MEMO

Date: June 16, 2015
From: Erika Kociolek, Evaluation Project Manager
Subject: Summary of Gas Fireplace Research – New Homes

Energy Trust currently offers incentives for qualifying high-efficiency, direct-vent gas fireplaces through its Existing Homes program, and has offered these incentives since 2009. The incentive is intended to influence customers to purchase high efficiency hearths over market baseline efficiency hearths.

Energy Trust's New Homes program is currently considering a gas fireplace measure. Energy Trust recently undertook three studies intended to gather information about baseline fireplace efficiency, prevalence of intermittent pilot ignitions, and average hours of use in new homes. The studies are listed below:

1. Verifier data collection
2. Builder interviews
3. Survey of new homeowners

Verifier data collection. Interviews conducted with hearth vendors in 2009 and 2013 provided information about the average fireplace efficiency (FE) and prevalence of standing pilot lights in the existing homes market. We lacked this information for the new homes market, which is essential for measure assumptions. CLEAResult worked with program verifiers to collect information about FE and prevalence of pilot lights in 186 newly constructed homes representing 61 builders. Based on the data collected, the average FE of fireplaces in these homes was 57. Just over half (53 percent) of fireplaces in these homes had intermittent pilot ignitions, although it is worth noting there was a marked difference in IPI prevalence between Washington (96 percent) and Oregon (35 percent).

Builder interviews. To help understand the difference in IPI prevalence observed in the data collected by verifiers (described above), and gather information regarding builder decision-making about gas fireplaces, Energy Trust worked with Evergreen Economics to survey 11 builders. Unfortunately, we were unable to reach many of the builders represented in the verifier data collection effort, and those we did reach were not always knowledgeable or able to provide detailed information about fireplaces being installed. While the interviews did not provide the desired insight into the difference in IPI prevalence between Washington and Oregon, they did provide useful information about how often fireplaces are being installed in new homes, what builders are looking for in fireplaces, where builders are purchasing fireplaces, and who is involved in making decisions about fireplace purchases.

New homeowner survey. The other critical piece of information needed for a potential measure is hours of use. A metering study was conducted in existing homes in 2014, but there are reasons to believe residents in new homes may use fireplaces differently than those purchasing a fireplace for their home. A survey of 146 homeowners included questions on a variety of topics of interest to New Homes program staff (which will be incorporated into the 2015 New Homes process evaluation); the content relevant to fireplaces can be found in Section 4 of the survey report. 81 percent of respondents reported having at least one gas fireplace in their home. Of the respondents with a fireplace, 16 percent said they did not use the fireplace at all. On average, homeowners reported using the fireplace 8.2 hours per week (during the heating season, defined as October through March).

MEMO

Date: December 8, 2014
To: New Homes Program
From: Erika Kociolek, Evaluation Project Manager
Subject: Summary of New Homes Gas Fireplace Data

Background and Methods

CLEAResult and PECI worked with New Home verifiers to collect data on gas fireplaces installed in a variety of new homes, including code, Energy Star, and EPS homes in Oregon and Washington. Data collection started in August 2014 and continued through October 2014. The goal of this data collection effort was to determine the average baseline fireplace efficiency (FE) of fireplaces installed in new homes, which could be used to develop a standalone gas fireplace measure.

Key Findings

- Most (94%) homes where a fireplace was installed had only one fireplace.
- Average fireplace efficiency in new homes is approximately 57% FE, and this did not differ significantly between code, EPS, and Energy Star homes.
- The incidence of fireplaces with intermittent pilot ignition (IPI) differed between Washington and Oregon; 96% of fireplaces installed in homes in Washington had IPI, compared to 35% of fireplaces installed in Oregon.

Characteristics of Homes

Table 1 summarizes the number of builders and homes for which data was collected, by verifier. Five verifiers participated in this data collection effort, collecting information from 186 homes and 61 builders about 193 fireplaces. One fireplace and site was dropped because the verifier reported that they were unsure if the fireplace uses natural gas, leaving the total number of homes at 185 and the total number of fireplaces at 192.

Table 1. Number of builders and homes in dataset, by verifier

Verifier	Number of Builders	Number of Homes	Percent of Homes By Verifier
1	32	85	46%
2	17	49	26%
3	10	29	16%
4	1	16	9%
5	2	6	3%
Total	61	185	-

Most homes (94%) had one fireplace. Eleven homes had two fireplaces, and one had three, as shown in Table 2 below. For seven of these twelve homes, information was collected about the additional fireplace(s).

Table 2. Number of fireplaces per home

	Number of Homes	Percent
One	174	94%
Two	11	6%
Three	1	0.5%
Total	185	-

Table 3 below shows the percent of the homes in Oregon versus Washington. Most fireplace data are for Oregon (71%).

Table 3. Number of homes, by state

	Number of Homes	Percent
Oregon	131	71%
Washington	54	29%
Total	185	-

Table 4 shows the number of homes in each home certification bin (EPS, Energy Star, and code), broken down by state. The percentages are the proportion of homes in each home certification bin, by state. Most homes in Oregon are EPS, and most homes in Washington are Energy Star.

Table 4. Number of homes, by state and home certification type

	EPS	Energy Star	Code	Total
Oregon	98 (97%)	10 (23%)	23 (58%)	131
Washington	3 (3%)	34 (77%)	17 (43%)	54
Total	101	44	40	185

There was good diversity of home builders in each home certification bin:

- 41 builders did EPS homes
- 16 builders did Energy Star homes
- 18 builders did code homes

The majority of homes in the sample in Washington were constructed by two builders (38%); there were 16 builders represented in the state overall. Fifty-six builders were represented overall in Oregon; 30% of homes in Oregon were constructed by two builders.

Looking at 2013 program data on the number of homes that received program incentives and for which a builder is listed in FastTrack, data was collected from most of the active builders in Washington.

In Oregon, data was collected from a good mix of builders that received incentives for 10 or more projects. It is worth noting no data was collected from a builder that received incentives for a large number of homes in Oregon in 2013.

Fireplace Efficiency

In the tables below, the unit of analysis changes to fireplaces from number of homes and number of builders, which were used above.

Table 5 below shows the minimum, mean, median, and maximum fireplace efficiency (FE) ratings for the 192 fireplaces for which data was collected. The average FE is 57%. Slightly more than half of fireplaces have intermittent pilot ignition (IPI) and 98% of all fireplaces are below 68% FE, the baseline fireplace efficiency estimated for the existing homes market.

Table 5. Summary of FE ratings and IPI

Minimum FE	45%
Mean FE	56.5%
Median FE	56.3%
Maximum FE	71.7%
% Below 65 FE	98%
% IPI	53%
N	192

When we look at FE by home certification type (Table 6), we see that average FE is the same for EPS and code homes, and is slightly lower for Energy Star homes. However, Energy Star homes had much higher incidence of IPI (65%) than EPS and code homes, 39% and 40%, respectively. All models in Energy Star and code homes were below 68% FE, while 97% were below 68% FE in EPS homes.

Table 6. Summary of FE ratings and IPI, by home certification type

	EPS	Energy Star	Code
Minimum FE	45%	51.4%	52.4%
Mean FE	57.9%	53%	56.5%
Median FE	59.4%	52.4%	59.4%
Maximum FE	71.7%	63.4%	59.4%
% Below 68 FE	97%	100%	100%
% IPI	39%	96%	40%
Total	107	45	40

We see that although the mean FE is slightly higher in Oregon (57.6%) compared to Washington (53.7%), almost all fireplaces in Washington (96%) had IPI compared to Oregon (35%).

Table 7. Summary of FE ratings, by state

	OR	WA
Minimum FE	45	51.4
Mean FE	57.6	53.7
Median FE	59.4	52.4
Maximum FE	71.7	71.6
% Below 68 FE	99%	98%
% IPI	35%	96%
Total	137	55

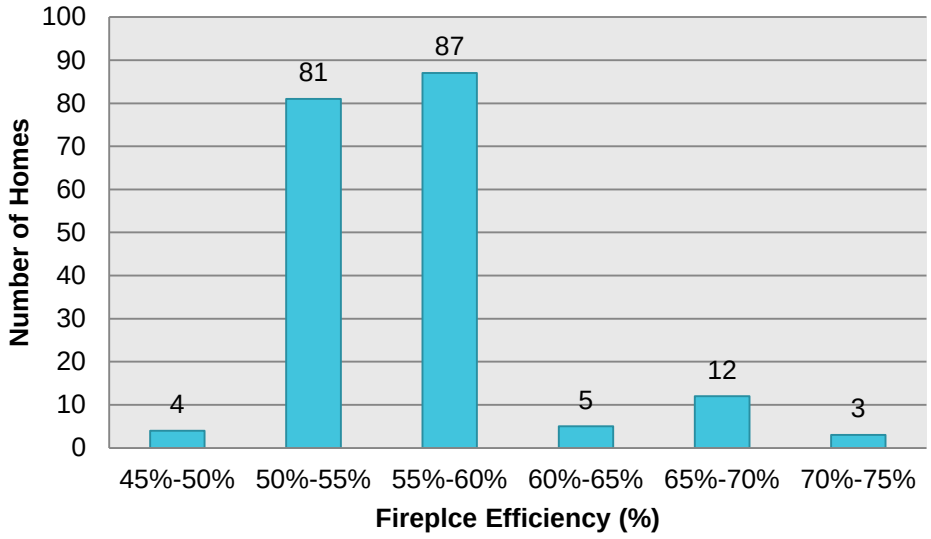
Table 8 shows that the difference in incidence of IPI in the three home certification bins is being driven primarily by state. Washington homes accounted for 77% of the Energy Star bin, while Oregon homes accounted for 97% of the EPS bin and 58% of the code bin. Fifteen of the 17 Washington code homes had IPI, while only 1 of the 23 Oregon code homes did.

Table 8. Percent of fireplaces with IPI, by state and home certification type

	EPS	Energy Star	Code
OR	37%	82%	4%
WA	100%	100%	88%

Figure 1 below shows the distribution of FE ratings. The vast majority are between 50% and 65% FE; very few are below or above this range.

Figure 1. Distribution of fireplace efficiency



EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

MEMORANDUM

Date: April 6, 2015

To: Erika Kociolek, Energy Trust of Oregon

From: John Cornwell

Re: Energy Trust of Oregon New Homes Gas Fireplace Builder Interviews Memorandum

This memorandum presents results from 11 in-depth interviews with new homebuilders in Oregon and Southwest Washington. The primary purpose of the interviews was to understand homebuilder practices regarding the installation of indoor gas fireplaces in new single-family homes in areas served by Energy Trust of Oregon (Energy Trust). Secondarily, the interviews also queried builders about their experiences with the New Homes program and new Washington residential building code introduced in 2012.

Background

Energy Trust's New Homes program provides incentives to new homebuilders for constructing homes that exceed state codes for energy efficiency. To enhance this program and capture additional energy savings, Energy Trust is considering providing incentives for the installation of energy efficient indoor gas fireplaces as a standalone measure. To explore the feasibility of a standalone gas fireplace measure, Energy Trust and CLEAResult, the program management contractor (PMC) for the New Homes program, worked with verifiers in late 2014 to collect information on fireplace characteristics from approximately 200 new homes constructed by 61 builders in Oregon and Washington. The goal of this data collection effort was to determine the average baseline fireplace efficiency (FE) and prevalence of fireplaces with Intermittent Pilot Ignition (IPI) installed in new homes.[1] Analysis of the data collected on gas fireplaces revealed an average FE of 56.5. The data also revealed a difference between fireplaces installed in new homes in Washington and Oregon - almost all fireplaces in Washington homes (96%) had IPI while less than half of fireplaces in Oregon homes (35%) had IPI.

The results of the data analysis led Energy Trust to engage Evergreen Economics (Evergreen) to conduct interviews with new homebuilders to learn about builders' decision-making

[1] Summary of New Homes Gas Fireplace Data. Energy Trust. 2014.

around installing gas fireplaces in new homes. Specific research questions explored in the builder interviews include:

- What proportion of new homes have an indoor gas fireplace installed, and where are they typically installed in a home?
- Are new homes designed to incorporate indoor gas fireplaces as an integral part of the heating system, or are gas fireplaces installed for use as secondary heating systems or for other reasons such as aesthetics or lifestyle?
- How and by whom is the decision made to install an indoor gas fireplace in new homes?
- How do builders select which fireplaces to install in new homes and how important is energy efficiency in the selection process?
- How do builders define high efficiency for indoor gas fireplaces?
- What is the average FE and prevalence of IPI among indoor gas fireplaces installed in new homes?
- How might an incentive influence homebuilders to purchase and install more efficient gas fireplaces?

In addition, Evergreen utilized the interviews to assess participating builder satisfaction with the New Homes program overall, and understand the impact of new building codes on homebuilders in Washington. The complete interview guide is included as an appendix to this memo. Evergreen completed interviews with 11 homebuilders, 8 in Oregon and 3 in Washington.

Key Findings

Following is a list of key findings identified during the homebuilder interviews:

- A significant majority, 76 percent in Oregon and 97 percent in Washington, of new homes constructed in 2014 by builders interviewed for this research have gas service.
- Of new homes with gas service constructed by builders interviewed for this research, approximately 93 percent in Oregon and 87 percent in Washington have at least one gas fireplace installed.
- Ninety-five percent of homes constructed by interviewed builders with gas fireplaces have one gas fireplace, typically installed in a great room or living room. Additional gas fireplaces are usually installed in a master bedroom or secondary living space.
- Interviewed builders noted that installation of indoor gas fireplaces has become a standard practice for many builders, particularly for mid-price and high-price homes, primarily driven by consumer demand for gas fireplaces.
- All interviewed builders stated that all of the indoor gas fireplaces that were installed in 2014 were enclosed fireplaces as opposed to open log sets.

- Energy efficiency is typically not a consideration in the selection of gas fireplaces for new homes, with only one builder mentioning energy efficiency as an influencing factor. Primary factors in selecting a fireplace for installation are unit price, aesthetics, and unit size.
- Builders have limited knowledge of the efficiency of the fireplaces they install. No builders were able to provide the FE or annual fuel utilization efficiency (AFUE) of installed fireplaces.
- Builders also have limited knowledge of fireplace efficiency rating systems. No builders were aware of the FE rating, and while builders were aware of the AFUE rating in relation to other products such as gas furnaces, they were unable to relate this to gas fireplaces and do not factor it into their decision-making process when purchasing indoor gas fireplaces.
- Builders primarily select gas fireplace models themselves, sometimes with advice from a fireplace distributor, or less commonly, their HVAC contractor.
- Builders are installing "standard efficiency" fireplaces almost exclusively. The average FE of fireplace models installed by interviewed Oregon and Washington builders was 57.6 and 58.4, respectively.
- All interviewed builders claim to be installing fireplace models that have intermittent pilot ignition only. They stated they do not install models with standing pilot lights. While all builders spoke with apparent knowledge of fireplace ignition systems, comparison with the verifier data revealed that at least one builder has installed fireplaces with standing pilot light ignition. This indicates that some builders either lack knowledge of ignition systems or are not aware of the specifications of fireplaces they install.
- One hundred percent of participating Oregon and Washington builders said an incentive to install energy efficient indoor gas fireplaces in new homes would motivate efficient fireplace installation.

Methodology

Evergreen worked closely with Energy Trust and CLEAResult staff to develop a detailed interview guide that addressed the key research questions outlined above. Energy Trust and CLEAResult staff provided Evergreen with a contact list of 46 homebuilders in Oregon and Southwest Washington. The contact list included builders who have participated in the program as well as non-participating builders. The evaluation team worked together to establish interview target goals across Oregon and Washington builders as well as participant and non-participant builders. In an effort to increase the interview response rate, CLEAResult staff notified participant homebuilders of the desired interviews via email.

Evergreen contacted all builders on the contact list via email and phone to schedule interviews. Unfortunately, despite builders being contacted at least three times by phone or email, the builder response rate was lower than we had hoped. As a result, Evergreen

conducted interviews with only 11 builders during January and February 2015. On average, the interviews lasted 36 minutes. Table 1 below presents the disposition of the builder sample, along with the interview goals and completions.

Table 1: Disposition of Homebuilder Sample

	Participant Builders			Non-Participant Builders			Total		
	Sample	Goal	Complete	Sample	Goal	Complete	Sample	Goal	Complete
Oregon	17	12	7	16	3	1	**33**	**15**	**8**
Washington	10	3	3	3	2	0	**13**	**5**	**3**
Total	**27**	**15**	**10**	**19**	**5**	**1**	**46**	**20**	**11**

Detailed Findings

Detailed findings are presented below, grouped by the following categories:

- Builder Characteristics
- Gas Fireplace Installations
- Gas Fireplace Selection and Stocking
- Efficiency of Indoor Gas Fireplaces
- Interest in Incentives
- Satisfaction with New Homes Program
- Adaptation to Washington Code

Builder Characteristics

The interviewed builders ranged across a variety of operating regions, business sizes, and target markets. Four of the seven Oregon builders participating in the New Homes program built new single-family homes in the Portland-Metro area alone, two built in the Portland-Metro area in addition to other parts of the state, and one built homes outside of the Portland-Metro area. Other locations outside of the Portland-Metro area included Corvallis (n=1) and Bend (n=1). One Oregon builder had built homes in both Oregon and Washington over the last year, noting there was no significant difference in their building practices between the states. The Oregon builder that did not participate in the New Homes program built in Marion County only. Two Washington builders built homes solely in the three Southwest Washington counties served by Energy Trust, while the third also built homes in the tri-cities area of Eastern Washington. One Washington builder noted that they had built two homes in Oregon in the past year, but that there was no difference in their building practices between the states.

Evergreen asked builders to estimate the number of homes their company built in 2014. Additionally, builders estimated how many of their completed homes had gas service. Table 2

below outlines the number of homes each interviewed builder completed last year along with the average percentage of those homes that had gas service included.

Table 2: Number of New Single-family Homes Constructed by Interviewed Builders by State (2014)

Oregon (n=8)			Washington (n=3)	
Number of 2014 Homes	Number of Builders	Percentage of Homes with Gas Service*	Number of Builders	Percentage of Homes with Gas Service*
0-10	1	100%	1	100%
11-50	3	100%	-	-
51-100	1	88%	1	95%
100 +	3	72%	1	98%
Total	**8**	**76%**	**3**	**97%**

*Calculated using a basic weighted average approach that accounts for the number of homes each builder estimated for 2014 and the percentage of those homes that included gas service.

Among Oregon builders, the number of single-family homes constructed in 2014 by a single builder ranged from four to 380. The total number of homes constructed across all builders was approximately 1,019, with approximately 36 percent showing in FastTrack (Energy Trust's project tracking system) as participating in the New Homes program[2]. As shown above, three out of eight Oregon builders were large builders, completing over 100 homes in 2014. In aggregate, approximately 76 percent of homes built by interviewed builders included gas service, and all but two builders stated that 100 percent of their homes had gas service. Of the two builders with less than 100 percent of homes having gas service, one, a large builder, stated that approximately 30 percent of their new homes in 2014 had gas service. Among Washington builders, the number of single-family homes constructed in 2014 by a single builder ranged from 10 to 120. The total number of homes constructed across all builders was approximately 190, with approximately 40 percent showing in FastTrack as participating in the New Homes program.

The location of a new home appears to be the primary determinant of the presence of gas service; both builders who built homes without gas service stated they build homes in rural areas of Oregon where gas service is less available than in urban areas of Oregon. The vast majority of homes built by Washington builders in 2014 had gas service.

The interviewed builders also build to a variety of target markets. Table 3 below summarizes the types of target markets for interviewed builders.

[2] FastTrack registers homes that participated in the New Homes program and received an EPS score as well as homes that received rebates for a standalone measures.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Table 3: Interviewed Builder Target Markets

Target Market	Oregon Builders	Washington Builders
Move-Up Buyers	5	3
First-Home Buyers	3	2
Downsizing Buyers	2	2
Luxury Homes	2	1
No Response	1	-

*Multiple answers allowed from each builder.

As shown above, the most common target markets for both Oregon and Washington new builders were move-up buyers, and entry-level buyers, followed by buyers downsizing their homes (e.g., retirees), and luxury homes. Six out of eight Oregon builders, and all Washington builders said they build homes to appeal to multiple target markets depending on the location, size of home, and type of home – either custom or production (i.e., "spec").

Gas Fireplace Installations

Evergreen asked builders a series of questions about the installation of indoor gas fireplaces in new single-family homes with gas service, focusing on the following topics:

- Proportion of homes with gas service that had gas fireplaces installed
- Number of fireplaces installed
- Locaton of fireplaces installed
- Role of gas fireplaces in the home's heating system(s)

Overall, builders indicated that a large majority of single-family homes with gas service include at least one indoor gas fireplace. Table 4, below shows the estimated percentage of homes with gas service that included indoor gas fireplaces.

Table 4: Percent of Homes with Gas Service Built in 2014 with Gas Fireplaces Installed

Target Market	Oregon Builders	Washington Builders
Less than 50%	-	-
50% - 59%	1	-
60% - 69%	-	-
70% - 79%	1	-
80% - 89%	1	1
90% - 99%	-	1
100%	5	1
Total	**8**	**3**

As shown above, seven of the eight Oregon builders estimated over 70 percent of their company's 2014 new homes with gas service included at least one indoor gas fireplace,

including all of the large builders. Those seven builders also noted there was not a significant difference between the number of homes with gas fireplaces in 2013 versus 2014.

The remaining builder estimated only half of their 2014 homes included indoor gas fireplaces, however, they said the percentage of homes with gas service that also have gas fireplaces increased in 2014, although the builder could not specify by how much. The primary reason only half of their homes with gas service included indoor gas fireplaces was because the builder built a number of homes in rural Oregon where, according to this builder, customer demand for gas fireplaces is low. The builder also stated that home prices in rural Oregon are lower than in other parts of the state, making standard installation of gas fireplaces uneconomical for the builder.

In general, Oregon builders said that it has become a common practice over the last five years for homes with gas service to include an indoor gas fireplace. Five of the eight Oregon builders stated that 100 percent of their homes have a gas fireplace and that this has become standard practice in the market, particularly for mid-price and high-price single family homes. Three illustrative quotes from these builders are provided below:

- "Mainly it's consumer desire. I think all the buyers really want them. I think it has become standard in the type of product we build and everyone is pretty much putting them in."
- "It's part of what the market wants, in the past five years it has become pretty standard, customers want them in there."
- "Our sales team says we won't sell homes without them. They (fireplaces) are an expectation of a new home buyer in our communities."

Similarly, the Washington builders stated that the majority of homes with gas service that they built in 2014 had gas fireplaces installed. The two builders that did not always install gas fireplaces noted that they offer gas fireplaces as standard in most of their homes but offer them as an option in their lower-price homes. One of these builders stated that most low-end buyers opt for a fireplace, while the other claimed about 50 percent of their low-end buyers opted for a gas fireplace. All Washington builders mentioned that in 2013 this mix had not changed significantly, however one builder claimed that over the past five years the number of gas fireplace installations has steadily increased.

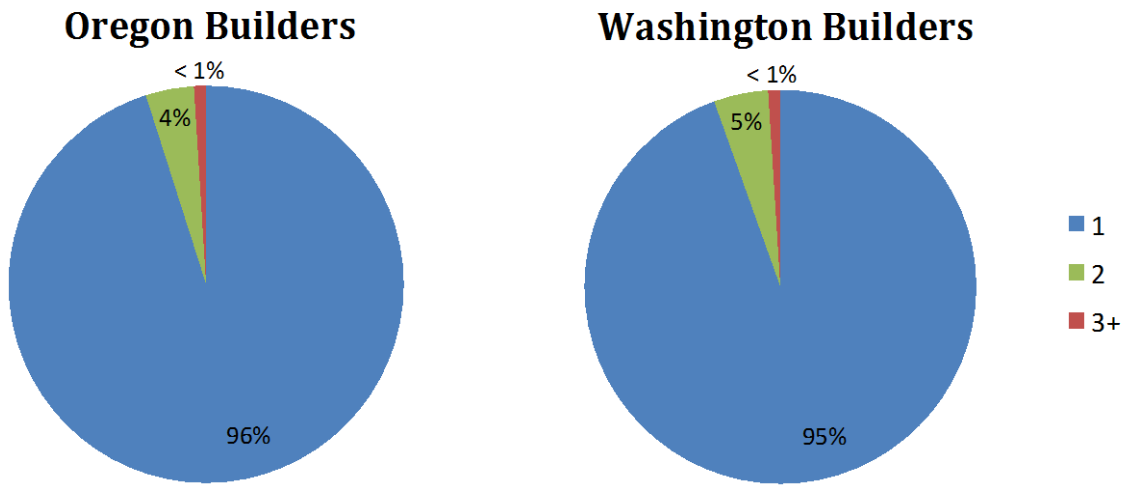
As illustrated by the comments above, the primary force driving the high level of gas fireplace installation is customer expectation that a new home, particularly in non-entry level homes, will include a gas fireplace. In addition, builders noted that this customer demand creates inertia in the building industry; as some builders respond to this demand, the demand among consumers increases, pushing lagging builders to begin installing the in-demand product to remain competitive.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

The primary factor for not installing a gas fireplace in a home with gas service among builders in both Oregon and Washington is the price of the home; lower priced homes may not have a gas fireplace as standard. One non-participating builder also mentioned home size as a factor, with homes under 1,500 square feet not having a gas fireplace as standard.

Oregon builders stated that a large majority of homes with gas service and indoor fireplaces had one fireplace installed. Figure 1 below shows a weighted average of the percent of homes with one, two, or three or more fireplaces installed based on the number of completed 2014 single-family homes.

Figure 1: Number of Fireplaces Installed in New Homes



Overall, 95 percent of homes with gas fireplaces have one gas fireplace. Approximately 96 percent of the Oregon homes with gas service and at least one indoor gas fireplace built in 2014 had only one fireplace installed, with approximately four percent having two indoor gas fireplaces, and less than one percent having three or more indoor gas fireplaces. The results were almost identical for the Washington builders. Builders from both states said the indoor fireplaces were generally located in the living room or great room. For the small percentage of homes that had more than one fireplace, builders said the second fireplace was located in the master bedroom, while the third was generally located in another communal living area.

All interviewed builders stated that all of the indoor gas fireplaces that were installed in 2014 were enclosed fireplaces as opposed to open log sets. Several builders said that enclosed indoor gas fireplaces (versus open log sets) have become the "standard" over the last several years, with one builder adding that they were unsure if they could even purchase open log sets anymore.

All interviewees stated that indoor gas fireplace installations are never designed to be incorporated as an integral part of the primary heating system of a house. Instead, gas fireplaces are installed for aesthetic appeal, and homeowner sense of comfort (both physical comfort and creating a comfortable atmosphere).

While fireplaces are not required to heat new homes, two builders stated that they believe homebuyers often use fireplaces as a supplemental heating source. One builder noted that they have spoken with some homeowners who use their gas fireplace as a heating source some evenings, either in addition to their primary heating system on cold nights or instead of their primary heating system on cool nights, for example in spring. The other builder did not provide specific information about when homeowners may use the gas fireplace, but did note that as their homes have begun to integrate mechanical ventilation systems, particularly heat recovery ventilation systems that distribute heat around the home, gas fireplaces are more effective in heating larger areas of the home.

Gas Fireplace Selection and Stocking

To better understand how builders select HVAC equipment, including, indoor gas fireplaces, Evergreen asked builders about who is responsible for selecting HVAC equipment, including indoor gas fireplaces, to install in their new homes with gas service.

Builders typically make decisions for selecting general HVAC equipment such as furnaces, heat pumps, and water heaters internally, and sometimes in consultation with an HVAC contractor. Table 5 below summarizes the entities responsible for selecting heating systems in new single-family homes.

Table 5: General HVAC System Decision Makers

Decision Maker	Oregon Builders	Washington Builders
Building Company Only	6	2
Building Company and HVAC Contractor*	2	1
HVAC Contractor Only	-	-
Home Buyer	-	-
Total	**8**	**3**

*Building company decision made in consultation with HVAC contractor.

Among builders that select HVAC equipment internally in both Washington and Oregon, two in Washington and three in Oregon have internal management teams that select the heating systems. These are typically larger building companies and the teams generally consist of executive staff (Chief Operating Officers or owners), purchasing staff, warranty staff, and designers. Builders indicated that the heating systems are selected by internal staff members because they are able to use the company resources to estimate cost-effectiveness and select the products that best fit their company's market strategy. However, as noted previously, builders said that they may also consult an HVAC professional during the selection process

because of their expertise and knowledge of specific brands and models. The final decision, however, rests with the building company.

Builders noted that the selection of indoor gas fireplaces often gets grouped in with the heating system selection despite fireplaces not being an integral part of the heating system. As a result, a majority of builders use the same person or team that selects the heating systems to select the indoor gas fireplace. Table 6 below shows a detailed breakdown of who is responsible for selecting the indoor fireplaces.

Table 6: Indoor Gas Fireplace Decision Makers

Decision Maker	Oregon Builders	Washington Builders
Building Company Only	6	3
Building Company and HVAC Contractor*	-	-
Building Company and Fireplace Distributor	2	-
HVAC Contractor Only	-	-
Home Buyer	-	-
Total	**8**	**3**

*Building company decision made in consultation with HVAC contractor.

Among all Oregon builders, the only discernible difference between the heating system selection process and the fireplace selection process was that one builder indicated the customer has some input on fireplace decisions based on the internal management team's selections. The internal management team for this particular builder had three fireplace options for the customer to select from based on their preferences and price point.

Regardless of who was responsible for selecting the indoor fireplace, all of the Oregon builders said that the general specifications of the indoor gas fireplaces, such as size, location, style, and aesthetic factors are typically specified in the intial home designs as opposed to being added later on.

Once the indoor fireplace specifications are determined, builders work with either a regional distributor or HVAC contractor to identify specific gas fireplace models that fit their specifications and, importantly, budget. Table 7 below provides a detailed description of the specific professionals that builders purchased indoor fireplaces from.

Table 7: Indoor Gas Fireplaces Suppliers

Fireplace Seller	Oregon Builders	Washington Builders
Fireplace Distributor	7	2
HVAC Contractor	3	1

*Multiple answers allowed from each builder.

As shown in Table 7, the majority (7 of 8) builders in Oregon used fireplace distributors for purchasing indoor gas fireplaces, with six builders using the distributor Fireside Home

Solutions in the Portland-Metro region and one builder using a Lennox distributor (JP Mechanical) out of Bend[3]. Three out of seven Oregon builders also purchased indoor gas fireplaces through an HVAC contractor depending on the location of the construction and the availability of specific products. Specifically, one builder noted they used an HVAC contractor in the Corvallis area but used Fireside Home Solutions in the Portland-Metro area. Additionally, one large builder used a combination of HVAC contractors and Fireside Home Solutions based on the availability of certain fireplace models. For Novus brand products, this builder used Fireside and for Lennox products, this builder used an HVAC contractor, Performance Building Products. All Oregon builders stated that distributors and contractors were also responsible for installing the indoor gas fireplaces because of their knowledge of, and expertise with, the various products. The primary factor builders considered in selecting a distributor or contractor was the construction location; in regions served by a large distributor, for example, Portland, builders tended to use a distributor, while in regions not served by a large distributor, builders tended to work with contractors.

Among the three Washington builders, two purchased fireplaces from distributors and one through their HVAC contractor. Of the two builders who purchased through distributors, one purchased fireplaces through either Fireside Home Solutions or Lisac's in Portland, while the other purchased from Gensco. These two builders noted that their distributors also provided installation services.

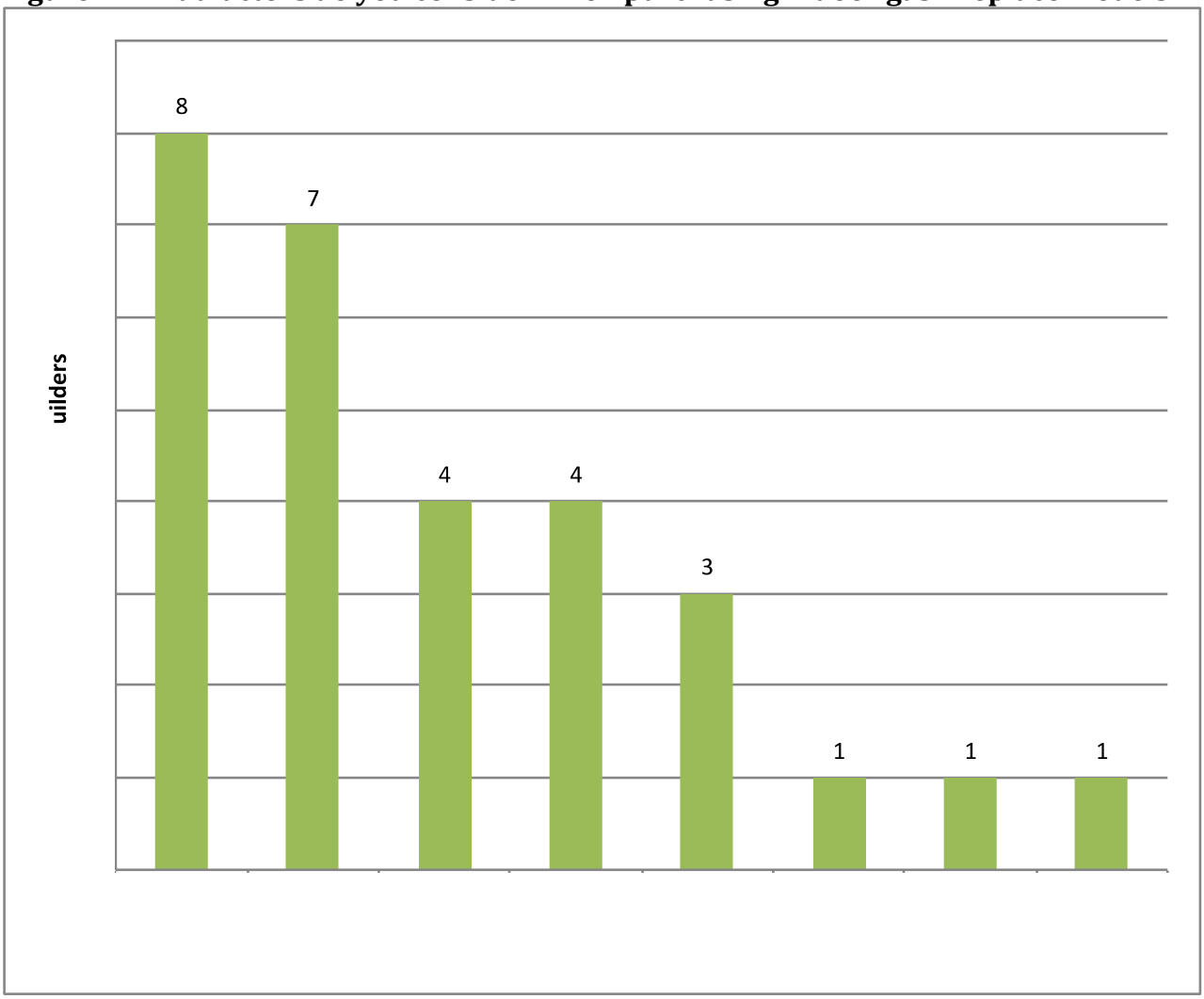
A majority of Oregon builders (six out of eight) purchased individual fireplaces for each of their homes with gas service as opposed to purchasing the fireplaces in bulk. Two builders also purchased in bulk if they were using similar or identical fireplace models in homes being constructed in the same community or project location. For the two builders who sometimes purchased in bulk, Fireside Home Solutions completed the installations once the homes were built. Otherwise, these two builders indicated it was easier to purchase the fireplaces individually for each new home based on the home's specifications. All three Washington builders stated that they purchased fireplaces individually for each house rather than purchasing fireplaces in bulk.

Builders considered a number of factors when selecting indoor gas fireplaces, including price, location, size, and appearance. Figure 2 below shows a complete list of factors that builders said impacted their purchasing decisions of indoor gas fireplaces, and the number of builders that mentioned each factor.

[3] Fireside Home Solutions has two locations in the Portland Metro area and distributes multiple fireplace brands including Heat-N-Glo, Heatilator, Napoleon and Quadra-Fire.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Figure 2: What factors do you consider when purchasing indoor gas fireplace models?



*Multiple answers allowed from each builder.

Interviewed builders mentioned price (n=8) and aesthetics (n=7) as the most important factors in deciding which indoor gas fireplace model to purchase. Additionally, quality (n=4) and unit size (n=4) were important considerations. Other factors mentioned by builders included other product specifications such as venting and construction details, as well as product availability and the quality of the product warranty.

Energy efficiency was mentioned by only one builder as being an important consideration. The majority of builders stated that energy efficiency was not a primary consideration when identifying indoor gas fireplaces for installation in their new homes.

For aesthetics, builders said some of the components they look for include:

- Attractive imitation logs
- Large fire display box relative to overall size of fireplace
- Traditional finishes and sizes
- Overall classic and simple look

In general, builders preferred traditional fireplaces to more modern models because of their lower cost and simple aesthetics. For example, builders preferred the more traditional fireplaces with a square or rectangular shape and a basic black/metal finish. The most common viewing area sizes included 36 inch, 39 inch, and 42 inch (this is the size of the glass panel, not the size of the insert itself).

Additionally, half (n=4) of Oregon builders said they purchase multiple makes and models based on the size of the unit, price point, or availability from their distributor or contractor. The manufacturers that Oregon builders identified included Continental (n=3), Heatilator (n=2), Heat-N-Glo (n=2), American Hearth (n=1), and Lennox (n=1). For Oregon builders, the average cost for the fireplaces, including installation costs[4], was approximately $1,270, ranging from $600 to $2,000. The three Washington builders installed products manufactured by Heat-N-Glo (n=3) and Heatilator (n=1). For Washington builders, the average cost for the fireplaces, including installation costs, was approximately $1,230, ranging from $700 to $1,700.

This information indicates that builders prioritize unit price, aesthetics, and other characteristics such as reliability and quality over energy efficiency. While we did not ask builders specifically why they do not install energy efficient gas fireplaces, it may be that the characteristics that builders prioritize are not available in higher efficiency gas fireplaces. In particular, unit price may be a limiting factor with gas fireplace units with very high efficiency ratings, such as condensing units, being significantly more expensive. While there are higher efficiency models that are available within the typical price range builders quoted, these models may not possess other qualities that builders are looking for in terms of aesthetics. In-depth research of fireplace model characteristics was beyond the scope of this project, however, it would be informative going forward to better understand builder choices.

Efficiency of Indoor Gas Fireplaces

As noted earlier, one of the primary takeaways from the builder interviews was that builders did not define high efficiency for the indoor gas fireplaces they installed in new 2014 homes. Specifically, none of the builders in Oregon or Washington knew about FE or could provide an average fireplace efficiency for the fireplaces installed in their 2014 homes. However, based on the manufacturer and basic model descriptions (including size and product IDs) provided by nine out of 11 of the builders, Evergreen conducted additional online research to

[4] All interviewed builders quoted cost including installation.

determine the FE of the gas fireplaces. Below, Table 8 provides summary statistics on FE for the fireplaces installed in the builders' 2014 single-family homes. More detail on the makes and models by builder can be found in Appendix A.

Table 8: Fireplace Efficiency Summary Statistics (n=8)

	Mean FE	Min FE	Max FE
Oregon	57.6	51.2	67.9
Washington	58.4	54.7	64.3

Overall, all of the installed fireplaces were categorized as normal efficiency, ranging from 51.2 FE to 67.9 FE, with an average of approximately 57.6 FE in Oregon and 58.4 FE in Washington. Additionally, despite installing fireplaces from a variety of different manufacturers, all but one of the builders said the models they selected were enclosed and included IPI instead of a standing pilot light. One small Oregon builder, stated that approximately 50 percent of their fireplace models have standing pilot lights, however, the builder was uncertain about the ignition systems and described the standing pilot light as an electronic ignition system. Unfortunately, this builder was unable to provide specific model details for the fireplace. The uncertainty expressed by this builder, along with a comparison of the fireplace makes and models reported by builders during these interviews with available verifier data (discussed in the following section), suggest that some builders are either unaware of the difference between fireplace ignition systems or do not have knowledge about the specifications of the fireplaces they install.

Comparison with Verifier Data

As discussed in the introduction of this memo, Energy Trust and CLEAResult worked with new home verifiers in late 2014 to collect information on the characteristics of fireplaces installed in new homes in Oregon and Washington. The data collection effort revealed that gas fireplaces installed in new homes had an average FE of 57.6 in Oregon and 53.7 in Washington. These FE ratings are in line with what the builder interviews revealed (shown in Table 8). The verifier data collection effort also found almost all fireplaces in Washington homes (96%) had IPI while less than half of fireplaces in Oregon homes (35%) had IPI. As discussed earlier, contrary to the verifier data, all but one interviewed builder claimed that all gas fireplaces installed have IPI. To investigate further, we compared the builder responses with the verifier data for the four builders (two Washington builders and two Oregon builders) that were part of both studies.

Table 9 below presents the builder reported make and model specifications and ignition type compared with the information gathered for each builder in the verifier data collection effort.

With regards to ignition systems, the responses from three of the four builders that they install fireplaces with IPIs are corroborated by the verifier data. However, one builder, Builder

1, that reported installing only gas fireplaces with IPIs, installed fireplaces in 2014 that had standing pilot lights. Of the 21 verified installations by this builder, 13 (61%) had standing pilot lights. This suggests that this builder is either not knowledgeable about ignition systems in general or, does not have in-depth knowledge of the details of the gas fireplaces being installed.

Table 9: Builder Interview Fireplace Specification Response - Comparison with Verifier Data

Builder Name	Builder State	Builder Reported Make/Model	Model FE	Model Ignition Type	Verifier Reported Make/Model	Verified FE	Verifier Ignition System
Builder 1	OR	Heatilator NDV4233i Heatilator NDV3933i	54.2 51.2	IPI IPI	Hearth & Home DV3732	52.4	IPI
Builder 2*	OR	Not Reported	N/A	IPI	Lennox MLDVT-40-NE-2 Lennox MPDR33RNE Hearth & Home DV3732 Continental CDV36NTR	61 53 52.4 59.4	IPI Standing IPI Standing
Builder 10	WA	Heat-N-Glo SL550TRS	64.3	IPI	Heat-N-Glo SL550TRIPIE	51.4	IPI
Builder 11	WA	Heat-N-Glo SL750TR	56.3	IPI	Heat-N-Glo SL750TRIPIE Hearth & Home DV3732 Hearth & Home NDV36301	56.3 52.4 55.4	IPI IPI IPI

*Builder 2 could not provide specific make and model information during the interview. Builder 2 reported that all models had IPI systems.

Additionally, two builders, Builder 1 and Builder 11, have additional fireplace models listed in the verifier data than those provided during the interviews. This suggests that at least some builders may only have provided details for a portion of the fireplaces they install, for instance, the most recent installations.

Interest in Incentives

As indoor gas fireplace efficiency is currently a low priority for new homebuilders, Evergreen asked builders about what changes in the market might motivate their companies to install more energy efficient fireplaces going forward. Table 10 below summarizes the builder responses.

Table 10: Factors that May Motivate Builders to Install More Efficient Fireplaces

Decision Maker	Number of Builders
Lower Cost of Energy Efficiency Equipment	9
Increased Customer Demand for Energy Efficiency	8
Availability of Rebate	6
State Code Changes	3
Increased Installation by Building Competition	1

*Multiple answers allowed from each builder

The majority of builders stated that lowering the overall cost of energy efficient fireplaces would motivate their companies to install more energy-efficient gas fireplaces on a consistent basis. Six builders specifically said a rebate would help motivate a change in installation practices, while others alluded to the fact that lowering the overall costs might include a rebate in addition to manufacturers lowering the initial costs as well.

Evergreen also asked builders directly if a rebate for energy-efficient indoor gas fireplaces would encourage them to install equipment that is more efficient. One hundred percent of all interviewed builders said an incentive to install energy efficient indoor gas fireplaces in new homes would motivate efficient fireplace installation.

Builders also acknowledged that if customers started to become interested in energy efficient fireplaces, for example, as they have become interested in energy efficient light bulbs, then builders would react accordingly and install more efficient fireplaces to meet demand.

Satisfaction with Energy Trust New Homes Program

Overall, participating builders indicated they have been satisfied with Energy Trust's New Homes program. Table 11 below shows a detailed breakdown of the participants' satisfaction levels ranging from 1 to 5, where 5 is very satisfied and 1 is not at all satsified.

Table 11: Participating Builder Satisfaction with New Homes Program

Satisfaction Score	Oregon Builders	Washington Builders
5 – Very Satisfied	3	2
4	2	1
3	2	-
2	-	-
1 – Not At All Satisfied	-	-
Total	**7**	**3**

As shown above, three of the Oregon builders gave a score of "5", two gave a "4", and two gave a "3", indicating a high level of overall satisfaction. Consequently, none of the participating Oregon builders said they had experienced any specific challenges or issues in participating with the New Home program.

Among the Washington builders, two builders rated the New Homes program a "5" on the satisfaction scale, and one rated the program a "4", stating that the program was very good but the incentive process can be slow at times. The only recommendations for improving program participation included increasing consumer education efforts for the New Homes program, increasing communication efforts between implementers and builders, and simplifying the participation process.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Adaptation to Washington Building Code

We asked Washington builders a battery of questions aimed at understanding the impact of the 2012 Washington building code changes. We first asked the builders to rate the level of difficulty of adopting the new code changes on a scale of 1 to 5, with 1 being very difficult and 5 being very easy. Two builders rated the adoption of the new Washington code a "5", or very easy, while one rated adoption of the new Washington code a "3". The builder that provided a score of "3" stated that while in practice the changes were not very difficult because they were already building above the new code, there was some difficulty in adapting to the additional compliance paperwork required by the new Washington code.

As noted above, the only challenge in adopting the new Washington code was the additional paperwork requirements, and therefore all builders stated that there were no new strategies they adopted to respond to the code changes, nor was any assistance required from Energy Trust to help adapt to the new code changes.

Conclusion And Recommendations

Builders interviewed for this study typically install standard efficiency gas fireplaces (between 50 and 64.9 FE) in the majority of new homes with gas service they build. All builders claimed to be installing fireplace models with IPI systems, however, comparison with the verifier data indicates that standing pilot lights are still prevalent in the market, revealing that some builders are not aware of the ignition systems of gas fireplaces they install.

Builders primarily consider unit price, aesthetic attributes, and unit size when selecting a gas fireplace model. Energy efficiency is typically not a consideration in the selection of gas fireplaces and builders have very low knowledge of energy efficiency related to gas fireplaces, including poor knowledge of fireplace efficiency ratings. Builders primarily select fireplace models themselves, sometimes with advice from a fireplace distributor or less commonly, their HVAC contractor. All interviewed builders said an incentive to install energy efficient indoor gas fireplaces in new homes would motivate efficient fireplace installation. The results of these interviews suggest that an opportunity exists to positively influence the efficiency of gas fireplaces installed in the new homes market.

Based on the results of the builder interviews Evergreen recommends:

- **Conducting targeted product research to identify low cost, high efficiency fireplace models.** Builders' primary considerations in selecting a gas fireplace are unit price, aesthetic attributes, size, and reliability. It is unclear if energy efficient models are at odds with builder's desired characteristics, particularly with regards to unit price. Additional research on product availability and characteristics would potentially shed light on builder model selection decisions, as well as develop a pool of products that could be part of any future offering. Energy Trust staff could likely leverage research conducted for the Existing Homes program's gas fireplace offering.

- **Investigating the feasibility of leveraging the influence of distributors in any future program design.** Builders noted that they often work with gas fireplace distributors in their model selection process. If Energy Trust decides to offer a gas fireplace standalone measure, Energy Trust should explore program design methods that target distributors as a point of entry into the market.
- **Educate builders and other market actors about gas fireplace energy efficiency.** Builders have very low knowledge of energy efficiency related to gas fireplaces, including poor knowledge of fireplace efficiency ratings and ignition systems. If Energy Trust decides to offer a gas fireplace standalone measure, Energy Trust should engage in builder education to raise awareness and understanding of gas fireplace efficiency and ignition systems.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Appendix A: Reported Make and Model Specifications by Builder

Builder Name	Builder State	Builder Reported Make/Model	Model FE	Model Ignition Type
Builder 1	OR	Heatilator NDV4233i	54.2	IPI
		Heatilator NDV3933i	51.2	IPI
Builder 2	OR	Not Reported	N/A	IPI*
Builder 3	OR	Continental CB42	62.5	IPI
Builder 4	OR	Not Reported	N/A	IPI*
Builder 5	OR	Heat N Glow DV3732 SBI	52	IPI
		American Hearth ADVD36FP	55.8	IPI
Builder 6	OR	Heatilator Novus NDV3630	54.4	IPI
		Lennox Hearth SLDVT	61	IPI
Builder 7	OR	Continental CHD4	67.9	IPI
Builder 8	OR	Continental BCDV36	59.4	IPI
Builder 9	WA	Heat N Glo 6000GL IPI	54.7	IPI
Builder 10	WA	Heat-N-Glo SL550TRS	64.3	IPI
Builder 11	WA	Heat-N-Glo SL750TR	56.3	IPI

*Reported by builder.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Appendix B: Builder Interview Guide

Builder Interview Guide
January 9, 2014

Key Objectives:

- Assess builder satisfaction with the New Homes program, and any issues
- Understand impact of new Washington code on builders and how they are adapting to it
- Understand how builders make decisions about gas fireplaces installed in new homes and influences on their decision
- Assess potential influence of new incentive to purchase and install more efficient gas fireplaces

Target Audience: 20 total builders - mostly participating builders. About 15 builders will primarily operate in Oregon, and 5 will be based in Southwest Washington (some may build homes in both states). Interviews will target larger builders, including those builders whose homes were included in the gas fireplace data collection effort (led by verifiers).

Introduction: Hello, my name is _____ with Evergreen Economics, an energy market research firm based in Portland. I want to assure you that this is not a sales call. Energy Trust of Oregon has asked us to help them better understand how well their New Homes program is working, and we are speaking with home builders to understand their business practices regarding the installation of gas fireplaces in new homes, and to get feedback to improve Energy Trust's program. Would you be available to participate in an interview with me regarding gas fireplaces and the New Homes program? Our questions will take about 30 minutes. If you are not available now, could we schedule a time later in the week that would be convenient for you?

Schedule Date and Time: _____

[IF NEEDED: This study will help Energy Trust to make its programs as successful as possible for builders like you. The answers you provide will not be linked to you or your company in any publicly available documents. Information about your company's fireplace selection practices may be shared with Energy Trust program staff and their program implementers for them to analyze.]

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

I. Business Scope

Let's start with some general questions about your company.

I would like to emphasize that we are asking about homes you build in Oregon or Washington only. If you build homes in both Oregon **and** Washington, I will ask you to answer some questions separately for your Washington homes and your Oregon homes. Additionally, for most of our questions, we are asking only about homes with gas service (i.e. gas lines).

Q 1. In what parts of Oregon and Washington do you build new single-family homes?

Q 2. Who is the target market for your new single-family homes? (Probe on income level, family size, first time v. move-up buyers, etc.)

Q 3. About how many homes did your company build in the past year?

Q 4. About how many homes did your company build that had gas service?

II. (PARTICIPANT BUILDERS ONLY – From Spreadsheet) Satisfaction with Energy Trust New Homes Program

Now I would like to ask you a few questions about your participation in the New Homes program. Thinking about your experience working with program over the past year:

Q 5. Overall, how would you rate your satisfaction with Energy Trust's program on a scale from 1 to 5, where 5 is very satisfied and 1 is not at all satisfied?

Q 6. Did you experience any challenges or issues in participating with the program? [If YES] Can you please describe the challenge(s) to me, and how they were resolved?

Q 7. What additional information or assistance do you want regarding participating in the program, if any? Why do you say that?

III. (WASHINGTON BUILDERS ONLY – From Q1) New Building Code

Now I have some questions about the recent energy code changes in Washington.

Q 8. On a scale of 1 to 5 where 5 is very easy and 1 is very difficult, how easy or difficult has it been to adapt to the new energy code in Washington? Why do you say this?

Q 9. What challenges (if any) are you having meeting the new energy code?

Q 10. What new strategies are you using to meet code?

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Q 11. What assistance (if any) would help you to meet the new code?

IV. Gas Fireplace Installation

Now I have some questions about installation of indoor gas fireplaces in your new homes with gas service. Please note that when I refer to gas fireplaces, I am referring to indoor gas fireplaces only. If you build homes in Washington and Oregon, please answer separately for each state.

(Interviewer Note: If builder reported builds homes in Washington and Oregon in Q1, ask each question separately for Washington and Oregon)

Q 12. About what percent of the homes with gas service your company built in the past year had indoor gas fireplaces in them? Has this increased, decreased, or stayed about the same over the past year

Q 13. What factors determine whether or not an indoor gas fireplace is installed in a new home with gas service?

Q 14. Of the homes built with indoor gas fireplaces in the past year, about what percent had: 1 fireplace only installed? 2 fireplaces installed? Three or more fireplaces installed? Has this mix changed over the past year?

Q 15. About what percent of the indoor gas fireplaces installed in the past year were enclosed indoor gas fireplaces? About what percent were open log sets? Has this increased, decreased, or stayed about the same over the past year?

Q 16. Are any of the homes you build with indoor gas fireplaces designed to incorporate the fireplace as an integral part of the heating system? [If YES] What percentage of your homes? [If < 100%] Has this increased, decreased, or stayed about the same over the past year?

Q 17. [If Q 16 = YES] In what percent of these homes with indoor gas fireplaces is the gas fireplace the main heating system, and in what percent are they a secondary or zonal system? Has this increased, decreased, or stayed about the same over the past year?

Q 18. For homes with one indoor gas fireplace installed, where in the home are they typically installed (i.e. main living room, bedroom, dining room)? What about homes with two or more?

V. Gas Fireplace Selection

Now, I'd like to learn more about who is responsible for selecting equipment to install in your new homes with gas service – specifically, heating systems and gas fireplaces. If you build homes in Washington and Oregon, please explain any differences between the two states.

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Q 19. Who makes decisions about which heating systems (e.g. furnace, heat pump, water heater) are installed in your new homes? [PROBE: Builder, architect, HVAC contractor, designer, homeowner]

a. [*If homeowner*] What is the homeowner's influence on the decision? [PROBE to see if they [homeowners] can specify the brand or efficiency level]

b. [*If homeowner*] Do you provide homeowners with a selection of heating system types?

Q 20. Who makes decisions about which indoor gas fireplaces are installed in your new homes with gas service? Is that the same or different person or group who makes decisions about the overall heating systems? [*If needed: get contact info for individual who makes decisions about gas fireplaces, noting company and title.*]

a. [*If homeowner*] Do you provide homeowners with a selection of models or does the homeowner make this decision separately?

Q 21. Is the indoor gas fireplace typically specified in the initial home designs, or added later on? If added later on, at what point is the decision made? Is this the same for other types of equipment (i.e., heating systems)?

VI. Fireplace Stocking and Selection

Now I have some questions about how you purchase fireplaces and select fireplaces for new homes with gas service.

[READ IF interviewee gave contact details for another person in Q20] Earlier you mentioned that someone else makes decisions about selecting the gas fireplaces you install. The next few questions will ask for specific information about where you purchase your fireplaces and the factors you consider when purchasing them, such as price and energy efficiency characteristics. Will you be able to answer these questions or should I direct these questions to the person you mentioned earlier?

IF interviewee can answer questions – continue with Section VI

ELSE SKIP to Section VII.]

If you build homes in Washington and Oregon, please answer separately for each state.

(Interviewer Note: If builder builds homes in Washington and Oregon, ask each question separately for Washington and Oregon)

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

[Interviewer Note: If builder cannot answer any question in this battery ask, "Is there someone else who could provide this information?" Get contact information for individual noting company and title.]

Q 22. From whom do you purchase the indoor gas fireplaces that you install in new homes with gas service? *[PROBE: Distributor, manufacturer, retail store, installation contractors, other – critical to get company names]*

Q 23. Do you buy individual indoor fireplaces for each of the homes with gas service that you build, or purchase fireplaces in bulk?

Q 24. What types of indoor gas fireplaces do you purchase, for example, fully enclosed? Open log sets?

Q 25. What factors do you consider when purchasing indoor gas fireplace models? *[PROBE: Local/current availability, distributors' stocks, manufacturer, aesthetics, energy efficiency (FE and IPI), price, size of unit, homeowner selection]*

a. Which factors are most important? Why?

b. Is pilot light type - for example, standing pilot light or intermittent pilot ignition - an important factor?

c. Do you purchase multiple makes and models?

[If yes] Why do you purchase more than one make and model? What considerations are involved? *[PROBE: Size, design, aesthetics]* [*If needed: A standing pilot light is a small flame that is always on that is used to ignite the fireplace. Some fireplaces have a standing pilot light and some have intermittent pilot lights or electronic ignition that ignites the pilot light only when needed.*]

Q 26. What factors do you consider when selecting an indoor gas fireplace to install in a specific home? *[PROBE: Size of unit, homeowner selection, energy efficiency, price of unit, price of home, aesthetics]*

Q 27. About what percent of the indoor gas fireplaces you install have standing pilot lights?

[If 100%] Does your fireplace supplier offer models with intermittent pilot ignition or electronic ignition?

[If less than 100%] Do the other fireplaces that you install have intermittent pilot ignition or electric ignition?

EVERGREEN ECONOMICS
333 SW Taylor St., Suite 200
Portland, Oregon 97204
evergreenecon.com

Q 28. How do you define high efficiency for indoor gas fireplaces?

Q 29. Can you please tell me the average fireplace efficiency, also known as FE, of your indoor gas fireplaces? [Note: If FE not known, ask for AFUE]

[*If needed: Fireplace Efficiency or FE is a measure of efficiency that measures efficiency over an entire heating season – not just at peak efficiency - and more accurately reflects actual energy performance*.]

Q 30. What is the average cost of the fireplaces - just the equipment cost - that you install in new homes?

VII. Interest in Incentives

Now I have a few final questions and then we'll be done.

Q 31. What changes in the marketplace, if any, might motivate your company to install indoor gas fireplaces that are more energy efficient? By energy efficient, I mean with an FE of at least 65 and an intermittent pilot ignition.

Q 32. If an incentive were available to install energy efficient indoor gas fireplaces in new homes, would this motivate you to install fireplaces that are more efficient?

a) If not, why not?

b) If yes, what information would you want to see? What concerns would you have (if any)?

Those are all the questions I have for you today. Is there any other information that we have not discussed that you would like to provide in regards to the Energy Trust New Homes program?

Thank you very much for your time and good information!

MEMO

Date: June 16, 2015
To: New Homes Program
From: Erika Kociolek, Evaluation Project Manager
Subject: Summary of New Homes Survey

Background

Energy Trust worked with Abt SRBI, a survey firm, to field a survey of residents living in homes for which builders received incentives through Energy Trust's New Homes program between 2012 and 2013. The main goal of this survey was to determine the prevalence and use of fireplaces installed in newly constructed homes, which could potentially be used to develop a standalone gas fireplace measure. In 2015, Energy Trust completed a metering study of gas fireplaces in existing homes and used the information collected from the study to estimate average hours of use.[1] However, there are several reasons to think that fireplace use in new homes may be different from use in existing homes. First, the vast majority of customers who participated in the existing homes metering study had recently purchased a new, high-efficiency gas fireplace. Because these customers selected and purchased the fireplace themselves, it's reasonable to think that they would use the fireplace more than a customer who purchased a new house that happened to come with a fireplace. Second, the characteristics of fireplaces being installed in new homes may be different than those being installed in existing homes, and that may impact how much residents are using them.

In addition, program staff expressed an interest in using the survey to learn about:

- homeowner awareness of energy-related certifications and ratings, and their impact on home purchase decisions
- changes made by homeowners
- prevalence of various energy-using devices

Key Findings

- **Incentive effectiveness**. The inclusion of a small incentive significantly boosted the survey response rate; the group that received a $1 bill in the survey invite letter had an 11% response rate compared to a control group, which had a 5% response rate.
- **Awareness of home ratings**. Residents appear to have relatively high awareness of home certifications and ratings (77%), although awareness of specific certifications is relatively low (Energy Star was the most remembered among respondents – 71% of those whose homes were Energy Star certified in Energy Trust records said they recalled receiving the certification). Additionally, among respondents who were aware of certifications, most respondents said that the certifications had an important role in their home purchase decision.

[1] Gas Fireplace Metering Study. 24 February 2015. http://assets.energytrust.org/api/assets/reports/Gas_Fireplace_Studies.pdf.

- **Prevalence of fireplaces**. Fireplaces appear to be widespread in new homes, with 81% of respondents reporting that they have at least one fireplace in their home.
- **Fireplace use**. Hours of use in new homes do appear to be lower compared to what was found in existing homes through a metering study (which estimated an average heating season use of 17 hours per week). The metering study compared self-reported and actual (metered) hours of use, and found that on average, participants overestimated their hours of use by 53%. We used this number to adjust the average reported hours of use from this survey (8.2 hours) and obtain an estimate of 5.4 hours per week of fireplace use. As was the case with the metering study, the distribution of hours of use is skewed, with many residents using the fireplace just a few hours a week, but a few residents using the fireplace a large number of hours per week.

Methods

Survey Methods

The development of the survey instrument was done in-house between October and December 2014 with input from Evaluation, Planning, and New Homes program staff. A copy of the survey instrument can be found in Appendix 1. Energy Trust worked with Abt SRBI, a firm based in New York, New York, with an Energy Division in Fort Myers, Florida, to field the survey. Since Energy Trust lacks contact information for residents of new homes, it was decided to send a survey invitation letter and a reminder postcard via US mail to the sites selected for the sample. The letter and postcard drove residents to an online web survey. It also offered residents the option of calling Abt SRBI to take the survey on the phone. The text of the letter and postcard can be found in Appendix 2.

The survey letter was distributed on April 22, 2015, with reminder post-cards distributed on May 7, 2015. Surveys were completed between May 7, 2015 and May 28, 2015.

Sample Selection Methods

The sample for the survey was developed by first pulling new homes measures recognized in 2012 and 2013. These are homes for which builders received an incentive payment through Energy Trust's New Homes program. These years were chosen to ensure that the homes had been occupied for at least a year. Sites under 800 square feet (with the goal of excluding accessory dwelling units), Washington sites that received incentives for tankless gas water heaters, and sites with unit numbers (since the target for the survey was single family homes) were all excluded from the sample, as were sites listed as do not contacts.

From this pool, a random sample of just under 2,000 unique addresses were selected. A 10% response rate was assumed, and 150-200 completed surveys were desired, hence the sample of 2,000 addresses. This pool was further divided into two groups: a group that received a $1 bill in their survey invitation letter ("incentive group") and a control group ("no incentive group"). The addresses were randomly assigned to the incentive and control groups. We did this so we could evaluate the extent to which including a small incentive in the survey invitation letter affected the survey response rate.

The table below shows the number of sites selected into the survey sample, broken out by group. Approximately 107 addresses were found to be invalid, and were not invited to take the survey. The survey invitation letter and reminder postcard were sent to 1,890 addresses. As of June 1, 2015, approximately 51 letters and/or postcards were returned to Abt SRBI and are considered "undeliverable." So, the survey invitations and postcards should have reached a total of 1,839 residents.

	Incentive ($1)	No incentive	Total
Initial sample provided to Abt SRBI	1,000	997	1,997
Number of addresses found to be invalid before sending	(58)	(49)	(107)
Number of letters and postcards sent	942	948	1,890
Number of addresses undeliverable	(25)	(26)	(51)
Total	917	922	1,839

Response rate

As shown in the table below, the survey was completed by 146 residents. Approximately 70% of those surveys were completed by residents that received an incentive in their survey invitation letter, while 30% were completed by residents in the "no incentive" group. Overall, about 8% of residents who were asked to take the survey ended up completing the survey. This percentage was higher for residents that received an incentive (11%) relative to residents that did not (5%), suggesting that the incentive was effective in driving a greater number of completed surveys.

	Number of surveys delivered	Number of completed Surveys	Response rate
Incentive ($1)	917	103	11%
No incentive	922	43	5%
Total	1,839	146	8%

Sample and Respondent Characteristics

In this section, we describe characteristics of the sample and compare to the characteristics of respondents. We want to verify that the respondents roughly resemble the sample (and therefore, the population) and flag any significant differences that could impact the representativeness of the survey results.

State

As shown in the table below, the split between Oregon and Washington homes in the sample and respondent pool was almost identical.

	Number – All Sample	Percent	Number – Respondents	Percent
Oregon	1,787	89%	132	90%
Washington	210	11%	14	10%
Total	1,997	-	146	

Region

There were slightly more responses from homes outside of the Portland Metro area relative to their prevalence in the sample.

	Number – All Sample	Percent	Number – Respondents	Percent
Portland Metro	1,418	71%	92	63%
Non-Portland Metro	579	30%	54	37%
Total	1,997	-	146	-

Home type

The sample was a mix of program and non-program homes; the table below shows the breakdown of program vs. non-program homes. There are a higher proportion of program homes in the respondent group than in the sample. In the sample (and, therefore, in the respondent group), the non-program homes are all homes in Oregon that received incentives as part of an air sealing pilot. One hundred ninety-eight distinct builders are represented in the sample; 60 are represented in the respondent group.

	Number – All Sample	Percent	Number – Respondents	Percent
Program	1,507	75%	119	82%
Non-program	490	25%	27	19%
Total	1,997	-	146	-

Number of certifications

The table below shows the number of certifications per home. A quarter of the sample and 18% of the respondent group did not have any certifications; these are all non-program homes. 75% of homes in the sample had at least one certification, compared with 82% of respondent homes. The average home in the sample had, on average, 1.2 certifications, compared with 1.4 for homes in the respondent group.

Number of Certifications	Number – All Sample	Percent	Number – Respondents	Percent
0	490	25%	27	18%
1	847	42%	58	40%
2	404	20%	42	29%
3	244	12%	19	13%
4	12	1%	-	-
Total	1,997	-	146	-

Certification type

The prevalence of specific home certifications differed between the sample and the respondent group, as shown in the table below.

Certification Type*	Number – All Sample	Percent	Number – Respondents	Percent
LEED	35	2%	15	10%
Energy Star	574	29%	95	65%
Earth Advantage	529	26%	67	46%
EPS	1,297	65%	53	36%
Total	1,997	-	146	-

*Note: A single home can have multiple certifications.

Summary of site square footage

The table below shows the distribution of square footage for the sample and for survey respondents. There was one large outlier (recorded as having more than 90,000 square feet) that was thought to be a data entry error. It was recoded as “missing” before estimating the statistics below. Homes in the sample tended to be slightly larger, on average, relative to the respondent group.

Square Footage	All Sample	Respondents
Minimum	840	840
Average	2,177	2,114
Median	2,082	1,980
Maximum	5,732	3,677
% Missing Square Footage	24%	17%

Survey Responses

We now summarize responses to the survey, which are grouped into the five sections listed below:

1. Respondent Characteristics
2. Home Certifications and Ratings
3. Home Appliances and Devices
4. Gas Fireplace Prevalence and Use
5. Demographics

1. Respondent Characteristics

The average length of time to complete the survey was nine minutes. Although a phone option was available, only one survey was completed over the phone.

Do you own or rent your home?

97% of respondents reported that they own their home, as shown in the table below.

	Number	Percent
Own	141	97%
Rent	5	3%
Total	146	-

[If owned their home] Are you the original (i.e., first) owner of this home?

As shown in the table below, 98% of those who own their home reported that they were the original home purchasers.

	Number	Percent
Yes	138	98%
No	3	2%
Don't know	-	-
Total	141	-

Is this home your primary residence?

All but one respondent reported that the home the survey invitation was sent to is their primary residence.

	Number	Percent
Yes	145	99%
No	1	1%
Total	146	

2. *Home Certifications and Ratings*

This section summarizes responses to questions focused on respondent awareness of home certifications and ratings.

Unfortunately there was an issue with the survey programming that prevented the first 48 respondents who took the survey from getting asked these questions, so their responses are excluded from the tables in this section.

[For those that reported owning their home and whose homes were recorded as having at least one certification] When you purchased your home, were you aware of any energy-related certifications and ratings that your home received?

The survey began by asking customers who reported owning their home and whose home was recorded as having at least one certification about their awareness of those certifications. 82% of homes in the respondent group were recorded as having at least one certification, and on average, each home had 1.4 certifications. As shown in the table below, 71% of respondents said that they were aware of certifications at the time they purchased their home.

	Number	Percent
Yes	67	71%
No	21	22%
Don't know	7	7%
Total	95	-

The table below compares the response to the question above with whether or not a certification was captured in Energy Trust's records. It's worth noting that the question asked about awareness at the time of purchase. Respondents may have answered differently if asked about awareness in general. Additionally, home certifications may have been achieved, but were not captured in Energy Trust records.

The table shows, of those who are recorded as having a certification, the percent that said they were and were not aware of the certification when they purchased their home, and what percent don't know. So, 77% of those that had a certification on file also said that they were aware of home certifications at the time they purchased their home.

Certification (in Energy Trust records)?	When you purchased your home, were you aware of any energy-related certifications and ratings that your home received?			
	Yes	**No**	**Don't know**	**Total**
Yes	77%	14%	5%	79
No	32%	53%	16%	19
Total	67	21	7	95

[For those that had least one certification in Energy Trust records, reported owning their home, and reported being aware of home certifications and ratings that home received] Do you recall whether your home received any of the following certifications?

If respondents answered "Yes" to the question above, owned their home, and were listed as having a certification in Energy Trust's records, they were asked if they recalled the specific certifications and ratings their home received (see table below). Note that the question was programmed to only display the certifications on record for the home, along with an "other" option.

Certification*	# with certification	% that recall receiving certification	% that did not recall receiving certification	% don't know
Earth Advantage®	24	21%	29%	50%
ENERGY STAR®	29	71%	4%	25%
EPS, an energy performance score	51	39%	14%	47%
Leadership in Energy and Environmental Design (LEED)	1	1 of 1	0	0

*Note: A single home can have multiple certifications.

Other certifications named by respondents can be found in Appendix 3; 21 respondents reported having an "other" certification. All of them reported having certifications that were not present in Energy Trust records: 7 of 21 reported having Earth Advantage certification, 7 of 21 reported having Energy Star certification, 1 of 21 reported having LEED certification, and the remaining 5 were unable to be categorized. This suggests that Energy Trust's records may not be complete, that customers are not correctly recalling certifications received, or that certifications happen after information is entered into FastTrack. See Appendix 3 for additional detail.

[If recalled receiving a certification] What role, if any, did these certifications play in your home purchase decision?

If respondents reported recalling one or more specific certifications, we asked about the role the certifications played in their home purchase decision via an open-ended question. Sixty-six (79%) of the 84 respondents who recalled a specific certification provided input. Of those 66, nine said "don't know." The remaining 57 provided an open-ended response, which are summarized in Appendix 4. These were reviewed and coded into one of three categories: important, not important, and unclear.

The table below summarizes all 66 responses. The majority of respondents who provided feedback (68%) said the certifications had an important role in their home purchase decision. About 17% said the certifications did not have an important role. 14% did not know, and 2% of respondents' comments we were unable to categorize.

Importance of certification to home purchase decision	Number	Percent
Important	45	68%
Not important	11	17%
Unclear	1	2%
Don't know	9	14%
Total	66	-

3. Home Appliances and Devices

This section summarizes questions focused on the types of energy-using appliances and devices in the home – specifically, whether certain devices were in the home when respondents moved in, and any changes made to devices in the home.

Thinking of the appliances in your home, please indicate which of the following statements best describes how you obtained these appliances.

The majority of respondents purchased major appliances (refrigerator, clothes washer, and dryer) when they moved into their home. Just under a third of respondents brought their clothes washer and dryer with them from a previous home, while 26% of respondents said their refrigerator was already in the home when they moved in.

	Refrigerator	Clothes washer	Dryer
Appliance was already in home when I moved in	26%	16%	16%
Purchased appliance when I moved in	64%	53%	52%
Brought appliance with me from previous home when I moved in	10%	30%	31%
Don't know	-	1%	1%

[Only asked of those who own their home] When you purchased your home, did the home come with light bulbs in the fixtures?

Almost all (97%) of respondents said there were light bulbs in the fixtures when they purchased their home.

	Number	Percent
Yes	137	97%
No	4	3%
Total	141	-

[If home came with light bulbs in the fixtures] What kind were they (primarily)?

Of those who said there were light bulbs in the fixtures at the time of the home purchase, most (66%) reported that the lighting was primarily CFLs. 18% said the lighting was primarily incandescent bulbs, and 11% said the lighting was primarily LEDs.

	Number	Percent
LEDs	15	11%
Compact fluorescent light (CFL) bulbs	91	66%
Incandescent bulbs	25	18%
Don't know	6	4%
Total	137	-

What changes, if any, did you make to your home within the first year of moving in? Please select all that apply.

51% of respondents said they did not make any changes the first year they were in their home. Of the 49% who reported making some type of change, 38% said they installed light bulbs, and 19% said they installed new showerhead fixtures. 12% described "other" changes they made, which can be found in Appendix 5. These were a diverse mix of changes; there was not a clear theme. Details about the changes can be found in Appendix 5.

	Number	Percent
Installed light bulbs	56	38%
Installed new showerhead fixtures	28	19%
Installed new faucet fixtures	5	3%
Installed different water heating system	2	1%
Installed solar electric system	3	2%
Replaced refrigerator*	-	-
Replaced clothes washer*	-	-
Replaced dryer*	-	-
Other**	17	12%
Did not make changes	75	51%
Total	146	-

*Note: These options were only displayed if respondents answered "Appliance was already in home when I moved in" for the corresponding appliance.
**Other responses are summarized in Appendix 5.

[If installed light bulbs] What type of light bulbs did you install? Please select all that apply.

Of the 38% of respondents who reported installing light bulbs, 63% of them installed LEDs, and 48% installed CFLs. 16% reported installing incandescent bulbs.

	Number	Percent*
LEDs	35	63%
Compact fluorescent light (CFL) bulbs	27	48%
Incandescent bulbs	9	16%
Don't know	-	-
Total	56	-

*Multiple responses possible.

[If installed light bulbs] Why did you decide to replace the lighting in your home?

Of the 56 respondents who said they installed light bulbs in their home within the first year of moving in, three responded "don't know" and the remaining 53 provided feedback on why they decided to make this change, which is summarized in Appendix 6. These responses were coded, and a list of reasons why respondents replaced their lighting is in the table below. The reasons were diverse, but a number of respondents mentioned energy or cost savings (38%) and needing new bulbs (21%). Other themes that emerged included wanting to use dimmers, wanting quicker or instant-on (respondents typically mentioned CFLs took time to warm up), wanting brighter or better light quality, and the long lifetime of LEDs. 11% of responses were unable to be coded.

Reason for replacing lighting	Number	Percent*
Savings ($ or energy)	20	38%
Wanted dimmers	6	11%
Wanted quicker or instant-on	7	13%
Needed new bulbs / old ones burned out	11	21%
Wanted brighter or better light quality	8	15%
Bulb lifetime	5	9%
Unclear	6	11%
Total	53	-

*Multiple responses possible.

[If installed different water heating system] Why did you decide to install a different water heating system?

Of the two respondents who said they decided to install a different water heating system within the first year of moving into their home, both provided feedback on why they decided to make this change, which is summarized below.

Open-ended responses (N = 2)
changed out to an on-demand gas water before I moved in
efficiency

How many of the following appliances do you have in your home?

Another question of interest to the program was the prevalence of various energy-using appliances. The table below shows the percentage of respondents that reported having any of the following devices. This ranged from a low of window air conditioning units (3%) to a high of PCs or laptops (100%). Most interesting was the relatively high prevalence of central air conditioning units – three-quarters of respondents reported having them.

	% of respondents with any of the following appliances	Range
Central air conditioning unit	75%	0-2
Window air conditioning unit(s)	3%	0-2
Stand-alone freezer (chest or upright)	24%	0-1
Hot tub	7%	0-2
PCs or laptops	100%	0-5+
Refrigerators	95%	0-3
Televisions	98%	0-5+

What kind of thermostat do you use in your home?

Given program interest in smart thermostats, we wanted to see what kind of thermostats respondents had in their homes. 82% had some type of programmable thermostat, and 12% had a smart or web-enabled thermostat.

	Number	Percent
Non-programmable thermostat	8	5%
Programmable thermostat	119	82%
Smart thermostat or web-enabled thermostat	18	12%
Don't know	1	1%
Total	146	-

Was the thermostat you use installed before you moved into your home, or did you purchase it after you moved in?

Most (87%) of respondents reported that the thermostat was installed before they moved into their home.

	Number	Percent
The thermostat was installed before I moved in	127	87%
I purchased the thermostat after I moved in	19	13%
Don't know	-	-
Total	146	-

[If use a programmable thermostat] Is your programmable thermostat set to change the temperature at different times of the day (like lowering at night, or while at work during the day), or is it set to run at a constant temperature?

80% of respondents with a programmable thermostat said their thermostat has been programmed. Just under 20% said their thermostat is set to a constant temperature.

	Number	Percent
I programmed my thermostat for different temperatures during the day	95	80%
My thermostat is set to a constant temperature	21	18%
Don't know	3	3%
Total	119	-

4. Gas Fireplace Prevalence and Use

This section summarizes information collected about gas fireplaces in new homes.

Do you have a gas fireplace in your home?

As shown in the table below, about 81% of respondents reported having at least one fireplace in their home. Of those with fireplaces, the vast majority (93%) had one fireplace, while 7% had multiple fireplaces. About 20% of respondents reported not having a fireplace in their home. All of the eight respondents who reported having multiple fireplaces in their home reported having two fireplaces.

	Number	Percent
One fireplace	110	75%
Multiple fireplaces	8	6%
No	28	19%
Don't know	-	-
Total	146	-

[If one or more gas fireplaces in home] Where is the fireplace in your home located?

We then asked where the fireplace(s) in their home were located. As shown in the table below, most reported that the fireplace was in a living room or family room.

	One fireplace	Multiple fireplaces*
Living room	87	7
Family room	19	3
Bedroom	-	2
Other**	4	4
Total	110	8

*Multiple responses possible.
**Other responses: for the four respondents with one fireplace who selected "other," all four respondents said their fireplace is in a great room. For the four respondents with multiple fireplaces who selected "other," one respondent said the other fireplace was in a basement living room, another said it was in an office, a third said it was in a game room, and the last respondent said it was in a parlor. Three of these four said their other fireplace was in the living room, and the other said it was in the family room.

The next series of questions focused on respondents' use of their gas fireplace during the heating season (October – March). These questions were only asked of those who said they had a gas fireplace in their home. We asked respondents who reported having multiple gas fireplaces to answer the questions thinking about their use of the fireplace in the central area of their home – in the living room or family room.

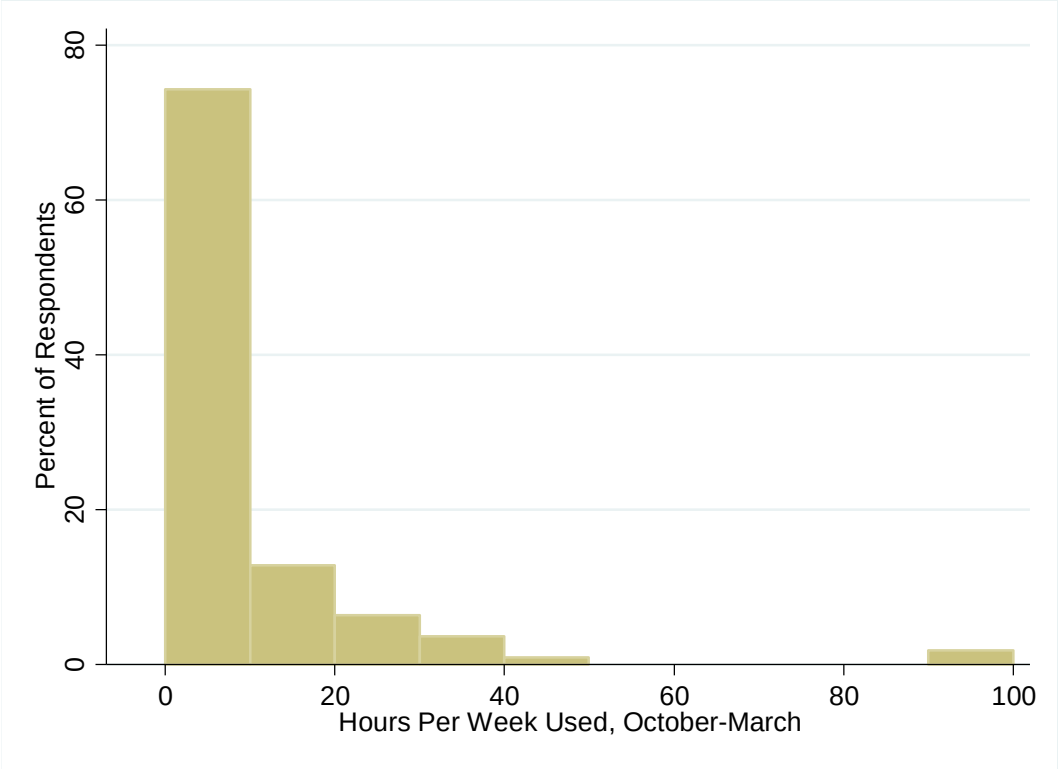
[If reported having a gas fireplace & owning their home] Was the gas fireplace installed when you purchased your home?

All but one respondent who reported having a gas fireplace in their home (a renter) reported that the fireplace was installed when they purchased their home.

	Number	Percent
Yes	117	100%
No	-	-
Don't know	-	-
Total	117	-

About how many hours per week do you use the fireplace during the heating season (October-March)?

This question was asked of all 118 respondents who reported having a fireplace. Nine (8%) said they didn't know how much they used the fireplace during the heating season. The graph below shows the distribution of hours of use for the remaining 110 respondents.



The average hours of use was 8.2 hours per week. However, there appears to be an outlier at 100 hours. If this outlier were excluded, the average drops to 6.5 hours. Of those who responded to the question, 16% reported not using the fireplace at all. If we exclude the 18 customers who reported not using the fireplace at all, the average is 9.8 hours including the outlier, and 7.8 hours without the outlier.

From a metering study conducted in existing homes, we learned that when comparing reported to metered fireplace use, study participants tended to over-estimate their use by 53% (on average).[2] We can use this information to adjust the reported hours of use obtained through this

[2] The study can be found at this link: http://assets.energytrust.org/api/assets/reports/Gas_Fireplace_Studies.pdf. It is worth noting that the metering study excluded customers who reported using their fireplace less than 5 hours per week, which was about 15% of customers that were asked about hours of use. The average reported hours of use was 26 hours per week, compared with 17, which was estimated using metering equipment. On average, customers over-estimated their use by 53%, and only 9 of the 42 sites that estimated their weekly use under-reported.

survey. So, if we adjust the 8.2 hours of use down by 53%, we get 5.4 hours of use.

The following four questions were also asked as part of the aforementioned metering study. Where relevant, we compare and contrast similarities and differences in results between this survey and the metering study. However, it is important to note that the metering study excluded customers who reported using their fireplace less than 5 hours per week, which was about 15% of customers that were asked about hours of use. So, the comparison between the two must account for this difference.

Are you currently using the gas fireplace as the main heating source for your home?

In contrast to the metering study, where 16% of respondents said they were using or planning to use the fireplace as the main heating source for their home, all of the respondents said they are not currently using the fireplace as the main heating source for their home.

	Number	Percent
Yes	-	-
No	118	100%
Don't know	-	-
Total	118	-

[If not using fireplace as main heating source for home] What do you use as your main heating system?

Since all respondents said they did not use their fireplace as the main heating source, all were asked what they use as their main heating system. The vast majority, 86%, said they were using a gas furnace, and the remaining respondents reported using an electric furnace, heat pump, or something else. Two percent did not know what they were using for their main heating system. These results align with the metering study results, where 90% of respondents that did not report using their fireplace as the main heating source for their home reported using a gas furnace as their main heating system.

	Number	Percent
Gas furnace	101	86%
Electric furnace	5	4%
Electric baseboard heater	-	-
Heat pump	5	4%
Other*	5	4%
Don't know	2	2%
Decline to answer	-	-
Total	118	-

*Other responses included: Geothermal heat pump; in-floor heat, gas boiler; Mitsubishi ductless heating and cooling system - 2; combo heat pump/gas; and two mini-split heat pump units.

Thinking about the current heating season (October – March), please tell me which of the following statements best describes how you primarily use the gas fireplace.

We then asked all respondents to describe how they primarily use the gas fireplace. Respondents were fairly evenly split between using the fireplace for heating in addition to other systems, (45%) and using the fireplace for purposes other than heating (42%). Nine percent said they do not use or have not used the fireplace, and 3% said they use the fireplace as the main heating system for their home (contradicting the earlier question where all respondents said they do not use the fireplace for heating). In the metering study, 98% of respondents said they use the fireplace for heating in addition to other systems, and 2% said they use the fireplace for purposes other than heating. So, new homeowners appear to either not use the fireplace or use the fireplace for other non-heating purposes more than existing homeowners.

	Number	Percent
As the main heating system for my home	4	3%
For heating, but I also use other systems to heat my home	53	45%
I use the fireplace, but for purposes other than heating	50	42%
I do not use the fireplace or have not yet used the fireplace	10	9%
Don't know	1	1%
Decline to answer	-	-
Total	118	-

[If reported using the fireplace in the prior question] Please tell me which of the following statements best describes how you use your other heating systems.

We also wanted to get insight into how use of the fireplace affects respondents' use of other heating systems. Of respondents who said they used the fireplace in the prior question (n = 107) 51% said using the fireplace does not affect their use of other heating systems, compared with 22% in the metering study. Forty-two percent said they use the fireplace for heating and use other heating systems less when the fireplace is on, compared with 78% in the metering study. Five percent said they do not use the other heating systems, and 2% responded "don't know."

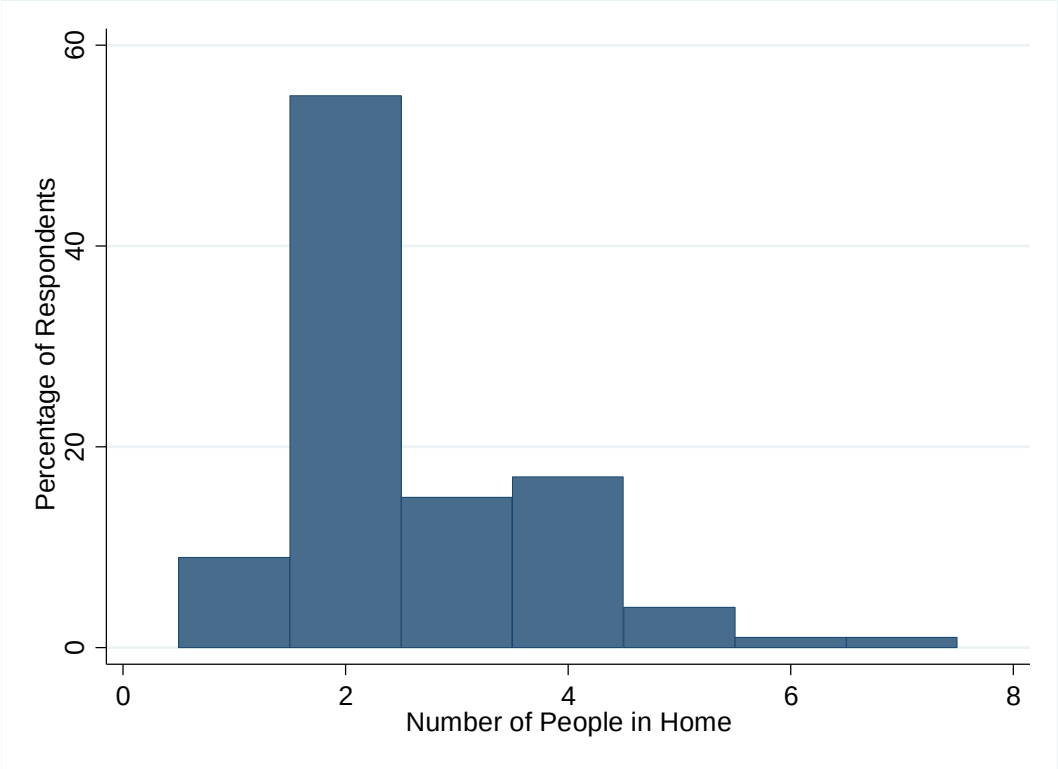
	Number	Percent
Using the gas fireplace does not affect my use of the other heating systems	55	51%
For heating, but I also use my other heating systems less when I turn the gas fireplace on	45	42%
I do not use the other heating systems at all	5	5%
I do not use the fireplace or have not yet used the fireplace	-	-
Don't know	2	2%
Decline to answer	-	-
Total	107	-

5. Respondent Demographics

We collected two pieces of demographic information: number of people in the home and number of years in the home.

How many people, including yourself, live in your home full-time?

Nine of the 146 respondents (6%) declined to state how many people live in their home. For the remaining 137 respondents, the graph below shows the distribution of number of people in the home. On average, there were 2.6 people in each home.



How long have you lived in this home?

The final survey question was how long respondents had lived in their home. 72% of respondents said they had lived in their home for 1 to 2 years, while 21% said they had lived in the home for 3 to 5 years.

	Number	Percent
Less than a year	9	6%
1 to 2 years	105	72%
3 to 5 years	31	21%
Don't know	-	-
Decline to answer	1	1%
Total	146	-

Conclusions

The survey successfully answered the key questions of fireplace prevalence and fireplace use in new homes:

- **Prevalence of fireplaces**. Fireplaces appear to be widespread in new homes, with 81% of respondents reporting that they have at least one fireplace in their home.
- **Fireplace use**. Hours of use in new homes do appear to be lower compared to what was found in existing homes through a metering study (which estimated an average use of 17 hours per week). The metering study compared self-reported and actual (metered) hours of use, and found that on average, participants overestimated their hours of use by 53%. We used this number to adjust the reported hours of use from this survey (8.2 hours) and obtain an estimate of 5.4 hours per week of fireplace use. As was the case with the metering study, the distribution of hours of use is skewed, with many residents using the fireplace just a few hours a week, but a few residents using the fireplace a large number of hours per week.

In addition, the survey collected useful information about the effectiveness of incentives on survey response rates, homeowner awareness of energy-related certifications and ratings (and their role on their home purchase decision), and the prevalence of major appliances in new homes. Key findings in these areas include:

- **Incentive effectiveness**. The inclusion of a small incentive significantly boosted the survey response rate; the group that received a $1 bill in the survey invite letter had an 11% response rate compared to a control group, which had a 5% response rate.
- **Awareness of home ratings**. Residents appear to have relatively high awareness of home certifications and ratings (77%), although awareness of specific certifications is relatively low (Energy Star was the most remembered among respondents – 71% of those whose homes were Energy Star certified in Energy Trust records said they recalled receiving the certification). Additionally, among respondents who were aware of certifications, most respondents said that the certifications had an important role in their home purchase decision.

If desired (and if there is sufficient sample size), the survey data can be used to look at differences in responses by state, region, square footage, program vs. non-program homes, reported ownership status, and reported length of time in home.

Appendix 1. Survey Instrument

INTRODUCTION

Thank you for taking this survey about home energy use. If you have any questions regarding the survey, please contact Abt SRBI at [redacted]. The survey should take about 5 minutes to complete. We greatly appreciate your response!

SAMPLE ATTRIBUTES

EPS	1
Energy Star	2
Earth Advantage	3
LEED	4

SCREENING QUESTIONS

[ASK ALL]

S1. Are you one of the persons who are responsible for making decisions about energy use in your household such as paying your utility bill or buying new appliances?

1. Yes
2. No

[If S1 = 2]

Please give the letter to another household member who is responsible for energy use decisions for your household. This person can use the same information on the letter to start the survey. Thank you.

S2. Do your own or rent your home?

1. Own
2. Rent

[Ask if S2 = 1]

S3. Were you the original (i.e., first) owner of this home?

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

S4. Is this home your primary residence?

1. Yes
2. No

GENERAL QUESTIONS

[ASK IF S2 = 1]

Q1A. When you purchased your home, were you aware of any energy-related certifications and ratings that your home received?

1. Yes

2. No
98. Don't know

[ASK IF S2 = 1 AND Q1A = 1; INSERT CERTIFICATIONS OBTAINED FROM FASTTRACK]
Q1B. Do you recall whether your home received any of the following certifications?

	1. Yes	2. No	98. Don't know
Q1BL. Leadership in Energy and Environmental Design (LEED) [ASK IF LEED = 1]			
Q1BEPS. EPS, an energy performance score [ASK IF EPS = 1]			
Q1BES. ENERGY STAR® [ASK IF ENERGY STAR = 1]			
Q1BEA. Earth Advantage® [ASK IF EARTH ADVANTAGE = 1]			
Q1BOTH. Other (Please specify:)			

[IF ANY Q1B = "Yes"]
Q1B_OE. What role, if any, did these certifications play in your home purchase decision? [Open-ended]

Q3. Thinking of the appliances in your home, please indicate which of the following statements best describes how you obtained these appliances:

	1. Appliance was already in home when I moved in	2. Purchased appliance when I moved in	3. Brought appliance with me from previous home when I moved in	98. Don't know
Q3R. Refrigerator				
Q3CW. Clothes washer				
Q3D. Dryer				

[Ask if S2 = 1]
Q4A. When you purchased your home, did the home come with light bulbs in the fixtures?
1. Yes
2. No
98. Don't know

[Ask if Q4A = 1]
Q4B. What kind were they (primarily)?
1. LEDs
2. Compact fluorescent light (CFL) bulbs (these are also called "twisty" bulbs)
3. Incandescent bulbs
98. Don't know

Q5A. What changes, if any, did you make to your home within the first year of moving in? Please select all that apply.
1. Installed light bulbs
2. Installed new showerhead fixtures

3. Installed new faucet fixtures
4. Installed different water heating system
5. Installed solar electric system
6. [If Q3R = 1] Replaced refrigerator
7. [If Q3CW = 1] Replaced clothes washer
8. [If Q3D = 1] Replaced dryer
9. Other (Please specify:)
10. Did not make changes

[ASK if Q5A = 1]
Q5A_L. What type of light bulbs did you install? Please select all that apply.
1. LEDs
2. Compact fluorescent light (CFL) bulbs (these are also called “twisty” bulbs)
3. Incandescent bulbs
98. Don’t know

[ASK if Q5A = 1]
Q5A_L_OE. Why did you decide to replace the lighting in your home? [Open-ended]

[ASK if Q5A = 4]
Q5A_WH_OE. Why did you decide to install a different water heating system? [Open-ended]

Q5B. How many of the following appliances do you have in your home?

	0	1	2	3	4	5 or more
Central air conditioning unit						
Window air conditioning unit						
Stand alone freezer (chest or upright)						
Hot tub						
PC or laptop						
Refrigerator						
Television						

Q5C. What kind of thermostat do you use in your home?
1. Non-programmable thermostat
2. Programmable thermostat
3. Smart thermostat or web-enabled thermostat
98. Don’t know

Q5D. Was the thermostat you use installed before you moved into your home, or did you purchase it after you moved in?
1. The thermostat was installed before I moved in
2. I purchased the thermostat after I moved in
98. Don’t know

[Ask if Q5C = 2]
Q5C_P. Is your programmable thermostat set to change the temperature at different times of the day (like lowering at night, or while at work during the day), or is it set to run at a constant temperature?
1. My thermostat is programmed for different temperatures during the day

2. My thermostat is set to a constant temperature
98. Don't know

Q6A. Do you have a gas fireplace in your home?
1. Yes, one gas fireplace
2. Yes, multiple gas fireplaces
3. No
98. Don't know

[Ask if Q6A = 2]
Q6B. How many fireplaces are in your home?
[FORCE NUMERIC RESPONSE]

[Ask if Q6A = 1 or Q6A = 2]
Q6C. [If Q6A = 1: Where is the fireplace in your home located?]
[If Q6A = 2: Where are the fireplaces in your home located? Please select all that apply.]
1. Living room
2. Family room
3. Bedroom
4. Other (Please specify:)

GAS FIREPLACE QUESTIONS [Ask if Q6A = 1 or Q6A = 2]

[If Q6A = 1]
We would like to know how you use your gas fireplace during the heating season.

[If Q6A = 2 & Q6C = 1-2]
We would like to know more about your use of the fireplace in the central area of your home – the living room or family room. Please think about your use of this fireplace during the heating season (October – March) when answering the following questions.

[ASK ALL]
Q7. Was the gas fireplace installed when you purchased your home?
1. Yes
2. No
98. Don't know

[ASK ALL]
Q8. ^About how many hours per week do you use the fireplace during the heating season (October – March)?
[FORCE NUMERIC RESPONSE]
98. Don't know

[ASK ALL]
Q9. *Are you currently using the gas fireplace as the main heating system for your home?
1. Yes
2. No
98. Don't know
99. Refused

[ASK IF Q9 != 1]

Q10. *What do you use as your main heating system?
1. Gas furnace
2. Electric furnace
3. Electric baseboard heater
4. Heat pump
5. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know
99. Refused

Q11. *Thinking about the current heating season (October – March), which of the following statements best describes how you primarily use the gas fireplace?
1. As the main heating system for my home
2. For heating, but I also use other systems to heat my home
3. I use the fireplace, but for purposes other than heating
4. I do not use the fireplace or have not yet used the fireplace
98. Don't know
99. Refused

[ASK IF Q11 = 1-3]
Q12. *Which of the following statements best describes how you use your other heating systems?
1. Using the gas fireplace does not affect my use of the other heating systems
2. For heating, but I also use my other heating systems less when I turn the gas fireplace on
3. I do not use the other heating systems at all
4. I do not use the fireplace or have not yet used the fireplace
98. Don't know
99. Refused

DEMOGRAPHIC QUESTIONS

Q13. How many people, including yourself, live in your home full time?
[FORCE NUMERIC RESPONSE]
99. Refused

Q14. How long have you lived in this home?
1. Less than a year
2. 1 to 2 years
3. 3 to 5 years
98. Don't know
99. Refused

Note: Asterisk (*) indicates we asked this question as part of the recruitment survey for the existing homes gas fireplace metering study. (^) indicates we collected this information from respondents during the installation of metering equipment for the existing homes gas fireplace metering study.

CONCLUSION

Thank you very much for your response. If you have any questions regarding the survey, please contact Abt SRBI at [redacted].

Appendix 2 – Survey Invitation Letter and Reminder Postcard

Survey invitation letter – Incentive group

April XX, 2015
Resident
Address
City, State XXXXX

Dear Resident,

Abt SRBI is conducting a study about home energy use on behalf of Energy Trust of Oregon, an independent non-profit that helps utility customers benefit from saving energy and generating renewable power. Your feedback will help Energy Trust continue to provide solutions and cash incentives for energy efficiency and renewable energy projects.

You are one of a small number of randomly selected homeowners being asked to participate in this study by completing a brief survey about the energy use, products and appliances for the home located at:

(address from sample)

The survey can be completed online at www.srbsurvey.com/energy. Your PIN to access the survey online is XXXXXX.

As a way of thanking you for your time and in appreciation of your valuable opinions, Abt SRBI would like to present you with the enclosed $1.

Thank you very much for your help with this important research. If you have any questions about this study, please contact Erika Kociolek, Evaluation Project Manager at Energy Trust, at or .

If you are unable to complete the survey online but would still like to participate in this important study, you can also call Abt SRBI toll-free at and one of our representatives can conduct the survey with you over the telephone.

Sincerely,

Carla Jackson
Vice President of Energy Research

7431 College Parkway / Suite A / Fort Myers, FL 33907 / 239.278.4044 / Fax 239.278.3601 / abtsrbi.com
New York City / Washington, DC / Chicago / Cambridge / Durham

Survey invitation letter – No incentive group

April XX, 2015
Resident
Address
City, State XXXXX

Dear Resident,

Abt SRBI is conducting a study about home energy use on behalf of Energy Trust of Oregon, an independent non-profit that helps utility customers benefit from saving energy and generating renewable power. Your feedback will help Energy Trust continue to provide solutions and cash incentives for energy efficiency and renewable energy projects.

You are one of a small number of randomly selected homeowners being asked to participate in this study by completing a brief survey about the energy use, products and appliances for the home located at:

(address from sample)

The survey can be completed online at www.srbsurvey.com/energy. Your PIN to access the survey online is XXXXXX.

Thank you very much for your help with this important research. If you have any questions about this study, please contact Erika Kociolek, Evaluation Project Manager at Energy Trust, at or .

If you are unable to complete the survey online but would still like to participate in this important study, you can also call Abt SRBI toll-free at and one of our representatives can conduct the survey with you over the telephone.

Sincerely,

Carla Jackson
Vice President of Energy Research

7431 College Parkway / Suite A / Fort Myers, FL 33907 / 239.278.4044 / Fax 239.278.3601 / abtsrbi.com
New York City / Washington, DC / Chicago / Cambridge / Durham

Reminder postcard – both groups

Dear Resident,

Last week, Abt SRBI mailed you a letter asking for your help with a study we are conducting on behalf of Energy Trust of Oregon concerning home energy use. We hope that you will participate by taking a brief online survey.

If someone in your household has already completed the survey, please accept our sincere thanks. If not, we ask that you take a few moments and complete the survey at www.srbsurvey.com/energy. Your PIN for accessing the survey is XXXXXX.

If you have questions about this study, please contact Erika Kociolek, Evaluation Project Manager at Energy Trust, at [redacted] or [redacted].

If you're unable to complete the survey online but would like to participate, please call Abt SRBI toll-free at [redacted] and a representative can conduct the survey with you over the telephone.

Thank you again for your help with this important research.

Sincerely,

Carla Jackson
Vice President of Energy Research

7431 College Parkway / Suite A / Fort Myers, FL 33907 / 239.278.4044 / Fax 239.278.3601 / abtsrbi.com
New York City / Washington, DC / Chicago / Cambridge / Durham

Appendix 3 – “Other” Responses for Q1B

[If had at least one certification, owned home, and were aware of home certifications and ratings that home received] Do you recall whether your home received any of the following certifications?

#	EPS	Energy Star	Earth Advantage	“Other” responses (N = 21)	Category
1	Don’t know	Yes	Don’t know	LEED certified	LEED
2	Yes	Yes	Not On File	Earth Advantage Gold	Earth Advantage
3	Don’t know	Don’t know	Not On File	Earth Advantage	Earth Advantage
4	Don’t know	Yes	Not On File	Earth Advantage Standards	Earth Advantage
5	Yes	Yes	Not On File	Earth Advantage home certification	Earth Advantage
6	Yes	Not On File	Not On File	Earth Advantage Platinum	Earth Advantage
7	Yes	Yes	Not On File	Earth Advantage Gold	Earth Advantage
8	Yes	Don’t know	Not On File	Earth Advantage home certification	Earth Advantage
9	Not On File	Not On File	Don’t know	Energy star qualified	Energy Star
10	Not On File	Not On File	No	Energy Star Rated	Energy Star
11	Not On File	Not On File	Don’t know	Energy star	Energy Star
12	Not On File	Not On File	No	Energy star	Energy Star
13	Don’t know	Not On File	No	Energy star	Energy Star
14	Don’t know	Not On File	Don’t know	energy star certified	Energy Star
15	No	Not On File	Not On File	ENERGY STAR	Energy Star
16	Not On File	Not On File	Don’t know	High Efficiency Certified Home	Unclear
17	No	Not On File	Not On File	The Home was build to ENERGY STAR Home Standards but the builder did not pursue the actual certification. All appliances, envelope systems, HVAC, DHW systems comply with ENERGY STAR Home reqs	Unclear
18	Don’t know	Not On File	Not On File	Energy star windows	Unclear
19	Yes	Not On File	Don’t know	I think so, on the furnace.	Unclear
20	Not On File	Not On File	No	New Traditions, "Home Energy Sufficiant" "Star Energy"	Unclear
21	Not On File	Not On File	Don’t know	Built Green - 3 Stars	Unclear

Appendix 4 – Open-Ended Responses for Q1B_OE

[If recalled receiving a certification] What role, if any, did these certifications play in your home purchase decision?

#	Open-ended responses (N = 57)	Role of Certification
1	Wasn't looking for certifications in particular, but did want a builder who focused energy efficiency - insulation, window quality, etc.	Important
2	Energy efficiency was primary reason for chosing a new home. It is why I chose this builder over another.	Important
3	paramount to my decision	Important
4	We have an Energy Star Platinum rating for our home. We anticipated lower monthly energy costs, which has happened	Important
5	it is desirous to have an energy efficient home primarily for 2 reasons, less monthly cost, and less waste of natural resources	Important
6	I have owned 5 old homes. The energy efficiency of this home sold us.	Important
7	We appreciate the lower utility bills.	Important
8	certifications of energy use played a strong role.	Important
9	it was a big part of the appeal	Important
10	Added value, lower utilities	Important
11	the special energy star home conditioning was a factor	Important
12	It was an important factor.	Important
13	It added to my decision.	Important
14	related to the purchase decision.	Important
15	understanding about the energy usage and cost.	Important
16	This was very much part of the purchase decision. With the planned 7 residents in it, minimizing our expenses and footprint were worth paying a little extra for.	Important
17	This is a custom-built home, designed for energy efficiency.	Important
18	Medium importance: home area and new construction were most critical as time was limited	Important
19	we built to be energy efficient	Important
20	At the time it meant a lot for our comfort and for the value of the home for resale.	Important
21	Definitely was interested in a "green" home.	Important
22	We had the home built to an energy advantage standard	Important
23	When I had the home built it was a requirement of mine	Important
24	It was important but I could not find information on what 'silver' earth advantage means. website at the time seemed to be written for builders, not consumers. i couldn't even find out if silver was third best category or best or any kind of b	Important
25	A positive very good feeling!	Important
26	Played a role in purchasing the home. We like to conserve energy.	Important
27	We built the home and wanted to be comfortable.	Important

#	Open-ended responses (N = 57)	Role of Certification
28	energy efficiency certifications contributed to selection of house/offer price. Very pleased to have a home that is energy efficient.	Important
29	It definitely made the house more desirable to purchase.	Important
30	Nice state of the art new home. Somewhat important.	Important
31	We enjoyed the fact that we were purchasing a highly efficient home.	Important
32	like to be efficient and economical	Important
33	I knew of the energy certification and it was a nice additional benefit	Important
34	It played a big role! I am in the Energy efficiency industry so value the importance of investing in energy efficient systems which result in long term utility savings. The builder advertised the home to be built to ENERGY STAR Standards, so we	Important
35	Saving $	Important
36	Moderate Role	Important
37	We built the home and the builder recommended getting the certification	Important
38	Energy efficient windows, water heater and well insulated floors, attic and walls	Important
39	Made a favorable impact but was not a deal breaker	Important
40	We built and required these certifications.	Important
41	My home is new construction & I purposely built it to be very energy efficient.	Important
42	It was certainly a benefit, but buying a new home it was expected and lack of a certification certainly would have played a role in our choice.	Important
43	Heating bills are much lower, which was important	Important
44	We built the home with higher efficiency windows, roof insulation, appliances, HVAC system, heat pump, and had it tested and -certified. The ability to do this played a large role in the decision to build a new home rather than purchasing a ho	Important
45	anything that reduces energy consumption/cost is a big plus.	Important
46	Little to none	Not Important
47	None	Not Important
48	It was a secondary factor in choosing a home builder.	Not Important
49	none	Not Important
50	Hardly any	Not Important
51	No role, but it is nice to have.	Not Important
52	None	Not Important
53	Very little	Not Important
54	Not really, though I was glad to see the rating	Not Important
55	None really.	Not Important
56	None, but felt it was beneficial.	Not Important
57	We built the home to our specifications	Unclear

Appendix 5 – “Other” Responses for Q5A

What changes, if any, did you make to your home within the first year of moving in? Please select all that apply.

#	“Other” responses (N = 17)	Category
1	Changed frequently used lights to led. Unfortunately, housemate insisted on changing out low flow shower nozel.	Lighting Showerhead
2	Bought air conditioner, black-out window coverings, built additions including closet system, storage shelves, and stand for washer/dryer	AC Window Coverings Other
3	Heat pump	Heat Pump
4	Installed Nest thermostat	Thermostat
5	Ceiling fan	Ceiling Fan
6	replaced light bulbs with LED	Lighting
7	Added window film	Window Film
8	a/c	Air Conditioning
9	Increased wattage on some light bulbs. Changed washer, dryer	Lighting Washer Dryer
10	Installed Air Conditioning	Air Conditioning
11	Installed light timers, installed two occupancy sensors.	Lighting Controls
12	installed some LED lighting	Lighting
13	new thermostat	Thermostat
14	Installed light bulbs: Home came with 60W CFL, Replaced all with 24W CFLs and 13W LEDs in dining chandelier, 5W LEDs as night lights. Installed low flow showerheads in one of the two bathrooms, reduced kitchen faucet flow to 1 GPM.	Lighting Showerheads Unclear
15	Sand and Stain deck	Deck
16	Removed few light bulbs as there were too many than needed to light a room	Lighting
17	This new house, built in 2012, already had an energy saving tankless hot water heater and water conserving showerhead fixtures	Unclear

Appendix 6 – Open-Ended Responses for Q5A_L_OE

[If installed light bulbs] Why did you decide to replace the lighting in your home?

#	Type of Lighting Replaced			Open-ended responses (N = 53)	Savings ($ or energy)	Wanted dimmers	Wanted quicker or instant-On	Needed new bulbs / old ones burned out	Wanted better or brighter light quality	Bulb lifetime	Unclear
1	LEDs			Installed several dimmers which required dimmer friendly bulbs - moved to LED at the same time.		X					
2	LEDs			Instant on needed in certain spaces.			X				
3	LEDs	CFL		Ability to dim the lights		X					
4	LEDs		Incandescent	did not like twisty lights, slow to come on. Will replace them with LED bulbs as the price comes down.			X				
5			Incandescent	Cfl were unable to dim or automate to our specs. We replaced a couple main lights with incas but left most as cfl. We have a couple addressable LEDs in the mix too		X					
6		CFL		Bulbs in garage were missing.				X			
7		CFL		bulb burnt out				X			
8	LEDs		Incandescent	Cost							X
9	LEDs			Brighter lights, instant on and longer lasting. Cost of energy is less.	X		X			X	
10	LEDs			Wanted to be able to use a dimmer switch		X					
11	LEDs	CFL		Wanted more light in some areas					X		
12		CFL		Save energy	X						
13	LEDs			energy use & reduce replacement frequency	X					X	
14	LEDs			energy savings, low replacement need.	X					X	
15			Incandescent	CFL's burned out very quickly when tried them before. Also, I do not like them if they break (mercury requiring hazmat procedures)				X			
16	LEDs	CFL		less power consumption and longer lifetime	X					X	
17	LEDs			energy saving	X						
18	LEDs	CFL		LEDs are more energy efficient.	X						
19	LEDs	CFL		Efficiency/lighting quality	X				X		
20	LEDs			To improve energy efficiency.	X						
21		CFL		Energy savings	X						
22	LEDs			some CFL's had burned out, and the LED's were dimmable		X					
23	LEDs			We kept most CFLs, but replaced the incandescent bulbs. We did replace some CFLs with higher Kelvin-rated bulbs for brighter lighting.					X		
24	LEDs	CFL		The original CFLs were too slow to turn to full brightness			X				
25	LEDs	CFL		efficiency	X						
26	LEDs			because the bulbs burnt out				X			
27	LEDs			Because the original bulb burned out.				X			
28	LEDs			more energy efficient and added dimmers	X	X					
29	LEDs			We're trying to get rid of all of our incandescent and cfc bulbs and install led bulbs							X
30	LEDs			Energy savings	X						
31		CFL		Did not replace all. Where we can we use the twisty bulbs.							X
32	LEDs			Energy efficiency. The bulbs I replaced were standard 65W floods. I also replaced overhead CFLs for the better light from LED.	X				X		
33			Incandescent	Dark closet.							X
34		CFL		Some of the energy efficient bulbs take way to long to get bright enough for use.			X				
35		CFL		Bulbs wore out					X		
36	LEDs	CFL		There were some incandescent bulbs that needed changing. Wanted better color of LED				X	X		

#	Type of Lighting Replaced			Open-ended responses (N = 53)	Savings ($ or energy)	Wanted dimmers	Wanted quicker or instant-On	Needed new bulbs / old ones burned out	Wanted better or brighter light quality	Bulb lifetime	Unclear
37		CFL		Replaced a couple incandescent bulbs with CFL's							X
38		CFL		Not all of them were CFL							X
39	LEDs			energy saving	X						
40	LEDs			I do not like CFL's They take too long to achieve full brightness and			X				
41		CFL		more energy efficient	X						
42	LEDs	CFL		To reduce electricity bills, COSTCO sold these with some ETO rebate or something at a very cheap price. It was a no brainer to replace 60W with 24 W. We dont mind the slightly dimmer light level associated with 24W. Also informed the neighbors	X						
43	LEDs			Longer lasting						X	
44		CFL		Burned out				X			
45		CFL		Energy save	X						
46		CFL	Incandescent	Burned out bulbs, wanted to replace with CFL and LED over time				X			
47	LEDs			cost, color	X				X		
48			Incandescent	Didn't like light output of those twisty bulbs. Too dim.					X		
49	LEDs	CFL		CFLs burnt out quickly and were mostly replaced with LEDs (unless they we couldn't find an LED that matched the CFL well).				X			
50		CFL		I didnt light bulbs needed replaced after use				X			
51	LEDs	CFL		Save on cost	X						
52		CFL	Incandescent	quality of lighting/some bulbs burned out				X			
53			Incandescent	Replaced some CFL bulbs with incandescent in fixtures where I wanted full brigthness quickly (i.e. bathroom, kitchen).			X				