research/into/action inc

Final Report

Engineering Review and Process Evaluation of the Energy Trust New Homes Program

Funded By:

EnergyTrust of Oregon

Prepared By:

research/into/action inc

Jane S. Peters, Ph.D.
Ryan E. Bliss
Nathaniel Albers
Joe Van Clock
Research Into Action, Inc.

and

David Robison
Stellar Processes

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ES EXECUTIVE SUMMARY

Energy Trust of Oregon's New Homes program – implemented by Portland Energy Conservation Inc. (PECI) and its subcontractor, Conservation Services Group (CSG) – promotes improved new-home design techniques and the installation of energy-efficient materials and appliances. The program also educates homebuyers about the benefits of energy-efficient homes and encourages buyers to seek efficient homes out in the marketplace.

In the past, this program has relied on promoting building to the ENERGY STAR® level, where computed energy use is 85% of the energy consumption for a similar house built to Oregon code. To simplify compliance, a prescriptive standard has been developed for ENERGY STAR® certification, with additional incentives to encourage emerging measures. Following a code change that went into effect in June 2008, since 2009, the program has offered the Energy Performance Score (EPS) as a way to rate and promote new site-built homes and claim savings on all upgrades above code. The goal of the EPS is to educate realtors and consumers to the relative efficiency of homes and transform market demand toward more energy-efficient homes.

In July 2009, Research Into Action, Inc., together with its subcontractor, Stellar Processes, Inc., was hired to carry out an engineering review and process evaluation to determine how builders are responding to the new program.

ENGINEERING REVIEW

The engineering review covered the measures included and the estimation tools used for the New Homes program.

Review of Measures

Of 55 new residential projects that have received an EPS rating, only 10% of the projects failed to meet ENERGY STAR® certification requirements; thus, efforts to promote the EPS rating have not diluted efforts to achieve ENERGY STAR® participation.

The EPS for ENERGY STAR®-qualified cases averaged 82% of that of a house built to code, and a few builders were able to achieve 60% to 70% of code. However, slightly more than half the qualified cases had EPS above 85% of the code-built house. For many of these cases, the added energy consumption came from mechanical ventilation needed with tighter shells, which was not taken into account in the development of the ENERGY STAR® requirements. Program staff reported they are trying to educate builders in more efficient ventilation approaches.

Most builders have reached ENERGY STAR® by constructing a tighter shell, reflecting previous educational efforts. A few have chosen the tankless water heater path, a new ENERGY STAR® option. Emerging measures still gaining market acceptance and not yet popular with builders included inside ducts, which require intervention early in the design process. Only one case was reported for each of two other of emerging technologies, 95% efficient gas furnace and a High Performance insulated shell. Although builders are allowed flexibility in trading off one measure for another, such a tradeoff appears to have been proposed in only two cases (4% of the sample).

In the case of radiant floor heating and mini-split system heat pump, it is not clear that the incentives use the proper base case and the modeling procedure for the radiant floor design is not clear. More development is needed to establish the appropriate base cases and modeling assumptions.

Review of Estimation Tools

Program staff currently use REM/*Rate*™ as a tool to estimate the energy savings relative to a code-minimum house. Although REM/*Rate*™ does not provide an accurate assessment of heat pump performance, staff have developed a post-processing spreadsheet that adjusts energy consumption adequately.

Alternatives include Ecotope's Simplified Energy Efficiency Model (SEEM), which offers better quantification of seasonal equipment performance and buffer space interactions. The spreadsheet could be made ready for use within the program with a similar ease of use as REM/*Rate*™ in about one month. Neither REM/*Rate*™ nor SEEM adequately deals with radiant floor systems, but high development costs and small market share probably make further development to address this low priority.

The estimating tools were compared in a prototypical house used in developing ENERGY STAR® requirements, excluding mechanical ventilation. The two procedures yield comparable EPS rating numbers, but REM/*Rate*™ appeared to be less sensitive to climate zone differences. It is difficult to account for the differences, but REM/*Rate*™ may not deal with buffer spaces as thoroughly as SEEM. Moreover, the methodology behind SEEM has been reviewed within the processes of the Regional Technical Forum (RTF) and, thus, represents some expert consensus.

PROCESS EVALUATION: SITE-BUILT HOMES

We interviewed eight program staff directly related to the site-built portion of the New Homes program and representatives from 18 homebuilders, ranging from small custom builders that build one to two homes per year to large production builders and builders that specialize in low-income housing. Builders were located across the state.

We found that the economic downturn of 2008-2009 had significant adverse impacts on all builders except small custom builders that have people on a waitlist for their services. Builders

specializing in low-income housing actually saw more demand for their houses, but did not build more houses because the potential homeowners did not meet other requirements to own a home.

Builders come to the program mostly because of outreach efforts by the Builder Outreach Specialist (BOS) assigned to their area, while a few learned about the program through their interaction with their subcontractors, other builders, or affiliations with agencies or associations. Once in the program, builders were generally satisfied with the program assistance and incentive amounts. Builders held program staff and the paperwork process in high regard, and complaints were minimal. Most builders found the paperwork process easy because of assistance received from their BOS.

The New Homes program requires communication and coordination among multiple entities. Energy Trust, PECI, CSG, and Earth Advantage all have their own organizational structures and internal processes to manage, as well as coordinate with builders. Respondent interviews indicated that internal communication problems are kept to a minimum among program staff. Furthermore, communication between program staff and builders was seen as consistent and problem-free, according to most builders.

Builders participate in the program for a variety of reasons. Low-income housing builders are attracted to the program because they want to provide a house that will be inexpensive to operate for the homeowner. Schools are attracted to the program because they want to teach their students the latest techniques and designs in efficient homebuilding. Both small custom builders and larger builders are interested in the market distinction that program participation offers. The latter group, however, were more explicit about the importance of the program incentives in allowing them to offset the costs of improved efficiency.

Builders were not knowledgeable of program details. They did not speak the language of the program. Terms like Builder Option Packages (BOPs) were not necessarily known, and there seemed to be a lack of knowledge about whether they achieved savings equal to, above, or below ENERGY STAR® requirements. Respondents could list the measures they installed, but did not seem to have a clear understanding of how or why those measures equated to incentives, as they depended heavily on the BOSs to identify savings paths and calculate their incentives.

Most builders chose envelope upgrades to receive incentives, because they are the least expensive way to attain incentives and the first, and perhaps largest, step in making a house more energy-efficient. Also, builders were familiar with envelope upgrades, as they had been a part of the program before the introduction of EPS. Few have yet used inside ducts, but at least five builders reported plans to use them in the future.

Cost and perceived lack of consumer awareness or concern about energy efficiency were the primary barriers to installing more energy-efficient measures noted by builders, particularly larger builders. It is difficult to gauge whether the builders' own lack of knowledge about energy savings paths and incentives is an additional barrier.

PROCESS EVALUATION: MANUFACTURED HOMES

The evaluation team completed interviews with four program staff, two program field representatives, thirteen manufactured home retailers, and five manufacturers.

The manufactured homes portion of the New Homes program supports retailers in selling ENERGY STAR® or eco-rated homes through a variety of incentives and training to retailers. At least 50% of the manufactured homes market is ENERGY STAR®-rated and some manufacturers only build ENERGY STAR® homes.

The manufactured home program saw a decline in the number of qualified houses from prior years because of the economic downturn. All retailers indicated a decline in sales from 2008 and that current customers were requesting smaller houses with fewer amenities.

Program staff members reported that internal program communications are smooth. Retailers largely reported that their communication with program staff had been effective and that program staff were accessible, responsive to the retailers needs, and able to effectively answer the retailers' questions or resolve issues. Any communication challenges occurred during periods of change in program staffing or program offerings. Applications were easy to complete, requiring only occasional and minor assistance from program staff.

Consistent with the high penetration of ENERGY STAR®-qualified homes, all of the manufactured home retailers interviewed – those that carry only or primarily ENERGY STAR® homes as well as other retailers – reported that they promote energy efficiency as part of their sales pitch to customers and are successful in up-selling energy efficiency to at least half of their customers. All reported that customers were interested in efficiency and most called it a "significant" concern for customers. However, retailers also reported that some customers could not afford the added cost of an energy-efficient home, despite the potential for long-term savings and that it had become more difficult for customers to find financing, further limiting their ability to purchase additional energy-efficient features.

Manufactured home retailers largely supported program staff members' assertion that the sales incentive motivates retailers to participate in the program. Most reported that the sales incentive effectively motivates sales people to promote energy-efficient homes, with half of the retailers reporting that the sales incentive was the most valuable of all the program's offerings.

RECOMMENDATIONS

Measures Review

➡ ***Recommendation*: The modeling tool used to calculate the EPS rating needs to be able to allow for alternative construction practices and components, calculate the impact of buffer spaces, include options for space conditioning equipment, quantify internal gains from equipment and occupancy, and account for seasonal variation.**

- ➡ ***Recommendation*: Consider replacing the NWPCC spreadsheet tool with the SEEM model**.
- ➡ ***Recommendation*: Reconsider qualifications for "no duct" systems**.

Process Analysis: Site-Built Homes

- ➡ ***Recommendation*: Continue support for BOSs and provide them with tools to encourage participation, but also make incentives as transparent to builders as possible**.
- ➡ ***Recommendation*: Attempt to improve coordination between the New Homes program and the tax credit program**.
- ➡ ***Recommendation*: Continue to publicize and market the EPS to the broad public using popular media outlets and other methods.**

Process Analysis: Manufactured Homes

- ➡ ***Recommendation*: Continue to offer, and potentially expand, coop advertising assistance and model home incentives for manufactured home retailers.**
- ➡ ***Recommendation*: Build awareness among retailers and homebuyers of the eco-rated label or other labels signifying higher levels of energy efficiency than ENERGY STAR®.**
- ➡ ***Recommendation*: Continue to maintain consistency in staffing and strive for transparency in changes to program offerings.**
- ➡ ***Recommendation*: Consider offering incentives to manufactured home manufacturers.**

Energy Trust of Oregon
851 SW Sixth Avenue, Suite 1200
Portland, Oregon 97204

Telephone: 1.866.368.7878
Facsimile: 503.546.6862
energytrust.org

EnergyTrust of Oregon

MEMO

Date: February 22, 2010
To: Board of Directors
From: Sarah Castor, Evaluation Project Manager
Kendall Youngblood, Residential Sector Manager, Efficient New Homes and ENERGY STAR® Products
Subject: Staff Response to the New Homes Program Engineering Review and Process Evaluation

This is the first process evaluation of Energy Trust's New Homes program since 2007 and the program has experienced significant change during this period. The program has now completed its transition to the new incentive structure and Energy Performance Score (EPS).

The process evaluation indicates that the program is working well for both participants and staff. Despite the simultaneous increase in building codes and downturn in the economy, Energy Trust's penetration in the new homes market has remained relatively stable, and satisfaction among builders and retailers is high.

Program staff anticipate an increase in the number of builders going above ENERGY STAR® standards as they gain more experience with new building techniques and the use of the EPS. We also feel that the evaluator's estimate of 3 to 5 years for widespread adoption of the EPS is reasonable, given the pace of the new homes market, although it may be accelerated by the release of an EPS for existing homes or statewide adoption of home energy labeling in the next year.

Although the evaluator recommended investigating the possible replacement of REM/*Rate*™ modeling with a tool reviewed by the Regional Technical Forum, we do not feel it is necessary at this point to move away from REM/*Rate*™. The program has invested significant resources in learning and adapting the software and we feel it serves the program's needs. However, we will continue to monitor the development of SEEM and other modeling tools for future use.

Findings for the site-built portion of the program indicate that the Builder Outreach Specialists (BOSs) are providing valuable outreach and program support to builders, but that builders often do not know about ENERGY STAR® requirements or understand incentive levels. To this end, the program

will work over the next year to increase builder familiarity with the new incentive levels and requirements.

On the manufactured homes side of the program, the program's move in 2008 to provide incentives to retailers rather than consumers appears successful; retailers report the incentive motivates them to promote more energy efficiency and they are successful in upselling efficiency in the majority of sales.

Cooperative marketing is an important part of our support for retailers and we plan to continue with the same level of total funding, while revising the requirements to provide more funds to retailers who sell more homes.

The program is also exploring the possibility for a tiered incentive with ENERGY STAR® manufactured homes as the base and a higher spec, such as eco-rated, earning a higher incentive. This will require building awareness among retailers and monitoring the supply of other specs from manufacturers. Currently, the program is not in a position to offer an incentive to manufacturers, although as the market becomes increasingly transformed toward ENERGY STAR®, such a strategy may be necessary to move to the next level of efficiency.