

Residential Building Code Change: Market Transformation Success, Back to the Beginning for ENERGY STAR Homes Program Implementation

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ABSTRACT

The ENERGY STAR Homes program in Oregon is working toward a shared goal – transforming the new construction marketplace to demonstrate readiness for improved building codes. With an 8.5% state-wide market penetration of ENERGY STAR Homes, the Oregon Department of Energy teamed up with the Oregon Building Codes Division to pass a residential code change requiring 15% improvement in energy performance; almost identical to the current ENERGY STAR homes requirements in the state. Stakeholders in Oregon are calling the code change a smashing market transformation success. However, program implementers were challenged with designing the next edition of an ENERGY STAR Homes program. The objectives of this paper are to:

- Outline the players and program structure that helped make the code change possible.
- Describe the unique elements of the code including the prescriptive paths, the solar compliance options, and how the code differs from the old ENERGY STAR requirement.
- Discuss the process for establishing the new ENERGY STAR Homes requirements at a level that is among the highest in the nation
- Present the challenges faced implementing the next generation of ENERGY STAR Homes after a code change.
- Describe the efforts to align the increased ENERGY STAR requirement with the local green building program, the federal rebate, the state tax credit, and the U.S. Department of Energy's Building America Challenge.
- Outline planned initiatives to incorporate labeling of the homes' carbon footprints as well as green mortgages and insurance products.

This paper provides insight into coordinating code and voluntary energy efficiency programs and maintaining the success of voluntary programs as codes change.

Market Actors and Structure

The Northwest states of Oregon, Washington, Idaho, and Montana initiated an ENERGY STAR Homes program in 2004. The Northwest Energy Efficiency Alliance (NEEA) took the role of overseeing the market transformation activities in the four-state region and set market penetration goals of achieving 20% market share within 5 years of start up. Energy Trust of Oregon, an independent non-profit responsible for administering the systems benefit charge, offered additional support in the state of Oregon with a focus on short-term energy savings and long-term market transformation. The Oregon Department of Energy (ODOE) was selected as the state certification organization to verify that homes meet the prescriptive ENERGY STAR

builder option package. The programs also worked closely with Earth Advantage, a green building program that was originally founded by the local electric utility, Portland General Electric in 1998. By the end of 2006, the combined efforts of these organizations resulted in significant results: 9.8% market penetration of ENERGY STAR new homes in Oregon and a network of trained builders, HVAC technicians, and subcontractors. In addition, NEEA's efforts on the residential ENERGY STAR CFL retail market transformation effort resulted in widespread adoption of CFLs, removing many cost and availability barriers common in other parts of the country. The foundation laid in a few short years became a key reason the code change was possible.

Adoption of the Oregon Residential New Construction Energy Code 2008

In March of 2008 the Oregon Building Codes Division (BCD) gave final approval to a new residential building code for the state of Oregon. The energy requirements in this new code reduce energy consumption in new homes by 15% as compared to the previous Oregon State code. It is anticipated that 1.6 million MWH cumulative savings will be obtained during the 2008 – 2025 timeframe. In addition, a cumulative 533 million therms will be saved and a cumulative 4.2 million tons CO₂ emissions will be prevented. This is equivalent to one year's worth of emissions from some 755,000 mid-sized cars, driven on average 12,500 miles per year.

Several factors and support from a variety of organizations contributed to the advent of this change. Oregon Governor Ted Kulongoski was one key advocate. In 2006 the Governor mandated that the state of Oregon improve energy performance in new residential construction by 15% by the year 2015. That year ODOE began conceptual discussions and engaged the Northwest Power and Conservation Council to conduct an independent analysis of potential measures. The organization believed that the conditions were right for moving ahead immediately and targeted the next code cycle to institute the improvement. The measures chosen were selected from the prescriptive path developed 3 years previously by the Environmental Protection Agency (EPA) and NEEA's Northwest ENERGY STAR Homes program. These measures had gained some acceptance by builders as a result of the efforts by NEEA, ODOE, the Energy Trust of Oregon, Oregon's public utilities, and the Earth Advantage green building program in promoting the ENERGY STAR Homes program. The ENERGY STAR Homes program had reached a 9.8% market share in Oregon in 2006. The program also had greatly improved the infrastructure to accomplish duct testing for new homes and proved that additional measures such as 50% of home sockets being outfitted with CFL's were achievable.

The Core Prescriptive Standards

The Oregon code adopted for July 2008 implementation raised the bar on energy efficiency measures as seen in Table 1 below. Note: bolded items indicate those requirements in the energy code that have been altered since the last code was adopted. This code applies to all homes across Oregon.

**Table 1. Oregon Residential New Construction Energy Code
Prescriptive Standards**

Measure ^A	Effective 07/01/08	Pre-Existing Code
Underfloor insulation	R-30	R-25
Slab-on-grade perimeter insulation	R-15	R-15
Heated slab , i.e., hydronic heat – underneath entire slab	R-10	n/a
Windows & sliding glass doors	U-0.35	U-0.40
Skylights ≤ 2% heated space floor area ^{B, C}	U-0.75^{B, C}	U-0.50 ^C
Skylights > 2% heated space floor area ^C	U-0.60^C	U-0.40 ^C
Exterior Door ≤ 24 ft ²	U-0.54	U-0.54
Exterior Door > 24 ft ²	U-0.20	U-0.20
Exterior doors with > 2 ft² glazing^D	U-0.40 ^D	U-0.40
Above grade wall insulation	R-21	R-21
Below grade wall insulation	R-15	R-15
Flat ceiling insulation	R-38	R-38
Vaulted ceilings – limited to ≤ 50% heated space floor area	R-38^E	R-30
Vaulted ceilings – > 50% heated space floor area	R-38 ^F	R-38
High efficiency lighting^G	50% fixtures^G	n/a
Forced air duct insulation, outside conditioned space	R-8	R-8
Heat Pump HSPF	7.7	6.8
Air conditioning SEER	13.0	n/a
Additional Measure must be selected from table on following page		

^A The prescriptive measure requirements are typically an overall U-factor, but code specifies R-values for standard wood-framed assemblies.

^B Skylights with vinyl, wood, or thermally broken aluminum frames and low-emissivity coatings shall be deemed to satisfy U-0.75 requirement if total skylight area installed is 2% or less of total heated space floor area.

^C Pre 04/01/08 skylight U-factor was based on NFRC testing in the vertical plane. Effective 04/01/08 skylight U is tested in the 20 degree overhead plane per NFRC standards.

^D Hinged doors only – does not include sliding glass doors. Sliding glass doors are categorized with windows. Glazing that is either double pane with low-e coating on one surface, or triple pane shall be deemed to comply with this U-0.40 requirement.

^E R-38 is representative of insulation installed in a standard wood framed scissor truss (U-0.042).

^F R-38 is representative of insulation installed in either a wood rafter or wood raised-heel scissor truss (U-0.031).

^G Either dedicated fixtures or screw-in lamps in conventional fixtures, lamps have efficacy of at least 40 Watts per lumen.

Additional measuers. In addition to the new prescriptive standards specified on the previous table, builders are required to **choose one** of the nine energy efficiency options listed in Table 2. Note: The option selected may pre-empt (be more stringent than) and be installed in place of a required prescriptive standard in Table 1.

Table 2. Oregon Residential New Construction Energy Code Additional Measures

	Measure Path	Description
1	High efficiency HVAC	90% AFUE furnace or boiler -or- 8.5 HSPF heat pump -or- 3.0 COP ground-source heat pump
2	High efficiency ducts	Performance Tested Ductwork performed by a contractor certified by ODOE Residential Energy Tax Credit program $\leq 0.06 \text{ CFM/ft}^2 @ 50 \text{ Pa}$ -or- All ducts within the conditioned space and air handler must be sealed combustion-air unit with air supply ducted from outdoors and is located within the conditioned space
3	High efficiency building envelope	R-24 exterior walls, R-30 advanced framing vaulted ceilings, R-49 flat ceilings, and U-0.32 windows and sliding glass doors
4	Zonal electric heat, or ductless furnace/heat pump and one of the high efficiency measures described	75% of permanently-installed lighting fixtures are fitted with energy efficient lamps -or- U-0.32 windows and sliding glass doors -or- R-30 advanced framing vaulted ceilings and R-49 flat ceilings -or- R-24 exterior walls
5	High efficiency windows/ceiling/lighting	R-30 advanced framing vaulted ceilings, R-49 flat ceilings, U-0.32 windows and sliding glass doors, and 75% of permanently-installed lighting fixtures are fitted with energy efficient lamps
6	High efficiency windows/ceiling/water heating	R-30 advanced framing vaulted ceilings, R-49 flat ceilings, U-0.32 windows and sliding glass doors, and natural gas/propane, on-demand water heating with minimum EF of 0.80.
7	High efficiency water heating/lighting	Natural gas/propane, on-demand water heating with min EF of 0.80 and 75% of permanently-installed lighting fixtures have efficient lamps
8	Solar photovoltaic	Minimum 1 Watt / sq ft. conditioned floor space with documentation indicating that Total Solar Resource Fraction is not less than 75%.
9	Solar water heating	Panels shall be Solar Rating and Certification Corporation (SRCC) Standard OG-300 certified and labeled, with documentation indicating that Total Solar Resource Fraction is not less than 75%. Minimum of 40 s.f. of gross collector area.

The light requirement. The proposal for addressing lighting in the Oregon code met with some resistance. Concerns were raised regarding mercury levels in CFL's as well as concerns regarding product availability and consumer acceptance. Several parties provided testimony addressing these concerns. NEEA was able to supply information about consumer acceptance of CFLs based on homeowner surveys from the Market Progress Evaluation Report on ENERGY STAR Homes dated August 31, 2007. ODOE provided product price and availability in Oregon markets, and explained how the reduction of electricity use due to CFLs would achieve a greater reduction in environmental mercury emissions from power plants than would be present in the installed CFLs. While the original recommendation was for 50% of the sockets to contain CFLs, the final language specified that 50% of the fixtures were to be fitted with CFLs or be ENERGY STAR fixtures. This shift in the requirement allows builders to use candelabra fixtures with many sockets without the penalty of counting many low wattage bulbs as non-CFL, and it simplifies code enforcement by allowing builders to identify junction boxes on plans intended to be fitted with efficient lighting.

Gaining equipment improvements beyond the federal standard. ODOE was interested in improving the efficiency of heating equipment as part of the energy code requirements. While state energy codes are not permitted to require equipment efficiency beyond the federal

standards, ODOE developed a set of options that would allow builders to choose a measure most appropriate for their individual building considerations. One option among nine potential options was a 90 AFUE furnace or 8.5 HSPF heat pump. Currently it is anticipated that this option will be the most frequently chosen path to comply with code.

A Performance Testing Infrastructure

Another option to meeting the code requirement is performance testing of duct systems. The ability to include this option was dependent on having an infrastructure that can provide these services to builders. The Pacific Northwest has over ten years of experience working with the HVAC industry to encourage contractors to test the air tightness of installed duct systems installed. This history included attempts to mainstream this service for both new construction and the retrofit market. Progress was initially made toward this goal during the Super Good Cents program of 1981-1988, when ducts emerged as an important system to consider in homes. NEEA and Bonneville Power continued to invest in the infrastructure regionally during the 1997 to 2004 time period with limited success, most of it in Oregon. ODOE also invested in creating the infrastructure through their state tax credit program beginning in 1998. Significant progress has been made, particularly in new construction since the advent of the ENERGY STAR Homes program. With participating builders now required to have ducts tested to obtain an ENERGY STAR certification, HVAC contractors are motivated to provide these services in a cost effective manner. Historical program investment in duct testing has resulted in over 60 HVAC shops trained and certified in Oregon to provide these services in the last past year. The existence of this network of HVAC contractors has made it possible to include duct testing performance measures in the 2008 Oregon code.

Inclusion of Renewable Energy Resources

The Oregon Department of Energy is intent upon encouraging both the use of energy efficiency measures and renewable resources to attain their goal of a sustainable energy future. One limiting factor in the current market penetration of these technologies is the lack of a base of qualified installers. It is hoped that including renewable energy technologies as options in the code will encourage plumbers and electricians to develop the skill base for installation of these measures. It could also assist in increasing market penetration rates that may affect production efficiencies and improve pricing of these technologies.

Acceptance from the building community. The building community was relatively supportive of the code change regarding the energy efficiency measures. There is recognition in the building industry in the state of Oregon that reducing energy usage is becoming increasingly important. The building community was well represented on the BCD's formal review committee that takes public testimony, reviews proposals and makes recommendations to the Residential Structures Board. The BCD-appointed board is also well represented with building industry members, and it is this board that makes final recommendations to the Building Codes Administrator to adopt the changes or not.

Concessions made during the process. The original code proposal included two measures that are not included in the adopted code. One of the original 9 proposed options that could be selected in addition to the core standards was size limitation. The option was stated as follows:

Less than or equal to 1,500 square feet in conditioned space area: Houses, dwelling units, or guestrooms sized at <1,500 sq. ft. with a ductless heating system such as zonal electric, radiant or ductless heat pump or furnace.

This “small dwelling” measure was intended to minimize cost impact on basic, low to moderate income housing. Also, encouraging smaller structures reduces the energy consumption and uses fewer materials for a significantly lower impact on the environment. ODOE removed this measure from the proposal after initial attempts of various parties to increase that maximum size limit of the “small dwelling” to the point that energy savings would be negated. The arbitrary size limitation that defined this measure would have required continued vigilance in future code change cycles to ensure the measure would remain effective.

The second option that did not make final code package was the proposed window U-value of 0.32. This was originally a proposed core standard. There was some objection from the window industry that significant wood-frame product lines were not able to meet this standard. ODOE chose not to challenge this industry objection, since the reduction of U-values to the level of 0.32 also necessitates specifying minimum SHGC values to demonstrate defensible energy savings. The window industry in the Northwest has not been focused on technologies to ensure the SHGC values meet this standard, and the construction supply chain has not been educated on the significance of SHGC values. Thus it was determined the market place was not yet ready for this measure to be mandatory. The measure is instead included in several options and in new above-code energy efficiency program specifications.

How the New Oregon Code Differs From the 2004 Northwest Energy Star Specs

While many of the measures of the 2008 Oregon Code were drawn from the 2004 Northwest ENERGY STAR specifications, the final code proposal is different from the ENERGY STAR standards in the following ways:

- The ENERGY STAR Home standards require that the heating equipment be upgraded to the 90 AFUE furnace or the 8.5 HSPF heat pump and that ducts are sealed and tested to <.06 CFM per square foot. The Oregon code specifies the upgraded equipment or the duct testing standards as options to meet the code requirements, which are among nine options that allow a home to comply.
- The ENERGY STAR Homes specifications require that 50% of the sockets in the home be fitted with ENERGY STAR bulbs or fixtures. The Oregon code requires that 50% of the fixtures be fitted with CFL bulbs or be CFL fixtures.
- The ENERGY STAR Homes specifications require that the dishwasher be upgraded to the ENERGY STAR standard, the Oregon code does not.

Developing a New Specification for ENERGY STAR in Oregon

The Oregon Department of Energy drafted a code change proposal that would be recommended to the BCD late winter of 2007 with the intention of implementing a new energy code in April of 2008. Once the proposed path was available, the stakeholders of the ENERGY STAR Homes program began to focus on developing new ENERGY STAR specifications that would exceed the potential new code by at least 15%. Interested parties included NEEA, ODOE, Energy Trust of Oregon, Bonneville Power, Earth Advantage state energy offices from other Northwest states and the EPA.

NEEA hired the firm Ecotope to develop a new prescriptive path for Oregon that could be presented to the EPA for approval. Program implementers of the ENERGY STAR homes program for NEEA and the Energy Trust, as well as Earth Advantage, provided perspective on what measures would be most accepted in the market place. Challenges existed in taking the next step to achieve 15% beyond the new code proposal. Potential measures included the following:

- Moving ducts inside the heated space or ductless systems
- R 24 walls with foam sheathing
- Improving equipment efficiencies to 92 or 95 AFUE furnaces
- Improving window U factors to .30 or .32
- Instantaneous gas water heaters of .81 EF
- Improved installation of insulation
- Intermediate framing – insulated headers, warm corners and partition wall intersections
- Increasing floor insulation to R 38
- Increasing flat ceiling insulation to R 49
- Increasing high efficiency lighting to 75%
- Increasing gas hot water tanks EF to .63

Some stakeholder parties had concerns that the program had been in the market a relatively short time and had not yet gained widespread acceptance. In addition, residential building starts in the state of Oregon were down in 2007 approximately 20% from 2006. Altering voluntary program requirements at such a time was believed to be a somewhat unstable situation. The team selected a variety of measures that provided incremental savings rather than some perceived to be more aggressive and difficult to implement. Items deemed to be early in the adoption cycle and difficult to implement included foam sheathing for walls, instantaneous water heaters and moving ducts inside the heated space. Initially, the group thought that bumping to a 92 AFUE furnace would be a measure with good savings potential. However, it was eliminated as an option based on Energy Trust of Oregon data indicating the furnaces installed to date in Oregon were on average over 91 AFUE thus creating a baseline of close to 92 AFUE and therefore we could not claim any additional savings from the increased furnace option. The final measures selected were as follows:

- The already existing measure of duct testing <.06 CFM per sq. ft.
- Improving window U values to .30 or .32
- Improved installation of insulation
- Intermediate framing

- Increasing floor insulation to R 38
- Increasing flat ceiling insulation to R 49
- Increasing lighting to 75%
- Increasing gas hot water tanks to .62

The resulting Oregon ENERGY STAR standards are listed in Figure 1.

Figure 1. Oregon ENERGY STAR Homes 2009 Prescriptive Path

NORTHWEST ENERGY STAR® HOMES
Certification Requirements
Single Family Homes Oregon

NWBOP 1
Ducted Natural Gas Fired Furnaces or Heat Pumps

Builder Option Packages (BOPs) are prescriptive methods for labeling new homes as ENERGY STAR. All requirements of the NWBOP shall be met in order to qualify a home for Northwest ENERGY STAR Homes Certification in Oregon upon verification by a Northwest ENERGY STAR Homes Verifier.

Measure	Code Requirements	ENERGY STAR Requirements				Comments for meeting ENERGY STAR Requirements	
		Envelope Upgrade	On Demand/ Tankless Hot Water Heater	Wall Upgrade	Ducts & HVAC Equipment Inside		
Insulation							
Ceiling	Flat	R-38	R-49	R-38	R-49	R-38	Requires insulation inspection.
	Rafter Vault	R-30			R-30		Requires insulation inspection.
	Scissor Truss	R-38			R-38		Requires insulation inspection.
Wall	R-21		R-21		R-21 + R-3 Sheathing	R-21	Requires intermediate framing techniques and insulation inspection.
Below-Grade Wall	R-19				R-19		Requires insulation inspection.
Floors Over Unconditioned Space	R-30		R-38		R-30		Insulation in floor joist cavity. Perimeter insulation not allowed.
Slab Floor	Unheated	R-15 Perimeter	TBD		R-15 Perimeter		Applies to all concrete slab floors above or below grade. R-5 thermal break at slab edge. Perimeter insulation shall be installed for a distance of 2 feet vertical, horizontal or combined distance. In areas east of the Cascade Mountains, 4 feet is recommended.
	Heated Radiant	R-10 Full Slab	TBD		R-10 Full Slab		
Doors & Windows							
Glazing	Max glazing area	no limit	21% of Heated Floor Area				Combined window and skylight area. Up to 1% of heated floor area is exempt.
	Windows	U - 0.35	U- 0.32 Max	U- 0.35 Max	U- 0.32 Max	U- 0.35 Max	
	Skylights	see code	code compliant Skylights, max area limited to 5% heated floor space				See code to determine rating requirements.
Doors	R-5				R-5		
Ducts							
Insulation	R-8		R-8		exempt		Tape not allowed.
Sealing	Option 2: Mastic or inside envelope OR no requirement		Mastic paste		Ducts & HVAC equip located in conditioned space. Mastic paste required.		
Max Leakage	Option 2: ≤0.06 CFM/ft ² or 75 CFM Total @ 50Pa OR no requirement		≤0.06 CFM/ft ² or 75 CFM Total @ 50Pa		No duct testing required.		All forced air heating and cooling system ducts shall be installed according to Northwest ENERGY STAR Homes Specifications for sizing and leakage. Performance testing is required by a certified contractor.
Return Air provisions	Designed to industry standards	Rooms with 2 or more supplies require dedicated return air path, rooms with single supplies may have door undercuts of at least 1" as a minimum.					Dedicated return air path options include transfer grills, jump-over ducts, or fully-ducted return for rooms with multiple supply ducts.
Ventilation & Air Sealing							
Whole House Ventilation	Operable Windows		Mechanical Ventilation				Meets Oregon Code Section 303.1 mechanical ventilation provisions
Spot Ventilation	See code section 303.3		ENERGY STAR qualified				Code stipulates that spot ventilation applies only to bathing and spa areas.
Envelope Tightness	no requirement		7.0 ACH @ 50Pa				Blower Door Testing to be performed by a certified ENERGY STAR verifier.



NORTHWEST ENERGY STAR® HOMES
 Certification Requirements
 Single Family Homes Oregon

NWBOP 1
 Ducted Natural Gas Fired Furnaces or Heat Pumps

Builder Option Packages (BOPs) are prescriptive methods for labeling new homes as ENERGY STAR. All requirements of the NWBOP shall be met in order to qualify a home for Northwest ENERGY STAR Homes Certification in Oregon upon verification by a Northwest ENERGY STAR Homes Verifier.

Measure	Code Requirements	ENERGY STAR Requirements				Comments for meeting ENERGY STAR Requirements
		Envelope Upgrade	On Demand/ Tankless Hot Water Heater	Wall Upgrade	Ducts & HVAC Equipment Inside	
Heating & Cooling Equipment						
Gas Furnace or Gas Heat Source	Option 1: 90 AFUE OR 78 AFUE	90 AFUE				
Heat Pump	Option 1: 8.5 HSPF OR 6.8 HSPF	8.5 HSPF/SEER 13				Heat Pumps must be in stalled according to ENERGY STAR Homes Specifications for sizing, controls, airflow and refrigerant charge. Must pass approved heat pump commissioning method and be performed by a certified contractor.
Air Conditioner	SEER 13	SEER 13				
Combustion Appliance Zone (CAZ)	no requirement	CAZ Pressure Test required				Whenever a combustion appliance used for primary space or water heating is present within a building, a CAZ pressure test is required.
Water Heating						
Natural Gas	≤60 gal	0.55	0.62	On Demand Hot Water Heater EF 82	0.62	0.62
	> 60 gal	0.55	0.62		0.62	0.62
Electric	≤70 gal	0.87	0.93	NA	0.93	0.93
	> 70 gal	0.87	0.92	NA	0.92	0.92
Appliances & Lighting						
Dishwasher	no requirement	ENERGY STAR Qualified				
Lighting	50%	75%				If permanent fixtures shall be fitted with either ENERGY STAR bulbs or ENERGY STAR fixtures.

Additional Notes:

Items in **BOLD** exceed Oregon Code Requirements.
 Thermal Bypass Checklist/Critical Detail requirements defined in Northwest ENERGY STAR Specification for Oregon.
 Intermediate framing requires at a minimum insulated headers (see Northwest ENERGY STAR Specification for Oregon).
 All insulation materials shall be installed according to the manufacturer's instructions to achieve proper densities, avoid compression and voids, and maintain uniform R-values. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value. All R-values specified are nominal. Insulation inspection is required as outlined in the Northwest ENERGY STAR Specification for Oregon.

EPA Approval

The EPA works with regional programs in those states where codes exceed the national standards to establish specifications for the ENERGY STAR Homes label that provide 15% savings over the local code. EPA reviewed this final set of prescriptive measures and approved them in February of 2008. The EPA and NEEA worked from September 2007 to February 2008 to negotiate several differences in energy savings assumptions. Among them were assumptions on heat pump base case performance, savings due to insulation inspections, and savings due to the implementing of the EPA's Thermal Bypass checklist. The Northwest attributes savings to commissioning of heat pumps; the EPA used research from the Northwest to allow these savings to be part of their calculation of energy savings for the Northwest path. The EPA utilizes RESNET assumptions on base case of insulation installation. The Northwest used Oregon code requirements and a study 68 homes for actual installation results conducted in fall of 2007. While the EPA counted energy savings due to the implementation of the Thermal Bypass checklist, the Northwest did not, but agreed to implement them as part of our requirements.

Final Savings Numbers and Estimated Costs

As seen below in Table 3, savings for the 2009 ENERGY STAR Homes path over code are reduced as compared to the 2004 specification. The reason is two fold. The base energy usage is less per home with the new Oregon code, thus 15% of the base provides fewer savings. In addition, the 2004 specification was 15% less energy usage than code not counting the lighting savings that resulted from the 50% ENERGY STAR lighting requirement.

Table 3. Energy Savings per Home for ENERGY STAR Homes Versus Code Homes 2009

e on	Crawlspac	Savings per home for ENERGY STAR Homes (kWh)					
	Constructi	Heat Pump		Gas FAF w/o CAC		Gas FAF w/ CAC	
	Zone	200	200	200	200	200	200
	4	9	4	9	4	9	
	Portland	4,40	2,90	700	500	1,10	700
	Medford	4,70	3,80	700	600	1,40	900
	Redmond	7,70	5,40	700	600	1,40	900

Facilitating Code Implementation

The challenges associated with a new code from a program implementation standpoint are many, but the most critical facing the state is getting builders and code officials trained to the new code specifications. ODOE, with help from NEEA, is responsible for conducting most of the code training. The ENERGY STAR homes program is able to provide code training as supplemental information in program training offerings to explain how the code relates to the old and new ENERGY STAR specifications. The regional parties developed a master presentation that covers the new code, new ENERGY STAR specifications, the state tax credit incentives for high performance homes, and solar. A uniform presentation will ensure that all trainings conducted throughout the state, by any party, will have a consistent message, information, and look and feel.

The new code goes into effect for homes permitted after July 1, 2008. While the building codes division considers the code in full effect as soon as it is printed and on the streets, most implementers know that it takes more than printing words to get the marketplace aware of the changes. The regional players agree that it will take 6 or more months of trainings and awareness campaigns before even a majority of the builders and code officials can be considered fully aware of the new code. This training delay allowed for a transition year in 2008 for ENERGY STAR. Rather than aligning the new ENERGY STAR specification to also change on July 1st, we are allowing builders to continue to build to the current specification for all homes they complete in 2008. We expect many builders to pull permits before the July 1st deadline and therefore don't expect to see many homes that were built under the new code complete before the end of 2008. This transition year is a great opportunity for builders who have never built an above-code home to join the ENERGY STAR program, receive free training and building science support, and receive incentives for building just beyond the new code requirements before they are required to. The program is taking advantage of this year to heavily recruit and train new builders and to demonstrate the marketing value that ENERGY STAR brings to their homes so that in 2009 and beyond, as the specifications increase, these builders will continue to find value in building to the ENERGY STAR standard.

Partnership with Green Building

The Earth Advantage program has always had energy efficiency as one of their four pillars of green building. When the ENERGY STAR program started in Oregon, Earth Advantage offered the ENERGY STAR certification as one of the paths to achieving Earth Advantage certification, but not the only path. In 2007, Earth Advantage agreed to call ENERGY STAR the “preferred path” and require it of all new Earth Advantage builders. Builders who had joined before ENERGY STAR started were allowed to do a modeling option for their energy performance rather than the ENERGY STAR prescriptive path. In 2008, Earth Advantage wanted to align with ENERGY STAR, but the changing code and delayed implementation of the increased specification presented a challenge. Earth Advantage decided to keep their base specification to align with the old ENERGY STAR path, and to develop and push their builders to an Earth Advantage Silver specification that aligns with the 2009 ENERGY STAR specification. Earth Advantage’s support is critical to the continued success of the ENERGY STAR program. At the end of 2007, they had a market share of 12%, almost double that of ENERGY STAR homes. Their alignment with the ENERGY STAR specification will substantially increase the penetration rates of ENERGY STAR and further strengthen the marketing messages around efficiency and green building.

Promoting the New ENERGY STAR Standard

The ENERGY STAR homes program implementers recognize that there may be a drop off in number of ENERGY STAR homes constructed in 2009 due to the changing specification. The new specification is a bump in building practices, price, and inspections. As stated earlier, the program is adding the EPA’s thermal bypass checklist to our requirements (optional for 2009, required in 2010). To minimize and potential drop off in volume of homes, Energy Trust is offering the 2009 ENERGY STAR incentive (starting at \$800 per home) to builders that construct homes to the higher level in 2008. The program is also developing a high performance homebuilder marketing campaign to encourage the current ENERGY STAR builders to go above and beyond the new specification, and to build to the state’s tax credit for efficiency and renewables.

To address the added requirements of the thermal bypass checklist, the ENERGY STAR programs have made available the tech tips and critical detail sheets developed by Advanced Energy to our builders and verifiers. These tips and checklist cover all of the items required by the thermal bypass checklist and present it in an easy to understand, communicate and verify package.

As discussed earlier, Earth Advantage will be encouraging their builders to go to the new ENERGY STAR level in 2008. Since over 90% of the ENERGY STAR homes are dual labeled with Earth Advantage, their early push will also help solidify the market and reduce the scale of builder drop off that we might otherwise expect.

Another factor that will influence the success of the 2009 specification is the City of Portland’s carbon “feebate” proposal. The City is proposing to administer a fee per home that is built to code to cover the carbon impact of that home. Homes that meet the new ENERGY STAR or Earth Advantage specification will have the fee waived, and homes that meet the state’s high performance home requirements for efficiency will receive a rebate from the City. The City’s alignment with the ENERGY STAR will also help boost awareness and participation.

Additionally, the U.S. Department of Energy's Building America program and Builder's Challenge have approached the ENERGY STAR homes programs in Oregon. The Building America team selected to work in the Pacific Northwest (Building Industry Research Alliance), has modeled Oregon's new ENERGY STAR specification using BEopt on a typical 2,500 sq/ft two story home in Portland, and determined that all new ENERGY STAR homes will exceed the DOE's Building America Benchmark by over 40%. Therefore, all new ENERGY STAR homes in Oregon will meet the DOE's Building America standard and the Builder's Challenge goals for marine climates. Because our standard is so high, the DOE is bringing technical resources and marketing support through these two campaigns to the state, which should also help with ENERGY STAR awareness and participation.

Real Estate, Appraiser, and Insurance Services Support

While the ENERGY STAR homes programs have been focused on the typical market actors (builders, verifiers, subcontractors, etc.), through our support of Earth Advantage, we are also reaching out to other key components of the new construction market: realtors, mortgage lenders, and insurance companies. In February 2007, the Regional Multiple Listing Service (RMLS), the region's most authoritative source of information on home sales, added the leading green building programs (ENERGY STAR, Earth Advantage, and LEED) into its searchable listings database. In response to the RMLS listings, Earth Advantage started offering training sessions to realtors, inspectors, appraisers and related industries in the Portland metro region. Those who successfully complete the program receive certification as Earth Advantage S.T.A.R. Accredited Professional Brokers. Earth Advantage opened the class to the public in June of 2007, and ended the year completing 16 classes. Out of the 349 class participants, 281 professionals chose to take the exam and graduated the course. Most participants were from Oregon and Washington, but one attendee flew out from New Jersey. They have also developed an Alumni group to sustain the growth of the S.T.A.R. course and continue to support the graduates. They plan to continue to support the S.T.A.R. graduates in their environmental education with the hope of continuing the cycle of education to their clients, friends and family.

Several appraisers have attended the S.T.A.R. course and are investigating working with Earth Advantage to make an accredited course that will qualify for continuing education credits specifically for appraisers. With the training of this group of people, we expect to start to see the benefits of efficient and green buildings reflected in the appraisal values of new homes. This is one more important link in the value chain for both homeowners and builders.

Energy efficient mortgages are not a new concept, but the traditional model of qualifying homeowners for a slightly higher mortgage neither worked nor was needed historically. However, Earth Advantage is in discussion with several local and national mortgage lenders to offer a climate friendly mortgage that offers homeowners a fraction of a percentage off of prime for the life of the loan. The success of this mortgage product will likely be tied to the energy performance certificate (described further below) as the mortgage lenders want to be able to claim that their loans contributed to the reduction of measurable amounts of carbon and other greenhouse gases.

The ENERGY STAR program is also supporting Earth Advantage to develop a green building guide that surmounts the considerable gap in understanding and knowledge that exists between the green industry and the financial industry, in particular the appraisers who advise companies, pension funds, banks, insurers and others on the investment side of real estate. The

result of this guide will be evidence that proves green buildings are more valuable than traditional buildings/developments. This guide will be a key factor for the appraisal community, as well as the insurance community, to help justify better insurance rates on green homes.

Going Beyond ENERGY STAR

Oregon wants to continue to push builders beyond code and ENERGY STAR and encourage them to construct truly high performance homes. ODOE has established a state tax credit for homes that are constructed to perform 30% better than the new code requires and that also include some form of renewable energy system. The builder can receive up to \$12,000 in state tax credits for building such a home. Energy Trust is encouraging builders to reach this level with a high performance home challenge marketing promotion and additional monies (up to \$2,200 in cash to builders) for building such a home.

The final integral detail we believe will make the efficient home market in Oregon successful is the energy performance certificate (EPC). Energy Trust of Oregon is working with Earth Advantage to pilot an EPC that is based on the home performance guide currently under development by the U.S. Department of Energy (see figure below). Unlike the home performance guide, the EPC will also show the homeowner the carbon footprint of the home and how it compares to a standard code home that will be based on carbon emissions from the state-wide power mix. The EPC will be an education tool for homeowners, a sales tool for builders, and a carbon impact tracking mechanism for the program, insurance companies, and mortgage lenders.

Figure 2. Home Performance Guide from the U.S. DOE's Building America Challenge Program

