

Adapting to Serve the Commercial New Construction Market in Oregon

*Thomas Giffin, SAIC
Spencer Moersfelder, Energy Trust of Oregon, Inc.*

ABSTRACT

Energy Trust of Oregon's New Buildings program serves the market for new construction and major renovations (replacing two or more building operating systems) in Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas territory in Oregon. This commercial new construction program promotes building energy efficiency, above the already aggressive Oregon Non-Residential Energy Code, and has acquired substantial energy savings in the commercial new construction market. Over the past 5 years, the program has undergone several expansions to serve wider markets, to reach deeper into known markets, to streamline participant requirements, and to simplify and expand the program's offerings. This paper describes the considerations and trade-offs associated with refining and expanding the processes, operations and offerings of the program; especially addressing how the needs of Oregon's new building market are served, and how the markets have responded.

Introduction

Energy Trust of Oregon's¹ Business Energy Solutions New Building program (formerly the New Building Efficiency program) has been designed, and consistently implemented since the beginning of 2004 with a high degree of success, reliability, and innovation. Processes and systems for the Program have been proven reliable, and numerous enhancements are continually made to improve the Program operations, its offerings, and its delivered results. The New Building program promotes higher energy efficiency, above the already aggressive Oregon Non-Residential Energy Code (Oregon Structural Specialty Code 2007), for new and renovated construction projects through multiple levels of financial incentives, covering prescriptive measures to customized high performance building energy analysis and modeling. The Program started in October 2003 but wasn't fully operational until January 2004. Science Applications International Corporation, SAIC, is the Program Management Contractor, performing the detailed design, management and implementation in cooperation with, and under contract to Energy Trust of Oregon, Inc. The purpose of the New Building program is, in simple terms, to "buy" electric and natural gas energy savings from new commercial buildings. Acquiring energy savings is the leading objective, with market transformation and technology development taking secondary levels of importance with the program. Participants to the program include any new

¹ The Energy Trust of Oregon began operation as a non-profit, charitable organization in March 2002 to fulfill a mandate to invest "public purposes funding" for energy efficiency, conservation and renewable energy resources in Oregon. The mandate emerged from 1999 energy restructuring legislation (Senate Bill 1149) that included a 3% public purposes charge to the rates of the two largest investor-owned utilities. Subsequent action by the Oregon Public Utility Commission encouraged the startup of a new non-profit organization to administer the funds created by the legislation. The state's largest natural gas utility voluntarily decided to participate. Energy Trust is dedicated to changing how Oregonians use energy by promoting energy efficiency and clean renewable energy for Oregon customers of Pacific Power, Portland General Electric, NW Natural and Cascade Natural Gas. More details on the New Building program may be found at: www.energytrust.org/newbuildingefficiency.

construction or major renovation of commercial, industrial and mixed-use buildings, as well as larger multi-family housing, located within the participating utilities' service territory.

Services offered by the New Building program include financial incentives for energy-efficient design that exceeds Oregon's Non-Residential Energy Code requirements. The value of the incentive is dependent upon the amount of energy saved annually.

The New Building program offers four options for new construction and major renovation projects:

- **Standard track** includes a set of prescriptive measures and incentives that are available after the program verifies installation. Historically, the incentive cap on the Standard Track topped out at \$50,000 but the program has expanded the cap to \$100,000 in 2008 to encourage more efficiency measures.
- **Custom track** offers a \$0.10/kWh and \$0.80/therm incentive for energy savings that exceed Oregon Energy Code as demonstrated by an energy model or calculation. In 2008, the incentive cap for the program was raised from \$200,000 to \$300,000. Technical Assistance incentives are also available to help with energy strategy design and modeling. These incentives are valued at 50% of the total incentive up to a cap of \$25,000. For 2008, the Technical Assistance incentive is now *in addition* to the energy-savings-based incentive. Custom Track participants can also receive incentives for commissioning valued at \$0.03/kWh and \$0.20/Therm and capped at \$40,000. For 2008, Custom Track can be combined with Standard Track for a total maximum incentive of \$465,000.
- **The Leadership in Energy and Environmental Design New Construction (LEED™ NC) Track** offers incentives based on the number of Energy and Atmosphere Credit One points, building size and occupancy type. This track allows LEED™ NC projects to pursue Energy Trust incentives without having to run two separate energy models: 1) one using ASHRAE 90.1 -2004 as the baseline to satisfy LEED™ NC, and 2) another using the Oregon Non-Residential Energy Code as the baseline to satisfy New Building program Custom Track requirements. Historically, this track has only been able to accommodate savings and pay incentives for buildings with a maximum size of 100,000 ft². In 2008, this track was expanded to accept the same energy analyses that are used for LEED™ NC certification to streamline participation for buildings of any size.
- **The ENERGY STAR® track** encourages buildings that have already participated in the Standard Track or did not participate in the program to acquire energy savings by achieving the U.S. Environmental Protection Agency (EPA) ENERGY STAR® rating.² ENERGY STAR® incentives provide \$1,000 to \$30,000 per eligible project. Based on the space type, geographical location, and level of business activity, a facility may use EPA's national energy performance rating system, Portfolio Manager, to obtain a rating on a scale of 1 to 100. Facilities that meet certain criteria and achieve a rating of 75 or higher are eligible to apply for the ENERGY STAR® incentive option through Energy Trust.

² The EPA's ENERGY STAR® building energy performance rating is determined by comparing the specific building to similar building through the Portfolio Manager tool. More information can be found at http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager.

Since the Program's inception, SAIC and Energy Trust have applied a continual improvement process to look for opportunities to better apply the tools, knowledge and personnel resources that are already in place, to capitalize and expand on offerings and processes of the New Building program, and to pursue innovative and effective approaches to improve the savings results and the cost-effectiveness.

In facing such challenges as reducing free ridership rates, reaching into small and medium-size building markets, streamlining program processes, and delivering marketing and outreach more cost-effectively, several questions continually emerged to the forefront of the New Building program planning and execution.

- How can the Program be made to be more sustainable in terms of incentive payments, services and implementation?
- Can market channels be used to a greater degree to continue to reduce the cost of the Program?
- Can prescriptive incentives be expanded to reduce the technical assistance costs or expand markets?
- What motivators, beyond incentives, can be used to support energy efficiency decision-making?
- What methods and means can effectively serve small and medium buildings?
- Can program resources be deployed more effectively by focusing on key building types, or market sectors?
- Can external market factors such as Energy Code revisions, green building interests, rising energy costs be leveraged to influence building energy efficiency?

Program Participation History

Table 1 demonstrates that 76% of the program's total number of projects has been less than 100,000 square feet (SF) in size. However, half of the program's total electric savings and 66.7% of total gas savings have come from projects over 100,000 SF. This illustrates that large projects have been a major part in delivering savings. To deliver the most cost-effective savings it makes sense to recruit large projects when they are available until either the number of large projects or program incentives are exhausted. Generally, available large projects have been depleted before the incentive budget, making it possible for the program to bring in more, although less cost-effective savings, on the margin. The total mix of projects, including the large projects with their high concentrations of savings, has resulted in a very cost-effective program with levelized costs of \$0.019/kWh and \$0.12/Therm.³

³ Unless otherwise noted, savings numbers in this paper are based on savings where "true-up multipliers" have been applied. "True-up multipliers" account for engineering realization rates and "free-rider" factors. Levelized cost metrics are based on savings numbers where "true-up multipliers" have been applied.

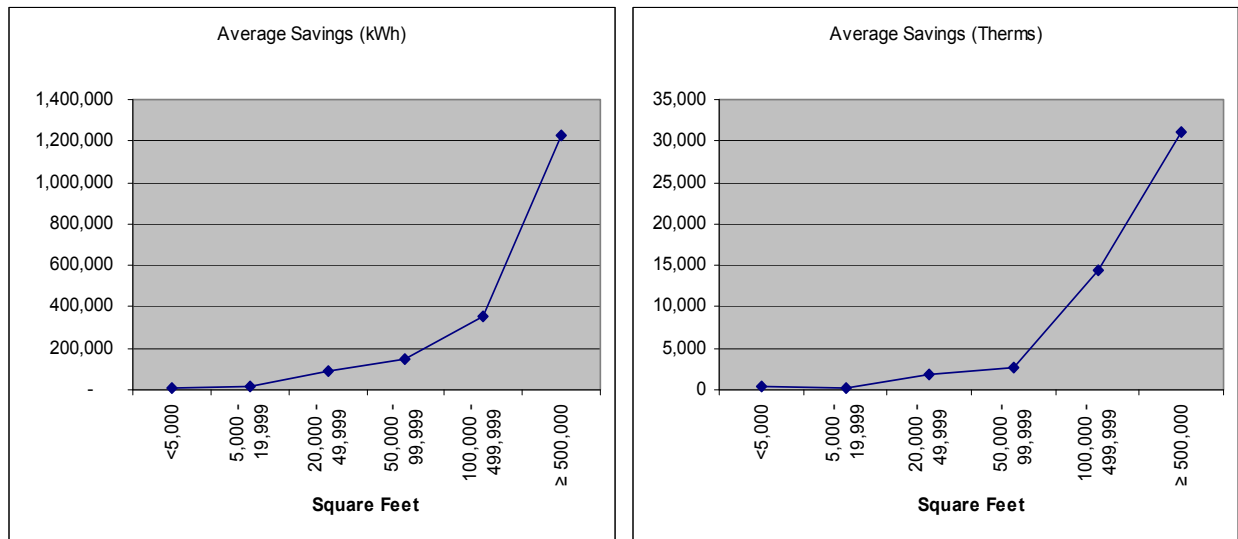
Table 1. Program Savings by Participating Building Size from Program Inception thru 11/1/07

Building Area (sq. ft.)	Total number of buildings	Percentage of total buildings	Electric Savings (kWh)	Percentage of Total Electric Savings (kWh)	Gas Savings (Therms)	Percentage of Total Gas Savings (Therms)
<5,000	30	9%	128,595	0.4%	13,383	1.2%
5,000 - 19,999	126	36%	1,979,207	5.4%	27,513	2.6%
20,000 - 49,999	104	30%	9,482,720	26.1%	190,661	17.8%
50,000 - 99,999	45	13%	6,577,298	18.1%	125,024	11.7%
100,000 - 499,999	45	13%	15,763,142	43.3%	652,030	60.9%
≥ 500,000	2	1%	2,454,163	6.7%	62,248	5.8%
	352	100%	36,385,125	100%	1,070,857	100%

Source: Energy Trust of Oregon Analysis of Program Data.

It is not surprising that average savings increase as building size increases (see Figure 1). Figure 1 further highlights that the program should pursue large projects in order to achieve a low program levelized cost per unit savings. Large projects tend to be high profile, easy to target, and may emphasize environmental and/or public recognition. This makes them easy and desirable targets for the New Buildings program. There are, however, a substantial number of other projects that are not as easily contacted and recruited. Historically, the program has not differentiated marketing strategies; it has used a “blanket” approach to reach the market. In 2008, some significant marketing enhancements have been put in place to create different approaches and offerings.

Figure 1. Average Savings per Project vs. Building Size



Serving Buildings Less Than 100,000 Square Feet

Reaching into the small- to medium-sized new building market was a key target area to expand the program’s presence. However, this market presented several challenges. Often buildings in these size ranges do not take the “typical” design, spec, bid and construction approaches; faster design-build approaches, or standard designs are often used. Furthermore, the energy savings

that may be obtained from projects in this size range can be limited such that the cost of an energy analysis may not be justified, even with financial incentives. Therefore, key strategic approaches to this part of the building market should attempt to lower the participation costs.

Several enhancements were developed to provide more cost-effective paths for this small- and medium-sized building market to participate in the New Building program. Several of these inter-related items include, in summary:

- Additional Equipment in the Standard Track
- Service Incentive of \$500 for the Standard Track assistance
- Increased Standard Track Maximum to \$100,000
- Incentives for LEED™ NC Certification

The below strategies were undertaken to include inter-related elements to address both the control of free ridership and the reduction of the cost for participation in the small- to medium-sized building projects.

Strategic Program Improvements

To address wider markets and reduce transaction costs for both the Program and the participants, streamlined processes, prescriptive incentives, and “self-service” capabilities were expanded. Streamlining the processes for the submittal, approval and verification of projects faced issues regarding program business risk exposure, technical verifications, and business/legal ramifications. Expanding technical measures under the prescriptive incentives were challenged to pass societal benefit-cost tests, yet decisions were not solely based on the “numbers.” Especially for the underserved mid-sized buildings, decisions also included issues of market transformation influences, appropriate technology applications, and the potential funding exposure for the Program. Also, specific incentive mechanisms were developed to integrate with LEED™ NC and to encourage LEED™ NC Certification to extend into more areas of the new construction market.

Streamlining and Simplifying Program Processes

This strategy focused on making participation easier and providing more accurate and complete information to reduce the amount of Program time and effort for correction of errors, and speed the ultimate approval of projects. In effect, this reduces the cost for both the participant and for the Program.

The New Building program has endeavored to continuously improve processes as part of the day-to-day operations. These continual improvements often manifest themselves in a series of small, almost unnoticed improvements to the Program involving such areas as clarifying specific protocol, or developing internal procedures for work flow, or designing and delivering improved technical processes for the energy analysts. From this improvement process, many noteworthy enhancements have greatly improved the ease of participation and the quality of information provided to the Program, several which are discussed below.

Revision to application forms was implemented as a mid-term improvement for the Program. The forms for all tracks and elements of the Program were changed to make their completion easier for the participants, and to improve the quality of information received by the Program. All forms were put on Excel and an electronic submission of the form is required; previously all forms were in a Word or PDF format and were largely completed by hand and submitted by paper copy. Going to Excel offered several improvements including:

- Auto-completion of repetitive information, such as names and addresses, was possible across the integrated application spreadsheet.
- Different forms that are needed at different stages of the project could be linked, for example, the original application data can carry through to the completion submittal forms.
- Automatic checks can be done on the information entries to improve the quality of the data received, for example, date sequences are checked to ensure that they are in chronological order.
- Energy savings calculation and other data attributes that are needed by the Program, but that are no concern to the Participants, can be integrated into the forms in hidden worksheet calculations.

The conversion to Excel with electronic (e-mail) submittal also supports improvements to the program processes.

Modified processes were put in place for several areas and for several reasons, but overall, these revisions were intended for: 1) allowing more streamlined and easier processing, 2) capturing more and better participation, or 3) providing more clear information to the participants about the Program processes.

Electronic submittal procedures were developed to require that the participants submit applications via e-mail. Initially, it was intended that electronic signatures be used, however, business and legal restrictions of the Energy Trust prohibited this approach. Alternately, the Program can now accept either an original or FAX signature which is sent in complement to the electronically transmitted applications. A waiver policy was established so that any applicant without e-mail could still participate, but this is intended to be the rare exception.

Custom and high-performance tracks were combined into one single track, now called Custom Track. The initial design specified two tracks with the Custom track intended for measure-level analysis with a lower incentive maximum of \$100,000. The High-Performance Track was intended to be for more comprehensive, whole building energy analyses and integrated building projects with a maximum of \$200,000. Over the first years' of the Program, the experience showed that projects differed not by their energy analysis approach, but rather in the scale of their energy savings. There was little or not distinction between the two tracks, otherwise. Therefore, since both these tracks already required analyses to be submitted, they were combined into one Custom Track.

A project notification process was established to capture projects that were early in their development. It was found fairly soon after the Program entered the market that there were many interested parties who were planning to build, but had not yet developed their building

project sufficiently to describe the potential energy efficiency measures, even at a schematic level. Therefore, this Project Notification allows the participant to register their “not-yet-fully-defined” projects so that the Program can begin to help in the early development stages.

A professional engineer’s certification process was added to provide a streamlined sign-off for energy analyses that are submitted under the Custom Track. Typically, the Program reviews energy studies and model results as part of the project approval process. However, in some cases, and especially with larger, more complex building projects, the energy analysis can become very complex and integral to the on-going design processes. Under these situations, the Program seeks to work with the building designers, and to accept the studies that should be available from these processes. This process gives the participant an option to have a Professional Engineer (of the owner’s choice) stamp and certify that the energy analysis complies with the Program requirements, ASHRAE guidelines, and reasonable practice protocol. Under such acclamation, the Program then only needs to perform a cursory review, saving time for both the Program and the participant.

Analytical guideline and submittal requirement processes have been developed and evolving over the Program life. Detailed energy analysis modeling guidelines and processes were designed and documented to provide clear direction of the various program requirements for the Custom Track energy analysts. Over the course of the Program’s operation, as individual projects participated, new situations arose that caused on-going refinements to the analysis guidelines. These have been developed in consensus with the building design and energy analysis community. As major issues arose, proposed solutions and approaches were both solicited from and screened by these energy analysis practitioners.

Expanding Program Offerings

Increasing and modifying portions of the incentive offerings of the New Building program is a primary strategy that affects both the quantity and the reliability of the achieved energy savings. This strategic area also includes improvements to the program offerings to the new building market that encourage greater uptake of improved energy practices, help to control free ridership, and potentially increase the participation of small- to medium-sized buildings. Several enhancements were made to expand the offerings, responding to the opportunities and needs of the market.

Additional standard track incentives were developed to expand the energy efficient equipment and technology offerings. Since these are in essence “pre-qualified” energy efficiency measures, an energy analysis is not part of the participant’s submittal. Unit incentives for energy-efficient chillers, air-to-air heat exchangers, water source heat pumps, geothermal heat pumps, and demand controlled ventilation have been added to the prior offerings such as lighting, motors, air-conditioners, variable speed drives and efficient natural gas equipment. The intent is to reduce the cost for participation by eliminating the need to do an energy analysis, and to encourage the uptake of more aggressive energy efficiency measures. Both of these effects can attract more buildings in the less than 100,000 square foot size range.

Increasing the standard track incentive maximum to \$100,000 per project (up from \$25,000 and \$50,000 previously) was done to encourage greater use of this program path. This is especially pertinent to the small- to medium-sized buildings where the energy savings potential and project budgets do not always support use of the Custom Track. Additionally, this change benefits all Custom Track projects by allowing energy analyses to be foregone, at the analyst's and owner's discretion, for measures that are widely accepted as energy-efficient and cost-effective.

Service incentive of \$500 for standard track applications was instituted to support vendors, contactors, and representatives to complete the Program applications and supporting documents for participants. While the Standard Track does not require energy analyses, it does require product documentation submittals. Oftentimes, these submittals are beyond the technical knowledge of the participant, therefore, this incentive was added to encourage that those involved in the equipment supply to develop the Program submittal information. This allows a channel for the participant to get help in completing the application and supporting documentation submittals, and it benefits the Program by receiving higher quality, more complete submittals.

Compatibility with other state programs is also established through the New Building procedures and guidelines. The Oregon Department of Energy (ODOE) administers the State Energy Efficient Design (SEED)⁴ program for State buildings, and the Business Energy Tax Credit (BETC)⁵ program. Both of these programs encourage energy efficiency, and they both have energy analysis requirements and guidelines. The New Building program procedures are designed to be compatible with these programs to minimize additional work on behalf of the participants, and consistency with ODOE is maintained. While SEED modeling standards are not required by the New Building program, they are acceptable to the Program. Further, the Analytical Guidelines are compatible with BETC requirements since BETC energy savings estimates can use any creditable analysis method.

An incentive offering for LEED™ NC certification was developed to encourage building projects to complete the full certification process with the U. S. Green Building Council – the actual throughput to LEED™ NC Certification is only about 10% for LEED™ NC registered projects.⁶ The participant's process is streamlined because the New Building program accepts LEED™ NC energy savings results and the LEED™ NC Certification issued by the USGBC for the building.

⁴ SEED was originally established in 1991 as a result of Oregon State law, ORS 276.900-915. This law directs state agencies to work with the Oregon Department of Energy to ensure cost-effective energy conservation measures (ECMs) are included in new and renovated public buildings. It was revised in 2001 to require that all state facilities constructed on or after June 30, 2001 exceed the energy conservation provisions of the Oregon State building code by 20 percent or more. More information can be found at <http://www.oregon.gov/ENERGY/CONS/SEED/SEEDhome.shtml>

⁵ Oregon's Business Energy Tax Credit (BETC) is for investments in energy conservation, recycling, renewable energy resources, or less-polluting transportation fuels. The tax credit can cover costs directly related to the project, including equipment cost, engineering and design fees, materials, supplies and installation costs. More information can be found at <http://www.oregon.gov/ENERGY/CONS/BUS/BETC.shtml>

⁶ U.S. Green Building Council's LEED® registration and certification statistics in 2006. Website: www.usgbc.org

There are three options for LEED™ NC projects in the New Buildings program. The first is the prescriptive LEED™ NC Track. The second option is to apply via the Custom Track and the third is to use a de-rating of the savings analysis already required by LEED™ NC.

Prescriptive LEED™ NC Track energy savings and respective incentives are determined based on the Energy and Atmosphere Credit 1 points for energy savings. Using Energy Utilization Indices (EUIs) for building types in the Pacific Northwest⁷, space occupancy type, square footage and the version of LEED™ NC sought, an algorithm determines the incentive amount and the savings up to 100,000 SF for specific space types. The values for savings and incentives can be calculated because there is a correlation between energy saving and square footage for buildings under 100,000 SF. However, this limits the amount of incentive paid by the program, and proportionately the amount of savings recognized. The requirements for project documentation are items that are part of the LEED™ NC certification process. When LEED™ NC projects apply through the Custom and Standard Tracks, documentation and analysis is required that is additional to the LEED™ NC certification process. For the Standard Track this includes product data sheets and invoices. For the Custom Track this includes savings calculations using the Oregon Non-Residential Energy Code as baseline, individual measure calculations, individual measure incremental costs, and interactive total savings.

To streamline documentation and analysis requirements, a third option was developed to allow the LEED™ NC-required analyses to be accepted. For LEED™ NC projects pursuing Energy & Atmosphere Credit 1 points using Option 1 – Whole Building Energy Simulation, a LEED™ Track that accepts ASHRAE Standard 90.1 as the baseline was established. The savings and incentives are determined by de-rating the LEED™ NC savings data as shown in Table 2 below.

Table 2. LEED™ Savings Adjustment Data

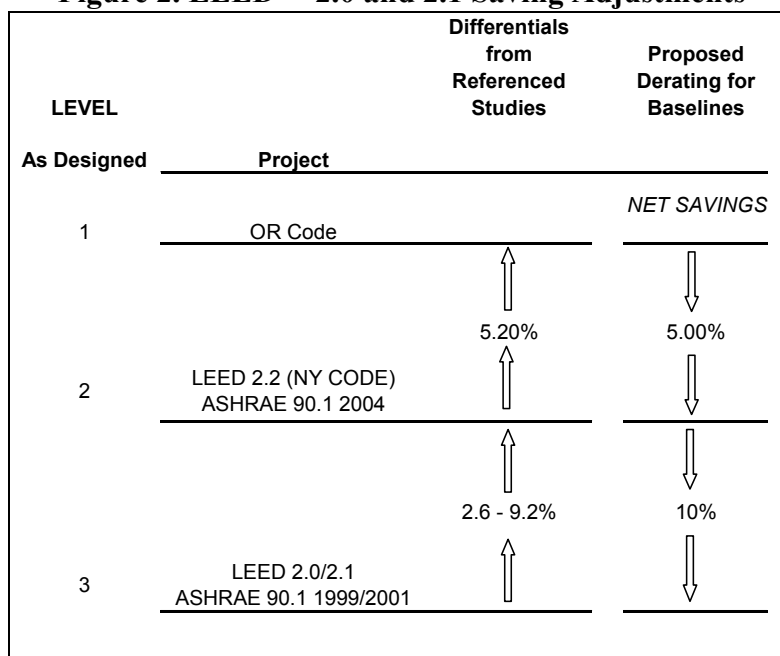
LEED NC Version	ASHRAE Baseline	% Difference per NY Study	% Difference per OR Study	Proposed Adjustment Factor
2.2	90.1-2004	NA	5.2%	-5%
2.1	90.1-1999/2001	2.6% - 9.2%	NA	-15%
2.0	90.1-1999/2001	2.6% - 9.2%	NA	-15%

The de-rating factors were determined based on the findings of the Oregon Department of Energy (Oregon Department of Energy 2007) and on the findings of Pacific Northwest National Laboratory (PNNL) study for New York (Gowri, Haverson & Richman 2007). The Oregon study concluded that the Oregon Non-Residential Energy Code is approximately 5% better than the ASHRAE Standard 90.1-2004. Therefore, a de-rating factor of 5% is used for LEED™ NC Version 2.2 projects to address the savings difference. The New York study concluded that the savings differences between the ASHRAE Standard 90.1-1999 and -2001 versions and the 2004 version range from 2.6% to 9.2%. It also showed that the majority of energy savings came from lighting and other non-weather-sensitive elements; therefore, it was justified that the general savings differences could be applied for the New Building program in Oregon. For all projects that submitted to LEED™ 2.0 and 2.1 a conservative de-rating factor of 10% is used by the New Buildings program to address these savings differences. When the 5% de-rating factor to account for the differences between the Oregon Code and ASHRAE 90.1-2004 is added to the

⁷ EUIs developed by Portland General Electric were applied. EUIs are a measurement of the annual energy use typically expressed as Btu per square foot per year.

10% factor, this results in a total de-rating factor of 15% for LEED™ NC 2.0 and 2.1. Figure 2 below illustrates the savings adjustments.

Figure 2. LEED™ 2.0 and 2.1 Saving Adjustments



The benefits of the LEED™ NC Track benefits to both the program and the participant include:

- Eliminating the additional engineering and the associated costs incurred for participation in the New Building program.
- Easy adjusting of differences between an Oregon Code baseline and an ASHRAE Standard 90.1 baseline by simply de-rating the savings.
- Easier documentation process for participant - The required documentation for the New Building program is part of the data created in the LEED™ NC process.

A commissioning track was added to encourage and support new building energy measure commissioning to test, adjust and document that energy efficiency measures are installed and operating to their design intent. A pilot Commissioning Track began January 1, 2006 with a \$40,000 per project cap and the incentives calculated at \$0.03/kWh and \$0.20/therm (roughly a 30% bonus) from energy efficient measures that were approved through the Custom Track and are electrical or mechanical systems that have variable performance or controls. The Commissioning Track was put into the New Buildings program as a permanent element of the Custom Track in 2007.

Conclusion

The New Buildings program continues to refine and adapt both its incentive and service offerings to approach and capture different sectors of the new building market.

Program features and offerings are designed and adapted to meet the needs of the market. Streamlined processes, prescriptive incentives, and the opportunity to “self-service” reduce transaction costs. A specific track enables participants to pursue incentives for energy savings in pursuit of LEED™ NC certification. The program supports building energy system commissioning to encourage the market to adopt post-construction verification of energy performance. Solar incentives are being integrated into the program to deliver single-source program services. Program processes complement the State’s requirements to receive tax credits. Special outreach efforts are intended to engage more remote communities, capture more diverse buildings, create alliances, and increase support for design professionals. Program history demonstrates that projects of many types and sizes have used the options available through the various program tracks.

The experiences of the program’s flexibility and adaptability to market opportunities is transferable to other state, utility, and public purpose fund programs to implement both market- and cost-effective commercial new construction programs.

References

Oregon Structural Specialty Code (OSSC), *Chapter 13: Non-Residential Energy Code Text* (effective April 1, 2007 - OSSC based on the IBC). <http://www.oregon.gov/ENERGY/CONS/Codes/codehm.shtml> Oregon Department of Energy, Conservation Division. Salem, Oregon.

Oregon Department of Energy. “*Final Report, Comparison of Oregon Energy Code 2005 & ASHRAE Standard 90.1-2004.*” Prepared under DOE Codes and Standards, Special Projects, DE-FG51-01R021293.

Gowri, G., Halverson, M.A., and Richman, E.E. August 2007. “*Analysis of Energy Saving Impacts of ASHRAE 90.1-2004 for the State of New York.*” Pacific Northwest National Laboratory, PNNL-16770 prepared for U.S Department of Energy Contract DE-AC05-76RL01830.