	50%
Recalls both SRP and statewide materials and rates influence of both campaigns equally. SRP and statewide materials are equally responsible for marketing influence, and SRP share of marketing influence is 50%. The overall SRP influence is equal to half of the SRP influence score.	100%	100%	50%	50%
	75%	75%	50%	38%
	50%	50%	50%	25%
Recalls both SRP and statewide materials and rates SRP materials as more influential in decision. A greater share of influence is attributable to SRP than statewide materials.	100%	50%	67%	67%
	75%	50%	60%	45%
Doesn't recall SRP marketing materials or says they had little or no influence on decision to participate. No overall SRP influence, independent of influence of statewide materials.	0%	0%	0%	0%
	0%	25%	0%	0%

EnergyWise Load Impact Estimation

For each EnergyWise measure category, we calculated load impacts as the total quantity of measures installed in the pilot area, multiplied by coincident peak kW savings:

*Peak kW Savings = Quantity * kW Reduction per Unit * Summer Diversity Factor*

To develop incremental SRP load impacts, we then multiplied total peak kW savings by the take rate. The following are key inputs into this analysis:

A. **Measure category:** The EnergyWise participation data included a measure category for each installation record. Peak savings are not assigned in the participation database, and therefore must be assigned based on deemed factors.
B. **Pilot Quantity:** Measure quantity comes from the program tracking data. We assigned measures installed in Tiverton and Little Compton to the 2014 SRP pilot period based on the paid date, to match how National Grid counts savings in each year. We assigned measures to the Tiverton substation based on lists of account numbers on subfeeders 33-34 provided by National Grid.
C. **Peak kW Reduction Factors:** National Grid provided a set of deemed load reduction values and diversity factors for each EnergyWise measure category. The factors that National Grid provided are the same load assumptions that National Grid is currently using for cost-effectiveness tests of the EnergyWise Single-Family program in Rhode Island. Since these assumptions are specific to the EnergyWise Program, they may differ from assumptions for analogous measures in the 2014 Rhode Island TRM (that other programs offer).
D. **Take Rate:** The take rate is the percentage of measure installations that can be attributed to the SRP Pilot efforts – i.e., measure installations that would not have occurred in the absence of SRP Pilot marketing efforts. We used an incremental participation analysis and EnergyWise survey results to estimate a pilot take rate for the EnergyWise Program. (See discussion in Section 2.2 above.)

The following table shows gross kW reduction assumptions and summer peak diversity factors for EnergyWise measures. Programmable thermostats, heat pump water heaters, weatherization, smart strips, refrigeration, ighting, and domestic hot water measures are all expected to achieve peak demand savings, with the highest per-unit savings expected from weatherization in homes with electric heat and programmable thermostats in homes with non-electric heat.

Table A-4. EnergyWise Load Impact Factors

Measure Category	Gross kW Reduction per unit	Summer Diversity Factor	Average Peak Summer Load Reduction (kW)
CFL	0.014	0.17	0.002
LED Bulb	0.014	0.17	0.002
LED Fixture	0.014	0.17	0.002
Indoor Fixture	0.020	0.17	0.003
Outdoor fixture	0.048	0.00	0.000
Torchiere	0.042	0.17	0.007
DHW	0.023	1.00	0.023
HPWH 50 Gallon	0.370	0.58	0.215

Measure Category	Gross kW Reduction per unit	Summer Diversity Factor	Average Peak Summer Load Reduction (kW)
HPWH 80 Gallon	0.370	0.58	0.215
Refrigerator Brush	0.005	1.00	0.005
Refrigerator Rebate	0.095	1.00	0.095
Smart Strip	0.016	0.73	0.012
Programmable Thermostat - Electric Heat	0.180	0.20	0.036
Programmable Thermostat - Non-Electric Heat	0.730	1.00	0.730
WiFi Thermostat Non-Elect	0.231	1.00	0.231
AC Timer	0.00	0.00	0.000
Weatherization - Electric Heat	0.832	0.20	0.166
Weatherization - Oil Heat	0.179	0.20	0.036
Weatherization - Gas Heat	0.134	0.20	0.027

Survey Marketing and Awareness & Influence Details

To date, the Evaluation Team has fielded four versions of an online survey among EnergyWise participants in Tiverton and Little Compton. All versions of the survey explored recall and influence of statewide and pilot-specific marketing and outreach efforts, drivers for participation in the EnergyWise and DemandLink programs, and levels of satisfaction with DemandLink thermostat equipment. The second through fourth versions also included questions about usage patterns and levels of satisfaction with DemandLink thermostat and Smart Plug equipment.

We fielded the third and fourth versions of the survey in December 2014 among 110 participants who 1) participated in the EnergyWise program December 19th 2013 and September 9th 2014 and 2) had a valid email address.

We provided survey respondents with images and descriptions of various marketing efforts they had been exposed to and asked them if they recalled seeing, hearing, or receiving each item. Each respondent was only asked about marketing efforts that took place in the six months prior to their becoming a lead. Survey version three was designed for participants with lead dates between May 2013 and November 2013 while the fourth version was designed for participants with lead dates between December 2013 and August 2014. If respondents could recall a marketing piece, we asked them to rate the level of influence it had on their decision to complete the home energy assessment.

The following subsections describe recall and influence of SRP-specific marketing and statewide marketing, respectively.

Recall and Influence of SRP-Specific Marketing

Direct Mail

Feb 2014

	Total
Recall	
Yes, I recall receiving this	60%
n	10
Influence	
Not Influential (1-2)	17%
Moderately Influential (3)	33%
Very Influential (4-5)	50%
n	6

Email Outreach

June 2014

	Total
Recall	
Yes, I recall receiving this	33%
n	3
Influence	
Not Influential (1-2)	0%
Moderately Influential (3)	0%
Very Influential (4-5)	100%
n	1

Phone

May -September 2014
Do you recall being contacted by phone by a National Grid representative about opportunities for reducing energy costs in your home?

	Total
Recall	
Yes, I recall receiving this	31%
n	32
Influence	
Not Influential (1-2)	10%
Moderately Influential (3)	10%
Very Influential (4-5)	80%
n	10

Community Event

May 2014
National Grid hosted an Energy Awareness Day at the Muddy Moose Café in Tiverton on May 27th, 2014. This event featured energy experts who were available to discuss ways to save money by participating in National Grid's DemandLink programs. Did you attend this event?

	Total
Recall	
Yes	14%
n	7
Influence	
Not Influential (1-2)	0%
Moderately Influential (3)	0%
Very Influential (4-5)	100%
n	1

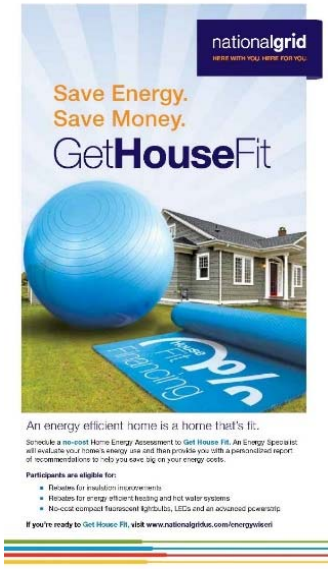
Recall and Influence of Statewide Marketing

Radio

February-March 2014 and September-November 2014
Throughout 2014, National Grid has been airing radio spots which promote the ways National Grid can help Rhode Islanders save energy and money on energy bills. These spots feature Rhode Islanders being interviewed about their home energy use. Do you recall hearing any of these radio spots?

	Total
Recall	
Yes	28%
n	18
Influence	
Not Influential (1-2)	40%
Moderately Influential (3)	20%
Very Influential (4-5)	40%
n	5

Newspaper Ads

January-July 2014


	Total
Recall	
Yes	38%
n	21
Influence	
Not Influential (1-2)	25%
Moderately Influential (3)	38%
Very Influential (4-5)	38%
n	8

Banner Ads

February-June 2014	January-June 2014

	February-June 2014	January-June 2014	Total
Recall			
Yes, I recall seeing this	18%	20%	19%
n	17	20	37
Influence			
Not Influential (1-2)	33%	25%	29%
Moderately Influential (3)	0%	0%	0%
Very Influential (4-5)	67%	75%	71%
n	3	4	7

YouTube

January-August 2014
Do you recall seeing any promotional videos online, like the one below, which provide an informational overview of National Grid's Home Energy Assessment Program?

	Total
Recall	
Yes	15%
n	20
Influence	
Not Influential (1-2)	33%
Moderately Influential (3)	0%
Very Influential (4-5)	67%
n	3

Van Wrap

Ongoing

	Total
Recall	
Yes	52%
n	23
Influence	
Not Influential (1-2)	42%
Moderately Influential (3)	25%
Very Influential (4-5)	33%
n	12

Appendix B. DemandLink Evaluation – Additional Details

Impact Methodology for Demand Response Impact Analysis

Model Specification

We used a linear fixed-effects regression (LFER) modeling approach for the demand response impact analysis. This model accounts for the time-invariant, household-level factors affecting energy use without measuring those factors and entering them explicitly in the models. These factors are contained in a household-specific intercept, or the constant term in the regression equation.

We selected the regression model specification to predict referential load during event days to address specific event day characteristics. The model incorporates weather variables with weather as the major predictor of energy consumption. Cooling degree hours (CDH) with base 65 is included in the model as the primary weather variable. The model also includes the hour of the day, as time of day is highly predictive of usage. Terms for month, day of week, morning load, and month by hour further correct for differences between the event day and the non-event days used as comparison days for the model.

As is standard practice for demand response impact analysis, we tested many models. We selected the final models based on fit with actual usage, especially during the hours leading up to the event. This is necessary because there are unique situations applicable to the program area that may influence the counterfactual, which we tested through this approach. We judged the ultimately selected model fit primarily on replication of actual usage during non-event hours, especially the hours before the event, so there is a high level of confidence in the reference points during event hours.

We fit separate regressions for each event for central AC, using the same model specification. We combined events for window AC due to the limited consumption data available. The linear fixed-effects regression (LFER) model specification is as follows:

Equation B-1. Regression Model

$$kw_{it} = \alpha_o + \alpha_i + \beta_{event} \cdot Event + \sum_{h=1}^{23} \beta_{hour\ h} \cdot Hour_h + \sum_{h=1}^{23} \beta_{event\ hour\ h} \cdot Event \cdot Hour_h +$$

$$\beta_{CDH} \cdot CDH_t + \beta_{mornload} \cdot MornLoad_i + \sum_{h=1}^{23} \beta_{mornload\ hour\ h} \cdot Hour_h \cdot MornLoad_i + \varepsilon_{it}$$

Where:

kw_{it} = Predicted hourly energy consumption – average load in hour *t* for the average customer *i*

α_o = Overall intercept

α_i = Participant specific intercept

ε_{it} = Error term

Event = Indicator variable for event day

Hour = Set of 23 indicator variables for the hours of the day

Month = Set of 3 indicator variables for the months of the program (June-Sept)

Day = Set of 4 indicator variables for the day of week (Monday-Friday)

CDH = Base 65 cooling degree hours

MornLoad = The mean load for participant i for the hours of 1 am through 11 am for the day

In addition to the model selected, we tested other variables and interactions for possible inclusion in the model specification. These included:

- CDH^2 – Cooling degree hours squared
- HDH – Heating degree hours
- Day – Day of the week
- Month – Month of the peak season, May through September
- Month by Hour – The interaction of month and hour of the day (adjusts for differences in average hourly load across months)
- Month by HDH – The interaction of month and HDH (adjusts for differences in average weather response across months)
- Day by Hour – The interaction of day of week and hour of the day (adjusts for differences in average hourly load across days of the week)
- Event by CDH – The interaction of event and CDH (adjusts for different hourly load on event days based on weather)

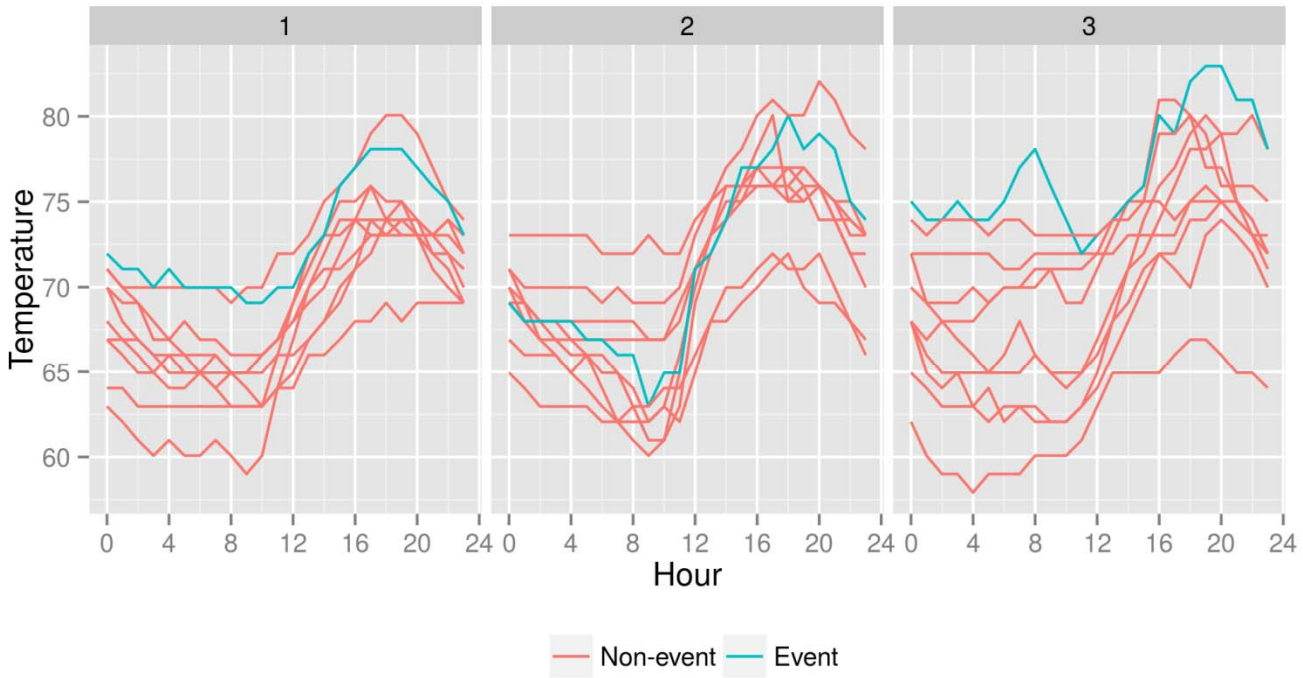
These terms do not appear in the final model specification, as the variables and interactions already in the model are effective at correcting for differences in the actual usage and the modeled usage for non-event hours that serve as comparison. It is very important that the final model correctly replicate load during non-event hours, so the counterfactual baseline usage during the event is reliable. It is also important to remove terms and interactions that do not improve the actual and baseline model fit, as they will unnecessarily increase variance in the estimates.

Day Matching

Not all days are included in the data used in the regression model. Including cool days, when air conditioning is not used, does not add useful information for modeling what happens on the hottest days, when events are called. For each event day, we used Mahalanobis distance matching to select the nine non-event days that best matched the hourly weather profile of the event day. Mahalanobis distance matching minimizes the difference between the event and non-event day temperatures at each hour, corrected for the measured

variation in temperature at that hour and the correlation of the temperature between hours. Figure B-1 shows the temperature profiles for each of the three event days in 2014 and the profiles of their matched days. The matched days do not align perfectly with the event days, but the matched days cover the range of temperatures experienced on the event days, so they are sufficient to provide support for estimating the baseline usage with linear fixed effects regression modeling.

Figure B-1. 2014 Event Day Temperature Profiles with Matched Day Temperature Profiles



Tracking Data and Thermostat Logs

The tracking data contains information about 231 households that participated in the pilot. Some of the homes have more than one thermostat: The 133 homes with central AC have 205 thermostats, while the 98 homes with window AC have 123 thermostats.

We received thermostat logs for 180 thermostats controlling central AC. Four of the 180 central AC thermostat logs contained no AC runtime data during the event days, so we removed them from the analysis. We received logs for 110 thermostats controlling window AC. Only 72 of these logs contained any non-missing window AC usage, and only 28 of those contained any non-zero usage during the peak season. Table B-1 shows the number of thermostats at each stage.

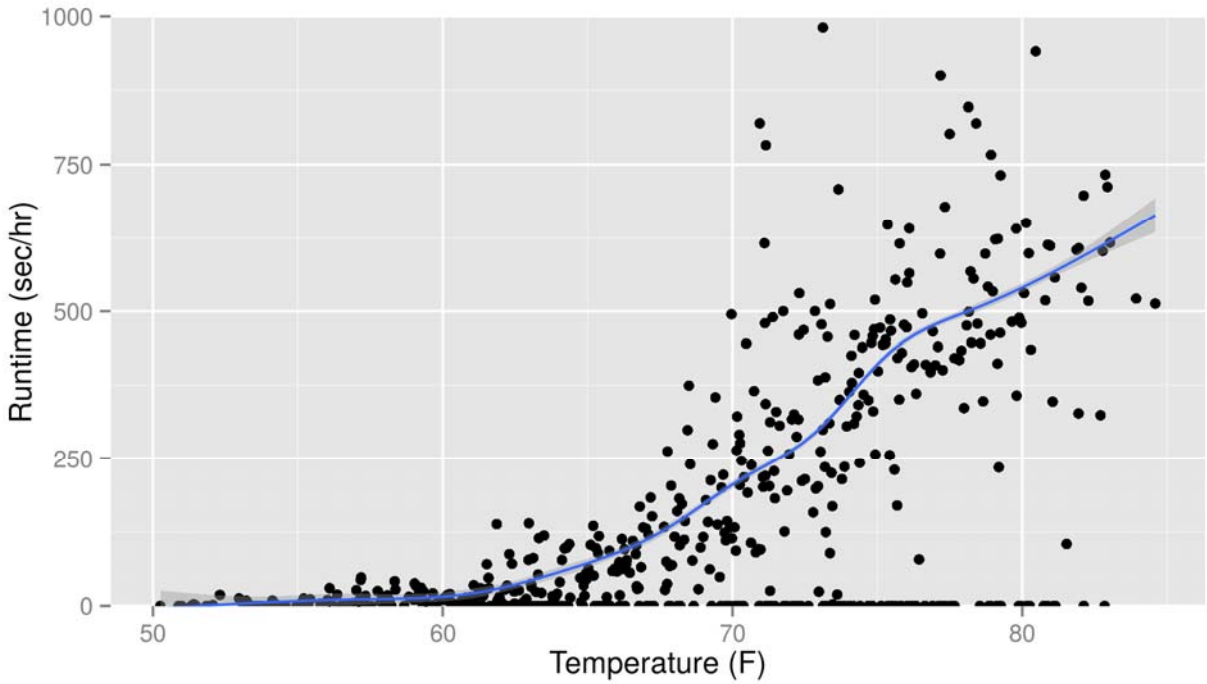
Table B-1. Thermostat Counts

	Tracking Data	Thermostat Logs	Final Data
Central AC	205	180	176
Window AC	123	110	28

Weather Data

Opinion Dynamics gathered weather data from the National Oceanic and Atmospheric Administration's National Climactic Data Center, which houses the Integrated Surface Database of hourly weather measurements from thousands of locations across the country. We used participant addresses to geocode the locations of all participants, and found that the weather station at the Newport State Airport was the closest to all pilot participants. We downloaded the hourly weather data from that station for 2013 and 2014 and merged it with the thermostat logs. We then calculated cooling degree hours with an outdoor base temperature of 65 degrees for use in the model. We chose 65 degrees as the base temperature because 65 degrees is approximately the point at which participants start using their central AC units during summer afternoons. Figure B-2 shows the average runtime versus temperature for peak season afternoons between noon and 8 PM. Based on the modeled line, it appears that we could use either 60 or 65 degrees as a base for cooling degree hours, but we chose 65 as that temperature is more standard.

Figure B-2. Mean Central AC Runtime versus Temperature for Peak Season Afternoons



Appendix C. Survey Sampling and Dispositions

EnergyWise Participant Survey

The sampling unit for the EnergyWise Participant Survey was the unique program participant. The population included 137 program participants who participated in the EnergyWise program between December 19th 2013 and September 9th 2014.[39] We removed 7 records with duplicate email addresses, 13 participants without email addresses, and 4 participants who did not install any EnergyWise measures. The EnergyWise participant survey asks respondents about marketing efforts that took place in the six months prior to their becoming a lead. Survey Version 3 was designed for participants with lead dates between May 2013 and November 2013 while Version 4 was designed for participants with lead dates between December 2013 and August 2014. We removed three participants with lead dates prior to April 30th 2013, who would have received Version 2 of the survey, last fielded in March 2014, because of the likelihood that these participants would not be able to accurately recall marketing materials they had been exposed to. The final sample frame consisted of 110 unique participants. We attempted to complete the survey with all 110 participants (census attempt).

The table below shows the final disposition for Versions 3 and 4 of the EnergyWise participant survey, fielded between December 2014 and January 2015. Out of the 110 e-mail invitations, 13 were undeliverable due to invalid e-mail addresses. The final response rate, calculated as the number of completes divided by the eligible sample, was 33%. The table below presents the final disposition for Version 3 and Version 4 of the EnergyWise participant survey.

Table C-1. EnergyWise Participant Survey Response Rates

	Version 3	Version 4	Combined
Total Sample	22	88	110
Undeliverables	3	10	13
Known Ineligible (Screened Out)	1	0	1
Eligible Sample	18	78	96
Completes	9	23	32
Response Rate (Completes/Eligible Sample)	50%	29%	33%

[39] The previous wave of the EnergyWise participant survey, reported on in the 2013 Marketing Effectiveness Findings, included participants through December 17th 2013.

DemandLink Participant Survey

Sampling

The sampling unit was the unique program participant. This survey was fielded in two waves, between June and July 2014 and between October and November of 2014. The population for Wave 1 included 216 unique participants in the DemandLink Thermostat Program, the Window AC Rebate Program, and/or Window AC Recycling Program; Wave 2 included 149 unique participants. Respondents who were non-responsive in the first wave (84) were included again in the second wave of fielding.

The table below shows the final disposition for the two waves of the DemandLink participant survey. We completed a total of 58 interviews in the first wave and 24 in the second wave, resulting in response rates of 31% and 20% and cooperation rates of 56% and 51% for the first wave and second wave, respectively.

Table C-2. DemandLink Participant Survey Response Rates

	Wave 1	Wave 2
Completed Interviews (I)	58	24
Partial (P)	2	4
Refusal and break off (R)	44	19
Non-Contact (NC)	69	46
Other (O)	0	0
Unknown Eligibility Non-Interview (U)	17	35
Non-eligible (E)	26	21
Total Phone Numbers Used	216	149
Response Rate	31%	20%
Cooperation Rate	56%	51%

The response rate and cooperation rate are calculated as follows:

$$AAPOR\ \ Response\ Rate3\ (RR3) = \frac{I}{\left(I + R + NC + O + (e * U)\right)}$$

Where:

$$e = \frac{(I + R + P + NC)}{(I + R + P + NC + E)}$$

$$Cooperation\ Rate = \frac{I}{(I + P + R)}$$

Table C-3 below summarizes the programs in which the 281 unique program participants participated (for the combined Wave 1 and 2 sample). Due to the small number of window AC rebate and recycling participants in our sample, and a desire to avoid questionnaire fatigue, we asked participants who took part in both the DemandLink Thermostat Program and one or both of the window AC programs, only window AC-related questions.

Table C-3. Program Participation Summary for Sample Development

Programs Participated In	Unique Participants
DemandLink Thermostat Only	225
DemandLink Thermostat + WAC Recycle + WAC Rebate	4
DemandLink Thermostat + WAC Rebate	2
WAC Recycle + WAC Rebate	19
WAC Recycle	10
WAC Rebate	21
Total	281

Weighting for the DemandLink Thermostat Process Evaluation

For the DemandLink process evaluation, we developed survey weights that reflect the fact that participants with central AC and those with window AC did not respond to the survey in proportion to their representation in the population. For each cooling method, we calculated the weight by dividing the cooling method's share of the overall population by its share of survey responses. Table C-4 presents the weights used in the process analysis.

Table C-4. Process Weights for DemandLink Participant Survey

Cooling Method	Number of Contacts in Population	Number of Completes	Weight
Central Air Conditioning	134	44	0.9624
Window Air Conditioning	97	29	1.0570
Total	231	73	

DemandLink Leads Survey

The sampling unit was the unique customer. The population included 750 customers who were leads for at least one of the four program offerings in 2014 according to RISE and RAM lead databases. We removed customers who participated in all programs they were a lead for as well as duplicate records and customers with invalid phone numbers. The final sample frame consisted of 429 unique customers who were leads for at least one of the four program offerings.

The table below shows the final disposition for the DemandLink Leads Survey. We completed a total of 82 interviews, resulting in a response rate of 22% and a cooperation rate of 48%.

Table C-5. DemandLink Leads Response Rates

	n
Completed Interviews (I)	82
Partial (P)	0
Refusal and break off (R)	89
Non-Contact (NC)	129
Other (O)	1
Unknown Eligibility Non-Interview (U)	80
Non-eligible (E)	30
Total Phone Numbers Used	411
Response Rate [a]	22%
Cooperation Rate [b]	48%

$$^{a}AAPOR\ \ Response\ Rate3\ (RR3) = \frac{I}{(I+R+NC+O+(e*U))}$$

$$Where: e = \frac{(I+R+P+NC)}{(I+R+P+NC+E)}$$

$$^{b}Cooperation\ Rate = \frac{I}{(I+P+R)}$$

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