



MEMORANDUM

August 18, 2017

To: Erika Kociolek and Adam Shick, Energy Trust of Oregon

From: Kevin Price and John Cornwell, Evergreen Economics

Re: Energy Trust of Oregon 2017 New Homes Gas Fireplace Survey

This memorandum summarizes results from a survey conducted between January 2017 and April 2017; Energy Trust worked with Abt SRBI and Evergreen Economics to complete this work. The goal of the survey, and the analysis described in this memo, was to analyze gas fireplace usage among residents living in homes for which builders received incentives through Energy Trust's New Homes program. This survey builds on a very similar survey that was performed in 2015¹. This survey covered a range of topics, including demographic information, building type, and appliance information. This memo does not summarize the results of the entire survey. This memo focuses on the questions related to gas fireplace usage and to what degree home characteristics (such as prevalence of a furnace) and local weather conditions affect gas fireplace usage, specifically, *the reported number of hours a home's fireplace was used in the seven days prior to the survey.*

1 Key Findings

Key findings from the 2017 New Homes Gas Fireplace survey include:

Mean "hours of use" across all 406 valid survey respondents is 6.1 hours per seven-day period.² The standard deviation is 11.76 hours, indicating a wide degree of variance across observations. The minimum usage is 0 hours and the maximum usage is 80 hours.

The data are heavily skewed toward zero hours of usage. 44 percent of

¹ The prior survey can be found here: https://energytrust.org/wp-content/uploads/2016/12/NewHomes_Gas_Fireplace_Studies.pdf.

² Note that the period is the seven days prior to the survey date, therefore it is not a standard week, i.e. Sunday – Saturday.

respondents stated they had not used their gas fireplace in the previous seven days.

Most respondents use their gas fireplace for both heating and ambience.

Across the 420 homes with at least one gas fireplace, 46 percent of respondents reported using a gas fireplace for both heating and ambience, 28 percent reported using the gas fireplace for ambience only, and 15 percent reported using their gas fireplace for heating only. Respondents who use their homes for heating only, or for heating and ambience, have higher hours of use than those that report using their gas fireplace for ambience only.

Respondents reporting using their gas fireplace for heating had, on average, 11.6 hours of use per seven days. Respondents that use their gas fireplace for heat and ambience had, on average, 8.8 hours of use per seven days. And respondents that reporting using their gas fireplace for decoration or ambience only that had 1.5 hours of use per seven days. The differences between respondents reporting using the fireplace for heating and those using it for decoration or ambience only, and respondents reporting using the fireplace for heat and ambience and those using it for decoration or ambience only are statistically significant at the 95% confidence level. Regression analysis shows a statistically significant relationship between homes that use their gas fireplace for heating and hours of use. The results indicate that if a home uses the gas fireplace primarily for heating, there is an increase of approximately 8 hours of use over a seven-day period.

Outside temperature has a statistically significant impact on gas fireplace usage. Average heating degree-days (HDD) over the previous seven days is statistically significant. For each unit increase in average HDD over the past seven days, there is an increase of 0.05 hours (3 minutes) per week in usage.

Heating fuel type does not appear to have a statistically significant impact on gas fireplace hours of use, however, the sample of electrically-heated homes is small (n=9). Average hours of use for electrically-heated and gas-heated homes are almost identical at 5.9 and 6.1 hours per seven days, respectively. However, the true mean value for electrically-heated homes could be as high as 12.2 hours



per seven days at the 95 percent confidence level.

MEMO

Date: August 14, 2017
To: Energy Trust Board of Directors
From: Erika Kociolek, Evaluation Project Manager
Subject: Staff Response to 2017 New Homes Gas Fireplace Survey

In 2015, Energy Trust fielded a survey of people living in homes for which the builders of those homes received incentives through Energy Trust's New Homes program. The key goals of the survey were to gather information about the prevalence of gas fireplaces and how often residents were using their fireplaces. Eighty-one percent of respondents said they had at least one gas fireplace in their home, and on average, respondents reported using their gas fireplace 8.2 hours per week during the heating season (October – March). In reviewing the findings from the 2015 survey, there were two major concerns with the approach used:

- The survey was conducted in May 2015 and asked respondents “how many hours per week [they used] the fireplace during the heating season (October – March).” Because the survey was fielded during a season in which respondents were likely not using their fireplace, there was concern that the hours of use reported were downwardly biased.
- Because the survey was fielded after a relatively warm winter, there was concern that the hours of use reported were downwardly biased.

To address these concerns, Energy Trust undertook another survey, which was fielded between January and April 2017 in four batches to capture varied weather conditions. In addition, the 2017 survey asked respondents about their gas fireplace use over the previous seven days, to allow for improved recall and to ensure we were asking about fireplace use close to when respondents were likely using their fireplace. In the 2017 survey, 89% of respondents said they had at least one gas fireplace in their home, and on average, respondents reported using their gas fireplace 6.1 hours over the prior seven days. The survey also yielded useful information about the factors impacting gas fireplace use.

We believe that the results of the 2017 survey are more reliable than the 2015 survey because there were more responses to the 2017 survey; the 2017 survey was fielded in four batches, with varied weather conditions; and respondents were asked to recall gas fireplace usage over the prior seven days, as opposed to average usage over the heating season. The results of the survey will be used to update the measure approval document for gas fireplaces.

2 Methods

2.1 Survey Methods

Energy Trust staff, in consultation with Evergreen Economics staff, developed the survey instrument (which can be found in Appendix 1) between June and October 2016, building on the 2015 survey. Energy Trust worked with Abt SRBI, a firm based in New York, New York, with an Energy Division in Fort Meyers, Florida, to field the survey.³ As with the 2015 survey, since Energy Trust lacks contact information for residents of new homes, survey invitation letters and reminder postcards were sent via US mail to the sites selected for the sample. The letter and postcard drove residents to an online web survey, and also offered residents the option of calling Abt SRBI to take the survey on the phone. All survey invitation letters included a \$1 bill in their survey invitation letter as a means of boosting the response rate; this method, which was tested as part of the 2015 survey, resulted in a higher response rate (11%) relative to a control group (5%). The initial plan was to conduct four waves of survey data collection during the 2016-2017 heating season, covering the months October, December, January, and March.

Fielding of the survey was delayed; the survey was rescheduled to four waves covering the following periods:

- January 2017
- February 2017
- March 2017
- April 2017

The intent of the survey was to conduct survey waves over the heating season that would include winter months, as well as shoulder season months, in order to ensure variation in weather. This was achieved despite the delay in survey fielding.

³ Abt SRBI is now known as Abt Associates.

2.2 Sample Selection

The sample for the survey was developed by first pulling new homes measures⁴ recognized in 2014 and 2015. These are homes⁵ for which builders received an incentive through Energy Trust’s New Homes program. These years were chosen so as to not overlap with the years selected for the 2015 survey (2012 and 2013), and to ensure that the homes had been occupied. Sites under 800 square feet (with the goal of excluding accessory dwelling units) and Washington sites that received incentives for tankless gas water heaters were excluded from the sample, as were sites listed as do not contacts.

From this pool, Energy Trust staff selected a random sample of 3,996 unique addresses. A 10% response rate was assumed, and 400 completed surveys were desired, hence the sample of 3,996 addresses.

The table below shows the number of sites selected into the survey sample, broken out by wave.

	Survey Wave 1	Survey Wave 2	Survey Wave 3	Survey Wave 4	Total
Initial sample provided to Abt SRBI	999	999	999	999	3,996
Number of letters sent	999	999	999	999	3,996
Number of reminder postcards	956	939	940	938	3,773
Number of addresses undeliverable	-	-	-	-	244*
Total					

*Note that mail returned to sender was not tracked by wave.

Table 1 below summarizes the response rate to the survey across the four waves. Four hundred and seventy-three (473) residents completed the online survey. 11.8% of residents who were asked to take the survey ended up completing the survey.

⁴ Minus showerhead, clothes washer, and tankless water heater measures, and non-savings measures.

⁵ Note that homes that did not have gas water heating or gas space heating were excluded from the sample.

Table 1: Survey Disposition

Survey Wave	Date Range	Sample Size	Number of Respondents	Response Rate
1	01/03/17 - 01/31/2017	999	115	11.5%
2	02/02/17 - 02/21/2017	999	122	12.2%
3	03/03/17 - 03/30/2017	999	114	11.4%
4	03/31/17 - 04/19/2017	999	122	12.2%
Total		3,996	473	11.8%

Table 2 below presents characteristics of the sample of 473 respondents, and the survey population.

Table 2: Respondent Disposition

Characteristic	Value	Number of Respondents	Percent of Total	Population	Percent of Total
State	OR	446	94%	3,569	89%
	WA	27	6%	431	11%
Tenure¹	Own	459	97%	N/A	N/A
	Rent or Other	14	3%	N/A	N/A
Heating Fuel Type	Electric	19	4%	155	4%
	Gas	453	96%	3,841	96%
	Missing	1	0%	4	0%
Total		473			
Mean Sq. Footage			2,328		2,307
Mean Vintage			2014		2014

¹Tenure not available for population.

2.3 Weather Data

Evergreen developed datasets of local weather conditions—daily high, average, and low temperatures, precipitation levels, and precipitation type (i.e., rain or snow)—for thirteen weather stations used by Energy Trust for billing analysis. Energy Trust uses these weather stations because they have very consistent data and a low proportion of missing data. To ensure consistency with other Energy Trust analysis, Energy Trust also provided a zip code to weather station mapping for all zip codes in regions served by Energy Trust. Evergreen staff used this weather station mapping to assign each survey respondent to the most appropriate weather station (using zip code). Using the `rnoaa` package in R, Evergreen downloaded daily weather data (daily high, average, and low temperatures, precipitation levels, and precipitation type) from NOAA’s Global Historic Climate Network (GHCN) daily database. These data were accessed on May 15, 2017 for the final analysis.

Once Evergreen downloaded the weather data, we calculated heating degree-days and aggregated the data into seven day periods to match to each survey respondent row in the survey data. To calculate HDD, we take the absolute value of the difference between the average daily temperature and a base of 60 degrees Fahrenheit, setting any day with a temperature above 60 degrees Fahrenheit to “0” HDD. The survey data contained a date field representing the date the respondent completed the survey. Because each survey respondent was asked:

Over the past seven days, that is, between [INSERT DATE = TODAY’S DATE-7] and [TODAY’S DATE], about how many hours did you use your gas fireplace?

For each calendar day we summed the HDD values over the seven-day period directly preceding that day. The summed values are assigned to each survey respondent according to their survey date. The end result is for each survey respondent we have a value that equals the sum of daily HDD over the seven days immediately preceding the survey data. In this report we refer to this as the “Seven Day HDD”.

Table 3 provides summary statistics for Seven Day HDD for each wave. As we would expect, the average HDD decreases with each wave as the weather moved from the winter into the shoulder season. We conducted an ANOVA test with a Bonferonni post hoc test to test if the differences in Seven Day HDD were statistically significant.

The difference in mean Seven Day HDD in each wave is statistically significant for each pairwise comparison at the 95% confidence level.

Table 3: Heating Degree-Day Summary By Survey Wave

Survey Wave	n	Seven Day HDD (Mean)	Seven Day HDD (Std. Deviation)	Seven Day HDD (Std. Error)	Seven Day HDD (95% CI)
1 – Jan 2017	115	207.22	43.99	4.10	±8.04*
2 – Feb 2017	122	151.41	30.29	2.74	±5.38*
3 – Mar 2017	114	109.03	28.09	2.63	±5.16*
4 – Apr 2017	122	78.81	11.89	1.08	±2.11*

*An ANOVA test with Bonferroni Post Hoc test confirms each wave has a statistically significant difference in Seven Day HDD from each other wave.

2.4 Analysis Methodology

Categorical Response and Open End Response Summary

The first stage of Evergreen’s analysis was a simple summary of categorical responses to key questions about gas fireplace usage asked during the survey. Specifically, we provide a tabular summary of responses to questions regarding the presence of a gas fireplace in the home, the location of the gas fireplace, and questions related to gas fireplace usage.

Basic Statistical Analysis

We report appropriate statistics (number of observations, mean, median, standard deviation, and confidence intervals, etc.) for hours of use across selected demographic, household, geographic, and weather related variables, as well as key categorical questions. We conducted targeted statistical testing to determine if observed differences in statistical parameters are statistically significant. For each separate analysis we identify if the differences across categories are statistically significant at the 95% confidence level using either a paired t-test, or ANOVA test for analysis that involves 3 or more categories. The results of these tests are presented in tabular format, as well as graphical format using box-plots and bar charts.

OLS Model

Evergreen conducted a regression modeling exercise to determine the impact of temperature, weather events (rain, snow, etc.), and key demographic and household characteristics on hours of use. During the course of analysis, Evergreen staff ran several model specifications. The final model is an Ordinary Least Squares model. We investigated different iterations of this equation and determined the model of best fit, using the data gathered during the survey was the following. Note that the variable “FireplaceUse” is a binary variable indicating if a household uses a fireplace primarily for heating or for ambience. Homes that stated they used their gas fireplace for heating and ambience are included in the “heating” group and assigned a value of 1. The final model specification is below:

$$HOU_i = \alpha + \beta_1 HDD_i + \beta_2 Precipitation + \beta_3 FireplaceUse + \varepsilon_i$$

Where :

HOU_i = Hours of Fireplace Use over Seven Days for Home i

HDD_i = Heating Degree Days over Seven Days for Home i

$Precipitation_i$ = Precipitation in thousands of inches over Seven Days for Home i

$FireplaceUse_i$ = A binary "dummy" variable indicating if a household (i) uses a fireplace primarily for heating (=1) or for ambience (=0)

ε_i = Error

The remainder of this report presents the results of the above mentioned analysis, followed by a discussion of the results in comparison with previous Energy Trust gas fireplace usage analysis.

Weighting

We considered the option of weighting the hours of use estimates by the relative sample size in each survey wave. Because the survey successfully met the goals for each survey wave, and each survey wave contains similar numbers of survey participants, we decided to present unweighted results.

3 Results

3.1 Categorical and Open End Response Summary

Across the 473 respondents, 417 (89%) of homes have at least one gas fireplace, with 56 homes (11%) reporting that they do not have a gas fireplace (Table 4). Of the ten homes with more than one gas fireplace, seven homes have two gas fireplaces, and three homes have three gas fireplaces.

Table 4: Reported Presence of Gas Fireplace

Response	n	Percent*
One gas fireplace	406	87%
Multiple gas fireplaces	14	3%
No gas fireplace	52	11%
Don't know	1	<1%
Total	473	100%

*Sum greater than 100% due to rounding.

Among homes with gas fireplaces, the most common location in the home for a gas fireplace is in the living room or family room, with 94 percent of primary gas fireplaces located in one of these two rooms.

Table 5: Reported Location of Gas Fireplace

Response	Primary Fireplace		Secondary Fireplace(s)¹	
	n	Percent	n	Percent
Living room ²	337	75%	0	49%
Family room	82	19%	4	30%
Bedroom	1	0%	5	21%
Other (please specify)	0	3%	0	0%
No Response	0	0%	4	0%
Total	420	100%	13	100%

¹Multiple responses permitted.

²Living room includes 14 responses of "great room" that combines living and dining area and in some cases kitchen area.

Across the 420 homes with at least one gas fireplace, 46 percent of respondents reported using a gas fireplace for both heating and ambience, while 15 percent

reported using their fireplace for heating only and 28 percent reported using their fireplace for decoration or ambience only (Table 6).

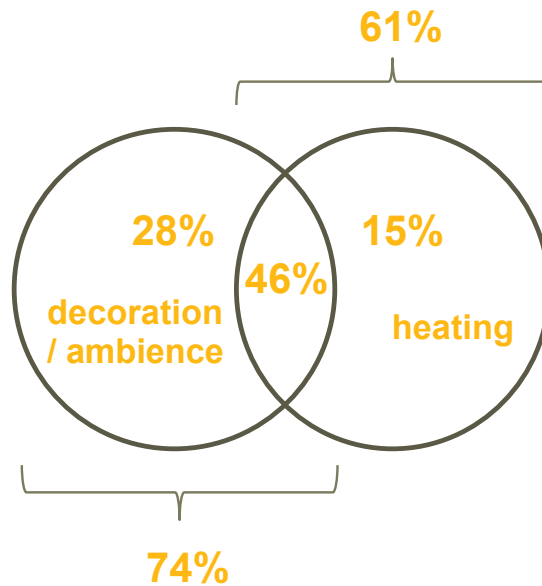
Table 6: Reported Primary Use of Gas Fireplace*

Response	n	%
To heat all or part of my home <input type="checkbox"/>	64	15%
For decoration or ambience	116	28%
To heat all or part of my home and for decoration or ambience	193	46%
I do not use the fireplace or have not yet used the fireplace	47	11%
Total	420	100%

*Twenty-two survey respondents provided an “other” answer to this question. All twenty-two respondents were reclassified into one of the four categories above based on review of their responses.

In all, 61 percent of respondents said that they used the fireplace for heating, while 74 percent reported using their fireplace for decoration or ambience (Figure 1).

Figure 1: Venn Diagram of Reported Primary Use of Gas Fireplace



The survey asked respondents who stated that they did not use, or had not yet used their gas fireplace, why they had not used their gas fireplaces. Forty-one respondents answered, and their answers fell into one of six categories presented in

Table 7 below. Survey takers who responded that the gas fireplace was not needed typically stated that they had a central heating system that was sufficient for their homes. People who thought their gas fireplace was too expensive often stated that they believed the gas fireplace was inefficient and wasted gas. Safety concerns typically centered around concern for child safety with all five safety respondents stating they had small children and were concerned they would burn themselves on the hot glass.

Table 7: Reported Reason for Not Using Gas Fireplace

Response	n	%
Conservation	2	4%
Not Needed	24	51%
Not Working	3	6%
Overheating	1	2%
Safety	5	11%
Too Expensive	6	13%
No Response	6	13%
Total	41	100%

The survey asked respondents to list their main heating system. Four (1%) survey respondents listed their gas fireplace as their main heating system, and each of these had two gas fireplaces. Gas furnaces were the most common main heating system (86%); 6% of respondents said they had an electric furnace and 4% said they had a heat pump. Ninety-one percent of respondents reported that their main heating system was sufficient to heat their entire home. Of the remaining nine percent (n=35), fifteen stated that their gas fireplace is sufficient additional heat to supplement their main system, three stated their gas fireplace was not sufficient to supplement their main system, and the remaining seventeen respondents did not know whether the gas fireplace was sufficient to supplement their main heating system. Of the four respondents reporting their gas fireplaces as their main heating system, two reported that the gas fireplaces were sufficient for their heating needs, and two reported that the gas fireplaces were insufficient for their heating needs.

The survey asked respondents if they ever use their gas fireplace, instead of their main heating system to heat their home, or part of their home. Approximately 20 percent (n=82) stated that they do occasionally use their gas fireplace instead of their main heating source. Of these 82 respondents, 18 percent (n=15) stated they do so in “not very cold weather”, 10 percent (n=8) claimed to use the gas fireplace to save on gas or money, and 82 percent (n=64) said they use it as zonal heat to heat part of the home rather than have their central system running.⁶

The majority of survey respondents (89 percent) stated that they control their gas fireplace manually, while only three percent report having their gas fireplace connected to an automatic thermostat control (Table 8).

Table 8: Reported Gas Fireplace Control Type

Response	n	%
Connected to a thermostat that turns the fireplace on and shuts the fireplace down automatically	14	3%
Manually turn the gas fireplace on and off with a switch on or near the fireplace	372	89%
Manually turn the gas fireplace on and off with a remote control	29	7%
Other* (Please specify:)	4	1%
No Response	1	<1%
Total	420	100%

*Other includes manually igniting with a match and wall switch.

3.2 Reported Hours of Use Statistical Analysis

3.2.1 Hours of Use Summary Statistics

As noted previously, a primary goal of the survey and this analysis is to determine household gas fireplace hours of use. The survey asked respondents to answer the following question:

Today is [INSERT TODAY'S DATE]. Over the past seven days, that is, between [INSERT DATE = TODAY'S DATE-7] and [TODAY'S DATE], about how many hours did you use your gas fireplace?

⁶ This question was a multiple response question, therefore, the total responses sums to over 100 percent.

The response to this question provides a seven-day estimate of gas fireplace hours of use. Across the 420 survey respondents with a gas fireplace (53 respondents did not have a gas fireplace), 406 respondents provided a response to this question, with 14 respondents answering “Don’t Know”. Table 9 below provides the summary statistics on overall reported hours of use.

Table 9: Seven-Day Hours of Use Summary Statistics

Statistic	All Respondents	Excluding Respondents Reporting Fireplace Not Used¹
Number of Observations	406	378
Minimum Hours of Use	0	0
Maximum Hours of Use	80	80
Median Hours of Use	1	1
Mean Hours of Use	6.10	6.80
Standard Deviation (SD)	11.76	12.13
Standard Error (SE = (SD/ \sqrt{n}))	0.58	0.62
95% Confidence Interval (CI)	± 1.14 (4.96 - 7.24)	± 1.22 (5.58 – 8.02)

¹ This only excludes respondents that answered “I do not use the fireplace or have not yet used the fireplace” in response to Q8A: “Which of the following statements best describes how you primarily use the gas fireplace?” This still includes respondents with that reported zero hours of seven day use in response to Q16A.

The mean hours of use across all 406 observations is 6.10 hours per seven-day period.⁷ The standard deviation is 11.76, indicating a wide degree of variance across observations. The median value across observations is 1, indicating that the data are heavily skewed toward zero, which is shown in Figure 2, a histogram of seven day hours of use showing that 184 (44%) of respondents claimed to have zero hours of use. Figure 3 presents four histograms representing the distribution of hours of use by survey wave.

⁷ Note that the period is the seven days prior to the survey date, therefore it is not a standard week, i.e. Sunday – Saturday.

Figure 2: Histogram of Hours of Use

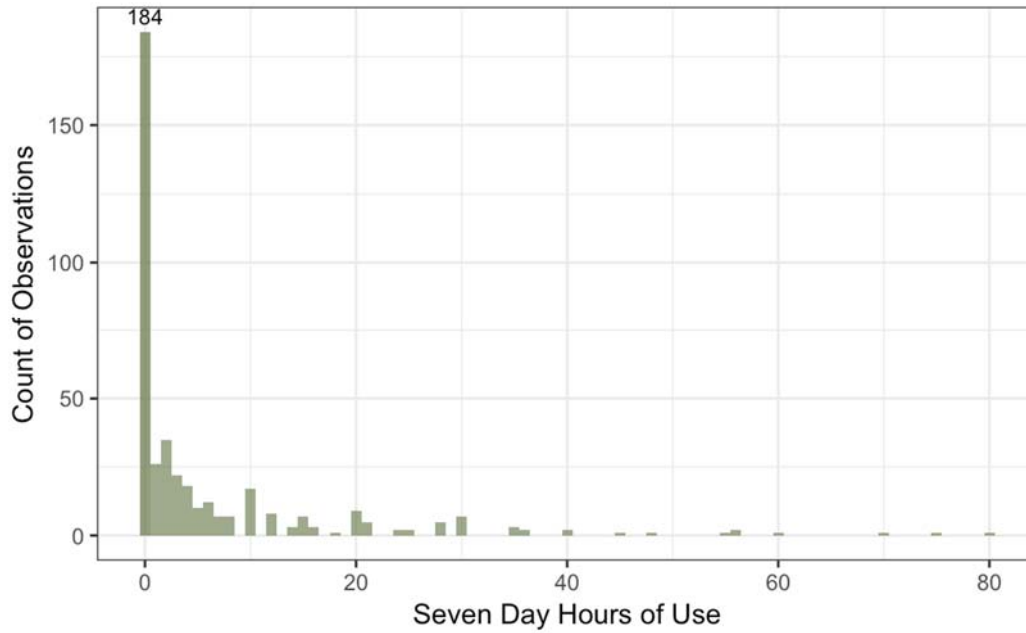


Figure 3: Histograms of Hours of Use by Survey Wave

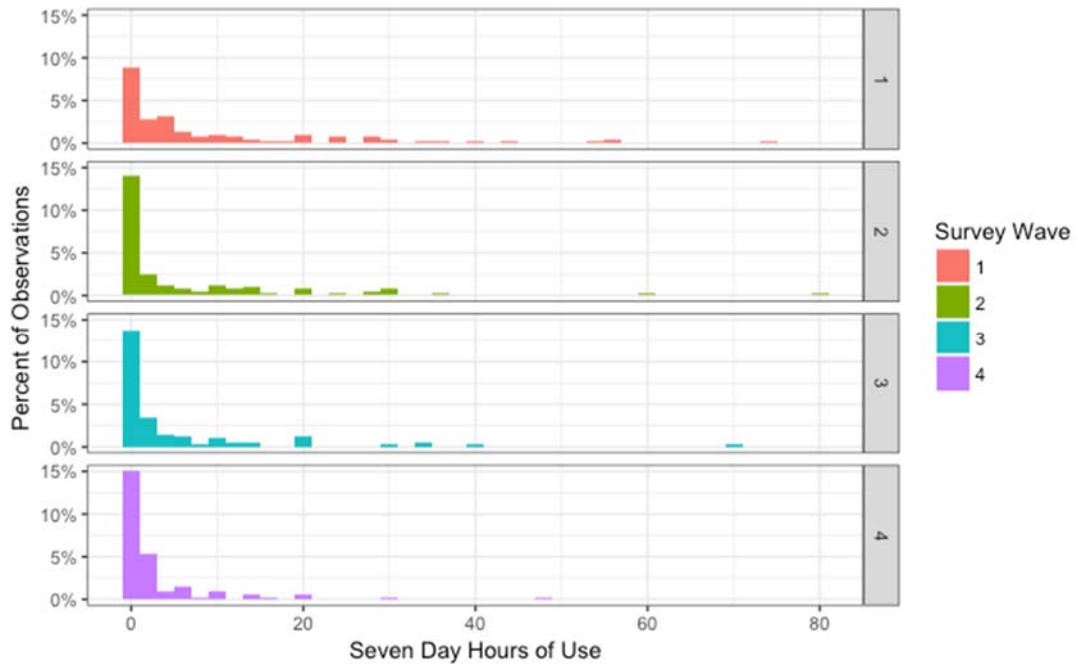


Table 10 presents the summary statistics of hours of use across the four survey waves. There is a statistically significant difference between survey wave 1 and survey wave 4.

Table 10: Average Seven-Day Hours of Use by Survey Wave

Survey Wave	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
1 – Jan 2017	103	25%	9.9	14.8	1.5	±2.9
2 – Feb 2017	106	25%	6.4	12.4	1.2	±2.3
3 – Mar 2017	101	24%	5.1	10.5	1.0	±2.0
4 – Apr 2017	110	26%	3.1	6.7	0.6	±1.3
Total	420	100%	6.1	11.7	0.58	±1.14

Table 11 below, presents the same summary statistics for only homes with greater than zero seven-day hours of use.

Table 11: Seven-Day Hours of Use Summary Statistics For Households Reporting Greater than Zero Usage over Seven Days

Statistic	Value
Number of Observations	222
Minimum Hours of Use	1
Maximum Hours of Use	80
Median Hours of Use	5.5
Mean Hours of Use	11.15
Standard Deviation (SD)	13.89
Standard Error (SE = (SD/√n))	0.93
95% Confidence Interval (CI)	±1.82 (9.33 -12.97)

3.2.2 Hours of Use Analysis Across Selected Categorical Variables

The next stage of analysis was to compare seven-day hours of use across different categorical variables, including question responses from the survey (including demographic information), and home characteristics from Energy Trust’s Project Tracking system. For each separate analysis we identify if the differences across

categories are statistically significant at the 95% confidence level using either a paired t-test or an ANOVA test for analysis that involves 3 or more categories. We call out statistically significant differences in the text, and with a superscript after the category label that aligns with any row that has a statistically significant difference. Another way to identify a likely statistically significant difference is to look at the confidence intervals of the categories you are comparing; if these do not overlap, then they are likely to be statistically significant.

We first looked at hours of use for electrically-heated homes and gas-heated homes. This analysis was driven by unpublished analysis of data from the 2015 new homes gas fireplace survey, which identified a large difference in gas fireplace usage between gas- and electrically-heated homes, with electrically-heated homes reporting 24.8 hours per week of use and gas-heated homes reporting 6.9 hours per week of use. However, the small sample size of electrically-heated homes (9 of 118 respondents) made this a statistically unreliable estimate. The same was true in this survey, with only 9 of 420 homes having electric heat. However, in this survey, the average hours of use for electrically-heated and gas-heated homes was almost identical, at 5.9 and 6.1 hours per seven days, respectively. However, the true mean value for electric homes could be as high as 12.2 hours per seven days at the 95 percent confidence level.

Table 12: Average Seven-Day Hours of Use by Heating Fuel

Response	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI (95%)
Electric	9	2%	5.9	9.6	3.2	±6.3
Gas	397	98%	6.1	11.7	0.6	±1.2
Total	406	100%	6.1	11.7	0.6	±1.14

Next, we looked at the difference between households reporting different reasons for using their gas fireplace. As Table 13 shows, there is a statistically significant difference between homes reporting using their gas fireplace for heating (11.6 hours per seven days) and homes reporting using their gas fireplace for decoration or ambience (1.5 hours per seven days). Likewise, the difference between homes

that use their gas fireplace for heat and ambience (8.8 hours per seven days) and those that only use the gas fireplace for ambience is statistically significant. There is no statistically significant difference between homes reporting using the gas fireplace for heat only and those reporting using the gas fireplace for heat and ambience.

Table 13: Average Seven-Day Hours of Use by Primary Reason to Use Gas Fireplace

Response	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
To heat all or part of my home ²	64	15%	11.6	17.6	2.3	±4.5
For decoration or ambience ^{1,3}	116	28%	1.5	3.7	0.3	±0.7
To heat all or part of my home and for decoration or ambience ²	193	46%	8.8	12.5	0.9	±1.8
Do not use / have not yet used the fireplace ^{1,2,3}	47	11%	0.1	0.6	0.1	±0.2
Total	420	100%	6.1	11.8	0.6	±1.14

Note: A superscript after the category label denotes a statistically significant difference with the row corresponding to the number.

Figure 4 below shows a box and whisker plot of the distribution of hours of use by gas fireplace use type. Overlaid on this plot is the mean value, marked as a blue dot, bound by the 95% confidence interval.

Figure 4: Box and Whisker Plot of Gas Fireplace Use Type by Hours of Use

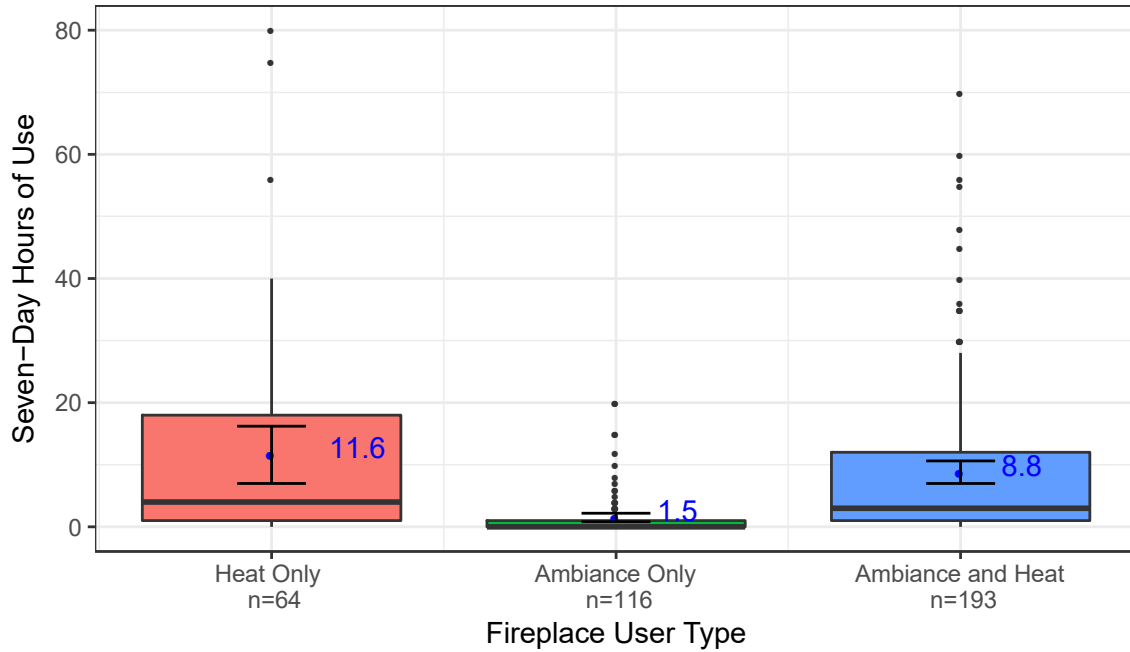


Figure 5 below shows the number of respondents that reported zero seven-days hours of use, broken down by gas fireplace use type.

Figure 5: Proportion of Households With Zero Hours of Use By Gas Fireplace Use Type



Fireplace Usage Type ■ Heat Only n=64 ■ Ambiance Only n=116 ■ Ambiance and Heat n=193

Table 14 shows hours of use across different reported gas fireplace control types. A large majority of homes reported that they manually turn on the gas fireplace with a switch on or near the gas fireplace. There is no statistically significant difference between any of the thermostat types, however, it is interesting to note that the respondents who reported having their thermostat connected to their fireplace had higher usage (12.6 hours per seven days) than those that used a manual system.

Table 14: Average Seven-Day Hours of Use by Type of Control

Response	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
Connected to a thermostat that turns the fireplace on and shuts the fireplace down automatically	14	3%	12.6	19.6	5.2	±10.2
Manually turn the gas fireplace on and off with a switch on or near the fireplace	372	89%	5.9	11.2	0.6	±1.2
Manually turn the gas fireplace on and off with a remote control	29	7%	7.7	12.8	2.4	±4.8
Other (Please specify): ¹	4	1%	0.0	0.0	0.0	±0.0
Total²	419	100%	6.1	11.8	0.6	±1.14

¹ Other includes manually igniting with a match and wall switch.

² One respondent answered “don’t know” and is excluded from the total.

Survey respondents were asked what temperature they tried to maintain in their home. We analyzed the results and split homes into four logical groups roughly based on the quartiles of temperature reported⁸. Table 15 presents hours of use across different temperature set-point groups. There is no statistically significant difference between these groups. Interestingly, in this sample, homes with lower set-points have, on average, higher gas fireplace hours of use. One reason for this could be that survey respondents with lower set-points could have taken the survey during periods with lower outdoor temperatures, randomly. We tested this hypothesis by conducting a chi-squared test between HDD quartiles and the temperature groups. This test failed to reject a null hypothesis that homes in the temperature set-point groups were evenly distributed across the HDD quartiles, indicating that this was not the cause for the observed difference.

⁸ A quartile would be four equal groups, however, because there is an uneven distribution across the temperature settings with large numbers of homes at set-points of 68 and 70, dividing into equal quartiles is not feasible.

Table 15: Average Seven-Day Hours of Use by Home Temperature

Home Temperature Group	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
60-67 F	103	24%	7.8	12.0	1.2	±2.4
68 F	126	30%	5.4	9.4	0.9	±1.7
69-70 F	124	30%	6.3	13.2	1.2	±2.3
71-76 F	67	16%	4.5	11.9	1.5	±2.9
Total	420	100%	6.1	11.7	0.58	±1.14

Table 16 shows hours of use across different reported main heating system types. Most homes in the sample (86%) reported having a gas furnace. There is no statistically significant difference across any heating type group.

As we would expect, the four respondents reporting they have a gas fireplace or gas fireplaces as their main heating system reported having higher usage, although there is significant variation across these four homes. Two of the four respondents who reported they have a gas fireplace as their main heating system reported having zero hours of use. These two homes gave the following responses when prompted to report why they don't use their fireplace:

- “used the heat”
- “didn't need the ambience”

This indicates that these two respondents may have misinterpreted the original question. The remaining two respondents who reported they have a gas fireplace as their main heating system reported 70 hours and 20 hours of use per seven days.

Table 16: Average Seven-Day Hours of Use by Main Heating System

Response	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
Gas Furnace	363	86%	5.8	11.0	0.6	±1.1
Electric Furnace	25	6%	5.2	9.5	1.9	±3.8
Electric Baseboard Heater	3	1%	3.0	4.2	3.0	±5.9
Heat Pump or DHP	17	4%	8.9	18.6	4.5	±8.8
Gas Fireplace	4	1%	22.5	33.0	16.5	±32.4
Other	5	1%	12.0	13.0	5.8	±11.4
Total¹	417	100%	5.9	11.3	0.6	±1.1

¹Three respondents answered “don’t know” and are therefore excluded from this table.

We next analyzed hours of use by number of occupants in the home (Table 17). There is no statistically significant difference across homes with different occupancy.

Table 17: Average Seven-Day Hours of Use by Number of Occupants

Number of Occupants	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
1	45	11%	4.6	12.0	1.9	±3.6
2	188	45%	6.9	12.21	0.9	±1.8
3	62	14%	4.6	9.8	1.3	±2.5
4	68	16%	7.2	13.8	1.7	±3.3
5	9	2%	5.3	9.4	3.3	±6.5
6	4	1%	4.3	5.7	2.8	±5.6
Not Answered	45	11%	4.8	8.1	1.3	±2.5
Total	420	100%	6.1	11.7	0.58	±1.14

After survey respondents were asked to estimate the number of hours in the past seven days they used their gas fireplace, they were asked if their usage over the previous seven days was typical. Specifically, the survey asked respondents if in a

typical seven days they would use the gas fireplace more, less, or about the same as they did in the previous seven days. We next analyzed hours of use by these responses (Table 18). We find a statistically significant difference between homes that stated they typically would have used their gas fireplace less in the previous seven days and homes that stated they typically would have used their gas fireplace more in the previous seven days. There is no statistically significant difference between homes that stated they would have used their gas fireplace the same amount in the past seven days and the other two categories, however, this value falls between the two other groups, as we would expect on average. This is a promising result as it indicates that on average, respondents may be providing fairly accurate estimates of their home usage for the previous seven days.

Table 18: Average Seven-Day Hours of Use by Typical Gas Fireplace Usage

Response	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
I typically use my fireplace more than I have over the past seven days ²	74	18%	3.7	8.4	1.0	±2.0
I typically use my fireplace less than I have over the past seven days ¹	95	22%	8.6	11.0	1.1	±2.2
I typically use my fireplace the same amount as I have over the past seven days	226	54%	6.3	13.1	0.9	±1.7
Don't know	25	6%	0.9	2.4	0.5	±1.0
Total	417	100%	6.1	11.7	0.58	±1.14

Note: A superscript after the category label denotes a statistically significant difference with the row corresponding to the number.

Lastly, we analyzed seven-day hours of use by weather. We first look at hours of use by heating degree-day (HDD) quartiles, followed by hours of use across precipitation quartiles. Table 19 presents a summary statistics for hours of use across the quartiles of HDD. We find a statistically significant difference between quartile 1 and quartiles 3 and 4, and between quartile 2 and quartile 4. These results suggest that outdoor temperature is a driver of gas fireplace usage.

Table 19: Average Seven-Day Hours of Use by Heating Degree-Day (HDD) Quartile

HDD Quartile	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
Quartile 1 (Low HDD / Higher Temp) ^{3,4}	108	25%	2.3	4.6	0.5	±0.9
Quartile 2 ⁴	103	25%	5.5	12.8	1.3	±2.5
Quartile 3 ¹	111	26%	6.4	10.9	1.1	±2.1
Quartile 4 (High HDD / Lower Temp) ^{1,2}	98	24%	10.6	14.9	1.5	±3.0
Total	420	100%	6.1	11.7	0.58	±1.14

Note: A superscript after the category label denotes a statistically significant difference with the row corresponding to the number.

Table 20 presents summary statistics for hours of use across the quartiles of rainfall precipitation. We do not find a statistically significant difference between quartiles.

Table 20: Average Seven-Day Hours of Use by Precipitation Quartile

Precipitation Quartile	n	%	Hours of Use Mean	Hours of Use SD	Hours of Use SE	Hours of Use CI
Quartile 1 (Low Precipitation)	106	25%	8.1	12.2	1.3	±2.5
Quartile 2	105	25%	7.5	13.6	1.4	±2.7
Quartile 3	104	25%	4.5	9.3	0.9	±1.8
Quartile 4 (High Precipitation)	105	25%	4.6	11.1	1.1	±2.1
Total	420	100%	6.1	11.7	0.58	±1.14

3.3 Regression Model Results

Evergreen conducted a regression modeling exercise to determine the impact of temperature, weather events (rain, snow, etc.), and key demographic and household characteristics on hours of use. Informed by the above analysis, Evergreen staff ran several model specifications, including a variety of demographic and home characteristic variables. The final model we present in this report is an Ordinary Least Squares regression model with the following specification:

$$HOU_i = \alpha + \beta_1 HDD_i + \beta_2 Precipitation + \beta_3 FireplaceUse + \varepsilon_i$$

Where :

HOU_i = Hours of Fireplace Use over Seven Days for Home i

HDD_i = Heating Degree Days over Seven Days for Home i

$Precipitation_i$ = Precipitation in thousands of inches over Seven Days for Home i

$FireplaceUse_i$ = A binary "dummy" variable indicating if a household (i) uses a fireplace primarily for heating (=1) or for ambience (=0)

ε_i = Error

We ran three iterations of the final model, starting with a model using only HDD as an independent variable, followed by a model with HDD and precipitation variables, and finally a third model which adds a binary “dummy” variable for gas fireplace primary use. Table 21, below, presents the results of the regression analysis. The left hand column provides the names of the independent variables; the numbered columns one through three represent three model iterations. Across all three models, average HDD over the previous seven days is statistically significant, and the coefficient remains stable across the regression iterations at approximately 0.05. This can be interpreted as: for each increase in average HDD over the past seven days, there is an increase of 0.05 hours (3 minutes) per week in usage. Precipitation is not a statistically significant independent variable, which aligns with the statistical analysis in the previous section. Lastly, the home gas fireplace use type, if a home uses a gas fireplace for heating or ambience is statistically significant. This can be interpreted as, if a home uses the gas fireplace primarily for heating, there is an increase of approximately 8 hours of use over a seven-day period.

The correlation coefficient (R^2) is low at 0.191 indicating that there are other factors not accounted for in this model that impact fireplace usage. Alternative model specifications with variables including days of cloud cover, day length, and days with snow were estimated with no improvement to the correlation coefficient.

Table 21: OLS Regression Results

<i>Dependent variable:</i>			
Hour of Use (Seven Days)			
<i>Independent Variables</i>	(1)	(2)	(3)
Average HDD (7 Days)	0.051*** (0.009)	0.049*** (0.010)	0.050*** (0.009)
Precipitation (Thousands/Inch)		-0.002 (0.002)	-0.0002 (0.002)
Fireplace Use Type (0 = Ambiance, 1 = Heating)			7.986*** (1.043)
Constant	-1.094 (1.394)	-0.224 (1.626)	-5.626*** (1.676)
Observations	402	402	402
R ²	0.070	0.072	0.191
Adjusted R ²	0.067	0.067	0.185
Residual Std. Error	10.873 (df = 400)	10.872 (df = 399)	10.163 (df = 398)
F Statistic	29.927*** (df = 1; 400)	15.505*** (df = 2; 399)	31.373*** (df = 3; 398)

Note: *p < 0.10 (significant at 90% level)
 **p < 0.05 (significant at 95% level)
 ***p < 0.01 (significant at 99% level)

4 Comparison with Previous Energy Trust Survey

In 2015, Energy Trust worked with Abt SRBI 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 2015 survey). The goal of the 2015 survey was also to understand the prevalence and use of gas fireplaces installed in newly constructed homes. In this section we compare the results of the 2015 survey with the present (2017) survey.

Two differences between the surveys are important to highlight. First, the 2015 survey was administered in one wave between May 7, 2015 and May 28, 2015. The 2017 survey was administered in four waves between January 1, 2017 and April 30, 2017. The time difference is important as data collection for the 2017 survey occurred throughout the heating and shoulder seasons, whereas data collection for the 2015 survey occurred at the end of the shoulder season. Second, the survey question asking about hours of use was different. The 2015 survey asked respondents:

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

The 2017 survey asked respondents:

Today is [INSERT TODAY'S DATE]. Over the past seven days, that is, between [INSERT DATE = TODAY'S DATE - 7] and [TODAY'S DATE], about how many hours did you use your gas fireplace?

It is our opinion that the 2017 survey method is superior and yields more reliable results for the following reasons:

- The 2017 survey included more respondents (473 vs. 146), improving statistical precision of parameter estimates.
- The 2017 survey asked participants to estimate fireplace usage over the previous seven-day period, rather than asking participants to recollect average weekly usage over the heating season. This should result in more

accurate recollection and reporting of hours of use as the time period is more recent.

- The 2017 survey asked for hours of use for a specific seven-day period for each participant, allowing allocation of specific weather data for that period.
- The 2017 survey was conducted in four waves throughout the winter heating and shoulder seasons, allowing more detailed analysis of usage across a variety of weather conditions

Table 22 below presents a comparison of respondent housing characteristics. The respondent samples appear to be similar based on these characteristics.

Table 22: Respondent Disposition

Characteristic	Value	2015 Survey (n=146)	2017 Survey (n=473)
State	OR	89%	94%
	WA	11%	6%
Tenure	Own	97%	97%
	Rent or Other	3%	3%
Heating Fuel Type	Electric	7%	4%
	Gas	83%	96%
Mean Sq. Footage		2,114	2,328

The following tables and charts present a comparison of survey results between the 2015 survey and the 2017 survey. Table 23 presents the proportion of respondents from the 2015 survey and 2017 survey reporting if they have at least one fireplace, and how they use their fireplace or fireplaces. The proportion of respondents reporting that they used their fireplace for zero hours over the period the survey asked them to report on is substantially higher in the 2017 survey (44%) compared with the 2015 survey (15%). While we cannot be certain about the cause of this

difference, differences in the way the questions related to hours of use respondents were asked likely difference factor.

Table 23: Proportion of Respondents Reporting Fireplace Use Characteristics

Percent of respondents . . .	2015 Survey	2017 Survey
. . . with at least one gas fireplace ¹	81%	89%
. . . reporting using their fireplace zero hours / don't know ²	15% / 8%	44% / 3%
. . . reporting not using the fireplace ³	9%	11%
. . . reporting using the fireplace as the main heating system ⁴	3%	1%

¹Q6A in 2015 survey and 2017 survey.

²Q8 in 2015 survey and Q16A in 2017 survey.

³Q11 in 2015 survey and Q8A in 2017 survey.

⁴Q9 in 2015 survey and Q5B_1 in 2017 survey.

Table 24 below presents a comparison of hours of use statistics for the entire set of respondents from both surveys including households that reported not using their fireplace. The difference in the mean usage between the 2015 and 2017 surveys is not statistically significant at the 95 percent level.

Table 24: Weekly Hours of Use Summary Statistics

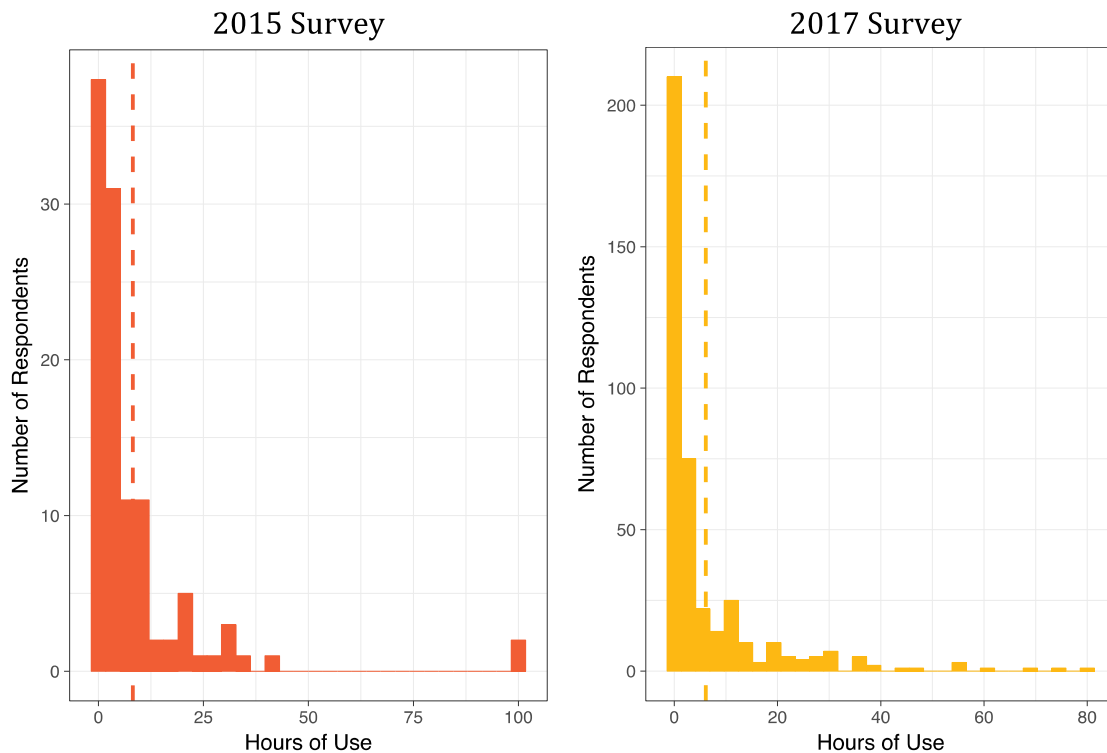
Statistic	2015 Survey	2017 Survey ¹
Number of Observations	118	406
Minimum Hours of Use	0	0
Maximum Hours of Use	100	80
Median Hours of Use	N/A	1
Mean Hours of Use	8.2	6.10
Standard Deviation (SD)	15.2	11.76
Standard Error (SE = (SD/ \sqrt{n}))	1.39	0.58
95% Confidence Interval (CI)	± 2.74 (5.45 – 10.94)	± 1.14 (4.96 - 7.24)

¹ 473 participants responded to the 2017 survey. 52 (11%) of survey respondents reported not having a fireplace and one respondent reported "don't know". Fourteen (3%) respondents did not provide an estimate of use. Of the 406 remaining, 47 (11.5%) stated that they do not ever use their fireplace.

Figure 6 below provides a graphical comparison of hours of use, presenting two histograms that show the frequency of hours of use across respondents for both surveys. The red and yellow dotted lines represent the mean hours of use values for

all respondents in each survey (8.2 hours per week in 2015 and 6.1 hours per week in 2017).

Figure 6: Comparison of Hours of Use Frequency Between 2015 and 2017 Surveys



The 2015 survey reported the mean hours of use after excluding respondents who reported not using the fireplace. In 2015, 16% reported not using the fireplace at all.⁹ After excluding these customers (18 customers), the average increased to 9.8 hours per week. When we conduct the same exercise with the 2017 survey, we remove 47 respondents (11.5%) who said they never use their fireplace and the average hours of use increases to 6.9. If we also exclude households who reported

⁹ 2015 survey question text – “Q12. Which of the following statements best describes how you use your other heating systems?”

that they had used their fireplace for zero hours in the past seven days, then we remove 184 respondents (45%) and the mean hours of use increase to 11.15 (Table 11).

Table 25: Hours of Use Comparison between 2015 Survey and 2017 Survey

	2015 Survey ¹⁰			2017 Survey		
	n	Hours of Use Mean	Hours of Use SD	n	Hours of Use Mean	Hours of Use SD
Overall	118	8.2	15.2	406	6.1	11.76
Home Heating Fuel						
Gas	109	6.9	12.3	397	5.9	9.6
Electric	9	24.8	32.5	9	6.1	11.7
State						
OR	109	8.2	15.5	384	6.2	11.9
WA	9	8.5	10.2	22	4.9	8
Type of Use						
For Heating	53	12.8	20			
For Other Purposes	50	5.1	8.2			
For Heating Only				64	11.6	17.6
For Ambiance Only				116	1.5	3.7
For Heating and Ambiance				193	8.8	12.5

*Note n values do not always sum to total due to missing or “don’t know” responses.

¹⁰ Note that the analysis of hours of use by home heating fuel, state, and type of use is unpublished, and is documented in a personal communication dated 1/17/2016.

5 Conclusions

The 2017 New Homes Gas Fireplace survey has added valuable information to Energy Trust's ongoing research into gas fireplace usage, and has provided additional answers to key questions about gas fireplace usage.

Key findings from the 2017 New Homes Gas Fireplace survey include:

Mean "hours of use" across all 406 valid survey respondents is 6.1 hours per seven-day period.¹¹ The standard deviation is 11.76 hours, indicating a wide degree of variance across observations. The minimum usage is 0 hours and the maximum usage is 80 hours.

The data are heavily skewed toward zero hours of usage. 44 percent of respondents stated they had not used their gas fireplace in the previous seven days.

Most respondents use their gas fireplace for both heating and ambience. Across the 420 homes with at least one gas fireplace, 46 percent of respondents reported using a fireplace for both heating and ambience, 28% reported using the gas fireplace for ambience only, and 15 percent reported using their gas fireplace for heating only. Respondents who use their homes for heating only, or for heating and ambience, have higher hours of use than homes that report using their gas fireplace for ambience only.

Respondents reporting using their gas fireplace for heating had, on average, 11.6 hours of use per seven days. Respondents that use their gas fireplace for heat and ambience had, on average, 8.8 hours of use per seven days. And respondents that reporting using their gas fireplace for decoration or ambience only that had 1.5 hours of use per seven days. The differences between respondents reporting using the fireplace for heating and those using it for decoration or ambience only, and respondents reporting using the fireplace for heat and ambience and those using it for decoration or ambience only are

¹¹ Note that the period is the seven days prior to the survey date, therefore it is not a standard week, i.e. Sunday – Saturday.

statistically significant at the 95% confidence level. Regression analysis shows a statistically significant relationship between homes that use their gas fireplace for heating and hours of use. The results indicate that if a home uses the gas fireplace primarily for heating, there is an increase of approximately 8 hours of use over a seven-day period.

Outside temperature has a statistically significant impact on gas fireplace usage. Average heating degree-days (HDD) over the previous seven days is statistically significant. For each unit increase in average HDD over the past seven days, there is an increase of 0.05 hours (3 minutes) per week in usage.

Heating fuel type does not appear to have a statistically significant impact on gas fireplace hours of use, however, the sample of electrically-heated homes is small (n=9). Average hours of use for electrically- and gas-heated homes are almost identical at 5.9 and 6.1 hours per seven days, respectively. However, the true mean value for electrically-heated homes could be as high as 12.2 hours per seven days at the 95 percent confidence level.

6 Appendix A: 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

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 you own or rent your home?

1. Own
2. Rent

[If S2 = 2]

S2A. Do you pay any of the utility bills for your home?

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

S2B. Which utility bills do you pay? [ACCEPT MULTIPLE RESPONSES]

1. Electricity
2. Gas
3. Water
98. Don't know

[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

[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

[If S2 = 1 AND Q1A = 1; INSERT SAMPLE ATTRIBUTES]

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) [If LEED = 1]			
Q1BEPS. EPS, an energy performance score [If EPS = 1]			
Q1BES. ENERGY STAR® [If ENERGY STAR = 1]			
Q1BEA. Earth Advantage® [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 response]

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				

[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

[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

[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

[If Q5A = 1]

Q5A_L_OE. Why did you decide to replace the lighting in your home? [Open response]

[If Q5A = 4]

Q5A_WH_OE. Why did you decide to install a different water heating system? [Open response]

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						

Q5B_1. What do you use as your main heating system?

1. Gas furnace
2. Electric furnace
3. Electric baseboard heater
4. Heat pump
5. Gas fireplace [SKIP TO Q6B]
6. Other, please specify: [Open response]
98. Don't know
99. Refused

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
4. No thermostat
98. Don't know

[If Q5C = 1, 2, 3]

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

[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

[If Q6A = 2]

Q6B. How many fireplaces are in your home?

[FORCE NUMERIC RESPONSE]

[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:)

Q7. Was/were the gas fireplace(s) installed when you purchased your home?

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

GAS FIREPLACE QUESTIONS [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]

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 when answering the following questions.

Q8. How do you control your fireplace?

1. Non-programmable thermostat
2. Programmable thermostat
3. Smart thermostat or web-enabled thermostat
4. Manually turn the fireplace on and off with a switch or button
5. Other [Open response]
98. Don't know

[If Q5B_1 = 5 and Q8 = 2, 3, 4]

Q8B. 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

[If Q8 = 1, 2, 5]

Q9A. Do you use the fireplace to maintain a specific temperature in your house or particular room?

1. Yes
2. No

[If Q8 = 1 or 5 and Q9A = 1]

Q9B. What temperature do you try to maintain?

[FORCE NUMERIC RESPONSE]

[If Q8 = 2 and Q9A = 1]

Q9C. What temperature is your thermostat set at to turn on your fireplace?

[FORCE NUMERIC RESPONSE]

[If Q8 = 3]

Q9D. 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

[If Q9D = 1]

Q9E. What temperature is your thermostat typically set at to turn on your fireplace when you are home? What about when you are away from home?

[FORCE NUMERIC RESPONSES]

[If Q9D = 2]

Q9F. What temperature is your thermostat set at to turn on your fireplace?

[FORCE NUMERIC RESPONSE]

[If Q5B_1 = 1, 2, 3, 4, 6, 98, 99]

Q10. Thinking about your overall home heating needs, does your [Q5B_1 response] typically provide sufficient heat without your fireplace turned on?

1. Yes
2. No

[If Q5B_1 = 1, 2, 3, 4, 6, 98, 99]

Q11. Which of the following statements best describes how you primarily use the gas fireplace?

1. For heating, but I also use other systems to heat my home
2. I use the fireplace, but for purposes other than heating
3. I do not use the fireplace or have not yet used the fireplace
98. Don't know
99. Refused

[If Q11 = 1]

Q12. Does your fireplace provide the right amount of additional heat to make the room comfortable?

1. Yes
2. No, not enough
3. No, too much

[If Q5B_1 = 5]

Q13. As your primary heating system, does your fireplace provide the right amount of heat for your home?

1. Yes
2. No, not enough
3. No, too much

[If Q11 = 2]

Q14. Does the fireplace ever overheat your room when you are using it for purposes other than heating?

1. Yes
2. No

[If Q5B_1 = 1, 2, 3, 4, 6, 98, 99]

Q15. Do you ever use your gas fireplace instead of your [Q5B_1 response] for heating your home?

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

Q16. Under what circumstances do you use your gas fireplace instead of your [Q5B_1 response]?

1. Not very cold weather
2. To save gas or money
3. To heat only part of the home (instead of all of the home)
4. Other [Open response]
98. Don't know

Again, thinking only about the fireplace in the central area of your home – the living room or family room for the next few questions...

Q17. Today is [INSERT TODAY'S DATE]. In the past seven days, that is, between [INSERT DATE = TODAY'S DATE-7] and [TODAY'S DATE], about how many hours did you use the gas fireplace?

[FORCE NUMERIC RESPONSE]

98. Don't know

Q18. Do you typically use your fireplace more or less than you did over the past seven days, that is, between [INSERT DATE = TODAY'S DATE – 7] and [TODAY'S DATE]?

1. I typically use my fireplace more than I have over the past seven days
2. I typically use my fireplace less than I have over the past seven days
98. Don't know

Q19. Why would you say you used the fireplace more/less than average?

1. We were not in the house as much as usual
2. We are trying to save money on energy
3. The weather was cooler / warmer than usual
4. We were home more than usual this week
5. Other [Open response]
98. Don't know

Q20. Do you have any other information to provide about your use of your gas fireplace? [Open response]

DEMOGRAPHIC QUESTIONS

Q21. How many people, including yourself, live in your home full time?

[FORCE NUMERIC RESPONSE]

99. Refused

Q22. 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

Q23. What is the highest grade or year of school that you have completed?

1. Never attended school or only attended kindergarten
2. Grades 1 through 8 (Elementary)
3. Grades 9 through 11 (Some high school)
4. Grade 12 or GED (High school graduate)
5. College 1 year to 3 years (Some college, technical school, Associates degree)
6. College 4 years or more (College graduate)
98. Don't know
99. Refused

Q24. Which of the following categories best describes your household's 2015 income. Would you say it was...?

1. Up to \$20,000
2. \$20,001 to \$30,000
3. \$30,001 to \$40,000
4. \$40,001 to \$50,000
5. \$50,001 to \$75,000
6. \$75,001 to \$100,000
7. \$100,001 to \$150,000
8. \$150,001 or more

CONCLUSION

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