

Watch Your Next Step – Continuing Change in the Northwest New Homes Market

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ABSTRACT

The Northwest Energy Efficiency Alliance (NEEA) is about to implement a new Next Step Home (NSH) initiative after conducting a pilot program with key builder partners. This initiative will offer single-family home builders in Idaho, Montana, Oregon and Washington (the Northwest states) another path to energy efficiency and market differentiation, with new homes expected to be at least 30 percent more efficient than state codes require. This paper presents findings from recently completed research on the current market for Next Step Homes and the results of a survey of Northwest home builders, which covered their projections of expected future market share of Next Step Homes, integration of specific elements (e.g., ductless heat pumps, U.25 windows), and anticipated challenges. In particular, the survey solicited estimates of future market shares of these homes via two methods: open-ended questions preceded by a double-bounded question format, often used in willingness-to-pay analysis. Analysis of the double-bounded questions provided validation of the open-ended response estimates. The findings suggest that long-term (i.e., 20-year) market share for the full Next Step Home specification will range across the Northwest states from 12% to 20% without further market intervention by NEEA or its partner organizations. This paper will be of interest to evaluators wishing to learn more about methods for forecasting future market adoption from primary market actors.

Introduction

For nearly a decade, the Northwest ENERGY STAR Homes Program at NEEA has promoted the construction and sale of new homes built to the Northwest ENERGY STAR Homes specification, which was designed specifically for the states of Idaho, Montana, Oregon and Washington. Homes built to the Northwest ENERGY STAR specification must be at least 15 percent more energy efficient than homes built to current building codes in the region. These homes usually include a combination of prescriptive features such as high efficiency lighting, windows, appliances, water heaters, insulation, and heating and cooling equipment. As a result, new Northwest ENERGY STAR homes are designed to save an average of 1,250 kWh per year across the four Northwest states.

The Northwest ENERGY STAR Homes Program has affected market transformation in many ways. During the height of the new construction downturn, the program attained regional market share greater than 15 percent (the program goal) as many builders remained in the program to differentiate their homes in an increasingly competitive market. In addition, regional builders have increased their duct sealing testing, are using improved air sealing and ventilation techniques, and have greater understanding of whole house building as an integrated system.¹

¹ For additional details on the achievements of the Northwest ENERGY STAR Homes program, readers can review the Market Progress Reports completed by ECONorthwest and Evergreen Economics, available on NEEA's website (<http://neea.org/resource-center/market-research-and-evaluation-reports>).

NEEA's work in residential new construction has also helped accelerate code adoption in the Northwest. More stringent codes mean that the new construction market continuously embraces advanced building practices and technologies exceeding ENERGY STAR that provide an opportunity for builders to get ahead of incremental code changes, and allow the region to capture greater energy savings. Market actors have also shown indications that the Northwest ENERGY STAR Homes program is ready to be market-driven with reduced intervention by NEEA. These factors were the impetus for NEEA to implement a transition strategy that moves elements of the Northwest ENERGY STAR Homes program to the market while beginning to focus on the next phase for residential new construction, namely the Next Step Home (NSH). This transition included aligning the Northwest ENERGY STAR program closer to the national program and adding tools that continue to strengthen the skill set of market actors - offering flexibility, and empowering these market actors to drive the program.

Next Step Homes Pilot

NEEA's new Next Step Home initiative is intended to further increase the adoption of advanced building practices and products with the ultimate goal of locking in these practices through advances in state energy codes. Over the course of 2013 as part of its early pilot phase, NEEA partnered with builders around the region to build 10-12 new construction homes that met the NSH performance targets with two main goals in mind:

1. Learn how builders meet the specification, including:
 - a. Establishing best practices
 - b. Identifying common challenges
 - c. Determining the cost of meeting program specifications
2. Understand the energy performance of the specification, requiring post occupancy data collection for 12+ months.

Each pilot builder chose a different pathway and product mix to achieve NSH performance targets. NEEA supported each project with technical support, training, incentives, limited marketing/public relations, and data collection. Early results indicated that builders can meet the NSH specification and that incentives are not the key driver for participation. Builders found value in partnering with NEEA for technical assistance and trainings, public relations and data collection. Builders do, however, need additional guidance on best practice when building a highly energy efficient home. NEEA is now in the process of engaging with builders to construct an additional 30 Next Step Home units in Phase II of the pilot to further investigate home performance and establish a standard modeling protocol for energy savings.

Next Step Home Technical Specification for Baseline Estimation

Before formally launching a new, regional Next Step Home Initiative it was critical to establish the naturally occurring baseline so that NEEA and its partner utilities can measure the impacts of their future market interventions. This required estimating the percentage of new single-family homes in the Northwest that currently meet and are likely to meet the Next Step Home specification *with no assistance from NEEA or its partner utilities*.

Compared to the Northwest ENERGY STAR Homes requirements, which include flexible, "performance path" options and also some prescriptive requirements (e.g., the national ENERGY STAR Version 3.0 checklists for HVAC equipment), the Next Step Home specification is a rigorous, prescriptive specification comprised of six core elements with options. Next Step Homes are expected to

deliver annual energy savings that are about double what a Northwest ENERGY STAR home would deliver. The Northwest ENERGY STAR specification is currently designed to deliver approximately 15% energy savings relative to state codes, and thus a Next Step Home would deliver roughly 30% savings. For purposes of the baseline study, Next Step Homes were required to meet a prescriptive specification that includes the following features:

1. Advanced wall efficiency (i.e., insulation and windows) with a u-value of 0.035 or lower in Heating Zone 1, and 0.030 or lower in Heating Zones 2 and 3;
2. An ultra-tight shell (i.e., 2.0 air changes per hour at 50 pascal (ACH₅₀)) with heat recovery ventilation (HRV);
3. Ducts inside the building shell (if applicable);
4. Efficient heating strategies, such as
 - a. Gas Furnace – 94% annual fuel utilization efficiency (AFUE)
 - b. Heat Pump – 9.0 heating season performance factor (HSPF), 12.0/11.5 energy efficiency rating (EER)
 - c. Ductless Heat Pump – 3.0 coefficient of performance (COP)
 - d. Radiant floor heating
5. A heat pump water heater, or natural gas water heater with 0.81 efficiency; and
6. U.25 windows.

Some of these energy efficient home features may be adopted into NEEA program state building codes in the future; however, it was not within the scope of the study to estimate if and when these code changes may occur. This is because NEEA tries to influence future residential energy code changes after baseline market penetration has been estimated. In this context, studies like this focus on purely “natural” adoption by builders for baseline estimations.

Homes that include these features may also achieve other home certifications, such as Passive House, LEED for Homes, Earth Advantage Gold or Platinum, and Built Green, although this is not a requirement of the NEEA initiative.

Estimation Methodology Overview

Early in the study, Evergreen Economics (Evergreen) conducted in-depth interviews with seven regional housing experts and staff that manage other efficient homes programs in the Northwest (e.g., LEED, Built Green, Earth Advantage, Northwest ENERGY STAR Homes, and Passive House). Some of the primary objectives of these interviews were to discuss current and projected trends in single-family new construction, builder adoption of the NSH specification and expected barriers, and available data to estimate current adoption of the specification. Expecting that current builders of Next Step Home “equivalents” are likely participating in these efficient homes programs, the findings could be used to corroborate and bound self-reported baseline activity yielded in the builders’ phone survey (discussed subsequently).

Evergreen also asked the program leads for their own estimates of regional market adoption of Next Step Homes 10 and 20 years into the future, based on their own expert knowledge of builders’ target markets, attitudes towards energy efficiency and cost structures. Based on Evergreen’s past experience evaluating new homes programs, market adoption of Next Step Homes 20 years into the future was expected to be less than 30%, and Evergreen wanted to try to refine this initial estimate for usage in a regional builders’ phone survey.

After Evergreen completed the interviews, CIC Research (on behalf of Evergreen) conducted a regional phone survey of 185 single-family homebuilders in May and June of 2014 operating in the

Northwest to obtain information about builders' current and projected building practices, and estimates of future Next Step Home construction levels. Companies with less than two years of new construction experience were screened out of the survey in order to prioritize information from the most experienced companies. **Table 1**, below, shows the distribution of completed surveys by state and builder size (number of homes completed in 2013).

Table 1: Number of Completed Builder Surveys

State	Subtotal By Builder Size (2013 Homes Built)			Total
	Small (2-4)	Medium (5-9)	Large (10+)	
ID	26	5	7	38
MT	21	9	6	36
OR	28	14	4	46
WA	36	14	15*	65
Total	111	42	32	185

*Because of the larger sample size, Washington builders were further disaggregated into 10-24 and 25+ homes strata with unique weights. For the other states, response rates were low for the largest categories, and thus were collapsed into a single size category of 10+ homes.

As shown in the table, 60% of the surveyed builders were small builders, 23% were medium volume builders, and 17% were large builders. Additionally, 21% of the builders surveyed were from Idaho, 19% from Montana, 25% from Oregon, and 35% from Washington. Overall, the distribution of completed surveys is representative of the northwest population of homebuilders. Additional methodological details are included in the next section.

Baseline Estimation Findings

Table 2 shows the number of single-family homes constructed in 2013 that the interviewed efficient home program managers confirmed or estimated to meet the Next Step Home specification. Some of the limitations to these data include:

- Lack of information on Next Step Home (NSH) associated construction in Montana, which historically has had relatively low shares of ENERGY STAR homes;
- Potential for other homes that meet the NSH specifications, but which are not accounted for by the programs surveyed;
- Some homes included in the counts above may not actually meet all of the NSH specifications; and
- Possibility of overlap between program homes/certifications - it was not possible to crosscheck all addresses with the limited program data provided.

Given these limitations, it is still reasonable to assume that the current market share for homes meeting the NSH specifications is less than 1%.

Table 2: 2013 Program Homes Meeting or Approximating Next Step Home Specifications²

State	Program Homes Meeting NSH Specification	Total Homes Constructed (2013)*	Approximate Market Share
ID	38	5,518	0.69%
MT	1	1,695	0.06%
OR	42	6,936	0.61%
WA	57	16,292	0.35%
Total	138	30,441	0.45%

* Total homes constructed based on Evergreen Economics’ analysis of US HUD permits data accessed on March 21, 2014.

To help forecast a baseline for NSHs, Evergreen asked the program managers to give their perspective on where the market for homes meeting NSH specifications may be heading in the future, absent significant code changes and promotion by NEEA and the Northwest utilities (including Bonneville Power Administration and Energy Trust of Oregon). Specifically, Evergreen asked what changes they anticipate in the market share of homes built to NEEA’s specification in 10 years and 20 years, if NEEA and the Northwest utilities do not provide technical, marketing or financial assistance to builders. Table 3 presents the results and shows that the efficient homes program managers expect future market shares of Next Step homes in the Northwest to generally range from 6% to 30% over the next 20 years.

Table 3: Interviewees’ Estimated Next Step Home Market Shares: 10 years and 20 years (n=7)³

Time Period	Market Share – Low	Market Share – High	Market Share – Average	Market Share - Median
2024	1%	40%	12%	6%
2034	5%	80%	30%	13%

Source: Interviewed homes program managers.

During the interviews, the efficient homes program managers noted that potential buyers of energy efficient homes face a wide range of financial, informational, and technical barriers. In particular, homebuyers and financial institutions often do not recognize and monetize long-term energy savings, and are not willing to finance more expensive energy efficient homes. Moreover, many homebuyers are unable to identify energy efficient homes or features and believe that existing codes guarantee

² Program homes tallied include: ENERGY STAR, Passive House, Earth Advantage, USGBC/LEED and Built Green. Earth Advantage does not track some specification data, namely wall or window u-values. The Earth Advantage homes tallied meet all other NSH specifications. USGBC (LEED) do not track specific measure information for certified homes, rather they are tracked on a point scale. Evergreen used the number of LEED Platinum single-family homes as a proxy for NSH-equivalent homes. The Built Green value is the number of homes built in King and Snohomish counties only, where the majority of homes built in this Washington-based program are located. Built Green does not track specific measure information sufficient to identify NSHs. Evergreen used the number of Built Green 5 Star homes, which typically are 40% to 50% more efficient than code, as a proxy for NSH-equivalent homes.

³ The highest market shares may reflect an expectation that some NSH measures will be adopted into residential building codes, although interviewees were explicitly told to “ignore” this scenario.

efficiency. Lastly, homebuyers sometimes perceive that heat pump water heaters, ductless heat pumps and tankless water heaters have general performance problems.⁴

Building upon the program manager interviews, Evergreen next implemented the regional phone survey of northwest single-family homebuilders. After answering various firmographics questions (e.g., age of company, typical home sizes/price ranges, custom versus production home offerings, etc.) builders were read the Next Step Home specification requirements. Builders were then asked to estimate the number of their 2013 completed homes that included each of energy efficient elements that are in the Next Step Home specification. As noted earlier, these elements included advanced walls, ultra tight shell with HRV, 94% efficiency gas furnace, high efficiency heat pumps, ductless heat pumps, radiant floor heating, ducts in conditioned spaces, heat pump water heater, 0.81 EF gas water heater, and U.25 windows. Table 4 summarizes the weighted average percentages of 2013 homes per state that included the efficient measures based on the homebuilder survey results. It was not within the study scope to verify the installation of these measures, particularly since most homes completed in 2013 are currently occupied.

Table 4: Builders Survey - Percentage of 2013 Homes with Next Step Home Efficiency Measures

Measure	State				Average
	ID (n=38)	MT (n=36)	OR (n=46)	WA (n=65)	
94% gas furnace	64%	63%	92%	81%	75%
Ducts in conditioned spaces	35%	91%	34%	56%	54%
0.81 EF gas water heater	15%	26%	92%	41%	44%
Advanced walls	46%	66%	49%	13%	44%
U.25 windows	33%	54%	31%	43%	40%
Ultra tight shell with HRV	6%	18%	26%	12%	16%
High efficiency heat pump	7%	6%	13%	16%	11%
Radiant floor heating	9%	5%	6%	3%	6%
Ductless heat pumps	1%	0%	3%	2%	2%
Heat pump water heater	1%	1%	0%	2%	1%

To develop the current baseline for Next Step Homes Evergreen then asked each builder for the number of their 2013 homes that included *all* of the measures – the key determinant of specification adoption. Respondents that had already built pilot homes – with financial and technical assistance from NEEA – were instructed to only consider their other homes that did not receive any assistance. While several builders indicated they had included at least some of the measures in their homes, none reported that they had completed a home with all of the measures in 2013. This finding is consistent with findings in Table 2 showing that the current market baseline for the Next Step Home is close to 0%.

⁴ For details on market acceptance of ductless heat pumps and heat pump water heaters, see [Northwest Ductless Heat Pump Initiative- Market Progress Evaluation Report #3](#) (Evergreen Economics) and [Northwest Heat Pump Water Heater Market Test Assessment](#) (Evergreen Economics), both available at: <http://neea.org/resource-center/market-research-and-evaluation-reports>.

During the survey, Evergreen also asked for builders' opinions about the future market potential of Next Step Homes based on questions that were open-ended and questions that were bounded. Following are the open-ended questions:

Q1.If NEEA and the Northwest utilities do not provide financial incentives or technical assistance to builders, and state codes do not change significantly, what do you think the market share for these homes will be in 20 years?

Q2.What do you think the market share for these homes will be in 10 years?

Table 5 shows the estimated market shares of Next Step Homes in 20 years by state and builder size, while Table 6 displays the estimates for 10 years. These results are based on the open-ended questions above.

Table 5: Builders Survey - Estimated Market Share of Next Step Homes - 20 Years (Median Values)

State	Subtotal By Builder Size				Overall
	2-4	5-9	10+ (10-24 for WA)	25+ (WA Only)	
ID (n=38)	14%	40%	12%	N/A	20%
MT (n=36)	15%	16%	15%	N/A	15%
OR (n=46)	17%	22%	20%	N/A	20%
WA (n=65)	19%	10%	10%	7%	12%
Overall (n=185)					15%

Table 6: Builders Survey - Estimated Market Share of Next Step Homes - 10 Years (Median Values)

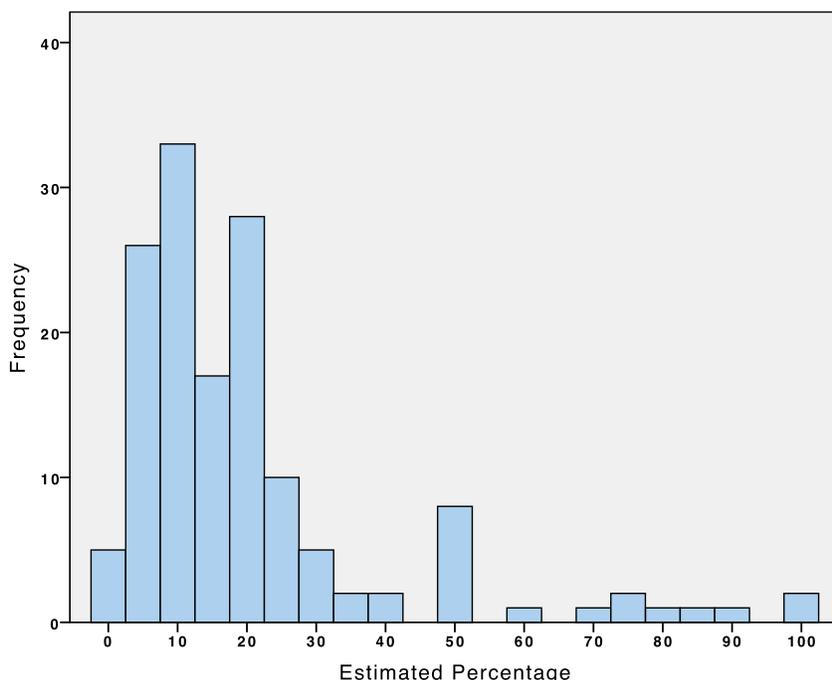
State	Subtotal By Builder Size				Overall
	2-4	5-9	10+ (10-24 for WA)	25+ (WA Only)	
ID (n=38)	10%	28%	10%	N/A	10%
MT (n=36)	10%	10%	10%	N/A	10%
OR (n=46)	10%	16%	20%	N/A	15%
WA (n=65)	10%	6%	10%	6%	10%
Overall (n=185)					10%

For the 20-year estimates, Idaho and Oregon builders provided the highest statewide market share estimates at 20%, followed by Montana at 15% and Washington at 12%. Idaho builders in the 5 to 9 home range were particularly inclined to project relatively high market shares, as were Oregon builders with 10 or more homes in 2013.

For the 10-year estimates, only Oregon builders estimated a market share higher than 10%, driven largely by builders in the 10+ homes group. Overall, the weighted median value estimate across all states and builder sizes was 10% in 10 years, compared to a weighted median value of 15% in 20 years. Notably, both the 10 and 20-year estimates from the open-ended questions are generally consistent with the median estimates provided by efficient home program managers (Table 3).

Figure 1 shows the distribution of responses by builders to the open-ended 20-year NSH market share question, for all states combined. While most builders believe the market share will be below 25% a small minority of builders stated that they believe that the market share for Next Step Homes will be over 50% of all new homes in 20 years. To reduce the impact of these “outlier” responses, we chose to report median values in the preceding tables as opposed to mean (average) values. As we found in our interviews with some program managers, we believe that some of these builders may have based their high estimates on expectations of rapidly increasing codes. That said, the fact that some builders gave estimated market shares over 50% suggests that some builders are particularly optimistic about the prospects for Next Step Homes, or highly efficient homes in general.

Figure 1: Builders Survey - Distribution of Estimated Market Shares of Next Step Homes - 20 Years



Computing confidence intervals using standard methods was not possible due to the complexity of the sample design for the builder survey and the weights developed to compute the results. Instead, Evergreen approximated the confidence intervals using an empirical resampling technique known as the *bias-corrected and accelerated (BCa) bootstrap method*.⁵ The bias-corrected and accelerated (BCa)

⁵ Like percentile-based methods, the BCa bootstrap is based on resampling from an empirical distribution of values and then selecting the alpha/2 and (1-alpha/2) values as the lower and upper values of the 1-alpha confidence interval, where Alpha represents the level of significance and 1-alpha represent the level of confidence. For example, a 90 percent confidence

bootstrap, by Efron (1987), adjusts for both bias and skewness in the bootstrap distribution. The BCa approach is applicable in a wide variety of analyses, in particular for those analyses where the measure of interest is bounded at one or more specific values, such as the current analysis where zero and 100 percent bound the survey responses. Tables 7 and 8 show the bootstrap confidence intervals for the 20- and 10-year market share for each state.

Table 7: Builders Survey - Confidence Intervals for Market Share of Next Step Homes – 20 Years

State	Market Share (Median)	90% Confidence Interval	
		Lower	Upper
ID (n=38)	20%	15.0%	26.1%
MT (n=36)	15%	11.9%	18.5%
OR (n=46)	20%	15.4%	24.7%
WA (n=65)	12%	8.9%	15.4%
Overall (n=185)	15%	13%	17.1%

Table 8: Builders Survey - Confidence Intervals for Market Share of Next Step Homes – 10 Years

State	Market Share (Median)	90% Confidence Interval	
		Lower	Upper
ID (n=38)	10%	7.4%	12.8%
MT (n=36)	10%	7.7%	13.0%
OR (n=46)	15%	12.4%	18.0%
WA (n=65)	10%	7.5%	13.3%
Overall (n=185)	10%	8.8%	11.4%

While the open-ended questions allowed homebuilders to state their opinion without the risk of interviewer bias (i.e., we did not in anyway guide their response; they were free to respond with any value between 0 and 100 percent), Evergreen had concerns that builder responses may tend to be unrealistically high or low.⁶

As a quality control check, Evergreen also utilized a double-bounded dichotomous choice framework, which is particularly useful for increasing the specificity of estimates for indicators that have a high degree of uncertainty, and is considered the standard approach for estimating willingness-to-pay for contingent valuation studies. Moreover, leading with questions in this format, as opposed to the open-ended estimates, can reduce “protest” responses. For example, respondents may claim that 0%

interval is associated with an alpha of 0.10. For the standard percentile-based confidence interval, the lower bound of the 90 percent confidence interval is the $0.10/2 = 5$ th percentile value; the upper bound of the 90 percent confidence interval is the $(1.0 - 0.1)/2 = 95$ th percentile value. See Efron, B., & Tibshirani, J. (1993). *An Introduction to the Bootstrap*. Boca Raton, FL: Chapman & Hall.

⁶ In fact, because the consensus market share from the experts we interviewed was only 13 percent, we were more concerned that the estimates of future market share could be unrealistically high.

market share will occur because, though they may believe there will be market penetration, they are protesting some aspect of the trend toward energy efficient homes or protesting the interview itself. Alternatively, some respondents may give an unreasonably high market share response because the individual places a high value on energy efficiency and they wish to signal this value. Following are the market share questions builders received before the open-ended questions:

Q1. Thinking about the single-family market in [state], if NEEA, BPA (if state = OR: Energy Trust), and the Northwest utilities do not provide financial incentives or technical assistance to builders, and state codes do not change significantly, do you think the market share for these homes will be greater than [random number between 10 and 20] 20 years from now?

Q2.a [If Q1= Yes] Do you think the market share for these homes will be greater than [random number from Q1 + 5 percentage points] 20 years from now?

Q2.b [If Q1= No] Do you think the market share for these homes will be greater than [random number from Q1 - 5 percentage points] 20 years from now?

Evergreen used a randomly drawn market share of between 10 and 20 percent in Q1 (for each respondent) based on the in-depth interviews conducted with the energy efficient homes program managers and experts. The median response from the seven interviews was 13% market share in 2034 (20 years in the future). Throughout the analysis, we relied on the median, rather than the mean, as the appropriate measure of central tendency. This is because the median is an ordinal measure and is therefore less sensitive (more robust) to extreme values.

This short battery of questions allowed us to either “bound” a respondent’s estimate of future market share (Q1 = Yes and Q2a = No; Q1 = No and Q2b = Yes), confirm the respondent’s belief that the market share will be “low” (Q1 = No and Q2b = No) or confirm the respondent’s belief the market share will be “high” (Q1 = Yes and Q2a = Yes). In doing so, this framework prevents the respondent from stating a value (either high or low) that expresses their feelings about the push toward higher energy efficiency in home construction. Analyzing the results of the bounded questions, Evergreen found close agreement with the open-ended questions, as shown in Table 9.

Table 9: Builders Survey - 20-Year Standard Error and 90% Confidence Intervals – Bounded Questions Format

State	Median Open-Ended	90% CI (Open-Ended)		Median Bounded
		Lower	Upper	
ID	20%	15.0%	26.1%	20.0%
MT	15%	11.9%	18.5%	16.5%
OR	20%	15.4%	24.7%	18.5%
WA	12%	8.9%	15.4%	13.5%
Total	15%	13.0%	17.1%	16.5%

Builders were also asked about the likelihood of including the specific Next Step Home measures in their homes over the next 10 years using a scale of 1 to 10, where 1 is “not at all likely” and 10 is “extremely likely.” **Table 10** displays the results for each of the measures by state, along with an average of all the Northwest states.

Table 10: Builders Survey - Likelihood of Installing Next Step Home Measures in Future Homes

Measure	State				Average (n=185)
	ID (n=38)	MT (n=36)	OR (n=46)	WA (n=65)	
94% gas furnace	8.68	8.99	8.12	7.70	8.15
U.25 windows	7.84	6.82	7.13	6.27	6.85
Ducts in conditioned spaces	6.68	8.29	6.50	6.50	6.76
0.81 EF gas water heater	6.77	5.93	7.31	5.58	6.31
High efficiency heat pump	5.64	4.02	6.59	6.49	6.05
Advanced walls	5.54	5.44	6.79	4.58	5.46
Ultra tight shell with HRV	5.76	5.29	6.53	4.65	5.44
Ductless heat pumps	3.93	2.95	5.46	4.63	4.51
Heat pump water heater	3.62	3.37	4.34	4.36	4.10
Radiant floor heating	3.72	5.08	3.88	3.63	3.90

The measures that builders said they were most likely to include in their future homes included high efficiency gas furnaces, U.25 windows, and ducts in conditioned spaces. On the other end of the spectrum, scores for ductless heat pumps, radiant floor heating, and heat pump water heaters all averaged below a 5. These low scores suggest that these measures will take a significantly longer time to be adapted by builders in the Northwest.

Finally, builders were asked to describe the main challenges for Next Step Home construction going forward. By far the most commonly reported challenge for homebuilders was the (expected) premium costs associated with these homes. Specifically, many homebuilders stated that few buyers will be able and willing to pay the higher up front cost of high efficiency homes despite the long-term energy savings the homes may yield. Other challenges that homebuilders identified included:

- Lack of consumer education about high efficiency measures;
- Difficulty integrating multiple efficiency systems;
- Expected low and stable electricity costs, which will reduce demand for energy efficiency;
- Challenges procuring U.25 windows, with added expense (unless window sizes or counts are reduced);
- Concerns about “too tight” homes with inadequate ventilation (i.e., mold and health issues); and
- Increasing manufacturer costs for mechanical systems.

Alternative Approaches

While confirming the final work scope for this study we considered utilizing a formal Delphi panel process to develop the future baseline estimates. Having utilized Delphi’s for other studies, NEEA and Evergreen elected not to pursue this option for a variety of reasons:

- The desired study schedule did not support a potentially long Delphi process with multiple rounds of analysis, reporting and discussion among recruited housing experts;

- Staff constraints limited the amount of time available to dedicate to recruiting expert participants; and
- Concern that the final number of participants would be too small to develop reliable estimates at the state level.

Acknowledgements

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