

ENERGY STAR Homes Northwest Program

Market Progress Evaluation Report #3

PREPARED BY

ECONorthwest

REPORT #E06-165
DECEMBER 12, 2006



**NORTHWEST
ENERGY
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ALLIANCE**

www.nwalliance.org

529 SW Third Avenue, Suite 600
Portland, Oregon 97204
(tel) 503-827-8416 (fax) 503-827-8437

ENERGY STAR Homes Northwest Program Third Market Progress Evaluation Report

A Report to the
Northwest Energy
Efficiency Alliance

ECONorthwest

ECONOMICS • FINANCE • PLANNING

888 SW Fifth Avenue, Suite 1460
Portland, Oregon 97204
503-222-6060

December 4, 2006

Acknowledgements

This report was prepared by ECONorthwest's Portland office for the Northwest Energy Efficiency Alliance. Dr. Stephen Grover was the ECONorthwest project manager for this analysis and was the primary author of this report. Questions regarding the report should be directed to him at grover@portland.econw.com or by phoning the Portland office at (503) 222-6060. Dr. Grover was assisted in this project by Peter Graven, Jonny Holz, and John Boroski. Quantum Consulting and Dr. Phil Willems also assisted with this evaluation and report.

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EXECUTIVE SUMMARY

ENERGY STAR Homes Northwest 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, it is estimated that these homes 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 third Market Progress Evaluation Report (MPER) presents the findings of a process evaluation based on interviews with the various 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 an update on progress towards program goals. Finally, a short post-occupancy phone survey was fielded in which recent ENERGY STAR homeowners were asked about their new home.

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. This goal has been reduced from a 20 percent market share since the last MPER. The goal was reduced as it has taken the program longer than anticipated to establish the ENERGY STAR infrastructure within the housing market.

Within the program territory, there were 87,878 new single-family homes constructed in 2005, an increase of 17 percent over the prior year. Of these, Washington makes up almost half of the total new home construction activity. Initial data through August of 2006 suggests a 10 percent decrease in new home construction activity and this reduction has been incorporated into the ENERGY STAR Homes program goals set for 2006.

As of September 2006, the program was at 79 percent of its overall homes goal for 2006 assuming that all the initiated homes are completed by the end of the year. The shortfall is primarily in Washington, where only 52 percent of the goal for new homes had been met as of September. One possible reason for this shortfall is turnover among the Building Operator Specialist (BOS) positions within Washington. It also appears that it is taking longer than expected for newly recruited builders to begin constructing ENERGY STAR homes.

Process Evaluation Findings

As of September 2006, 567 builders had been recruited to the program, including 219 in 2006 alone. Of all participating builders, 32 were large builders (building more than 100 homes a year) that accounted for 52 percent of the ENERGY STAR homes certified to date. However, small builders (building 4 homes or less annually) account for 80 percent of all builders in the program territory. While large builders are important (especially in

the short-term for meeting annual home targets), the program will need to develop strategies to reach and support small builders in order to meet its longer-term market share goals.

Active participating builders are generally satisfied with the ENERGY STAR Homes Northwest program and have been pleased with the services that verifiers and BOSs have provided to them, including technical assistance and training for contractors. The majority of builders are also pleased with the marketing support provided by the program. They said that they take advantage of the marketing materials that the program provides and believe they are important tools for explaining the benefits of ENERGY STAR homes to homebuyers. While participating builders did not consider the building specifications problematic, several were not aware that dedicated CFL fixtures could be used to meet the lighting requirement.

Performance testing contractors report that the ENERGY STAR home requirements have been clear and that project implementation process has been generally smooth. Several did suggest that duct tests should be conducted toward the end of the construction process because several duct test failures resulted from post-installation damage from other contractors. Although performance testers believe the training provided by the program is useful, there was general consensus that it is not sufficient to prepare someone for the field without some sort of hands-on apprenticeship. Most respondents reported having extensive hands-on training before they took the performance testing course, or their company provided continuing training after they completed the course.

State Certification Organizations (SCOs) and Quality Assurance (QA) specialists report that they are spending more time than expected assisting with training verifiers and educating builders on program requirements. Builders in general appear to be pleased with the QA function provided by the program, however. Coordination with the SCOs also appears to be going well in general, although there have been ongoing issues in Idaho where some verifiers feel that they are not receiving equal and fair treatment from the SCO. The evaluation is continuing to monitor this issues and it will be more fully addressed in the next MPER when we will have an expanded sample of market actor and builder in-depth interviews on which to base evaluation conclusions and program recommendations.

In general, it appears that homeowners are very satisfied with the ENERGY STAR homes. While there has been some replacement of lighting (both CFLs and incandescents), the small survey sample sizes make it difficult to draw strong conclusions. The on-site data collection effort planned for late 2006 is designed to provide more definitive data on the retention of lighting measures and these results will be presented in the next MPER.

Market Progress

Based on evaluation findings to date, early indicators of market transformation in the new homes market are apparent. Specific evidence includes reports from builders and HVAC contractors that they have begun to use the ENERGY STAR label to differentiate

themselves in the market. In addition, HVAC contractors actively involved in building ENERGY STAR homes have successfully incorporated performance testing standards into their installations and anecdotal reports suggest that both they and some of the builders believe there are benefits associated with the performance testing requirements. Based on the limited number of homebuyer surveys conducted for this report, saving money on their energy bill was cited as the most common reason for purchasing an ENERGY STAR home. The next MPER will include a more comprehensive assessment of market progress as of early 2007, including results from quantitative surveys with builders and homebuyers.

1. INTRODUCTION

1.1 EVALUATION OVERVIEW

This report is the third of four Market Progress Evaluation Reports (MPERs) of the Northwest Energy Efficiency Alliance's (NEEA's) ENERGY STAR Homes Northwest program. This project is one of two major projects within NEEA's Residential Sector Initiative and works in close coordination with NEEA's ENERGY STAR Home 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 third evaluation report presents the findings of the process evaluation conducted on NEEA's ENERGY STAR Homes Northwest program. This 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. Finally, a short post-occupancy phone survey was fielded in which recent ENERGY STAR homeowners were asked about their new home. Selected results from these surveys are presented in this MPER.

Table 1 below summarizes the main components of the MPERs planned for the ENERGY STAR Northwest Homes evaluation. Each report will contain 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 will be repeated in the final MPER scheduled for 2007. In-depth interviews with a smaller sample of builders and various market actors, including realtors and building contractors, will be conducted for all four reports. The final two interview rounds will also include several questions related to program processes. The process evaluation component also includes interviews with utilities, state energy offices, and home verifiers involved with program. Beginning in 2005, a combination of the post-occupancy phone survey and on-site audits will be used to collect information on satisfaction and retention of individual measures. A limited impact evaluation for the performance testing component will also be completed and included in the final report. Finally, a review of the cost effectiveness modeling and underlying model assumptions will be conducted for the final evaluation report.

Table 1: Evaluation Report Components

Analysis Component	MPER 1 Baseline Report	MPER 2 (3Q 2005)	MPER 3 (3Q2006)	MPER 4 (1Q 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
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 directly 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 project 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 project 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 are 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 requiring that:
 - Every central HVAC system be performance tested (unless the State Certification Office (SCO) approves 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 project specifications (unless the SCO approves 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 has also developed the program website www.northwestenergystar.com as an additional information resource for builders and potential new homebuyers.
- Coordination and incorporation of multiple project 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 project 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 PROGRESS INDICATORS

Progress indicators identified at the outset of the program reflect the focus of the project 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:

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

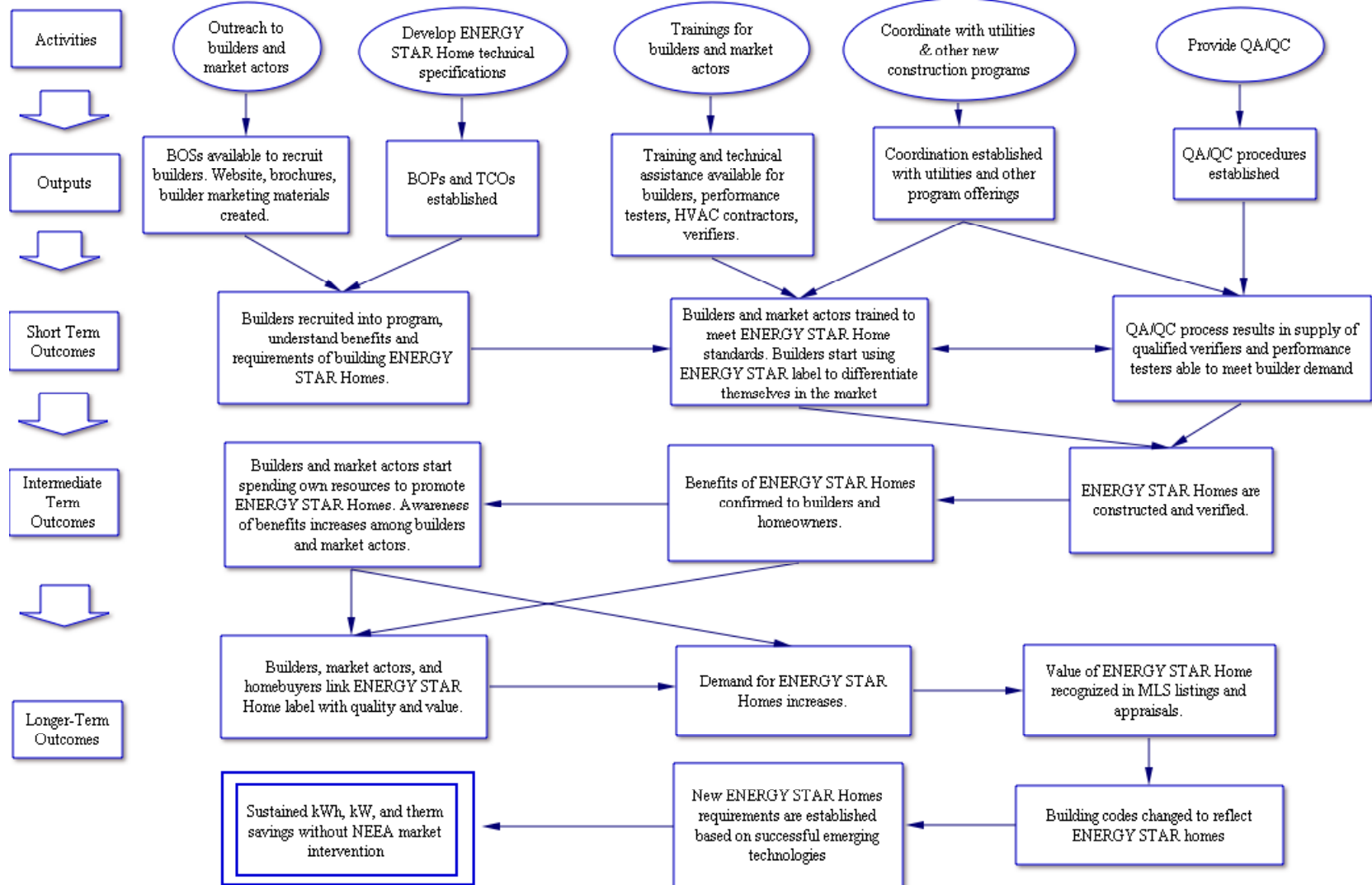
- Multiple Listing Services include whether a home is certified ENERGY STAR in their listings;
- The value of efficiency upgrades is automatically included in the appraisal process;
- Private sector market actors replace NEEA as providers of program services;

- 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.

For this MPER, the evaluation focused primarily on process issues relating to program delivery rather than on broader market issues and the progress indicators listed above. As a result, this report does not describe recent progress made by the program on the market progress indicators. Progress on all of the market progress indicators will be researched and included as part of the final evaluation report scheduled for 2007.

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 project. 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.

2.1 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 taken from the program tracking database maintained by PECL.

2.2 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.¹ 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.

¹ 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.

The sample sizes for each interview group are shown in Table 2. 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 2: In-Depth Interview Samples

Interview Group	Sample Size
Participating Builders	16
Verifiers	10
Performance Testers	9
SCO / QA Specialists	6
Total	41

2.3 POST-OCCUPANCY SURVEY

The final major component of this MPER is a post-occupancy phone survey that was fielded in November 2005 and February 2006. The original intent of this survey was to interview recent ENERGY STAR homebuyers after they had occupied their home for three months. The survey focused on general satisfaction with the home, the importance placed on the ENERGY STAR label during the purchase process, and retention of the lighting measures.

Our initial plan was to get at least 100 completed surveys every three months and to continue fielding the survey throughout the current evaluation. However, our success in getting contact names and phone numbers for these homeowners was less than we expected and we were only able to complete a total of 65 surveys from both survey waves combined. Because of the poor success with this survey and b/c of the desire to verify CFL retention, it will be replaced with an on-site verification task (where the same survey will be administered) as part of the next evaluation report.

3. FINDINGS

3.1 MARKET CHARACTERIZATION

This section provides an overview of the residential construction market for Washington, Oregon, Idaho and Montana as of June 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.

Residential New Construction Market Overview

Table 3 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 and for the entire region, new housing increased by 16.5 percent in 2005 relative to 2004. As of August 2006, new building permits for single family homes is 10 percent less than what was observed for the first 8 months of 2005. This expected slowdown in the region's new home construction market has been taken into account when setting the ENERGY STAR Homes goals for 2006.

Table 3: Single Family New Construction by State (1998-2006)

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 (Jan – Aug)	25,303	15,090	11,841	2,681	54,915	-10.0

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

Table 4 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 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 (26 percent) while Western Montana has seen the largest decrease (10 percent). This is not surprising considering that Washington and Idaho have both seen steady growth in single-family construction while Montana's growth has remained flat for the last two years (see Table 3). On the other hand, while Oregon has also seen steady growth

in new single family construction, the Construction Monitor data shows a 4 percent decrease in issued builders permits in the Portland / Vancouver / Salem area.

Table 4: Number of Builders Issued Permits by Region (2004-2006)

Area Name	2004-2005	2005-2006	Percent Change
Inland Empire (Eastern WA, Northern ID)	514	650	26%
Portland / Vancouver / Salem	1,661	1,597	-4
Puget Sound	1,805	1,944	8
Southern Idaho	1,694	1,878	11
Western Montana	1,489	1,343	-10

Source: *Construction Monitor*. Data begin in July and ends in June for the years specified.

Table 5 shows the distribution of builders based on home volume throughout the region. The vast majority of builders (80 percent) are small builders constructing four or less homes a year. In contrast, there are just 67 large builders (constructing 100 homes or more) in the program area, which comprise less than 1 percent of the overall builder population and 34 percent of homes constructed.

Table 5: Builders by Region and Volume (2005-2006)

Region	Number of Units Built (Annually)					Total	Average
	1-4	5-9	10-24	25-99	> 100		
Inland Empire	545	52	31	15	7	650	5.7
Portland-Vancouver	1,218	187	120	53	19	1,597	7.8
Puget Sound	1,466	211	147	94	26	1,944	8.5
Southern Idaho	1,463	207	130	63	15	1,878	7.0
Western Montana	1,038	202	82	21	0	1,343	3.8
Total	5,730	859	510	246	67	7,168	7.1

Source: *Construction Monitor*.

As shown in the preceding tables, most of the new home construction occurs in Washington and Oregon, although there is also significant building activity in Idaho. Areas in Idaho (Inland Empire, Southern Idaho) have also seen the largest recent increases in building activity. Within this market, most builders are small operations that build only a few homes each year. Together this suggests that the program should focus on regions with the most new home building activity and utilize a recruitment strategy that can eventually reach large numbers of small builders.

Progress Assessment

For this MPER, progress on program goals is limited to progress on the builder participation and home construction goals presented in this section. The other market progress indicators discussed in the previous chapter will all be addressed in the final MPER scheduled for 2007.

Table 6 shows the number of new builders who have contractually agreed to participate in the ENERGY STAR Homes Northwest program between January and September of 2006 and also the cumulative number of participating builders since program inception. Results are shown by state and builder volume. Builder recruitment has been active this year, with 39 percent of the total cumulative participating builders in all four states combined having joined the program from January through September 7 of 2006.

Table 6: Participating Builders – New and Cumulative

State	2006 Participating Builders (Jan-Sept 2006)		Cumulative Total of Participating Builders (May 2004 – Sept 2006)		2006 Participating Builders as a Percentage of Cumulative Total
	Small-Volume Builders (<100 homes/year)	Large-Volume Builders (100 + homes/year)	Small-Volume Builders (<100 homes/year)	Large-Volume Builders (100 + homes/year)	
WA	69	5	136	20	47%
OR	64	0	164	9	37%
ID	68	1	190	3	36%
MT	12	0	45	0	27%
Total	213	6	535	32	39%

Source: Data provided by PECEI as of September 7, 2006

Table 7 shows the distribution of participating ENERGY STAR builders based on how many ENERGY STAR homes they had completed through June 2006. The majority of the builders in each state 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 therefore have not had sufficient time to get fully integrated in the program and complete a project. Of the 337 builders who have not yet completed an ENERGY STAR home, 59 percent joined the program in 2006. Aside from the builders that have not yet completed an ENERGY STAR home, the majority of the builders in each state build between 1 to 4 homes per year.

Table 7: Participating Builders by State and Number of Completed ENERGY STAR Homes (May 2004-September 2006)

State	Number of Total ENERGY STAR Units Completed						Total Number of Builders
	0	1 to 4	5 to 9	10 to 24	25 to 99	> 100	
ID	106	67	11	6	2	1	193
MT	25	19	1	0	0	0	45
OR	100	59	5	4	4	1	173
WA	106	33	0	10	4	3	156
Grand Total	337	178	17	20	10	5	567

Source: Data provided by PECI as of September 7, 2006

Table 8 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 home per year) to participate. Although only around 6 percent of the total participating builders are large builders (see Table 6), the 5 builders who have completed over 100 ENERGY STAR homes account for 52 percent of the total completed ENERGY STAR homes.

Table 8: Cumulative Number of ES Homes Completed by Builder Volume

Number of ES Homes Completed	Cumulative Completed Homes	Percent of Total
1 to 4	280	11%
5 to 9	100	4%
10 to 24	305	12%
25 to 99	521	21%
>100	1330	52%
Total	2536	100%

Source: Data provided by PECI as of September 7, 2006

Table 9 shows the construction activity achieved through the ENERGY STAR Homes program as of September 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.”²

² 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 9.

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. Actual performance relative to this goal will not be known until final housing numbers are available for 2006. The goals shown in Table 9 are determined by the program based on the program's own estimates of the housing market for 2006. At the time of this report, the program was predicting a 10 percent decrease in overall housing starts in 2006 relative to 2005.

Rather than have the program estimate housing starts during the current year to determine goals, we recommend that the program consider purchasing housing data (such as F.W. Dodge data) that provides a forecast of new home starts for the upcoming year. This will enable the yearly goals to be determined independently, as the housing starts estimate for the year will be determined through third-party source not affiliated with the program.

Overall, the total number of certified and initiated homes through September 7, 2006 amounts to 79 percent of the program goal for 2006, while certified homes by themselves amount to 47 percent of the program goal for 2006. On a state-by-state basis, Oregon has already met its 2006 goal and Idaho appears to be on target to reach its goal by the end of the year. Montana is currently at 34 percent of its goal, but the goal for that state is a relatively small part of the overall goal for the program.

Washington has the largest share of the overall program goal and as of September only 52 percent of the homes goal had been met for this state. Without a substantial number of new homes initiated and completed by the end of the year, it seems unlikely that the homes goal for Washington will be met. Given the importance of Washington in the overall program goals, it appears that the ENERGY STAR Homes program might not meet its 2006 homes goal. Issues relating to the program and the housing market in Washington will be explored more fully in the next MPER.

It should be noted that not all initiated homes are required to be entered into the program tracking database (except in Oregon), so there may be more program activity than shown in Table 9. There may also be a large increase in activity at the end of year, as there was in December 2005 (see Figure 2). Even when considering these mitigating issues, we still believe that the program should make Washington a priority to help ensure that the overall program goals are met for 2006.

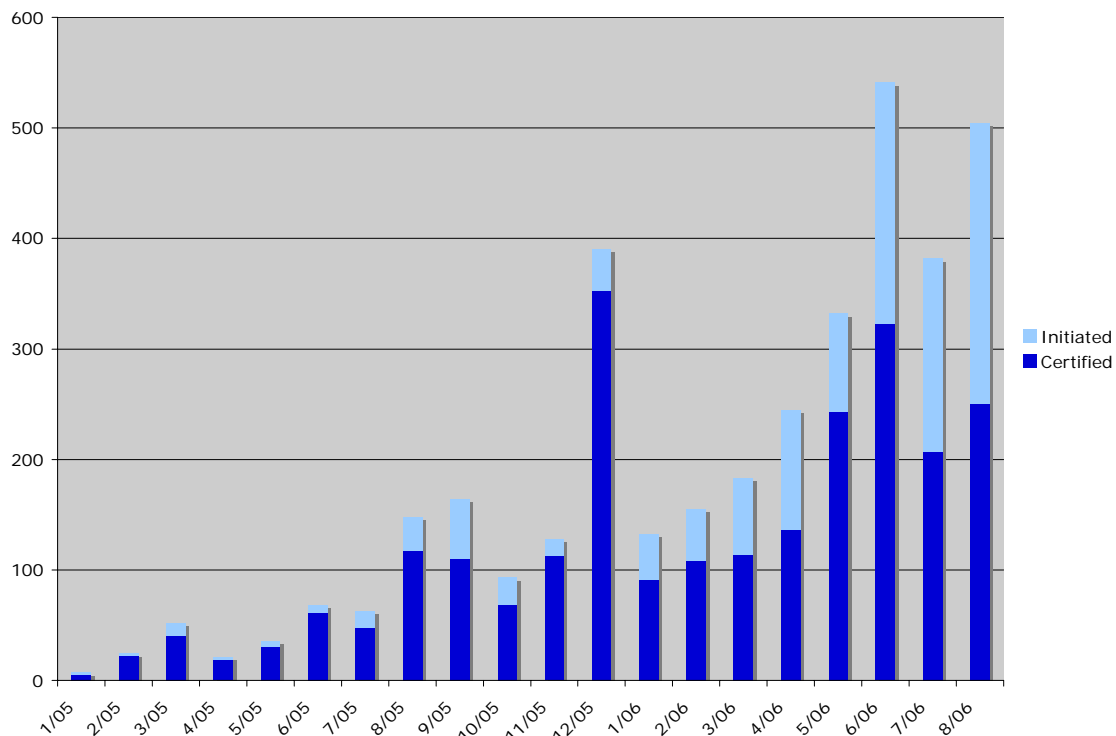
Table 9: 2006 ENERGY STAR Home Construction Status (Jan-Sept 2006)

State	Certified	Initiated	Total Certified and Initiated (Forecast Completions)	NEEA 2006 Goal (Certified Only)	Projected 2006 New Homes	Total Certified and Initiated Homes as a Share of 2006 Goal
WA	480	313	793	1,513	36,894	52%
OR	682	406	1088	871	21,241	125%
ID	325	299	624	700	17,082	89%
MT	23	20	43	126	3,082	34%
Total	1510	1038	2,548	3,210	78,299	79%

Source: Certified and Initiated homes and goal data from PECEI as of September 7, 2006. 2006 Projected New Homes estimated by CSG.

Figure 2 shows the monthly totals of homes that have been initiated and certified from January 2005 through August 2006. It is clear that there has been a steady increase in the number of completed ENERGY STAR homes over the period shown. The combined monthly total of initiated and certified homes in 2006 alone has increased by nearly 400 percent since January 2006. Monthly program activity by state is provided in Appendix D.

Figure 2. Certified and Initiated Homes (Monthly Totals)



Source: Data provided by PECEI as of September 7, 2006, ECONorthwest

Table 10 shows the number of participating verifiers and performance testers that have joined the program between January and September of 2006. Of the four states, Washington has seen the largest growth of both participating verifiers and performance testers. The cumulative totals since May 2004 for both verifiers and performance testers are also shown in Table 10. The total number of verifiers and performance testers that joined the program in 2006 represent 27 percent and 30 percent of the cumulative total, respectively.

Table 10. 2006 Participating Verifiers and Performance Testers

State	Verifiers		Performance Testers	
	New Jan – Sept 2006	Cumulative May 2004 – Sept 2006	New Jan – Sept 2006	Cumulative May 2004 – Sept 2006
WA	19	55	83	125
OR	14	48	36	135
ID	0	13	1	10
MT	3	19	5	20
Total	36	135	86	290

Source: ENERGY STAR Data Base. Data as of September 8, 2006.

3.2 BUILDER INTERVIEWS

This section presents the results of in-depth interviews conducted with participating ENERGY STAR Homes builders. The purpose of the builder interviews is to provide the builder perspective on program process issues being addressed by the evaluation. The analysis is generally qualitative in scope, although percentages or numbers of respondents are cited to help the reader understand the relative importance of findings. Note, however, that 1) many of the questions asked were open-ended, and did not necessarily yield clear responses; and 2) the sample was too small to provide meaningful statistical analysis of results.

The participating builders were recruited from the program tracking database maintained by PECEI. The recruiting effort emphasized those builders that had the most experience in the program in terms of the number of ENERGY STAR Homes completed. We also attempted to get a mix of active participants that we had interviewed for previous reports as well as new participants that were actively building ENERGY STAR homes according to the program tracking database. A total of 16 in-depth interviews were completed with builders actively participating in the program.

Table 11 shows how the builder interviews were distributed across the states. For the participating builder interviews, we attempted to get a mix of builders (both production

and custom) across the entire region.³ The builder interviews were conducted by phone during March of 2006.

Table 11: Participating Builder Interview Sample By State

Builder Group	WA	OR	ID	MT	Total
Participating Builders	5	5	6	0	16
Total	5	5	6	0	16

Regarding their home building plans for 2006, the interviewed builders had the following characteristics:

- The number of homes planned for 2006 by interviewed builders ranged from as few as 8 to as many as 1,400.
- The two largest builders interviewed account for about 66 percent (2,400 of 3,615) of the total number of homes the builders said they plan to build in 2006.
- Around 56 percent of the homes planned for 2006 by interviewed builders are expected to be ENERGY STAR rated.
- 11 of the respondents said they planned to build over 50 homes in 2006, 7 of which said they planned to build over 100 homes.
- One of the builders had recently become a participant and had yet to break ground on a planned ENERGY STAR home.⁴

Although fourteen of the 16 builders interviewed said that all or almost all of their 2006 production will be ENERGY STAR qualifying, one of the large builders (more than 1,000 homes) that offers ENERGY STAR as an option said he expects around 3 percent of the homes built to be ENERGY STAR qualifying. One builder said that although all 8 of the houses he expects to build in 2006 will meet ENERGY STAR requirements, none will actually be certified because he is not planning on participating with the program any longer, as discussed in greater detail subsequently. Overall, the interviewed builders expect to build almost 2,050 ENERGY STAR rated homes in 2006. It is important to note that a single large builder accounts for around 45 percent of the projected volume of ENERGY STAR Homes.

³ Given the small sample size and the low level of building activity, we did not interview any builders in Montana but will be interviewing them for the final MPER.

⁴ This builder had several homes committed as ENERGY STAR and so was selected to be interviewed to get his initial perspectives on the program.

Program Benefits and Advantages

When asked to name the biggest advantages to the builder from participating in the ENERGY STAR homes program, builders offered the following:

- Almost all the participating builders gave responses related to product differentiation, marketing, and the recognition enjoyed by the ENERGY STAR name.
- About one-third of the respondents said that customer demand for ENERGY STAR features and the importance of energy savings were program benefits. Some builders offered comments such as the benefits of having “the ability to fly the [ENERGY STAR] flag and show the people that it is going to save some money,” and “as utility energy prices go up customers are looking for greater efficiency.”
- Two of the respondents cited the benefits of the 3rd party verification provided through the program as an important benefit.
- Two builders stated that sustainable building was important to them personally and to their employees. Some builders offered comments such as “energy efficiency is important, both personally and to customers.”
- One builder located in Idaho stated that he plans on ending his participation with the ENERGY STAR Homes program. This individual stated that he had no problem with the “building integrated” requirements of the ENERGY STAR Homes program, referring to the insulation and duct requirements, but he did not believe that his customers were willing to pay for the added costs of the additional ENERGY STAR components such as lighting and appliances.

When asked if they believed that building to ENERGY STAR requirements reduced callbacks on their homes, five of the builders said that they think it does reduce callbacks. Increased insulation resulting in reduced indoor draft was cited as the most common reason for fewer callbacks, along with fewer HVAC problems. Of the remaining 11 builders, five stated that they did not believe building to ENERGY STAR requirements reduced callbacks and six builders stated that they did not know.

Builders were also asked to name the most and least valuable aspects of assistance offered by the program:

- Nine respondents cited the Building Outreach Specialist (BOS) or their verifier as the most valuable assistance offered by the program, often mentioning the person by name.
- Another one-third of respondents (5) said the marketing materials and assistance were the most useful. Two builders specifically commented on the benefits of the

new computer kiosks that ENERGY STAR is beginning to use to educate customers about the benefits of ENERGY STAR homes.

- Two respondents cited contractor training as the most important assistance that the program provides.
- Very few of the builders were able to identify less valuable aspects of program assistance. In response to this question, one builder stated that the lack of knowledge about ENERGY STAR homes on the part of sales agents and realtors is a problem. Another builder commented on the amount of paperwork required by the program and also cited problems understanding program acronyms.

From the interviews it is clear that the BOSs and verifiers are providing a wide range of important services to the participating builders. Many of the builders commented that their BOS or verifier helped them “get over program hurdles,” or “get contractors up to speed.”

Twelve of the 16 respondents stated that their local utilities support the ENERGY STAR homes program in some capacity. The majority of the utility support comes in the form of financial incentives for the ENERGY STAR rating or, in some cases, for specific equipment. One utility offered a discount for the temporary hook-up during the building phase. Another builder explained that the city where he works awards building permits based on a point system.

Developments that are ENERGY STAR rated receive extra points, therefore making it easier to receive a building permit. This particular builder said that this was the primary reason that he decided to participate in the ENERGY STAR program. Of the 12 respondents that stated that their utilities provide some support for the program, six indicated that the support was important to them.

The majority of respondents (13) knew of other energy efficiency programs for homes. At least two builders, both in Oregon, were also participating in the Earth Advantage program. When asked what types of assistance the builders would like ENERGY STAR to provide, eight of the builders interviewed said there was no additional assistance they wanted from the ENERGY STAR Homes program, with several offering comments that “they have been pretty helpful” or “everything has been going smooth.”

The most frequently requested additional assistance or recommended changes included:

- Additional marketing and education to customers;
- Added financial incentives and rebates;
- Technical support; and
- Best practices meeting or builder chat group.

Program Requirements

General Requirements

Builders were asked about their awareness of the different Builder Option Packages (BOPs) that were available to them for meeting the ENERGY STAR Home requirements. In general, a BOS will suggest a single set of requirements to a builder based on what the BOS believes will best fit that builder's needs. As a consequence, most builders are generally unaware of the full range of the BOP and Technical Compliance Options (TCO's) available to them.⁵ This is by design, as the program does not want to unnecessarily overwhelm builders with all available options but instead makes a recommendation as to which option(s) will likely be most useful for each builder.

In response to the questions concerning the value of different compliance options, builders provided the following comments:

- Some builders offered comments such as “the more flexibility the better,” “good system,” and the BOPs are “easy to use.”
- Other builders offered comments such as “the BOPs are not easy to understand,” and they are “too rigid.” The respondent who stated that the BOPs are too rigid commented that the prescriptive nature of the ENERGY STAR program does not take into account differences in each house. As an example, the builder pointed out that the ENERGY STAR homes program does not distinguish between a house with fewer windows but less wall insulation and a house with more windows but greater wall insulation, even though both houses will be similar in terms of energy efficiency, since windows have much lower insulation properties (higher U-Value) than walls with insulation.

Program Information

- All but two respondents said that it had been easy finding information about the program requirements. Of those that found it easy to get program information, five cited their BOS or verifier as an important source of information.

Other responses on this topic include the following:

- One of the exceptions said that his organization had been building houses to ENERGY STAR specifications before they enrolled in the program and therefore had no need to look into program requirements. The respondent did say that a verifier had been providing assistance to the organization's builders.

⁵ Details on all of the BOPs and TCOs are provided in Appendix B.

- The other exception stated that he had not been enthusiastic about the program to begin with and had not actively looked for any of the program requirements. This builder has not completed any ENERGY STAR rated homes and does not plan on continuing his participation with the ENERGY STAR program.

In response to a question about who has provided the most program support, ten out of the eleven builders who responded stated that their verifier or BOS provided the most assistance. The respondents usually provided the person's name, and it is not clear if they knew whether the person is a verifier or BOS. One builder stated that his heating contractor has provided the most program support.

Air Conditioners

In response to a question regarding how the ENERGY STAR requirement to use SEER 13 rated air conditioners affects them, 13 builders said it has not negatively affected them, while two cited cost as the largest effect. Eight of the respondents stated that they had already been using SEER 13 rated air conditioners, with six of those respondents citing that this is already code in their territory.

Lighting Requirement

When asked if the ENERGY STAR requirement that 50 percent of the lighting fixtures/bulbs be ENERGY STAR rated has been an issue, most builders (11 of 16) did not view the lighting requirement as a problem. Respondents were also asked to rank the difficulty in meeting the lighting requirement relative to the other ENERGY STAR home requirements. One quarter (4 of 16) cited this as a major issue.

Although the majority of the respondents did not believe the lighting requirement was a major problem, they did state that there were some challenges with the requirement:

- The most common difficulty that builders mentioned had to do with the light quality and appearance of the ENERGY STAR rated lighting. One builder mentioned that he typically tries to place the efficient lighting in places where they will not be easily seen, stating that "lighting is not a big issue, but the lights are ugly so it helps to put them in the right spots" so that they are not very prominent. A different builder stated "lighting has not been a problem, although many of the lights available are not very nice."
- One respondent questioned whether the lighting requirement should be part of the ENERGY STAR home program. The builder stated that lighting should be a decision of the homeowner, and if they don't like the lighting that the builders use they will just replace the bulbs.
- Three builders said that their opinion about the lighting equipment has changed since they began the program. Two of these builders had initially questioned the requirement and expected more resistance from clients than they actually

encountered. One builder was worried about the added cost, but found some good deals on ENERGY STAR rated lights.

- Four of the respondents did not know that fixtures could be used to meet the lighting requirement. One of these four was a builder that had yet to build an ENERGY STAR home, however.

For the respondents who stated the lighting requirement was a major issue for them, there was no single theme that they all mentioned. Instead, builders had their own unique concerns with the requirement:

- One builder stated that the lighting requirement is “the worst part of the entire program.” According to this builder, the problem with the 50 percent lighting requirement is that if the builder installs a decorative chandelier that contains many standard bulbs, the builder must then install extra lighting sockets just so he can install more CFLs to meet the requirement.
- One of the large builders interviewed stated that it would be too much work to change the 300 different standard blueprints that his organization uses to accommodate for ENERGY STAR fixtures, and therefore they just use CFLs to meet the requirement.
- A different builder stated that “lighting is a tough sell. Customers don't like the ENERGY STAR light bulbs. They put them in, they take them out. Customers feel they are getting an inferior product.”

The majority of the builders (10 of 16) purchased their lighting from a lighting distributor such as Seattle Lighting. The remaining builders either purchased their lighting from a “big box” store or had their electrical contractor do the purchasing. Estimates of the added cost per home due to the lighting requirement varied from \$40 to \$350, with an average estimate of around \$100. One builder believed that purchasing ENERGY STAR rated lights might actually reduce the cost of the home because of the financial incentives that are available.

Barriers

Builders were asked what the biggest challenge has been participating in the ENERGY STAR program and what the toughest requirement has been. Three respondents stated that they have had no problems participating in the program. The remaining respondents provided a variety of responses to these questions, with no single barrier or difficulty standing out:

- Three respondents cited the added cost as the greatest challenge in participating in the program, noting that it has been difficult selling the added value to customers who are concerned with the bottom line. Two of these respondents still said they expect 100 percent of the homes that they build to be ENERGY STAR rated. The

third respondent, who is a large builder, said he expects around 3 percent of the homes built by his organization to be ENERGY STAR rated.

- Two respondents cited problems getting qualified subcontractors that can do ENERGY STAR quality work.
- One respondent cited the prescriptive nature of the BOPs as a major barrier. The respondent stated that it has been difficult to get new technologies approved for the ENERGY STAR program.
- Other comments had to do with difficulties with specific requirements such as air conditioners (long payback in the northwest), duct testing and lights.

When asked about difficulties finding equipment to meet the ENERGY STAR requirements, all but two respondents stated that they have had no problems locating equipment. One respondent had some trouble locating a gas fired hot water heater that meets the ENERGY STAR requirement and another commented on the difficulty of finding efficient decorative lighting.

Training, Duct Testing, Verification and Quality Assurance

Training

Almost half of the builders (7 of 16) stated that their contractors have received formal training. For the remainder of the builders, six stated that their contractors have received informal training from the verifiers, BOS or testers, and three respondents either did not know or did not think their contractors have received any training. Those who knew their subcontractors had received training all stated that the training had been beneficial and that the contractors were brought up to speed in a timely manner. Those who stated that their subcontractors received informal training also stated that the assistance was beneficial and that they have had no problems.

Duct Testing

In general, the builders interviewed were happy with the duct-testing element of the ENERGY STAR program. Many said that they believe it is one of the more important inspections that the program performs and results in a better HVAC system for the home:

- One-third of the respondents stated that third party verification was an important benefit of the duct testing by helping to ensure that the installations were done correctly.
- Three respondents cited marketing benefits a major benefit of duct testing. Builders made comments such as “It is a big sales feature when you talk to them about it.”

Although many of the builders had a positive view of duct testing, one-third of the respondents either did not know what the benefits of duct testing were or did not believe there were any.

Six of the builders believe that homebuyers are aware of the benefits of duct testing, while 7 builders stated that they do provide at least some marketing materials promoting the benefits of duct testing.

From the builders' perspective, the main benefit of duct testing to homebuyers is that it is an important part of the overall ENERGY STAR package and is responsible for a large part of the energy savings:

- One builder made the comment that “savings are what is most important to customers, and they respond to duct testing.”
- One respondent stated that the third party verification is the most important benefit for the homebuyer.

None of the builders interviewed saw any disadvantages to duct testing, and all but one builder stated that it was worth the cost. In general, the builders seem to be happy with their duct testers. None of the builders have had problems locating a tester or scheduling an appointment. The builders stated that the test usually takes 1-2 hours.

Seven of the builders have had at least one house fail the duct test. Minor duct leakage was the most common reason for failure mentioned by the builders. One builder stated that the leaks usually occur “in the stack where the floor transitions,” while another builder stated that leaks usually occur where the ducts connect to the furnace. In all cases they said the problem was corrected quickly and the failed test did not result in any significant delays.

When builders were asked if they had any final comments about duct testing, the only comment was that conducting a duct test on every house seemed redundant. The builder recommended letting the verifier decide whether a house needs a duct test.

Verification

All but one builder stated that they have had houses verified through the ENERGY STAR program. Builders found their verifiers through industry contacts, ENERGY STAR program representatives or Earth Advantage program representatives. Builders reported a variety of experiences with the verification process:

- In general, the builders have been very pleased with verification process. Respondents described the process as “smooth” and “great.”
- Builders appreciate the services that their verifiers are providing. Respondents commented on the verifier's ability to provide technical assistance, program

information, assistance with problem solving, and help making sure contractors know and can meet ENERGY STAR requirements.

- Four builders said they had failed at least one stage of the verification process. All four builders said that the failures were due to minor issues such as small duct leaks, and all were corrected quickly and without resulting in significant delays.
- One of the builders who said he failed a test did not think it was worth the time or money to fix the minor problem in order to get the ENERGY STAR rating. The same builder stated that the verification process was a major problem with the program. The builder believes that there are too many verification stages, it is too expensive, and that the verifiers focus on “smaller” aspects of the house and not the “larger” building integrated systems such as the HVAC system and insulation.
- Only two of the builders interviewed stated that they had experienced delays due to the verification process. One of these builders, who is located in Oregon, attributed the delay to a lack of verifiers in the area and therefore had difficulty scheduling an appointment. The other builder stated that the verifiers focused too much on smaller components of the ENERGY STAR program, which can cause costly delays and result in minimal benefits.

Builders were asked how long it takes to get the ENERGY STAR label from the time the verifier approves the house. The most common response was around 3 weeks, although one respondent said it took a few months.

When asked if there are any disadvantages to the verification process, only two builders responded. Both said that the main disadvantage has been delays.

Quality Assurance

Builders were asked whether they have had any interaction with the ENERGY STAR quality assurance process. Of the 16 builders interviewed, 5 said that a quality assurance representative had contacted them, and 4 said that at least one of their homes had been inspected. When asked how the QA process went, the builders gave responses such as “quick and easy” and “no problem.”

Marketing

Half (8) of the builders interviewed said they use real estate agents to sell their homes. With the exception of one builder who sells home via word-of-mouth, the remaining seven builders use their own sales agents. Other marketing issues reported by the builders include the following:

- The builders that use their own sales agents were more likely to say that their sales agents were knowledgeable about ENERGY STAR and were effectively selling the benefits of ENERGY STAR homes. Many of the builders with their own sales

force stated that their sales agents have received some training about the ENERGY STAR program.

- Approximately half of the builders said that they do not believe that real estate agents are effectively selling the benefits of ENERGY STAR to customers. These builders almost all used real estate agent so sell their homes. Many builders commented that it would be helpful if classes were available to train real estate agents.
- Builders believe that it is the ENERGY STAR label, not any individual component of the ENERGY STAR package, that drives consumers to buy ENERGY STAR rated homes. Lighting was not seen as a factor influencing homebuyers.
- One builder said that the third party verification was important to homebuyers because it adds confidence that the building was constructed soundly.
- Most of the builders said they have found the marketing materials provided by the ENERGY STAR program very helpful. The ENERGY STAR plaque and brochures were frequently commented on as being the most useful. One builder was excited about a new interactive education tool that was going to be installed in his sales office.

When asked what aspects of ENERGY STAR homes they promote to customers, most builders cite increased energy efficiency and reduced utility bills. Two builders said they promote the overall ENERGY STAR package as a “green” and sustainable option. Two builders specifically said that they promote the increased comfort and better air quality of ENERGY STAR homes.

Builders were asked what they consider the biggest marketing challenges for ENERGY STAR homes. Eight of the builders were not sure what the biggest marketing challenges are for ENERGY STAR. The respondents that did have opinions about marketing challenges provided the following responses:

- Four builders thought that lack of customer awareness of ENERGY STAR homes was the largest marketing challenge.
- Three builders stated that the increased price for ENERGY STAR homes presents the biggest marketing challenge.
 - One of these builders did not believe that customers were willing to pay more for a home that is ENERGY STAR rated.
 - One large builder considered the added cost to be the greatest marketing challenge, yet this builder also stated that 90 percent of the new homes built by his organization will be ENERGY STAR rated.

Overall, builders were happy with ENERGY STAR efforts to market the program. When asked what the ENERGY STAR program should do to effectively market the program, builders gave responses such as “nothing, they have done a great job providing materials and assistance.” Some builders said they would like to see more customer awareness, and recommended things such as a “marketing blitz” and also promoting the builders themselves as being “responsible builders.” One builder recommended targeting real estate agents, appraisers, and building inspectors.

When asked if they had any final comments about the ENERGY STAR homes program, the builders provided the following comments:

- “Overall everything is good. I am 100 percent on-board.”
- “The program has been painless, a real workable program. It would be nice if the gas company provided rebates.”
- “I view the program as an overall package for environmental responsibility. Individual components are not issues, you just do them.”
- “ENERGY STAR needs to focus on major building components and also refine the verification process.”
- “It would be good to have more builder input and cooperation on the program. Some decisions were made without input from builders.”
- “What’s the next step for ENERGY STAR? Is there another level coming?”
- “Having different levels of ENERGY STAR, such as platinum, gold, silver... would be useful, both from a builders point of view and also for marketing.”
- “It would be nice if there were a wider range of appliances, including entry level appliances. Only high-end ones exist for ENERGY STAR.”

3.3 VERIFIER INTERVIEWS

This section presents the results of interviews conducted with participating ENERGY STAR verifiers. These verifiers are specialists providing third-party verification that the requirements for an ENERGY STAR home 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 interviews also provide the verifiers’ perspective on how builders and HVAC contractors perceive the verification process. The analysis is generally qualitative in scope, although percentages or numbers of respondents are cited to help the reader understand the relative importance of findings.

In total, interviews were conducted with 10 individuals who are certified as verifiers for the program. The interview sample was chosen to get a mix of verifiers across states and to include those verifiers that had actually completed some ENERGY STAR home

verifications. The experience level of the interviewed verifiers ranged from 2 to 350 ENERGY STAR homes inspected.

Table 12 shows how the verifier interviews were distributed across the states. Among the 10 verifiers, 7 were also certified for performance testing in the program. The 2 verifiers in Idaho were interviewed specifically to elicit comments on their relationship with the State Certifying Organization (Idaho’s State Energy Office) and one was also interviewed as a performance tester. Only the findings relating to verification tasks are discussed in this section, however.

Table 12: Verifier Interview Sample By State

Builder Group	WA	OR	ID	MT	Total
Verifiers	3	4	2	1	10
Total	3	4	2	1	10

Business Environment

Five of the verifiers work at private companies that are competing to provide verification services. In addition to verifying ENERGY STAR Homes, all five also provide other services for their builders. The other types of services they provide include:

- Built Green consultations
- Duct testing
- Insulation installation
- Sales of heat recovery equipment
- Inspection services

In most cases, the verifiers we spoke with recruited builders through the relationships they developed from offering these services themselves. A couple of verifiers recruited builders through cold calls based on observed construction activity. One verifier suggested that it would be nice to have an updated list of builders with activity in the area, and they were working with their BOS to find such a list. One also mentioned that it would be helpful to receive an information packet about the program when they get their building permit.

The amount of business each company derived from ENERGY STAR Home verification services varied greatly. At some places, it was 100 percent of their business while at others, just 5 percent. In general, the prospects for future business were mixed. Two verifiers from rural Washington and one from Montana were concerned that they had not picked up more business in their areas. At the same time, one thought there is a strong business opportunity once they get builders on board, and one believed the market is definitely going to grow.

The rates charged for services varied from \$115 to \$400 per home, depending on what other services were included and if the home was built in a development that qualified for sampling. 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 the trainings for builders and HVAC contractors.

Half of the verifiers had experience with verifying a home's performance in previous programs. These verifiers generally preferred the building science elements of the training as opposed to the technical requirements. One verifier said the most valuable part was "understanding how components work together and *why* they need to work the way they do. How the systems balance. Verifiers need to have a good understanding to explain the benefits to builders."

First-time verifiers appreciated learning the details of the program and getting practical answers from the experienced verifiers about specific questions. One of these verifiers mentioned that the training should "emphasize where to find information about ENERGY STAR requirements and where updates are posted."

Builder trainings were generally perceived as being valuable. In most cases, the verifiers believe the builders understand the basics pretty well. Most of the verifiers indicated that they themselves end up being the builders' real resource for program information, technical assistance, and other program issues. Regarding the training coordination, one verifier mentioned that it is better if PEGI does not get involved because "they do not have the relationship with the builder." One verifier suggested that the builder training should include "a checklist that outlines the ENERGY STAR lighting and heating requirements, for example."

The HVAC contractors are showing an "exponential" improvement in their skills, according to one verifier. Most agreed that the contractors initially tend to have difficulties meeting standards, but that they are able to successfully develop the necessary skills with growing experience. Two of the verifiers mentioned that the HVAC trainings could be extended to a full day if they were combined with other certifications. Otherwise, they need to be respectful of the opportunity cost of contractors attending the trainings, even if they are free. One verifier suggested that they should provide a quick reference guide that just covers the ENERGY STAR requirements for HVAC. They think that the current guidelines are too intermixed with requirements pertaining to other aspects of the house (e.g., the lighting).

Comments on Builder Requirements

Verifiers were asked to evaluate how successful the builders were in meeting the various program requirements. It is fairly rare that persistent difficulties with the requirements will cause a home to be dropped from the program, and only one builder was said to have

withdrawn from the program altogether. Most often, all of the initial problems are remedied and the house still receives certification.

The most troublesome requirement in the minds of the verifiers is duct sealing. Six verifiers mentioned that leaky duct systems are a common problem. One specific reason mentioned was that contractors do not bid the project right and end up having more work than they planned. Verifiers also mentioned that duct sealing problems often occur when the builders use an HVAC contractor who is new to the ENERGY STAR Homes program. More specifically, the duct blast tests usually reveal leaks around the heating element.

Four verifiers mentioned lighting as a problem for the builders. The problem typically relates to customer and builder objections to the output and quality of light. One verifier said some builders have stopped installing dedicated fixtures due to persistent dissatisfaction with the lighting.

Insulation was also mentioned several times as a problematic requirement. Verifiers indicated that splitting insulation around wires and fluffing insulation rather than forcing it in were frequent issues. Additionally, installing insufficient insulation in the ceiling and floor are frequent mistakes.

The two verifiers that mentioned problems with windows noted that builders don't always order the right windows and find out too late, and that the manufacturer sometimes labels them incorrectly (Milgard was cited as the lone example).

In general, the verifiers believed it was fairly easy to resolve any failed program requirements without adding to the construction time for the home.

Interaction with other Market Actors

Verifiers were very pleased with the BOSs. They found them to be a great resource and easy to work with. The biggest difficulty was the amount of turnover and lack of replacements. A couple of verifiers (one in Washington and one in Oregon) essentially did not have a dedicated BOS because specialists that had retired or had been fired were not replaced. Otherwise, the verifiers talked regularly with their BOS and felt the relationship worked best when the BOS has the technical knowledge to provide expertise as well.

Of the 6 verifiers that did not work at a utility, only one had significant contact with their local utility. This verifier thought that Puget Sound Energy was a great supporter of the program and couldn't say enough about the good things they were doing.

The interactions with the state certifying offices (SCOs) were positive, with the exception of the verifiers we talked to in Idaho. In the other states, no problems were mentioned about the quality assurance process. One verifier said that it is useful when the SCO occasionally goes on verifications with the verifier as a way to both do the quality assurance and provide any educational points.

In Idaho, one verifier said that the ENERGY STAR program has been slow to respond to his requests for marketing materials. The verifier believes that part of the problem is due to back orders for the materials, and part of the problem is due to unfair treatment by the State Energy Office's distribution system. This respondent stated that many builders and other contractors are discouraged from participating in the ENERGY STAR homes program because they do not want to deal with the State Energy Office.

Upcoming Challenges

The Federal Energy Tax Credits pose the greatest challenge to verifiers, as it appears that a greater amount of energy savings is needed to qualify for the credit than is currently provided through the current BOP options. Other challenges described by verifiers include:

- Concern about Pacific Power increasing their HVAC requirements and making it more difficult to receive rebates
- Builders who are just interested in the label and not in building high performance homes
- Rural contractors have difficulties attending trainings
- Training realtors
- Having BOSs available for all areas

Overall Program Comments

The verifiers had generally positive comments about the overall program. A few didn't have any final comments, which indicated a high level of satisfaction with the program. Listed below are the comments from those that did respond:

- Several believed that the program had progressed significantly in the last year and was being responsive to problems when they arise.
- One verifier feels strongly that more trainings for builders and contractors would help a lot, and that otherwise there are no major program gaps.
- One verifier suggested that the program provide some kind of operational manual to the homeowner to keep them connected to the ENERGY STAR program after they move in.
- One verifier was critical of the job done by CSG in replacing BOSs and taking responsibility for mistakes.

3.4 PERFORMANCE TESTER INTERVIEWS

This section presents the results of interviews conducted with participating ENERGY STAR Homes performance testers. Performance testers conduct duct testing and possibly duct blaster and/or a blower door tests. The performance testers are generally either HVAC contractors or else verifiers that also provide performance testing services. The purpose of these interviews is to provide the performance tester perspective on the various ENERGY STAR Homes program components and processes and their perception

of how well the performance testing requirement is accepted by builders and HVAC contractors. The analysis is generally qualitative in scope, although percentages or numbers of respondents are cited to help the reader understand the relative importance of findings.

The participating performance testers were recruited from the program tracking database maintained by PECL. The recruiting effort emphasized those performance testers that had the most experience in the program in terms of the number of tests completed for ENERGY STAR homes. A total of 9 in-depth interviews were completed with performance testers actively participating in the program. Of the people interviewed, 4 were also verifiers for the ENERGY STAR Homes program.

Table 13 shows how the tester interviews were distributed across states. The tester interviews were conducted by phone during April and May of 2006.

Table 13: Performance Tester Interview Sample By State

Builder Group	WA	OR	ID	MT	Total
Participating Testers	2	4	2	1	9
Total	2	4	2	1	9

Participation

Most of the performance testers interviewed (6 of 9) had been involved since the beginning of the ENERGY STAR Homes program. Four of these testers were offering testing services prior to the ENERGY STAR Homes program. When asked why they began offering duct-testing services, the most common reason the respondents stated was to participate in the ENERGY STAR Homes program.

- One respondent who works with some large builders said he saw a business opportunity and wanted to “pioneer the ENERGY STAR program” and be a “one stop shop for their builders.”
- Another respondent who began offering duct testing before the ENERGY STAR program stated that they “viewed conservation as a good niche market” and they believed that duct testing would eventually be mandatory.

When asked how much of their total business is devoted to duct testing, most of the respondents stated that performance testing was a small part of their business, with the exception of one respondent who stated that testing accounted for around 50 percent of his business. One respondent noted that this is a difficult question because although performance testing by itself is small in terms of the amount of time and revenue it accounts for, it is an important factor when it comes to selling the full spectrum of the business’s HVAC services.

The number of completed performance tests varied greatly among the testers interviewed. For those that stated they had been offering performance tests prior to the ENERGY STAR Homes program, the number of completed tests tended to be much higher. All of the respondents stated that almost all of the performance tests they do for new construction are for the ENERGY STAR Homes program. One respondent stated that he also performs duct testing for other programs such as Build America, Earth Advantage and Health House.

- Five respondents (two in ID, two in OR and one in WA) stated that they have completed over 50 performance tests for the ENERGY STAR Homes program.
- One respondent located in Idaho said that he expects to perform around 150 tests in 2006.

The number of builders that the performance testers work with also varied widely, from as little as five builders to over 50 builders. The respondents stated that almost all of the builders that they provide performance testing for are ENERGY STAR builders.

When asked how they expect their testing business to change in the upcoming year, all of the respondents stated that they expect it to grow. There seemed to be a general consensus that builders and contractors are becoming more conscious of energy efficiency and are acknowledging that increased building standards will become the norm sooner or later. The respondents attributed most of the increased attention to energy efficiency to the ENERGY STAR program, and in some cases to other energy efficiency programs or local utilities that are promoting energy efficiency.

- One respondent located in Oregon stated that the local utility Mid-State Electric is effectively promoting the ENERGY STAR program in its territory.
- Another respondent located in Oregon stated that he expects the industry to grow, but also warned that as more people and organizations get involved in energy efficiency things will likely become more complicated. He believes “there are too many fingers in the pie.” He also expressed concern that the paperwork that comes along with different residential energy efficiency programs is becoming overwhelming and redundant, saying that the different programs “need to get on the same page.”
- One respondent located in WA stated that he expects duct testing to be adopted as part of Codes and Standards. He also said that developers are beginning to require duct testing, in part because their municipalities are pushing for greater energy efficiency and sustainability.

Training

Most of the performance testers interviewed stated that their companies have between one and three staff trained to perform duct testing. The company with the most trained staff had six people trained to offer duct testing, although only three of the six actually

perform tests on a regular basis. Performance testers received training from a variety of organizations, including the following sources:

- Idaho State Energy Department
- Energy Outlet
- Oregon Department of Energy
- Washington State Energy Office
- Climate Crafters
- Delta-T
- Conservation Services Group (CSG)

When asked about the effectiveness of the training, all of the respondents stated that it was helpful, but most added that it is not sufficient on its own, and that additional training is still necessary. At least three of the respondents said that they or their staff received in-house training prior to the official performance tester training and other respondents said that staff received additional training after the course.

Nearly all of the respondents thought that the hands-on fieldwork was the most important part of the training. One exception to this was a respondent who thought that written training manuals were the most important part of the training.

When asked for suggestions on how duct testing training could be improved, the respondents offered the following:

- “The training should be more of an apprenticeship program.”
- “Ongoing training would be useful. One training for new personnel is not sufficient.”
- “Smaller classes and more hands-on training would be helpful. It would be beneficial to spread the training out for a few days and go to multiple sites.”
- One respondent suggested that a section be added to the training about the true-flow plate air test.
- Four respondents stated that the training was fine and they had no suggestions for improvement.

Performance Tester Perceptions of Builders, HVAC Contractors, and Homebuyers

The majority of the respondents thought that builders do understand the value of performance testing. Only two respondents stated that they did not believe builders understand the benefits of testing. The respondents offered a variety of comments about how they think builders view performance testing.

- One respondent who works for a full service HVAC company stated that his company encourages all builders, ENERGY STAR and non-ENERGY STAR, to have their HVAC installations tested. This respondent thought that ENERGY STAR builders were knowledgeable about the benefits of performance testing, but non-ENERGY STAR builders were less likely to believe testing is worthwhile.
- One respondent located in a high growth area in Oregon stated that builders in his area are becoming savvy about marketing the benefits of performance testing to homebuyers in order to get an edge on the competition. Another respondent who works for a full service HVAC company stated that builders like the testing because his company certifies the quality of their installations if they are tested. If any problems arise, the company will then return to fix them at no additional cost.

One respondent stated that although many builders understand the benefits of performance testing, it is still important to continue to educate builders. This respondent recommended that the ENERGY STAR program provide builders with some simple literature that explains the benefits of performance testing. Another respondent stated that builders appreciate the benefits of duct testing after they see the difference between an ENERGY STAR installation and a “standard” installation.

The respondents tended to describe the HVAC contractors as being a little more reluctant than builders to acknowledge the benefits of performance testing. One respondent thought that builders needed to do a better job explaining the ENERGY STAR requirements up front to the HVAC contractors. The respondents thought that, in general, the contractors appreciate the benefits of testing after they see their first ENERGY STAR installations tested. Most contractors fail their first test, and as a result they are able to see the amount of leakage resulting from old practices, and hence the benefits of testing. One respondent mentioned that HVAC contractors are beginning to market testing to builders as a way of distinguishing themselves from the competition.

There was a general consensus that homebuyers knew little about duct testing and were not aware of the benefits of testing.

Performance Testing Process

Most of the respondents (7 of 9) stated that a typical duct test takes between one and two hours. One respondent stated that a two-man crew usually completes a test in around two hours and another respondent stated that a typical test takes around three hours. While all of the respondents stated that they have completed tests when the ducts have failed, the

percentage of failed tests varied from around five percent for experienced contractors, to 70 percent for first time installations. Most of the respondents stated that there is a quick learning curve for most HVAC contractors. After a contractor has had a few jobs tested their installations tend to improve to where they either pass the test or have some minor leaks that can be quickly fixed. The amount of time it takes to fix a problem varied (a couple of weeks to a few hours) depending on the magnitude of the problem and also if the installer needed to be called back or not.

- Two respondents who work for full service HVAC companies stated that their testers are trained to fix problems encountered during duct testing.
- One respondent stated that he encourages the contractor to be on site when the test is performed so that the contractor can fix problems on the spot.

The most common reasons for failed tests are minor leaks due to poor sealing, leaks from the air handler cabinet itself, and from post-installation damage to the HVAC system from other contractors. Post-installation damage from other contractors was stated as a major problem by three respondents. One respondent estimated that around 50 percent of the problems he has encountered could be attributed to damage caused by other contractors. This respondent thought that plumbing contractors were especially hard on the duct work. To address this issue, the respondent recommended that houses should be tested towards the end of the construction process after other work around the ducts has been completed. As one respondent explained, “Duct testing needs to happen towards the end of the project in case of problems resulting from construction.” This respondent said that he usually conducts the test when the project is around 90 percent finished.

When asked what problems, if any, there are with duct testing, the respondents offered the following:

- “No problems, it is a good test.”
- “It is one of the better practices that ENERGY STAR does. In reference to the idea of “sampling” a contractors work (testing only a fraction of a given contractors installations) the respondent said that “sampling is not a good option since even experienced contractors will have around a five percent failure rate.”
- “It is important that the duct test is performed at the end of the construction process to check if there is damage from other contractors.”
- “On larger homes, [the performance tester’s] safety can be an issue when returns are in awkward places. In these situations a split system test should be permitted.”
- “The installers should be there during the testing, at least for their first few tests.”
- “At times the process can be cumbersome and it takes time, but the difference is dramatic. It is amazing how much leakage you can get rid of.”

- “Sometimes a duct is not sealable. ENERGY STAR should provide guidelines of what to do in these cases.”

Marketing

Most of the respondents stated that they do market their participation with the ENERGY STAR program, although only one respondent stated that his business specifically markets their duct testing services. Specifically, this respondent said that his business promotes duct testing by marketing benefits such as conserving energy and improved air quality. When asked what the ENERGY STAR Homes program could do to help market duct testing, the respondents suggested the following:

- “ENERGY STAR needs to market duct testing to the HVAC contractors and get them on board so they do it as regular practice, not just for ENERGY STAR.”
- “A more consistent supply of marketing materials would be helpful, along with more co-op money for marketing.” (Idaho)
- “ENERGY STAR is doing a good job marketing, although they could hit up utilities to get larger rebates for duct testing.” (Washington)
- One respondent located in Oregon recommended that ENERGY STAR should focus on advertising to homebuyers and also promote ENERGY STAR contractors as high quality installers. The respondent also recommended that ENERGY STAR get out and meet contractors and builders in person to get them on board.
- Two respondents recommended that ENERGY STAR should focus its marketing on rising energy costs and the money that ENERGY STAR homes can save.

Overall Program Experience

When asked about their overall experience with the ENERGY STAR Homes program, the respondents offered the following:

- “It’s good to have such a large-scale program that people can have a label for. Overall I think the standards are good. I also have received good technical support.” (Montana)
- “We have had a good experience with the ENERGY STAR program and should see good growth. We have already seen around a 300 percent growth.” (Oregon)
- “ENERGY STAR is doing a good job. They have done a good job explaining everything, mostly through the verifiers.” (Oregon)
- “This has been a much better program than others. The people working with the program are very knowledgeable.” (Oregon)

- “The future looks good. The program had a rocky start, but once they got their feet planted things started to pick up a lot of momentum.” (Oregon)
- “Our experience has been pretty good, although it is confusing to figure out who is who in the program. The program has also been having a problem replacing the Building Operation Specialist in the state.” (Washington)
- “Our experience has been good. We got in at the ground floor and it has been a good learning experience for us. It has benefited the company and also lends credibility to the company.” (Washington)
- When asked if there was anything about the program that was unclear or confusing, all of the respondents said they have found the program to be clear. Two respondents, who are both located in Oregon, added that there has been some confusion about who is who within the ENERGY STAR Homes program. Specifically they referred to confusion over the roles of staff at different organizations such as the Energy Trust of Oregon, the Northwest Energy Efficiency Alliance, and The Conservation Services Group (CSG).

When asked what they think will be the biggest future challenge as a performance tester, the most common response was that as the program grows it will be difficult to get new installers trained and integrated smoothly into the program. In regard to this challenge, respondents recommended conducting additional on-site trainings and also producing some simple training and reference materials for HVAC contractors. One respondent located in Washington explained that Pacific Power was thinking about increasing the HVAC efficiency standards in its territory. The respondent stated this would be a major damper to the program in the area due to the increase in cost resulting from the HVAC upgrade.

When asked if they had any final comments on the ENERGY STAR Homes program, the respondents offered the following:

- One respondent thought that the ENERGY STAR program should include ventilation standards and air quality in their criteria. In regard to this, the respondent said that “The ENERGY STAR program is a good program. So far they have been responsive to issues that have come up, but they need to address the ventilation issue.”
- “We are still learning, the more we do the better we get.”
- One respondent reiterated his concern that the forms required for different energy efficiency programs, including the paperwork required by the ENERGY STAR program is resulting in a lot of redundant forms and is creating a burden for contractors.

3.5 STATE CERTIFICATION OFFICE / QA INTERVIEWS

A portion of the in-depth interviews was devoted to 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 six QA specialists in the program territory: two in Washington, one in Oregon, two in Idaho, and one in Montana.

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. 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 Idaho, all the QA inspections are conducted by a third party retained by the SCO, while in Oregon all the homes that are built through the Energy Trust of Oregon program have QA performed by a contractor. Both contractors are directed by the SCO. In Washington and Montana, SCO staff conducts inspections, as are Oregon ENERGY STAR homes outside the Energy Trust program.

Since SCOs deal extensively with verifiers, it is important to note that most of the verifiers in Oregon are affiliated with utilities – in contrast to the other states, where they are predominantly independent for-profit 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.

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 say the primary goal is to confirm that the installation meets the program specification; 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.

Sampling and Scheduling

Most of the states have been conducting QA on a sample of about 10 percent of homes, but there are variations. Washington and Oregon in particular emphasize the need to

inspect a higher percentage for less experienced builders/verifiers, with a corresponding reduction below 10 percent for well established verifier/builder combinations that have proven their compliance.

- In Oregon, the sampling rate averages about 10 percent, overall, but varies by verifier depending on how their homes score on a QA template developed by the Oregon SCO and also used by the other states. For verifiers whose homes consistently pass QA testing they have a smaller sampling rate; if they do not document early and extensive involvement of the verifier and the homes score more marginally, they go with a higher percentage.
- Washington is sampling about 10 percent, but notes that this sampling level can only be maintained if the State Office receives a significant subsidy over and above the certification fee paid by builders to help cover the cost of the QA effort. Washington hopes to be able to reduce the sampling rate to 3 percent and make the program self-sustaining, so that the certification fee paid by the builders covers the full cost of the QA effort. However, one Washington QA specialist noted that this may be difficult, since contractor teams turn over frequently, and every new team will require training and ongoing monitoring.
- Idaho QA specialists echo that sentiment, citing their experience with the manufactured homes program. They say that if the sampling rate falls below 10 percent, builders get lackadaisical. “We learned this in manufactured housing; you have to ride them constantly on QA.”

Selection of homes to inspect also varies somewhat. While Idaho and Montana use the complete program database and both Washington and Oregon are trying to use the local version of the database they have developed, all the states more often rely on direct communication with verifiers to alert them when homes are ready for the final QA.

In most states the actual inspection of selected homes is tempered by whether those selected homes are already occupied, since only Idaho does testing on occupied homes.

- A Washington QA specialist usually prints a list of completed homes the morning or the night before inspections are to be conducted, and then visits the homes to identify those that are not occupied, which are then inspected.
- The Oregon inspector will visit a subdivision with, for example, 50 homes all inspected by the same verifier and will attempt to conduct inspections on five of those. This inspector pre-selects five number one choices from the program database list, as well as five second tier alternates. He initially tries to inspect the number one choices, but inspects an alternate if a first-tier choice is occupied, making certain to cover all the stages of construction.
- In Idaho, the QA contractor conducts inspections at a pre-designated time, usually when the framing is up but the interior walls are not yet covered. After inspecting

the framing, he typically returns in the next several days to inspect the insulation and then works with the Home Performance Specialist (verifier), if possible, to observe the tests. Finally, the QA contractor goes back at the end of the construction process for the complete inspection. Idaho homes are routinely subject to a QA inspection after occupancy. While a single builder and Home Performance Specialist object to having occupied homes inspected, none of the others have expressed concern. The QA Manager emphasizes that “Homeowners love it; it’s never an issue”.

The QA process does not appear to be creating delays in the construction process.

- A Washington QA specialist did offer two reasons why scheduling can pose a problem. First, the verifier and QA specialist must maintain good communication. Second, the tight timeline may make scheduling difficult, since there may be less than a week between completion and occupancy, especially in the Puget Sound region. This specialist adds, however, that builders do not stop for this process, and will risk the certification rather than stop.
- In Idaho, the state QA specialist notes that concern about delays has calmed down since the early months of the program, now that both builders and home performance specialists see that the process is working.

Failure Rate/Reasons

In Washington, about 1 in 7 homes do not pass the QA testing initially. Main reasons for failure include duct tightness issues (particularly the return run from the furnace to the house where it makes a blind connection through fire rock that's usually installed before the ducts, making it hard for the HVAC contractor to seal); use of rigid foam duct insulation; and leakage around the furnace cabinet. There have also been issues of inadequate blown-in insulation, where the level was not found to be up to code. Lighting also continues to be an issue in Washington, according to the QA specialist. Particularly in upscale homes, buyers are resistant to CFLs because of light quality concerns, and some homes have failed the QA inspection because they did not meet the 50 percent CFL bulbs standard.

Oregon initially had problems in as many as one-third of its homes, but the QA specialist notes that this percentage has fallen sharply, both because contractors have improved their performance and because some of the QA inspections were initially taking place before the verifier had conducted tests and worked with the builder to ensure compliance. Initial problems tended to pertain to duct tightness and incorrectly specified air conditioners or heat pumps, but the QA specialist is now finding that contractors are making the ducts tight and routinely installing 13 SEER AC units because of the new Federal standard. Oregon is also still finding some homes short on CFL bulbs even after the verifier has signed off, although all these homes are said to have been very close to the required 50%. The only other issue reported by the Oregon QA specialist centers around details that are not clearly the responsibility of a specific contractor. For example,

neither HVAC nor sheetrock contractors consider it their responsibility to seal the sheet metal boot for the duct system to the drywall.

In Idaho, overall compliance thus far has been high, with the few failures attributable either to too few CFL bulbs or inadequate insulation.

The Montana QA specialist says they have had no failures to date, noting that average numbers on the blower door test are about 4 ACH, or about half the standard. He adds that lighting is still the requirement that poses the biggest challenge to builders. There is some interest in putting in ENERGY STAR fixtures, but the QA specialist says that not all the distributors carry them.

Certification

Issuance of the ENERGY STAR certificate, another function of the SCOs, usually happens within a week of the last verifier inspection. Certification typically occurs before the QA verification, and several QA specialists pointed out that issuance of certificates was not dependent on successful completion of a QA inspection for those homes selected for QA. In fact, Washington has been starting the process of generating certificates before the final verifier inspection because they believe it is important to have the labels available for homes as soon as they pass the inspection by the verifier. They now set a date for issuance of the label when the verifier initiates the home in the database and establishes an estimated completed date; 30 days before that date the labels are sent out.

On the other hand, a Washington QA inspector notes that this process has not been followed in cases where a builder's homes have repeatedly failed. In those cases, certification has been withheld until the QA inspection verifies that all issues have been addressed. The QA inspector notes that for a few builders, "it's gotten to the point where the teeth are coming out," indicating that QA inspectors are actually using the withholding of certification to ensure compliance with program requirements.

Builder and Verifier Response

Most builders are pleased with the QA function provided by the program. Washington builders that have bought into the program are pleased because they are getting a commissioning service. Builders that are less committed to building energy-efficient homes tend to see it as an annoyance and may drop the program.

The Oregon QA program manager says builders in his state also appreciate the QA, pointing out that, in practice, the general contractor may not touch the house a lot. Larger builders in particular are primarily managing and coordinating the construction process, and they welcome having someone else take a look at the house.

In Idaho, all but one builder have been receptive to the QA process, while the Montana SCO says they have taken steps to provide the verifiers and builders with feedback throughout the construction process, which builders find helpful.

Most verifiers, too, see the QA process as a useful source of feedback. However, one QA specialist in Washington commented that since verifiers set their own prices, there are always a few who do not provide for enough time to coordinate with the QA specialist and the QA process, and who are less likely to communicate with the QA specialist as a result.

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. However, one Washington QA specialist felt that there was room for improvement and that people in the verification business should be hired to do the training.

Several QA specialists suggested that verifiers could use additional training on marketing if they are to become the primary point of contact for getting builders into the program. In addition, interview respondents said that verifiers should be either trained or encouraged to be more timely in their entry of data into the database, with several (in Oregon and Montana) noting that they had encountered “ghost houses” listed in the paper or shown at an Open House as ENERGY STAR homes even though they were not in the database.

Overall Role of QA and Outlook

Three QA specialists pointed out that the QA effort has proven to be both broader in scope and more resource intensive than originally anticipated. One Washington QA specialist cited an example where the Performance Testers had not been adequately trained, so the performance testing had to be repeated several times. The verifier could not train them, so the scope of the QA person has drifted into performance testing, “I was supposed to go out and pass and fail houses. I go out there and do a lot more. Mainly because there needs to be more support. The program needs to clarify the BOS role and verifier role. Getting people in is more than just having them sign up.”

Some of the challenges for the QA function – particularly into broader roles of performance testing and even builder education – appear to be the direct result of decisions made early in the ENERGY STAR Homes Northwest program design. Comments offered on this topic by three SCOs included:

- “I believe that we launched way too early...infrastructure was not even agreed upon. Lots of decisions were made under the gun and behind the eight ball.”
- “There was a tendency in the beginning to undersell the requirements; ‘you’re almost there’. Some verifiers took that to mean they didn’t need to do that much, but that’s not true. Insulation needs to be code and sometimes isn’t. Some companies still use duct tape, going to mastic and testing is a big deal. The expectation that it wouldn’t be much work -- among everybody involved -- was just wrong.”

- “The reality is marketers think up these programs and then underestimate the cost. No one ever realized the curve it took to get builders from 2 by 4 R13 walls to doing an ENERGY STAR Home, and the follow up that takes. If you have a builder already doing 2 by 6 framing and other stuff, there’s less of that, but those other guys have a lot to learn. I would spend time with the builders in the field when there were three or four trips to builders a week talking to them and getting the builder up to speed. The marketing team just thinks it will happen, but it’s taken a lot more time, effort, and cash.”

Two QA specialists said they also play an indirect role in marketing the program, since they can help emphasize the importance of the performance testing and verification process.

- “From the QA standpoint, if I get in early and meet with builder or construction superintendent when they hear it from the person who is going to inspect it bears more weight. So if I can get out there early it makes things work out better.”
- “Builders like hearing about the program requirement from the state QA person. The BOS doesn’t have that credibility because they’re not enforcing the standard.”

As the program evolves, several SCOs foresee an expanded role for verifiers and a more limited role for the QA specialists. The Washington SCO representative said that, “If the program is going to be self sustaining it will be necessary to ask verifiers to do builder outreach on their own. The long-term market transformation model for the program entails the verifiers taking on the marketing function. We want the QA specialists to be the people who come out once a quarter.”

Coordination

The biggest issues relating to coordination were raised in Oregon and Idaho.

In Oregon, there has inevitably been confusion because of the coexistence of Energy Trust and NEEA portions of the program. The QA specialist said he has often been unsure of whom to turn to and has had to call around to a broad range of people. “For example, the BOS has had [Energy Trust] overlap, so the BOS wears several different hats. It has not been altogether clear who’s responsible for what, so if a [Energy Trust] BOS is talking, which hat are they wearing? It’s been frustrating in the past; confusing to see which hat they were wearing and how they were melding their roles.”

One coordination issue with regard to the two programs is that other verifiers enter data into the regional database, while for the Energy Trust Program they fax in the paper forms, which are then entered first into the Energy Trust database and then into the regional database. This had led to some of the “ghost houses” mentioned earlier.

While the Oregon SCO believes that overall coordination is going reasonably well, his organization would like to be more in front of the builders and have more of a mechanism to educate builders directly. “The Energy Trust folks don’t have long-term relationships

with the builder and may not give them as much education or feedback as we would like to see. We want to help the builders go the next steps.” He believes this will happen in the future because, “as we get all the specs aligned across the region and take care of those other details, I look forward to more of an education role to help us build support for code changes.”

In Idaho, there are issues with what is perceived as an effort by the program to bypass the SCO both on program requirements and on the certification process itself.

- The Idaho SCO is also concerned because the head of ResNet has, he says, been cleared to come into Idaho to offer certification and QA services. Representatives from the Idaho SCO point out that they have an exclusive contract to do this to the end of this December. They say they are just about to break this program into credibility and it will be sustainable after this year, but if somebody else comes in it will 1) reduce fees, which represent a return on the significant investment made by IDWR, 2) confuse the builders, 3) create a bias toward HERS rather than the approach approved for certification and QA by the regional technical forum.
- IDWR may leave the ENERGY STAR Homes program altogether. They say they have put in extra time and money to make this program a success, including extra time to keep builders after a previous BOS had alienated them.

Despite these concerns, the Idaho QA Program Manager says that communications with the rest of the ENERGY STAR team and other SCOs have been good, noting, “there is a ton of communication. It’s a great team that works well together.” The only thing he would ask for from the program is “more money for QA. They should be more realistic about what it takes.”

Similar issues with the Idaho SCO were discussed in the previous MPER for this program. The evaluation is continuing to monitor this issue and it will be more fully addressed in the next MPER when we will have an expanded sample of market actor and builder in-depth interviews on which to base evaluation conclusions and program recommendations.

3.6 POST-OCCUPANCY SURVEY

This section of the report describes the results of post-occupancy phone surveys that were completed in November 2005 and February 2006. This survey was designed to collect information on initial satisfaction of ENERGY STAR homeowners that had occupied their homes for three months or more. The survey also addressed satisfaction with the ENERGY STAR lighting and collected information on whether the homeowner had removed any of the light bulbs or fixtures.

The original goal of the post-occupancy survey was to get approximately 100 completed surveys each quarter. Since the program tracking database does not have homeowner information, we needed to take the address information and do a reverse lookup to determine each homeowner’s name and phone number to conduct the survey. This

proved to be less successful than we had initially hoped, as we were able to match only about 25 percent of the addresses in the database. As a result of the limited sample, we were able to complete 65 surveys across the two survey waves, which is considerably less than the 200 we had planned to complete.

Due to the difficulty in obtaining phone numbers, and the need for a reliable verification of measure retention for use in the program cost-effectiveness calculations, we are discontinuing the phone version of the post-occupancy survey. The survey will be replaced with on-site verification visits, and 100 on-sites are planned for fall of 2006. These on-sites will involve verifying the installation and retention of the lighting measures and the administration of a revised version of the post-occupancy phone survey. The results of the on-site data collection effort will be reported in the final MPER scheduled for early 2007.

Selected results from the phone version of the post-occupancy survey are discussed below. Due to the small sample sizes, the results should be interpreted as qualitative findings.

Homeowner Characteristics and Motivations

Sixty-nine percent of the respondents reside in Idaho, followed by 18 percent, 9 percent, and 3 percent living in Washington, Oregon, and Montana respectively. In comparison, only 35 percent of ENERGY STAR homes have been built in Idaho through July 2006, and 35 percent have been built in Oregon. Thus the responses over-represent Idaho residents and under-represent Oregon residents in particular. The Washington and Montana response rates are roughly representative of actual building percentages.

Forty-one respondents had selected homes that were already designated as ENERGY STAR prior to their purchase, while 19 had the option to choose an ENERGY STAR home or other design from the builder. Most respondents (65 percent) had lived in their home at least 6 months.

Table 14 shows that the primary reason homeowners selected an ENERGY STAR home was to save money on energy bills. The most common responses in the “other” category related to the home’s desirable location/neighborhood, a pleasing layout or floorplan, or a desire to support the ENERGY STAR brand and the concept of energy efficient homes. In a separate question regarding concerns about purchasing an ENERGY STAR home, 71 percent of respondents said that they had no concerns.

Table 14: Reason for Purchasing an ENERGY STAR Home

Response (n = 65)	% Of Respondents
To save money on energy bills	32%
Builder recommended	9%
Better value	9%
Realtor/sales person recommended	5%
Solid construction	5%
Concerned about the environment	3%
Other	35%
Don't know	14%

Q: Why did you decide to purchase an ENERGY STAR home?

Homeowner Satisfaction

When asked to rate their overall satisfaction with their ENERGY STAR home, where a score of 5 = extremely satisfied and 1 = extremely dissatisfied, 86 percent of respondents gave a score of 4 or 5, and no respondent gave a score less than 3 (see Table 15).

Table 15: Overall Satisfaction with ENERGY STAR Home

Response (n = 65)	% Of Respondents
5 – extremely satisfied	54%
4	32%
3	6%
2	0%
1 – extremely dissatisfied	0%
Don't know	8%

Q: 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.

In separate questions (responses not shown) 88 percent of ENERGY STAR homeowners said they would recommend an ENERGY STAR home to other prospective homebuyers. The greatest overall benefit is perceived to be energy savings followed by better insulation. Relatively few respondents noted improved windows, tight ductwork, or improved air quality.

Forty-six respondents (71 percent) said there was no aspect of their ENERGY STAR home that did not meet their expectations. Among those that did perceive problems, five respondents (8 percent) mentioned air quality/circulation and four respondents (6 percent) mentioned the lighting.

Lighting Satisfaction and Retention

Table 16 shows how the respondents rated their experience with the lighting specifically, and indicates that satisfaction with the lighting is lower than satisfaction with the entire home product. The main reasons for dissatisfaction with the lighting are insufficient brightness (12 percent) and that it takes too long to start (11 percent).

Table 16: Satisfaction with ENERGY STAR Home Lighting

Response (n = 65)	% Of Respondents
5 – extremely satisfied	40%
4	29%
3	23%
2	6%
1 – extremely dissatisfied	2%

Q: 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?

The second wave of the post-occupancy survey collected the most detailed answers regarding the removal and replacement of the lights (additional questions were added from the first wave of the survey). These results are presented in Table 17 but due to the very small sample sizes the results should be viewed as qualitative.

Fifteen respondents (47 percent of the second wave) indicated that they have replaced lighting since moving in, and most of these (54 percent) had replaced three or fewer lights. Of these fifteen respondents, three indicated that they had replaced CFL lamps; ten said they had replaced incandescent lamps, and the remaining two respondents did not know what type of light they replaced.

Table 17: Type of Bulb Replaced (Second Survey Wave)

Response (n = 15)	% Of Respondents
CFLs	20%
Incandescents	67%
Don't know	13%

Q: For the bulbs you replaced, were they CFLs or normal incandescent light bulbs?

When asked what type of bulbs they had installed as replacements, four respondents stated that they installed a CFLs and eight installed incandescent lamps. One respondent indicated that they had used both CFLs and incandescent lamps as replacements.

Table 18 shows the main reasons for replacing the lighting among respondents who replaced any bulb or fixture (respondents could choose more than one answer). Note that

this table includes both survey waves and includes all respondents that replaced either CFLs or incandescents.

Table 18: Reason for Replacing Lighting (Both Survey Waves)

Response (n = 25)	% Of Respondents
Burn out	40%
Not bright enough	32%
Didn't like light color	12%
Did not like look	12%
Took too long to start	8%
Other	8%

Q: Why did you replace the lighting?

Of the fifteen respondents in the second survey wave that replaced lighting, three had replaced CFLs and all of these respondents said that the CFLs were replaced due to burnouts. The respondents that replaced CFLs all indicated that they replaced the CFLs with a combination of CFL and incandescent bulbs.

Post-Occupancy Survey Summary

In general, it appears the homeowners are very satisfied with their ENERGY STAR homes. While there has been some replacement of lighting (both CFLs and incandescents), the small survey sample sizes make it difficult to draw strong conclusions. The on-site data collection effort planned for 2006 is defined to provide more definitive data on the retention of lighting measures and these results will be presented in the next MPER.

4. CONCLUSIONS AND RECOMMENDATIONS

The following general conclusions are drawn from the data sources and analysis presented in this report:

- **Participating builders that are active in the program are generally satisfied with the ENERGY STAR Homes Program.** The builders enjoy the market differentiation that the program provides, and at least a third of the builders said that there is customer demand for ENERGY STAR features. Some builders also expect ENERGY STAR to become more important to homebuyers if energy prices continue to rise. Builders also indicate that verifiers and Building Outreach Specialists (BOSs) play an important role assisting builders with the program. The verifiers and BOSs provide a wide range of services to the builders, including technical assistance, help understanding the program requirements, and training to contractors.
- **Performance testers have also been pleased with the ENERGY STAR Homes program.** Performance testers perform duct tests and sometimes duct blaster and/or blower door tests on ENERGY STAR Homes as part of the home certification process. The testers we interviewed indicated that the requirements have been clear and that the implementation of the ENERGY STAR Homes program has been smooth.
- **HVAC companies are beginning to use performance testing as a way to differentiate themselves from their competition.** This was stated mostly by respondents who work for HVAC companies in high growth areas where there is more activity in the ENERGY STAR Homes program. Respondents stated that they are marketing themselves as a “one-stop shop” for ENERGY STAR builders. They are also encouraging non-ENERGY STAR builders to include performance testing when they have an HVAC installation. Although the testing itself accounts for a small part of the overall business for full service HVAC companies, at least one respondent believes that the testing is a valuable service that helps the company sell more jobs.
- **Builders and contractors acknowledge the benefits of performance testing.** In general, respondents stated that they have had little difficulty working with builders, and that the builders appreciate the benefits of duct testing. One respondent stated that builders like that his HVAC company guarantees the quality of the installation when performance testing is included. For the most part, respondents also thought contractors appreciate the benefits of duct testing, although it sometimes takes a few demonstrations before they are willing to change their past practices. Builders have also indicated that they are able to market the benefits of performance testing to prospective homebuyers.
- **Many performance testers noted that the timing of the duct tests is an important issue.** Many duct test failures are due to post-installation damage from

other contractors and respondents recommended that duct tests be performed towards the end of the construction process to account for this issue.

- **Performance testers believe that the current level of training provided by the program is not sufficient on its own.** Although they did think the training was useful, there was a general consensus that without some sort of in-house apprenticeship, the training would not be sufficient to prepare somebody for the field. Respondents recommended extending training courses to allow for a greater number of on-site trainings or require an apprenticeship before becoming a performance tester. Most of the respondents stated that they either had extensive in-house trainings before they took a performance tester training course, or their company provided continuing training after they took the course.
- **The program requirements do not pose significant barriers for participating builders.**⁶ While the requirements were not considered problematic for the builders we talked to, it did appear that some builders may not fully understand all of the requirements and the benefits of some of the home specifications. In general, builders were not bothered by the lighting requirement, and many builders said they expected it to be part of the program. Several of the builders were not aware that dedicated CFL fixtures could be used to meet the lighting requirement, however. Although most of the builders interviewed said they believed that duct testing was an important aspect of the program, around a third of the respondents said that they were not aware of any benefits of duct testing.
- **Builders are pleased with the marketing support that the ENERGY STAR Homes program provides.** The majority of builders said that they take advantage of the marketing materials that the program provides and believe they are important tools for explaining the benefits of ENERGY STAR homes to customers.
- **Low ENERGY STAR Homes production in Washington will likely cause the program to miss its goal for 2006.** As of September 2006, the program was at 79 percent of its overall homes goal for 2006 assuming that all the initiated homes are completed by the end of the year. The shortfall is primarily due to Washington, where only 52 percent of the homes goal for 2006 had been met as of September.
- **Homebuyers are purchasing ENERGY STAR Homes primarily to reduce their energy bills.** Saving money on energy bills was the most common reason cited by homebuyers on why they purchased an ENERGY STAR home. Other homebuyers stated that they bought an ENERGY STAR home based on the

⁶ The perception of program requirements among nonparticipant builders will be addressed in the next MPER.

builder or realtor recommendation. Homebuyer motivations will be examined in more detail with the larger survey efforts planned for the final MPER. These surveys will include a phone survey of recent new home buyers and in-depth interviews with real estate agents and sales reps for ENERGY STAR builders.

Based on the evaluation findings, we make the following recommendations:

- **Increasing the production of ENERGY STAR Homes in Washington needs to become a high priority.** As discussed above, the overall shortfall of ENERGY STAR homes in 2006 is primarily due to Washington, where only 52 percent of the homes goal for 2006 had been met as of September. Increasing production in Washington needs to be a high priority for the remainder of the year if the homes goal is to be met.
- **Investigate issues relating to lighting fixtures and the lighting requirement.** One builder mentioned that when he installs a decorative chandelier with many non-ENERGY STAR bulbs, he is forced to add extra lighting fixtures to the house so that he can meet the 50 percent requirement of the ENERGY STAR program. The extra fixtures that are added have the potential to make the house less energy efficient than otherwise, since this essentially adds unnecessary bulbs to the home.

In addition to the chandelier issue, 4 of 16 builders we interviewed were unaware that dedicated CFL fixtures could be used to meet the lighting requirement. Additional information should be provided to builders so that they are aware that both CFLs and dedicated CFL fixtures are options for ENERGY STAR homes.

- **Lighting retention should receive additional study.** There is evidence from the post-occupancy survey that at least some of the CFLs installed in the homes are being removed due to burnouts, but this is based on a very small sample. This issue will be addressed in greater detail through the on-site data collection effort planned for fall of 2006.
- **Promote the potential benefit of ENERGY STAR Homes in the permitting process.** One builder mentioned that the local government where he works (in Washington) awards building permits based on a point system. Developments that will be rated as ENERGY STAR receive additional points, making it easier to receive a building permit. This kind of incentive has the potential to be attractive to builders, especially larger developers who must go through a more rigorous building permitting process. The program should use this as a marketing tool in areas where it currently exists and encourage permitting agencies in other areas to begin offering preferences for ENERGY STAR homes.
- **Performance testing training and education should be increased.** The performance testers we interviewed emphasized the need for training that is ongoing rather than a single training session. The testers also emphasized the

value of the hands-on fieldwork as part of their training. In addition, one third of the builders we spoke with did not know the benefits of duct testing or did not believe that any existed. This indicates that the benefits of testing need to be better communicated to builders, and that more on-going training opportunities are needed for performance testers.

- **The use of an independent forecast of housing starts to determine program goals should be considered.** F. W. Dodge is a commercially available source of home construction data and also provides forecasts of the housing market in upcoming years. Rather than have the program estimate housing starts during the current year to determine goals, we recommend that the program consider purchasing Dodge data. This will enable the yearly goals to be determined independently, as the housing starts estimate for the year will be determined through third-party source not affiliated with the program.
- **Marketing of ENERGY STAR homes directly to consumers should be increased.** Builders cite the lack of consumer awareness as one of the biggest barriers for ENERGY STAR homes. Several builders also recommended that training classes be offered to realtors so that they can learn to sell ENERGY STAR homes more effectively. Finally, several builders mentioned that homebuyers do respond to the benefits of duct testing when they are promoted which suggests that these benefits should be included in any consumer marketing campaign.

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 PECCI.

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.

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.

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 19 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 19. 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 Package⁷ 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.

⁷ 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: INTERVIEW GUIDES / SURVEY INSTRUMENTS

ENERGY STAR Builder Interview Guide

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 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 offering a northwest regional version of the national Energy Star homes program. That's why they are looking for input from new homebuilders in the Pacific Northwest.

[WHEN CORRECT PERSON IS ON-LINE:]

Name: _____
Company: _____
Title: _____
Phone: _____

Program Participation

First, let me ask you a few questions on how you decided to participate in the program and then we'll talk about the various steps involved in the program.

1. Approximately how many total homes do you expect to build this year?
2. Of these, will they all be ENERGY STAR, or will ENERGY STAR be offered as a possible option on some? (Get estimate on how many ES if appropriate)
3. What do you consider to be the biggest advantages to you from participating in the ENERGY STAR homes program?
4. What types of program support do you find the most valuable? The least valuable?

List of possible support areas:
Verification/Inspection of homes
Co-op advertising

Incentives
PR support
BOS
Marketing materials [probe for specifics on which materials they found helpful]
PT Training for HVAC contractors
Training for contractors
Training for builders

Program Requirements

5. How easy or difficult has it been for you to find information regarding program requirements and participation? Why do you say that?
6. How will the change to SEER 13 air conditioners affect you?
7. There are many different options (or BOPs) for builders to qualify their homes for the program. How does that affect you? Do you use one particular option for all of your homes?
8. What individuals or organizations have provided you with the most information and assistance about the program? Then probe for BOS vs. verifier, HPS, duct tester, utility, etc.

Lighting Requirement

9. What about the lighting requirement, has this been an issue for you?
10. What was your opinion regarding the lighting requirement when you first started the program? Did you think that you would need to meet the lighting requirement using fixtures only?
11. Has your opinion of the lighting requirement changed since you started the program? Was meeting the lighting requirement easier or harder than you expected?
12. Given all of the ENERGY STAR home requirements, how big of an issue is the lighting requirement for you relative to the requirements?
13. Where do you buy the CFL lamps and fixtures you use for these homes? (Probe on type of store (big-box, hardware, lighting showroom) and purchase process details)
14. On average, how much is the ENERGY STAR lighting requirement adding to the cost of your homes?
15. What has been the biggest challenge for you in participating in the ENERGY STAR Homes program? What has been the toughest ENERGY STAR requirement for you to meet?

16. Have you had any problems finding equipment needed to meet the ENERGY STAR requirements (probe specifically for CFL bulbs and fixtures)
17. What additional types of assistance would you like to see provided to builders by the ES Homes program?
18. Does your utility support the program? What kind of support do they provide? How important to you is that support in participating in the program?
19. Are you aware of other energy efficiency related programs for homes? Do you also build to any of their requirements? Would you say the programs complement one another or are more in opposition to each other? Why?

Contractor Training

20. Has your HVAC contractor been trained? How beneficial has the ENERGY STAR training been for your HVAC contractor? Do you feel that they were brought up to speed in a timely manner? Have there been any problems?
21. We are also talking to HVAC contractors in our interviews and would like to talk to the contractor you use since you are participating in the ENERGY STAR homes program. Could we get the company name and a contact person of your HVAC contractor (try to get phone number too)
22. We are also going to talk to electrical contractors, could we get contact information for your electrical contractor?
23. We are also going to talk to electrical contractors, could we get contact information for your electrical contractor?

Performance Testing

Now I'd like to ask a few questions regarding the performance testing of ducts that is required by the ENERGY STAR homes program.

24. Who does the duct testing for your homes?
25. What do you think are the benefits of duct testing to the builder?
26. What are the benefits to the homebuyer of duct testing? Do you believe that the homebuyer is aware of these benefits?
27. Do you specifically market the fact that the ducts have passed (or will be required to pass) the duct test when promoting your homes to prospective buyers? Do you promote the benefits of duct testing?
28. How long does the duct test take? Have you had any problems locating a tester or scheduling a time for them to come and do the tests?

29. What are the disadvantages with duct testing, if any
30. How would you rate the value of duct testing relative to its cost?
31. Have any of your homes failed the duct test at some point? Why did they fail and what was done to correct the problem?
32. Do you have any other comments about the duct testing process?

Verification Process

Next I'd like to ask you some questions about the verifier (in Idaho – Home Performance Specialist) you have for your ENERGY STAR homes

33. How did you find a verifier/Home Performance Specialist for your homes? (Probe source, did verifier approach them, did they talk to more than one verifier)
34. Approximately how many ENERGY STAR homes have you had verified to date?
35. In general, how well has the verification process gone?
36. Does your verifier/HPS provide you with any other types of building assistance in addition to verifying the various ENERGY STAR Homes requirements (If yes, get details)
37. Have any of the ENERGY STAR Homes you built failed any of the verification stages? (If so, find out specific issues.
38. If yes, for those that failed, how long did it take to fix the problem and then have the verifier/HPS come back and complete the verification?
39. Have there been any delays in construction due to the verification process? If so, what do you think should be done to help improve the verification process to prevent delays?
40. What are the disadvantages (if any) of the verification process?
41. Do you think that building homes to the ENERGY STAR specifications reduces callbacks?

Quality Assurance / Certification

42. The ENERGY STAR Homes program has a state organization that randomly visits a sample of homes to check up on the Verifier/Home Performance Specialists work. Have you had any interactions with the program quality assurance that oversee the certification process? (If yes, get details)
43. How well did the QA process go? Did this cause any delay in the process?

44. Have you received an ENERGY STAR label for any of your homes
45. How long did it take from the time your Verifier/Home Performance Specialist approved the home to the time you received the label on the home. Were there issues with this process?

Marketing

Finally, I'd like to talk to you about how you market your ENERGY STAR homes.

46. Do you sell your homes through your own sales reps or through real estate agents?
 - Sales reps
 - Real estate agents
 - Other
47. Do you feel your sales reps are knowledgeable about the program? Do you feel they are effectively selling the advantages of an ENERGY STAR home?
48. Which methods do you use to promote your ENERGY STAR homes?
 - Newspaper ads
 - TV/Radio
 - Real estate ads
 - Outdoor signs
 - Model homes
 - Brochures / Sales materials
 - Internet
 - Other
49. Which ENERGY STAR benefits do you/will you promote when marketing these homes?
50. What do you think are the biggest marketing challenges for ENERGY STAR homes?
51. What role does lighting play in customer's decision to choose ES?
52. What do you think the ENERGY STAR homes program should do to effectively market the benefits of an ENERGY STAR home?
53. Do you feel that you have been well informed by the program regarding marketing opportunities?
54. They are co-op advertising, signage for outside and inside the house, brochures, home owner guides for when the homeowner moves in.
55. Which ones have you used, found most helpful? Do you have any issues/concerns with any of the marketing support?

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

ENERGY STAR Verifier / PT Interview Guide

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 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:

Introduction and Business Scope

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)

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. 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)
18. Do you have any suggestions for the program for improving the builder training?
19. How about contractors, have you had any experience with the ENERGY STAR Homes training provided to them? Do you feel that this training has been effective?
20. Do you have any suggestions for improving contractor training?

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.

21. How would you characterize your relationship with your builders? How often do you talk? (Probe for if relationship is cooperative or adversarial).
22. How did the builders you work with find you?
23. What type of marketing, if any, do you do to attract builders? (Probe for channels, methods)
24. What type of assistance would help you market more effectively (Probe)
25. 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.)
26. How long does a typical verification visit last? (Probe for activities, what they look for, what they discuss with the builder, etc.)
27. Have you used the program's online database? Has this been helpful? (Probe for details, particularly problems and suggestions for improving)
28. 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)
29. 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?)

30. 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)
31. 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.)
32. 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)
33. 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)
34. Have you had any interactions with the State Energy Offices that provide the quality assurance (QA) oversight for verifiers?
35. How does the state coordinate its QA activities with you and your builders? How has this process worked so far? Any suggestions for improvement?
36. 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?
37. Have you received any technical support from the state certification office? Did this go well?

Duct Testing Module (to duct testers only)

Now I'd like to ask you some questions about your duct testing work

38. How long have you been doing duct tests?
39. Why did you start offering duct testing services?
40. Where did you receive training to become a duct tester?
41. Did this training adequately prepare you for testing in the field?
42. What was the most valuable part of this training? Least valuable?
43. Do you have any suggestions on how the duct tester training could be improved?
44. 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)

45. 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)
46. On average, how many duct tests a month do you perform? How many can you do in a single day?
47. How long does it take to do a duct test?
48. Have you done any tests where the ducts failed the first time? (Probe for reaction by HVAC contractor, builder to failed test)
49. For those homes that fail tests, how long before you returned to re-test the ducts? (Probe for potential scheduling issues)
50. 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.)
51. 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
52. Do you think builders believe that duct testing is worthwhile? How about the HVAC contractors?
53. Do you think that builders are knowledgeable about the benefits of duct testing? How about homeowners?
54. Do you actively market the benefits of duct testing?
55. If so, who do you market to? What benefits do you emphasize?
56. 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 _____

Overall Program Interaction/Conclusions

Finally, I'd like to conclude by asking you a few questions about the overall program...

57. Overall, how would you rate your experience with the ENERGY STAR Homes program? Why do you say that? (Probe fully.)

58. Is there anything about the program that is confusing/unclear?

59. What do you think will be the biggest future challenges for you as a verifier?

60. What can the ENERGY STAR Homes program do to help address these challenges?

61. 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 3: Certified and Initiated Homes by Month - Idaho

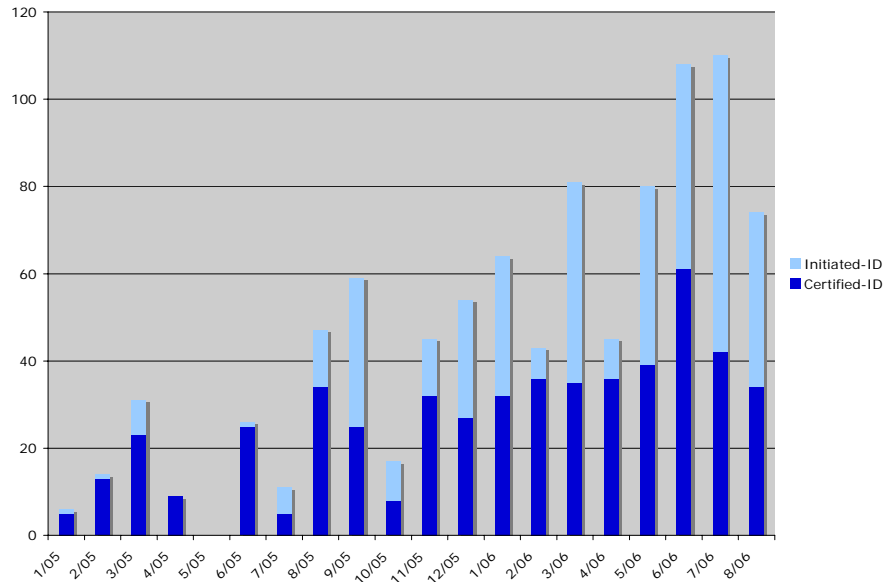


Figure 4: Certified and Initiated Homes by Month - Montana

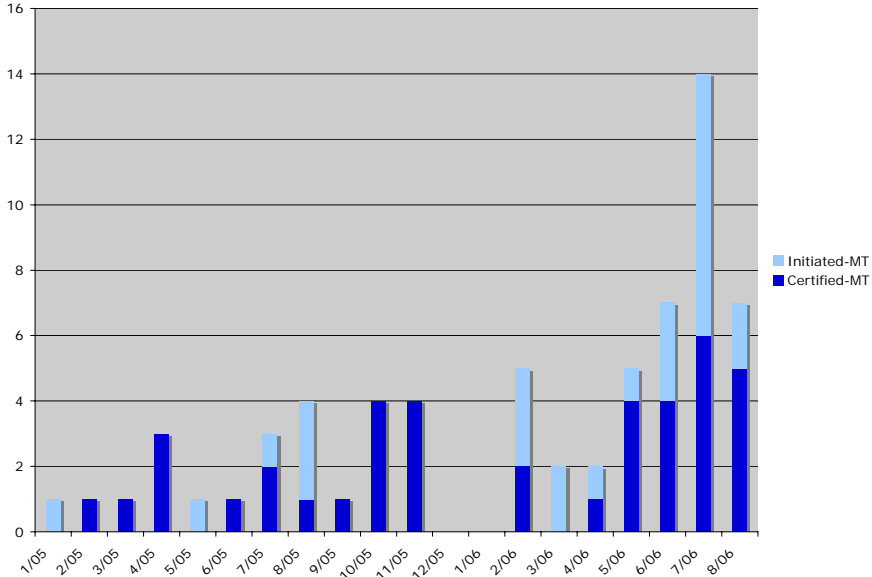


Figure 5: Certified and Initiated Homes by Month - Oregon

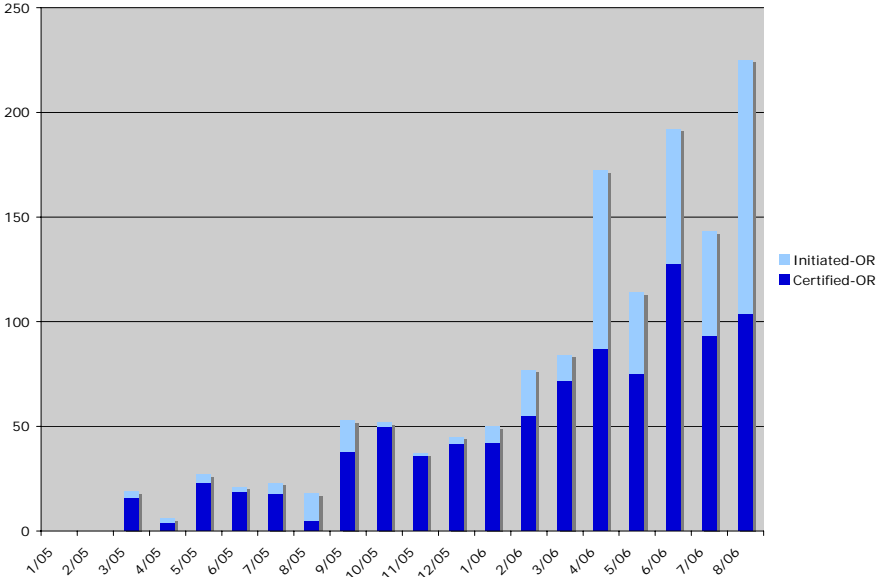


Figure 6: Certified and Initiated Homes by Month - Washington

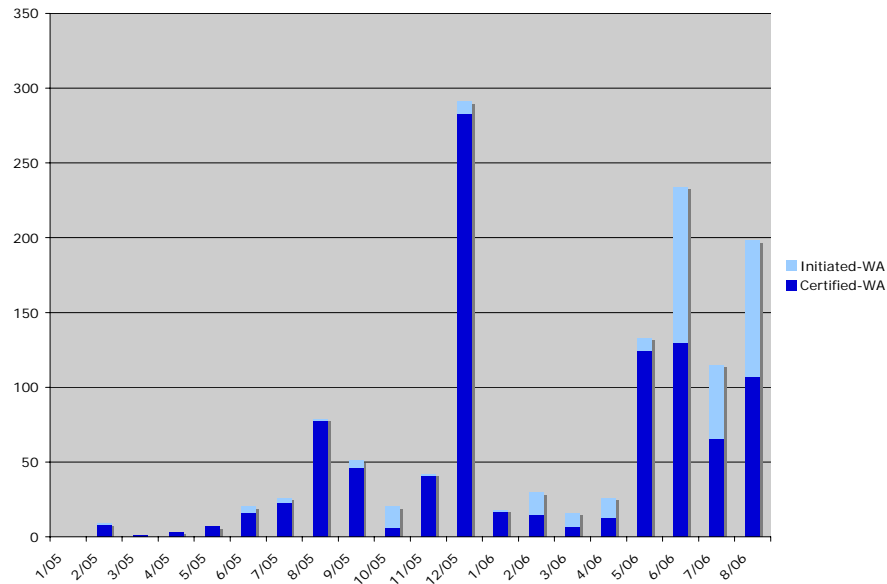


Figure 7: Certified and Initiated Homes by Month - Total

