HEAT Loan Assessment

Final Report

November 19, 2018

Prepared by

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Executive Summary

This report presents findings from an assessment of National Grid's HEAT Loan offering, part of the EnergyWise program that offers home energy assessments in Rhode Island.[1] National Grid contracted with Research Into Action to conduct the assessment, which took place during May and June of 2018.

Program Description

The EnergyWise program offers home energy assessments at no charge to all National Grid residential customers in single family homes, 1-4 units, except for those who qualify for income-eligible services, who are served by another program. EnergyWise serves homes heated by electricity, natural gas, and delivered fuels (oil and propane). Staff of the program's lead vendor, RISE Engineering (RISE), conduct the energy assessment. Following the assessment, the assessor provides the participant with a report of the findings, information about National Grid incentive and financing programs, and energy efficiency opportunities offered by partner organizations, and a detailed action plan for any weatherization work the assessment recommends.

National Grid works with six local financial institution partners in Rhode Island to make HEAT Loans available to EnergyWise participants and assessment recipients. HEAT Loans allow participants to borrow up to $25,000 for a period of up to seven years at 0% interest to pay for efficient heating systems, domestic hot water systems, and weatherization measures recommended in their EnergyWise assessments. RISE authorizes an EnergyWise participant to apply with a lender for a HEAT Loan. The HEAT Loan offering began in 2011.

Customers making upgrades to their electric or natural gas[2] space heating or domestic hot water (DHW) system through National Grid's residential HVAC program are also eligible to apply for HEAT Loan after getting a home energy assessment. Once the assessment has been scheduled or completed, RISE authorizes a customer to apply for a HEAT Loan from a participating lender. The lender goes through an underwriting process and either approves or denies the customers for the HEAT Loan.

Customers making upgrades to their space heating or domestic hot water heating system and either do not want to get a home energy assessment or want to install the equipment themselves instead of through an approved contractor, may participate in National Grid's residential HVAC program. These customers are ineligible for the HEAT Loan.

Research Objectives

The main objectives of this assessment were to:

- Understand the extent to which HEAT Loans enable EnergyWise and HVAC projects (weatherization only, HVAC/DHW only, and weatherization with HVAC/DHW), and

[1] Though HEAT is capitalized, it is not an acronym.

[2] Space heating and DHW upgrades for homes using delivered fuels are not eligible for the 0% Interest HEAT Loan.

- Identify opportunities for changes to the HEAT Loan offering that will enable higher uptake of measures offered through the EnergyWise and HVAC programs.

National Grid also delineated about a dozen specific research questions to be explored within each data collection activity; we list the detailed research questions in Appendix A. In general, they relate to HEAT Loan uptake, promotion by lenders and HVAC contractors, importance of the HEAT Loan in the decision to install upgrades, the assessment requirement for loan eligibility, importance of the 0% interest rate, measures supported by the HEAT Loan, satisfaction with HEAT Loan process, and energy savings generated from HEAT Loan projects compared to non-HEAT Loan projects.

Methodology

Four data sources informed this assessment:

- **Program database analysis:** We reviewed exports from the EnergyWise program and residential HVAC program for program years 2014 to 2017. This analysis included exports from RISE for home energy assessment records and HEAT Loan records.
- **Participant survey:** We invited 2017 EnergyWise and HVAC participants, and 2016-2017 HEAT Loan recipients, to complete an online survey. Ultimately, 322 participants completed the survey. We note that the survey findings may have study self-selection bias.
- **In-depth interviews with HVAC contractors:** We conducted in-depth interviews with five HVAC contractors who have had customers use the HEAT Loan.
- **In-depth interviews with lenders offering the HEAT Loan:** We conducted in-depth interviews with four lenders offering the HEAT Loan.

Key Findings

If HEAT Loan Was Unavailable

- **More than three-quarters of HEAT Loan recipients (76%) would have delayed, reduced, or canceled their project if they did not have the HEAT Loan.** Interviewed contractors corroborated this finding, saying that their customers denied a HEAT Loan will install less expensive, less efficient equipment or reapply for a HEAT Loan at a credit union serving lower-income customers.
- **More than half of HEAT Loan recipients (57%) would have had to find another means of repayment over time for their project without the HEAT Loan.** A large majority of those (85%) said that they would have faced difficulty managing household expenses if they paid with a method other than the 0% interest HEAT Loan.
- **Contractors report they would sell fewer energy efficient HVAC projects without the 0% interest HEAT Loan.** Lenders report that few customers use other loans to finance energy efficiency improvements to their homes.

Influence in Upgrade Decisions

- **The availability of the 0% interest HEAT Loan strongly influenced upgrade decisions.** Eighty-eight percent of participants who installed weatherization measures rated the 0% interest HEAT Loan as "very important" in their decision to do the project and 93% of those who installed HVAC equipment said the 0% interest HEAT Loan was "very important" in that decision. Availability of National Grid rebates was the next-highest rated influencing factor.

HEAT Loan Project Characterization

- **HEAT Loan recipients had higher conversion rates than non-HEAT Loan participants.** For example, for those participants whose assessor recommended only HVAC upgrades, 33% of HEAT Loan recipients installed HVAC measures while 5% of non-HEAT Loan recipients did.[3]
- **HEAT Loan projects typically included more measure types than non-HEAT Loan projects.** HEAT Loan recipients' most prevalent measure mix (accounting for 18% of loan recipients' projects) included four measure types, while non-HEAT Loan recipients' most prevalent measure mix (accounting for 21% of non-loan recipients' projects) included two measure types. Over one-third (36%) of HEAT Loan projects include both weatherization and HVAC measures, compared with 15% of non-HEAT Loan projects.
- **HEAT Loan projects contained a higher rate of each measure type than non-HEAT Loan projects.**[4] Those denied a HEAT Loan had fewer installed measures of each type than all other groups.
- **HEAT Loans substantially contributed to natural gas savings.** HEAT Loan projects of all types, on average, saved more therms than non-HEAT Loan projects.
- **Weatherization-only projects comprise about three-quarters of the customers eligible for HEAT Loans and make the greatest total contribution to program electricity savings among both the HEAT Loan and non-HEAT Loan groups.** On average, non-HEAT Loan households saved significantly more kWh than HEAT Loan households, particularly for HVAC-only projects. These findings appear to be driven by high kWh savings in electrically heated homes, which are more prevalent in the non-HEAT Loan population than in the HEAT Loan population. There was little difference in kWh savings in the HEAT Loan and non-HEAT Loan households using natural gas and delivered fuels.[5]

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3 These findings are obtained from the analysis of program tracking data. The tracking data cannot reveal causality. The HEAT Loan may have engendered a higher conversion rate or participants intending to install measures may have been more likely to seek a HEAT Loan. As reported under "If HEAT Loan Was Unavailable," 76% of surveyed HEAT Loan respondents indicated they would have delayed, reduced, or canceled their project if they did not have the HEAT Loan.

4 Stated differently, the program installed each measure type in HEAT Loan projects more frequently than it installed the corresponding measure type in non-HEAT Loan projects.

5 This study does not estimate MMBtu savings from delivered fuels. Future HEAT Loan studies should consider assessing oil and propane savings.

- **Average ratepayer cost associated with the provision of HEAT Loans** is roughly $500 for weatherization-only projects and roughly $1,500 for projects with HVAC upgrades. Loan incentives are costs that would otherwise be incurred by the borrower (the interest rate buy-down and the HEAT Loan administration fee) and loan administrative costs are the Quality Assurance inspection fees.

HEAT Loan Promotion, Awareness, and Uptake

- **Lenders do not actively promote HEAT Loan, aside from listing in on their website.** Contractors present a simple overview of HEAT Loan terms to customers who indicate interest in financing and reported not having any printed materials to provide customers to promote the HEAT Loan.
- **HEAT Loan awareness was higher among EnergyWise participants (71%) than HVAC program participants (41%)**. Overall, 61% of surveyed participants were aware of the HEAT Loan. Most EnergyWise participants learned of the HEAT Loan from their assessor and most HVAC program participants learned through National Grid marketing channels, such as the website or TV advertisements.
- **Nineteen percent of EnergyWise participants who installed a measure following assessment received a HEAT Loan**, according to program database records and 74% of those who the assessment contractor authorized to apply for a loan received a HEAT Loan. HEAT Loan participation was highest (39%) in the group who installed weatherization upgrades in combination with an HVAC or domestic hot water upgrade, though this group composes the smallest portion of EnergyWise participants.
- **More than half of surveyed HVAC program participants (54%) said they would consider financing future energy efficiency upgrades with a HEAT Loan** after being informed of the HEAT Loan eligibility requirements, including eligible measures and the assessment requirement.

HEAT Loan Terms, Conditions, and Application Process

- **Lenders report high approval rates, ranging from 73% to 96%.** Denials are most often due to high debt-to-income ratios. The underwriting process is where most customers "fall out" of the financing process. Survey findings indicate 6% of participants start a HEAT Loan application, but do not submit it.
- **The 0% aspect of the HEAT Loan is important to customers, lenders, and contractors.** Both lenders and contractors estimated that 3% interest is the point where most customers would lose interest in the HEAT Loan. No surveyed customers would be interested in the HEAT Loan if the interest rate was 5% or more, and 51% of surveyed HEAT Loan recipients said they would not have used the loan without the 0% interest.
- **The home energy assessment requirement is a challenge for emergency replacements, particularly in wintertime, and may reduce HEAT Loan uptake, according to contractors.** The time that elapses between a contractor visiting the home, scheduling the assessment, completing it, and applying for the loan can deter customers with time-sensitive replacements.

Opportunities for Improvement

- **Lenders report some customer confusion with the HEAT Loan application process.** These include confusion about the timing for the assessment, who to contact and when, required documentation for the loan, how rebates tie-in, eligible measures, and how the contractor gets paid. Lenders suggested that better education by National Grid would reduce the amount of questions lenders receive from customers about the HEAT Loan process.
- **Surveyed participants were interested in using the HEAT Loan to finance additional measures that could save energy in their homes.** These included efficient air conditioning (25%), windows (22%), solar installations (15%), and roofing improvements (8%).

Conclusions and Recommendations

We offer the following conclusions and recommendations.

Conclusion: The current HEAT Loan model with 0% interest for customers over seven years is well-liked by customers, contractors, and lenders. Contractors were not interested in offering their own financing and lenders were not interested in a loan loss reserve model. Half of HEAT Loan recipients would not have used the loan if it included interest.

> **Recommendation:** Maintain the 0% interest to the customer with the interest rate buy-down for the lenders.

Conclusion: The HEAT Loan is generating energy savings for National Grid that would not have otherwise occurred. The HEAT Loan availability was very important in those loan customers' decisions to install measures following their home energy assessment. Without the HEAT Loan, three-quarters of loan recipients would have canceled, postponed, or reduced their home energy project scope. Very few customers use other loan products to finance energy efficiency upgrades in their homes. Contractors reportedly would not sell as much efficient HVAC equipment without the HEAT Loan.[6] HEAT Loan projects typically included more measures than non-HEAT Loan projects and HEAT Loan projects substantially enabled natural gas savings for the EnergyWise program.

> **Recommendation:** Maintain the HEAT Loan offering for EnergyWise customers.

Conclusion: There is an opportunity to improve customer education on the HEAT Loan process. Some customers are reportedly unclear about the HEAT Loan process, including the home energy assessment requirement, rebates, and how the contractor is paid. Lenders report receiving numerous customer questions they say should not be their responsibility to answer and thought that better education and outreach by National Grid would improve customer understanding.

> **Recommendation:** National Grid should provide HVAC contractors and assessors with a pamphlet to give customers that explains the HEAT Loan process, including the need to contact

[6] In addition, HEAT Loan projects typically included more measures than non-HEAT Loan projects and HEAT Loan projects significantly enabled natural gas savings for the EnergyWise program, however these findings from the program tracking data do not speak to causality.

National Grid to schedule the assessment, authorization and application requirements, how rebates tie-in, and how the contractor is paid.

Conclusion: Interviewed contractors appear to be unaware of program policy on emergency HVAC replacements. As reported by HVAC contractors, some customers who may benefit from the HEAT Loan do not want to lengthen their HVAC upgrade projects to meet the home energy assessment requirement for loan eligibility. These contractors are apparently unaware that customers needing emergency replacements can work with qualified contractors, apply for HEAT Loan, and have the emergency replacement prior to having an audit, as long as they schedule an audit. This policy is not explicitly documented in the HEAT Loan forms/pamphlets.

Recommendation: National Grid should conduct outreach with HVAC contractors to inform them of the program's emergency replacement policy

Conclusion: There is widespread interest in the HEAT Loan, and customers want to be able to finance other upgrades with it. More than half of HVAC program participants reported interest in using the HEAT Loan to finance for future upgrades and surveyed participants wanted to be able to use the HEAT Loan to finance efficient air conditioning, window replacements, and solar installations.

Recommendation: Conduct research to determine which additional measures would offer cost-effective energy savings if financed through the HEAT Loan.

Conclusion: Program database records contained aggregated, missing, or implausible values that impeded measure-level analyses. These challenges affected several variables important for calculating annual and lifetime energy savings and measure costs. Further complicating analyses was the fact that insulation savings were aggregated at the project level and could not be broken out to determine relative contributions of wall, attic, basement, and floor insulation.

Recommendation: National Grid should work with their implementers to assess the feasibility of tracking measure-level savings across EnergyWise and HVAC projects and the possibility of implementing automated data quality checks that identify values outside an expected range.

1. Introduction

This report presents findings from an assessment of the HEAT Loan offering in Rhode Island, part of National Grid's EnergyWise program. National Grid contracted with Research Into Action to conduct the assessment, which took place during June and July of 2018.

1.1. EnergyWise, HEAT Loan, and HVAC Program Overview

The EnergyWise program offers home energy assessments at no charge to all National Grid residential customers in single family homes, 1-4 units, except for those who qualify for income-eligible services, who are served by another program. EnergyWise serves homes heated by electricity, natural gas, or delivered fuels (oil and propane). Staff of the program's lead vendor, RISE Engineering (RISE), conduct the energy assessment. During the assessment, the assessor installs efficient light bulbs, faucet aerators, showerheads, and other measures. Following the assessment, the assessor provides the participant with a report of the findings, information about National Grid incentive and financing programs, and energy efficiency opportunities offered by partner organizations, and a detailed action plan for any weatherization work the assessment recommends.

National Grid works with six local financial institution partners in Rhode Island to make HEAT Loans available to EnergyWise participants and assessment recipients. HEAT Loans allow participants to borrow up to $25,000 for a period of up to seven years at 0% interest to pay for efficient heating systems, domestic hot water systems, and weatherization measures recommended in their EnergyWise assessments. RISE authorizes an EnergyWise participant to apply with a lender for a HEAT Loan. The HEAT Loan offering began in 2011.

Customers making upgrades to their electric or natural gas[7] space heating or domestic hot water heating system through National Grid's residential HVAC program are also eligible to apply for HEAT Loan after getting a home energy assessment. Once the assessment has been scheduled or completed, RISE authorizes a customer to apply for a HEAT Loan from a participating lender. The lender goes through an underwriting process and either approves or denies the customers for the HEAT Loan.

Customers making upgrades to their space heating or domestic hot water heating system that do not want to get a home energy assessment, or who want to install the equipment themselves instead of through an approved contractor, may participate in National Grid's residential HVAC program. They are ineligible for the HEAT Loan. These customers comprise HVAC Program participants and are included in this study.

[7] Space heating and DHW upgrades for homes using delivered fuels are not eligible for the 0% Interest HEAT Loan.

1.2. Research Objectives

The main objectives of this assessment were to:

- Understand the extent to which HEAT Loans enable EnergyWise and HVAC projects, and
- Identify opportunities for changes to the HEAT Loan offering that will enable higher uptake of measures offered through the EnergyWise and HVAC programs.

Within each research objective, there were also specific research questions, listed in Appendix A. Below is a summary of the types of research questions we explored as part of this study:

- **Promotion of HEAT Loans:** How do contractors and lenders promote the HEAT Loan; how did customers learn of the HEAT Loan.
- **HEAT Loan uptake:** How do customers qualify for a HEAT Loan; how many customers were authorized for a HEAT Loan and how many received one; why do customers not pursue HEAT Loans; what are primary reasons applicants' loans are denied; what aspects of the loan application process are troublesome.
- **Upgrades supported by HEAT Loan:** What role did the HEAT Loan play in the customers' decision to install measures; what measures were supported by the HEAT Loan; how does project size differ among HEAT Loan recipients versus non-HEAT Loan recipients; how would projects differ if the customer did not receive the HEAT Loan; does the HEAT Loan improve access to energy efficiency upgrades.
- **HEAT Loan components:** How important is the 0% aspect of the HEAT Loan; how does the home energy assessment requirement affect HEAT Loan use; would lenders be interested in a loan loss reserve model; are there currently ineligible measures customers would want to be able to finance with a HEAT Loan.

1.3. Methods

We used a multi-faceted approach to answer the research questions. For the program database analyses and participant survey, we divided participants into five groups based on whether they received a home energy assessment and on types of measures installed (Table 1-1). Participants in Groups 2 through 4 may have received a HEAT Loan to pay for their installed measures. Weatherization measures included air sealing, duct sealing, and insulation installed in attics, floors, basements, or walls. EnergyWise participants are in Groups 1 through 4, and HVAC program participants are in Groups 3, 4, and 5.

Table 1-1: Participant Groups

Groups	HEAT Loan Recipients	Non-HEAT Loan Recipients
Group 1: Assessment recipients who did not complete weatherization upgrades, nor complete an HVAC or domestic hot water upgrade.		✓
Group 2: Assessment recipients who completed weatherization services through the EnergyWise program.	✓	✓
Group 3: Assessment recipients who completed weatherization services through the EnergyWise program and completed an HVAC or domestic hot water upgrade through the HVAC program.	✓	✓
Group 4: Assessment recipients who completed an HVAC or domestic hot water upgrade through the HVAC program.	✓	✓
Group 5: Customers who completed HVAC or domestic hot water upgrade through the HVAC program but did not receive an assessment.		✓

Program Database Analysis

National Grid provided Research Into Action with exports from the EnergyWise and residential HVAC program databases, along with HEAT Loan records and home energy assessment records from RISE. We used the customers' names, addresses, customer numbers, bill account numbers, and RISE client numbers to match participants across the data exports. This approach yielded 51,189 customers. Our analyses for this research task included program years 2014 to 2017, so we removed records listed in 2012, 2013, and 2018.

Over one-quarter of participants (27%) had program activity in more than one year, as indicated by a matched name, address, and at least one account number across data exports. As examples, they may have received an assessment in one year and installed a measure in another year, or they may have records of installed HVAC, weatherization, or domestic hot water measures in multiple years. For these reasons, we had to perform analyses either by year or by group, but not by group *and* by year. Assigning a group by year would have misrepresented the participants who received an assessment in a year different than their upgrade or who installed different measures in different years, leading to erroneous inferences about rates of conversion from assessment to installation, measure mix, and so on.

Our initial analysis revealed some questionable values in the program database exports. For example, there were missing values on annual kWh savings and MWh savings as well extreme outliers for some metrics, such as kWh savings and measure lifetime, likely suggesting data entry errors. These issues affected 6,960 cases, or about 14% of the data. For each variable, we consulted National Grid, and together developed resolutions. We describe the challenges with each variable and the resolution in Appendix C.

Participant Survey

Research Into Action invited 2017 EnergyWise and HVAC participants to take an online survey about their energy efficiency upgrades, how they paid for them, their awareness of the HEAT Loan offering, and other aspects of the HEAT Loan. We also invited 2016 participants who received the HEAT Loan to take the survey to ensure we had sufficient HEAT Loan recipients among the survey respondents.

We sent two emails to participants in June 2018 inviting them to take the survey. We sent the survey to 10,074 number of participants, and received 322 number of surveys, for a 3% response rate. This response rate is relatively low response low and may suggest the presence of non-response bias, a possible study limitation. As HEAT Loan recipients are a small proportion of total EnergyWise and HVAC participants (about 4%), the survey data include few HEAT Loan recipients.

A disproportionately low number of Group 5 (HVAC not EnergyWise) participants responded to the survey, so we weighted their responses to appropriately report the distribution of answers. Group 5 participants constituted 43% of the participant population, but their proportion among the final completed sample was considerably lower (18%).[8] Therefore, when we report a combined total of Group 5 and Group 1 through 4 (EnergyWise participants), we weighted the responses of Group 5 at 2.34 (equal to the population percent divided by the sample percent). Likewise, we applied an adjustment weight for Groups 1 through 4. Group 1 through 4 participants consisted of 57% of the participant population but were 82% of final completed sample. Therefore, when we report a combined total, Group 1 through 4 responses are weighted at 0.70. Within each group, we report results with unweighted data.

We analyzed the data in *SPSS, the Statistical Package for the Social Sciences*.

In-Depth Interviews

Research Into Action conducted in-depth interviews with HVAC contractors whose customers have used the HEAT Loan and lenders at financial institutions offering the HEAT Loan (Table 1-2). We created tailored interview guides for each population (see Appendix D). We conducted these interviews over the phone in May and June 2018. We analyzed the data in *NVivo*, a qualitative data analysis program.

Table 1-2: Interview Groups

Group	Population Size	Number Contacted	Number of Completes
HVAC Contractors	22 contractors at 15 companies	20 contractors at 15 companies	5 contractors at 5 companies
Lenders Offering HEAT Loan	6 lenders	6 lenders	4 lenders

[8] This is the proportion of 2017 program participants, not years 2014 to 2017.

Measures Included in the Analyses

The analyses presented in this report exclude direct install measures for two reasons: 1) those measures are not eligible for the HEAT Loan, and 2) they would have been similar among all assessment recipients regardless of HEAT Loan status. The report includes some analyses at the measure type level. See Appendix B for a list of the measures included in each measure type, as well as the measures excluded from the analysis.

1.4. Report Overview

Chapter 2 presents findings from the analysis of National Grid's program database for program years 2014 through 2017. Chapter 3 presents findings from the participant survey. Chapter 4 includes findings from the interviews we conducted with HVAC contractors and lenders offering the HEAT Loan. Chapter 5 synthesizes these findings to present overall conclusions and recommendations for improvement.

2. Program Data Analysis

This chapter presents findings from the Program Database analysis for participation in years 2014 through 2017. We organize this chapter by research question for the database analysis. The groups are based on whether the participant received a home energy assessment and the measures they installed as outlined in Table 2-1. EnergyWise program participants are in Groups 1 through 4, and HVAC program participants are in Groups 3, 4 and 5.

Table 2-1: Participant Groups

Groups	HEAT Loan Recipients	Non-HEAT Loan Recipients
Group 1: Assessment recipients who did not complete weatherization upgrades, nor complete an HVAC or domestic hot water upgrade.		✓
Group 2: Assessment recipients who completed weatherization services through the EnergyWise program.	✓	✓
Group 3: Assessment recipients who completed weatherization services through the EnergyWise program and completed an HVAC or domestic hot water upgrade through the HVAC program.	✓	✓
Group 4: Assessment recipients who completed an HVAC or domestic hot water upgrade through the HVAC program.	✓	✓
Group 5: Customers who completed HVAC or domestic hot water upgrade through the HVAC program but did not receive an assessment.		✓

How many customers participated in EnergyWise and HVAC programs?

There were 51,189 participants total in our analyses for years 2014 to 2017. Figure 2-1 displays the number of participants by group for years 2014 to 2017. Groups 1 through 4 represent EnergyWise participants and Group 5 represents participants in the HVAC program who did not receive a home energy assessment and therefore were ineligible for the HEAT Loan.

Across all groups (EnergyWise and HVAC program), we found 27% of participants had program activity in multiple years, indicating substantial repeat participation, an unstated goal of many residential assessments and upgrade programs.

Among the 9,308 weatherization-only participants (Group 2), 5,936 (64%) used natural gas, 2,878 (31%) used delivered fuels, and 494 (5%) used electric energy for heating.

Figure 2-1: Number of Participants (2014-2017)

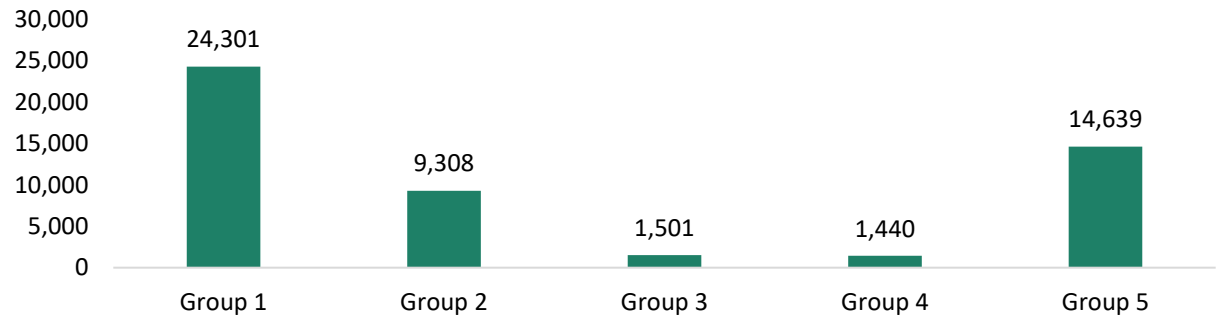


Table 2-2 provides the participant count by group and by HEAT Loan status.

Table 2-2: Participant Groups

Groups	HEAT Loan Recipients	Non-HEAT Loan Recipients
Group 1: Assessment recipients who did not complete weatherization upgrades, nor complete an HVAC or domestic hot water upgrade.		24,301
Group 2: Assessment recipients who completed weatherization services.	1,448	7,860
Weatherization Gas (Wx-gas)	*771*	*5,165*
Weatherization Delivered Fuels (Wx-delivered fuels)	*647*	*2,231*
Weatherization Electric (Wx-electric)	*30*	*464*
Group 3: Assessment recipients who completed weatherization services and completed an HVAC or domestic hot water upgrade.	588	913
Group 4: Assessment recipients who completed an HVAC or domestic hot water upgrade.	250	1,190
Group 5: Customers who completed HVAC or domestic hot water upgrade but did not receive an assessment.		14,639

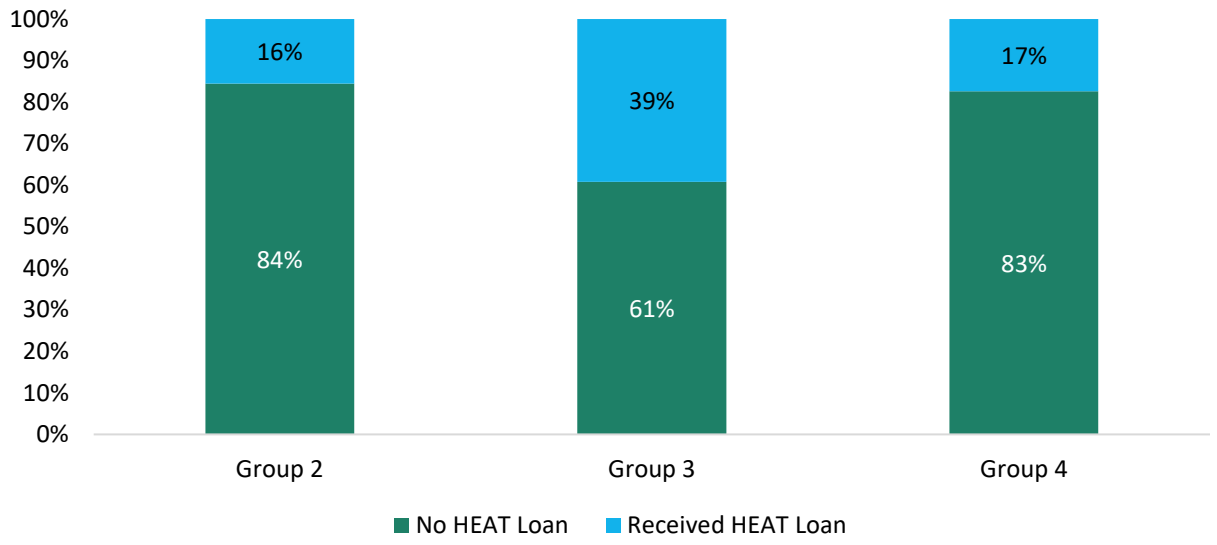
What percent of EnergyWise and HVAC participants received a HEAT Loan?

Overall, 19% of EnergyWise participants who installed a measure following their assessment received a HEAT Loan across years 2014 to 2017 (Figure 2-2). Though Group 3 (weatherization + HVAC/DHW) had the largest proportion of HEAT Loan recipients at 39%, they make up about 3% of the total EnergyWise population.

Out of the Group 2, weatherization-only participants who received a HEAT Loan, 53% used natural gas, 45% used delivered fuels, and 2% used electric energy for heating. Sixty-six percent of Group 2,

weatherization-only participants who did not receive a HEAT Loan used natural gas, 28% used delivered fuels, and 6% used electric energy for heating.

Figure 2-2: Percent of Program Group Receiving HEAT Loans (n=12,249)



How many customers received authorization from the Lead Vendor to seek a HEAT Loan but did not subsequently take out a HEAT Loan?

Overall, 74% of EnergyWise participants authorized by RISE to apply for a HEAT Loan subsequently received the HEAT Loan from a lender (Table 2-3, Figure 2-3). The proportion of authorized participants receiving HEAT Loans has declined somewhat over the analysis period. National Grid may want to explore in future research reasons for the decline as the information collected and analyzed for this study do not suggest any hypotheses.

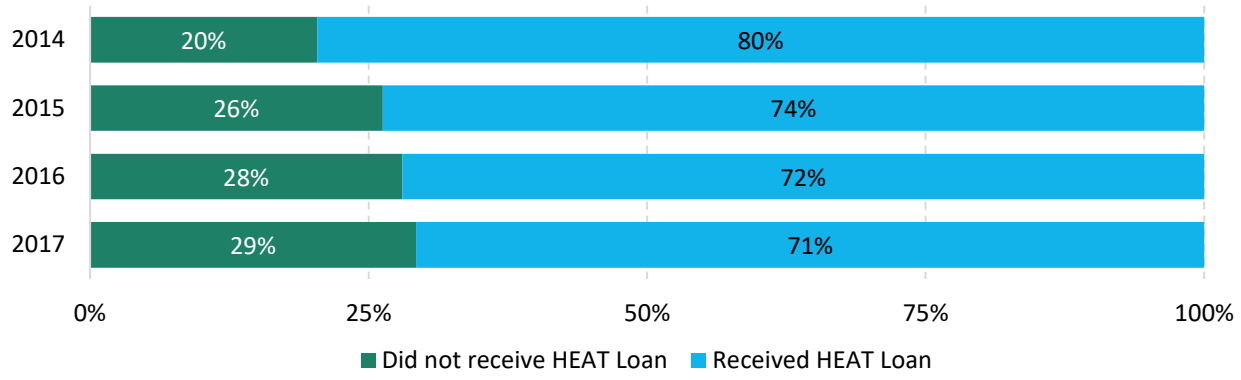
Table 2-3: Number of Participants Authorized for HEAT Loan and Receipt Status by Year (n=4,507)*

Authorization Year	Did not receive HEAT Loan	Received HEAT Loan	Total Authorized	Percent Received
2014	266	1,039	1,305	80%
2015	339	951	1,290	74%
2016	262	673	935	72%
2017	286	691	977	71%
Total	**1,153**	**3,354**	**4,507**	**74%**

* The cumulative totals differ from Table 2-2 program totals because Table 2-3 double-counts customers that participated in multiple years, whereas Table 2-2 does not. In addition, the analysis presented here is straightforward and based on one program database export. Table 2-2, which summarizes our analysis dataset, included participants matched across five program exports; some participants (less than 5%) are not included in Table 2-3 due to inability to match across all exports.

The percentages from the final column above are presented in blue in Figure 2-3.

Figure 2-3: Percent of Receiving HEAT Loan Among those Authorized for Loan



What percent of EnergyWise participants (by HEAT Loan participation) received each of the following recommendations and completed weatherization; completed heating system improvement; and completed both.

HEAT Loan recipients were much more likely to install the measures recommended in their home energy assessment than non-HEAT Loan recipients (Table 2-4). For example, 20% of EnergyWise participants had only weatherization recommendations following their home energy assessment. Ninety-seven percent of HEAT Loan recipients acted on that recommendation and installed the weatherization measures, whereas 29% of participants paying another way made the recommended weatherization improvements.

Table 2-4: Assessment of Installation Conversion Rates by HEAT Loan and Non-HEAT Loan Recipients*

Recommendations Received	Percent of EnergyWise Participants (n=36,550)	Percent of Participants that Installed One or More Recommended Measure	
		HEAT Loan Recipients (n=2,286)	Non-HEAT Loan Recipients (n=20,144)
Weatherization Recommendation Only (n=7,221)	20%	97%	29%
HVAC Recommendation Only (n=1,012)	3%	89%	5%
Weatherization and HVAC Recommendation (n=27,703)	76%	26%	2%
Total	**99%[a]**	**Not Applicable[b]**	**Not Applicable[b]**

* This analysis included Groups 1 through 4, because those are the groups that received a home energy assessment with recommendations.

[a] Total does not equal 100% due to rounding.

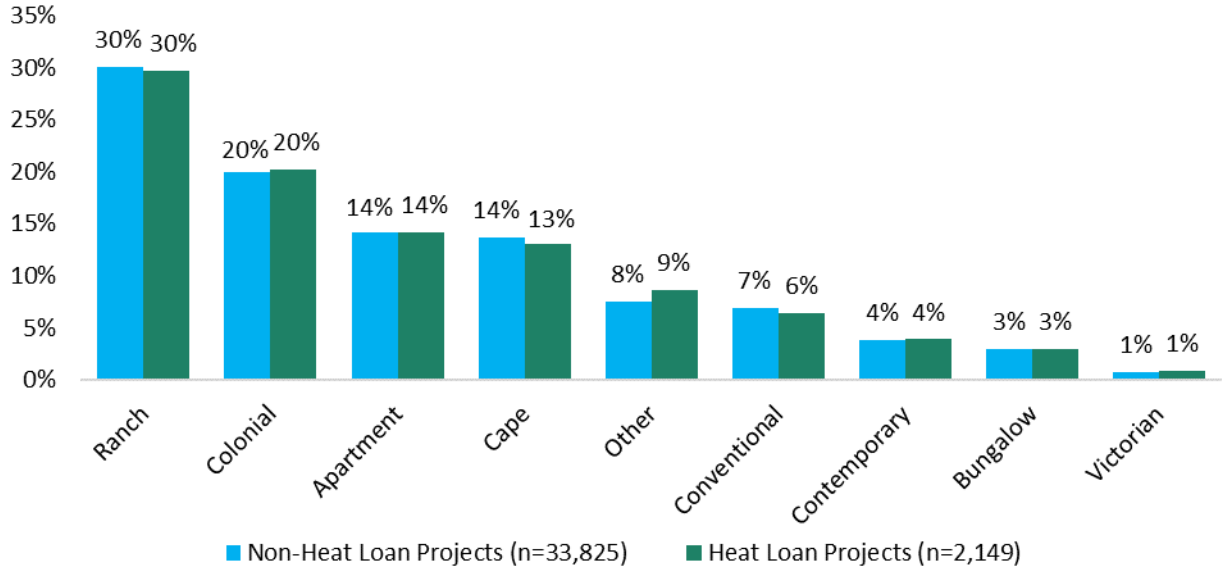
[b] Number of customers does not sum to 36,550 because some assessment recipients did not install measures.

The proportions installing measures among both HEAT Loan and Non-HEAT Loan recipients are highest for those with weatherization recommendations and lowest for weatherization and HVAC recommendations. Under simplifying assumptions that weatherization projects are least costly, weatherization and HVAC projects are most costly, and HVAC (solely) projects fall between the two, it appears that as the total cost of recommended measures increases, the likelihood falls that even a single measure is installed.

What are the prevalent characteristics of HEAT Loan participants?

HEAT Loan recipients did not differ from non-HEAT Loan recipients in house type (Figure 2-4), house age (Figure 2-5), or house size (Figure 2-6).

Figure 2-4: Home Types by HEAT Loan Status*



* Bars with the same percent may look slightly different in height due to rounding. For example, the numbers for Colonial homes is 19.9% of non-HEAT Loan recipients and 20.2% of HEAT Loan recipients. The "other" category includes homes such as A-frame, cottage, log cabin, saltbox, and unknown.

Figure 2-5: Home Vintage of Home by HEAT Loan Status

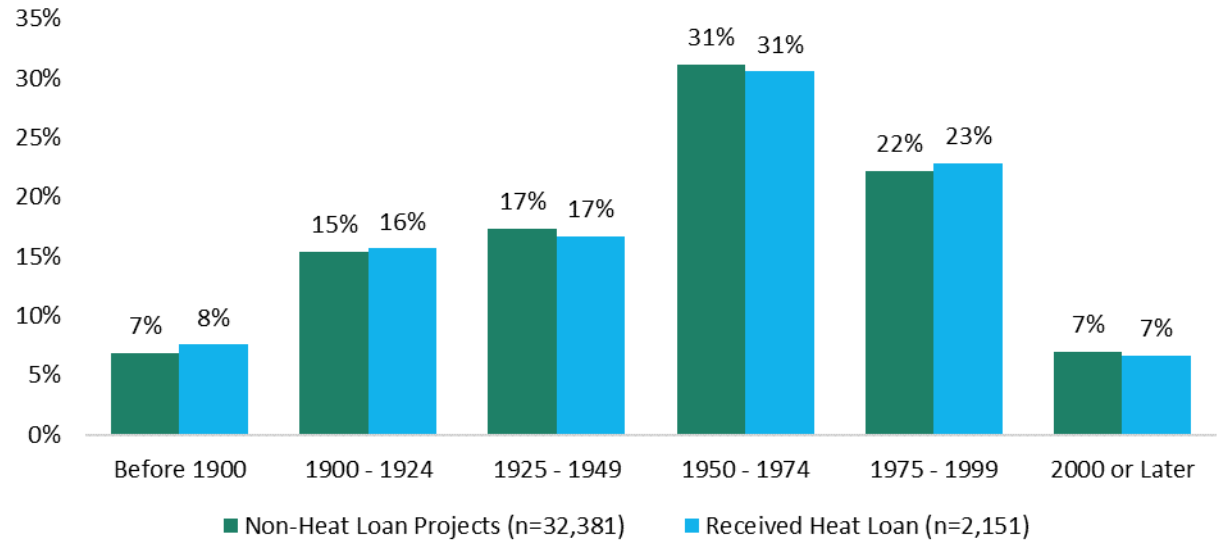
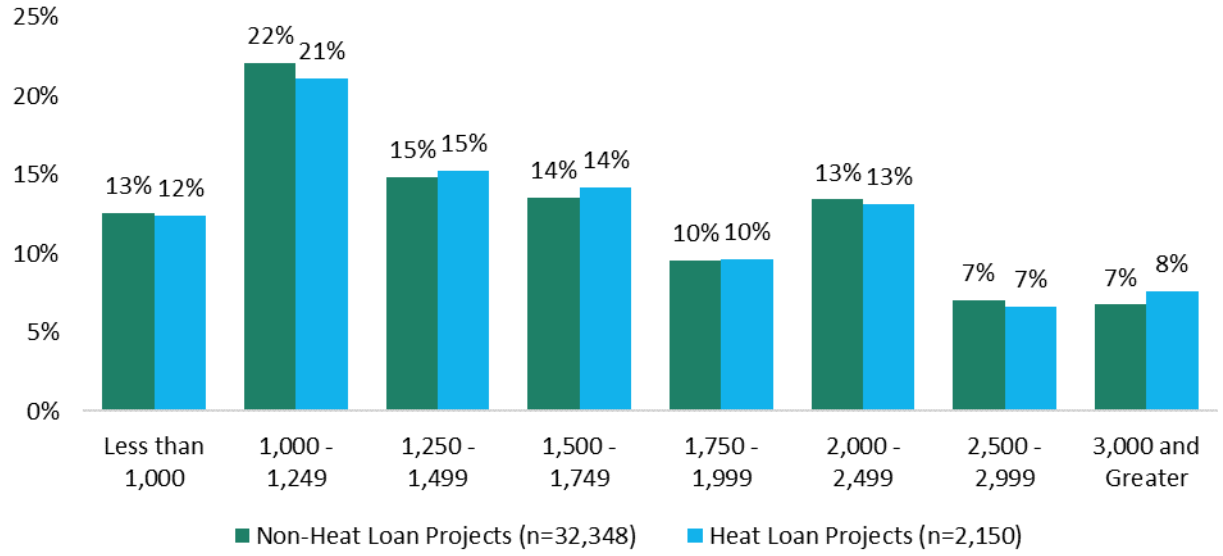


Figure 2-6: Home Size (SF) by HEAT Loan Status



What are the prevalent characteristics of customers who applied for a HEAT Loan but were denied the loan?

EnergyWise participants denied a HEAT Loan are, overall, very similar to HEAT Loan recipients in house type (Figure 2-7), house age (Figure 2-8), and house size (Figure 2-9). The largest differences among the two groups are not very consequential: EnergyWise participants denied a HEAT Loan were *less* likely to live in an apartment (9% versus 14%) and *more* likely to live in homes sized between 1,500 and 1,749 square feet (19% versus 14%) than were those who received the HEAT Loan.

Figure 2-7: Home Types of Participants Denied a HEAT Loan (n=123)

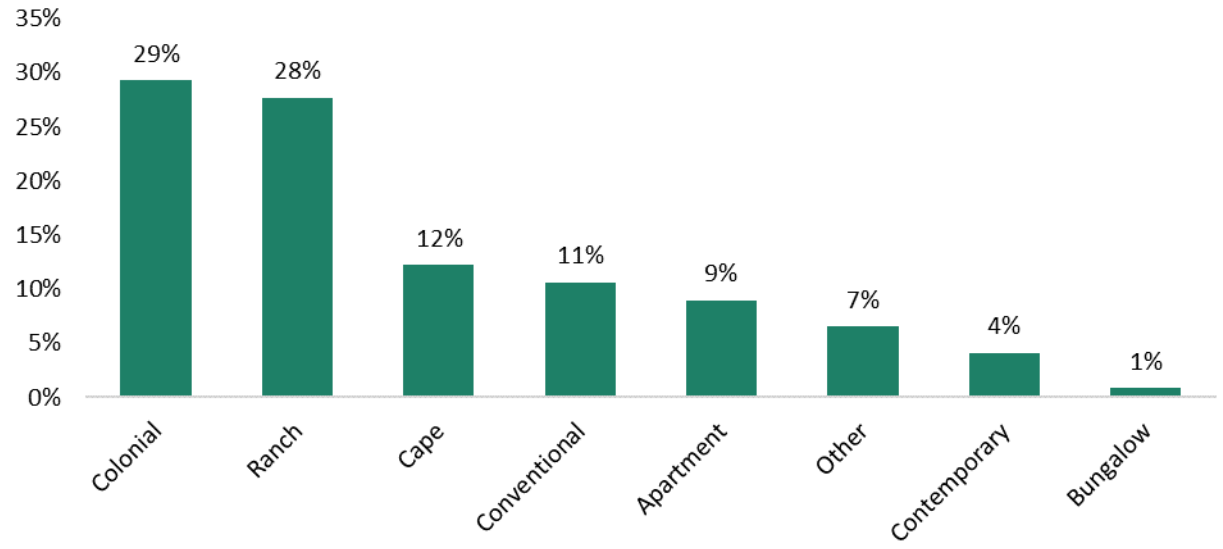


Figure 2-8: Home Vintage of Participants Denied a HEAT Loan (n=123)

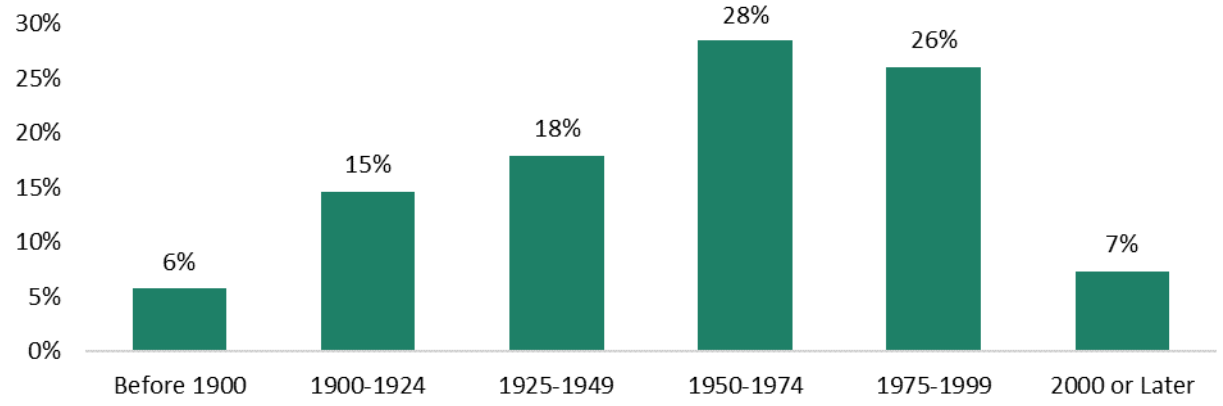
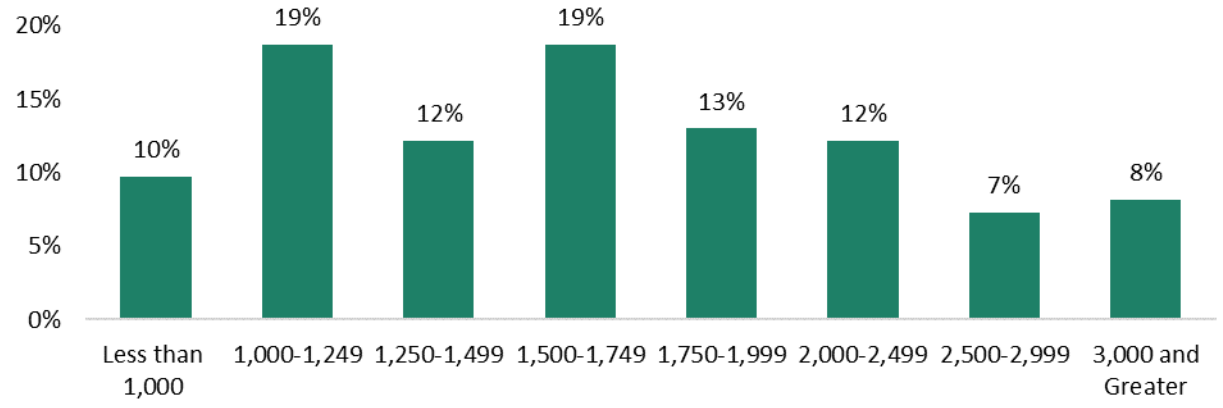


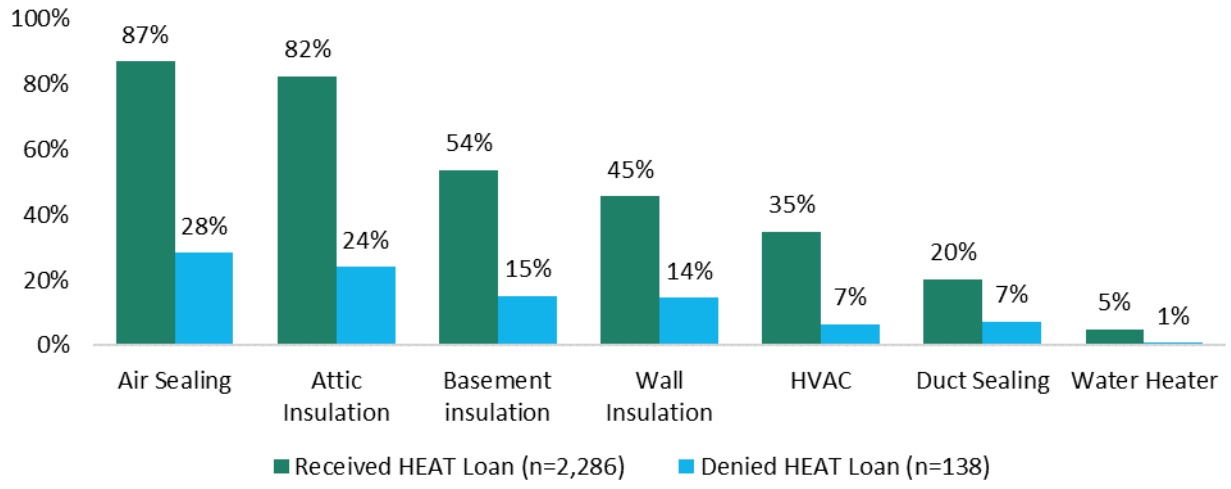
Figure 2-9: Home Size (Square Feet) of Participants Denied a HEAT Loan (n=123)



What measures were supported by HEAT Loan? Are the participants denied a HEAT Loan disproportionately seeking financing for specific measures?

Air sealing (conducted with other measures), attic insulation, and basement insulation are the most commonly installed measures among both HEAT Loan recipients and those denied a HEAT Loan. (Figure 2-10). For all but one measure (duct sealing), HEAT Loan recipients were more than three times as likely as those denied a HEAT Loan to install each measure. Most notably, HEAT Loan recipients were over five times more likely than those denied a loan to install HVAC (35% versus 7%) and water heater upgrades (5% versus 1%).

Figure 2-10: Measures Installed by HEAT Loan Recipients and Participants Denied a HEAT Loan

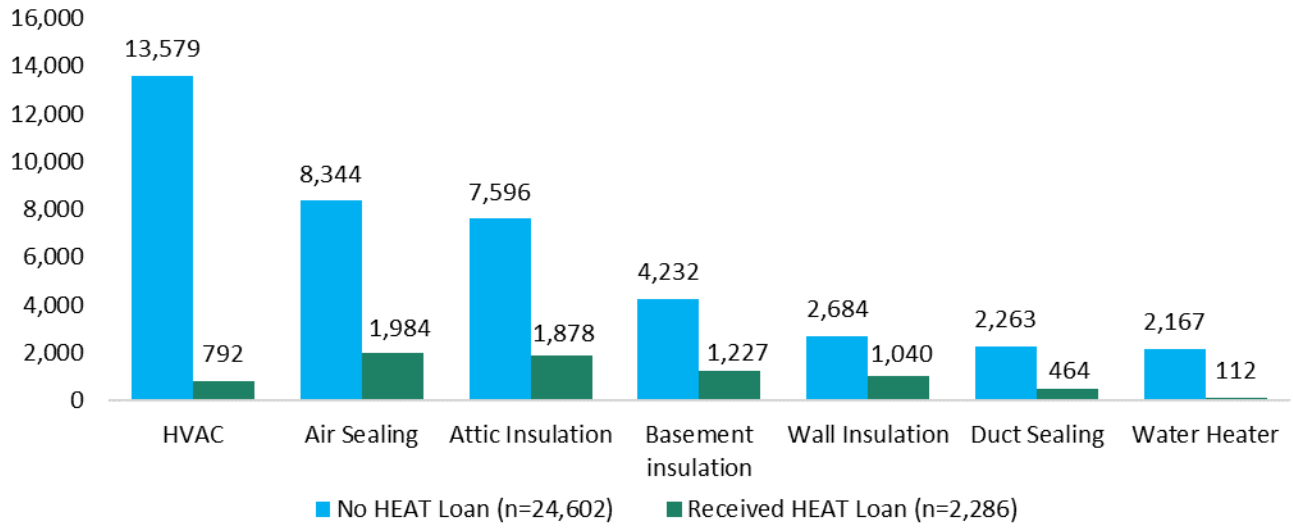


Air sealing was the most common measure installed by HEAT Loan recipients, closely followed by attic insulation. Water heaters were the least common measure installed by HEAT Loan recipients.

What is the incidence of each measure within the HEAT Loan participants vs non-participants?

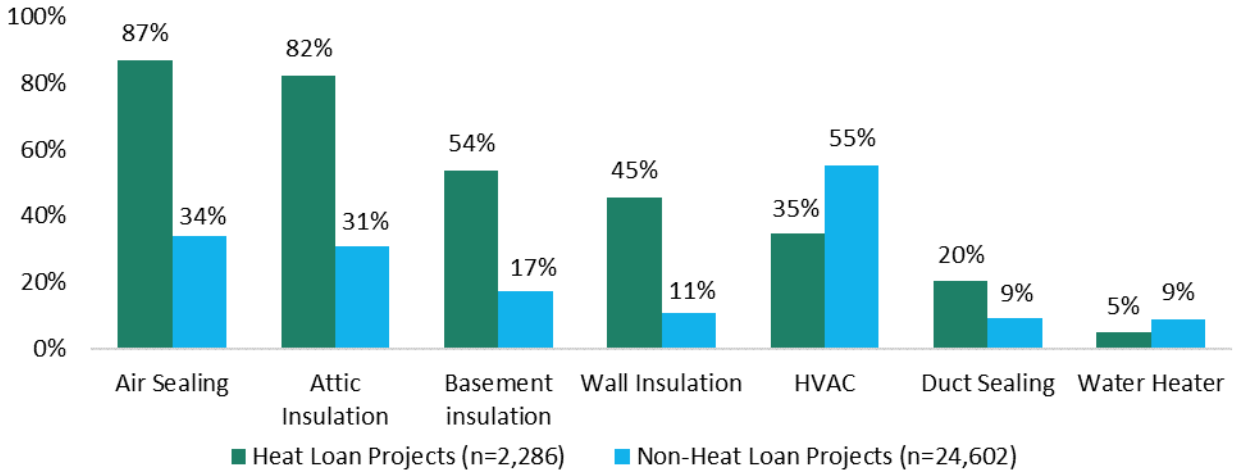
Figure 2-11 displays the numbers of each measure installed by HEAT Loan status across all groups that installed measures (Groups 2 - 5).

Figure 2-11: Quantities of Measures Installed, by HEAT Loan Status



To facilitate a comparison of measure uptake by HEAT Loan status given that HEAT Loan recipients are so much fewer than non-HEAT Loan participants, Figure 2-12 shows the incidence of measure type as a percent of participants with and without HEAT Loans. The percentages represent the percent of all HEAT Loan or non-HEAT Loan projects that included that measure type. HEAT Loan projects contained a higher incidence of all measure types, which is consistent with Table 2-5 that shows more measures in HEAT Loan projects than non-HEAT Loan projects.

Figure 2-12: Percentage Installing Measures by HEAT Loan Status



What are the most prevalent measure mixes among HEAT Loan and without-HEAT Loan projects?

Both HEAT Loan projects and non-HEAT Loan projects had the same most prevalent measure mixes (attic insulation and air sealing, alone or in combination with basement or wall insulation; Table 2-5). HEAT Loan projects had a greater diversity of measure mixes, as evidenced by the top three mixes comprising 41% of their projects, compared with 49% for non-HEAT Loan projects. For these analyses, we included projects with more than one installed measure and identified the top five measure mixes for each group.

Table 2-5: Most Common Measure Mixes for HEAT Loan Recipients (n=2,026)

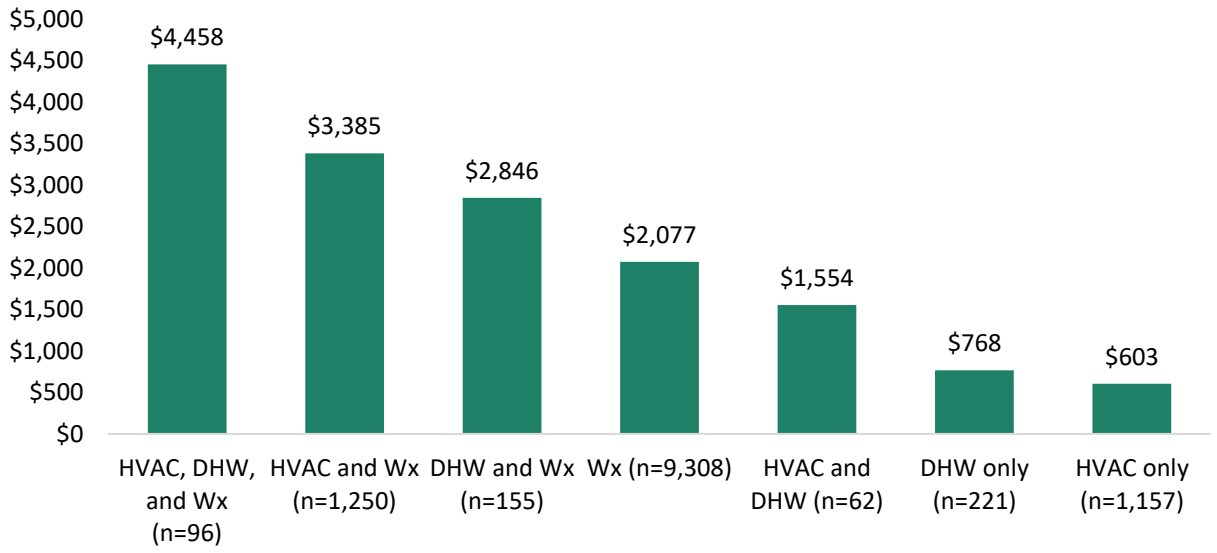
Measure Mix	Percent of HEAT Loan Projects	Percent of Non-HEAT Loan Projects
Attic Insulation, Basement Insulation, Wall Insulation, Air Sealing	18%	10%
Attic Insulation, Basement Insulation, Air Sealing	13%	18%
Attic Insulation, Air Sealing	10%	21%
Attic Insulation, Wall Insulation, Air Sealing	9%	--*
HVAC, Attic Insulation, Basement Insulation, Wall Insulation, Air Sealing	5%	--*
Attic Insulation, Air Sealing, Duct Sealing	--*	9%
Attic Insulation, Basement Insulation, Air Sealing, Duct Sealing	--*	7%
Total	**55%**	**65%**

* Measure mix not among top five mix for the group. Percentage not calculated, but is less than 5%.

What is the total incentive cost per project including HEAT Loan and EnergyWise with (1) HVAC equipment rebates and (2) gas and electric equipment incentives (domestic hot water [DWH] incentives)

Figure 2-13 displays the average incentive cost of EnergyWise projects, regardless of HEAT Loan status. The incentives we included in these analyses were the total rebates received by the customer and, for HEAT Loan projects, the interest rate buy-down. We have not included any participants that received a home energy assessment without a subsequent upgrade. Delivered fuel-homes are not eligible for HVAC/DHW measures and so are excluded from this analysis.

Figure 2-13: Average Incentive Cost by Project Type



What is total and average project size (cost, annual and lifetime electricity and natural gas savings) of (1) EnergyWise (weatherization installed, Group 2), (2) EnergyWise + HVAC/DHW (Group 3), and (3) HVAC/DHW (Group 4) with and without HEAT Loan? What are the total cost and savings of each measure within the HEAT Loan participants versus nonparticipants?

Project and measure cost and measure savings: We do not present project cost, nor measure cost and savings, due to limitations in the program tracking data.[9] Here we address the other elements of these research questions.

Weatherization projects make the greatest contribution to savings (Table 2-6). Savings from HEAT Loan projects constituted 17% of total savings from Groups 2-4. If we consider that 76% of surveyed HEAT Loan recipients said they would have postponed, reduced, or canceled their project without the HEAT Loan (see section 3.3), and HEAT Loan projects contributed 17% of savings, then we conservatively estimate about 312,654 kWh in savings in years 2014 to 2017 (about 8%) would not have materialized without the HEAT Loan.[10] Our analyses did not include direct install measures for two reasons: 1) those

[9] For example, the tracking data included a substantial proportion of implausibly high cost values, in the tens and even hundreds of thousands of dollars. The HVAC program tracker provides cost for the entire project, not per-measure costs. The EnergyWise program tracker provides total insultation savings per household without providing savings by measure type (such as attic insulation).

[10] To explain our calculation, if three-quarters of HEAT Loan recipients would have canceled, postponed, or delayed their project, we took half of their estimated savings away. They contributed 17% to savings, so we estimated 8% would not have materialized. Eight percent of 3,908,184 kWh is 312,654 kWh.

measures are not eligible for the HEAT Loan, and 2) they would have been similar among all assessment recipients, regardless of HEAT Loan status.[11]

Table 2-6: Total Annual kWh Saved by Group, Exclusive of Direct Install Measures (2014 to 2017, n=11,344)

Group	No HEAT Loan	Received HEAT Loan	Grand Total
Weatherization	2,211,585	361,471	2,573,056
Wx-gas	1,019,339	153,508	1,172,848
Wx-delivered fuels	552,178	161,562	713,740
Wx-electric	640,068	46,401	686,468
Weatherization + HVAC	496,434	241,409	737,843
HVAC (EnergyWise)	537,823	59,462	597,285
Grand Total	**3,245,842**	**662,342**	**3,908,184**

Non-HEAT Loan households saved significantly more kWh on average than HEAT Loan households, particularly for HVAC-only projects. These findings appear to be driven by high kWh savings in electrically heated homes, which are more prevalent in the non-HEAT Loan population than in the HEAT Loan population. HEAT Loan and non-HEAT Loan households using natural gas and delivered fuels for heating saved very similar amounts of kWh (Table 2-7). The households that use electric heat are driving the group savings values in this table; for weatherization, they have eight times the electricity savings of the other-fuel weatherization projects. This disparity, coupled with the much larger sample size of non-HEAT Loan households (there are over 13 times as many Wx-electric, non-HEAT Loan participants as Wx-electric HEAT Loan participants), caused the overall weatherization group, and group average, to have higher non-HEAT Loan electricity savings. Further, 10% of the records for HVAC replacements showed zero kWh savings and these records are disproportionately among the HEAT Loan participants. The calculations for this table do not include direct install measures.

[11] This study does not estimate MMBtu savings from delivered fuels. Future HEAT Loan studies should consider assessing oil and propane savings.

Table 2-7: Average Annual kWh Saved by Group, Exclusive of Direct Install Measures (2014 to 2017, n=11,344)

Group	No HEAT Loan	Received HEAT Loan	Group Average
Weatherization*	305	272	300
Wx-gas	205	206	205
Wx-delivered fuels	291	291	291
Wx-electric	1,667	1,657	1,666
Weatherization + HVAC**	549	412	495
HVAC (EnergyWise)**	514	247	464
Group Average*	**353**	**307**	**344**

* The difference in kWh saved between weatherization projects was significant at the p≤ .05 level using a one-tailed T-test.

** The difference in kWh saved between HEAT Loan and no HEAT Loan project types is statistically significant at the p ≤ .01 level using a one-tailed T-test. The difference in the group average (last row in table) of kWh saved between HEAT Loan and no HEAT Loan is statistically significant.

National Grid saved over 2.2 million therms between 2014 and 2017 for upgrades made by assessment recipients (Table 2-8), exclusive of direct install measures such as pipe wrap and showerheads.

Table 2-8: Total Annual Therms Saved by Group, Exclusive of Direct Install Measures (2014 to 2017, n=8,491)

Group	No HEAT Loan	Received HEAT Loan	Grand Total
Weatherization	1,359,806	273,667	1,633,473
Weatherization + HVAC	261,712	257,672	519,385
HVAC (EnergyWise)	39,572	23,198	62,770
Grand Total	**1,661,091**	**554,537**	**2,215,628**

On average, HEAT Loan projects of all types saved significantly more therms than non-HEAT Loan projects (Table 2-9).

Table 2-9: Average Annual Therms Saved by Group, Exclusive of Direct Install Measures (2014 to 2017, n=8,491)

Group	No HEAT Loan	Received HEAT Loan	Group Average
Weatherization*	274	367	286
Weatherization + HVAC*	290	440	349
HVAC (EnergyWise)*	38	96	49
Group Average*	**240**	**353**	**261**

* The difference in therms saved between HEAT Loan and no HEAT Loan is statistically significant for all groups and the group average at the $p \leq .01$ level using a one-tailed T-test.

For measures installed in years 2014 to 2017, National Grid's EnergyWise program saved approximately 66,404 net lifetime MWh (Table 2-10).

Table 2-10: Total Net Lifetime MWh Saved by Group, Exclusive of Direct Install Measures (2014-2017, n=11,344)

Group	No HEAT Loan	Received HEAT Loan	Grand Total
Weatherization	41,790	6,963	48,753
Wx-gas	19,873	3,010	22,882
Wx-delivered fuels	10,999	3,206	14,205
Wx-electric	10,919	747	11,666
Weatherization + HVAC	7,176	3,768	10,944
HVAC (EnergyWise)	5,978	728	6,707
Grand Total	**54,945**	**11,459**	**66,404**

On average, non-HEAT Loan households saved significantly more MWh than HEAT Loan households, again, particularly among households with HVAC projects (Table 2-11). The same factors that affected the kWh analyses (Table 2-7) affected these analyses: Households with electric heat are driving the differences in group averages and the zero savings values in electric HVAC projects disproportionately affects the HEAT Loan households.

Table 2-11: Average Net Lifetime MWh Saved by Group (2014 to 2017, n=11,344)

Group	No HEAT Loan	Received HEAT Loan	Group Average
Weatherization*	5.8	5.2	5.7
Wx-gas	4.0	4.0	4.0
Wx-delivered fuels	5.8	5.8	5.8
Wx-electric	28.4	26.7	28.3
Weatherization + HVAC*	7.9	6.4	7.3
HVAC (EnergyWise)*	5.7	3.0	5.2
Group Average*	**6.0**	**5.3**	**5.9**

* The difference in average net lifetime MWh saved between HEAT Loan and no HEAT Loan is statistically significant at the $p \leq .01$ level using a one-tailed T-test. The difference in the group average (last row in table) of net lifetime MWh saved between HEAT Loan and no HEAT Loan is statistically significant.

For measures installed in 2014 to 2017, National Grid's EnergyWise program saved almost 43 million total net lifetime therms (Table 2-12).

Table 2-12: Total Net Lifetime Therms Saved by Group (2014 to 2017, n=8,491)

Group	No HEAT Loan	Received HEAT Loan	Grand Total
Weatherization	26,906,744	5,451,159	32,357,903
Weatherization + HVAC	4,936,972	4,818,492	9,755,464
HVAC (EnergyWise)	561,430	318,743	880,173
Grand Total	**32,405,146**	**10,588,394**	**42,993,539**

On average, HEAT Loan projects of all types generated more net lifetime therm savings than non-HEAT Loan projects (Table 2-13).

Table 2-13: Average Net Lifetime Therms Saved by Group (2014 to 2017, n=8,491)

Group	No HEAT Loan	Received HEAT Loan	Group Average
Weatherization*	5,415	7,317	5,663
Weatherization + HVAC*	5,467	8,223	6,552
HVAC (EnergyWise)*	536	1,323	683
Group Average*	**4,684**	**6,736**	**5,063**

* The difference in average net lifetime therms saved between HEAT Loan and no HEAT Loan is statistically significant for all groups and the group average at the $p \leq .01$ level using a one-tailed T-test.

What is the total ratepayer cost per HEAT Loan, including Loan incentive and Loan administration?

Average ratepayer cost associated with the provision of HEAT Loans is roughly $500 for weatherization-only and roughly $1,500 with HVAC upgrades (Table 2-14). On average, the total ratepayer cost per HEAT Loan is $906. The data indicate that *average* ratepayer costs for HVAC projects do not vary with respect to whether the HVAC project also includes weatherization and do not include available non-Loan incentives.[12] Loan incentives are costs that would otherwise be incurred by the borrower and comprise the interest rate buy-down paid by National Grid to the lender and the HEAT Loan administration fee ($35) paid by National Grid to RISE. Loan administrative costs are the Quality Assurance inspection fees ($125) on heating system upgrades paid by National Grid to inspectors.

Table 2-14: Average Ratepayer Cost per HEAT Loan by Project Type (n=2,213)

Group	Number of HEAT Loan Participants	Total Average Ratepayer Cost Per HEAT Loan
Weatherization	1,389	$530
Wx-gas	723	$556
Wx-delivered fuels	641	$500
Wx-electric	25	$544
Weatherization + HVAC	581	$1,541
HVAC (EnergyWise)	243	$1,542
Average	**2,213**	**$906**

[12] This finding of comparable average cost for HVAC projects with or without weatherization is counter-intuitive, yet verified through re-analysis of the data. The median ratepayer cost for HEAT Loan projects with both weatherization and HVAC exceed those for projects with HVAC only by $106 ($1,489 vs. $1,383). The third quartile values (the value that exceeds 75% of the observations) are $2,000 for HVAC with weatherization and $1,865 for HVAC alone. The values that Excel identifies as cut-off values to identify outliers (that is, values above which Excel's embedded statistics categorize as outliers) are $3,485 for HVAC with weatherization and $3,064 for HVAC without weatherization.

3. Participant Survey

This chapter presents findings from the web survey conducted with EnergyWise (Groups 1 through 4) and HVAC-only (Group 5) participants.[13] EnergyWise participants received a home energy assessment and may or may not have made upgrades. HVAC-only participants did not receive a home energy assessment and installed either HVAC equipment or domestic hot water heating equipment.

This chapter reviews the awareness of the loan among survey respondents, reasons they did not pursue a HEAT Loan, how HEAT Loan availability influenced decisions to upgrade equipment, what was appealing about the HEAT Loan, satisfaction with the HEAT Loan experience, and how participants paid for the upgrades they made. We rounded to the nearest whole number the statistics presented and thus table totals do not always equal 100%.

See Section 1.3 Methods for a discussion of survey limitations.

3.1. HEAT Loan Awareness

The home energy assessment exposes customers to the HEAT Loan offering. Those that do not get assessments learn about the loan through National Grid marketing materials, including the website. Among all surveyed participants, 61% were aware of the HEAT Loan; EnergyWise participants had greater awareness of the HEAT Loan than did HVAC-only participants (Table 3-1).

Table 3-1: Customer Awareness of HEAT Loan

Participant Group	Percent Aware
EnergyWise (n=184)	71%
HVAC-only (n=138)	41%
Total (n=322)	**61%**

The most common way EnergyWise participants learned of the HEAT Loan was from their assessor (Table 3-2), either during or after their home energy assessment (29%). Almost three-quarters of HVAC-only participants, on the other hand, learned of the HEAT Loan from National Grid informational materials – either the website (43%), printed materials (19%), or paid advertisements (10%). Fewer than a quarter (23%) of EnergyWise participants reported hearing about the HEAT Loan prior to their home energy assessment.

[13] Participants in the HVAC program could have also installed a domestic hot water measure.

Table 3-2: Source of HEAT Loan Awareness by Program Type

Method	EnergyWise (n=129)*	HVAC-only (n=49)*
From my assessor during or after my home energy assessment	**29%**	0%
From family, friends, or acquaintances	21%	10%
From the National Grid website	18%	**43%**
From a contractor	8%	19%
From a bill insert or other printed National Grid materials	8%	19%
From a TV or radio advertisement	3%	10%
From a lender or bank	1%	0%
Other or don't know	13%	0%
Total	**100%**	**100%**

* Column total appears to equal 101% due to rounding error.

Among the HVAC-only participants who learned of the HEAT Loan from their contractor, most (5 of 7) said their contractor spent about two to five minutes discussing the loan with them, while the remaining two discussed the HEAT Loan with their contractor for more than five minutes. Ninety percent of HVAC-only participants reported knowing that National Grid offers home energy assessments (47 of 52).

3.2. Barriers to HEAT Loan Use

Customers aware of the HEAT Loan did not pursue it largely because they did not need a loan (Table 3-3). The restrictions on do-it-yourself installations did not meaningfully affect HEAT Loan uptake. Only two people (less than 1%) said they did not pursue a HEAT Loan because they wanted to install the equipment themselves.

Table 3-3: Reasons Customers did not Pursue a HEAT Loan (n=174)*

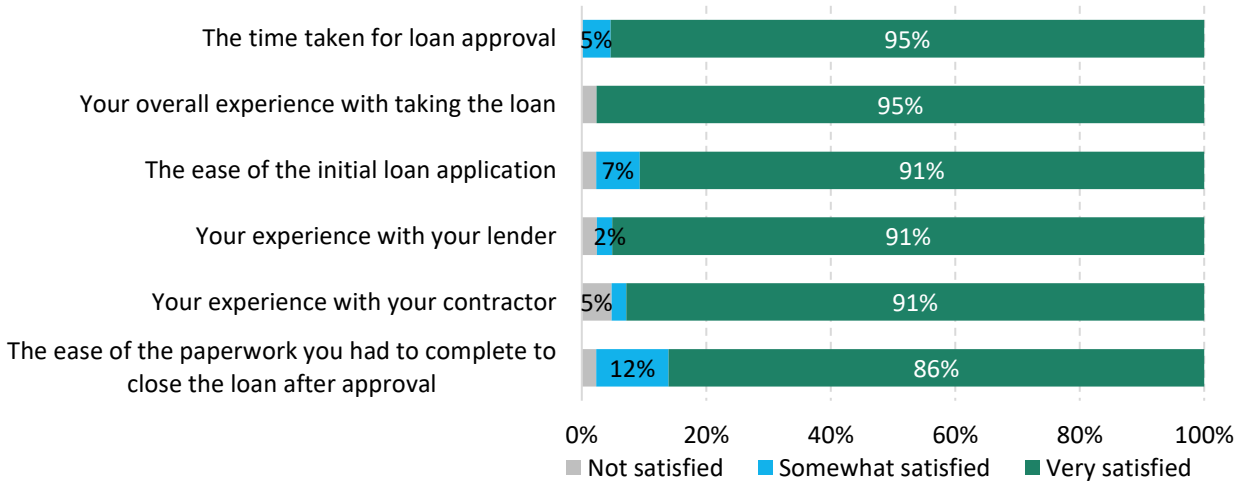
Reason	EnergyWise (n=125)	HVAC-only (n=49)	All Respondents (n=174)
Did not need a loan: had funds available	60%	71%	63%
Did not want to take on debt or commit to monthly payments	23%	14%	20%
Did not think you would qualify	3%	5%	4%
Did not want to go through the loan application process	7%	0%	5%
Had a different source of financing you preferred	3%	0%	2%
Was not eligible because you wanted to install it yourself	1%	0%	1%
Other	6%	5%	6%

* Multiple responses allowed.

Fifteen percent of surveyed EnergyWise participants aware of the HEAT Loan started an application and 9% submitted one. Therefore, 6% started an application, but did not submit one. Among the three respondents who applied for a HEAT Loan, but did not receive it, one person's application was denied, one person reported no follow-up from the lender after submitting their application, and one said they were approved but decided to complete the project without the loan.[14]

Survey respondents who received a HEAT Loan were highly satisfied with all aspects of their loan experience (Figure 3-1). The areas with the lowest satisfaction were the initial loan application and the paperwork to close the loan.

Figure 3-1: Satisfaction with HEAT Loan Experience (n=43)



We asked those who were not satisfied with their loan experience, how it could have been improved. Three of the four survey respondents who wrote in answers had negative experiences related to their contractors, and one reported "terrible" customer service from the lender.

There is interest in the HEAT Loan among HVAC-only survey takers. Among HVAC-only participants, more than half (54%) said that they would consider applying for a HEAT Loan in the future to pay for eligible upgrades. Less than one-third said they would not consider it (29%).[15] Of those that said they would not consider it, the most common reason given was that they were not in need of upgrades in the near future, either because they were in a new home or had already completed recent upgrades (54%). Nearly a quarter (23%) percent said they did not want to take on debt, and 8% said they did not have enough time to pursue applying.

[14] The one person whose application was denied, declined to answer why it was denied.

[15] The remaining 17% said they did not know if they would consider applying.

3.3. Deciding and Paying for Upgrades

Financial support from National Grid was the most important factors in customers' decisions to install energy efficiency equipment, with the HEAT Loan rated as most important and rebates rated as second most important. Surveyed EnergyWise participants who made insulation and/or air sealing improvements, HVAC, and hot water upgrades rated the availability of the 0% interest loan as very important in their decisions to make those upgrades (Figure 3-2, Figure 3-3, and Figure 3-4). Rebates were also rated as highly important. Assessor recommendations were more important for those who made hot water or insulation and/or air sealing improvements, while contractor recommendations were more important than assessor recommendations for those who installed HVAC equipment.

Figure 3-2: Importance of Factors in Decision to Install Weatherization Measures

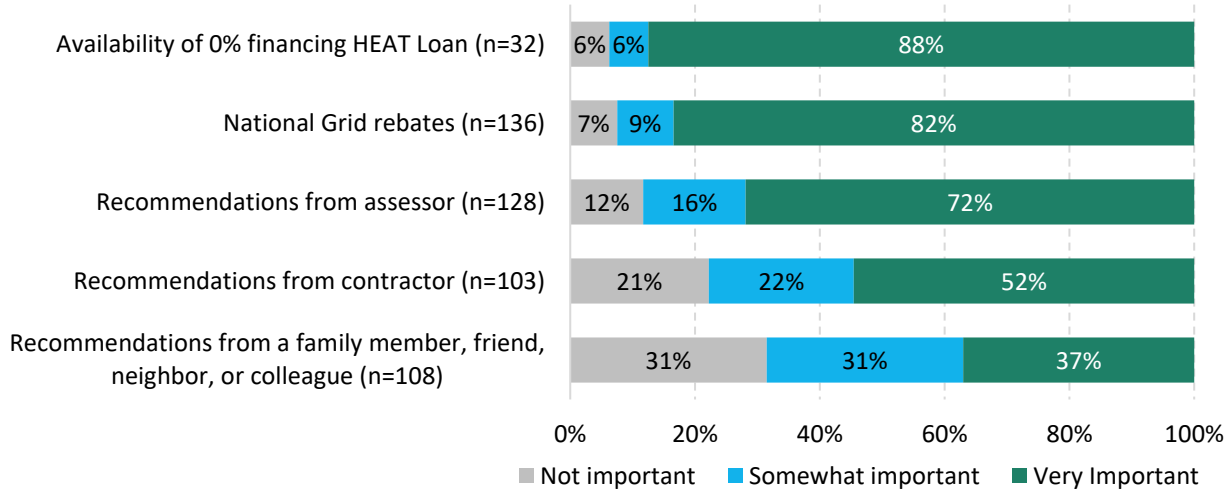


Figure 3-3: Importance of Factors in Decision to Install HVAC Equipment

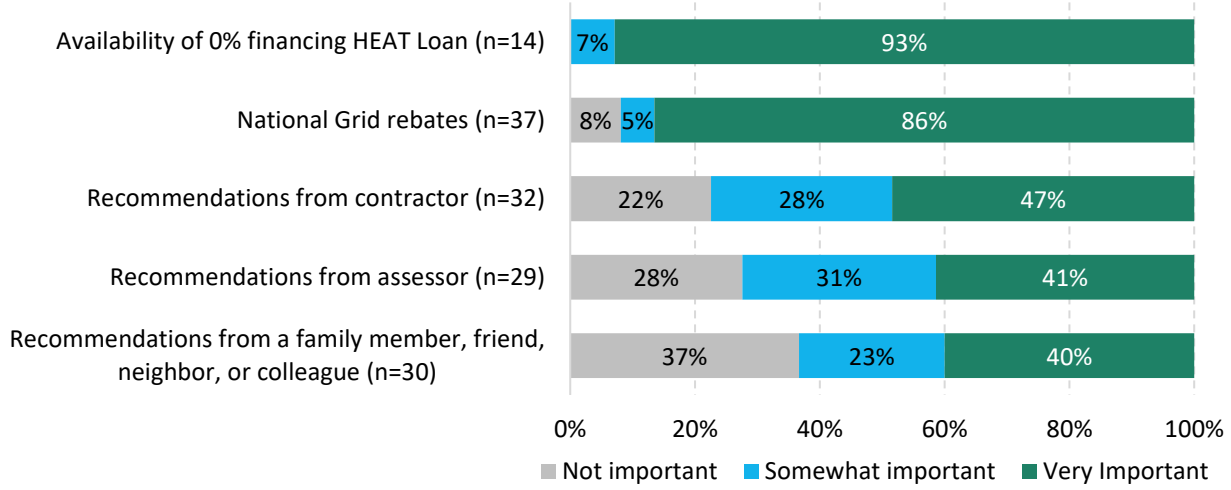
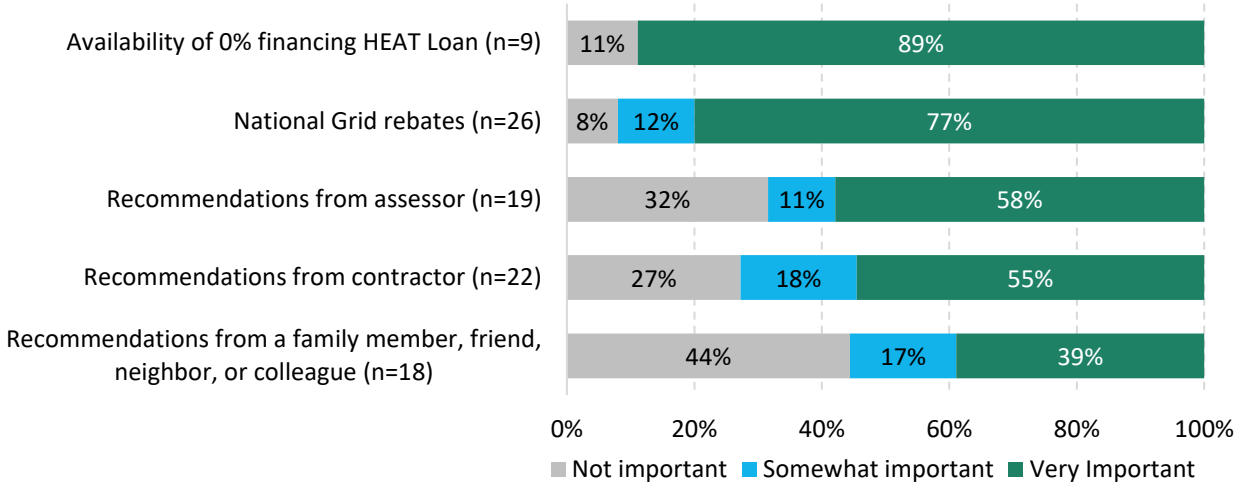
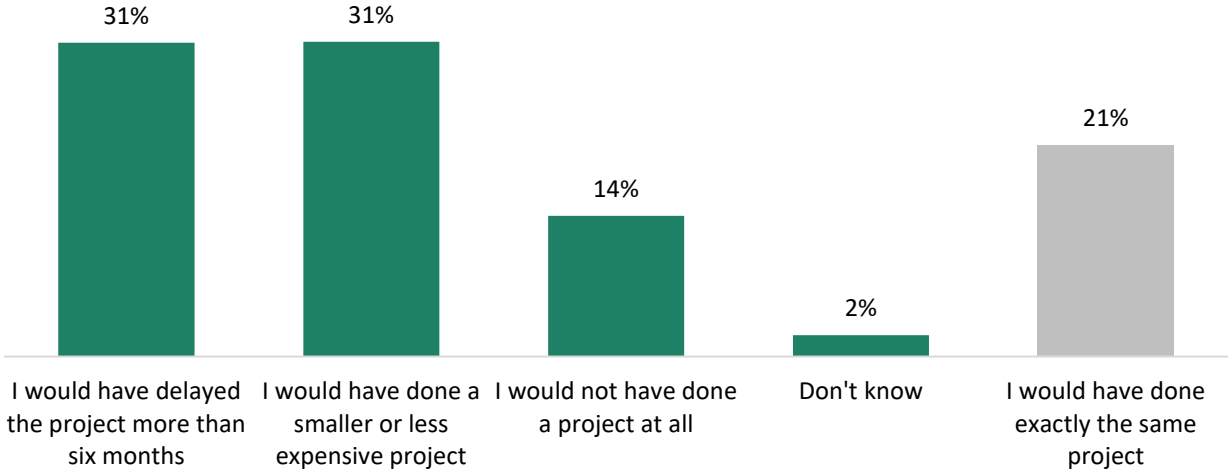


Figure 3-4: Importance of Factors in Decision to Install Hot Water Heating Equipment



Three-fourths of HEAT Loan recipients would have postponed, reduced, or canceled their energy efficiency upgrade project if they had not received the HEAT Loan (Figure 3-5). One of the people who said they would have done the same project explained that their boiler had failed, and thus "had to do the project." A respondent reporting they would have done a smaller project said they would have "broken the project up" and done parts over time rather than having it done all at once. Another person who would have done a smaller project reported they would have installed less expensive, less efficient equipment. Finally, another respondent said that without the HEAT Loan they "would have froze for the winter."

Figure 3-5: What Customer Would Have Done Without HEAT Loan (n=42)



More than half of HEAT Loan recipients would have had to use another means of repayment over time to pay for their energy efficiency upgrade if they did not receive the HEAT Loan (Table 3-4). The one survey respondent who reported their HEAT Loan application was denied said they paid for the upgrades they made with another loan.

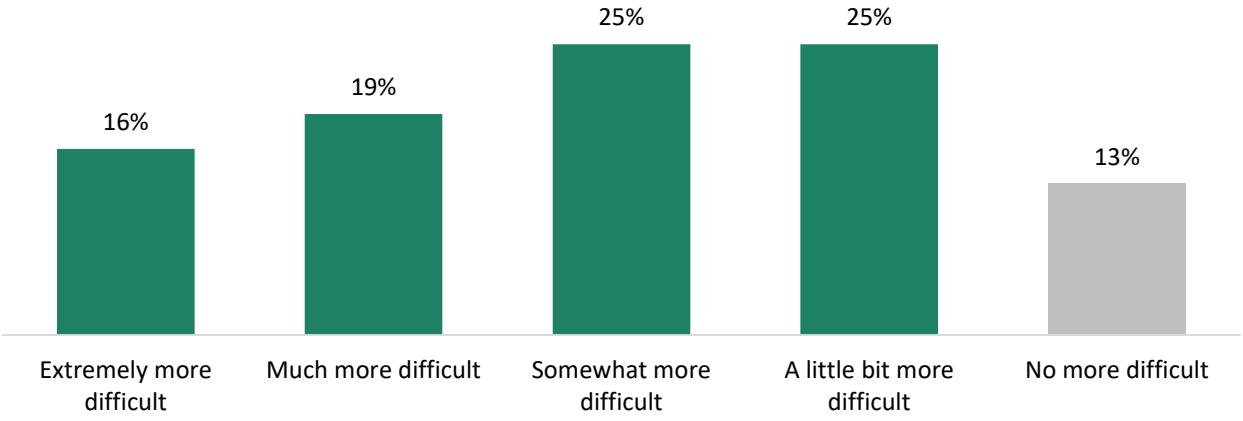
Table 3-4: How Loan Recipients Reportedly Would Have Paid for Upgrades Without HEAT Loan

Alternative payment method	Percent (n=32)*
Cash, check, or credit card with the intention to pay in full at the end of the month	37%
Loan other than 0% interest HEAT Loan	26%
Credit card with the intention to repay over time	23%
Financing or payment plan from the contractor	8%
Don't know	6%
Total	**100%**

* We asked this question of the HEAT Loan recipients who said they still would have done a project without the HEAT Loan.

Paying for their upgrades with the alternative payment method would have made it more difficult for 87% of HEAT Loan recipients to manage their household expenses. To assess the financial burden caused by the HEAT Loan not being available, we asked customers how much more difficult it would be for the customer to manage their household expenses if they had used the alternative payment method indicated in Table 3-4. Nearly 90% said that it would have been more difficult for them to manage their finances if not using the 0% interest HEAT Loan (Figure 3-6). More than one-third expressed that it would have been much more difficult to manage household expenses without the HEAT Loan.

Figure 3-6: Difficulty Managing Household Expenses if Not Using HEAT Loan (n=32)



The 0% interest aspect of the HEAT Loan drives its uptake. Half of surveyed HEAT Loan recipients said they would not finance energy efficiency improvements without the 0% interest loan (Table 3-5). No respondents said they would consider the HEAT Loan if the interest rate was 5% or more.

Table 3-5: Maximum Interest Rate at Which Respondent Would Consider a HEAT Loan (n=43)*

Interest Rate	Percent
I would not finance the energy efficiency improvements without the 0% interest loan	51%
1% (about $68 interest monthly on a $5,500 loan)	7%
2% (about $70 interest monthly on a $5,500 loan)	16%
3% (about $73 interest monthly on a $5,500 loan)	5%
4% (about $75 interest monthly on a $5,500 loan)	7%
5% (about $78 interest monthly on a $5,500 loan)	0%
6% (about $80 interest monthly on a $5,500 loan)	0%
7% (about $83 interest monthly on a $5,500 loan)	0%
Don't know	14%
Total	**100%**

* Approximate interest payment based on a seven-year repayment period for a $5,500 loan, an approximation of the average HEAT Loan.

A portion of non-HEAT Loan recipients (15%) had to use a payment method for their energy efficiency upgrades that allowed them to pay the cost over time (Table 3-6). A large majority, though, reported using cash, check, or a credit card with the intention to pay in full at the end of the month, which is consistent with their reasons for not pursuing a HEAT Loan – they had funds available and did not need a loan.

Table 3-6: Sources of Payment Non-HEAT Loan Recipients Used Upgrades*

Payment Method	Percent (n=118)
Cash, check, or credit card with the intention to pay in full at the end of the month	84%
Financing or payment plan from the contractor	6%
Loan other than 0% interest HEAT Loan	5%
Credit card with the intention to repay over time	4%
Don't know	2%

* Multiple responses allowed.

3.4. HEAT Loan Applicants and Recipients

Among those who applied for a HEAT Loan, the large majority found the 0% interest rate appealing (Table 3-7). More than half liked the ability to repay the project costs over time and a little less than half liked the payback term length.

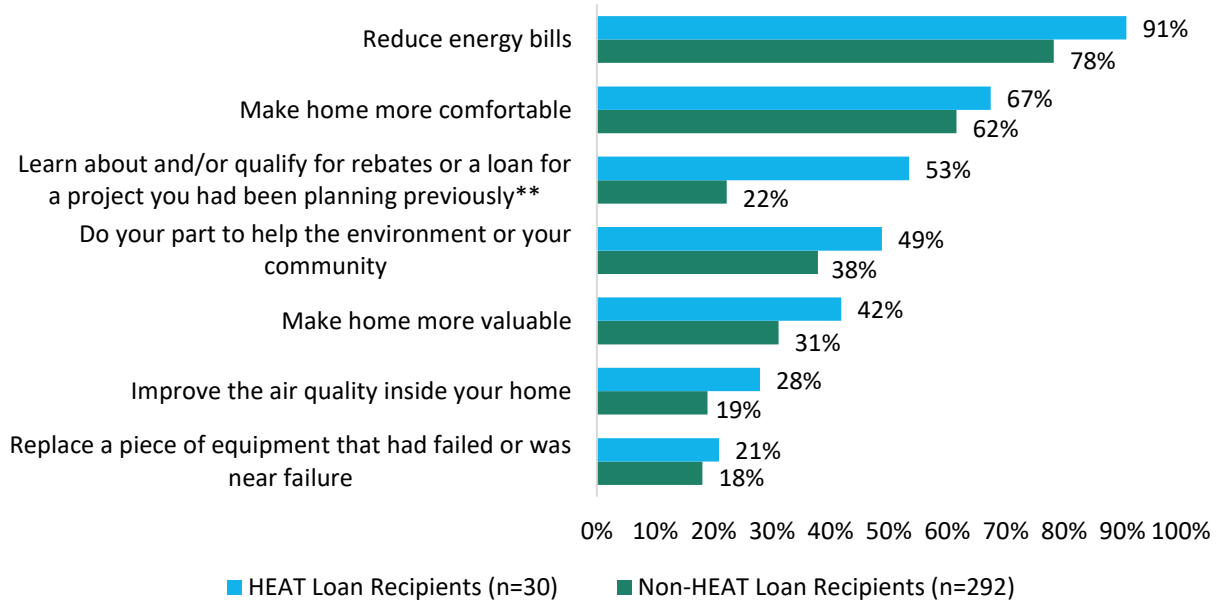
Table 3-7: Appealing Aspects of the HEAT Loan

Appealing Aspect	Percent of Those who Applied for a HEAT Loan (n=43)*
0% interest rate	91%
Ability to repay project costs over time	60%
Length of loan payback	47%
Ease of qualifying for the loan	44%
Convenience	33%
Choice of lenders available to work with	23%
Other or don't know	2%

* Multiple responses allowed.

Nearly all HEAT Loan recipients were interested in having a home energy assessment to reduce their energy bills (Figure 3-9). HEAT Loan recipients were significantly more likely than non-HEAT Loan recipients to pursue program participation to learn about or qualify for rebates or a loan for a project they had been planning previously.

Figure 3-7: Reasons for an Assessment or Installed Equipment by HEAT Loan Status (n=43)*

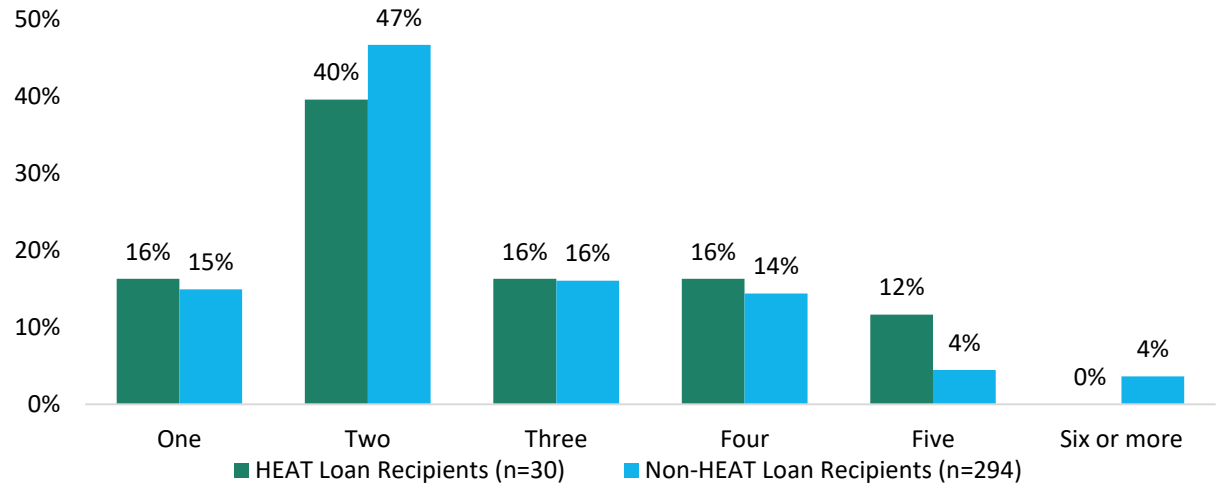


* Multiple responses allowed; we asked Group 5 participants (who did not receive an assessment) why they were interested in installing the new HVAC or DHW equipment. All groups were presented with the same response options.

** Statistically significant at the p≤.01 level using chi-square.

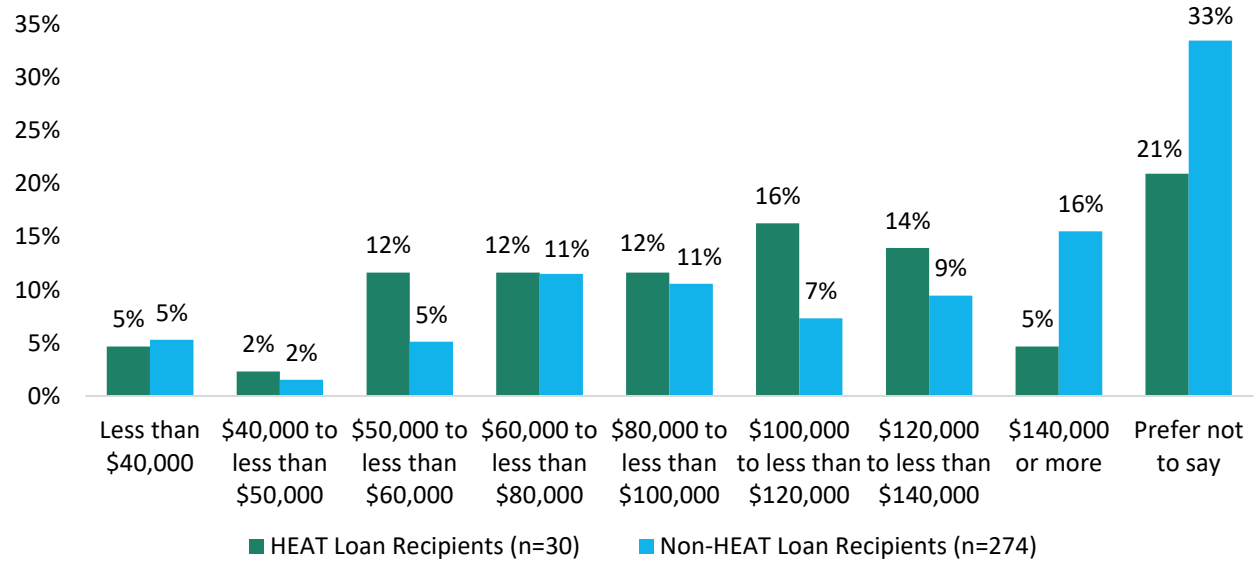
HEAT Loan recipients most commonly lived in two-person households (Figure 3-8). The distribution of HEAT Loan recipients across household size was not significantly different than the household size distribution of non-HEAT Loan recipients.

Figure 3-8: Number of People in Household by HEAT Loan Status



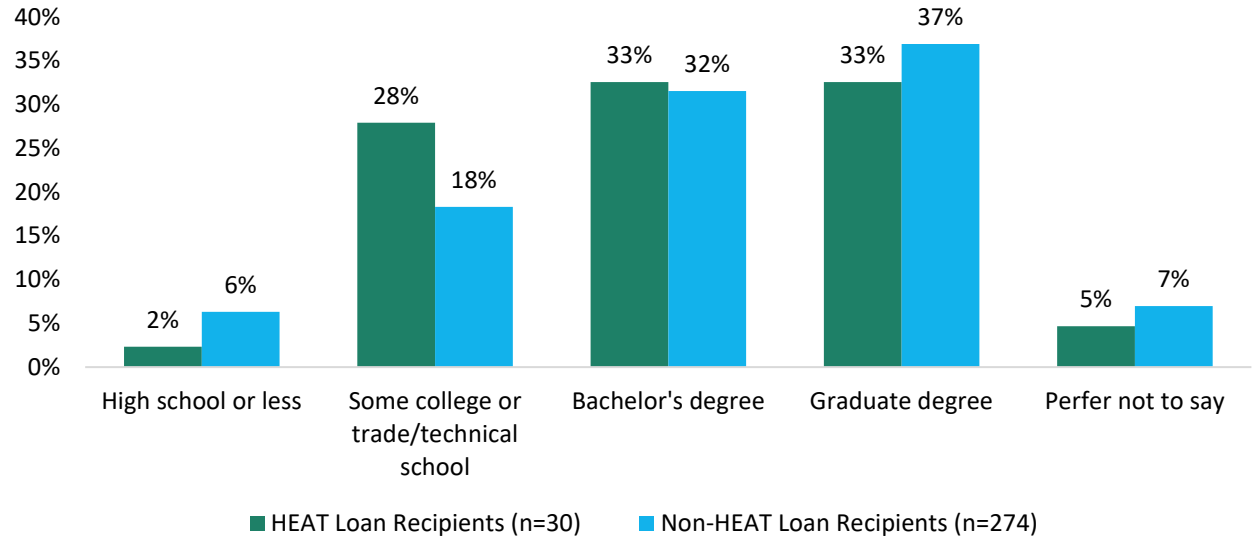
HEAT Loan recipients had moderate to high incomes (Figure 3-9). More than one-third of HEAT Loan recipients had a 2017 before-tax income greater than $100,000, while 7% reported an annual income of less than $50,000. Non-HEAT Loan recipients were 50% more likely than HEAT Loan recipients (33% vs. 21%) to not answer this question, making it difficult to draw conclusions between the two groups. Based on reported data and adjusting to eliminate "prefer not to say" from the percentages, HEAT Loan recipients were more likely than non-HEAT Loan recipients to report incomes between $50,000 to less than $60,000 or $100,000 to less than $140,000. Conversely, non-HEAT Loan recipients were more likely than HEAT Loan recipients to report incomes above $140,000. The two groups were roughly equally likely to report incomes less than $50,000 or $60,000 to less than $100,000.

Figure 3-9: Household Income by HEAT Loan Status



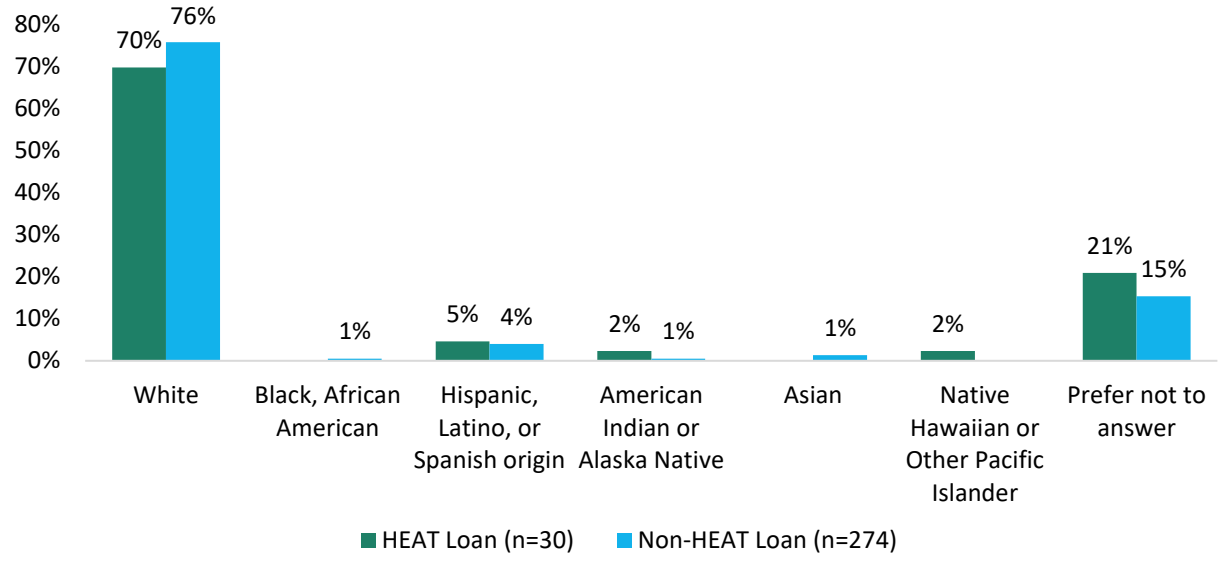
Nearly all HEAT Loan recipients attended college, while one-third had a graduate or professional degree (Figure 3-10).

Figure 3-10: Education Level by HEAT Loan Status



Most HEAT Loan recipients were white (70%) and 5% were Hispanic (Figure 3-11). HEAT Loan recipients were slightly more likely to be non-white than non-HEAT Loan recipients, but this difference was not statistically significant.

Figure 3-11: Racial and Ethnic Categories by HEAT Loan Status



3.5. Opportunities for Improvement

Customers would like to see the HEAT Loan available for efficient air conditioning, efficient windows, adding solar, and upgrading roofing (Table 3-8). Surveyed customers expressed interest in using the HEAT Loan to install efficient central air conditioning.[16] A portion also mentioned envelope measures such as windows, doors, and roofs. A small number said they would be interested in a 0% interest loan to finance anything that would save them energy.

Table 3-8: Measures for Which Customers Would Like HEAT Loan Availability (n=88)

Item	Percent Suggesting*
Air conditioning	25%
Windows	22%
Solar	15%
Roofing	8%
Doors	6%
All/Anything	6%

* Multiple responses allowed.

[16] While central air conditioning is eligible for a HEAT Loan in Massachusetts, it is not eligible in Rhode Island.

4. Interviews with Lenders and Contractors

This chapter presents findings from the in-depth interviews with lenders who offer the HEAT Loan and HVAC contractors who promote the HEAT Loan to their customers.

4.1. Promotion of HEAT Loans

There is minimal marketing of the HEAT Loan among participating lenders. Similarly, contractors discuss the loan in a broad sense, providing customers with a simple overview of the terms.

Lenders

Lenders are not actively marketing HEAT Loans to their customers aside from listing the loan on their website as a product offered. Lenders reported that customers hear about the HEAT Loan through consultation with their contractor or word of mouth. Two lenders reported that active promotion is not needed, as the offering "sells itself" through its "enticing" terms of 0% interest and seven-year length. Another reason for not actively marketing the HEAT Loan is due to the nature of customers who qualify for it. The program targets a limited population: only for homeowners who are doing weatherization, HVAC, or hot water upgrades, and who have received the EnergyWise home energy assessment.

> *"It's very difficult to find someone who either has already had an audit or is thinking about having one. And our acquisition costs — the amount we would have to spend to happen upon the person who would be interested in the loan — would be very high."*

One of the four lenders reported marketing HEAT Loans through general advertising in local newspapers.

Contractors

When applicable, contractors present basic information about the HEAT Loan offering. Contractors mention the HEAT Loan offering when their customers indicate they want financing due to the upfront cost of the HVAC system replacement.

When this happens, almost all contractors (4 of 5) discuss the 0% interest rate, the term length, and the home energy assessment requirement. Contractors then direct customers to RISE or the National Grid website for more detailed information about the process. Two contractors reported they inform their customers of specific steps they need to take to get the HEAT Loan, with one mentioning directing customers to the appropriate paperwork needed for the loan.

No contractors reported providing printed materials to customers to promote the HEAT Loan program. One contractor, though, said he integrates the HEAT Loan information into his proposal process: the proposal package that he sends to his customers via email contains the HEAT Loan application, the list of participating lenders, and other information about the product.

Three of five contractors reported they sometimes have customers who are reluctant to finance their projects. In some cases, this is because they are overextended with other loans. In other situations, they are reluctant to contact National Grid to schedule an assessment and complete the authorization steps through RISE. Other challenges reported by contractors included: timing of assessments, questions about how rebates tie into the loan, and the fact that some HVAC systems do not qualify for the loan. Two contractors reported they do not usually describe the HEAT Loan offering in detail, thus they rarely encounter challenges in promoting the loan.

When we asked contractors if it is more complicated to explain the HEAT Loan than other loan options to their customers, most were not aware of other options and therefore only discussed the HEAT Loan with their customers. The one contractor who reported referring some customers to the Green Sky program said that customers typically prefer the HEAT Loan program over the Green Sky financing, as the 0% interest is appealing. However, in terms of the process to get the loans, this contractor was unsure if the HEAT Loan offering was more complex than the Green Sky option.

4.2. Qualification and Approval for HEAT Loans

The underwriting process for HEAT Loans is typically implemented using a case by case, holistic approach, rather than a set of stringent requirements. Lenders look for applicants' ability to repay the loan, which is generally based on some or all of the following:

- Debt to income ratio
- Spending trends: their daily average balances in their checking account
- Proof of income
- Verification of home ownership
- Credit history
- FICO score

FICO scores typically do not drive lenders' decisions to accept or deny a HEAT Loan applicant, though it does play a role at times. For example, one lender reported that they require a FICO score of 660 or above for larger HEAT Loans, while another lender tends to look for a score of 680 or above.

HEAT Loans have similar underwriting processes as other unsecured loan products, with about the same amount of paperwork required. All lenders reported the underwriting requirements, as well as the amount of paperwork, are about the same as any unsecured loan.

Three out of four lenders noted that their qualification requirements or terms for the HEAT Loan have changed since they first began offering HEAT Loans. The reported changes related to larger loans — $15,000 or above. More specifically, one lender said that they recently instituted a debt-to-income ratio and FICO score requirements for loans $15,000 or higher. Another noted that they treat loans $15,000 or higher as secured loan products. Last, another lender described changes to the maximum HEAT Loan size over time, dependent on their portfolio size. Their maximum HEAT Loan size had fluxed over time and they recently increased the maximum loan size to $15,000 to generate more customers as their portfolio had shrunk recently.

Lenders report moderately high approval rates for the HEAT Loan. HVAC contractors similarly report denials as being very rare among their customers. Lenders reported approval rates for the HEAT Loan ranging from 73% to 96%, with one being unsure about the rate.

Lenders deny HEAT Loan applicants for a variety of reasons (Table 4-1), though high debt-to-income ratios was the most frequently mentioned reason.

Table 4-1 Reasons for HEAT Loan Application Denials (n = 4)

Reasons	Number of Mentions
High debt-to-income ratios	Three
Bad credit	Two
Overextended with other debt obligations	Two
Bank account overdrafts	One

Though rare according to contractors, denied HEAT Loan applicants typically do one of the following:

- reapply for a HEAT Loan at the Capital Good Fund because, as a non-profit, they specifically serve low- to moderate-income customers,
- install less expensive, less energy efficient equipment, or
- cancel their projects all together (the rarest situation).

Although infrequent, lenders report that some customers encounter issues and confusion during the HEAT Loan application process. While one lender reported the process to apply and receive the loan is smooth and not difficult for customers, three others mentioned multiple aspects that are not always clear for customers. Issues noted by lenders include:

- **Required paperwork:** some customer confusion about documentation to disclose income and debts, such as bank statements.
- **Procedure:** unclear about the steps they need to take and when; how the contractor gets paid or who pays the contractor.
- **Timing:** A substantial amount of time can elapse between scheduling the energy assessment, receiving the assessment, and having the installation work completed. The timing of these steps does not always work well for customers with emergency needs.
- **Inconvenience:** one lender reported that their whole process is done in-person; some customers said it was inconvenient to drive to the branch.

Homing in the procedural issue, one lender described the process to get the HEAT Loan as unclear to some customers:

> *"I think they lack an understanding of the full flow of the process, from beginning to end. They don't seem to understand at what point they need to contact us, or at what point they need to reach out to them to get enrolled and get the inspection (assessment). The steps, procedurally, I think that's where they tend to get a little lost."*

Despite these issues, lenders reported that the issues are uncommon, and very few customers fall out of the financing process. In the rare case when they do fall out, it is typically during the underwriting process, because a customer has a high debt-to-income ratio, or their bank statement is problematic. One lender described another scenario: customers start the HEAT Loan process, but learn the price of the equipment went down, so they decide to pay out-of-pocket and do not complete the loan process.

4.3. Alternative Financing Options

Lenders reported that few customers use other loan products to finance energy efficiency projects in their homes. Half of the lenders (2 of 4) reported that some customers use home equity or another type of personal loan to do generic home improvement projects, though customers rarely specify to the lenders whether the projects are energy efficiency upgrades. Two lenders noted that they have had customers use other financing products for solar projects. Two other lenders reported that the HEAT Loan offering is the primary product that homeowners use for financing energy efficient upgrades.

Most contractors have never offered their own financing packages to their customers; they haven't considered it, nor are they interested. Four of the five contractors reported they do not have their own financing packages, while one contractor reported they offered one in the past, but no longer do. When this contractor's firm offered financing, it was too expensive because they had to pay the lender 10 to 15% of each installation job and it did not "work out too well" for the HVAC company.

Most contractors are not familiar with other financing packages besides National Grid's HEAT Loan offering. Four out of five HVAC contractors reported the HEAT Loan is the only financing they offer to their customers. One contractor reported offering the Green Sky program for customers who are installing air conditioning units, or less efficient equipment that does not qualify for a HEAT Loan. This contractor, though, described the HEAT Loan package as most favorable for customers, due to the advantageous terms.

4.4. Benefits & Challenges

Contractors and lenders highlighted the importance of maintaining some elements of the HEAT Loan program because they provide benefits to themselves and their customers. They also provided multiple suggestions for improving the HEAT Loan offering.

Benefits of the HEAT Loan Program: Elements to Keep

According to both contractors and lenders, the HEAT Loan offering has greatly improved access to financing energy efficient home upgrades; elimination of the program would hurt customers' access to energy efficient equipment. The attractive terms of the loan — 0% for seven years —have enticed usually reluctant or affluent customers to install and finance efficient HVAC systems in their homes, according to contractors. Contractors reported they would not sell as much high-efficiency equipment if National Grid stopped offering the 0% interest HEAT Loan to its customers, as many homeowners would have difficulty affording such systems without financing.

The Full Interest Rate Buy-Down Model

Lenders perceive the HEAT Loan offering as beneficial to their organization and most would like the model to remain the same. They provided multiple reasons for why the product is appealing to their organization. These include that the HEAT Loan:

- performs very well and has low default rates,
- opens credit union membership and opportunities to expand throughout the state, and contributes to the local economic development
- allows lenders to grow their portfolios and sell more products,
- targets homeowners, who provide a nice customer base for advertising other products, such as mortgages or equity loans,
- generates a good amount of revenue, and
- eases the lender's ability to offer loans because they get interest upfront.

The interest rate buy-down is influential in lenders' decision to offer the HEAT Loan. One lender was neutral on the buy-down rate, but two said it was an important factor for them. For one of these lenders, the program buys-down the interest rate from 7.5% to zero, rather than the program's standard 5%, which they said was essential for them because they are the non-profit lender that works with customers unlikely to qualify for a loan from a traditional lender. The last lender expressed a desire for the program to buy-down interest rates from 7% to zero instead of 5% to zero so they may generate more revenue by offering the HEAT Loan.

HEAT Loans perform well for lenders; default rates are low. All lenders reported that the default rate is low — usually less than 1 or 2%. They noted that these rates are similar, if not better, than default rates for other unsecured loan products. The reason for this is because the HEAT Loan targets homeowners, who have tendencies to pay their debts.

Transitioning to a loan loss reserve system, coupled with a smaller interest rate buy-down, might cause the amount of loans for efficiency upgrades to go down or not change. Two lenders reported that a loan loss reserve model would likely not affect the number of efficiency loans. One lender was unsure what the impact would be, while another lender reported that it would result in few efficiency loans. This lender also noted that their organization would prefer to continue with the full interest rate buy-down model.

Changes in the prime lending rate would negatively affect lenders' interest and ability to deliver HEAT Loans. Three out of four lenders reported that a 3% or more rise in the prime lending rate would make delivery of the HEAT Loan more difficult; the cost of doing business would be too high and not worthwhile. These lenders reported they would be less interested in offering the HEAT Loan if this change occurred. One lender was unsure about how this change would affect their delivery or interest in the HEAT Loan.

0% Interest for Customers

According to both contractors and lenders, uptake of the HEAT Loan offering would likely go down if the terms changed and customers were required to pay interest. The magnitude of that decrease, however, would depend on the interest rate. Three lenders noted that if the interest rate was higher than 5%, customers would find the financing less enticing, and would likely opt for a different option. One contractor reported an interest rate of 3% or more as the point in which customers may find it unappealing.

Contractors also noted the importance of keeping the interest at 0%: all contractors reported that it is extremely important to retain a 0% interest rate for the sake of their customers. All contractors reported that uptake of the loan would decrease if the interest rate increased to 3%. Two contractors reported that the effect would be moderate, while the remaining three contractors felt that a significant number of homeowners would go with a different financing option if a 3% interest rate were required.

Opportunities for Improvement

Lenders and contractors offered multiple suggestions for improving the HEAT Loan for their customers. These opportunities related to the home energy assessment requirement, expanding the HEAT Loan offering to include other equipment, and increasing marketing efforts to educate customers and contractors about the HEAT Loan process.

Energy Assessment Requirement

Contractors generally spoke positively about the EnergyWise home energy assessment required for the HEAT Loan, stating it provides customers with a variety of benefits. However, in emergency equipment replacement scenarios, the timeframe for receiving the assessment can be a major obstacle in the HEAT Loan process.

All contractors reported that the home energy assessment itself is beneficial for the customer. Benefits they reported included:

- Energy savings from direct-install lighting replacements
- Identification of other energy-saving opportunities in the household
- Detection of issues in the home such as poor windows or insulation
- Increased awareness and knowledge of energy efficiency
- Free for the customer

Despite the home energy assessment offering multiple benefits to the customer, the timing of this requirement has been problematic for some. Two contractors and one lender emphasized the point that the timing of the assessment is an impediment to the HEAT Loan process. More specifically, these respondents described situations in which customers with broken heating systems having to wait several weeks or months for the assessment to take place, for them to receive financing through the HEAT Loan. This situation is especially problematic in the winter when emergency replacements are time-sensitive. One contractor said they thought National Grid is losing business after October 1st because the home energy assessment requirement deters customers from seeking financing for a time-sensitive equipment replacement. A lender described the HEAT Loan offering as great for customers who are planning a replacement, but not designed for homeowners experiencing an unexpected broken heating system. Another contractor reported that the company that performs the assessments (RISE) appeared understaffed:

> *"That's probably one of the biggest problems with the HEAT Loan process, the fact that RISE can't keep up with the demand for these energy audits."*

Contractors reported mixed thoughts about the possibility of relaxing the home energy assessment requirement. Two contractors reported that if it was relaxed, more customers would get the HEAT Loan. Of these contractors, one described a scenario in which the assessment requirement comes after the needed equipment is installed, rather than before, to ease the time-sensitivity of replacements. This contractor elaborated on his thoughts regarding the assessment requirement:

> *"I don't think the audit should be a criterion for them to do the HEAT Loan program. To get their heating equipment changed through the HEAT Loan program, the efficiency level of the new equipment, the age of the old equipment, and the fact that people want to put in the high-efficiency unit anyway, that should be enough. It's really slowing down the amount of people who want to do this."*

Two other respondents perceived the home energy assessment requirement as a beneficial tool in the HEAT Loan process, though one of these contractors reported the need for more staff to improve the turnaround time for scheduling it. Last, one contractor reported that EnergyWise *already* relaxes the assessment requirement for HEAT Loans: in winter months, the timing of the assessment is flexible, and customers can move forward with financing as soon as an assessment is scheduled.

Expand Equipment Eligibility

Contractors think the measures that qualify for the HEAT Loan should expand to allow more customers to participate. Two contractors mentioned the need for the HEAT Loan to cover high-efficiency AC systems:

> *"I would love to see high-efficiency AC be included in the energy improvements eligible for these loan programs. You have a lot of people out there that have standard or older AC equipment that is costing just as much money in utility fees and costs, where they could be greatly improving their AC systems and getting higher efficiency AC products and getting loans on those as well. I think there could be an energy improvement in that respect as well."*

Another contractor reported the program should allow propane customers the ability to receive HEAT Loans to finance their equipment as well.

Increase Education

Contractors and lenders both reported the need for increased marketing or promotion to educate their customers about the process. One contractor reported there seems to be a lack of marketing by National Grid. Two lenders reported having to answer many customer questions about the HEAT Loan process, questions they judged were out of their dominion. Of these lenders, one noted these frequent questions may be due to lack of knowledge from not enough promotion and information about the program. They reported they received questions from customers about the various equipment eligible for the HEAT Loan, such as roofs or windows. The other lender perceived it was because the contractors were unfamiliar with the HEAT Loan process and did not provide enough clear information to their customers. This lender noted that they often find themselves explaining the whole energy assessment and HEAT Loan process to their customers.

5. Conclusions and Recommendations

We offer the following conclusions and recommendations.

Conclusion: The current HEAT Loan model with 0% interest for customers over seven years is well-liked by customers, contractors, and lenders. Contractors were not interested in offering their own financing and lenders were not interested in a loan loss reserve model. Half of HEAT Loan recipients would not have used the loan if it included interest.

> **Recommendation:** Maintain the 0% interest to the customer with the interest rate buy-down for the lenders.

Conclusion: The HEAT Loan is generating energy savings for National Grid that would not have otherwise occurred. HEAT Loan projects typically included more measures than non-HEAT Loan projects and HEAT Loan projects substantially enabled natural gas savings for the EnergyWise program. The HEAT Loan availability was very important in those loan customers' decisions to install the measures. Without the HEAT Loan, three-quarters of loan recipients would have canceled, postponed, or reduced their home energy project scope. Very few customers use other loan products to finance energy efficiency upgrades in their homes. Contractors reportedly would not sell as much efficient HVAC equipment without the HEAT Loan.

> **Recommendation:** Maintain the HEAT Loan offering for EnergyWise customers.

Conclusion: There is an opportunity to improve customer education on the HEAT Loan process. Some customers are reportedly unclear about the HEAT Loan process, including the home energy assessment requirement, rebates, and how the contractor is paid. Lenders report receiving numerous customer questions that they say should not be their responsibility to answer and thought that better education and outreach by National Grid would improve customer understanding.

> **Recommendation:** National Grid should provide HVAC contractors and assessors with a pamphlet to give customers that explains the HEAT Loan process, including the need to contact National Grid to schedule the assessment, authorization and application requirements, how rebates tie-in, and how the contractor is paid.

Conclusion: Interviewed contractors appear to be unaware of program policy on emergency HVAC replacements. As reported by HVAC contractors, some customers who may benefit from the HEAT Loan do not want to lengthen their HVAC upgrade projects to meet the home energy assessment requirement for loan eligibility. These contractors are apparently unaware that customers needing emergency replacements can work with qualified contractors, apply for HEAT Loan, and have the emergency replacement prior to having an audit, as long as they schedule an audit. This policy is not explicitly documented in the HEAT Loan forms/pamphlets.

> **Recommendation:** National Grid should conduct outreach with HVAC contractors to inform them of the program's emergency replacement policy.

Conclusion: There is widespread interest in the HEAT Loan, and customers want to be able to finance other upgrades with it. More than half of HVAC program participants reported interest in using the HEAT Loan to finance for future upgrades and surveyed participants wanted to be able to use the HEAT Loan to finance efficient air conditioning, window replacements, and solar installations.

> **Recommendation:** Conduct research to determine which additional measures would offer cost-effective energy savings if financed through the HEAT Loan.

Conclusion: Program database records contained aggregated, missing, or implausible values that impeded measure-level analyses. These challenges affected several variables important for calculating annual and lifetime energy savings and measure costs. Further complicating analyses was the fact that insulation savings were aggregated at the project level and could not be broken out to determine relative contributions of wall, attic, basement, and floor insulation.

> **Recommendation:** National Grid should work with their implementers to assess the feasibility of tracking measure-level savings across EnergyWise and HVAC projects and the possibility of implementing automated data quality checks that identify values outside an expected range.

Appendix A. Detailed Research Questions

These are the specific research questions we sought to answer with each methodological approach.

A.1. Program Data Review

- How many customers participated in EnergyWise and HVAC programs by project type?
- What percent of EnergyWise and HVAC participants received a HEAT Loan?
- How many customers received authorization from the Lead Vendor to seek a HEAT Loan but did not subsequently take out a HEAT Loan?
- What percent of EnergyWise participants (by HEAT Loan participation) received each of the following recommendations and
  - completed weatherization;
  - completed heating system/domestic hot water improvement; and
  - completed both.
- What measures were supported by HEAT Loan?
- What are the prevalent characteristics of HEAT Loan participants?
- What are the prevalent characteristics of customers who received authorization for a HEAT Loan but did not receive one? Are they disproportionately seeking financing for specific measures?
- What is the total incentive cost per project including HEAT Loan and EnergyWise with:
  - HVAC equipment rebates
  - Gas, Oil and Electric equipment incentives
- What is total and average project size (cost, annual savings, lifetime savings) of each combination below with and without-HEAT Loan?
  - EnergyWise
  - HVAC
  - EnergyWise + HVAC
- What is the incidence of each measure: number, and size (cost and savings) within the HEAT Loan participants vs non-participants (EnergyWise and/or HVAC)?
- What is the most prevalent measure mix with HEAT Loan vs without-HEAT Loan projects?
- What is the total ratepayer cost per HEAT Loan, including incentive and administration?

A.2. Participant Survey

- What is the level of awareness among EnergyWise and HVAC participants of HEAT Loan?
- Had Energy/Wise participants heard about the HEAT Loan prior to their home energy assessment?
- How did customers learn about HEAT Loan?
- What are reasons participants do not pursue HEAT Loans (e.g. not aware, not eligible, no need for capital, prefer not to take on debt, etc.)?
- What barriers do customers face in using a HEAT Loan to improve the efficiency of their homes? How do barriers differ by customer types?
- What role did the HEAT Loan play in the customer's decision to install the recommended measures? How many customers would not have done the project without HEAT Loan, EnergyWise or both?
- To what extent did the HEAT Loan cause participants to do more than they otherwise would have?
- How do participants finance weatherization and/or HVAC upgrades if not using HEAT Loan?
- Are there currently ineligible equipment/measures that participants would have financed if they were eligible through HEAT Loan?
- Does the loan restriction on do-it-yourself installations meaningfully impact participation? At what rate do these customers move forward with efficiency improvements without a HEAT Loan?
- If a customer is denied a HEAT Loan, what other options do they pursue?
- At what point in the HEAT Loan process do customers fall out of the financing process? What are the most common reasons?
- Were there any aspects of securing the loan that were difficult or problematic? If so, what?
- Are there opportunities to adjust delivery of the HEAT Loan that will enable increased adoption of key measures?

A.3. Interviews with Lenders

- Does HEAT Loan help you originate loans for efficiency upgrades?
- How does HEAT Loan support or change your underwriting process?
- What are the primary reasons that participating lenders decline HEAT Loan applications?
- What is the lowest FICO score eligible for a HEAT Loan through your bank/credit union?

- Are you actively marketing HEAT Loans with your customers?
- How does the 5% to 0% rate buy down influence your interest in marketing HEAT Loans?
- How would each of the following affect your interest/ability to deliver HEAT Loans, under the current 5% to 0% buy down?
  - A 1% rise in the prime lending rate
  - A 2% rise in the prime lending rate
  - A 3% or more rise in the prime lending rate
- In your opinion, which program model would enable you to originate more efficiency loans (explain why)?
  - 0% interest
  - Somewhat reduced interest rate loans (relative to market rates), with loan loss reserve
- Are any aspects of securing the loan difficult or problematic for participants? If so, what?
- At what point in the HEAT Loan process do customers fall out of the financing process? What are the most common reasons?

A.4. Interviews with HVAC Contractors

- How do HVAC contractors promote HEAT Loans?
- What are the barriers to promoting HEAT Loans?
- What are the advantages and disadvantages of having HVAC participants undergo a home energy audit first to get a HEAT Loan?
- What other financing options do contractors recommend?
- What are the HVAC contractors' perspectives on maintaining 0% interest HEAT Loans?
- Has the HEAT Loan offering improved access to financing?
- How complex is the HEAT Loan compared to other EE financing programs?
- Are there opportunities to adjust delivery to increase HEAT Loan participation?
- If customers are denied HEAT Loans, what other financing options do they recommend?
- What is the potential for contractors to offer/originate financing for HVAC upgrades?

Appendix B. List of Measures Included in the Analyses

B.1. EnergyWise Attic Insulation Measures

ALUM GABLE VENT 12 X 12
ALUM GABLE VENT 12 X 18
ATTIC - DBL FLRD R-13
ATTIC - DBL FLRD R-19
ATTIC - DBL FLRD R-25
ATTIC - DBL FLRD R-32
ATTIC - DBL FLRD R-38
ATTIC - FLOORED R-13
ATTIC - FLOORED R-19
ATTIC - FLOORED R-25
ATTIC - FLOORED R-32
ATTIC - FLOORED R-38
ATTIC - OPEN R-13
ATTIC - OPEN R-19
ATTIC - OPEN R-25
ATTIC - OPEN R-30
ATTIC - OPEN R-38
ATTIC - OPEN R-49
ATTIC - UNFACED R-19
ATTIC - UNFACED R-30
ATTIC - UNFACED R-38
ATTIC FLAT: FLOORED R-49
ATTIC FLAT: OPEN R-60 Elec heat only
ATTIC HATCH - SEAL & INSULATE
BATH VENT THRU SOFFIT
DRYER - VENT THROUGH ROOF
FINISHED KNEE WALL ACCESS
GARAGE CEILING 5 TRUSS
GARAGE CEILING 9 TRUSS
INSULATE KNEE WALL DRAWER
INSULATE KNEE WALL HATCH
KNEE WALL - 2 RIGID BOARD
KNEE WALL - R-13 FG
KNEE WALL - R-19 FG
KNEE WALL SLOPE - FG + RIGID
RIDGE VENT
ROOF STRIP BEYOND 5 FEET
ROOF STRIP UP TO 5 FEET
ROOF VENT - GRAY ALUMINUM
ROOF VENT - PLASTIC
SHEATHING ACCESS TO ATTIC
SLOPE - DENSE PACK 6
SLOPE - DENSE PACK 8
SLOPE - W/FG BATTS
SLOPES W/CHUTES
SOFFIT VENTS 4
SOFFIT VENTS 6
SOFFIT VENTS 8
SOFFIT VENTS VINYL
THERMADOME
VENTILATION CHUTES
VINYL GABLE VENT 12 X 12
VINYL GABLE VENT 12 X 18
WOOD GABLE VENT 12 X 12
WOOD GABLE VENT 12 X 18
WOOD GABLE VENT 18 X 24

B.2. EnergyWise Basement Insulation Measures

BASEMENT CEILING ENCAPSULATED
BASEMENT CEILING R-19
BASEMENT CEILING R-30
BASEMENT CEILING RANDOM R-13
BASEMENT CEILING RANDOM R-19
BASEMENT CEILING RANDOM R-30
BASEMENT SILL R-19
BASEMENT - INSULATE EXISTING DOOR
CRAWLSPACE 10MIL GROUND COVER
CRAWLSPACE WALL RIGID INSULATION
CRAWLSPACE WEB TRUSS R19

B.3. EnergyWise Wall Insulation Measures

CRAWLSPACE R-13
CRAWLSPACE R-19
CRAWLSPACE R-30
CRAWLSPACE RANDOM R-19
CRAWLSPACE RANDOM R-30
CRAWLSPACE WEB TRUSS R30
GARAGE CEILING 10 DENSE
GARAGE CEILING 8 DENSE
GARAGE CEILING R-19
GARAGE CEILING R-30
PLASTER CEILING BELOW FLOOR
WALL - 3RD STORY ADDER
WALL - ALUMINUM OR ASBESTOS
WALL - FIBERGLASS
WALL - WOOD OR VINYL
WALL INSULATION - INTERIOR D&P
WALL INSULATION - OPEN FG BATT
WALL INSULATION: MULTI-SIDED
WALL INSULATION: ASBESTOS SIDED

B.4. EnergyWise Air Sealing Measures

COMMON WALL - INT DRILL & PLUG
DRYER - VENT THRU WALL
EXTERIOR FLOOR OVERHANG
HOME AIR LEAKAGE SEALING
INSULATE EXISTING DOOR
WALL - EXT DRILL & PLUG
WEATHER-STRIP DOOR
WHOLE HOUSE FAN COVER

B.5. EnergyWise Duct Sealing Measures

DUCT INSULATION

- Insulated Flex Duct 16 Return
- Insulated Flex Duct 8 or 10

SEAL DUCTS

B.6. HVAC + HEHE Program DHW Measures

Heat Pump Water Heater 50 or 60 gal

Heat Pump Water Heater 80 gal

WTRHTR_HP50E

0.94 EF tankless gas water heater

Condensing Gas WH >=95% (75-300 MBH)

Energy Star Freestanding Water Heater EF => 0.67

High Efficiency Indirect Water Heaters

Water Heater: LP Tankless, EF>=0.82 (1/1/09 Criteria)

B.7. HVAC + HEHE Program HVAC Measures

Air Source Heat Pump 16.0 SEER 8.5 HSPF

Air Source Heat Pump 18.0 SEER 9.6

Central Air Source Heat Pump, SEER 16, EER 13, HSPF 8.5

CoolSmart Wm Air Furnace ECM (GN Reb) Gas

CS HP SEER =>14.5 EER =>12, NEW Estar -regardless of sizing

Ductless Mini Split Heat Pump 18.0 SEER 9.0 HSPF

Ductless Mini Split Heat Pump 20.0 SEER 11.0

Ductless Mini-Split SEER 16, EER 12, HSPF 8.2

Ductless Mini-Split SEER 19, EER 12.5, HSPF 10

Ductless Mini-Split SEER 20, EER 13, HSPF 10

Early Replacement HP systems with 15 SEER or greater and 12.5 EER or greater

Hot Water Boilers (AFUE 85%+)

HPMS SEER>=18 HSPF>=10 Mini-Split Heat Pump

HPMS SEER>=20 HSPF>=12 Mini-Split Heat Pump

Seasonal savings for the nest Thermostats

Steam Boilers (AFUE 82%+)

THERMOSTAT

Wi-Fi Thermostat - Cooling & Heating

Wi-Fi Thermostat (Oil heating & central cooling)

Wi-Fi Thermostat (SRP)

95% AFUE or greater forced-water boiler

97% AFUE gas furnace

Boiler - Hot Water AFUE 90%

Boiler Load Control

Boiler Reset

Furnace 95% AFUE with ECM

Furnace 96% AFUE with ECM

HEAT RECOVERY VENT

THERMOSTAT

Water Heater/Condensing Boiler.90 Energy Factor 90% AFUE

Water Heater/Condensing Boiler .95 Energy Factor 95% AFUE

Wi-Fi Thermostat - Cooling & Heating

Wi-Fi Thermostat - Gas Heat Only

B.8. HVAC + HEHE Program Measures Excluded from the Analysis

ACS14_5E12 Mini-Split AC

ACS16E13

Central AC 16.0 SEER 13 EER

Central AC 18.0 SEER 13 EER

CoolSmart AC QIV ES

CoolSmart AC QIV NES

CoolSmart AC SEER 15.0 => (Equip) - EER>=12.5

CoolSmart HP SEER 15.0 => (Equip) Tier 2

CoolSmart AC Tuneup

CS AC SEER =>14.5 EER =>12, NEW Estar -regardless of sizing

Down Size 1/2 ton

Early Replacement AC systems with 14.5 SEER or greater and 12 EER or greater

Early Replacement AC systems with 15 SEER or greater and 12.5 EER or greater

ECM boiler pumps

Furnace 92E Oil

Oil Furnaces (85%+ AFUE) with ECM

Duct Sealing - 100 CFM reduction in leaks 20% of flow to 10%

B.9. EnergyWise Direct Install and Other Measures Excluded from the Analyses

1/2 OR 3/4 PIPE INSULATION

10W 4" Recess 1440.414

10W BR30 LED 1160.538

10W LED Omni Dim 1100.0172

10W R20 Dim 1160.9854 (SEC)

11 w A-lamp dim

12W 5-6" Recess 1440.413

12W TCP R40 Reflector LED

13W A Lamp 1100.910

13W Spiral 1100.128

13W TCP LED

14 WATT G25 GLOBE

14W A Lamp 1100.794

14W G25 1100.784

14W Globe 1100.905

14W Par 1160.659

14W Par38 1160.9997 (SEC)

15 w BR 30 dim

15 WATT COMPACT FLUORESCENT

15W DIMMABLE FLOOD

15W LED Philips 1100.1552

16 WATT NON-DIMMABLE R30 REFLE

16W R30 Dim 1160.771

17W Maxlite R38 Reflector LED

18 w par

18W Spiral A Lamp 1100.9271

19W A21 Dim LED 1100.1553 (SEC)

1-LAMP CEILING BRASS

1-LAMP CEILING BRONZE

1-LAMP CEILING NICKEL

1-LAMP CEILING WHITE

1-LAMP PORCH SQUARE

1-LAMP WALL SCONCE

1LB CEILING

1LN CEILING

1LW CEILING

2.5W LED Diamond Candle 1316

20 WATT A LAMP

20 WATT COMPACT FLUORESCENT

20W Spiral 1100.138

20WATT DIMMABLE SPIRAL

23 WATT EXTERIOR FLOOD

23W Par 38 1160.649

23W Spiral 1100.139

28 WATT 3 WAY BULB

2-LAMP BATH VANITY

2-LAMP CEILING BRASS

2-LAMP CEILING BRONZE

2-LAMP CEILING NICKEL

2-LAMP CEILING WHITE

2-LAMP PORCH SQUARE

3 Way Omni LED 1100.8283

3.5 w CANDELABRA

30 WATT COMPACT FLUORESCENT

3-LAMP CEILING BRASS

3-LAMP CEILING BRONZE

3-LAMP CEILING NICKEL

3-LAMP CEILING WHITE

3Way Spiral 1100.828

3Way Spiral 1100.8281 (SEC)

4 WATT CANDELABRA TORPEDO TIP

4.5W Philips Candle Base LED

5W G16 GLOBE

5W G25 LED 1100.539

5W Torpedo Cand 1100.0181

5W Torpedo Med 1100.0178

7W Philips Globe LED
8W G25 LED 1100.695
8W LED R20 1160.9853 (SEC)
8W R20 Flood 1160.9865
8W R20 Flood 1160.9866
8W R20 LED Flood 1160.534
9 WATT A LAMP
9 WATT CANDELABRA TORPEDOTIP
9 WATT G25 GLOBE
9.5W BR30/F90 2700 DIM AF 6/1
9W Globe 1100.755
9W TCP LED
9W TCP R30 Reflector LED
9W Torpedo 1100.758
ACCESS CLOSED WITH ROOF VENT
ACCESS THRU PLASTER & LATHE
APPLIANCE TIMER A/C & POOL
BATH FAN - HOSE ONLY
BATH FAN - ROOF
BLACK TORCHIERE
COMPREHENSIVE ASSESSMENT
CONTRACTOR MANAGEMENT FEE
ENERGY STAR REFRIGERATOR
EXTERIOR FLOOD LIGHT
FG&2" RIGID BOARD
FINISHED CEILING ACCESS
FLIP/SLASH EXISTING
G25 LED Globe 1100.8087 (SEC)
HARP OR SOCKET EXTENDER
HOMEOWNER DECLINED THE INSTALLATION OF NEW BULBS
INC SUMMER
Incentive Summer 2015
KITCHEN EXHAUST THRU ROOF
LED 11 WATT
LED 14W A LAMP
LED 3.5W
LED TRIM 4" THERMAL BOUNDARY
LED TRIM 6" THERMAL BOUNDARY
LIGHTING IS ALREADY ENERGY-EFFICIENT
LOW FLOW FAUCET AERATOR 1.5 GP
LOW FLOW FLIP AERATOR 2.5 GPM
LOW FLOW HAND HELD SHOWERHEAD
LOW FLOW SHOWERHEAD
NEST WIFI THERMOSTAT
OPEN STUD STAIRWELL
PCR BONUS
PIPE Insulation
PLASTERED STAIRWELL
PLASTIC GROUND COVER
PLYWOOD ACCESS
PRE-WEATHERIZATION CREDIT
Programmable Thermostats
PROJECT MANAGEMENT FEE
PSK PAPER
REBATE APPL FOR REFRIGERATOR
REBATE PROCESSING FEE
REFRIGERATOR BRUSH
REMOVE EXISTING INSUL
Site Visit QA Inspection
Slim Fit 1100.1571 (SEC)
SMART STRIP
TEMPORARY ACCESS THRU DRYWALL
TEMPORARY ACCESS THRU ROOF
THERMADOME WITH WOOD BUILD-UP
THERMAL TENT
TORCHIERE
TSTAT-LINE VOLT (one room)
TSTAT-LOW VOLT (controls mult)
WALL LANTERN B
WALL LANTERN C
WHITE TORCHIERE
WIFI ECOBEE AC
WIFI ECOBEE B
WIFI ECOBEE HT
WIFI LYRIC HT
WIFI LYRIC HTAC
WIFI_B36_HUB
WIFI_B36_REPEAT
WIFI_B36_TSTA_B
WIFI_B36_TSTA_C
WIFI_B36_TSTA_H
WIFI_ELEC_FEE2
WIFI_ELEC_FEE3
WIFI_TSTAT_1FEE
WIFI_TSTAT_2FEE
WL9C - IR ADDER

Appendix C. Description of Data Challenges

Table C-1 lists the challenges with variables in the program database exports. They relate to implausible values and missing values. The final column explains our approach for imputing plausible values or how we otherwise handled the data.

Table C-1: Variable challenges and resolutions.

Variable	Challenge	Issue	Resolution
Annual kWh	Missing values	Has lifetime MWh but missing kWh	Identified projects with same lifetime MWh value; selected the kWh value associated with the plurality of those projects.
Lifetime MWh	Outlier (high) values	Has implied lifetime greater than 20 years (calculated MWh/kWh)	Capped lifetime MWh at 20 years. Assigned MWh = 20*kWh.
Lifetime MWh	Missing values	Has kWh > 0 but lifetime MWh savings of 0	Identified projects with same kWh value; selected the lifetime MWh value associated with the plurality of those projects.
			When no projects with same kWh value, assigned lifetime MWh based on 10-year lifetime, the most common lifetime value in the dataset.
Lifetime Therms	Outlier (high) values	Has lifetime greater than 20 years	Capped lifetime therms at 20 years. Assigned lifetime therms = 20*annual therms.
Annual & Lifetime Therms	Negative values	Has negative savings	Negative values set to missing.

Appendix D. Instruments

D.1. Participant Survey

Introduction

Subject Line: Help National Grid Improve its Energy-Saving Offerings

From: Research Into Action

Reply to email: feedback@researchintoaction.com

Dear Rhode Island Resident,

In order to provide the best possible service to its customers in Rhode Island, National Grid would like your feedback on [GROUP 1: the EnergyWise Home Energy Assessment you received from Rise Engineering].

[GROUPS 2-4: the EnergyWise Home Energy Assessment you received from Rise Engineering and any energy efficiency improvements you made to your home following the assessment].

[GROUP 5: your recent energy efficient equipment upgrade].

In less than 10 minutes, you can provide valuable feedback that will help National Grid improve the support it offers customers like you to save energy in their homes.

Please follow this link to the short survey: Take the Survey

Or copy and paste the URL below into your internet browser:

Research Into Action, an independent research firm, is conducting this research on behalf of National Grid. We will keep all your responses confidential and will not report findings in a way that would identify any individual respondent.

If you have questions about this survey, including technical difficulties completing it, please contact Jun Suzuki at Jun.Suzuki@researchintoaction.com or by calling (503) 943-2133.

I am also available to answer questions about this research effort at (781) 907-3709.

If you wish to be excluded from future research efforts, please follow this unsubscribe link:

Sincerely,

Jen Loomis, Ph.D.

Research Into Action

Screening Questions

[GROUP 5 ONLY]

S1. Our records show your household installed [MEASURE NAME(S)] at [ADDRESS] and received a rebate from National Grid Rhode Island. Is this correct?

1. Yes – my household had that installed and received a rebate for it
2. Yes – my household had that installed, but I don't recall receiving a rebate
3. No – my household did not have that installed (→ TERMINATE)
98. Don't know

S2. We would like to hear from a household member who was directly involved in coordinating with a contractor and applying for rebates for [MEASURE NAME(S)] at [ADDRESS]. Are you that person?

1. Yes – I was involved in coordinating with a contractor and applying for rebates at that address (→ Q1)
2. No – I was not involved in coordinating with a contractor and applying for rebates at that address (→ TERMINATE)
98. Don't know (→ TERMINATE)

[GROUPS 1 THROUGH 4]

S3. Our records show your household received a free EnergyWise Home Energy Assessment through National Grid, performed by Rise Engineering at [ADDRESS]. Is this correct?

1. Yes – my household received the energy assessment (→ S5)
2. No – my household did not receive an energy assessment
98. Don't know

[IF S3=2 OR 98]

S4. In the past year, have you had someone come to your home to identify opportunities to make your home more energy efficient? If so, we are going to refer to that experience as your energy assessment.

1. Yes – my household received an energy assessment
2. No – my household did not receive an energy assessment (→ TERMINATE)
98. Don't know (→ TERMINATE)

[If S4=1]

S5. We would like to hear from a household member that was involved in the energy assessment experience. Are you that person?

1. Yes – I was involved in the energy assessment experience (→ Q1)
2. No – I am not involved in the energy assessment experience (→ TERMINATE)
98. Don't know (→ TERMINATE)

Measures Taken

Q1. [ASK GROUPS 1 THROUGH 4] Why were you interested in having a home energy assessment? Were you seeking opportunities to… (please select all that apply:)
[ASK GROUP 5] Why were you interested in installing [MEASURE(S)]? Were you seeking to… (please select all that apply)

[MULTIPLE RESPONSE, RANDOMIZE OPTIONS 1-7]

1. Reduce energy bills
2. Do your part to help the environment or your community
3. Make your home more comfortable
4. Improve the air quality inside your home
5. Replace a piece of equipment that had failed or was near failure
6. Make your home more valuable
7. Learn about and/or qualify for rebates or a loan for a project you had been planning previously

96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK GROUPS 2 THROUGH 4]

Q2. Please select the option that best describes the action you took, or plan to take, in response to your energy assessment's recommendations in each of the following areas:

[MATRIX QUESTION]

Item	1-Already made recommended improvements	2-Plan to make recommended improvements within the next 6 months	3-Will not make recommended improvements within 6 months	4-No improvements recommended	96 Other, specify	98 DK
a) Added insulation or had air sealing performed						
b) Replace heating and cooling equipment						
c) Replace hot water heater						

[IF ANY ITEM IN Q2=3]

Q3. Why did you decide not to make the improvements your energy assessment recommended in each of the following areas? Select all that apply.

[MATRIX QUESTION. MULTIPLE RESPONSE]

Item	Did	Could	Loan	Did not	Not	Completing	Did not	Did not	96	98

	not need it	not afford it	application was denied	want to use approved contractor	convinced of value	work would have been too inconvenient, not enough time	know how to proceed with work	qualify for program support because I wanted to install the equipment myself	Other	DK
a) [IF Q2a)=3] Add insulation or had air sealing performed										
b) [IF Q2b)=3] Replace heating and cooling equipment										
c) [IF Q2c=3] Replace hot water heater										

Financing [ASK ALL]

[IF RESPONDENT DID NOT RECEIVE HEAT LOAN]

Q4. Were you aware that National Grid works with lenders to offer 0% financing to help you pay for insulation, air sealing improvements, new heating equipment, and new hot water heaters?

[SINGLE RESPONSE]

1. Yes
2. No

[IF Q4=1 OR IF RESPONDENT RECEIVED A HEAT LOAN]

Q5. How did you first hear about National Grid's 0% interest HEAT Loan?

[SINGLE RESPONSE AND RANDOMIZE RESPONSE OPTIONS 1-7]

1. [DISPLAY TO GROUPS 1 THROUGH 4] From my assessor during or after my home energy assessment
2. From a contractor
3. From the National Grid website
4. From a bill insert or other printed National Grid materials
5. From family, friends, or acquaintances
6. From a TV or radio advertisement
7. From a lender or bank
8. Other, please specify: [OPEN-ENDED RESPONSE]
98. DON'T KNOW

[GROUP 5, IF Q5=2]

Q6. How much time did your contractor spend talking with you about the HEAT Loan?

1. A very little amount of time (less than two minutes)
2. A small amount of time (two to five minutes)
3. A moderate amount of time (more than five minutes)
98. Don't know

[GROUP 5]

Q7. Were you aware that National Grid offers Home Energy Assessments to identify energy-saving opportunities in your home?

1. Yes
2. No
98. Don't know

[IF Q7=1]

Q8. How did you first learn about National Grid's Home Energy Assessments?

1. From a contractor
2. From the National Grid website
3. From a bill insert or other printed National Grid materials
4. From family, friends, or acquaintances
5. From a TV or radio advertisement
6. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[GROUPS 1 THROUGH 4 IF Q5=2 THROUGH 6]

Q9. Had you heard about the HEAT Loan before your home energy assessment?

1. Yes: I was aware of HEAT Loans before my home energy assessment
2. No: I first learned about HEAT Loans at or after my home energy assessment
98. I don't recall

[GROUPS 1-4; IF (Q4=1)]

Q10. Did you apply for a HEAT Loan – National Grid's 0% financing offer – to help pay for improvements recommended in your energy assessment?

[SINGLE RESPONSE]

1. Yes – submitted an application
2. No – started an application, but did not complete or submit it
3. No – did not pursue a HEAT Loan
98. Don't know

[GROUP 5 IF Q4=1 OR GROUPS 1 THROUGH 4 IF Q10=2 OR 3]

Q11. Why didn't you apply for a 0% interest HEAT Loan for your energy efficiency improvements? Please select all that apply:

[MULTIPLE RESPONSE – RANDOMIZE 1-7]

1. Did not need a loan: had funds available
2. Did not want to take on debt or commit to monthly payments
3. Did not think you would qualify
4. Did not want to go through the loan application process
5. Had a different source of financing you preferred
6. Wanted a loan you could repay over a longer time period
7. Did not want to get an assessment first
8. Was not eligible because you wanted to install it yourself
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF Q10=1]

Q12. Did you receive a 0% interest HEAT Loan to pay for the improvements your energy assessment recommended?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[IF Q12=2]

Q13. Why didn't you receive the HEAT Loan?

[SINGLE RESPONSE]

1. My application was denied
2. My application was approved, but I did not complete my project
3. My application was approved, but I decided to complete my project without the loan
96. Other, please specify: [OPEN-ENDED RESPONSE]

98. Don't know

[IF Q13=3]

Q14. Why did you decide not to move forward with the HEAT Loan after applying?

1. [OPEN-ENDED RESPONSE]

[IF Q13=1]

Q15. To help National Grid understand how it can help more people access loans for energy efficiency upgrades, please tell us why your loan application was denied:

[MULTIPLE RESPONSE]

1. Low credit score
2. Too much other debt
3. Past bankruptcy or other problem with financial history
4. Lack of credit history
5. Employment or income status
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. I'd rather not say

[IF ((Q2A) OR (Q2B) OR (Q2C)=1 AND RESPONDENT DID NOT RECEIVE HEAT LOAN (Q12=2)) OR GROUP 5]

Q16. How did you pay for the energy efficiency improvements you made?

[MULTIPLE RESPONSE, RANDOMIZE]

1. Cash, check, or credit card with intention to pay in full at the end of the month
2. Credit card with intention to repay over time
3. Financing or payment plan from the contractor
4. Loan other than 0% interest HEAT Loan (including home equity line of credit, personal loan from a bank, or a loan from family, friends, or peers)
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK GROUP 5]

Q17. Would you consider applying for a 0% interest HEAT Loan to finance future energy efficiency improvements for your home? You would be required to obtain a Home Energy Assessment before applying and you could use it to finance an energy efficient HVAC upgrade, hot water heater upgrade, or add insulation and do air sealing.

1. Yes
2. No
98. Don't know

[ASK IF Q17=2]

Q18. Please tell us why you would not be interested in the 0% interest HEAT Loan to finance future energy efficiency improvements.

1. [OPEN-ENDED RESPONSE]

[IF RESPONDENT RECEIVED HEAT LOAN OR Q12=1 OR (Q10=1 OR 2)]

Q19. What was appealing about the 0% interest HEAT Loan you used to pay for the improvements your energy assessment recommended? Please select all that apply:

[MULTIPLE RESPONSE, RANDOMIZE 1-6]

1. 0% interest rate
2. Convenience
3. Ability to repay project costs over time
4. Ease of qualifying for the loan
5. Choice of lenders available to work with
6. Length of loan payback
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[IF(Q2A)=1]

Q20. How important were each of the following factors in your decision to make insulation and/or air sealing improvements?

[MATRIX QUESTION: SCALE]

[RANDOMIZE] Item	1-Not at all important	2-Not very important	3-Somewhat important	4-Very important	5-Extremely important	98 – Don't know	99 N/A
National Grid rebates							
[IF RECEIVED LOAN OR Q12=1] Availability of 0% financing HEAT Loan							
[GROUPS 1 THROUGH 4] Recommendations from my assessor							
Recommendations from a contractor							
Recommendations from a family member, friend, neighbor, or colleague							

[IF (Q2B)=1]

Q21. How important were each of the following factors in your decision to install new heating or cooling equipment?

[MATRIX QUESTION: SCALE]

[LOGIC] Item	1-Not at all important	2-Not very important	3-Somewhat important	4-Very important	5-Extremely important	98 – Don't know	99 N/A
National Grid rebates							
[IF RECEIVED LOAN OR Q12=1] Availability of 0% financing HEAT Loan							
[GROUPS 1 THROUGH 4] Recommendations from my assessor							
Recommendations from a contractor							
Recommendations from a family member, friend, neighbor, or colleague							

[IF (Q2C=1]

Q22. How important were each of the following factors in your decision to install a new hot water heater?

[MATRIX QUESTION: SCALE]

[LOGIC] Item	1-Not at all important	2-Not very important	3-Somewhat important	4-Very important	5-Extremely important	98 – Don't know	99 N/A
National Grid rebates							
[IF RECEIVED LOAN OR Q12=1] Availability of 0% financing HEAT Loan							
[GROUPS 1 THROUGH 4] Recommendations							

[LOGIC] Item	1-Not at all important	2-Not very important	3-Somewhat important	4-Very important	5-Extremely important	98 – Don't know	99 N/A
from my assessor							
Recommendations from a contractor							
Recommendations from a family member, friend, neighbor, or colleague							

[IF RESPONDENT RECEIVED HEAT LOAN OR Q12=1]

Q23. Which of the following options best describes what you would have done if you had not received the 0% interest HEAT Loan for the improvements your energy assessment recommended?

[SINGLE RESPONSE. RANDOMIZE]

1. I would not have done a project at all
2. I would have delayed the project more than six months
3. I would have done a smaller or less expensive project
4. I would have done exactly the same project
96. OTHER, PLEASE SPECIFY: [OPEN-ENDED RESPONSE]
98. Don't know

[IF Q23=2, 3 OR 4]

Q24. How would you have paid for the improvements if you had not received the HEAT Loan?

[MULTIPLE RESPONSE]

1. Cash, check, or credit card with intention to pay in full at the end of the month
2. Credit card with intention to repay over time
3. Financing or payment plan from the contractor
4. Some other type of loan (including home equity line of credit, personal loan from a bank, or a loan from family, friends, or peers)
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[DISPLAY ON SAME PAGE AS Q24]

Q25. How much more difficult would it be for you to manage your household expenses if you had paid for your improvements in that way, rather than using a HEAT Loan?

[SINGLE RESPONSE]

1. Extremely more difficult
2. Much more difficult

3. Somewhat more difficult
4. A little bit more difficult
5. No more difficult
98. Don't know

[ASK ALL]

Q26. The 0% interest HEAT Loan is currently available for air sealing, adding insulation, heating, and water heating system improvements. What other energy efficiency improvements for your home, if any, would you consider financing with a 0% interest loan if it were available?"

1. [OPEN-ENDED RESPONSE]
98. Don't know

[IF RESPONDENT RECEIVED HEAT LOAN OR Q12=1]

Q27. What is the maximum interest rate at which you would consider a HEAT Loan? For context, the amounts next to the interest rate show how much more per month you would pay on a $5,500 loan with a term length of seven years.

[SINGLE RESPONSE]

1. 1% (about $68 interest monthly)
2. 2% (about $70 interest monthly)
3. 3% (about $73 interest monthly)
4. 4% (about $75 interest monthly)
5. 5% (about $78 interest monthly)
6. 6% (about $80 interest monthly)
7. 7% (about $83 interest monthly)
8. I would not finance the energy efficiency improvements without the 0% interest loan.
98. Don't know

[IF RESPONDENT RECEIVED HEAT LOAN OR Q12=1]

Q28. Please rate your satisfaction with the following elements of your experience obtaining your 0% interest HEAT Loan for the improvements your energy assessment recommended:

[MATRIX QUESTION: SCALE]

[LOGIC] Item	1: Not at all satisfied	2: Not very satisfied	3: Somewhat satisfied	4: Very satisfied	5: Extremely satisfied	98 DK
The ease of the initial loan application						
The time taken for loan approval						
The ease of the paperwork you had to complete to close the loan after approval						
Your experience with [PIPE IN LENDER]						

Your experience with your contractor						
Your overall experience with taking the loan						

[IF ANY ITEM IN Q28=1, 2, OR 3]

Q29. How could your experience with the HEAT Loan have been improved?

1. [OPEN-ENDED RESPONSE]

Demographics [ASK ALL]

Thank you for your responses so far. We have just a few more questions that will help National Grid ensure its energy efficiency services are reaching all Rhode Islanders.

[ASK ALL]

Q30. Including yourself, how many people currently live in your home year-round?

[SINGLE RESPONSE]

1. Response Text [FORCE NUMERIC RESPONSE]

[ASK ALL]

Q31. Which of the following ranges includes your total annual household income in 2017, before taxes?

[SINGLE RESPONSE]

1. Under $20,000
2. $20,000 to under $30,000
3. $30,000 to under $40,000
4. $40,000 to under $50,000
5. $50,000 to under $60,000
6. $60,000 to under $80,000
7. $80,000 to under $100,000
8. $100,000 to under $120,000
9. $120,000 to under $140,000
10. $140,000 to under $160,000
11. $160,000 or more
98. Don't know
99. Prefer not to answer

[ASK ALL]

Q32. What is the highest level of education you have completed so far?

[SINGLE RESPONSE]

1. No schooling
2. Less than high school
3. Some high school
4. High school graduate or equivalent (such as GED)
5. Trade or technical school
6. Some college (including Associate degree)
7. College degree (Bachelor's degree)
8. Some graduate school
9. Graduate degree, professional degree, or doctorate
99. I'd rather not say

[ASK ALL]

Q33. What is your race? Please select all that apply:

[MULTIPLE RESPONSE]

1. White
2. Black, African American
3. Hispanic, Latino, or Spanish origin
4. American Indian or Alaska Native
5. Asian
6. Native Hawaiian or Other Pacific Islander
96. Other
99. I'd rather not say

Click the next arrow to submit your answers.

Thank you for your time. Your responses will be very valuable in helping National Grid improve the services it offers to help people in Rhode Island save energy.

D.2. Lender Interview Guide

Introduction

Thank you for taking the time to talk with me. As I said in my email, we are working with National Grid staff to help them improve their HEAT Loan offering in the EnergyWise program for homeowners. In our conversation today, I'd like to hear about how the HEAT Loans are working for you, how changes in interest rates might affect the loan offering, and learn about opportunities for improvement.

Is it okay with you if I record our conversation to help with my note taking? We won't report anything in a way that would identify any particular person or organization.

Do you have any questions for me before we start?

Role and Overview

Q1. First, please tell me your role and how that relates to HEAT Loans.

Q2. What, if anything, does your organization do to promote HEAT Loans to your customers?

1. [If unclear] Are you actively marketing it to your customers? If so, how?

Interest Rates

The next set of questions is about interest rates.

Q3. How do you think uptake of the HEAT Loan would change if customers were required to pay interest?

1. [If they say it depends upon the interest rate] At what interest rate do you think customers would no longer find the HEAT Loan appealing?

Q4. What is appealing to your organization about offering HEAT Loans?

1. **[If not mentioned]** How does the 5% to 0% rate buy down influence your interest in offering HEAT Loans?

Q5. I'd like to know how a rise in the prime lending rate might affect your interest or ability to deliver HEAT Loans under the current 5% to 0% buy down. So, first, how would…

1. A 3% or more rise in the prime lending rate affect your interest or ability to deliver HEAT Loans?
2. [If still interested at 3%] How about a 2% rise in the prime lending rate
3. [If still interested at 2%] And, finally, how would a 1% rise in the prime lending rate affect your interest or ability to deliver HEAT Loans?

Q6. National Grid is considering replacing the current model of the full interest rate buy down to a smaller interest rate buy down coupled with a loan loss reserve. Would such a change likely result in more efficiency loans, fewer loans, or the same amount of loans. Why do you say that?

Q7. To what extent are your customers using other loan products to finance energy efficiency improvements to their homes? (If needed: These may be purchases of energy efficiency appliances like refrigerators or washing machines, adding insulation, or new windows.)

Q8. Based on what you've seen, do you think the HEAT Loan helps your customers finance energy efficiency upgrades in their homes that they otherwise would not be able to finance? Why do you say that?

Underwriting

Now I have some questions about qualifying for the loan.

Q9. What requirements does an applicant have to meet to qualify for a HEAT Loan?

1. **[If not mentioned]** What is the lowest FICO score eligible for a HEAT Loan through your bank/institution?
2. Is there a range of FICO scores that are only acceptable if other criteria are satisfied? [If yes:] What is the range?

Q10. How do those underwriting requirements compare to other loan products you offer, including amount of forms or paperwork to complete?

1. **[If qualification requirements differ:]** Why are your HEAT Loan qualification requirements different from other types of loans?

Q11. How, if at all, have your qualification requirements changed since you began offering HEAT Loans?

1. [If any changes] What motivated you to make those changes?

Loan Performance

We're almost done. Just a few questions left about customers.

Q12. About what percent of HEAT Loan applications do you deny? (*If we have prior interview data, check prior interview and confirm answer*)

Q13. What is the most common reason you turn down applicants for HEAT Loans?

Q14. Which aspects of applying for or closing the loan seem to be the most difficult for borrowers?

Q15. **[If unclear]** Where do applicants seem to make the most errors or have the most questions?

Q16. **[If unclear]** At what point in the HEAT Loan process do customers fall out of the financing process, from expression of interest in the loan to loan decision (approval or denial)?

1. What are the most common reasons for that?

Q17. What is the default rate for HEAT Loans?

1. How does that rate compare to other loans?

Closing

Q18. Those are all the questions I had prepared. Is there anything we haven't talked about that you think is important for me to know about the HEAT Loan offering or other ways to improve it?

D.3. Contractor Interview Guide

Introduction

Hi. Thank you for making the time to talk with me today. As I mentioned, my company is working with National Grid to identify ways to improve their HEAT Loan offering for HVAC customers and learn more about how they can help customers access financing for energy efficiency upgrades. In our conversation today, I want to hear your perspective as a contractor talking with homeowners about financing and National Grid's HEAT Loan offering.

I'll be taking notes as we talk, but would you mind if I record our conversation? It's just to help with my note taking and I won't share it with anyone. And, we won't report anything in a way that would identify you or your company.

Do you have any questions for me before we get started?

Questions

Q1. What financing options do you present to customers who want to install new HVAC equipment?

1. Anything else?
2. [If not mentioned:] Does the manufacturer offer a financing package?
3. [If not mentioned:] Does your firm offer a financing package?
4. **[If multiple options]** How do you decide which option to present to which customer, if it varies?

Q2. [If company does not offer financing] Has your firm considered offering financing packages for your customers?

1. **[If not stated]** Why don't you offer financing packages?

Q3. How do you promote the HEAT Loan, specifically, to your customers?

1. [If not mentioned]: What aspects of the loan do you discuss? (Probes: Interest rates, term length, monthly amount, participating lenders/banks. Do you factor in energy savings into estimates of monthly cost?)
2. [If not mentioned]: Do you have any printed materials you can leave with them?
3. [If not mentioned]: Do you encourage them to visit the National Grid website?

Q4. How does the HEAT Loan compare to other energy efficiency financing programs you're aware of?

1. How do the terms of the HEAT Loan compare to other loans that are available? (Interest rate, length of loan).
2. How does the complexity of the process to get a HEAT Loan compare to other loans?
3. How does the ease of qualifying for a HEAT Loan compare to other loans?
4. Among your customers, how many use a HEAT Loan compared to the number who use other energy efficiency financing options?

Q5. What, if anything, makes it challenging to discuss HEAT Loans with your customers?

1. [If not mentioned]: Are there aspects of the loan that make it difficult to explain? (Interest rates, term length, participating lenders/banks)
2. [If not mentioned]: Is there anything situational that constrains your ability to discuss the HEAT Loan with the customer in their home?
3. [If not mentioned]: How reluctant are customers to finance HVAC upgrades?

Q6. To the best of your knowledge, how frequently are your customers' applications for HEAT Loans denied?

1. When that happens, what do the customers typically do?
2. [If not mentioned] Do you present another financing option to them?
3. [If yes] If so, which one?
4. How often do they change their projects to install less expensive or less energy efficient equipment?
5. How often do they cancel their projects altogether?

Q7. Do some customers not pursue a HEAT Loan because of the audit requirement? Why is that?

1. Are there any benefits of having a customer get an energy audit in order to qualify for a HEAT Loan?
2. Do you think customers will be more likely to use the loan and install efficient HVAC equipment if audit requirement was relaxed? What makes you say that?
3. About what percent of your jobs are emergency replacements?

Q8. [If any in Q7] Those customers who are eligible for a HEAT Loan, but don't pursue it because of the audit requirement, do they tend do the same project with efficient equipment but finance it a different way, or do they cancel their project or go with less efficient equipment?

Q9. From what you've seen, do you think the HEAT Loan offering has improved customers' access to financing? (If needed: Does having the HEAT Loan product make it easier for customers to finance efficient HVAC upgrades compared to a situation where it was not available?)

1. [If needed] Why do you say that?

Q10. If National Grid's 0% interest HEAT Loan went away, how would that affect your business?

1. Would it affect the amount of high efficiency equipment you sell?

Q11. We're almost done, I just have a few more questions. How important do you think it is to maintain the HEAT Loan offering at a 0% interest rate? (Probes: Important to your business, important for high efficiency equipment, important for customers)

1. How do you think uptake of HEAT Loans would change if the interest rate increased to 3%?

Q12. Are there ways you can think of to improve the promotion or delivery of the HEAT Loan to make it more effective in motivating people to install efficient heating systems?

Q13. [If time] What (other) opportunities to do you see to improve the HEAT Loan offering?

Closing

Those are all the questions I prepared. Is there anything else you think is important for me to know about your experience with the HEAT Loan product or how to improve the HEAT Loan offering?

Thank you very much for your time.