ENERGY STAR Homes Northwest Program

Market Progress Evaluation Report

PREPARED BY

ECONorthwest

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ENERGY STAR Homes Northwest Program

Fourth Market Evaluation Progress Report

A Report to the Northwest Energy Efficiency Alliance

August 31, 2007

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Table of Contents

EXECUTIVE SUMMARY

This is the fourth Market Progress Evaluation Report (MPER) of the ENERGY STAR Homes Northwest program. This report presents evaluation findings based on telephone surveys of builders and homebuyers and in-depth interviews with verifiers, state energy officers, realtors, and participating builders. In addition, the results of on-site audits of ENERGY STAR homes are presented as well as an analysis of the energy savings from the duct testing requirement.

Progress Toward Goals

The current program goal is to achieve a 14 percent market share for ENERGY STAR homes within the region's new home market by the end of 2009. Early in 2006, program staff reduced the goal from 20 percent because it took the program longer than anticipated to establish the ENERGY STAR infrastructure within the housing market. Within the program territory, there were 74,769 new single-family homes constructed in 2006, a decrease of 15 percent from the prior year. Of these, Washington makes up almost half of the total new home construction activity. New home construction for 2007 is forecasted to decrease an additional 14 percent before rebounding in 2008.

There were 2,353 certified ENERGY STAR homes built in 2006, which is 77 percent of the program goal for the year and represents a market share of about 3 percent. The shortfall was primarily in Washington, which reached only 52 percent of the goal for new homes. One possible reason for this shortfall is turnover among the Building Operator Specialist (BOS) positions within Washington.

Market Progress

Despite falling short of program goals, early indicators of market transformation in the new homes market are apparent. Since 2004 (when the last round of surveys was fielded), awareness of the ENERGY STAR label for homes has increased. Homebuyer awareness of the ENERGY STAR Homes label has increased substantially, rising from 19 percent in 2004 to 32 percent in 2007. Similarly, builder awareness of the ENERGY STAR label for homes has increased from 56 in 2004 to 69 percent in 2007.

Builders are also beginning to perceive the benefits of using the ENERGY STAR label to differentiate themselves in the market. From the builder phone survey, 60 percent of builders in 2007 indicated that product differentiation was a benefit of the ENERGY STAR label, which is a significant increase from the 27 percent stating the same thing in the 2004 builder survey. Of those builders participating in the program, almost all said that they actively promoted the fact that their homes had the ENERGY STAR label. Among recent ENERGY STAR homebuyers, almost half indicated that the builder or sales rep discussed the energy saving features of the ENERGY STAR home during their home search.

Builders are also becoming more knowledgeable about duct testing and its benefits, with half of the region's builders now aware of duct testing. In addition, builders who perform

duct testing on their homes widely perceive that confirming the HVAC installation is done correctly is a benefit of duct testing. In the 2007 survey, 61 percent of builders mentioned this as a benefit, which is significantly greater than the 26 percent observed in the 2004 survey. Additionally, almost half of the participating builders we interviewed said that they also conduct duct tests in their non-ENERGY STAR homes, which further demonstrates the value some builders place on having these tests done. A separate analysis conducted in this evaluation shows that ENERGY STAR homes have significantly less leakage than the regional average for new homes due to these tests.

Both builders and homebuyers are beginning to make the connection between the ENERGY STAR label and home value. A majority of builders we surveyed agreed with the statement that the ENERGY STAR label makes homes more marketable. Similarly, among recent homebuyers that purchased an ENERGY STAR home, two-thirds linked the ENERGY STAR certification to energy savings, which was double the percentage from the 2004 survey of homebuyers. When homebuyers were given a description of what the ENERGY STAR label represents for new homes, on average they stated that they would have paid an additional $7,173 had their home been ENERGY STAR certified. Realtors and sales reps that we interviewed also indicated that ENERGY STAR homes sell at a slight premium.

On-site audits of ENERGY STAR Homes revealed that ENERGY STAR lighting remains installed after homeowners occupy their homes. From the on-site audit data, 50 percent of the lighting sockets had ENERGY STAR lighting in the homes inspected 6 to 12 months after they were occupied. While some homeowners had replaced some CFLs with incandescents, others had replaced incandescents with CFLs. The end result is that there has been no net loss of ENERGY STAR lighting after the homeowners occupied the homes. Homeowners also indicated that they were satisfied with the ENERGY STAR lighting in their home.

Satisfaction with the ENERGY STAR Homes Program is high for both builders and homebuyers. Over two-thirds of the participating builders we surveyed indicated that they were either extremely or somewhat satisfied with the program overall. Participants were also satisfied with the ease of participation, verification, and certification processes. Similarly, the vast majority of homeowners were very satisfied with their ENERGY STAR home with 93 percent providing a satisfaction rating of 4 or higher on a 5-point scale.

While the program is showing positive signs of market transformation, there are still areas where additional work is needed. Although duct testing awareness has increased and builders do acknowledge potential benefits, builders seldom promote duct testing benefits to homebuyers. There was also no change across surveys in the number of builders mentioning ducts when asked about which home components are significant for reducing energy use in the home. Additionally, less than a third of builders agreed with the statement that customers understand the benefits of duct testing.

Finally, more program resources should be directed to marketing and assisting builders that are new to the program. Marketing support was the most common response given by builders regarding what they would change about the program, and the satisfaction ratings for co-op advertising were low relative to builder satisfaction with other program elements. Among nonparticipating builders, lack of information was the most common reason given for not participating in the program. Interview results from participating builders, verifiers, and the State Certification Organizations also indicate that more support is needed early on in the program in order for builders to fully understand the ENERGY STAR Home program requirements and processes.

1. INTRODUCTION

1.1 EVALUATION OVERVIEW

This report is the last of four Market Progress Evaluation Reports (MPERs) of the Northwest Energy Efficiency Alliance's (NEEA's) ENERGY STAR Homes Northwest program for the 2004-2006 funding period. This program is one of two major projects within NEEA's Northwest ENERGY STAR Initiative and works in close coordination with NEEA's ENERGY STAR Consumer Products program—the other project included in the Initiative.

The ENERGY STAR Homes Northwest program promotes the construction and sale of new homes built to the ENERGY STAR Homes Northwest specification, which was designed specifically for the states of Washington, Oregon, Idaho, and Montana. Homes built to this specification are at least 15 percent more energy efficient than Washington and Oregon State energy codes. These ENERGY STAR homes also include high efficiency lighting, windows, appliances, water heaters, insulation, and heating and cooling equipment. As a result, these new homes are designed to save an average of 1,000 to 1,500 kWh per year for gas-heated homes and 3,700 kWh annually for electrically heated homes.

This evaluation report presents the findings of an evaluation conducted on NEEA's ENERGY STAR Homes Northwest program for the period through December 31, 2006. It is the last in a series of four MPERs that ECONorthwest conducted for the program funding period from 2004 -2006. It includes findings from multiple interviews with the market actors and agencies involved with the program, including builders, contractors, and state energy offices. The report also includes current data on the new home market in the Northwest as well as information on progress towards program goals. In addition, this MPER includes an impact evaluation for the performance testing component of the program. A review of the cost effectiveness modeling and underlying model assumptions was also conducted. Finally, builder and homebuyer surveys were fielded, and selected results from these surveys are presented in this MPER.

Table 1 below summarizes the main components of the MPERs conducted for the ENERGY STAR Northwest Homes evaluation. Each report contains a market assessment showing current conditions in the new home market and tracking changes over time. Phone surveys of both builders and new homebuyers were included in the first MPER and are repeated in this final MPER. In-depth interviews with a smaller sample of builders and various market actors, including realtors and building contractors, were conducted for all four reports. The final two interview rounds also included several questions related to program processes. The process evaluation component also includes interviews with utilities, state energy offices, and home verifiers involved with the program. Beginning in 2005, a combination of post-occupancy phone surveys and on-site audits were used to collect information on homeowner satisfaction and retention of individual measures.

Table 1: Evaluation Report Components

Analysis Component	MPER 1 Baseline Report	MPER 2 (3Q 2005)	MPER 3 (3Q2006)	MPER 4 (2Q 2007)
Market Characterization	λ	λ	λ	λ
Market Actor Interviews	λ	λ	λ	λ
Utility Interviews	λ			λ
Builder Phone Survey	λ			λ
Builder In-Depth Interviews	λ	λ	λ	λ
Homebuyer Phone Survey	λ			λ
Process Evaluation		λ	λ	λ
Post-Occupancy Homebuyer Survey			λ	
Performance Testing Impact Analysis				λ
On-Site Post Occupancy Survey				λ
Duct Test Impact Analysis				λ
Review of Cost Effectiveness Modeling		λ		λ

1.2 PROGRAM OVERVIEW

The ENERGY STAR Homes Northwest program officially began in May 2004 with a goal of achieving a 20 percent market share for ENERGY STAR homes within the residential new construction market by the end of 2009. In 2006 the program revised its goal to reflect the longer than anticipated ramp-up time, and now hopes to achieve a 14 percent market share by the end of 2009. The program markets the benefits of building homes to ENERGY STAR standards to builders. The ENERGY STAR brand serves as a mechanism to differentiate builders and the homes they build and also provides consumers with an easy way to identify energy efficient homes. Certification, labeling and marketing efforts are designed to increase the market share of ENERGY STAR new homes while simultaneously protecting the ENERGY STAR brand.

While it has been successful in other parts of the country, the national program model for ENERGY STAR homes was not a good fit for the Northwest region. This can be attributed to a number of factors, the most significant of which include the success of robust energy codes in Oregon and Washington, past focus on (electric heat) Super Good

Cents branding for new construction, and the lack of an energy-rating infrastructure that has traditionally been used in other parts of the country.

In order to make the ENERGY STAR Homes program work in the Northwest, the EPA worked with NEEA and its stakeholders to develop a tailored specification that includes a package of prescribed conservation measures and is designed to be fuel-neutral. As the current codes in Washington and Oregon already meet the national ENERGY STAR standard, it was necessary to develop new and more stringent ENERGY STAR requirements for the region if significant efficiency gains were to be achieved in the new homes market. (The detailed prescriptive specifications for the various ENERGY STAR Home options are provided in Appendix B.)

In addition to the prescriptive measure requirements, there are several program elements that are designed to assist builders and contractors with the ENERGY STAR requirements. These program elements include:

- Infrastructure development and market actor training and education, particularly for HVAC contractors and performance testers;
- A quality assurance process, which requires that:
    - Every central HVAC system be performance tested (unless the State Certification Office (SCO) determines that only a sample of HVAC systems needs to be tested);
    - Every home be inspected by a certified verifier for compliance with ENERGY STAR Northwest program specifications (unless the SCO determines that only a sample of homes needs to be inspected); and
    - Every home be certified by a third-party contractor operating under an independent ENERGY STAR Northwest quality assurance process.
- Marketing, outreach, promotion, and consumer education focused on branding and labeling, quality and value, and other co-branding and cross-promotion opportunities. This is done through press releases, articles, and newsletters that advertise the program and provide information on the benefits of ENERGY STAR homes. The program also provides marketing materials to builders so that they can promote the fact that their homes are ENERGY STAR rated. In addition, the program has developed the program website www.northwestenergystar.com as an additional information resource for builders and potential new homebuyers.
- Coordination and incorporation of multiple program efforts by utilities and others, specifically including technical standards and financial incentives.

- Promotion and support for "plus" packages that increase energy efficiency or other attributes such as green or healthy buildings (beyond base program requirements) that will further support builder differentiation through efficiency.

Future program activities are anticipated to explore and demonstrate emerging new construction products, services and techniques. These efforts may include support for next generation products as well as comprehensive design approaches such as the Zero Energy Home. In addition, NEEA will plan and implement codes and standards activities designed to facilitate code improvements and compliance.

1.3 Market Barriers and Market Opportunities

There are a number of barriers to increasing the efficiency of energy use in new homes, including:

Lack of Awareness and Information. Builders, consumers, and other market actors are often unaware of the magnitude and potential value of energy savings that can result from improved construction practices. Similarly, there is a lack of awareness and appreciation of the non-energy benefits such as improved indoor air quality and lower maintenance costs that result from more efficient construction.

Inability to Identify Efficiency. Many builders claim to be building efficient homes, but consumers cannot always differentiate between accurate and false efficiency claims. In addition, the presence of multiple individual utility and other local programs promoting energy efficiency and green building practices may add to market confusion regarding what constitutes an energy efficient home.

Split Incentives. For new homes, builders and contractors make energy efficiency design and investment decisions but do not ultimately pay the energy bills. Many builders doubt they will be able to increase the home sales price in order to cover the initial costs of the energy efficiency improvements.

Limited Technical Skill. Many builders and subcontractors have an inadequate understanding of the nature of key efficiency losses in the home – such as through HVAC ducts or building air leakage. These are critical elements for capturing the energy efficiency potential in new homes and yet there are few contractors currently trained and certified to deliver results. Building the infrastructure necessary to support a viable contractor pool that can provide heating and cooling system commissioning and duct testing and sealing is a major challenge for this program.

Economic Benefits Not Recognized by Financial Markets. Appraisers do not value energy efficiency improvements or benefits when making their valuations. As a result, homebuyers who stay in their new home only a few years are unable to recoup the extra cost of efficiency investments through bill savings alone. Similarly, most mortgage lenders do not distinguish between efficient and

inefficient homes when deciding whether a consumer can afford a mortgage or when developing mortgage products that reflect lower risk of default from homes that are more efficient and therefore have lower energy bills.[1]

Despite the market barriers, the current new construction market offers a number of opportunities for market transformation. Market opportunities addressed by the program include:

Builder Differentiation. Given the large number of builders in the market, individual builders must differentiate themselves from their competitors. In addition, the desire to differentiate tends to fluctuate with the market – when demand for housing decreases, builders are more interested in differentiation as a means to capture business.

Consumer Demand for New Home Efficiency. Historically, consumer surveys have shown that efficiency is a key component in what is expected in a new home. However, since the home is brand new many consumers already assume that it will be energy efficient simply because it is new.

Consumer Awareness of ENERGY STAR Brand. Many consumers are already aware of the ENERGY STAR label for products but additional education may be needed to establish awareness of the label for homes. To facilitate this, the ENERGY STAR requirements for homes need to represent a significant improvement over current practice.

Interest in Sustainable Building Practices. There is a small but growing interest in sustainable or "green" construction practices among both builders and homebuyers. However, efficiency is not always part of the package of specified sustainable measures. The program will need to link efficiency to sustainability with those partners that may view efficiency or ENERGY STAR as competitors.

1.4 MARKET PROGRESS INDICATORS

Progress indicators identified at the outset of the program reflect the focus of the program on all facets of the residential new construction market and are designed to address the key market barriers and opportunities discussed above.

Short-term and long-term indicators include:

[1] This barrier primarily impacts those that have trouble qualifying for a mortgage such as some first time home buyers and low income households. The importance of this barrier is lessened somewhat in the current market that is enjoying very low interest rates but will become more of a factor as mortgage interest rates rise.

Short-term Indicators

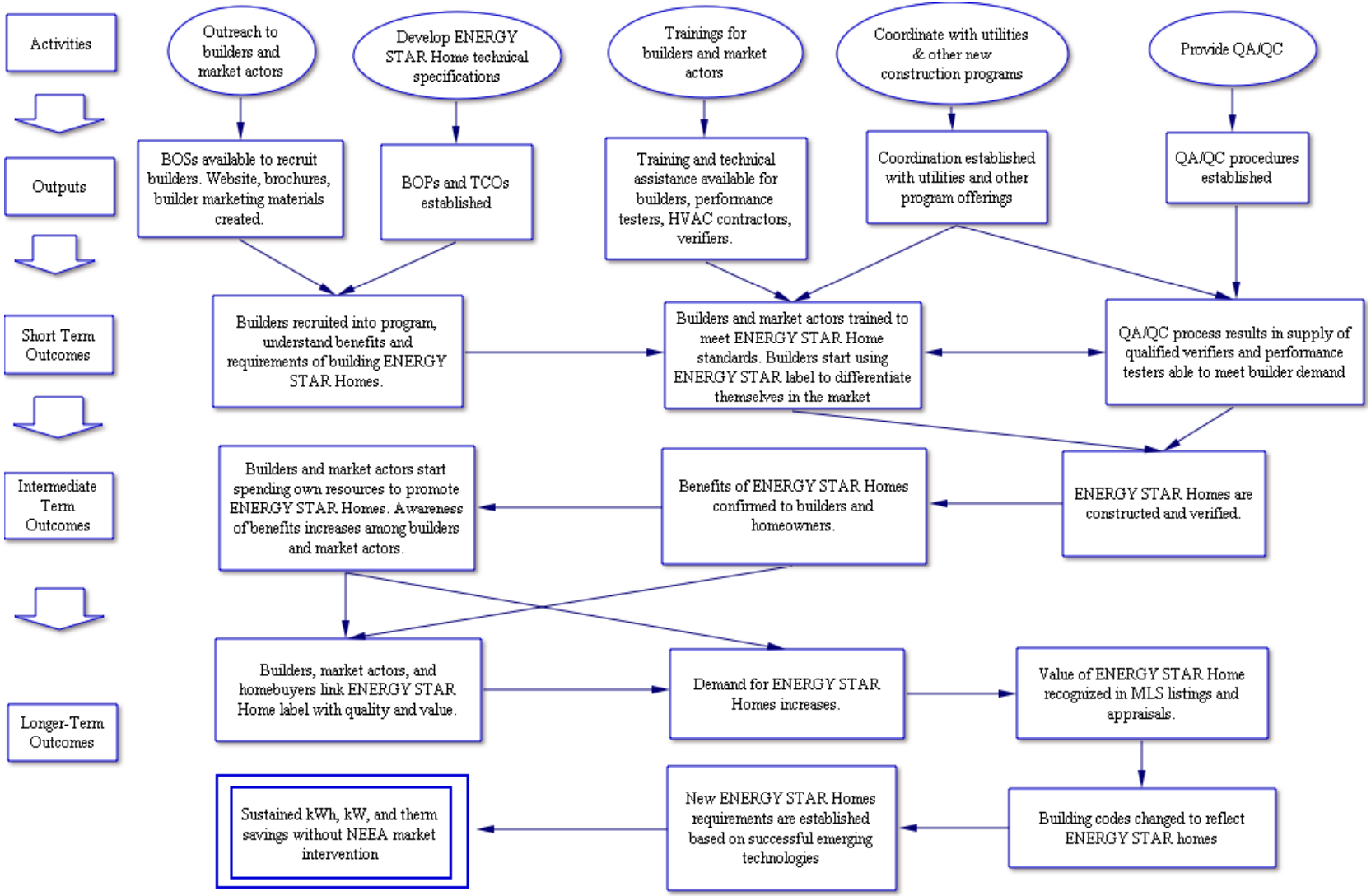
- Builders use the ENERGY STAR label to differentiate themselves in the marketplace;
- Consumers, builders, and other market actors link ENERGY STAR homes and home quality/value;
- Builders are convinced of the long-term cost savings from reductions in call-backs that should result from performance testing and quality assurance practices;
- Increased awareness by builders and subcontractors of key efficiency and quality issues;
- Other market actors and trade allies are spending their own resources marketing ENERGY STAR Homes and matching NEEA investments;
- Builders and their subcontractors have expanded knowledge and skills necessary to treat key energy efficiency and quality issues, particularly performance testing of HVAC ducts and equipment; and
- Increasing recognition of the ENERGY STAR label and understanding what it means for new homes.

Long-term Indicators

- Multiple Listing Services include whether a home is certified ENERGY STAR in their listings;
- The value of efficiency upgrades is automatically included in the appraisal process;
- Private sector market actors replace NEEA as providers of program services;
- Residential energy codes are upgraded to incorporate some or all of the current ENERGY STAR requirements; and
- A new level of efficiency for ENERGY STAR is adopted based on successful demonstration of new and emerging technologies.

The short and long term indicators reflect the various activity-outcome linkages in the program logic, which is presented in Figure 1. Measurement and tracking of these indicators in the current and future evaluations will provide an indication of the success of the overall program design.

Figure 1: ENERGY STAR Homes Northwest Logic Model



2. EVALUATION METHODOLOGY

This evaluation report focuses on the process evaluation of the ENERGY STAR Homes Northwest program. This includes in-depth interviews with all of the major entities that are involved in implementing the ENERGY STAR Homes program. In addition, current market data on new home construction and program progress towards goals is presented to provide context for the process evaluation results. The third major component of this report is a discussion of the results from the post-occupancy survey of ENERGY STAR homeowners. Table 2 shows a summary of the sample sizes for the different data analysis activities.

Table 2: Data Sample Sizes

Data Collection Activity	Sample Size
In-Depth Interviews	43
Builder Survey	200
Homebuyer Survey	300
On-Site survey	100
Duct Test Analysis	2,563

2.1 EVALUATION TASKS

Market Characterization and Progress

One of the primary tasks of the evaluation is to characterize the current new home construction market in the region. In particular, the objectives of the market characterization are to:

- Characterize the overall market for new homes in the region and the number of homebuilders so that the potential for the ENERGY STAR homes market can be assessed.

- Show current progress toward program goals, including the number of ENERGY STAR homes certified (and initiated) and the number of builders and verifiers participating in the program.

These tasks were addressed by utilizing secondary data sources such as the building industry publication *Construction Monitor* for information on new homes and the number of homebuilders in the region. Current participation data were obtained from the program tracking database maintained by PECI.

In-Depth Interviews

The market actor interviews are designed to provide an additional perspective on key ENERGY STAR home components. These interviews were conducted by phone and involved extended conversations with builders, verifiers, and performance testers that are

involved in the program.[2] We also interviewed participating builders that were officially enrolled in the program but had not yet constructed an ENERGY STAR Home. Interviews were also conducted with staff for each state's State Certification Office (SCO) and their Quality Assurance (QA) specialists. All interviews focused on program implementation issues and were designed to elicit suggestions for improving the current program.

The sample sizes for each interview group are shown in Table 3. All interviews were conducted by phone during March-June of 2006. Note that some of the people interviewed have more than one role in the program; a verifier may also be a performance tester, for example. In these cases, the respondent was given a separate set of questions addressing each role and is reflected as two separate interviews in the table below.

Table 3: In-Depth Interview Samples

Interview Group	Sample Size
Participating Builders	20
Verifiers	12
Realtors	6
SCO / QA Specialists	5
Total	**43**

Builder and Homebuyer Surveys

Much of this evaluation focused on obtaining detailed information from both builders and new homebuyers via quantitative surveys. The samples included participating and non-participating builders and homebuyers in ID, MT, OR, and WA. These surveys included collecting information on:

- Current building practices relating to the ENERGY STAR home specifications
- ENERGY STAR awareness among builders and homebuyers
- Perceptions of the ENERGY STAR label and what it signifies for homes
- Experience with the ENERGY STAR Homes Northwest program

[2] The market actors that were interviewed are defined as follows;
- Builders: A builder who is participating and active in the ENERGY STAR Homes program.
- Verifier: Someone that provides third-party verification that the requirements for an ENERGY STAR home are being met.
- Performance tester: Someone that conducts duct testing and possibly duct blaster and/or a blower door tests.

Both the builder and homebuyer survey instruments were developed by ECONorthwest and Itron and fielded by Itron. Questions in both surveys are linked to specific market progress indicators set for the ENERGY STAR Homes Northwest program. Consequently, the survey responses not only serve as measures of the current baseline, but they will be used to evaluate program progress on these key progress metrics over the life of the program.

Duct Test Impact Analysis

NEEA intends to conduct an evaluation of realized savings for ENERGY STAR new homes in 2008-2009 once a sufficient number of homes have been built to generate an adequate sample. In the nearer term, NEEA sought to validate its assumptions about duct and building tightness based on actual performance testing results to date. In order to do this, ECONorthwest performed an analysis of performance testing data from the Northwest ENERGY STAR (ES) Homes database. Specifically, we analyzed the results of 2,563 duct tests that have been conducted in Idaho, Montana, Oregon, and Washington as part of the requirements of the ENERGY STAR homes program. We then compare the results from the ENERGY STAR duct tests to the findings of a baseline study conducted by RLW Analytics for the NEEA titled "Residential New Construction Characteristics And Practices."

On-site Survey and Lighting Audit

NEEA also sought to validate the retention rate of CFLs in ENERGY STAR homes, since lighting is such a critical component of modeled energy savings. In order to verify CFL retention, ECONorthwest conducted 100 on-site audits of ENERGY STAR homes in September and October 2006.

3. MARKET CHARACTERIZATION

This section provides an overview of the residential construction market for Washington, Oregon, Idaho and Montana through 2006 using the most current data available. Builder participation, program goals, and ENERGY STAR home construction data are also presented and provide a context for the interview results presented in the following chapters.

3.1 RESIDENTIAL NEW CONSTRUCTION MARKET OVERVIEW

Table 4 shows the number of new homes built by state since 1998. Single-family home construction activity has been strong throughout the region during recent years, but experienced a decline in 2006. New housing increased by 16.5 percent in 2005 relative to 2004, but declined by 14.8 percent in 2006 relative to 2005.

Table 4: Single Family New Construction by State – Census Data

Year	Washington	Oregon	Idaho	Montana	Total	Change from Prior Year
1998	28,644	16,936	10,277	1,485	57,342	
1999	28,111	16,595	10,497	1,607	56,810	-0.9%
2000	25,471	15,619	9,681	1,565	52,336	-7.9%
2001	26,736	16,323	9,738	1,790	54,587	4.3%
2002	30,239	17,413	10,845	2,050	60,547	10.9%
2003	33,091	17,875	12,601	2,340	65,907	8.9%
2004	36,153	20,728	15,106	3,423	75,410	14.4%
2005	41,407	23,840	19,172	3,459	87,878	16.5%
2006	35,020	20,486	15,627	3,636	74,769	-14.9%
Change From 2005 to 2006	**-15.4%**	**-14.1%**	**-18.5%**	**-5.1%**		

Source: US Census, Housing Units Authorized by Building Permit Report

Table 5 shows both historical and forecast data from McGraw-Hill for new single family construction. The shaded portion of the table represents forecasted data. According to the data, all four states will see a decrease in single family construction in 2007, with an overall 14 percent decline in new home construction compared to 2006. New single family construction is then forecasted to increase from 2008 until 2010. It should be noted that although the McGraw-Hill data shows the same general trends as the US Census data, the historical totals average 3.7 percent less than the US Census data for 2004 through 2006.

Table 5: Single Family New Construction Forecast By State - McGraw Hill Data

Year	Washington	Oregon	Idaho	Montana	Total	Change From Prior Year
2002	29,463	16,606	10,905	1,939	58,913	
2003	31,965	17,373	12,855	2,163	64,356	9%
2004	34,345	19,920	14,855	3,005	72,125	12%
2005	40,312	22,362	18,597	3,290	84,561	17%
2006	34,913	18,286	14,831	2,876	70,906	-16%
2007	30,449	16,265	12,288	2,266	61,268	-14%
2008	31,619	17,197	13,073	2,410	64,298	5%
2009	35,094	18,959	14,908	2,748	71,709	12%
2010	35,920	19,187	15,086	2,780	72,972	2%
2011	34,338	18,151	13,773	2,538	68,799	-6%

Source: McGraw-Hill Construction Data. (Shading represents forecast data)

Table 6 shows the number of builders in regions defined by the Construction Monitor, which provides information on construction activity based on building permits. The data do not cover all of the NEEA program territory but do provide key information about building permits that is not obtainable from other sources. According to these data, the Inland Empire territory has seen the largest increase in the number of builders over the last two years (31 percent) while Western Montana has seen the largest decrease (10 percent). The increase in the number of builders in the Inland Empire is somewhat surprising considering that Washington and Idaho both experienced a dip in single-family construction in 2006, though both states experienced relatively steady growth in single-family construction in previous years. This suggests that while construction has declined overall in the two states, the areas that comprise the Inland Empire (Eastern Washington and Northern Idaho) are still experiencing significant residential building activity. Montana's decrease in the number of builders is not surprising since growth has remained flat for the last two years (see Table 4). Oregon also experienced a dip in single-family new construction during 2006 while Construction Monitor data shows a 1 percent decease in the number of builders issued permits in the Portland / Vancouver / Salem area.

Table 6: Number of Builders Issued Permits by Region (2006)

Area Name	2005	2006	Percent Change
Inland Empire (Eastern WA, Northern ID)	546	713	31%
Portland / Vancouver / Salem	1,655	1,645	-1%
Puget Sound	1,931	1,946	1%
Southern Idaho	1,860	1,771	-5%
Western Montana	1,425	1,289	-10%
Total	**7,417**	**7,364**	**0.7%**

Source: *Construction Monitor.*

Table 7 shows the distribution of builders based on home volume throughout the region. The vast majority of builders (79 percent) are small builders constructing four or fewer homes a year. In contrast, there are just 49 large builders (constructing 100 homes or more) in the program area, which comprise less than 1 percent of the overall builder population.

Table 7: Builders by Region and Volume (2006)

Region	Number of Units Built Annually					
	1-4	5-9	10-24	25-99	> 100	Total
Inland Empire	611	60	23	16	3	713
Portland-Vancouver	1,295	181	107	48	14	1,645
Puget Sound	1,487	219	139	77	24	1,946
Southern Idaho	1,411	190	115	47	8	1,771
Western Montana	1,017	185	64	23	-	1,289
Total	**5,821**	**835**	**448**	**211**	**49**	**7,364**
Percentage of Grand Total	**79%**	**11%**	**6%**	**3%**	**<1%**	

Source: *Construction Monitor.*

By comparing Table 7 and Table 8, it can be seen that while large builders that construct over 100 homes per year comprise less than 1 percent of the total number of builders, they are responsible for 29 percent of the total homes built. By comparison, builders that build less than 5 homes per year comprise 79 percent of the total number of builders yet account for only 22 percent of the total homes built.

Table 8: Units By Region and Builder Volume (2006)

Region	Number of Units Built Annually					
	1-4	5-9	10-24	25-99	> 100	Total
Inland Empire	928	388	351	856	489	3,012
Portland-Vancouver	2,117	1,178	1,634	2,153	3,338	10,420
Puget Sound	2,408	1,404	2,065	3,338	5,704	14,919
Southern Idaho	2,346	1,250	1,685	2,167	3,097	10,545
Western Montana	1,740	1,199	846	911	-	4,696
Total	**9,539**	**5,419**	**6,581**	**9,425**	**12,628**	**43,592**
Percent of Grand Total	**22%**	**12%**	**15%**	**22%**	**29%**	**100%**

Source: Construction Monitor.

3.2 PROGRESS ASSESSMENT

Below we discuss the current progress towards program goals, including the number of certified and initiated homes and the number of participating builders, performance testers, and verifiers.

Table 9 shows the number of new builders who have contractually agreed to participate in the ENERGY STAR Homes Northwest program through 2006 and also the cumulative number of participating builders since program inception. Results are shown by state and builder volume. Builder recruitment was active during 2006, with 66 percent of the total cumulative participating builders in all four states combined joining the program during 2006.

Table 9: Participating Builders – New and Cumulative

	2006 Participating Builders		Cumulative Total of Participating Builders		
State	Small-Volume Builders (<100 homes/year)	Large-Volume Builders (100 + homes/year)	Small-Volume Builders (<100 homes/year	Large-Volume Builders (100 + homes/year)	2006 Participating Builders as a Percentage of Cumulative Total
WA	95	6	121	15	74%
OR	98	1	138	7	68%
ID	83	1	139	2	60%
MT	12	0	25	0	48%
Total	**288**	**8**	**423**	**24**	**66%**

Source: *ENERGY STAR Data Base.* Data as of March 14, 2007.

Table 10 shows the distribution of participating ENERGY STAR builders based on how many ENERGY STAR homes they had completed through 2006. Overall, 45 percent of the builders in the four states combined have yet to complete an ENERGY STAR home. This is in large part due to the large number of builders who joined the program in 2006, and who have not had sufficient time to get fully integrated in the program and complete a project. Of the 203 builders who have not yet completed an ENERGY STAR home, 94 percent joined the program in 2006. Builders that have completed an ENERGY STAR home have mostly built between 1 and 4 ENERGY STAR homes.

Table 10: Cumulative Number Participating Builders by State and Number of Completed ENERGY STAR Homes

State	Number of Total ENERGY STAR Units Completed						
	0	1 to 4	5 to 9	10 to 24	25 to 99	> 100	Total Number of Builders
ID	55	62	12	7	3	2	141
MT	9	12	4	0	0	0	25
OR	68	57	8	4	7	1	145
WA	71	43	5	9	5	3	136
Total	**203**	**174**	**29**	**20**	**15**	**6**	**447**

Source: *ENERGY STAR Data Base.* Data as of March 14, 2007.

Table 11 shows the cumulative number of completed ENERGY STAR homes by builder volume group. This table highlights the importance of getting large builders (builders who build over 100 homes per year) to participate. Although only around 5 percent of the total participating builders are large builders (see Table 9), the six builders who have completed over 100 ENERGY STAR homes account for 54 percent of the total completed ENERGY STAR homes.

Table 11: Cumulative Number of ENERGY STAR Homes Completed by Builder Volume

Number of ENERGY STAR Homes Completed	Cumulative Completed Homes	Percent of Total
1 to 4	292	8%
5 to 9	201	6%
10 to 24	304	9%
25 to 99	826	23%
>100	1,913	54%
Total	**3,536**	**100%**

Source: *ENERGY STAR Data Base.* Data as of March 14, 2007.

Table 12 shows the construction activity achieved through the ENERGY STAR Homes program for 2006. "Certified" homes refer to those that have been constructed and certified as ENERGY STAR-compliant by the program. "Initiated" homes are those that have started construction but are not yet completed, and have their status in the ENERGY STAR Northwest Homes Database listed as "pending." [3] Based on the 2,353 certified homes completed in 2006, the program was able to achieve a 3 percent market share.

Although the program goal is listed as a number in the table, it is actually defined as 4.1 percent of the total market in 2006, and Washington accounts for about half of the overall homes goal. As shown in the far right column of Table 12, the program achieved only 77 percent of its overall goal for certified homes in 2006. Much of this shortfall is in Washington, where only 52 percent of the goal was achieved. It should be noted that if initiated homes are included with certified homes, then the combined total would exceed the overall goal for 2006.

Table 12: 2006 ENERGY STAR Home Construction Status

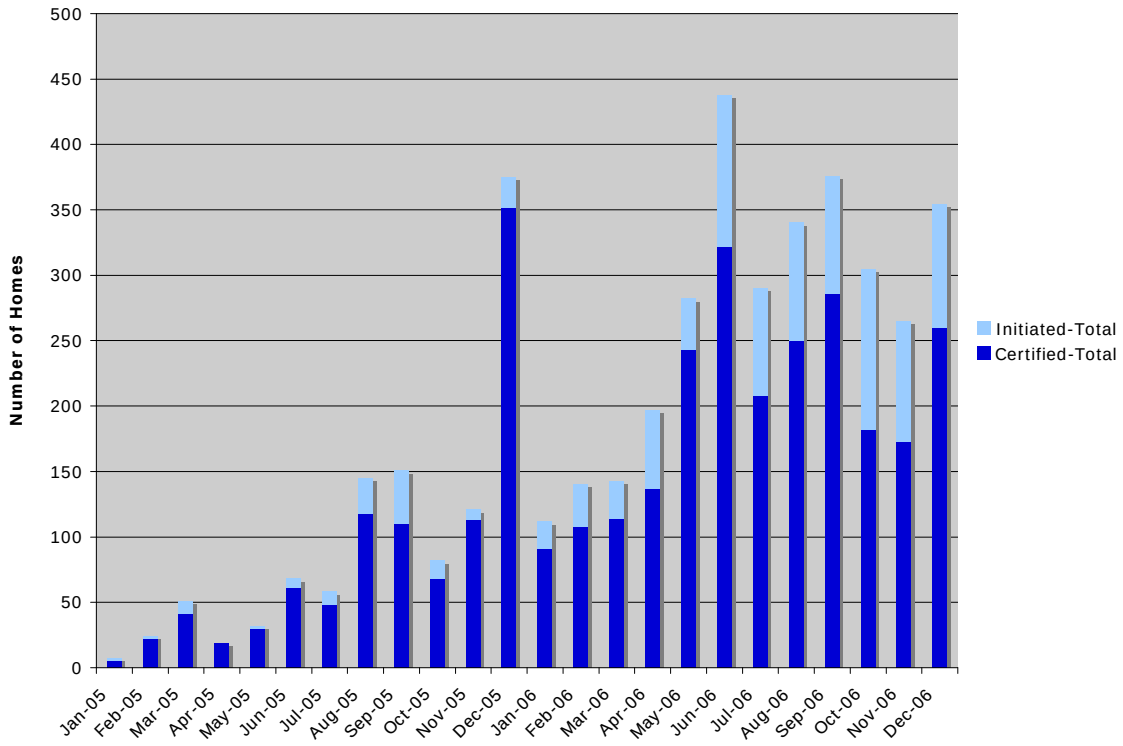
State	Certified	Initiated	Total Certified and Initiated (Forecast Completions)	NEEA 2006 Goal (Certified Only)	2006 New Homes	Total Certified Homes as Share of 2006 Goal
WA	750	314	1,064	1,436	35,020	52%
OR	1,110	315	1,425	840	20,486	132%
ID	463	220	683	641	15,627	72%
MT	30	19	49	149	3,636	20%
Total	**2,353**	**868**	**3,221**	**3,066**	**74,769**	**77%**

Source: Certified and Initiated homes from *Fluid Market Strategies.* Data as of June 21, 2007.

Figure 2 shows the monthly totals of homes that have been initiated and certified from January 2005 through December 2006. It is clear that there has been a steady increase in the number of completed ENERGY STAR homes over the period shown. On average, the monthly total of initiated and certified homes in 2006 is over 400 percent higher than the total from the same month in 2005. The total number of initiated and certified homes during 2006 has increased by over 180 percent since 2005. Monthly program activity by state is provided in Appendix D.

[3] Homes outside of the Energy Trust of Oregon territory are not required to be registered in the database before completion, though many are. As a result, the actual number of initiated homes may be larger than what is reported in Table 12.

Figure 2. Certified and Initiated Homes (Monthly Totals)



Source: *Fluid Market Strategies.* Data as of June 21, 2007.

Table 13 shows the number of verifiers and performance testers participating in the program during 2006. Although the ENERGY STAR program does not have a goal for the number of participating verifiers and performance testers, an increased number of market actors indicates that more businesses are viewing the program as a business opportunity. Of the four states, Oregon has seen the largest growth of participating verifiers during 2006, with Washington following close behind. Washington has seen the largest increase in performance testers during the same year. The cumulative totals since May 2004 for both verifiers and performance testers are also shown in Table 13. The total number of verifiers and performance testers that joined the program in 2006 represent 28 percent and 52 percent of the cumulative totals, respectively.

Table 13: 2006 Participating Verifiers and Performance Testers

	Verifiers		Performance Testers	
State	**New 2006**	**Cumulative**	**New 2006**	**Cumulative**
WA	17	53	135	181
OR	19	57	64	161
ID	0	13	1	35
MT	4	20	6	20
Total	**40**	**143**	**206**	**397**

Source: *ENERGY STAR Data Base.* Data as of March 14, 2007.

4. FINDINGS

4.1 BUILDER PHONE SURVEY

Methodology and Sample Composition

A total of 200 builder phone surveys were completed during March of 2007. The phone survey sample was drawn from the Construction Monitor list of builders. Sample quotas were set by state, based on new home construction, and by builder size, to ensure that the sample represented the population of builders in each of the states. By design, we emphasized large builders in the survey sample. As shown in Table 11, large builders are responsible for 54 percent of the completed ENERGY STAR homes. Since these builders are important for the long-term success of the program, they were targeted for this survey to obtain their opinions on important program issues.

Although large volume builders are over-represented in the sample, the survey results are weighted to the actual builder population, which helps reduce any potential bias these respondents may have and prevents them from having too much influence over the sample, as these builders actually comprise a very small portion of the overall builder population. In most cases we have reported the builder survey results using the builder-weighting scheme. Some results are reported unweighted, however, such as questions relating to program satisfaction among participating builders only.

Selected builder survey results are presented below. In addition to the current builder survey results, results from the previous builder survey conducted for the 2004 ENERGY STAR MPER 1 report are presented for certain questions in order to assess if and how builder perceptions have changed over the past 3 years. The wording for these questions was left unchanged between the 2004 survey and the 2007 survey so that the results can be directly compared. For tables where differences can be directly compared, results that are statistically different between the 2007 and 2004 surveys are highlighted in the tables.

The final builder phone survey sample by construction volume is shown in Table 14.

Table 14: Builder Survey Sample by Construction Volume

State	Number of Units Built (2006)					
	1-4	5-9	10-24	25-99	> 100	Total
WA	33	12	6	21	8	80
OR	17	6	4	3	4	34
ID	25	11	4	10	3	53
MT	19	10	1	3	0	33
Total	**94**	**39**	**15**	**37**	**15**	**200**

Table 15 shows the distribution of the 2007 and 2004 survey samples based on several builder characteristics. For the recent survey, participants in the ENERGY STAR Homes program comprised 14 percent of the sample. It should be noted that while the percentage of participants in the two surveys is similar, in the 2004 survey program participants were purposely over-represented (they were not in the 2007 survey). Nevertheless, the 14 percent of builders in the sample that are participating in the ENERGY STAR homes program is considerably higher than the 6 percent of builders in the total population that participate in the program. The inclusion of these builders could therefore bias upward the reported experience with the various energy efficiency components (ENERGY STAR lighting, duct testing, etc.) relative to the overall builder population.

A large share of the builders we talked to (43 percent) stated that at least 75 percent of the homes they construct are "spec" homes that followed a pre-set design, which is similar to the earlier survey. The majority of the builders (81 percent) build homes with an average price of over $250,000. This differs considerably from the mix of home prices from the 2004 survey, in which only 13 percent of the sample built homes with an average price of over $250,000. This difference is at least partly due to the rapid growth that the housing market has experienced in the northwest. According the US census data, both the average and median prices of homes in the western United States have increased 19 percent from 2004 to 2006. Although the data does not represent northwest states specifically, it is an indicator of the kind of growth the area has experienced.

Table 15: Builder Survey Sample Characteristics

	ES Program Participants		Percent Production Homes (Non-Custom Homes)			Average Home Price				
Survey Year	Yes	No	0-24%	25-74%	75%+	< $125K	$125-149K	$150-199K	$200-250K	$250K+
2007	14%	86%	27%	31%	43%	<1%	1%	4%	13%	81%
2004	12%	88%	29%	27%	44%	27%	15%	25%	21%	13%

Duct Testing and Sealing

As shown in Table 16, 61 percent of the respondents stated that they were aware of duct testing. This result is essentially unchanged from the 2004 survey.

Table 16: Awareness of Duct Testing

	2007 (N=200)	2004 (N=120)
Familiarity	Weighted to Builder Population	Weighted to Builder Population
Yes	61%	59%
No	39%	41%
Total	**100%**	**100%**

Q34. Are you familiar with duct tightness testing and duct sealing for new homes?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

Table 17 shows the percentage of respondents that have at least some duct testing performed on their homes. Of the respondents from the 2007 survey, 18 percent stated that they do have duct tests performed on at least some of their homes, and this is statistically unchanged from the 2004 survey.

Table 17: Duct Testing Performed

	2007 (N=200)	2004 (N=120)
Response	**Weighted to Builder Population**	**Weighted to Builder Population**
Yes	9%	17%
Sometimes	9%	7%
No	43%	33%
Don't know	0%	2%
Not aware of duct testing	39%	41%
Total	**100%**	**100%**

Q35. Do you have duct tests performed on the homes you build?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

The reasons builders gave for not having duct tests done are shown in Table 18. The two most common responses were that duct testing is too expensive (30 percent) and that duct testing is not required (23 percent). These were also the two most common responses from the 2004 survey.

Table 18: Reasons For Not Having Ducts Tested

	2007 (N=88)	2004 (N=45)
Reasons	**Weighted to Builder Population**	**Weighted to Builder Population**
Too expensive	30%	29%
Not required	23%	31%
HVAC / Contractor decision	12%	0%
Customers don't consider valuable	10%	1%
Not worth hassle	9%	1%
Time consuming	6%	6%
Don't know who to call	0%	0%
Delays in scheduling testers	0%	0%
No problems	0%	6%
Other	7%	23%
Don't know	6%	4%

Q40. (Of those aware of duct testing) Why don't you have the ducts tested in the homes you build?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

For those respondents that stated they do have duct testing performed on their homes, the average percentage of the non-ENERGY STAR homes that have duct tests is shown in Table 19. When weighted to the builder population, the average percentage that is also testing their non-ENERGY STAR homes is 58 percent.

Table 19: Percentage of Non-ENERGY STAR Homes Duct Tested

	2007 (N=31)
	Weighted to Builder Population
Average percentage tested	58%

Q36. What percentage of your non-ENERGY STAR homes are duct tested?

Builder perceptions about the benefits of duct testing are shown in Table 20. The most common benefit cited by respondents was that duct testing provides verification that the HVAC is installed correctly. Although this was also the most common response from the 2004 survey, a significantly larger percentage of respondents cited this as a benefit in the 2007 survey (61 percent compared to 26 percent). Other common responses include verification that ducts don't leak (36 percent) and reduced callbacks (24 percent). Though a smaller percentage of builders in 2007 indicated that there are no builder benefits from

duct testing (21 percent compared to 28 percent), the difference between the two surveys is not statistically significant.

Table 20: Builder Benefits From Duct Testing

	2007 (N=44)	2004 (N=26)
Benefits	**Weighted to Builder Population**	**Weighted to Builder Population**
Verification HVAC correct	61%	26%
Verification that ducts don't leak	36%	20%
Reduced callbacks	24%	12%
No benefit	21%	28%
Catch problems before customer (liability, warranty)	14%	25%
Smaller furnace size	0%	1%
Other	0%	19%
Don't know	11%	0%

Q39. (For those who have had ducts tested) What do you view as the benefits to the builder, if any, of duct testing and sealing?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

In addition, builders were asked what problems are associated with duct testing. As shown in Table 21, the majority of respondents (87 percent) stated that there are no problems with duct testing. This represents a significant change from the 2004 survey where 52 percent of the respondents stated that there were no problems with duct testing. In addition, while 11 percent of the respondents in 2004 stated that the price of duct testing was an issue, none of the respondents in the 2007 survey stated that this is an issue.

Table 21: Problems with Duct Testing

	2007 (N=44)	2004 (N=26)
Problems	**Weighted to Builder Population**	**Weighted to Builder Population**
No problems	87%	52%
Time consuming	7%	10%
Lack of competence w/testers	5%	4%
Tests inaccurate, do not reflect true equipment performance	1%	0%
Too expensive	0%	11%
Delays in scheduling testers	0%	4%
Other	0%	11%

Q38. (For those who have had ducts tested) What are the problems, if any, with duct testing?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

As shown in Table 22, 42 percent of the respondents thought that duct testing would become standard practice.

Table 22: Duct Testing To Be Standard Practice

	2007 (N=132)
Response	**Weighted to Builder Population**
Yes	42%
No	39%
Don't know	19%
Total	**100%**

Q41. Do you expect duct testing to become standard practice?

Builder Attitudes and Perceptions

Table 23 shows builders' perceptions about what components of a home are most important for reducing energy use. Insulation for walls and the roof were mentioned by the most builders (90 and 87 percent, respectively), followed by the furnace (64 percent) and windows (57 percent). Other components, such as appliances, water heaters, and construction tightness were also mentioned, but not by the majority of builders. It should be noted that ducts were mentioned by only 2 percent of the respondents. The most commonly mentioned components in the 2007 survey were similar to those in the 2004 survey. In both surveys, wall and roof insulation were the most commonly mentioned components for reducing energy consumption in homes. One statistically significant difference is the higher percentage (64 percent compared to 38 percent) of builders that

mentioned the furnace in the 2007 survey. Also, a significantly higher percentage of respondents in the 2007 survey mentioned appliances, the water heater and construction tightness as important energy saving components. Doors and floor insulation also had a statistically significant increase, though they still were mentioned by only a small percentage of the builders.

Table 23: Most Important Components for Reducing Energy Consumption

	2007 (N=200)	2004 (N=119)
Component	**Weighted to Builder Population**	**Weighted to Builder Population**
Insulation wall	90%	78%
Insulation roof	87%	78%
Furnace	64%	38%
Windows	57%	66%
Appliances	26%	8%
Water heater	22%	3%
Construction tightness	23%	13%
AC/HVAC	22%	16%
Lighting	11%	5%
Doors	11%	0%
Whole house design	10%	4%
Floor insulation	4%	0%
Ducts	2%	3%
Using more gas or electric	1%	4%
Other	5%	13%

Q8. What components of the home do you consider most important for reducing home energy consumption? (Unaided responses with multiple responses allowed)

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

As shown in Table 24, there has been an increase in builder awareness of the ENERGY STAR label since the 2004 survey. In the 2007 survey, 69 percent of the respondents, representing 80 percent of the homes, stated that they were aware of the ENERGY STAR label for homes. This represents a 13 percent increase from 2004. Nevertheless, the fact that approximately 30 percent of the builders are not aware of the ENERGY STAR label indicates that there is still a significant number of builders who have had no contact with the ENERGY STAR homes program.

Table 24: Awareness of ENERGY STAR Label For New Homes

	2007 (N=200)	2004 (N=120)
Aware	**Weighted to Builder Population**	**Weighted to Builder Population**
Yes	69%	56%
No	28%	44%
Don't know	3%	0%
Total	**100%**	**100%**

Q9. Have you ever heard of the ENERGY STAR label for new homes?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 25 shows awareness of the ENERGY STAR label by construction volume. As shown in the table, larger builders tend to be more aware of the ENERGY STAR label than smaller builders. Specifically, 79 percent of the builders who build 25 to 99 homes annually are aware of the label and 93 percent of the builders who build over 100 homes annually are aware of the label. By comparison, 63 percent of the builders who build 1 to 4 homes annually are aware of the ENERGY STAR label for new homes.

Table 25: Awareness of ENERGY STAR Label For New Homes by Construction Volume

	Number of Units Built (2006)					
Aware	**1-4 (N = 94)**	**5-9 (N = 39)**	**10-24 (N = 15)**	**25-99 (N = 37)**	**> 100 (N = 15)**	**Total (N = 200)**
Yes	63%	72%	93%	79%	93%	69%
No	33%	28%	7%	16%	7%	28%
Don't Know	4%	0%	0%	5%	0%	3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Q9. Have you ever heard of the ENERGY STAR label for new homes?

The percentages of builders aware of the ENERGY STAR label are shown again in Table 26, but here they are shown by state. Builders in Idaho and Montana were most aware of the label, with 87 percent and 80 percent indicating awareness, respectively. Builders in Oregon were the least aware, with 47 percent of the respondents indicating that they had heard of the ENERGY STAR label. The Oregon result is surprising given the presence of the ENERGY STAR Homes program in that state. However, many of the Oregon respondents are smaller builders (50 percent of respondents build only 1-4 homes per year), which is a group that received less attention from the program than larger builders. Additionally, the ENERGY STAR label is only one component of the Oregon-based

Earth Advantage Program, and Oregon builders may be more familiar with that label than ENERGY STAR even though Earth Advantage homes are also ENERGY STAR homes.

Table 26: Awareness of the ENERGY STAR Label by State

Aware	ID (N=53)	MT (N=33)	OR (N=34)	WA (N=80)	Total – 2007 (N=200)
Yes	87%	80%	47%	61%	69%
No	11%	20%	46%	37%	28%
Don't know	2%	0%	7%	2%	3%
Total	**100%**	**100%**	**100%**	**100%**	**100%**

Q9. Have you ever heard of the ENERGY STAR label for new homes? (Weighted to builder population)

As shown in Table 27, builders believe that one of the primary benefits to them of building ENERGY STAR homes is marketing and product differentiation (60 percent of respondents). When compared to the 2004 responses, this represents a significant change of builder perception, and indicates that builders are increasingly viewing the ENERGY STAR label as having market value. In addition, whereas 42 percent of the respondents in the 2004 survey did not know of any benefits associated with the ENERGY STAR label, in 2007 only 11 percent did not know of any benefits.

Table 27: Benefits From ENERGY STAR Homes To Builder

	2007 (N=145)	2004 (N=74)
Benefits	**Weighted to Builder Population**	**Weighted to Builder Population**
Marketing/Product differentiation	60%	27%
Rebate from utility	12%	4%
Higher quality	5%	16%
Sells faster	3%	2%
Promotion assistance	1%	4%
Higher price	1%	0%
Energy efficiency	0%	13%
Don't know	11%	42%
Other	17%	4%

Q10. To the best of your knowledge, what do you believe are the primary benefits to the builder, if any, of building ENERGY STAR Homes?
Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 28 shows the percentage of builders that agree or disagree with a series of attitudinal statements about ENERGY STAR homes. Of the statements, builders most strongly agreed that the ENERGY STAR label makes homes more marketable, with 70

percent of the respondents either strongly or somewhat agreeing with this statement. In addition, respondents tended to agree with the statements that ENERGY STAR homes sell for a higher price and enjoy a competitive market advantage compared with standard homes. These results are consistent with the response that builders gave indicating that the primary benefit of the ENERGY STAR label is market differentiation (see Table 27).

Builders were mixed about whether ENERGY STAR homes tend to be of higher quality compared to standard homes, with 46 percent either strongly or somewhat agreeing and 42 percent somewhat or strongly disagreeing with this statement. Builders tended to disagree with the statement that ENERGY STAR certified homes sell faster than standard homes. In addition, builders tended to disagree with the statement that homes built to code are efficient enough. These results indicate that builders generally do see value in the ENERGY STAR label, though they don't necessarily view it as something that will help them sell their homes quicker.

Although there were differences between the responses from 2007 compared to 2004, none of the differences were statistically significant.

Table 28: Attitudes about ENERGY STAR Label in the Marketplace

Statements	Strongly Agree (1)	Somewhat Agree (2)	Neither (3)	Somewhat Disagree (4)	Strongly Disagree (5)	Don't know	Mean – 2007	Mean – 2004
The ENERGY STAR label makes homes more marketable to home buyers	22%	48%	11%	14%	5%	1%	2.3	2.5
ENERGY STAR certified homes sell for a higher price than non-ENERGY STAR homes	23%	33%	7%	15%	13%	7%	2.6	3
Builders of ENERGY STAR homes enjoy a competitive advantage in the market	11%	40%	13%	21%	10%	6%	2.8	2.7
ENERGY STAR certified homes tend to be higher quality overall	17%	29%	8%	24%	18%	3%	3	2.7
ENERGY STAR certified homes sell faster than non-ENERGY STAR homes	6%	28%	17%	26%	15%	9%	3.2	3.1
Homes built to code are energy efficient enough	17%	27%	6%	29%	22%	0%	3.1	3.1

Q11. Please tell me how much you agree or disagree with each of the following statements.
(Sample Size: 2007=144, 2004=75, weighted to builder population)

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 29 provides a comparison between the percentage of builders who were aware of the ENERGY STAR label and those that actually participate in the program. As shown in

the table, although 69 percent of the respondents stated that they were aware of the ENERGY STAR label for homes, only 10 percent actually participate in the program.

Table 29: Participation With ENERGY STAR Homes Program

	Aware of ENERGY STAR Label (N=200)	Participate in ENERGY STAR (N=200)
Aware	**Weighted to Builder Population**	**Weighted to Builder Population**
Yes	69%	10%
No	28%	90%
Don't know	3%	0%
Total	**100%**	**100%**

Q9, Q12. Have you ever heard of the ENERGY STAR label for new homes? Are you currently participating in the ENERGY STAR homes program?

Table 30 shows the percentage of builders who participate with the ENERGY STAR Homes program by construction volume. Similar to builder awareness of the ENERGY STAR Homes label, the trend is that larger builders have a higher participation rate.

Table 30: Participation with the ENERGY STAR Home Program by Construction Volume

Participate	Number of Units Built (2006)					
	1-4 (N=94)	5-9 (N=39)	10-24 (N=15)	25-99 (N=37)	> 100 (N=15)	Total (N=200)
Yes	8%	10%	11%	27%	33%	10%
No	92%	90%	89%	73%	67%	90%
Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Those builders that do not participate in the ENERGY STAR homes program, but are aware of the label, were asked why they do not participate. As shown in Table 31, the most common reason for not participating was that they did not have the information needed to sell them on the program (31 percent). Other common reasons for not participating include added price to the home (26 percent), no need for the program (18 percent), and too much hassle to participate (16 percent). A major difference between the 2007 survey and the 2004 survey is that in 2004, 54 percent did not participate in the program because they had not heard about it, whereas only 7 percent of the respondents in the 2007 survey stated that this was why they did not participate. This indicates that while the program has been successful at building awareness of ENERGY STAR label

among builders, it also needs to focus on providing targeted information to builders in order to make the business case for the program.

Table 31: Reasons For Not Participating in The ENERGY STAR Homes Program

	2007 (N=118)	2004 (N=63)
Reason	**Weighted to Builder Population**	**Weighted to Builder Population**
Not enough information/Not sold on program	31%	0%
Adds to home price	26%	10%
No need for program	18%	0%
Too much hassle	16%	8%
Never contacted by program	11%	0%
Not cost effective	9%	0%
Customers don't want it	8%	7%
Already build to ENERGY STAR standard, don't need label	9%	2%
Don't know	8%	3%
Hadn't heard about it	7%	54%
Plan to begin building ENERGY STAR homes	3%	4%
Don't want to have performance tests	2%	1%
Other	5%	18%

Q22. Why don't you participate in the ENERGY STAR homes program for the homes you build?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

When asked what it would take to get them to participate, respondents gave answers consistent with their responses for why they do not currently participate. As shown in Table 32, the majority of the respondents stated that they need more information about the ENERGY STAR homes program before they would participate (56 percent). In addition, 38 percent of the respondents stated that the program would need to be cost effective for them to participate. These were also the two most common responses from the 2004 survey.

Table 32: Requirements for Offering ENERGY STAR Option

	2007 (N=116)	2004 (N=62)
Requirement	**Weighted to Builder Population**	**Weighted to Builder Population**
More information	56%	53%
Cost effectiveness	38%	21%
Need ENERGY STAR reps to make contact about the program	16%	0%
Customer demand	9%	13%
Other	6%	12%
No need for program	5%	0%
Needs to be hassle free	4%	0%
Don't know	3%	1%
Plan to start building ENERGY STAR homes	2%	0%

Q23. What would it take for you to begin offering ENERGY STAR homes as an option in the homes you build?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

ENERGY STAR Participant Attitudes

A series of questions was asked to builders participating in the ENERGY STAR Homes program. Since participating builders were not targeted specifically by this survey, the sub-sample of participating builders was quite small. Consequently, the error bounds around these question responses tended to be large and not statistically different than responses from the 2004 survey.

Builders that do participate in the ENERGY STAR homes program were asked if they promote the fact that the homes they build are ENERGY STAR certified. As shown in Table 33, 79 percent of the respondents stated that they do promote the fact that their homes are ENERGY STAR. Although fewer respondents in the 2007 survey indicated that they do promote their ENERGY STAR homes compared to the 2004 survey, the difference is not statistically significant.

Table 33: Promotion of ENERGY STAR Homes

	2007 (N=28)	2004 (N=14)
Response	**Unweighted**	**Unweighted**
Yes	79%	97%
No	18%	3%
Don't know	3%	0%
Total	**100%**	**100%**

Q43. Do you actively promote the fact that your homes are ENERGY STAR?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

Table 34 shows which ENERGY STAR home benefits are promoted by builders to homebuyers. Just as in the 2004 survey, energy savings was promoted by most builders (86 percent). The second most common benefit promoted was improved air quality (27 percent). This represents a shift from the 2004 results, in which no builders stated that this was a benefit that they promoted.

Table 34: ENERGY STAR Home Benefits Promoted

	2007 (N=22)	2004 (N=9)
Benefits	**Unweighted**	**Unweighted**
Energy Savings	86%	89%
Better air quality	27%	0%
Comfort	18%	44%
Resale value	14%	22%
Overall construction	14%	0%
Don't promote any particular feature	14%	0%
Environmental impact	5%	0%
Quality / Whole house design	0%	22%
Quiet	0%	11%
Other	5%	11%

Q44. What specific benefits, if any, do promote about your ENERGY STAR homes?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

Of the builders who promote the fact that their homes are ENERGY STAR, less than half receive any financial assistance for their promotions, as shown in Table 35. For those that have received some outside resources to help promote ENERGY STAR homes, utilities or other agencies have been the most common source of support.

Table 35: Outside Resources to Promote ENERGY STAR Homes

	2007 (N=22)	2004 (N=9)
Response	**Unweighted**	**Unweighted**
No one	55%	78%
Share promotional expenses with utility or other agency	36%	0%
Receive coop marketing funds from ENERGY STAR Home program	14%	11%
Other	5%	11%

Q46. (Of those who promoted ENERGY STAR Homes) From whom, if anyone, do you receive any financial assistance for these promotions?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 36 shows the percent of respondents that agree or disagree with a series of questions about their attitudes towards the ENERGY STAR label. Builders most strongly agreed with the statements *homebuyers link the ENERGY STAR label with home value*, and *homebuyers link the ENERGY STAR label with home comfort*, with over 75 percent of the respondents either strongly or somewhat agreeing with both of these statements. Respondents also generally agreed that the ENERGY STAR certification process does not delay home construction, with 60 percent of the respondents either strongly or somewhat agreeing with this statement.

Regarding customer understanding of the ENERGY STAR homes, respondents tended to agree with the statement *customers understand the benefits of the ENERGY STAR label*, though they disagreed with the statement *customers understand the value of duct testing and duct sealing.*

Table 36: Participant Attitudes About ENERGY STAR Label

Statements	Strongly Agree (1)	Somewhat Agree (2)	Neither (3)	Somewhat Disagree (4)	Strongly Disagree (5)	Don't know	Mean - 2007	Mean - 2004
The certification process for ENERGY STAR homes does not delay home construction	39%	21%	18%	14%	4%	4%	2.2	1.9
Homebuyers link the ENERGY STAR label with home value	32%	57%	7%	4%	0%	0%	1.8	2.2
Homebuyers link the ENERGY STAR label with home comfort	39%	36%	11%	11%	0%	4%	1.9	2.0
Customers understand the benefits of the ENERGY STAR label	7%	71%	4%	18%	0%	0%	2.3	2.0
Customers understand the value of duct testing and duct sealing	4%	14%	18%	46%	18%	0%	3.6	3.1

Q42. Please tell me how much you agree or disagree with each of the following statements (Sample Size 2007=28, 2004=14, unweighted).

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level

Builders were also asked to rate their satisfaction with a number of different aspects of the ENERGY STAR homes program, as shown in Table 37. Respondents were quite satisfied with the program overall, with 71 percent indicating that they are either somewhat or extremely satisfied with the program, and no respondents indicating that they are dissatisfied with the program overall. Respondents also indicated that they were satisfied with many other aspects of the program, such as ease of participation, performance testing, and the certification and verification process. Although the majority of the respondents (61 percent) were satisfied with the responsiveness of the program staff and the BOS, 18 percent did indicate that they were either extremely or somewhat dissatisfied with the responsiveness of program staff and 15 percent indicated that they were either extremely or somewhat dissatisfied with the responsiveness of the BOS. Respondents were more neutral about the cost of participation, with 43 percent indicating that they are neither satisfied nor dissatisfied with this component. Respondents also tended to be more split on the quality of the marketing materials and the amount of co-op advertising provided by the program.

Table 37: Participant Attitudes About Program Aspects

Program component	Extremely Dissatisfied (1)	Somewhat Dissatisfied (2)	Neither (3)	Somewhat Satisfied (4)	Extremely Satisfied (5)	Don't know	Mean - 2007	Mean - 2004
The program overall	0%	0%	29%	39%	32%	0%	4	3.8
Ease of participation	4%	4%	21%	29%	43%	0%	4	3.6
Performance Testing	0%	4%	18%	46%	21%	11%	4	NA
Certification and verification process	0%	11%	21%	29%	29%	11%	3.8	3.7
Responsiveness of program staff	4%	14%	18%	32%	29%	4%	3.7	3.7
Responsiveness of BOS	11%	4%	18%	32%	29%	7%	3.7	NA
Cost of participation	0%	7%	43%	29%	18%	4%	3.6	3.4
Amount of paperwork required to participate	0%	11%	43%	18%	21%	4%	3.4	3.6
Quality of marketing support materials	4%	18%	29%	29%	18%	4%	3.4	3.2
Amount of co-op advertising	7%	18%	43%	18%	4%	11%	2.9	2.8

Q 47. Now I am going to ask you to rate your satisfaction with each of the following aspects of the ENERGY STAR homes program… (Sample Size: 2007=28, 2004=14, unweighted)

Builders were also asked what aspects of the ENERGY STAR Homes program have been the most and the least helpful. As shown in Table 38, education was the most commonly recognized helpful aspect (39 percent).

Table 38: Most Helpful Aspects of the ENERGY STAR Program for Builders

	2007 (N=28)
Response	**Unweighted**
Education	39%
Marketing	29%
ENERGY STAR label	14%
Staff	11%
Don't know	11%

Q48. What single aspect of the ENERGY STAR program have you found most helpful?

As shown in Table 39, builders generally did not find any particular aspect of the program to be unhelpful, with 46 percent indicating that they either did not find anything unhelpful, or they did not know. Of the two aspects that were identified as being the least helpful, instability of program staff was the most common (18 percent), while 14 percent indicated that the marketing provided by the program was the least helpful.

Table 39: Least Helpful Aspect of the ENERGY STAR Program for Builders

	2007 (N=28)
Response	**Unweighted**
Nothing	32%
Instability of staff	18%
Marketing	14%
Don't know	14%

Q49. What single aspect of the program have you found least helpful?

Lastly, builders were asked if they had any recommendations for the ENERGY STAR Homes program. As shown in Table 40, the most common recommendation (43 percent) was to improve the marketing of the program. The other commonly made recommendation was for more educational programs (39 percent).

Table 40: Recommendations for ENERGY STAR Program

	2007 (N=28)
Response	**Unweighted**
Better marketing	43%
More educational programs	39%
Don't know	39%
More rebates / credits	14%
Other	11%

Q50. What changes, if any, would you recommend for the program?

Builder Survey Summary

The builder surveys provide information on several important trends related to builder attitudes, perceptions, and current building practices:

- **Builders are more aware of key energy saving issues for new homes.** The most commonly mentioned components for saving energy in the 2007 survey were similar to those in the 2004 survey, though a higher percentage of builders recognized these benefits in the 2007 survey. Specifically, a higher percentage (64 percent compared to 38 percent) of builders mentioned the furnace in the 2007 survey. Also, a significantly higher percentage of respondents in the 2007 survey mentioned appliances (26 percent compared to 8 percent), the water heater (22 percent compared to 3 percent), and construction tightness (23 percent compared to 13 percent), as important energy saving components.

- **While most builders (70 percent) are aware of duct testing, the percentage of builders who have duct testing on their homes is low (18 percent).** The most common reasons that builders stated for not having duct testing and sealing

performed on their homes was the price of the services and the fact that it is not required. These results are consistent with those from the 2004 survey.

- **Among builders that perform duct testing, there is an increased perception of the benefits of duct testing and sealing.** Although the majority of the builders stated that they do not have duct testing performed on their homes, most of those who do believe there are benefits to the builder associated with duct testing and sealing. Specifically, 61 percent of those builders cited verification that the HVAC was installed correctly as a benefit, compared to 26% in 2004. In addition, 87 percent of the builders that perform duct testing stated that there are no problems associated with duct testing, compared to 52 percent in the 2004 survey.

- **Builders are more aware of the ENERGY STAR label.** Sixty-nine percent of the builders stated that they were aware of the ENERGY STAR label. This represents a 13 percent increase over the 2004 survey. In addition, larger builders showed greater awareness of the ENERGY STAR label than smaller builders. The survey found that 79 percent of the builders who build 25 to 99 homes annually were aware of the label and 93 percent of the builders who build over 100 homes annually were aware of the label. In comparison, 63 percent of the builders who build between 1 to 4 homes were aware of the ENERGY STAR label. This shows that although there are still a large number of builders who are not aware of the ENERGY STAR label, the program has done a good job building awareness among high volume builders who have a greater potential to impact the ENERGY STAR program. These results validate a key program progress indicator, which is *increased recognition and understanding of the ENERGY STAR label.*

- **Builders have an increased perception of the benefits of ENERGY STAR to the builder.** Overall, 89 percent of the builders who were aware of the ENERGY STAR label for homes stated building ENERGY STAR homes provided some benefit to builders, with marketing and product differentiation cited the most commonly (60 percent). This is a significant increase in the perception of the benefits from ENERGY STAR homes compared to the 2004 survey, where only 58 percent of the builders knew of benefits that ENERGY STAR homes provided to builders. In addition, builders tended to agree (70 percent either strongly or somewhat agree) that the ENERGY STAR label makes homes more marketable to homebuyers. Although most of the respondents were not ENERGY STAR participants, the fact they view the label as a way of distinguishing builders is a metric that helps validate the program indicator *builders use ENERGY STAR to differentiate themselves*.

- **The most common reason (31 percent) builders cited for not participating in the ENERGY STAR Homes program was because they did not have enough information, or were not presented with information that compelled them to participate.** In addition, 26 percent cited the higher cost of ENERGY STAR homes as a reason for not participating. Not surprisingly, builders most commonly cited the need for additional information (56 percent) and cost effectiveness (38

percent) as requirements before they would participate in the ENERGY STAR Home program.

- **The vast majority of participating ENERGY STAR builders stated that they promote the fact that their homes are ENERGY STAR certified.** The most commonly promoted benefit of ENERGY STAR homes is energy savings (86 percent), followed by better air quality (27 percent).

- **Participating builders believe that homebuyers associate the ENERGY STAR label with quality.** Eighty-nine percent of the participating builders either strongly or somewhat agreed that homebuyers link the ENERGY STAR Homes label with home value, and 75 percent either strongly or somewhat agreed that homebuyers associate the label with home comfort. This result serves as a metric to validate the program progress indicator *builders link ENERGY STAR to home value.*

- **Overall, participating ENERGY STAR builders were satisfied with the ENERGY STAR Homes program.** Seventy-one percent of the builders indicated that they were either extremely or somewhat satisfied with the program overall. Participants were equally satisfied with the ease of participation, and generally satisfied with the certification and verification process. Of the program aspects that they were asked about, the amount of co-op advertising received the lowest satisfaction rating, with 25 percent indicating that they are either extremely or somewhat dissatisfied, versus 22 percent who indicated that they are either extremely or somewhat satisfied with this component.

4.2 HOMEBUYER PHONE SURVEY

This section presents the results of a phone survey of 300 homebuyers that had purchased a newly constructed home no later than June 2005. The sample data were purchased from Claritas. The survey utilized a random, stratified sample, with sample quotas established by state, to correspond to new home construction activity. The sample was therefore created to be a representative sample of new homebuyers in the four states. The distribution of the homebuyer survey sample by state is shown in Table 41. Itron fielded this most recent phone survey in March 2007. (The homebuyer survey instrument is included in Appendix C.) This section also includes results from the first homebuyer survey (fielded by Itron in June 2004) for comparison purposes.

Table 41: Homebuyer Survey Sample

	Number of Respondents	Percent of Total Sample
WA	153	51%
OR	88	29%
ID	54	18%
MT	5	2%
Total	**300**	**100%**

Table 42 shows the size and price of the homes purchased by the survey respondents. Fifty-nine percent of the respondents claimed that their homes were between 1,700 and 2,799 square feet. While the distribution within this range was fairly even in 2004, in 2007 respondents indicated that they were buying generally larger homes (2,100 square feet or more). Similarly, the purchase price of Energy Star homes in our survey sample has increased since 2004. In 2007, 86 percent of the purchased homes cost $200,000 or more, while in 2004 only 43 percent of the homes cost this much. This is likely due to the larger homes included in the 2007 survey and general home price inflation observed throughout the region since 2004.

Table 42: Respondents by Home Size and Price

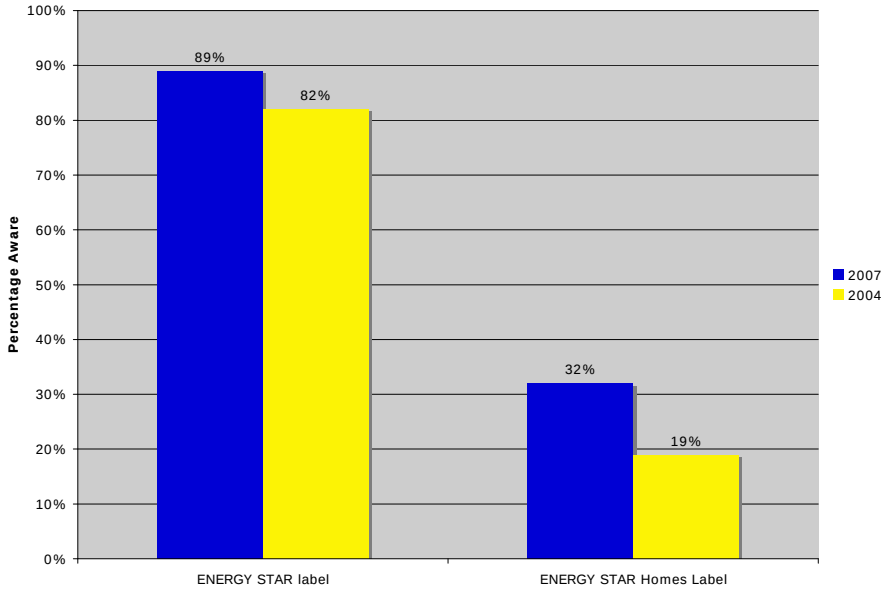
	2007	2004
	Percent of Total Sample	**Percent of Total Sample**
Home Size	**(N=287)**	**(N=288)**
<1700 ft^2	17%	26%
1700-2099 ft^2	21%	27%
2100-2799 ft^2	38%	26%
≥2800 ft^2	24%	21%
Total	100%	100%
Home Price	**(N=281)**	**(N=292)**
< $150,000	2%	29%
$150,000-$199,999	12%	28%
$200,000-$299,999	36%	24%
≥ $300,000	50%	19%
Total	**100%**	**100%**

Q5, Q41. What is the approximate square footage of the house? / Please stop me when I read the price range that includes the price you paid for your new home.

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Figure 3 shows a breakdown of respondents by their familiarity with the ENERGY STAR label. The vast majority (89 percent) of the homebuyers we surveyed were aware of the ENERGY STAR label from other products such as refrigerators, clothes washers, and dishwashers. While most respondents were familiar with the ENERGY STAR label for appliances and consumer goods, fewer new homebuyers (32 percent) were aware of the ENERGY STAR label for new homes. That said, awareness of the ENERGY STAR label for new homes has increased significantly from 2004, from 19 percent to 32 percent.

Figure 3: Awareness of the ENERGY STAR Label



Q10, Q13. Have you ever seen or heard of the ENERGY STAR label / ENERGY STAR label for homes?

Table 43 shows awareness of the ENERGY STAR label for homes broken down by annual household income. As shown in the table, the respondents who were aware of the ENERGY STAR label for homes were widely dispersed throughout the different income brackets.

Table 43: Awareness of ENERGY STAR Label For Homes by Household Income

Aware	Total (N=300)	<40K (N=35)	40-60K (N=53)	61-80K (N=45)	81-120K (N=81)	>120K (N=35)	DK / RF (N=51)
Yes	32%	4%	7%	5%	6%	5%	6%
No	61%	7%	10%	8%	20%	6%	10%
Don't know	7%	1%	1%	1%	1%	1%	1%
Total	**100%**	**12%**	**18%**	**14%**	**27%**	**12%**	**17%**

Q10. Have you ever seen or heard of the ENERGY STAR label for homes? (Sample = 300)

Table 44 reports the perceived value of owning an ENERGY STAR-certified home among respondents that are aware of the ENERGY STAR label for homes. Most respondents viewed an ENERGY STAR home as being highly valuable – rated 4 or 5 on a 5-point value scale – and very few respondents claimed that ENERGY STAR homes offer little to no value. Overall, respondents gave ENERGY STAR homes an average rating of 4.2, indicating that homeowners place a high value on energy efficiency in a new home. These ratings do not differ significantly from responses given in 2004.

Table 44: Value Of An ENERGY STAR Home

	2007	2004
	Percent (N=97)	**(N=57)**
5 Extremely valuable	50%	53%
4	28%	33%
3	16%	9%
2	5%	4%
1 Not at all valuable	1%	0%
Don't Know	0%	1%
Total	**100%**	**100%**
Mean Value	**4.2**	**4.4**

Q15. How would you rate the value of having an ENERGY STAR-certified home on a scale of 1-5, where 1 is not at all valuable and 5 is extremely valuable?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Respondents who did not purchase an ENERGY STAR home were provided with a brief description of the significance of the ENERGY STAR label for new homes. They were then asked how much more money they would have paid for the home they recently purchased had it been an ENERGY STAR home. As shown in Table 45, the average additional amount that respondents stated they would have paid for their home was $7,173 and the median additional amount was $5,000. Notably, 41 percent of respondents claimed they would pay nothing extra for an ENERGY STAR home.

Table 45: Added value for ENERGY STAR Label

Added Value ($)	Percent (N=196)
$0	41%
<$5,001	28%
$5,001-$10,000	16%
$10,001-$15,000	3%
$20,001-$25,000	7%
$25,000+	6%
Total	100%
Mean Value	**$7,173**
Median Value	**$5,000**

Table 46 describes respondents' perceptions of the features included in an ENERGY STAR certified home. The largest group of respondents thought that certification implied *energy savings* in general (69 percent), which was a significant increase over the 2004 survey. Fewer respondents (20 percent or less) thought that certification included

increased insulation, *ENERGY STAR appliances*, *high efficiency windows*, and *tight construction,* although respondents for the most part thought that these components are equally likely to be included. Few respondents identified *tight ducts* and *CFL lighting* as being required components. In comparison, in 2004 respondents were more aware of specific ENERGY STAR home features, particularly *increased insulation* (39 percent) and *high efficiency furnaces* (26 percent), and relatively less aware of the overall *energy savings* (35 percent) that result from these features.

Table 46: Perceived Components of ENERGY STAR Certification

	2007 (N=97)	2004 (N=57)
Component	Percent who think component is part of certification	Percent who think component is part of certification
Save energy/efficiency	69%	35%
Save money	38%	23%
Increased insulation	20%	39%
ENERGY STAR appliances	18%	14%
High efficiency windows	16%	18%
Tight construction	13%	14%
High efficiency furnace	10%	26%
High efficiency cooling	8%	16%
House positioned to reduce energy needs	6%	18%
Recyclable building materials	5%	2%
Environmentally better	5%	NA
House inspected by state energy office	4%	NA
Tight ducts	3%	2%
Lighting (CFLs)	1%	4%

Q16. To the best of your knowledge, what does it mean if a home is ENERGY STAR certified?
Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 47 reports what respondents believe are the primary benefits of an ENERGY STAR certified home. The majority of respondents—74 percent—felt that a certified home would allow for *lower energy bills*. The next largest groups of respondents felt that a certified home would be "Green" or *environmentally friendly* (30 percent), and would have *more energy efficient heating equipment* (16 percent). Equal shares of respondents (12 percent) felt that a certified home would have *more energy efficient cooling equipment* and greater *comfort*. Only a very small share of respondents (3 percent) could not identify specific benefits. Overall, these responses were not significantly different

from those given in the 2004 survey.

Table 47: Perceived Benefits of an ENERGY STAR Home

	2007 (N=97)	2004 (N=57)
Benefit	**Percent who recognize benefit**	**Percent who recognize benefit**
Lower energy bills	74%	86%
Green/environmentally friendly	30%	26%
More energy efficient heating equipment	16%	14%
More energy efficient cooling equipment	12%	9%
Comfort	12%	9%
Higher resale value	9%	19%
More efficient building materials	8%	9%
Reduced draftiness	7%	5%
Better indoor air quality	5%	9%
Reduced draftiness	7%	5%
Other	1%	2%
Don't know	3%	2%

Q20. What do you consider to be the benefits of having an ENERGY STAR certified home?

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 48 shows the percentage of respondents that have purchased an ENERGY STAR home. Although the 8 percent of respondents who purchased an ENERGY STAR home is double the 4 percent market share of certified and initiated homes presented in the market characterization section (Table 12), the error bound for the 2007 survey result is 4 percent, which means that the survey results are not significantly different from the ENERGY STAR homes database at the 90 percent confidence level. The 2007 results, however, are significantly different from the 2004 results in which 3 percent of the respondents had purchased ENERGY STAR homes.[4]

[4] It may also be the case that some respondents answered this question incorrectly and indicated that their home was ENERGY STAR when it actually was not. This may result, for example, if the home was featured as part of some other efficiency program (e.g., LEED or other program emphasizing green or sustainable building practices) or was promoted as energy efficient by the builder without going through the program. Having a prominent and permanent ENERGY STAR label for the home would help reduce or eliminate this problem.

Table 48: Respondents Who Purchased an ENERGY STAR Home

	2007 (N=300)	2004 (N=304)
Purchased ES Home	**Percent**	**Percent**
Yes	8%	3%
No	77%	90%
Don't Know	15%	7%
Total	**100%**	**100%**

Q17. Is your new home an ENERGY STAR home?
Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

Table 49 shows the share of respondents that had the ENERGY STAR certification of their new home actively promoted to them. Almost half of the respondents (46 percent) said that the builder or their agent discussed the general energy-saving qualities of their new home, which indicates that builders are actively promoting ENERGY STAR benefits to these customers.

Table 49: Promotion of ENERGY STAR Homes

	2007 (N=24)
	Percent
Yes	46%
No	42%
Don't Know	12%
Total	**100%**

Q23. Did the sales agent or builder promote the fact that your home was an ENERGY STAR home?

Table 50 shows the specific features of ENERGY STAR homes that were promoted to respondents by the builder or sales agent. The majority of respondents (55 percent) said that both the tight construction and insulation of the home were actively promoted.

Table 50: ENERGY STAR Home Features Promoted by Builders/Sales Agents

	2007 (N=11)
Feature	**Percent of sales agents or builders that promoted feature**
Tight construction	55%
Insulation	55%
Energy efficiency	4%
Overall quality	3%
Heating system	2%
Duct tightness	2%
Air quality	1%
Cooling system	1%
Other	1%
Don't know	1%

Q24. What ENERGY STAR features did the sales agent or builder promote?

Table 51 shows the share of homebuyers that had the benefits of duct testing (less leaking) explained to them by the builder or sales agent. Less than half of the respondents (42 percent) reported being told about the benefits of heating/cooling duct testing.

Table 51: Duct Testing Benefits Explained to Homebuyers

	2007 (N=24)
	Percent
No	46%
Yes	42%
Don't Know	12%
Total	**100%**

Q25. Did the sales agent or builder mention anything about the heating and cooling ducts in the home being tested for tightness to ensure they don't leak?

Table 52 shows homebuyer responses to various statements regarding energy-efficient homes. The statement "energy-efficient homes have lower energy bills" achieved the highest level of agreement, with 69 percent strongly agreeing with this statement and 21 percent agreeing somewhat. The statement that received the second highest level of agreement was "energy-efficient homes have greater resale value," with 57 percent strongly agreeing and 29 percent agreeing somewhat. This indicates that homeowners expect that *other* homeowners also recognize the monetary savings that result from

energy efficiency (and thus these savings get capitalized into home values). Relatively high levels of agreement were also observed for statements that link energy-efficiency with home comfort, and that claim that most new homes could be more energy efficient. The statement that achieved the lowest level of agreement was "new homes often have leaky air ducts," which shows that homeowners believe that improved energy savings are attained through other home components. Overall, the responses were not significantly different from those given in the 2004 survey.

Table 52: Homebuyer Attitudes and Perceptions Regarding Energy-Efficient Homes

Statements	Strongly Agree (1)	Somewhat Agree (2)	Neither (3)	Somewhat Disagree (4)	Strongly Disagree (5)	Don't know	Mean- 2007 (N=300)	Mean – 2004 (N=304)
Energy-efficient homes have lower energy bills	69%	21%	3%	3%	3%	1%	1.4	1.3
Energy-efficient homes have greater resale value	57%	29%	6%	3%	0%	5%	1.5	1.6
Energy-efficient homes are more comfortable than standard new homes	43%	27%	16%	2%	0%	7%	1.9	1.7
Most newly built homes could be much more energy-efficient	50%	33%	7%	5%	1%	4%	1.7	2.0
New homes are highly energy-efficient	25%	39%	11%	13%	6%	5%	2.3	2.1
New homes often allow heated or air-conditioned air from the inside to escape to the outside	17%	24%	17%	20%	13%	9%	2.9	3.0
New homes often have leaky air ducts	11%	12%	21%	22%	16%	18%	3.3	3.3

Q36. Please tell me how much you agree or disagree with each of the following statements. Would you say that you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, or strongly disagree that…

Note: Shading signifies that the responses from the 2004 and 2007 surveys are significantly different at the 90 percent confidence level.

4.3 ON-SITE SURVEYS AND LIGHTING AUDIT

This section presents the results from the on-site audits of ENERGY STAR homes conducted in September and October 2006. The purpose of the on-site audits was to gain information about ENERGY STAR lighting retention and replacement, as well as to measure homebuyer satisfaction with ENERGY STAR Homes.

The ENERGY STAR on-site audit participants were recruited by mail from the participant database maintained by PECI. Respondents were paid $50 for their participation in the study. Although we attempted to create a sample that matched the distribution of certified homes, our dependence on homebuyers to respond to our request for an on-site interview limited our ability to choose our sample at will. We were constrained also by our attempt to recruit homebuyers who lived in close geographic proximity in order to limit drive time expenses (which is why no interviews were conducted in MT).

For the audit, a field person from ECONorthwest or Itron visited the respondent at their home and administered a short survey. Following the survey, the interviewer conducted an audit of all the light sockets in the home and recorded the type and location of lighting and whether or not it was ENERGY STAR.

Key findings

- Most respondents either learned about the ENERGY STAR label for homes from a builder (33 percent) or a real estate/sales agent (31 percent).
- Thirty percent of the homebuyers stated that saving money on energy bills influenced their purchase decision. Forty-three percent of the homebuyers stated that the fact that the home was ENERGY STAR did not play a significant role in their decision.
- The vast majority (93 percent) of respondents indicated that they were very satisfied with their homes, with 63 percent indicating that they were "extremely satisfied" (providing a ranking of 5).
- Respondents were generally very satisfied with the lighting in their ENERGY STAR homes, providing an average satisfaction rating of 4.2 (5 represents "extremely satisfied").
- Respondents stated that the most common reason (46 percent) for replacing lighting was due to lights burning out.
- Of the homes that were audited, ENERGY STAR lighting accounted for 50 percent of the total lighting.
- Since moving in, the overall share of ENERGY STAR lighting in the homes audited dropped by 0.27 percent.

Onsite Homeowner Survey Results

A total of 100 interviews were completed in Idaho, Oregon, and Washington as shown in Table 53. The table also shows the distribution of certified ENERGY STAR homes as contained in the ENERGY STAR database at the time of the sample creation. As shown in the table, the sample was overweighted in ID and underweighted in OR and WA.

Table 53: Respondent States

State	% Of Respondents (N=100)	% Of Certified Homes
ID	44%	24%
OR	24%	34%
WA	32%	40%
MT	0%	2%
Total	**100%**	**100%**

As shown in Table 54, approximately two-thirds of the respondents moved into their new ENERGY STAR home during 2006, while most of the remaining third moved in during 2005.

Table 54: Move-In Year

Move In Year	% Of Respondents (N=100)
2004	4%
2005	33%
2006	63%
Total	**100%**

Q1. When did you move into your new home?

Table 55 shows the distribution of homes grouped by square footage. The size of the home was given by the homeowners and was not independently verified. The average house size of the 98 homes with size data is 2,340 sq. ft.

Table 55: Size of Home

Sq. Ft. of Home	% Of Respondents (N=100)
<1,499	6%
1,500-1,999	28%
2,000-2,499	18%
2,500-2,999	20%
3,000-3,499	23%
>3,500	3%
Don't Know	2%
Total	**100%**
Average Size	**2,340 Sq. Ft.**

Q1A. What is the estimated square footage of your home?

Homeowners were asked how they first became aware of the ENERGY STAR label for new homes. As shown in Table 56, homeowners most commonly became aware of the ENERGY STAR homes label either through the builder of their home or the sales agent for the home. It should be noted that 9 percent of the respondents stated that they did not know their house was ENERGY STAR certified until after they purchased the house, including 6 percent that found out when they were contacted to participate in the on-site survey.

Table 56: Awareness of ENERGY STAR Home Label

Source	% Of Respondents (N=100)
Builder	33%
Newspaper / magazine	9%
Internet	5%
When contacted for onsite survey	6%
Real estate agent / sales rep	31%
Other	16%
Total	**100%**

Q2. How did you first become aware of the ENERGY STAR label for new homes?

When asked why they decided to purchase an ENERGY STAR home, 30 percent of the homebuyers stated that saving money on energy bills influenced their purchase decision. Forty-three percent of the homebuyers stated that the fact that the home was ENERGY STAR did not play a significant role in their decision, and instead they were influenced by other aspects such as the location, price, and layout of the home.

Table 57: Purchase Decision

Reason For Purchase	% Of Respondents (N=100)
ENERGY STAR was not a significant factor	43%
Wanted to save money on energy bills	30%
Realtor / sales person recommended	10%
Concerned about the environment	10%
Builder recommended	8%
Better value	7%
Solid construction	3%
Don't Know / Refused	5%

Q3. Why did you decide to purchase an ENERGY STAR home?
Note: Percentage of responses adds to over 100 percent because respondents were allowed multiple responses.

As shown in Table 58, 74 percent of the respondents stated that their home was already planned to be built to ENERGY STAR specifications before they decided to purchase it, while 23 percent of the respondents stated that they were given an option of whether or not they wanted their new home to be built to ENERGY STAR specifications or not, and they chose ENERGY STAR.

Table 58: ENERGY STAR Home Building Option

Choice of ES	% Of Respondents (N=100)
Already designed as ES	74%
Option	23%
Don't Know / Refused	3%
Total	**100%**

Q4. Which of the following statements best describes the process you went through when choosing your new home?

Table 59 shows the overall satisfaction rating that homeowners gave to their ENERGY STAR homes. The vast majority (93 percent) indicated that they were very satisfied with their ENERGY STAR homes, providing a rank of 4 or 5, with 63 percent indicating that they are "extremely satisfied." For the two who were extremely unsatisfied (ranking of one), one person was unhappy with the overall construction of the house, including poor insulation under the house, and light failures. The other person had problems with lamps burning out and also failing to turn on at times. This individual also stated that he had difficulty purchasing the lamps required for his fixtures (dedicated CFLs) due to a lack of availability. Lighting issues are discussed further in Table 64 through Table 68.

Table 59: Overall Satisfaction With The ENERGY STAR Home

Rating (1 = Extremely unsatisfied, 5 = Extremely satisfied)	% Of Respondents (N=100)
5	63%
4	30%
3	5%
2	0%
1	2%
Total	**100%**
Average	**4.5**

Q5. On a scale of 1 to 5, please rate your overall satisfaction with your ENERGY STAR home, where 5 is Extremely Satisfied and 1 is Extremely Dissatisfied.

As shown in Table 60, almost all of the homeowners (95 percent) stated that they would recommend an ENERGY STAR home to another prospective homebuyer.

Table 60: Recommend ENERGY STAR Home To Other Prospective Homebuyers

Recommend ENERGY STAR Homes	% Of Respondents (N=100)
Yes	95%
No	2%
Maybe / Unsure	3%
Total	**100%**

Q6. Would you recommend an ENERGY STAR home to other prospective homebuyers?

Table 61 shows the percentage of respondents that had various initial concerns about purchasing an ENERGY STAR home as opposed to a standard home. Most homeowners (80 percent) stated that they had no concerns. Of the concerns that people did have, the value of the added cost for ENERGY STAR (7 percent) and concerns about the ENERGY STAR lighting (6 percent) ranked the highest.

Table 61: Initial Concerns About ENERGY STAR Homes

Initial Concerns About ENERGY STAR Homes	% Of Respondents (N=100)
None	80%
Extra cost may not be worth it	7%
Lighting	6%
Construction quality	3%
Mold	2%
Bill savings claims too high	1%
Uncertain of ENERGY STAR regulatory procedures	1%
Total	**100%**

Q7. What if any concerns did you have about purchasing an ENERGY STAR home?

As shown in Table 62, three-quarters of the respondents believe that the primary benefit of ENERGY STAR homes over standard homes is energy savings. Insulation was the second most cited benefit, with 18 percent of the respondents noting this.

Table 62: Perceived Benefits of ENERGY STAR Homes

Benefit of ENERGY STAR Homes	% Of Respondents (N=100)
Energy savings	76%
Insulation	18%
Overall construction	13%
Environmental benefits	7%
Lighting	5%
Windows	3%
Greater comfort	2%
Too early to know	2%
Air quality	1%
Other	3%
Don't know / Refused	8%

Q8. What do you consider the greatest benefit of your ENERGY STAR Home?

Note: Percentage of responses adds to over 100 percent because respondents were allowed multiple responses.

Homeowners were asked if there were aspects of their ENERGY STAR home that they were not satisfied with. As shown in Table 63, the majority of respondents (72 percent) stated that there was nothing about their home that they were unhappy with. The most common aspect of the ENERGY STAR homes that homeowners were dissatisfied with was the lighting (9 percent of respondents). Two respondents thought that the air

exchanger in their house allowed too much cold air to enter the house, making it uncomfortable. Three respondents stated that they would like more energy efficient aspects in the home, such as more CFLs, while nine other respondents indicated that they were dissatisfied with the lighting, reporting problems such as burn-outs, lack of dimming capability, and difficulty finding dedicated CFLs.

Table 63: Aspects of ENERGY STAR Home That Did Not Meet Expectations

Aspects that did not meet expectations	% Of Respondents (N=100)
None	72%
Lighting	9%
Wanted more energy efficiency aspects	3%
Air Exchanger	2%
Insulation/Climate control	3%
Other	11%
Total	**100%**

Q9. Is there anything about your ENERGY STAR home that did not meet your expectations?

Respondents were also asked to rate their satisfaction with lighting specifically. As shown in Table 64, the average satisfaction rating for the lighting was 4.2, with 82 percent of the homeowners indicating that they were very satisfied (ranking of 4 or 5) with the lighting in the home. Only 4 percent of the respondents indicated that they were dissatisfied with their lighting (ranking of 1 or 2). One of the respondents who rated the lighting a "1" stated that he had problems with lamps & fixtures failing and had trouble finding replacement lamps for the dedicated CFL fixtures.

Table 64: Satisfaction With Lighting

Rating	% Of Respondents (N=100)
5	44%
4	38%
3	14%
2	2%
1	2%
Total	**100%**
Average	**4.2**

Q10. On a scale of 1 to 5, where 5 is Extremely Satisfied and 1 is Extremely Dissatisfied, how satisfied are you with the lighting in your home?

Homeowners were then asked what aspects of the lighting in their homes they were dissatisfied with. As shown in Table 65, approximately half of the respondents stated that there was nothing about their lighting that they were unhappy with. The most common complaint (9 percent of respondents) about the lighting had to do with the placement of

the fixtures. Specifically, some homeowners stated that certain rooms had either too many fixtures which made the rooms too bright, or not enough fixtures, therefore requiring the homeowners to purchase floor and table lamps.

Table 65: Lighting Aspects That Did Not Meet Expectations

Lighting Aspects That Did Not Meet Expectations	% Of Respondents (N=100)
None	49%
Lighting placement	9%
Faulty ballasts / lamps	7%
Light quality	6%
Too dim in some areas	5%
Warm-up time	4%
Limited availability of lamps	3%
Not enough ENERGY STAR lighting	3%
No dimming	2%
Other	12%
Total	**100%**

Q11. Are there any aspects of your lighting that you are dissatisfied with?

Table 66 shows the homeowners' responses when asked if they had replaced any lamps or fixtures since they moved in to their house. They were also asked what kind of lamps they used to replace the original lamps. Forty-six percent of the respondents indicated that they had replaced lamps, but no fixtures in their house, while 18 percent indicated that they had replaced some fixtures as well as lamps (one homeowner replaced some fixtures, but kept the original lamps). Thirty-five percent of the respondents stated that they had not replaced any lighting since they moved in. Of those who indicated that they had replaced some lamps, 70 percent said that they had used at least some CFLs as replacements.

Table 66: Lighting Replacement

Replaced Lighting	Lamps And/Or Fixtures	Replaced With	% Of Respondents (N=100)
No			35%
Yes	Lamps only	CFLs	20%
		Incandescents	16%
		CFLs & Incandescents	7%
		Don't know / Refused	3%
	Some fixtures replaced	CFLs	13%
		CFLs & Incandescents	5%
		Original Lamps	1%
Total			**100%**

Q12. Have you replaced any of the lighting in your home since you've moved in?
Q13. Of those replaced, were they light bulbs only or did some replacements involve removing the entire fixture?
Q14. For the bulbs you replaced, were they CFLs or normal incandescent light bulbs?

The reasons that homeowners said they replaced their lighting are shown in Table 67. The most common reason (46 percent) for replacing lighting was because of lamps burning out. Twenty-seven percent of respondents indicated that they replaced lighting because of light quality issues, such as light color, brightness, lamps sticking out of the fixture, or they did not like the look. In addition, 5 percent of the respondents who replaced lighting did so because they wanted more ENERGY STAR lighting than what was originally installed in their homes.

Table 67: Reason For Lighting Replacement

Reason Replaced	% Of Respondents (N=65)
Lamp burnt out	46%
Faulty fixture	12%
Didn't like light color	11%
Not bright enough	8%
Wanted ENERGY STAR Lighting	5%
Lamps stuck out of fixture	5%
Did not like look	3%
Wanted dimmer	3%
DK/R	3%
Other	5%

Q17. Why did you replace the lighting? [Do not read list; check all that apply]
Note: Percentage of responses adds to over 100 percent because respondents were allowed multiple responses.

Respondents were also asked to recall in which rooms they had replaced lighting. The most common rooms to have lighting replaced were the kitchen (18 percent) and the bathroom (17 percent).

Table 68: Rooms Where Lighting Was Replaced

Room	% Of Respondents (N=100)
Kitchen	18%
Bathroom	17%
Garage	14%
Dining Room	12%
Hall	10%
Porch	10%
Living Room	7%
Bedroom – Master	6%
Family Room	6%
Laundry Room	5%
Closet	3%
Office	3%
Bedroom – Other	2%
Other	2%

Q16. In which rooms did you replace the lighting?

Note: Percentage of responses adds to over 100 percent because respondents were allowed multiple responses.

Lighting Audit Results

Table 69 shows the sample of homes that completed the on-site audit. Note that the total number of completed audits is 103 compared to 100 completed surveys. The discrepancy is due to the 3 homeowners who were able to complete the audit but unable to take the survey. In these cases, the on-site field person was able to get access to the home and complete the lighting audit.

Table 69: Completed On-Site Audits

State	Sample Size
Idaho	47
Oregon	24
Washington	32
Total	**103**

Table 70 shows the share of lamps in the home that were ENERGY STAR at the time of the audit. As shown in the far right column, the share of ENERGY STAR lighting has remained at 50 percent.

Table 70: Share of ENERGY STAR Lighting

Current Lighting Type	Number (N =103)	Percent of Total
ENERGY STAR	3,657	49.5%
Non-ENERGY STAR	3,730	50.5%
Total	**7,387**	**100.0%**

Table 71 shows the amount and type of lighting that was replaced since the homeowner had moved in. As shown in the far right column of Table 71, the majority of replacements (66.9 percent) resulted in ENERGY STAR lighting being installed. This was true both for replacements of ENERGY STAR lighting (67.6 percent of replacements used ENERGY STAR lights) and replacements of non-ENERGY STAR lighting (66.6 percent of replacements used ENERGY STAR lights). Between the two types of lighting, replacements resulted in a net loss of 10 ENERGY STAR lights across all 100 homes audited, or a drop of 0.27 percent in the overall share of ENERGY STAR lighting since the homeowners moved in.

These results indicate that while there may be some dissatisfaction with lighting (resulting in non-ENERGY STAR installations for lights that were originally ENERGY

STAR), these replacements are almost completely offset by other homeowners installing ENERGY STAR lighting in sockets originally filled with non-ENERGY STAR lighting.

Table 71: Lighting Replacements

Original Lamp Type	Total Lamps (N=103)	Percent of Total Replaced	Percent Replaced with non-ES	Percent Replaced with ES
Non-ENERGY STAR	3,643	4.1%	32.4%	67.6%
ENERGY STAR	3,732	8.8%	33.4%	66.6%
Don't Know	12	100.0%	33.3%	66.7%
Total	**7,387**	**6.6%**	**33.1%**	**66.9%**

Table 72 shows the average number and percentage of ENERGY STAR lamps and the total number of lamps in different kinds of rooms. Although the ratio of ENERGY STAR to non-ENERGY STAR lamps varies widely between rooms, it does appear that builders tend to use a higher percentage of non-ENERGY STAR lamps in more heavily used rooms, such as in the dining room, living room, and kitchen.

Table 72: Current Lighting By Room

Room	Total Number of Lamps (N=103)	Average Lamps Per Room	Average ENERGY STAR Lamps Per Room	Percentage of ENERGY STAR Lamps
Bathroom	1,442	5.0	2.1	42%
Bedroom	921	2.9	1.6	54%
Closet	409	4.4	3.8	87%
Dining Room	452	5.1	1.6	31%
Family Room	214	5.0	2.6	52%
Garage	413	4.3	2.5	58%
Hall	996	10.0	6.4	64%
Kitchen	963	9.4	3.8	40%
Laundry Room	246	2.6	2.2	83%
Living Room	456	4.7	1.8	38%
Office	179	3.3	1.7	54%
Other	77	4.3	1.6	38%
Porch	545	5.6	2.2	39%
Rec Room	74	5.3	2.9	54%
Overall	**7,387**	**4.9**	**2.5**	**50%**

Lastly, Table 73 shows the average watts of ENERGY STAR lamps, the average number of ENERGY STAR lamps, and average watts per ENERGY STAR lamp by room. Although there were a total of 3,757 ENERGY STAR lamps installed, wattage information could only be collected for 3,446 lamps (92 percent of total ENERGY STAR lamps) due to difficulties inspecting lamps that were in certain fixtures. As a result of the missing data, multiplying the "Average ENERGY STAR lamp Per Room" and "Average Watts Per ENERGY STAR Lamp Per Room" columns will not total to the "Average ENERGY STAR Watts Per Room" column. Of the ENERGY STAR lamps for which we were able to collect wattage information, the average ENERGY STAR lamp was 16 watts. Most rooms had on average between 30 and 50 watts of ENERGY STAR lighting installed. Aside from halls (see table note), kitchens had the highest average installed watts of ENERGY STAR lighting with an average of 59 watts of ENERGY STAR lighting.

Table 73: Average ENERGY STAR Watts Per Room

Room	Average ENERGY STAR Watts Per Room (N=103)	Average ENERGY STAR Lamps Per Room	Average Watts Per ENERGY STAR Lamp by Room
Bathroom	31	2.1	15
Bedroom	22	1.6	14
Closet	53	3.8	17
Dining Room	22	1.6	14
Family Room	42	2.6	17
Garage	42	2.5	21
Hall*	95	6.4	16
Kitchen	59	3.8	18
Laundry Room	35	2.2	19
Living Room	29	1.8	17
Office	26	1.7	17
Other	21	1.6	16
Porch	34	2.2	16
Recreation Room	37	2.9	13
Overall	**37**	**2.5**	**16**

*Lighting data for halls were recorded on an aggregate level by house as opposed to recording data for each individual hall within a house.

4.4 BUILDER INTERVIEWS

In-depth interviews were conducted with non-active builders to identify potential barriers to full participation in the program. The 20 interviews conducted targeted builders without a completed or "in process" home after having signed up for more than nine months. The interviews addressed the long lead time between when a builder enrolls in the program and when an ENERGY STAR home gets built and certified. This period is longer than what was originally anticipated by the program and, given that the program did not meet its goals for 2006, determining the reasons behind this delay has become a priority for the evaluation.

These interviews were limited to those builders that did not yet have any ENERGY STAR homes completed or in process and had signed up for the program prior to April 2006. Table 74 shows the number of builders meeting these criteria out of 497 total builders participating in the program. Of these, about half did not have a certified home and a third did not have an ENERGY STAR home currently in the building stage ("in process"). To ensure that we focused our interviews only on those builders that were showing the longest delays, we limited our interviews to those that had signed up for the program prior to April 2006 and still had not started an ENERGY STAR home. While this comprised only 9 percent of the builders, we believed that it was worthwhile to talk to them to find out if there were systemic problems that were causing delays that could be affecting all builders in the program.

Table 74: Sample Selection

Total Participating Builders…		497
	Without certified homes	256
…And	Without homes "in-process"	156
…And	Signed up before April, 2006	43
…And	Record includes phone number	39

Given these criteria, 20 in-depth interviews were conducted in January–March of 2007 with inactive participating builders. Of these, nine builders indicated that they had at least one ENERGY STAR home in process but this was not evident in the program database we used to draw the sample. These nine builders were interviewed, even though they may be active working toward building ENERGY STAR homes, as their responses could provide some insight as to why it is taking so long for new builders to start building ENERGY STAR homes.

The interview sample contained primarily smaller builders, which is consistent with the general builder population. Table 75 shows the number of homes per year completed on average for the interviewed builders. More than two-thirds of the sample built 10 or fewer homes, which is similar to the population distribution of builders in the program.

Table 75: Interviewed Builders by Size

Homes Per Year	Sample	Part Population[5]
0-10	13	346
11-20	4	73
21-100	3	58
101+	0	20
Total	**20**	**497**

Reasons for Inactivity (Barriers to full participation)

Among the builders we talked with, there is a perception that certain house types are appropriate for ENERGY STAR and others are not. Finding the "right" project type was a problem mentioned by 7 builders. Examples of this type of comment included:

- Had been building smaller homes (2)
- Building department problem with the development
- Builder only does remodels
- Don't build many homes / no opportunities (3)

Since smaller builders had less prescribed building processes, building ENERGY STAR was not as simple as changing their standard building practice, as this might vary significantly with each home. Instead, they would need to commit to the certification separately for each home. For some builders building smaller homes, it seems that they are equating ENERGY STAR with larger (presumably more expensive) homes and that the ENERGY STAR standard is less applicable for smaller homes.

Program requirements was the most often mentioned barrier for building an ENERGY STAR home, with six of the 20 builders listing this as an issue and four of the six saying that this was a major issue. There was not general agreement on which specific requirements were creating the problem. Examples mentioned include:

- Cadet heaters (electric) not allowed
- Percent of window glazing required
- Insulation for vaulted ceilings

[5] Based on an extract of builder records in the Northwest ES Homes database on 1/10/07

- Window type
- Customers' dislike of CFLs

The "Cadet heaters" response referred to using electric radiant heaters, as opposed to a forced air system, in order to keep the overall home cost down. The builder that mentioned window glazing indicated that customers are demanding more and more windows and to restrict the total percentage of exterior openings is causing a problem for their architect.

A small builder mentioned difficulty in combination with all the requirements made reaching the standards "almost impossible." In particular, the builder mentioned the inability to get the required amount of insulation into vaulted ceilings. Another builder had a minor problem with windows because he tried to get certified after the fact and realized the aluminum windows would not pass. The builder who mentioned customer disapproval of CFLs thought that the whole program would fail because of this one requirement. The builder targeted upscale homes and believed their customers needed more aesthetically pleasing options and functions (dimming and warm-up delay).

Program support and general complexity of the requirements were also cited as barriers, with four builders mentioning this and two of those builders indicating it was a major barrier. Comments regarding this issue generally varied across builders. One builder was already building environmentally sound homes and did not see a lot of additional benefit in certification (although he admitted it would make sense to do so). Another builder wanted more communication with the program and had expected the verifier to walk them through the process of getting certified. (This builder had not spoken with the verifier in four months and wanted more frequent contact.) One owner-builder had a verifier test the home and then never heard back from the verifier regarding the test results. The builder assumed the house had failed but the verifier never confirmed this. Another builder indicated the verifier had pushed for duct testing before the house was ready and then tried to charge the sub-contractor when it failed. This frustrated the builder enough to quit the program entirely.

Finally, another barrier related to the higher construction costs and fees associated with building an ENERGY STAR home. Two of the respondents were from non-profit builders and one them indicated that their board had not budgeted for the ENERGY STAR certification and therefore they were unable to continue in the program until that changed. The other hoped there were more incentives available to offset the additional construction costs to meet the standards.

Perceived Program Benefits

In addition to barriers, builders were also asked what they believed to be the benefits of the program for comparison with other groups of builders interviewed previously. The results were largely similar to the responses from active builders in prior surveys. Builders typically came from two perspectives. Either they are already environmental

builders and were just looking to add to their qualifications, or they believed that the ENERGY STAR certification would show their homes were of higher quality.

Since the builders had not actually had any homes certified it could only be asked what *they thought* were the benefits rather than benefits they had actually experienced. In this regard, there were some differences from active builders. These builders tended to be more concerned about the discouraging effect of increased price on their buyers. Several builders suggested that the additional price was going to be a real problem in selling the homes. Our interviews with active builders have shown that the increased price has not been a major sticking point and that in most cases the additional costs are insignificant in the selling of the home.

Contact Information Trends in Program Tracking Database

Finally, a tangential issue that came out of these interviews was an analysis of the builder information being tracked in the program tracking database. During this review and the sampling process, it was discovered that the number of builders with full contact information (i.e., included a phone number), dropped substantially after April 2006. Below is a table showing the reduction in contact information by builder signup date.

Table 76: Contact Information in 2006 by Month

Month (2006)	Missing Phone	Includes Phone	Total
Jan	4	27	31
Feb	3	31	34
Mar	4	50	54
Apr	9	9	18
May	32	12	44
Jun	18	6	24
Jul	19	3	22
Aug	22	9	31
Sep	18	6	24
Oct	14	6	20
Nov	11	7	18
Dec	12	2	14
Total (all years)	**170**	**327**	**497**

This lack of contact information presents several potential problems. First, it limits the effectiveness of random sampling for evaluation research and auditing. For example,

those builders that have phone numbers may be generally more proactive (with multiple contacts with the program) relative to other builders that may actually benefit more from program contact. Additionally, it limits general communication or prompt communication regarding program issues with builders. This is especially important in light of the high turnover among the program implementation team and with comments made by the builders regarding a desire for more contact with the program.

4.5 VERIFIER INTERVIEWS

This section presents the results of interviews conducted with participating ENERGY STAR verifiers. These verifiers are specialists that provide third-party confirmation that the requirements for ENERGY STAR homes are being met. The purpose of these interviews is to provide the verifier perspective on the various ENERGY STAR Homes program components and processes. The analysis is generally qualitative in scope, although percentages or numbers of respondents are sometimes cited to help the reader understand the relative importance of findings.

Interviews were conducted with 12 individuals who are certified as verifiers for the program. The interview sample was chosen to get a mix of verifiers across the states and state submarkets, and to include verifiers that had actually completed some ENERGY STAR home verifications. The experience level of the interviewed verifiers ranged from five to over 400 ENERGY STAR homes inspected, and half of the verifiers had completed 50 or more verifications. Table 77 shows how the verifier interviews were distributed across the states. Among the 12 verifiers, five were also performing duct testing in the program.

Table 77: Verifier Interview Sample By State

Interview Group	WA	OR	ID	MT	Total
Verifiers	3	4	3	2	12
Total	**3**	**4**	**3**	**2**	**12**

Business Environment

Eight of the verifiers work at private companies that are competing to provide verification services, while four work for local utilities and/or cities. In addition to verifying ENERGY STAR Homes, the private verifiers also provide other services for their builders. The other types of services they provide include:

- Green building, Earth Advantage, and other energy efficiency consulting
- Duct testing, blower door tests, and flow hood tests (exhaust fan cfm)
- Insulation installation
- HVAC design and engineering, sales of heat recovery equipment
- Home plan reviews
- REM energy analysis, LEED rating

Verifiers use a wide range of methods to market to builders, which include: approaching established industry contacts, cold-calling, attending home shows and utility-sponsored builder meetings, and getting referrals through BOS's, utilities and builder word-of-mouth. Most verifiers said that they do not need additional marketing assistance, although

one verifier noted that it is difficult to market directly to national homebuilders with out-of-state offices.

The amount of business each company derived from ENERGY STAR home verification services varied greatly. For some it was 100 percent of their business while for others, just 5 percent. In general, the prospects for future business growth were positive. One verifier in Idaho noted that significant reporting requirements are likely to deter some prospective verifiers, and one from Montana was dismayed that very few ENERGY STAR homes are being built in his area. The other verifiers, however, said that more builders are "buying into" the ENERGY STAR label, they are increasingly using this to differentiate their homes, and the market is being helped by federal tax credits. That said, some said that the "green," LEED, and Earth Advantage home markets are growing faster than ENERGY STAR, and are advertised much more extensively.

The rates charged for services varied from $150 to $600 per home, with rates in Idaho being the highest (utilities in all states typically provide services for free). Private verifiers usually lower their per-home charges for larger projects where multiple homes (i.e., a sample) will be verified instead of all the new homes.

Training

Verifiers were asked to evaluate the training they received to become verifiers and any experience they may have had with training offered to builders and HVAC contractors.

Most of the verifiers were trained by state energy offices or private contractors, and four had previous experience in other home rating programs. Most of the verifiers could not recall the details of their training experience but generally noted that it was "good" or "superb" and adequately prepared them. One verifier in Idaho particularly valued the building science focus of the training, and another in Montana praised the very structured materials and presentation (by NCAT). One verifier said, however, that some information was not clear (testing for propane fireplaces) and one said that state staff (in Idaho) was not expert enough to lead the training and some of the information was incorrect. Most of the verifiers continue to get education from NCAT, RESNET, BPI, ACI and their state energy offices. One verifier said that the program should work to make Kansas Building Science Institute classes available in the northwest, and another verifier would like the program to inform him of relevant continuing education (he is not aware of his options).

Four of the verifiers noted that refresher classes would be valuable to keep them informed of program and industry changes. The training would also benefit from additional focus on: lighting (product options and how to market to builders), verifier business viability strategies, what verifiers actually see in the field, and allowed BPO/TCO deviations. One verifier said that less focus should be placed on building science and advanced energy calculations, as his prospective labor pool would have difficulty with these concepts and does not need to know them to do the job suitably.

Most of the verifiers believe that the builders are learning the program "fundamentals" fairly well and that a day of training is suitable. Some of the verifiers also indicated that

they find themselves acting as the builders' ultimate resource for program information and technical assistance after the initial training. One verifier in Oregon said that the training manuals should provide more technical details for referencing after the training, and another verifier in Idaho felt that the classroom training could be longer and more extensive. Verifiers in Washington did not know if or how builders were being trained, or were planning to offer training themselves. Regarding training planning, one verifier stated that the program should also confer with local utilities that know the local builders well and can get them to attend training (Conservation Services Group did not always do this and attendance suffered).

One verifier in Idaho that conducts HVAC training claimed that the quality of work varies greatly depending on who does the training, and that his students generally pass the duct tests without problems. Another Idaho verifier thought that the quality of training is generally very good, the quality of actual work is "picking up slowly but surely," and that more contractors should be trained so they aren't so nervous on their first ENERGY STAR job (when he often assists them). Oregon verifiers also said the quality of HVAC training was high, and that heat pump commissioning training was also needed in some markets (Eugene, Ashland). Verifiers in Montana and Washington generally had no direct experience with HVAC training, except in the Tri-Cities area where BPA has developed a strong training program. Almost all of the verifiers noted that frequent HVAC training is required due to high contractor turnover and infrequent work in smaller markets.

Comments on Builder Requirements

Verifiers were asked to evaluate how successful the builders were in meeting the various program requirements. Overall, it is rare that persistent difficulties with the requirements will cause a home to be dropped from the program, and this only tends to occur when private homeowner/builders explore ENERGY STAR certification after they have completed significant construction without first learning the requirements. Most often, however, professional builders fix all of the initial problems they find within one week and the house still receives certification. (Builders also know which are their "problem homes" and do not bother to have them verified.) According to one verifier, "sloppy builders generally don't pursue ENERGY STAR."

The most troublesome requirement according to the verifiers is duct sealing, and seven verifiers mentioned that leaky duct systems are a common problem. Specific problem areas/issues that were mentioned include: connections to furnace plenums and manifolds, panned joists and wall cavities for returns (solid ductwork in bays and chases works better), rectangular ducts flush against ceilings, and crawl space ductwork (gets neglected). These problems are most often caused by contractor inexperience (even if they have received ENERGY STAR training), lack of training or program understanding, and "laziness" according to some verifiers.

Three verifiers mentioned that small volume builders often do not meet the efficiency ratings for water heaters initially, and subsequently order and install more efficient

equipment. Insulation is generally not perceived to be a problem, but three verifiers noted occasional problems with vaulted ceilings, un-insulated pockets and insulation not being flush with sheetrock.

Two verifiers noted that the lighting requirements sometimes delay builders, either because builders simply forget about this requirement altogether or because they initially miscount (i.e., over-report) the CFL bulbs that they have installed. One verifier also noted that windows are sometimes installed with inadequate or unknown U-factors, probably because windows are often shipped to builders in large mixed shipments, and builders or contractors remove the stickers before they are installed.

Other technical and logistical challenges mentioned by verifiers include: sealing around sheetrock penetrations (e.g., electrical boxes), pocket doors, vapor barriers in crawlspaces, lack of qualified heat pump commissioners, preference for custom wood doors in some markets, keeping window coverage less than 21 percent in sunny scenic markets, and getting dispersed testing specialists to dispersed homes (in Montana).

In general, however, the verifiers believed that no requirements are inherently difficult for builders to meet.

Interaction with other Market Actors

Most of the verifiers outside of Washington reported that they have good relationships with their BOS and that BOS's have assisted them in a variety of ways, including: providing builder referrals, explaining the verifier role to builders (i.e., giving credibility), clarifying program requirements, informing them of training and marketing funding opportunities, coaching on initial verification visits, and helping to improve "problem" heating contractors. In Washington, the experience was more mixed. One verifier no longer had a BOS assigned and now received program help from the state, and another had received sporadic but inadequate coverage from Idaho and Portland. The other Washington verifier was receiving good support from a BOS, but claims that BOS's often underestimate HVAC costs to builders and do not have good knowledge about HVAC installation costs in particular.

Among the verifiers that do not work at a utility, few had significant contact with their local utility. Verifiers noted that utilities sometimes provide builder referrals, and one verifier was working with two utilities to promote the program in some markets. Some utility programs (Puget Sound Energy, BPA) are also key drivers of the ENERGY STAR program.

Interactions with the state energy offices were generally positive, although again there was some variation across the states. In Idaho, verifiers noted that the state gives good technical assistance, provides builder referrals, and effectively recruits builders. Problems found during quality assurance checks are well-communicated and final certificates issued promptly. One verifier, however, thought that the state was too lenient with verifiers with poor track records.

In Montana, the state has less involvement in the program, and both verifiers had not worked with NCAT regarding quality assurance (they assume it is happening). They also said that final certificates are sent to builders by the state after approval by NCAT, and that the process is cumbersome.

Oregon verifiers said that the state office has been generally supportive, is very knowledgeable and has helped to initiate builder training in some markets. Regarding quality assurance, one verifier was unaware of how the state does this while another is called to suggest homes to visit. Other verifiers had done very few homes or their manager deals directly with the state. In addition, some verifiers reported getting labels in a few days while another said it takes a few weeks.

In Washington, verifiers noted that the state provides good technical assistance when it can, but that the state has experienced turnover problems and may be understaffed. They are not sure how often quality assurance occurs as they have had little direct contact themselves, although one verifier thought that some (poor) verifiers are checked often, while another thinks the state could be inspecting too many occupied homes due to processing delays. One verifier gets labels before final inspections to avoid multiple trips to (quickly occupied) homes, another has had problems getting labels and is not sure how the process is supposed to work, and the other verifier prints her own certificates and has given up on receiving labels.

Upcoming Challenges

There was no predominant program or professional challenge mentioned by the verifiers, although a fairly wide range of issues was described. Some of the challenges described by verifiers include:

- Significant data reporting requirements that seem to increase each year, and which intrude on productive billable time (said one, "there has to be a simpler way")
- Finding good verifier staff to match the growing market, and keeping the local contractor infrastructure intact
- Requirements that they do more program marketing themselves; they lack time and marketing experience, and some verifiers could sell the program incorrectly
- Some builders are told and/or perceive that incremental ENERGY STAR costs are higher than they typically are
- Some prospective builders think the BOPs are too prescriptive and remove the building science aspect of their work; they would rather achieve a simple energy savings score however they can
- Rural contractors have difficulty attending trainings
- The program database is poorly designed and cumbersome to use
- Some markets are very dependent on BPA incentives offered through utilities, and these could expire.

Overall Program Comments

The verifiers had generally positive comments about the overall program, and a few made suggestions regarding how the program could be improved further. Listed below are some of their comments and recommendations:

- Most believed that the program is well conceived and has been effective. They get good program support and training and staff are very cooperative.
- The program codes and requirements are generally clear to builders and verifiers.
- Most of the verifiers said that much more general advertising is needed to saturate the market (i.e., on par with ENERGY STAR products) and make the program grow.
- One verifier said that the program should consider developing a passive solar path to compliance.
- One verifier thought that the program should put verifiers in contact with each other so they can form regional networks.
- One verifier said that the program must convincingly demonstrate and communicate to heating contractors that installations and testing are not difficult if done consistently.

Following are some of the program criticisms that were offered:

- There are too many competing program stakeholders with their own goals and motives. Verifiers in Oregon, for instance, noted that there have been disagreements between the various program actors over data access and ownership, which have negatively impacted their own ability to enter and access data in the program database. Builders sometimes get confused regarding who does what in the program or who to contact.
- The program changes too often with little input from the actual market actors. The program should "stabilize" for a while to solidify the existing builder market and get all the program actors to work together more closely.

4.6 REALTOR INTERVIEWS

In February 2007, ECONorthwest interviewed local realtors to understand how NEEA could better market the ENERGY STAR Homes program to new home buyers in the Northwest. The interviews sought to determine how NEEA could facilitate market growth by improving realtor and customer understanding of ENERGY STAR certification in new homes. We selected six realtors and sales representatives—four in Oregon, one in Washington and one in Idaho—who have experience selling new homes for mid-size realty companies.

Five of the people interviewed are sales representatives who work for companies that build, market and sell their homes. In these cases, the homes being sold were new and ENERGY STAR certified. One respondent is an independent realtor who advocates "green" building in Oregon. This realtor has experience refurbishing older homes to meet energy efficiency certification, including ENERGY STAR, Earth Advantage and LEED. On average, the respondents reported that their offices sold 180 homes last year and expect to sell slightly less (170) in 2007. The smallest reported number of homes sold in 2006 was 100 and the highest was 280. For 2007, estimates ranged from 100 to 300 home sales.

All of the realtors were familiar with the broad goals of the ENERGY STAR program. Four of the realtors reported having received "formal training" regarding how to sell ENERGY STAR homes. These four respondents consistently characterized the training as "minimal" and insufficient, albeit valuable. Two realtors—one from Washington and one from Idaho—indicated that local public utility representatives discussed ENERGY STAR and Earth Advantage concurrently in a classroom setting. The difference between the two programs, however, remains unclear to many of the respondents' colleagues who also received the training. Another realtor received training through an ENERGY STAR Continuing Education session, which culminated in a tour of a model home and a demonstration of the certification process. The fourth realtor was given a brief overview of all the ENERGY STAR features installed in new homes by a realtor company.[6] All of these realtors indicated that the training was a good learning experience but far too brief.

The realtor and sales representatives claimed that they actively promote the benefits of an ENERGY STAR certified home to their customers. All six respondents reported that the most popular benefit they relate to potential buyers is lower energy bills due to increased efficiency. Three also mention healthier indoor air due to enhanced ventilation and duct systems. Three regularly discuss the third party inspection and certification process. One actually compares the energy bills of certified and non-certified homes from the same locale. All six believe that customers are mostly interested in reduced bills due to power savings; on rare occasions, prospective buyers seem intrigued by the aspect of healthier

[6] Another realtor received information regarding ENERGY STAR lighting and dishwashers only.

air or an efficient furnace. Very few customers buy the homes for the efficiency; they are sold on the location and floor plan and regard the certification as an added feature. Therefore, potential buyers are seldom discouraged by the extra cost of the features, which the realtors estimate add a $3,000 to $5,000 premium to the homes. One mentioned that they do not believe there is a premium associated with certification. All believe that ENERGY STAR certified homes are not necessarily easier to sell than non-certified homes.

When discussing ENERGY STAR certification, all try to gauge the customer's interest and knowledge with energy efficiency and speak broadly about the features; two respondents indicated that they are uncomfortable delving into the details. Most customers do not ask for technical details; one realtor mentioned that ENERGY STAR brochures located in the sales office are seldom read. However, one realtor did note that buyers' knowledge of energy efficiency and "green" building is slowly becoming more sophisticated.

Five of the realtors believe that brochures and other promotional materials—those that give the homebuyer a clear, "dollars and cents" explanation of program features and expected benefits—would be helpful in the sales process for ENERGY STAR homes. The same number believe that the national program is effective, but marketing materials for individual homes are lacking. A piece of literature with definitive cost savings figures would be helpful. Materials, other than the existing call-out cards, that specifically highlight ENERGY STAR features in the homes would be useful. A couple of respondents noted that the current materials—small call-out cards—fall down and become strewn about the homes by children. Potential solutions are large easels that display features using simple text or permanent plaques that verify the certification with some kind of energy savings figure or rating.

One realtor who deals with existing ENERGY STAR and Earth Advantage certified homes was adamant about permanent signage so that there is verifiable proof of energy efficiency. She mentioned etching the ENERGY STAR logo into windowpanes, or placing it within the building envelope where it won't be replaced or destroyed. Therefore, realtors would be able to effectively market ENERGY STAR certified homes as such when the home is resold. Not only would future buyers be aware of the features, but appraisers will be able to appropriately value the homes.

All of the realtors who sell new homes indicated that the ENERGY STAR logo appears on all of their marketing materials, including the MLS and the Internet. Four respondents reported that a text description of efficiency features accompanies their homes on the MLS. Of the building companies whose representatives we interviewed, only one prominently displays the ENERGY STAR logo on every page as well as includes a section that clearly describes the features and certification process. Another builder has the ENERGY STAR logo buried in an "About Us" section. One fails to include the logo. None of the builders give the Internet user an option to search for only those homes that are ENERGY STAR certified. The independent realtor is working to put energy

certification on the MLS for older homes and encourages potential buyers to use EcoBroker (a national service that lists efficient, but not necessarily certified, homes).

All of the respondents noted that their experience with the ENERGY STAR program has been positive. Everyone agreed that more education for them and their colleagues would be valuable:

- "Although the ENERGY STAR logo is nationally recognized, I feel we need more education regarding ENERGY STAR and Earth Advantage. Perhaps they could be sold as a package."

- "More training would help us [to better market the homes]. We have hired a lot of new sales agents who have not had any training."

One respondent sums up the reason why many realtors do not feel comfortable discussing the many benefits of ENERGY STAR certification:

- "Most realtors don't understand building construction. Education that helps them understand the inner-workings of homes, and how efficiency works, would be a valuable tool."

4.7 STATE CERTIFICATION OFFICE / QA INTERVIEWS

In-depth interviews were conducted with staff at the state energy offices that work on the ENERGY STAR Homes Program. The interviewees are the Quality Assurance (QA) specialists working for the State Certifying Organization (SCO) providing the third-party certification of the ENERGY STAR Homes. The QA specialists work with the verifiers to ensure that the verification process is proceeding smoothly and the ENERGY STAR standards are being met. For this evaluation, we spoke by phone with five QA specialists in the program territory: two in Washington, one in the other three states.

QA Process

Each state has a different agency serving as the SCO for the program: in Oregon, the SCO involved is the Department of Energy, in Washington it is the Washington State University Energy Program, in Idaho it is the Energy Division of the Department of Water Resources (IDWR) and in Montana it is the National Center for Appropriate Technology (NCAT). Moreover, the QA process varies between states. While all use a QA process to verify that homes inspected and certified by the verifier do in fact meet the ENERGY STAR requirements, the number and types of inspection visits, and the person or persons doing the visits vary.

In both Idaho and Oregon, most of the QA inspections in 2006 were conducted by a third party retained by the SCO. In Idaho, a contractor inspected homes in the 3-county area around Boise, while in Oregon all the homes built through the Energy Trust of Oregon program had QA performed by a contractor. Both contractors are directed by the SCO. In Washington and Montana, inspections are conducted by SCO staff, as are Oregon ENERGY STAR homes outside the Energy Trust program and Idaho homes elsewhere in the state[7].

Since SCOs deal extensively with verifiers, it is important to note that most of the verifiers in Oregon are affiliated with the Earth Advantage program or with utilities—in contrast to the other states, where they are predominantly independent businesses. In addition, the performance testing/verification functions are separate in Washington, Oregon, and Montana, while they are combined in the Home Performance Specialist (HPS) role in Idaho. The Washington SCO in particular is pushing the model of having HVAC contractors test and commission their own installations rather than relying on an outside third party, while the Montana SCO does not believe this is an effective approach for his state.

[7] This is was changing as of April 2007. In Oregon the SCO's QA specialist is in the process of hiring a contractor to conduct QA on the portion of the state he now handles, while in Idaho the contractor who was doing the inspections is being brought on staff, which should enable him to cover the rest of Idaho, currently excluded from the QA contract.

All the states have filed QA plans that have been approved by the Regional Technical Forum (RTF), and all conduct inspections and/or tests at various stages of the construction process. Washington and Oregon have generally been more focused on confirming that the homes and the verification process meet program specifications; Idaho and Montana say that they also want to build a database of technical data on the performance of homes built and tested through the program, but have also begun to place greater emphasis on doing an assessment of the testing and verification process.

Sampling and Scheduling

The original QA plan for each state was to conduct QA on a sample of about 10 percent of homes, but the percentage was lower in 2006 for all states but Montana. In Washington, the goal has always been to lower the percentage of inspections to about 3 percent as part of a strategy to make the QA process self-sufficient. It was hoped that growth in program participation would enable the SCO to reduce the percentage of homes inspected, while certification fees would grow with the increase in activity, thereby helping the QA effort to become self-sufficient. This has not happened to date.

All of the states emphasize the need to inspect a higher percentage for less experienced builders and verifiers, with a corresponding reduction for well established verifier/builder combinations that have proven their compliance. The percentage of inspected homes therefore varies according to the mix of the verifier and builder population.

As shown in Table 78, verification activity is highly concentrated in a small fraction of the verifier population. Data from the ENERGY STAR Homes Northwest website showing both the names of verifiers and the number of homes verified to date by each indicate that 20 percent of verifiers in each state account for more than 90 percent of homes verified, and just three verifiers in each state account for at least 75 percent of homes verified per state.

Table 78: Verifiers and Number of Homes by State

	WA	OR	ID	MT
From Website				
Number of Homes	995	363	674	53
Number of Verifiers	60	43	14	23
No. of Homes for top 20% of verifiers	968	339	611	49
% for top 20% of verifiers	97.3%	93.4%	90.7%	92.5%
No. of Homes for top 3 verifiers	795	294	611	40
% for top 3 verifiers	79.9%	81%	90.7%	75.5%
From Interviews				
Approx. % of homes QA'd in 2006	5%	5%	6%	10%

From a QA standpoint, these figures show that most verifications are done by experienced verifiers who have demonstrated their competence, so that relatively fewer QA inspections are called for. But they also show the importance of bringing "new" verifiers into the QA process. As verifiers are trained, acquire builders as clients and conduct the verification process on their first homes, they must be closely watched by the SCOs. The QA plan calls for each of the first three homes verified by a new verifier to go through the QA process, with the results of those first three inspections determining what percentage of subsequent homes will need to go through QA. Specifically, the percentage of homes sampled will not be reduced until the verifier achieves a better than minimum passing score. The result is that new verifiers account for a disproportionate share of QA resources. As one QA specialist notes, "In administering the program, having these new verifiers is going to influence what I do. New verifiers have been a lot more work to bring along."

This emphasis on new verifiers has also had other effects on the QA process in several states.

- New verifiers may be entering the business by working in areas that have not been served by ENERGY STAR builders in the past. In Idaho, for example, several new verifiers are working in the Northern part of the state—an area not covered by the QA inspector contracted to conduct inspections in the area around Boise. The high travel time and cost associated with inspecting homes in more remote areas of the state increases the workload on the SCO.

- In Montana, QA inspections for new verifiers are usually conducted in real time; that is, the SCO QA specialist accompanies the verifier on his/her visit and inspects the work as it is done. This has obvious benefits in the amount of verifier education and training accomplished by the QA process and assures that the first homes certified will be up to program standards, but it can delay the truly

"independent" assessment of verifier performance conducted by a QA specialist after a completed verification.

- In Oregon, as elsewhere, homes to be inspected are drawn from the program database. However, data entry for newly built homes for some organizations with multiple verifiers—such as Earth Advantage and Eugene Water and Electric Board—is sometimes done by an administrative data entry specialist rather than by the individual verifier, so that the verifier is identified in the database only as "Earth Advantage" or "EWEB". This makes it extremely difficult to identify specific homes done by "new" verifiers within those organizations so that they can be singled out for inspection in accordance with the QA plan.

- Washington sampled about 5 percent in 2006, but the Washington SCO QA specialist noted that even this level requires significant subsidy to support the QA effort. Over the longer term, Washington hopes to be able to get to 3 percent and make the program self-sustaining.

Selection of homes to inspect also varies by state, and is influenced by the extent to which the program database supports the identification of initiated and completed homes.

- In Idaho, the SCO data manager receives a project initiation for every house from the Homes Performance Specialist (HPS) through the program database, and every tenth home that comes in is selected for QA. Because data entry procedures were established for Idaho's predecessor program to ENERGY STAR Homes Northwest, most homes have project initiation forms and are put into the database in a timely manner.

- Similarly, in Montana, the goal is to randomly select every 10^{th} home, but in practice the process has been driven by the need to inspect the work of new verifiers. The SCO tracks when the selected home is verified through the database, notifies the verifier and the builder of the inspection, and confirms that the home is not yet occupied. The QA inspector typically will go to an area and also inspect several other homes for that verifier, trying to schedule them at the same time as the verifier is going through.

- In Washington, selection of homes to inspect in 2006 was focused on trying to do QA on the first few homes for each builder and verifier. Even if the homes were not the first for the verifier, the goal was to get feedback quickly to new builders, so the selection was very heavily weighted toward new verifiers, performance testers and builders. The QA specialists estimate that about 85 percent of homes inspected fell into that category, with the remainder randomly selected from established verifiers and builders. "We start out trying to sample 10 percent and based on how well they score on the QA we reduce the sampling rate," said Washington's SCO Director. "I look at it as a client-based service for all the players. The selection is random in that it's a call out of the blue, but it's not every 10^{th} or 20^{th} home. It's not just new verifiers, but we look at those more closely."

- In Oregon, identifying homes has been a challenge. Oregon had planned to rely on the database to randomly select specific homes during construction, but the SCO found that the database was sometimes being used only to record finished homes. As a result, the SCO uses the database to identify subdivisions where homes are being completed, and the QA contractor goes to that location and finds homes in different stages of completion. He first inspects a completed home, and based on concerns or questions raised by that inspection, conducts QA on houses in process by the same verifier or builder.

  Oregon also uses this approach because it cannot rely on a purely random selection of homes to inspect, since a few builders account for most participating homes, and random selection would lead to a majority of QA inspections being conducted on one or two well established builders and verifiers. Instead, Oregon focuses on beginning verifiers and builders who are more likely to need QA inspections.

In most states the actual inspection of selected homes is tempered by whether those selected homes are already occupied, since only Idaho routinely does QA testing on occupied homes. However, the Oregon SCO notes that they have had instances of ENERGY STAR homes entered into the database as initiated, completed, and inspected all in a single day – sometimes after the home is already occupied. In those cases they require the verifier to come back to the occupied home to go through the inspection with the QA specialist.

A Washington QA inspector points out that "The biggest issue in the process is the scheduling, because you want it done on a timely basis without inconvenience to the homeowner. But there is no real incentive to the verifier to enter data on a timely basis, especially if they're busy. To the extent that they have to pay for the certificate once the house is entered, they may put it off." There has been some discussion about offering the verifiers an incentive—such as a slightly reduced certification fee—for timely data entry.

Despite some problems in scheduling the QA inspections before buyers move in, the QA process overall does not appear to be creating delays in the construction process itself.

Failure Rate/Reasons

In Washington, about 85 percent of homes pass the QA testing. For those that fail, the main reasons include ducts and lighting. According to the Eastern Washington QA specialist, "The most consistent failure is the duct testing. It's a big chunk of the savings, but overall it's the hardest thing. It can get passed by the verifier, who has only confirmed that a performance tester has signed off and entered the test results. On one level, it's not a failure of the verification, it's a failure at the performance testing level. Somebody has signed off on it and they should not have."

Washington has also had problems with insulation not being thoroughly checked by the verifier, with some cases "bordering on fraud." A QA specialist explains that according to Washington code if there is access to the attic through an attic access hatch, the

insulation contractor must staple a tape measure to a stud to show the depth of the insulation. “We found a case with multiple houses where the tape measure was there, but the bottom 4 inches had been cut off. The sub was cheating the builder. In that case we were more diligent than the verifier; they saw the measuring stick, but we actually measured.”

Oregon also reports that about 85 percent of homes pass the QA inspection. According to the QA specialist, “part of the reason for that is that we had some items in the specs that were not clearly communicated, those continue to flush through the system. For example, that they need return air paths in every zone. Mostly for those the duct leakage passed, but zones did not all have separate returns.” Other problems include items such as ducts that were tested at rough-in (that is, when the walls are framed but before the interior walls are finished) and were subsequently disrupted during the construction process (such as a plumber bending or moving ducts), the wrong windows and some improper installations. Lighting has dropped off as a problem dramatically. As part of the QA process, Oregon has also started to do qualitative measures of lighting levels and the CRI (color rendering index), and has found that a common problem is that lighting levels are too low, because some contractors have been putting 13 Watt CFLs even in fixtures that would have held 75 or 100 Watt incandescent bulbs.

For Idaho, concerns have been a few substantive violations like inadequate insulation (particularly in attics or angled ceilings) and problems with ducts; typically not with duct tightness so much as with installation, such as slinky duct cramped into corners so it will not let air flow. In addition, there are process issues that may or may not affect the actual performance of the home. For example, there may be evidence that the HPS did not inspect the crawl space or attic—even though the level of insulation is adequate. However, failure rates are essentially zero on inspected homes, since Idaho now makes passing the QA testing a precondition of certification for all homes selected for QA.

In Montana, the biggest compliance problem, according to the SCO Director, is the requirement for conditioned crawlspaces—which are common in Idaho and Montana, but not in Washington and Oregon. The technical compliance option for conditioned crawlspace is to have R30 wall insulation, which the SCO Director describes as nearly impossible from a construction perspective, and a reason that some builders drop out of the program.

Getting feedback to verifiers and builders is generally clear if there are specific problems to be addressed: the QA inspector notifies the verifier, who notifies the builder, who contacts the appropriate subcontractors to take corrective action. The builder is then required to send documentation that the problem has been fixed.

The feedback process is less clear if the home passes—even if the inspection identifies areas where the verifier could do a better job. “If there are no problems there is no formal feedback,” says one inspector. “We just communicate to the verifier that everything looks OK.”

Certification

Issuance of the ENERGY STAR certificate, another function of the SCOs, usually occurs within a week of the last verifier inspection. With the exception of Idaho, issuance of a certificate is generally not dependent on successful completion of a QA inspection for those homes selected for QA. In addition, even if substantive problems are found on a QA's homes, the certification is not revoked; nor is it called to the attention of the home buyer. Issuing of ENERGY STAR certificates appears to be proceeding smoothly in all the states.

Response

Most builders are pleased with the QA function provided by the program, and welcome the third party review of the overall process. One QA Manager described an instance where insufficient insulation was installed In this case the builder immediately called the insulation subcontractor to return to the site and repair the problem.

- In Oregon and Washington, most builders have been responsive to the QA process. One of the Washington QA inspectors notes that "my experience is that builders are very positive if you give them the information as a way to correct deficiencies. They see that it's in their interest because they paid someone to do this, and they appreciate it when someone points out that it wasn't done."

- Builders have been somewhat more reluctant in the two eastern states. In Idaho, "we've brought some of the builders around, but there is still some resistance," while in Montana a number of builders have been alienated by what they see as the unrealistic TCO, discussed above, addressing conditioned crawl spaces.

Overall, verifiers appear to appreciate the QA function for their first homes and then to accept it as a necessary aspect of participation for subsequent homes.

- In Oregon, verifiers have been very receptive. The newer verifiers in particular seem to appreciate plans for the State QA specialist to conduct QA ride-alongs with verifiers.

- QA specialists in both Washington and Montana also noted that verifiers have been receptive to the QA visits as part of the overall participation process. One of the Washington QA inspectors says, "There is lots of handholding in the QA process, we educate verifiers and builders to keep it from being a negative experience. Quality is important, but we don't want to stomp on everybody's fingers so much. As the QA rep we are the police, but we try to not be too heavy handed about it."

- In Idaho, the SCO also said that most verifiers have been willing to work with the state office for QA inspections, but that there had been exceptions. Specifically, they reportedly had to terminate one HPS who refused to fix a home after the QA inspection found deficiencies. "We sent out letters to three major HPSs who had

problems. One went out and fixed it right away; another dawdled but eventually fixed it, and one just said no."

Two QA specialists suggested that verifier willingness to cooperate with the QA effort may be linked to the amount they are charging for their services, since some verifiers set prices too low to allow more than a single visit, and even that single visit may not be as thorough as it should be. Cooperation with the QA inspection adds one more activity that must be covered by the fixed verification cost. Moreover, the increasing demands on verifiers – both to take on additional marketing responsibility within the ENERGY STAR program and to address other programs and tax credits – make it more likely that ENERGY STAR Homes inspections will not receive the full attention they require. While the QA process appears to have ensured that verification standards are being met, the SCOs should monitor the prices being charged for verification and call the verifier's attention to fees that appear to be too low to support a thorough verification effort.

Verifier Training

Since most of the QA specialists are themselves either responsible for or involved in the verifier training, they not surprisingly said the training has been well received and effective. This may have been in part because of the high level of existing building science skills brought to the program by trainees in the past. As potential new verifiers enter the market, the training may have to be reviewed (as several SCOs appear to be doing) to ensure that all the needed skills are being covered.

The entry of growing numbers of new verifiers has placed a strain on training and—as addressed previously—on the QA resources overall. Several QA specialists noted that the level of expertise of new entrants to the business is not as high as it was for verifiers who started with the program several years ago. The Oregon QA specialist explained, "In earlier years we trained people who did not need training, but just needed program information. Now firms are hiring trench warriors to go out and do inspections, so we are getting people with different levels of understanding."

One result has been that the amount of training required has grown. "The new verifiers I'm training now are not nearly as qualified," says a trainer. "I used to be able to give a brief training, now I'm making what used to be 2 days a 4 day training." The Eastern Washington QA specialist responsible for most of the trainings in the state concurs. "The ones that are doing it are well trained, but the vast majority of people have not had a lot of experience. A lot more people have gotten trained than have ever verified many houses."

In Montana, where several markets with growing building activity are not currently served by local verifiers, the QA specialist is trying to train knowledgeable home energy raters to perform the verification function in those markets rather than relying on new verifiers who have had two days of training but no building science background. He sees this move as consistent with the greater marketing role verifiers are taking on, but notes

that almost all Montana verifiers are expected to continue to use the ENERGY STAR Homes program as a means to augment other business activities – not as a full time job.

Montana also needs to train additional performance testers. The QA specialist believes that having HVAC contractors conduct performance testing is not a viable option due to unacceptable results in the past.

Overall Role Of QA and Outlook

Several QA specialists pointed out that the QA effort has proven to be both more important and more resource intensive than originally anticipated, in part because the program has lagged well behind its original targets in most states. Washington in particular noted the difficulty of meeting all the demands placed upon the SCO with the available budget. Washington originally staffed up in anticipation of a volume of homes and builders projected for 2004 and 2005, but did not cut back quickly when the level of participation fell significantly short. As a result, funds for the QA effort have been limited in 2006 and 2007. The hope is that the level of participation will increase in 2007 to help generate certification money to cover the cost of QA. But even if participation grows, the QA specialist notes, "we have an unfunded mandate to do additional technical assistance work (with verifiers), but the funding scope doesn't allow for that. That's a real balancing act. When we interact with builders through the verifiers, we work on stuff that's not part of our portfolio."

The broader role foreseen for verifiers also complicates the QA effort. Within the ENERGY STAR Homes Northwest program, verifiers are increasingly responsible for broader program marketing tasks and for providing technical assistance to builders. However, they also conduct home ratings to qualify homes for tax credits. This puts additional demands on their time and may limit the resources they can devote to the ENERGY STAR verification function.

Coordination

While representatives of most of the SCOs said they enjoyed good communications with program representatives, all emphasize the complexity of the program because of the multiple players with whom they must interact. Depending on the situation of the individual state, the SCO may have to coordinate with several different representatives of the program itself (NEEA, the implementation contractor, one or more subcontractors), the regional technical committee, builders, performance testers and verifiers – not to mention related organizations such as utilities, BPA and other programs such as Earth Advantage and Built Green. Even with good communications, that level of interaction requires a lot of time. As the Idaho QA specialist notes, "it's a complex program and we now have four people involved with it out of a very small staff. It's a huge coordination effort because we have utilities, the NEEA contractor, subcontractors, HPSs and builders that we interact with."

One SCO believes that coordination may become a bigger issue as the marketing function becomes less centralized and becomes the responsibility of verifiers. As an example, he

explains that in attempting to recruit builders who may be regional or national players, local verifiers often only have access to that builder through one subdivision's site supervisor; corporate HQ would be elsewhere. Energy Trust and NEEA might both be pursuing these builders without the verifier's knowledge, which puts the verifier in the embarrassing situation of attempting to initiate contact when the program is already communicating with corporate headquarters.

SCO Conclusions and Outlook

To summarize key findings and recommendations regarding the QA process:

- Just 20 percent of verifiers in each state account for more than 90 percent of homes verified, indicating that experienced verifiers who have demonstrated their competence and for whom relatively fewer QA inspections are required do most verifications. In contrast, new verifiers account for a disproportionate share of QA resources.

- To help identify new verifier homes for sampling purposes, organizations such as EWEB and Earth Advantage should be encouraged to include the names of individual verifiers for all homes entered in the program database.

- The fact that up to 15 percent of homes still fail some aspect of the QA inspection suggests that the percentage of inspections should not be reduced.

- To ensure that verifiers allocate enough time and resources to the verification process, the SCOs should monitor the prices being charged by verifiers and alert those whose fees appear too low to support a thorough inspection.

- A mechanism should be established for the SCO to provide feedback to verifiers in cases where the home does not have obvious failures.

- Verifier training appears to be good, in part because of the high level of existing building science skills brought to the program by trainees in the past. As potential new verifiers enter the market, however, the training may have to be reviewed (as several SCOs are doing) to ensure that all the needed skills are being covered.

Several SCO representatives expressed optimism that the ENERGY STAR Homes Northwest program appeared to be gaining greater acceptance, and could be close to "turning the corner" toward reaching the goal of 20 percent market penetration. These same representatives caution, however, that such a level of participation would require greater coordination and likely strain their own QA resources, especially during the time when additional inspections are needed but before revenues from increased participation are received.

One factor that could influence the outlook for the program is the continued divergence in building practices, codes, and baselines between the eastern and western parts of the region. The Montana and Idaho SCOs tend to see the ENERGY STAR Homes program

as oriented to Western Washington and Oregon – specifically with regard to the technical requirements for homes built to suit their local climate. If, as seems likely, Oregon pursues an upgrade of its residential energy code that would affect the ENERGY STAR Homes program, this east-west split could become more problematic in the future.

5. DUCT TEST IMPACT ANALYSIS

This section describes the results of our analysis of performance testing data from the Northwest ENERGY STAR (ES) Homes database. Specifically, we analyzed the results of 2,563 duct tests that have been conducted in Idaho, Montana, Oregon, and Washington as part of the requirements of the ENERGY STAR homes program. We then compare the results from the duct tests conducted for the ENERGY STAR Homes program to the findings of a study conducted by RLW Analytics for the NEEA titled "Residential New Construction Characteristics And Practices." The purpose of the RLW report was to document construction practices and characteristics of new residential construction which would serve as a baseline for comparison with ENERGY STAR homes.

Results From ENERGY STAR Homes Duct Leakage Tests

The data used for our analysis were extracted from the online ENERGY STAR database on November 27, 2006. To develop our analysis dataset, we applied the following data screens:

- Only homes that had been certified through inspection were included
- Data points missing conditioned sq. ft information were dropped
- Data points missing the actual leakage data were dropped
- Data points representing spaces with less than 500 square feet were dropped as we assumed that any space smaller than 500 square feet likely did not represent an entire house. Only one data point did not meet this criterion.

The ENERGY STAR homes duct testing data were analyzed as two separate data sets. One data set represents whole house duct leakage while the other data set represents only duct leakage to the exterior. The fundamental difference between these two tests is that the whole house leakage test measures air leakage from the ducts in both conditioned and un-conditioned space. The exterior leakage test only measures leakage to un-conditioned space. The whole house leakage test will, therefore, always result in leakage results greater or equal to the results of the exterior leakage duct test in an identical house.

The data recorded in the ENERGY STAR database include the measured leakage in units of cubic feet per meter (CFM) at 50 Pascals (Pa) and the conditioned square footage of the home where the test took place. In order to weight the results according to home size, the results presented below are all given in units of CFM/sqft. The ENERGY STAR Homes program specification requires that homes do not exceed 0.06 CFM/sqft.

Of the 2,563 ENERGY STAR duct tests included in this analysis, 86 percent (2,210) of them were of the whole house type. These results are summarized below in Table 79. About half of the duct tests took place in Oregon, which is approximately the market share of ENERGY STAR certified homes in Oregon (see Table 12). The remaining tests were divided somewhat equally between Idaho and Washington. The ENERGY STAR database did not contain any whole house duct tests from Montana. The average leakage

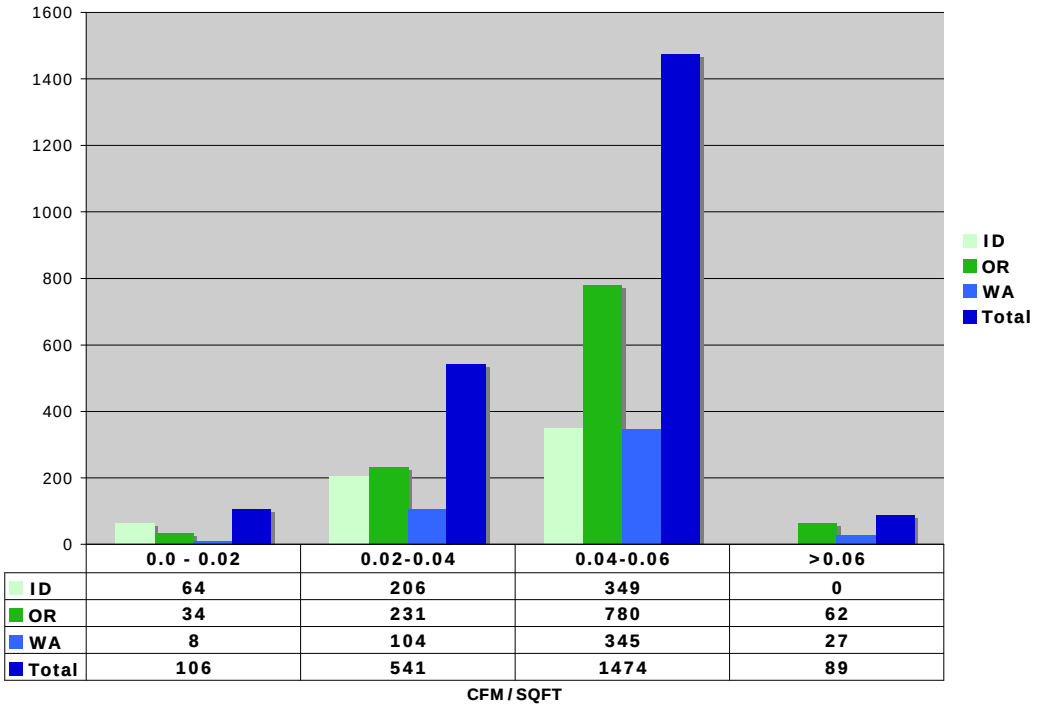
ranged from 0.04 to 0.05 CFM/sqft for each state, with an overall average of 0.05 CFM/sqft.

Table 79: ENERGY STAR Average Duct Leakage - Whole House

STATE	Number of Homes	Avg. CFM/SQFT	EB (95% CI)
ID	619	0.04	0.001
OR	1107	0.05	0.001
WA	484	0.05	0.001
Total	2,210	0.05	0.001

Figure 4 shows the distribution of test results by state. The majority (67 percent) of the tests resulted in duct leakage between 0.04 to 0.06 CFM/sqft. Of the remaining tests, 24 percent resulted in leakage between 0.02 to 0.04 CFM/sqft, and 5 percent resulted in leakage between 0.0 to 0.02 CFM/sqft. Note that 4 percent of the tests resulted in leakage greater than 0.06 CFM/sqft, which exceeds the ENERGY STAR specification that requires duct leakage to be no greater than 0.06 CFM/sqft.

Figure 4: ENERGY STAR Duct Leakage – Whole House (CFM/SQFT)



	0.0 - 0.02	0.02-0.04	0.04-0.06	>0.06
ID	64	206	349	0
OR	34	231	780	62
WA	8	104	345	27
Total	106	541	1474	89

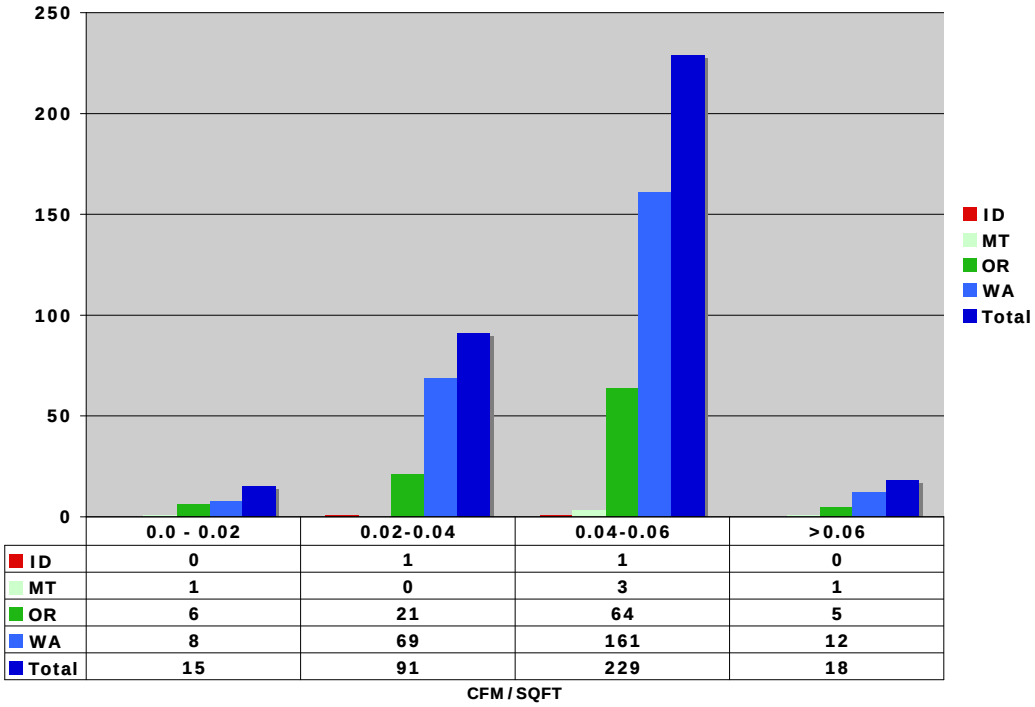
Table 80 summarizes the results from the duct tests that measured leakage to the exterior. This test was performed on a total of 353 of the sites analyzed (14 percent of total sites in the ENERGY STAR database). The results from this test were similar to those of the whole house leakage tests, with average CFM/sqft ranging from 0.04 to 0.05 CFM/sqft for each state, and an overall average of 0.05 CFM/sqft for all states combined.

Table 80: ENERGY STAR Average Duct Leakage - Exterior

STATE	Number of Homes	Avg. CFM/SQFT	EB (95% CI)
ID	2	0.04	.005
MT	5	0.04	.016
OR	96	0.05	.003
WA	250	0.05	.002
Total	353	0.05	.001

Figure 5 shows how the results of the duct leakage test to the exterior are distributed across size categories. Most of the tests (65 percent) resulted in duct leakage between 0.04 to 0.06 CFM/sqft. Of the remaining tests, 26 percent resulted in leakage between 0.02 to 0.04 CFM/sqft, 4 percent resulted in leakage between 0.0 to 0.02 CFM/sqft, and 5 percent resulted in leakage greater than 0.06 CFM/sqft, which exceeds the ENERGY STAR specification.

Figure 5: ENERGY STAR Duct Leakage - Exterior (CFM/SQFT)



	0.0 - 0.02	0.02-0.04	0.04-0.06	>0.06
ID	0	1	1	0
MT	1	0	3	1
OR	6	21	64	5
WA	8	69	161	12
Total	15	91	229	18

Comparison Between ENERGY STAR homes and RLW Duct Leakage Results

All of the duct leakage tests that were conducted by RLW were of leakage to the exterior. Direct comparisons can therefore be made between these results and the results from the ENERGY STAR tests that measured leakage to the exterior.

A direct comparison cannot be made between the RLW results and the ENERGY STAR duct test results that measured leakage to the whole house, which account for the majority of the ENERGY STAR duct tests conducted. However, as mentioned previously, duct leakage tests of the whole house will always measure leakage greater than or equal to leakage tests of the exterior. We can therefore take the results of the ENERGY STAR whole house test as an upper bound of the leakage to the exterior for the same homes. This comparison between these two tests is included in the analysis below.

A summary of the RLW results is shown in Table 81. RLW performed duct tests in a total of 225 homes. The results averaged between 0.13 to 0.15 CFM/sqft by state, with an overall overage of 0.14 CFM/sqft.

Table 81: RLW Average Duct Leakage - Exterior

State	RLW Number of Homes - Exterior	Avg. CFM/SQFT	EB (95% CI)
ID	40	0.14	0.03
MT	3	0.15	0.05
OR	102	0.13	0.03
WA	80	0.14	0.01
Total	**225**	**0.14**	**0.01**

A comparison between the RLW results and ENERGY STAR results is shown in Table 82. The results from both of the ENERGY STAR data sets show that on average, duct leakage in ENERGY STAR homes is 67 percent less than leakage in standard homes tested by RLW.

Table 82: Comparison Between RLW and ENERGY STAR Duct Test Results

State	RLW Duct Leakage - Exterior	ES Duct Leakage - Exterior	Percent Difference – Exterior (RLW VS ES)	ES Duct Leakage – Whole House	Pe
ID	0.14	0.04	-72%	0.04	
MT	0.15	0.04	-70%	NA	
OR	0.13	0.05	-65%	0.05	
WA	0.14	0.05	-67%	0.05	
Total	**0.14**	**0.05**	**-67%**	**0.05**	

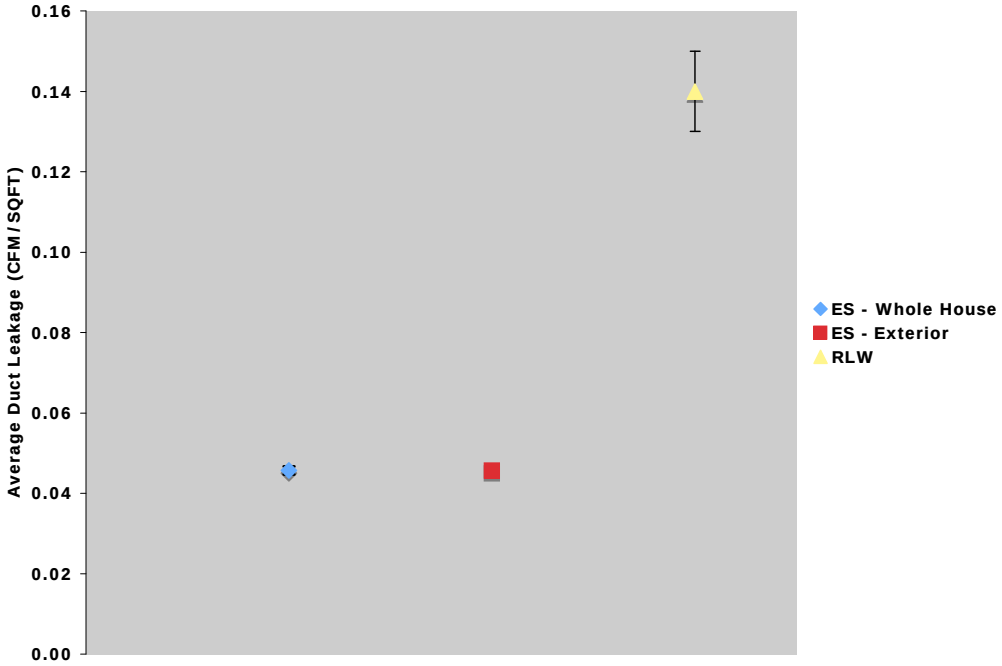
The results for all three tests are presented in Table 83 with error bounds reflecting a 95 percent confidence interval (CI). All of the ENERGY STAR results are statistically different from the RLW data.

Table 83: Comparison Between RLW and ENERGY STAR Duct Test with Error Bounds

State	RLW Duct Leakage - Exterior	RLW EB (95% CI)	ES Duct Leakage - Exterior	ES EB - Exterior (95% CI)	ES Duct Leakage – Whole House	ES EB – Whole House (95% CI)
ID	0.14	0.03	0.04	.005	0.04	0.001
MT	0.15	0.05	0.04	.016	NA	NA
OR	0.13	0.03	0.05	.003	0.05	0.001
WA	0.14	0.01	0.05	.002	0.05	0.001
Total	**0.14**	**0.01**	**0.05**	**.001**	**0.05**	**0.001**

Figure 6 shows the total average duct leakage results with error bounds. On average, ENERGY STAR homes have duct leakage of 0.05 CFM/sqft. These results are significantly different from the RLW results that found overall duct leakage to be 0.14 CFM/sqft in the baseline new construction building stock.

Figure 6: Overall Duct Leakage Results with Error Bounds



6. REVIEW OF NEEA COST EFFECTIVENESS (ACE) MODEL

As part of this evaluation, ECONorthwest conducted a review of the Alliance Cost Effectiveness Model (ACE Model) used by NEEA to calculate the cost effectiveness of the ENERGY STAR Homes program. This review included both a review of the model assumptions documentation (draft dated March 9, 2007 and used for the 2005 Market Activities Report) and the Excel file that contains the ACE Model.

Table 84 summarizes the ACE Model factors that were considered in this review.

Table 84: Summary of Cost Effectiveness Modeling Issues

Key Assumption	Current Value	Recommendations
Baseline activities	Low in early years, formula used to show growth over time. Utility programs are kept separate from the baseline	
Savings estimates	Unchanged from original estimates for ENERGY STAR homes	Update with new values from upcoming impact evaluation
CFL costs	$5 replacement cost for consumers, $3 for builders	Update using current cost data. Recommend $3 for consumer cost, $1.5 for builder cost.
Heating and cooling types	Values based on NPPC estimates	Update using data from ENERGY STAR Homes database.
Duct test impacts	Old values integrated into HVAC impact estimates (no detail included in documentation).	Use latest information on duct impacts from this evaluation.
Costs for 'non-savings' measures	Costs for measures that do not contribute to savings are included as part of incremental costs	Set costs for 'non-savings' measures equal to zero
Annual O&M costs	$3.20 for CFL replacement	Set O&M costs to zero
Certification costs	Not included in net benefit calculation	Certification costs should be added to the incremental costs of an ENERGY STAR home
Documentation	General documentation included in Model Assumptions report	Additional detail should be added for the savings and cost values for each ENERGY STAR home component.

The main issues resulting from this review are discussed below.

- **Savings values reviewed and appear to be generally consistent with secondary sources.** A cursory review of the savings values for the major ENERGY STAR components was completed and found that the per unit savings values for lighting, duct tests, insulation, HVAC, and appliances were generally consistent with those found in existing data sources such as the RTF and the

DEER database used in California. As a detailed impact evaluation for the ENERGY STAR Homes program is planned for 2008, a more extensive analysis of the savings values was not conducted as part of the current evaluation.

- **CFL costs should be revised downward.** The ACE Model assumes a customer cost of $5 per CFL and this cost is kept constant throughout the model time horizon (through 2015). Current data from NEEA's evaluation of the residential lighting market indicate that customer costs average about $4 per CFL. Furthermore, this cost should continue to decline in future years. If a single CFL cost number is to be used for all years, we recommend that a value of $3 per CFL be used for customer costs and $1.50 per CFL be used for builder costs.

- **Incremental costs should be updated.** In addition to CFL costs, some of the other incremental cost values should be updated. The RTF will be updating its incremental cost estimates for measures later in 2007 and we recommend that these updated numbers be incorporated into the ACE Model once available.

- **Distribution of heating and cooling types should be updated.** The model assumes a distribution of heating and cooling types based on information from the Northwest Power Planning Council and has been updated with program data. The ENERGY STAR Homes database also tracks this information for certified homes and homes in process of being built. Table 85 compares the distribution calculated by ECONorthwest based on certified and in process homes (through 2006) with the current distribution assumption used in the ACE model.

Table 85: Distribution of Heating Types for ENERGY STAR homes

	Heat Pump	Zonal (No AC)	Gas + AC	Gas (No AC)	Total
ACE Model	9.5%	4.8%	35.9%	49.8%	**100%**
ENERGY STAR Homes Data	12.5%	1.9%	27.9%	57.6%	**100%**

The new distribution results in only a small change in total household savings (1,451 kWh relative to the original estimate of 1,453 kWh savings annually). Nevertheless, we recommend that the ACE model distributions be updated each year using the tracking data on ENERGY STAR Homes.

- **Latest duct test impacts should be incorporated into the savings estimates.** The current documentation states "Embedded within the underlying savings estimates for both heat pumps and gas furnaces is an estimate of the duct system efficiency improvement that is calculated directly by the engineering simulation model." (page 14). A similar comment is made for cooling. Additional details on how the duct test improvements are used in the savings calculations are not provided.

An impact evaluation for this program is currently planned for 2008 and presumably additional work on the duct impacts will be done as part of this effort and be incorporated into the ACE model. If this does not occur, we recommend that the results of duct impact analysis done for the current evaluation be incorporated into the ACE model savings estimates.

- **Cost data for "non-savings" measures should be set to zero if these measures are being considered as part of the baseline.** Page 17 of the documentation states that "the capital cost of ESHNW was unchanged from the 2004 MAR even though there are a number of measures which are no longer counted as contributing to savings. Measures in this category include ENERGY STAR Windows, ENERGY STAR Dishwashers, SEER 13 air-conditioning and heat pump incremental cost to go from base level of HSPF 6.8 even though the savings analysis now assumes a base case HSPF of 7.7."

  While these assumptions result in a more conservative estimate of cost effectiveness (since costs for these measures remain unchanged rather than decreasing to reflect actual market conditions), we recommend that the costs be revised down to reflect actual market conditions. If the measures listed above are now considered standard (and therefore part of the baseline), then the incremental cost should be zero for these measures in the ACE Model.

- **Annual O&M costs should be reviewed and possibly removed from the model.** The current model assumes $3.20 in annual O&M costs which are due to the higher costs associated with replacing CFLs relative to incandescents (page 18). It seems that these costs are already included in the NPV costs for ENERGY STAR homes that account for the replacement of all the high efficiency components over the 70-year life of the home (page 17). If CFL replacement costs are already included in the NPV cost calculation, then the O&M costs should be set to zero to avoid double-counting these costs.

- **More complete documentation of sources for costs and savings values should be included in the ACE Model Assumptions write-up.** Currently the ACE Model consists of an Excel file that performs the benefit-cost calculations and a Word file that discusses the various calculations. From an evaluation standpoint, it would be useful to have more detail included in the Word document for the various measures included in the calculations. At a minimum, this would include the per unit cost and savings values for each of the ENERGY STAR Homes components, the source for each value, and an indication of the last time each parameter was reviewed and updated.

- **Cost of ENERGY STAR certification should be included in the ACE Model.** Currently the costs of ENERGY STAR certification (several hundred dollars on average per home) is not included as a cost in the ACE Model. The certification

cost should be added to the model as it is one of the incremental costs associated with an ENERGY STAR home.

- **Change "Net-to-Gross Ratio" adjustment label to "Retention" for CFL measures.** Currently the documentation uses an adjustment factor to account for the fact that some homeowners remove (and do not replace) CFLs and CFL fixtures. The adjustment factor is incorrectly labeled as a net-to-gross ratio and should be renamed as a retention adjustment. The primary components of the net-to-gross ratio (free ridership and spillover) are not included in the current factor. Furthermore, both free ridership and spillover are already accounted for in the baseline and therefore there is no need for an additional adjustment.

7. CONCLUSIONS AND RECOMMENDATIONS

The evaluation findings presented in this MPER are used to draw the following conclusions that relate to each of the short-term market progress indicators established by NEEA for the ENERGY STAR Homes program.

1. ***Market Indicator****: Builders use the ENERGY STAR label to differentiate themselves in the marketplace*

Evaluation Finding: Builders are clearly beginning to perceive the benefits of using the ENERGY STAR label to differentiate themselves in the market. From the builder phone survey, 60 percent of builders in 2007 indicated that product differentiation was a benefit of the ENERGY STAR label compared with only 27 percent citing this in 2004. Of those builders participating in the program, 79 percent said that they actively promoted the fact that their homes had the ENERGY STAR label. Among recent ENERGY STAR homebuyers, 46 percent indicated that the builder or sales rep discussed the energy saving features of the ENERGY STAR home during their home search.

2. ***Market Indicator****: Consumers, builders, and other market actors link ENERGY STAR homes and home quality/value.*

Evaluation Finding: Both builders and homebuyers are beginning to make the connection between the ENERGY STAR label and home value. Similarly, 70 percent of the builders we surveyed agreed with the statement that the ENERGY STAR label makes homes more marketable and 56 percent agreed with the statement that ENERGY STAR homes sell for a higher price. Among recent homebuyers that purchased an ENERGY STAR home, 69 percent linked the ENERGY STAR certification to energy savings, which was double the percentage from the 2004 survey of homebuyers. Realtors and sales reps that we talked to also indicated that ENERGY STAR homes sell at a slight premium. When homebuyers were given a description of what the ENERGY STAR label represents for new homes, they stated that they would have paid an additional $7,173 had their home been ENERGY STAR certified.

3. ***Market Indicator****: Builders are convinced of the long-term cost savings from reductions in callbacks that should result from performance testing and quality assurance practices;*

Evaluation Finding: In the phone survey, there was not a significant difference among builders that listed reduced callbacks as a benefit (12 percent in 2004, 24 percent in 2007). The benefit of knowing that the HVAC installation is done correctly, however, is widely perceived by builders to be a benefit. In the 2007 survey, 61 percent mentioned this as a benefit, which is significantly greater than the 26 percent observed in the 2004 survey. Since there will be fewer callbacks with an HVAC system installed correctly, the program is making progress in this area among builders. Additionally, 46 percent of the participating builders we interviewed said that they do performance testing in their non-ENERGY STAR homes also, which further demonstrates the value some builders place

on having these tests done. While these responses show some improvement, the number of builders indicating that there are no benefits to duct testing remained basically unchanged from the 2004 survey.

4. ***Market Indicator**: Increased awareness by builders and subcontractors of key efficiency and quality issues;*

Evaluation Finding: Builder awareness of duct testing is statistically unchanged from 2004 at 60%. In 2007, 18 percent of the builders indicated that they do have duct tests performed on the homes they build. Additionally, ENERGY STAR builders are also beginning to have their non-ENERGY STAR homes duct tested (58 percent of these homes on average), which suggests that there may be some spillover benefits as a result of the program.

While awareness has been maintained and builders do acknowledge potential benefits of duct testing, it is seldom promoted to homebuyers as a benefit. There was also no change across surveys in the number of builders mentioning ducts when asked about which home components are significant for reducing energy use in the home. Additionally, only 18 percent of builders agreed with the statement that customers understand the benefits of duct testing.

5. ***Market Indicator**: Other market actors and trade allies are spending their own resources marketing ENERGY STAR Homes and matching NEEA investments;*

Evaluation Finding: Of the participating builders we surveyed in 2007, 55 percent indicated that they use only their own resources to promote their ENERGY STAR homes.

6. ***Market Indicator**: Builders and their subcontractors have expanded knowledge and skills necessary to treat key energy efficiency and quality issues, particularly performance testing of HVAC ducts and equipment.*

Evaluation Finding: For builders that have duct tests performed, 87 percent reported no problems with the tests in the 2007 builder survey. This is an improvement over the 52 percent that said the same thing in the 2004 builder survey.

7. ***Market Indicator**: Increasing recognition of the ENERGY STAR label and understanding what it means for new homes.*

Evaluation Finding: Builder awareness of the ENERGY STAR label for homes has increased from 56 in 2004 to 69 percent in 2007. Similarly, homebuyer awareness of the ENERGY STAR Homes label also increased from 19 in 2004 to 32 in 2007. In 2007, most homebuyers (69 percent) also linked the ENERGY STAR homes label to energy efficiency, which was an increase over the 35 percent observed in the 2004 homebuyer survey. Half of the homebuyers (50 percent) also rated the ENERGY LABEL as "extremely valuable," giving it a 5 on a 5-point scale.

In addition to these findings that relate to specific market indicators set up for the program, there are additional conclusions that can be drawn from the latest evaluation research:

- **ENERGY STAR Homes achieved a 3 percent market share in 2006.** Based on program participation and market data, the market share for certified ENERGY STAR Homes was 3 percent. This can be increased in future program years if the program can make progress in meeting its goals for Washington.

- **Lighting measures are being retained in ENERGY STAR homes.** Based on the ENERGY STAR Homes on-site audit data, 50 percent of the lighting sockets had ENERGY STAR lighting in the homes inspected. While some homeowners had replaced their CFLs with incandescents, others had replaced incandescents with CFLs. Among all lighting replacements in the home, 67 percent resulted in ENERGY STAR lighting being installed (33 percent involved installing incandescents). The end result is that there has been no net loss of ENERGY STAR lighting after the homeowners occupied the homes.

- **The program is having a positive impact on builder attitudes toward duct testing.** As discussed above with the market progress indicators, builders are showing positive signs that they are beginning to understand the benefits of duct testing. Of the builders we surveyed in 2007, 18 percent said that they have duct tests performed and ENERGY STAR builders stated that they also perform duct tests on over half of their non-ENERGY STAR homes. The fact that the duct test provides a means to verify that the HVAC installations are done correctly was also a commonly cited benefit among builders and has increased significantly from the 2004 survey. The vast majority of builders that do duct tests (87 percent) indicated that they had no problems with the tests, which was also a significant improvement over the 2004 results.

- **ENERGY STAR Homes have significantly less leakage compared with the average new home in the region.** Based on analysis of duct test results from ENERGY STAR homes and the general new home population study conducted by RLW, ENERGY STAR homes have significantly less leakage than the regional average. This indicates that the duct test requirement of the program is resulting in a significant improvement in energy usage for these homes.

- **Lack of information is the most common reason given by builders for not participating in the ENERGY STAR Homes program.** Among nonparticipating builders, 31 percent said they did not participate because they do not have enough information, or have not been presented with information that compelled them to participate. In addition, 26 percent cited added price of the home as a reason for not participating. Not surprisingly, builders most commonly cited the need for additional information (56 percent) and cost effectiveness (38 percent) as requirements before they would participate in the ENERGY STAR Home program.

- **Overall, satisfaction with ENERGY STAR Homes program is high for both builders and homebuyers.** Seventy-one percent of the builders indicated that they were either extremely or somewhat satisfied with the program overall. Participants were equally satisfied with the ease of participation, and generally satisfied with the certification and verification process. Similarly, 63 percent of ENERGY STAR homeowners responded that they were "extremely satisfied" with their ENERGY STAR home.

Based on the evaluation results presented in this MPER, we offer the following recommendations for the ENERGY STAR Homes Northwest Program:

- **Marketing and program support for builders in Washington should be increased.** Given Washington's share of the new home construction market, the program needs to focus its efforts in that state (particularly the I-5 corridor) in order to increase ENERGY STAR homes production and meet program goals. Marketing in this area should become a priority for the program.

- **More hands-on support of builders and verifiers needed at the beginning of the participation process.** Among participating builders that had yet to build an ENERGY STAR home, lack of contact with the program or verifier was cited as a reason for the delay. Increasing support to builders during recruiting and during the initial building phase will help address both these issues. The QA specialists we spoke with also indicated a need for better training among the verifiers, particularly now that more verification is required with the growth of the program.

- **Provide additional education and marketing support for ENERGY STAR homes.** Marketing support was the most common response given by builders regarding what they would change about the program and the satisfaction ratings for co-op advertising were low relative to builder satisfaction with other program elements. Realtors also indicated that they could benefit from additional training on how to sell ENERGY STAR homes. And while homebuyer awareness of the ENERGY STAR Homes label has been increasing, it remains low. All of these factors indicate a need for more marketing support for ENERGY STAR homes.

- **Permanent ENERGY STAR label needed for homes.** One realtor stressed that this would help make these homes more marketable and increase their resale value. A permanent label should also help instill a sense of value in these homes among ENERGY STAR homeowners and help distinguish the ENERGY STAR label from other programs. As has been mentioned in prior MPERs, the final certification should be completed and ENERGY STAR label installed prior to the homeowner occupying the home.

- **Program database needs to be updated regularly.** The QA process relies on the database to conducts its reviews and therefore requires up to date status information on homes. Complete builder contact information should also be

required in the database to facilitate QA appointments and conducting random samples for evaluation and auditing. Not having up-to-date information inhibits the ability of the program to conduct the final verification and install an ENERGY STAR label on the home prior to the customer moving in.

- **Communicate onsite audit findings on lighting to builders.** Lighting is sometimes mentioned by builders as a barrier for their participating in the program. Information from the on-site audits that show very high retention levels for CFLs should be used to help address this concern among builders during the recruitment phase.

- **Update ACE Model assumptions.** In particular, the ACE model should be updated using the new savings values that will be produced in the upcoming impact evaluation for this program. These new impacts should be discussed in detail in the ACE Model documentation for this program. (Additional minor recommendations are discussed in Chapter 5 of this report.)

APPENDIX A: GLOSSARY

Annual Fuel Utilization Efficiency (AFUE). A numeric efficiency rating for furnaces. An AFUE rating of 0.90 or higher for gas furnaces and 0.80 for propane heating is needed to qualify for the ENERGY STAR Homes program.

Air Changes per Hour (ACH). Refers to the number of times air is circulated within a home within an hour. Minimum levels are established to help combat mold due to tight building envelopes required for efficient homes.

Builder Option Package (BOP). A specified list of measures and building practices that builders can follow to build an ENERGY STAR-qualifying home.

Building Outreach Specialist (BOS). A representative of the program that recruits builders and provides technical assistance.

Compact fluorescent light (CFL). A type of lightbulb that is more energy efficient than a regular incandescent bulb and has a longer equipment life. A CFL often has a distinctive twisted design.

CFL fixture. A lighting fixture where only CFL lamps can be used. These fixtures usually require pin-based CFL lamps so that the bulb cannot be swapped out for incandescent bulbs.

Conservation Services Group (CSG). One of the companies implementing the ENERGY STAR Homes program, under the direction of the prime contractor PECI.

Duct Test. General term referring to either a duct blaster test (where only the ductwork is tested for leaks) or a blower door test (where the whole house is tested for leaks).

Earth Advantage. A sustainable buildings program originally created by Portland General Electric.

Energy Factor (EF). An EF value shows the efficiency of water heaters. For gas water heaters, an EF of 0.60 or better is required, while electric water heaters require an EF of 0.93 or better.

Energy Trust of Oregon (ETO). Energy Trust of Oregon implements energy efficiency programs in Oregon using public benefits funds collected from several utilities. Energy Trust of Oregon also helps sponsor and implement NEEA's ENERGY STAR Homes Program within Oregon.

HVAC. Refers to heating, ventilation, and air conditioning systems and is used as a generic term for heating and cooling equipment.

Heat Pump. A type of air conditioner that will also provide heat during the winter.

Heat Recovery Ventilator (HRV). An HRV provides an efficient method for bringing in fresh air into a building while removing stale air. The HRV will preheat the incoming air in the winter and cool the incoming air in the summer.

Home Performance Specialist. The job title used for verifiers in Idaho.

Heating Seasonal Performance Factor (HSPF). A measure of efficiency for heat pumps. The ENERGY STAR Homes program requires an HSPF of 8.0 or better to qualify for the program.

Market Progress Evaluation Report (MPER). MPER is the acronym used by NEEA for all its evaluation reports.

NCAT. National Center for Appropriate Technology is located in Montana and promotes energy efficiency and appropriate uses of technology for low income communities. Also serves as the SCO for the ENERGY STAR Homes program in Montana.

NEEA. The Northwest Energy Efficiency Alliance is the agency sponsoring the ENERGY STAR Homes Program. See the website www.nwalliance.org for more detailed information.

Performance Testing. A more general term used for duct testing and could involve a duct blaster and/or a blower door test.

Portland Energy Conservation, Inc. (PECI). PECI is the company that has been hired by NEEA to implement the ENERGY STAR Homes Program for NEEA.

Quality assurance (QA) specialist. A quality assurance specialist works for the State Certifying Organization to monitor and verify the work completed by the verifiers.

RESNET. A national non-profit organization devoted to creating consistent national standards for energy efficiency ratings. RESNET developed the Home Energy Rating System (HERS) rating for homes.

State Certifying Organization (SCO). An SCO is the agency that provides the final certification for an ENERGY STAR Home.

State Energy Office (SEO). An SEO is the state government office in charge of energy issues for the state (such as the Oregon Department of Energy). In the case of Oregon and Idaho, the SEO is also the SCO for ENERGY STAR homes within the state.

Seasonal Energy Efficiency Rating (SEER). A numeric rating system for air conditioner and heat pump efficiency. A SEER rating of 13 is required by the ENERGY STAR Homes program.

Technical Compliance Option (TCO). A TCO are additional specifications within a BOP that allow for different equipment to be installed and still meet the ENERGY STAR Homes specification requirements.

Verifier. A verifier provides third-party verification that the requirements for an ENERGY STAR home are being met.

APPENDIX B: ENERGY STAR HOMES NORTHWEST SPECIFICATIONS

Table 86 provides a summary of the two prescriptive Builder Options Packages (BOPs) for single-family, site-built homes. The ENERGY STAR Homes Northwest package was designed to include efficiency measures that would result in a level of performance that was a minimum of 15 percent better than that required by codes in the region. It is also designed to include efficiency improvements in all major end-uses including space heating and cooling, water heating, lighting, and appliances. Testing the HVAC and duct systems for leaks is also required using ENERGY STAR Northwest performance testing specifications. Finally, the requirements were designed to maximize the marketing impact by linking to as many ENERGY STAR branded components as possible, from the heating and cooling system to lighting and appliances.

Table 86. ENERGY STAR Homes Northwest Technical Specifications

Component	BOP 1 (Heat Pump/Gas Furnace)	BOP 2 (Zonal Electric/Propane)
Ceiling	R-38 Std	R-38 Std
Wall	R-21 Std.	R-21 Std. + 2.5
Floor Insulation	R-30	R-30
Unheated Slab Below Grade	R-10	R-10
Windows	U-0.35	U-0.30
Heating System	8.0 HSPF 0.90 AFUE	N/A / 0.80 AFUE
Ventilation System	Central Exhaust	HRV 70%
Air Conditioning System	SEER 13	SEER 13
Duct Insulation	R-8	Electric: N/A Propane: R-8
Duct Sealing	Mastic	Electric: N/A Propane: Mastic
Duct Tightness	< 0.06 CFM per ft^2 Floor OR 75 CFM Total @ 50 Pa	Electric N/A Propane: same as BOP1
Envelope Tightness	7.0 ACH @ 50 Pa	2.5 ACH @ 50 Pa
Water Heating	Electric 0.93 EF / Gas 0.60 EF / (> 60 gal.)	Electric 0.93 EF / Gas 0.60 EF / (> 60 gal.)
Appliances	All built-ins are ENERGY STAR	
Lighting	> 50% of sockets either ENERGY STAR lamps or fixtures	

To further increase the flexibility of these requirements, there are also several Technical Compliance Options (TCO) that are allowed within each of the two BOPs:

- TCO #1 substitutes perimeter insulation for floor insulation in homes with crawlspaces.
- TCO #2 replaces the SEER 13 air conditioning unit with a SEER 12 unit in exchange for additional upgrades in the building shell or equipment.

- TCO #3 utilizes the U.S. EPA's Advanced Lighting Package[8] in place of the current BOP standard.

- TCO #4 allows for a gas hydronic heating system for use with BOP #1 and includes several modifications to the efficiency requirements for water heating and insulation depending on the type of system.

- TCO #5 allows for an electric hydronic heating system for use with BOP #2 and includes several modifications to the efficiency requirements for water heating and insulation depending on the type of system.

- TCO #6 allows for U-value trade-offs within BOP #1.

- TCO #7 allows for U-value trade-offs within BOP #2.

- TCO #8 allows for trade-offs between hot water heater efficiency and insulation requirements.

- TCO #9 provides for hybrid gas unit heaters with electric resistance zonal heating.

- TCO #10 allows for hybrid "ductless split" heat pumps with electric resistance zonal heating

- TCO #11 provides for propane furnaces (90 AFUE minimum)

These TCOs help the program to include a greater range of equipment options, many of which are driven by alternative building practices.

[8] The U.S. EPA Advanced Lighting Package requires that 50 percent of high-use rooms and outdoor lights must have ENERGY STAR fixtures. In addition, all ceiling fans must be ENERGY STAR and 25 percent of medium-use and low-use rooms must have ENERGY STAR fixtures.

APPENDIX C: SURVEY INSTRUMENTS / INTERVIEW GUIDES

BUILDER PHONE SURVEY

February 2007

Hello, my name is _____ with Itron, an energy market research firm based in Berkeley, California. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand the market for energy-saving features in the new home construction market. Could I speak to _____ or could I speak to the person responsible for making design and construction decisions affecting energy use of the homes you build?

[WHEN CORRECT PERSON IS ON-LINE:]
Hello, my name is _____ and I'm calling from Itron, an energy market research firm based in Berkeley, California. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand the market for energy-saving features in the residential new home construction market. Can I confirm that you're the person responsible for making design and construction decisions affecting energy use of the homes you build?

Yes	[CONTINUE]
No/DK	[ASK TO SPEAK WITH CORRECT PERSON, OR TERMINATE]
Refused	[TERMINATE]

This survey is important for our ability to make our construction programs as useful as possible to builders like yourself. Our survey will take about 15 minutes and all your answers are held confidential and we never link any information to a particular person or company.

Is now a good time?

Yes	[CONTINUE]
No	[SET UP CALLBACK]
DK/refused	[TERMINATE]

I. Background / Firmographic Information

Q 1. How many new homes did you build in 2006?

1) Number built_____
88) Don't know
99) Refused

Q 2. Of the homes built in 2006, what percentage were built inside the states of Washington, Oregon, Idaho, and Montana?

1) Percent within states_____
88) Don't know
99) Refused

Q 3. And of those homes inside these states, what percentages are:

1) Single family detached (If 0, TNT)
2) Single family attached (duplex, townhouse, rowhouse)
3) Multifamily

88) Don't know
99) Refused

Q 4. What is the approximate price range of the homes you build? (READ LIST)

1) Give Range:_____
88) Don't know
99) Refused

Q 5. What percent of your homes are "spec" built or have been almost completely built without the customer's direct involvement.

1) Percent _____
88) Don't know
99) Refused

Q 6. Do you sell your homes through your own sales representatives, or through real estate agents?

1) Sales reps
2) Real estate agents
3) Both
4) Other, please specify:_____
89) Don't know
99) Refused

Q 7. What is the most important method you use to promote your home?

1) Newspaper ads
2) TV/Radio
3) Real estate ads
4) Outdoor signs
5) Model homes
6) Brochures / Sales materials
7) Internet
8) Other_____
88) Don't Know
99) Refused

II. Awareness/Knowledge/Participation in ES Homes Program

Next I would like to ask you about energy efficiency and its role in your business.

Q 8. What components of the home do you consider most important for reducing home energy consumption? [DO NOT READ; ACCEPT MULTIPLE RESPONSES; MARK CHOICE THAT IS FIRST MENTION.]

1) Air conditioner/HVAC
2) Construction tightness, air seal, building envelope (not window envelope)
3) Appliances
4) Clock thermostat
5) Daylighting
6) Ducts – tight ducts, insulated ducts
7) Fans (attic, whole-house)
8) Furnace
9) Using more gas or electric
10) Heat pump
11) Insulation (Roof)

12) Insulation (Walls)
13) Windows
14) Lighting
15) Water Heater
16) Whole-house Design
17) Other _____
88) Don't Know
99) Refused

Q 9. Have you ever heard of the ENERGY STAR label for new homes?
1) Yes
2) No (Skip to Q 24)
88) Don't know (Skip to Q 24)
99) Refused (Skip to Q 24Q 10. To the best of your knowledge, what do you believe are the primary benefits **to the builder**, if any, of building ENERGY STAR Homes? (DO NOT READ. ACCEPT MULTIPLE RESPONSES)
1) Marketing/ Product differentiation
2) Higher quality
3) Higher price
4) Sells faster
5) Rebate from utility
6) Promotion assistance
7) Reduced callbacks
8) Other, please specify:_____
88) Don't know
99) Refused

Q 11. Please tell me how much you agree or disagree with each of the following statements. Would you say that you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, or strongly disagree that: [RANDOMIZE].

The ENERGY STAR label makes homes more marketable to homebuyers
ENERGY STAR-certified homes tend to be higher quality overall
ENERGY STAR-certified homes sell faster than non-ENERGY STAR homes
ENERGY STAR-certified homes sell for a higher price than non-ENERGY STAR homes
Builders of ENERGY STAR homes enjoy a competitive advantage in the market
Homes built to code are energy efficient enough
Homebuyers ask for ENERGY STAR Homes.

Q 12. Are you currently participating in the ENERGY STAR Homes program?
1) Yes
2) No (Skip to Q 20)
88) Don't know (Skip to Q 20)
99) Refused (Skip to Q 20)

Q 13. How many ENERGY STAR homes did you build in 2006?
1) Number of homes:_____
88) Don't know
99) Refused

Q 14. And how many ENERGY STAR homes do you plan to build in 2007 ?
1) Number of homes:_____(IF GREATER THAN ZERO, SKIP TO Q 16)
88) Don't know
99) Refused

Q 15. What is the primary reason that you are not planning on building any ENERGY STAR homes in 2007? (DO NOT READ. ACCEPT MULTIPLE ANSWERS)

1) Adds to home price
2) Don't want to have performance tests
3) Too much hassle
4) Process delays construction
5) Customers don't want it
6) Already build to ENERGY STAR standard, don't need label
7) Other (SPECIFY):_____
88) Don't know
99) Refused

Q 16. Do you offer ENERGY STAR as an optional feature for the homes you build, or are all your homes ENERGY STAR?

1) ENERGY STAR offered as an option
2) All homes built are ENERGY STAR
88) Don't know
99) Refused

Q 17. Do any of the homes you build exceed the ENERGY STAR requirements?

1) Yes
2) No (SKIP TO Q 19)
88) Don't know (SKIP TO Q 19)
99) Refused (SKIP TO Q 19)

Q 18. How specifically do you exceed the ENERGY STAR REQUIREMENTS:

1) Specify:_____
88) Don't know
99) Refused

Q 19. How much more, if at all, does it cost you to build an ENERGY STAR home compared to a regular home?

1) Specify amount_____(SKIP TO Q 24)
2) No additional cost (SKIP TO Q 24)
3) ENERGY STAR home cost less than regular home (SKIP TO Q 24)
88) Don't know (SKIP TO Q 24)
99) Refused (SKIP TO Q 24)

Q 20. [IF Q 12= 2, 88, or 99]: Have you ever been approached about participating in the ENERGY STAR homes program?

1) Yes
2) No (SKIP TO Q 22)
88) Don't know (SKIP TO Q 22)
99) Refused (SKIP TO Q 22)

Q 21. Who approached you about participating in the ENERGY STAR homes program?

1) (SPECIFY):_____
88) Don't know
99) Refused

Q 22. Why don't you participate in the ENERGY STAR program for the homes you build? (DO NOT READ, ACCEPT MULTIPLE ANSWERS)

1) Adds to home price

2) Don't want to have performance tests
3) Too much hassle
4) Process delays construction
5) Customers don't want it
6) Already build to ENERGY STAR standard, don't need label
7) Hadn't heard about it
8) Plan to begin building ENERGY STAR homes
9) Other (specify)_____
88) Don't know
99) Refused

Q 23. What would it take for you to begin offering ENERGY STAR home as an option in the homes you build?

1) Get verbatim response:_____
88) Don't know
99) Refused

Q 24. What energy efficiency programs for residential new construction, if any, are you participating in at present? What programs have you participated in the past?

	Present	Past
1) Earth Advantage		
2) Built Green		
3) Environments For Living		
4) Super Good Cents		
5) Other (specify)		
88) Don't know		
99) Refused		

III. Building Practices/Components: Awareness, Knowledge, Practices, Perceptions

Next I want to ask you about some of your standard practices regarding specific home features.

Heating and Cooling

The next set of questions refers to high efficiency heating and cooling equipment. For gas heating, "high efficiency" is defined as having an AFUE rating of 90 or higher. With an electric heat pump, "high efficiency" is defined as having an HSPF rating of 8.5 or higher. With a propane or oil furnace, "high efficiency" is defined as having a AFUE rating of 80 or higher. For cooling, "high efficiency" is defined as the air conditioner having a SEER rating of 13.0 or higher.

IF NO ENERGY STAR HOMES, SKIP NEXT 2 QUESTIONS

Q 25. Which of the following types of heating systems do you install in the ENERGY STAR homes you build? [READ and CHECK ALL THAT APPLY]

1) High efficiency gas (AFUE 90 or higher)
2) Electric Resistance
3) High Efficiency Heat Pump (HSPF of 8.0 or higher)
4) Do not build any ENERGY STAR homes [DO NOT READ]
88) Don't know
99) Refused

Q 26. Which of the following type of cooling systems do you install in the ENERGY STAR homes you build? [READ LIST and CHECK ALL THAT APPLY]

1) High Efficiency Heat Pump (SEER 13.0 or higher)
2) High efficiency air conditioner (SEER of 13.0 of higher)
3) No cooling system
4) Do not build any ENERGY STAR homes [DO NOT READ]
88) Don't know
99) Refused

ASK EVERYONE

Q 27. Which of the following types of heating systems do you install in the [IF ENERGY STAR HOMES: non-ENERGY STAR] homes you build? [READ and CHECK ALL THAT APPLY]
1) Only build ENERGY STAR homes (DO NOT READ)
2) Standard efficiency gas
3) High efficiency gas (AFUE 90 or higher)
4) Electric Resistance
5) Standard Efficiency Heat Pump
6) High Efficiency Heat Pump (HSPF of 8.0 or higher)
7) Hot water heating
8) Gas/oil fired boiler
9) Wood burning stove
10) Other, please specify:_____
88) Don't know
99) Refused

Q 28. Which of the following types of cooling systems do you install in the [IF ENERGY STAR HOMES: non-ENERGY STAR] homes you build? [CHECK ALL THAT APPLY
1) Only build ENERGY STAR homes (DO NOT READ)
2) Standard Efficiency Heat Pump
3) High Efficiency Heat Pump (SEER 13.0 or higher)
4) Standard Efficiency air conditioner
5) High efficiency air conditioner (SEER of 13.0 of higher)
6) Room air conditioners only
7) No cooling system
88) Don't know
99) Refused

IF HIGH EFFICIENCY IN Q 27 AND Q 28, THEN SKIP TO Q 30.
Q 29. Why don't you install high efficiency heating and cooling equipment in the homes you build [Do NOT READ. CHECK ALL THAT APPLY]?
1) Cost
2) Install high efficiency heat, but customers don't demand cooling
3) Customers don't demand it
4) Poor equipment performance/reliability
5) Energy savings not high enough to justify extra cost
6) Other, please specify:_____
88) Don't know
99) Refused

Lighting

The next set of questions refers to high efficiency lighting. For these questions, "high efficiency" is defined as any fixtures or lamps with the ENERGY STAR label. This includes various types of compact fluorescent light bulbs (CFLs) and dedicated CFL fixtures that use only fluorescent light bulbs, and any fixtures and lamps with the ENERGY STAR label.

Q 30. Which of the following types of lighting, if any, do you install in the [IF ENERGY STAR HOMES: non-ENERGY STAR] homes you build? [READ LIST AND CHECK ALL THAT APPLY]

1) Compact fluorescent light bulbs (CFLs)
2) Dedicated compact fluorescent fixtures
3) Halogen lighting
4) T-5's (long slender fluorescent tubes)
5) T-8's (long slender fluorescent tubes)
6) T-12's (long slender fluorescent tubes)
7) Other, please specify:_____
88) Don't know
99) Refused

Q 31. Have you ever had any problems with the availability of ENERGY STAR light bulbs or fixtures through your regular electrical suppliers?

1) No
2) Yes, bulbs
3) Yes, lighting fixtures
4) Yes, both CFL bulbs and fixtures
5) Other, please specify:_____
88) Don't know
99) Refused

Q 32. Why don't you install ENERGY STAR lighting in the homes you build [DO NOT READ. CHECK ALL THAT APPLY]?

1) All homes are ENERGY STAR
2) Adds too much to home price
3) Bulbs burn out
4) Can't find fixtures
5) Poor light quality / weak light
6) Customers don't demand it
7) Equipment problems with fixtures
8) Energy savings not high enough to justify extra cost
9) Other, please specify:_____
88) Don't know
99) Refused

Q 33. Are there specific performance problems with either compact fluorescent light bulbs or fixtures that keep you from using them in the homes you build? [PROBE FOR PROBLEMS WITH BOTH CFL LIGHT BULBS AND FIXTURES.]

1) Yes (Specify:_____)
2) No
88) Don't know
99) Refused

Duct Testing and Sealing

Q 34. Are you familiar with duct tightness testing and duct sealing for new homes?

1) Yes
2) No (SKIP TO Q 42)
88) Don't Know (SKIP TO Q 42)
99) Refused (SKIP TO Q 42)

Q 35. Do you have duct tightness tests performed for the homes you build?

1) Yes
2) No, (Skip to Q 40)
3) Sometimes
4) Do for ENERGY STAR Homes only (Skip to Q 37)
88) Don't know (Skip to Q 40)
99) Refused (Skip to Q 40)

Q 36. [For non-ENERGY STAR builders] What percentage of your homes are duct tested?
[For ENERGY STAR builders] What percentage of your non-ENERGY STAR homes are duct tested?

1) Percentage of homes_____
88) Don't know
99) Refused

Q 37. Who performs the duct testing for your homes?

1) HVAC contractor
2) Third Party Consultant
3) Utility staff
4) Alliance / program staff
5) Other, please specify:_____
88) Don't know
99) Refused

Q 38. What problems, if any, have you experienced with duct testing?

1) Time consuming
2) Tests inaccurate, do not reflect actual equipment performance
3) Too expensive
4) Delays in scheduling testers
5) Testers not available in area
6) Lack of competence among testers
7) Other, please specify:_____
8) No problems
88) Don't know
99) Refused

Q 39. What do you view as the benefits **to the builder**, if any, of duct testing and sealing [DO NOT READ LIST]

1) Reduced callbacks (liability, warranty issues)
2) Verification that HVAC done correctly
3) Verification that ducts do not leak
4) Catches some problems before customer moves in
5) Other, please specify:_____
6) No benefit
88) Don't know
99) Refused

[IF Q 35 = 1,3,4 THEN SKIP TO Q 41]
Q 40. Why don't you have the ducts tested in the homes you build?

1) Time consuming
2) Tests inaccurate, do not reflect actual equipment performance

3) Too expensive
4) Not worth hassle
5) Customers do not consider testing valuable
6) Delays in scheduling testers
7) Testers not available in area
8) Certified testers not available in my area
9) Lack of competence among testers
10) Other, please specify:_____
11) No problems
12) Don't know who to call
13) Not familiar with duct testing
88) Don't know
99) Refused

Q 41. Do you expect duct testing to become standard practice?

1) Yes
2) No
88) Don't know
99) Refused

IV. Participant Attitudes and Marketing Practices

Ask the following questions only for ENERGY STAR Homes program participants

Q 42. Please tell me how much you agree or disagree with each of the following statements. Would you say that you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, or strongly disagree with the following statements [RANDOMIZE ORDER]:

Q 42a) Homebuyers understand the benefits of the ENERGY STAR label
Q 43b) Homebuyers understand the value of duct testing and duct sealing
Q 44c) Homebuyers link the ENERGY STAR home label with home value
Q 45d) Homebuyers link the ENERGY STAR label with home comfort
Q 46e) The certification process for ENERGY STAR homes does not delay home construction
Q 47. Do you actively promote the fact that your homes are ENERGY STAR?
1) Yes
2) No (Skip to Q 47)
88) Don't know (Skip to Q 47)
99) Refused (Skip to Q 47)

Q 48. What specific BENEFITS, if any, do you promote about your ENERGY STAR homes?
1) Energy savings
2) Better air quality
3) Increased comfort
4) Overall Construction
5) Other (Specify):_____
6) Don't promote any particular benefit, just general ENERGY STAR label
7) Do not promote
88) Don't know
99) Refused

Q 49. And based on your experience, which energy saving features are most marketable to consumers? [DO NOT READ; CIRCLE ALL; MARK CHOICE THAT IS FIRST MENTIONED.]
1) High-efficiency HVAC system

2) High-efficiency appliances
3) Clock thermostat
4) Daylighting
5) Ducts – sealing, testing, insulation
6) Fans (attic, whole-house)
7) Furnace
8) Heat fuel choice
9) Heat pump
10) Roof insulation
11) Wall insulation
12) High-efficiency windows
13) Energy Star lighting
14) High-efficiency water heater
15) Whole-house design
16) Air Exchanger
17) Tight Construction
18) None
19) Other (Specify):_____
88) Don't Know
99) Refused

Q 50. From whom do you receive financial assistance for marketing ENERGY STAR components of your homes to homebuyers.

1) No one, advertising expenses entirely out-of-pocket
2) Yes, receive coop marketing funds from Energy Star Homes program
3) Yes, share promotion expenses with utility or other agency
4) Other (Specify)_____
88) Don't Know
99) Refused

Now I would like to discuss your experience participating in the ENERGY STAR homes program.
Q 51. Now I am going to ask you to rate your satisfaction with each of the following aspects of the ENERGY STAR homes program. For each, please rate your satisfaction on a 1 to 5 scale, with 5 indicating extremely satisfied and 1 indicating extremely dissatisfied:

Q 52a) Cost of participation
Q 53b) Quality of marketing support materials
Q 54c) Certification process and verification process
Q 55d) Performance Testing
Q 56e) Ease of participation
Q 57f) Responsiveness of program staff
Q 58g) Responsiveness of BOS
Q 59h) Amount of co-op advertising support
Q 60i) Amount of paperwork required to participate
Q 61j) The program overall

Q 62. What single aspect of the ENERGY STAR homes program have you found most helpful?

Q 63. And what single aspect of the program have you found least helpful?

Q 64. What changes, if any, would you recommend for the program?

Q 65. Do you have any final comments about the ENERGY STAR homes program?

Those are all the questions I have for you today. Thank you very much for your time.

Home Buyer Phone Survey

March 2007

Hello, my name is _____ with Itron, an energy market research firm, and I'm calling on behalf of the Northwest Energy Efficiency Alliance, a regional corporation that works to make energy-efficient products and services available in the marketplace. We're conducting a study among households about their home buying decision. I want to assure you that this is not a sales call and that the information that you provide will be kept strictly confidential. This will only take about 10 minutes of your time.

(DO NOT READ) If asked about the Northwest Energy Efficiency Alliance, say:

The Alliance is a non-profit corporation supported by electric utilities, public benefits administrators, state governments, public interest groups and energy efficiency industry representatives. These entities work together to make affordable, energy-efficient products and services available in the marketplace. [WHEN CORRECT PERSON IS ON-LINE:]
Hello, my name is _____ with Itron, an energy market research firm based in Berkeley, California. I'm calling on behalf of the Northwest Energy Efficiency Alliance. We're conducting a study among households about their home buying decision. I want to assure you that this is not a sales call and that the information that you provide will be kept strictly confidential. This will only take about 10 minutes of your time.

SCREEN1 Can I confirm that you were responsible for choosing the house you purchased?

1 Yes [CONTINUE]
2 No
88 REFUSED
99 DON'T KNOW

SCREEN2 Can I confirm that the house you purchased is a newly constructed home? That is, was your house built shortly before you moved in and are you the first occupant?
1 Yes [CONTINUE]
2 No
88 REFUSED
99 DON'T KNOW

SCREEN3 Also, can I confirm that the house is currently occupied by the owner as a single-family household?
1 Yes [CONTINUE]
2 No
88 REFUSED
99 DON'T KNOW

SCREEN4 And is the home a single family detached home?
1 Yes [CONTINUE]
2 No
88 REFUSED
99 DON'T KNOW

I. Home Purchase Info

Q1. What year was your home built?
1: 2007,
2: 2006,
3: 2005,
4: 2004,
5: 2003,
6: 2002 or before,
88 REFUSED
99 DON'T KNOW

Q2_MO
In what month and year did you purchase your new house?
1: January
2: February
3: March
4: April
5: May
6: June
7: July
8: August
9: September
10: October
11: November
12: December
88 REFUSED
99 DON'T KNOW

Q2_YR
And in which year?
1: 2007
2: 2006,
3: 2005,
4: 2004,
5: 2003,
6: 2002,
7: Before 2002
88 REFUSED
99 DON'T KNOW

IF HOME WAS PURCHASED BEFORE JUNE 2005 THAN TERMINATE SURVEY
[READ: Thank you for your time and consideration. Unfortunately we are only interested in homebuyers who purchased a new home since June of 2005. Since you purchased your home after this date we do not need to complete the remainder of this survey.]

Now we would like to know a little about the characteristics of the house you purchased?
Q3 How many bedrooms does it have?
1,
2,
3,
4,
5,

6,
7,
8,
9,
10
88 REFUSED
99 DON'T KNOW

Q4 How many bathrooms does it have? (use decimals for partial bathrooms)
FORMAT is n.n (2 and 1\2 baths = 2.5)
REFUSED IS 8.8 and DON'T KNOW is 9.9
____ Bathrooms

Q5 What is the approximate square footage of the house?
88888 is REFUSED 99999 is DON'T KNOW

Q6 What type of heating fuel does your house use?
1) Gas furnace
2) Electric (baseboard)
3) Electric (Central "forced air")
4) Heat pump
5) Propane
6) Oil
7) wood
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q7 Does your house have air conditioning? (Probe for central AC or window units)
1) Yes, Central
2) Yes, window units
3) Yes Both
4) None
88 REFUSED
99 DON'T KNOW

Q8 Did you have input on the final design of your home?
1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q8 (YES)
Q8A What specific features did you have input on?

77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

DISPLAY: Using a 1 to 10 scale, where 1 is not at all important and 10 is extremely important, please tell me how important each of the following characteristics were to you in your selection of a new home?
How important was _____to you (RANDOMIZE)

Q9A # of bedrooms
Q9B Size of kitchen
Q9C Size of yard
Q9D Price
Q9E Amount of noise/traffic on the street
Q9F Energy efficiency features
Q9G Schools
Q9H Layout and design
Q9I Builder reputation
Q9J Overall home size
Q9K Commuting distance

FIND: Which of the following resources did you use to find your new home? [After reading list, ask/probe if any others]

1 Real estate agent
2 Real estate company (probe for name)
3 Real estate tabloid (free)
4 Real estate section in newspaper
5 Classified advertising
6 Internet search engine
7 Internet web sites (probe for names)
8 Friends/family
9 Builder/developer brochures/advertising
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

IF FIND (Real estate company)
FIND2 Which real estate companies did you use?

77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

IF FIND(Internet Web Sites)
FIND7 Which Internet Web Sites did you use?

77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

II. Energy Star Awareness

Q10 Have you ever seen or heard of the ENERGY STAR label?
1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q10 IS NO, REFUSED or DON'T KNOW ASK Q11;
Q11 The ENERGY STAR Label is used to signify energy efficiency for appliances, lighting, and consumer products. The label has the word "energy" and a star symbol. Now that I've described ENERGY STAR label to you, do you recall seeing or hearing anything about it before this survey?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q10 (YES) or IF Q11 (YES) ELSE SKIP TO Q35;

Q12 On what types of products have you seen the ENERGY STAR label? (Multiple Response, Do Not Read)
1: Clothes washers
2: Dehumidifiers,
3: Dishwashers,
4: Refrigerators,
5: Room Air Conditioner,
6: Central AC,
7: Ceiling Fans,
8: Programmable Thermostat,
9: Furnace,
10: DVD,
11: VCR,
12: Television,
13: Cordless Phones,
14: CFL Bulbs,
15: Computers,
16: Copiers,
17: Printers,
18: Scanners
19: Windows/Doors/Skylights,
20: Water coolers,
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q13 Have you ever seen or heard of the ENERGY STAR label for homes?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q13 (YES) ELSE SKIP TO Q27;
Q14 How did you find out about Energy Star homes? (multiple response) DO NOT READ

1: Friends/Family/Word of mouth
2: Realtor
3: Lender
4: Builder
5: Internet
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q15 How would you rate the value of having an ENERGY STAR-certified home on a scale of 1-5, where 1 is not at all valuable and 5 is extremely valuable?
1: 1 NOT AT ALL VALUABLE,
2: 2
3: 3
4: 4
5: 5 EXTREMELY VALUABLE
88 REFUSED
99 DON'T KNOW

Q16 To the best of your knowledge, what does it mean if a home is ENERGY STAR – certified? (Do NOT READ probe 'anything else' to exhaustion).

1: Increased Insulation
2: Tight construction
3: High efficiency windows
4: Energy star appliances
5: Tight ducts
6: High efficiency furnace
7: High efficiency air conditioner
8: Lighting (CFLs or dedicated fixtures)
9: Construction materials are recyclable or less damaging
10: Downspouts disconnected
11: House positioned to reduce energy needs
12: House inspected by state energy office
13: NOTHING MORE
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

III. ENERGY STAR Home Experience

Q17 Is your new home an Energy Star home?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q17 (NO) ASK Q18 & Q19 ELSE SKIP TO Q20

Q18 Did you consider an Energy Star home when shopping for your new home?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

Q19 Why didn't you purchase and ENERGY STAR home? (DO NOT READ)

1: Cost
2: Didn't believe claims on energy savings/benefits
3: Inconvenient features
4: Hassle of certification

5: Wasn't offered for the house we wanted
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q20 What do you consider to be the benefits of having an Energy Star-certified home? (DO NOT READ LIST, PROBE FOR MULTIPLE RESPONSE TO EXHAUSTION)

1: Reduced draftiness
2: Better indoor air quality
3: Low energy bills
4: More energy efficient heating equipment (boiler, furnaces, heat pumps)
5: More energy efficient cooling equipment (central AC)
6: "Green" or environmentally friendly
7: House inspected by state energy office
8: NOTHING MORE
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

DISPLAY: Please tell me how much you agree or disagree with each of the following statements. Would you say that you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, or strongly disagree that: [RANDOMIZE].

Q21A Energy Star homes are hard to find
Q21B ENERGY STAR homes are more comfortable than standard new homes
Q21C Most new homes are highly energy-efficient even if they are not ENERGY STAR certified
Q21D ENERGY STAR homes provide additional quality
Q21E ENERGY STAR homes are worth more
Q21F It's hard to understand the benefits of Energy Star homes
Q21G ENERGY STAR homes have lower energy bills

IF Q17(YES) CONTINUE ELSE SKIP TO Q27.

ENERGY STAR Homes Only
Q22 What did you consider to be the most important benefit of purchasing an ENERGY STAR home? (DO NOT READ)
1: Lower energy bills
2: More comfort
3: Higher quality
4: Environmentally friendly
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q23 Did the sales agent or builder promote the fact that your home was an ENERGY STAR home?
1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q23 (YES)
Q24 What ENERGY STAR features did the sales agent or builder promote? (DO NOT READ LIST)

1: Energy efficiency
2: Air quality
3: Overall quality
4: Cooling system
5: Heating system
6: Duct tightness
7: Tight construction/less draftiness
77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q25 Did the sales agent or builder mention anything about the heating and cooling ducts in the home being tested for tightness to ensure they don't leak?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q25 (YES) ASK Q26
Q26. Do you view this as an important benefit?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

Home Features

DISPLAY: Please tell me which of the following items in your home are ENERGY STAR [READ LIST]?

Q27A Clothes Washer
Q27B Refrigerator
Q27C Air Conditioner
Q27D Dishwasher
Q27E Lighting Fixture(s)
Q27F Compact Fluorescent light bulbs (CFLs)
Q27G Furnace
Q27H Windows

DISPLAY: For each of the items I just mentioned did you consider buying ENERGY STAR but chose not to. Did you consider an ENERGY STAR _____

Q28A Clothes Washer
Q28B Refrigerator
Q28C Air Conditioner
Q28D Dishwasher
Q28E Lighting Fixture(s)
Q28F Compact Fluorescent light bulbs (CFLs)
Q28G Furnace
Q28H Windows 1) Clothes Washer

IF Q27H (YES) then continue ELSE SKIP to Q34
Q29: Please tell me which rooms have CFLs in them? READ LIST AND ACCEPT MULTIPLES.

1 Kitchen
2 Dining Room
3 Living Room
4 Family Room
5 Master Bedroom
6 Other Bedrooms
7 Bathrooms
8 Closets
9 Hall
10 Utility Room
11 Garage
12 Outdoor Lighting
13 Did not install
77 Other:_____
88 Refused
99 Don't Know

DISPLAY: For each room above == YES, How many CFLS are installed in …

Q29KITCH Kitchen
Q29DR Dining Room
Q29LR Living Room
Q29FR Family Room
Q29MBR Master Bedroom
Q29OBR Other Bedrooms
Q29BATH Bathrooms
Q29CLOS Closets
Q29HALL Hall
Q29UTIL Utility Room
Q29GAR Garage
Q29OUT Outdoor Lighting
Q29OTH OTHER

Q30. Have you ever replaced any of the CFLs?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q30(YES) CONTINUE ELSE SKIP to Q34

Q31 How many CFLs did you replace?
Enter in a number or 77 = all of them, 88 = refused or 99 = don't know

Q32. Why did you replace the CFL(s) [ACCEPT MULTIPLE ANSWERS]?

1: Burnt out
2: Too dim
3: Took to long to start up
4: Poor light color
77 Other:_____
88 Refused
99 Don't Know

Q33. Did you replace the CFL with another CFL or with a standard incandescent bulb?
1: Replaced with CFL
2: Replaced with incandescent
3: Both CFLs and incandescents
4: Haven't replaced yet
88 Refused
99 Don't Know

DISPLAY: Earlier you said you considered purchasing a _____but decided against it.
Why didn't you buy an ENERGY STAR _____?

Q34A CLOTHES WASHER
Q34B REFRIGERATOR
Q34C AIR CONDITIONER
Q34D DISHWASHER
Q34E LIGHTING FIXTURES
Q34F CFL COMPACT FLUORESCENT LIGHT BULBS

77 OTHER SPECIFY
88 REFUSED
99 DON'T KNOW

Q35 How would you rate the value of having an energy-efficient home on a scale of 1-5, where 1 is not at all valuable and 5 is extremely valuable?

1: 1 NOT AT ALL VALUABLE
2: 2
3: 3
4: 4
5: 5 EXTREMELY VALUABLE
88 REFUSED
99 DON'T KNOW

DISPLAY: Please tell me how much you agree or disagree with each of the following statements. Would you say that you strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, or strongly disagree that: [RANDOMIZE].

Q36A Energy efficient homes are more comfortable than standard new homes
Q36B Most new homes are highly energy-efficient
Q36C Energy efficient homes have lower energy bills
Q36D Most newly built homes could be much more energy efficient
Q36E New homes often allow heated or air-conditioned air from inside to escape to the outside
Q36F New homes often have leaky air ducts
Q36G Energy efficient homes have a greater resale value

DISPLAY_____The Energy Star Label is awarded to homes that have been certified to be 15 percent more energy efficient than required by state law. As a result, ENERGY STAR CERTIFIED homes are more comfortable because they are less drafty and have better indoor air quality. These homes also require lower maintenance due to the tight construction, and independent testing required to earn the ENERGY STAR LABEL. Buyers of ENERGY STAR homes also enjoy lower energy bills because the homes are constructed with high efficiency heating and cooling systems, appliances, and windows.
!! _____Considering the home you just purchased, please tell me how much more, if anything, you would have been willing to pay if your home hade been an ENERGY STAR home, and included all the features and benefits I just described.\;

PROMPT IF RESPONDENT ASKS HOW MUCH THEY'LL SAVE IF THEY
HAD AN ENERGY STAR HOME, TELL THEM.....
!! _____It is expected you will save 15 percent off of your
energy bill.

1: They DID NOT ask,
2: They ASKED for percentage

AMT_SVD: ENTER DOLLAR AMOUNT THAT THEY WOULD PAY\,

____
88888 is REFUSED 99999 is DON'T KNOW\;

Demographics
The following questions are for classification purposes only. All your answers are kept confidential.

Q38 Including yourself, how many people live in your home? Please include children.?
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
More than 15
88 REFUSED
99 DON'T KNOW

Q39 Please tell me which of the following categories best describes your age.
1: Less than 25
2: Between 25 and 34
3: Between 35 and 44
4: Between 45 and 54
5: Between 55 and 64
6 65 and older

88 REFUSED
99 DON'T KNOW

Q40 Which of the following describes your educational background?
1: Less than high school,
2: High school or GED
3: Some college
4: Technical College (2 year degree)
5: 4 Year college
6: Graduate degree

Q41 Please stop me when I read the price range that includes the price you paid for your new home
1: Less than 150K
2: 150 – 199K
3: 200 – 249K
4: 250 – 299K
5: 300 – 399K
6: 400 – 499K
7: 500K and over
88 REFUSED
99 DON'T KNOW

IF Q17 (YES)
Q42 Did you pay more for your house because it was ENERGY STAR-certified?

1 Yes
2 No
88 REFUSED
99 DON'T KNOW

IF Q42 (YES)
Q43 How much more did you pay for your house because it was ENERGY STAR-certified?
Dollar amount (whole dollars) or
88888 is REFUSED 99999 is DON'T KNOW

Q44 Which of the following best represents your annual household income (IF NEEDED, from all sources in 2003, before taxes)?
1: << 40K
2: Between 40K and 60K
3: Between 61K and 80K
4: Between 81K and 120K
5: Over 120K
88 REFUSED

VNAME For verification purposes only, may I have your name.

GENDER Record M or F .

Those are all the questions I have for you. Thank you very much for your time.

NON-ACTIVE PARTICIPATING BUILDER INTERVIEW GUIDE

February 2007

Hello, my name is _____ calling on behalf of ECONorthwest, an energy research firm based in Portland. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand how well the current ENERGY STAR Homes Northwest is operating. Could I speak to _____ or could I speak to the person at your firm most involved with the ENERGY STAR Homes program?

[IF NECESSARY:] This survey is extremely important to the Alliance's understanding of the new homes market, and will help in the design and delivery of programs that will directly affect firms like yours. We're willing to work around your company's schedule to find a time when the appropriate person at your firm can speak with us for about 10 minutes.

1) When did you sign up for the ENERGY STAR Homes program? (Have sign-up date from database ready for prompt if needed).

2) Why did you originally decide to join the program?

3) What did you think were going to be the primary benefits of the program for you?

4) Our records show that you have not built any ENERGY STAR Homes since signing up for the program, is this correct?

5) Why haven't you built any ENERGY STAR homes? (Probe for all reasons, including requirements, program support, information provided, customer demand, slow down in construction market)

6) Are their particular ENERGY STAR requirements that are keeping you from building ENERGY STAR homes? (Probe on duct tests, lighting)

7) Do you plan to build any ENERGY STAR Homes in the upcoming year? (If yes): how many ENERGY STAR Homes do you anticipate building.

8) What has changed in the last year that would allow you to consider building ENERGY STAR Homes?
9) Have you received adequate support from the program when you've needed it? (If yes): Please give me an example of the kind of support you received.

10) What things about the program have not met your expectations?

11) Have you marketed/offered ENERGY STAR Homes to your customers?

12) Are you planning to market ENERGY STAR Homes to your customers in the upcoming year?

13) What do you think may be holding your customers back from buying ENERGY STAR Homes? (Probe on awareness, cost, disinterest/low priority)

14) What needs to change in the program in order for you to start building ENERGY STAR Homes?

15) Do you have any other comments or suggestions for improving the ENERGY STAR Homes program?

Thank you for taking the time to talk to me today about the ENERGY STAR Homes program.

ENERGY STAR VERIFIER / PT INTERVIEW GUIDE

February 2007

Hello, my name is _____ calling on behalf of ECONorthwest, an energy market research firm based in Portland. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand the market for energy-saving features in the residential new home construction market. Could I speak to _____ or could I speak to the person at your firm most involved in supplying the residential new construction market?

[IF NECESSARY:] This survey is extremely important to the Alliance's understanding of the new homes market, and will help in the design and delivery of programs that will directly affect firms like yours. We're willing to work around your company's schedule to find a time when the appropriate person at your firm can speak with us for about twenty minutes.

[IF NECESSARY:] The Northwest Energy Efficiency Alliance is a non-profit corporation supported by electric utilities, public benefits administrators, state governments, public interest groups and energy efficiency industry representatives. These entities work together to make affordable, energy-efficient products and services available in the marketplace. The Alliance is currently in the process of developing and offering a Northwest regional version of the national ENERGY STAR homes program. That's why they are looking for input from builders, distributors, and other firms who operate in the Pacific Northwest new homes market.

[WHEN CORRECT PERSON IS ON-LINE:]

Name: _____

Company: _____

Title: _____

Phone: _____

Hello, my name is _____ and I'm calling on behalf of ECONorthwest, an energy market research firm based in Portland. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand the market for energy-saving features in the residential new home construction market. We are talking to verifiers/home performance specialists to understand their experience in relation to the ENERGY STAR Homes program. Can I confirm that you are engaged in verifications for the ENERGY STAR Homes program?

If YES, continue. If NO, thank and terminate:

I. INTRODUCTION AND BUSINESS SCOPE

Please note that all the questions I am going to ask you refer to your program experiences prior to 2007, when the program was being run by the previous contract implementer PECI/CSG. We will be talking to verifiers later this year about their experiences with the new program implementer (Fluid) that started in January 2007.

I'd like to start with some general information about you and your company.

1. When did you become a verifier [Home Performance Specialist/Idaho]?

2. Do you have a contract to be a verifier with another organization, or are you an independent contractor?
    a. Utility contract
    b. CSG or Earth Advantage contract (PGE's Energy Services Group (ESG))
    c. Independent Contractor

3. Approximately how many ENERGY STAR home verifications have you done to date?

4. Do you also perform duct testing on ENERGY STAR homes?
    a. Yes, also do duct testing
    b. No duct testing

5. Do you offer any other services to builders or contractors that are involved with building homes?

6. How much of your business is from ENERGY STAR home verification?

    a. Verification:_____
    b. Duct Testing:_____
    c. Other:_____

7. Do you expect this to change in the upcoming year? In what way? (Probe for expectations of work as a verifier, will verifications increase or decrease, etc.)

8. How big of a business opportunity do you consider verification to be?

9. How many different builders are you currently working with as a verifier for the ENERGY STAR homes program? [IF ALSO DUCT TESTER, ASK] Of these, how many do you do duct tests for?

10. How much do you charge for your verification services? (Per home)

11. Do you expect your fee to change in the upcoming year?

12. IF INDEPENDENT CONTRACTOR, ASK:] For your current builder clients, how did they find you? How do you go about recruiting builders for your services? Do you actively market your verification services to builders? If so, what aspects do you emphasize?

13. What kinds of assistance would help you more effectively market these ENERGY STAR benefits to builders?

14. What do you think the ENERGY STAR program should be doing to help market ENERGY STAR homes? (Probe for suggestions for marketing to builders, contractors, and homebuyers)

II. TRAINING

Next I'd like to ask you some questions specifically about your experience with the ENERGY STAR Homes program training:

15. Who trained you to become a verifier for the ENERGY STAR Homes program? Do you feel that the training adequately prepared you to verify ENERGY STAR homes?

16. What aspects of the training do you think were most valuable? Least valuable? How, if at all, could the training have been improved?

17. Have you taken any of the continuing educations courses offered for verifiers? What have you taken? What type of continuing education would you like to receive?

18. How about builders, have you had any experience with the training offered to builders regarding ENERGY STAR? How do you feel this training is going? (Probe for opinion on if builders are adequately trained on the various ENERGY STAR requirements including duct testing, proper HVAC installation, lighting)

19. Do you have any suggestions for the program for improving the builder training?

20. How about HVAC contractors, have you had any experience with the ENERGY STAR Homes training provided to them? Do you feel that this training has been effective?

21. Do you have any suggestions for improving contractor training?

IV. VERIFICATION PROCESS COORDINATION

Next I'd like to ask you some questions about the verification process and how you coordinate your activities with builders and others involved in the process.

22. How would you characterize your relationship with your builders? How often do you talk? (Probe for if relationship is cooperative or adversarial).

23. How did the builders you work with find you?

24. What type of marketing, if any, do you do to attract builders? (Probe for channels, methods)

25. What type of assistance would help you market more effectively (Probe)

26. How do you coordinate the timing of the verification visits with the builder? (Probe for how well they are kept informed of building stages and how quickly they can get this information, their use of online database, timing of information and if it's kept up-to-date.)

27. How long does a typical verification visit last? (Probe for activities, what they look for, what they discuss with the builder, etc.)

28. Have you used the program's online database? Has this been helpful? (Probe for details, particularly problems and suggestions for improving)

29. How many of the homes you have worked with failed their verification? What is the most common reason(s) that homes you've tested have failed verification? (Probe for specific areas where they failed)

30. For those that failed, how long did it take for them to fix the problem? (Probe for specifics; differences according to different builders, different problems?)

31. Have you come back out to complete the verification for homes that failed the initial verification? Did they pass the 2nd time? (Probe for specifics)

32. Based on your experience, which of the ENERGY STAR requirements, if any, pose (or would pose) significant challenges to builders and other contractors? (Probe for ventilation, testing, equipment availability, difficult installation, need to do mastic sealing of ducts, etc.)

33. Have you worked with the Builder Outreach Specialists from the ENERGY STAR program? What kind of interactions have you had? (Probe for how well this has gone)

34. Have you worked with the utilities? If so, what has been the utility involvement? How has the process worked for you? (Probe for benefits and problems)

35. Have you had any interactions with the State Energy Offices that provide the quality assurance (QA) oversight for verifiers?

36. How does the state coordinate its QA activities with you and your builders? How has this process worked so far? Any suggestions for improvement?

37. How about certification, have you had any ENERGY STAR homes go through the entire certification process yet? Once you approve a home for certification, is the SEO getting the certificate and the label to you/the builder in a timely manner?

38. Have you received any technical support from the state certification office? Did this go well? What could have been done differently? (Basically asking about areas for improvement)

39. Do you feel you are getting consistent program information and are up to date on technical details? Do you receive the technical updates via e-mail? Are these helpful? Do you have any suggestions for improvement on program communications?

IV. Duct Testing Module (to duct testers only)
Now I'd like to ask you some questions about your duct testing work

40. How long have you been doing duct tests?

41. Why did you start offering duct testing services?

42. Where did you receive training to become a duct tester?

43. Did this training adequately prepare you for testing in the field?

44. What was the most valuable part of this training? Least valuable?

45. Do you have any suggestions on how the duct tester training could be improved?

46. How many duct tests have you done on new homes to date? How many of these were for ENERGY STAR homes (probe for if they were for other programs like Earth Advantage)

47. How, if at all, do you expect your duct testing business to change in the upcoming year? (probe for reasons on any expected increase or decrease)

48. On average, how many duct tests a month do you perform? How many can you do in a single day?

49. How long does it take to do a duct test?

50. Have you done any tests where the ducts failed the first time? (Probe for reaction by HVAC contractor, builder to failed test)

51. For those homes that fail tests, how long before you returned to re-test the ducts? (Probe for potential scheduling issues)

52. What are the most common reasons for ducts to fail their test? (Probe for particular areas in the duct system, types of equipment, systems, or home designs that are more prone to fail, etc.)

53. In general, what are the problems, if any, with duct testing?
    1) Time consuming
    2) Tests inaccurate, do not reflect actual equipment performance
    3) Too expensive
    4) Delays in scheduling testers
    5) Testers not available in area
    6) Lack of competence among testers
    7) Other, please specify:_____
    8) No problems
    88) Don't know
    99) Refused

54. Do you think builders believe that duct testing is worthwhile? How about the HVAC contractors?

55. Do you think that builders are knowledgeable about the benefits of duct testing? How about homeowners?

56. Do you actively market the benefits of duct testing?

57. If so, who do you market to? What benefits do you emphasize?

58. Is there anything else the ENERGY STAR Homes program can do to help you better market or perform the duct tests?
    1) More training on how to do duct sealing and testing
    2) Materials that show dollar savings for duct testing
    3) Materials that show other benefits of duct testing
    4) Advertising to build home buyer awareness and interest in ENERGY STAR
    5) Other _____

V. Overall Program Interaction/Conclusions

Finally, I'd like to conclude by asking you a few questions about the overall program…

59. Overall, how would you rate your experience with the ENERGY STAR Homes program? Why do you say that? (Probe fully.)

60. Is there anything about the program that is confusing/unclear?

61. What do you think will be the biggest future challenges for you as a verifier ?
62. What can the ENERGY STAR Homes program do to help address these challenges?

63. Do you have any final comments on the ENERGY STAR Homes program?

Those are all the questions I have for you today. Thank you very much for your time.

ENERGY STAR REALTOR INTERVIEW GUIDE

February 2007

Hello, my name is _____ calling on behalf of ECONorthwest, an energy market research firm based in Portland. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand the market for ENERGY STAR homes. Could I speak to _____

[IF NECESSARY:] This survey is extremely important to the Alliance's understanding of the new homes market, and will help in the design and delivery of programs that will directly affect firms like yours. We're willing to work around your company's schedule to find a time when the appropriate person at your firm can speak with us for about twenty minutes.

[IF NECESSARY:] The Northwest Energy Efficiency Alliance is a non-profit corporation supported by electric utilities, public benefits administrators, state governments, public interest groups and energy efficiency industry representatives. These entities work together to make affordable, energy-efficient products and services available in the marketplace. The Alliance is currently in the process of developing and offering a Northwest regional version of the national ENERGY STAR homes program. That's why they are looking for input from those involved in selling new homes in the Pacific Northwest.

[WHEN CORRECT PERSON IS ON-LINE:]

Name: _____

Company: _____

Title: _____

Phone: _____

Hello, my name is _____ and I'm calling on behalf of ECONorthwest, an energy market research firm based in Portland. First, I want to assure you that this is not a sales call. The Northwest Energy Efficiency Alliance has asked us to help them better understand the market for ENERGY STAR homes. You were referred to us by the ENERGY STAR Homes program as someone who has experience selling ENERGY STAR homes. Is that correct?

If YES, continue. If NO, thank and terminate:

I. INTRODUCTION AND BUSINESS SCOPE

I'd like to start with some general information about you and your company.

1. How long has (NAME OF COMPANY) been in business?

2. Approximately how many new homes did your office sell last year? How many do you expect to sell in the upcoming year?

3. We understand that you sell new homes for [builder name(s)], is this correct? (If not, try to find person that is knowledgeable about the company's participation)

4. Have any of the homes you've sold for [BUILDER] been ENERGY STAR? Probe for number, or if they have any on the market at the moment.

5. How many of the new homes you sold last year were ENERGY STAR homes? How many ENERGY STAR homes do you expect to sell in the upcoming year?

II. EXPERIENCE WITH THE ES HOMES PROGRAM

6. Have you received training on how to sell ENERGY STAR homes? Who did this training? What did this training cover?

7. Overall, how would you characterize the training? Do you feel that it gave you the tools needed to effectively sell ENERGY STAR homes?

8. In general, do you actively promote the benefits of an ENERGY STAR home? How?

9. What are the benefits of an ENERGY STAR that you promote to the customers [DO NOT READ]:
   1) Tight construction
   2) Insulation
   3) Windows
   4) High efficiency HVAC
   5) Lighting
   6) Duct testing
   7) Verification / 3rd party certification
   8) Lower energy bills
   9) Better air quality
   10) Other:_____

10. Which of these benefits are the customers most interested in?

11. Do customers see any drawbacks to ENERGY STAR homes?

12. Do you believe that the customers understand the benefits of an ENERGY STAR home? Are there particular benefits that customers have a difficult time understanding? What types of assistance can the program offer to help address these?

13. How important are the ENERGY STAR benefits to customers relative to the other home features?

14. Given your experience, is the ENERGY STAR label valuable? Does it make a new home easier to sell? Do ENERGY STAR homes sell faster than other homes? Do they sell for a higher price (If so, get price increment and base price of house)

15. How do you market the homes you sell?
    1) Newspaper ads
    2) TV/Radio
    3) Real estate ads
    4) Outdoor signs
    5) Model homes
    6) Brochures / Sales materials
    7) Internet
    8) Multiple listing service
    9) Other_____
        1. Don't Know
    10) Refused

16. What are the biggest challenges you face in marketing ENERGY STAR homes? (Probe for issues with specific features such as HVAC, lighting, etc. relative to added cost)

17. What do you think the ENERGY STAR program should be doing to help market ENERGY STAR homes to new homebuyers?

18. Do you think it would be useful to have ENERGY STAR certification listed as a feature in the MLS?

19. Overall, how would you rate your experience with the ENERGY STAR homes program?

20. Do you have any final comments on the ENERGY STAR new homes program?

Those are all the questions I have for you today. Thank you very much for your time.

ENERGY STAR STATE ENERGY OFFICE STAFF INTERVIEW GUIDE

March 2007

Hello, my name is _____ calling on behalf of ECONorthwest, an energy market research firm based in Portland. We are working with the ENERGY STAR Homes Northwest program and the Northwest Energy Efficiency Alliance to help them to better understand how well the current program is operating. Could I speak to _____?

[WHEN CORRECT PERSON IS ON-LINE:]

Name: _____

Company: _____

Title: _____

Phone: _____

I. BACKGROUND

1. What are your primary responsibilities in relation to quality assurance for the ENERGY STAR homes program?

2. How many homes/builders are you working with right now? How many different verifiers does this involve?

3. Approximately how many ENERGY STAR homes have you done the QA for to date?

4. And what percentage of those have passed/failed the QA inspection process? (Probe for differences by builder)

5. To date, what have been the primary reasons that homes have failed QA?

II. QA PROCESS

I'd like to ask you a few questions regarding the QA process.

6. How do you determine which homes to do the QA?

7. Have there been any issues getting into homes or identifying homes?

8. On average, how often do you visit a home during construction? What stages of the home construction do you inspect? (Probe for specific items such as insulation installation, duct installation, other things that may not be visible when verifier does final inspection)

9. What does a typical QA inspection involve? How long does a typical visit last? (Probe for activities, what they look for, what they discuss with the builder, etc.)

10. How do you coordinate the timing of these visits with the verifier and/or builder? (Probe for how well they are kept informed of building stages and how quickly they can get this information, their use of online database, timing of information and if it's kept up-to-date.)

11. Has there ever been a delay in construction that resulted from one of these visits due to the failure to meet the ENERGY STAR standard? (Probe for specific details)

12. Based on your experience to date, which of the ENERGY STAR requirements, if any, seem to be posing significant challenges to builders and other contractors? (Probe for ventilation, testing, equipment availability, difficult installation, need to do mastic sealing of ducts, etc.)

13. How are builders reacting to the QA process? Do builders believe in the benefits of the QA process? Are they clear on the distinction between verification and QA?

14. Do you use the online database for your work? If so, does it help you? (Probe for details and any suggestions for improving the database)

15. Overall, how well do you think the QA process is working? What is working well? What have been the most challenging aspects of the QA process?

16. Overall, how would you characterize the coordination between you and the builders? Any issues? Is there anything the program can do to improve coordination and communication between you and the verifiers?

17. What do you anticipate will be the greatest future challenges for the ES Homes QA process?

18. On average, once a home has been verified, how long does it take you to do the final paperwork to complete the ENERGY STAR certification? Are there any issues with this process? Any suggestions from improving the process?

19. Any other suggestions as to how the ENERGY STAR Homes program can improve the QA process?

III. VERIFICATION PROCESS

Next I'd like to ask you some questions about the ENERGY STAR Homes verification as a separate process from the QA.

20. First, how would you characterize your relationship with the verifiers you work with? What kind of interaction do you have with verifiers? (Probe for issues relating to coordination and communication.)

21. Do the verifiers believe in the benefits of the QA process?

22. How would you characterize the training that verifiers have received prior to working for the ENERGY STAR Homes program. Does it appear that verifiers have been adequately trained? What aspects of the training do you think has been most valuable for verifiers? Any areas where more training might be needed?

23. Based on your experience with QA so far, how are the verifiers doing? What are the biggest challenges facing verifiers? (Probe for specific problems with verifiers)

24. Overall, how would you characterize the coordination between you and the verifiers? Any issues? Is there anything the program can do to improve coordination and communication between you and the verifiers?

IV. OTHER COORDINATION ISSUES

Next I'd like to ask you about your interactions with other agencies involved with the ENERGY STAR Homes program.

25. Have you worked with staff from the PECI or CSG? If so, please describe your interaction with them. What, if anything, hasn't worked well? (probe for details on coordination and communication)

26. How about utilities, have you had any interaction with them regarding the ENERGY STAR Homes program? If so, please describe your interaction. What, if anything, hasn't worked well? (probe for details on coordination and communication)

27. How about the Northwest Energy Efficiency Alliance, have you worked with any of there staff? If so, please describe your interaction with them. What, if anything, hasn't worked well? (probe for details on coordination and communication)

28. Overall, how would you rate your experience with the ENERGY STAR Homes program so far? Why do you say that?

29. What kinds of assistance from the ENERGY STAR program would help you do your job more effectively?

30. Do you have any final comments on the ENERGY STAR homes program?

Those are all the questions I have for you today. Thank you very much for your time.

APPENDIX D: CERTIFIED AND INITIATED HOMES BY STATE

Below are charts showing the total number of certified and initiated homes by month and by state.

Figure 7: Certified and Initiated Homes by Month - ID

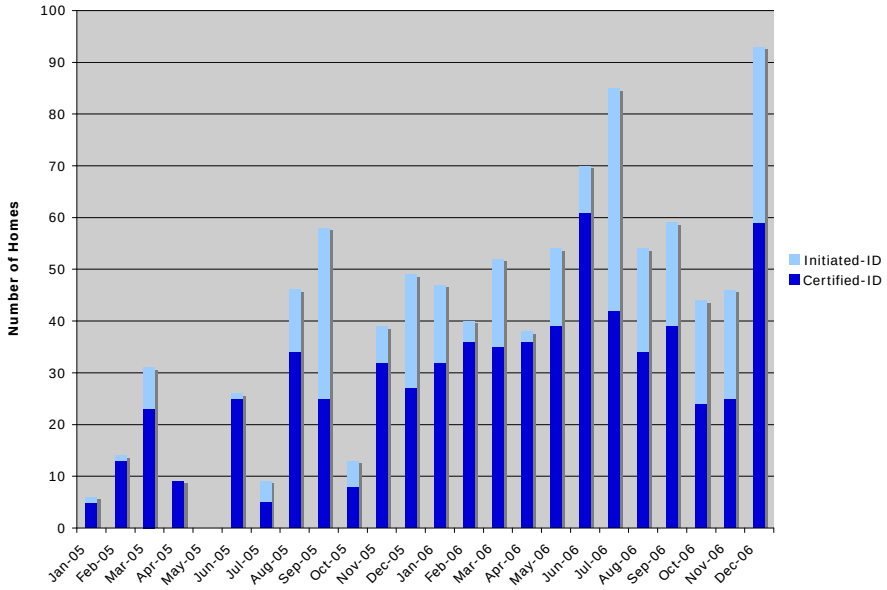


Figure 8: Certified and Initiated Homes by Month - MT

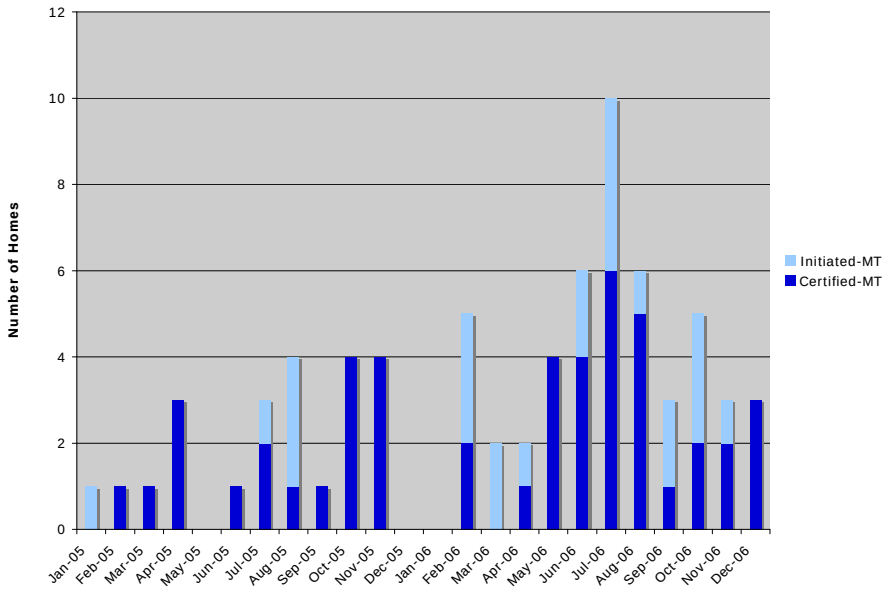


Figure 9: Certified and Initiated Homes by Month - OR

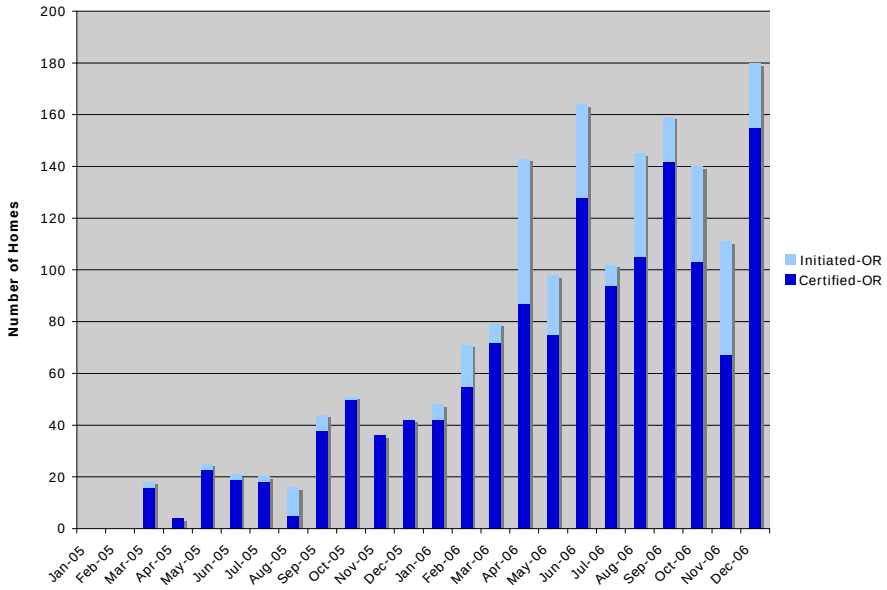


Figure 10: Certified and Initiated Homes by Month - WA