Encouraging Efficiency in an Already Efficient Market

Tom Mauldin and Lynn Hoefgen, Nexus Market Research
Greg Stiles, Energy Trust of Oregon
Charlotte Rollier, Quantec LLC
Cathy Chappell, Heschong Mahone Group

ABSTRACT

The commercial new construction market in Oregon is arguably one of the most sophisticated energy efficiency markets in the U.S., having been shaped by a variety of factors. These factors include a strong environmental ethic, a stringent energy code, prior utility-operated energy efficiency programs, and existing energy efficiency programs operated by the state of Oregon and other organizations. Within this market, the Energy Trust of Oregon launched the New Building Efficiency (NBE) program in 2003 in order to improve the efficiency of new buildings and renovations in the non-residential sector. In 2005, the NBE program underwent an evaluation in order to help improve processes and performance early in the life of the program.

This evaluation found that the NBE program had achieved ample recognition and market penetration and that most participants were satisfied with their projects. However, based on a limited number of participant interviews, the evaluation found that the program may not be influencing design decisions as much as expected. The evaluation resulted in several recommendations, including the following: integrate the program with LEED requirements, re-evaluate the baseline criteria, fund commissioning for selected projects, and clearly outline the participation process. The NBE program is currently following up on these recommendations and other modifications, and will undergo an impact evaluation in 2006.

Introduction

The commercial new construction market in Oregon is arguably one of the most sophisticated energy efficiency markets in the U.S., having been shaped by a variety of factors. Market actors in Oregon have been influenced by a general environmental ethos that is unparalleled in the United States[1]. This ethic encourages designers, developers, and business leaders to value environmental concerns, including energy efficiency, to a greater degree than most other places in the United States. Reflecting this ethic, the state energy code, which was last updated in October 2003, is among the most stringent in the nation, and has required the building community to adopt advanced construction practices.

The environmental ethic is also reflected in Oregon's strong tradition of utility-sponsored energy efficiency programs. The prior existence of programs operated by the two major investor-owned electric utilities in Oregon - Portland General Electric (PGE) and Pacific Power (PP) - as well as significant programs run by municipal utilities such as Eugene Water & Electric Board (EWEB), have had a significant effect on new construction practices. The PGE and PP programs were phased out in 2003 when the Energy Trust of Oregon's programs were launched.

[1] Epitomized by the novel *Ecotopia*. As another example, in November 1993 the City of Portland became the first US city to adopt a strategy to reduce emissions of carbon dioxide (CO_2), the heat-trapping gas primarily responsible for global warming.

Other efficiency programs also influence the commercial new construction market in Oregon, including several operated by the Oregon Department of Energy (ODOE). The ODOE Business Energy Tax Credit program (BETC) offers tax credits to businesses installing measures during new construction that exceed state energy code by at least 10%. Businesses can receive a tax credit valued at 35% of the incremental costs associated with eligible measures. Through 2003, a total of 7,400 tax credits have been issued through the BETC program (ODOE 2006a). A Sustainable Buildings Tax Credit is also available for buildings meeting or exceeding the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) Silver accreditation that also achieve additional LEED credits.

ODOE also operates the State Energy Efficiency Design program (SEED), which mandates efficiency levels 20% above state energy code for all state buildings, including those built by state agencies and institutions for higher education (ODOE 2006b). The law creating the SEED program was first passed in 1991 and was revised in 2001. More recently, ODOE launched a program to encourage the construction of high-efficiency schools. The High-Performance Schools program (HPS) offers $50,000 toward the construction of energy-efficient school facilities that achieve a minimum of LEED Silver (ODOE 2006c).

In addition to the ODOE programs, the Northwest Energy Efficiency Alliance offers the BetterBricks program, which provides design assistance for "cutting edge" new construction projects in the hospital, school, grocery store, and office sectors (NWEEA 2006). Services include information dissemination, education, training, and technical assistance.

In addition to (or perhaps in part because of) these programs, there is a high concentration of certified LEED buildings in Oregon. As of February of 2006, there were a total of 24 LEED-certified projects in Oregon—the highest incidence per capita of any state in the U.S (USGBC 2006).[2] Nineteen of these LEED-certified buildings are in the Portland metropolitan area; the City of Portland, through its Office of Sustainable Development, has established a localized, enhanced version of LEED to reflect local construction practices (POSD 2006).

Cumulatively, the stringent energy code, environmental ethos, and energy efficiency programs (both past and present) have helped to foster a sophisticated design community of architects and engineers with a great deal of experience making energy efficiency a primary consideration in new building design. This sophistication is most evident in larger building projects, in which designers are deeply involved in the building design; in public buildings, which more directly reflect the environmental ethos of Oregon's citizenry; and in western Oregon, where this ethos is most prevalent. The incorporation of energy efficiency into building design is not nearly as common among private compared to public projects, in eastern Oregon compared to western Oregon, in small A&E firms compared to large A&E firms, or among electrical and HVAC subcontractors, who are more influential in smaller spec-build and design-build projects.

Table 1 and Table 2 summarize the factors that have influenced the commercial new construction market in Oregon, including the inducements and barriers to energy efficiency as well as the affected groups.

[2] The incidence of LEED projects is higher in Washington, DC.

Table 1. Inducements to Energy Efficiency in Commercial New Construction in Oregon

Inducements	Group
Environmental Ethos	Most pronounced in Western Oregon—especially Portland, Salem, Corvallis, and Eugene
Knowledge of/expertise in energy-efficient design	Large A&E firms
Receptivity to energy-efficient design	Public sector, not-for-profits, and generally Western Oregon, especially Portland, Salem, Corvallis, and Eugene
Better Bricks Program (NEEA)	Hospitals, schools, grocery stores, offices—"leading edge" projects only
Business Energy Tax Credit program (ODOE)	All commercial, industrial, and institutional customers obligated to pay state income taxes
State Energy Efficiency Design Program (ODOE)	State buildings
High Performance Schools Program (ODOE)	K-12 Schools
Prior utility new construction programs (Portland General Electric and Pacific Power)	All PGE and Pacific Power commercial, industrial, and institutional customers
Municipal electric company programs (EWEB, etc.)	Municipal electric customers
Leadership in Energy and Environmental Design program (USGBC)	All buildings theoretically eligible, but greatest receptivity among large A&E firms, universities, schools, other public buildings, not-for-profits, and Class A office and retail space; special program in Portland

Table 2. Barriers to Energy Efficiency in Commercial New Construction in Oregon

Barriers	Group
Resistance to/backlash against environmental ethos	Eastern Oregon; those with "hard-nosed" business orientation
Lack of awareness of benefits of energy efficiency	Private owners & developers, subcontractors, small A&E firms
Lack of knowledge of and experience with energy-efficient design/technologies	Private owners & developers, subcontractors, small A&E firms
Lack of time/resources to consider or investigate energy-efficient options ("hassle factor")	Private owners & developers, subcontractors, small A&E firms
Emphasis on/pressure to control upfront costs ("value engineering")	Private owners & developers, subcontractors, small A&E firms
Split incentives—those paying for efficiency measures don't receive the benefit of lower bills	Spec-built buildings, leased buildings

New Building Efficiency Program

Within this sophisticated market, starting in August of 2003, the Energy Trust of Oregon has operated the New Building Efficiency (NBE) program, which serves to improve the efficiency of new buildings and renovations in the non-residential sector (ETO 2006). At this time, the responsibility for operating energy efficiency programs for customers of the two major investor-owned utilities was transferred from Pacific Power and Portland General Electric to the

newly created Energy Trust. The NBE program was designed to continue promoting energy efficiency in the commercial building sector in order to provide a seamless offering of services and to further elevate standard construction practices and target remaining opportunities for energy savings.

The NBE program built upon the efforts of the previous utility programs and was designed to integrate with existing programs operated by the state and other organizations. The program was designed in the context of the sophisticated market where it operates, thus the following strategic goals were developed:

- Enhanced design practices and construction practices
- "As good or better" service compared to prior commercial new construction programs
- Complement and integrate with high performance/sustainable building design
- Complement and package efforts of other parties striving to enhance the energy efficient design and construction of commercial facilities
- Acceptance as a beneficial service by the design and construction community
- Broad participation

For 2005, the program targeted electricity savings of 4,673 to 6,231 MWh (0.53 to 0.71 aMW) and natural gas savings of 55,125 to 73,500 therms. Projects meeting the following requirements are eligible to participate in the NBE Program:

- The project must be served by Portland General Electric, Pacific Power, and/or NW Natural in Oregon and must pay a public purpose charge.[3]
- The project must involve (1) a new commercial or industrial building or structure, (2) an addition to a new commercial or industrial building or structure or (3) major renovations that affect two or more energy systems in an existing commercial or industrial building or structure. This includes multi-family residential buildings of four or more stories.

While the program emphasizes the recruitment of architects and engineers to serve as program allies in order to enroll larger custom-designed projects, the program also recruits electrical and HVAC subcontractors to serve as trade allies and thereby enroll smaller spec-build or design-build projects.

The NBE Program is divided into three tracks: Standard, Custom, and LEED-NC. These tracks were developed in order to offer compatible services to the full range of construction projects in the market – from small spec-built projects to the custom high-performance and sustainable "green" buildings. A brief description of each track follows.

- **Standard Track.** The Standard Track addresses the market for smaller and spec-build projects and those with severe time constraints and budgets. The Standard Track was designed for projects beyond the design stage in order to provide a simple, quick process to obtain a relatively small amount of incentives for cost-effective measures. Up to $50,000 per project is available for prescriptive measures including lighting and controls, motors, drives, HVAC and natural gas equipment. Program pre-approval is required for

[3] Customers of NW Natural are eligible for funding towards natural gas efficiency measures.

projects receiving more than $3,000 of incentives; these projects are eligible for $500 in assistance for completing program applications.

- **Custom Track**. The Custom Track supports developers wishing to create high performance buildings. The Custom Track is designed for projects in the concept, schematic or early design stages with long lead times, allowing the program to influence equipment choices and building design. Custom project incentives are designed to encourage an integrated, whole-building design approach in order to maximize energy efficiency. Program incentives are available up to $200,000 per project for approved Custom applications plus another $50,000 for Standard Track incentives. In order to receive incentives for energy efficiency measures, projects must provide a summary of the measures expected to be installed as well as an energy analysis report that supports the estimated savings.

  The Custom Track offers up to $25,000, on a 50-50 cost-share basis, toward a front-end grant for energy modeling and design advisory services. This funding can be used to sponsor feasibility studies and develop energy-use models.
- **LEED-NC Track.** The LEED-NC track is intended for projects registering for certification with the LEED New Construction program. Only projects achieving LEED NC Versions 2.0 and 2.1 are eligible. Incentive amounts up to $200,000 are calculated based on average energy consumption for different building uses as well as the number of Energy & Atmosphere Credit points awarded to the project.[4]

The NBE program makes efforts to coordinate with other efficiency programs in order to encourage seamless participation. Examples of such coordination include providing assistance to customers in completing BETC applications and allowing SEED projects to bypass the requirement that individual measures pass program cost-effectiveness tests.

Evaluation Findings

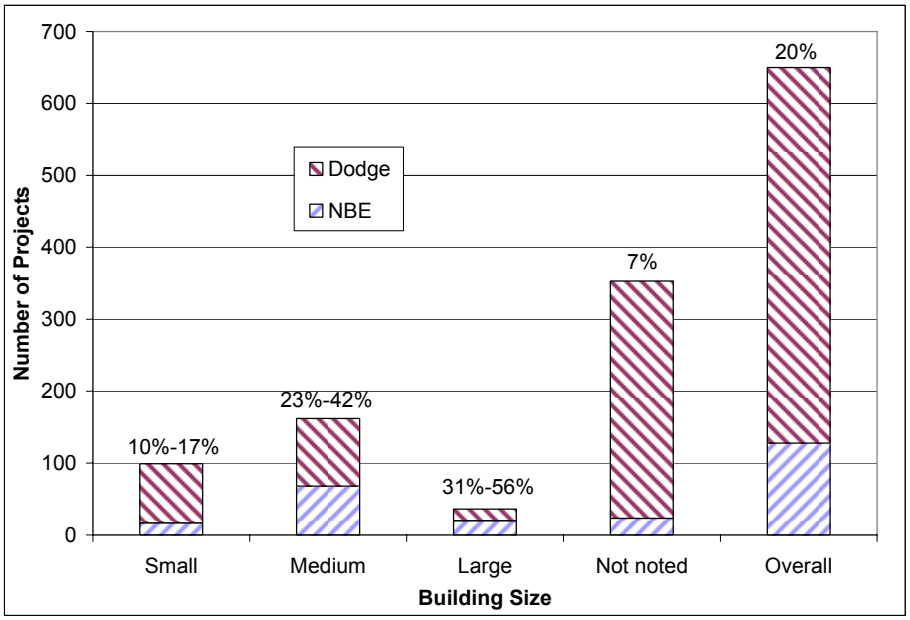
The NBE program underwent an evaluation during 2005 in order to help improve processes and performance early in the life of the program. The process evaluation component involved interviews with program staff (7), participating customers (20), non-participating customers (81), and managers of other commercial new construction programs (4), as well as the development of a program logic model. The impact evaluation feasibility assessment involved a review of program data collection and the development of an impact evaluation plan. The market assessment characterized the non-residential new construction market in which the program operates and measured program penetration. The key findings from this research are presented below.

Market penetration. Program penetration in the market is 20% in terms of the number of projects; the FW Dodge database recorded 650 qualified construction projects compared to 129 projects participating in the NBE program (Figure 1). In terms of building area, program penetration is 22% based on over 36 million square feet of construction recorded in the Dodge database. Based on the short time frame the program has been implemented, the program has already shown ample penetration with still greater opportunities to tap into the market. Penetration estimates by building size indicate that the program has achieved greater success

[4] The LEED track was introduced after the evaluation was completed in late 2005.

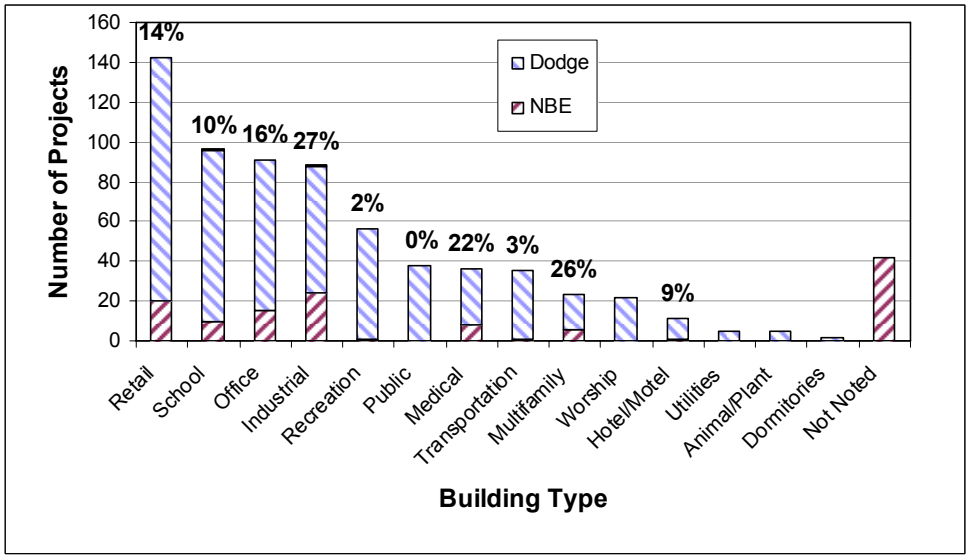
with larger projects, with penetration estimates of 10%-17% for "Small" projects (as a percentage of projects), 23%-42% for "Medium" projects, and 31%-56% for "Large" projects.[5]

Figure 1. Program Market Penetration by Building Size



Penetration estimates by building type indicate that the program is performing well in actively engaging projects from a variety of building sectors (Figure 2).

Figure 2. Program Market Penetration by Building Type



[5] Projects of less than 10,000 square feet were categorized as "small." Projects equal to or greater than 10,000 square feet and less than 100,000 square feet were categorized as "medium". Projects of 100,000 square feet or more were categorized as "large". The penetration estimates are provided as ranges because a substantial portion of the FW Dodge records did not include square footage.

Recognition. Sixty-two percent of the 81 non-participants interviewed had heard of the Energy Trust and 30% are familiar with the program - a reasonable achievement over the course of two years. However, only 13% of non-participants knew, on an unaided basis, that the program offered incentives for energy-efficient equipment and measures.

Satisfaction. Nearly all participants interviewed were satisfied or extremely satisfied with the overall program (Table 3). Most participants thought the program was good and that participation was easy and said that they had no problems. In addition, the majority of participants were satisfied with the types of measures eligible for incentives and the level of incentives. Most respondents thought that the incentives covered the measures in which they were interested and that the amounts were reasonable. However, while a majority of respondents were satisfied with the application process and the time to receive incentives, satisfaction was somewhat lower. Several respondents thought the application process was unclear and the turnaround time on incentives was slow.

Table 3. Summary of Satisfaction with Program Elements by Participants

Satisfaction	Overall Program	Application Process	Time to Receive Incentives	Types of Measures Eligible	Amount of Incentives
Extremely Satisfied	9	9	4	9	6
Satisfied	10	5	4	9	11
Neither Satisfied nor Dissatisfied	1	3	1	1	1
Dissatisfied	0	1	2	1	1
Extremely Dissatisfied	0	1	0	0	0
Don't Know / NA	0	1	1	0	1
Total Respondents	**20**	**20**	**12**[6]	**20**	**20**

Asked about barriers to participation, several respondents mentioned lack of familiarity with the program, the level of time investment and excessive paperwork requirements, and the lack of sophistication on the part of their project's design team.

Effects on building designs. Preliminary, qualitative estimates of free ridership were calculated based on 18 completed participant surveys. Free ridership was estimated to be 66%, as a percentage of electricity savings for the eighteen interviewed projects.[7] However, when the one project with the most electricity savings is excluded from the analysis, the free ridership estimate drops to 33%. The undue influence of the outlier is more a function of sample size than program impact. At 100%, free ridership is highest for the four Custom Track projects and, at 16%-17%, lowest for the fourteen Standard Track projects.

It should be stressed that the free ridership estimates are based on a relatively small sample of projects, and thus the results should be viewed as indicators of program influence rather than quantitative measurements. However, program staff deliberately encouraged participation by well-known design firms and high-profile projects in order to increase the visibility of the program in the start-up phase, which undoubtedly increased free ridership.

[6] There are only twelve respondents for this question because only twelve of the 20 respondents were at the appropriate stage of program participation.

[7] Free ridership is defined as those respondents who reported that they were "likely" or "extremely likely" to have installed program-funded measures in the absence of the program. The findings regarding free ridership were supported by other questions regarding code compliance and efficiency level.

Moreover, participants as well as program staff strongly believe that the design community in Oregon is more sophisticated than elsewhere in the country and more likely to consider energy efficiency. A high level of free ridership - especially for large projects in which the design community plays a larger role - would be consistent with a high level of sophistication about energy efficiency. In response to these findings, the Energy Trust has introduced elements intended to reduce free ridership, such as an early project enrollment form and additional equipment added to the Standard Track. The Energy Trust also plans a more rigorous assessment of free ridership, as well as spillover, in 2006.

Energy code compliance. Of the 20 participants interviewed, 16 report that they knew whether or not their project exceeded energy code. Six of these 16 respondents thought their project just met code, but did not exceed it; this suggests that the program may be funding projects that are not achieving energy savings. The remaining ten participants believe that their project exceeded code, with five estimating that the project exceeded code by 20% to 40%. However, just one respondent believes that the program contributed to the savings beyond code. These findings tend to support the above figures on free ridership, and may actually indicate that they are conservative estimates.

Efficiency level. Eight of nine participants[8] believe their building is "more efficient" than comparable projects they have been involved in within the past two years. Of these eight, only three attributed any of the increased efficiency to the program. Again, these findings tend to support the earlier findings on free ridership.

Future participation. Nearly all participants interviewed (19 of 20) report that they are likely to participate in the program in the future. In addition, eighteen participants state that they are also likely to recommend the program to colleagues.

Evaluation Recommendations

Based on the evaluation findings, multiple recommendations were developed, of which several key recommendations are discussed below. In addition, as the program has evolved it has already addressed some of the issues raised by the evaluation; these are discussed as well.

Integrate program with LEED requirements. At the time the evaluation was completed in August of 2005, program staff was already working toward developing a track for LEED projects. This strategy was supported by the evaluation, as several participants suggested that the NBE Program should be integrated with the LEED program. Given the potency of LEED in the Portland market, it made natural sense to coordinate and integrate these programs to the extent possible. The LEED-NC track has met with high demand since it was launched in November 2005, although LEED projects typically require long lead times for certification due to a one-year post-occupancy requirement for commissioning.

Re-evaluate the baseline criteria for custom track projects. Given the high level of free ridership (100%) found for electricity savings in the four Custom Track projects interviewed, the program should investigate the level of program resources that are allocated to these projects.

[8] Only architects or engineers were asked this series of questions, involving only nine projects.

Given the sophistication of the design community in Oregon, it may be that common practices exceed energy code (at least for certain measures); the program may want to establish a minimum level of savings above code (possibly 5%-10%) before these projects become eligible for incentives. In order to establish the appropriate baseline, the program plans an impact evaluation (see following bullet).

Resurvey a substantially larger, statistically valid sample of participants and non-participants in conjunction with the impact evaluation in 2006. These surveys should focus on free ridership and spillover using a more rigorous protocol with results that are statistically valid for both gas and electric measures. This impact evaluation should provide information to determine if, and to what extent, common practices exceed code, as well as for which measure types (if feasible), in order to establish appropriate baselines for the program.

Fund commissioning for selected projects. For projects that rely on control systems to achieve a substantial portion of energy savings (EMS, HVAC controls, etc.) the program should require and pay for commissioning in order to ensure that control-based energy savings are being realized. The program is currently investigating offering a commissioning option in the near future.

Clearly outline the participation process upfront. While the program received high ratings in terms of overall customer satisfaction, the aspects that received the lowest ratings were the application process and time to receive incentives. Several participants thought the participation process was not clearly defined up front and they did not anticipate some of the program requirements. Some of these documentation issues have been alleviated by a new process that allows participants more flexibility in meeting program requirements and the provision of a "Participant Manual," which outlines the participation process.

The program has undertaken other initiatives to ease participation, including adding more eligible equipment to the prescriptive Standard Track, instituting a project notice form that collects information up front for interested project planners, and integrating application forms into one Excel workbook in order to eliminate redundancy in completing forms.

The program developed Excel-based spreadsheet forms that can calculate energy savings for various measures, automatically fills in duplicated information, and includes built-in error checking in order to further ease the application process for customers. In addition, the program has launched an educational initiative via "webinars" on various topics including commissioning, LEED, integrated design, and solar thermal heating. These web-based trainings are offered during lunchtime and have received a good response thus far from designers.

Lessons Learned

The evaluation of the New Building Efficiency program, and the experience of the staff involved in the program, yielded several ideas regarding the design of commercial new construction program for a sophisticated market.

- **Adopt a market-oriented strategy.** In order to serve customers effectively, the NBE program was structured to match the way in which buildings are designed and

constructed. This approach ensures that the program services and requirements supplement, rather than conflict with, the construction process.

- **Integrate with other programs where possible.** The Oregon market may be unique in that multiple energy efficiency programs are offered by several organizations. In this situation, it is critical to strive for seamless participation in programs by streamlining information requirements.
- **Build strong relationships with designers and contractors.** Developing strong connections with architects and engineers is crucial to achieving long-term success. In order to reach the smaller spec-built/design-build market, the NBE program has found that electrical and HVAC contractors are important for recruiting new projects.
- **Simplify program participation.** Easing program participation will encourage projects to enroll that otherwise may not due to obstacles such as labor investment, lack of familiarity, etc. The NBE program has developed numerous tools and procedures for simplifying participation.
- **Deliver education and training.** In order to foster the continued advancement of energy efficiency practices, the NBE program provides opportunities for education and training to designers and contractors. These trainings also serve to enhance the reputation of the program as well.
- **Establish appropriate baselines.** Given the sophisticated market, it may be expected that standard practices exceed code, even though code was updated within the past few years. Hence measuring the appropriate baseline, and then regularly updating the baseline, is important to continued progress in achieving energy savings. The NBE program is planning an impact evaluation study in 2006 in order to establish appropriate baselines.
- **Embrace a flexible approach.** During its three year existence, the NBE program has continually evolved in order to effectively pursue energy savings in the Oregon market. A flexible approach is important because of the diversity of building projects and the fact that delays and changes are inherent in the construction process.

References

Callenbach, E. 1975. *Ecotopia.* Berkeley, CA: Banan Tree Books.

Energy Trust of Oregon. 2006. http://www.energytrust.org/newbuildingefficiency/ index.html

Oregon Department of Energy. 2006a. http://egov.oregon.gov/ENERGY/CONS/BUS/BETC.shtml

Oregon Department of Energy. 2006b. http://egov.oregon.gov/ENERGY/CONS/SEED/SEEDhome.shtml

Oregon Department of Energy. 2006c. http://www.oregon.gov/ENERGY/CONS/school/highperform.shtml

Northwest Energy Efficiency Alliance. 2006. http://www.betterbricks.com/default.aspx

Portland Office of Sustainable Development. 2006. http://www.green-rated.org/p_leed.asp

United States Green Building Council. 2006. http://www.usgbc.org/