



R1602 Residential New Construction Program – Process Evaluation

REVIEW DRAFT

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Table of Contents

EXECUTIVE SUMMARY	I
FINDINGS	I
Program Design and Implementation.....	I
Awareness and Communication	III
Participation	IV
Attitudes and Demand.....	V
Program Influence and Relevance.....	V
Persistence	VI
CONCLUSIONS AND RECOMMENDATIONS	VII
SECTION 1 INTRODUCTION.....	1
SECTION 2 METHODOLOGY	3
2.1 IN-DEPTH INTERVIEWS	3
2.2 HOMEBUYER SURVEY	4
SECTION 3 PROGRAM DESIGN AND IMPLEMENTATION	6
3.1 OVERALL PROGRAM DESIGN	6
3.2 HERS RATER ROLE.....	7
3.3 RECENT DESIGN CHANGES	8
3.4 APPLICATION PROCESS.....	10
3.5 PROGRAM TECHNICAL SUPPORT	11
3.6 PARTICIPATION DATA TRACKING.....	12
SECTION 4 AWARENESS AND COMMUNICATION.....	14
SECTION 5 PARTICIPATION	17
5.1 NATURE OF HOMEBUYER PARTICIPATION.....	17
5.2 PROGRAM SATISFACTION.....	19
5.3 DRIVERS TO PARTICIPATION.....	21
5.4 BARRIERS TO PARTICIPATION	22
5.5 PARTICIPATION CHALLENGES	23
5.5.1 Incremental Costs	24
5.5.2 Multifamily Participation.....	26
SECTION 6 ATTITUDES AND DEMAND	27
6.1 DEMAND FOR ENERGY EFFICIENCY	27
6.2 DECISION-MAKING FACTORS.....	27

6.3	KNOWLEDGE OF ENERGY EFFICIENCY	30
SECTION 7	PROGRAM INFLUENCE AND RELEVANCE	32
7.1	BUILDER PRACTICES	32
7.2	HERS RATERS	33
7.3	ENERGY CODE	35
7.4	MEASURE PERSISTENCE	36
APPENDIX A	ADDITIONAL HOMEBUYER SURVEY DETAILS	A-1
A.1	ATTITUDES TOWARD GLOBAL WARMING	A-1
A.2	DEMOGRAPHIC AND HOME CHARACTERISTICS	A-4
APPENDIX B	DATA COLLECTION INSTRUMENTS	B-1
B.1	PROGRAM MANAGER INTERVIEW GUIDE	B-1
B.1.1	Introduction.....	B-1
B.1.2	Program Process.....	B-1
B.1.3	Participant Engagement	B-3
B.1.4	2016 Program Changes	B-3
B.1.5	Strengths and Weaknesses	B-4
B.2	PARTICIPATING BUILDER INTERVIEW GUIDE	B-6
B.2.1	Introduction.....	B-6
B.2.2	Program Process.....	B-7
B.2.3	Marketing.....	B-10
B.2.4	Program Changes and Zero Net Energy Homes	B-11
B.2.5	New Code.....	B-12
B.2.6	Closing	B-13
B.3	PARTICIPATING HERS RATER INTERVIEW GUIDE	B-13
B.3.1	Introduction.....	B-13
B.3.2	Program Process.....	B-15
B.3.3	Marketing.....	B-17
B.3.4	Program Changes and Zero Net Energy Homes	B-18
B.3.5	New Code.....	B-19
B.3.6	Closing	B-20
B.4	PARTICIPATING HOMEBUYER SURVEY INSTRUMENT	B-20
B.4.1	Introduction.....	B-20
B.4.2	Building/Purchase Process	B-23

B.4.3 Energy efficiency awareness and perceptions B-24
 B.4.4 Measure Persistence..... B-27
 B.4.5 Attitudes B-29
 B.4.6 Demographic and Economic Factors B-30

Figures

FIGURE 1: HOMEBUYER DEMOGRAPHICS AND HOME CHARACTERISTICS SNAPSHOT 5
 FIGURE 2: HOMEBUYER MEANS FOR FINDING PROGRAM HERS RATERS 8
 FIGURE 3: HOMEBUYER AWARENESS OF PROGRAM AND PARTICIPATION 15
 FIGURE 4: HOMEBUYER MEANS OF FIRST LEARNING ABOUT PROGRAM 16
 FIGURE 5: HOMEBUYER LEVEL OF INVOLVEMENT IN PROGRAM PARTICIPATION 17
 FIGURE 6: NATURE OF HOMEBUYER INVOLVEMENT IN PROGRAM PARTICIPATION 18
 FIGURE 7: HOMEBUYER TIMING OF PROGRAM QUALIFICATION AWARENESS..... 19
 FIGURE 8: BUILDER AND HERS RATER PROGRAM SATISFACTION 20
 FIGURE 9: HOMEBUYER ENERGY BILL EXPECTATIONS AND SATISFACTION WITH
 PARTICIPATION 21
 FIGURE 10: HOMEBUYER PERCEPTIONS OF PROGRAM VALUE 22
 FIGURE 11: HOMEBUYER PERCEPTIONS OF PROGRAM IMPACT ON HOME PRICING 25
 FIGURE 12: HOMEBUYER PERCEPTIONS OF PROGRAM IMPACT ON HOME COSTS..... 25
 FIGURE 13: BUILDER AND HERS RATER PERCEPTIONS OF HOMEBUYER VALUES 28
 FIGURE 14: HOMEBUYER FACTORS IN PURCHASING AND BUILDING DECISIONS 29
 FIGURE 15: HOMEBUYER TOPICS OF DISCUSSION WITH TRADE PROFESSIONALS..... 30
 FIGURE 16: HOMEBUYER PERCEPTIONS OF NEW CONSTRUCTION ENERGY
 EFFICIENCY 31
 FIGURE 17: RELEVANCE OF HERS SCORING FOR HOMEBUYERS 35
 FIGURE 18: ENERGY-EFFICIENCY FEATURES CHANGED SINCE PARTICIPATING 36
 FIGURE 19: HOMEBUYER ATTITUDES TOWARD GLOBAL WARMING A-3

Tables

TABLE 1: PROCESS EVALUATION TOPIC AREAS AND RESEARCH QUESTIONS 2
 TABLE 2: BUILDER AND HERS RATER INTERVIEWEE PROGRAM ACTIVITY LEVELS IN
 2015 4
 TABLE 3: HOMEBUYER ATTITUDES TOWARD GLOBAL WARMING A-4
 TABLE 4: HOMEBUYER DEMOGRAPHIC AND HOME CHARACTERISTICS A-4



Executive Summary

Eversource and United Illuminating (UI) Company (“the Companies”) contracted NMR to perform a billing analysis, process evaluation, and baseline study for the Connecticut Residential New Construction (RNC) program. Collectively, these tasks are referred to as the R1602 study.

This report includes the results of the process evaluation, while the baseline study and billing analysis will stand as two separate and forthcoming reports.

The process evaluation covered six broad topic areas:

- Program design and implementation
- Awareness and communication
- Elements dictating participation levels (drivers, barriers, etc.)
- Attitudes toward and demand for energy efficiency
- Program influence and relevance
- Persistence of major measures

Assessing these topics involved four efforts conducted in 2016 and 2017:

- In-depth interviews with two program staff
- In-depth interviews with six participating builders
- In-depth interviews with four participating HERS raters
- Telephone surveys with 70 participating homebuyers

The RNC program (referred to as *the program*) offers incentives to participants for reaching certain levels of energy efficiency in single-family and multifamily homes that are either newly constructed or gut renovations in the Companies’ service territory.

FINDINGS

This section offers a high-level summary of the findings presented in the body of the report.

Program Design and Implementation

Program design is effective, well-received, and streamlined.

Program staff see the program as streamlined and consider the program’s generous incentives—some of the highest in the nation—as a key strength. Participating trade ally interviewees (HERS raters and builders) suggest improving the application process by fine-tuning communication, decreasing paperwork, and limiting redundancy; increasing marketing and outreach; and adding some leniency to program technical requirements—yet no single requirement stood out as problematic across interviewees.

HERS raters play a vital role in program execution.

On top of testing the energy efficiency of program homes, HERS raters act as conduits between the program and participants who are builders and/or homebuyers. Program staff characterized the participating HERS raters as *phenomenal*, applauding their strong understanding of the program and technical expertise. Builders also reported high satisfaction with their HERS raters.

The performance-based approach has been well-received.

In 2014, the program began replacing the prescriptive rebate offering with a tiered-incentive system dependent on home performance as measured on the HERS Index. Builder and HERS rater interviewees welcome the performance-based approach, saying it increased the program's flexibility, made it become more streamlined, reduced paperwork, and grew industry knowledge.

Participation is smooth, but the application process needs improvement.

Even though trade ally interviewees concluded that the performance-based approach has made the program more streamlined and reduced paperwork, they still experienced challenges: *back-and-forth* with program staff during the application process, too much paperwork, and redundancies that require them to provide the same information numerous times.

Higher savings designations receive mixed reactions.

In 2015, the program began requiring renewable energy readiness for its higher tier participants, and in 2016 it began implementing an incentive system to promote zero energy buildings. Builders and HERS raters have mixed reactions to these bonus incentives, with a few saying that additional steps might present a burden that would daunt potential participants.

Program support is adequate, but builders may need more guidance.

The program offers trainings that seek to meet the builders' and HERS raters' most current needs—usually code compliance or certification program trainings. All HERS raters were very satisfied with program trainings, citing quick response times from program staff on their technical questions. Builders saw a need for the program to provide them with technical guidance in practical terms (i.e., *plain English*); HERS raters, seeing a knowledge gap,

thought the program should provide builders with more air-sealing training, especially to help them meet 2012 International Energy Conservation Code (IECC), which recently went into effect in Connecticut.

Program data tracking needs improvement.

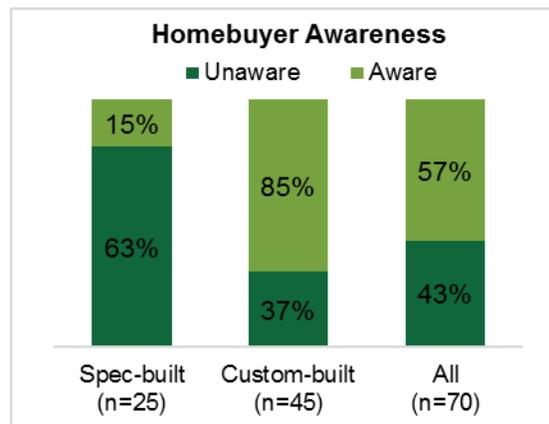
Some program data tracking practices were problematic, especially for evaluation purposes. The evaluation team came across several problems with program data when conducting R1602 tasks:

- On their own end, the Company program staff faced challenges compiling REM/rate files.
- Unique identifiers to link billing, participation, and REM/rate files were missing.
- Renewable energy generation data needed for the billing analysis were missing—it is unclear if the energy generation data were simply missing from the provided files or if those data are untracked.

Awareness and Communication

Marketing and outreach efforts have room for growth.

The program performs its own marketing where it executes online campaigns, maintains a social media presence, issues press releases, conducts radio interviews, gives presentations and hosts booths at trade association trainings, and leverages other demand-side management programs. Builders recalled learning about the program through HERS raters or builder association conferences. With builders and architects acting as conduits, homebuyers were often, yet not always, aware their homes participated. The program does not engage in cooperative marketing where it provides trade allies with collateral to leverage in their own marketing materials.

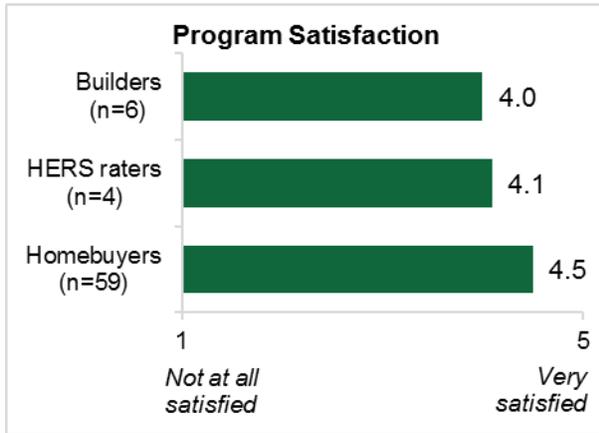


Homebuyers were more likely to be aware of the program if they had custom-built homes. Builders leverage the program in that they portray it as a third party that confirms to homebuyers that the home is indeed energy efficient; builders do not view the program as a critical discussion topic, perceiving that customers are interested in energy bill savings—not the program—and that brand recognition needs to improve to make it more of a relevant talking point. When aware of the program, most homebuyers reported they were actively involved in the participation process, often in the form of measure selection.

Participation

Program satisfaction is high, yet some participation barriers exist.

As noted, builders were very satisfied with HERS raters' performance, but HERS raters become frustrated with builders' resistance to practices that are required to meet program specifications, specifically when it comes to air sealing. Nonetheless, HERS raters are satisfied with the program, primarily because it drives their businesses. Homebuyers' program satisfaction is somewhat correlated with their expectations about energy bills; those who expected their energy bills to be lower than they were in reality were less satisfied than those whose energy bills were lower than what they expected. Regardless, homebuyers reported fairly high levels of satisfaction.



Interviewees and survey respondents reflected on drivers and barriers to participation and challenges incurred during participation. Builders originally became involved with the program to develop a marketing *edge* and out of a genuine focus on energy efficiency, and they continue to be involved because the rebates offer them the financial support to learn new practices. HERS raters explained that the program drives their businesses. Builders speculated that the program might attract homebuyers because it offers third-party recognition, and homebuyers estimated that program-certified homes offer more *value for the money* compared to a similar home that is not certified. No single reason explained why homes might not participate in the program, but trade ally interviewees' experiences indicated it could be attributable to differences in preferences or interests. For example, one HERS rater speculated that builders of nonparticipating homes may not have the capability, desire, or time to adhere to program standards. When it comes to actually participating, the amount of paperwork, delays in rebate issuance, underdeveloped skills, and HVAC subcontractor resistance challenge trade participants. Builders incur incremental costs, but they are small and are usually offset by the program rebates—in other words, they do not appear to act as an impediment to participation.

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There are opportunities to better engage the multifamily market.

The program seeks to focus on the growing multifamily new construction market, but according to interviewees, the program needs to tailor its processes to accommodate this growing market. Program staff saw a need for targeted marketing; trade ally interviewees thought that the amount of work required for multifamily participation might drive potential participants away, referencing the requirement for some HERS raters to conduct air-leakage

testing on *all* housing units as opposed to a sample of housing units,¹ and redundancies in the paperwork.

Attitudes and Demand

Homebuyers care about energy efficiency, but it does not tip the scales.

Homebuyers' preferences and values can dictate the success or failure of a program. Trade ally interviewees observed some growth in demand for energy efficiency, but they do not perceive that homebuyers place much weight on it. Homebuyers reported that the biggest factors for them when it comes to buying or building a home are the quality of construction and the opportunity to be involved in decision making; however, they also highly rated their desires for lower energy bills and energy efficiency.

Program Influence and Relevance

R1602 did not estimate net-to-gross factors or quantify program influence or market effects; however, the interviews offered insight into the program's influence and relevance for the HERS rater market, builder practices, and customer awareness and attitudes.

The program has been crucial to growing and establishing the CT HERS market.

According to interviewees, the program has been *vital* important for the growth of the HERS rater industry in Connecticut. However, not all HERS rater interviewees' projects went through the program—20% of the most active HERS rater's company's projects were nonparticipants. This is primarily due to the fact that some builders set out with the intention to participate in the RNC program, but ultimately their practices or timing did not meet program requirements. Interviews revealed that other market forces have also contributed to the establishment of the HERS rater market and will contribute to their growth, including the mortgage industry, ENERGY STAR, Zero-Net Energy (ZNE),² and energy codes; that is, some program participants have alternative motives when approaching HERS raters (e.g., ENERGY STAR certification), but HERS raters direct them to the program. While it is not clear what proportion of HERS rater business today is attributable to the program specifically, nor how much business they would lose if the program ceased, the program's inception and existence have increased HERS rater business.

¹ The program allows HERS raters who have been approved by their RESNET providers to sample just some units. However, sampling must be consistent with RESNET guidelines. HERS raters who do not comply with these requirements must test all units.

² Through renewable-energy infrastructure, a ZNE home annually consumes no more energy than what it produces onsite.

Trade ally interviewees reported that the program has changed builders’ practices and builders would have been unlikely to make those changes without the program. Builders listed, and HERS raters confirmed, the practices they have changed since participating:

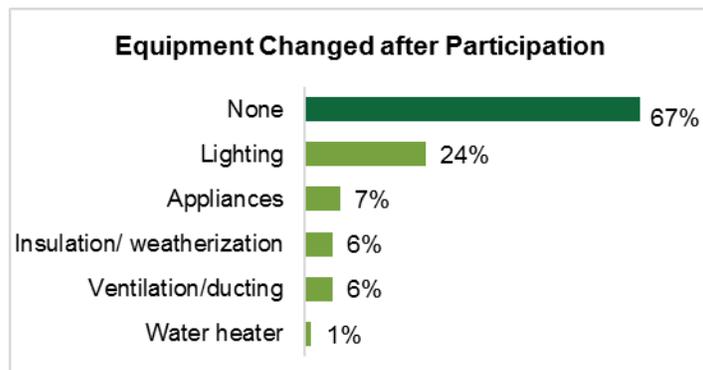
- Prioritized air sealing and *flashing*³
- Upgraded insulation
- Improved insulation installation techniques
- Began paying more attention to duct sealing and location
- Started using advanced framing techniques

HERS rating appears to be an important element. First, builders confirmed that the program HERS raters specifically have impacted their practices, too; not only have HERS raters recommended new measures, they have also perpetuated a more holistic building approach. Builders confirmed that they have applied what they learned during program participation to nonparticipating projects. On a different note, a slight majority of homebuyers (53%) reported that they considered their homes’ HERS scores during the purchasing/building processes.

Persistence

Measure persistence is high.

The study measured the extent to which homeowners remove or change energy-efficient equipment that is installed after the home goes through the participation process by asking participants if they made changes to any major measures. Two-thirds of homebuyers made no changes, and it appears that the changes that homeowners did make *increased* energy efficiency.



For example, the one-quarter of respondents (24%) that made changes to lighting generally replaced CFLs or other lighting with LEDs.⁴

³ Flashing refers to a practice in which a thin layer of spray foam is applied to a home’s thermal envelope to supplement insulation thickness and air seal.

⁴ In 2017, the program is shifting to all LEDs for screw-in applications.

CONCLUSIONS AND RECOMMENDATIONS

Overall design and design changes. Program staff and market actors' feedback indicates that the program design is effective, well-received, and streamlined. Some trade allies worry that the program technical requirements may be too demanding; however, no single concern stood out. Trade allies appreciate the performance-based approach transition and have no strong feelings about the bonus incentives.

- **Recommendation.** While program requirements intend to drive optimal savings, builders may need to be better informed about their purposes. It could be helpful to meet with active builders to discuss program requirements and communicate the science behind the requirements. Allow builders the opportunity to express their reasoning as to why they see certain requirements as unnecessary to potentially identify areas for leniency. Consider the option to require air-leakage testing of only a subset of multifamily housing units.

Program technical support. HERS raters play a vital role in the execution of the program. The only real challenges they experience come from their interactions with builders whom they often find are either resistant to change or, more importantly, lacking the necessary skills to adequately air seal (either to meet program requirements or building code) newly constructed homes.

- **Recommendation.** Continue applauding and acknowledging HERS raters' efforts to reinforce their commitment to the program. For example, send appreciation letters or acknowledge the high activity levels of the leading HERS raters in newsletters. Program staff should continue to provide commendable technical support, but trainings may need to be more thorough or intellectually accessible with a heavy focus on air-sealing techniques. Continue to coordinate these offerings with educational-credit trainings to encourage builder attendance.

Application process. While the participation process runs quite smoothly, especially at the pre-approval/initial application stage, there are some areas for improvement. Not unlike many RNC programs, HERS raters and participants experience some challenges with the submittal of the complete application, finding application paperwork to be redundant and excessive and resulting in too much back-and-forth communication with program staff.

- **Recommendation.** Study program applications, possibly in collaboration with active HERS raters and/or builders, to identify areas of redundancy that could be eliminated. As time allows, engage less-experienced applicants after pre-approval to ensure that they understand exactly what materials are needed for the final application.

Program data tracking. The Companies' program staff faced hurdles in compiling data to support evaluation efforts. As NMR presented in a memo to the EEB on April 11, 2017, the evaluation team estimated spending an extensive number of hours that were unproductive and resulted solely from data issues related to the R1602 study. These issues largely supported the R1602 Billing Analysis and Baseline Study efforts and included incorrect data extractions, duplicate records, unclear unique identifiers to link projects across datasets, and inadequate site descriptions. Similarly, it appeared that lack of systematic data storage, such

as disaggregated REM/rate files, led to missing files and unnecessarily burdened the Companies' program staff when they needed to compile the information to serve evaluation efforts. UI is currently revamping its program data tracking system, but Eversource, at the time of interview, was not. Energy generation data for renewable energy projects were not present in the billing data.

- **Recommendation.** The program may wish to consult with database experts to structure the database to support program staff so they can easily interface with the database and to ensure completeness.
 1. Per the suggestion of one trade ally and program staff, examine the feasibility of shifting to an online application process which will lessen the burden on program staff to manually enter participation data in program tracking systems and help streamline the participant and HERS rater efforts.
 2. The program should systematically name and populate REM/rate files. NMR's baseline study research team experts note that classifying the files' phases is essential. The Companies may find it useful to incorporate the project's phase (e.g., *plans*, *post-construction*, and *final*) into the file names. Similarly, separately storing the records by these construction phases would be helpful to ensure accurate tracking and facilitate evaluation efforts.
 3. Also, confirm that energy generation is being tracked for program projects with renewable energy infrastructures to accurately capture all program impacts.

Awareness and communication. While program staff promote the program, such as at trade events, they do not engage in cooperative advertising efforts with trade professionals. Buyers of spec-built homes (i.e., homes that are purchased after they have been listed on the open market) are not overwhelmingly aware of the program. Homebuyers' reports show that they see value in program certification; in contrast, builders do not see a need to inform their customers that their homes participated in the program, perceiving that customers are disinterested in program details and relate more to energy bill savings. That said, builders believed that the program needs to increase brand recognition in the same vein as ENERGY STAR® to make it a relevant talking point. Customers who know about the program usually learn of it through their builders. Builders who highlight it use it as a third-party verification to prove energy efficiency.

- **Recommendation.** Customer awareness can stimulate participation, especially through word-of-mouth channels. Awareness also increases the value of the program in the marketplace; in other words, when customers know what the program signifies, then real estate brokers and other trade allies can make assertions such as *Other homes say they are energy efficient, but only program homes are **verified** as energy efficient.*
- HERS raters saw this dynamic and stressed that educating real estate assessors and brokers on the value and distinction of the program is key; on that note, the program should continue its efforts to promote and explain the program at trade events.
- Providing builders with cooperative advertising materials that they can customize for their own businesses may encourage them to notify homebuyers that their homes are certified through the program. Further, the program may wish to develop a logo to

enhance name recognition which could, in turn, act as a marketing tool for builders to effectively prove program verification on top of increasing customer awareness. These logos could be given to builders to place somewhere in the home (e.g., a decal to place on an entryway window) for potential homebuyers to see.

Participation, attitudes, and demand. Market actors are satisfied with the program overall, with HERS raters' performance leaving builders satisfied and the program's fueling of business leaving HERS raters satisfied. Homebuyers prioritize energy efficiency, yet it is not as important as the quality of construction and the opportunity to be involved in decision making when shopping for or building a new home. When it comes to participation hurdles, the amount of paperwork involved in the application may be daunting, and rebate issuance moves slowly. The incremental costs that builders incur to participate are negligible and are usually offset by the program rebates; in fact, builders see program rebates as a double bonus, offsetting the costs of building *and* funding their training to build energy-efficient homes. The program wants to leverage the growing multifamily new construction market in the state, which could increase the program's cost-effectiveness and increase total savings, but interviewees saw some obstacles.

- **Recommendation.** Program outreach messaging toward builders should highlight the negligible incremental cost of participation and how it is offset by rebates that in the process grow their skills. The program's messaging toward potential homebuyers could highlight secondary benefits such as *Drive your home's design by participating* or *Take hold of your home's construction process by participating*. Per the suggestions of program staff and trade allies, program outreach and processes should attract multifamily builders, possibly by diminishing any redundancies in paperwork.

Program influence and relevance. The program has been one essential factor in developing and growing the HERS rater market in Connecticut, yet factors such as ENERGY STAR, ZNE, and energy codes appear to be the initial drivers for some builders to seek a HERS rating—HERS raters will then direct these participants to the RNC program. In turn, HERS raters' activities perpetuate the program's enhancement of builders' energy-efficiency practices. Builders added that they have carried over the practices they learned during participation to their nonparticipating projects.

- **Recommendation.** This evidence flags signs of program free ridership, spillover, and market effects; the evaluation team underscores the value of exploring this further. The EEB recently publicized a request for proposals for an RNC net-to-gross study which will provide a more accurate depiction of claimable savings. This study supports that decision.

Measure persistence. There is no concern that homeowners are removing major measures following participation.

1

Section 1 Introduction

The Companies contracted NMR to perform a billing analysis, process evaluation, and baseline study for the Connecticut RNC program. Collectively, these tasks are referred to as the R1602 study. R1602, conducted in 2016 and 2017, seeks to answer four key questions through these three tasks:

- How has the market baseline changed over time?
- What kinds of changes in building practices and equipment installations have occurred?
- To what extent is the program responsible for changes in building practices among participant builders?
- How accurately do program energy models reflect actual program home energy consumption, and what are the appropriate adjustment factors to bring them into alignment?

This report includes the results of the process evaluation, while the baseline study and billing analysis will stand as two separate and forthcoming reports.

In 2014, the program began replacing its prescriptive rebate offering with a tiered-incentive system dependent on home performance as measured by the HERS Index. The recent changes also included bonus incentives for homes that qualify for energy-efficiency certifications and designations. Among other topics, R1602 sought to determine if the program structure may influence the level of participation in the program, satisfaction with the program, and savings associated with the program. Understanding the impacts of recent program changes on builder participation and satisfaction is important in assessing the potential of the program moving forward.

Table 1 outlines the process evaluation topics in full and maps them to the research tasks. The data collection instruments included in Appendix B provide the actual questions asked of program administrators and participating HERS raters, builders, and homebuyers geared toward addressing the research questions for this study.

Table 1: Process Evaluation Topic Areas and Research Questions

Topic Area	Research Question(s)	IDIs	Surveys	Report Section
Program design and implementation	What is the current program design?	✓		Section 3
	What are market actors' roles in participation?	✓		
	How are program processes (e.g., applications, data tracking) functioning?	✓		
	How are market actors responding to recent program changes?	✓		
	How effective are the program's efforts to support trade allies?	✓		
Awareness and communication	How does the program effectively reach market actors?	✓		Section 4
	How aware of the program are builders and homebuyers?	✓	✓	
Participation	How satisfied are HERS raters and participants with the program?	✓	✓	Section 1
	What drives market actors to participate in the program?	✓	✓	
	What types of barriers or challenges might limit participation?	✓	✓	
Attitudes and demand	What are customers' attitudes toward and awareness of energy efficiency and how does it factor into their decision making?	✓	✓	Section 6
Program influence and relevance	How has the program impacted builders' practices?	✓		Section 7
	Does the HERS index matter to homebuyers and how important is HERS ratings to transforming builders' practices?	✓	✓	
	How will changes in energy code impact program relevance?	✓		
Measure persistence	How often do homebuyers remove or replace major measures after participating in the program?		✓	Section 7

2

Section 2 Methodology

The process evaluation involved four tasks:

- In-depth interviews with two program staff
- In-depth interviews with six participating builders
- In-depth interviews with four participating HERS raters
- Telephone surveys with 70 participating homebuyers

2.1 IN-DEPTH INTERVIEWS

In August and September 2016, the team completed two in-depth interviews with program staff administering the RNC program—one with Eversource staff and the other with UI staff. Laying the ground for the other process evaluation tasks, the interviews asked program administrators for background and perspectives on program design and processes.

From December 2016 through February 2017, the team completed in-depth interviews with ten trade allies—six participating builders and four participating HERS raters. The trade ally interviewees had varying levels of participation activity (Table 2). For example, in 2015,⁵ one HERS rater’s company rated only four program projects (all single-family), while the most active interviewee rated 450 single-family and 500 multifamily units.

- In total, the HERS rater interviewees rated 482 program projects. Only the most active HERS rater had rated homes that did not go through the program, estimating that 80% of his company’s projects and housing units statewide went through the program. Section 5.4 explains why some projects do not go through the program, and Section 7.2 discusses the program’s importance and relevance for HERS raters’ businesses.
- Builder interviewees built 52 program projects, which represented 98% of their projects and more than 99% of their housing units statewide.

Interviewees served as both UI and Eversource participants. Unable to provide exact estimates, they estimated, on average, that about 60% of their combined program homes were in Eversource territory and 40% were in UI territory.

⁵ While the conversations with builders and HERS raters occurred in 2017, there is no evidence that program participation changed substantially for builders from 2015 to 2016.

Table 2: Builder and HERS Rater Interviewee Program Activity Levels in 2015
(Based on self-reports)

Home Type	HERS Raters, Rated (n=4)		Builders, Built (n=6)	
	Statewide (number in program)	% of Statewide ¹	Statewide (number in Program)	% of Statewide
Projects				
Single-family	459	80%	30	97%
Multifamily	23	100%	22	100%
Total	482	81%	52	98%
Housing units				
Single-family	459	80%	30	97%
Multifamily	608	100%	237	100%
Total	1,067	91%	267	>99%

¹ Bases are equal to the total statewide-housing buildings and units built/rated by interviewees that year.

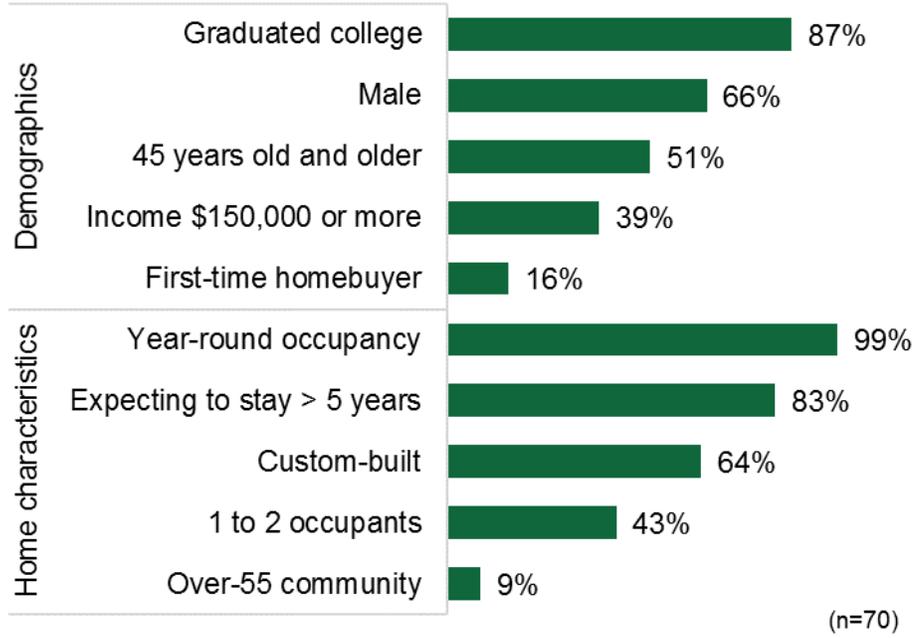
2.2 HOMEBUYER SURVEY

In January and February 2017, the team completed 70 interviews with homebuyers who had participated in the program between January 2014 and September 2016. The team obtained contact information for 544 Eversource customer participants and eight UI customer participants, completing surveys with 13% of the population; all were Eversource participants.

Figure 1 provides a snapshot of respondent demographics and their participating homes' characteristics. Most often, survey respondents were college graduates, male, 45 years old and older, not first-time homebuyers, and had annual incomes of \$150,000 or higher. On average, the participating homes had 3.2 full-time occupants, with occupants usually expecting to stay in the homes for more than five years.

About one-third of the 70 respondents (36%) purchased *spec-built* homes where they were uninvolved in the home's overall design; the other 64% were involved with *custom-built* homes where they, possibly in collaboration with an architect or builder, made the decisions about their home's design during the building process. In fact, nearly one-fifth of respondents (19%) were the builders themselves—on top of owning and occupying the home. Table 4 in Appendix A.2 includes more details.

Figure 1: Homebuyer Demographics and Home Characteristics Snapshot
 (Participating homebuyer CATI survey)



3

Section 3 Program Design and Implementation

The process evaluation explored aspects of program design and implementation:

- Confirming the overall program design and gaining market actor perspectives on it
- Defining participating HERS raters' roles
- Gauging reactions to recent program design changes
- Assessing the participation application process and program data tracking

3.1 OVERALL PROGRAM DESIGN

➤ *Program staff see the program as streamlined. On top of having positive relationships with HERS raters, they consider the program's generous incentives as a key strength. Trade ally interviewees suggest improving the application process, increasing marketing and outreach, and adding leniency to program technical requirements.*

The RNC program offers incentives to participants for reaching certain levels of energy efficiency in single-family and multifamily homes that are either newly constructed or gut renovations in the Companies' service territory. Interviewers asked program staff to define the program's greatest strength.

- **Participation process.** Despite acknowledging challenges with the application process (Section 3.4), one Company's program staff said that the program's greatest strength is its streamlined participation process, which has enabled program staff to have excellent working relationships with builders and HERS raters.
- **Incentives.** The other Company's program staff perceived that the program incentive levels—some of the highest in the nation—are its greatest strength. The first Company's program staff also acknowledged this strength, pointing out that the incentives offset the cost of the HERS rater services and still offer additional monies to the builder or homeowner.

One Company's program staff suggested updating the user-defined reference home (UDRH), which the R1602 baseline study is undertaking. The other Company's program staff added that a multifamily-specific updated UDRH would help increase multifamily participation; in fact, one HERS rater interviewee believed that all multifamily builders in the state want to participate in the program. Further, they suggested that the program could see even more savings and participation if it served moderate-rehab projects (as opposed to gut-rehab only) which at that time the program was considering.

On top of their suggestions for improving the application process (Section 3.4), builders and HERs raters recommended ways to improve program design:

- **Marketing and outreach.** Builders most often suggested increasing marketing to recruit more builders and create public demand and understanding of energy efficiency. HERS raters also recommended increasing marketing and outreach to builders by positioning the program as a tool to meet the new building code. Section 4 details the program’s marketing and outreach efforts.
- **Reducing participation requirements.** The program requires some HERS raters to test for air leakage in all multifamily units; one builder, who was not approved to do so,⁶ requested being able to test a sample of units in a project as opposed to testing every unit. Three HERS raters recommended reducing some requirements that prevent builders from participating, such as leniency during new builders’ learning curves when it comes to insulation levels or air sealing requirements. One HERS rater suggested eliminating a requirement if the regulatory energy code is already stringent enough. For example, as the code requires *tighter and tighter* houses, program administrators could determine the standard requirement is efficient enough and remove the requirement from the program.

One builder suggested that the program could offer additional support by subsidizing spray foam to facilitate air sealing, but trade allies generally did not express concerns about incentive amounts.

3.2 HERS RATER ROLE

- ***HERS raters act as conduits between participants and the program; they receive excellent reviews from program staff and builders.***

HERS raters act as program ushers or as, in the words of the program staff, “they are the boots on the ground,” acting as “conduits” between the program and builders and/or homebuyers (i.e., *participants*). They are defined as independent third-party energy-efficiency consultants. The Companies approve HERS raters that have passed the Residential Energy Services Network (RESNET) HERS training and are in good standing with their RESNET-accredited rating providers (who ensure the quality of rating services). According to program tracking data, only a few HERS raters are responsible for most program projects. Program staff are in touch with participating HERS raters daily, yet HERS raters are under no contractual obligation with the program. Program staff characterized the participating HERS raters as “phenomenal,” applauding their strong understanding of the program and technical expertise. As discussed in Section 5.2, builders rated their satisfaction with their interactions with their HERS raters very highly as well.

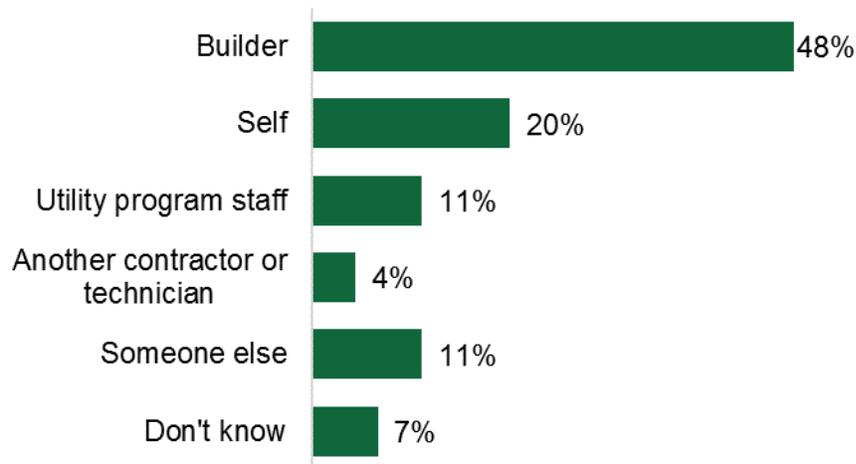
The Energize Connecticut website includes a list of program-approved HERS raters.⁷ Participants can reach out to the HERS raters to enlist in the program. HERS raters—paid by the participants—then guide participants through the participation process.

⁶ HERS raters must be certified to do sampling by their RESNET providers to be allowed to conduct sampling in the RNC program (that sampling must be consistent with RESNET guidelines).

⁷ <http://www.energizect.com/sites/default/files/uploads/HersRaters/List%20of%20CT%20HERS%20Raters%20-%202015%20012615.pdf>. Accessed February 28, 2017.

As illustrated in Figure 2, of the 46 homebuyer survey respondents who had some familiarity with HERS raters, nearly one-half (48%) reported finding their HERS raters through their builders (48%). One-fifth of the homebuyer respondents found their HERS raters on their own—only two were those reporting building their own homes (2 of 9). According to program staff, if potential participants first reach out to them instead of directly to the HERS raters, the program staff help them find the HERS raters; some homebuyers reported learning of the HERS raters through program staff (11%).

Figure 2: Homebuyer Means for Finding Program HERS Raters
(Participating homebuyer CATI survey)



Base includes respondents familiar with HERS rating

(n=46)

3.3 RECENT DESIGN CHANGES

- ***Builders and HERS raters have mixed reactions to program design changes, yet largely welcome a performance-based approach, saying it increased flexibility, reduced paperwork, and grew industry knowledge.***

In 2014, the program began replacing the prescriptive rebate offering with a tiered-incentive system dependent on home performance as measured on the HERS Index. The recent changes also included bonus incentives for homes that qualify for energy-efficiency certifications and designations.

Photovoltaic (PV) Readiness

The program requires program homes to be PV-ready, and to use a PV-readiness checklist for the higher program tiers. As program staff explained, the program carefully tries to limit requirements, with a sensitivity about overburdening participants, especially given the upcoming code changes.

- Builders observed that the PV requirement effects are minimal, but had mixed feelings about it. Two builders said the specification was better than what was offered before,

and two thought it was worse than what was offered before, namely pointing to the burden of additional steps for a feature for which they do not see market demand.

- HERS raters had mixed responses as well. One thought the requirement was a positive, one thought it had no effect, and the other two thought it presented challenges that may prevent builders from participating in the highest tiers. However, another HERS rater disagreed, saying the requirement was not cost-prohibitive.

Zero Energy Challenge

A key priority in the 2016-2018 C&LM Plan was to move all buildings toward becoming Zero Energy buildings, also known as ZNE buildings.⁸ The program holds a Zero Energy Challenge which offers incentives and recognition to builders building ZNE buildings. The challenge awards builders or homebuyers for going *above and beyond*; the program has a website devoted to the challenge and highlights the winners.

- Builders were less familiar than HERS raters with the challenge; using a 1 to 5 scale, where 1 is *never heard of it* and 5 is *very familiar*, they rated it 2.8 and 4.3, respectively, on average. Only one of the six builders completed or started ZNE homes that will or have participated in the challenge, but three of the four HERS raters have worked on ZNE homes.
- One builder and two HERS raters thought that the challenge has effectively promoted energy efficiency. Others (one builder and two HERS raters) believed that the challenge presents a great standard, calling it “a great carrot on the end of the stick.” However, three (two HERS raters and one builder) reported that the technical specifications and paperwork requirements of the challenge were quite difficult and occasionally led to projects abandoning the challenge during construction.

In 2017, the Companies are considering reinstating a Zero Energy Homes tier for the RNC program.

Performance-Based Approach

Perceiving that it has increased participation rates, program staff observed that builders appear to prefer the performance-based approach. Builder and HERS rater interviewees agreed, reporting that the transition gives them more leeway in meeting program requirements. In their opinion, participation in 2016 differed from previous years in that the process is now more streamlined (confirming program staff perceptions) and easier due to increased flexibility in requirements, less paperwork, and better understanding from contractors and product manufacturers.

“The flexibility is great and means more builders are willing to look at the program.”

-Builder participant

Two builders’ experiences were no different than the previous year, and one thought the requirements and paperwork are, in one’s words, “getting worse.” Only one HERS rater noted a difference in program participation in 2016 compared to 2015, noting that the main

⁸ Through renewable-energy infrastructure, a ZNE home annually consumes no more energy than what it produces onsite.

challenge is communicating the differences between tiers to builders before construction. One Company’s program staff speculated that shifting away from basing incentives on tiers to a straightforward savings-based incentive system would help them to meet program goals more effectively.

3.4 APPLICATION PROCESS

- ***Interviewees see opportunities for improving the application process, such as fine-tuning communication, decreasing paperwork, and limiting redundancy.***

Eversource program staff opined that the application process is straightforward and streamlined. In-depth interviews asked builders and HERS raters to describe their experiences with the application process.

Initial Application/Pre-approval

Typically, HERS raters make the first contact with the program on behalf of the participant and submit an initial application. The initial application includes the construction design, which helps to inform the HERS rating with the associated incentive estimates. It also provides an estimated construction completion date—which could be two years after the submittal of the initial application.

Program staff rated the pre-approval process highly (mean of 4.5) on a scale of 1 to 5, where 1 is *very poorly* and 5 is *very well*, with one interviewee attributing to it the fact that *HERS raters have adapted so well* to the submittal process. Among numerous program components, HERS raters thought most favorably of this stage (Section 5.2 discusses HERS rater and builder satisfaction more thoroughly).

Final Application

When projects are completed, HERS raters electronically provide program staff with REM/rate files, invoices, Air-conditioning Heating & Refrigeration Institute (AHRI) certificates, and any other relevant inventory of the home.

- Program staff saw some—yet infrequent—challenges during this phase, recounting instances where they need to conduct a great deal of “back-and-forth” with HERS raters to obtain missing application pieces (e.g., lighting inventories). Builders and HERS raters also mentioned back-and-forth as a point of dissatisfaction.
- Program staff rated the final application process a 3.5 on the 1 to 5 *very poorly* to *very well* scale. Builders were least satisfied with this process. One builder explained,

“That was a nightmare. There were communication issues between me and the program. [I had to ask] ‘Did you receive [the application]?’ ‘When is the refund coming?’ There was a lot of back-and-forth. It was very annoying.”

Suggestions

Builders and HERS raters had some specific thoughts about improving the application process. When asked if there could be fewer steps in the participation process, five of six builders suggested ways to reduce the steps.

- Although all builders say the HERS raters handle most of the paperwork, two think applications could be simplified in some way.
- Similarly, three out of four HERS raters felt the application process has cumbersome paperwork. One HERS rater suggested putting all the paperwork for an application online to more easily track progress and compliance—program staff agreed that online applications would be preferable for program tracking as well.
- Currently, builders submit separate applications for each housing unit within a multifamily project. Two builders explained that the application process could be expedited if, once a builder has established a standard for their projects, they aggregate the units into a single application.
- One builder suggested that the program send confirmation emails indicating that applications have been received.

3.5 PROGRAM TECHNICAL SUPPORT

- ***HERS raters and builders are satisfied with technical program support, finding the seminars and program staff communication to be adequate. HERS raters see a need to increase builders' air leakage training.***

The program offers trainings that seek to meet the builders and HERS raters' most current needs.

- **Code compliance.** The program offers builders code compliance training to ensure builders know about the changing codes in the state and what that means for their building practices. Program staff explained that builders need to be informed as to why they should hire HERS raters to do envelope and duct testing, code requirements aside. In fact, the UI program staff perceived that the biggest advantage of the program for builders is that it provides them with the opportunity to prepare for code changes by gaining more experience working with HERS raters.
- **Certification programs.** The program offers trainings to HERS raters on topics such as ENERGY STAR New Homes and U.S. Department of Energy's Zero Energy Ready Homes programs to promote building certification programs.

Three of the six builders interviewed received program technical support, either by attending seminars or directly emailing program staff. They were fairly satisfied, offering an average rating of 4.3 on a 1 to 5 satisfaction scale where 1 is *very dissatisfied* and 5 is *very satisfied*. Some suggested that the program more readily provide a concise summary of program and code changes in practical terms (i.e., "plain English"). Two HERS rater interviewees said they received program technical support; they attended rollout seminars and directly corresponded with program staff. Their satisfaction was high—using the same satisfaction scale, they gave an average rating of 5.0, citing quick response times from program staff on their technical questions.

When asked if the program should offer more trainings, program staff were amenable but observed that builders already have difficulty finding time to attend trainings due to their

demanding schedules, yet coordinating trainings with educational credits appears to drive attendance.

Section 7.3 discusses recent building code changes. Currently, and in the past, builders reported reading codebooks and/or attending seminars and webinars to prepare for code changes. They said that they were satisfied with these means, but they noted that receiving more succinct explanations on the key changes would be helpful. All four HERS raters highlighted the need for trainings on air sealing; for example, a seminar that uses practical photos and covers *leakage pathways*, where to find them, and ways to seal them would help builders prepare for code changes.

3.6 PARTICIPATION DATA TRACKING

➤ ***Some program data tracking practices are problematic, especially for evaluation purposes.***

Upon receiving the application materials, program staff manually enter the information that HERS raters provide into the program tracking system to quantify energy savings and pay incentives to the applicants (builders or customers). The Companies do not consistently or comprehensively track contact information for the builder (or the homebuyer when the homebuyer is already in the picture).

Program staff saw an opportunity to streamline the data entry processes, suggesting—like one HERS rater—that HERS raters submit their applications online. Manually entering multifamily projects becomes particularly onerous, and not having the ability in the system to track certain phases of a project greatly hinders the program staff’s ability to ensure that completion dates are accurate.

The evaluation team came across challenges in obtaining and merging program data to execute evaluation efforts. These issues—present in either one or both Companies’ data—can present challenges not only for evaluation, but also for program implementation:

- **Data access.** Program staff had challenges accessing their own participation data. For example, compiling REM/rate files presented a challenge for program staff.
- **Unique identifiers.** REM/rate files did not include identifiers to link them to program participation and billing data. R1602 tasks included a baseline study and a billing analysis in addition to the process evaluation; carrying out the billing analysis proved challenging due to lack of a unique identifier to link billing data to REM/rate files. Housing units within a single site were disaggregated without a unique identifier present to demonstrate that they were part of the same site; this type of data tracking presents hurdles for evaluation sampling.
- **Disaggregated/Unorganized REM/rate files.** In some instances, HERS raters submit multiple REM/rate files during the program process. Without any standard naming convention, evaluation and data access are complicated. Staff have to manually go through records to make sure each home is represented with only one record and that the finalized record is used. Multiple files can occur when HERS raters do projected ratings, incorporate design changes, or make corrections.

- **Energy generation.** Participation data did not include the amount of energy PV systems generated. It is unclear if production data are untracked or if they are stored separately outside of billing data. This information is critical for a billing analysis.
- **Dwelling type.** The program participation data did not consistently or accurately track dwelling type.
- **New-service requests.** Not directly a program data issue, new-service request data did not include bill payer names, phone numbers, or email addresses. This, on top of missing dwelling type and construction type flags (e.g., gut renovation), made it difficult to develop a baseline study sample, requiring eight additional hours of staff time (costing over \$1,000).
- **Billing data.** Not a program data issue either, the program homes' billing data that one Company provided at the start of the project were incorrectly extracted. The evaluation team spent 25 hours working with this data, performing initial cleaning and exploratory analyses to learn that the data was incorrect. The revised extraction duplicated records, exaggerating energy usage, and unproductively using over 60 hours of the evaluation team's time.

At the time of the interview, UI program staff reported that UI is piloting a different program tracking system to consolidate the data and make it more easily accessible; Eversource did not have plans to make procedural changes.

4

Section 4 Awareness and Communication

One Company’s program staff thought that the program marketing and outreach were adequate; the other Company’s staff saw room for growth in terms of quantity, yet they acknowledged that there are many more *existing* buildings than new construction in Connecticut, which—in their opinion—more greatly warrants budget being allocated to existing homes programs over RNC programs.

The program performs its own marketing where it executes online campaigns, maintains a social media presence, issues press releases, conducts radio interviews, gives presentations and hosts booths at trade association trainings, and leverages other demand-side management programs. Program staff described how they contact builders directly to generate leads, and if program staff learn of a project, they will contact HERS raters to suggest pursuing the project. Builders recalled learning about the program through HERS raters or builder association conferences. HERS raters were unable to specify how they learned about the program, indicating that at the start of the program, they were already entrenched in the industry.

During the first quarter of each year, the program updates the website page; holds a rollout, inviting industry members (code officials, builders, HERS raters, etc.) to communicate program changes; and sends out email blasts to participating builders and HERS raters.

➤ ***Builders leverage the program as a “third-party” recognition to prove energy efficiency.***

The program does not engage in cooperative advertising efforts. When asked, builders said that they mention the program itself only in the context of the HERS score, explaining that the HERS score was ascertained through this *third-party* program. HERS raters agreed that builders’ marketing materials highlight utility bill savings and *energy efficiency* in a general sense. Most trade ally interviewees (five out of six builders and three out of four HERS raters) said that homebuyers do not usually know that the home has received program incentives; builders explained that they limit their discussions about the program because customers become *glossy-eyed* when they dig into energy efficiency details; builders saw a need to increase brand recognition and added that customers relate more to discussions of how their energy bills are impacted.

According to their reports, builders do not pass rebate savings on to the homebuyers. Builders said this is because they themselves put the time and money into the efficiency upgrades and build the rebates into their business models, while the homeowners benefit from reduced utility costs over time. As one builder put it,

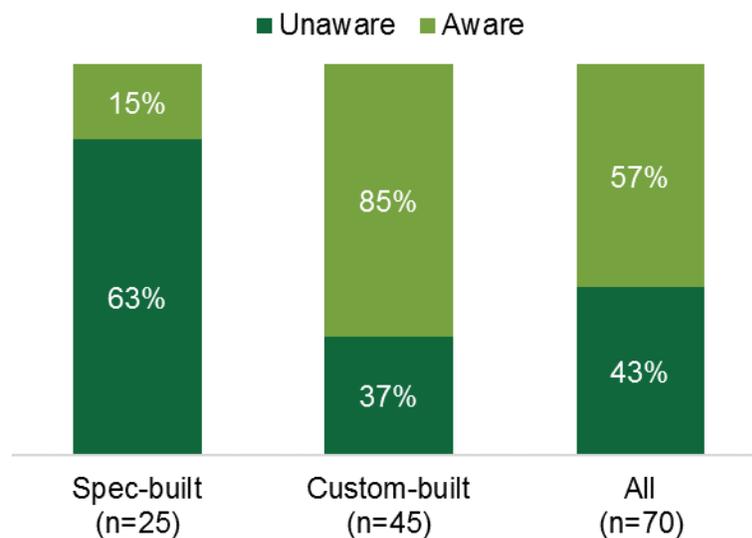
“I don’t specifically [discuss the program with customers]. That rebate is part of my profit margin now. It’s not a bonus.”

Builders and HERS raters discussed the need to educate market actors about the program to further incentivize builder participation, speculating that builders will participate if they think it will help sell their homes more quickly and at a higher price point. One HERS rater observed a need to educate real estate assessors and brokers about the program so that the value is better communicated to homebuyers and to help them distinguish between advanced energy-efficient designs associated with the program and standalone energy-efficient measures (i.e., just because a home has energy-efficient windows does not mean it is an energy-efficient home).

- ***With builders and architects acting as conduits, homebuyers are often, yet not always, aware their homes participated.***

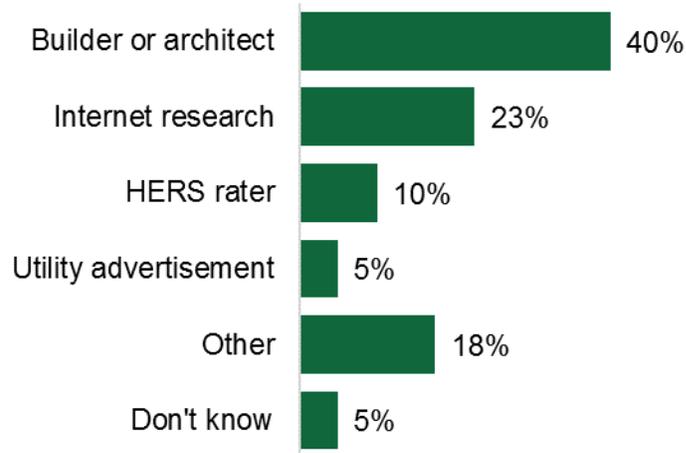
More than one-half of the 70 homebuyer survey respondents were aware of the program before the survey (57%), and all of those 40 respondents knew that their homes participated in it (Figure 3). Likely because they were more involved in the construction process, those with custom-built homes (85%) were notably more likely than those with spec-built homes (15%) to be aware of the program.

Figure 3: Homebuyer Awareness of Program and Participation
(Participating homebuyer CATI survey)



Two-fifths of the homebuyer participants who were aware of the program reported first learning of the program through their builders or architects, and close to one-quarter found it through internet research (23%). HERS raters (10%) and utility advertisements (5%) were less common means of hearing about the program (Figure 4).

Figure 4: Homebuyer Means of First Learning about Program
(Participating homebuyer CATI survey)



Base includes respondents aware of the program

(n=40)

5

Section 5 Participation

The process evaluation explored various aspects of participation, seeking to:

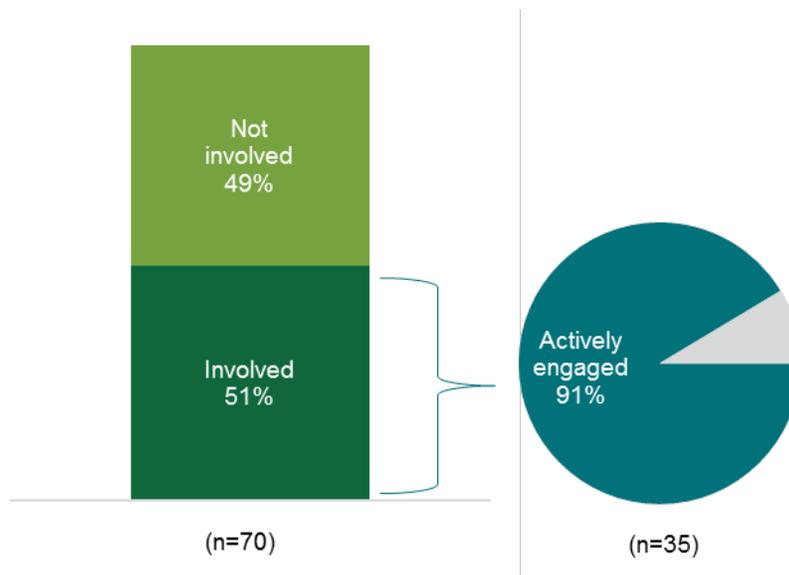
- Understand the ways in which homebuyers participate in the program
- Assess how satisfied HERS raters and participants are with the program
- Interpret what drives market actors to participate and what impedes their participation
- Identify what types of incremental costs may be involved in participating
- Characterize how multifamily participation is treated
- Forecast the way market transitions may impact participation

5.1 NATURE OF HOMEBUYER PARTICIPATION

- *When aware of the program, most homebuyers are actively involved in the participation process, often in the form of measure selection.*

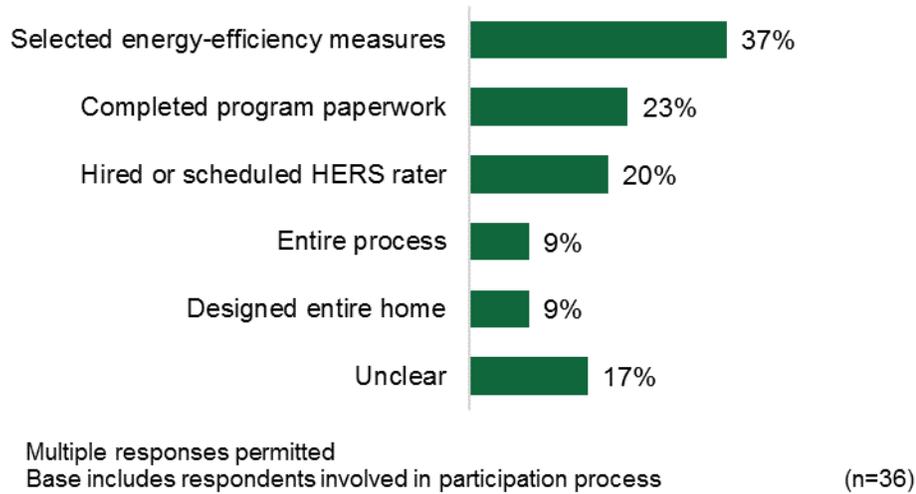
Fifty-one percent of homebuyer participants—or 90% of those aware that their home participated—were involved in the program participation process. Most of them (91%) reported that they were *actively* involved with program participation (Figure 5).

Figure 5: Homebuyer Level of Involvement in Program Participation
(Participating homebuyer CATI survey)



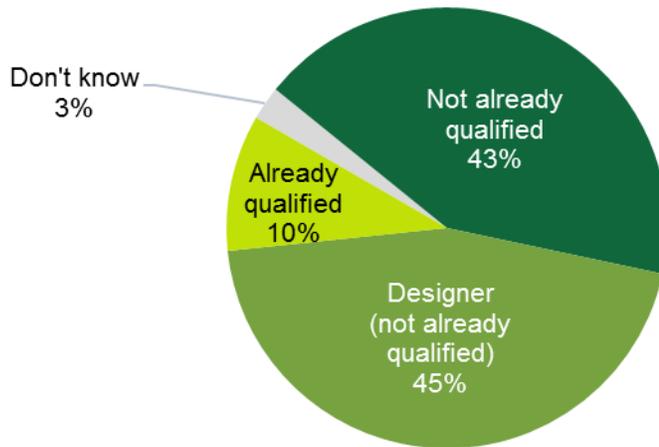
Homebuyers that were involved described the ways in which they contributed to program participation (Figure 6). Most often they described how they selected energy-efficiency measures for the home (37%), particularly HVAC systems. Nearly one-quarter completed the program paperwork (23%), and one-fifth characterized their involvement as hiring or working with the HERS rater.

Figure 6: Nature of Homebuyer Involvement in Program Participation
(Participating homebuyer CATI survey)



Only 4 of the 40 respondents who were aware of their program participation said their homes were already qualified for the program when they first looked at the home. Most (88%) recalled that their homes were not already qualified, either because they themselves were the designers or the home simply was not yet qualified (Figure 7).

Figure 7: Homebuyer Timing of Program Qualification Awareness
(Participating homebuyer CATI survey)



Base includes respondents aware of participation (n=40)

5.2 PROGRAM SATISFACTION

- **Satisfaction is high, especially with HERS raters' performance. Builder resistance may cause some challenges for HERS raters, but HERS raters' dependence on the program leaves them satisfied.**

Program staff applauded current program operations, associating *repeat clients* with a positive participation experience. As evidence, builders reported a high level of overall satisfaction with the program, providing an average rating of 4.0 on a scale of 1 to 5, where 1 is *very dissatisfied* and 5 is *very satisfied* (Figure 8).

HERS raters gave an average rating of 4.1. They explained that they appreciate the job security the program provides; in fact, three of the four interviewees said that generally the program drives the majority of their business in Connecticut.

- **Participation type.** Using the same scale to rate specific program components, builders were most satisfied with *deciding which tier or certification to pursue* (4.3), although generally they said this step was done largely through consultation with the HERS raters.
- **Initial application.** Rating the same program components, HERS raters thought most favorably of *submitting the initial application* (4.7). One highlighted that responses always came within 24 hours of submitting it.
- **Completed application.** As noted in Section 3.4, builders were least satisfied with *submitting the complete application*, giving an average rating of 3.0.
- **Interactions with builders.** HERS raters gave the most negative ratings for their *interaction with builders* (2.9) saying that the tiers can be confusing to explain and

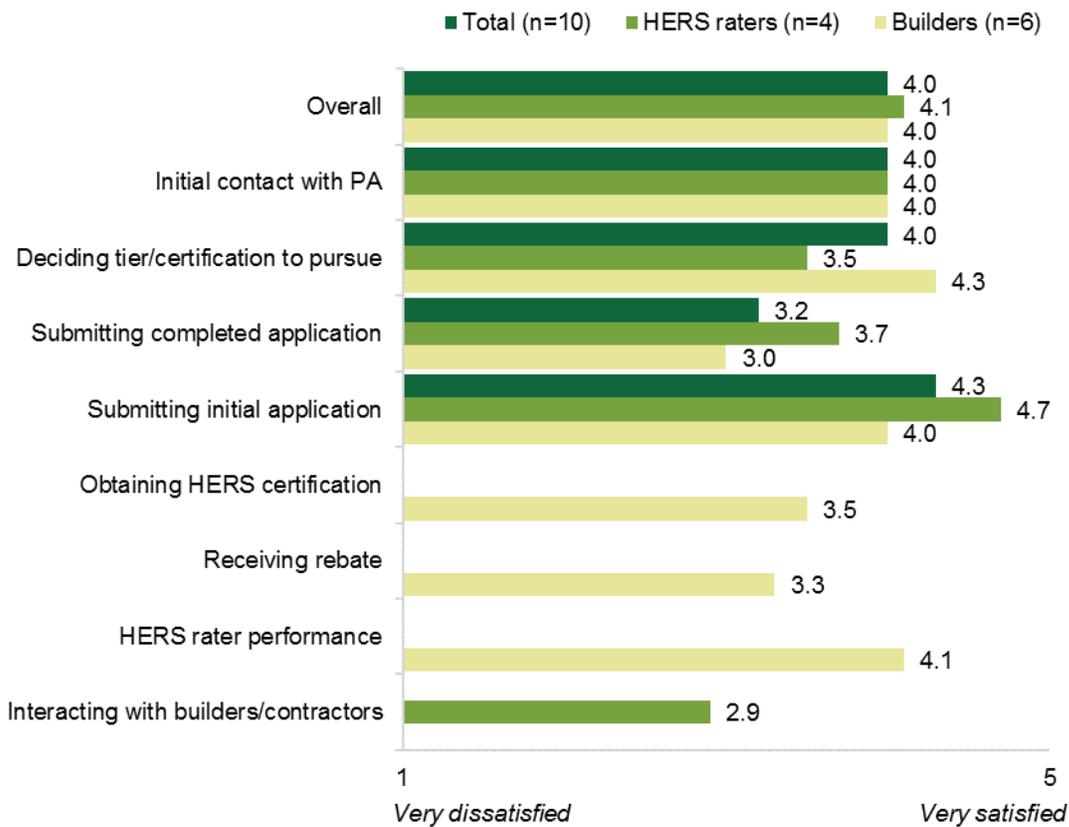
"I am very satisfied with the program. I think it's great."

-Builder participant

that builders are resistant to instituting changes. Specifically, HERS raters cited builders being resistant to tight air leakage requirements; indeed, one builder said he does not “believe” in making houses “air tight.”

- **HERS rater performance.** As mentioned, program staff were highly pleased with participating HERS raters’ performances (Section 3.1). Builders had high levels of satisfaction with *HERS rater performance* as well, rating their satisfaction a 4.1, on average.

Figure 8: Builder and HERS Rater Program Satisfaction
(Builder/HERS rater interviews, average ratings)



➤ **Homebuyers’ satisfaction is somewhat correlated with their expectations about energy bills.**

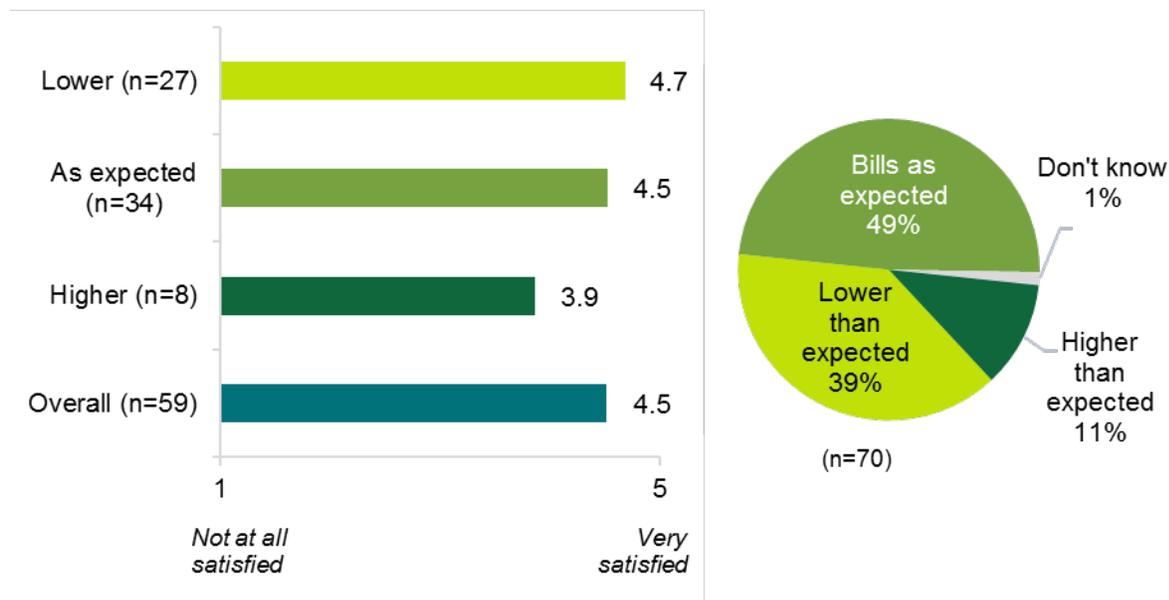
Using a scale of 1 to 5, where 1 equals *not at all satisfied* and 5 equals *very satisfied*, respondents gave an average rating of 4.5 when asked to rate how satisfied they were with the fact that their home participated in the program. Only two respondents gave low satisfaction ratings (1 or 2); one attributed her dissatisfaction with the program to perceiving that her insulation and heating system were inadequate, leaving the home feeling cold.

As shown in Figure 9, there was some correlation between satisfaction and perceptions of energy bills, yet sample sizes were too small to draw statistically significant conclusions.

Nearly one-half of homebuyers (49%) reflected that their home’s energy bills were on par with what they expected, and nearly two-fifths (39%) estimated that their energy bills were lower than expected; only 11% of respondents had anticipated their bills would be lower than reality. Respondents who incurred lower bills than anticipated gave a mean rating of 4.7, while respondents who incurred higher bills than anticipated gave a mean rating of 3.9.

Figure 9: Homebuyer Energy Bill Expectations and Satisfaction with Participation

(Participating homebuyer CATI survey)



5.3 DRIVERS TO PARTICIPATION

- **Program participation offers builders the needed support to improve practices and drives HERS raters’ businesses. Homebuyers, possibly comforted by the third-party recognition, estimate that program-certified homes offer value for the money.**

Interviewees summarized participation benefits:

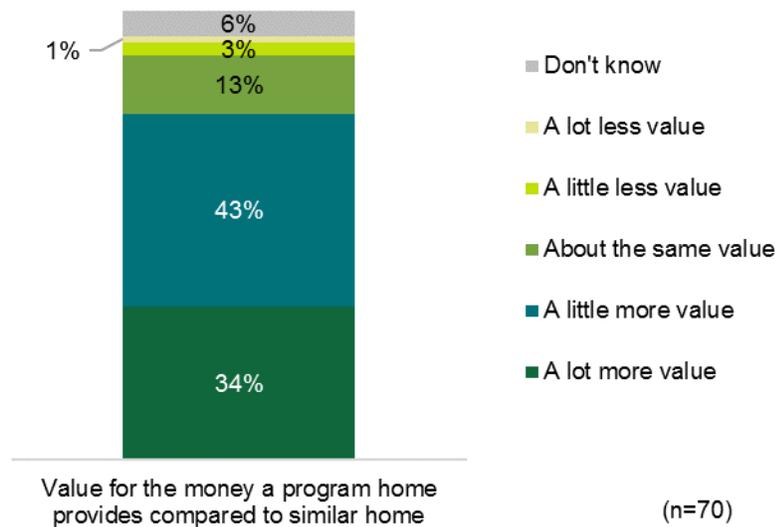
- **Builders.** Builders explained that they became involved with the program because they wanted a “marketing edge” or their companies valued energy efficiency. When asked to identify the biggest advantage they get from participating in the program, builders identified the rebate, saying it supports them so they can build a better product, thus easing the burden of getting over the learning curve.
- **HERS raters.** HERS raters reported that the biggest advantage for them was the business the program funnels to them in Connecticut.
- **Homebuyers.** Program staff saw homebuyers’ primary benefits of participating as 1) the cost savings they see on their energy bills and 2) the third-party energy consultant ensuring the house is built properly, adding that this in turn acts as a boon to the builders—a benefit that builders leverage. Six of the ten trade ally interviewees

thought the fact that a home has participated in the program acts as a good selling point, but slightly more interviewees (eight) perceived that ENERGY STAR certification is a good selling point due to label recognition. Overall, builders and HERS raters felt that both the program and ENERGY STAR label have little effect on the final decision and that homebuyers do not understand their significance or the distinction between them.

Surveys asked homebuyer participants how much value for the money they thought a program-certified home provides compared to a similar home which is not certified. As shown in Figure 10, homebuyers most often estimated that it has either a little (43%) or a lot (34%) more value than a similar home. As mentioned, one HERS rater observed a need to educate real estate assessors and brokers about the program so that the value is better communicated to homebuyers and to help them distinguish between an advanced energy-efficiency recognition level and standalone energy-efficient equipment or measures.

As discussed in Section 6.2, homebuyers consider RNC program *qualification* and *rebates* as important factors in their homebuying and homebuilding processes: using a scale of 1 to 10, where 1 is *not at all important* and 10 is *extremely important*, they rated them 8.8.

Figure 10: Homebuyer Perceptions of Program Value
(Participating homebuyer CATI survey)



5.4 BARRIERS TO PARTICIPATION

➤ **No single reason explains why homes may not participate in the program, but trade ally interviewees’ experiences indicate it could be attributable to differences in preferences or interests.**

Builder interviewees estimated that fewer than ten of their total 894 housing units they cumulatively expected to break ground within the next three years would not participate in the program, and based on their reports, less than 1% of builder interviewees’ homes in 2015

did not participate in the program. Trade ally interviewees listed reasons why homes might not participate in the program:

- One builder said that homes that do not participate are custom-built homes and that, for those future homeowners, features such as ample square footage (which could be diminished by the wall thickness required for energy-efficient insulation) outweigh energy efficiency. He described how those homes differed from program homes in that they used different insulation materials (such as fiberglass instead of spray foam).
- Only one HERS rater interviewee worked on homes that did not go through the program in Connecticut in 2015. The interviewee described how some builders set out with the intention to participate in the program, but after the HERS rating, their practices or timing ultimately do not meet program requirements, speculating that those homes' builders do not have the capability, desire, or time to adhere to program standards.
- The same HERS rater added that some homes do not participate if they contact the HERS rater too late in the construction process.
- HERS raters described nonprogram homes as those that are built just to code.

5.5 PARTICIPATION CHALLENGES

➤ *Trade ally interviewees are challenged by paperwork, delays in rebate issuance, underdeveloped builder and contractor skills, and HVAC subcontractor resistance.*

When it came to participation challenges, program staff observed that HERS raters are tasked with more burden than builders, having to gather paperwork and get to the site before construction is too far along.

- **Paperwork.** HERS raters agreed, citing paperwork as one of their top participation challenges. Nevertheless, builders still pointed to paperwork as one of their own top participation challenges.
- **Payout delays.** Program staff from both Companies, HERS raters, and builders mentioned that the payout process should be a little faster; in fact, builders cited the time lapse as one of their main challenges.
- **Skill development.** HERS raters listed keeping up with changing requirements and getting the builders to comply with requirements—such as air sealing and insulation installation. While builders did not directly voice this, three HERS raters perceived that the biggest challenge for builders was learning the skills to build a program home, specifically pointing to air-tightness techniques.

- **HVAC contractor resistance.** Additionally, both HERS raters and builders described communication challenges between HVAC contractors and HERS raters. They have found that HVAC contractors are resistant to the approaches needed to meet program requirements. HERS raters explained that HVAC contractors use “rule of thumb” calculations for equipment sizing as opposed to following Manual J calculations.⁹ One HERS rater described HVAC contractors as “the last holdouts.”

“The communication between HVAC contractors and HERS raters is the issue.”

-Builder participant

5.5.1 Incremental Costs

- **Builders estimate that program participation adds 6% to their construction costs, but believe the rebates often offset that amount. Homebuyers estimate that their homes cost a little more than comparable nonprogram homes but have more value than those homes.**

Not perceiving any overwhelming procedural challenges toward participation for builders, program staff speculated that builders may be deterred by the incremental cost they incur when they participate. Trade ally interviewees confirmed that builders do in fact incur incremental construction costs when they participate in the program; however, some felt the rebates covered the costs. Upgraded materials, equipment, labor, and the HERS testing account for most of those costs, in their experiences. One builder summarized,

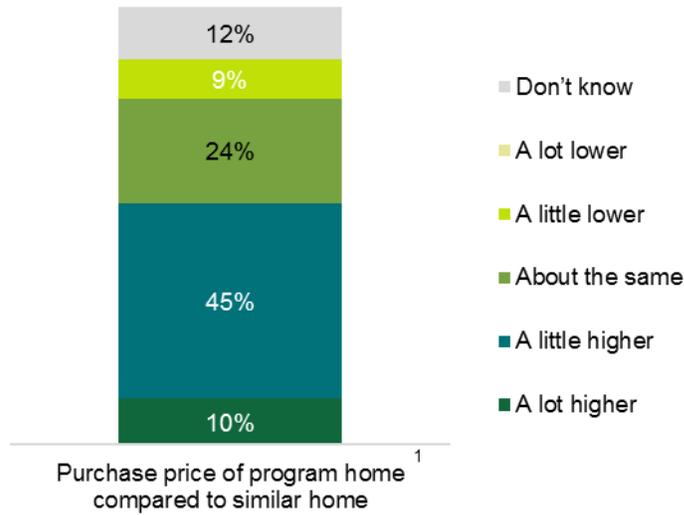
“It costs more absolutely, that’s why we count on the rebates to help offset those costs for rigid foam, spray foam, and upgraded HVAC. We spend more but we get some back. We also have to pay the HERS rater.”

One HERS rater observed that builders who had experience with energy-efficient building could participate with no increased costs, reporting that one builder, in fact, *has it down to a science*. On average, builders estimated that the cost of participating in the program usually adds about 6% to their total construction costs. The incremental costs were attributed to purchasing new materials, increased labor (such as for air sealing), HVAC equipment, and hiring HERS raters. HERS raters estimated that builders’ incremental costs were 8% higher.

Homebuyer surveys asked participants how the *purchase price* and *monthly costs* of owning a program-certified home compared to a home of similar efficiency level that is not certified by the program. Most estimated that the purchase price of a program-certified home is a little higher than that of a similar home (45%); next most commonly, they guessed that it would cost about the same (24%). Respondents most often perceived that the monthly costs of owning a program-certified home, including the combined cost of the mortgage payments and the energy bills, was a little lower (47%) or a lot lower (30%) than owning a similar home. Figure 11 and Figure 12 show responses in full.

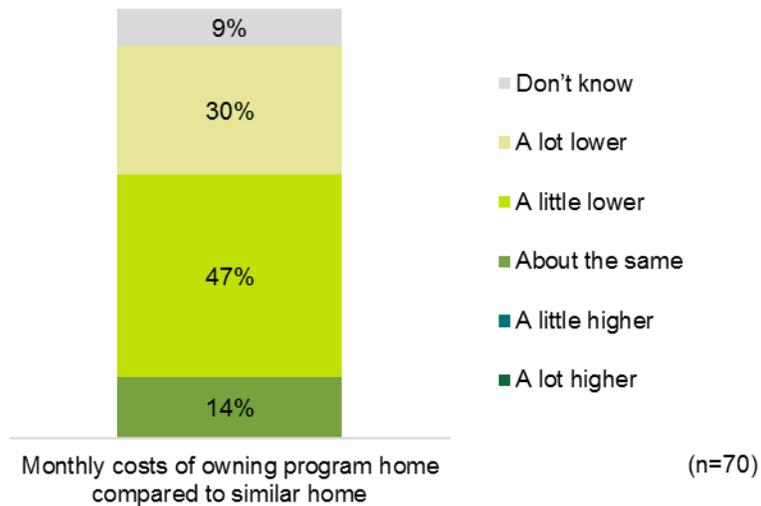
⁹ Manual J is a specific protocol used to estimate the heating and cooling a home needs. See <http://www.resnet.us/blog/manual-j-heating-and-cooling-load-calculation/> for more information.

Figure 11: Homebuyer Perceptions of Program Impact on Home Pricing
(Participating homebuyer CATI survey)



¹ A programming error skipped three respondents from this question. (n=67)

Figure 12: Homebuyer Perceptions of Program Impact on Home Costs
(Participating homebuyer CATI survey)



5.5.2 Multifamily Participation

- **According to interviewees, the program needs to tailor its processes to accommodate the growing multifamily new construction market through targeted marketing, decreased testing, and paperwork reductions.**

Program staff noted that eliciting participation from multifamily developers presents a challenge, attributing it to the *split-incentive*¹⁰ dynamic and assessing that the program has already established a strong rapport with existing single-family builders. Program staff saw great potential in tapping the multifamily market, but admitted the challenge of that is keeping up with the everchanging builders that flow in from other states. They described how the program has made efforts to attract this group—even going as far as creating a multifamily-specific HERS rater list. Program staff suggested that the program develop its messaging to target multifamily developers.

Two multifamily builders wanted the program to tailor more to multifamily projects. Given that some HERS raters must test all multifamily units for air leakage, one suggested revising the requirement so that *all* HERS raters need only to test a sample of housing units.¹¹ Another suggested allowing builders who have gone through the program numerous times to be able to reuse paperwork and have less testing.

The share of new building permits for multifamily new construction has been increasing in Connecticut.¹² Most builders (four of six) and every HERS rater anticipated that this trend will continue and that it will require more education about *compartmentalization*. *Compartmentalization* refers to the requirement that each unit receive a blower door test to verify an ACH50 value of 5 or less if the unit is greater than 850 square feet and an ACH50 value of 6.5 or less if the unit is less than 850 square feet.¹³ Currently, HERS raters feel builders do not understand the differences in air sealing units based on their location in the building (e.g., corner, side, or elevator shaft) or do not see a need to air seal individual units along with the entire building.

¹⁰ Split-incentive refers to instances where the party investing does not reap the benefits; for example, a landlord might invest in energy-efficient equipment, but if their tenants pay their own bills, the landlord may not realize a return on investment in the form of reduced energy bills.

¹¹ HERS raters must be certified to do sampling by their RESNET providers to conduct sampling in the RNC program, and that sampling must be consistent with RESNET guidelines.

¹² <https://www.census.gov/construction/bps/stateannual.html>

¹³ ACH50 refers to *air changes per hour* with a pressure gradient of 50 pascals between the inside and outside of the unit.

6

Section 6 Attitudes and Demand

This section summarizes homebuyers' attitudes toward energy efficiency and their demand for it.

6.1 DEMAND FOR ENERGY EFFICIENCY

- ***Trade allies see some demand for energy efficiency, but they do not expect homebuyers to place much weight on it.***

Builders and HERS raters had mixed observations about whether homebuyers' demand and expectations for energy-efficient homes have increased over the past few years. Builders were evenly split on the issue, while three out of four HERS raters said there had been a slight increase in demand. Four builders and three HERS raters perceived that homebuyers are willing to pay more for energy-efficient homes. They described interested customers as those who are energy-conscious and typically higher income, although interviewees characterized low-to-moderate-income buyers as valuing energy efficiency to save money on their utility bills and to financially support a house in the long term. On average, they speculated that about one-third of homebuyers (32%) would be willing to pay more, estimating they would be willing to pay about 5% more than they would for a non-energy-efficient home.

Five of the six builders and two of the four HERS raters reported that they recommend homebuyers add energy-efficient features to their new homes, with most reporting that cost generally impedes homebuyers from implementing the recommendations. All six builders reported that their sales efforts highlight the energy-efficiency levels of the homes that they build; when they do so, they typically emphasize savings on utility bills, the ENERGY STAR label if applicable, HVAC equipment, LED lighting, and insulation.

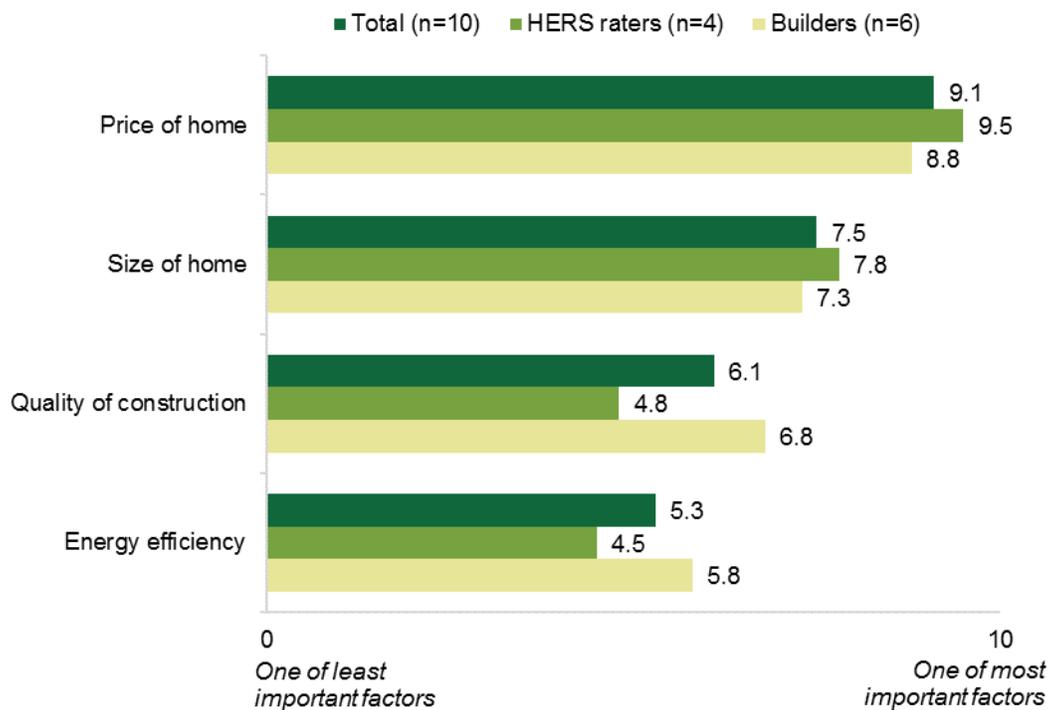
6.2 DECISION-MAKING FACTORS

- ***Homebuyers report that they most value quality of construction and the opportunity to be involved in decision making, yet lower energy bills and energy efficiency are high-ranking factors, too.***

Generally, trade ally interviewees believed that customers currently have more interest in energy efficiency than they used to and that their awareness is growing; however, in the interviewees' opinion, energy efficiency does not greatly impact homebuyers' decision making. Trade ally interviewees asserted that homebuyers dismiss energy-efficiency features in the face of costs or other factors such as square footage reductions.

When asked to rate the importance of four factors to homebuyers, using a scale of 0 to 10, where 0 is *one of the least important factors* and 10 is *one of the most important factors*, builders and HERS raters perceived that price was most important—rated at 9.1, on average (Figure 13)—while they rated energy efficiency as least important (5.3, on average).

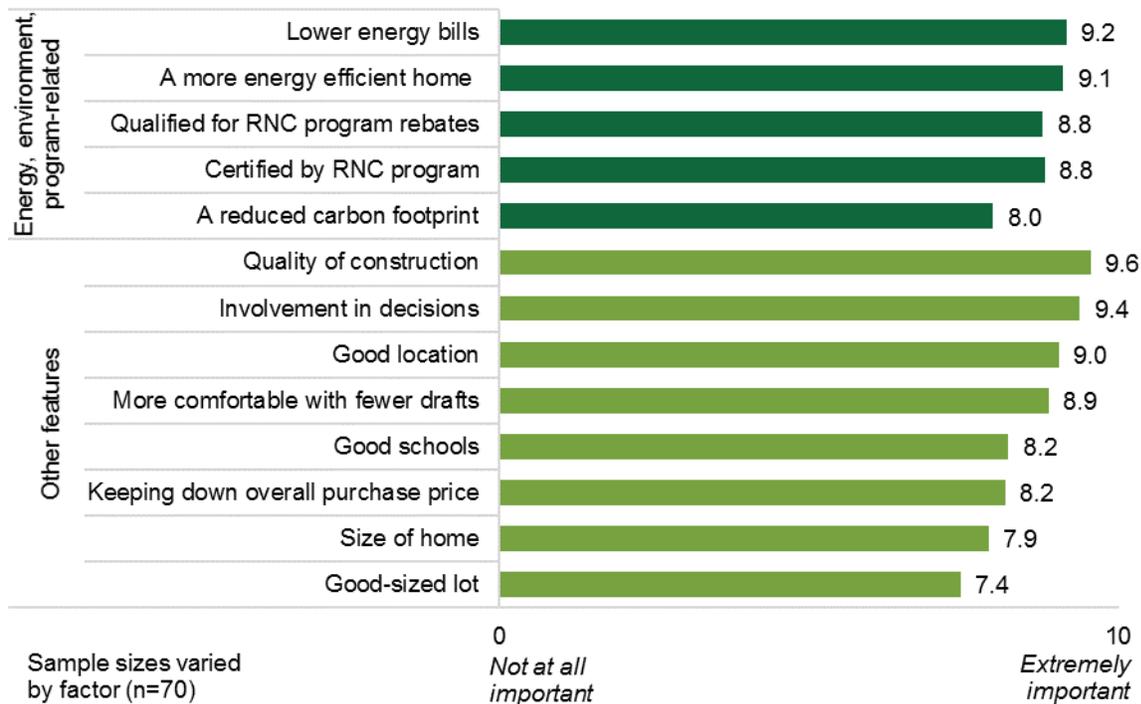
Figure 13: Builder and HERS Rater Perceptions of Homebuyer Values
(Builder/HERS rater interviews, average ratings)



Using a similar 0 to 10 scale, where 0 is *not at all important* and 10 is *extremely important*, homebuyer participants rated the importance of these and even more factors involved in their home purchasing/building processes (Figure 14). Their values did not perfectly align with those of the builder and HERS rater interviewees.

- Homebuyers rated quality of construction (9.6) the most highly, on average. Trade ally interviewees, in contrast, did not think that homebuyers highly valued quality of construction (6.1).
- Trailing closely, homebuyers rated the opportunity to be involved in decisions about features of the home (9.4) as an important factor.
- Trade ally interviewees perceived that homebuyers did not value energy efficiency (5.3), but homeowners rated energy efficiency a 9.1, on average. Among energy and environmental factors, homebuyers were most concerned with low energy bills (9.2) and energy efficiency (9.1).
- Both trade ally interviewees (8.5) and homebuyers (9.0) agreed that location is an important priority.
- Reducing carbon footprint (8.0) and the size of the home (7.9) and the lot (7.4) were the least important factors for homebuyers.

Figure 14: Homebuyer Factors in Purchasing and Building Decisions
 (Participating homebuyer CATI survey, average ratings)

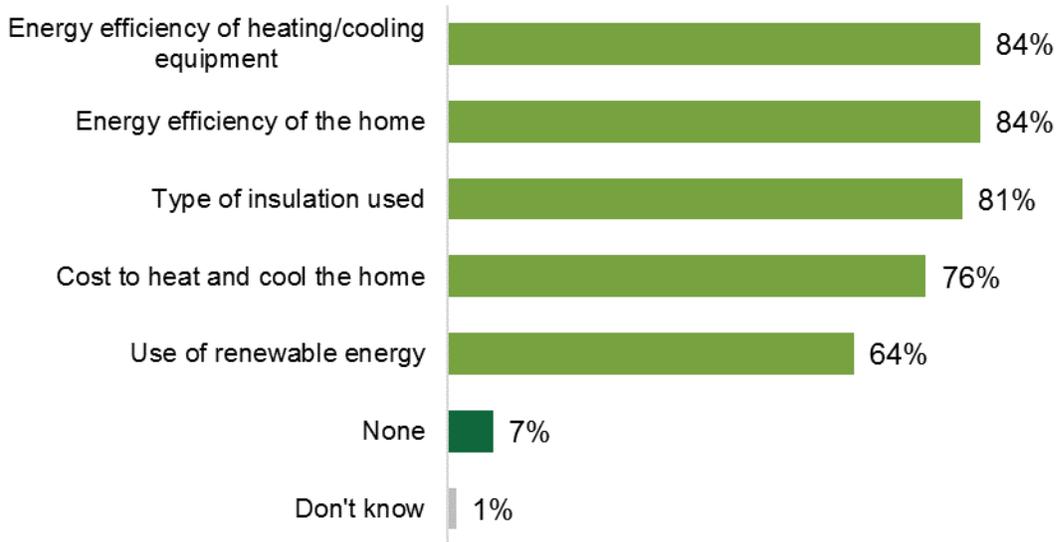


Overall, respondents were fairly engaged in energy-related features in their discussions over building or purchasing a home (Figure 15). When asked about the topics of discussion that they had with trade professionals such as realtors, designers, or builders while shopping for, designing, or constructing their new homes, homebuyers reported discussing the energy efficiency of their heating and/or cooling equipment (84%) and the general energy efficiency of the home (84%) most often. Of the topics asked about, they were least likely to discuss renewable energy, yet close to two-thirds discussed it (64%).

Only one respondent felt that the trade professional could not answer his question satisfactorily; the respondent recalled asking about the annual fuel utilization efficiency (AFUE) level of the furnace that was either already installed or about to be installed.¹⁴

¹⁴ While AFUE levels are often on the side of furnaces, this furnace or its literature possibly lacked proper, unclear, or inconsistent documentation of the AFUE rating.

Figure 15: Homebuyer Topics of Discussion with Trade Professionals
(Participating homebuyer CATI survey)



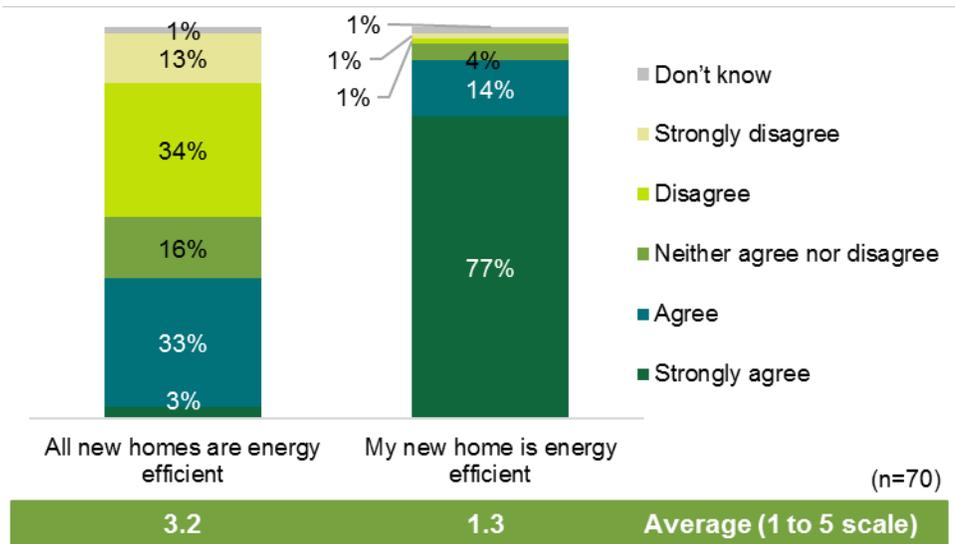
Multiple responses permitted

(n=70)

6.3 KNOWLEDGE OF ENERGY EFFICIENCY

Homebuyers rated their levels of agreement with two statements about new construction and energy efficiency: *All new homes are energy efficient* and *My new home is energy efficient*. The majority strongly agreed that *their* new home is energy efficient (77%), but only 3% agreed that *all* new homes are energy efficient. Figure 16 compares the range of their responses and the average ratings, where 1 is *strongly agree* and 5 is *strongly disagree*.

Figure 16: Homebuyer Perceptions of New Construction Energy Efficiency
 (Participating homebuyer CATI survey)



7

Section 7 Program Influence and Relevance

R1602 did not estimate net-to-gross or quantify program influence or market effects; however, the interviews and CATI survey offered insight into the program’s general impact on the market and building practices, and its importance and relevance for customers.

7.1 BUILDER PRACTICES

- ***Trade ally interviewees report that the program has changed builders’ practices, and builders would have been unlikely to make those changes without the program.***

To assess the program’s general impact on building practices, interviewees asked trade allies the following questions:

1. *Have builders changed their practices?*

When asked, all four HERS rater interviewees speculated that participating builders changed their building practices *specifically* to participate in the program. On average, they estimated that 83% of the builders they worked with changed their practices after participating in the program. They observed that builders improved their air leakage techniques and insulation materials and installation.

All six builder interviewees said they have changed their practices since participating in the program. Nonetheless, HERS raters explained that some builders will not change because they do not “buy into” the building science, specifically air tightness requirements. HERS raters discussed that some builders just want to build the way they have always built and will never change. From HERS raters’ perspective, 10% to 20% of builders simply do not trust findings demonstrating the benefits of tight homes and instead prefer to build by their own philosophy that “houses should breathe.” Only one builder asserted that he disagreed with building science.

“I learned about how small changes could effectuate a big return.”

-Builder participant

2. *What changes have builders made?*

Builders listed the practices they have changed since participating: four of the six recalled how they have prioritized air sealing and *flashing*,¹⁵ and three mentioned upgrading insulation types and improving installation techniques; they also mentioned paying more attention to ductwork (sealing and location) and using advanced framing techniques. HERS raters’ observations confirmed these changes.

¹⁵ *Flashing* refers to a practice in which a thin layer of spray foam is applied to a home’s thermal envelope to supplement insulation thickness and air seal.

3. *How likely would builders have been to change?*

Interviewers asked builders who changed their practices how likely they would have been to make the changes if the program had not been available. Using a scale of 1 to 5, where 1 is *not at all likely* and 5 is *very likely*, they rated their likelihood 2.2, on average. Similarly, interviewers asked HERS raters to rate the likelihood that they perceived among builders changing their practices; the HERS raters attributed even more influence to the program, giving an average rating of 1.2. Builders pointed to the program as a crucial source for building science education that also offset the costs of the educational process and changed practices.

4. *Have learned practices been implemented outside of the program?*

When asked if they applied what they learned in their program projects to nonparticipating projects, five of the six builders interviewed recalled that they had, although one said it was contingent on costs. They described how they are now more conscientious about how they install measures and install more energy-efficient measures. One even noted that they now treat basements differently, considering them as part of the house rather than a *dark dank area*. As one particularly enthusiastic builder put it,

“I learned about how small changes could effectuate a big return, so I was all about it. And when you do well on one home, you want to do better on the next, so you do more and more. It becomes a game.”

7.2 HERS RATERS

➤ ***The program has been “vitally important” for the growth of the HERS rater industry in Connecticut; however, other market forces have contributed to HERS rater businesses’ establishment and will contribute to their growth, including the mortgage industry, ENERGY STAR, ZNE, and energy codes.***

As discussed, not all HERS rater interviewees’ projects went through the program: 20% of the most active HERS rater’s company’s projects were nonparticipants (Section 2.1). This raises the question of why their projects would need to be HERS rated without going through the RNC program. Some builders set out with the intention to participate in the RNC program, but after the HERS rating, their practices or timing ultimately do not meet program requirements (Section 5.4). As noted in Section 5.3, all HERS rater interviewees said that the program drives their businesses; however, numerous dynamics come into play when assessing the program’s level of influence on the HERS rater industry.

- One of the less active HERS raters speculated that the HERS market would not currently exist in Connecticut without the program, saying the program has been and will be “vitally important” for the growth of HERS rater business.
- The active HERS rater recalled that his company and other HERS raters were already established in the area before the RNC program because of the 1970’s formation of RESNET to serve the mortgage industry. Some program participants have alternative motives when approaching HERS raters, but HERS raters direct them to the program. The interviewee explained how some customers come to them on a path to obtain

the ENERGY STAR Home Performance label or ZNE certification—not the RNC program—but his company directs these customers to participate in the RNC program as well. While he could not estimate the proportion of his company’s business today that is attributable to the program specifically, nor how much business they would lose if the program ceased, he reflected that his company has had a “symbiotic relationship” with the program since the program’s inception—the interviewee recalled a surge in business once the program enticed builders with the incentives.

- HERS raters believe that their businesses will grow further due to the newly enacted energy codes which require additional testing and verification (Section 7.3). The active HERS rater reported how customers also historically came to him to comply with energy code and then, with the program’s emergence, he directed them to the RNC program.

➤ ***HERS rating appears to be an important element. Program HERS raters have impacted builders’ practices. More than one-half of homebuyer participants report that they considered their homes’ HERS scores.***

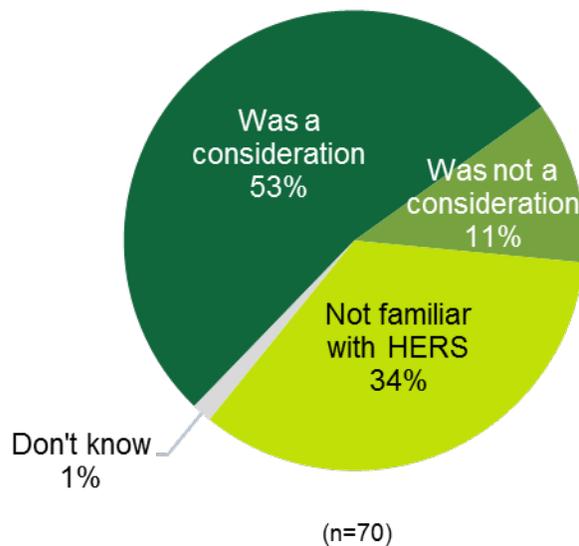
Nearly all builders (five of six) assessed that their interactions with program HERS raters specifically have changed or will change their own construction practices. They said that HERS raters recommended air sealing, duct sealing, heat recovery ventilator systems, efficient mechanical equipment, spray foam, LED lighting, and low-emissivity windows. The builders explained that they now air seal and duct seal more effectively such as by using flash and batting.¹⁶ HERS raters and builders also discussed transforming to a holistic building approach by bringing the builder, architect, homeowner, HERS rater, and contractors together during the design phase, thus allowing analysis of benefits and trade-offs for various energy efficiency options. One builder appreciated,

“One of the great things our HERS rater does is at the beginning of the project, they put together a spreadsheet where they show us different options we can use, such as different types of windows, R-values, etc. So, they’ve actually worked very closely with us at project startup to lay it all out and say, ‘Look, here are ten different options.’”

Using a scale of 1 to 5, where 1 is *not at all familiar* and 5 is *very familiar*, homebuyers rated their familiarity with HERS ratings a 3.4, on average. About one-third (34%) were not too familiar (giving familiarity with ratings of 1 or 2). As shown in Figure 17, more than one-half of homebuyers (53%) considered their homes’ HERS ratings during the building and/or purchasing decision.

¹⁶ Similar to flashing, *flash and batting* refers to filling wall cavities with fiberglass batts after flashing.

Figure 17: Relevance of HERS Scoring for Homebuyers
(Participating homebuyer CATI survey)



Builders and HERS raters predicted that the RNC market in Connecticut will grow slightly in the next three years and that it will grow relatively similarly to how it has the last few years—which they feel is slow due to what they view as a stagnant economy in Connecticut. Like program staff, builders and HERS raters thought there were enough qualified HERS raters to meet the coming demand. One builder disagreed, citing his experience with overbooked HERS raters. One HERS rater suggested the program partner with Northeast HERS Alliance to offer a training facility or subsidize training costs should the program see a need for more raters.¹⁷

7.3 ENERGY CODE

- ***From the HERS raters' perspectives, builders would benefit from air-sealing training to meet 2012 International Energy Conservation Code (IECC).***

Starting in the fall of 2016, Connecticut adopted a new energy code based on the 2012 IECC.¹⁸ Builders reported that this change has not affected their work yet (likely because it was so recently enacted), and they did not expect it to change their work much in the future. The biggest change, some noted, was the lower air-exchange rate requirement. HERS raters think it will provide more business for them because now air and duct leakage must be tested and third-party verification is required for certain measures, such as insulation installations.

¹⁷ Northeast HERS Alliance is an industry organization for HERS raters and building science professionals, offering trainings and extended learning seminars on state of the art building science issues. For more details, see <http://www.nehers.org/>.

¹⁸ For more details, see <http://www.iccsafe.org/about-icc/government-relations/international-energy-conservation-code-resource-page/>.

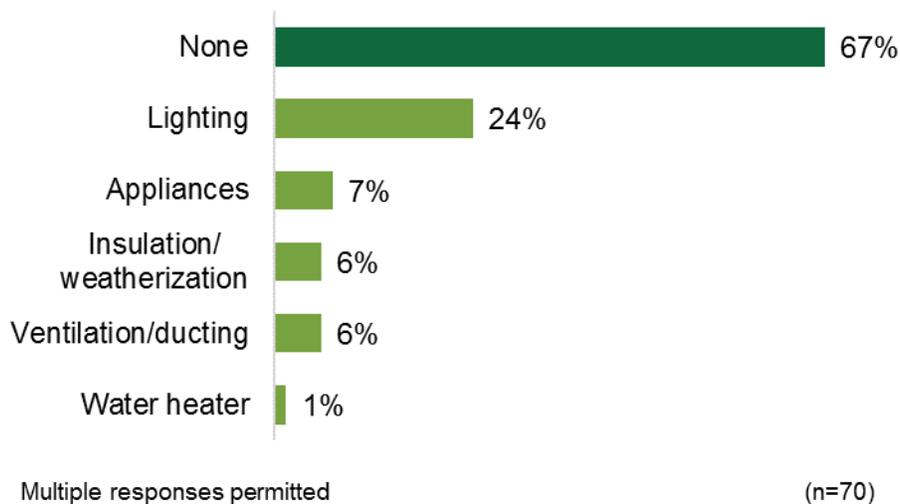
Two HERS raters expressed concern that builders are not prepared to meet the air-leakage requirements.

7.4 MEASURE PERSISTENCE

➤ **Homebuyer reports indicate measure persistence is high.**

The study measured the extent to which homeowners remove or change energy-efficient equipment that is installed after the home goes through the participation process by asking participants if they made changes to any major measures. There was no clear sign of persistence issues that would decrease energy efficiency (Figure 18). Two-thirds of homebuyers made no changes. In fact, it appears that changes typically increased energy efficiency. Close to one-quarter (24%) made changes to lighting, generally replacing CFLs or other lighting with LEDs (13 of 17) and not making changes to fixtures. Five respondents (7%) replaced or added new appliances, but only one of them specified that their replacement appliances were energy efficient; several others added insulation or weather-stripping.

Figure 18: Energy-Efficiency Features Changed since Participating
(Participating homebuyer CATI survey)





Appendix A Additional Homebuyer Survey Details

The following appendix offers additional details from homebuyer surveys.

A.1 ATTITUDES TOWARD GLOBAL WARMING

Gallup regularly conducts polls measuring US households' attitudes toward the environment and global warming. As shown in Figure 19, a couple differences between the program participants and the general population may be counterintuitive at first glance:¹⁹

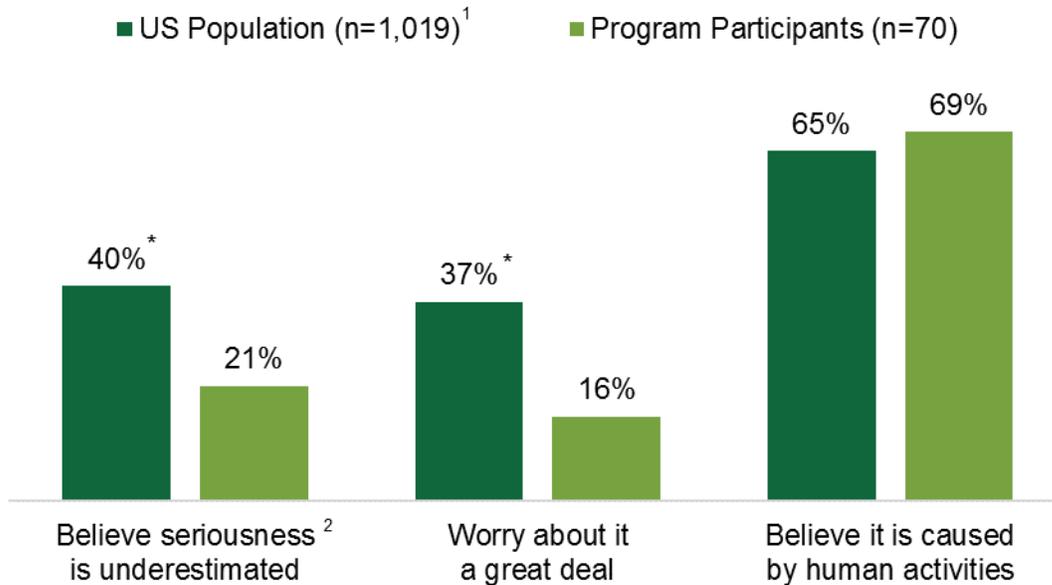
- Compared to the population (40%), program participants (21%) were significantly less likely to perceive that the seriousness of global warming is *generally underestimated* in the news. However, as shown in

¹⁹ The reader should note that differences may not just reflect differences between the US population and program participants, but it may also reflect differences between the US population and Connecticut residents.

- Table 3 below the figure, program participants were also significantly more likely to say that it was *generally correct* (53% compared to 25%) while the population was significantly more likely to say it was *generally exaggerated* (34% compared to 17%).
- Program participants (16%) were also significantly less likely than the population (37%) to report that they frequently worry about global warming *a great deal*. Yet, as shown in

- Table 3, program participants still were concerned—they were significantly more likely to say they worried about it a *fair amount* (44% compared to 27%).
- Compared to the population (65%), program participants (69%) were about equally likely to believe that increases in the earth’s temperature over the last century are due more to human activity than natural causes.

Figure 19: Homebuyer Attitudes toward Global Warming
(U.S. population survey and participating homebuyer CATI survey)



* Statistically significantly different at the 90% confidence level.

¹ Gallup News Service. *Poll Social Series: Environment*. March 2016

² Asked only of 504 Gallup poll respondents.

Table 3: Homebuyer Attitudes toward Global Warming
(U.S. population survey and participating homebuyer CATI survey)

Response Category	US Population (n=1,019)	Program Participants (n=70)
Thinking about what is said in the news, in your view is the seriousness of global warming...		
Generally, exaggerated	34%*	17%
Generally, correct	25%	53%*
Generally, underestimated	40%*	21%
<i>Don't know</i>	2%	9%
How much do you personally worry about global warming? Would you say...		
Great deal	37%*	16%
Fair amount	27%	44%*
Only a little	17%	26%
Not at all	19%	13%
<i>Don't know</i>	0%	1%
And from what you have heard or read, do you believe increases in the earth's temperature over the last century are due more to...		
Human activities	65%	69%
Natural causes	31%	27%
<i>Don't know</i>	4%	4%
Generally exaggerated	34%	17%
Generally correct	25%	53%

* Statistically significantly different at the 90% confidence level.

A.2 DEMOGRAPHIC AND HOME CHARACTERISTICS

Table 4: Homebuyer Demographic and Home Characteristics
(Participating homebuyer CATI survey)

Demographic/Characteristic	n=70
Income category	
\$35,000 to \$49,999	1%
\$50,000 to \$74,999	4%
\$75,000 to \$99,999	3%
\$100,000 to \$149,999	17%
\$150,000 to \$199,999	13%
\$200,000 or more	26%
<i>Don't know</i>	1%
<i>Refused</i>	34%
Household occupant count	
1 to 2	43%
3	11%
4	30%
5 to 7	14%

Demographic/Characteristic	n=70
<i>Don't know</i>	1%
Education level	
High school graduate	10%
Some college	1%
College graduate	37%
Some graduate school	3%
Graduate degree	47%
<i>Refused</i>	1%
Age range	
25 to 34	13%
35 to 44	31%
45 to 54	11%
55 to 64	29%
65 or over	11%
<i>Refused</i>	4%
Expected tenure	
One year or less	1%
Two to three years	1%
Four to five years	10%
Six to ten years	16%
More than ten years	37%
Indefinitely/the rest of my life	30%
<i>Don't know</i>	3%
<i>Refused</i>	1%



B

Appendix B Data Collection Instruments

This appendix includes the interview and survey instruments used for the process evaluation.

B.1 PROGRAM MANAGER INTERVIEW GUIDE

Hello, may I speak to [_____] ? My name is _____, and I'm calling from NMR Group, an independent research firm. As part of our process evaluation of the Energize Connecticut Residential New Construction Program, we are interviewing program administrators to better understand how it operates, reactions to recent changes, and how it could potentially be improved.

The interview will last about 45 minutes.

Is this a good time for us to speak with you? IF NOT, SET UP CALL BACK APPOINTMENT.

B.1.1 Introduction

IN1. How long has [COMPANY] been administering the Residential New Construction Program?

IN2. And how long have you been working on this program's administration?

IN3. Please describe your role in the program? How does it fit in with what others at [COMPANY] do to run the program?

B.1.2 Program Process

Our team has reviewed program documentation, but I'd like start by making sure that we fully understand the program processes.

P1. Could you describe the role played by the three following groups of people in the program, and the methods you use to communicate with them directly (if you do)?

- a) Builders/Developers
- b) Homebuyers/Landlords/Housing Authorities
- c) HERs Raters

P2. How do participants make their initial contact with the program?

(If needed)

- a. Who makes the first contact with the program?
 - b. What is the first step in their participation process?
 - c. How does this differ between single-family applicants and multifamily projects?
- P3. What about when it comes to the application process:
- a. What is the process for submitting them? (Probe for pre-approvals, final applications)
 - b. Who submits the application(s)?
 - c. How does this differ between single-family applicants and multifamily projects?
 - d. What type of documentation do they need to submit at each step of the participation process?
 - e. What type of materials do the HERS raters submit? (Clarify if needed) Is the builder responsible for submitting the HERS documentation?
- P4. How long after a project enrolls in the program is it typically completed?
- a. Does this differ between single-family and multifamily?
- P5. Could you describe the program's data tracking process from the initial application through projection completion?
- a. Are the data kept all in one database, or are they spread across two or more? If the latter, why is this?
 - b. Is there any way that the tracking process could improve?
 - c. Are there any planned changes to the tracking process?
- P6. What kind of technical support, such as trainings, do builders receive from the program?
- a. Do builders request technical support from the program? [PROBE for what kind of support, if any, they have needed and who has provided it]
 - d. Do you believe the program should provide more technical and/or administrative support?
- P7. Are there are enough HERS raters available in Connecticut to fully support participation in the program for everyone who is interested?

- a. [If no] Is there anything the program could do to help support an increase in the number of HERS raters?

B.1.3 Participant Engagement

- E1. What type of marketing does the program conduct to encourage participation?
 - a. (If unclear) How does the program engage builders?
 - b. What about potential homebuyers?
 - c. HERS raters?

- E2. To your knowledge, are RNC program participation levels on track to meet their targets in 2016?
 - a. Is there anything the program could do to increase program participation?

- E3. In your experience, do homebuyers know that their homes have participated in the program or received rebates from [COMPANY]?
 - a. What type of contact, if any, do you have with homeowners?
 - b. Does [COMPANY] have a way to track that the customer's home participated in the program given that their contact information is not on the program application?
 - c. Do builders ever pass the rebate savings along to homebuyers through a discount?

B.1.4 2016 Program Changes

- C1. As you know, the program has undergone some changes in 2016. We understand that the Prescriptive Path has been eliminated and the program offers a performance-based design tier incentive system using the HERS Index, and has added bonus incentives for homes that qualify for energy-efficiency certifications and designations.
 - a. Is this an accurate description of the changes?
 - b. Are there other important changes that were made recently made or are going to be made?

- C2. What has been the timeline for implementing these changes?

- C3. How were these changes communicated to the builders and other interested parties?

- a. Do you think the communication process was effective?
- b. Why or why not?

C4. What has been the builders' overall reaction to these changes?

- a. How do you think the changes have affected participation?

C5. Have there been any challenges with implementing these changes?

- a. [If yes] What are they and how have they been addressed?

We will also be interviewing builders and possibly HERS raters about this program. What do you think are the most important issues we should address with builders?

Do you see value in interviewing HERS raters as well? If we did, what are some of the most important issues we should address with them?

How important would you say increasing participation in the more advanced tiers, that is, Tier 2 and Tier 3, of the program is relative to other goals you have?

What do you think is the effect of the requirement to have homes be solar photovoltaic ready to qualify for those tiers? Have you gotten any feedback from builders or HERS raters on whether this requirement has an effect on their qualifying for the higher tiers?

How effective has the program been in promoting ZNE homes? What more could the program do?

Do you believe there are enough training opportunities offered in Connecticut? Is this something the program should be more involved in?

B.1.5 Strengths and Weaknesses

S1. How well do you see the various parts of the participation process working? Please rate the following components using a scale of 1 to 5 where 1 is "very poorly" and 5 is "very well".

1. Initial contact with the program by...
 - a. Builders
 - b. HERS raters
2. Participants deciding what rebate levels or certifications to pursue
3. The pre-approval application submittal process
4. Verifying HERS reports, including all on-site tests, done
5. Submitting the completed application at the end of the construction
6. Issuing rebates at the end of construction
7. Program outreach and marketing materials

- S2. [If any items are rated 3 or less] Why do you think this part of the process is working less well?
- S3. Do you think the program requirements and participation process could be more streamlined so there are fewer steps?
- a. [If yes] How could the program do that?
- S4. What are the program's greatest strengths, in your opinion?
- c. Does this differ between single-family and multifamily?
- S5. What do you consider to be the biggest advantages of the program for home builders?
- a. What about homebuyers?
- S6. Do you think that the program is missing any opportunities to increase participation or savings?
- a. How could those be addressed?
- S7. What do you consider the biggest challenges for those participating in the program? [PROBE: incremental costs, application requirements, availability of HERS raters, other]
- a. How does this differ between single-family and multifamily?
- b. How does the program attempt to address those challenges?
- c. Are there any recommended changes to the program under discussion?
- i. If yes, what?
- d. Based on your experience, would you suggest any program changes or refinements?
- S8. Do you have any final comments on the program that we should take into account in our evaluation?

Thank respondent.

B.2 PARTICIPATING BUILDER INTERVIEW GUIDE

Hello, may I speak to [_____] ? My name is _____, and I'm calling from NMR Group, an independent research firm, on behalf of the sponsors of the Energize Connecticut Residential New Construction Program. We are conducting interviews with homebuilders who participated in this program to better understand how well it is operating, reactions to recent changes, and how it could potentially be improved.

In appreciation for your time, we will provide \$100 for responding to this interview. The payment can be sent to you, your company, or the charity of your choice. The survey will last about 30 minutes, and your responses will be kept confidential.

(If needed): Our findings will be reported to the program sponsors in a confidential, "summary" format that combines responses from all interviewees. We will not identify you or your company.

Is this a good time for us to speak with you? (IF NOT, SET UP CALL BACK APPOINTMENT). May I record this conversation?

B.2.1 Introduction

First, I'd like to ask some basic questions about your company:

2. How long has [COMPANY] been building homes in Connecticut?
3. Are all the homes your company builds custom homes, spec homes, or a mixture of the two? [IF NECESSARY: By custom-built, I mean that the buyer had their own land and hired an architect or contractor to design their home, or bought the land from you and then worked with you or an architect to design and build a home. By spec-built, I mean the home was either completed or under construction before the buyer became involved.]
4. What is your role in the [COMPANY]? [Owner, president, general manager, sales, etc.]
5. What is your role with respect to the Energize Connecticut Residential New Construction Program? [PROBE: interactions with the program, interactions with HERS raters, filing applications, paperwork, etc.]
6. When did your company first begin participating in the Energize Connecticut Residential New Construction Program?
7. How did you become involved with the program?
8. Now, I would like to ask you about the number of homes completed in 2015.
 - a) How many single-family detached homes did your company complete in Connecticut in 2015? [IF NEEDED CLARIFY THOSE BOTH INSIDE AND

OUTSIDE OF THE PROGRAM; IF BUILD BOTH CUSTOM AND SPEC, GET A COUNT OF EACH TYPE]

- b) How many multifamily buildings did your company complete in Connecticut in 2015?
 - c) [If 7b >0) How many housing units were involved? [PROBE: if not all completions were detached single family homes, get counts of attached units and low rise multifamily buildings]
 - d) [IF answered both 7a and 7c] So together that would be [INSERT SUM OF 7A AND 7C] total number of homes and housing units.
 - e) [If not owner, president or general manager in Q3, ask] How many of these (homes/housing units) were you responsible for?
9. How many of the [number from Q.#7a, 7c, or 7d] homes/units completed in 2015 participated in the Energize Connecticut Residential New Construction Program?
- a) How many of these homes were in the Eversource territory? And how many in the United Illuminating territory? [IF RESPONDENT DOES NOT KNOW, ASK WHICH CITIES OR TOWNS THE HOMES ARE IN]
 - b) Check if all homes/housing units completed in 2015 match number participating in the program. [IF YES, skip to Q.# 10]
10. [If not all homes completed in 2015 participated] Why did some homes (housing units) not participate in the program? [PROBE: did they submit applications for any homes that did not qualify due to HERS ratings or some other factor; did they know some homes would not qualify; or did they just neglect to have a HERS rating/submit an application]
- a) Are the homes (housing units) that did not participate in the program built differently? If so, how do they differ from homes that do participate?
 - b) [If Q#9a=no, i.e., homes (housing units) that did not participate in the program are NOT built differently] So, please summarize for me why these homes (housing units) did not participate in the program.

B.2.2 Program Process

Now, I'd like to talk about your experience participating in the Energize Connecticut Residential New Construction Program.

11. I would like you to tell me how satisfied you are with the various parts of the participation process using a scale of 1 to 5 where 1 is "very dissatisfied" and 5 is "very satisfied." You may also tell me you did not have any experience with this part of the process.
- a) Initial contact with the program administrator

- b) Deciding what tier levels or certifications, such as Energy Star, to pursue
 - c) Submitting the initial project application
 - d) Obtaining HERS certification, including all on-site tests
 - e) Submitting the completed application at the end of the construction
 - f) Receiving the rebate
12. [If any items are rated 3 or less] Why were you less than satisfied with [item]?
13. Do you think the program requirements and participation process could be more streamlined so there are fewer steps?
- a) [If yes] How could the program do that?
14. Did you receive any technical support from the program; this could be through materials provided by the program, attending any classroom trainings, contacting the program with any questions, or any other way?
- a) [IF YES] Please describe the type of support you received
 - b) How satisfied are you with the program's technical support? Again, please use a scale of 1 to 5 where 1 is "very dissatisfied" and 5 is "very satisfied.
 - c) [If rate technical support 3 or less] Why were you less than satisfied with the technical support received?
 - d) [PROBE if builds both single and multi-family homes, about any differences in the two markets]
15. How satisfied are you with the performance of the HERS raters you have worked with in the program? Again, please use a scale of 1 to 5 where 1 is "very dissatisfied" and 5 is "very satisfied. [PROBE: Have you encountered any problems working with HERS raters? What types of problems? How could these problems be corrected?]
- a) Has your interaction with the HERS raters changed your construction practices? If yes, please describe how you have changed your practices after working with HERS raters.
 - b) Have HERS raters recommended you add more energy efficiency features to the homes you build? [IF YES, PROBE about what features were recommended by HERS raters]
 - c) [IF INTERACTION WITH HERS RATERS HAS CHANGED CONSTRUCTION PRACTICES IN ANY WAY] Are you applying what you have learned to other homes you are building or may be building in the future? Why or why not? Would you be applying what you have

learned from this experience to any homes that may not participate in the Connecticut Energize Residential New Construction Program?

16. What type of growth in the next three years in Connecticut do you anticipate in the residential new construction market?
 - a) Are there enough HERS raters available in Connecticut to fully support your participation in the program? [IF BUILDS BOTH SINGLE AND MULTI-FAMILY HOMES, PROBE about any differences in the two markets]
 - b) [IF NOT ENOUGH HERS RATERS] What, if anything, could the program do to help increase the number of qualified raters?

17. Have you changed your building practices since participating in the Energize Connecticut Residential New Construction Program?
 - a) [IF YES] Please tell me what practices you have changed.
 - b) [IF YES] Using a scale of 1 to 5 where 1 is “Not at all likely” and 5 is “Very likely,” how likely do you think would you have been to make these changes if the Energize Connecticut Residential New Construction Program was not available?
 - c) [IF NO TO Q#16] Why do you think you have not made any changes? [PROBE did the respondent believe the homes would have met program requirements without any changes?]

18. How involved are you in specifying energy efficient features to reach a specified tier of the Energize Connecticut Residential New Construction Program? [PROBE; What features the respondent has worked with a designer to specify; do most homes simply reach the desired tiers without additional work that what was originally planned]
 - a) For what percentage of projects are you involved in making those specifications?

19. Are there any incremental construction costs to participating in the program for you? [IF NO SKIP TO Q#19] [IF YES AND SINGLE FAMILY DETACHED] Please give me an estimate of what those costs would be on a per home basis; I realize this would be a rough estimate. [IF YES AND SINGLE FAMILY ATTACHED OR MULTIFAMILY] Please give me an estimate of what those costs would be on a per building and per unit basis; I realize these would be rough estimates. [ASK BOTH IF BUILDS BOTH TYPES OF HOMES]
 - a) What area accounts for most of the incremental costs? [PROBE: materials, HVAC systems, insulation, labor costs, HERS rater costs]
 - b) Please give me an estimate of the percentage these incremental costs add to the total costs of constructing a program participating [IF SINGLE FAMILY DETACHED] home [IF SINGLE FAMILY ATTACHED OR

MULTIFAMILY] housing unit. [ASK BOTH IF BUILDS BOTH TYPES OF HOMES]

B.2.3 Marketing

20. Do you believe homebuyer demand and expectations for energy efficient homes have changed over the past few years?

- a) If so, how? [PROBE: Has energy efficiency become more important compared to other factors]
- b) How important would you say the following factors are at present to homebuyers on a scale of 0 to 10, where 0 is “one of the least important factors” and 10 is “one of the most important factors.”
 - i. The size of the home
 - ii. Price of the home
 - iii. Quality of construction
 - iv. Location
 - v. Energy efficiency of the home

21. [IF BUILDS ANY CUSTOM HOMES] Have you ever recommended owners add energy efficient features to homes?

- a) [IF YES] how often does this happen?
- b) Please describe what you proposed and the owner’s reaction? [NOTE WHAT WAS RECOMMENDED AND IF RESPONDENT SUCCESSFULLY PERSUADED OWNER]

22. Do you or your agents include information regarding the energy efficiency of the new homes you build in your marketing?

- a) If so, what elements do you emphasize? [PROBE: lower operating costs, helping the environment, more comfortable home, better resale value, other selling points, whether convey information verbally or provide written materials]
- b) [Ask about items not mentioned in Q#21. a] Do you mention any of the following to prospective homebuyers?
 - i. Program participation
 - ii. Participation in the Zero Net Energy Challenge
 - iii. HERS rating
 - iv. Specific energy efficient features [If yes] Which features do you emphasize?

23. Do you believe the fact that a home has participated in the program is a good selling point for marketing to prospective homebuyers?

- a) Do you believe a label such as ENERGY STAR certification is a good selling point?
 - b) How do you think it compares to a home that has participated in the program but does not have an ENERGY STAR certification?
24. Do you think homebuyers are willing to pay more for energy efficient homes?
- a) What share of homebuyers would be willing to pay more for energy-efficient homes? If yes, please describe these prospective buyers.
 - b) If yes, about what percentage more would they be willing to pay? Does this vary by the type of buyer? How does it vary? [If possible, get separate percentages for different types of groups of prospective buyers]
 - c) Would homebuyers be willing to pay more for a home with ENERGY STAR certification over a home built to code without certification? If yes, what percentage more would they be willing to pay?
25. Do home buyers know participating homes receive rebates?
- a) Do you pass the rebate savings along to homebuyers?

B.2.4 Program Changes and Zero Net Energy Homes

26. As you may know, the program has undergone some changes over the last few years. The Prescriptive Path has been eliminated and the program offers a performance-based design tier incentive system using the HERS Index. Additionally, the program offers bonus incentives for homes that qualify for energy-efficiency certifications and designations. What is your overall reaction to these changes? [PROBE: Are these features better or worse than what was offered earlier for them? Why or why not? Have they helped make the program process more efficient?]
27. Do these changes affect your company's work? [PROBE: had they been using the prescriptive path in the past, do they build homes that qualify for ENERGY STAR bonus incentives, if builds both single and multi-family homes, ask about any differences in the two markets]
28. As you may know, homes need to be solar photovoltaic ready, using a PV readiness checklist, to qualify for the higher incentive tiers. What do you think is the effect of the requirement to have homes be PV ready to qualify for those tiers? [PROBE: do they know if the homes install solar at a later time; what are the increased costs (IF NOT COVERED IN Q 18); does this deter them from applying for the higher tiers]
- a) Overall, is this feature better or worse than what was offered earlier? Why or why not? Has it helped make the program process more efficient?
29. How familiar are you with the program's Zero Energy Challenge? [IF NECESSARY: The Zero Energy Challenge offers incentives and recognition to builders building zero net

energy homes] Please rate your knowledge on a scale of 1 to 5 where 1 is never heard of it and 5 is very familiar.

- a) Do you think the program has been effective in promoting zero net energy homes? Why or why not?
 - b) [If familiarity with Zero Energy Challenge is 3, 4, or 5] Overall, is this feature better or worse than what was offered earlier? Why or why not? Has it helped make the program process more efficient?
30. Have you completed or are you in the process of building any zero net energy homes? [IF YES, ASK a THRU c]
- a) How many zero net energy homes have you built? [PROBE about dates of completion and types of homes]
 - b) [IF NOT MENTIONED ABOVE] Have you participated or considered applying in the Zero Energy Challenge?
 - c) [IF YES TO b] Please describe your experience with Zero Energy Challenge.
31. Do you have any homes under construction or completed under the 2016 Energize Connecticut Residential New Construction Program?
- a) [If yes] What, if any, were the biggest differences for your company in participating in 2016 compared to previous years? [PROBE for complying with new requirements, paperwork, increased costs]
32. Please give me a rough estimate of the number of (homes/buildings and housing units) you expect to have under construction over the next three years. [PROBE on what would influence building rates]
- a) How many of these (homes/housing units) do you think would participate in the program? [PROBE on what would influence participation rates]

B.2.5 New Code

33. As you probably know, Connecticut has adopted a new energy code based on the 2012 IECC this fall. How has this affected/will this affect your work? [PROBE if already building to the new code standards; what need to change]
34. What types of training on the new code would be most useful to you and your contractors? What about Connecticut builders and contractors in general?
- a) Have you attended any energy code trainings in the past? [IF YES] Can you tell me about how long ago you attended, who sponsored the trainings, and how useful they were to you?
 - b) Where do you and other builders currently look to get training on changes in the code and related issues?

B.2.6 Closing

35. As you probably know, the share of new building permits for multifamily construction has been increasing in Connecticut. Do you believe this trend will continue? If so, what, if any, impact do you see on your company's operations?
36. What do you consider to be the biggest advantages of the program to you from being a program builder?
37. What has been the biggest challenge for you in participating in the program? [PROBE: incremental costs, application requirements, other]
38. On a scale of 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied," how would you rate your satisfaction with the program?
39. [If satisfaction is 3 or less] Why are you less than satisfied?
40. Do you have any recommended changes to the program? In particular, think about whether there are any gaps or unaddressed issues the program should consider.
 - a) If yes, what would you change?
41. Do you have any final comments on the Connecticut Energize Residential New Construction Program?

Thank respondent and obtain name and address for check.

B.3 PARTICIPATING HERS RATER INTERVIEW GUIDE

Hello, may I speak to [_____] ? My name is _____, and I'm calling from NMR Group, an independent research firm, on behalf of the sponsors of the Energize Connecticut Residential New Construction Program. We are conducting interviews with HERS raters who participated in this program to better understand how well it is operating, reactions to recent changes, and how it could potentially be improved.

In appreciation for your time, we will provide \$100 for responding to this interview. The payment can be sent to you, your company, or the charity of your choice. The survey will last about 30 minutes, and your responses will be kept confidential.

(If needed): Our findings will be reported to the program sponsors in a confidential, "summary" format that combines responses from all interviewees. We will not identify you or your company.

Is this a good time for us to speak with you? (IF NOT, SET UP CALL BACK APPOINTMENT). May I record this conversation?

B.3.1 Introduction

First, I'd like to ask some basic questions about your company:

42. How long have you been working as a HERS rater in Connecticut?
- a) In addition to HERS ratings, do you provide any other support for building energy efficient homes in Connecticut? [IF YES, ASK i and ii below]
 - i. Please describe briefly what you do
 - ii. How long have you been providing this support in Connecticut?
43. What is your role with respect to the Energize Connecticut Residential New Construction Program? [PROBE: interactions with the program, interactions with builders, contractors, and homeowners, filing applications, paperwork, etc.]
44. When did you first begin participating in the Energize Connecticut Residential New Construction Program?
45. How did you become involved with the program?
46. Now, I would like to ask you about the number of homes you provided HERS ratings for in 2015.
- a) How many single-family detached homes did you provide HERS ratings for in Connecticut in 2015? [IF NEEDED CLARIFY THOSE BOTH INSIDE AND OUTSIDE OF THE PROGRAM]
 - b) [IF Q#5a >1] For how many of these homes did you work with the homeowners? And for how many did you work with builders or contractors?
 - c) How many multifamily buildings did you provide HERS ratings for in Connecticut in 2015?
 - d) [If 5c >0] How many housing units were involved? [PROBE: if not all HERS ratings were for detached single family homes, get counts of attached units and low rise multifamily buildings]
 - e) [IF answered both 5a and 5d] So together that would be [INSERT SUM OF 5A AND 5D] total number of homes and housing units.
47. How many of the [number from Q.#5a, 5c, or 5e] homes/units you worked on in 2015 participated in the Energize Connecticut Residential New Construction Program?
- c) How many of these homes were in the Eversource territory? And how many in the United Illuminating territory? [IF RESPONDENT DOES NOT KNOW, ASK WHICH CITIES OR TOWNS THE HOMES ARE IN]
 - d) Check if all homes/housing units worked on in 2015 match number participating in the program. [IF YES, skip to Q.# 8]

48. [If not all homes did HERS ratings for in 2015 participated] Why did some homes (housing units) you worked on not participate in the program? [PROBE: did they submit applications for any homes that did not qualify due to HERS ratings or some other factor; did they know some homes would not qualify; or did the builder or owner not want to participate]
- c) Are the homes (housing units) that did not participate in the program built differently? If so, how do they differ from homes that do participate? [PROBE if HERS rater was simply helping builder comply with the code rather than participate in the program]
 - d) [If Q#7a=no, i.e., homes (housing units) that did not participate in the program are NOT built differently] So, please summarize for me why these homes (housing units) did not participate in the program.

B.3.2 Program Process

Now, I'd like to talk about your experience participating in the Energize Connecticut Residential New Construction Program.

49. I would like you to tell me how satisfied you are with the various parts of the participation process using a scale of 1 to 5 where 1 is "very dissatisfied" and 5 is "very satisfied." You may also tell me you did not have any experience with this part of the process.
- g) Initial contact with the program administrator
 - h) Deciding what tier levels or certifications, such as Energy Star, to pursue
 - i) Submitting the initial project application
 - j) Interactions with builders and contractors
 - k) Submitting the completed application at the end of the construction
50. [If any items are rated 3 or less] Why were you less than satisfied with [item]?
51. Do you think the program requirements and participation process could be more streamlined so there are fewer steps?
- a) [If yes] How could the program do that?
52. Did you receive any technical support from the program; this could be through materials provided by the program, attending any classroom trainings, contacting the program with any questions, or any other way? [IF YES, ask 11a through 11d]
- e) Please describe the type of support you received
 - f) How satisfied are you with the program's technical support? Again, please use a scale of 1 to 5 where 1 is "very dissatisfied" and 5 is "very satisfied.
 - g) [If rate technical support 3 or less] Why were you less than satisfied with the technical support received?

- h) [PROBE if works on both single and multi-family homes, about any differences in the two markets]
53. What type of growth in the next three years in Connecticut do you anticipate in the residential new construction market?
- a) Do you believe there are enough HERS raters available in Connecticut to fully support the program's recruitment potential [IF THEY BELIEVE THERE WILL BE GROWTH: and the growing market in Connecticut]? [IF WORKS ON BOTH SINGLE AND MULTI-FAMILY HOMES, PROBE about any differences in the two markets]
- b) [IF NOT ENOUGH HERS RATERS] What, if anything, could the program do to help increase the number of qualified raters?
54. Have you recommended that builders or owners add more energy efficiency features to the homes for which you provide HERS ratings? [IF YES, ask 13a through 13c]
- a) What features have you recommended most often?
- b) Whom did you provide the recommendations to?
- c) What was the outcome [PROBE if possible to get specific examples of features recommended, how they affected the HERS rating and qualification for specific program tiers]?
55. Do you believe any of the builders or owners you work with have changed their practices in order to participate in the Energize Connecticut Residential New Construction Program? [IF YES, ask 14a through 14c, then skip to Q16]
- a) Please give me an estimate of the number of builders you have worked with over the past three years and the number you believe have changed any practices in order to participate in the Energize Connecticut Residential New Construction Program.
- b) What practices are most often changed to participate in the program?
- c) Using a scale of 1 to 5 where 1 is "Not at all likely" and 5 is "Very likely," how likely do you think they would have been to make these changes if the Energize Connecticut Residential New Construction Program was not available?
- d) Do you think they will be applying what they have learned to other homes they are building or maybe building in the future? Why or why not? Would they be applying what they have learned from this experience to any homes that may not participate in the Connecticut Energize Residential New Construction Program?
56. [IF NO to Q14] Why do you think they have not made any changes? [PROBE if the respondent has only worked on homes would have met program requirements without any changes]

57. Are there any incremental construction costs to participating in the program for the builders you work with? [IF NO SKIP TO Q#17] [IF YES AND SINGLE FAMILY DETACHED] Please give me an estimate of what those costs would be on a per home basis; I realize this would be a rough estimate. [IF YES AND SINGLE FAMILY ATTACHED OR MULTIFAMILY] Please give me an estimate of what those costs would be on a per building and per unit basis; I realize these would be rough estimates. [ASK BOTH IF WORKS ON BOTH TYPES OF HOMES]
- c) What area accounts for most of the incremental costs? [PROBE: materials, HVAC systems, insulation, labor costs, HERS rater costs]
 - d) Please give me an estimate of the percentage these incremental costs add to the total costs of constructing a program participating [IF SINGLE FAMILY DETACHED] home [IF SINGLE FAMILY ATTACHED OR MULTIFAMILY] housing unit. [ASK BOTH IF WORKS ON BOTH TYPES OF HOMES]

B.3.3 Marketing

58. Do you believe homebuyer demand and expectations for energy efficient homes have changed over the past few years?
- a) If so, how? [PROBE: Has energy efficiency become more important compared to other factors]
 - b) How important would you say the following factors are at present to homebuyers on a scale of 0 to 10, where 0 is “one of the least important factors” and 10 is “one of the most important factors.”
 - i. The size of the home
 - ii. Price of the home
 - iii. Quality of construction
 - iv. Location
 - v. Energy efficiency of the home
59. Do the builders you work for include information regarding the energy efficiency of the new homes they build in their marketing?
- a) If so, what elements are emphasized? [PROBE: lower operating costs, helping the environment, more comfortable home, better resale value, other selling points, whether information is conveyed verbally or through written materials]
 - b) [Ask about items not mentioned in Q#18. a] Do you know if any of the following are mentioned to prospective homebuyers?
 - v. Program participation
 - vi. Participation in the Zero Net Energy Challenge

- vii. HERS rating
 - viii. Specific energy efficient features [If yes] Which features are emphasized?
60. Do you believe the fact that a home has participated in the program is a good selling point for marketing to prospective homebuyers?
- a) Do you believe a label such as ENERGY STAR certification is a good selling point?
 - b) How do you think it compares to a home that has participated in the program but does not have an ENERGY STAR certification?
61. Do you think homebuyers are willing to pay more for energy efficient homes?
- a) What share of homebuyers would be willing to pay more for energy-efficient homes? If yes, please describe these prospective buyers.
 - b) If yes, about what percentage more would they be willing to pay? Does this vary by the type of buyer? How does it vary? [If possible, get separate percentages for different types of groups of prospective buyers]
 - c) Would homebuyers be willing to pay more for a home with ENERGY STAR certification over a home built to code without certification? If yes, what percentage more would they be willing to pay?
62. Do homebuyers normally know participating homes receive rebates?
- a) Do builders normally pass the rebate savings along to homebuyers?

B.3.4 Program Changes and Zero Net Energy Homes

63. As you may know, the program has undergone some changes over the last few years. The Prescriptive Path has been eliminated and the program offers a performance-based design tier incentive system using the HERS Index. Additionally, the program offers bonus incentives for homes that qualify for energy-efficiency certifications and designations. What is your overall reaction to these changes? [PROBE: Are these features better or worse than what was offered earlier for them? Why or why not? Have they helped make the program process more efficient?]
64. Do these changes affect your work? [PROBE: is there more demand for HERS ratings in the absence of the prescriptive path, do they work on homes that qualify for ENERGY STAR bonus incentives, if work on both single and multi-family homes, ask about any differences in the two markets]
65. As you may know, homes need to be solar photovoltaic ready, using a PV readiness checklist, to qualify for the higher incentive tiers. What do you think is the effect of the requirement to have homes be PV ready to qualify for those tiers? [PROBE: do they know if the homes install solar at a later time; what are the increased costs to builders

(IF NOT COVERED IN Q 16); does this deter builders from applying for the higher tiers]

- c) Overall, is this feature better or worse than what was offered earlier? Why or why not? Has it helped make the program process more efficient?

66. How familiar are you with the program's Zero Energy Challenge? [IF NECESSARY: The Zero Energy Challenge offers incentives and recognition to builders building zero net energy homes] Please rate your knowledge on a scale of 1 to 5 where 1 is never heard of it and 5 is very familiar.

- b) Do you think the program has been effective in promoting zero net energy homes? Why or why not?
- d) [If familiarity with Zero Energy Challenge is 3, 4, or 5] Overall, is this feature better or worse than what was offered earlier? Why or why not? Has it helped make the program process more efficient?

67. Have you worked on any zero net energy homes? [IF YES, ASK a THRU c]

- d) How many zero net energy homes have you worked on? [PROBE about dates of completion and types of homes]
- e) [IF NOT MENTIONED ABOVE] Have the builders participated in the Zero Energy Challenge?
- f) [IF YES TO b] Please describe any experience you have had with Zero Energy Challenge.

68. Are you working on any homes under construction or completed under the 2016 Energize Connecticut Residential New Construction Program?

- b) [If yes] What, if any, were the biggest differences in working on homes participating in 2016 compared to previous years? [PROBE for complying with new requirements, paperwork, increased costs]

B.3.5 New Code

69. As you probably know, Connecticut has adopted a new energy code based on the 2012 IECC this fall. How has this affected/will this affect your work? [PROBE if provide diagnostic services for builders in general such as duct leakage measurement for the 2009 IECC and duct and air leakage measurement for the 2012 IECC]

70. What types of training on the new code would be most useful to builders, contractors, and HERS raters such as yourself?

- c) Have you attended any energy code trainings in the past? [IF YES] Can you tell me about how long ago you attended, who sponsored the trainings, and how useful they were to you?

- d) Where do you currently look to get training on changes in the code and related issues? What about builders and contractors?

B.3.6 Closing

71. As you probably know, the share of new building permits for multifamily construction has been increasing in Connecticut. Do you believe this trend will continue? If so, what, if any, impact do you see on your work?
72. What do you consider to be the biggest advantages of the program to you? And to builders?
73. What has been the biggest challenge for you in participating in the program? And for builders? [PROBE: incremental costs for builders, application requirements, other]
74. On a scale of 1 to 5, where 1 is “very dissatisfied” and 5 is “very satisfied,” how would you rate your satisfaction with the program?
75. [If satisfaction is 3 or less] Why are you less than satisfied?
76. Do you have any recommended changes to the program? In particular, think about whether there are any gaps or unaddressed issues the program should consider.
- a) If yes, what would you change?
77. Do you have any final comments on the Connecticut Energize Residential New Construction Program?

Thank respondent and obtain name and address.

B.4 PARTICIPATING HOMEBUYER SURVEY INSTRUMENT

Hello, my name is _____, and I’m calling on behalf of [read sponsor from sample]. We are conducting a study to help them better understand the needs and preferences of buyers of recently built homes like you. The survey should take around 15 minutes, and the information you provide will help [read sponsor from sample] improve its energy efficiency programs and services which will, in turn, help keep energy costs as low as possible by reducing energy consumption. In appreciation for your time, we are offering a \$20 Visa gift card for completing this survey. Your responses will be kept strictly confidential and we can schedule a time that is convenient for you.

B.4.1 Introduction

1. First, I would like to confirm that you live at [ADDRESS] in [TOWN] and that your home was constructed within the past five years. Is this correct?
1. Yes [CONTINUE]

- 2. No **[THANK AND TERMINATE]**
- 98. Don't know **[THANK AND TERMINATE]**
- 99. Refused **[THANK AND TERMINATE]**

2. Are you the person or one of the people who is most knowledgeable about the decision to buy this home?

- 1. Yes **[CONTINUE]**
- 2. No, someone else in home **[ASK TO SPEAK TO PROPER PERSON AND BEGIN AGAIN; CALL BACK IF NEEDED]**
- 3. No, no one is knowledgeable **[THANK AND TERMINATE]**
- 97. (Renter/not owner) **[THANK AND TERMINATE]**
- 98. Don't know **[THANK AND TERMINATE]**
- 99. Refused **[THANK AND TERMINATE]**

[IF TERMINATE]: I'm sorry, but unfortunately you are ineligible to complete this survey. We appreciate your willingness to respond, however. Have a nice day.

3. Which of the following best describes how you purchased your home?

- 1. Purchased land and worked with an architect and/or builder to design and build the home.
- 2. Had a house plan and a lot and hired a contractor or builder to build the home.
- 3. Purchased a lot from a builder, selected one of several house plans offered by the builder and selected from various available upgrade options.
- 4. Purchased a home that was under construction and selected from various available upgrade options.
- 5. Purchased a finished home
- 6. I am the owner and builder
- 55. (Other **[SPECIFY: _____]**)
- 98. (Don't know)
- 99. (Refused)

4. Are you aware of the Energize Connecticut Residential New Construction Program funded by Connecticut utilities?

- 1. Yes
- 2. No **[SKIP TO Q.#7]**
- 98. (Don't know) **[SKIP TO Q.#7]**
- 99. (Refused) **[SKIP TO Q.#7]**

4a. To confirm, this program is designed to help home buyers, architects and builders design and construct energy efficient homes through guidance from energy specialists and rebates for homes based on performance. Is this the program you had in mind?

- 1. Yes
- 2. No [SKIP TO Q.#7]
- 98. (Don't know) [SKIP TO Q.#7]
- 99. Refused [SKIP TO Q.#7]

[GENERATE NEW VARIABLE: AWARE=0; IF Q4a=1, AWARE=1]

5. How did you FIRST learn of the program? Was it through...

- 1. A real estate agent
- 2. The builder
- 3. A HERS rater [pronounce like "that is hers"]
- 4. A model homes sales office
- 5. An Internet search
- 6. A utility ad [SPECIFY WHERE SAW AD: _____]
- 55. Or another way [SPECIFY: _____]
- 98. (Don't know)
- 99. (Refused)

6. Did your new home participate in the program?

- 1. Yes
- 2. No
- 3. (Tried but did not qualify)
- 98. (Don't know)
- 99. (Refused)

6a. **[ASK IF Q6=1]** Were you involved in the process of having your home participate in the Energize Connecticut Residential New Construction Program; by this, I mean specifying that the home includes certain energy efficiency measures, dealing with paperwork, or some other involvement.

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

6b. **[ASK IF Q6A=1]** Please tell me briefly what you did. **[SPECIFY: _____ PROBE FOR DETAILS; 98=DON'T KNOW; 99=REFUSED]**

6c. **[ASK IF Q6=1]** When you first looked at your home was it already qualified for the program?

- 1. Yes
- 2. No
- 97. (Designed it ourselves)

- 98. (Don't know)
- 99. (Refused)

6d. **[ASK IF Q6C=2 OR 97]** Were you actively engaged in making the decisions about your home's level of energy efficiency?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

B.4.2 Building/Purchase Process

7. **[IF Q.#3 NE 1, 2, OR 6 READ:]** How important were the following factors in your decision to buy this home rather than another home?

[IF Q.#3 EQ 1, 2, OR 6 READ:] How important were the following factors in your decision-making process when building this home?

[FOR ALL, READ:] Use a scale from 0 to 10, where 0 is "not at all important" and 10 is "extremely important." If a particular feature does not apply to your home or your purchase decision, say "does not apply" **[RANDOMIZE AND READ a THROUGH I]**
[97=DOES NOT APPLY; 98=DON'T KNOW; 99=REFUSED]

- a. The size of the home
 - b. Keeping down the overall purchase price of the home
 - c. Quality of construction
 - d. Being involved in decisions about features of the home
 - e. Getting a more energy efficient home
 - f. Getting a home with a reduced carbon footprint
 - g. Getting a home with lower energy bills
 - h. **[IF Q.#6 EQ YES]** Having a home that qualified for rebates through the Energize Connecticut Residential New Construction Program
 - i. Good-sized lot
 - j. Getting a more comfortable home with fewer drafts
 - k. Good location
 - l. **[IF Q.#6 EQ YES]** Having a home that was certified as energy efficient by the Energize Connecticut Residential New Construction Program
 - m. Good schools
8. Is there anything I have not mentioned that was an important factor in you choosing to build or buy this particular home rather than another home?
- 1. Yes **[SPECIFY: _____]**
 - 2. No
 - 98. (Don't know)
 - 99. (Refused)

9. **[IF Q.#3 NE 1 OR 2]** Did you discuss any of the following topics with any professionals such as realtors, designers, or builders while shopping for, designing, or constructing your new home?

[IF Q.#3 EQ 1 OR 2] Did you discuss any of the following with your builder?

[ACCEPT MULTIPLE RESPONSES; RANDOMIZE]

1. Energy efficiency of the home
2. Energy efficiency of heating and/or cooling equipment
3. Type of insulation used
4. The cost to heat and cool the home
5. Use of renewable energy
97. (None)
98. (Don't know)
99. (Refused)

10. **[IF ANY OF Q#9 < 97; OTHERWISE, SKIP TO TEXT BEFORE Q.#12]** Did they answer your questions satisfactorily?

1. Yes **[SKIP TO Q.#12]**
2. No
98. (Don't know) **[SKIP TO Q.#12]**
99. (Refused) **[SKIP TO Q.#12]**

11. Can you briefly describe what question they could not answer to your satisfaction?
**[SPECIFY: _____ PROBE FOR DETAILS; 98=DON'T KNOW;
99=REFUSED]**

B.4.3 Energy efficiency awareness and perceptions

12. How strongly do you agree or disagree with the following statement: "All new homes are energy efficient." **[READ RESPONSES]**

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree
98. (Don't know)
99. (Refused)

13. How strongly do you agree or disagree with the following statement: "My new home is energy efficient." **[READ RESPONSES]**

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree
98. (Don't know)
99. (Refused)

[READ IF Q4 NE 1] The Energize Connecticut Residential New Construction Program that I mentioned earlier is a program that is designed to help home buyers, architects and builders design and construct energy efficient homes through guidance from energy specialists and rebates for homes based on performance.

[READ IF Q6 NOT ASKED OR NE 1] Our records show that in [YEAR] your home participated in the Energize Connecticut Residential New Construction Program that I mentioned earlier.

14. How do you think the purchase price of an energy efficient home, certified by the Energize Connecticut Residential New Construction Program, compares to the price of a similar home? Would you say the price of the program certified home is: **[READ RESPONSES]**

1. A lot lower
2. A little lower
3. About the same
4. A little higher
5. A lot higher
98. (Don't know)
99. (Refused)

15. How do you think monthly costs of owning a program certified home compare to the costs of a similar home which is not certified? By monthly costs, I mean the combined cost of the mortgage payment and the energy bills. Would you say the monthly costs of the program certified home are: **[READ RESPONSES]**

1. A lot lower
2. A little lower
3. About the same
4. A little higher
5. A lot higher
98. (Don't know)
99. (Refused)

16. How much value for the money do you think a program certified home provides compared to a similar home which is not certified? Would you say a program certified home provides: **[READ RESPONSES]**
1. A lot less value for the money
 2. A little less value for the money
 3. About the same value for the money
 4. A little more value for the money
 5. A lot more value for the money
 98. (Don't know)
 99. (Refused)
17. Since you moved into your new home, have your energy bills been about what you expected, higher, or lower?
1. As expected
 2. Higher
 3. Lower
 98. (Don't know)
 99. (Refused)
18. Using a scale of 1 to 5, where 1 is "Not at all familiar" and 5 is "Very familiar," how familiar are you with the Home Energy Rating System, or HERS [pronounce like "that is hers"], used to rate the efficiency of a newly constructed home?
98. (Don't know)
 99. (Refused)
- 18a. **[ASK IF Q18=3, 4, OR 5]** Was your home's HERS score a consideration in your purchasing and/or design decisions?
1. Yes
 2. No
 98. (Don't know)
 99. (Refused)
- 18b. **[ASK IF Q18=3, 4, OR 5]** As you may know, the HERS rating process is led by a HERS rater. Who found the HERS rater that rated your home? Was it...
1. You
 2. Your builder
 3. Another contractor or technician
 4. A utility company or program staff person OR
 55. Someone else?
 98. (Don't know)
 99. (Refused)

19. Using a scale of 1 to 5, where 1 is “Not at all satisfied” and 5 is “Very satisfied,” how satisfied are you that your home participated in the Energize Connecticut Residential New Construction Program?

98. (Don't know)

99. (Refused)

19a. **[ASK IF Q19=1 OR 2]** Can you briefly describe why you are less than satisfied that your home participated in the Energize Connecticut Residential New Construction Program? **[SPECIFY: _____ PROBE FOR DETAILS; 98=DON'T KNOW; 99=REFUSED; IF RESPONDENT SAID THEY WERE INVOLVED IN THE PROGRAM PROCESS IN Q6a, PROBE ABOUT WHY THEY WERE LESS THAN SATISFIED WITH IT]**

B.4.4 Measure Persistence

20. Now I would like to ask about any changes you may have made to your home since you bought it. Have you made any changes to the heating system equipment that was originally installed in your new home?

1. Yes

2. No **[SKIP TO Q.#21]**

98. (Don't know) **[SKIP TO Q.#21]**

99. (Refused) **[SKIP TO Q.#21]**

20a. **[IF Q20=1]** What changes did you make to your heating system? **[SPECIFY: _____ PROBE FOR DETAILS SUCH AS CHANGING OUT ENTIRE SYSTEM AND WHAT REPLACED IT]**

98. (Don't know)

99. (Refused)

21. What type of cooling system or systems does your new home use? **[MULTIPLE RESPONSE, RANDOMIZE AND READ 1 – 5, THEN READ 6]**

1. Central air conditioning system

2. Window or room air conditioning unit(s)

3. Air source heat pump(s) **[IF NEEDED: Air source heat pumps cool by absorbing heat from inside a home and pushing it outside; in the winter, they absorb heat from the outside air and push it inside to heat the home. The indoor units are typically installed on walls and connected to a condenser on the outside of a home.]**

4. Ground source or geothermal heat pump **[IF NEEDED: These are a central heating and/or cooling system that transfers heat to or from the ground.]**

5. Attic fan

6. Window or room fans

97. (No air conditioning installed)
98. (Don't know)
99. (Refused)
- 21a. **[IF Q21=1, 3, or 4]** Have you made any changes to the cooling system that was originally installed in your new home?
1. Yes
2. No **[SKIP TO Q.#22]**
98. (Don't know) **[SKIP TO Q.#22]**
99. (Refused) **[SKIP TO Q.#22]**
- 21b. **[IF Q21a=1]** What changes did you make to the cooling system? **[SPECIFY: _____ PROBE FOR DETAILS SUCH AS CHANGING OUT ENTIRE SYSTEM AND WHAT REPLACED IT]**
98. (Don't know)
99. (Refused)
22. Have you made any changes to the water heating system that was originally installed?
1. Yes
2. No **[SKIP TO Q.#23]**
98. (Don't know) **[SKIP TO Q.#23]**
99. (Refused) **[SKIP TO Q.#23]**
- 22a. **[IF Q22=1]** What changes did you make to your water heating system? **[SPECIFY: _____ PROBE FOR DETAILS SUCH AS CHANGING OUT ENTIRE SYSTEM AND WHAT REPLACED IT]**
98. (Don't know)
99. (Refused)
23. Have you changed out any large appliances such as refrigerators, clothes washers, room air conditioners, and dishwashers that came with the home?
1. Yes
2. No **[SKIP TO Q.#24]**
98. (Don't know) **[SKIP TO Q.#24]**
99. (Refused) **[SKIP TO Q.#24]**
- 23a. **[IF Q23=1]** What appliances did you change out? **[MULTIPLE RESPONSES]**
1. Refrigerator
2. Clothes washer

- 3. Room air conditioner
- 4. Dishwasher
- 55. Other **[SPECIFY]**
- 98. (Don't know) **[SKIP TO Q.#24]**
- 99. (Refused) **[SKIP TO Q.#24]**

23b. **[IF Q23=1]** What changes did you make to it/them? **[SPECIFY: _____ PROBE FOR DETAILS SUCH AS WHICH APPLIANCES WERE INVOLVED AND WHAT REPLACED THEM]**

- 98. (Don't know)
- 99. (Refused)

24. Have you changed out any lighting; that is switching from one type of bulb to another or changing the fixtures themselves?

- 1. Yes
- 2. No **[SKIP TO Q.#25]**
- 98. (Don't know) **[SKIP TO Q.#25]**
- 99. (Refused) **[SKIP TO Q.#25]**

24a. **[IF Q24=1]** What changes did you make to your lighting? **[SPECIFY: _____ PROBE FOR DETAILS SUCH AS WHAT TYPES OF BULBS OR FIXTURES WERE INVOLVED AND WHAT REPLACED THEM]**

- 98. (Don't know)
- 99. (Refused)

25. Have you made any changes to the insulation or weather stripping materials that were originally installed?

- 1. Yes
- 2. No **[SKIP TO Q.#26]**
- 98. (Don't know) **[SKIP TO Q.#26]**
- 99. (Refused) **[SKIP TO Q.#26]**

25a. **[IF Q25=1]** What changes did you make to insulation or weather stripping materials? **[SPECIFY: _____ PROBE FOR DETAILS SUCH AS WHAT WAS REMOVED, IF ANYTHING REPLACED IT, AND, IF SO, WHAT]**

- 98. (Don't know)
- 99. (Refused)

B.4.5 Attitudes

A1. Thinking about what is said in the news, in your view is the seriousness of global warming...

1. Generally exaggerated
2. Generally correct OR
3. Generally underestimated?
98. (Don't know)
99. (Refused)

A2 How much do you personally worry about global warming? Would you say...

1. A great deal
2. A fair amount
3. Only a little OR
4. Not at all?
97. (Do not believe in global warming) **[SKIP to Q26]**
98. (Don't know)
99. (Refused)

A3. And from what you have heard or read, do you believe increases in the earth's temperature over the last century are due more to...

1. The effects of pollution from human activities OR
2. Natural changes in the environment?
97. (Do not believe it is occurring)
98. (Don't know)
99. (Refused)

B.4.6 Demographic and Economic Factors

Now I have a few last questions for statistical purposes only.

26 Are you a first-time homebuyer, or did you already own a home before you bought this one?

1. First-time homebuyer
2. Already owned home
98. (Don't know)
99. (Refused)

27. Is your home occupied year-round, or is it a seasonal home?

1. Year-round residence
2. Seasonal / vacation home
3. (Other) **[Specify: _____]**
98. (Don't know)
99. (Refused)

28. Including yourself, how many people live in your home most of the year?

- [OPEN END NUMERIC]**
98. (Don't know)

99. (Refused)

29. What is the highest level of education that you have completed? **[READ RESPONSES]**

1. Less than high school
2. High school graduate
3. Technical or trade school graduate
4. Some college
5. College graduate
6. Some graduate school
7. Graduate degree
98. (Don't know)
99. (Refused)

30. What is your age? Are you...

1. 18 to 24 **[SKIP TO Q.#32]**
2. 25 to 34 **[SKIP TO Q.#32]**
3. 35 to 44 **[SKIP TO Q.#32]**
4. 45 to 54 **[SKIP TO Q.#32]**
5. 55 to 64
6. 65 or over
98. (Don't know)
99. (Refused)

31. Is your new home in an over-55 community?

1. Yes
2. No
98. (Don't know)
99. (Refused)

32. How long do you expect to stay in your new home?

1. One year or less
2. Two to three years
3. Four to five years
4. Six to ten years
5. More than ten years
6. (Indefinitely/the rest of my life)
98. (Don't know)
99. (Refused)

33. What category best describes your total household income in 2015, before taxes?

1. Less than \$35,000
2. \$35,000 to \$49,999
3. \$50,000 to \$74,999
4. \$75,000 to \$99,999
5. \$100,000 to \$149,999
6. \$150,000 to \$199,999
7. \$200,000 or more
98. (Don't know)
99. (Refused)

34. **[DO NOT READ]** Gender

1. Female
2. Male

Thank respondent and obtain address for gift card.