ENERGY STAR Homes Northwest

Market Progress Evaluation Report

prepared by

EcoNorthwest

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ENERGY STAR Homes Northwest Program

Second Market Evaluation Progress Report

A Report to the Northwest Energy Efficiency Alliance

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EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

This report is the second of three market progress evaluation reports (MPERs) of the Northwest Energy Efficiency Alliance's ENERGY STAR Homes Northwest program. This project is one of two major projects within the Alliance's Residential Sector Initiative and works in close coordination with the Alliance's ENERGY STAR Consumer Products program – the other project included in the Initiative.

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

The primary purpose of this second evaluation report is to present the findings of the process evaluation conducted on the Alliance'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, utilities, and state energy offices. The report also includes current data on the new home market in the Northwest as well as information on program progress toward its goals. The cost effectiveness modeling done by the Alliance for the ENERGY STAR Homes Northwest program is also reviewed in this report.

PROGRAM OVERVIEW

The ENERGY STAR Homes Northwest program officially began in May 2004 and has a goal of achieving a 20 percent market share for ENERGY STAR homes within the residential new construction market by the end of 2009. The ENERGY STAR Homes Northwest program markets the benefits of building homes to the ENERGY STAR standard directly to builders. ENERGY STAR serves as the mechanism to both differentiate builders and the homes they build and to provide consumers with an easy way to identify the home as efficient. Certification, labeling and marketing efforts in the project 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 has not been a particularly good fit for this region. This can be attributed to a number of factors, but the most significant 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 the Alliance and its stakeholders to develop a tailored prescriptive specification that includes a package of prescribed conservation measures and is designed to be fuel-neutral.

Additionally, the current codes in Washington and Oregon already meet the national ENERGY STAR standard, which necessitated a newer, more stringent ENERGY STAR requirement for the region if significant efficiency gains were to be achieved in the new homes market.

The following table 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 the ENERGY STAR Homes 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.

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 ft2 Floor OR 75 CFM Total @ 50 Pa	Electric N/A Propane: same as BOP1
Envelope Tightness	7.0 ACH @ 50 Pa	2.5 ACH @ 50 Pa
Water Heating	Electric 0.93 EF / Gas 0.60 EF / (> 60 gal.)	Electric 0.93 EF / Gas 0.60 EF / (> 60 gal.)
Appliances	All built-ins are ENERGY STAR	
Lighting	> 50% of sockets either ENERGY STAR lamps or fixtures	

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

TCO #1 substitutes perimeter insulation for floor insulation in homes with crawlspaces.

TCO #2 replaces the SEER 13 air conditioning unit with a SEER 12 unit in exchange for additional upgrades in the building shell or equipment.

TCO #3 utilizes the U.S. EPA's Advanced Lighting Package[1] 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 construction techniques.

In addition to the prescriptive component requirements listed above, there are additional program components 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 approval is received from the State Certification Office (SCO) to test only a sample of homes);
    - 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 need to be verified); and

[1] 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.

- 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, the Alliance will plan and implement codes and standards activities designed to facilitate code improvements and compliance.

EVALUATION OVERVIEW

As discussed in the previous section, 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 toward goals is presented to provide context for the process evaluation results. The third major component of this report is a review of the underlying assumptions used by the Alliance in its cost effectiveness modeling for the program.

Market Characterization

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 committed 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 PECI. (A summary of results from the market characterization was presented earlier in this executive summary.)

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, performance testers, realtors, HVAC contractors, electrical distributors and contractors that are involved in the program. Interviews were also conducted with staff for each state's SCO and their Quality Assurance (QA) specialists. All interviews focused on program implementation issues and were designed to elicit suggestions for improving the current program.

The sample sizes for each interview group are shown in below. All interviews were conducted by phone during April-June of 2005. Note that some of the people interviewed have more than one role in the program; an HVAC contractor or verifier may also be a performance tester, for example. In these cases, the respondent is given a separate set of questions addressing each role and is reflected as two separate interviews in the table below. Additional detail on each sample and on recruitment methods is provided in the following chapters that discuss the interview results.

In-Depth Interview Samples

Interview Group	Sample Size
Participating Builders	25
Nonparticipant Builders	20
Verifiers	15
Performance Testers	17
HVAC Contractors	15
Realtors / Sales Reps	12
Electrical Contractors	4
Electrical Distributors	6
SCO / QA Specialists	9
Utilities	58
Total	**181**

Cost Effectiveness Modeling Review

The cost effectiveness modeling assumptions are reviewed in detail as part of this evaluation. This includes an assessment of the validity of assumptions regarding program market share, energy savings, incremental equipment costs, and baseline construction activities. Suggestions for modifying some of these assumptions are provided in this report and many of the parameters

will be updated in the future based on information that will become available upon completion of several other Alliance research projects.

MARKET CHARACTERIZATION

Residential New Construction Market Overview

The following table 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 14 percent in 2004 relative to 2003.

Single Family New Construction by State (1998-2005)

Year	Washington	Oregon	Idaho	Montana	Total	Percent 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 (Jan - June)	20,168	12,642	9,563	1,898	44,271	

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

The next table shows the distribution of builders based on home volume throughout the region. The vast majority of builders (78 percent) are small builders constructing four or less homes a year. In contrast, there are just 65 large builders (constructing 100 homes or more) in the program area, which comprise less than 1 percent of the overall builder population and 40 percent of homes constructed.

Builders by Region and Volume (2004-2005)

Region	Number of Units Built (Annually)						
	1-4	5-9	10-24	25-99	> 100	Total	Average
Inland Empire	396	64	31	16	8	515	8.9
Portland-Vancouver	1,267	199	127	49	20	1,662	7.8
Puget Sound	1,377	194	140	71	24	1,806	8.8
Southern Idaho	1,324	190	123	47	11	1,695	7.2
Western Montana	1,217	181	67	23	2	1,490	4.6
Total	5,581	828	488	206	65	7,168	7.3

Source: *Construction Monitor.*

Participation

The table below presents the number of builders who have contractually agreed to participate in the ENERGY STAR Homes Northwest program as of July 2005. Results are shown by state and builder volume and include the program's 2005 builder participation goals. Based on participation to date, it appears that the program is on track to meet its region-wide 2005 builder recruitment goals for large-volume and small-volume builders for 2005. At the state level, the program has significantly exceeded its Idaho recruitment goal for small-volume builders but as of July had not yet met goal its of recruiting two large-volume builders in that state. As of July, the program was significantly short of its small-volume builder goal in Washington.

2005 Participating Builders (Jan-July 2005)

State	Small-Volume Builders (<100 homes/year)		Large-Volume Builders (100+ homes/year)	
	2005 Actual	205 Goal	2005 Actual	2005 Goal
WA	15	39	4	4
OR	41	47	7	4
ID	45	21	0	2
MT	7	9	0	0
Total	108	115	11	10

Source: *PECI Monthly Status Report.* Data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

The following table shows the builder recruitment results and goals since the program began in May 2004. Overall, the program has met its builder recruitment goals to date. For Washington, recruitment of smaller builders is significantly lower than the target while large-volume builder recruitment has exceeded the goal set for that state.

Cumulative Total of Participating Builders (May 2004-July 2005)

State	Small-Volume Builders (<100 homes/year)		Large-Volume Builders (100+ homes/year)	
	Cumulative Actual	Cumulative Goal	Cumulative Actual	Cumulative Goal
WA	39	81	13	7
OR	70	69	9	7
ID	87	39	1	4
MT	25	16	0	0
Total	221	204	23	17

Source: ENERGY STAR Northwest Homes Database, *PECI Monthly Status Report*, data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

The next table shows the combined recruitment totals and goals for 2004 and 2005 for both verifiers and performance testers. As of July, recruitment in Washington, Idaho, and Montana had not yet reached the combined 2004/2005 goals. .

Cumulative Total of Verifiers and Performance Testers (May 2004-July 2005)

State	Verifiers		Performance Testers	
	Cumulative Actual	Cumulative Goal	Cumulative Actual	Cumulative Goal
WA	23	33	31	51
OR	25	20	71	42
ID	10	22	8	20
MT	15	18	9	12
Total	73	93	119	124

Source: ENERGY STAR Northwest Homes Database, *PECI Monthly Status Report*, data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

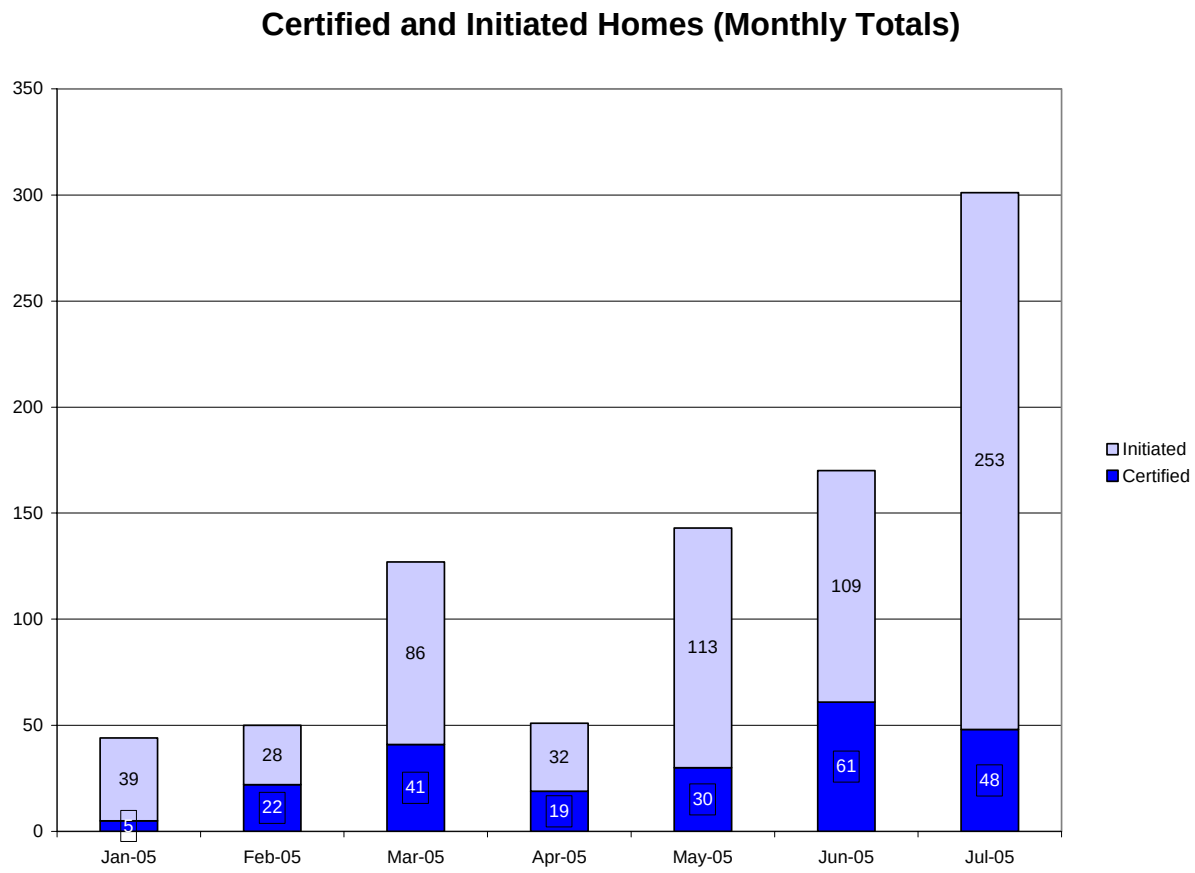
The table below shows the construction activity achieved through the ENERGY STAR Homes program as of July 2005. "Certified" homes refer to those that have been constructed and certified as ENERGY STAR-compliant by the program. "Initiated" homes are those that have construction underway but not yet completed and have been entered into the ENERGY STAR Northwest Homes Database. "Total Forecast Completions" as reported in the PECI monthly status report are estimates from the Builder Outreach Specialists (BOSs) for the number of homes to be certified in 2005 based on their conversations with participating builders. In the table below, we report "Other Forecast Completions" that exclude both "Certified" and "Initiated" homes. In 2005, the average length of time for a home to go from "Initiated" to "Certified" was 87 days, or about 2 months.

2005 ENERGY STAR Home Construction Status (Jan-July 2005)

State	Certified	Initiated	Other Forecast Completions	Total Forecast Completions	2005 Goal	Total 2004 Homes (All New Homes)	Forecast Completions as a Share of 2004 Total Homes
WA	56	159	629	844	962	36,153	2.3%
OR	80	206	286	572	538	20,728	2.8%
ID	82	152	91	325	455	15,106	2.2%
MT	8	19	7	34	45	3,423	1.0%
Total	**226**	**536**	**1013**	**1,775**	**2,000**	**75,410**	**2.4%**

Source: ENERGY STAR Northwest Homes Database, US Census, PECI Monthly Activity Reports, ECONorthwest. Data as of July 31, 2005.
Note: "Forecast Completion" figures are the result of BOS discussions with builders about developments in their territory and are therefore the initial builder estimates of the total number of homes to be certified in 2005. Prior to March 2005, these data were not collected under that definition and therefore are not shown in the table above.

At the end of July, the program forecast that 1,775 homes will be certified in 2005. However, as of July 2005 only 226 homes have been certified, with another 536 initiated. If all of the 536 homes that have been initiated are certified by year-end, it would require that an additional 1,013 homes be initiated and completed by year-end to realize the 1,775 forecast. Although the number of homes certified per month has been increasing (as shown in the figure below), it seems unlikely that the most recent 2005 ENERGY STAR homes forecast will be met.



Source: ENERGY STAR Northwest Homes Database, Monthly Activity Reports, ECONorthwest.
Note: The data shown are based on analysis of the online database extracted on 9/2/05 of totals through July 2005. These results may differ from the monthly reports as the participation database is continuously updated and certification and initiation dates are revised over time.

EVALUATION CONCLUSIONS AND RECOMMENDATIONS

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

- **The program is on track to meet its overall builder participation goals for both large- and small-volume builders.** At the state level, the program has exceeded its 2005 large-volume builder goal for Oregon. In Idaho, the program has more than doubled its small-builder goal, but has not yet recruited its target of 2 new large-volume builders.

- **The program is on track to meet its overall goal for performance tester recruitment.** At the state level, it has significantly exceeded its recruitment goal in Oregon, but would need to recruit more performance testers in Washington and Idaho to meet its original goals for those states. The program has likewise not yet reached its original 2005 recruitment goal for verifiers in Washington and Idaho. However, the program will likely adjust its 2005 market-specific goals for performance testers and verifiers to better reflect current builder activity in certain Washington and Idaho markets.

- **Participating builders are generally very satisfied with the program.** They know that ENERGY STAR is a widely recognized and respected brand, and they speak highly both of the program's goals and of the individuals associated with the program, including the BOSs as well as verifiers and testers. Those builders who have gone through the whole process of building and certifying an ENERGY STAR home report that both the testing and verification went smoothly, and did not significantly delay the construction process. Builders appear to value duct testing as a means of confirming that the subcontractors are doing the job properly, although some builders question the benefit of testing every home once the contractor learns how to do the installations correctly.

  It should be noted that the in-depth builder interviews focused on those participants that have experience certifying ENERGY STAR homes through the program. These builders were early participants in the program and therefore are more likely to be predisposed to the building practices promoted by the program. Many of these builders also had previously participated in other new construction programs such as Earth Advantage. While the interview results presented in this report are encouraging, future participating builders might be more resistant to some of the program requirements and may require additional training. The following conclusions and recommendations should be considered with this in mind.

- **Most builders have limited experience building ENERGY STAR Homes to date.** Builders are still fairly new to the program and are still learning the processes and practices involved in the program. As discussed above, many of the builders interviewed have previous experience with other new construction efficiency programs such as GemStar, Super Good Cents, and Earth Advantage, and this seems to have made them more receptive to the ENERGY STAR Homes program. In part because they are new to the program, some builders are aware that their subcontractors need time to become familiar with duct sealing and other program requirements.

- **It is unlikely that the 2005 goal for certified ENERGY STAR homes will be met, but it is too early to assess the likelihood of achieving the program's long-term goal.** The program goal for 2005 is 2,000 certified ENERGY STAR homes. At the end of July, the program forecast that 1,775 homes would be certified by year-end, which amounts to a market share of about 2 percent assuming 2004 new home construction activity. However, as of July 2005 only 226 homes have been certified, with another 536 initiated. If all of the 536 homes that have been initiated are certified by year-end, it would require that an additional 1,013 homes be initiated and completed by year-end to realize the 1,775 forecast. While the number of new certified homes has been increasing, the maximum number of new certified homes within a single month to date was 61 (June 2005). Without a very large increase in the number of homes initiated, completed, and then certified within the next five months, it seems unlikely that the program will be able to certify an additional 1,775 homes by year-end.

  The outlook for 2006 is better as participating builders become more experienced with the program and expect to build more ENERGY STAR homes. At the end of July there were 2,988 ENERGY STAR homes forecasted for completion in 2006 from current participating builders, which is about a 50 percent increase over the number currently

forecasted for 2005 and amounts to about a 4 percent market share. This total should increase as more builders are added to the program next year.

The long-term goal of the program is a market share of 20 percent for ENERGY STAR homes by the end of 2009. Assuming that 2004 new construction levels increase at the Alliance's assumed rate of 3.8 percent annually, achieving this goal will require that over 18,000 homes be ENERGY STAR certified in 2009. While the expected growth in ENERGY STAR homes for 2006 is encouraging, the program is still too early in its implementation phase for us to assess the likelihood of reaching the 20 percent market share goal by 2009. Future evaluation research will continue to track progress in this area.

One of the primary reasons for the shortfall in homes for 2005 is the longer than expected time from new builder recruitment to new ENERGY STAR home construction. Based on the in-depth interview results, it is taking longer than expected for participating builders to begin construction on ENERGY STAR homes; many of the builders we interviewed had yet to finish an ENERGY STAR home even though the program had been operating for over a year. Contributing factors to slower than anticipated throughput include a strong sellers' market in which homes are selling faster than they are built, and the fact that several large builders sign on for new subdivisions that take time to initiate. There has also been a need for the program (BOSs, verifiers, QA specialists) to spend additional time with builders to help them understand and comply with the program requirements, which is also likely contributing to the slower rates of ENERGY STAR home production.

As discussed above, these needs may become more significant for some period of time as the program adds new builders. Future participating builders will likely have less experience with the building practices required for ENERGY STAR certification than those interviewed for this evaluation. These builders will likely need more technical assistance from the program and may require more time between program enrollment and ENERGY STAR home construction.

- **Barriers to participation generally relate to the lack of consumer demand for ENERGY STAR Homes.** A common response among nonparticipating builders was that a lack of consumer demand for ENERGY STAR homes kept them from participating in the program. Other nonparticipating builders cited the extra cost of these homes, which implies that they do not believe consumer demand is high enough to command a higher price. Despite these concerns, a third of the nonparticipating builders were considering participating in the program and another 5 of the 20 builders said that they would consider participating in the program if demand for these homes increased.

- **Duct testing and the lighting requirement are also considered barriers to participation.** In addition to demand issues, nonparticipating builders identified duct testing and the lighting requirement as the most challenging requirements of the program. The utilities stressed that the lighting requirement was a major barrier to program participation. When asked generally about ENERGY STAR lighting issues, electrical contractors and distributors mentioned the availability of decorative fixtures or matched fixtures that could be installed throughout the house. Electrical contractors also

mentioned that brands and styles of CFL lamps and fixtures were constantly changing, making it difficult to maintain a reliable supply.

- **Coordination with builders is critical for successful verification**. While verifiers say that they are able to conduct their visits without disrupting the builder's schedule, they emphasize that frequent communication is required to make this process flow smoothly. Most verifiers say they regularly find some items that fail, but that many of those are small defects that can be rectified on the spot. Several verifiers also said that their goal is to help the builder meet the program requirements by anticipating and correcting potential problems before they happen.

  A big concern of verifiers and builders is that the QA specialists sometimes conduct the final inspections after the homeowner has occupied the home, which occurred a few times in Idaho and Washington. Verifiers felt that this was an inconvenience to homebuyers and creates resentment among the builders. This has the potential to become an even bigger problem as the volume of ENERGY STAR homes increases. As with the coordination between the builder and verifiers during the construction process, better coordination to ensure that the final inspection is done prior to occupancy is critical for the long-term success of the program.

- **Participating HVAC contractors are generally accepting toward duct testing**. HVAC contractors overall have responded positively to duct testing. About half of the contractors said that almost all of their installations had passed the tests. The others are working to change their installation practices in order to conform to the demands of the test. None of the contractors that had failed the duct test complained about the testing procedures of the duct testers themselves. The performance testers confirmed these findings, saying that HVAC contractors new to the program generally fail their first few duct tests but then tend to improve rapidly in subsequent tests.

- **More time needed for providing technical assistance to builders and verifiers than originally anticipated.** The QA specialists have found that they are spending more time than planned working with builders and verifiers to help them meet the program requirements. In Washington, QA specialists are inspecting additional homes with new verifiers as a way to train them on the program requirements. In Idaho, one QA specialist has also needed to answer technical questions for builders in order to recruit them to the program, and the lack of more QA staff in Idaho has created a backlog in the final QA process for homes and is resulting in homes having their final inspection after they are occupied. As discussed above, this may become an even greater issue as the program increases its recruitment of builders that have less experience with the building practices required for the ENERGY STAR specification. As more verifiers join the program, however, verifiers rather than QA specialists theoretically will provide this type of support to builders in the long run which will help reduce the demands placed on the QA specialists.

- **Estimates of potential savings will help market ENERGY STAR Homes.** Both utilities and realtors suggested that having more information on the energy savings would

be an effective way to promote these homes. One utility suggested that information on energy savings relative to baseline home designs be provided on the program website.

- **Marketing of ENERGY STAR Homes to consumers needs to be increased.** All of the groups we interviewed emphasized the need to increase awareness and demand of the ENERGY STAR homes among consumers. Realtors also indicated that an ENERGY STAR home could command a higher price, with estimates tending to range from a 5 to 10 percent price premium.

- **Realtors and sales reps should be better informed of the ENERGY STAR home specifications and benefits.** Realtors and sales reps generally understood that ENERGY STAR homes will save consumers money and they promote this fact to their customers. In terms of understanding and promoting specific ENERGY STAR benefits, however, the sellers were less knowledgeable. Currently the realtors and sales reps tend to emphasize the more visible aspects of an ENERGY STAR home, which includes appliances and windows. Realtors also stressed insulation levels when promoting a home's energy saving benefits. Sellers of ENERGY STAR homes should be better informed as to which components drive the savings (primarily heating/cooling and lighting). Other benefits such as improved air quality and comfort, duct testing, and third party certification will likely resonate with homebuyers if promoted by realtors. Better education in this area will be critical for increasing demand for these homes, a need stressed by all of the respondents we interviewed in this evaluation. Realtors indicated that they would be interested in training on how to better sell an ENERGY STAR home.

The following recommendations are based on the above findings:

- **Adjust program goals and forecast for 2005 and 2006 to better reflect the current program status.** Although the program has largely met its builder recruitment goals, ramp-up and throughput have been slower than originally forecast for a variety of reasons. The program should critically assess how many homes it believes will be certified by December 31, 2005 based on realistic estimates of ENERGY HOME housing starts, average time from start to certification, and maximum attainable throughput.

- **Increase builder support.** It appears that builders continue to need support regarding program requirements after they initially join the program. While this need is designed to be met by the BOSs when builders first enroll (and eventually by verifiers once the program matures), it appears that the additional support has been needed and this has been supplied by the QA specialists and verifiers. Given the expected volume of homes and the issues regarding coordinating inspections, this could become a potentially critical issue without more staff available to help builders navigate the program.

- **Program support to participating large-volume builders should be made a priority.** A key to achieving the 20 percent market share goal for ENERGY STAR homes will be the construction activity of large-volume builders participating in the program. The program has already been successful in recruiting 23 of the 65 large-volume builders in the region and should strive to recruit as many of the remainder as possible. Moving forward, the program should have regular contact with the participating large-volume

builders and provide assistance as needed to the individual construction crews within each company as they work to learn the building practices required by the program. Regular calls or visits with these builders should be a priority so that any questions or training needs can be met quickly.

- **More "hands-on" training needed for HVAC contractors and performance testers.** In addition to increased training for builders, additional training was also suggested for HVAC contractors and performance testers so that they are better able to comply with the program requirements. The HVAC contractors and performance testers indicated that "hands-on" training was particularly valuable for the duct sealing and testing aspects of the program. Several BOSs and verifiers also emphasized the importance of providing training to the actual HVAC installation crews, not just the HVAC contracting company's owner or superintendent.

- **Utilize a standard referral process to match builders and verifiers.** An impartial referral process needs to be used for verifiers to remove any impression of favoritism. Some verifiers in Idaho felt that referrals from the SCO were being directed to only a few verifiers and not distributed equally among all verifiers. Developing a standardized referral process is especially important as building activity increases and more verifications are performed by private verifiers. It may be possible to address this issue by listing all qualified verifiers on the program website and then make sure that utilities and SCOs always refer builders to the website to find a verifier.

- **Promote performance testing to prospective builders as an effective means to ensure quality HVAC installation.** While non-participating builders noted the duct testing requirements as one of the barriers to participation, participating builders have indicated that they value duct testing as a means of confirming that the subcontractors are doing the job properly. Information on aggregate initial test results for participating builders could be a compelling selling point for overcoming this barrier.

- **Continue outreach to builders and contractors to reduce barriers relating to ENERGY STAR lighting.** Suggestions for improving acceptance of ENERGY STAR included having more focus on ENERGY STAR lighting in lighting showrooms. One utility suggested that the program develop a website that shows the available ENERGY STAR fixture options. Contractors also suggested having a simple cost breakdown showing the potential savings with the ENERGY STAR lighting option. Sales calls and one-on-one visits with contractors are also considered important for increasing acceptance of ENERGY STAR lighting. One builder was particularly impressed with the time their BOS dedicated to making sure they found lighting fixtures that would fit their needs. The BOS accompanied the builder's lighting designer to the store to help select fixtures. This builder cited this action as the most valuable support they received from the program. Continued outreach to builders and contractors and general promotion of new ENERGY STAR lamp and fixture options that the program views as high quality will help reduce some the concern about the quality and availability of these products. In particular, information on new, high quality ENERGY STAR lighting options should be part of the program's regular contact with large-volume builders recommended above.

- **Increase marketing of the program directly to prospective homebuyers.** Increasing consumer demand will encourage more builders to join the program which in turn will increase demand for supporting sub-contractor services such as performance testing and verification. While the ENERGY STAR Homes program is specifically designed to address the builder side of the market, we recommend that this be done in conjunction with a broader marketing campaign targeting the consumer that emphasizes not only energy savings, but also benefits such as comfort, health and safety, and overall home quality.

- **Coordination of final home inspection / QA review needs to be formalized so that it is completed prior to occupation.** There have been instances in Idaho and Washington in which the final QA inspection process has occurred after the home has been occupied, which has created some conflicts with both the builders and homeowners. This may be due in part to some of the Idaho QA staff needing to spend more time providing builder technical support rather working strictly on QA tasks. As building volumes increase, this may become more of an issue especially if QA staffing levels remain at their current levels. To minimize these occurrences, we recommend that the program develop a formal process for completing the final home inspections to ensure that they are completed prior to occupation. This inspection procedure should be incorporated into the participation agreement and clearly explained to the builder at the start of their participation.

- **Educate realtors on ENERGY STAR home benefits.** In order to increase demand for ENERGY STAR Homes, realtors need to have a better understanding of the program requirements and the associated benefits on an ENERGY STAR Home. This will help ensure that prospective homebuyers are more fully informed about ENERGY STAR home advantages. One concrete step that could be taken would be to encourage the Multiple Listing Services in the four program states to incorporate ENERGY STAR as a selection criterion in their database searches.

- **Revise cost effectiveness modeling assumptions.** We recommend that the cost effectiveness modeling assumptions be revised based on the issues discussed in Chapter 8. In particular, the assumptions regarding baseline market activity should be increased.

1. INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This report is the second of three market progress evaluation reports (MPERs) of the Northwest Energy Efficiency Alliance's ENERGY STAR Homes Northwest program. This project is one of two major projects within the Alliance's Residential Sector Initiative and works in close coordination with the Alliance'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.

The primary purpose of this second evaluation report is to present the findings of the process evaluation conducted on the Alliance'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, utilities, and state energy offices. The report also includes current data on the new home market in the Northwest as well as information on program progress toward its goals. The cost effectiveness modeling done by the Alliance for the ENERGY STAR Homes Northwest program is also reviewed in this report.

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 the current conditions in the new home market and tracking changes over time. Phone surveys for both builders and new homebuyers were included in the first MPER and will be repeated in the final MPER scheduled for 2006. Beginning in 2005, we will also be conducting a post-occupancy survey of homebuyers that recently purchased ENERGY STAR homes to determine satisfaction and retention of individual measures. In-depth interviews with a smaller sample of builders and various market actors including realtors and building contractors will be conducted for all three reports, and the final two interview rounds will include a significant amount of process related discussion. The process evaluation component also involves interviews with utilities, state energy offices, and home verifiers involved with program. Finally, a review of the cost effectiveness modeling and underlying model assumptions will be conducted for the second and final evaluation reports.

Table 1. Evaluation Report Components

Analysis Component	MPER 1 Baseline Report	MPER 2 (3Q 2005)	MPER 3 (1Q 2006)
Market Assessment	λ	λ	λ
Market Actor Interviews	λ	λ	λ
Builder Phone Survey	λ		λ
Builder In-Depth Interviews	λ	λ	λ
Homebuyer Phone Survey	λ		λ
Process Evaluation		λ	λ
Post-Occupancy Homebuyer Survey			λ
Review of Cost Effectiveness Modeling		λ	λ

1.2 PROJECT BACKGROUND

Program Overview

The ENERGY STAR Homes Northwest program officially began in May 2004 and has a goal of achieving a 20 percent market share for ENERGY STAR homes within the residential new construction market by the end of 2009. The ENERGY STAR Homes Northwest program markets the benefits of building homes to the ENERGY STAR standard directly to builders. ENERGY STAR serves as the mechanism to both differentiate builders and the homes they build and to provide consumers with an easy way to identify the home as efficient. Certification, labeling and marketing efforts in the project 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 has not been a particularly good fit for this region. This can be attributed to a number of factors, but the most significant 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 the Alliance and its stakeholders to develop a tailored prescriptive specification which includes a package of prescribed conservation measures and is designed to be fuel-neutral. Additionally, the current codes in Washington and Oregon already meet the national ENERGY STAR standard, which necessitated a newer, more stringent ENERGY STAR requirement for the region if significant efficiency gains were to be achieved in the new homes market.

Table 2 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 2. ENERGY STAR Homes Northwest Technical Specifications

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

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

TCO #1 substitutes perimeter insulation for floor insulation in homes with crawlspaces.

TCO #2 replaces the SEER 13 air conditioning unit with a SEER 12 unit in exchange for additional upgrades in the building shell or equipment.

TCO #3 utilizes the U.S. EPA's Advanced Lighting Package[2] 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.

In addition to the prescriptive component requirements listed above, there are additional program components 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);

[2] 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.

- 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, the Alliance will plan and implement codes and standards activities designed to facilitate code improvements and compliance.

Market Transformation Theory

The primary market transformation mechanism for the ENERGY STAR Homes Northwest program seeks to remove the barriers to homebuyer identification of an energy efficient new home while simultaneously providing builders a means to differentiate themselves in the market. Given sufficient marketing resources, the ENERGY STAR brand has already proven that it can become a credible product differentiator that provides consumers with a readily identifiable means to distinguish a minimum level of efficiency in appliance and lighting markets. Previous experience with Super Good Cents homes within the Alliance territory demonstrated the power of a having a consolidated regional marketing effort focused on a single brand as the differentiation mark for efficiency.

Second, the implementation strategy leverages the ENERGY STAR brand equity to raise awareness of the higher level of efficiency available in the new homes market. Awareness of the ENERGY STAR label is currently over 80 percent among new homebuyers within the Alliance service territory, and increasing numbers of consumers not only recognize the label but are able to describe that it means the labeled product will use less energy and will cost less to operate. The current marketing effort in the ENERGY STAR Homes Northwest program is intended to promote the ENERGY STAR label to the new home buying market in a way that builds on this existing awareness. The theory is that homebuyers will learn that – as with purchasing an appliance – a home with the ENERGY STAR label will guarantee an energy efficient home.

If the program is successful, the ENERGY STAR brand and label will become firmly established for new homes making identification and differentiation of these homes possible. Consumers will value and demand these homes and builders will provide and promote ENERGY STAR homes to increase their sales and profit. As ENERGY STAR homes become more prevalent, appraisers and real estate agents will acknowledge their value and Multiple Listing Services will include whether a home is ENERGY STAR certified in their listings.

As market share for ENERGY STAR begins to grow, the differentiating ability of the brand will need to be protected. To accomplish this, the ENERGY STAR Homes Northwest program will identify and test the next level of energy efficiency in new homes through a series of demonstration projects. Those measures that are successful in the demonstration efforts will be incorporated into the "next generation" ENERGY STAR specification. Similarly, as measures in the current ENERGY STAR specification become part of current practice, the program will support the adoption of these elements into minimum code requirements. These last two elements provide the long-term mechanisms to maintain the integrity of the brand while solidifying the energy efficiency gains made through marketing of the ENERGY STAR Northwest home.

Market Barriers and Market Opportunities

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

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

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

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

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

Economic Benefits Not Recognized by Financial Markets. Appraisers do not value energy efficiency improvements or benefits when making their valuations. As a result, homebuyers who stay in their new home only a few years are unable to recoup the extra cost of efficiency investments through bill savings alone. Similarly, most mortgage lenders do not distinguish between efficient and inefficient homes when deciding whether a consumer can afford a mortgage or when developing mortgage products that reflect lower risk of default from homes that are more efficient and therefore have lower energy bills.[3]

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

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

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

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

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

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

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

- 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 Alliance 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;
- 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.

For this MPER, the evaluation focused on process issues relating to program delivery rather than on the broader market issues relating to the progress indicators listed above. As a result, this report does not address 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 future evaluation reports.

1.3 Evaluation Overview

As discussed in the previous section, 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 toward goals is presented to provide context for the process evaluation results. The third major component of this report is a review of the underlying assumptions used by the Alliance in its cost effectiveness modeling for the program.

Market Characterization

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 committed 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 PECI.

In-Depth Interviews

The market actor interviews are designed to provide an additional perspective on key ENERGY STAR home components. These interviews were conducted by phone and involved extended conversations with builders, verifiers, performance testers, realtors, HVAC contractors, electrical distributors and contractors that are involved in the program. Interviews were also conducted with staff for each state's State Certification Office (SCO) and their Quality Assurance (QA) specialists. All interviews focused on program implementation issues and were designed to elicit suggestions for improving the current program.

The sample sizes for each interview group are shown in Table 3. All interviews were conducted by phone during April-July of 2005. Note that some of the people interviewed have more than one role in the program; an HVAC contractor or verifier may also be a performance tester, for example. In these cases, the respondent is given a separate set of questions addressing each role and is reflected as two separate interviews in the table below. Additional detail on each sample and on recruitment methods is provided in the following chapters that discuss the interview results.

Table 3. In-Depth Interview Samples

Interview Group	Sample Size
Participating Builders	25
Nonparticipant Builders	20
Verifiers	15
Performance Testers	17
HVAC Contractors	15
Realtors / Sales Reps	12
Electrical Contractors	4
Electrical Distributors	6
SCO / QA Specialists	9
Utilities	58
Total	**181**

Cost Effectiveness Modeling Review

The cost effectiveness modeling assumptions are reviewed in detail as part of this evaluation. This includes an assessment of the validity of assumptions regarding program market share, energy savings, incremental equipment costs, and baseline construction activities. Suggestions for modifying some of these assumptions are provided in this report and many of the parameters will be updated in the future based on information that will become available upon completion of several other Alliance research projects.

The remainder of this report is organized as follows. Following this introduction, Chapter 2 provides a characterization of the new homes market within the program territory. Following the market characterization, Chapter 3 presents the results of our builder interviews and includes findings from both participating and nonparticipating builders. This is followed by the results of verifier interviews in Chapter 4, the performance tester interviews in Chapter 5, and the HVAC contractor interviews in Chapter 6. The remaining market actor interviews (realtors, electrical contractors and distributors, utilities, and QA specialists) are discussed in Chapter 7. This is followed by a review of the cost effectiveness modeling assumptions in Chapter 8. Finally, the overall evaluation conclusions and recommendations are presented in Chapter 9. Appendix A contains copies of the interview guides used for this evaluation.

2. MARKET CHARACTERIZATION

This chapter provides an overview of the residential construction market for Washington, Oregon, Idaho and Montana as of June 2005 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.

2.1 RESIDENTIAL NEW CONSTRUCTION MARKET OVERVIEW

Table 4 shows the number of new homes built by state since 1998. Single family home construction activity has been strong throughout the region during recent years and for the entire region, new housing increased by 14 percent in 2004 relative to 2003.

Table 4. Single Family New Construction by State (1998-2005)

Year	Washington	Oregon	Idaho	Montana	Total	Percent 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 (Jan - June)	20,168	12,642	9,563	1,898	44,271	

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

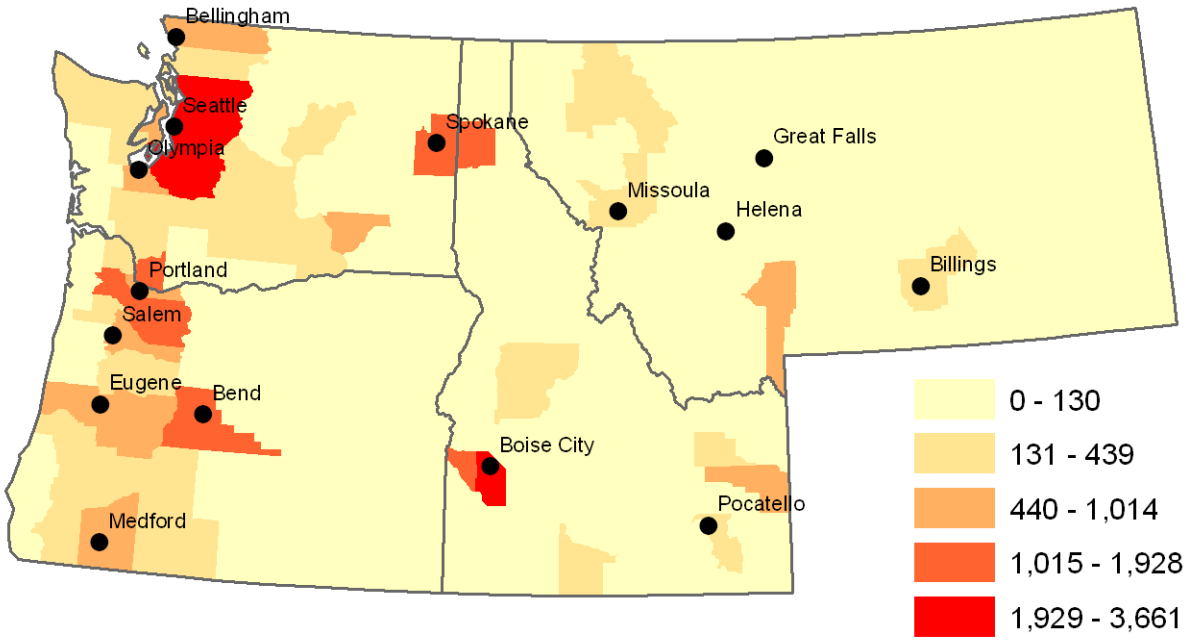
Table 5 shows each state's share of the total new construction housing market from 1998 through June 2005. Throughout this period, Washington has had the largest share of new home construction with about half of the total market (46 percent in 2005). Idaho has seen the largest growth in the region with a relative increase in market share from 18 percent in 1998 to 22 percent so far in 2005.

Table 5. Share of Regional New Construction (1998-2005)

Year	Washington	Oregon	Idaho	Montana
1998	50%	30%	18%	3%
1999	49%	29%	18%	3%
2000	49%	30%	18%	3%
2001	49%	30%	18%	3%
2002	50%	29%	18%	3%
2003	50%	27%	19%	4%
2004	48%	27%	20%	5%
2005 (Jan-June)	46%	29%	22%	4%

Each state has different "hot spots" where much of the residential new construction growth is occurring. Figure 1 shows geographically the number of single family homes built by county from January to June 2005. Predictably, the major cities, such as Seattle, Portland, and Boise have higher levels of construction. Also shown is the large number of homes around the Bend and Spokane areas.

Figure 1. New Single Family Homes by County (January 2005– June 2005)

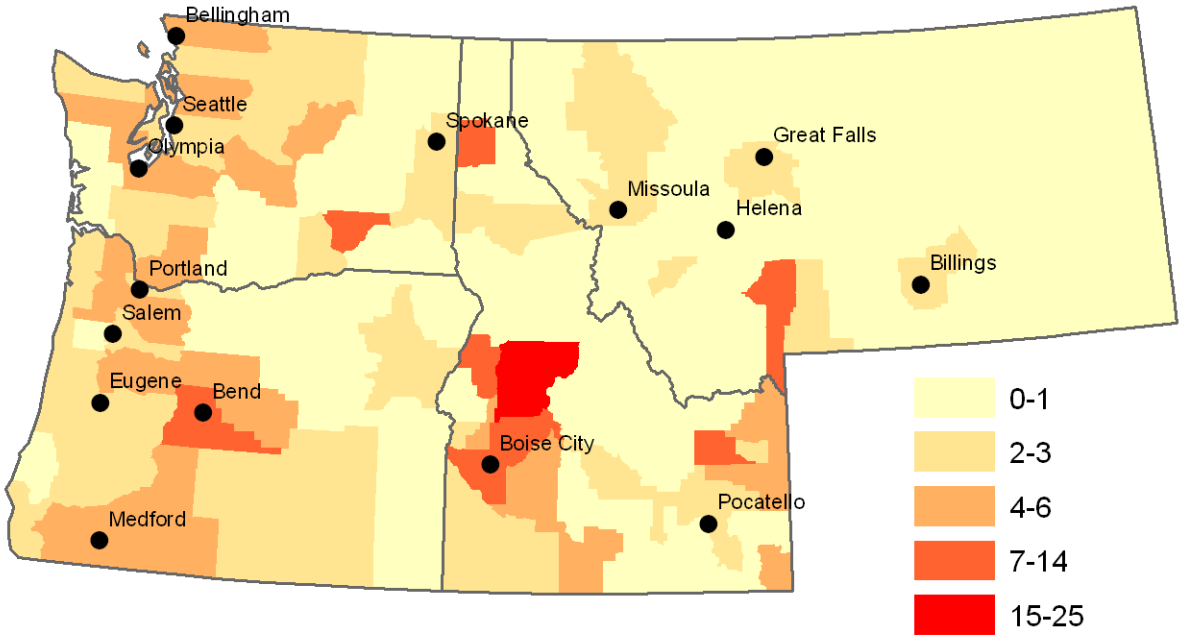


Source: US Census Bureau Building Permit Reports, compiled by ECONorthwest.

Outside the major urban areas there are some counties showing strong growth relative to existing populations. Figure 2 highlights the number of single family homes per thousand persons by county. Since this display controls for population levels, smaller cities with high growth show up more prominently. Some lesser known areas experiencing high rates of development include

the McCall-Valley County area of Idaho, Bozeman-Gallatin County area of Montana, the Bend-Deschutes County area of Oregon, and Pasco-Franklin County area of Washington.

Figure 2. Single Family Homes Per 1,000 Persons by County (January 2005-June 2005)



Source: US Census Bureau Building Permit Reports, ECONorthwest. Population estimates are from July 2004.

Not surprisingly, the number of builders in the region has also increased throughout most of the region. Table 6 shows the number of builders in regions defined by the Construction Monitor, which provides information on construction activity based on building permits. The data do not cover all of the Alliance program territory but do provide key information about building permits not obtainable from other sources. According to these data, Western Montana and Southern Idaho have seen the largest increase in number of builders over the last two years.

Table 6. Number of Builders Issued Permits by Region (2003-2005)

Area Name	2003-2004	2004-2005	Percent Change
Inland Empire (Eastern WA, Northern ID)	460	514	12%
Portland-Vancouver	1,581	1,661	5
Puget Sound	1,632	1,805	11
Southern Idaho	1,444	1,694	17
Western Montana	1,056	1,489	41

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

Table 7 shows the distribution of builders based on home volume throughout the region. The vast majority of builders (78 percent) are small builders constructing four or less homes a year. In contrast, there are just 65 large builders (constructing 100 homes or more) in the program

area, which comprise less than 1 percent of the overall builder population and 40 percent of homes constructed.

Table 7. Builders by Region and Volume (2004-2005)

Region	Number of Units Built (Annually)						
	1-4	5-9	10-24	25-99	> 100	Total	Average
Inland Empire	396	64	31	16	8	515	8.9
Portland-Vancouver	1,267	199	127	49	20	1,662	7.8
Puget Sound	1,377	194	140	71	24	1,806	8.8
Southern Idaho	1,324	190	123	47	11	1,695	7.2
Western Montana	1,217	181	67	23	2	1,490	4.6
Total	5,581	828	488	206	65	7,168	7.3

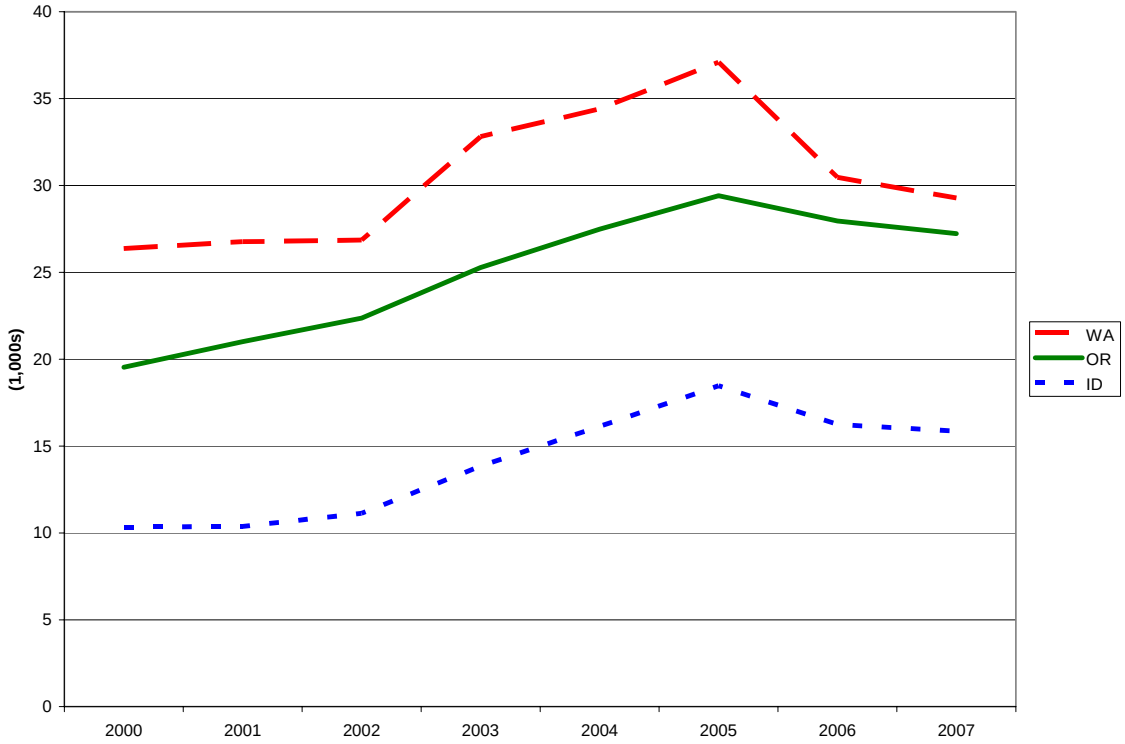
Source: *Construction Monitor.*

Despite the rapid growth in home building in the region, there are indications that this pace will decrease in the near future. The economic forecasts for Washington, Oregon, and Idaho have all predicted slower growth in housing construction in 2006 and 2007. Figure 3 shows the historical and forecasted growth in new housing in these states.[4] Montana does not forecast housing starts, however, there is concern from economists in the state that housing bubbles may exist in some of the faster growing areas of the state.[5]

[4] Oregon data are for all housing starts. Both Washington and Idaho data are for single family housing starts.

[5] Montana Economic Outlook 2005, Bureau of Business and Economic Research, University of Montana, pg 1.

Figure 3. New Home Construction Forecast (2001-2007)



Note: Oregon data are for all housing starts, Washington and Idaho include only single-family homes.
Source: Oregon Office of Economic Analysis, Washington Economic and Revenue Forecast Council, Idaho Division of Financial Management.

2.2 PARTICIPATION

Table 8 presents the number of builders who have contractually agreed to participate in the ENERGY STAR Homes Northwest program as of July 2005. Results are shown by state and builder volume and include the program's 2005 builder participation goals. Based on participation to date, the program is on track to meet its overall builder participation goals for both large- and small-volume builders. At the state level, the program has exceeded its 2005 large builder goal for Oregon. In Idaho, the program has more than doubled its small-builder goal, but has not yet recruited its target of 2 new large-volume builders.

Table 8: 2005 Participating Builders (Jan-July 2005)

State	Small-Volume Builders (<100 homes/year)		Large-Volume Builders (100+ homes/year)	
	2005 Actual	205 Goal	2005 Actual	2005 Goal
WA	15	39	4	4
OR	41	47	7	4
ID	45	21	0	2
MT	7	9	0	0
Total	108	115	11	10

Source: *PECI Monthly Status Report.* Data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

The following table shows the builder recruitment results and goals since the program began in May 2004. Overall, the program has met its builder recruitment goals to date. For Washington, recruitment of smaller builders is significantly lower than the target while large-volume builder recruitment has exceeded the goal set for that state.

Table 9. Cumulative Total of Participating Builders (May 2004-July 2005)

State	Small-Volume Builders (<100 homes/year)		Large-Volume Builders (100+ homes/year)	
	Cumulative Actual	Cumulative Goal	Cumulative Actual	Cumulative Goal
WA	39	81	13	7
OR	70	69	9	7
ID	87	39	1	4
MT	25	16	0	0
Total	221	204	23	17

Source: *PECI Monthly Status Report*, data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

Table 10 shows the 2005 goals and current participation levels for verifiers and performance testers as of July 2005. Verifier recruitment for 2005 is at about one-half of the goal for the year. With just under half of the year remaining, the overall 2005 goal is attainable. By state, the number of verifiers signed up in Washington and Montana, however, is not on target to meet goals for 2005. On the performance tester side, recruitment levels are already nearing the target for the year overall. Oregon is already well ahead of its target for the year and Washington and Idaho appear to be on pace to reach their goals for 2005.

Table 10. 2005 Participating Verifiers and Performance Testers (Jan-July 2005)

State	Verifiers		Performance Testers	
	2005 Actual	2005 Goal	2005 Actual	2005 Goal
WA	3	18	13	25
OR	13	10	35	24
ID	3	7	4	8
MT	0	6	0	6
Total	19	41	51	62

Source: *PECI Monthly Status Report*, data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

Table 11 shows the combined recruitment totals and goals for 2004 and 2005 for both verifiers and performance testers. As of July, recruitment in Washington, Idaho, and Montana had not yet reached the combined 2004/2005 goals.

Table 11. Cumulative Total of Verifiers and Performance Testers (May 2004-July 2005)

State	Verifiers		Performance Testers	
	Cumulative Actual	Cumulative Goal	Cumulative Actual	Cumulative Goal
WA	23	33	31	51
OR	25	20	71	42
ID	10	22	8	20
MT	15	18	9	12
Total	73	93	119	124

Source: *PECI Monthly Status Report*, data as of July 2005.
Note: For this table, the 2005 goal in the Spokane / Northern Idaho region is split evenly between ID and WA. Totals may not add up due to rounding.

Table 12 shows the construction activity achieved through the ENERGY STAR Homes program as of July 2005. "Certified" homes refer to those that have been constructed and certified as ENERGY STAR-compliant by the program. "Initiated" homes are those that have construction underway but not yet completed and have been entered into the ENERGY STAR Northwest Homes Database. "Forecast Completions" as reported in the PECI monthly status report are estimates from the Builder Outreach Specialists (BOSs) for the number of homes to be certified in 2005 based on their conversations with participating builders. In the table below, we report "Other Forecast Completions" that exclude both "Certified" and "Initiated" homes. In 2005, the average length of time for a home to go from "Initiated" to "Certified" was 87 days, or about 2 months.

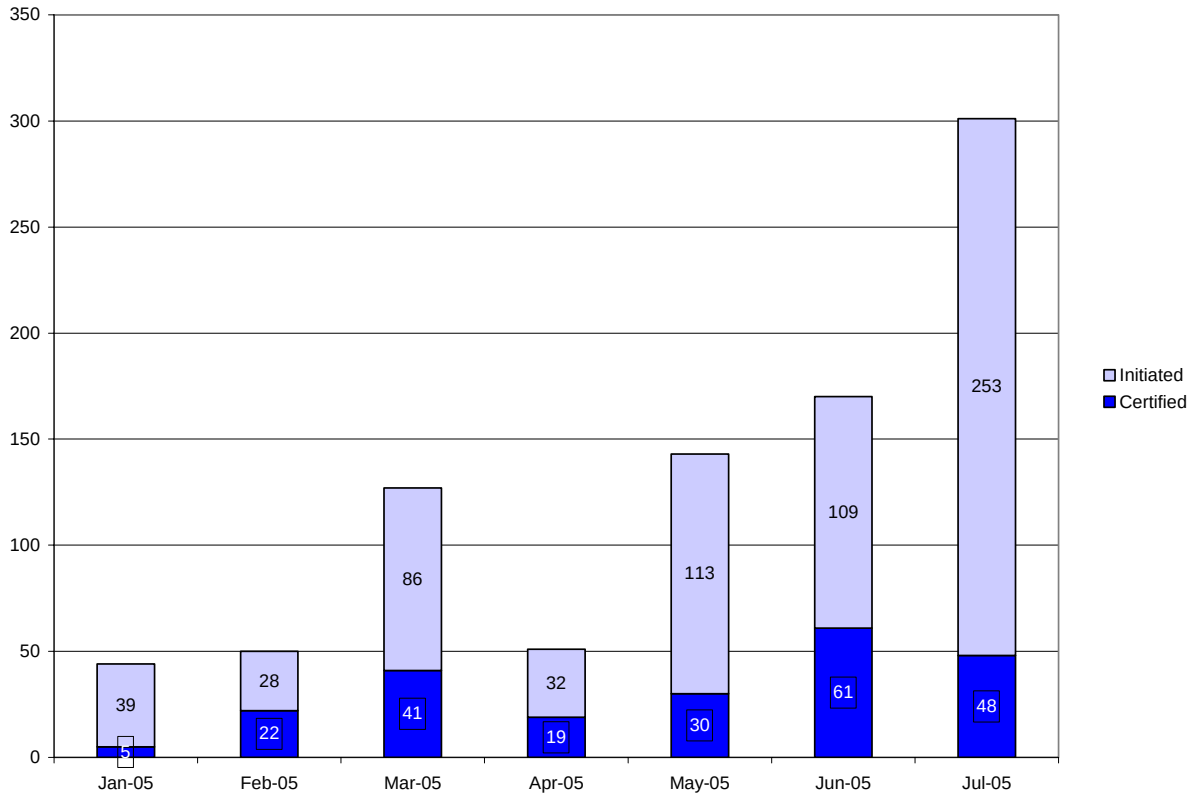
Table 12. 2005 ENERGY STAR Home Construction Status (Jan-July 2005)

State	Certified	Initiated	Other Forecast Completions	Total Forecast Completions	2005 Goal	Total 2004 Homes (All New Homes)	Total Forecast Completions as a Share of 2004 Total Homes
WA	56	159	629	844	962	36,153	2.3%
OR	80	206	286	572	538	20,728	2.8%
ID	82	152	91	325	455	15,106	2.2%
MT	8	19	7	34	45	3,423	1.0%
Total	**226**	**536**	**1013**	**1,775**	**2,000**	**75,410**	**2.4%**

Source: ENERGY STAR Northwest Homes Database, US Census, PECI Monthly Activity Reports, ECONorthwest. Data as of July 31, 2005.
Note: "Forecast Completion" figures are the result of BOS discussions with builders about developments in their territory and are therefore the initial builder estimates of the total number of homes to be certified in 2005. Prior to March 2005, these data were not collected under that definition and therefore are not shown in the table above.

At the end of July, the program forecast that 1,775 homes will be certified in 2005. However, as of July 2005 only 226 homes have been certified, with another 536 initiated. If all of the 536 homes that have been initiated are certified by year-end, it would require that an additional 1,013 homes be initiated and completed by year-end to realize the 1,775 forecast. Although the number of homes certified per month has been increasing (as shown in the Figure 4 below), it seems unlikely that the most recent ENERGY STAR homes forecast will be met. These same builders are projecting that 2,988 ENERGY STAR homes will be built in 2006, however.

Figure 4. Certified and Initiated Homes (Monthly Totals)



Source: ENERGY STAR Northwest Homes Database, Monthly Activity Reports, ECONorthwest.
Note: The data shown are based on analysis of the online database extracted on 9/2/05 of totals through July 2005. These results may differ from the monthly reports as the participation database is continuously updated and certification and initiation dates are revised over time.

3. BUILDERS IN-DEPTH INTERVIEWS

3.1 METHODOLOGY AND SAMPLE COMPOSITION

The purpose of the builder interview results presented in this chapter 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 many of the questions asked were open-ended, and did not necessarily yield unambiguous responses.

There were two separate components to the builder interview effort. The first was to interview participating builders to collect information on their experiences with the ENERGY STAR Homes program. These builders were recruited from the program tracking database maintained by PECI. The recruiting effort emphasized those builders that had the most experience in the program in terms of the number of ENERGY STAR Homes completed. A total of 25 in-depth interviews were completed with builders actively participating in the program.

In addition to the participating builders, we also interviewed 20 nonparticipating builders that were aware of the ENERGY STAR Homes program. These builders were identified by PECI as ones they had recruited for the program but that had ultimately declined to participate. The purpose of the interviews was to identify those barriers and issues that prevented participation once builders were made aware of the program.

Table 13 shows how the builder interviews are distributed across states. For both the participant and nonparticipant interviews, we attempted to get a mix of builders across all states. The builder interviews were conducted by phone during April and May of 2005.

Table 13: Builder Interview Sample by State

Builder Group	WA	OR	ID	MT	Total
Participating Builders	5	8	9	3	25
Nonparticipating Builders	11	8	0	1	20
Total	**16**	**16**	**9**	**4**	**45**

3.2 PARTICIPATING BUILDERS INTERVIEW RESULTS

In total, 25 telephone interviews were conducted with builders having the following characteristics.

- The number of homes planned for 2005 by interviewed builders ranged from as few as 1 to 850, with an average of just under 100 homes.
- A few large builders account for about 80 percent of the homes planned: a single corporation with operations in both Washington and Oregon plans to build a total of more than 1600 homes.
- Almost half of all respondents said they planned to build fewer than 10 homes in 2005.

Most builders said only a portion of their 2005 production will be ENERGY STAR qualifying, with the percentage ranging from one out of 20 planned homes to 100 percent of an expected total of 120 homes. Overall, the interviewed builders expect to build almost 800 ENERGY STAR homes in 2005, although several qualified their responses by noting that the number of ENERGY STAR homes completed will depend upon buyer response and on whether program participation slows down the construction process.

Almost half of the participating builders (12 of 25 respondents) said they had heard about ENERGY STAR Homes through another program, usually either Earth Advantage in Oregon or GemStar in Idaho. About 30 percent (7 builders) reported either having a previous interest in energy-efficient construction or actively looking for a program through internet searches or other means. Another 4 builders said they had heard the ENERGY STAR Homes name and/or seen signs or a label for the program. Only 2 respondents said they learned of the program from a program representative (although several of those who said they heard about ENERGY STAR through their involvement with other programs were working with people who are also ENERGY STAR Homes representatives).

Not surprisingly, all builders said they had heard of the program within the past year. Spring 2004 was the earliest mention, while most said they learned of the program in the fall or winter of last year.

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.

- About 40 percent of participating builders gave responses related to product differentiation, marketing, and the recognition enjoyed by the ENERGY STAR name.

- About one-third of participants said they were participating primarily because of their own desire to build high quality, energy efficient homes. Several offered comments such as "the biggest thing is the self satisfaction that I'm delivering a superior product," "I think it's the right way to build," and "it's good to sell something you feel good about." Several of these builders also cited the fact that they learn how to build a better home through program participation.

- Among other respondents, a few builders cited the benefits of the program in ultimately transforming the market by both bringing down the cost of energy efficient construction and by making customers more aware of energy efficiency. One builder mentioned the cash incentive for participation paid by his utility as an advantage, and another said the builder gets no benefits – those go exclusively to the customers who buy the homes.

Builders were also asked to name both the most and least valuable assistance offered by the program.

- Almost half of participating builders (12 of 25) cited the Building Outreach Specialist (BOS) or their verifier as the most valuable assistance offered by the program, often mentioning the person by name. One builder was particularly impressed with the time

their BOS dedicated to making sure they found lighting fixtures that would fit their needs. The BOS accompanied the builder's lighting designer to the store to help select fixtures. This builder cited this action as the most valuable support they received from the program.

- Another one-third of respondents (8 of 25) said the marketing materials and assistance were the most useful, and 4 builders mentioned more general engineering or technical assistance, including testing. Only one respondent said incentives were the most useful.

- Very few of the builders were able to identify less valuable aspects of program assistance. In response to this question, one builder said that his HVAC contractors were gouging him under the guise of meeting program requirements, and another said that there were some aspects of the training on construction techniques that were not suited to the dry climate where he builds.

All respondents but one said they were well informed about the program. The only exception said that he felt reasonably well informed but that the materials "could be better." He recommended "a clear workbook with suggested resources."

While builders highly value the advice they are receiving, they are not always able to distinguish between the BOS and the verifier or performance tester.

- Builders tended to respond to questions regarding their contact with the BOS either with the name of their BOS or with the name of their verifier.

- About half cited the verifier as their primary program contact and source of information.

- Several builders elaborated on the responses given earlier regarding the value of the assistance provided by program representatives (either BOS or verifier/tester).

It is clear that these individuals play a valuable role in guiding builders into and through the program by serving as the primary point of contact for all program-related questions, whether technical or procedural. The frequency of contact ranged from "at least monthly" to "two or three times a year." None of the builders said they had found their program contacts hard to reach or unavailable.

To determine what barriers builders still face to the construction of ENERGY STAR homes, respondents were asked what they considered the biggest challenge relating to program participation.

- Overall, the biggest challenge associated with program participation was perceived to be the extra cost of building to ENERGY STAR standards. This seemed to be particularly true for builders in Oregon who had been building to Earth Advantage standards and for those in Idaho who had previously been participating in GemStar. Specific items mentioned as contributing to cost increases included the duct blaster testing, 50% CFLs, ceiling insulation, going from 2x4 to 2x6 framing, and high efficiency HVAC (several builders commented on the very long payback on high efficiency HVAC in their climate).

One builder pointed out the continuing first cost barrier posed by compliance, noting "We get killed by competitors by 5-10 percent on the things we're doing that they're not. Buyers look at 200 versus 195 and they just go for the cheaper one."

- A second challenge was simply the learning curve involved in building to the new standard and in getting subcontractors to comply with the duct sealing requirement. A large volume builder noted that it can take 3-4 months before subcontractors are fully trained, while another builder said that there were simply no HVAC contractors in his area who knew how to seal ducts properly.

- Aside from the extra cost, no ENERGY STAR requirements were seen as especially difficult or challenging, although several builders commented that the program was inflexible in not accepting any deviations from the BOPs. Several builders offered detailed technical discussion regarding sprayed-in foam insulation and window requirements, and one offered comments regarding the difficulty of meeting program standards with concrete form homes.

- Availability of ENERGY STAR-compliant products was generally not seen as a problem. The only exception, mentioned several times, was for CFL fixtures – particularly the dimmable fixtures that home buyers often request. Even with CFL fixtures, however, the problem has generally been the higher price of these fixtures rather than actual availability. Among other products, one builder mentioned windows and one mentioned 14 SEER air conditioners as raising the cost of compliance.

- One very large builder noted as a challenge the ambiguous relationship between the ENERGY STAR program and the Earth Advantage program, which would seem to be in competition yet have the same people working for both of them.

Fifteen of 25 builders interviewed said there was no additional assistance they wanted from the ENERGY STAR Homes program, with several offering comments that "they are doing very well" or "I've actually been pretty impressed with what's provided." The most frequently requested additional assistance or recommended changes were:

- More assistance in raising customer awareness;

- Training and support materials for sales people;

- More help in design review;

- Annual rather than *ad hoc* program changes;

- Improved airflow calculations by HVAC contractors;

- More certification levels to recognize higher efficiency; and

- The ability to "innovate some new ideas for efficiency and be allowed to solely implement them for a time."

Fifteen of the 25 builders also said they were aware that their utility provided some type of support for the ENERGY STAR Homes program, but only 5 of those said the utility support was a factor in their participation. Idaho builders were the most likely to report utility involvement and the fact they had been influenced, noting that Idaho Power offers a $750 incentive for qualifying homes.

Training, Duct Testing, and Verification

Training

Most builders did not think their subcontractors had received training in the requirements of the ENERGY STAR program: only 6 responded positively that their HVAC contractors had been trained. The rest typically said either that they thought the contractors had received informal instruction on duct sealing from the BOS, verifier, or tester or that they didn't know whether the subs had been trained. Several said their subcontractors had been trained in the past for either the Super Good Cents or Earth Advantage Programs.

- Those who knew that their subcontractors had been trained for the ENERGY STAR Homes program were generally satisfied with the level of the training, although one respondent complained that "they train a lot of them and they still end up with problems for 3-4 months."

- One builder noted that the courses filled up before his HVAC contractors could enroll, while another said that HVAC contractors typically sent higher level people from their organization rather than the technicians who would actually do the installations.

Duct Testing

When asked who was performing the duct tests on their homes, 7 respondents said they had not reached that stage of participation yet. Of the remaining builders, two-thirds (12 of 18) said their verifier was also doing the duct tests, with four builders saying the testing was being done by a trained and certified HVAC contractor, one mentioning Earth Advantage, and one their BOS.

- Most builders see the primary benefit of duct testing as a quality control tool for checking the performance of their subcontractors.

- Several noted, however, that the duct tests also serve as a learning tool that allows them and their subcontractors to get up to speed on proper duct installation techniques.

- Two of the larger builders expressed the opinion that 100 percent testing becomes redundant once HVAC contractors have learned proper duct sealing methods, and that a sampling approach would be more cost effective.

Builders are less convinced that buyers recognize the benefits of duct testing. Only about half think that homebuyers are aware that there is some benefit to testing, and many of those say they continue to actively market the benefits and help buyers understand the value of testing. From their own perspective, builders generally think testing is a good value relative to its cost. While a few builders cited the high cost of testing (particularly if required for every home), several

enthusiastically commented that testing is "definitely worth the cost" or "it's one of the top values out there."

Only three builders noted any drawbacks to duct testing: one again cited the cost of testing every house; another noted that it "adds a day to our schedule;" and one said that the only disadvantage was that home buyers often do not understand the benefit.

About one-third of builders reported that at least some of their homes had initially failed the duct tests; however, all but three of those said any problems were fixed on the spot. Among the others, one said problems were fixed within a few days, one noted that "it took six months before they were doing it right the first time," and another said that in one case "the heating contractor had to come back three times to do it right." The builder who made this final comment used it to explain his support for duct testing, noting that "if it had been any other house without this process they never would have found or fixed those problems and the homeowner would have been none the wiser."

Verification

As noted previously, most of the participating builders interviewed were relatively new to the program and had only limited experience with the verification process.

- Of the 25 builders interviewed, 15 had not gone through a complete verification process on any ENERGY STAR homes, and about half of the remainder had only completed the process for one or two homes. Several of the larger builders, however, had already completed more than 50 verifications.

- Builders either found their verifier through the ENERGY STAR program (either their BOS or the ENERGY STAR Homes website), through contacts in the industry, or by selecting one after a detailed analysis of available verifiers and their credentials.

Builders said that verifiers typically review home plans before construction begins, and then make several visits during a typical home's construction, including inspections both before the drywall goes up and after the duct testing has been done.

- Builders who made comments consistently praised the verifiers and their skills, noting that they had provided extra assistance in design, equipment sizing, and other aspects of program compliance. They also emphasized that verifiers helped them to anticipate and avoid problems rather than merely pointing them out at inspections. Similarly, builders all said that the verification process had gone smoothly.

- Benefits of the verification process were the same as those cited for duct testing: assurance that the work of subcontractors had been properly done to meet program standards.

- None of the builders reported delays because of the verification process, although two said they were proceeding more slowly on their initial ENERGY STAR homes because they were learning as they went along.

The few inspection failures reported by builders were generally caused by the duct testing, as reported above. In addition, one builder said they had failed an inspection because there were not enough CFLs and another said that a standard efficiency water heater had mistakenly been installed. Respondents said both defects were corrected within a few days.

QA Process

The state-level QA process has been largely invisible to builders. Only one builder was aware of any of his ENERGY STAR homes having gone through the process. While he said he appreciates the need for quality control, he did not like the fact that the state QA inspectors knock on the homeowner's door unannounced. "I don't see the point of going in unannounced. What am I going to do, reseal the house?"

About a half dozen builders said they had received ENERGY STAR certifications for their homes. Almost all said the process went smoothly, although in Idaho it sometimes took up to a few weeks for the certificate to arrive. Since this meant the certificate typically arrived after the home buyers had moved in, several builders felt it limited the impact of the certificate as evidence that a home meets ENERGY STAR standards.

Marketing

Over half of the builders said they use realtors or agents for all or part of their marketing effort. Others say they sell through their own sales staff (for larger builders), do the selling themselves (smaller builders), or have customers come to them. About half of the builders who use realtors or agents believe those agents are knowledgeable about the program; the rest say much more education will be required.

Builders say they emphasize the ENERGY STAR label itself in their own marketing, rather than individual components. The fact that ENERGY STAR requires a whole package of measures makes it easier for them to convey that buyers are getting a home that is not only more energy efficient, but is of higher quality overall, is environmentally sound, and offers greater comfort and indoor air quality. To the extent that one feature is emphasized more than others, it is usually energy efficiency.

Builders use a wide range of promotional techniques, including web sites, Parade of Homes promotions, newspapers, and radio ads to promote their ENERGY STAR homes. The most widely used methods include the ENERGY STAR signage on the model home or job site and inclusion of their homes in the Multiple Listing Service (MLS). One builder pointed out that buyers from out of state, notably California and Arizona, have experience with the ENERGY STAR homes label and often want to search the MLS for ENERGY STAR homes, but find that MLS does not allow that as a search criterion. This builder said he was told that MLS makes the decision on which search criteria to use once a year; he also noted that Idaho Power planned to encourage MLS to include ENERGY STAR as a search criterion.

Major hurdles to promotion of ENERGY STAR homes cited by builders were cost and home buyer ignorance. Among the 16 builders who noted obstacles, 8 mentioned higher costs of ENERGY STAR homes, particularly in the price-sensitive lower end of the market; 7 cited lack

of awareness among buyers and realtors, and 1 mentioned the difficulty of getting customers to accept CFLs.

Final Comments

Builders were given an opportunity at the end of the interview to offer final comments regarding the ENERGY STAR program. Most either had no additional comments or offered their approval of the program overall, but a handful raised specific issues.

- One builder in Oregon said that "the AC requirement has to go," noting that payback on high efficiency AC is very long in his region. Another expressed concern regarding the requirement that crawl spaces be insulated, saying that, "I would have to put R-11 batt in my crawl space, which wouldn't improve my building but would make indoor air quality worse and cost more."

- A production builder who plans to complete about 100 ENERGY STAR homes this year commented that, "some builders just try to slap together the components but aren't committed." He worried that there are many builders signed up in his area, explaining that he produces almost all the ENERGY STAR homes, yet on the website he is just one of many. He felt that if a builder hasn't built a home in a year from signing up they should be taken off the list until they do so.

- A southern Washington builder expressed confusion about the organization structure of the ENERGY STAR Homes program. "It's very confusing who's in charge of what. We end up talking to Portland General Electric, who has a contract with NEEA, which also works with WSU, so it's hard to tell who's in charge and who can answer questions. (The BOS) is a good point of contact, but it's hard to know who's in charge…Probably one thing that would be very helpful to the builder would be a list or an organizational chart that shows the hierarchy of information and who you need to call for different things, so we can figure out how this whole thing works."

3.3 Nonparticipating Builders Interview Results

In addition to talking to participating builders, we also interviewed nonparticipating builders that were aware of the ENERGY STAR Homes program. The purpose of the analysis presented here is to provide the non-participating builder perspective on program process issues being addressed by the evaluation – particularly with regard to program outreach and barriers to participation. Because of the small sample size, the analysis should be considered qualitative in scope.

Builder Characteristics and Program Awareness

In total, 20 telephone surveys were conducted with non-participating builders having the following characteristics.

- Of the 20 builders, 4 described themselves as production builders, 4 as semi-custom builders, and 9 as custom builders.

- The number of homes planned for 2005 by surveyed builders ranged from as few as 1 to 460, with an average of just under 70 homes.

- Two relatively large builders who build only in Washington account for about 60 percent of the nonparticipant homes planned.

- Only four respondents (20 percent) said they planned to build fewer than 10 homes in 2005. This contrasts with the higher proportion of small builders among participating builders interviewed.

All of the non-participating builders said they had heard about the ENERGY STAR Homes program. The most common source of information was reported to be a program representative, cited by just over half of all respondents. Another four builders responded in the affirmative when asked if they had met with a program representative. Other sources of awareness included advertisements (4 respondents), word of mouth (2), presentation at a builder show (1), and "an appliance distributor" (1).

Information received by builders included brochures, handbooks, the program website, and meetings with program representatives. All 17 builders who reported receiving information said they had found it clear and easy to understand. The only suggestion for improvement was for a step-by-step description on the website of what procedures to follow.

Similarly, all but one of the 14 respondents who had met with program representatives found them well informed. The only suggestion for improvement was that representatives have references or testimonials from other builders who had participated.

Overall, 15 of the 17 nonparticipants who had received information said they considered themselves well-informed about the program.

Program Benefits and Requirements

Among all 20 respondents, 14 said they were either somewhat or very likely to participate in the program in the future. When asked why they were not participating in the program now, reasons offered included the extra cost (6 respondents), lack of customer demand (5), extra time/hassle involved (3), current participation in Earth Advantage (3), and the already stringent Washington code (2).

Among the specific program requirements that builders said they find challenging, the most commonly cited were lighting (7 mentions), duct testing (5), and the verification process, heating, and windows (3 each).

When asked to name features of the ENERGY STAR homes program that would be beneficial to them, 5 respondents said they could see no benefits. Other non-participants generally referred to either marketing benefits to them (name recognition, ENERGY STAR label) or direct benefits to the home buyer (quality, comfort, energy efficiency.) One respondent cited rebates.

When asked what program changes would make them more likely to participate, about one-third said that no changes were needed and they were moving toward participation. Among the changes cited by others were increased customer demand (mentioned by five builders), reduction in paperwork, elimination of the CFL requirement, and a standard that more effectively accommodates radiant heating.

3.4 BUILDER INTERVIEW SUMMARY

The following is a summary of the key findings from the builder interviews:

- **All but a few participating builders are fairly new to the program.** Most builders have limited experience building ENERGY STAR Homes and are still learning the processes and practices involved in the program. Many builders have previous experience with other new construction efficiency programs such as GemStar, Super Good Cents, and Earth Advantage, and this seems to have made them more receptive to the ENERGY STAR Homes program. In part because they are new to the program, some builders are aware that their subcontractors need time to become familiar with duct sealing and other program requirements. Most do not believe that their subcontractors have been formally trained, however.

- **Builders are generally very satisfied with the program.** Participating builders realize that ENERGY STAR is a widely recognized and respected brand, and they speak highly both of the program's goals and of the individuals associated with the program, including the BOSs as well as verifiers and testers. Those builders who have gone through the whole process of building and certifying an ENERGY STAR home report that both the testing and verification went smoothly, and did not significantly delay the construction process. Builders appear to value duct testing as a means of confirming that the subcontractors are doing the job properly, although some builders question the benefit of testing every home once the contractor learns how to do the installations correctly.

- **Most builders do not plan to build 100 percent ENERGY STAR homes.** Although they are in the program, most participating builders are not yet ready to commit to building only ENERGY STAR Homes. They see cost as the biggest hurdle to marketing ENERGY STAR homes, particularly because most buyers are not sufficiently informed about the program's benefits to be willing to pay extra for an ENERGY STAR home.

- **Barriers to participation generally relate to the lack of consumer demand for ENERGY STAR Homes.** A common response among nonparticipating builders was that a lack of consumer demand for ENERGY STAR homes kept them from participating in the program. Other nonparticipating builders cited the extra cost of these homes, which implies that they do not believe consumer demand is great enough to command a higher price. Despite these concerns, a third of the nonparticipating builders were considering participating in the program and 5 of the 20 builders said that they would consider participating in the program if demand for these homes increased.

- **Duct testing and lighting requirements are also considered barriers to participation.** In addition to demand issues, nonparticipating builders identified duct testing and the lighting requirement as the most challenging requirements of the program.

- **More marketing to consumers needed.** Both participating and nonparticipating builders stressed the need to increase consumer awareness and demand for ENERGY STAR Homes. Participating builders also mentioned that increased awareness of the program among realtors is also needed to help increase demand for these homes.

4. VERIFIERS

4.1 METHODOLOGY AND SAMPLE COMPOSITION

In addition to builders, verifiers[6] working on the ENERGY STAR Homes program were also interviewed about their experience with the program to date. Verifiers inspect the ENERGY STAR Home at various stages of construction to ensure that the home is meeting the ENERGY STAR requirements. Once a verifier signs off on a home, the paperwork can be filed to receive the ENERGY STAR label for the home.

The verifiers were recruited for interviews from the population of verifiers listed in the program participant database maintained by PECI. All of these interviews were conducted by phone in May and June of 2005. Table 14 shows the sample of verifiers interviewed by state.

Table 14. Verifier Interview Sample by State

State	Sample
WA	8
OR	1
ID	3
MT	3
Total	**15**

In preparing for the interviews, we found that the roles of verifier, duct tester, HVAC contractor, and even BOS came from populations that had significant overlap. Of the nine BOSs listed on the ENERGY STAR Homes program website, five are also listed as a verifier, duct tester, or both. In addition, there are 11 other individuals who are listed as both verifiers and testers. Similarly, many of the duct testers are also participating HVAC contractors and a few contractors also act as verifiers. This overlap across functions occurred in all four states. Verifiers generally came from two groups: utility or state agency and private companies. Of the 15 individuals contacted, 8 were utility/state-related and 7 worked for private companies.

To maximize the value of these interviews, respondents were asked questions regarding each of their roles in the program. The results of the verifier questions are presented in this chapter while the results from the other question batteries are included in the following chapters.

4.2 VERIFIER INTERVIEW RESULTS

Verifier Characteristics and Involvement

About one half of the verifiers have not had extensive experience with the program at this time, and four of those interviewed had not done any verifications yet but had been through the

[6] In Idaho, the verifiers are known as "Home Performance Specialists". For ease of exposition, both verifiers and Home Performance Specialists will be referred to as "verifiers" throughout this report.

training. There were some notable exceptions in Idaho where verifiers had been involved with GemStar, Idaho's predecessor ENERGY STAR Homes program for a longer period of time. In addition, it should be noted that many of the verifiers have over the years been involved with a variety of residential energy efficiency initiatives, including Super Good Cents, Earth Advantage, audit programs offered by utilities, and individual utility rebate programs.

Training

Verifiers found the trainings to be generally well-structured. Many of the verifiers have led verifier trainings at other times.

- A few verifiers mentioned the training locations needed better geographic coverage in Idaho and Montana.

- All but two had positive remarks for the trainings, emphasizing that they particularly liked the hands-on field work provided during training.

- One verifier found a Montana class to be somewhat disorganized. In addition, he noted that his company had expected to pay $90 each for training that would certify the four people they sent as both verifiers and testers, but found that the training was $90 per day for two days and covered verification only.

- One verifier mentioned the benefit of learning the building science and a different verifier indicated that they should include more building science concepts in the training.

In general, most verifiers had previously attended many other types of training that complemented the ENERGY STAR Homes training, and, as noted above, many have extensive experience in energy efficient construction and technologies. For that reason, some verifiers said they did not find the trainings particularly informative.

Builder Interaction

Verifiers reported working with one or two up to about 10 different builders. Most verifiers had a mix of builders; some that needed a lot of attention and others that needed almost none. Newly enrolled builders in particular were said to require extensive interaction, with one verifier noting that, "I don't make any money on the first four of five homes." In this early stage, most verifiers use a hands-on approach by coming out and doing plan reviews, conducting regular or informal visual inspections, or providing advice.

While verifiers say that they are able to conduct their visits without disrupting the builder's schedule, they emphasize that frequent communication is required.

- One verifier explained the situation as follows: "Coordination is an issue almost every time. With every appointment, I call in the morning before I go out to confirm that they're ready. If you don't do that 90 percent of the time they're not nearly ready."

- Another verifier noted, "A lot of the builders see the vision, but builders have a hard time with the subs. What we find is that we also train the insulation and HVAC contractors, work with all aspects of the subcontractor trade to be more in synch."

Verifiers said their visits take anywhere from an hour to half a day, depending on the scope of the inspection and whether or not a duct blaster test is involved. Most verifiers regularly find some items that fail, but that many of those are small defects that can be rectified on the spot. Several verifiers also said that their goal is to help the builder meet the program requirements by anticipating and correcting potential problems before they happen.

As far as the marketing of verifier services to participating builders, one verifier who works for a state agency in Montana (where the state has been careful not to compete with private verifiers) expressed surprise that private verifiers had not been more active in marketing their services to builders. He cited a recent ENERGY STAR homes training session for a builders group where verifiers would have had an excellent marketing opportunity, yet none were present. In contrast, the following perception exists as well:

- In describing the recruitment of builders in one verifier's region, the verifier noted they were more surprised by who was not at the builder breakfast. The president of the homes association was not there and was described to be very influential if something new is to take hold in the area. This verifier was waiting to see who was going to sign up before promoting the program to builders to avoid a negative perception for the verifier's other services.

Comments on Builder Requirements

Verifiers were asked to comment on which of the ENERGY STAR requirements posed significant challenges to the builders. Ductwork was the primary problem noted by verifiers (5 of the 9 who answered the question). Many of the verifiers mentioned that many HVAC contractors and builders have not focused on sealing ducts and so there are many bad habits. Other problems include:

- One verifier said the water heater requirement was not flexible enough. The contractor mentioned that with insulation you can easily make a slightly less efficient water heater save as much as more expensive models.

- Building tightness was mentioned by one verifier.

- Insulation was mentioned by one verifier.

- Heat pump testing was mentioned by one verifier.

- Local lighting supply company thought T12s were on the list according to one verifier.

Builder Outreach Specialist Interaction

Presumably because of the overlapping roles cited earlier, Builder Outreach Specialists are occasionally confused with other roles in the program. For instance, when verifiers were asked

about their BOSs, some referred by name to staff from their State Certification Organization (SCO). In general, almost all verifiers referred to the helpfulness of the BOSs and reported that they work closely with them.

Utility Interaction

Utility involvement by verifiers varies across states. Overall, verifiers in Idaho and Washington appear to have the most utility contact and those in Oregon and Montana have the least. Some of the interviewed verifiers in fact work for utilities, and are providing verification services to make it easier for builders to participate.

- A Montana verifier said, "Sadly enough, they're not involved. Northwestern does gas and electricity and they don't care, because they're having problems themselves. And the co-ops haven't gotten on board and they ask, what's it worth to us. BPA paid them for Super Good Cents homes so they're spoiled. They're member owned, but fairly mercenary."

- One verifier was concerned about the inability of some utilities to provide incentives because of the funding structure. In particular because of the C&RD funding cycle, some utilities cannot do much to help right now.

- The fact that Idaho Power pays rebates for ENERGY STAR Homes contributes significantly to the demand for verification services, according to one Idaho verifier, who notes that, "Honestly I expect it to go down if the incentives go away or if IDWR funding diminishes from NEEA and elsewhere. They had dropped GemStar and it was fading away."

State Certifying Office Interaction

There have been multiple issues reported with the verifier interaction with SCOs. Some have been reported to the program others may not be as visible. One area of concern to the verifiers is the process by which the SCOs conduct the QA inspection.

- Four verifiers located in Idaho and Washington commented on the fact that the QA inspections are occurring after the homeowner is present. It was noted that this unnecessarily inconveniences occupants and as a result creates resentment from builders.

- One verifier who works for a PUD said, "They come after the fact. Usually people are in the homes. We had one guy who was a little glad to see us leave."

- On the other side, another verifier mentioned that a QA inspection had occurred before the verification was complete and therefore made the verifier look foolish.

One half of the verifiers reported positive overall interaction with their SCO. Several Idaho verifiers, however, referred to problems with their interactions with the SCO.

- One Idaho respondent noted that "The protocol is for IDWR to communicate with the builders through the verifiers but we can't figure out why IDWR is now going directly to the builders."

- Another Idaho verifier said "Four of us feel the state is very partial to a single rater because he gets all the referrals." Several other Idaho verifiers expressed similar concerns that the SCO was unfairly favoring a single verifier and being unresponsive in his dealings with others. These problems were said to have been reported to NEEA and certain mediation attempts have proven unsuccessful from the perspective of the concerned verifiers.

These opinions have coincided with frustrations regarding the timeliness of verified homes being certified.

- One of the verifiers quoted above said that, "Last fall they lost 8 of 8 of my files and we had to reconstruct all the paperwork which took 3-5 months and lost at least one builder because of that. It makes us look bad. The state said we never turned it in. They moved in October, we turned in a lot of files 10 days before that, and they got lost."

- Another verifier indicated that the SCO in Idaho "sits on" the files.

A Montana verifier said that their SCO usually gets them done within a week, which they felt was reasonable. Other verifiers said they had not had enough experience with the certification process to assess its effectiveness.

Overall Program Comments

Some of the more general program comments were mixed from the verifiers.

- While one respondent was encouraged by the range of BOP options and opportunities to offset savings in other places, another thought the program was still too prescriptive and did not allow verifiers to make rational tradeoffs. He suggested using national software programs to calculate savings as an alternative to the BOP system.

- Several verifiers mentioned that the process by which builder leads are distributed from state certifying organization to the verifiers needs to be more established or equitable. One verifier suggested using a rotation method.

There was general agreement that the program needs to increase the level of mass market advertising to build consumer awareness and demand. A couple of verifiers contrasted the ENERGY STAR Homes program with the Super Good Cents program and suggested that there had been much more promotion done for that program.

4.3 VERIFIER INTERVIEW SUMMARY

The key findings from the verifier interviews are summarized below.

- **Coordination with builders is critical for successful verification**. While verifiers say that they are able to conduct their visits without disrupting the builder's schedule, they emphasize that frequent communication is required to make this process flow smoothly. Most verifiers regularly find some items that fail, but that many of those are small defects that can be rectified on the spot. Several verifiers also said that their goal is to help the builder meet the program requirements by anticipating and correcting potential problems before they happen. Verifiers also reported that they needed to spend significant amounts of time with builders that were new to the program.

- **Early verification issues tend to relate to duct work.** Issues relating to the duct installations were the most common reason give by verifiers as the reason that homes do not pass the verification. This was also the most common response when verifiers asked what the most challenging program requirement was for builders. Verifiers also reported spending a lot of time with builders new to the program in order to help advise and educate on the program requirements.

- **Final home inspections need to occur prior to homes being occupied.** A big concern of verifiers is that the SCOs sometimes conduct the final inspections after the homeowner has occupied the home. Verifiers felt that this was an inconvenience to homebuyers and creates resentment among the builders. This has the potential to become an even bigger problem as the volume of ENERGY STAR homes increases. As with the coordination between the builder and verifiers during the construction process, better coordination to ensure that the final inspection is done prior to occupation is critical for the long term success of the program.

- **Referral protocol for verifiers needs to be developed.** As more ENERGY STAR Homes are scheduled to be built and more private verifiers begin working with the program, a protocol needs to be developed so that builder referrals from state agencies and utilities are distributed fairly and equitably to verifiers. This issue may also be addressed by referring builders to a website that lists all the qualified verifiers within the region and then letting the builder decide which verifier to use. A set protocol should eliminate any perception that state agencies or utilities are favoring a few verifiers when making builder referrals.

- **More mass marketing needed.** As with builders, verifiers also stressed the need to increase demand for ENERGY STAR homes among prospective homebuyers. They recommend that this be done through more mass marketing efforts aimed directly at consumers.

5. PERFORMANCE TESTERS

5.1 METHODOLOGY AND SAMPLE COMPOSITION

Performance testing of the ducts and HVAC system is one of the primary ENERGY STAR Home requirements and the test represents a significant change in building practices for many builders. To assess how well the duct testing component of the program is going, we interviewed several performance testers in each state that are active with the ENERGY STAR Homes program. These testers were recruited for phone interviews from PECI's program tracking database, which lists performance testers that are active in the program.

Table 15 shows the interview sample for the performance testers and recruiting was done to ensure that testers from each state were interviewed. In total, 17 people were interviewed about their performance testing experience: 6 HVAC contractors and 11 verifiers. Within the verifier group, 6 individuals had roles at various PUDs or state agencies. Some of these individuals are representatives of the program to some degree, and their responses may have been influenced by that relationship.

Table 15. Performance Tester Interview Sample by State

State	Sample
WA	7
OR	4
ID	3
MT	3
Total	**17**

5.2 PERFORMANCE TESTER INTERVIEW RESULTS

Awareness/Participation

Most of the performance testers interviewed (12 of the 17) had been involved since the beginning of the ENERGY STAR Homes program. In some cases, their experience with performance testing began with the GemStar program in Idaho, the Super Good Cents program, Climate Crafters, and other past or current programs. There were, however, five performance testers that had received their certification in the last year. In most cases, the more experienced performance testers came from the verifier population.

The number of completed performance tests varied from just a couple for a few performance testers to up to a dozen for the majority of the performance testers and as many as 40 for 1 or 2 testers. All the performance testers said that at least one-half of their duct tests were ENERGY STAR Homes and about one-half said nearly all their duct tests were ENERGY STAR Homes. For the HVAC contractors interviewed that are also testers, the performance testing was always done by someone other than the person that did the installation.

While few of the performance testers have as much work currently as they would like, most said they are optimistic about the future volume of work. The items they noted that gave them reason for the positive outlook included:

- Larger developments (100 or more homes) signing on.
- More builders signing up in their area.
- The general increase in ES and non-ES home building.

Training

The performance testers received training from a variety of organizations, depending on their history and relationship to the ENERGY STAR Homes program itself. The following sources were mentioned:

- Climate Crafters (5)
- Performance Testing Comfort Systems (PTCS) (5)
- Previous program training (3)
- ES Homes program (2)
- Equipment manufacturer (1)
- Kansas Building Science Institute (1)

The response to the training effectiveness was about evenly divided between performance testers who thought the training was mostly material they already knew and those who thought it was particularly informative and adequately prepared them for the tests. The exception was an individual who thought the trainings were "not well run or comprehensive." This individual's organization had five people trained and found that the costs were double what they had expected.

Nearly all the respondents thought the fieldwork was the best part of the training. As opposed to the fieldwork, one tester described the classroom part as a waste of time. On the other hand, another performance tester appreciated the theory that was explained in the classroom setting. One tester said the best thing was that they showed you how to use the equipment correctly.

When asked about items that could be improved, the performance testers noted the following suggestions:

- "More hands on. Some people are squeamish about doing hands on stuff. Unless they do that stuff on a variety of different houses, they are likely to make mistakes. More repetition for each student. Lots of training had been devoted to the theoretical."

- "Field work was good, but given the amount of time available, some things just could not be covered adequately."

- "The lecture/book presentation needs improvement."

- "We were in an existing home. I think going to a home under construction where the ductwork is more visible would have helped, and having the heating contractor there to explain how the system was designed and why."

- "It should be better organized. Turned out to be expensive, since we were given a one day price and it was a two day course. So far we have drawn nothing from it, and if we've done no verification in 1 year we're out. With lack of response, etc, not much of a payback. There was supposed to be advertising, etc. to push builders into this."

- "You can't really spend enough time on it in a one-day course. An hour after a guy leaves the training he will have forgotten; they just have to do it again and a again."

Perception of Builders, HVAC contractors, and Homeowners

The responses varied in regards to whether the benefits of ENERGY STAR homes are understood by builders, HVAC contractors, and homeowners. Indeed, in many cases the performance testers believe the builders do not believe the ducts leak, the HVAC contractors are resistant to the change in habit, and the homeowners are unaware of the savings. From a positive perspective, however, there were a number of comments that indicated builders are receptive when they see it in the field as opposed to discussing it in theory. In particular, the builders can become convinced when they see how leaky their own homes are when they have used their standard practices. Likewise, other performance testers described how HVAC contractors are reluctant at first to change but eventually become receptive and see the difference. Very few people believed the homeowners really understood the performance testing and therefore probably did not grasp the benefits.

On-site

The amount of time required for the duct tests varied widely. There were 6 performance testers that said it took less than an hour. Another couple said it was 1-2 hours. Additionally, there were 4 others that said it could take from 2 to 8 hours. (5 testers could not determine an average duration due to the variability). Of course, there are some consistency issues in comparing results because some testers tended to assume best-case scenarios while the others provided more conservative responses. Predictably, the major reason for delay is if the system does not pass. In most cases the HVAC contractors are present to make corrections (particularly early-on in their experience with the program) and therefore it adds just an hour or two to the test.

Overall, the trend was that HVAC contractors started out pretty poor at passing the tests. Once they had done a few there was a fast learning curve where failures became relatively uncommon. In their first test, however, several testers said none of the duct installations passed and they had to make major corrections. Many said the inaugural test was closer to a 50 percent failure rate. There were a couple of testers that did say all their tests had passed. One tester noted that, "Upfront with a new builder it's pretty much all of them failing. It takes a couple of discussions

with heating contractor. Get it to the grunts. The builder usually talks to the owner or superintendent, so I try to get the crews."

The most common problems in passing the test was not putting mastic in enough places and difficulty sealing panned returns. Comments on these issues and other typical problems causing ducts to fail the test include the following:

- "Panned returns and building cavity returns are a problem."
- "Plumbers are trying to cramp things in next to the ducts. Or other contractors may step on things or accidentally cut them with a knife."
- "The ones with pan returns are more likely to fail."
- " It's lack of sealing."
- "They need to put more mastic on joints."
- "Sometimes it's the boot connection, sometimes it's the box to the ductwork. If they paint the mastic on as thin as they can get it there are problems as well."
- "Multiple returns may have more failure initially."
- "Sealing, using wall cavities, duct pans are a big issue."
- "They need to use duct mastic."
- "Not applying mastic on air handler."

Issues with the Performance Testing Process

Performance testers seemed generally positive about how the process works for them. In most cases, the requirements made sense and could be maintained without too much difficulty, although some mentioned difficulties in scheduling testing and conducting tests at the right stage of the construction process. Below are excerpts from their comments:

- "I know a lot of builders who put in undersized ductwork, and nobody proves the equipment. Need to do an airflow measurement and temperature measurement and I could prove the efficiency but it takes about an hour and a half."
- "If you get in at the end of the job before the painters and carpet people then it goes smooth. Return air is sometimes dangerous to get to when doing the tests due to height."
- "Duct testing is done early after rough-in and there are a lot of trades in the house after we leave, so electricians and insulators could damage the system. Tested and certified after we left."

- "More often there is a problem with duct sizing because people are under-sizing equipment."

- "We are having a little trouble of contractors not getting a hold of us. Want to do it at rough-in. Education issue. That was more typical at the start."

- "I don't see a value in the duct blaster over the pressure pan testing. Duct blaster is much more time consuming. It takes an additional 1 to 2 hours to do the test and I've done both ways multiple times and in every case the test that passes the pressurization comes in under .5 pascals for pressure pan. Other testers are less experienced and see this as less of an issue."

- "Change the worst case depressurization requirements. It doesn't need to be a part of the ES Homes requirements, but we could still do it and inform the homeowner."

- "If shell is not intact and if you are doing the total leakage test, it is tough to pressurize the house at that early stage.

Promotions

None of the three HVAC contractors who are performance testers are promoting duct sealing techniques to the builders. Two of the three said "not yet" because they are waiting until they have a little more experience before putting their reputation behind a certain practice. Performance testers who are not contractors usually market testing more aggressively, noting that since the builders look to them for knowledge about how to do the ducts it is easy for them suggest the different practices. One tester said, "One of my greatest accomplishments is turning builders away from the dark side." Another said that builders can often be persuaded by testing one of their homes. "Especially if you give them a free one and you prove that the house is leaky. That's got us 10 builders."

Performance testers believed that additional marketing of the benefits to builders and homeowners by the ENERGY STAR Homes program would help them gain more customers. They felt that increased advertising would keep the idea in the minds of the builders and would move them closer to using the services for ENERGY STAR and non-ENERGY STAR homes. Several marketing-related comments were offered.

- One tester noted that "there was supposed to be advertising, to push builders into this. With the lack of response from builders, there hasn't been much of a payback."

- A number of the performance testers said it is important to stress the health, safety and comfort benefits of testing even more than the energy savings, but one noted that "you can't rely on the builder to do it."

- From a critical perspective, one performance tester noted, "pens, pencils, and a banner is not good marketing."

Conclusions

Performance testers seemed generally pleased with the program. They are ready and waiting for more jobs to come up and hope new developments and increased marketing will provide a boost. They are not discouraged by the high early failure rate of some new builders/contractors and believe that over time contractors are picking up the required duct installation practices just fine. As specialists in building science and performance, some testers have critiques of the testing requirements but understand the vast improvement the standards are pushing.

5.3 Performance Tester Interview Summary

Findings from the performance tester interviews are summarized as follows:

- **Performance testers were generally positive about the ENERGY STAR Homes program.** In most cases, the performance testers felt that the program requirements made sense and could be maintained without too much difficulty. A few of the testers did have difficulties in scheduling testing and conducting tests at the right stage of the construction process, however. In general it appears that even though the HVAC contractors fail their first few duct tests, they improve rapidly and generally are able to pass the tests after only a few installations.

- **Performance testers had mixed reactions to training.** Some of the performance testers felt that the training was not very informative, although these tended to be from testers that were already experienced duct testers and were therefore familiar with much of the material. Other testers that were new to the program indicated that the training was informative and adequately prepared them to perform the tests. Nearly all the respondents thought the fieldwork was the best part of the training.

- **More marketing to builders needed to increase demand for duct testing.** Performance testers said that there is a need for more marketing to builders on the benefits of duct testing. Several testers indicated that this should emphasize benefits such as air quality and comfort even more than the energy savings benefits of duct testing.

- **Marketing to consumers should be increased.** As with the other groups interviewed, the performance testers stressed the need to increase the general marketing of the program in order to increase demand among homebuyers for ENERGY STAR homes.

6. HVAC CONTRACTORS

6.1 METHODOLOGY AND SAMPLE COMPOSITION

This chapter summarizes the results of interviews with HVAC contractors that are involved with the ENERGY STAR Homes program. For these interviews, potential HVAC contractor interviewees were identified by asking participating builders for the names of HVAC contractors they had worked with on their ENERGY STAR Homes. Additionally, some of the individuals listed as performance testers in the ENERGY STAR Homes database were also HVAC contractors and the results of their responses to the HVAC contractor questions are included in this chapter. Table 18 shows the distribution of the HVAC contractor interviews completed by state. All interviews were done in May and June of 2005.

Table 16. HVAC Contractor Interview Sample by State

State	Sample
WA	5
OR	6
ID	3
MT	1
Total	**15**

6.2 HVAC CONTRACTOR INTERVIEW RESULTS

Overall, 15 HVAC contractors were interviewed, including 6 that also do duct testing. Characteristics of the sampled HVAC contractors include the following:

- HVAC contractors varied in size, with 4 companies employing 30 or more installers, 5 with between 10 and 30 installers and 6 with less than 10 installers.

- New home installations dominate the respondents' business. All but one contractor focused almost exclusively on residential installations, and only one reported that new home installations accounted for less than half of their work.

- The number of builders the contractors worked with ranged from 6 to 30.

Since many of the HVAC contractors are also duct testers, they have received training on proper duct sealing for installation through their duct testing certification. Overall, 10 contractors received either duct testing training or ENERGY STAR training for HVAC installations. Comments from those who did attend trainings were generally positive, with particular praise for the hands-on nature of the training. Comments included:

- "The best thing was being in the field for a whole day and actually running the tests. They spent some time going over the stuff in books, and that doesn't mean much to me."

- "It was really good. Lots of times there are classes where you are sitting all day, but this wasn't like that, with the on-sites."

- "The guys who went really liked the class because it took out a lot of the mystery. It was two days and had class time as well as actual testing."

- One contractor said he was confused by the different organizations involved in the training, noting that "I'm still not clear just what they expect and I get confused because I got ENERGY STAR Homes Northwest then I got this Climate Crafters."

HVAC Requirements

Contractors were generally neutral about the requirements. While most recognize that the requirements will force them to acquire some new habits, they are not seen as impossible to fulfill. However, several contractors mentioned inconsistencies between the ENERGY STAR requirements and those of other programs, including Earth Advantage and Build Green. In all, 5 of the 15 contractors did not have any issues with the requirements, while 6 mentioned just 1 issue, typically minor. Some of the issues raised are described below:

- The air conditioner requirement of a 13 SEER did not seem reasonable to several contractors, with one noting that the Earth Advantage program only requires 12 SEER, and another pointing out that "in my computer on a 3 ton system going from 10 to 13 saves $42 per year. The payback isn't there."

- On contractor said that "the biggest issue is that it's hard to (pass) the pressure testing. We seal everything and we still didn't make it. We mastic everything. The UL 181A, we used that, but we had to go back and reseal because that stuff cracked. Silicon works better, in my opinion."

- A different contractor thought the "biggest single issue is builders wanting to become ENERGY STAR with homes that have furnace and ductwork systems that will cause us to need to redesign the house or HVAC. These changes could be a big expense, which may make it cost-prohibitive."

- "Some furnaces have difficulty getting sealed from brand to brand."

- "Having the cold air returns without using voids; hard to get builder not to use voids; builders don't want to do that."

- "If you are doing a post and beam in the rain, it presents a problem for the mastic issue."

In addition to noting requirements that were difficult to meet, several contractors offered additional or more stringent standards.

One contractor suggested additional requirements that would make the standards more effective, including mechanical ventilation with heat recovery, building wraps (Tyvek or similar), and additional insulation for "bonus rooms" built above garages.

Another said that he would "want to see a 16 SEER two-speed in 2006. That would be a tool for me to have happier customers." He felt that lax requirements could undermine the program's value, noting that "People are going catch on to this program and start giving it away like everything else."

Conflicting information from a local building inspector (not a verifier) was mentioned as an issue by one contractor. The contractor indicated that in some cases the inspectors were telling them they did not need to do certain things. For some newer contractors this could pose a communication problem. It was not known whether the inspector knew the home was going to be an ENERGY STAR home or, consequently, if they knew the standards.

Promotion

Of the 15 contractors interviewed, 9 discussed promotion of energy efficient homes, and 4 of those indicated they actively promote ENERGY STAR to their builders. Some of the descriptions are noted below

- "I give them price on good, better, best equipment. Most homeowners want benefits of high-efficiency, comfort, longevity of the equipment, and savings payback. Typically people will go with the better efficiency and best efficiency options."

- "I co-host lunches, etc. I do everything in my power to get people on the program."

- One contractor said it was best to focus specifically on the phrase "energy savings."

When asked what types of assistance would help them more effectively promote ENERGY STAR systems to the builders, contractors had the following suggestions:

- One mentioned by name the "ENERGY STAR Investment Results Summary" which the contractor had used a few years ago but couldn't download anymore. The contractor was able to plug in costs and savings and loan terms and said it really helped to show to the customer. Another contractor referred to a "projected savings chart" that the contractor said was being worked on by NEEA.

- A larger HVAC contractor said their salespeople could use a class in how to market the ENERGY STAR systems.

- One contractor thought the program could put together packets that the HVAC contractors could give to builders. They said they already have a 3 ring binder with the products and that the ENERGY STAR packet would work well there.

- Several contractors suggested mass market advertisements to increase public awareness.

- One contractor said, "Incentives to the contractors to promote it. (ENERGY STAR) Stickers for vans."

Contractors were also asked about what the program could do directly to help market ENERGY STAR HVAC systems. Most of the responses were in the same vein as the previous set of comments:

- One contractor thought the program could do more to promote the whole ENERGY STAR package rather than just the equipment. The contractor felt that poor installation of good equipment, and the existence of ENERGY STAR labels on cheaper equipment does not focus the message of ENERGY STAR on the installation component, which is their value-added.

- Another contractor suggested promoting coops of certified heating and cooling contractors or some other basic certification process to distinguish contractors that have had training.

Duct Test Results

Of the contractors who had had installations go through duct testing, about half said that essentially all of their installations passed. The other half said they were still in the process of learning what it takes to pass the tests, and had needed to take corrective action. Of those who had failed, none complained about the testing procedures or the duct testers themselves. Comments from both groups included:

- One system had zero loss and the other one also passed

- We pass almost every one; can't remember the last one we failed.

- We were close but no cigar.

- Pretty much all needed corrective action but ultimately passed.

- A guy from Energy Trust did the test. We did some corrective actions, he came in on a second test, and we passed that one. We sealed the seams at the snap locks with mastic, and we tightened the machine at our shop that puts those together.

Finally, one contractor commented that even passing the test is no guarantee that the HVAC system will work efficiently. "One of the biggest things I see in residential installations is that the ductwork is not made per ASHRAE or SMACNA[7] standards…If ductwork is not run properly or is too small, it won't be effective. The problem is that local building officials don't recognize it. (The HVAC system) may have to run harder even though it passes."

Overall Observations/conclusions

The participating HVAC contractors generally were very happy with the program. Indeed many of them specialize in energy efficiency to some extent and were excited to have the strength of a

[7] Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

national label for their work. Almost all of the contractors did mention to some extent that more marketing would be a positive thing for the program.

Contractors were also asked what they believed would be their biggest challenge going forward.

- A contractor indicated that in general he was a little worried about the watering down of the ENERGY STAR standard. The contractor said there were a number of companies marketing ENERGY STAR and not knowing how to install correctly. More specifically the contractor mentioned, "There's a big push for numbers to show the project was a success and that could lead to watering down of standards."

- Noting the housing boom in much of the region, one contractor noted, "My only concern is that the housing market will soften and then price will become a huge issue again. Right now we're having no problem with the additional price for ENERGY STAR installations."

- A contractor who was concerned that the program would force builders to change the way their homes are designed pointed out that, "The biggest single issue is builders wanting to become ENERGY STAR with homes that have furnace and ductwork systems that will cause us to need to redesign the house or HVAC. That could be a big expense, which may make it cost-prohibitive."

6.3 HVAC CONTRACTOR INTERVIEW SUMMARY

The following conclusions are derived from the HVAC contractor interviews:

- **Participating HVAC contractors to date are generally accepting of the duct testing requirement**. HVAC contractors overall have responded positively to duct testing. Of the contractors who have had installations go through duct testing, about half said that essentially all of their installations passed. The other half is working to change their installation practices in order to conform to the demands of the test. None of the contractors that had failed the duct test complained about the testing procedures or about the duct testers themselves.

- **HVAC contractors have been happy with training received by the program**. The HVAC contractors overall gave favorable reviews regarding the training they received from the program. The training that was more "hands-on" was considered particularly valuable for some HVAC contractors.

- **Tools are needed to help calculate and market energy savings.** Contractors indicated that it would be helpful to have tools that would provide concrete estimates of energy savings from the HVAC system. One contractor had previously used a tool that combined savings information with loan data to show how the equipment would help pay for itself over time. Developing a packet that HVAC contractors could give to builders regarding the different HVAC options was also suggested.

- **Program marketing efforts to consumers need to be increased.** Like other market actors, HVAC contractors also suggested that more marketing be done to consumers.

Contractors provided several creative ideas for this, including ENERGY STAR stickers for vans and some method for distinguishing those contractors that had completed training through the program.

7. MARKET ACTOR INTERVIEWS

7.1 METHODOLOGY AND SAMPLE COMPOSITION

This chapter presents the results of the remaining market actors and includes interviews with the SCOs and QA specialists, realtors and sales reps, electrical distributors, and electrical contractors. The sample for these interviews is shown in Table 17. All of the interviews were done by phone during May-July of 2005 and we attempted to talk to at least some market actors from each state. Additional detail on recruiting is presented along with the interview results for each market actor group.

Table 17. Market Actor interview Sample by State

State	SCO/QA	Realtors	Electrical Contractors	Electrical Distributors
WA	4	4	2	5
OR	1	4	0	1
ID	2	4	2	0
MT	2	0	0	0
Total	**9**	**12**	**4**	**6**

In addition to the market actors listed above, interviews with various utilities in the region were done by KEMA as a joint effort with the Consumer Products Evaluation as part of the Alliance's Residential Sector Initiative. The sample design for the utility interviews focused on utility size as well as geographic coverage of utilities across all states. The final sample for the utility interviews is shown in Table 18.

Table 18. Utility Interview Sample by Size and Region

Region	Large	Medium	Small	Total
WA West	4	6	3	13
OR West	3	9	6	18
OR/WA East	1	7	3	11
Montana	1	1	6	8
Idaho	1	2	5	8
Total	**10**	**25**	**23**	**58**

7.2 STATE CERTIFICATION OFFICE / QA INTERVIEW RESULTS

A portion of the in-depth interviews was devoted to state energy office staff that work on the ENERGY STAR Homes Program. The interviewers were with the QA specialists working for

the SCOs providing the third party certification of the ENERGY STAR Homes.[8] 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 almost all of the QA specialists in the program territory. This included 4 staff in Washington, 1 in Oregon, 2 in Idaho, and 2 in Montana.

QA Process

Most of the QA specialists work with a few active verifiers (typically 3-5), although more verifiers have been trained within each state. For the most part, QA staff report that verifiers understand the benefits of the QA process. In Idaho there were some early conflicts with a few home performance specialists, but these individuals have since left the program and the early problems have been mostly resolved.

The first three homes done by a new verifier are required to go through the QA process to ensure that the verifier is doing the job correctly. In Washington, they have done additional QA visits on homes as means to help train verifiers and the majority of ENERGY STAR Homes have gone through the QA process in that state. After the first three homes, each state has adopted a sampling approach for QA, where 10-15 percent of the homes are randomly sampled for QA visits.

The QA specialist will typically visit a home at the end of construction and then confirm that the ENERGY STAR requirements have been met. This involves verifying that the lights, windows, and appliances meet the ENERGY STAR requirements. In Washington, the QA specialist will also do a duct test as part of the final inspection. In Idaho, they try to coordinate the QA visit with the initial duct test. They also try to have the HVAC contractor there so that they can see problems and get them fixed immediately.

The time it takes for a typical QA visit varies across states. In Washington, where the QA process includes a duct test, an inspection will last 2 or 3 hours. In Oregon where the QA visit may occur at different stages of construction, the inspection can take a few minutes (if just inspecting insulation) to over 2 hours if doing a full review. Once a home has passed the QA and the paperwork has been completed, the ENERGY STAR certificate is issued quickly, usually the same day or else within 48 hours.

Most of the homes to date have passed the QA process. The process is designed so that most problems are caught during the construction process and resolved prior to the final QA inspection. In one instance in Idaho, some requirements were not met and it took a couple of weeks to resolve the problem. In most other cases, it appears that problems are resolved more quickly (within a day or two) so that the construction process is not delayed.

[8] Each state has a different agency serving as the SCO for the program. In Oregon, the SCO is the Department of Energy, in Washington it is the Washington State University Energy Program, in Idaho it is the Department of Water Resources Energy Division, and in Montana it is the National Center for Appropriate Technology.

Coordination

The QA specialists generally do not rely on the program database to coordinate their QA activities. Both Washington and Oregon are developing their own databases to coordinate inspection processes. For most states, the verifiers typically will call the QA specialist to let them know that a house is ready for the final inspection. Generally this coordination has worked well, although in Washington there are some high volume builders where timing gets tight, as they only have 10 days to do the inspection and issue a certificate before the home is occupied. Washington is also working on developing a system where they can get regular feedback (quarterly) from the verifiers.

In Idaho, there have been some staffing shortages, which has resulted in homes having their final inspection after the homeowner has moved in. Currently they are behind and as of July 2005 had a backlog of 28 homes waiting for QA. This has led to conflict between one builder and the SCO, as the builder does not want the home inspected after it has been occupied.

One of the Idaho QA specialists has also been one of the primary technical contacts for builders who have questions about specific program requirements prior to participation. Using this QA specialist as a technical resource has helped these particular builders, but relying on one person for this is slowing down both participation and the QA process as meetings with builders take time away from QA inspections. The staffing issue will continue to be an issue in Idaho as the ENERGY STAR homes goal for that state was recently increased to 500 for 2005 without a corresponding increase in funding for additional QA staff.

The majority of verifiers and builders seem to understand the benefits of the QA process, according to the QA specialists. As one builder in Oregon tells his QA person "Go find something wrong," since this is a means for him to determine if their contractors are actually meeting the program requirements. The degree to which both verifiers and builders accept the QA process depends on their level of training, however. For some builders in Washington, the QA process is still viewed as an administrative hassle. Other builders in Washington were surprised by the QA inspection since they thought this was already covered during the verification process. With larger builders, sometimes the builder understands the coordination issues but the site supervisor has been left out of the loop and is not as informed about the ENERGY STAR Homes inspection processes.

The QA specialists have had some interactions with the utilities, particularly since some of the verifiers are also utility staff. One QA specialist pointed out that the utilities should be involved more so that they can leverage utility staff. There has been some reluctance by utilities to become more involved in the program, however, particularly with some electric utilities that believe that the program places too much emphasis on gas heating.

There is a sense with the SCOs (particularly Idaho and Washington) that their input and experience with earlier new construction programs was not adequately considered when the ENERGY STAR Homes program was designed. An example of this was the development of the Builders Field Guide in Washington. Washington already had one to address code issues and didn't feel that their input on Washington code and other issues was heard initially when the program's Builder Field Guide was put together. Similarly, states did not feel a part of the initial

process in designing the program and wished that they had been involved in the original negotiations with EPA on the ENERGY STAR code for the Northwest.

This feeling also carried through to the implementation contractors, where it was felt that the program was presented to them with a "take it or leave it" attitude without seeking input from the states or incorporating the experience and infrastructure available from previous programs done within the state. As one QA specialist said, requests to CSG were treated more like suggestions and it was not clear if they were ever incorporated. There was also some initial confusion at times as to what the appropriate communication channels were with CSG and PECI for particular issues.

For all of the coordination issues, the QA specialists we spoke with indicated that the problems they encountered were primarily at the start of the program and that for the most part things have improved since then. They also said that the Alliance has been doing a good job overseeing the program and they recognize that the Alliance needs to balance multiple competing interests. The Alliance was also perceived as being accessible and willing to listen to issues by other agencies involved with the program.

Training

The level of training of verifiers varied by state due to the existence of other new construction programs. In Washington, where there have not been any similar programs, the QA staff indicated that they were required to spend more time than originally anticipated with verifiers in order to get them trained. In Idaho and Oregon, where verifiers have been doing similar work in other programs, less training was needed. In Idaho, this involved staff that was involved with the earlier version of the ENERGY STAR program in that state. In Oregon, verifiers are coordinated with Earth Advantage and the Energy Trust of Oregon, while some areas rely on the utilities to do the inspections.

According to the QA specialists, the biggest challenges for builders are the duct requirements. This includes following the prescriptive duct requirements such as duct insulation and using mastic on all the joints. One QA specialist indicated that builders need to understand early in the process that unless they are truly a "top notch" builder or are very current on energy efficiency practices and sealing, they will need to put in some effort to meet the duct requirements and that building to code is simply not enough to pass.

Lighting was also mentioned as an issue, as there is still reluctance to install CFLs among some builders that construct higher end homes. Determining the number of sockets can also be an issue. One QA specialist gave the example of a dining room chandelier, which could be counted as either seven or three sockets depending on the fixture used. The same QA specialist indicated that until quality CFL fixtures are readily available at places like Home Depot, the fixtures are not yet "ready for primetime."

For verifiers, the biggest challenge ahead will likely be the volume of homes. As one QA specialist in Washington pointed out, the current number of verifiers can handle this volume if they were able to work full time. However, many of the current verifiers are full-time utility staff with other responsibilities and therefore will not be able to work full time as verifiers. This

may also lead to the utility verifiers giving those homes with electric heat a higher priority over gas heat for verifications, which is only a fraction of the homes being built through the program.

Outreach and Marketing

The QA specialists emphasized the need for marketing the program better to both builders and homeowners. In Washington, the QA staff emphasized that the program needs to be marketed to builders more effectively in the field. While the BOSs in the state (particularly in the Puget Sound region) are doing a good job, there is concern that their message emphasizes the technical requirements of the program too much and that more focus should be placed on marketing the benefits to the builder and less on the building science.

A different QA specialist in Washington emphasized that builders need to be better informed about the technical requirements of the program, as some are surprised when they do not make it through the verification process. The need for builders to be better informed early on about program requirements was also mentioned in Idaho. As one Idaho QA specialist reported, for builders and contractors new to the program, the requirements can be confusing and if the only training they receive is the packet from NEEA, the homes "are sure to fail" the verification process. In response to this, Idaho will begin requiring that all HVAC contractors receive training prior to being involved in the ENERGY STAR Homes program.

Finally, increased marketing to homeowners is also needed in order to increase demand. As one QA specialist said, "It's real simple, they can build these homes but won't do it unless they can make money."

7.3 Realtor / Sales Representatives Interview Results

This section summarizes the results of interviews conducted with real estate agents and sales representatives selling ENERGY STAR Homes. ECONorthwest interviewed 12 realtors – four from Idaho, four from Oregon, and four from Washington – who have been involved in promoting or selling ENERGY STAR homes. These realtors either work directly as sales reps for companies that build ENERGY STAR Homes or else work for an independent real estate agency and have an arrangement with a participating builder to sell ENERGY STAR homes. We targeted for interviews sales reps for those builders that have been the most active in selling ENERGY STAR homes to date as the agents for these builders would have the most experience in selling these homes. Most of the realtors we interviewed were referred to us by builders during the builder interviews. All interviews were conducted in June of 2005.

While all of the agents interviewed were aware of the ENERGY STAR Homes program, their experience with actually selling ENERGY STAR homes was variable. Six of the 12 either had not yet sold a certified home, or were uncertain whether they had or not. Most of the remaining realtors sold between 10 and 30 ENERGY STAR homes.

Almost all of the realtors reported that they sell at least some production homes and about half only sell production homes. Several realtors classified the homes they sell as "semi-custom" meaning that homebuyers may choose among a variety of existing floor plans and features when purchasing their home.

Awareness of ENERGY STAR Benefits

Realtors were asked about their knowledge of the ENERGY STAR Home requirements. Out of the 12 realtors we talked to, 4 said they did not know what the ENERGY STAR Home requirements were. Of the remaining realtors, 7 mentioned energy efficient windows, 6 mentioned insulation, and 4 said energy efficient appliances. Only 2 realtors mentioned duct sealing and lighting as being program requirements. Energy efficient HVAC systems were mentioned by only 2 realtors as a program requirement.

Realtors were also asked a series of questions regarding energy efficiency and the benefits of an ENERGY STAR home. When asked about which home components are most important for reducing energy consumption, the most common response was windows, which was mentioned by 8 of 10 realtors. Wall insulation was also commonly cited (7 out of 10 realtors mentioning), as were furnaces and heat pumps (6 out of 10 realtors mentioning). Roof insulation and appliances were also mentioned as important by half of the realtors we talked to. Note that ducts – a key element of the ENERGY STAR Homes Program – were only mentioned by 4 of 10 realtors as having a big impact on energy consumption. Lighting – another key program component – was not mentioned by any of the realtors we interviewed.

During the interviews, realtors were asked about the primary benefits to homeowners from the various ENERGY STAR Home components such as lighting, appliances, heating and cooling, and duct testing. For each of these components, realtors overwhelmingly said that the primary benefit was cost savings to the homeowner. With duct testing and sealing, realtors did mention the additional benefits of improved air quality, comfort, and the assurance that the duct insulation was done correctly through third party verification. For windows, several agents said that energy efficient windows help reduce fading of furniture and carpet.

Realtors were also asked about the primary ENERGY STAR benefits they emphasize when selling an ENERGY STAR home. All respondents said that they emphasize the overall cost savings advantages of an ENERGY STAR home to their customers. Most realtors also said that they specifically market the ENERGY STAR label to prospective homebuyers. Other benefits that were listed include sealed ducts, lighting, high efficiency furnace, and overall construction quality, each of which were mentioned once. As discussed above, realtors did perceive some additional benefits such as improved air quality and comfort from the individual home components. These benefits do not appear to receive much emphasis when marketing these homes, however.

Slightly different responses were given when questioned about which home features are most marketable to homebuyers. Realtors said that insulation levels and appliances were the most marketable features, as the latter are the most immediately visible to a prospective homebuyer. High efficiency heating was also mentioned by two respondents and lighting was mentioned once. About half of the realtors said they did not market individual features but rather focused on the overall cost savings to the customer.

Marketing

For realtors, the primary benefit of the program is that ENERGY STAR label provides a means to differentiate homes in a competitive market. Several realtors mentioned that, given the rising

costs of energy, the potential cost saving associated with purchase of an ENERGY STAR home was an important selling point. One realtor said that, though it is an infrequent occurrence, the visibility of the ENERGY STAR program has led at least two or three potential buyers to specifically request an ENERGY STAR home. One realtor responded that there are no benefits to the realtor of selling ENERGY STAR certified homes.

Almost all of the realtors said that there were no disadvantages to selling an ENERGY STAR home, although one respondent said that the increased cost of the homes has discouraged some buyers. All said that the advantages of the program outweigh its disadvantages in terms of selling these homes.

Most of the realtors we interviewed believed that an ENERGY STAR home could command a premium price in the market. When asked how much more a $200,000 home could sell for if it were ENERGY STAR certified, one realtor said that it would add $20,000 to the sale price while two others said the price would increase $10,000 to $15,000. Others believed that the premium would be more modest with four realtors saying a $200,000 ENERGY STAR home would sell for an additional $3,000 to $7,500.

Summary

When asked about how the program could be improved, realtors emphasized the need for outreach and advertising to the general public to increase awareness of the potential cost savings associated with purchasing an ENERGY STAR homes. Television advertising on ENERGY STAR home benefits was recommended as being most effective. Creating brochures or other marketing materials for realtors to help explain energy savings over time was also suggested. Most of the realtors expressed interest in attending training on selling ENERGY STAR homes if it were offered.

Following are some statements from the agents that illustrate the range of their collective enthusiasm for the ENERGY STAR program and some thoughts about improving it. While many opinions were expressed, overall, the agents were enthusiastic about selling ENERGY STAR homes.

- I'm proud to sell the ENERGY STAR product, because I would buy it myself.
- I work with builders of ENERGY STAR because they are better builders. Their product is better, and is easier to sell.
- Some builders are reluctant to join the program, because they believe it will increase their construction costs without correspondingly increasing sales costs. Outreach to builders is important.
- Increasing awareness of the program among the general public will be critical to its success. People have to know what they are buying; they are very brand-conscious.
- There is no benefit to the realtor of selling ENERGY STAR homes. They are more expensive, and in a competitive market, people will chose the lowest price.
- In a competitive market, anything that can differentiate one home from another will increase its salability.

7.4 ELECTRICAL CONTRACTOR / LIGHTING DISTRIBUTOR INTERVIEW RESULTS

Sample Methods

During the builder interviews, we asked participating builders to provide contact information for the electrical contractors used in their ENERGY STAR homes. This list of contacts was used to recruit electrical contractors for interviews, as we wanted to focus on only those contractors that had at least some experience with builders participating in the program. From our list of contacts, four contractors were interviewed about their experience with the ENERGY STAR Homes program. Two of the contractors were from Washington and two were from Idaho.

In addition to electrical contractors, we also interviewed 6 lighting distributors within the region to collect information on supply and performance issues relating to ENERGY STAR lamps and fixtures. The lighting distributors were identified from a list purchased from Dunn and Bradstreet of SIC codes that matched electrical distributors in the four-state area. We also talked to staff at Ecos Consulting to make sure that we targeted the most important lighting distributors for these interviews. A total of 5 distributors in Washington (1 in Eastern Washington) and 1 distributor in Oregon were interviewed for this task. As a portion of their residential sales, all six distributors said that ENERGY STAR lighting made up less than 20 percent of their sales, with three of the six distributors saying that ENERGY STAR lighting comprised 5 percent or less of their total sales.

Program Experience/Awareness

Despite the recruiting method described above, the electrical contractors we talked to were generally unfamiliar with the ENERGY STAR Homes program even though they have been working for a builder participating in the program. All of the contractors we talked with were familiar with CFLs, however. One contractor was aware of a program sponsored by Tacoma Power that emphasizes using CFLs in high use areas within the home.

The influence over the type of lighting installed in a new home varied across the contractors we talked to. Some electrical contractors had very little influence in the type of lighting that is installed, which helps explain the generally low awareness levels for the program. In fact, one contractor installed lighting for an ENERGY STAR Home without being made aware of the program. For these homes, the contractor brought the wiring to the location and provided the junction box to match whatever type of lighting was chosen by the builder. The same contractor believed most electrical contractors worked in a similar fashion. In contrast, a different contractor said that they had a significant influence in some projects. In about half of the homes they worked on, this contractor indicated that he was the one that chose which lighting and fixtures to install.

All the distributors interviewed were familiar with ENERGY STAR lighting products. About half of the distributors were aware of the ENERGY STAR Homes program, usually because a builder approached them about supplying lighting for an ENERGY STAR home. Only one of the distributors knew the specific lighting requirements of the program. Another distributor said that they had gone through a training class sponsored by the program and although they said that the training went well, this particular distributor did not know the specific lighting requirements for the ENERGY STAR Homes program.

Lighting Performance and Supply Issues

The electrical contractors we talked with had several issues regarding performance and availability of ENERGY STAR lighting. One contractor mentioned that they had difficulty finding chandeliers and bathroom fixtures. Another said they had issues with using the CFL lamps in regular fixtures as the bulbs tended to stick out too far. One contractor also said that they had difficulties finding groups of fixtures or enough CFL fixtures with the same finish that they could use throughout the house.

Another issue contractors had related to the changing styles and brands of CFLs and CFL fixtures. Many products are only around for a short time and do not provide a dependable supply. One contractor complained that the entire stock changes every few months and that many of the lighting companies seem to go out of business. This contractor was stuck paying a $15,000 lighting order because the company had gone out of businesses. They also said that they sometimes have difficulties finding suppliers that could meet large lighting orders, although if they needed only a few bulbs then the distributor usually had supply in stock.

Distributors also had some issues regarding ENERGY STAR lighting available in the market. The distributors' primary concern for meeting the ENERGY STAR Homes lighting requirements (after they were made aware of them during the interview) was the lack of decorative fixtures. The lack of dimmable fixtures was also mentioned by several distributors as an issue that still needed to be addressed by the lighting market. One distributor stated that incandescents simply provide better quality light than CFLs.

Marketing

When asked about how the program should promote ENERGY STAR lighting or help make it easier to fulfill the lighting requirement in an ENERGY STAR home, one contractor mentioned that they ENERGY STAR lighting should be displayed in the lighting showrooms. Two contractors also suggested providing a simple breakdown showing the costs and savings achievable with the ENERGY STAR lighting option. One contractor mentioned that they should focus on the places that are the easiest to sell to the consumer such as the laundry room, garage, and outdoor applications.

Five of the six distributors said they try to promote the ENERGY STAR lighting in at least some applications. However, opinions were mixed among distributors as to which applications were best. One said outdoor applications were a good opportunity to up-sell to ENERGY STAR lighting while another said there were not enough types of outdoor lighting to do this easily. One distributor said that they tried to push fixtures as opposed to screw-ins. One distributor also stressed outreach to contractors and said that they "need to have a presence at the contractor level. Contractors appreciate one-on-one sales calls and in-person visits."

Overall, distributors and contractors did not have strong opinions specifically regarding the ENERGY STAR Homes program. However, one distributor felt that the residential market was far behind the commercial market in efficiency. This distributor said that building codes needed to be pushed further if they want anything to change: "Utilities need to tout and express to the public to bring energy usage down. People continue to enjoy incandescent. Code is the only way to get it done."

7.5 UTILITY INTERVIEW RESULTS

A survey of 58 utility program managers regarding the Alliance's Residential Sector Initiative was conducted by KEMA, the ENERGY STAR Consumer Products program evaluator. These interviews were completed in May and June of 2005. While these interviews covered both the ENERGY STAR Consumer Products and ENERGY STAR Homes programs, only the findings relating to the ENERGY STAR Homes program are presented here.

Coordination

In general, the utilities interviewed seemed to appreciate that the Alliance has a challenging job in coordinating the ENERGY STAR Homes program across a wide and diverse territory. Utility response to the program has been mixed and appears to be driven by the perceived demand for the program within each service territory. For example, smaller utilities and those serving more rural areas have less building activity and therefore do not see a need for the program. Interestingly, some utilities in regions where there is a high amount of building activity indicated that builders are simply too busy to concern themselves with the program. Other utilities have been receptive to the program and were satisfied by the support they had received.

The program website www.northwestenergystar.com received favorable reviews from the utilities and several mentioned that it was a good way to communicate program information and updates. Utilities also had the following suggestions on how the website could be improved to help the program.

- In the Super Good Cents program, we had a "how-to" guidebook for builders. It would be great if we could get something like that together for the ENERGY STAR New Homes program. It would be good if there were chapters on duct sealing and testing and certification. Those sections as well as the lighting piece are the newer issues and builders need a lot of guidance on those. We should be sure to address the issues of recessed lighting and the dimmability of CFLs in the manual.

- It would be very nice if there were a comparison to a baseline (by state since codes differ). It would be good to show how the energy savings differed between a standard home and an ENERGY STAR home. We would use this to help educate customers and builders. Perhaps the savings benchmarks could be provided for a few different home sizes (say 1,500 and a 2,500 square foot home). That would help make it easier for customers to see the issues.

- It would be nice to have a different download function to get various sections of documents at a time. It would be good to be able to download either the whole document or the pertinent pieces of it (i.e. the ENERGY STAR homes specification guide).

Several utilities said that while the Alliance was good at collecting feedback on the program, they did not always act on the comments received. This seemed to be particularly an issue with suggestions for changing the BOPs to make them more flexible. Several utilities were very concerned that the current BOPs place too much emphasis on gas measures, which do not benefit electric utilities. There is also the concern that the program requirements are not much better than code in some areas.

Outreach and Marketing

Utilities generally seemed to be satisfied with their interactions with the utility coordinators and BOSs. In some instances, however, utilities have said that the BOSs are stretched too thin and are not able to spend as much time with them as they would like.

Along these lines, the most common issue with all the utilities is the need for more support and outreach for builders and contractors. One large utility mentioned that the focus seems to be too much on signing up builders for the program and not enough emphasis on providing the resources they need once they are in and trying to build houses to the ENERGY STAR specifications. More program staff is needed to provide sustained support to builders and contractors throughout the construction process. As one builder stated, "…the challenge is that real market transformation takes a long time so the efforts cannot be one-time events that have no follow-up or they will not be effective."

Some utilities suggested that the program should consider focusing on the top 50 builders, as the smaller number of builders would allow the program to provide more support throughout the construction process. Several utilities also suggested that having the BOSs help with builder breakfasts would be an effective way to reach builders. Utilities emphasized the need for a sustained approach and contact with builders.

Along with builder outreach is the issue of training builders and contractors. Many of the utilities emphasized the need for more training for builders and access to information on the technical aspects of the program. The need for more 'hands-on' training that showed how duct tests are done in the field was suggested by one utility as a means to help builders and contractors understand the program. The need to have both lighting and HVAC contractors better trained on the program requirements was also mentioned by several utilities.

Utilities suggested that better information on the potential savings would help builders market the program better. The current emphasis on building homes "20 percent better than code" does not mean much to most customers, according to one large utility. It would be more useful to have detailed informational materials that show how much customers actually spend on energy and what their savings might be. Heating contractors need similar savings information so that they can sell the builders and help promote the program.

Several utilities mentioned that the lighting requirement was a serious drawback for the program. Working on the builder supply side chain to create lighting packages that are acceptable to the builders and customers was suggested as one way to address builder concerns about the lighting requirement. Utilities also suggested that builders need to be trained on how to better market the lighting to consumers. According to one utility, if a customer is told that a lamp is fluorescent, they will resist it due to the negative perceptions of fluorescent lighting. If the lights are first described as energy efficient and are accompanied with savings values, then it is much easier to make the sale. This utility felt that a lot of work is needed to address the lighting marketing issue.

Finally, utilities suggested that more outreach to the consumers was needed to help build demand for the program. One medium-sized utility suggested having ads that were supported by the

Alliance that focused on a few target markets. Getting articles in local papers was suggested by another medium-sized utility as an effective way to build demand for the program.

7.6 Market Actor Interview Summary

The following are the key findings from our interviews with other market actors, including QA specialists, utilities, electrical contractors, realtors, and sales representatives.

- **QA specialists are spending more time on training verifiers than originally anticipated.** The QA specialists are spending more time than expected to train verifiers new to the program. In Idaho, the extra time has also been spent with builders to recruit them to the program, and the lack of more QA staff has created a backlog in the final QA process for homes and is resulting in homes having their final inspection after they are occupied.

- **More estimates of savings needed to market ENERGY STAR Homes.** Both utilities and realtors suggested that having more information on the energy savings associated with ENERGY STAR requirements would be an effective way to promote these homes. Utilities suggested that information on energy savings relative to a baseline home be provided on the program website.

- **Lighting requirement perceived as a significant barrier to the program.** The utilities stressed that the 50 percent CFL lighting requirement was a major barrier to program participation. Electrical contractors and distributors also had issues with ENERGY STAR lighting in general, particularly regarding the availability of decorative fixtures or matched fixtures that could be installed throughout the house. Electrical contractors also mentioned that brands and styles of CFL lamps and fixtures were constantly changing, making it difficult to maintain a reliable supply.

- **More training for builders and contractors needed.** Utilities said that more training of builders was needed, an issue that was also demonstrated by the QA specialists and the time they have been spending with builders and verifiers new to the program. Training was also suggested for HVAC and electrical contractors so that they are able to comply with the program requirements.

- **Marketing of ENERGY STAR Homes to consumers needs to be increased.** The QA specialists, utilities, and realtors stressed the need to increase awareness and demand of the ENERGY STAR homes among consumers. Realtors also indicated that an ENERGY STAR home could command a price premium, with estimates ranging from about a 5 to 10 percent price increase for a $200,000 home.

- **Realtors and sales reps should be better informed of the ENERGY STAR home specifications and benefits.** Realtors and sales reps generally understood that ENERGY STAR homes will save consumers money and they promote this fact to their customers. In terms of understanding and promoting specific ENERGY STAR benefits, however, the sellers were less knowledgeable. Currently the realtors and sales reps tend to emphasize the more visible aspects of an ENERGY STAR home, which includes appliances and

windows. Realtors also stressed insulation levels when promoting a home's energy saving benefits. Sellers of ENERGY STAR homes should be better informed as to which components drive the savings (primarily heating/cooling and lighting). Other benefits such as improved air quality and comfort, duct testing, and third party certification will likely resonate with homebuyers if promoted by realtors. Better education in this area will be critical for increasing demand for these homes, a need stressed by all of the respondents we interviewed in this evaluation. Realtors indicated that they would be interested in training on how to better sell an ENERGY STAR home.

8. COST EFFECTIVENESS MODEL REVIEW

As part of this evaluation, we reviewed cost effectiveness modeling procedures that were completed by the Alliance for the ENERGY STAR Homes program. This involved meeting with the staff involved in the modeling, reviewing the spreadsheet models, and reviewing the individual parameter assumptions used in the model.

Table 19 shows the key parameters used in the cost effectiveness modeling for this program. For each parameter, the current value used by the Alliance is shown along with its source. Where appropriate we have made recommendations on revising these assumptions. Each of these assumptions is discussed in more detail below.

Table 19. Summary of Cost Effectiveness Modeling Issues

Key Assumption	Current Value	Source	Recommendations
Incremental cost	$1,342.68	Alliance estimates, RTF values	Add replacement of windows after 60 years.
Energy savings (kWh/year)	1.930.7 kWh	Ecotope, Inc.	Update with new model runs based on ENERGY STAR homes and current building codes. Update other parameters as new information becomes available from upcoming residential new construction audits and the post-occupancy survey.
Market growth	3.85%	NPPC Power Plan	No changes recommended.
Baseline activities	0	Alliance estimate	Use 5 percent baseline assumption until more detailed estimate can be obtained.
Market saturation	75 % by 2015 98% by 2025	Alliance estimate	Modify based on program goals and current progress.
Non-energy benefits ($)	$228.42/year	Alliance estimate	Re-name as “non-electric benefits”.

Energy Savings

The energy savings estimates for an ENERGY STAR home are driven primarily by HVAC upgrades and lighting. For lighting, the CFL savings are estimated by comparing 70 Watt incandescent bulbs to 20 Watt CFLs and are assumed to have a measure life of 6,000 hours (the ENERGY STAR minimum) and are estimated to be operating just over 2 hours a day. The Alliance estimates that on average, site-built homes have 36 sockets and that the 50 percent of those that are filled with ENERGY STAR lamps are on for a total of 49 hours/day. The Alliance

estimates that in the long run, 85 percent of CFLs will be replaced by CFLs (rather than incandescents) in the ENERGY STAR homes.

The HVAC savings assumptions are based on estimates by Ecotope using the SUNCODE model. From our conversations with Alliance staff, it appears that these model runs were done in 2002 and 2003 and may not have completely reflected the current ENERGY STAR Home requirements. It is also unclear what baseline assumptions were used in these estimates or if the most recent changes to building codes have been incorporated in the savings numbers. We recommend that new model runs be done using model specifications that address specifically the current ENERGY STAR Home requirements. These new savings estimates should also take into account the current building codes within each state.

The HVAC savings numbers also assume a distribution of heating types based on Ecotope estimates on residential new construction practices.[9] These numbers are shown below in Table 20. The overall savings values are derived based on this distribution of heating types and as shown below, the total savings will vary substantially based on the type of heating. Heat pumps have the highest savings and are assumed to be included in 9.5 percent of new ENERGY STAR homes. The majority of new ENERGY STAR homes are assumed to have gas heat, with 35.9 percent having gas with air conditioning and 49.8 percent having gas with no air conditioning.

The distribution of heating types across current participation (178 certified ENERGY STAR homes as of June 2005) is also shown in Table 20. Heating systems within ENERGY STAR Homes is generally consistent with the assumptions used in the cost effectiveness modeling, although the current sample of homes is relatively small this early in the program. We will continue to track this issue as participation increases and will recommend changes to this assumption if the need becomes evident based on future participation trends.

Table 20. Distribution of Heating Types and Savings

	Heat Pump	Zonal	Gas + AC	Gas (No AC)
Assumed Market Share	9.5%	4.8%	35.9%	49.8%
Current Program Share (n=178)	9%	1%	48%	42%
Savings (Annual)	6,702 kWh	3,766 kWh	1,558 kWh	980 kWh

The Alliance is currently working on several studies that will provide updated information for some of these savings components. Research is currently underway to identify the building, appliance, and lighting characteristics of 400 new homes throughout the region, and these new data should be used to update the assumptions on the number of sockets and the distribution of heating types across homes. In addition, this evaluation will be conducting a post-occupancy survey of those that recently purchased an ENERGY STAR home. Survey information will

[9] *Baseline Characteristics of the Residential Sector*, prepared by Ecotope, Inc. for the Alliance (report #01-095) in December 2001.

provide new data on CFL retention rates. We recommend that these new data be used for the cost-effectiveness modeling for this program as soon as they become available.

Incremental Cost

The incremental costs of heat pumps and gas furnace upgrades are Alliance estimates based on utility rebate programs. The incremental cost of performance testing for zonal homes reflects the Alliance's estimate of the costs of an air tightness package and heat recovery ventilator (HRV). The incremental cost of insulation/windows is primarily an estimate of the incremental cost of Class 35 windows compared to Class 40 windows, except for the zonal package, where the incremental cost is the cost of Class 30 windows compared to Class 40 windows. We do not recommend any changes to these values at this time.

The replacement cost for each component is included in the cost effectiveness calculations and is based on the number of times each component will be replaced over the 70-year life of the home. In our review of the replacement assumptions, we found that no replacements for windows were assumed even though they have an expected life of 60 years. We recommend that the costs of one complete window replacement be included in the cost effectiveness calculations. Since the incremental costs are low for windows and the replacement occurs near the end of the project life, this change will have little impact on the overall cost effectiveness calculation for this program

Market Growth

The Alliance's estimate of 3.85 percent annual market growth is based off the Northwest Power and Conservation Council's Power Plan estimate of future new home construction for the region. The assumed rate is less than the 5.8 percent average annual growth in new construction observed for the region over the last 5 years and the 5.0 percent average over the last 20 years. Since the current value is conservative relative to the historical rates and to maintain consistency with the Power Plan, we are not recommending any changes to the market growth rate used in the cost effectiveness modeling.

Baseline Activities

For this program, the baseline is determined by what is occurring in the market at the time the program was started. Since there were no new homes being built that officially met the ENERGY STAR Homes Northwest requirements, baseline activities were zero. The assumption of a zero baseline is maintained for all future years.

We recommend that the baseline activities be changed to reflect the fact that at least some ENERGY STAR-qualifying homes would be built in absence of the Alliance program. For example, Idaho had been implementing an ENERGY STAR homes program (with slightly different requirements) and Portland General Electric's Earth Advantage program is also resulting in new homes that would likely meet the current ENERGY STAR Homes Northwest standard. By way of comparison, the long-term market share goal of the Earth Advantage program is 15 percent of new homes in Oregon. The current emphasis on green buildings in the region will also create at least some homes that would meet the ENERGY STAR standard.

For comparison, Southern California Edison assumes a net-to-gross ratio of 0.80, which implies a free-ridership rate of *at least 20 percent* (equal to 20 percent if no spillover) in that region. While it appears that the ENERGY STAR requirements may be less stringent in California (which would result in a higher baseline), we recommend that some baseline activity be assumed for the cost effectiveness modeling. Until more detailed estimates can be obtained, we recommend that a baseline of 5 percent be assumed. This is significantly lower than the value used in California but takes into account the more stringent nature of the ENERGY STAR Homes requirements.

Market Saturation

The current model assumes that about 75 percent of all new homes will be ENERGY STAR by 2015 and that about 100 percent of all new homes by 2025. Conversations with the Alliance indicate that this saturation rate anticipates future changes in building codes that will incorporate the primary ENERGY STAR home requirements (lighting, duct sealing, high efficiency heating and cooling) by 2015. Along these lines, Oregon's governor recently mandated changes in the building code that will improve energy efficiency by 15 percent over current levels. While we understand that the Alliance is actively working with states to change building codes in the region, the program should probably not assume full credit for future code changes in its cost effectiveness modeling.

Even with the possible changes in building codes, we believe that the saturation estimates credited to the program are too high and recommend that they be revised downward to a level that reflects both the current progress of the program and the long term goal of the program of a 20 percent market share by 2009. (For comparison, the Earth Advantage program has a 15 percent market share in Oregon as its long term goal.) As the program matures and the trend in ENERGY STAR homes is more evident, than the market saturation numbers can be adjusted further based on observed participation levels and estimated program growth.

Non-Energy Benefits

The non-energy benefits consist primarily of gas savings benefits that result from the ENERGY STAR home specification. These should be considered as energy benefits and the non-energy benefit category should be reserved for ancillary benefits such as water and sewer savings that result from the high efficiency dishwashing and clothes washing options. While a general category of non-energy benefits is mentioned in the model, it appears that the final calculations rely almost entirely on the gas savings values. We recommend that the true non-energy benefits be separated out from the gas savings benefits that the latter be re-categorized as "non-electric benefits" for clarification.

9. EVALUATION CONCLUSIONS AND RECOMMENDATIONS

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

- **The program is on track to meet its overall builder participation goals for both large- and small-volume builders.** At the state level, the program has exceeded its 2005 large-volume builder goal for Oregon. In Idaho, the program has more than doubled its small-builder goal, but has not yet recruited its target of 2 new large-volume builders.

- **The program is on track to meet its overall goal for performance tester recruitment.** At the state level, it has significantly exceeded its recruitment goal in Oregon, but would need to recruit more performance testers in Washington and Idaho to meet its original goals for those states. The program has likewise not yet reached its original 2005 recruitment goal for verifiers in Washington and Idaho. However, the program will likely adjust its 2005 market-specific goals for performance testers and verifiers to better reflect current builder activity in certain Washington and Idaho markets.

- **Participating builders are generally very satisfied with the program.** They know that ENERGY STAR is a widely recognized and respected brand, and they speak highly both of the program's goals and of the individuals associated with the program, including the BOSs as well as verifiers and testers. Those builders who have gone through the whole process of building and certifying an ENERGY STAR home report that both the testing and verification went smoothly, and did not significantly delay the construction process. Builders appear to value duct testing as a means of confirming that the subcontractors are doing the job properly, although some builders question the benefit of testing every home once the contractor learns how to do the installations correctly.

  It should be noted that the in-depth builder interviews focused on those participants that have experience certifying ENERGY STAR homes through the program. These builders were early participants in the program and therefore are more likely to be predisposed to the building practices promoted by the program. Many of these builders also had previously participated in other new construction programs such as Earth Advantage. While the interview results presented in this report are encouraging, future participating builders might be more resistant to some of the program requirements and may require additional training. The following conclusions and recommendations should be considered with this in mind.

- **Most builders have limited experience building ENERGY STAR Homes to date.** Builders are still fairly new to the program and are still learning the processes and practices involved in the program. As discussed above, many of the builders interviewed have previous experience with other new construction efficiency programs such as GemStar, Super Good Cents, and Earth Advantage, and this seems to have made them more receptive to the ENERGY STAR Homes program. In part because they are new to the program, some builders are aware that their subcontractors need time to become familiar with duct sealing and other program requirements.

- **It is unlikely that the 2005 goal for certified ENERGY STAR homes will be met, but it is too early to assess the likelihood of achieving the program's long-term goal.** The program goal for 2005 is 2,000 certified ENERGY STAR homes. At the end of July, the program forecast that 1,775 homes would be certified by year-end, which amounts to a market share of about 2 percent assuming 2004 new home construction activity. However, as of July 2005 only 226 homes have been certified, with another 536 initiated. If all of the 536 homes that have been initiated are certified by year-end, it would require that an additional 1,013 homes be initiated and completed by year-end to realize the 1,775 forecast. While the number of new certified homes has been increasing, the maximum number of new certified homes within a single month to date was 61 (June 2005). Without a very large increase in the number of homes initiated, completed, and then certified within the next five months, it seems unlikely that the program will be able to certify an additional 1,775 homes by year-end.

  The outlook for 2006 is better as participating builders become more experienced with the program and expect to build more ENERGY STAR homes. At the end of July there were 2,988 ENERGY STAR homes forecasted for completion in 2006 from current participating builders, which is about a 50 percent increase over the number currently forecasted for 2005 and amounts to about a 4 percent market share. This total should increase as more builders are added to the program next year.

  The long-term goal of the program is a market share of 20 percent for ENERGY STAR homes by the end of 2009. Assuming that 2004 new construction levels increase at the Alliance's assumed rate of 3.8 percent annually, achieving this goal will require that over 18,000 homes be ENERGY STAR certified in 2009. While the expected growth in ENERGY STAR homes for 2006 is encouraging, the program is still too early in its implementation phase for us to assess the likelihood of reaching the 20 percent market share goal by 2009. Future evaluation research will continue to track progress in this area.

  One of the primary reasons for the shortfall in homes for 2005 is the longer than expected time from new builder recruitment to new ENERGY STAR home construction. Based on the in-depth interview results, it is taking longer than expected for participating builders to begin construction on ENERGY STAR homes; many of the builders we interviewed had yet to finish an ENERGY STAR home even though the program had been operating for over a year. Contributing factors to slower than anticipated throughput include a strong sellers' market in which homes are selling faster than they are built, and the fact that several large builders sign on for new subdivisions that take time to initiate. There has also been a need for the program (BOSs, verifiers, QA specialists) to spend additional time with builders to help them understand and comply with the program requirements, which is also likely contributing to the slower rates of ENERGY STAR home production.

  As discussed above, these needs may become more significant for some period of time as the program adds new builders. Future participating builders will likely have less experience with the building practices required for ENERGY STAR certification than those interviewed for this evaluation. These builders will likely need more technical assistance from the program and may require more time between program enrollment and ENERGY STAR home construction.

- **Barriers to participation generally relate to the lack of consumer demand for ENERGY STAR Homes.** A common response among nonparticipating builders was that a lack of consumer demand for ENERGY STAR homes kept them from participating in the program. Other nonparticipating builders cited the extra cost of these homes, which implies that they do not believe consumer demand is high enough to command a higher price. Despite these concerns, a third of the nonparticipating builders were considering participating in the program and another 5 of the 20 builders said that they would consider participating in the program if demand for these homes increased.

- **Duct testing and the lighting requirement are also considered barriers to participation.** In addition to demand issues, nonparticipating builders identified duct testing and the lighting requirement as the most challenging requirements of the program. The utilities stressed that the lighting requirement was a major barrier to program participation. When asked generally about ENERGY STAR lighting issues, electrical contractors and distributors mentioned the availability of decorative fixtures or matched fixtures that could be installed throughout the house. Electrical contractors also mentioned that brands and styles of CFL lamps and fixtures were constantly changing, making it difficult to maintain a reliable supply.

- **Coordination with builders is critical for successful verification**. While verifiers say that they are able to conduct their visits without disrupting the builder's schedule, they emphasize that frequent communication is required to make this process flow smoothly. Most verifiers say they regularly find some items that fail, but that many of those are small defects that can be rectified on the spot. Several verifiers also said that their goal is to help the builder meet the program requirements by anticipating and correcting potential problems before they happen.

  A big concern of verifiers and builders is that the QA specialists sometimes conduct the final inspections after the homeowner has occupied the home, which occurred a few times in Idaho and Washington. Verifiers felt that this was an inconvenience to homebuyers and creates resentment among the builders. This has the potential to become an even bigger problem as the volume of ENERGY STAR homes increases. As with the coordination between the builder and verifiers during the construction process, better coordination to ensure that the final inspection is done prior to occupancy is critical for the long-term success of the program.

- **Participating HVAC contractors are generally accepting toward duct testing**. HVAC contractors overall have responded positively to duct testing. About half of the contractors said that almost all of their installations had passed the tests. The others are working to change their installation practices in order to conform to the demands of the test. None of the contractors that had failed the duct test complained about the testing procedures of the duct testers themselves. The performance testers confirmed these findings, saying that HVAC contractors new to the program generally fail their first few duct tests but then tend to improve rapidly in subsequent tests.

- **More time needed for providing technical assistance to builders and verifiers than originally anticipated.** The QA specialists have found that they are spending more time

than planned working with builders and verifiers to help them meet the program requirements. In Washington, QA specialists are inspecting additional homes with new verifiers as a way to train them on the program requirements. In Idaho, one QA specialist has also needed to answer technical questions for builders in order to recruit them to the program, and the lack of more QA staff in Idaho has created a backlog in the final QA process for homes and is resulting in homes having their final inspection after they are occupied. As discussed above, this may become an even greater issue as the program increases its recruitment of builders that have less experience with the building practices required for the ENERGY STAR specification. As more verifiers join the program, however, verifiers rather than QA specialists theoretically will provide this type of support to builders in the long run which will help reduce the demands placed on the QA specialists.

- **Estimates of potential savings will help market ENERGY STAR Homes.** Both utilities and realtors suggested that having more information on the energy savings would be an effective way to promote these homes. One utility suggested that information on energy savings relative to baseline home designs be provided on the program website.

- **Marketing of ENERGY STAR Homes to consumers needs to be increased.** All of the groups we interviewed emphasized the need to increase awareness and demand of the ENERGY STAR homes among consumers. Realtors also indicated that an ENERGY STAR home could command a higher price, with estimates tending to range from a 5 to 10 percent price premium.

- **Realtors and sales reps should be better informed of the ENERGY STAR home specifications and benefits.** Realtors and sales reps generally understood that ENERGY STAR homes will save consumers money and they promote this fact to their customers. In terms of understanding and promoting specific ENERGY STAR benefits, however, the sellers were less knowledgeable. Currently the realtors and sales reps tend to emphasize the more visible aspects of an ENERGY STAR home, which includes appliances and windows. Realtors also stressed insulation levels when promoting a home's energy saving benefits. Sellers of ENERGY STAR homes should be better informed as to which components drive the savings (primarily heating/cooling and lighting). Other benefits such as improved air quality and comfort, duct testing, and third party certification will likely resonate with homebuyers if promoted by realtors. Better education in this area will be critical for increasing demand for these homes, a need stressed by all of the respondents we interviewed in this evaluation. Realtors indicated that they would be interested in training on how to better sell an ENERGY STAR home.

The following recommendations are based on the above findings:

- **Adjust program goals and forecast for 2005 and 2006 to better reflect the current program status.** Although the program has largely met its builder recruitment goals, ramp-up and throughput have been slower than originally forecast for a variety of reasons. The program should critically assess how many homes it believes will be certified by December 31, 2005 based on realistic estimates of ENERGY HOME housing starts, average time from start to certification, and maximum attainable throughput.

- **Increase builder support.** It appears that builders continue to need support regarding program requirements after they initially join the program. While this need is designed to be met by the BOSs when builders first enroll (and eventually by verifiers once the program matures), it appears that the additional support has been needed and this has been supplied by the QA specialists and verifiers. Given the expected volume of homes and the issues regarding coordinating inspections, this could become a potentially critical issue without more staff available to help builders navigate the program.

- **Program support to participating large-volume builders should be made a priority.** A key to achieving the 20 percent market share goal for ENERGY STAR homes will be the construction activity of large-volume builders participating in the program. The program has already been successful in recruiting 23 of the 65 large-volume builders in the region and should strive to recruit as many of the remainder as possible. Moving forward, the program should have regular contact with the participating large-volume builders and provide assistance as needed to the individual construction crews within each company as they work to learn the building practices required by the program. Regular calls or visits with these builders should be a priority so that any questions or training needs can be met quickly.

- **More "hands-on" training needed for HVAC contractors and performance testers.** In addition to increased training for builders, additional training was also suggested for HVAC contractors and performance testers so that they are better able to comply with the program requirements. The HVAC contractors and performance testers indicated that "hands-on" training was particularly valuable for the duct sealing and testing aspects of the program. Several BOSs and verifiers also emphasized the importance of providing training to the actual HVAC installation crews, not just the HVAC contracting company's owner or superintendent.

- **Utilize a standard referral process to match builders and verifiers.** An impartial referral process needs to be used for verifiers to remove any impression of favoritism. Some verifiers in Idaho felt that referrals from the SCO were being directed to only a few verifiers and not distributed equally among all verifiers. Developing a standardized referral process is especially important as building activity increases and more verifications are performed by private verifiers. It may be possible to address this issue by listing all qualified verifiers on the program website and then make sure that utilities and SCOs always refer builders to the website to find a verifier.

- **Promote performance testing to prospective builders as an effective means to ensure quality HVAC installation.** While non-participating builders noted the duct testing requirements as one of the barriers to participation, participating builders have indicated that they value duct testing as a means of confirming that the subcontractors are doing the job properly. Information on aggregate initial test results for participating builders could be a compelling selling point for overcoming this barrier.

- **Continue outreach to builders and contractors to reduce barriers relating to ENERGY STAR lighting.** Suggestions for improving acceptance of ENERGY STAR included having more focus on ENERGY STAR lighting in lighting showrooms. One

utility suggested that the program develop a website that shows the available ENERGY STAR fixture options. Contractors also suggested having a simple cost breakdown showing the potential savings with the ENERGY STAR lighting option. Sales calls and one-on-one visits with contractors are also considered important for increasing acceptance of ENERGY STAR lighting. One builder was particularly impressed with the time their BOS dedicated to making sure they found lighting fixtures that would fit their needs. The BOS accompanied the builder's lighting designer to the store to help select fixtures. This builder cited this action as the most valuable support they received from the program. Continued outreach to builders and contractors and general promotion of new ENERGY STAR lamp and fixture options that the program views as high quality will help reduce some the concern about the quality and availability of these products. In particular, information on new, high quality ENERGY STAR lighting options should be part of the program's regular contact with large-volume builders recommended above.

- **Increase marketing of the program directly to prospective homebuyers.** Increasing consumer demand will encourage more builders to join the program which in turn will increase demand for supporting sub-contractor services such as performance testing and verification. While the ENERGY STAR Homes program is specifically designed to address the builder side of the market, we recommend that this be done in conjunction with a broader marketing campaign targeting the consumer that emphasizes not only energy savings, but also benefits such as comfort, health and safety, and overall home quality.

- **Coordination of final home inspection / QA review needs to be formalized so that it is completed prior to occupation.** There have been instances in Idaho and Washington in which the final QA inspection process has occurred after the home has been occupied, which has created some conflicts with both the builders and homeowners. This may be due in part to some of the Idaho QA staff needing to spend more time providing builder technical support rather working strictly on QA tasks. As building volumes increase, this may become more of an issue especially if QA staffing levels remain at their current levels. To minimize these occurrences, we recommend that the program develop a formal process for completing the final home inspections to ensure that they are completed prior to occupation. This inspection procedure should be incorporated into the participation agreement and clearly explained to the builder at the start of their participation.

- **Educate realtors on ENERGY STAR home benefits.** In order to increase demand for ENERGY STAR Homes, realtors need to have a better understanding of the program requirements and the associated benefits on an ENERGY STAR Home. This will help ensure that prospective homebuyers are more fully informed about ENERGY STAR home advantages. One concrete step that could be taken would be to encourage the Multiple Listing Services in the four program states to incorporate ENERGY STAR as a selection criterion in their database searches.

- **Revise cost effectiveness modeling assumptions.** We recommend that the cost effectiveness modeling assumptions be revised based on the issues discussed in Chapter 8. In particular, the assumptions regarding baseline market activity should be increased.