



**EVALUATION OF THE
EFFICIENCY MAINE TRUST
PACE, POWERSAVER, AND RDI
PROGRAMS
FINAL EVALUATION REPORT
Volume I: PACE & PowerSaver Loan Program**

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1. EXECUTIVE SUMMARY

This report is Volume I of the Final Report on the Evaluation of the Efficiency Maine Trust's PACE, PowerSaver, and Residential Direct Install (RDI) Programs. Volume I presents the results of an independent evaluation of Efficiency Maine's Property Assessed Clean Energy (PACE) & PowerSaver Loan Program for Fiscal Year 2013. It is one component of a multi-program multi-year evaluation project conducted by Opinion Dynamics Corporation, with subcontractors Dunsky Energy Consulting and Johnson Consulting Group, under contract to the Trust. The programs covered by the evaluation project, which are funded by BetterBuildings Program Grant from the U.S. Department of Energy to Efficiency Maine, are:

- The PACE Loan Program, which provides loans to Maine homeowners to finance the cost of making eligible energy-saving improvements to their property. This was the original program among the three included in the evaluation;
- The PowerSaver Loan Program, a companion financing program, which covers the same home energy improvements as PACE but offers a wider range of loan amounts and has slightly different eligibility criteria; and
- The Residential Direct Install (RDI) Program, which focuses on targeted air sealing and insulation improvements to address the most-pressing energy-loss issues in Maine homes. The RDI Program provides a \$600 incentive for the completion of at least six hours of air sealing and insulation work in conjunction with a home energy assessment.

This Final Evaluation Report, presented in two volumes, follows an Interim Process Report completed in November 2012 and an Interim Impact Report completed in April 2013. It is the third and final milestone in the overall evaluation project.

1.1 EVALUATION OBJECTIVES

The Trust has two main objectives for the overall evaluation project:

- (1) To quantify and verify the energy savings achieved through the PACE & PowerSaver Loan Program and the RDI Program as well as the cost-effectiveness of those savings; and
- (2) To examine the design, delivery, and market effects of the Efficiency Maine PACE Loan Program and identify opportunities to increase the program's success, including opportunities within the PowerSaver Loan Program and the RDI Program.

The focus of the Final Evaluation Report is to assess:

- Program impacts in Fiscal Year 2013 (FY2013), including gross and net energy savings achieved;
- Program cost-effectiveness for FY2013; and
- Program processes and experiences.

The Final Evaluation Report is presented in two volumes: This document, Volume I, covers the PACE & PowerSaver Loan Program, and Volume II (presented as a separate document) covers the RDI Program.

1.2 EVALUATION METHODS

The Evaluation Team conducted a variety of activities supporting this evaluation of the PACE & PowerSaver Loan Program. They include:

- Assessment of PACE and PowerSaver gross and net impacts
- Analysis of PACE and PowerSaver heating fuel bills
- Assessment of PACE and PowerSaver cost-effectiveness and macroeconomic effects
- Review of PACE and PowerSaver program databases
- Interviews with implementation staff
- Survey of PACE and PowerSaver participants

1.3 KEY FINDINGS

Program Activity

In FY2013, participants received 203 loans, totaling \$2.5 million, through Efficiency Maine's PACE & PowerSaver Loan Program. This includes 129 PACE loans, 25 Secured PowerSaver loans, and 49 Unsecured PowerSaver loans. These 203 loans supported 192 unique projects, with 11 participants receiving both a PACE and PowerSaver loan for the same project. FY2013 PACE loans averaged \$12,730, while the average Secured PowerSaver loan was \$21,349 and the average Unsecured PowerSaver loan was \$6,528.

The most common measures financed with a PACE or PowerSaver loan during FY2013 were insulation (83%), air sealing (75%), and HVAC equipment (boilers, furnaces, heat pumps, and central A/C systems) (46%).

A total of 94 firms participated in the PACE & PowerSaver Loan Program in FY2013, either as a participating energy advisor (PEA) (14) or a registered vendor (RV) (55) or both (25). The number of projects completed by an individual PEA or RV during FY2013 ranged from 1 to 14; however, 65% of RVs and 51% of PEAs completed only one project in FY2013.

Gross Impacts

Verified first-year, annual gross savings for the PACE & PowerSaver Loan Program in FY2013 are 10,445 MMBTU, or an average of 54.4 MMBTU for each of the 192 projects completed during this time period.¹ On average, these savings represent 27.7% of pre-project whole-house energy usage.

The overall realization rates for PACE and PowerSaver gross savings are as follows:

- RHA Project Realization Rate = 0.78. This means that verified gross savings for the 113 projects modeled in CSG's Real Home Analyzer software (RHA) are 78% of the total savings reported for those projects in the RHA database.

¹ 54.4 MMBTU are equivalent to 394 gallons of heating oil.

- Program Realization Rate = 1.32. This means that verified gross savings for the 192 projects completed are 132% of the total savings reported in the RHA database.

A separate analysis of heating fuel bills for 18 PACE and PowerSaver projects showed savings ranging from less than 1% to 52% of pre-project heating fuel usage, with an average of 24%.

Net Impacts

Net program impacts are calculated by multiplying the net-to-gross ratio (NTGR) by verified gross program savings. The NTGR, which represents the percentage of gross program savings that we can reliably attribute to the program, is calculated as $(1 - \text{Free-Ridership} + \text{Spillover})$. The estimated NTGR for the PACE & PowerSaver Loan Program in FY2013 was 1.052.

Table ES-1. FY2013 PACE/PowerSaver NTGR

Component	Value
FR	0.103
Participant Spillover	0.155
NTGR	1.052

Source: Impact Analysis (2013).

The estimated free ridership rate is 0.10, meaning that 90% $(1 - 0.10)$ of reported savings can be attributed to the program.

Based on the free-ridership and spillover results, the net-to-gross ratio for the PACE & PowerSaver Loan Program for FY2013 is estimated to be 1.052. This means that energy savings attributable to the program are 105% of verified gross savings.

Applying the net-to-gross ratio of 1.052 to verified gross savings of 10,445 MMBTU yields annual program-level net impacts of 10,986 MMBTU, or 57.2 MMBTU per project for the 192 projects completed during FY2013.²

Cost-Effectiveness Analysis and Macroeconomic Effects

Our analysis of the PACE & PowerSaver Loan Program for FY2013 found that the program is cost-effective for all three tests performed: the Total Resource Cost test (TRC), the Program Administrator Cost Test (PACT), and the Participant Cost Test (PCT). All tests show a positive net present value and a benefit-cost ratio that well exceeds 1.0. This analysis is based on the 192 projects that were completed between July 2012 and June 2013 (FY2013).

Estimated benefit-cost ratios for the program are:

- TRC = 2.5
- PACT = 11.7
- PCT = 3.0

² 57.2 MMBTU are equivalent to 414 gallons of heating oil.

Total FY2013 spending (cost) of \$3.3 million³ as a result of the PACE & Powersaver Loan Program resulted in an estimated \$14.8 million increase in gross state product and the creation of 220 job-years, where each job-year is equivalent to one full time job for one year.

Databases

Following program changes to data tracking practices made during FY2013, there is better agreement between the improvements listed in CSG's Real Home Analyzer (RHA) database and the installed measures documented in the AFC First documentation (database and loan files) than was reported in the Interim Impact report. However, in the AFC First database the classification of measures as "other," rather than under the specific measure category, e.g. insulation, has increased, which reduces the usefulness of this database for program savings tracking and evaluation.

Participant Experience

Survey responses show a high level of participant satisfaction with the PACE & PowerSaver Loan Program overall, with their PEA, and with their RV. Confirming their general satisfaction, 96% of surveyed participants would recommend the program to their family and friends.

Most FY2013 participants report noticing improvements following their projects: 83% report a decrease in energy bills and 83% report an increase in home comfort. For 14%, it was too early to tell if there had been changes to energy bills, and for 12%, home comfort had stayed the same.

Overall, 57% of participants report closing their loan within six weeks. However, the share of loans closing in more than eight weeks has increased since the Interim Process Report (41% compared to 14%).

Traditional media (newspapers, radio, TV), contractors, and word-of-mouth are the most common ways that FY2013 participants first learned about the PACE & PowerSaver Loan Program.

1.4 OPPORTUNITIES FOR PROGRAM IMPROVEMENT

This evaluation focused mainly on the assessment of gross and net impacts, as well as the cost-effectiveness, of the PACE & PowerSaver Loan Program for FY2013. Based on this work, the following are opportunities for program improvements Efficiency Maine may wish to consider:

- **Data Tracking.** In the AFC First database, improve coding of improvements to utilize the available measure categories rather than "Other." This might require changing the Specification Sheet to better capture the detail required for database entry.
- **QA Inspections.** Conduct post-project QA inspection site visits on an on-going basis, rather than following the program year. These visits are important for quality control and play a key role in program tracking and evaluation.

³ Note that total spending for the macroeconomic impact analysis includes spillover measure costs and is therefore higher than direct PACE & PowerSaver Loan Program spending.

2. INTRODUCTION

2.1 EVALUATION OBJECTIVES

The evaluation is intended to fulfill the statutory requirements that the Trust arrange for an independent evaluation, at least once every five years, of each program that has an annual budget of more than \$500,000, including an evaluation of the program's effectiveness in achieving goals specified in the law governing the Trust (35-A MRSA section 10104, subsection 10). In addition, the evaluation was part of the Better Buildings Grant application to DOE, and will fulfill the requirements of that grant.

The Trust has two main objectives for this evaluation:

- (1) To quantify and verify the energy savings achieved through the PACE & PowerSaver Loan Program and the RDI Program as well as the cost-effectiveness of those savings; and
- (2) To examine the design, delivery, and market effects of the Efficiency Maine PACE Loan Program and identify opportunities to increase the program's success, including opportunities within the PowerSaver Loan Program and the RDI Program.

This Final Evaluation Report follows an Interim Process Report completed in November 2012 and an Interim Impact Report completed in April 2013. It is the third and final milestone in the overall evaluation project. The focus of the Final Evaluation Report is to assess:

- Program impacts in Fiscal Year 2013 (FY2013), including gross and net energy savings achieved;
- Program cost-effectiveness for FY2013; and
- Program processes and experiences.

The Final Evaluation Report is presented in two volumes: This document, Volume I, covers the PACE & PowerSaver Loan Program, and Volume II covers the RDI Program.

2.2 PACE AND POWERSAVER OVERVIEW

The Maine PACE & PowerSaver Loan Program provide loans to Maine homeowners to finance the cost of making eligible energy saving improvements to their property. This program is designed to provide a financing option that makes energy improvements more feasible for homeowners.

Legislation enacted in 2010 established the legal framework for the Property Assessed Clean Energy (or PACE) Loan Program (Maine PACE Act, PL 2009, c.591). To qualify for a PACE loan, the homeowner's property must be located in a municipality that has adopted a PACE ordinance authorizing the program. As of September 3, 2013, a total of 166 Maine municipalities had passed PACE ordinances and entered into an agreement with Efficiency Maine to administer the loan program on their behalf.

Efficiency Maine applied for and won a competitive grant from the U.S. Department of Energy (DOE), which supports the PACE & PowerSaver Loan Program. This grant is funded with American Recovery and Reinvestment Act of 2009 (ARRA), Energy Efficiency and Conservation Block Grant (EECBG) funds administered through the DOE BetterBuildings Program. With the EECBG BetterBuildings grant,

Efficiency Maine has established a \$20.4 million revolving loan fund for the PACE & PowerSaver Loan Program. As homeowners pay back the loans, the loan fund will be replenished so that Efficiency Maine can issue loans or procure additional funding to finance home energy savings improvements for the next round of homeowner applicants.

PACE and PowerSaver Loan Features

Efficiency Maine currently offers three types of loans: Maine PACE loans, secured PowerSaver loans, and unsecured PowerSaver loans.

PACE Loans

Maine PACE loans range in value from \$6,500 to \$15,000 and offer a repayment period of 5, 10, or 15 years at a fixed interest rate of 4.99% APR, with no processing fees. What makes a Maine PACE loan different from other home equity loans is that the PACE loan stays with the property. PACE loans in Maine are different from those in other states because Maine’s PACE law dictates that the loans do not have a senior priority over a primary home mortgage, original or new, and that loan assessments (payments) will not be added to or treated like a property tax.

PACE loans are available for residential buildings with one to four units located in municipalities that have passed a PACE ordinance. Homeowners must meet underwriting requirements set by the PACE Loan Program. These underwriting requirements include:

- a debt-to-income ratio of no more than 45%;
- a loan-to-value ratio less than 100%;
- property tax and sewer payments being current; and
- no outstanding liens; no reverse mortgages; and no mortgage default, foreclosure, or delinquency.

Maine PACE loans are available for home energy projects that meet the requirements of Efficiency Maine’s Home Energy Savings Program (HESP). PACE-eligible energy improvements include, but are not limited to: insulation, air sealing, energy efficient heating systems, lighting and appliances, windows and doors, and solar energy systems. Under current program guidelines, the homeowner’s package of energy efficiency improvements must generate savings of at least 20% of home energy usage or 25% of heating and hot water energy usage to qualify for a PACE loan.

PowerSaver Loans

To increase the pool of eligible participants and provide more options to Maine homeowners, Efficiency Maine began offering PowerSaver loans in the spring of 2012.⁴ PowerSaver loans have similar eligibility criteria and loan terms as PACE loans. These loans differ from PACE loans in the following ways:

⁴ In early 2012, Efficiency Maine became a “HUD Title 1 Government Lender” allowing the organization to offer PowerSaver loans to customers in Maine. Efficiency Maine’s PowerSaver Program launched on April 11, 2012. As a provider of PowerSaver loans, AFC First is granted funds from HUD to offset the costs associated with servicing the PowerSaver loans, such as the appraisal and inspection fees.

- PowerSaver loans are available statewide to owners of single-family detached residential homes.
- Efficiency Maine offers both *secured* and *unsecured* PowerSaver loans.
 - Participants may borrow between \$7,500 and \$25,000 for secured PowerSaver loans and up to \$7,500 for unsecured loans.
 - Secured PowerSaver loans may be no less than the homeowner’s second position mortgage, up to 100% of their home equity, while unsecured loans are not secured to the property.
 - Neither secured nor unsecured PowerSaver loans are assumable upon transfer of mortgages.
- All PowerSaver participants must have a credit score of at least 660.
- Loan terms may be up to 15 years for secured PowerSaver loans or up to 20 years with the installation of a solar PV system. Unsecured PowerSaver loans may be up to 10 years.

Other aspects of the PowerSaver loans, such as the interest rate, debt to income ratio, participation process, and eligible measures are the same as PACE loans. Table 2-1 compares the features of the three types of loan offered by Efficiency Maine.

Table 2-1. Summary of Features of Efficiency Maine Loans

Feature	PACE	Secured PowerSaver	Unsecured PowerSaver
Availability	Participating Municipalities	Statewide	Statewide
Loan Terms	Up to 15 years	Up to 15 years, or 20 with solar installation	Up to 10 years
Interest Rate	Fixed 4.99% APR	Fixed 4.99% APR	Fixed 4.99% APR
Building Type	Residential: 1-4 units	Single family detached	Single family detached
Loan Amounts	\$6,500 to \$15,000	\$7,500 to \$25,000	Up to \$7,500
Mortgage Position	Junior to primary mortgages and existing liens	No less than 2 nd position mortgage	Not secured to property
Energy Audit Required	Yes	Yes	Yes
Credit Score Minimum	None	660	660
Homeowner Equity	Lending to 100% of value	Lending to 100% of value	None required
Debt to Income Ratio	45%	45%	45%
Assumable Upon Transfer	Yes	No	N/A

Source: <http://www.efficiencymaine.com/docs/PACE-PowerSaver-Comparison-Chart.pdf>

Program Delivery Structure and Components

The PACE & PowerSaver Loan Program is delivered by a team, led by the Trust, that includes financial services vendor AFC First, the Conservation Services Group (CSG), and a network of Participating Energy Advisors (PEAs) and Registered Vendors (RVs) who work directly with homeowners. The financial side of the loan programs is provided as a contractual service by AFC First. AFC First’s responsibilities include originating, processing, closing, and servicing loans on behalf of Efficiency

Maine, including the functions of master provider and master servicer.⁵ Specific AFC First duties include, but are not limited to: maintaining a call center and online application system; receiving and processing loan applications; performing underwriting analyses and determining loan approval or denial based on underwriting standards established by the Trust; and disbursing loan proceeds and managing loan servicing activities.

The home energy improvements side of the PACE & PowerSaver Loan Program is delivered through a network of PEAs and RVs. CSG also plays a key role as the reviewer of the proposed work scope and associated energy model for each project. As part of the loan approval process, the program requires approval by CSG of project work scopes and projected savings estimates. Efficiency Maine designated PEAs perform energy audits and on-site post-installation verification inspections, which include blower door tests and general inspection of the work performed. All PEAs must go through specific training and be certified by the Building Performance Institute (BPI). The installation of energy efficiency measures on PACE and PowerSaver loan projects must be conducted by a Registered Vendor, who has completed a Registered Vendor agreement with Efficiency Maine and supplied necessary supporting documentation. Many PEAs also conduct installations as RVs.

The PACE & PowerSaver Loan Program currently involves the following components and steps for participants:

1. Have a home energy audit by a PEA
2. Obtain contractor bids for the energy improvements
3. Submit a loan application forms and related documents
4. Close loan, following approval
5. Complete energy savings improvements with an Efficiency Maine RV (30% of the project cost is available the week following closing)
6. Have project completion verified by a PEA
7. Submit project completion forms
8. Receive the balance of the loan
9. Make monthly loan repayments for the term of the loan

2.3 EVALUATION DATA

The impact and process evaluations of the PACE & PowerSaver Loan Program rely on several data sources, including the program tracking databases and primary data collected through a survey of FY2013 participants. Each data source is described in the following subsections.

Program Tracking Data

The PACE & PowerSaver Loan Program is supported by two tracking databases, one compiled by the financial services vendor AFC First and one compiled CSG. The AFC First database is designed and maintained to support the loan application, approval, and servicing process. Among other things, this database documents the energy improvements financed with the loan. CSG's RHA database, on the other hand, is designed to support and document the energy audit and the energy improvements

⁵ The terms "master provider" and "master servicer" indicate that AFC First is the sole entity that provides and services the loans in the program.

recommended to the customer as a result of the audit (for projects modeled with CSG’s RHA software) and the associated savings projections. Both databases include other information about each project.

The impact analysis is based on the 192 unique households in the AFC First database that received a loan (in some cases two) and completed a project in FY2013.

Survey of Participants

Opinion Dynamics conducted a Computer-Assisted Telephone Interviewing (CATI) survey with 72 customers that participated in the PACE & PowerSaver Loan Program between July 1, 2012 and June 30, 2013. This survey supports the process and net impact evaluations presented in this report.

The survey explored a variety of aspects of participants’ experiences ranging from recall of marketing and outreach efforts; perceptions of and satisfaction with the program participation process (including the loan application process, their experience working with the PEAs and RVs, and usefulness of the audits to the participant); recommended and installed measures; changes in energy use since participating in the program; and recommendations for improving program delivery. In addition, the survey explored attribution of energy efficiency installations to program efforts (free-ridership and participant spillover).

Opinion Dynamics' Utah-based telephone interviewing center conducted the interviews in July 2013. The overall response rate was 45%, with a cooperation rate of 74%. (See Appendix A for information on how the response and cooperation rates were calculated.)

Sampling/Weighting

The sampling unit was the household. Based on the AFC First database, 192 unique households received a loan and completed a project in FY2013. For 17 of these households, installed measures were classified only as “other” in the database, preventing us from verifying what specific measures were installed. After removing these 17 records, the sample frame included 175 participants, and we attempted to reach all of the households (census attempt).

Since our sampling strategy was a census attempt, no weighting was necessary, and there is no sampling error associated with the survey results.

2.4 ORGANIZATION OF REPORT

The remainder of this report is organized as follows:

- **Section 3: Descriptive Analysis of Projects** presents information about program activity in FY2013.
- **Section 4: Impact Evaluation** presents an update on our review of the program tracking databases, as well as the methodology and results of the FY2013 gross and net impact analyses for the PACE & PowerSaver Loan Program.
- **Section 5: Summary of PACE/Power Saver Heating Fuel Bill Analysis** describes the methodology and a summary of results of our analysis of heating fuel bills for 18 PACE and PowerSaver-funded projects.
- **Section 6: Cost-Effectiveness and Macroeconomic Effects** presents the methodology and results of the FY2013 cost-effectiveness and macroeconomic effects analyses for the PACE & PowerSaver Loan Program.

- **Section 7: Participant Experience** summarizes findings from the participant survey. Topics of analysis include loan terms and the application process, marketing and outreach, the home energy audit and installed improvements, and participant satisfaction.
- **Section 8: Findings and Recommendations** summarizes the findings from our research efforts and provides recommendations for program improvement.

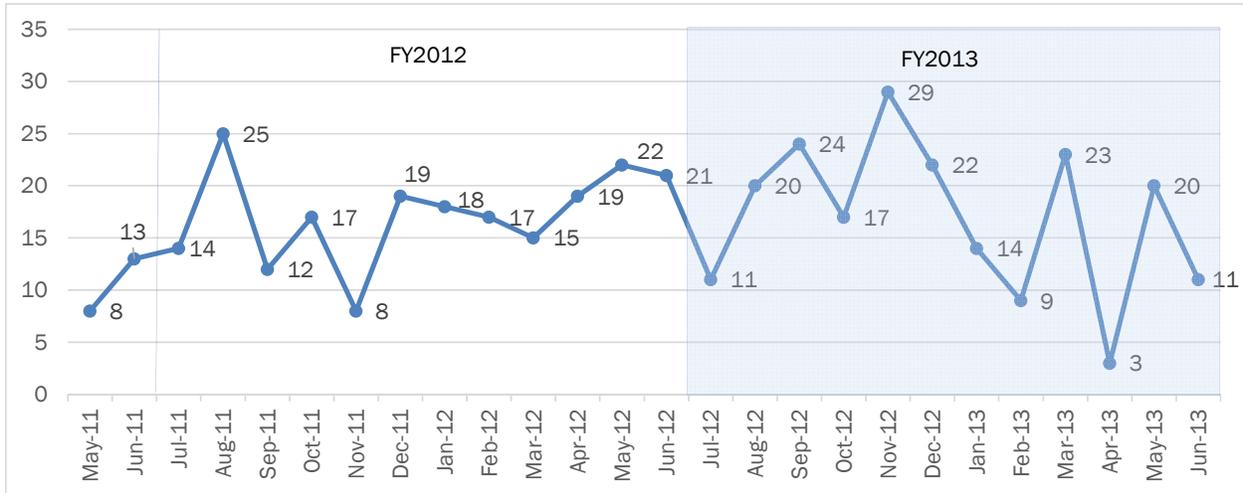
The report has the following appendices:

- **Appendix A: Participant Survey Dispositions** presents the disposition as well as the response rate and cooperation rate for the Pace & PowerSaver participant survey.
- **Appendix B: Supporting Information for PACE/PowerSaver Gross Impact Analysis** provides additional information on the measure eligibility analysis conducted for the PACE & PowerSaver Loan Program.
- **Appendix C: Supporting Information for Heating Fuel Bill Analysis** presents heating fuel usage graphs for the 18 PACE and PowerSaver projects included in the heating fuel bill analysis.

3. DESCRIPTIVE ANALYSIS OF PROJECTS

In FY2013, 192 participants received 203 loans, totaling \$2.5 million, through Efficiency Maine’s PACE & PowerSaver Loan Program. This includes 129 PACE loans, 25 Secured PowerSaver loans, and 49 Unsecured PowerSaver loans. Eleven participants received both a PACE and PowerSaver loan for the same project. On average, the program issued 17 loans per month during FY2013, the same average as in FY2012.⁶

Figure 3-1. Number of PACE/PowerSaver Loans Closed per Month

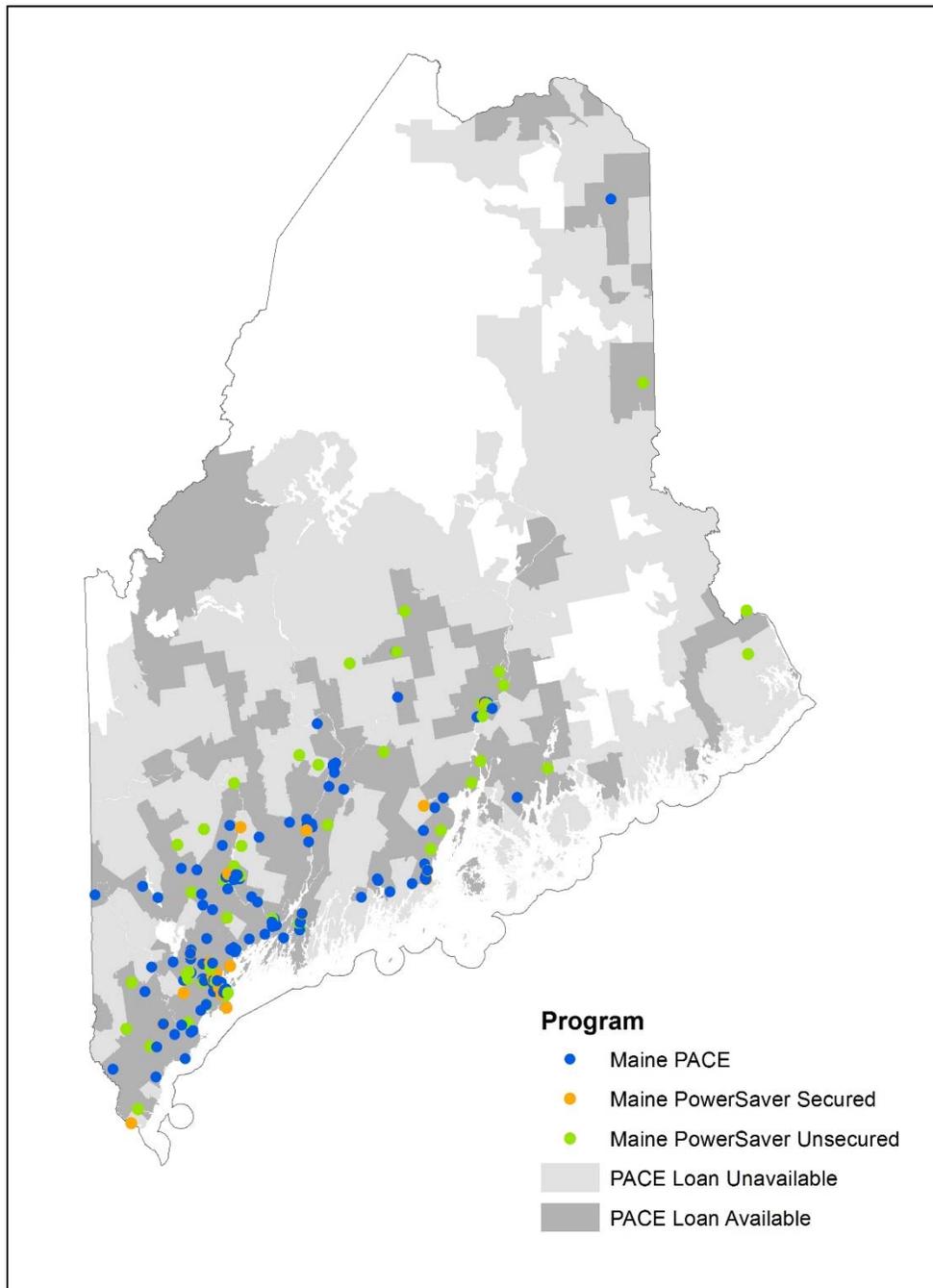


Source: AFC First Tracking Data (as of July 1, 2013)

Figure 3-2 shows the geographic distribution of the PACE and PowerSaver loans closed in FY2013. Most participants are located in the more populated southern part of Maine. Unsecured PowerSaver loans made up the bulk of loans in the northern half of the state. In Figure 3-2, the dark gray areas represent the 166 towns that have passed a PACE ordinance as of September 3, 2013. Notably, of the 74 PowerSaver loans provided in FY2013, 61 (82%) were issued in towns where PACE loans are also available.

⁶ The month represents the first payment (generally 30% of total loan amount) to the contractor, rather than the final payment at the completion of the project. The AFC First database did not contain check dates for 35 projects funded after March 15, 2013. For these projects, the projects’ funding date was used in the analysis.

Figure 3-2. Geographic Distribution of PACE/PowerSaver Projects



Source: AFC First Tracking Data (as July 1, 2013) and <http://www.energymaine.com/docs/List-of-PACE-municipalities1.pdf> (updated August 29, 2013)

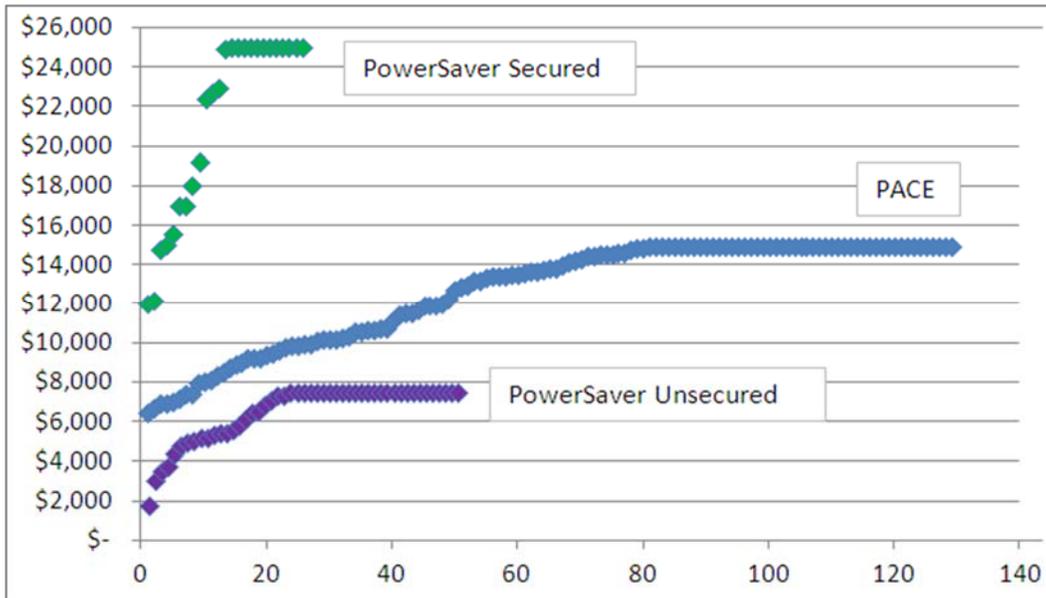
Efficiency Maine offers three types of loans with different ranges of available loan amounts. FY2013 loan amounts were as follows:

- PACE loans ranged from \$6,500 to \$15,000, with an average amount of \$12,730. About one-third of PACE loans (36%) were of the maximum amount of \$15,000.

- Secured PowerSaver loans ranged from \$12,000 to \$25,000, with an average amount of \$21,349. Forty-four percent (44%) of Secured PowerSaver loans were of the maximum amount of \$25,000.
- Unsecured PowerSaver loans ranged from \$1,758 to \$7,500, with an average amount of \$6,528. Fifty-three percent (53%) of Unsecured PowerSaver loans were of the maximum amount of \$7,500.

Figure 3-3 depicts the number and amounts of FY2013 PACE and PowerSaver loans.

Figure 3-3. Distribution of PACE and PowerSaver Loans by Loan Amount



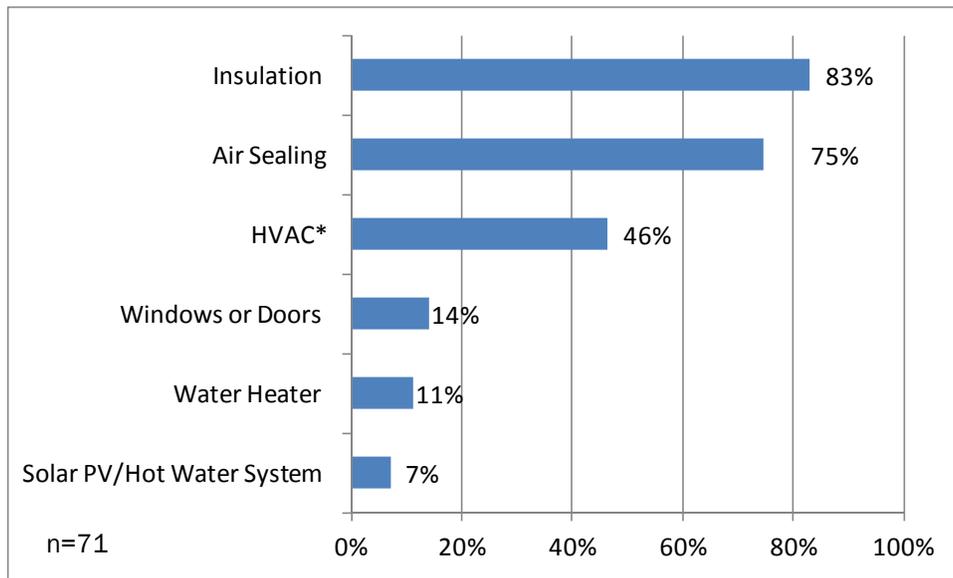
Source: AFC First Tracking Data (as of July 1, 2013)

Survey data suggests that the range of loans offered by Efficiency Maine meets the needs of most participants. Only 7% of participants reported that they did not make a recommended improvement (or that they made it without an Efficiency Maine loan) because the project cost exceeded the maximum loan amount.

Insulation (83%) and air sealing (75%) were the most common improvements funded with a PACE or PowerSaver loan during FY2013. This is consistent with the program's primary mission to provide weatherization services to Maine homeowners. Almost half of participants (46%) also financed new HVAC equipment, including boilers, furnaces, heat pumps, and central air conditioning with their loan.⁷

⁷ Note that these measure installation rates are based on responses to the participant survey. Comprehensive measure data is not available from the program tracking databases.

Figure 3-4. PACE and PowerSaver Improvements

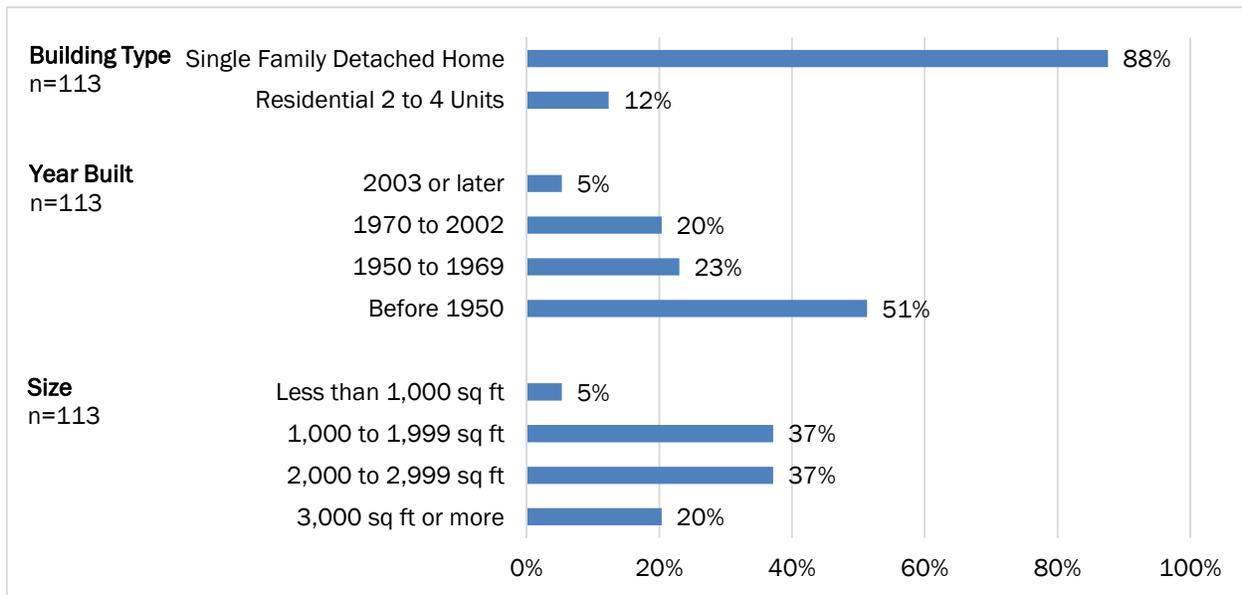


Source: PACE/PowerSaver Participant Survey (July 2013)

*HVAC measures include boilers (n=16), furnaces (n=9), heat pumps (n=7), and split central air conditioners (n=1)

Single family homes (88%) and homes built before 1950 (51%) account for the bulk of PACE and PowerSaver participant homes. The large majority of homes (74%) are between 1,000 and 3,000 square feet, evenly divided between 1,000-2,000 square feet (37%) and 2,000-3,000 square feet (37%).

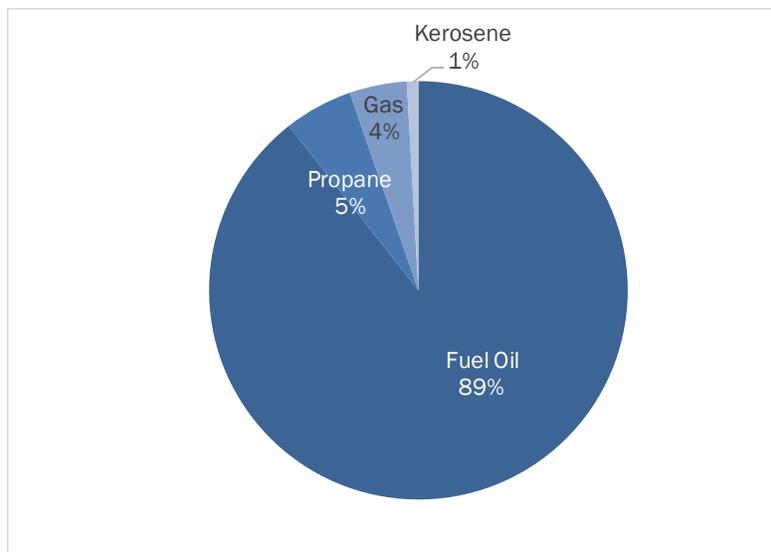
Figure 3-5. Building Characteristics of PACE/PowerSaver Participants



Source: CSG Tracking Data (as of July 1, 2013)

The vast majority (89%) of PACE and PowerSaver participants uses oil as their primary heating fuel. Propane and natural gas account for 5% and 4%, respectively, of participants' primary heating fuel.

Figure 3-6. Primary Heating Fuel of FY2013 PACE and PowerSaver Participants



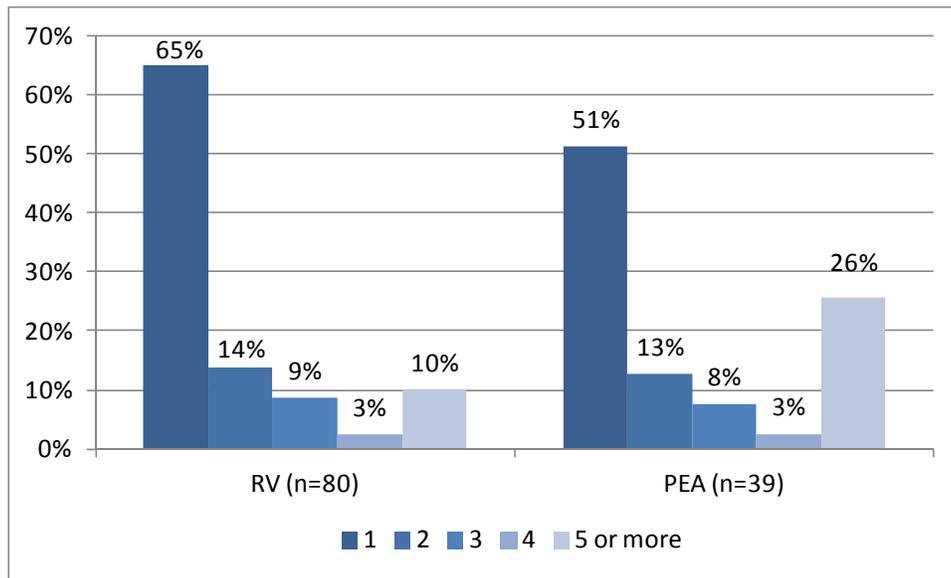
Source: CSG Tracking Data (as of July 1, 2013)

Participating Energy Advisors and Registered Vendors

Based on the program tracking database, 94 firms participated in the PACE & PowerSaver Loan Program in FY2013, either as a PEA (14) or an RV (55) or both (25).⁸ There was a range of contractor activity: Contractors that completed PACE or PowerSaver-financed improvements as an RV completed between 1 to 14 projects in FY2013, with a mean of 2.4. Contractors that conducted PACE or PowerSaver energy audits as a PEA completed between 1 to 14 audits in FY2013, with a mean of 3.3. More than half of contractors completed improvements (65%) or audits (51%) for only one project in FY2013 (Figure 3-7).

⁸ Note that for 90 of the funded projects, the auditor field in the tracking database was blank. It is unclear if the auditor is the same as the contractor in these cases. For many projects with both contractor and auditor named, they are different companies, but in some cases they are the same.

Figure 3-7. Distribution of FY2013 PACE/PowerSaver Project Counts, by Contractor Type



Source: AFC First Tracking Data (as of July 1, 2013)

4. IMPACT EVALUATION

4.1 DATABASE REVIEW

The Interim Impact Report included a detailed review of the PACE & PowerSaver Loan Program's two tracking databases (the AFC First database compiled by the financial services vendor, and the RHA database compiled by CSG) and associated data flow processes. In support of the Final Report, we conducted follow-up interviews with AFC First and CSG staff and conducted several analyses to assess changes to data flow processes since the Interim Report.

The AFC First database is designed and maintained to support the loan application, approval, and servicing process. Among other things, this database documents the energy improvements financed with the loan. The RHA database, on the other hand, is designed to support and document the energy audit, the energy improvements recommended to the customer as a result of the audit (for projects modeled with CSG's RHA software), and the savings projections associated with the improvements.

Review of the AFC First and RHA databases for the Interim Impact Report revealed some significant variation between the two with respect to the documented energy improvements. We found that this variation was a product of the different purposes served by each of the databases, as described above, as well as several aspects of the existing program data flow processes. The interviews and analyses conducted for the Final Report revealed that while variation persists between the AFC First and RHA databases, there are relatively few discrepancies between what is documented in RHA and what was actually installed and financed with an Efficiency Maine loan based on documentation in AFC First customer loan files.

4.1.1 STAFF INTERVIEWS

In the follow-up interviews for the Final Report, staff reported that a number of changes had been implemented in the fall of 2012 to address data flow process issues identified in the Interim Report. In these interviews staff reported that:

- AFC First now sends back to CSG for remodeling any project where the measures actually installed (based on the "Specification Sheet") are different from those transmitted to AFC First on CSG's project approval form (based on modeling by the PEA); and
- Once CSG receives this information from AFC First, CSG updates the RHA database with new modeling results that reflect actually installed measures, rather than recommended measures from the audit.

These changes, if implemented as described, would eliminate most of the concerns described in the Interim Report regarding 1) not having a single database for reliable tracking and evaluation of installed measures and 2) whether projects meet the program's minimum savings requirements.

To verify these reported changes in program data flow processes, we conducted two analyses:

- **Aggregate Database Comparison:** For the 113 projects in FY2013 that were modeled with RHA, we determined the percentage of measures listed in the RHA database that are also listed in the AFC First database.

- **Comparison of Sample:** For a sample of 10 projects implemented in 2013 that had RHA measures that were not listed in the AFC First database, we conducted a more detailed comparison of measures based on project loan file documentation.

4.1.2 AGGREGATE DATABASE COMPARISON

To assess whether the new feedback loop between AFC First and CSG is working as described, i.e., if projects where measures initially do not match are indeed sent back for remodeling in the RHA database, we determined the percentage of RHA measures that are also listed in the AFC First database. We conducted this comparison for projects implemented before January 1, 2013 (“Pre-change projects”) and for projects implemented on or after January 1, 2013 (“Post-change projects”).⁹ If the feedback loop is working, then we would expect to find that the share of RHA modeled measures that are also listed in the AFC First database increased following implementation of the data flow changes.

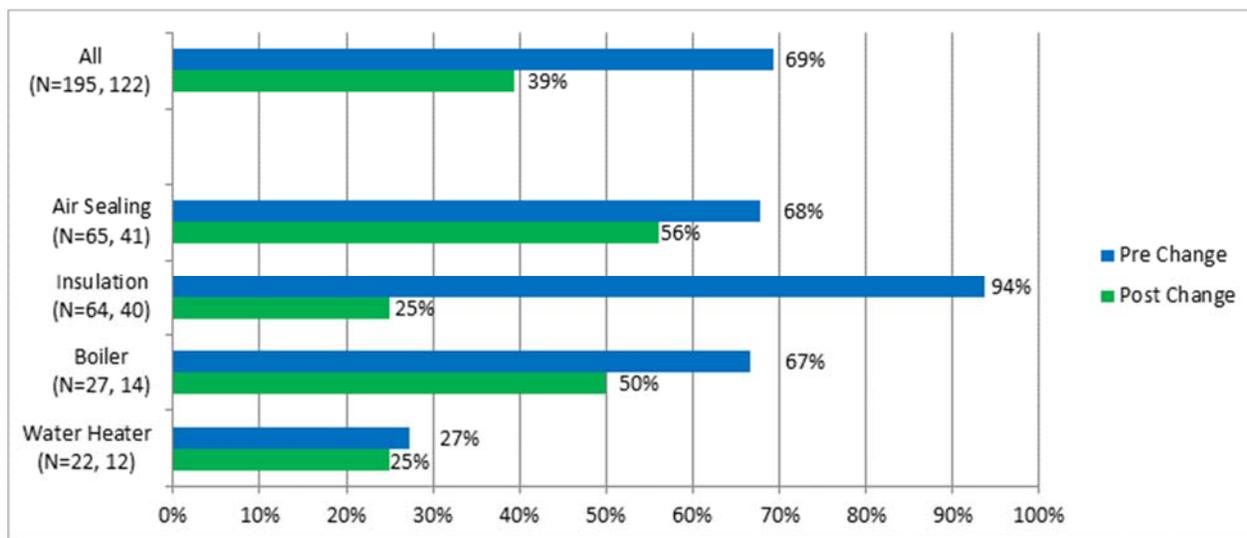
Our comparison found that the process changes described to our team have not resulted in the expected improvement. For all 113 FY2013 projects, only 58% of measures in the RHA database were also listed in the AFC First database.¹⁰ This share decreased from 69% of measures for pre-change projects to 39% of measures for post-change projects. For all measure types except furnaces, the match between the two databases actually decreased, not increased, after the reported data flow change. Notably, the overlap of insulation measures decreased from 94% for pre-change projects to 25% of post-change projects.

Figure 4-1 summarizes the match of the most common measures in the RHA database, compared to the AFC First database.

⁹ Implementation is based on the first check date, documented in the AFC First tracking database. We chose January 1, 2013 as a break point for this analysis as it can reasonably be expected that by January 1, 2013, changes that were being implemented in the fall of 2012 would have fully taken effect.

¹⁰ Note that this comparison excludes RHA measures that are not categorized in the AFC First database, such as lighting upgrades, energy efficient appliances, and measures related to water heaters (e.g., pipe insulation, tank wrap, aerators, and low-flow showerheads).

Figure 4-1. Match of RHA Measures to AFC First Database



Source: Comparison of CSG Tracking Data (as of July 1, 2013) and AFC First Tracking Data (as of July 1, 2013)

4.1.3 COMPARISON OF SAMPLE OF PROJECTS

To better understand to what extent the observed discrepancies between the two databases are associated with data entry issues as opposed to true discrepancies between what is documented in RHA and what was actually installed and financed with an Efficiency Maine loan, we took a random sample of 10 projects that were implemented after January 1, 2013 and that showed RHA-listed measures without a match in the AFC First database. For these 10 projects, we performed a detailed review of the supporting materials in the project’s loan file maintained by AFC First, including Specification Sheets (which document the agreement between the loan recipient and the contractor for the installation of eligible measures) and contractors’ proposals and invoices.

For the sampled projects, we found that most of the measures documented in RHA without a match in the AFC First database had supporting loan file documentation demonstrating that these measures were in fact installed and financed with an Efficiency Maine loan. In most cases, these measures had been entered into the AFC First database under the generic “Other” category, rather than under the specific measure name. For example, all 10 sampled projects have “insulation” listed in the RHA database, but only three of them also have “insulation” listed in the AFC First database. The supporting documentation in the project loan files demonstrates that the other seven of these 10 projects did include insulation, consistent with the information in the RHA database.¹¹

After using information in the loan files to assign specific measure categories to the “other” measures in the AFC First database, only a few discrepancies remain; i.e., what is documented in RHA and what was actually installed and financed with an Efficiency Maine loan based on documentation in AFC First customer loan files is generally closely aligned. Table 4-1 summarizes the measure comparison of the data and loan file documentation for the 10 sampled projects.

¹¹ It should be noted that AFC First changed its classification of insulation in mid-March 2013, adding additional detail. It is possible that this database change has contributed to the mis-classification of insulation projects as “other.”

Table 4-1. Summary of Comparison of 10 Sampled Projects

Measure	Projects with Measure in RHA	Projects with Match in AFC First Data	
		AFC First Database	Loan File Documentation
Insulation	10	3	10
Air Sealing	10	3	7
Boiler	3	1	3
Water Heater	3	1	1
Doors	3	0	1
Windows	1	0	0
Renewable	1	0	1

Source: Comparison of CSG Tracking Data (as of July 1, 2013) and AFC First Tracking Data (as of July 1, 2013); review of AFC First loan files

4.2 GROSS IMPACT ANALYSIS

The gross impact analysis for the FY2013 PACE & PowerSaver Loan Program used the same methodology as the analysis conducted for the Interim Impact Report. This analysis consisted of developing estimates of gross savings through several steps, using information from: the AFC First database; the CSG RHA database; CSG Quality Assurance (QA) inspection data for 40 projects; and data from project “Specification Sheets” collected by AFC First as part of the loan file.¹²

In addition to this analysis, we also conducted an analysis of heating fuel bills, to obtain a real-life perspective of the magnitude of savings realized through Efficiency Maine loan-financed projects.

The remainder of Section 4.2 summarizes the approach and results of the gross impact analysis, based on the program tracking databases. Section 5 provides a summary of the heating fuel bill analysis.

4.2.1 SUMMARY OF GROSS IMPACTS

Verified first-year, annual gross savings for the PACE & PowerSaver Loan Program for FY2013 are 10,445 MMBTU, or an average of 54.4 MMBTU per project for the 192 projects completed during this time period. On average, these savings represent 27.7% of pre-project whole-house energy usage (as captured in the RHA database).

We developed the verified gross savings estimate using the savings reported for the 113 FY2013 loan projects documented in the RHA database as the starting point. We then applied four adjustment factors to arrive at program gross savings:

- **QA-Inspection Factor ($Factor_{insp}$).** This factor accounts for the fact that not all recommended measures documented in RHA are installed. It reflects the savings of verified installed measures (from QA inspections by CSG) as a percentage of savings from the recommended measures in RHA.

¹² Because the PACE predecessor program, HESP, had undergone a detailed impact evaluation in 2011 – including site visits, modeling, and engineering desk reviews – it was decided that a full assessment of gross impacts of the PACE & PowerSaver Program was not warranted.

- **Additional AFC First Project Factor ($Factor_{AddAFC}$).** This factor accounts for measures that are documented in the AFC First database as part of the loan, but do not appear in the RHA database.
- **Eligibility Factor ($Factor_{Elig}$).** This factor provides a means to adjust for any measures that do not meet the program's efficiency standards.
- **Non-RHA Projects ($Factor_{NonRHA}$).** This factor is used to extrapolate results for the RHA-modeled projects (113) to the full population of projects (192).

Verified gross program savings are calculated as:

$$Verified\ Gross\ Savings = RHA\ Savings * Factor_{Insp} * Factor_{AddAFC} * Factor_{Elig} * Factor_{NonRHA}$$

Table 4-2 summarizes the four adjustments made to RHA reported gross savings and the resulting savings estimates. Each savings estimate is derived by multiplying the preceding estimate by the factor.

Table 4-2. Summary of PACE/PowerSaver Gross Impact Analysis

Gross Impact Estimate / Adjustment	Savings (MMBTU)	Value of Factor
A. Reported RHA Gross Savings	7,911	
<i>QA-Inspection Factor ($Factor_{Insp}$)</i>		0.69
B. Inspection-Adjusted RHA Gross Savings	5,432	
<i>Additional AFC First Project Factor ($Factor_{AddAFC}$)</i>		1.13
C. AFC Adjusted RHA Gross Savings	6,164	
<i>Eligibility Factor ($Factor_{Elig}$)</i>		0.997
D. Verified RHA Gross Savings	6,147	
<i>Non-RHA Projects ($Factor_{NonRHA}$)</i>		1.70
E. Verified Program Gross Savings	10,445	
<i>Overall Gross Realization Rate – All Projects (E/A)</i>		1.32
<i>Overall Gross Realization Rate – RHA Projects (D/A)</i>		0.78

Source: Gross Impact Analysis.

The table shows that, overall, verified program savings are 132% of the savings reported in the RHA database (calculated as E/A in Table 4-2). Projects modeled with software other than RHA represent the largest adjustment (70%) to RHA-reported savings (79 of the 192 projects in FY2013 are modeled with a different software and are therefore not captured in the RHA database). The QA-Inspection Factor also greatly impacted verified program gross savings, reducing RHA reported savings by 31%. Additional installed measures (i.e., those not documented in RHA) increase savings by 13%, while the reduction in savings due to ineligible measures was negligible.

The table also shows that verified savings for the 113 projects modeled in RHA are 78% of the savings reported in the RHA database (calculated as D/A in Table 4-2 above). For RHA verified savings, the QA-inspection factor represents the largest adjustment to reported savings.

The next section provides additional detail on each of the four adjustments made to RHA-reported savings.

4.2.2 GROSS IMPACT ADJUSTMENT FACTORS

QA Inspection Factor

To develop savings values that reflect actual installations, as opposed to modeled measures, we relied on Quality Assurance (QA) inspections of completed PACE and PowerSaver projects conducted by CSG.¹³ These inspections included blower door tests as well as visual verification inspections of all measures listed in the RHA database. Based on the inspection, CSG assigned a “% Measure Installed” ratio for each measure that reflects the actual installation relative to what was initially modeled and included in the RHA database. In effect, CSG developed a realization rate for each measure in the RHA database for the inspected sites. CSG then aggregated measure-level realization rates to compute a weighted average project-level realization rate for each inspected project.

The program has a goal of conducting QA inspections of 15% of projects. However, the majority of post-project inspections takes place after the program year has ended. As a result, only three FY2013 projects had been inspected at the time of this analysis. Because post-inspection results for only three FY2013 projects are insufficient for our analysis, we based the QA Inspection Factor analysis on all 40 inspections performed over the life of the PACE & PowerSaver Loan Program, in order to provide the most robust estimate of the inspection factor.¹⁴

For each of the 40 projects (i), we estimated inspection-adjusted savings by multiplying the savings reported in the RHA database ($RHA\ Savings_i$) by the project-level realization rate (RR_{Insp_i}). We then developed the overall QA-inspection factor ($Factor_{Insp}$) by dividing the sum of inspection-adjusted savings for the 40 projects by the sum of RHA reported savings for those projects. We used the following equation for this calculation:

$$Factor_{Insp} = \sum_{i=1}^{40} (RHA\ Savings_i * RR_{Insp_i}) / \sum_{i=1}^{40} RHA\ Savings_i = 0.69$$

Based on this analysis, 69% of estimated project savings listed in the RHA database could be confirmed.

Project-specific realization rates in the sample range from 12% to 133%.¹⁵ Low project-level realization rates often result from some of the recommended measures listed in the RHA database not having been installed. Table 4-3 shows the distribution of post-inspection realization rates for the 40 projects.

¹³ According to CSG, projects are generally chosen for inspection on a random basis, although some are targeted as a result of customer concerns or requests.

¹⁴ Note that the gross impact analysis for the Interim Impact Report included 35 of these 40 projects.

¹⁵ CSG’s spreadsheet included measure and project level realization rates for inspected projects. The range of realization rates presented here is slightly different from those calculated by CSG due to corrections made to the spreadsheet during the evaluation process.

Table 4-3. Distribution of Post-Inspection Realization Rates

Realization Rate	# Projects	% Projects
< 25%	2	5%
25% to <50%	7	18%
50% to <75%	7	18%
75% to <95%	11	28%
95% or greater	13	33%
Total	40	

Source: Gross Impact Analysis

Factor for Additional Installed Measures

To account for any installed measures not listed in the RHA database, we compared measures documented in the RHA database and the AFC First database for the 40 PACE and PowerSaver projects for which a post-project QA inspection had been completed, and we determined savings for the additional measures documented by AFC First.

We first developed a final AFC First measure list for the 40 projects. To capture all measures installed, we examined the Specification Sheets in the loan files for the 40 projects and noted any differences compared to those listed in the AFC First database. We then updated the measure list from the AFC First database for each of the 40 projects with information from the Specification Sheets to arrive at the final AFC First measure list.

We then compared the final AFC First measure list to the measures recorded in the RHA database for each project and identified those measures that were not already included in the RHA database. Among the 40 QA inspection projects, we identified 27 additional measures in the AFC First documentation (data or loan files) that were not already included in the RHA database. The most common additional measure, with 16 incidences, is in the “other” category.¹⁶ However, seven heating system measures (heat pumps, furnaces, and boilers) account for 80% of savings associated with additional AFC First measures. Since the AFC First database does not contain measure-level savings, we had to assign savings estimates for these 27 additional measures. In general, we used the average per project savings for the measure based on all RHA projects with that measure.

Table 4-4 summarizes our findings.

¹⁶ For measures categorized as “Other” or “Other (Whole House Recommendation)” in the AFC First database, no comparable average RHA savings value exists. In support of the Interim Impact Report, we conducted a separate analysis for these measures to 1) identify what measures are included in these two categories, 2) assign a savings estimate to them, and 3) calculate an average savings value for projects with “other” measures. This analysis is described in Appendix B of the Interim Impact Report.

Table 4-4. Summary of Additional Measures and Their Savings

Measure Category	Additional AFC First Measures	Per Unit Savings (MMBTU)	Total Additional Savings (MMBTU)
Boiler	4	24.4 / 21.6*	94.7
Heat Pump	1	85.8	85.8
Furnace	2	40.6	81.1
Other	16	2.3	36.0
Renewable	2	12.7	25.4
Windows	1	3.4	3.4
Doors	1	1.2	1.2
Total	27		327.7

Source: Gross Impact Analysis

*We applied two different average per unit savings values for additional boilers: For the 35 projects included in the Interim Impact Report, we applied the average value of 24.4 MMBTU, as estimated in that report. For the five projects inspected after the analysis for the Interim Impact Report had been completed, we applied the FY2013 average value of 21.6 MMBTU.

Based on these results, we calculated the adjustment factor for additional measures documented by AFC First ($Factor_{AddAFC}$), based on the 40 projects with QA inspections, as follows:

$$Factor_{AddAFC} = 1 + \left(\sum_{i=1}^{40} \text{Additional AFC First Savings}_i / \sum_{i=1}^{40} \text{InspectionAdj RHA Savings}_i \right)$$

Or:

$$Factor_{AddAFC} = 1 + \frac{327.7}{2,432.5} = 1.13$$

This means that installed measures documented in the AFC First database, but that are not included in the RHA database, contribute an additional 13% savings per project.

Factor for Eligibility of Installed Measures

To determine if the installed measures met program eligibility guidelines, we compared listed performance values in the AFC First database to efficiency levels required by the program. We determined eligibility for central air conditioning systems, heat pumps, boilers, furnaces, water heaters, and windows. We did not determine eligibility for measures for which an objective efficiency level does not exist (e.g., doors or fans) or which are inherently efficient or improve the efficiency of the home (e.g., programmable thermostats, renewable systems, insulation, or air or duct sealing). Table B-1 in Appendix B summarizes the program eligibility criteria based on Energy Star efficiency levels.

Performance data was present for 78 of the 125 installed measures (62%) in the end-use categories for which we assessed eligibility. Of these 78 measures, the listed performance values met the program eligibility requirements for 77 (99%). Given this finding, we determined that it would be appropriate to assume that the other 47 measures in these end-use categories (for which we did not have performance data) also met program eligibility criteria.

To calculate the adjustment factor for eligibility of measures, we identified the gross energy savings associated with the ineligible gas furnace (30 MMBTU) and deducted this amount from the total gross

savings associated with all measures documented in the AFC First database. We then divided the result by total gross savings, giving us:

$$Factor_{Elig} = \frac{11,705 - 30}{11,705} = 0.997$$

Extrapolation Factor for Non-RHA Projects

The RHA database only contains projects modeled with the RHA software (113 out of 192 projects in FY2013), and therefore does not capture all projects for which a PACE or PowerSaver loan has been provided. The AFC First database, on the other hand, contains all projects for which a PACE or PowerSaver loan has been provided (192 projects in FY2013).

To ensure that program-level results account for projects not present in the RHA database, we developed a factor that is equal to the quotient of the number of projects in the AFC First database and the number of projects in the RHA database:

$$Factor_{NonRHA} = \frac{192}{113} = 1.70$$

Applying this factor assumes that RHA-modeled projects are representative of projects not modeled in RHA, i.e., that both types of project have similar average savings, inspection realization rates, and overlap in measures with the AFC First database. Based on a comparison of projects in the AFC First database that were modeled with RHA and those that were modeled with another software, we believe that this is a reasonable assumption.

4.3 NET IMPACT ANALYSIS

The analysis of FY2013 net impacts for the PACE & PowerSaver Loan Program included a quantitative analysis of free-ridership. We also applied the estimate of partial participant spillover from the Interim Impact Report.¹⁷ We assessed participant spillover but did not quantify it as part of the net-to-gross ratio because we determined that our gross impact methodology already takes into account improvements that were made following the energy audit but that were not included in the loan. As such, our verified gross impact estimate already includes savings that, in the context of program evaluation, are often considered participant spillover. Finally, in this evaluation, we did not measure non-participant spillover.¹⁸

4.3.1 SUMMARY OF NET IMPACTS

Net program impacts are calculated by multiplying the net-to-gross ratio (NTGR) by verified gross program savings. The NTGR, which represents the percentage of gross program savings that we can reliably attribute to the program, is calculated as $NTGR = (1 - \text{Free-Ridership} + \text{Spillover})$.

¹⁷ These findings were based on responses to the survey of program drop-outs conducted in support of the Interim Process Report, which provided a measure of partial participant spillover. This survey was not repeated for the Final Evaluation Report.

¹⁸ Any non-participant spillover would increase the NTGR.

Based on the estimated levels of free-ridership and partial participant spillover, we estimate the NTGR for the PACE & PowerSaver Loan Program in FY2013 to be 1.052. Table 4-5 summarizes the NTGR results.

Table 4-5. FY2013 PACE/PowerSaver NTGR

Component	Value
Free Ridership	0.103
Partial Participant Spillover	0.155
NTGR	1.052

Source: Net impact analysis.

Applying the NTGR to verified gross program savings of 10,445 MMBTU (see Table 4-2) yields annual program-level net impacts of 10,986 MMBTU, or 57.2 MMBTU for each of the 192 projects completed during in FY2013.¹⁹

4.3.2 FREE-RIDERSHIP AND SPILLOVER RESULTS

Free-Ridership

In the context of the PACE & PowerSaver Loan Program, free-riders are program participants who would have made the energy efficient home improvement(s) included in their loan, even without the program. The free-ridership analysis is based on self-reported information from the FY2013 participant survey, conducted in July 2013. The survey collected free-ridership data for 70 PACE and PowerSaver projects completed in FY2013. Respondents included PACE participants (45), PowerSaver participants (23), and those that received both a PACE and PowerSaver loan (2).

We assessed free-ridership by asking participants a series of questions that explore 1) the influence of the program components in making the energy efficient installations and 2) likely actions had the program not been available.

Influence of Program Components

We asked respondents to rate the influence of four program components (on a scale of 0 to 10, where 0 is not at all important and 10 is very important) on their decision to make the loan-funded improvements to their home: 1) the information provided by the home energy audit or the Energy Advisor, 2) the availability of the PACE or PowerSaver loan, 3) access to a contractor with specific training in energy efficiency, and 4) the ease of participation. The program influence component part of the free-ridership score is calculated as:²⁰

$$\text{Program Components Score} = 1 - (\text{Maximum rating of any of the four components} / 10)$$

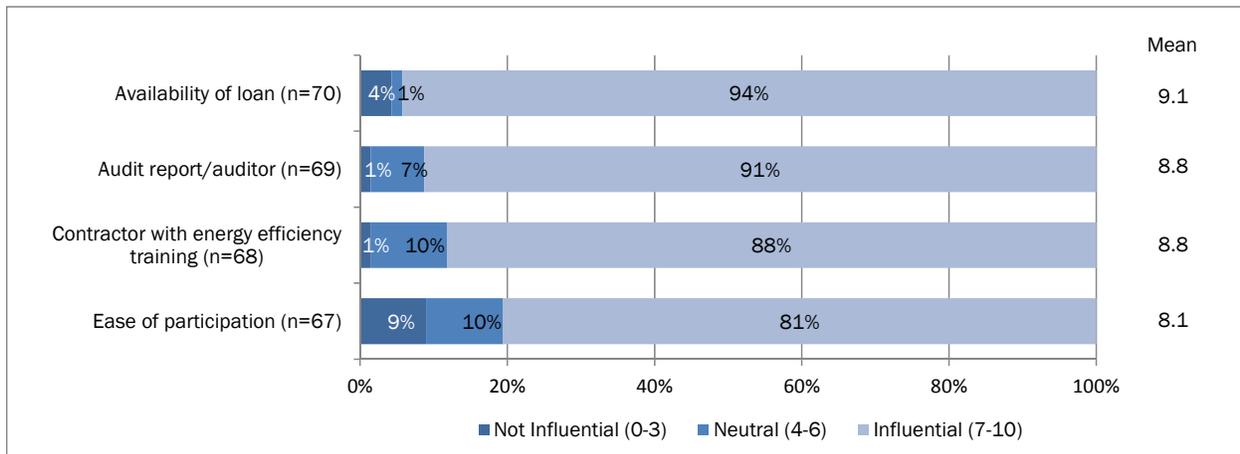
¹⁹ 57.2 MMBTU are equivalent to 414 gallons of heating oil.

²⁰ We reduced the rating for the importance of information provided by the home energy audit or the Energy Advisor by 50%, if the participant was “very likely” to have had an audit without the program.

The Program Components free-ridership scores thus range from 0 (0% free-ridership, 100% program attribution) to 1 (100% free-ridership, 0% program attribution). Greater influence of the program components means a lower level of free-ridership.

Participants generally gave high ratings to the influence of program components on their decision to make the energy improvements to their home. Almost all participants (94%) rated the loan as influential (a rating of 7 to 10 on a scale of 0 to 10), with 61% giving the highest rating of 10. The information provided by the home energy audit or Energy Advisor and having access to a contractor trained in energy efficiency were also important in customers’ decision-making.

Figure 4-2. Influence of Program Components on Decision to Make Improvements



Source: PACE/PowerSaver Participant Survey (July 2013)

Likely Action without Program

We asked respondents up to four questions about the home improvements for which they received a PACE or PowerSaver loan: 1) would they have made the improvement(s) without the program (independent of the efficiency level); if yes, 2) how likely is it that the installation(s) would have been of the same efficiency without the program; 3) when would they have made the installation(s) without the program; and 4) if the installation(s) would have been made later, how much later.

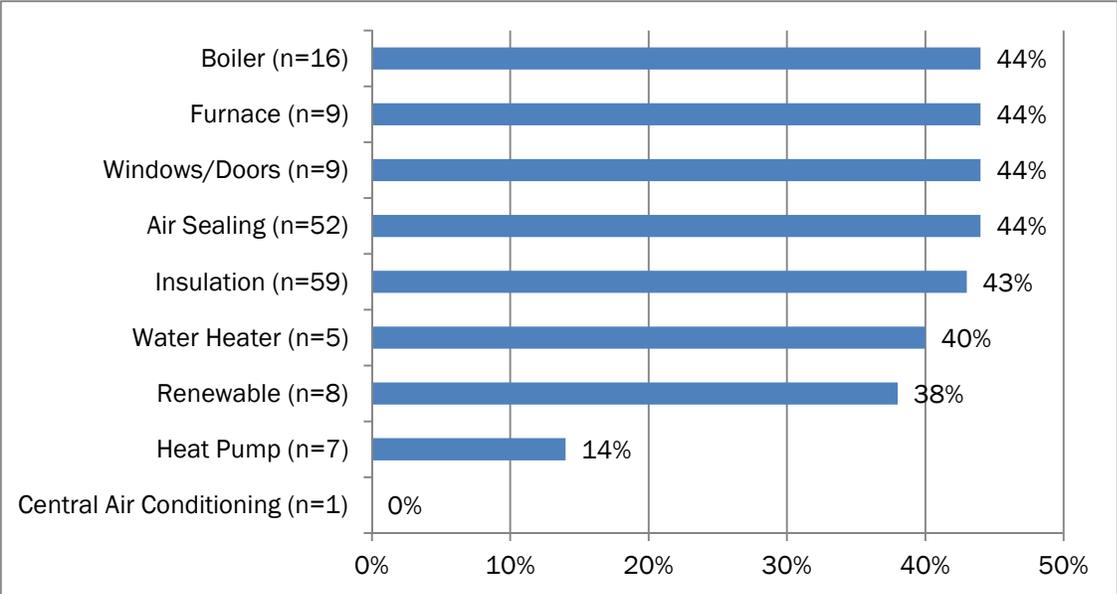
Participants who would *not* have made any of the loan financed improvements without the program are not free-riders. For those who would have installed at least one improvement without the program, we estimated the percentage of total project savings for improvements they would have made without the program. This percentage was then adjusted, based on the responses to the level of efficiency and timing, to determine the Likely Action free-ridership score. As with the Program Components Score, the Likely Action Score values range from 0 to 1. Lower efficiency levels or later implementation without the program means a lower level of free-ridership.

As shown in Figure 4-3, about 44% of participants surveyed indicate they would have installed their loan-financed boilers, furnaces, windows/doors, air sealing, and insulation, without the program. However, based on survey results, even those measures that participants indicated they would have installed without the program would often have been less efficient or installed later in time, if the program had not been available.

It is typical for a home performance type of energy efficiency program to have a higher likelihood of installation without the program for equipment-type measures (e.g., boilers and furnaces) than for

weatherization measures (e.g., insulation and air sealing), because the need to replace old or broken equipment is often what initially attracts customers to the program. However, in the case of the PACE & PowerSaver Loan Program, we observe a similar degree of likely installations without the loan program for equipment measures and weatherization measures, as shown in Figure 4-3. The relatively high degree of likely installations of weatherization measures without the program is largely driven by loan program participants who were also RDI Program participants and received an RDI incentive for implementing air sealing and insulation.

Figure 4-3. Percent of Installations that Would Have Happened Without Loan

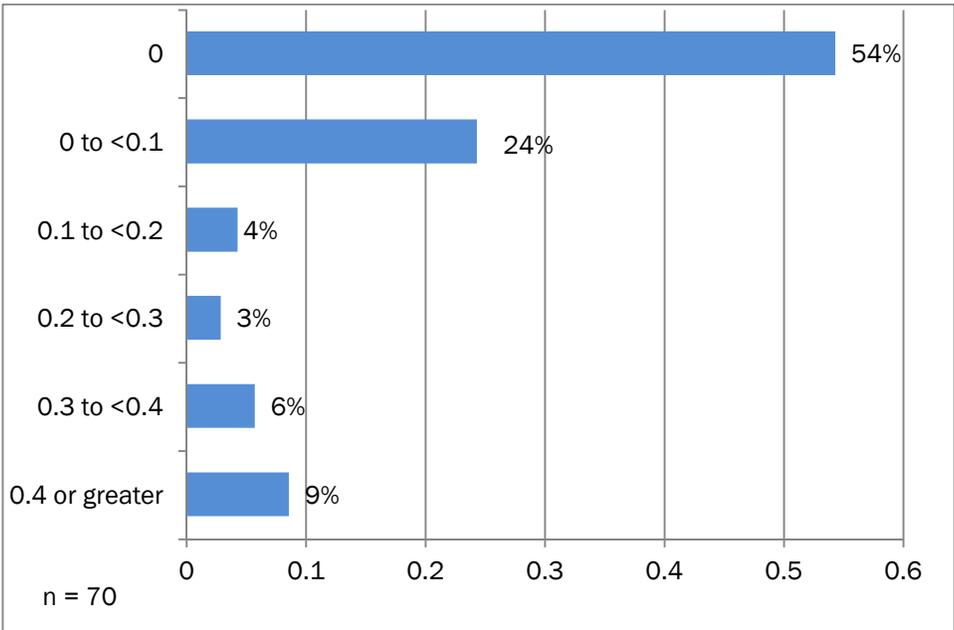


Source: PACE/PowerSaver Participant Survey (July 2013)

Overall Free-Ridership Score

The overall free-ridership score for each survey respondent is the average of the Program Component and Likely Action scores. To estimate program free-ridership, we aggregated the respondent-level free-ridership scores, weighted by energy savings. Free-ridership scores for the 70 survey respondents range from 0 to 0.60. Notably, we estimate a free-ridership score of 0 (no free-ridership) for 54% of participants. Only 9% of participants have a free-ridership score of 0.4 or greater. Figure 4-4 summarizes these findings.

Figure 4-4. Distribution of PACE and PowerSaver Free-Ridership Scores



Source: PACE/PowerSaver Participant Survey (July 2013), net impact analysis.

The resulting program-level estimate of free-ridership is 0.10 (meaning 90% of savings are attributable to the program).

Participant Spillover

For the participant spillover analysis, we considered energy efficiency improvements that were 1) recommended during the audit, 2) installed after the loan-funded project but were not part of the loan, and 3) influenced by the program (i.e., the respondent rated the importance of the experience with their loan on the decision to make the improvements a 7 or higher, on a scale of 0 to 10). Based on responses to the participant survey, four respondents (6%) made improvements that met these criteria. These respondents reported installing insulation (3), a heat pump (1), and windows (1).

To verify if these additional installation would qualify for participant spillover, we checked if the measures were already included in either the RHA database or the AFC First loan files. If so, we did not count the measures as participant spillover because our gross impact methodology already included their savings.²¹

This analysis found that two of the four projects (both with insulation and one with a heat pump) do not qualify for participant spillover because the potential spillover savings were already captured by the gross impact analysis. The other two projects were not modeled in RHA, and no additional

²¹ Our estimate of gross savings starts with RHA-reported savings and adjusts them for QA post-inspection results and additional AFC First projects. Measures that were recommended and documented in RHA would have been confirmed during the QA inspection process, whether or not they were financed with a loan. Measures that were not in RHA but documented by AFC First would have been added. Savings for those measures are therefore already included in the gross impact estimate, and adding them as participant spillover would double-count them.

information on recommended or installed measures was available.²² These projects included insulation and windows as potential spillover measures.

Since there is insufficient information to make the determination that the improvements qualify for spillover, we do not include savings for these measures in the NTGR. If we did include these improvements and assigned average RHA-based savings values to them, the participant spillover rate would be 1.4%.

Partial Participant Spillover

Partial participant spillover refers to home energy improvements undertaken by program drop-outs that were influenced by the program but were not funded by a PACE or PowerSaver loan. An example of partial participant spillover is when a customer who withdrew their application before receiving a loan, but after receiving a home energy audit, makes recommended improvements on their own because of the information received from the audit report.

We estimated partial participant spillover in support of the Interim Impact Report, based on a survey of program drop-outs.²³ We estimated partial participant spillover for any program drop-out who 1) made energy-related home improvement projects that were completed after applying for the PACE loan, 2) had a home energy audit completed, and 3) rated the importance of the energy audit on the decision to make the improvements a 7 or higher (on a scale of 0 to 10). For each of these drop-outs, we applied average RHA savings by measure to the energy-related improvements made by the customer. The estimated partial participant spillover was 15.5% of gross savings. We applied this value in the FY2013 net impact analysis of the PACE & PowerSaver Loan Program.

²² The loan approval letters did not list recommended measure, and loan files were not available.

²³ The drop-out survey was conducted in June of 2012, in support of the Interim Process Evaluation Report, and collected information from 56 participants that began the loan application process but dropped out before closing the loan.

5. SUMMARY OF PACE/POWER SAVER HEATING FUEL BILL ANALYSIS

Efficiency Maine program staff expressed a strong interest in obtaining “real-life” (i.e., not modeled) estimates of the level of project savings (relative to baseline home energy usage) as part of this evaluation. Plans to conduct a billing analysis as part of the impact evaluation were carefully evaluated but ultimately dismissed at an earlier stage of this evaluation, due to the known challenges of collecting robust pre- and post-project billing data, given Maine’s high incidence of heating fuel oil and reliance on one or more supplemental sources of heating fuel (often cord wood or pellets). Despite these known challenges, the Evaluation Team, in accordance with Efficiency Maine, decided to spend limited resources on initial attempts to collect heating fuel bill information and analyze the information collected.

5.1 METHODOLOGY

Heating Fuel Bill Data Collection

Initial attempts to collect fuel bill information focused on obtaining customer fuel bills from PEAs, who had already collected them from customers who participated in the PACE & PowerSaver Loan Program. This strategy provided limited success as few PEAs had this information available (or were willing to contact their customers to obtain it).

The Evaluation Team then directly contacted PACE and PowerSaver participants who completed their PACE or PowerSaver projects before the winter of 2012/2013, sending them a letter with a request for heating fuel bill data. Customers who were interested in participating were given the opportunity to opt into this effort via a brief on-line survey that collected key data that allowed us to ascertain if the customer had all the required heating fuel bill information available. Customers could then send the required information – which included the fuel type, date of fuel delivery, and amount delivered (and, for fuel types like oil and propane, whether the tank was filled to full) – via e-mail, fax, or mail. Customers who provided their heating fuel bills were given an incentive of \$25, to reimburse them for their efforts.

Overall, through the efforts with PEAs and customers, we obtained pre- and post-project fuel bills from 24 loan program participants.

Data Cleaning

We reviewed the billing data for the 24 projects for completeness as well as the availability of a sufficient number of pre- and post-project months/fillings. We also reviewed any additional information the customer provided about their bills. This data cleaning process resulted in the removal of six projects from the analysis (two projects because we only had usable data for two pre- and two post-project months; two because of significant changes in the home over the comparison period; one because it had insufficient fuel tank fill data; and one because the only installed measure was a solar PV system, which does not significantly affect heating fuel usage).

Following the data cleaning process, we had fuel bills for 18 projects available for our analysis.

Analytical Approach

Given that we did not have sufficient billing data to support a regression-based billing analysis, we developed a methodology of comparing weather-adjusted pre- and post-project fuel usage on an individual participant level. We took the following steps:

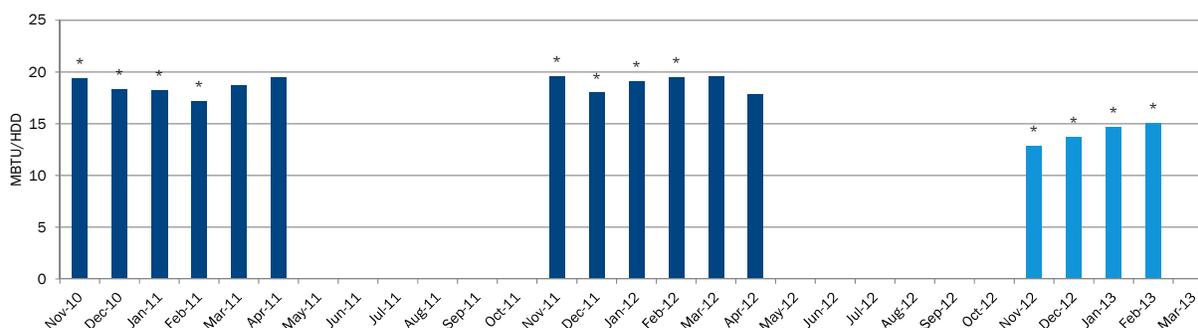
1. Obtain Fahrenheit-based heating degree days (HDD)²⁴ for a base temperature of 65F, for the Bangor International Airport weather station.
2. Determine HDD for the time period associated with each fill event²⁵ (i.e., the days between two fuel tank fillings or the number of days in a billing cycle).
3. Convert fuel information into thousands of British Thermal Units (MBTU).
4. Determine MBTU/HDD associated with each fill event.
5. Assign MBTU/HDD associated with each fill event to specific months (by fuel type, if more than one used by the household).
6. Develop total monthly household MBTU/HDD by summing over multiple fuel types used by the household.
7. Determine pre- and post- periods for each project, based on the dates of project installation.
8. Determine comparison months (including only winter months, November through April, and matched months, e.g., if only Dec.-Feb. is available post project, only Dec.-Feb. is included pre project).
9. Calculate average MBTU/HDD for pre-project comparison months and matching post-project comparison months.
10. Calculate percentage savings as: $(\text{Pre MBTU/HDD} - \text{Post MBTU/HDD}) / \text{Pre MBTU/HDD}$

For each project, we developed a graph that shows 1) weather-adjusted fuel usage in the pre-project winter months (dark blue bars) and in the post-project winter months (light blue bars), 2) the project installation period, if during the winter months (gray bars), and 3) months included in the comparison (bars with an asterisk). Figure 5-1 presents an example of the usage graphs. As part of the analysis, we also looked at the installed measures that accounted for the savings as well as the model-predicted percentage savings.

²⁴ Heating Degree Days (HDD) = 65° F – average daily temperature

²⁵ For oil, propane, and kerosene, “fill event” is the filling of the fuel tank; for natural gas and electricity it is the metered usage based on the utility’s billing cycle (e.g., monthly).

Figure 5-1. Example of Heating Fuel Bill Analysis Graphs



5.2 RESULTS

The estimated heating fuel savings for the 18 analyzed PACE and PowerSaver projects range from less than 1% to 52% of pre-project weather-adjusted fuel usage, with an average of 24%. We estimate heating fuel savings of 20% or higher for 12 of the 18 projects. Almost all of these projects include insulation, and air sealing is included in 9 of the 18 projects. Three of the projects involved fuel switching. Table 5-1 presents these results, showing the 18 analyzed projects from highest estimated savings to lowest.

Table 5-1. Estimated Bill Savings and Major Measures of Sample of PACE/PowerSaver Projects

Project	% Estimated Savings	AFC First Measures
1	52%	Insulation, Water Heater, Windows
2	49%	Renewable
3	39%	Insulation, Boiler
4	32%	Insulation, Air Sealing
5	29%	Boiler, Air Sealing, Insulation
6	26%	Insulation
7	26%	Insulation
8	25%	Insulation
9	23%	Insulation, Boiler, Air Sealing
10	21%	Insulation, Air Sealing
11	21%	Boiler
12	21%	Insulation, Boiler, Air Sealing
13	17%	Insulation, Air Sealing
14	16%	Insulation, Air Sealing
15	10%	Boiler, Insulation
16	8%	Insulation, Ducts
17	7%	Insulation, Air Sealing
18	0.3%	Air Sealing, Boiler
Average	24%	

Source: Participant fuel bills, AFC First Tracking Data (as of July 1, 2013), fuel bill analysis.

RHA modeled savings for these projects (for measures reported in the AFC First database) as a percentage of baseline fuel usage averaged 40% (based on data for 14 of the 18 projects) compared to the 24% estimated through the fuel bill analysis. In most cases, the project's RHA modeled savings exceeded savings based on our heating fuel bill analysis. However, it should be noted that the two estimates of savings are not directly comparable because: 1) The RHA modeled savings are based on *average* savings values in cases where AFC First reported measures did not match measures for the same project in RHA, while the heating bill analysis is based on the individual household. In individual cases, average values can vary significantly from values specific to a home. 2) The RHA modeled savings do not take into account the possibility that for improvements like insulation and air sealing, the amount actually installed might be more or less than what was modeled. For example, if insulation is listed in the AFC First database and the RHA database, we assign the RHA modeled savings for that measure, but the actual project might have included more or less insulation than was modeled.

6. COST-EFFECTIVENESS AND MACROECONOMIC EFFECTS

6.1 METHODOLOGY

For this Final Evaluation Report, the Evaluation Team conducted a cost-effectiveness analysis for FY2013 using Efficiency Maine's Benefit/Cost Screening Model (version 2.2) developed by GDS Associates.

Initial program inputs for the FY2013 cost-effectiveness analysis were provided by Efficiency Maine.²⁶ The Evaluation Team used the Benefit/Cost model to develop results for 1) the Total Resource Cost test (TRC),²⁷ which is the test used by Efficiency Maine; 2) the Program Administrator Cost Test (PACT); and 3) the Participant Cost Test (PCT). Each test calculates a benefit-cost ratio by taking the present value (PV) of benefits and dividing them by the first-year costs applicable for each test. NPV discounts for the time value of money (i.e., savings that accrue in the future are less valuable than immediate savings).

Total Resource Cost Test (TRC)

The TRC examines the costs and benefits of an energy efficiency program from a societal perspective. It compares net energy-savings benefits (avoided costs) to the net costs incurred by the program administrator, as well as net costs incurred by the participant, such as the incremental cost of purchasing the program measure. The TRC views program incentives/rebates as transfers at the societal level and not as program costs.

Program Administrator Cost Test (PACT)

The PACT examines the costs and benefits from the perspective of the program administrator. It compares the net benefits to the net costs incurred by the program administrator, including any rebate/incentive costs but excluding any net costs incurred by the participant, such as the actual measure cost.

Participant Cost Test (PCT)

The PCT examines the costs and benefits from the perspective of the customer installing the energy efficiency measure (homeowner, business, etc.). Benefits include bill savings realized by the customer from reduced energy consumption, and the incentives received by the customer, including any applicable tax credits. Costs include the incremental cost (borne by the customer) of purchasing and installing the efficient equipment rather than standard equipment. In some cases incremental operations and maintenance costs (or savings) are also included.

²⁶ Avoided costs are based on Synapse Energy Economics' *Avoided Energy Supply Costs in New England: 2013 Report*, which provides avoided costs for 2013-2043.

²⁷ Note that the TRC values are estimated without accounting for the value of CO₂ under the Regional Greenhouse Gas Initiative (RGGI).

Macroeconomic Effects

We estimated macroeconomic effects using multipliers developed by Environment Northeast (ENE) in its report for Northeastern states.²⁸ Job creation (job-years) and economic stimulus (increase in gross state product, GSP) were estimated using the programs’ total spending (including both administrator and participant spending).

The macroeconomic benefits of energy efficiency occur as a result of increased spending on efficiency measures and decreased spending on energy. Lower energy costs cause other forms of consumer spending to increase. ENE modeled two scenarios for each fuel: 1) each state acts alone (the “individual” scenario); and 2) all New England states implement the program at once (the “simultaneous” scenario). We used results from the individual scenario to estimate macroeconomic impacts of the PACE & PowerSaver and RDI programs. It should be noted that the simultaneous scenario would result in slightly higher macroeconomic impacts than those presented in this report.

ENE developed multipliers for electricity, natural gas, and unregulated fuels such as fuel oil and propane. These multipliers were prorated for each program using MMBTU savings per fuel type. Job-years created per million in spending in 2008 dollars were converted to job-years per million in spending in 2013 dollars, using a 2% yearly inflation rate. Because of inflation, spending in 2013 dollars results in a lesser economic impact.

6.2 FY2013 COST-EFFECTIVENESS RESULTS

Our analysis of the PACE & PowerSaver Loan Program for FY2013 found that the program is cost-effective for all three tests, the Total Resource Cost test (TRC), the Program Administrator Cost Test (PACT), and the Participant Cost Test (PCT). All tests show a positive net present value and a benefit-cost ratio that well exceeds 1.0. This analysis is based on the 192 projects that were completed between July 2012 and June 2013 (FY2013).

Table 6-1. Summary of Cost-Effectiveness for the PACE & PowerSaver Loan Program

	TRC	PACT	PCT
PV of Costs (million \$) (A)	3.0	0.6	2.4
PV of Savings (million \$) (B)	7.4	7.4	7.0
NPV (million \$) (B-A)	4.4	6.8	4.7
Benefit/Cost Ratio (B/A)	2.5	11.7	3.0

Source: Cost-Effectiveness Analysis.

Macroeconomic Impacts

Total FY2013 spending (cost) of \$3.3 million²⁹ as a result of the PACE & PowerSaver Loan Program resulted in an estimated \$14.8 million increase in gross state product and the creation of 220 job-years.

²⁸ Environment Northeast. 2009. Energy Efficiency: Engine of Economic Growth – A Macroeconomic Modeling Assessment.

²⁹ Note that total spending for the macroeconomic impact analysis includes spillover measure costs and is therefore higher than direct PACE & PowerSaver Loan Program spending.

7. PARTICIPANT EXPERIENCE

7.1 LOAN TERMS AND APPLICATION PROCESSES

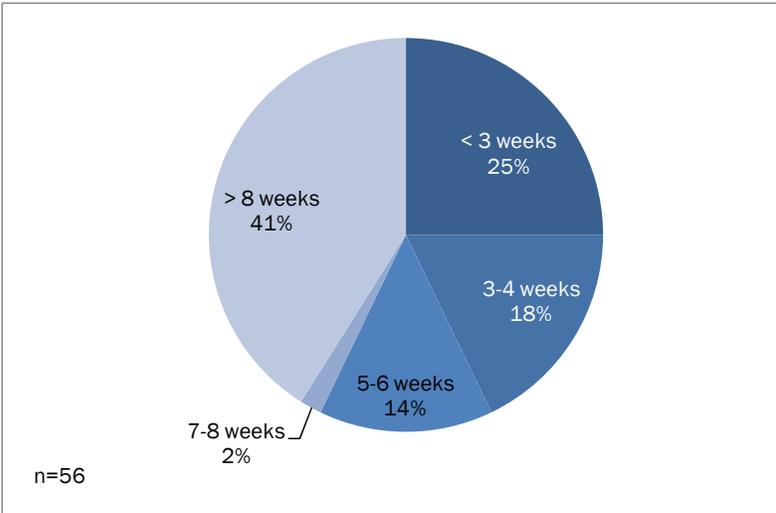
Loan Application Processes

Maine residents can apply for a PACE or PowerSaver loan either online or by calling Efficiency Maine. Sixty-two percent of FY2013 participants applied online and approximately one-third (31%) applied over the phone.³⁰ All who applied over the phone found the Efficiency Maine representative to be “very helpful” (77%) or “somewhat helpful” (23%). Additionally, all FY2013 participants found the AFC First representative who worked with them to process and close the loan to be either “very helpful” (78%) or “somewhat helpful” (22%).

Eighty-five percent of participants find that it is either very easy (57%) or somewhat easy (28%) to complete the paperwork and provide the documentation required for a PACE or PowerSaver loan, while 12% find the process to be “not very easy” (10%) or “not at all easy” (2%). Those participants who were not satisfied with the paperwork most commonly cited the large amount of required paperwork compared to other loans.

More than half of participants (57%) report that it took six weeks or less to close the loan with AFC First, once the application had been submitted. The loan took more than eight weeks to close for 41% of participants. The majority of participants are “very satisfied” (64%) or “somewhat satisfied” (19%) with the loan processing time, while 11% are “not very satisfied” and 4% are “not at all satisfied.”³¹

Figure 7-1. Time to Close Loan



Source: PACE/PowerSaver Participant Survey (July 2013)

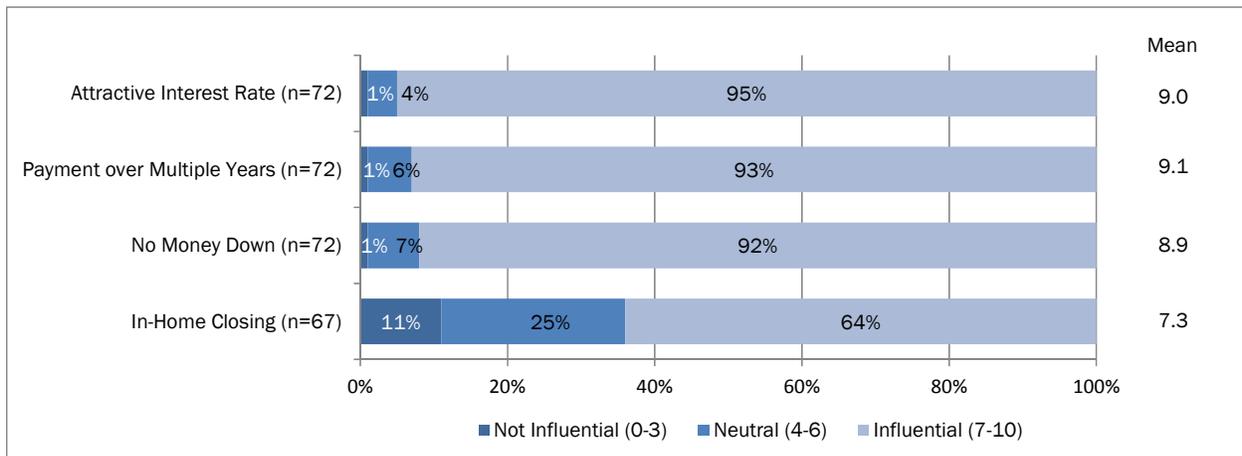
³⁰ The remainder of respondents did not recall how they applied.

³¹ These reported loan closing times are longer compared to times reported in the first participant survey (conducted in June 2012 in support of the Interim Process Report). Satisfaction with processing times is lower as well.

Influence of Loan Aspects

The participant survey explored the influence of several loan aspects on the decision to apply for a PACE or PowerSaver loan. Overwhelmingly, participants rated the attractive interest rate (95%), the option of paying over several years (93%), and not having to make an up-front payment (92%) as influential in their decision to apply for the loan. The option to have the loan closing take place in their home was influential for 64% of participants. Figure 7-2 summarizes these findings.

Figure 7-2. Influence of Financing Aspects on Decision to Apply for PACE Loan



Source: PACE/PowerSaver Participant Survey (July 2013)

7.2 MARKETING AND OUTREACH

Efficiency Maine markets its loan programs in a variety of ways. Beginning in the fall of 2011 and through the spring of 2013, the program leveraged Efficiency Maine’s “Save Like a Mainer” campaign, a statewide umbrella marketing initiative that included print advertisements, online marketing, and radio and TV spots to promote general energy efficiency as well as specific program incentives and loan offerings. In addition to this general outreach, the PACE and PowerSaver Loan Program has performed more targeted marketing, including flyers to customers of local oil dealers, tax bill inserts in select PACE municipalities, and postcards to residents. Tax bill inserts have been sent to all property owners in over 100 municipalities in each of the last two years, reaching large numbers of Maine residents.

Participants most frequently learn about the PACE & PowerSaver Loan Program through traditional media such as newspapers, radio, and TV (25%). Contractors (18%) and word-of-mouth (18%) were also frequent sources of information. Table 7-1 summarizes the sources through which FY2013 participants learned about the program.

Table 7-1. Ways Participants First Learned about Efficiency Maine Loan Program

	Participants (n=72)
Newspaper/radio/TV	25%
Contractor/energy advisor/auditor	18%
Friends/family/word of mouth	18%
Efficiency Maine website	10%
Online	10%
Professional connection	4%
Public presentation in my community	4%
Efficiency Maine mailing/brochure	3%
Realtor	3%
Other	3%
Don't know	3%

Source: PACE/PowerSaver Participant Survey (July 2013)

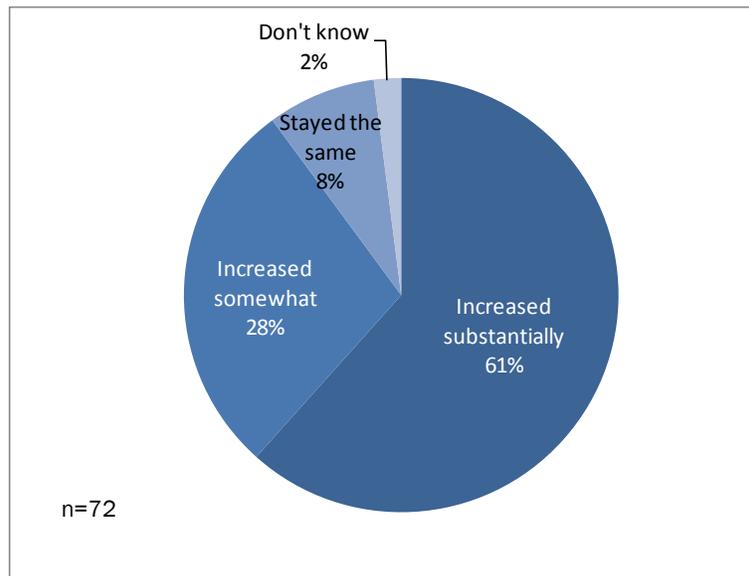
7.3 HOME ENERGY AUDIT AND IMPROVEMENTS

Home Energy Audit

A home energy audit is a requirement to qualify for a PACE or PowerSaver loan. Besides having the audit because it was required (40%) to qualify for a PACE or PowerSaver loan, other reasons for having the audit include learning ways to save money on utility bills, learning how their home uses energy, and other related factors. Slightly less than half of participants (46%) report that they would have been likely to have an energy audit performed if it had not been part of the PACE & PowerSaver Loan Program. For most participants (89%), the audit resulted in an increase in their awareness of energy efficiency and ways to make their home more efficient (Figure 7-3).³²

³² While the share of participants reporting that the audit resulted in an increase in their awareness of energy efficiency is virtually unchanged from the Interim Process Report (87%), the share of participants stating that their awareness “increased substantially” increased from 48% to 61%.

Figure 7-3. Change in Awareness of Home Energy Efficiency as a Result of Home Energy Audit



Source: PACE/PowerSaver Participant Survey (July 2013)

Finding and Selecting PEAs and RVs

Forty percent (40%) of FY2013 participants found their PEA through the Efficiency Maine website. An additional 19% of participants found the PEA through family, friends, or word of mouth, and 11% were assisted by an Efficiency Maine representative. Respondents selected their PEA for a variety of reasons. The most common reason was that the auditor was highly recommended and had positive references (38%). Other commonly cited reasons for selection include that the PEA was local, their knowledge and expertise, and their availability.

For 46% of PACE and PowerSaver projects, the RV firm that made the energy improvements to the home is different from the PEA firm that conducted the energy audit. Participants most often found these RVs through recommendations from family or friends (24%), through a referral from Efficiency Maine (21%), or through previous experience with the contractor (15%). Participants' most common reasons for selecting their RV include that the contractor had positive references or was highly recommended (36%) and that the contractor was recommended by a family member or friend (30%).

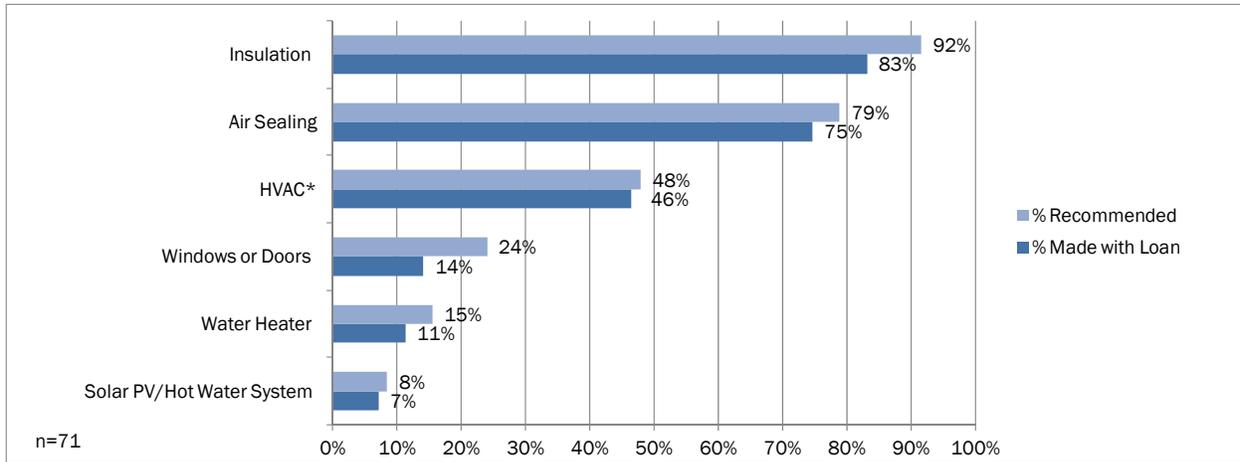
Energy Efficiency Improvements

The main reason program participants decide to make energy improvements to their home following the energy audit is to save money on their energy bills (42%). Other common reasons include to save energy (29%), to increase the comfort in the home (26%), or to replace old or broken equipment (24%).

Figure 7-4 shows that almost all energy audits (92%) include the recommendation to add insulation. PEAs also commonly recommend performing air sealing (79%) and installing efficient HVAC equipment

(48%).³³ Insulation (83% of participants) and air sealing (75% of participants) are also the measures most often installed.

Figure 7-4. Share of Participants with Recommended and Installed Measures



Source: PACE/PowerSaver Participant Survey (July 2013)

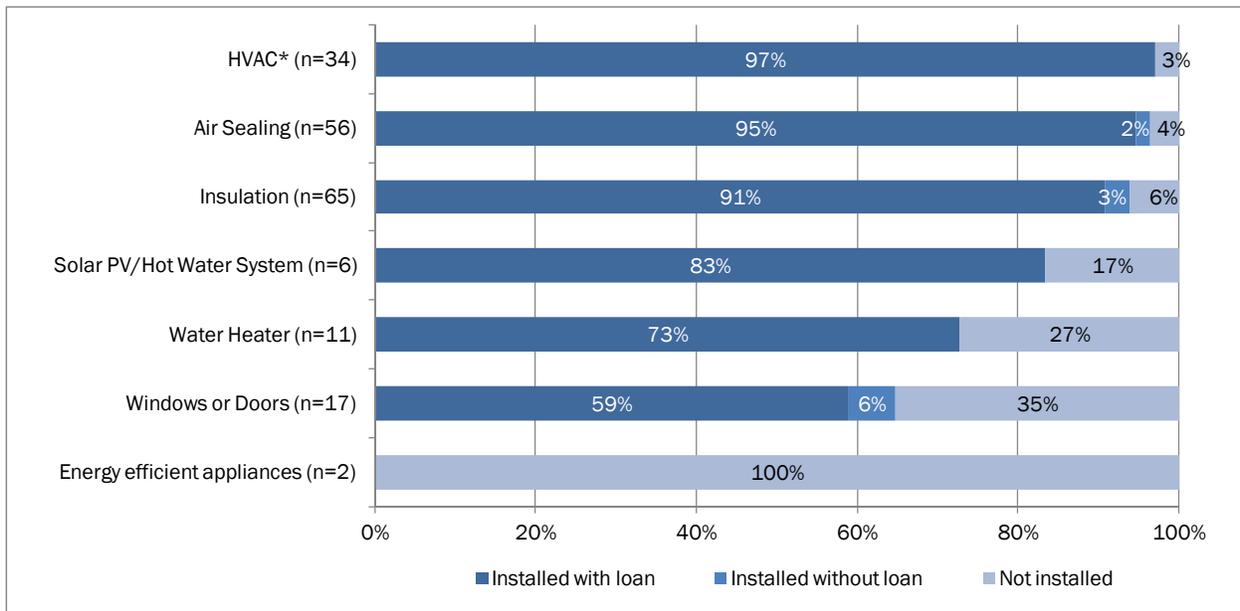
*HVAC measures include boilers (n=16), furnaces (n=10), heat pumps (n=7), and split central air conditioners (n=1)

More than half of participants (53%) said their PEA or the audit report recommended additional improvements that were not included in their PACE or PowerSaver loan. The most common additional recommendations that were not included in the loan include insulation (59%) and windows or doors (17%). Of those participants that had additional improvements recommended, only 7% had made all or some of these additional recommended improvements on their own at the time of the survey.

Figure 7-5 shows all recommended measures, comparing whether they were: (a) installed with a PACE or PowerSaver loan, (b) installed without a loan, or (c) not installed. Virtually all participants that received recommendations to install HVAC systems, air sealing, or insulation installed these measures with the PACE or PowerSaver loan or on their own. Recommended installation of solar PV/hot water systems and water heaters was done with the loan or not at all. A small number of participants also received recommendations for energy efficient appliances, but did not make this improvement.

³³ Notably, the share of participants reporting that air sealing was recommended and performed (79% and 75%, respectively) is substantially larger than in the Interim report (39% and 24%, respectively).

Figure 7-5. Installation of Recommended Measures



Source: PACE/PowerSaver Participant Survey (July 2013)

*HVAC measures include boilers (n=16), furnaces (n=10), heat pumps (n=7), and split central air conditioners (n=1)

Most FY2013 participants report noticing improvements following their projects: 83% report a decrease in energy bills and 83% report an increase in home comfort. For 14%, it was too early to tell if there had been changes to energy bills. Most of these participants completed their projects during or following the winter of 2012/2013 and have not yet had a full heating season to observe the effects of the loan-funded improvements on their energy usage.

Table 7-2. Change in Participants' Energy Bills and Comfort Level Since Making Improvements

Energy Bills (n=72)		Comfort Level (n=72)	
Decreased	83%	Increased	83%
Stayed the same	1%	Stayed the same	12%
Increased	1%	Decreased	1%
Too early to tell/don't know	14%	Too early to tell/don't know	3%

Source: PACE/PowerSaver Participant Survey (July 2013)

7.4 SATISFACTION

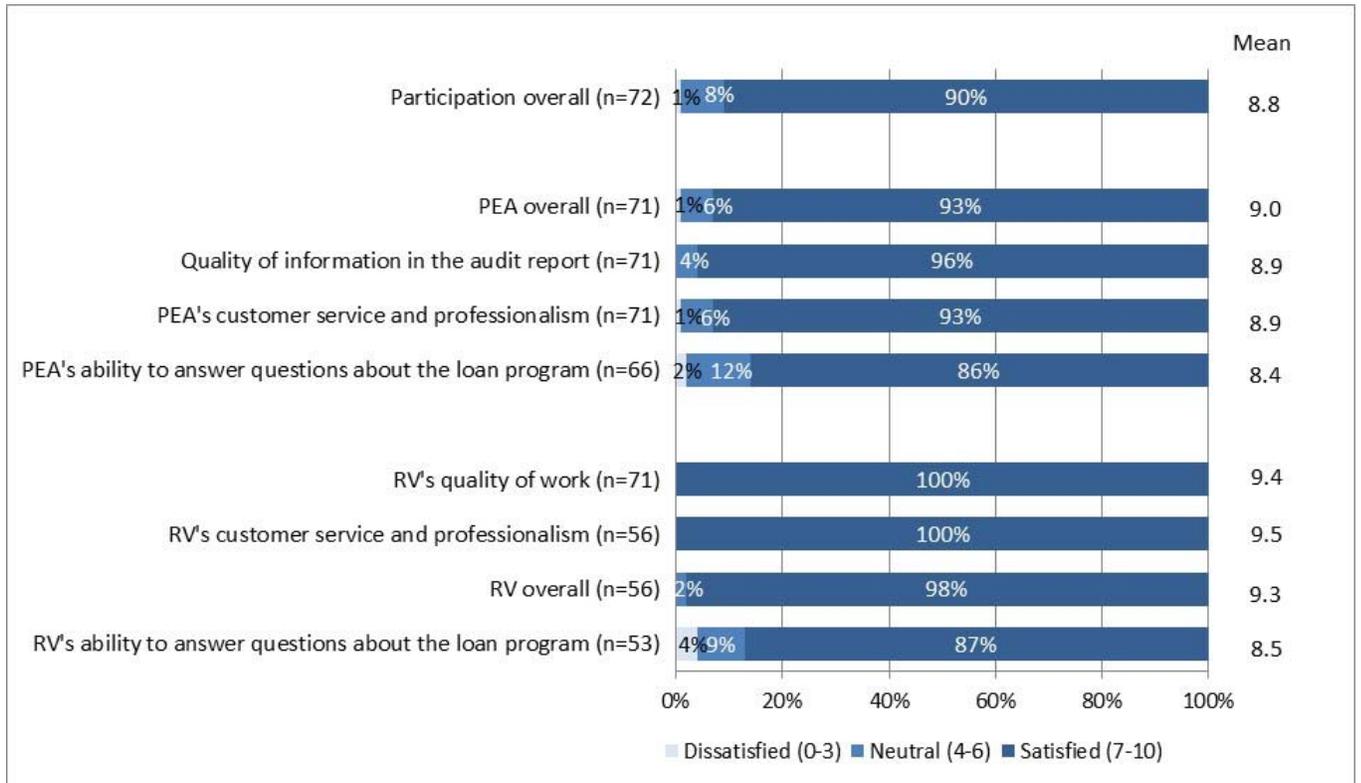
Participants were asked to rate their overall experience with the PACE & PowerSaver Loan Program, as well as various aspects of their interaction with their PEA and their RV, using a scale of 0 to 10 scale (with 0 meaning extremely dissatisfied and 10 meaning extremely satisfied). Our analysis considers a rating of 0 to 3 as “dissatisfied,” a rating of 4 to 6 as “neutral,” and a rating of 7 to 10 as “satisfied.” Survey responses show a high level of participant satisfaction with the PACE & PowerSaver Loan Program overall, with their PEA, and with their RV:

- Overall, 90% of participants are satisfied with their participation in the program, with a mean rating of 8.8.

- Confirming their general satisfaction, 96% of surveyed participants would recommend the program to their family and friends.
- Satisfaction with the PEAs is also high, including the quality of information provided in the audit report (96%) and the PEA’s level of customer service and professionalism (93%). Participants provide slightly lower, but still high, satisfaction ratings for the PEA’s ability to answer questions about the PACE & PowerSaver Loan Program (86%). Those who are less than satisfied cite the auditor’s newness to the program as the primary reason for their inability to answer questions or provide more detail about the program.
- Participants are extremely satisfied with their RVs, providing uniformly high ratings for the quality of work done (100%), customer service and professionalism (100%), and the RV overall (98%). Similar to findings for PEAs, participant satisfaction with the RVs’ ability to answer questions about the program is slightly lower, but still high (87%), with several participants noting that the contractor was not familiar with the program prior to their project.

Figure 7-6 summarizes participants responses to the satisfaction questions and provides the mean response to each question.

Figure 7-6. Participant Satisfaction with Program, PEAs, and RVs



Source: PACE/PowerSaver Participant Survey (July 2013)

Despite the high level of overall satisfaction, 19% of participants report that they experienced problems during their participation in the PACE & PowerSaver Loan program. Issues most frequently mentioned by these participants include the lengthy process and inconsistent program information.

The participant survey also provided respondents the opportunity to make recommendations to improve the program. While most participants (60%) did not have any recommendations, those who did have recommendations most often suggested improving program communication and providing more consistent information and providing an easier loan application/qualification process (Table 7-3).

Table 7-3. Recommendations to Improve PACE & PowerSaver Loan Program (Multiple Response)

	Participants (n=72)
Improve program communication/more consistent information	15%
Easier loan application process/easier to qualify	11%
Increase awareness of program/more marketing	6%
Improve contractor training/other contractor issues	6%
Faster loan processing time	4%
More favorable loan terms (more competitive interest rate/larger loans)	4%
Increase number of eligible measures	3%
Other	4%
None	60%

Source: PACE/PowerSaver Participant Survey (July 2013)

8. FINDINGS AND RECOMMENDATIONS

Program Activity

In FY2013, participants received 203 loans, totaling \$2.5 million, through Efficiency Maine's PACE & PowerSaver Loan Program. This includes 129 PACE loans, 25 Secured PowerSaver loans, and 49 Unsecured PowerSaver loans. These 203 loans supported 192 unique projects, with 11 participants receiving both a PACE and PowerSaver loan for the same project. FY2013 PACE loans averaged \$12,730, while the average Secured PowerSaver loan was \$21,349 and the average Unsecured PowerSaver loan was \$6,528.

The most common measures financed with a PACE or PowerSaver loan during FY2013 were insulation (83%), air sealing (75%), and HVAC equipment (boilers, furnaces, heat pumps, and central A/C systems) (46%).

A total of 94 firms participated in the PACE & PowerSaver Loan Program in FY2013, either as a participating energy advisor (PEA) (14) or a registered vendor (RV) (55) or both (25). The number of projects completed by an individual PEA or RV during FY2013 ranged from 1 to 14; however, 65% of RVs and 51% of PEAs completed one only project in FY2013.

Gross Impacts

Verified first-year, annual gross savings for the PACE & PowerSaver Loan Program in FY2013 are 10,445 MMBTU, or an average of 54.4 MMBTU for each of the 192 projects completed during this time period.³⁴ On average, these savings represent 27.7% of pre-project whole-house energy usage.

We based the verified gross savings estimate on savings reported for 113 projects in the RHA database but applied the following adjustments:

- **QA-Inspection Factor ($Factor_{Insp}$).** This factor accounts for the fact that not all recommended measures documented in RHA were installed. It reflects the savings of verified installed measures (from QA inspections by CSG) as a percentage of savings from the recommended measures in RHA.
- **Additional AFC First Project Factor ($Factor_{AddAFC}$).** This factor accounts for measures that are documented in the AFC First database but that are not included in the RHA database.
- **Eligibility Factor ($Factor_{Elig}$).** This factor provides a means to adjust for any measures that do not meet the program's efficiency standards.
- **Non-RHA Projects ($Factor_{NonRHA}$).** This factor is used to extrapolate results for the RHA-modeled projects (113) to the full population of projects (192).

The overall realization rates for PACE and PowerSaver gross savings are as follows:

- **Program Realization Rate = 1.32.** This means that verified gross savings for the 192 projects completed are 132% of the total savings reported in the RHA database.

³⁴ 54.4 MMBTU are equivalent to 394 gallons of heating oil.

- RHA Project Realization Rate = 0.78. This means that verified gross savings for the 113 projects modeled in RHA are 78% of the total savings for those projects reported in the RHA database.

A separate analysis of heating fuel bills for 18 PACE and PowerSaver projects showed savings ranging from less than 1% to 52% of pre-project heating fuel usage, with an average of 24%.

Recommendations

We recommend the following:

- **Conduct quality assurance inspections on an on-going basis.** The PACE & PowerSaver Loan Program currently completes most of its post-program inspections after the program year has ended. Given that more than half of participating RVs and PEAs completed only one project in FY2013 – which indicates limited experience with the program – conducting inspections of completed projects on an on-going basis will help ensure high levels of quality and will facilitate program tracking and evaluation.
- **Capture measure eligibility based on efficiency levels.** While installations of ineligible measures does not appear to be an issue in the program, performance data was missing in the AFC First database for 38% of installed measures (47 out of 125) within the end-use categories for which we assessed eligibility (central air conditioning systems, heat pumps, boilers, furnaces, water heaters, and windows). We recommend that AFC First require that performance values are listed on specification sheets and enter them in the database for all measures for which efficiency standards exist.

Net Impacts

Net program impacts are calculated by multiplying the net-to-gross ratio (NTGR) by verified gross program savings. The NTGR, which represents the percentage of gross program savings that we can reliably attribute to the program, is calculated as $(1 - \text{Free-Ridership} + \text{Spillover})$. The estimated NTGR for the PACE & PowerSaver Loan Program in FY2013 was 1.052.

Table ES-1. FY2013 PACE/PowerSaver NTGR

Component	Value
FR	0.103
Participant Spillover	0.155
NTGR	1.052

Source: Impact Analysis (2013).

The estimated free ridership rate is 0.10, meaning that 90% $(1 - 0.10)$ of reported savings can be attributed to the program.

Based on the free-ridership and spillover results, the net-to-gross ratio for the PACE & PowerSaver Loan Program for FY2013 is estimated to be 1.052. This means that energy savings attributable to the program are 105% of verified gross savings.

Applying the net-to-gross ratio of 1.052 to verified gross savings of 10,445 MMBTU yields annual program-level net impacts of 10,986 MMBTU, or 57.2 MMBTU per project for the 192 projects completed during FY2013.³⁵

Cost-Effectiveness Analysis and Macroeconomic Effects

Our analysis of the PACE & PowerSaver Loan Program for FY2013 found that the program is cost-effective for all three tests performed: the Total Resource Cost test (TRC), the Program Administrator Cost Test (PACT), and the Participant Cost Test (PCT). All tests show a positive net present value and a benefit-cost ratio that well exceeds 1.0. This analysis is based on the 192 projects that were completed between July 2012 and June 2013 (FY2013).

Estimated benefit-cost ratios for the program are:

- TRC = 2.5
- PACT = 11.7
- PCT = 3.0

Total FY2013 spending (cost) of \$3.3 million³⁶ as a result of the PACE & Powersaver Loan Program resulted in an estimated \$14.8 million increase in gross state product and the creation of 220 job-years, where each job-year is equivalent to one full time job for one year.

Databases

Following program changes to data tracking practices made during FY2013, there is better agreement between the improvements listed in CSG's Real Home Analyzer (RHA) database and the installed measures documented in the AFC First documentation (database and loan files) than was reported in the Interim Impact report. However, in the AFC First database the classification of measures as "other," rather than under the specific measure category, e.g. insulation, has increased, which reduces the usefulness of this database for program savings tracking and evaluation.

Recommendations

- **In the AFC First database, capture improvements under their proper categories, rather than "Other."** Given the recent change observed in the AFC First database, particularly with respect to the tracking of insulation measures, this might require updating the Specification Sheet to better align with the detail required for database entry. More accurate accounting of the improvements funded by the PACE and PowerSaver loans will facilitate program tracking and evaluation efforts.

³⁵ 57.2 MMBTU are equivalent to 414 gallons of heating oil.

³⁶ Note that total spending for the macroeconomic impact analysis includes spillover measure costs and is therefore higher than direct PACE & PowerSaver Loan Program spending.

Participant Experience

Survey responses show a high level of participant satisfaction with the PACE & PowerSaver Loan Program overall, with their PEA, and with their RV. Confirming their general satisfaction, 96% of surveyed participants would recommend the program to their family and friends.

Most FY2013 participants report noticing improvements following their projects: 83% report a decrease in energy bills and 83% report an increase in home comfort. For 14%, it was too early to tell if there had been changes to energy bills, and for 12%, home comfort had stayed the same.

Overall, 57% of participants report closing their loan within six weeks. However, the share of loans closing in more than eight weeks has increased since the Interim Process Report (41% compared to 14%).

Traditional media (newspapers, radio, TV), contractors, and word-of-mouth are the most common ways that FY2013 participants first learned about the PACE & PowerSaver Loan Program.

APPENDIX A: PARTICIPANT SURVEY DISPOSITIONS

Table A-1 presents the final disposition for the PACE and PowerSaver participant survey. The response rate was 45% (computed as the number of completed interviews divided by the number of eligible respondents). The cooperation rate was 74% (computed as the number of completed interviews divided by the total number of eligible sample units actually contacted).

Table A-1. Participant Survey Disposition

Disposition	Participants
Completed Interviews (I)	72
Eligible Non-Interviews	
<i>Refusals (R)</i>	20
<i>Mid-Interview terminate (R)</i>	5
<i>Answering Machine (NC)</i>	23
<i>Respondent never available (NC)</i>	15
Not Eligible (e)	
<i>Fax/Data Line</i>	1
<i>Duplicate Number</i>	3
<i>Non-Working</i>	6
<i>Wrong Number</i>	1
<i>Business, government office, other organization</i>	0
<i>No eligible respondent</i>	0
Unknown Eligibility Non-Interview (U)	
<i>No Answer</i>	28
<i>Call Blocking</i>	0
Total Contacts in Sample	
Response Rate	45%
Cooperation Rate	74%

Source: Opinion Dynamics CATI Call Center.

We calculated the response rate using the standards and formulas set forth by the American Association for Public Opinion Research (AAPOR).³⁷ For various reasons, we were unable to determine the eligibility of all sample units through the survey process and chose to use AAPOR Response Rate 3 (RR3). RR3 includes an estimate of eligibility for these unknown sample units. The formulas used to calculate RR3 are presented below. The definitions of the letters used in the formulas are displayed in the table above.

$$E = (I + R + NC) / (I + R + NC + e)$$

Where “E” is the percentage of respondents with whom we have made contact that is eligible.

$$RR3 = I / ((I + R + NC) + (E*U))$$

³⁷ *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys*, AAPOR, 2009. http://www.aapor.org/Standard_Definitions/1818.htm

The cooperation rate is the number of completed interviews divided by the total number of eligible sample units actually contacted. In essence, the cooperation rate gives the percentage of participants who completed an interview out of all of the participants with whom we actually spoke. We used AAPOR Cooperation Rate 1 (COOP1), the formula for which is shown below. The definitions of the letters used in the formulas are displayed in the table above.

$$\text{COOP1} = I / (I + R)$$

APPENDIX B: SUPPORTING INFORMATION FOR PACE/POWERSAVER GROSS IMPACT ANALYSIS

This appendix provides additional information used in the gross impact analysis of the PACE & PowerSaver Loan Program.

Program Eligibility Criteria Based on Energy Star Efficiency Levels

Table B-1 summarizes the efficiency levels used to assess measure eligibility for the PACE & PowerSaver Loan Program.

In some cases, the efficiency level required for an ENERGY STAR rating depends on the specific type of measure installed, e.g., the HSPF standard is 8.2 for split air source heat pumps and 8.0 for packaged air source heat pumps. If information on the specific type of installed equipment was not available from the AFC First database, we applied the lower standard, i.e., an HSPF of 8.0 in the case of heat pumps. In addition, if the AFC First database did not list a performance value, we assumed that the installation met eligibility criteria.

Table B-1. Eligibility Criteria Based on Energy Star Efficiency Levels

Improvement	Performance Measure	Efficiency Level for Energy Star
Central Air System	SEER	≥14.5 SEER/ ≥11 EER
Heat Pump	HSPF, SEER	≥8.0 HSPF/ ≥14 SEER/ ≥11 EER
Boiler (Gas, Oil, Other)	AFUE	≥ 85%
Gas Furnace	AFUE	≥ 95%
Furnace (Oil, Other)	AFUE	≥ 85%
Water Heater (Gas)	EF	EF ≥ 0.67
Water Heater (Electric, Heat Pump)	EF	EF ≥ 2.0
Windows	U-value	≤ 0.3

Source: Energy Star Program (<http://www.energystar.gov>)

APPENDIX C: SUPPORTING INFORMATION FOR HEATING FUEL BILL ANALYSIS

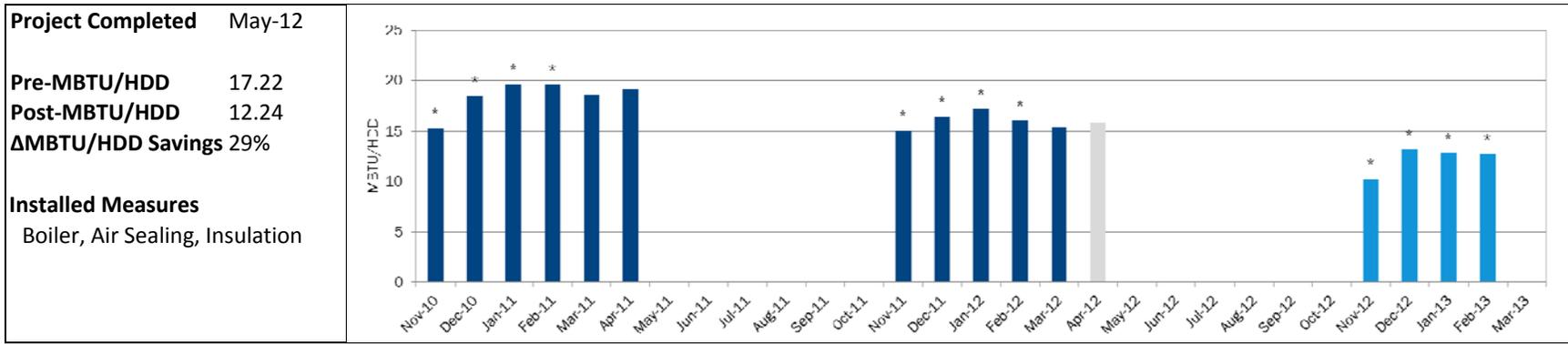
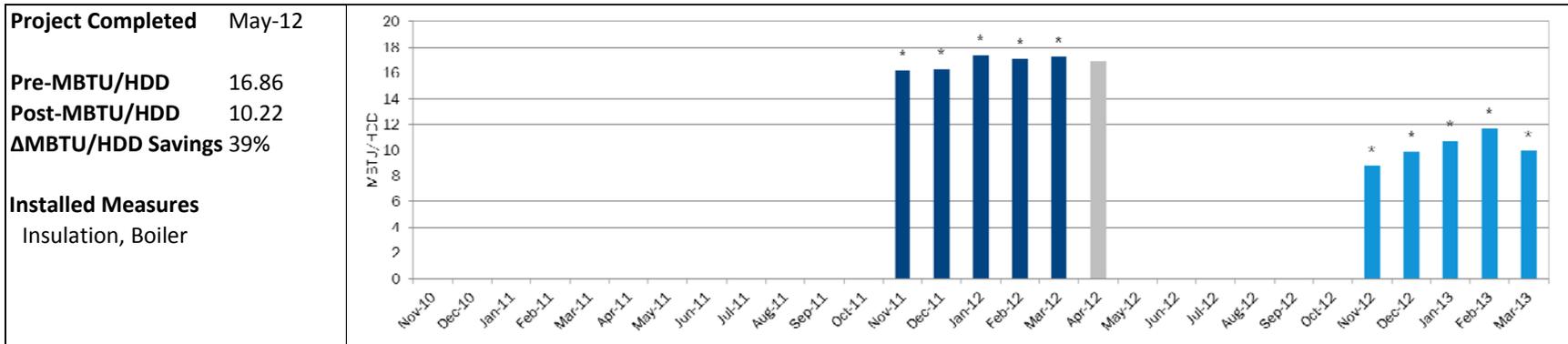
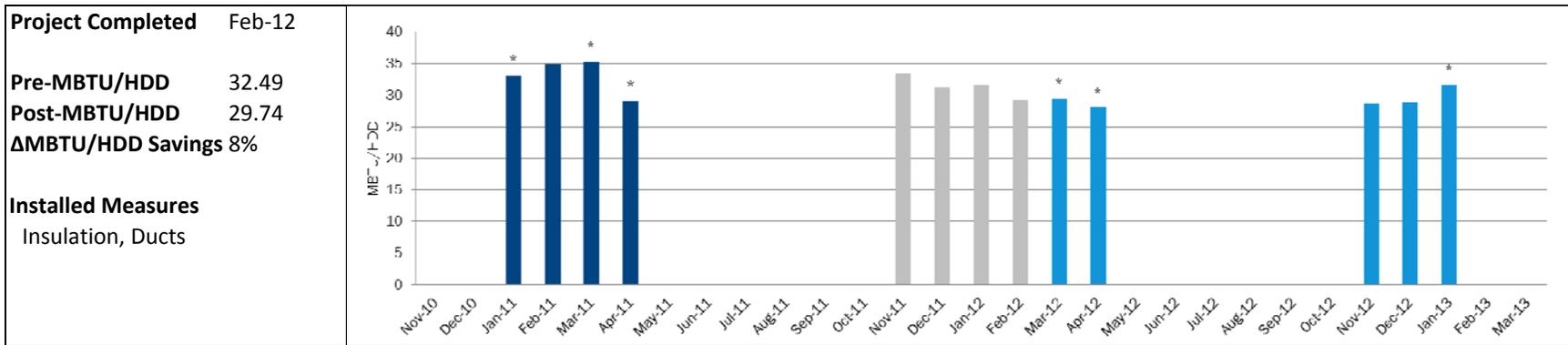
This appendix presents the heating fuel usage graphs for the 18 PACE and PowerSaver projects included in the heating fuel bill analysis. Each usage graph shows:

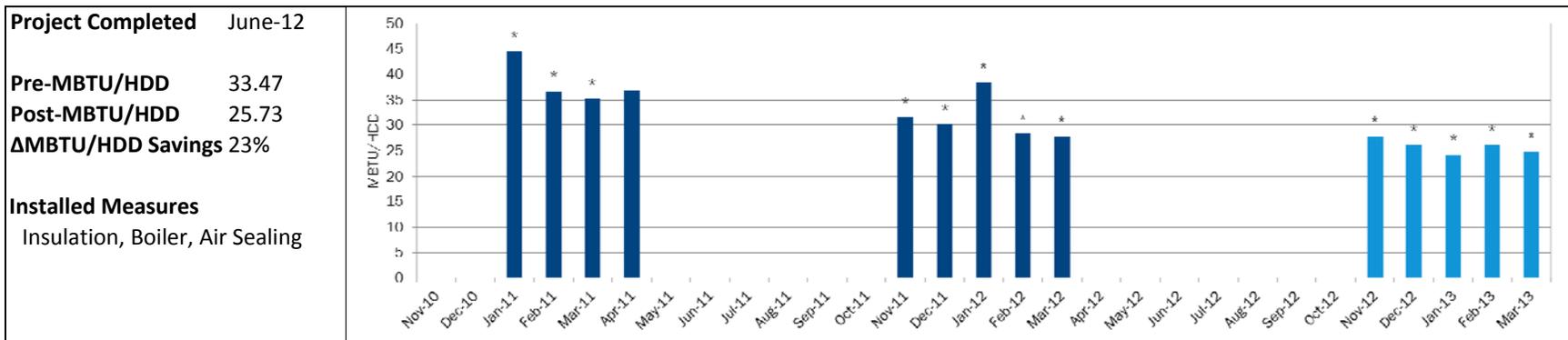
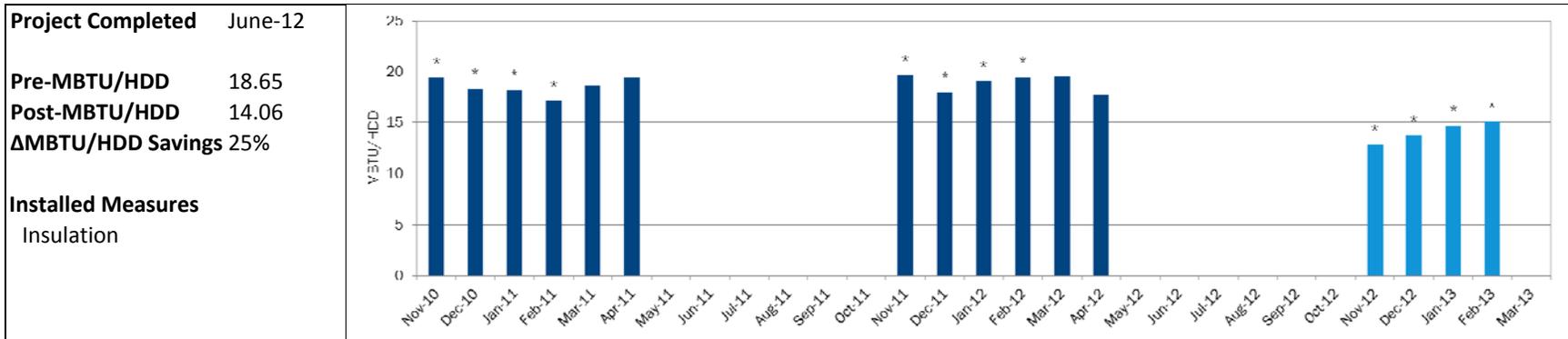
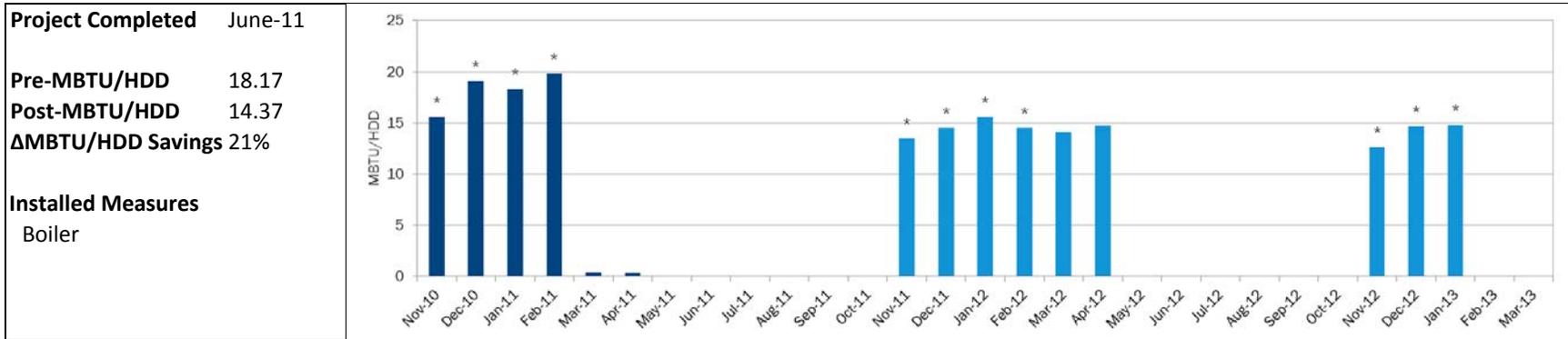
- weather-adjusted fuel usage in the pre-project winter months (dark blue bars) and the post-project winter months (light blue bars),
- the project installation period, if during the winter months (gray bars), and
- the months included in the comparison (asterisk above bar).

Alongside the usage graphs, we also present the following for each project:

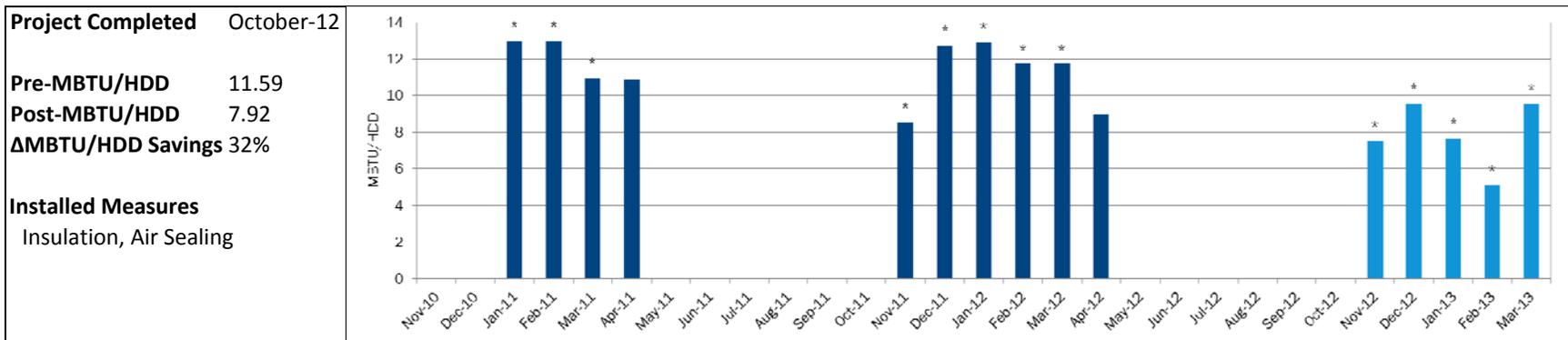
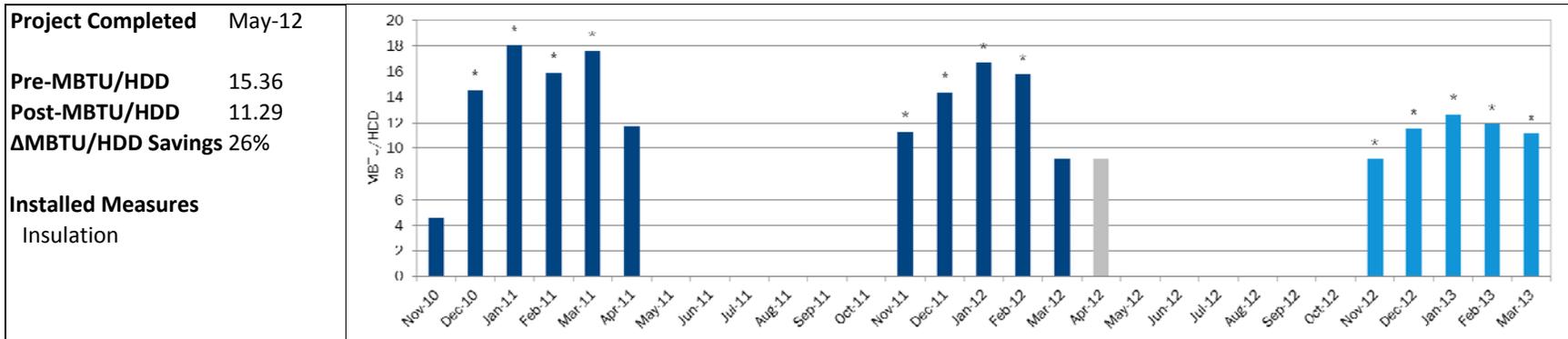
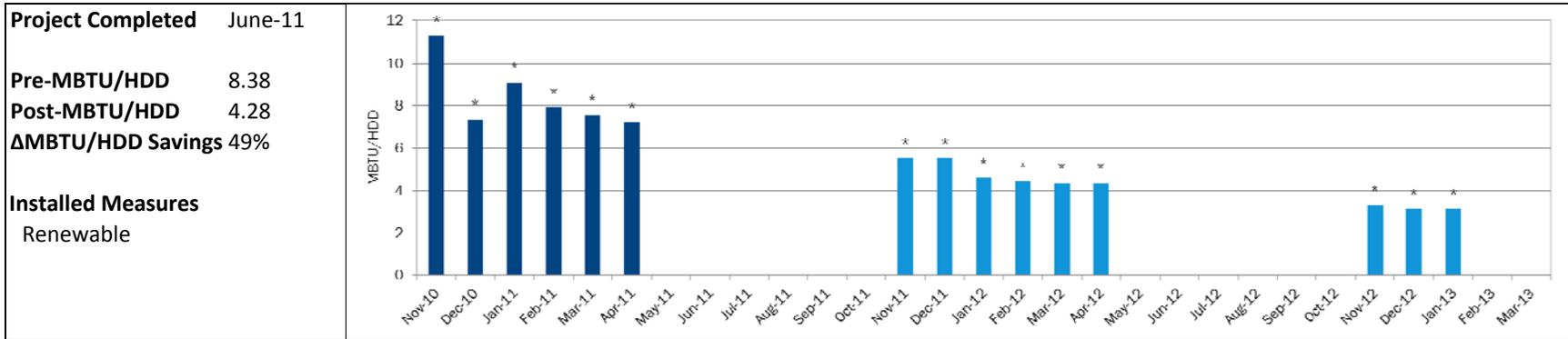
- the month and year the project was completed,
- the estimates of total pre- and post-project MBTU per heating degree day (HDD),
- the estimated percentage fuel bill savings, and
- the measures that were installed with the PACE or PowerSaver loan.

In the estimates of pre-project and post-project MBTU per HDD, we only included those winter months (November through April) where we had at least one pre-project month and one post-project month of data. If we had more than one pre-project or more than one post-project data point for a given calendar month, we averaged the two observations before conducting the pre-post comparison. For example, if we had two pre-project January usage values (2011 and 2012) but only one post-project January value (2013), we included the average pre-project January value in the comparison. We took this approach to maximize the number of observations to include in our analysis, while at the same time keeping an equal number of comparison points between the pre- and post-project periods.

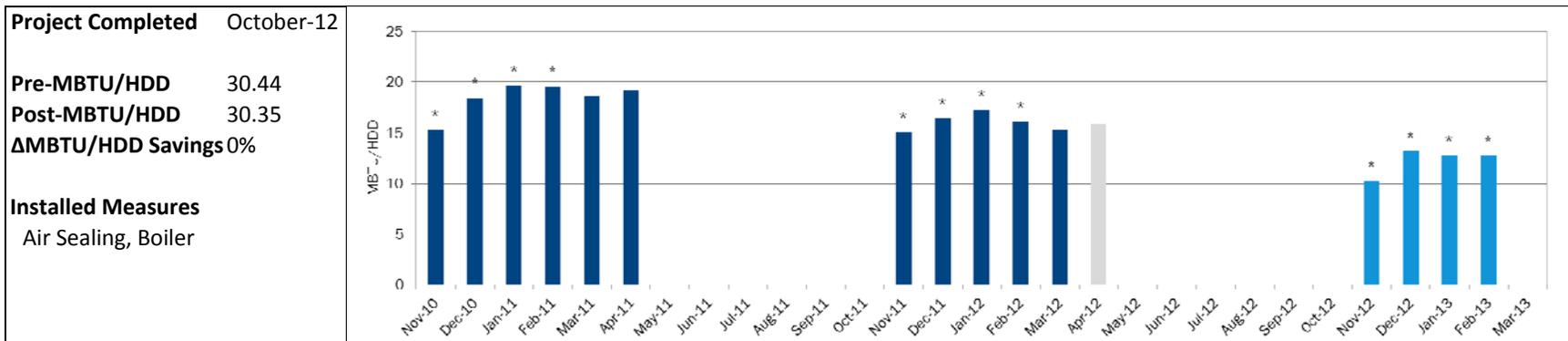
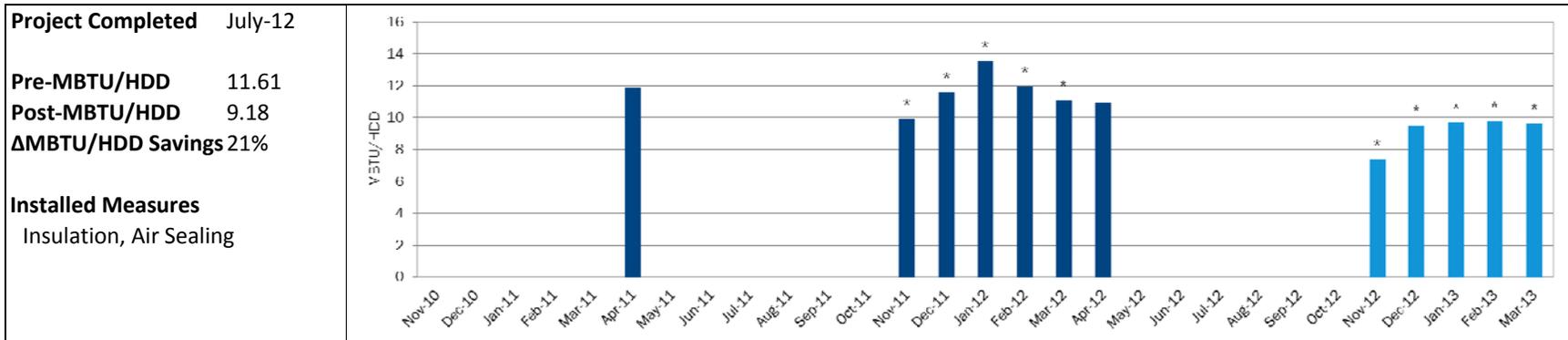
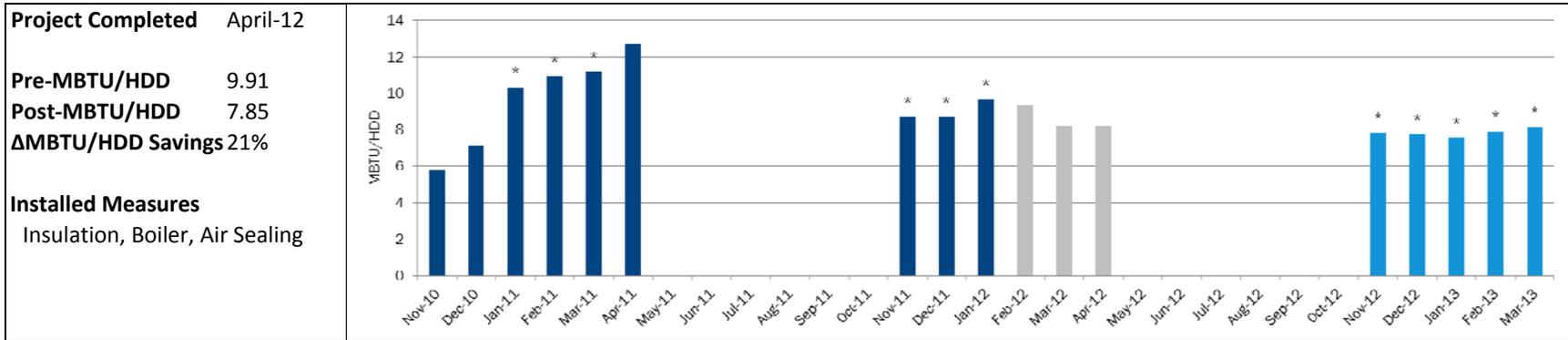




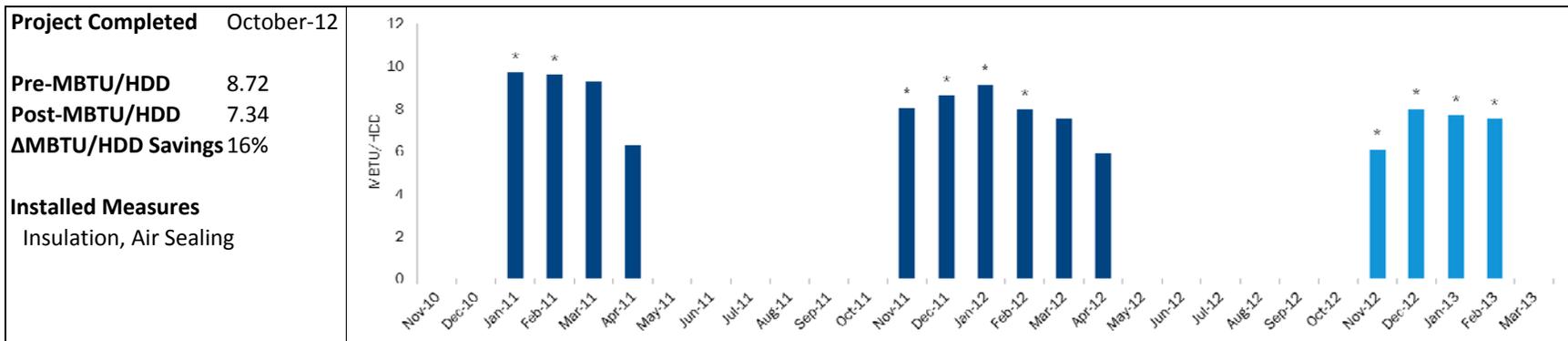
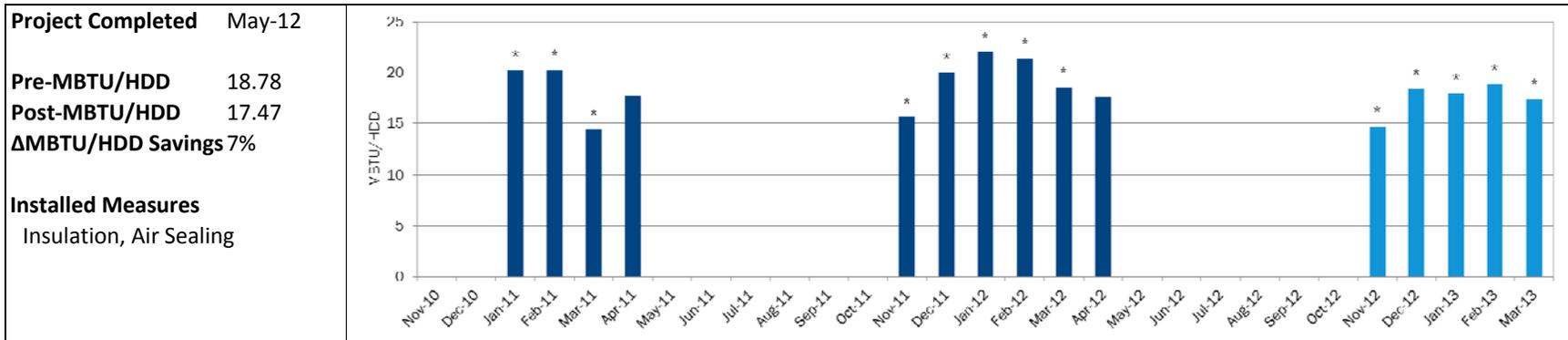
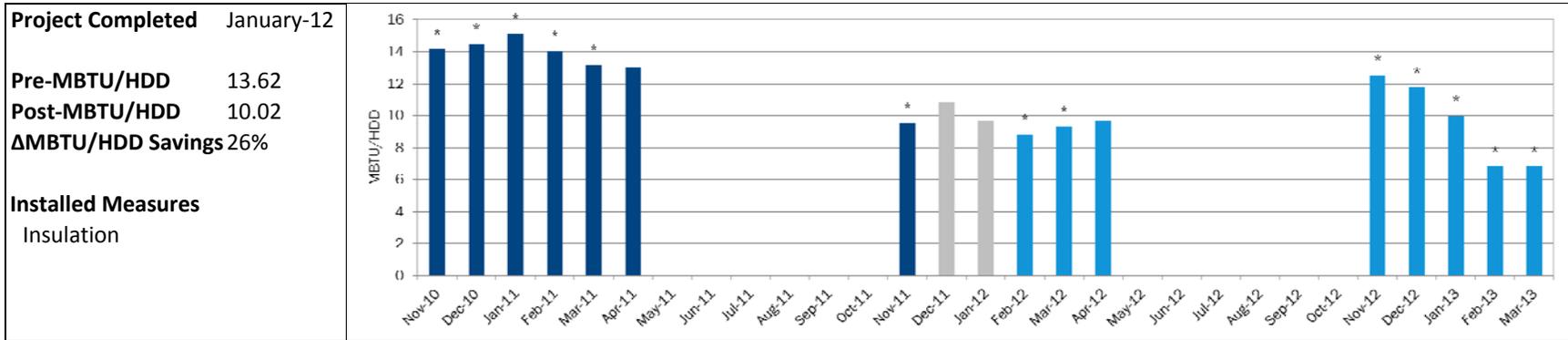
Pre-Project
 Project in progress
 Post-Project
 * Included in Pre/Post Average



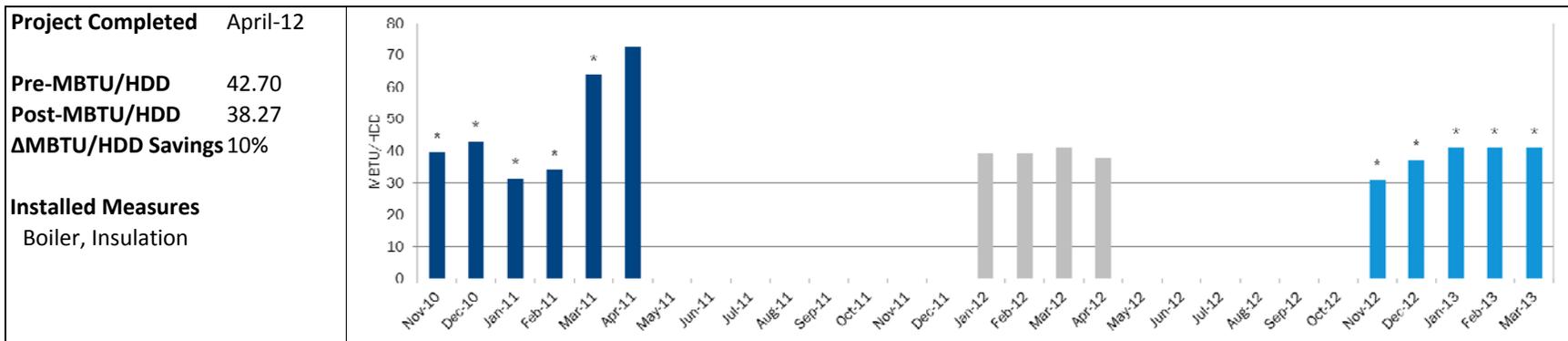
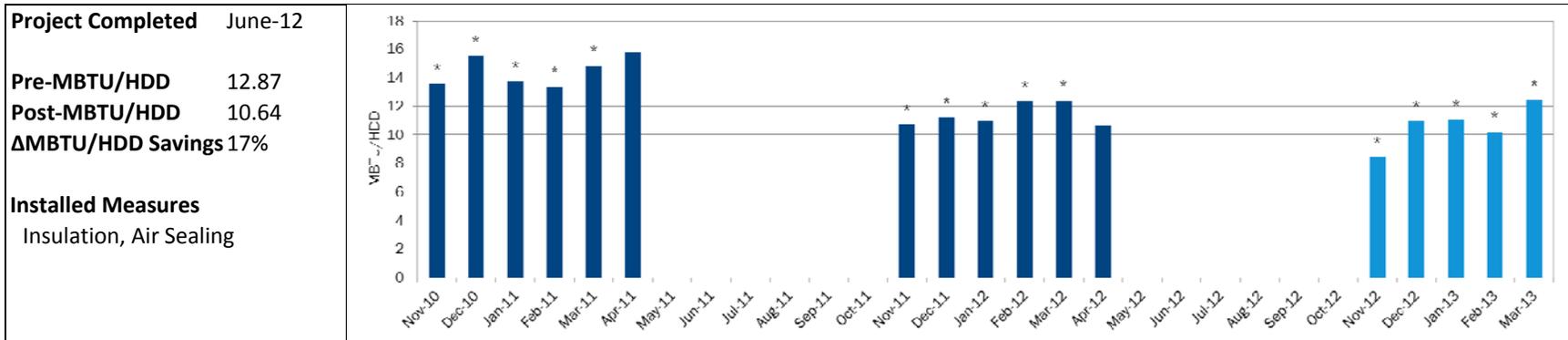
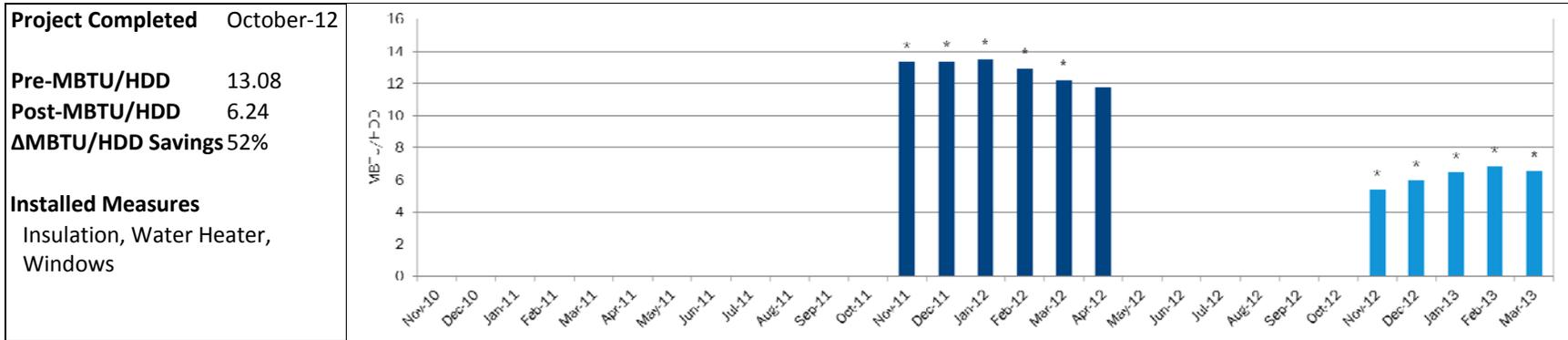
Pre-Project
 Project in progress
 Post-Project
 * Included in Pre/Post Average



■ Pre-Project
 ■ Project in progress
 ■ Post-Project
 * Included in Pre/Post Average



■ Pre-Project
 ■ Project in progress
 ■ Post-Project
 * Included in Pre/Post Average



Pre-Project
 Project in progress
 Post-Project
 * Included in Pre/Post Average