



MASSACHUSETTS CROSS-CUTTING BEHAVIORAL PROGRAM EVALUATION

Volume I Final

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1. EXECUTIVE SUMMARY

This report serves as the first annual impact and process evaluation of Massachusetts Behavioral Programs under the three-year Massachusetts Cross-Cutting Program Evaluation plan. Opinion Dynamics Corporation, with subcontractor Navigant Consulting (henceforth the “Evaluation Team”), was contracted to conduct the evaluation of Massachusetts behavioral programs through 2012. This report covers programs that were implemented in the 2009-2010 program years; in the case of this effort, the only program implemented during this timeline (and covered by this evaluation) is the National Grid Home Energy Report (HER) Program implemented by OPOWER for the pilot year September 2009-September 2010.¹ The National Grid HER program was expanded in 2010.

1.1 Key Impact Findings

The HER program was delivered to 24,853 electric pilot participants and 24,994 gas pilot participants during the first year of the pilot program. The HER program also retained 24,752 electric and 24,876 gas customers to serve as a control group for the program.

This is the first in a series of studies designed to examine the HER program’s potential to generate savings through three primary mechanisms: (1) through conservation actions; (2) through direct measure installations outside of rebate programs; and (3) through existing National Grid programs. The first two savings mechanisms are unique to the HER program, while the third mechanism—savings through existing National Grid programs—reflects savings that are already counted by other programs. Future studies will examine the program’s ability to generate savings through these three mechanisms in expansion cohorts and in other jurisdictions (NSTAR’s program). Additional analysis, including an investigation of savings persistence and Effective Useful Life, will be conducted to verify and add greater depth to these insights.

Through all three mechanisms, our evaluation found that the HER program generated the following net savings for the first year of the pilot program:

- Electric pilot households averaged 184.1 net kWh annual savings per participant, and 1.61% kWh savings from 11,433 kWh per participant expected consumption in the absence of the program.² This equates to a total of 4,575 MWh savings across all households, representing 80.5% of the pilot’s first-year percent savings goal.
- Gas pilot participants averaged 9.93 net therm savings per participant and 0.77% therm savings from 1,286 therms per participant expected consumption in the

¹ The beginning of program treatment—and therefore dates of the first program year—varies by the date of the first Home Energy Report, which varies by account. We conducted impact analysis based on the duration of the first program year for each customer.

² Expected consumption in the absence of the program is based on ex post evaluation of actual energy consumption by the participant group, plus ex post net savings attributable to the HER program. A detailed methodology is available in Section 2.2 of Volume II.

absence of the program. This equates to a total of 248,257 therm savings across all households, representing 75.8% of the pilot’s first-year percent savings goal.

The majority of these net savings were obtained independently through actions taken outside of National Grid programs. Table 1 below summarizes the HER program’s savings goals, net program savings from billing analysis (reflecting all three savings mechanisms), and final net program savings after accounting for cross participation in other National Grid programs.

Table 1. Home Energy Report Net Savings and Performance against Goals, PY1

	Electric Pilot Participants			Gas Pilot Participants		
	Average % Reduction in kWh	Average kWh Savings per Household	Total MWh Savings ^a	Average % Reduction in Therm	Average Therm Savings per Household	Total Therm Savings ¹
Program Goal^b	2.05%	228.78	5,686	1.04%	13.10	327,521
Net Program Savings, from Billing Analysis ^a	1.61%	184.07	4,575	0.81%	10.42	260,437
Percent of Goal	78.5%	80.5%	80.5%	77.9%	79.5%	79.5%
Incremental savings from other programs	--	--	--	0.04%	0.49	12,180
Percent of Goal	0%	0%	0%	3.6%	3.7%	3.7%
Net Program Savings, Final	1.61%	184.07	4,575	0.77%	9.93	248,257
Percent of Goal	78.5%	80.5%	80.5%	74.3%	75.8%	75.8%

^a Total net program savings calculated based on evaluated net ex post savings, and extrapolates PY1 savings to entire participant population of each pilot cohort.

^b Goals for percent savings and total program savings are based off of the Massachusetts Technical Reference manual for Residential Electric Efficiency Measures (Effective Date 1/1/2011). The total program savings goal is based on the TRM unit savings assumption that depends on baseload consumption of the target population: $\Delta kWh = (kWh_{BASE}) (\% SAVE)$.

The great majority of savings from the HER program are obtained outside of the programs with a relatively small percentage of savings obtained through cross-program participation.

- Savings from gas measures installed through other programs contributed an average of 0.49 therm savings per household, a small but statistically significant lift in channeled savings over the control group. There were no statistically significant differences in savings gained through channeling to electric programs.³

Our survey research indicates that HER participants report installing more measures than the control group overall. In addition, participants were no more likely to report conservation actions than the control group overall:

- National Grid HER participants were more likely than control group members to report purchasing or installing at least one of the following measures: high-efficiency consumer electronics, building envelope measures, and low-cost measures.

³ Note that our initial review of the expansion electric cohort found that participation in other programs is greater than for the original the pilot, indicating a potential trend towards greater incremental program participation in 2010 for electric customers.

- HER participants did not report an overall change in conservation behaviors that surpassed the self report of the control group, with the exception of two behavior changes detected when we examine both fuel types combined (putting computers to sleep when not in use and turning off lights when leaving a room, see Section 3 in Volume II for more detail). When we examine these behaviors as composites, we see no statistically significant changes above the control group among HER participants in self-reported behavior change. Note that self reported behavior change may not be able to capture all subtleties of conservation behaviors.(bottom half of Table 8).⁴

Because these findings are self reported, additional studies will be conducted in 2011 to further explore and verify these findings.

While overall savings estimates for the pilot program may not have met the program targets, our survey research suggests that the measure life of these savings could be longer, given the reported uptake in measure installations among participants.

- Of unique savings gained through the HER program (outside of other programs), our data suggests that a larger proportion of HER program savings may be due to measure installations. These findings will be confirmed in future research in the 2011 program and these findings should be considered preliminary.

Baseload consumption and household composition may play a role in the household's propensity to take action, indicating that continuing to segment and target specific households with specific recommendations may help to meet program goals:

- The highest-consuming third of electric pilot households achieved 1.86% kWh savings (under the 2.05% kWh savings goal but greater than the overall savings of 1.06%), and the highest-consuming third of gas pilot households achieved 1.09% therm savings, slightly above the 1.04% therm savings goal.

These findings offer preliminary insights into the actions that may be driving savings, which will be further investigated through additional research with the National Grid expansion group as well as NSTAR's HER program. In addition, an Effective Useful Life study will be conducted in the 2011 evaluation efforts to specifically investigate the potential source of and persistence of the program's savings.

1.2 Key Process Findings

Our evaluation team found that most participants read the HER report and that it is increasing their awareness of their energy use relative to their neighbors. In addition, the evaluation found that participants are interested in more positive affirmation for changes in consumption and insight into their personal household energy use. Notably, many of the

⁴ It is important to note that participant and control groups are changing their conservation behaviors – for example, 36-37% of all NGRID behavioral change survey respondents either started to take at least one lighting-related energy conservation actions in the past year, or increased the frequency with which they took at least one lighting-related energy conservation action. Across most groups of daily and periodic energy-saving behaviors, a similar percentage (20-40%) of all customers started or increased at least one behavior in the past year, indicating a general shift in knowledge of potential energy efficiency behaviors, which could be the result of the behavioral program, other PA interventions, general media, energy prices, or other market factors. However, there was no significant difference between the participant and control groups for these changes.

process insights gained here have been used to adjust the program for the expansion group. Thus, these findings should be understood as specific to the pilot program:

- Most participants (94%) have read at least some of the reports they have received.⁵
 - Notably, those interviewed in our ethnographic research (n=11) indicated that they read the report very lightly, focusing primarily on the neighbor comparisons, and often overlooking or disregarding the back of the HER, where specific energy saving tips are provided.
- When asked how their energy use compared to their neighbors, participants reported “don’t know” less frequently than the control group (6% and 11% respectively) and were also likely to report their energy use as “slightly higher” (27% participants and 13% control) or “much higher” (12% participants and 4% control).
- Participants are interested in more positive affirmations of their progress to date. Currently, the HER has modules that track changes over time to the household and relative to their neighbors. Participants wanted these changes more explicitly called out and affirmation regarding their progress over time.
- Currently, the HER website has the capabilities to provide more detailed, household-level tips; however, few participants in our ethnography interviews noticed the web link and 10% of our survey respondents indicated that they had visited the site. OPOWER’s own web analytics indicate that just 1% of the pilot cohorts have actually engaged the site.⁶ These findings suggest that participants who go to the webpage may not be actively engaged with the site. Notably, our ethnographic research found that many participants could not find the web link on the HER, indicating that its placement on the report may have an effect on the low conversion of readers to the website. It is our understanding that the expansion program is working to address this.

1.3 Recommendations

1.3.1 Statewide Considerations for Behavioral Program Planning, Policy, and Evaluation

Below, we provide a summary of our overarching findings for the EEAC and the PAs in the development and implementation of behavioral programs. These are preliminary findings gained through the HER report. The results will be explored and verified through additional, forthcoming research.

⁵ This readership metric is based off of participant survey data, which pre-screened HER participants for recall and awareness of the Home Energy Reports.

⁶ Note that the participant survey pre-screened HER participants for recall and awareness of the Home Energy Reports, therefore it is possible that participant respondents were more likely to see the website link and visit the HER website than the general participant population (which includes households who do not read reports).

Planning and Policy

- **The PAs and the EEAC should continue to develop approaches for targeting different household types with different messages through the HER program.** Currently, the HER program has its own proprietary targeting approach. Our data suggests that the programs, overall, may benefit from targeted outreach. Where possible, programs should develop and/or continue to develop messaging that is more tailored to household types, to either capitalize on their existing propensity or motivate actions that they may not be taking, in order to ultimately optimize savings.
- **The PAs and the EEAC should conduct additional research to determine the effective useful life and persistence estimates for the HER program.** Our preliminary data suggests that the HER behavioral program may be generating a large proportion of savings through direct measure installations outside of the programs. The PAs and the EEAC should work with the evaluation team to conduct additional research studies to more closely examine these findings and revisit persistence assumptions for the HER program, once this phase is completed.
- **The PAs and the EEAC should determine whether the HER and other behavioral programs should aim to channel customers to other rebate and audit programs.** Currently, the programs do, to some extent, cross promote other programs. However the goals for these efforts are not explicit. The programs should determine if and how they want to cross promote.
 - **If cross-program promotion is desired, two-three months after the delivery of the first report may be the most appropriate time to do so.** Our data suggests that the greatest channeling lift occurs roughly two months into the program. This may be an appropriate point in time to cross promote the programs.

1.3.2 Relevant Findings Specific to the HER Program

The HER program has made many changes since the implementation of the pilot based on our ongoing feedback and communication. Here we state the insights we gained through the pilot evaluation, some which have been incorporated into the expansion program. To generate deeper savings through the HER program, we have developed the following recommendations:

- **Consider developing ways to personalize the experience further by providing customers with more household-specific information.** Many interviewed participants noted they are doing everything they could to save energy and are generally unclear as to why, specifically, they rate lower than their neighbors or the top 20% of energy savings that they are compared with in the HER. In addition, many were looking for tips and recommendations that address their unique household needs. For this reason, the program should consider ways to offer customized tips and feedback to participants. Some suggestions for making the HER program appear more personalized include:
 - **More actively promote the website and increase its prominence on the report.** The HER program is currently looking for ways to more actively promote this

feature, as it can provide more customized feedback; currently, few customers use these feature and often overlook it.

- **The HER should aim to provide more explicit, positive affirmations to participants.** Participants indicated that they wanted to have a more explicit understanding of their progress each month. While the program does offer year over year household and neighbor comparisons through various modules, we recommend more explicitly calling out participant’s year-over-year (or seasonal) progress in the form of an affirmation, for example: “Congratulations, you have used less energy this heating season than last heating season!”

1.4 Changes to the HER Program Since the Evaluation

The HER program has made a number of changes to enhance its offerings since this evaluation. These changes include the following: developing additional modules that offer season-specific comparisons, providing door hangers and window stickers to customers, cross-promoting other programs, such as Mass Save, and giving customers concrete energy saving goals and tracking their progress against those goals. Greater detail on these changes may be found on page 43.

2. EVALUATION INTRODUCTION

2.1 Massachusetts Behavioral Program Evaluation

The Behavioral Programs evaluation covers three program years: 2010, 2011 and 2012. The primary objectives of the Behavioral Programs evaluation are to: (1) identify savings generated through program interventions; (2) provide process recommendations; and (3) assess the utility and feasibility of running behavioral programs as part of a statewide effort. Table 2 details the timing of each behavioral program and its respective evaluations.

Table 2. Massachusetts Behavioral Program Status and Evaluation Report Date

Program Administrator Program Name	Launch Date	Report Date (P=Process, I=Impact)		
		2010	2011	2012
Cape Light Compact - Smart Energy Monitor	August 2011 (estimated)	P, I		P, I
National Grid - Home Energy Reports	Fall 2009 (pilot) January 2010 (expansion)		P, I	P, I
NSTAR - Home Energy Reports	September 2010		P, I	P, I
Western Mass Electric Company - Western Mass Saves	November 2010		P, I	P, I

2.2 2010 Behavioral Program Evaluation

Our research tasks in 2010 covered two types of programs: (1) programs that were in the implementation phase (with pilot programs in field for more than one year); and (2) programs that were launched in 2010 where baseline data was collected for demographic, household, behavioral and attitudinal data prior to program launch. The focus of this report is on National Grid’s Home Energy Report (HER) program, which was the most mature program in 2009-2010. In addition, we collected baseline research for the Western Mass Electric Company’s (WMECO) Western Mass Saves program before its launch in November 2010, to enable comparison of participant characteristics and energy using behaviors before and after exposure to program efforts. We conducted more limited research efforts for other programs in this first evaluation year, primarily to build an understanding of each program and plan future evaluation activities.

Subsequent evaluation reports will focus on the NSTAR, WMECO, and Cape Light Compact (CLC) program efforts. The Opinion Dynamics Evaluation Team prioritized identifying impact estimates and providing process recommendations for National Grid’s HER program. Where possible, our team also provides insight on the cross-applicability of our findings to other behavioral programs.

The objectives of this evaluation were to address a set of over-arching Researchable Issues our team developed to assess all behavioral programs in Massachusetts. The researchable issues focus on program effects and impacts, with a secondary emphasis on process-related questions. Our goal is to answer these researchable issues by evaluating aspects of each behavioral program—as such, we do not need to ask these questions of each behavioral program separately. Below we detail the researchable issues covered in the 2010 evaluation:

1. What behavioral efforts are currently being tried in Massachusetts? And, how do they compare in terms of:
 - a. Outreach strategies
 - b. Motivational appeals and messaging
 - c. Behaviors promoted
2. What are the energy saving impacts of these efforts?
3. Are there specific program characteristics that lead to greater savings (e.g., by outreach type, such as mail, web, Home Energy Reports, bill inserts, etc.; or participant type, such as usage levels, income and other socio-demographics)?
4. Do these programs lead to additional participation in other PA programs (i.e., rebate programs)?
5. What specific actions are taken as a result of the program?
6. What is the persistence of the actions taken (and related savings) as a result of behavioral programs?
7. Are there other effects from these program efforts (e.g., increased awareness, changes in attitudes)?
8. What are the barriers and drivers to behavioral adoption, persistence, and relapse?
9. Are there ways to improve these programs to reach more participants, increase savings, and/or integrate better with other PA programs across the state?
10. What are the benchmarks of success for behavioral programs and what methods should be used to track, evaluate, and report on behavioral programs in the future?

A Note on Terminology

For the purposes of this evaluation report, we refer to the National Grid behavioral program as the “HER program.” We refer to customers receiving Home Energy Reports as “HER participants” and to those customers retained as a control group as the “control group.” The National Grid behavioral program evaluated in this report included three waves of program intervention, varying by participant fuel type and the date of the first report. We will refer to the electric-only pilot cohort as the “electric pilot,” the gas-only pilot cohort as the “gas pilot,” and the expansion of the electric cohort to a broader geography at a later date as the “electric expansion.” We will refer to National Grid energy efficiency programs available to HER participant and control households outside of the HER program – e.g., rebate and home assessment programs – as “other National Grid programs.”

3. PROGRAM SUMMARY

Below we briefly summarize the four behavioral programs under evaluation as part of the Massachusetts Cross-Cutting Behavioral Evaluation. Appendix A of this report (Volume I) provides a detailed description of each program.

3.1 National Grid Home Energy Report

Program Size and Timing: To date, the largest program in field is National Grid's Home Energy Reports (implemented by OPOWER), which began). The program launched in the 2009 pilot in the fall of 2009 with 25,000 gas participants and 25,000 electric participants. In 2010, the gas program expanded to an additional 75,000 participants, while the electric program expanded to an additional 125,000 participants. In 2011, the gas and electric programs are both expected to add 100,000 participants each. The total number of participants active by the end of 2011 is expected to be 425,000.

Program Design: The program provides normative comparisons, coupled with energy savings recommendations, to educate and motivate participants to take energy saving actions and behaviors within their homes. The program delivers information on household energy consumption, including neighbor comparisons and historical consumption trends, through monthly Home Energy Reports (direct mail) and an Energy Insider website (promoted in direct mail).

Customer targeting: The program targeted residential single-family homeowners with high energy use. The program implementer selects a control group of matched comparison households, with equivalent energy usage and approximate location (at the Census block level), for participants in each pilot fuel group.

Savings Goals: In 2009, the program set an annual savings goal of 2.05% kWh savings per participating household for the electric pilot effort, based on the only evaluation at the time, Summit Blue's impact evaluation of Sacramento Municipal Utility District. The gas annual savings goal was planned at 1.04% therms per participant based on implementer projections. Electric savings goals were revised to 1.9% kWh per participant for the expansion cohorts in the 2011 program year.⁷ For the purposes of this evaluation, the 2009-2010 goals were used. Future evaluations will use the revised savings goals to benchmark program success.

3.2 WMECO Western Mass Saves

The WMECO Western Mass Saves program is a multi-channel effort, incorporating community outreach alongside behavioral program efforts. All WMECO customers can access a web-based portal—the primary component of the program—where they can learn about conservation actions and behaviors, and engage in online activities that encourage

⁷ Source: Massachusetts Technical Reference manual for Residential Electric Efficiency Measures (Effective Date 1/1/2011).

energy saving. The web-based portal implemented by Efficiency 2.0 is the focus of the behavioral evaluation.

Program Size and Timing: The behavioral component of the program—the web-based portal and direct mail promoting the web portal—launched in November 2010. The direct mail effort includes distinct participant and control groups, each with 25,000 households randomly chosen within target communities. Program treatment for direct mail participants began in November 2010.

Program Design: The web portal is designed to generate verifiable energy savings, by providing customers with personalized recommendations for conservation actions, goal setting, consumption feedback, community comparisons, and rewards. The program cross-markets the web portal through direct mail, community-based efforts, and other WMECO customer communications. As such, the program features a quasi-experimental design, as the control group held out from direct mail efforts could learn about the web portal through other sources.

Savings Goals: The behavioral component of the program does not have explicit energy savings goals, though the Western Mass Saves aggregate energy savings goal (including the community outreach component) is a 3% reduction in energy use within the target communities. The behavioral component is expected to attract 1,400 sign-ups for the web-based portal.

3.3 NSTAR Home Energy Report

Program Size and Timing: NSTAR's Home Energy Report program (implemented by OPOWER) targets gas customers and was launched in September 2010. The first pilot phase included 25,000 dual-fuel NSTAR customers, who received the report during the 2010-2011 heating season (ending March 2011). The program was rolled out to another 25,000 gas customers (expansion effort) in February 2011.

Program Design: The program provides normative comparisons, coupled with energy savings recommendations, to educate and motivate participants to take heating-related energy saving actions and behaviors within their homes. The program delivers information on household energy consumption through monthly Home Energy Reports and an Energy Insider website.

Customer targeting: The first phase of the program targeted residential single family and multi-family customers with high energy use who are dual-fuel NSTAR customers (electric and gas), while the expansion program effort included gas-only NSTAR customers. The program implementer selected a control group of matched comparison households, with equivalent energy usage and approximate location (at the Census block level), for participants in each program cohort.

Savings Goals: The program set an annual savings goal of 1.33% therm savings per participant for the first phase of the program, and 1.04% therm savings per participant for the expansion effort.⁸

⁸ From Q3 2010 filing

3.4 Cape Light Compact Smart Energy Monitor

While much smaller in scope, Cape Light Compact's Smart Home Energy Monitoring Pilot (SHEMP) was the first pilot to be supported by public benefit funding in Massachusetts (June 2009). This pilot effort included 86 participants, and has completed a third party evaluation. To date, the first phase of the SHEMP pilot has concluded and Cape Light Compact is planning a continuation of its behavioral effort, SHEMP Phase II.

Program Size and Timing: SHEMP Phase II is currently recruiting participants, with a goal of enrolling 500 customer households. The one-year program will begin in August 2011, after equipment installations are completed in participant homes.

Program Design: Program participants receive in-home energy monitoring devices, using the Tendril™ platform, which displays energy usage information and suggestions for saving energy, both in-home and on a personalized program website. Participation is based on (a) opt-in, and (b) household qualification – interested participants apply and must be selected by CLC for program treatment. A comparison group comprised of waitlisted participants will serve as a quasi-control group.

Savings Goals: TBD

4. METHODOLOGY

We designed this evaluation to answer the Researchable Issues listed above. We conducted six primary evaluation tasks to address these issues:

1. Upfront research to inform research design and process evaluation efforts;
2. Annual survey research among participants and non-participants to determine actions taken, and compare actions and behaviors between participants and non-participants;
3. Baseline panel survey research among WMECO participants prior to program exposure, to establish baseline actions and attitudes (to be analyzed in 2011 after post-survey results);
4. In-home observations to assess the influences on behavior and attribution to the program;
5. Billing analysis of program savings to determine program energy impacts;
6. Channeling analysis to determine the effect of the program on other PA program participation, as well as implications for net energy savings estimates.⁹

Below, we provide a brief overview of the methods we used in this evaluation. Volume II of this report contains a detailed methodology for each data collection effort.

4.1 Upfront Research

We began the evaluation process by determining the scope of the behavioral program efforts. We collected data necessary for the process and impact evaluation efforts. Tasks included:

- **Interviews with Program Administrators and Implementers:** The Evaluation Team conducted in-depth interviews with 14 program administrators and implementers in 2010 to determine: (1) key actors in program design and implementation; (2) program theory and market intervention tactics; (3) program timing and anticipated reach; (4) program integration and/or channeling to rebate programs; and (5) internal evaluation, measurement and verification efforts, including pilot and program impact analysis.
- **Data Review and Secondary Research:** Opinion Dynamics conducted a thorough review of program-related data, marketing and outreach materials, and existing primary and secondary research data, to gain more knowledge of program efforts and to inform program process, effects, and impact analysis. Specifically, we reviewed: (1) program implementation plans and three-year filings; (2) formative research conducted to inform program design; (3) customer marketing, education, and outreach materials; and (4) internal and/or third-party evaluation and impact

⁹ Channeling refers to the analysis of participants in behavioral programs who have also participated in other PA programs, either through behavioral program promotion or other drivers.

assessments. This review is ongoing, and incorporates new program planning, implementation, and evaluation information as it becomes available.

4.2 Survey Research

4.2.1 National Grid HER Post-Program Survey

Opinion Dynamics conducted a telephone survey among targeted participants and control group members of National Grid's behavioral program. The primary role of annual behavior change survey research was: (1) to determine what actions participants report taking as compared to control groups; (2) to determine the proportion of actions that are reported to be equipment-based versus conservation behavior-based; and (3) to assess specifically which behaviors are contributing to program savings.

We designed the survey to allow comparisons between participant and control group members, regarding reported actions and behaviors taken in the year following first exposure to the behavioral program. Key questions included:

- Energy efficiency and conservation behaviors, including:
 - High-cost actions (such as appliances or envelope measures)
 - Low-cost actions (such as installing CFLs, SmartStrips)
 - No-cost actions (such as unplugging appliances, turning off lights)
 - Equipment maintenance and upkeep (such as HVAC tune ups)
 - Participation in rebate or other, non-behavioral programs (including audits)
- Demographic and household characteristics
- Engagement with Home Energy Report (if participant)

The survey was designed to understand differences in energy efficiency and conservation behaviors among participants, compared with control group members, based on participant exposure to the Home Energy Report. Therefore the survey screened for recall of the Home Energy Report, to ensure that we spoke with household members who a) were exposed to their report (based on their recall of the report), and b) could provide some feedback related to the report (to ensure completion of process-related questions).

The survey was designed to minimize potential differences in response bias between treatment and control groups, such as differences that may occur if participants become more aware of potential energy saving actions (and hence, have better recall of their actions) than control group members, based on exposure to the HER. For this survey, we first asked all respondents if they had certain equipment in their home and regularly did certain behaviors. Next we asked all respondents if they installed any equipment or changed any behaviors in the past year. Then we asked about many specific actions and behaviors.

Survey Sample Design

Our team surveyed 1,002 National Grid electric and gas pilot customers in November 2010–December 2010. These customers were sampled to obtain equal representation of program pilot participants and their control groups for each fuel type (with a goal of completing 250 interviews per group). Pilot HER participants have been receiving Home Energy Reports since late September 2009, while control group members have never received Home Energy Reports.

Table 3. Sample Frame for 2010 Annual Behavioral Change Survey

	HER Participant n	HER Participant Sample Frame N	Control n	Control Sample Frame N
National Grid - Electric Only Pilot	250	24,853	251	24,754
National Grid - Gas Only Pilot	251	24,997	250	24,876
Total Efforts	501	Participant	501	Non-Participant

We randomly selected customers from OPOWER participant lists for the telephone survey effort, and offered a \$10 gift card as incentive for completing the survey. After the first 800 survey respondents (200 in each of the four groups, defined above) we set age quotas on the sample. We did this to ensure that a) participant and control groups were similar enough in terms of demographic and household characteristics to be able to compare actions and behaviors between groups, and b) survey data align as closely as possible to the expected population. The age quota for the final 200 respondents (50 in each group) was based on the age distribution of the Massachusetts householders’ population (plus or minus 10% in each age group).¹⁰

We conducted surveys for the first 800 respondents without any kind of quota. This allowed us to compare profiles of participants and control group members within the underlying pilot program population, to verify that the underlying groups were, in fact, similar in terms of demographic and housing characteristics. Section 1 of Volume II compares HER participant and control characteristics.

4.2.2 WMECO Baseline of Behavior Change Survey

We also conducted the behavior change survey described above as a baseline survey for participants in the WMECO Western Mass Saves program in November 2010. We will include analysis of the WMECO survey effort in the PY2 report, after post-program findings are available. Volume II contains methods and baseline results.

¹⁰ Source: US Census American Community Survey data from 2005-2009, age of householders of owner-occupied homes. The Massachusetts homeowner population was chosen because the behavioral program targets high energy use, single-family owner-occupied homes. The majority of the first 800 survey respondents were homeowners.

4.3 In-Home Ethnography

Opinion Dynamics conducted a qualitative, in-home study with National Grid HER pilot participants¹¹ to supplement the insights gained through our annual survey efforts. We conducted 11 in-home visits with participants in National Grid's electric pilot program in November 2010. We recruited a random selection of participants by telephone, and screened participants to ensure representation of a range of income levels, lifestyles (e.g., age, children in the home), and housing stock. Our in-home ethnographic interviews explored the following subjects: (1) participants' awareness of the home energy report; (2) responses to the report content; (3) changes in behaviors and intentions that may have occurred as a result of the report; and (4) recommendations for report content and delivery.

4.4 Billing Analysis

Navigant Consulting conducted a billing analysis to assess changes in energy consumption attributable to behavioral programs. We estimated annual electric savings for the National Grid electric-only pilot and annual therm savings for the National Grid gas-only pilot, using a linear fixed effects regression (LFER) analysis to estimate program effects, and customer billing data.¹² LFER analysis provides what is termed a Difference-in-Difference (DID) estimate of program savings, that essentially compares the average change in energy consumption between pre- and post-periods among the participant group to the average change in energy consumption between pre- and post-periods among the non-participant group, to assess what participant consumption would have been absence of the program, i.e., program savings.

We used two separate models to estimate savings attributable to the program – a simple LFER model and an expanded model that includes weather variables. Both models look at each customer's average daily consumption in each billing period as a function of household-specific factors, being in the post-treatment period, and being exposed to program treatment. Both models capture the average effect on energy consumption that is directly attributable to National Grid's HER program. Section 2 of Volume II contains a detailed description of each regression model.

We conducted Program Year 1 billing analysis for two National Grid behavioral program cohorts—the electric-only pilot and gas-only pilot—both of which began in fall 2009. First reports were delivered to households over a period of about one month, corresponding to variability in the dates on which households typically received their energy bills.¹³ Control group members were assigned a dummy first report date that is analogous to the first report dates of treatment group members. This first report date marks the beginning of HER program treatment. The first billing period after the first report date is the first billing period considered as the post-treatment period in billing analysis.

¹¹ Note the WMECO, NSTAR, and CLC in-home efforts will be conducted in 2011.

¹² Savings estimates for the National Grid Electric Expansion cohort will be provided in 2011, when a longer billing history (e.g., full heating and cooling season data) is available for program participants.

¹³ For electric pilot customers, most first report dates fell between September 28-October 7, 2009, and for gas pilot customers, between September 22 and October 8, 2009. Control group members were assigned analogous first report dates to match the distribution of program start dates for HER participants.

We did not include all sample households in statistical analysis. In particular, for the pilot electric-only and pilot gas cohorts, initiated in fall 2009, we restricted analysis to sample households with at least 10 bills after the program start date, to ensure adequacy of energy usage data during heating and cooling seasons. We also restricted analysis to sample households that did not opt out of the program, as of the start of the analysis. The number of households excluded from analysis represents approximately 1.3% of electric pilot accounts and 4.0% of gas pilot accounts available for billing analysis.¹⁴

4.5 Channeling Analysis

The HER behavioral program sometimes promotes other National Grid energy efficiency programs—particularly rebate-based programs—in program materials, and directs customers to National Grid resources to sign up for these programs. If HER program materials are effective, we would expect to see a lift in participation in other National Grid energy efficiency programs among HER participants—i.e., a higher rate of participation among the treatment group, compared to the control. Increased participation in other National Grid energy efficiency programs among HER participants suggests that some portion of savings from other programs may be counted by both the behavioral program (through the billing analysis savings estimate) and other National Grid programs (through deemed savings in their tracking databases). The purpose of channeling analysis is to answer the following two questions:

- Does behavioral program treatment have an incremental effect on participation in other National Grid energy efficiency programs? (**Participation Lift**)
- What portion of savings from behavioral program treatment is double-counted by other National Grid energy efficiency programs? (**Savings Adjustment**)

4.5.1 Participation Lift Analysis

To determine whether behavioral program treatment generates lift in other energy efficiency programs, we calculated whether more treatment than control group members initiated participation in other National Grid energy efficiency programs after the start of the behavioral program. We cross-referenced the databases of the HER behavioral program—both treatment and control groups—with the 2008-2010 databases of other National Grid residential energy efficiency programs available to the customer base targeted by the behavioral program (single-family, standard income Massachusetts residents). Through this database crossing, we determined (1) whether each HER program household participated in any program after the start of the HER program, and (2) the date of first participation in each non-behavioral energy efficiency program. Programs under evaluation include:

- MassSAVE (Electric and Gas)
- ENERGY STAR Appliances (Electric)
- Residential Cooling and Heating Equipment (Electric and Gas)

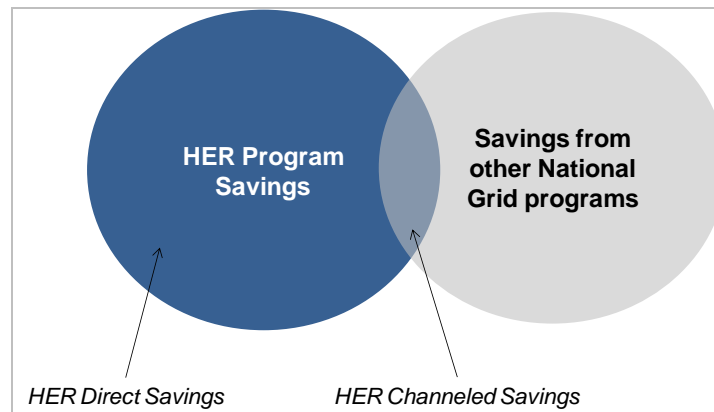
¹⁴ Through September 2010, about 0.48% of electric pilot participants and 0.60% of gas pilot participants had opted out of the HER program.

Across these programs, we calculated a participation rate for the first program year of the HER program, based on the number of accounts that initiated participation in any National Grid energy efficiency program within 365 days of the first HER.^{15,16} This rate captures how many customers engaged a utility program after exposure to the behavioral program. The difference in treatment and control participation rates is participation lift. We also looked at participation rates in the year prior to the behavioral program to ensure that there were no pre-existing differences in program participation rates between treatment and control.

4.5.2 Savings Adjustment

HER participants can save energy directly—through conservation behaviors, or measures installed outside of an energy efficiency program—and indirectly, through measures installed as part of other National Grid energy efficiency programs (channeling). Though indirect savings through other National Grid energy efficiency programs may not have occurred in the absence of the behavioral program (e.g., if the HER induces participation), these savings may be still be counted by other programs. The objective of the savings adjustment component of channeling analysis is to determine what portion of HER net savings, as measured through the billing analysis, are captured in other program databases, and then to adjust HER net savings to reflect only direct savings obtained outside of other PA programs. Figure 1 illustrates our approach to impact evaluation, which considers HER direct and channeled savings.

Figure 1. Home Energy Report Impact Evaluation Approach (Illustrative)



The starting point of savings adjustment analysis is HER program savings detected in billing analysis. Billing analysis models assume that treatment and control are equivalent on all dimensions except behavioral program treatment. However, because treatment and control rates of participation in other energy efficiency programs may not be equivalent (discussed above), it is possible that some portion of HER savings detected in billing analysis is not unique to the HER program. To estimate HER Direct Savings, we first (1) estimate total HER

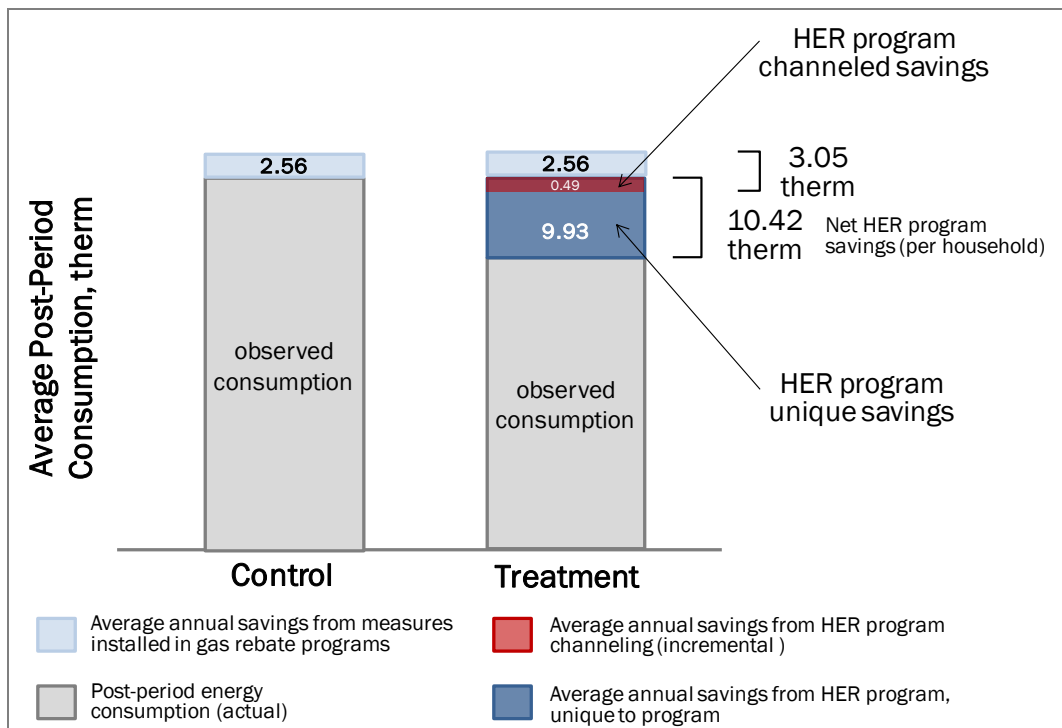
¹⁵ HER control group members were assigned a “first Home Energy Report” date that aligns with the data of HER participants. The distribution of program start dates for each cohort is equivalent between treatment and control.

¹⁶ We used the first audit or installation date of each account that participated in a particular program to determine whether a household *initiated* participated in any program after the first HER.

net program savings from billing analysis, and then (2) estimate HER channeled savings as the difference between savings from other programs achieved by the HER participant group, compared with the control group, to further refine our net savings estimates. We calculated channeled savings from other National Grid energy efficiency programs in the first program year using the following approach (illustrated in Figure 2):

1. Identify deemed net savings from all measures installed by HER accounts 365 days after each account’s first report date within the programs listed above (sum of light blue and red boxes for participants in Figure 2).
2. Adjust annual deemed savings for each measure installation in proportion to number of days per year in which measure has been installed. For example, if the measure was installed 3 months after the first report date, we multiplied annual deemed savings by 75%.¹⁷
3. Calculate average annual savings from other programs as average of sum of savings for each HER account within each program cohort and treatment group (e.g., electric pilot control)
4. Subtract average annual savings among the control group from average annual savings for the HER treatment group, resulting in incremental channeled savings (In Figure 2, 10.42 therm savings from billing analysis, less 0.49 channeled savings, results in 9.93 therms in unique net savings among participants).

Figure 2. Illustration of HER Channeled Savings Adjustment



Note: Figure is for illustrative purposes and is not drawn to scale.

¹⁷ Note these savings were not adjusted or prorated for seasonal measures. The evaluation team assumed equal distribution of savings across the calendar year.

Note the evaluation team did not adjust for upstream lighting programs. Based on our survey research detailed in Volume II, there was no indication that the HER program participants participated in upstream CFL programs (determined by CFL installations) more than the control group. For this reason, the evaluation team did not adjust for upstream program savings.

The result of this database crossing and calculation is an HER channeled savings estimate, which can be subtracted from the estimate of total HER program savings. Note that these channeled savings could be attributed to both the HER and other utility programs, as they would not occur unless both programs were operating, but for accounting purposes, only one program can claim these savings. In Volume II, we explain the empirical basis for this approach in a detailed methodology.

5. KEY FINDINGS

The key findings outlined in this section focus on National Grid’s Home Energy Report programs, specifically the first year of the gas and electric pilot program efforts dating from September 2009-September 2010.¹⁸ Here, we summarize our findings, addressing each of the researchable issues outlined in Section 2.2, 2010 Behavioral Program Evaluation. We present findings in the following order: (1) impact findings; (2) process findings; and (3) implications of findings for other behavioral programs, followed by recommendations. Volume II of this report includes detailed findings by data collection effort.

Note: We refer to the HER behavioral program implemented by OPOWER as “the program” throughout this section.

5.1 Impact Findings

As part of the impact evaluation for this program, the Opinion Dynamics Evaluation Team sought to ascertain the following:

1. What are the annual energy saving impacts of the HER program?
2. Does the HER lead to participation in other National Grid programs?
3. What proportion of observed HER program energy savings are due to participation in other National Grid programs?
4. What are the adjusted net savings of the HER program?
5. What specific actions have participants taken as a result of the HER program?
6. What is the potential persistence of these savings?

Figure 1 illustrates our two-stage approach to impact evaluation, with the goal of estimating net savings of the HER program. Our understanding of the direct actions that generate program savings—and the potential persistence of those savings—is informed by survey research.

5.1.1 What is the Annual Energy Saving Impact of the HER?

Our billing analysis of the first year of the HER program detected statistically significant electric (kWh) and gas (therm) savings generated by electric and gas pilot participants,

¹⁸ The beginning of program treatment – and therefore dates of the first program year – varies by the first report date of the HER program, which varies by account. For electric pilot customers, most first report date fell between Sept. 28-Oct. 7, 2009, and for gas pilot customers, between Sept. 22 and Oct. 8, 2009. Control group members were assigned analogous first report dates to match the duration of the first program year for HER participants. All impact analysis is conducted based on the duration of the first program year for each participant.

respectively.¹⁹ After one year of program implementation, the electric pilot has generated an average of 184.1 kWh annual savings per participant, which represents a 1.61% average savings rate, representing 78.5% of the pilot's first-year savings goal.²⁰ After one year of program implementation, the gas pilot program has achieved 10.42 annual therms savings per participant and a 0.81% average savings rate, representing 77.9% of the pilot's first-year savings goal. Table 4 shows net HER program savings, and adjusted net program savings after accounting for savings through other National Grid programs (discussed below).

Table 4. Total and Net Program Savings for HER Participant Households

Cohort	Electric Pilot	Gas Pilot
Total Treatment Households	24,853	24,994
Net Program Savings		
Average Annual Savings per Household	184.07 kWh	10.42 therm
Total Program Savings, All Households	4,575 MWh	260,437 therm
Lower Bound (90% confidence) ^a	3,930	204,521
Upper Bound (90% confidence)	5,219	316,354
Net Program Savings, Final		
Adjusted Annual Savings per Household ^b	184.07 kWh	9.93 therm
Net Program Savings, All Households	4,575 MWh	248,257 therm
Lower Bound (90% confidence)	3,930	192,341
Upper Bound (90% confidence)	5,219	304,174

^a Confidence interval based on standard error of average annual savings estimate, reported in Table 7 and Table 11 of Volume II.

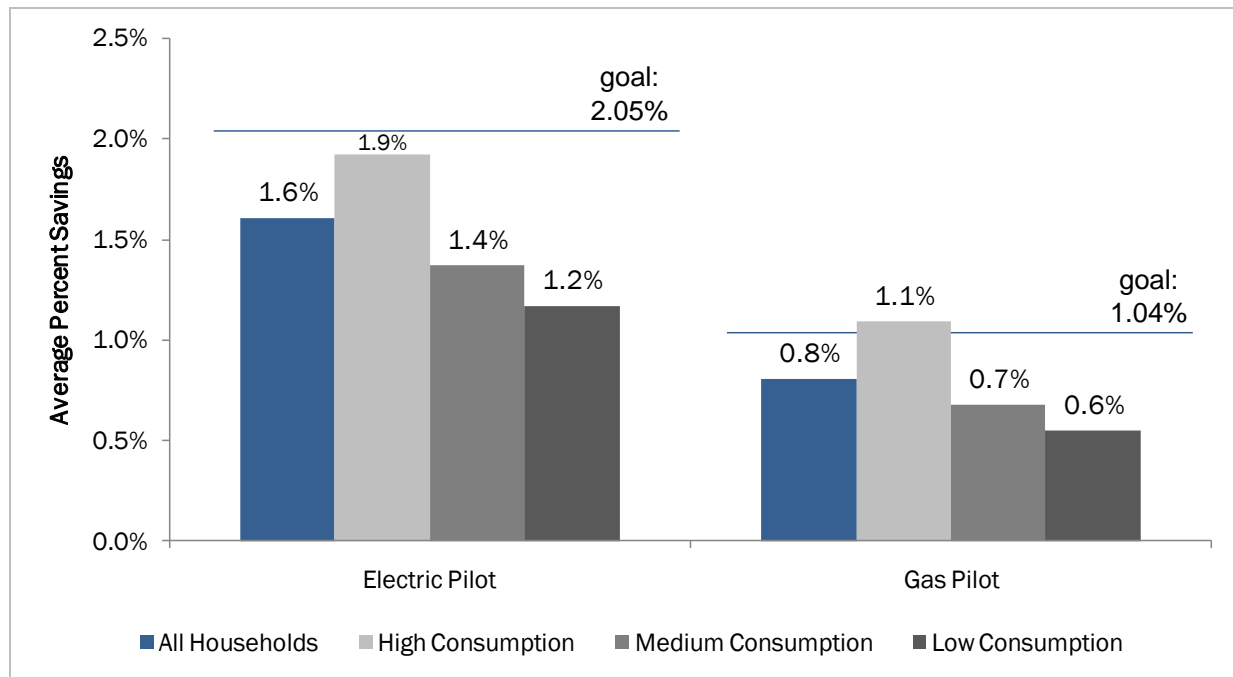
^b Program savings are not adjusted for the electric pilot because there was no significant difference in savings from National Grid programs between the HER participant and control groups of the electric pilot.

Figure 3 shows HER program savings estimates for all households in each cohort as well as households within three equally sized energy consumption groups based on their energy usage in the year prior to the behavioral program. Participants in the high baseline consumption group saved more energy on a unit and percent basis in the year following program treatment than participants in medium and low baseline consumption groups. Participants in the medium baseline consumption group also save more energy on a unit basis than participants in the low baseline consumption groups (for both electric and gas pilot cohorts).

¹⁹ Please recall that savings estimates are fuel-specific —i.e., electric savings were generated from electric-only National Grid customers in one geographic region, while gas savings were generated from gas-only National Grid customers in another region.

²⁰ Percent savings rate defined as the energy savings (kWh or therm) achieved by the program as a percentage of what energy consumption would have been for treated participants in the absence of the program.

Figure 3. Savings Estimates from Billing Analysis of HER Electric and Gas Pilots



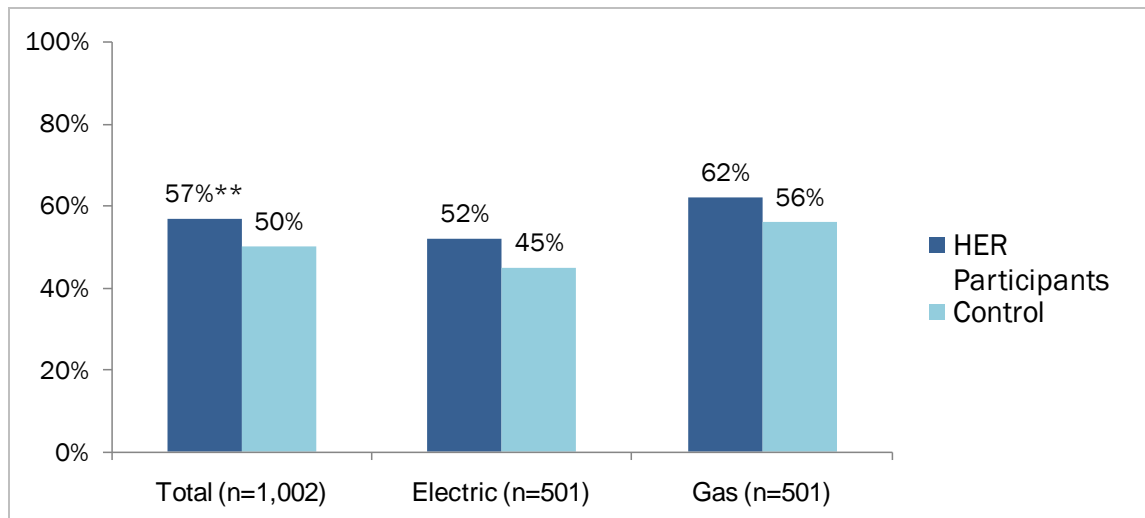
These savings estimates represent overall net program savings for the first year of the HER program—both the unique and channeled savings attributable to the HER program. As discussed above, to reach final net savings we must also consider incremental channeled savings, which could be counted by other National Grid programs. Next, we investigate the extent to which the HER program has increased participation in other National Grid programs, above the control group, and the potential energy savings that are likely due to the joint efforts of these programs.

5.1.2 Does the HER Lead to Participation in Other National Grid Programs?

Our research indicates that the HER program is obtaining the great majority of their energy savings through direct action outside of National Grid program participation. While awareness is higher among National Grid's pilot participants compared with the control group, (57% of electric and gas participants (combined) aware, compared with 50% of the electric and gas control group (combined)), this awareness is not translating into significant uptake in program participation.²¹

²¹ Awareness result is statistically significant at alpha=0.05 in a two-tailed test.

Figure 4. Awareness of National Grid Programs



** Significantly higher than other treatment group at 95% confidence level

^ Significantly higher than other treatment group at 90% confidence level

Further, of those who were aware of the HER program, our research found that participants are not seeking out rebates for the actions they are taking. As indicated in the table below, our survey found that HER participants are taking more rebate-eligible actions as a result of the program, but are not actually seeking out rebates for those products at a higher rate. These findings indicate that the savings obtained through rebate programs are primarily direct savings not already counted through other programs.

Table 5. Rebates for Energy Efficient Measures

	National Grid (Electric)		National Grid (Gas)		National Grid (All Fuel)		WMECO Base-line
	Part.	Cntl.	Part.	Cntl.	Part.	Cntl.	
Purchased any rebate-eligible item (as % of total n)	45.4%**	34.4%	36.8%**	27.9%	41.1%**	31.1%	32.9%
Used rebate (as % of people with at least one eligible purchase)	29.8%	33.7%	34.8%	28.6%	32.0%	31.4%	24.5%
Total n	250	251	251	250	501	501	334

Note: Please refer to questions PE9a-PE9t in Appendix A of Volume II for the rebate-eligible items.

** Significantly higher than other treatment group at 95% confidence level.

^ Significantly higher than other treatment group at 90% confidence level.

This finding is backed by our channeling analysis findings. Our research suggests that, despite higher program awareness among participants, exposure to the HER program is translating into small increases in National Grid program participation among HER recipients, when compared against the control group. As shown in Table 6, the HER report is producing a small increase in National Grid program participation (.35% increase above control in participation among the electric pilot and .64% among the gas pilot participations).

Table 6. National Grid Program Participation among HER Participants and Control Group

Cohort	Electric Pilot		Gas Pilot	
	Control	Treatment	Control	Treatment
Group size (n)	24,752	24,853	24,876	24,994
Before Behavioral Program				
Participants in other EE programs ^a	467	457	796	766
Participation Rate	1.89%	1.84%	3.20%	3.06%
Difference in Participation Rate	-0.05%		-0.14%	
p-value of difference	0.693		0.386	
After Behavioral Program (PY1)				
Participants in other EE programs	956	1,048	798	962
Participation Rate	3.86%	4.22%**	3.21%	3.85%**
Difference in Participation Rate	0.35%**		0.64%**	
p-value of difference	0.045		0.0001	

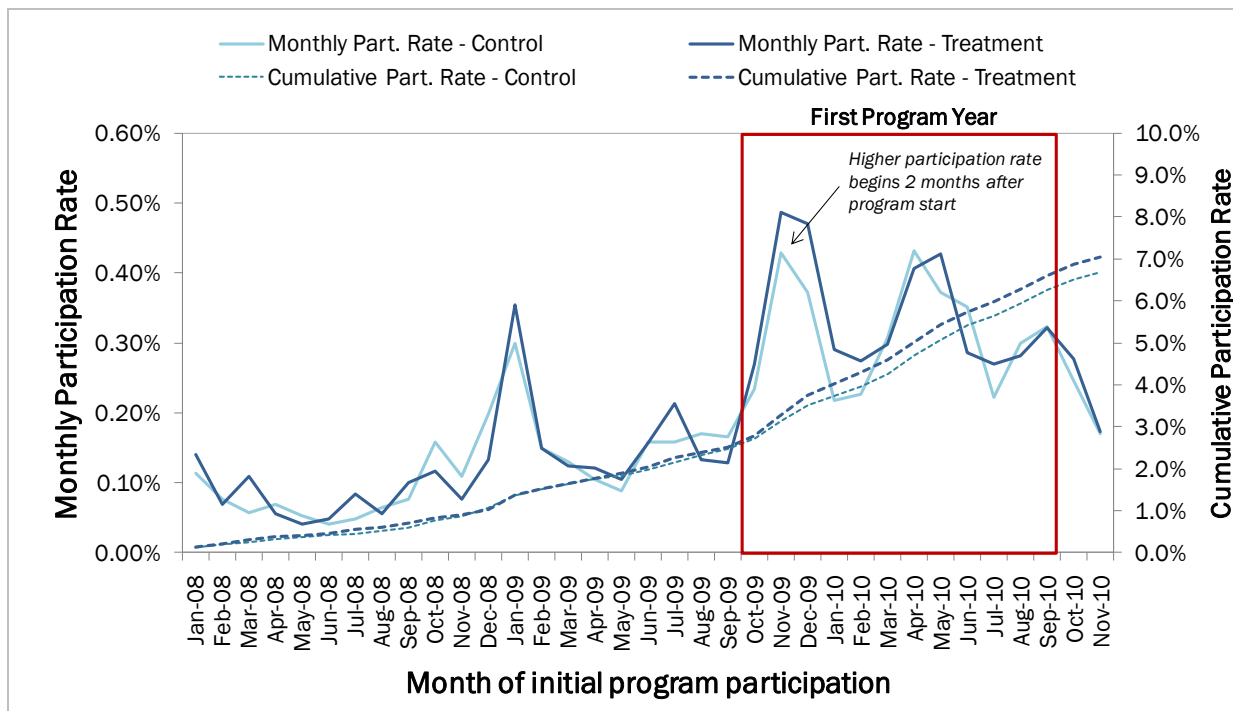
^a Participation in other EE programs specific to fuel type – i.e., for the electric pilot, this is the number that initiated participation in any electric EE program during the analysis period.

** Significantly higher than other treatment group at 95% confidence level

^ Significantly higher than other treatment group at 90% confidence level

When we examine program participation trends, our research suggest that the measurable (albeit small) lift in program participation may be occurring as early as month one or two of initial behavioral program participation, as shown in Figure 5 and Figure 6. This data indicates that the two months after exposure may be the best time to promote the program.

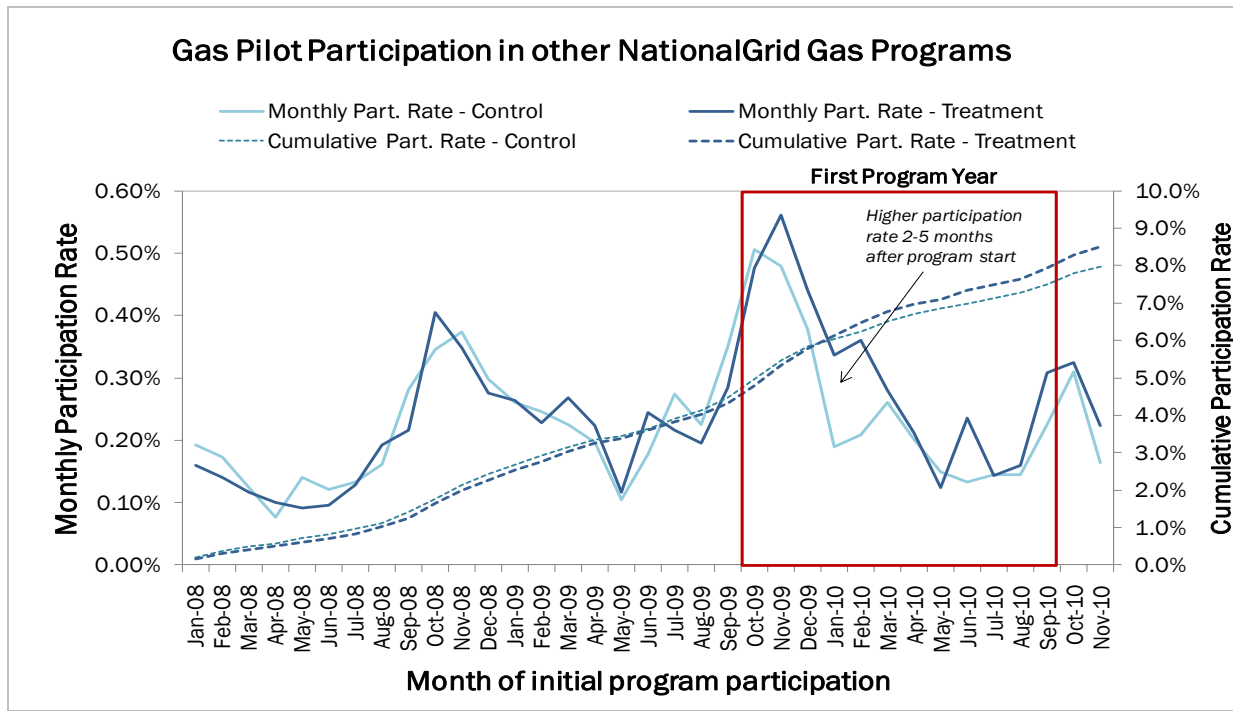
Figure 5. Trended Electric Program Participation Rate for Electric Pilot Cohort^a



^a Monthly participation rate captures the number of household that *first* initiated participation in a National

Grid energy efficiency program in that month. A participating household is only counted once – in the month that they initiated participation in any of the programs under evaluation. The cumulative participation rate captures the proportion of households who had initiated participation in any program on or before that month.

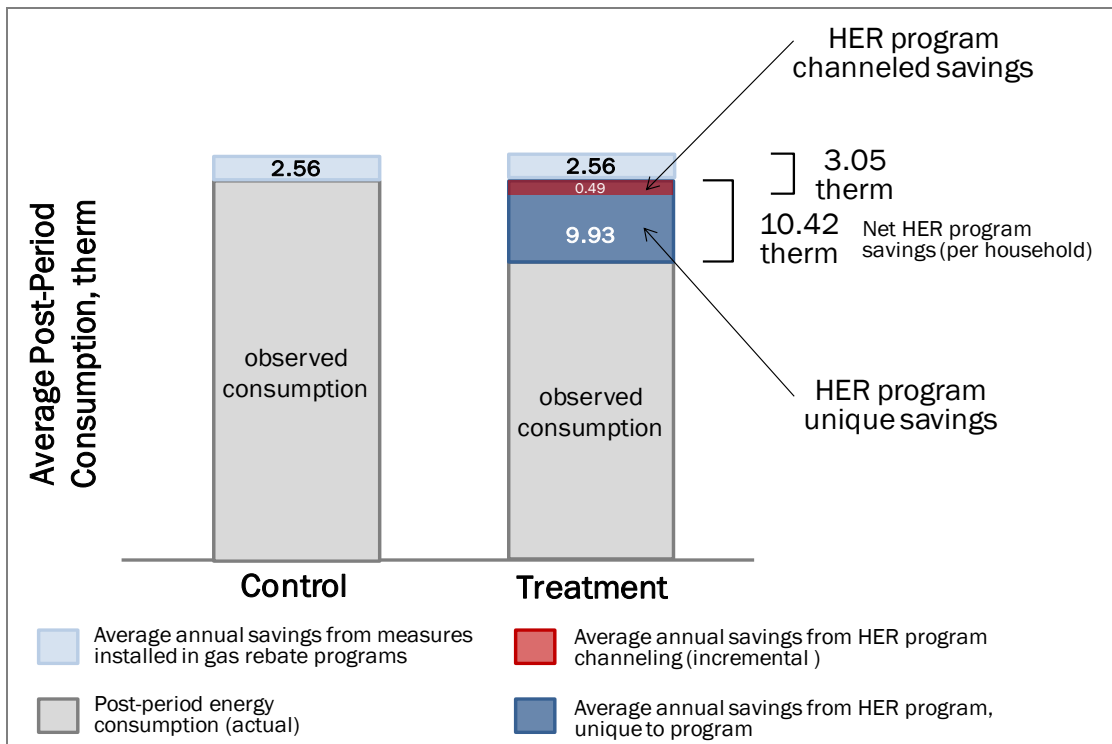
Figure 6. Trended Gas Program Participation Rate for Gas Pilot Cohort



5.1.3 What Savings from Observed HER Energy Savings Were Already Accounted for in Other National Grid Programs?

The Evaluation Team assessed the proportion of savings that may be double counted in other programs. Through our analysis, we found statistically significant differences in PY1 savings from measures installed in other National Grid programs among gas pilot participants. The average PY1 treatment group savings from program channeling are 0.49 therms per household higher than the control group (19% difference; statistically significant at 95% confidence level). While our research detected a net positive difference in PY1 savings in the electric cohort, these incremental savings were not statistically significant.

Figure 7. HER Savings Adjustment Approach



Note: Figure is for illustrative purposes and is not drawn to scale.

It is important to note here that the statistical significance of incremental participation findings and channeled savings findings do not align perfectly, despite consistent directional findings within each pilot cohort. There are a few potential reasons why we do not expect participation rates and savings from program channeling to align perfectly, such as: (1) program mix; (2) measure mix (energy intensity of installed measures within a program); (3) timing of measure installation (recall that savings are adjusted based on number of days each measure installed); (4) fuel-specific program design; (5) program promotion by the HER (or lack thereof); and (6) effects of other non-National Grid programs operating in each cohort's geography during the pilot.

The HER may also be having an effect on the mix of programs its participants are participating in. We find evidence for a slightly different program mix among treatment and control groups, with significantly more HER participants within each cohort participating in the MassSave home assessment program. Conversion to follow-up measure installation at different rates between groups could lead to differences in associated savings (explored in Table 20 of Volume II). In addition, there is evidence of a different measure installation pattern among gas pilot customers, potentially related to program mix or measure installation timing. It is also possible that external factors like other PA programs could influence one cohort – or even one treatment group – more than another, due to interaction between the HER and external marketing messages. We discuss these issues in Section 3.4 of Volume II.

**Table 7. Channeled Savings Summary for Households with Channeled Savings
(Measures installed in PY1)**

Cohort	Control	Treatment
Electric Pilot (kWh)		
Average annual savings from program channeling	26.89 kWh	27.96 kWh
Households with any measures installed in PY1 (%) ^a	3.77%	3.96%
Savings per household (Among households with PY1 measure installations)	713.3 kWh	706.9 kWh
Gas Pilot (Therm)		
Average annual savings from program channeling	2.56 therm	3.05 therm**
Households with any measures installed in PY1 (%) ^a	2.46%	2.66%
Savings per household (Among households with PY1 measure installations)	103.1 therm	114.6 therm**

** Significantly higher than other treatment group at 95% confidence level.

^ Significantly higher than other treatment group at 90% confidence level. No statistically significant difference between treatment and control unless marked.

^a Note that this proportion is not a participation rate—it is the proportion of households that installed a measure with a positive deemed savings value (i.e., not an audit or screening visit) within 365 days of the first report date, regardless of when the household initiated participation in the associated energy efficiency program.

It is important to note that billing and channeling analysis did not examine savings across fuel types – that is, we did not determine whether electric program participants achieved therm savings, or whether gas program participants achieved electric savings. Future billing analysis could examine these questions, to determine whether the effects of the HER reach beyond fuel-specific marketing (e.g., by increasing general knowledge and motivation to take energy-saving actions).

5.1.4 What Are the Adjusted Net Savings of the HER Program?

Drawing on our channeling analysis, the evaluation team estimated the adjusted net savings for the HER program to avoid double counting with other programs. For this effort, we removed those savings that are potentially double counted by other statewide programs. While these savings are likely due to the combined market presence of the HER and other programs, the program teams need to determine the best place to “count” these incremental savings. To remain conservative on our savings estimates, we present the adjusted net savings to avoid double counting (realized savings from the billing analysis minus the savings obtained through channeling to other National Grid programs).

- For the gas-only pilot, average net annual savings per household for the first program year are 9.93 therms, and the net savings percentage is 0.77% of average annual therm usage.
- For the electric-only pilot, our savings from other programs were not statistically significant, and therefore we have not reduced the savings estimates.

Future evaluation efforts will incorporate participation findings and savings estimates from other statewide programs into the billing analysis to provide additional insight into the interaction effects of cross-program participation on incremental savings.

5.1.5 What Specific Actions Have Participants Taken as a Result of the HER?

The evaluation team measured the specific actions taken as a result of the HER program through customer surveys to determine the type and measure life of the energy savings generated through the program. Because our findings are based on self-reported data, these findings are considered preliminary insights in the behavioral drivers to savings and will be further examined for the National Grid expansion program as well as in other territories.

As demonstrated in previous sections, the great majority of the program savings have been generated through direct action. The Evaluation Team surveyed both electric and gas program participants to assess increases in energy saving actions among HER participants compared to the control group. Participant self-report data findings indicates that the HER program may be generating a larger proportion of direct savings through energy efficiency actions rather than conservation behaviors. Table 8 shows the percentage of each treatment group that reported installing high-efficiency measures, or started or increased conservation behaviors, in the first year of the HER program. These measure and behavior composites are calculated as the number of households that reported taking any actions within the group of actions (composite), as a percentage of households that were “eligible” to take any action in the measure group (based on installed equipment).

Table 8. Measure and Behavior Composites of Energy Saving Actions Taken by HER Participant and Control Groups (At least 1 of each group)^{a,b}

Measure Group	National Grid (Electric)		National Grid (Gas)		National Grid (All Fuels)		WMECO Baseline
	% Part. ^c	% Cntl. ^c	% Part.	% Cntl.	% Part.	% Cntl.	
High-Efficiency Measures ^a							
Heating / Cooling	11.9%	8.6%	8.6%	8.1%	10.2%	8.4%	10.5%
Appliances	28.2	22.8	21.5	16.8	24.8[^]	19.8	19.9
Consumer Electronics	22.8^{**}	14.0	17.9	13.2	20.4^{**}	13.6	12.3
Light Fixtures	9.3	9.2	10.8[^]	6.5	10.0	7.8	9.4
Building Envelope	18.0^{**}	10.7	13.9^{**}	7.3	16.0^{**}	9.0	13.0
Low-Cost Measures	49.6^{**}	40.6	41.0	37.6	45.3^{**}	39.1	32.3
Behaviors ^b							
Hot water usage	41.2	35.1	39.8	37.6	40.5	36.3	41.9
Lighting	34.0	37.5	39.8	34.8	36.9	36.1	39.5
Consumer electronics	41.2	37.8	45.4	40.4	43.3	39.1	44.6
HVAC maintenance	22.1	26.3	24.4	29.6	23.2	27.9[^]	38.1
Space heating and cooling	27.2	28.7	34.7	31.6	30.9	30.1	35.9
Refrigerator maintenance	20.0	19.1	21.3	23.6	20.7	21.4	38.0
Home Energy Audit							
Home Energy Audit	3.7	4.9	8.2	7.3	5.9	6.1	6.7

^a Measure composite metric: Percentage of respondents who purchased or installed at least one energy efficient item in measure group in past year (as % of eligible base). Note that this metric does not imply positive

net savings from these measures, as some could be additional units. Items in high-efficiency measure groups are described in Tables 24 and 25 of Volume II.

^b Behavior composite metric: Percentage of respondents who started or increased at least one of items in behavior group in past year (as % of eligible base). Items in behavior composite groups are described in Table 21 of Volume II.

^c Part. are behavioral program Participants who receives HER and Cntl. are control group members

** Significantly higher than other treatment group at 95% confidence level

^ Significantly higher than other treatment group at 90% confidence level

National Grid HER participants reported purchasing or installing more high-efficiency equipment in the past year, compared to the control group (top half of Table 8). Electric pilot participants were more likely than control group members to report installing at least one measure in the following measure groups:

- High-efficiency consumer electronics (e.g., ENERGY STAR television)
- Building envelope measures (e.g., insulation, energy-efficient or storm windows)
- Low-cost measures (e.g., weather stripping)

Gas pilot participants were more likely than control group members to report installing at least one measure in these measure groups:

- Building envelope measures
- Light fixtures (indoor and outdoor)

Notably, most of these actions do not appear to be taken through National Grid programs. Referencing Table 5, the data show that of those rebate eligible products, the participant group is not reporting rebate seeking behavior in a greater rate than the control group. This suggests that most measure-related savings obtained through the HER program occurred outside of National Grid's programs.

In addition, HER participants did not self report an overall change in conservation behaviors that surpassed the control group, with the exception of two actions when both fuel types were combined (putting computers to sleep when not in use and turning off lights when leaving a room, see Section 3 in Volume II for more detail). When we examine these behaviors as composites, we see no statistically significant changes above the control group among HER participants and our data indicates that they were no more likely to start or increase energy-saving behaviors in the past year compared with the control group (bottom half of Table 8).²² When we examine differences by unique behaviors (as opposed to composites) we see some differences between the self-report of participant and control groups, but these differences do not show a clear trend in favor of the program – i.e., the

²² It is important to note that participant and control groups are changing their conservation behaviors – for example, 36-37% of all NGRID behavioral change survey respondents either started to take at least one lighting-related energy conservation actions in the past year, or increased the frequency with which they took at least one lighting-related energy conservation action. Across most groups of daily and periodic energy-saving behaviors, a similar percentage (20-40%) of all customers started or increased at least one behavior in the past year, indicating a general shift in knowledge of potential energy efficiency behaviors, which could be the result of the behavioral program, other PA interventions, general media, energy prices, or other market factors. However, there was no significant difference between the participant and control groups for these changes.

control group was slightly more likely to change some conservation behaviors than the treatment group, but for some other behaviors, the reverse was true.

Notably, the evaluation team was unable to obtain data on which tips the program gave to participant groups, to verify whether these differences between participant and control groups are directly linked to program recommendations, or whether they represent a broader effect of the program. Such analysis would be insightful to determine if the program's tips are directional in their effect (e.g. directing participants towards one action vs. another) or broadly motivational (e.g. prompting participants to take some form of energy saving action, whether or not the program directly promoted it).

5.1.6 What Is the Potential Measure Life of the HER Program?

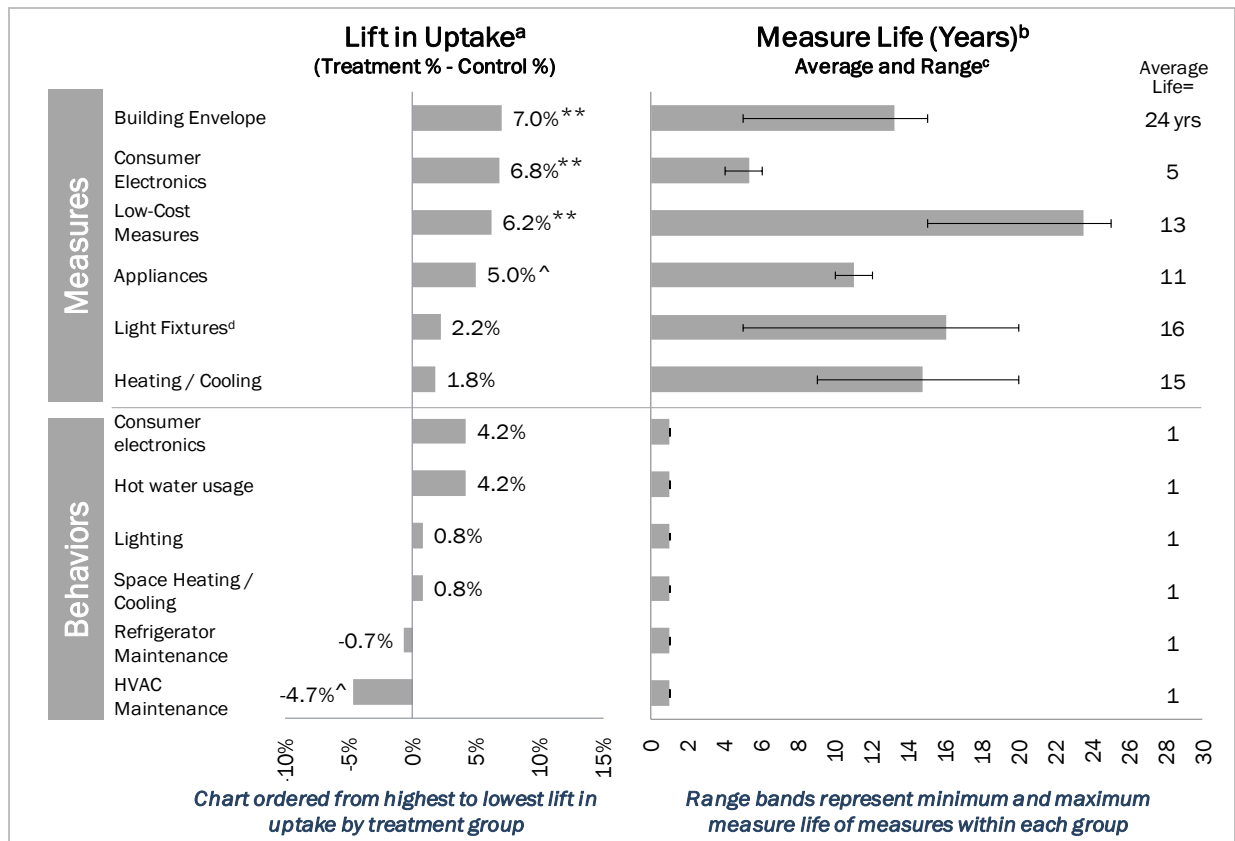
Our survey data indicates that direct HER program savings may be driven by a greater proportion of measure installations than originally thought. This finding has important implications for estimating the effective useful life of the HER program and thus may affect persistence estimates. These self-reported findings will be explored in greater detail in future studies, but here we offer preliminary insight into the potential measure life of the program.

Currently, Massachusetts estimates HER program persistence for one program year as one year (e.g., measure life of one year).²³ However, our data on actions taken indicate that the persistence of HER program savings in Massachusetts may be longer, given evidence of a greater mix of measure installations driving program savings. While this data is preliminary, it suggests that the HER program savings may persist longer than initially considered. Below we provide a range of persistence values from the Massachusetts TRM for actions that were shown to be different between the treatment and control groups (Figure 8).²⁴

²³ Source: 2011 Massachusetts Technical Reference Manual, Residential Energy Efficiency Measures

²⁴ It is important to note that these actions are stated in terms of lift and, when factored as net positive changes (savings due to replacements net of additional installations in the home, or positive behavior changes net of decreases in conservation behaviors), the savings estimates per measure are likely to be smaller.

Figure 8. Illustration of Potential Measure Life Range of HER Actions



^a Source: Measure and behavior composites of energy saving actions taken by HER participant and control groups (Table 8).

^b Source: Massachusetts Technical Reference manual for Residential Electric Efficiency Measures (Effective Date 1/1/2011) – Estimate of average, minimum and maximum for each measure group based on measures within measure group. Note that measure life calculations weight by relative uptake of measures by control group, and do not attempt to account for savings.

^c Range bands represent minimum and maximum measure life of measures within each group

^d Note that “Light Fixtures” group excludes CFLs, which are in Low-Cost Measures group

** Significantly higher than other treatment group at 95% confidence level

^ Significantly higher than other treatment group at 90% confidence level

The measure life of the program may range from one year to 20+ years for a given household, depending on the actions taken. The effect of measure installations on the savings persistence of the program has yet to be determined and requires additional research. Our evaluation team will further examine these questions of persistence in our 2011 final program evaluations, where we will examine the persistence of the HER pilot cohort over time, as well as savings trends among HER expansion cohorts. The per-unit savings contribution of incremental measure installations should also be considered when assessing the persistence of program savings.

5.1.7 Can National Grid HER Program Savings Be Used as a Proxy for Savings Potential in Other Markets?

Our preliminary data suggest that the savings potential through the HER program in National Grid's territory may be specific to the market conditions in which the program is implemented and the pre-treatment characteristics of participants. Program goals that were based on other utility territories have not yet been achieved in pilot cohorts, despite analogous targeting criteria. Between the two PA customer groups we have surveyed (WMECO and NGRID survey respondents), there are many differences in measure installation and behavior, likely due to a different participant profile (shown in Volume II), different baseline consumption, and different exposure to energy efficiency messages among customer groups (due to PA-specific efforts). These customer differences, combined with differences in behavioral program design, suggest that there will likely be differences in energy savings. This makes the magnitude and direction of differences difficult to predict. Even between National Grid electric cohorts, who were targeted on fairly similar geographic and usage criteria, and who can participate in identical PA programs, we see preliminary evidence for differences in program participation and channeled savings in the pilot cohort compared with the expansion.²⁵

For these reasons, it is difficult to extrapolate results between different customer groups, despite similar targeting criteria. We suggest that the savings gained through this specific program should likely not be used to predict the impact of other PA programs, or other cohorts of customers. Behavioral program savings should continue to rely on verified, ex-post savings estimates rather than ex-ante savings estimates.

The 2012 cross-cutting analysis will allow us to consider additional factors that may affect behavioral program savings in Massachusetts, such as cohort effects (e.g., region, timing), market effects (e.g., statewide marketing messaging), program targeting (e.g., usage), or program design (e.g., delivery methods).

5.2 Process Findings

Our process evaluation of the National Grid HER program focused on the following overarching research question:

1. What are participants' initial reactions to the HER?
2. How is the HER raising awareness?
3. How can the HER Program be improved to generate more savings?

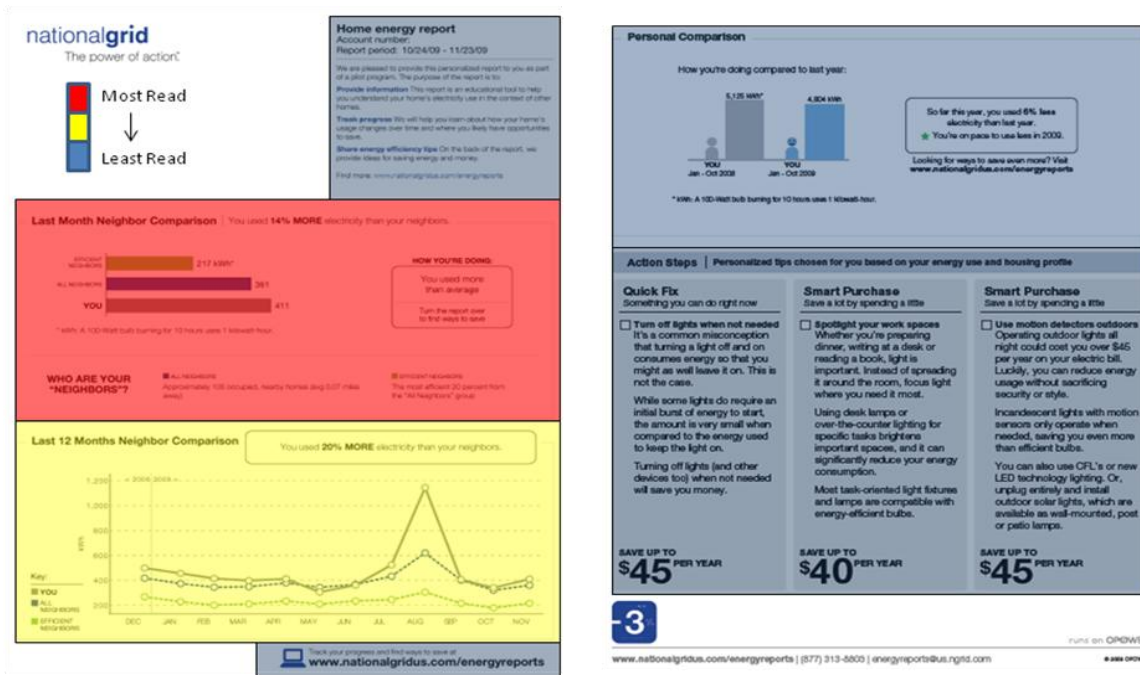
We based process findings in this section on a synthesis of survey findings, ethnographic research, and interpretation of impact findings. As such, some findings are qualitative in nature. Section 5 of Volume II contains more detailed information.

²⁵ Note that OPOWER draws on algorithms to identify and target participants for the program, based on their likelihood to generate savings due to HER exposure.

5.2.1 What Are Participants' Initial Reactions to the HER?

Our interviews with participants indicate that most HER participants recall the report and read at least some of the report when they receive it. However, our ethnographic research suggests that participants' attention to the detail of the report is relatively low, as they focus their attention primarily on the Neighbor Comparisons and the front side of the report. Notably, they lightly review the information on the back of the report, which includes the Personal Comparison and Action Steps sections. This finding is important to note, given this is the site where participants receive energy savings tips and information. Figure 9 qualitatively illustrates where customers focus their attention.

Figure 9. National Grid HER Heat Map



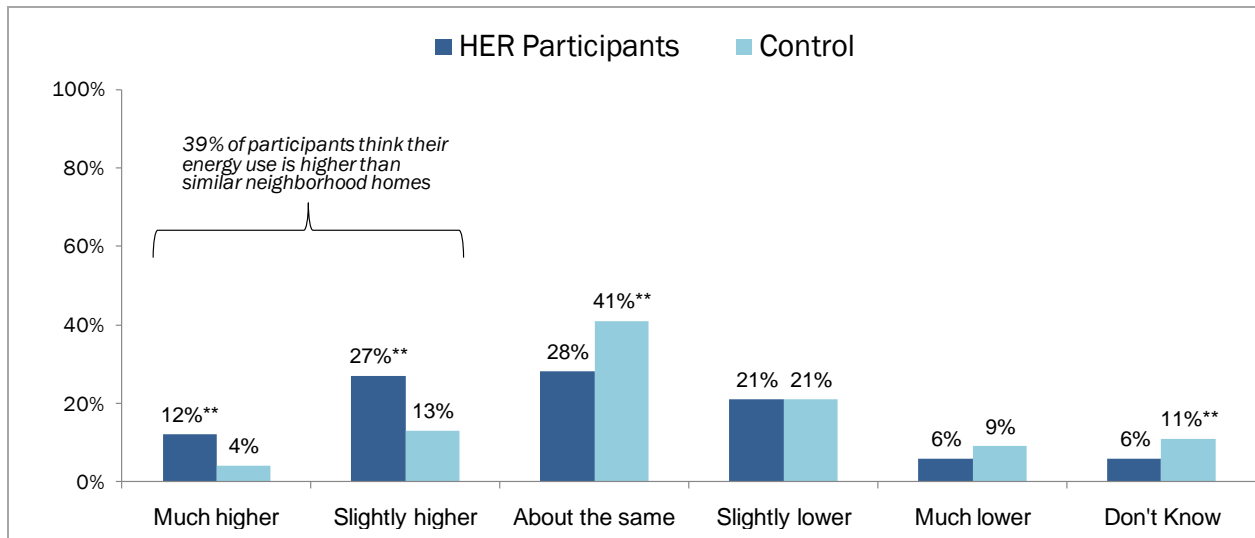
Our ethnographic research also suggests that participants can have widely varied emotional and behavioral responses to the report. Specifically, the report does evoke a sense of competitiveness among participants toward their neighbors; however, depending on where they are relative to their neighbors, the emotional response can be negative and distrustful of the data, or positive and self-congratulatory. Our research did not detect a clear trend that suggests whether participants' initial emotional response had an effect on their willingness or desire to change their behaviors.

5.2.2 How Is the HER Raising Awareness?

Through our evaluation efforts, we found that the HER has raised participants' awareness in two primary ways. The HER has: (1) increased awareness of participant's energy use relative to their neighbors and (2) increased awareness of National Grid programs among the participant group. In particular, the Neighbor Comparisons is very effective at raising customers' awareness of their home energy consumption. Compared to the control group,

participants who receive the HER report are more likely to classify their household energy use as higher than their neighbors and less frequently report that they “don’t know” how they compare to their neighbors (Figure 10). The HER is also having an effect on PA program awareness, with more program participants aware of utility-sponsored energy efficiency programs than control group members (Figure 4).

Figure 10. Perception of Household Energy Use Compared with Neighbors



** Significantly higher than other treatment group at 95% confidence level

^ Significantly higher than other treatment group at 90% confidence level

In addition to raising awareness, the report generates discussion among household members about energy efficiency. Many participants have discussed ways to save energy with their family members (57%) since receiving the report, and some (13%) have discussed the report with neighbors. Specifically, participants are talking to their family members about what contributes to household energy use, and trying to rationalize energy consumption relative to neighbors.

A small proportion of participants take steps to engage with behavioral program information in other communication channels. For example, OPOWER’s own web statistics indicate that just 1% of all treated participants used the website, which includes all individuals exposed to the program. Our data indicates that 10% of participants who recall the HER report visited the National Grid Home Energy Report website (the URL listed on the report), while only 5% called the phone number/emailed the address listed on the report.

In-Home Ethnography participants were similarly unlikely to visit the online platform. Many explained that they did not notice a link to the website, likely due to the placement of the website in the fine print of the report. It is important to note that both In-Home Ethnography Respondents and Behavior Change Survey Respondents (29%) expressed interest in visiting an online platform with more detailed usage information, but few may notice this program feature due to its lack of prominence in the report.

While our data indicates that the program is having an effect on the actions of participants, we found that participants do not necessarily see a direct link between the behavioral

program and their energy efficiency knowledge or actions. During in-home ethnographic research, most participants could not *attribute* specific behavior changes to the HER, and claimed often that they did not pay much attention to the report, as demonstrated in Figure 9 above. From these findings, we believe that the influence of the program may occur at a higher or more subtle level than promoting direct purchase, installation and behavioral decisions. This aligns with program's social norming theory, and with similar marketing and outreach efforts evaluated in other jurisdictions. It is important to note here that we did not explicitly evaluate the success of the norming approach in this study. Thus, the effect could be due to the influence of social norms or the general awareness-raising effects of the report, or both.

5.2.3 How Can the HER Program Be Improved to Generate More Savings?

The HER program is currently in the expansion phase. Many of the recommendations and process findings developed for the pilot program have been incorporated into changes to the program design. In addition, the program has already expanded to 450,000 customers. Thus this section is aimed at increasing the depth of savings among existing participant households.

Based on our in-depth interviews and surveys with participants, our data suggest two primary ways for HER programs to generate deeper savings: (1) by providing positive affirmation; and (2) through optimizing the promotion and placement of opportunities for customers to receive more detailed information, such as the website.

➤ **Customers are interested in more explicit positive reinforcement.**

Our ethnographic research suggests that customers are interested in receiving more explicit information on their improvements month over month. Currently, customers receive modules that demonstrate graphically how they compare to their neighbors, as well as their own household year-over-year. However, participants expressed an interest in positive reinforcement on their own progress, even when their status relative to their neighbors has not changed. Based on our ethnographic interviews, customer desire insight and affirmation geared toward indicating whether they have improved their status versus their neighbors. In this way, they want to be rewarded for the actions they have taken to date.

➤ **Customers want detail that the HER website can provide.**

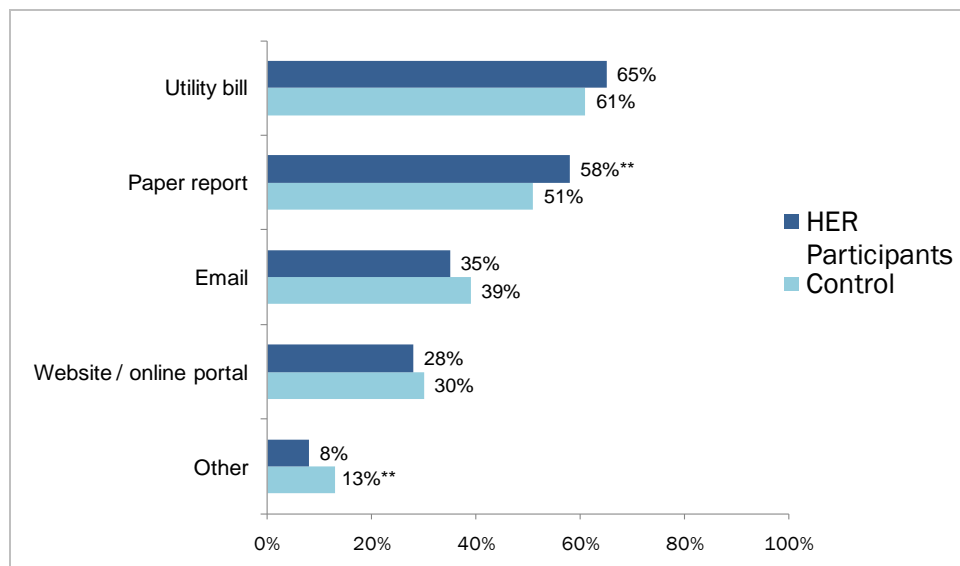
Most customers in our ethnographic research feel that they are “doing everything they can.” With this sentiment, many customers wanted to know explicitly what else they can do in their household-specific tips that went beyond “what we already know.” Customers also expect recommendations to be customized to their specific home and household. Because much of the report's content is already customized to season and customer segment, the program has a few additional considerations that may help to highlight customized aspects of the program. Currently, the HER program offers more detailed information and tips on its website, but our data indicates that this feature is often overlooked. On the site, the HER program offers tools that would meet this need articulated by customers. Thus, providing a stronger link to the HER website and calling out the website's features may help to meet these customer demands. If it is programmatically difficult to deliver accurate, household-

specific energy consumption feedback on the report itself, the website feature may also offer a solution for positive affirmation.

We understand that the program is actively working to better highlight this feature, and that future evaluation efforts will help to determine if these efforts result in enhanced savings.

The mailed report is an appropriate delivery channel. Our data suggest that readership of the Home Energy Report is already high, with over half (63%) of survey respondents (who recalled the program) reading all of the reports. Additionally, the current delivery channel is acceptable to the majority of participants, with 58% listing paper reports as a preferred channel for receiving energy usage information.²⁶ Some participants may also be receptive to information provided through more, or alternative, communication channels. For example, 35% of participant survey respondents would like to receive this information via email, and 28% through a website or online portal.²⁷ To meet these needs, there may be opportunities to promote the HER website through National Grid online billing systems or other web-specific outreach mechanisms that may already be in place. The program team may want to consider additional cross-referencing of the HER program, if these efforts do not affect the experimental design of the program.

Figure 11. Preferred Channels for Receiving Energy Usage Information



** Significantly higher than other treatment group at 95% confidence level

^ Significantly higher than other treatment group at 90% confidence level

These channel preferences do not mean that customers would like to receive the HER itself through alternative channels, but suggest that customers may be receptive to related information through multiple channels. Exploring behavioral program content delivery through additional channels may be an opportunity to increase customer engagement with

²⁶ 58% of participants would like to receive information about energy usage, comparisons, and tips via paper report, as it is currently delivered.

²⁷ Note that this was a multiple response question, so respondents could indicate preference for multiple delivery channels.

the program, and potentially deepen customer savings. Reinforcing usage information, comparisons, and tips for saving energy through multiple channels might be one way to deepen engagement with the program among participants. Notably, current usage of the Home Energy Report website platform is low among survey respondents (10%), compared with the proportion of participants who would like to receive similar information via a website or online portal (28%). The program could consider opportunities to promote the HER website URL on the report itself, as well as opportunities for cross-promoting the URL among participants who use online bill payment (e.g., if a marketing module may be available that could reach only participant accounts).

➤ **Continue customized messaging in HER report.**

The HER program already uses algorithms to determine customer segments and deliver messages customized to particular segments. Since this evaluation does not cover how these segments are determined, or which messages or tips were marketed to each segment, we cannot draw conclusions about how effective customized messaging has been. In support of this method, our research indicates that targeted, customized recommendations for high-cost actions, low-cost actions, or a combination of the two is likely appropriate for the HER participant population, since we observed differences in characteristics of households that took relatively more actions of each type compared with those who took fewer actions.

Our survey research suggests that a number of factors, not limited to baseline energy consumption, may correlate with greater energy savings. In addition to baseline consumption, we found that household composition, demographic and ideological differences may play a role in the likelihood and type of actions taken across National Grid pilot customers (including the control group). This indicates that customers seem to have predispositions to take measure-based or behavioral actions.²⁸

When we examine behaviors, pilot customers who made a relatively high number of behavioral changes have more people in the household (3.1) compared with households who made a low number of behavior changes (2.9). They are also relatively more likely to have children in the household (47% have children under 18 in the household), be younger (54% are between the ages of 35-54), be female, and be non-white. These factors suggest that household composition may play a stronger role in adoption of behavior changes, compared with higher-cost measure installation (see below). These findings align with trends we have seen in segments in other jurisdictions, and point to the importance of targeting in behavioral programs.

The case is different for measures. National Grid pilot customers with high measure uptake (relative to other customers) were significantly more likely to be white, live in a single-family detached home, and describe themselves as liberal or moderate, compared with customers with low measure uptake. There is also a slight difference in the income distribution, with

²⁸ We classified survey respondents as falling above vs. below the median (within their cohort) in terms of (1) measure uptake: the number of high-efficiency measures purchased or installed in the past year (adjusted for household equipment / capacity to install measures); and (2) behavior change: the number of net positive behavior changes made in the past year (adjusted for household equipment/capacity to make changes). Section 3 of Volume II contains detailed methodology and results.

slightly more customers with high measure uptake having income over \$100K. These differences may be related to ability to purchase high-efficiency equipment for the home, as well as awareness of energy saving opportunities (significantly more customers with high measure uptake are aware of National Grid programs). Interestingly, sociodemographic and ideological differences are more marked than standard predictors of energy use, such as household composition, square footage, age of home, and presence of central air conditioning. The tables below summarize these findings.

Table 9. Demographic and Housing Characteristics of Respondents with Low and High Net Positive Behavior Change

		Low Behavior Change	High Behavior Change
Demographics			
Age	under 35	1.6	4.9
	35-54	40.0	53.5**
	55+	58.4	41.7**
Household size	Avg. number of people	2.9	3.1**
Children in household	At least 1 child <18 yrs	36.8	46.9**
Education of respondent	Bachelor's or higher	65.6	61.6
Household Income	under 50K	19.2	18.6
	50-100K	41.4	36.1
	100-200K	31.0	36.5
	200K or higher	8.4	8.8
Gender	Female	51.4	57.6^
Race	White	94.2^	91.2
Housing			
Homeownership	Own	98.4	97.0
Housing type	Single-family detached	94.4	93.2
Home size	Avg. square feet	3,310	3,384
Age of house	Before 1960	55.3	52.1
	1960-1990	33.0	33.2
	1990 or later	11.7	14.7
Central Air Conditioning	Have CAC	34.4	37.9
Pool	Have pool	17.6	19.3
Changes in past year			
Household occupancy	Increase in occupancy	6.6	9.4
	Decrease in occupancy	13.2	13.2
	No change	80.2	77.5
Employment status of people in household	Increase in employment	4.4	5.4
	Decrease in employment	16.8	20.4
	No change	78.8	74.2
Other			
Politics	Liberal or moderate	65.4	68.2
	Conservative	34.6	31.8
Awareness of PA programs to save energy	Percentage aware	52.6	54.8
Total n		500	502

** Statistically significant increase over other group at 95% confidence level

^ Statistically significant increase over other group at 90% confidence level

Note: All figures are percentages, unless denoted as "Avg." (average). Significance testing based on chi-squared test (if more than two categories) or z-test (if two categories; only one shown in table). Additional proportion testing performed for age distribution after finding a significant chi-squared statistic to determine which age categories were different.

Table 10. Demographic and Housing Characteristics of Respondents with Low and High Measure Uptake

		Low Measure Uptake	High Measure Uptake
Demographics			
Age	under 35	3.0	3.5
	35-54	45.3	48.2
	55+	51.7	48.2
Household size	Avg. number of people	2.9	3.1
Children in household	At least 1 child <18 yrs	39.5	44.3
Education of respondent	Bachelor's or higher	62.1	65.2
Household Income	under 50K	21.0	16.8
	50-100K	40.7	36.6
	100-200K	31.2	36.6
	200K or higher	7.1	10.1
Gender	Female	56.8	52.1
Race	White	90.5	95.0**
Housing			
Homeownership	Own	97.1	98.4
Housing type	Single-family detached	92.1	95.5**
Home size	Avg. square feet	3,339	3,355
Age of house	Before 1960	55.5	51.9
	1960-1990	31.5	34.8
	1990 or later	13.1	13.4
Central Air Conditioning	Have CAC	38.5	33.7
Pool	Have pool	18.3	18.7
Changes in past year			
Household occupancy	Increase in occupancy	7.7	8.3
	Decrease in occupancy	14.9	11.4
	No change	77.4	80.3
Employment status of people in household	Increase in employment	4.7	5.1
	Decrease in employment	17.7	19.6
	No change	77.6	75.4
Other			
Politics	Liberal or moderate	64.1	69.6^
	Conservative	35.9^	30.4
Awareness of PA programs to save energy	Percentage aware	50.9	56.6^
Total n		509	493

** Statistically significant increase over other group at 95% confidence level

^ Statistically significant increase over other group at 90% confidence level

Note: All figures are percentages, unless denoted as “Avg.” (average). Significance testing based on chi-squared test (if more than two categories) or z-test (if two categories; only one shown).

There is a relationship between high and low measure uptake and the overall income distribution at a 90% confidence level based on a chi-squared test for joint significance.

The program should continue to test and optimize messaging by segment, or by other characteristics associated with net energy savings. This evaluation adds one more dimension against which behavioral program messaging could be optimized – i.e., household propensity to install measures versus increase conservation behaviors. Household characteristics predictive of savings from each source could be explored in future research.

5.2.4 Are There Insights That Can Be Leveraged to Improve Statewide Programs Overall?

Our ethnographic data suggests that customers generally believe that they are doing everything they can, and when asked directly, have difficulty identifying what actions they can take to further reduce their energy use. Though this report focuses on the National Grid program, some of these general findings may be useful to other PA behavioral programs to address this sentiment. The first year of the HER program has shown us that participants are engaged with normative comparisons, interested in improving their energy status, and interested in feedback and customized recommendations.²⁹

However, customer expectation of positive reinforcement and customized content means that behavioral programs should work to more explicitly provide a link between usage information, home characteristics, and recommendations, in order to enhance the effectiveness of their program efforts. Customer interest in receiving energy usage information in multiple channels represents an opportunity to test whether a cross-channel program delivery approach may engage more customers with behavioral content.

This cross-cutting evaluation provides an opportunity to determine, across multiple program delivery methods and customer groups, whether content delivery across multiple channels can increase program savings through deeper content engagement.

In addition, our analysis of the survey data suggests that behavioral programs may benefit from targeting specific types of actions (measure installations vs. behaviors) to specific types of households. Any effort on the part of programs to segment and target the population based on primary or secondary research has the potential to enhance the program’s effectiveness.

Further, participants, especially those with above-average consumption relative to their neighbors, would like to know why their household uses so much energy, and what their specific household can do to reduce consumption. Behavioral programs should provide tools and content to help customers find customized recommendations, and if these tools are

²⁹ Participants, especially those with above-average consumption, would like to know why their household uses so much energy, and what their specific household can do to reduce consumption.

already available, promote them further. If such changes are implemented, we recommend continuing to monitor the relationship between program savings, program design changes, the relative promotion of conservation behaviors and high-efficiency measures, and the targeting criteria used for each cohort.

5.3 Summary of Key Findings

The value of the multi-year MACC Behavioral Evaluation is that it will provide a cross-program, longitudinal analysis of the impact and savings potential of behavioral programs across the 2010-2012 program years.

5.3.1 Statewide Considerations for Behavioral Program Planning, Policy, and Evaluation

Below, we provide a summary of our overarching findings for the EEAC and the PAs in the development and implementation of behavioral programs. These are preliminary findings gained through the HER report. The results will be explored and verified through additional, forthcoming research.

Planning and Policy

- **The PAs and the EEAC should continue to develop approaches for targeting different household types with different messages through the HER program.** Currently, the HER program has its own proprietary targeting approach. Our data suggests that the programs, overall, may benefit from targeted outreach. Customer demographics and household information may be indicative of the types of actions customers are likely to take. Where possible, programs should develop and/or continue to develop messaging that is more tailored to household types. This can either capitalize on their existing propensity or motivate actions that they may not be taking, which will ultimately optimize savings.
- **The PAs and the EEAC should conduct additional research to determine the effective useful life and persistence estimates for the HER program.** Our preliminary survey data suggests that the HER behavioral program may be generated a larger proportion of savings through direct measure installations outside of the programs, and as a result, the effective useful life of the program may be longer than initially thought. This requires additional investigation. Thus, the PAs and the EEAC should work with the evaluation team to conduct additional research studies to more closely examine these findings, then revisit persistence assumptions for the HER program once the study is completed.
- **The PAs and the EEAC should determine whether the HER and other behavioral programs should aim to channel customers to other rebate and audit programs.** Currently, the programs do, to some extent, cross promote other programs. However the goals for these efforts are not explicit. The programs should determine if and how they want to cross promote.
 - **If cross-program promotion is desired, two-three months after the delivery of the first report may be the most appropriate time to do so.** Our data suggests that the

greatest channeling lift occurs roughly two months into the program. This may be an appropriate point in time to cross promote the programs.

Monitoring and Evaluation

- **Program savings forecasts should be developed based on ex post or market-specific findings from the implementers or evaluation.** Our evaluation found that the HER program savings estimates were less than expected, when estimated based on savings assumptions from other jurisdictions (such as the 2.05% per household savings estimates in Sacramento Municipal Utility District (SMUD) that were used to develop the savings goals for the pilot), The HER program has adjusted its savings estimates since the pilot launch, to accommodate these findings.
- **Continue to employ empirical methods, such as billing analysis using panel data or treatment/control experimental design, to gauge the impact of the report on energy savings, awareness and attitudes.** Given the limited opportunity of participants to self-report on the influence of the report on their energy-saving actions, treatment/control comparison may continue to be useful for evaluating non-energy changes in awareness, knowledge, and motivation to save energy.
- **Continue to incorporate channeling analysis to determine behavioral program impacts.** Our research suggests that verified channeling analysis is necessary for each cohort and each program year as savings through other programs can vary greatly across groups due to market factors. We recommend conducting channeling analysis in other PA territories and among participants of behavioral programs to determine whether behavioral programs drive participants to other programs.
- **Enhance participant surveys to gather information on actions participants and non-participants have taken to save energy.** Participant and non-participant surveys are an essential tool for understanding what behaviors consumers have taken and what measures they have installed. They provide insight into program persistence. Participant surveys are also useful for understanding other “intermediate” actions participants may have taken toward saving energy (e.g., go online, talk to family and friends, call utility, etc).

Note that this evaluation is the first of three major annual deliverables for the MACC Behavioral Program evaluation. The findings provided here represent initial recommendations based on our review of National Grid’s HER program. They should be considered preliminary until the final, longitudinal and comparative evaluation effort is completed.

5.3.2 Relevant Findings Specific to the HER Program

The HER program has made many changes since the implementation of the pilot, based on our ongoing feedback and communication. Here we state the insights we gained through the pilot evaluation, some of which have been incorporated into the expansion program.

Overall, our research suggests that the report is increasing awareness of energy usage and other National Grid programs available to customers, and generating discussion about ways

to save energy. While recipients are highly attentive to neighbor comparisons, engagement with action steps and the HER website was relatively light among pilot participants. To generate deeper savings through the HER program, we have developed the following recommendations:

- **Consider developing ways to provide customers with more household-specific information.** Many interviewed participants noted they are doing everything they could to save energy and are generally unclear as to why, specifically, they rate lower than their neighbors or the top 20%. In addition, many were looking for tips and recommendations that address their unique household needs. For this reason, the program should consider ways to offer customized tips and feedback to participants. In addition, to meet this goal, the HER program should:
 - **More actively promote the website and increase its prominence on the report.** The HER program is currently looking for ways to more actively promote this feature, as it can provide more customized feedback; currently, few customers use these feature and often overlook it.
 - **The HER should aim to provide more explicit, positive affirmations to participants.** Participants indicated that they wanted to have a more explicit understanding of their progress each month. While the program does offer year over year household and neighbor comparisons through various modules, we recommend more explicitly calling out participant’s year-over-year (or seasonal) progress in the form of an affirmation, for example: “Congratulations, you have used less energy this heating season compared with last heating season!”

5.4 Summary of Key Findings

Since the launch of the pilot, the HER program has made a number of enhancements that are worth noting. These enhancements will be formally evaluated in future evaluation activities under our contract. These changes, provided by the program implementation team, are summarized below.

2010 Program Enhancements

- The HER program promoted the Mass Save website by sending an accompanying insert with customers’ reports to integrate with other program efforts
- To realize greater savings for the gas program, the HER program has made the following changes:
 - In October, instead of the standard “Last Month Neighbor Comparison” module on the front of reports, customers instead received a module called “Last Winter Neighbor Comparison”; since October is the first report of the gas season, this module provides additional relevant information to re-introduce the customer to the reports, provide them a seasonal view as a motivator, and prepare them for achieving winter-season savings.
 - In November, customers received a door-hanger with their Home Energy Report that reminded them to turn down their thermostat; follow up surveys at other

programs where door hangers were sent indicate that customers did in fact place them in prominent positions;

- In December, customers received a module on their reports that reminded them to turn down their thermostat. This served as a reminder to the door hanger received in the previous month.
- Electric customers were automatically enrolled in a savings commitment goal of 3% on the OPOWER web platform. The commitment module tracks individual customer progress against a goal of using 3% less energy than the previous 12 months and updates customers of their progress against this goal on each Home Energy Report and on the web portal.
- Customers received holiday-themed, seasonal Tips on their final report for 2010 in an effort to deliver savings tips that are relevant at different times of the year. Providing seasonal messaging is important to continue to engage with customers to motivate them to take action.

2011 Program Enhancements

- Gas customers received new, normative messaging on the outer envelope as a way to entice more customers to open the reports.
- Customers received a dynamic mix of report content that varied report module replacement over time, and OPOWER introduced new modules such as “Neighbor Rank” that displays the customer’s actual neighbor ranking (1 to 100) on the report.
- OPOWER partnered with a national retailer and mailed 50,000 (½ gas and ½ electric) customers a postcard (branded as if it were coming from National Grid), asking them to go online and participate in a brief survey to learn more about their energy efficiency attitudes and interest. There were multiple goals of the survey, including driving energy efficiency awareness, recall of the Home Energy Report, and testing different survey messaging. Recipients who completed the full survey received a \$10 coupon. Full analysis of results is underway.
- The program added additional language on the reports to drive customers to the website to update their home profiles.
- For the 2011 summer, the HER program will be mailing door hangers and easy-to-remove stickers (as inserts in the envelopes) to remind customers to turn up their thermostat during the summer months to 78 degrees, particularly when they leave their homes, to save energy and money.

A. APPENDIX A. BEHAVIORAL PROGRAM DESCRIPTIONS

Below we provide tables describing each of the Massachusetts behavioral programs that have been fielded to date. These summaries include a description of the program, its design and program theory, budget, target population, outreach methods, claimed energy savings, and evaluation approaches.

Table A-1. National Grid Home Energy Report Program

Description	Program Overall			
Implementer	OPOWER			
Program Theory	The program is designed to provide normative comparisons coupled with energy savings recommendations to educate and motivate participants to take energy saving actions and behaviors within their homes.			
Outreach Tactics	Home Energy Reports (direct mail) and Energy Insider Website (Promoted in Home Energy Report)			
Evaluation Tactics	Participant and Control experimental design enables a fixed effects regression to estimate aggregate energy savings.			
Channeling Approach	OPower includes a channeling assumption in savings projections and actuals in 2011 .			
Reporting	Quarterly reports include number of participants and savings based on planned energy savings percent per household and baseline consumption per cohort.			
Program Components	Electric Pilot	Electric Expansions	Gas Pilot	Gas Expansion
Annual budget*	2010: 1,166,038 2011: 2,561,921 2012: 3,405,027		2010: \$531,338 2011: \$2,515,032 2012: \$3,552,025	
Savings planned in filings	2010: 26,000 MWh 2011: 52,018 MWh 2012: 73,028 MWh		2010: 730,000 therms 2011: 2,524,600 therms 2012: 3,668,600 therms	
Date of launch	October 2009–present	February 2010–present	October 2009–present	October 2010–present

Appendix A. Behavioral Program Descriptions

Goals	2.05% savings**	Reduced to 1.91% mid 2010 through 2012 savings**	1.04% gas savings**	1.04% gas savings**
Number of participants	25,000 participants	75,000 participants added in February 2010; 25,000 added in October 2010; another 100,000 added in January 2011	25,000 participants	100,000 added in October 2010; another 100,000 added in January 2011
Target participants	Residential homeowners with high energy use, SF homes, 12 months billing history. Electric pilot territory was chosen to avoid Worcester and Western Mass due to a planned Smart Grid pilot.	Residential homeowners with similar usage to pilot, MF and SF homes, > 3 months billing history. Also includes Western Mass. Still excluding Worcester to limit control group contamination for the Smart Grid pilot.	Residential homeowners with gas heating; single family homes.	Residential homeowners with gas heating; single family homes.
Metrics	Aggregate savings are tracked on a quarterly and yearly basis to provide: Resource Metrics: <ul style="list-style-type: none"> • Normalized Gross Electricity Savings (annual) • Gross Verified Electricity Savings (annual) • Gross Electricity Savings (quarterly) Non-Resource Metrics: <ul style="list-style-type: none"> • Web analytics metrics (site visits, page views, pages/visit, bounce rate, average time on site, % new visits, absolute unique visitors, average page views, technical profile, traffic sources, navigation summary) • Opt-out rates and attrition 	Aggregate savings are tracked on a quarterly and yearly basis to provide: Resource Metrics: <ul style="list-style-type: none"> • Normalized Gross Therm Savings (annual) • Gross Verified Therm Savings (annual) • Gross Therm Savings (quarterly) Non-Resource Metrics: <ul style="list-style-type: none"> • Web analytics metrics (site visits, page views, pages/visit, bounce rate, average time on site, % new visits, absolute unique visitors, average page views, technical profile, traffic sources, navigation summary) • Opt-out rates and attrition 	Aggregate savings are tracked on a quarterly and yearly basis to provide: Resource Metrics: <ul style="list-style-type: none"> • Normalized Gross Therm Savings (annual) • Gross Verified Therm Savings (annual) • Gross Therm Savings (quarterly) Non-Resource Metrics: <ul style="list-style-type: none"> • Web analytics metrics (site visits, page views, pages/visit, bounce rate, average time on site, % new visits, absolute unique visitors, average page views, technical profile, traffic sources, navigation summary) • Opt-out rates and attrition 	Aggregate savings are tracked on a quarterly and yearly basis to provide: Resource Metrics: <ul style="list-style-type: none"> • Normalized Gross Therm Savings (annual) • Gross Verified Therm Savings (annual) • Gross Therm Savings (quarterly) Non-Resource Metrics: <ul style="list-style-type: none"> • Web analytics metrics (site visits, page views, pages/visit, bounce rate, average time on site, % new visits, absolute unique visitors, average page views, technical profile, traffic sources, navigation summary) • Opt-out rates and attrition

* From 2010 Mid Term Modification 08-50 Tables, costs equal Total PA Costs. The annual budget combines many cohorts together and cannot be split into pilot vs. expansion

** From 3 year TRM plan.

Table A-2. WMECO Western Mass Saves Program

Description	Program Overall		
3-year budget	\$150,000 Annual Budget, with additional budget based upon pilot success		
Savings claimed in filings	N/A		
Date of pilot launch	November, 2010		
Program Theory	<p>Western Mass Saves program is designed to generate verified energy savings.</p> <p>Activities are based upon four principles:</p> <ul style="list-style-type: none"> • Personalized recommendations • Goal setting and feedback • Social context and comparisons • Rewards 		
Outreach Tactics	Multi-channel behavioral marketing approach to capture all possible savings and boost program participation rates. Outreach to customers through: 1) Web portal, 2) Direct mail, and 3) Community outreach efforts. All efforts are cross marketed.		
Reporting	An outcome report will be generated for the EEAC at the end of 2011.		
Program Components	Web Portal	Mailer	Community Based Outreach
Implementer	Efficiency 2.0	Efficiency 2.0	Smart Power
Goals	<p>Primary component of the program.</p> <p>Goals include:</p> <ul style="list-style-type: none"> • 5,000 web sign-ups • 1.5% energy savings for passive customers (those who receive report, but do not go online), and 5-6% energy savings for customers who go online • Educate customers about how conservation actions lead to reductions in their bill • Have people take conservation actions 	<p>Goals include:</p> <ul style="list-style-type: none"> • Channel participants into online platform • Generate energy savings 	<p>Goals include:</p> <ul style="list-style-type: none"> • 3% aggregate energy savings • Community milestones (e.g. 5-year reduction plans in energy to receive 1 kW PV panel for municipal buildings, provide purchasing support for 20% clean energy). • Channel participants into online platform

Number of participants	1,400 sign-ups out of goal of 5,000	25,000 participants, 25,000 control within target communities	Four targeted communities, five control communities by zip code. These include: <ul style="list-style-type: none"> • Springfield • West Springfield • Ludlow • Agawam • Easthampton • Amherst/Pelham • Montgomery • Sunderland
Target participants	All customers in service territory.	Randomly chosen households with property records and available billing data.	Communities targeted by demographics and high energy use.
Outreach Tactics	Online web platform. Customers also receive a report via email that is automatically sent out to users. M&O also includes press releases, links on WMECO website, TV and radio interviews, challenge towns (ground engagement with environmental groups).	Direct mailers to participant households. Mailer provides links to web portal. M&O also includes press releases, links on WMECO website, TV and radio interviews, challenge towns (ground engagement with environmental groups).	Community events, grass roots social networking, competitions and incentives, earned media, field marketing. Promotion of web portal. M&O also includes press releases, links on WMECO website, TV and radio interviews, challenge towns (ground engagement with environmental groups).
Evaluation tactics	Quasi-experimental design; evaluates pre and post engagement online normalized by weather and billing period, tracks against those customers who do not engage online. Can track 80-85% of account numbers online.	Experimental Design; compares randomized control group to participant group by billing account information.	Aggregate Quasi-Experimental design; estimates energy savings aggregated by zip code.

<p>Metrics</p>	<p>End-year-reporting will include aggregate and individual savings, such as:</p> <p>Resource Metrics:</p> <ul style="list-style-type: none"> • Normalized Gross Electricity Savings • Gross Verified Electricity Savings • Gross Deemed Savings • Net Deemed Savings • Net Verified Electricity Savings <p>Non-Resource Metrics:</p> <ul style="list-style-type: none"> • Acquisition metrics (website hits, web sign-ups from mailer and no-mailer customers) • Activation metrics (rewards program registration, savings plan commitments) • Engagement Metrics (cross program referrals, number and most common committed actions, estimated resource savings from committed actions) 	<p>End-year-reporting will include aggregate and individual savings, such as:</p> <p>Resource Metrics:</p> <ul style="list-style-type: none"> • Normalized Gross Electricity Savings • Gross Verified Electricity Savings • Gross Deemed Savings • Net Deemed Savings • Net Verified Electricity Savings <p>Non-Resource Metrics:</p> <ul style="list-style-type: none"> • Mailer customer opt-outs • Engagement Metrics (cross program referral) 	<p>End-year-reporting will include aggregate and individual savings, such as:</p> <p>Resource Metrics:</p> <ul style="list-style-type: none"> • Normalized Gross Electricity Savings • Gross Verified Electricity Savings • Gross Deemed Savings • Net Deemed Savings • Net Verified Electricity Savings <p>Non-Resource Metrics:</p> <ul style="list-style-type: none"> • Engagement Metrics (cross program referral, number of events, number of attendees, etc.)
<p>Channeling Approach</p>	<p>Tracks Efficiency 2.0's product purchase e-commerce tracking metrics.</p>	<p>Compares participants/control households to list of RA participants provided by PA; uses deemed savings to calculate net savings.</p>	<p>Aggregates RA program uptake by zip code.</p>
<p>Client Reporting</p>	<p>Bi-weekly reporting on web metrics.</p>	<p>Billing analysis tracked month to month to provide aggregate "verified savings" in annual report (TBD). Planning on monthly reporting.</p>	<p>Follow up is required, but appears to be reporting on community based efforts including attendance at community events, meetings with environmental groups, businesses, and other key stakeholders.</p>

Table A-3. NSTAR Home Energy Report Program

Description	Program Overall	
Implementer	OPOWER	
Program Theory	The program is designed to provide normative comparisons coupled with energy savings recommendations to educate and motivate participants to take energy saving actions and behaviors within their homes.	
Evaluation tactics	Participant and Control experimental design enables a fixed effects regression to estimate aggregate energy savings.	
Channeling Approach	OPower includes a channeling assumption in savings projections and actuals.	
Reporting	Quarterly reports include the number of participants, expenditures and therm savings based on planned (deemed) energy savings. 2011 reporting will include OPOWER's savings estimate.	
Program Components	Gas First Phase	Gas Expansion
Annual budget	\$350,000	\$284,220
Savings claimed in filings	366,850 therms	Goal is 273,000 therms
Date reports first mailed	September 2010	February 2011
Goals	1.33% gas savings	1.04% gas savings
Number of participants	25,000	25,000
Target participants	Residential gas customers with high energy use who are dual fuel NSTAR customers. Participants could be single-family or multi-family homeowners or renters.	Targets all of NSTAR gas territory but excludes National Grid electric customers.
Outreach Tactics	Home Energy Reports and Energy Insider Website; can receive reports via email	
Channeling Approach	OPower includes a channeling assumption in savings projections. Each quarter NSTAR sends OPOWER a database of customers who participated in energy efficiency programs so that OPower can match to their participant list.	

Metrics	<p>Aggregate savings are tracked on a quarterly and yearly basis to provide:</p> <p>Resource Metrics:</p> <ul style="list-style-type: none">• Normalized Gross Therm Savings (annual)• Gross Verified Therm Savings (annual)• Gross Therm Savings (quarterly) <p>Non-Resource Metrics:</p> <ul style="list-style-type: none">• Web analytics metrics (site visits, page views, pages/visit, bounce rate, average time on site, % new visits, absolute unique visitors, average page views, technical profile, traffic sources, navigation summary)• Opt-out rates and attrition
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*Budget includes only the cost of the program implementer, not total PA budget

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