Economic Impacts of Portland's High Performance Green Building Policy

Prepared for City of Portland Office of Sustainable Development

Prepared in conjunction with Clark Brockman, SERA Architects

ECONorthwest
ECONOMICS • FINANCE • PLANNING

888 SW Fifth Avenue
Suite 1460
Portland, Oregon 97204
503-222-6060
www.econw.com

Jules Kopel-Bailey, Alec Josephson

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Executive Summary

The City of Portland has outlined with stakeholders a proposed "High Performance Green Building Policy" (HPGBP). ECONorthwest, in partnership with SERA Architects, contracted with the City to evaluate the economic impacts of the HPGBP. This report presents a framework for analyzing the economic benefits of the policy, and projects benefits (direct, indirect, induced) likely to occur based upon assumptions about future construction, building mix, technology costs, and energy savings.

The proposed HPGBP is a "feebate," with a fee for construction that meets the minimum code, a fee waiver for new buildings that meet LEED Silver plus minimum energy and water efficiency levels, and a rebate or reward for new high performance green building projects that meet LEED Gold and above. The HPGBP also requires existing commercial buildings to disclose energy usage, water usage, and stormwater management data.

The evaluation had five-steps: (1) estimate green building technology frequency of use in Portland; (2) estimate incremental spending for green building technologies; (3) estimate total spending by scenario, building type, and technology; (4) estimate economic impacts using input-output analysis (IMPLAN); and (5) calculate impacts from energy savings.

The IMPLAN analysis projects annual growth in employment and economic output from three HPGBP scenarios. This projected growth is "net" in the relationships between sectors (there is no double counting of benefits), but it is "gross" in that it does not include any potential decrease in the economy or construction from the policy. In summary, under the high scenario, ECO's analysis shows the program could lead to:

- Over $14 million in increased annual output and 119 new jobs in the Oregon economy from construction impacts in the first year
- 8.8 new jobs per year created through energy savings, and approximately 44 new jobs over the first 5 years of the program
- Benefits to environmental and amenity benefits, and benefits to public infrastructure as evidenced from a review of the literature

Because the scope of the project cannot account for all variables, ECO relied on the City for key assumptions, including percent of buildings receiving a waiver or reward under each scenario, total square footage of buildings constructed by type, and total energy savings by type. The City also compiled and calculated the incremental cost data for ECO. In addition, the figures do not project a likely rise in energy prices, or future

changes in technology, state building code, cost of implementation, or changes in building mix / total square footage.

Main report

The City of Portland has been a leader in promoting green building construction. Portland has consistently ranked in the top cities nationally for sustainability, and has among the most LEED (Leadership in Energy and Environmental Design) certified buildings of any city in the U.S.[i]

The benefits of green building practices are well documented. Greater energy efficiency is critical to any climate change strategy. Buildings in the U.S. make up 39% of total energy use, 68% of total electricity consumption, and 38% of carbon dioxide emissions.[ii] The economic costs and benefits of green building policies are less clear. The American Council for an Energy-Efficient Economy (ACEEE), which looked at the issue of economic benefits in a June 2008 report, found "there are a large number of state-level studies that suggest a small but positive benefit for the American economy as a result of policies that emphasize investment-led energy efficiency improvements."[iii] The ACEEE study looked at 48 statewide energy efficiency programs, concluding that they "show an average 23 percent efficiency gain with a nearly 2 to 1 benefit-cost ratio."

Working together with stakeholders, the City of Portland has outlined a proposed program intended to spur the use of green building technologies within the City known as the "High Performance Green Building Policy" (HPGBP). ECONorthwest, in partnership with SERA Architects, has contracted with the City to evaluate the economic impacts of the proposed HPGBP. This report presents a framework for analyzing the economic benefits of the policy, as well as projects a range of benefits (direct, indirect, induced) likely to occur based upon assumptions about future construction, building mix, technology costs, and energy savings.

Organization of this report:

- **Background** describes the history of the HPBGP, outlines the policy, and provides a context for understanding LEED certification
- **Framework for the analysis** offers a way to think about economic benefits generally and in the context of this study. It (1) defines economic benefits, (2) gives the scope of the analysis (3) lists key assumptions and limitations of the study (4) and describes evaluation methods used
- **Results** gives the results of the analysis, focusing on the range of output, income and job impacts of the proposed HPGBP
- **Conclusions** offers our discussion of the results, and suggestions for future study

- **Appendices** follow, containing data by building type (A), LEED point distribution in Portland (B), and endnotes (C)

1 BACKGROUND

The City of Portland created the Office of Sustainable Development (OSD) in 2000. As one of its many functions related to sustainability, OSD offers green building technical assistance, education and financial incentives to the building community and the general public. In 2001, the City required new construction of municipal buildings to obtain U.S. Green Building Council (USGBC) LEED Silver certification, later raised to Gold in 2005. The Portland Development Commission (PDC) adopted its own green building policy in 2001, requiring that all construction projects supported by PDC funds achieve LEED certification, later raised to Silver in 2005.

To build on the environmental and potential economic benefits of past green building initiatives, Council directed OSD to develop additional green building policy options for commercial and residential buildings in 2007. OSD has been working with stakeholders to outline the elements of the HPGBP, and a Technical Advisory Group (TAG) has been meeting since March 2008 to recommend local amendments to the State building code for green building practices.[iv]

1.1 HPGBP PROGRAM DESCRIPTION

The HPGBP is a proposed set of revenue-neutral policies and incentives designed to encourage environmentally friendly development and construction practices in the private sector. Rather than mandating LEED buildings, the feebate requires a new green building fee for new construction to create a revenue-neutral green building fund that pays rewards to high performing buildings. Similar to LEED buildings in general, OSD identifies the goals of the program as ones that:

- Reduce global warming and air pollution
- Maximize energy efficiency and cost savings
- Decrease consumption of potable water, especially during summer months
- Increase onsite stormwater management
- Reduce solid waste during construction and operation
- Improve indoor environmental quality, occupant health and productivity
- Increase the number of local, living-wage jobs

Portland's proposed HPGBP program is anchored in the concept of a "feebate," a market-based tool that imposes a fee for a behavior a public entity wants to discourage, and uses that fee to offer a reward for behavior the City wants to incentivize. In this case, the program imposes a fee for new construction that meets the minimum code, a waiver of that fee for new buildings that meet LEED Silver plus minimum energy and water efficiency thresholds, and a rebate or reward for new high performance green building projects that meet LEED Gold and above. The program is intended to be financially self-supporting: payments received from low-performing buildings support reward payments for high performing buildings. In addition to the feebate, the HPGBP requires existing commercial buildings to disclose energy usage, water usage, and stormwater management data. The disclosure requirements are intended to introduce more and better information into the market so that potential buyers or lessees can factor environmental performance into their rent or purchasing decisions.

The feebate will apply to new single-family residential projects of 1,200 square feet (SF) or greater, multifamily residential projects of 5,000 SF or greater, and commercial projects of 20,000 SF or greater. Commercial construction includes assembly buildings, hospitals, hotels, offices, retail stores and schools. Industrial buildings and warehouses are not covered by the feebate since these buildings are generally unoccupied or consume resources primarily through manufacturing processes rather than building operation. Multifamily buildings include residence halls, apartments and condominiums with at least three units. The commercial and multifamily feebate program works as follows:

- **Reward.** For new buildings that attain a LEED Gold or Platinum rating and improve energy performance by 35%, a payment is made to the building owner when LEED certification has been completed. Environmental performance and building size would affect the amount of the reward.
- **Waiver.** For new buildings that reach a LEED Silver rating and improve energy performance by 25%, a payment waiver is given.
- **Fee.** For buildings that do not reach LEED Silver rating and minimum energy performance thresholds, a fee is assessed. This fee is used to make reward payments to high performance buildings.[v]

The single-family residential feebate program works similarly to the commercial and multifamily program. The policy description produced by the City describes the single-family program this way:

The City proposes to work with area builders to continue to increase the prevalence of certified green homes and to achieve performance targets for the percentage of new homes built that achieve these standards. If the residential market transformation toward green building continues, a feebate may not be necessary to achieve the City of Portland's residential performance targets, as follows:

- In 2009, 20% of new homes certified as Earth Advantage (EA) or LEED for Homes
- In 2010, 30% of new homes certified as EA or LEED for Homes
- In 2011, 40% of new homes certified as EA or LEED for Homers

The City will annually monitor the percentage of EA or LEED for Homes certified projects to determine whether the policy's performance targets are achieved. Verification of performance targets will be based on anew residential buildings with an R3 permit occupancy classification (defined by the 2007 Oregon Structural Specialty Code).

Note that this economic impact analysis assumes that targets have not been met. Thus, when the feebate is in effect, the program works as follows:

- **Reward.** A reward is paid to the property owner upon verification of LEED for Homes Silver or EA Gold certification. A fixed reward amount is offered based on the home's performance, not the size of the home. Homes less than 1,200 SF are also eligible for rewards.
- **Waiver.** A payment waiver is given to homeowners for new construction that meets a green building EA standard.
- **Fee.** A fee is assessed for homeowners whose homes do not meet any green building standard and only build to the minimum Oregon code. The fee varies based on the size of the home.[vi]

The green building standards and energy performance thresholds embedded in the HPGBP are scheduled to be reassessed every three years in accordance with building code cycles. Thus, when the Oregon structural code improves building energy efficiency, the HPGBP would be adapted to raise the minimum waiver and reward thresholds to encourage a higher level of performance over time.

1.2 WHAT IS LEED?

Leadership in Energy and Environmental Design (LEED) is an independent building standard overseen by the U.S. Green Building Council (USGBC) and is probably the most accepted and widely-used

standard for evaluating green building design, construction and operation in the country. In addition to rating systems for new construction, there are also rating systems for existing buildings, commercial interiors, core and shell of buildings, schools, retail, healthcare, homes and neighborhood development. This report only discusses those rating systems applicable to new commercial, multi-family and single-family residential buildings. It is important to have a basic understanding of LEED since it is the standard by which Portland's proposed HPGBP program will reward, waive, or charge building owners as part of the feebate system.

The LEED New Construction (LEED NC) program is a point-based system whereby developers or builders can achieve LEED certification by meeting specified energy, water use, sustainable design, building material use, indoor environmental quality, and design innovation minimum standards. For LEED NC the more standards that are met or exceeded during construction of the building and site, the more points are received by the building and the higher the LEED certification level. For commercial buildings, the USGBC has four levels of LEED NC certification: (1) Certified – 26-32 points necessary (2) Silver – 33 – 38 points necessary (3) Gold 39 – 51 points necessary and (4) Platinum – 52 – 69 points necessary. This rating system applies also to multifamily buildings.[vii]

Single-family homes have a similar rating system, but different standards are used to assign points and assess performance. The LEED for Homes residential rating system evaluates new homes in eight different areas, for which there are a total of 136 points available. These levels translate to the following ratings: (1) LEED for Homes Certified: 45-59 points, (2) LEED for Homes Silver: 60-74 points, (3) LEED for Homes Gold: 75-89 points, and (4) LEED for Homes Platinum: 90-136 points. EA provides an alternative green building certification for residential projects with a similar range of ratings: Silver, Gold and Platinum. The Portland HPGBP proposes to reward single-family residential projects that attain minimum LEED for Homes or EA certification requirements.[viii]

This point system in LEED has important implications for the methodology of this report, which is discussed in section 2.4.

2 FRAMEWORK FOR THE ANALYSIS

This section is a framework for thinking about policy choices and their economic benefits and costs. It is intended to give a context for and aid the reader in evaluating the economic impact results discussed in Section 3. It also presents the methodology for calculating those results.

2.1 OVERVIEW OF ECONOMIC IMPACTS

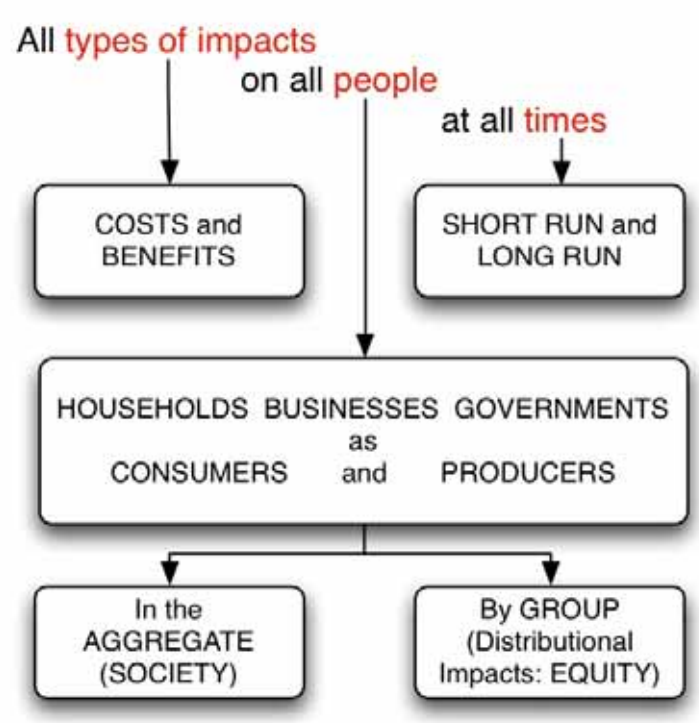
Decision makers must choose the "best" alternative among competing options. An impact analysis typically describes the range and magnitude of likely economic outcomes for each option. In situations where economics is relevant, describing the economic consequences of the possible policy choices helps identify the best option. In this case, the City of Portland seeks to understand what the economic impacts of the HPGBP are likely to be. Impact analysis can help the City understand what the range of impacts for the proposed green building policy is likely to be for the different scenarios considered. An impact analysis can estimate the employment and income consequences for the local economy of the proposed green building policy. Implicit in the feebate concept is the idea that the fees from building construction are invested by another path for economic benefit. City Council can then weigh these benefits against the actual cost of administering the HPGBP program.

Before discussing how ECO calculates economic impacts, it is useful think more broadly about what economic impacts are, and how to measure them. Following that discussion, we give brief overview of some of the literature on economic impacts of green buildings.

2.1.1 What are economic impacts?

Economic impacts are a broad concept. At its core, it is about benefit-cost analysis: summing up all the costs and all the benefits of a policy, measuring how those costs and benefits are distributed among people, and bringing all that information from across time back to today (although, as we explain the methodology section, this report focuses on annual impacts and not cumulative impacts). In essence, economic impact analysis measures what happens, to whom it happens, and when it happens. Figure 1 gives an illustration of cost benefit analysis.

Figure 1: Illustration of economic impact analysis

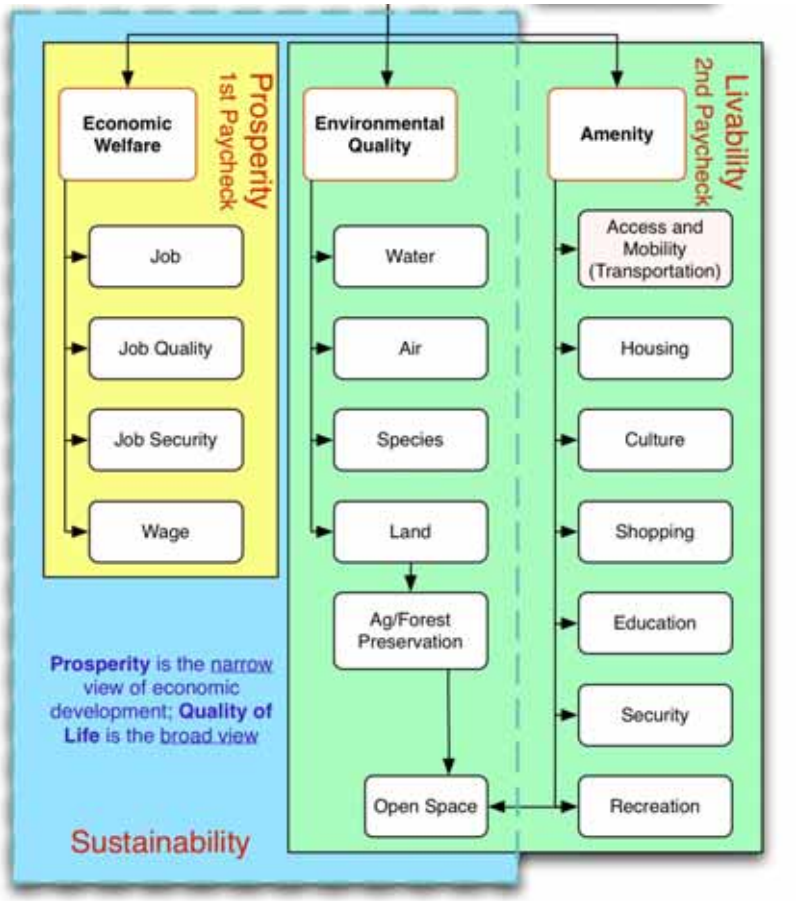


Some techniques in economic impact analysis are easier than others. Some are impossible. Clearly, we cannot measure every possible impact on every possible person across all time. By rule, economic impacts always fall short of a full analysis and contain uncertainty.

To understand the complexity of analysis, it is helpful to think of two categories of economic impacts: the first and second paychecks. The first paycheck has well defined tools and methods associated with measuring it. It is the impact we frequently think of when we think of the economy: jobs, wages, output, etc. The first impact includes energy savings to the extent that cost savings have an effect on output, jobs, wages, etc.

There are, however, a large number of impacts that have very real and valuable effects on people's lives that fall outside these measures. These impacts can be thought of as a "second paycheck." The second paycheck is the value of the environment and amenities, which include not only clean air and clean water, but also education, social networks, culture, recreation, and all the quality of life we enjoy outside the dollars in our bank account. Figure 2 illustrates the two paychecks:

Figure 2: The first and second paychecks



Measuring the second paycheck is less straighforward. One can think of ripples in a pond: the ripples closer to the impact are well defined, localized, and easy to measure. These are the immediate economic impacts. As the ripples move out, they are more diffuse and wide spread, and thus, harder to measure. Examples in the context of the HPGBP might include:

- **Reduced healthcare costs.** A greener and cleaner environment, better indoor environment and air quality, and fewer toxins mean healthier people.
- **Green capitalization.** Higher rents and market values for green office buildings can generate higher tax revenue to local government (see next section). This revenue can support schools, arts, and public safety.
- **Lower taxes.** Green buildings require less public infrastructure for stormwater, sewage, potable water, and power plants. The benefits of reduced infrastructure redounds to the taxpayer.

- **Better learning**. Evidence suggests day lighting in green buildings can improve learning and performance in children and workers.
- **The "green" brand.** Investments in green buildings are an investment in Portland's image as a green city. Possible benefits of this include attraction of knowledge workers and "creative class" employees (residents), increased tourism, and branding for exports.

This report focuses on the first paycheck and does not quantitatively measure the more diffuse benefits and costs of the HPGBP. This is not to imply that these impacts are any less important or real – in fact, they may be greater than the total first paycheck economic impacts. However, the scope and budget of this study necessitate a focus on economic activity created by direct, indirect, and induced jobs and wages through input-output analysis (see sections 2.3 and 2.4 for discussions of the scope and methodology).

To help contextualize the input-output analysis, the next section gives a brief overview of some of the literature on green building.

2.1.2 What the literature says about the benefits of going green

Much has been written about the costs and tradeoffs of employing green technologies in building construction, and by extension, about state or city programs to encourage these technologies. This section summarizes some of the major findings in the literature about green building technologies and their costs and benefits.

- **Going green does not mean more expensive.** A July 2007 study titled "Cost of Green Revisited" by Davis Langdon concluded there is "no significant difference in average costs for green buildings as compared to non-green buildings." According to Langdon "Many project teams are building green buildings with little or no added cost, and with budgets within the cost range of non-green buildings with similar programs." This study compared 83 LEED certified buildings to 138 conventionally constructed buildings with similar development programs. Although the program focused on academic buildings, laboratories and libraries, community centers and ambulatory facilities, the results still have strong indications for all green building types.[ix]
- **Going green has positive employment impacts.** A study by the American Council for Energy-Efficient Economy (ACEEE) in June

2008, estimated that the net employment benefits from resulting from a 20% energy savings (23,600 Trillion BTUs) at a net benefit cost ratio of 3.0 cold create as many as 1.2 million new jobs by the year 2030 across the United States.[x]

- **Green buildings can mean higher rents and higher market values.** An April 2008 study by the Institute of Business and Economic Research and the Fisher Center for Real Estate and Urban Economics found that rents in green office buildings were about 6% higher than in comparable non-green office buildings. The average green office building has $5 million more of market value than a non-green office building.[xi]
- **Green buildings can mean healthier people.** Sick building syndrome is a term applied to buildings with interior environments that cause significant stress to occupants, including headaches, irritation to the eyes, nose and throat, fatigue, and difficulty breathing. While only a small fraction of buildings receive attention as "sick buildings," a Harvard University study found that an estimated 23% of all buildings caused noticeable symptoms in occupants.[xii] Even in buildings where there is no immediately noticeable impact of indoor pollutants, health effects of long-term exposure can cause cancer, genetic toxicity, central nervous system disorders, and damage to gastrointestinal, circulatory, and respiratory systems.[xiii]
- **Green buildings, as part of a strategy for Low Impact Development, have water benefits.** Braden and Johnston (2004), among many others, show that low impact development (LID) can lead to reduced flooding, improved water quality, and increased groundwater recharge. Plumb and Seggos (2007) show LID leads to reduced public expenditures on stormwater infrastructure and reduced energy use. Furthermore, LID can increase aesthetics, and enhance property values (U.S. Department of Defense, 2004).
- **Green buildings can mean better workers and students.** There is a growing body of research that suggests that increased daylight and ventilation, and reduction of indoor irritants, have a significant positive effect on worker productivity.[xiv] Moreover, similar studies conducted in classroom environments have shown similar trends, and have caught the attention of policy makers in California and North Carolina.[xv]

2.2 IMPLAN AND MEASURING ECONOMIC IMPACTS

Section 2.1 described economic impacts in concept. This section describes the types of impacts ECO measured. The City asked ECO to measure the direct, indirect, and induced economic impacts of the HPGBP. These impacts are squarely within the first paycheck, and are commonly produced by a technique generally called "input-output" analysis. This technique is often called IMPLAN after the company that provides economic data necessary to run the model.

Before describing IMPLAN, we first describe the three general categories of impacts: (1) direct (2) indirect and (3) induced.

Direct impacts are the change in income and employment from the direct sales of good or services. For example, a $1 million increase in window sales might increase employment at the window factory by 10 employees. Another way of thinking about this relationship is that it takes 10 employees to produce $1 million worth of high-efficiency windows. Direct impacts, therefore, describe the changes in economic activity in the industry sector or group of sectors that first experiences a change in demand as a result of a policy decision or development option.

Indirect impacts are the second stage of impacts as a change in demand ripples through an economy. Indirect impacts are driven by the economic linkages among firms and sectors. An increase in sales of high-efficiency windows increases the demand for the inputs used to make the windows (fiberglass frames, equipment for cutting glass, etc). Indirect employment impacts are the change in employment at firms that manufacture the inputs. In the example, a $1 million in green window sales might generate 10 jobs directly and 4 jobs indirectly in the various businesses that supply green window components. Indirect impacts, therefore, describe the change in economic activity in industry sectors or groups of sectors that are linked to and driven by the direct change in economic activity.

Induced impacts capture the final stage of economic consequences of a change in demand. Induced impacts are generated by the change in household and business spending patterns that result from direct and indirect impacts. In the example, a $1 million increase in high-efficiency window sales generates the equivalent of 14 direct and indirect jobs. These 14 jobs mean 14 new paychecks. The induced impacts are the increase in household expenditures as a result of this new income. Completing our example, $1 million in window sales might result in 12 new induced jobs. Typically, these impacts are spread throughout the sectors of an economy.

These three concepts flow clearly into the idea of input-output analysis and IMPLAN. Businesses in an economy are linked by their patterns of purchases and sales of goods and services. We distinguish between backward and forward linkages. Backward linkages begin with a finished good and describe the goods and services that go into the production of the good. For example, backward linkages for the production of motors within heating and cooling systems (called HVAC systems) include purchases for ducting, fans and other machined parts, sheet metal, paint, oil, wiring, etc. Increasing the production of motors for HVAC systems increases the demand for and production of the goods and services that are components of the system. Forward linkages begin with a good and describe the products or services that use this good as an input. Forward linkages for an HVAC system motor could be the production of other motor/fan systems, such as for air compressors. Increasing the production of any of these items increases the demand for and purchase of motors.

Another way of describing these backward and forward linkages is as production inputs and outputs. The input-output analytical method takes its name from these linkages in an economy. An input-output model describes the backward and forward linkages in an economy and estimates how a change in demand for a good or service works its way through these linkages. For a given change in demand for a good or service, input-output models can estimate the resulting change in output of all goods and services in an economy, the change in employment as a result of this change in output, and the change in income as a result of the change in employment.

The benefits of expenditures accrue to the economy where the goods or services are produced, which may be different from the economy where the goods or services are purchased. For example, leakages of economic benefits occur whenever goods and services are imported into an economy. In the HVAC example above, if the economy in question contains a manufacturer of ducting but does not contain a manufacturer of wiring, the economic benefits associated with the production of the wiring leaks out of the local economy. While the increase in production of HVAC systems will benefit the local economy, the portion of the economic benefits tied to the manufacture of wiring will not. These relationships are summarized in large matrices called inter-industry transactions matrices.

One of the most common software packages used to conduct input-output analyses is IMPLAN (for IMpact analysis for PLANning). ECO has applied the model to a variety of public- and private-sector projects. IMPLAN generates a model of the economy within the specified geographic area (in this case Multnomah County and the State of Oregon). The model includes a description of the relevant input-output linkages

and the portion of economic activity that leaks out of the modeled economy. IMPLAN breaks an economy down to 528 separate sectors. Sectors can be grouped or combined depending on the focus of the analysis. IMPLAN's 528 sectors correspond closely to the US Bureau of Economic Analysis' sectoral scheme.

IMPLAN can estimate five types of impacts for each of the 528 individual sectors or groups of sectors: industry output or production, personal income, proprietor income, value added, and employment. IMPLAN can further breakdown each type of economic impact into three sub-categories: direct, indirect, and induced impacts. IMPLAN describes output, income and employment in terms of multipliers for direct, indirect, and induced impacts. Multipliers summarize the impacts on a sector or groups of sectors of a *given* change in demand for goods and services. There are several types of multipliers:

- **Output multipliers** typically describe the change in output in an economy per dollar of direct impact. Output multipliers are further categorized as direct, indirect and induced output multipliers. All of these multipliers are expressed as the dollar change in output per dollar change in indirect, direct or induced impacts. The total output multiplier represents the sum of direct, indirect, and induced impacts per dollar change in direct output. As an example, if the direct output multiplier is 1.00, the indirect output multiplier is 0.20, and the induced output multiplier is 0.38, the total output multiplier is 1.58. This indicates that for each dollar increase in direct output, the total increase in output in the economy is $1.58.
- **Income multipliers** work in much the same way as output multipliers except that income multipliers describe the change in income per dollar change in output. Income multipliers are also classified as direct, indirect and induced. As an example, in a case with a direct income multiplier of 0.29, an indirect income multiplier of 0.07 and an induced income multiplier of 0.13, the total income multiplier would be 0.49. This multiplier indicates that for every dollar increase in direct output, total income in the economy increases by $0.49.
- **Employment multipliers** represent the number of full time-equivalent positions per million dollars of direct output. We distinguish between the number of full time-equivalent positions and the number of jobs because one full time-equivalent position could be filled by two or more part-time employees. In a case with a direct employment multiplier of 14.21, indirect employment multiplier of 4.43 and an induced employment multiplier of 8.87, the total employment multiplier is 27.51. This indicates that for a

million dollar increase in direct output, the total number of full time-equivalent positions created in the economy is 27.51.

Economic impacts are estimated by multiplying the economic stimuli by the appropriate employment and income multipliers. In this case, the process is multiplying projected expenditures by developers / builders on green technologies by the appropriate multiplier to estimate employment and income impacts.

IMPLAN offers a detailed snapshot of the economy and a powerful tool for calculating economic impacts. However, like any tool, it does have limitations:

- IMPLAN models are a snapshot of the economy at a point in time. They don't take into account growth in the economy for different sectors over time, nor do they account for changes in technology and manufacturing. They assume that what is true today for economic sectors, will also be true tomorrow, next year and 10 years from now. Dynamic models exist, but are expensive to run and the extra expense achieves only marginally better results because the future is hard to predict.
- The analysis uses incremental costs for green technologies. As technologies get better and producers get better at manufacturing them they will get less expensive. At the same time, demand will rise for green technologies as they become cheaper.
- IMPLAN models make assumptions about where inputs are purchased. If an input is available locally, the model assumes the input will come from the local supplier. It does not account for foreign competition.

While it is important to bear in mind the narrow scope and limitation of IMPLAN, it does give a good picture of the economy at this point in time.

2.3 SCOPE OF THE ANALYSIS

This section of the report describes the parameters of the analysis including, geography, time, construction type, building type, technology type and impact type.

- **Geography.** This analysis looks at the economic impacts on the economies of Portland and the State of Oregon. Because IMPLAN cannot look at geography smaller than a single county, the analysis uses Multnomah County as the Portland economy. Thus, when we

refer to the Portland economy in this analysis, we are talking about Multnomah County proper, and not the Portland Metro area.

- **Time.** This analysis uses a description of the Portland and Oregon Economies from the Bureau of Labor Statistics (BLS) in 2006, which is the most recent information available. The BLS data shows the number of jobs and wages by sector in Portland and Oregon. The analysis is static – it does not account for future changes in sectors of the economy.
- **New construction versus existing buildings.** This analysis looks at the impacts of the HPGBP in encouraging green building technology in new construction. Although the HPGBP includes a performance disclosure requirement from existing commercial and multifamily buildings, this analysis examines only the impacts of the policy on new construction.
- **Building types.** This analysis focuses on the impacts of the proposed HPGBP for new commercial, multi-family and single-family building types. Commercial construction includes assembly buildings, hospitals, hotels, offices, retail stores and schools. Industrial buildings and warehouses are not covered by the feebate since these buildings are generally unoccupied or consume resources primarily through manufacturing processes rather than building operation. Multi-family buildings are residential buildings with three or more units in a single-structure such as apartments and condos. Single-family buildings include detached one-family housing, duplexes and row houses.
- **Technologies.** In the universe of green building technologies, there are many technologies. Our analysis used the categories and technologies that the USGBC (LEED program) uses to assign points to projects. This analysis focused on the points most commonly sought in the Portland area, including those with implication for energy use. For further information on these technologies and the distribution of LEED points in Portland area projects, please see Appendix B.
- **Cost savings.** This analysis models how the savings to households and consumers from decreased energy consumption result in direct, indirect and induced economic impacts. However, we do not model the savings from decreased water usage, nor do we model the benefit from lower cost public infrastructure. See section 2.1.2 for a description of the literature on the benefits of stormwater management.

- **Multiple cause-effect relationships.** Measuring economic impacts can be complicated. Quantifying impacts is tricky because it can be difficult to separate out the impacts of one policy from the influence of another. Additionally, as one gets further away from the policy in time and economic space, the impact of the policy is also harder to predict. The pond analogy is useful: if a stone (new policy) is thrown into the pond (economy), the ripples are easy to see 6-inches away from the point of impact, but are almost undetectable (even though they may be present) on the other side of the pond. Furthermore, if two or three stones are thrown in the pond at once, it can be difficult to tell which ripples belong to which stones.

2.4 EVALUATION METHODS

Projecting the impact of a policy that hasn't yet been instituted must accommodate considerable uncertainty. ECO had to make and rely on several sets of assumptions to achieve the impact projections. This section gives a step-by-step description of the methodology, and makes explicit our assumptions in the analysis.

Step 1: Estimate which green building technologies get used in Portland, and how often

There are many ways to build a green building within LEED. The first step in compiling the data for an input-output is to know what technologies and sectors are being used. SERA Architects and the City, with the help of local green building consultants compiled a detailed summary of nearly all LEED NC and LEED for Core and Shell projects in Portland, by building type, by level of certification, across developers. The result of this data gathering was a spreadsheet indicating how often each point within LEED gets pursued in Portland. This data allowed the project team to focus on points and technologies that are most often used in Portland, and to scale the spending totals by the percent of buildings that seek each point.

Step 2: Estimate incremental spending for different green building technologies

Once the project team determined on which points and technologies to focus, the City worked with green building developers to obtain proprietary information about the purchasing and costs within each point, across building type and for different levels of green building certification. Using that spending data, and building off the experience of green developers, the City and SERA Architects calculated the incremental cost,

per square foot, per technology within each point for both the waiver level of the HPGBP and the reward level. Based on recent project experience, a 1.5% incremental cost was estimated for commercial and multifamily projects to achieve the feebate waiver threshold, and a 2.5% increase to reach the reward threshold. For single-family residential construction, a 1% incremental cost was assumed for projects to reach the waiver threshold and a 2% increase for the reward level.

These incremental costs are above the total cost of that technology in buildings that do not meet the waiver level. For example, the data show that in commercial buildings insulation and framing on average costs $0.09 per square foot for the waiver level and $0.38 per square foot for the reward level *more* than buildings below the waiver level. (Note that some technology costs are higher for the reward level because of the higher marginal cost of achieving greater efficiency).

Step 3. Estimate total spending by scenario, building type, and technology

Steps 1 and 2 gave ECO the incremental amount spent by technology, by building type, by level of certification, per square foot. ECO also had data to indicate what percent of each building type pursue each technology. To get to total incremental spending, ECO had to multiply (1) the total square footage by building type, and (2) the percent of projects pursuing both waiver and reward levels of the HPGBP. This is a critical assumption in the analysis. ECO used square footage data provided by the city, and assumed implementation rates (high, medium, and low scenarios) from the City. ECO did not project whether total building would increase or decrease as a result of the HPBGP, only what the impact of the program would be given square footage and uptake assumptions. In essence, ECO estimated the size of the pie, but based on given assumptions about the mix and quantity of ingredients.

Amount spent for each scenario

To estimate the amount spent for each scenario, building type and technology, assumptions need to be made about the percent of buildings that will receive a reward, have their fee waived or will pay a fee. ECO used scenarios provided by the City of Portland about the percentage of projects that would be rewarded, receive a waiver or would pay. At the direction of City Staff, ECO analyzed three different scenarios:

- **Low Feebate Scenario.** In this scenario, 10% of buildings receive a reward for achieving a high performance green building certification; another 30% of buildings receive a waiver; 60% of

buildings do not achieve the waiver level and are required to pay a fee.

- **Medium Feebate Scenario.** In this scenario, 15% of buildings receive a reward for achieving a high performance green building certification; another 40% of buildings receive a waiver; 45% of buildings do not achieve the waiver level and are required to pay a fee.
- **High Feebate Scenario.** In this scenario, 20% of buildings receive a reward for achieving a high performance green building certification; another 50% of buildings receive a waiver; 30% of buildings do not achieve the waiver level and are required to pay a fee.

The scenarios are intended to give a range of possible uptake rates. To calculate the amount spent for each scenario, ECO multiplied the average annual building square footage constructed for each building type (for green and non-green buildings) by the incremental costs for green technologies per square foot, then scaled this by the percent of green buildings (percent of reward and waiver buildings of the total) in each scenario, and finally adjusted for the percent of technologies pursued (not all technologies are implemented at the same rate). This gives the following formula, where (Y) is total spending, (c) is incremental cost by technology (t) and level of performance (l), (F) is the total square footage by building type (b), (s) is the share of buildings by level of performance (l) and scenario (o), and (p) is the proportion of projects that employ that category of technology (t) to achieve certification.

$$Y_{tlbo} = (c_{tl}) \cdot (F_b) \cdot (s_{lo}) \cdot (p_t)$$

This gives the total incremental spending by technology for each scenario and building type, for each level of performance. Note that the costs have been scaled by the percent of projects likely to pursue each technology. The technologies were summed to reach total incremental spending by scenario and building type.

Table 1 shows the estimated annual incremental amount that will be spent on green building technologies for each building type and scenario.

Table 1. Estimated annual incremental spending by building type and scenario

Building Type	Feebate Scenario		
	Low	Med	High
Commercial	$ 1,536,608	$ 2,138,463	$ 2,747,377
Multi-Family	$ 5,132,930	$ 7,151,519	$ 9,170,108
Single Family	$ 839,801	$ 1,174,788	$ 1,509,775
Total	**$ 7,509,339**	**$ 10,464,770**	**$ 13,427,260**

Source: Calculated by ECONorthwest with scenarios and incremental technology costs provided by the City of Portland.

While Table 1 is interesting, as an input, ECO focused on the total spending by technology.

Step 4. Estimate economic impacts using IMPLAN sectors

Using data from the Energy Trust of Oregon, mapped each green building technology to one of the 528 sectors within IMPLAN. For each technology, ECO used IMPLAN to calculate the percent of spending on *equipment* and the amount of spending on *labor and services*. Some technologies map to multiple sectors. Green rooftops, for example, require construction inputs, as well as nursery plant products, and require both architectural services as well as construction services and horticultural services. Some spending was not associated with equipment, such as architectural and LEED consulting services. These sectors were mapped to 100% labor.

Once the spending by technology was mapped to IMPLAN sectors, ECO ran the IMPLAN model and generated the annual economic impact numbers for green building construction.

Step 5. Calculate impacts from energy savings

To calculate the impact that dollars saved on energy have in the economy, ECO needed to determine (1) how those dollars are used by households, and (2) how those dollars are used by businesses. For households ECO used IMPLAN data on household spending patterns and assumed that a dollar saved on energy is spent on purchases in the economy (though not every purchase is made in Portland, so there is not a one to one correlation with savings and spending). For commercial buildings, ECO used the IMPLAN data to determine the mix of industries across commercial buildings in Portland. ECO then assumed that each dollar of savings resulted in a dollar of output, and mapped that output by the proportion of industries represented in commercial buildings. For example, clothing and accessory stores make up 1.29% of all commercial building space, and ECO assumed that 1.29% of the savings would accrue

to clothing retailers, with their associate economic multiplier. Using that model, ECO used annual energy savings data by building type by scenario and multiplied it by the average cost of electricity and gas ($0.0666 / kWh ($2006), and $1.27 / therm ($2006)) respectively.

2.4.1 Key assumptions and limitations

Section 2.3 defined the scope of the analysis. This section lists key assumptions within that scope on which the analysis is based.

- **Green building mix in scenarios.** The percentage of green buildings constructed in each year (buildings receiving rewards or waivers) is a major driver of economic impacts and job creation, as discussed in the results section of this memorandum. Each scenario assumes a different proportion of green buildings constructed versus conventional buildings constructed. As more green buildings are constructed, more green technologies are implemented in the buildings, more is spent on these technologies, and the economic impacts are greater. The percentage mix of green buildings used in each scenario was given to ECO by City of Portland staff. In reality, the percentage mix of green buildings constructed in a year will likely vary from the percent specified in each scenario of this analysis. For this reason, the scenarios are designed to capture a likely range of green buildings constructed each year and therefore, a likely range of economic impacts that the City and State will experience.
- **Scenarios do not distinguish between building types.** Each scenario, (Low Feebate, Medium Feebate and High Feebate) specifies what percentage of buildings will receive a reward or waiver versus what percent will pay a fee. In this analysis, we look at three different types of buildings – commercial, multifamily and single-family residential. The scenarios assume that that a consistent percentage of buildings will receive rewards, waivers or pay a fee across building types. For instance, in the Low Feebate Scenario, 10% of all buildings will receive a reward, 30 % will receive a waiver and 60% will pay a fee
- **Current versus constant dollars.** In this analysis, all dollar values for economic impacts and spending on green technologies are expressed in constant 2008 dollars. The value of constant dollars does not count inflation and does not change over time. If a gallon of milk costs $2.50 in the year 2008, expressed in constant 2008 dollars, then it will also cost $2.50 in the year 2025 if the price is expressed in 2008 constant dollars. Current dollars take into account the effect of inflation. Continuing with the example above,

if a gallon of milk costs $2.50 in 2008 current dollars, inflation will increase the price of this milk, so that in the year 2025 the milk will cost more like $4.13 per gallon assuming 3 percent annual inflation.

What this means for the analysis is that the economic impact results given here, do not represent actual dollar amounts of impact in any given year, since they do not take into account inflation. They are order of magnitude estimates for the purposes of comparing projections of economic impacts between the different scenarios.

- **Total annual square footage of buildings constructed.** It is possible that the HPGBP could cause the total square footage of new construction (and associated jobs) to increase or decrease. Calculating an annual projection of new construction across building types is itself a large project and very difficult. Given the scope of the project, ECO was asked to rely on square footage assumptions given by the City that are based on recent annual data trends on new construction by building type. This is a major assumption built into the model. If the total square footage of construction were to decline because of the HPGBP (and not external factors), it could offset any additional economic benefits from green building. This means that the higher costs of green buildings are not included in the analysis, as that cost would manifest through a change in the amount of square footage built. In this sense, the analysis is not "net."
- **Entire amount of fee is recycled into rebate.** The projections in this report assume that the entire amount of the fee collected in each scenario is recycled into a rebate for new construction in the same year. For example, if the HPGBP collects X dollars from fees in year one, then there will be sufficient reward projects to use those X dollars entirely with none left over. This is an important assumption: if there are not sufficient reward projects, the money collected from the fee will be taken out of the economy and not reinvested.
- **Analysis reflects today's policy, technology, and cost only.** The impacts reported in this report are annual. However, the further from today the analysis is taken into the future, the less reliable the results. Costs and technologies change over time, which will change the economic impacts. Government standards may also change. The HPGBP policy is indexed to state building standards. This report cannot guess what will happen with those standards in the future, and how those standards will affect the HPGBP. As state standards change the HPGBP, economic impacts will change as well.

Energy costs are also calculated using current data. Energy prices will change over time, perhaps by large degree. The more energy prices rise, the greater the economic impact from the energy savings from the HPGBP.

- **Energy savings are not "saved."** The economic effects for energy savings are based on an assumption that dollars saved are spent on consumption or output, and are not saved by households or businesses for long periods of time. The calculations also assume a proportionally equal savings across all businesses within commercial buildings, according to the Energy Trust breakdown.

3 RESULTS

This section gives the results of the economic impact analysis for the low, medium and high scenarios. For each of these categories, we discuss the direct, indirect and induced impacts. Appendix A gives the results by scenario, for each of the three building types. First, however, we give a few definitions of the parameters of economic output.

- **Output** is the broadest measure of economic activity. It represents the total value of production or, alternatively, business revenues. Output includes the costs of materials and labor, net business income (profits), and indirect business taxes.
- **Income** represents the total payments to workers (wages) and business owners (proprietor and corporate income). Together, wages and business income are often referred to as personal income. Corporate income represents net business income or profits. These may be reinvested or paid as dividends to shareholders. Income excludes payments from one industry to another for the purchase of intermediate goods, and is often used as a measure of the value added during production.[xvi]
- **Jobs** represent the number of additional jobs gained or lost as a result of some economic activity. Job impacts are the most popular measure of economic impacts because they are easy to understand.

The scenarios discussed here are designed to offer a range of possible outcomes for possible economic impacts, influenced by a host of factors already discussed in this memorandum. However, the most notable difference in economic output between the scenarios is the percentage of buildings receiving rewards and waivers (the "green buildings") versus those that have to pay (conventional buildings).

3.1 LOW FEEBATE SCENARIO

From building impacts, this scenario projects a total of approximately $7 million of total additional annual economic output generated by the direct spending on green building technologies in the Portland Area. A majority of this output is value added in the form of personal income, other income and indirect business taxes. Of the total output, $4.2 million is direct, $1.4 million is indirect and $1.4 million is induced. There are also a total of 55.5 additional jobs created annually in this scenario in Portland, about half of which are direct jobs. In the state as a whole, there is almost $8 million of projected annual additional output and 66.8 additional jobs created, or an additional $1 million of output and 11 jobs outside of

Portland. Energy impacts are small adding only about 3 additional jobs statewide annually, however the cumulative effect of energy savings can be substantial over time. Investing in energy efficient design results in continuous energy savings and resulting job creation throughout a building's lifetime as demonstrated in Figure 3 for the first five years of operation in buildings covered by the initial year of the feebate.

Low Scenario

Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$4,177,080	$1,355,580	$1,456,140	$6,988,800
Value Added				
Personal Income	$1,693,110	$512,730	$540,820	$2,746,660
Other Income	$309,520	$176,630	$296,880	$783,030
Indirect Business Taxes	$21,660	$51,860	$82,310	$155,830
Total Value Added	$3,717,400	$1,253,950	$1,460,830	$6,432,180
Jobs	31.2	11.0	13.3	55.5
Oregon				
Output	$4,373,180	$1,562,310	$1,995,420	$7,930,910
Value Added				
Personal Income	$1,774,810	$576,500	$751,520	$3,102,830
Other Income	$480,260	$213,340	$367,020	$1,060,620
Indirect Business Taxes	$22,220	$57,630	$113,380	$193,230
Total Value Added	$4,052,100	$1,423,970	$1,983,440	$7,459,510
Jobs	34.3	13.1	19.4	66.8

Table 2. Total projected economic impacts for the Low Feebate Scenario

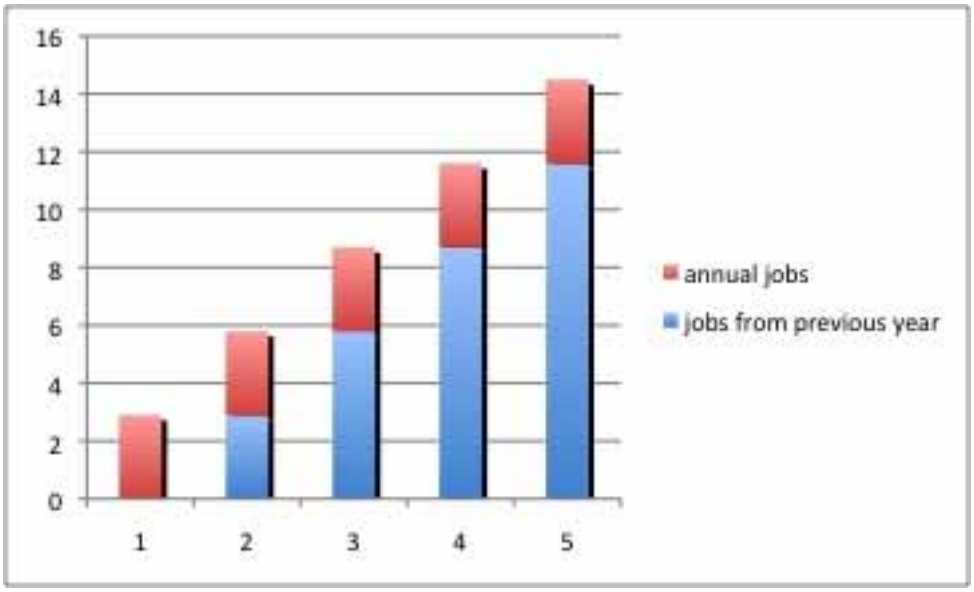
Source: Calculated by ECONorthwest

Table 3: Total projected annual energy savings impacts for the Low Feebate Scenarios in 2008$

Total Impacts (Dollars)

Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$185,569	$62,226	$59,547	$307,343
Value Added				
Wages	$55,442	$18,615	$22,081	$96,138
Business Income	$7,192	$3,369	$1,937	$12,498
Personal Income	$62,634	$21,985	$24,017	$108,636
Other Income	$34,143	$10,353	$11,583	$56,079
Indirect Business Taxes	$8,811	$2,650	$3,155	$14,616
Total Value Added	$168,222	$56,972	$62,773	$287,968
Jobs	1.5	0.5	0.6	2.6
Oregon				
Output	$187,046	$65,926	$80,095	$333,066
Value Added				
Wages	$55,662	$18,689	$27,681	$102,032
Business Income	$7,327	$3,492	$2,824	$13,643
Personal Income	$62,988	$22,181	$30,506	$115,675
Other Income	$34,209	$10,756	$15,669	$60,634
Indirect Business Taxes	$8,826	$2,775	$4,340	$15,941
Total Value Added	$169,012	$57,894	$81,021	$307,926
Jobs	1.6	0.6	0.8	2.9

Figure 3: Cumulative job creation from energy savings under the low feebate scenario over 5 years



3.2 MEDIUM FEEBATE SCENARIO

Total economic output in Portland increases by more than $2.7 million over the Low Feebate scenario to $9.7 million, even though the percentage of total waiver and reward level green buildings only increases by 15%. Due to the multiplier effect, percentage increases in economic output and jobs are disproportionate to the increases in the percentage of green buildings each year. In this scenario, there is over $11 million of projected output and approximately 93 new jobs created annually in Oregon. Again, energy impacts are small in the first year, creating approximately 6 jobs statewide, but significant over time as demonstrated in Figure 4,.

Table 4. Total projected economic impacts for the Med Feebate Scenario

Medium Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$5,814,760	$1,884,150	$2,024,880	$9,723,790
Value Added				
Personal Income	$2,355,190	$712,470	$752,050	$3,819,710
Other Income	$432,470	$245,490	$412,820	$1,090,780
Indirect Business Taxes	$30,150	$72,150	$114,450	$216,750
Total Value Added	$5,173,000	$1,742,580	$2,031,370	$8,946,950
Jobs	43.5	15.4	18.5	77.4
Oregon				
Output	$6,088,760	$2,172,710	$2,775,310	$11,036,780
Value Added				
Personal Income	$2,469,430	$801,610	$1,045,500	$4,316,540
Other Income	$670,980	$298,060	$516,630	$1,485,670
Indirect Business Taxes	$30,960	$80,220	$157,680	$268,860
Total Value Added	$5,640,800	$1,981,500	$2,765,310	$10,387,610
Jobs	47.5	18.1	27.1	92.7

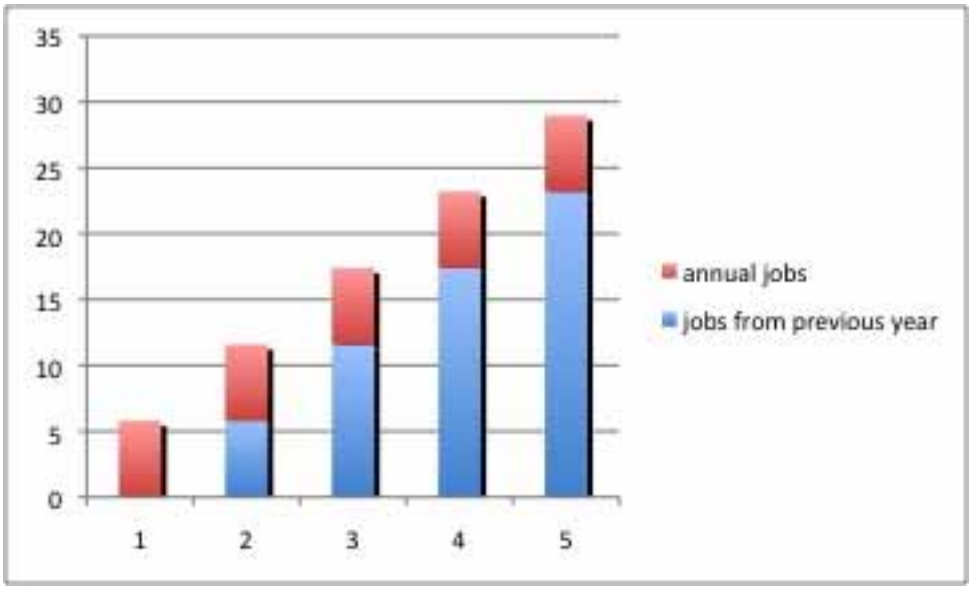
Source: Calculated by ECONorthwest

Table 5. Total projected annual energy savings impacts for the Medium Feebate Scenarios in 2008$

Total Impacts (Dollars)				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$371,139	$124,452	$119,095	$614,686
Value Added				
Wages	$110,883	$37,231	$44,161	$192,276
Business Income	$14,384	$6,739	$3,873	$24,996
Personal Income	$125,267	$43,970	$48,035	$217,272
Other Income	$68,287	$20,706	$23,167	$112,159
Indirect Business Taxes	$17,623	$5,299	$6,311	$29,233
Total Value Added	$336,444	$113,944	$125,547	$575,935
Jobs	3.1	1.0	1.1	5.2
Oregon				
Output	$374,092	$131,852	$160,189	$666,133
Value Added				
Wages	$111,324	$37,378	$55,363	$204,064
Business Income	$14,653	$6,985	$5,649	$27,286
Personal Income	$125,977	$44,363	$61,011	$231,351
Other Income	$68,418	$21,513	$31,337	$121,268
Indirect Business Taxes	$17,652	$5,550	$8,681	$31,883
Total Value Added	$338,023	$115,788	$162,041	$615,852
Jobs	3.2	1.1	1.6	5.8

Source: Calculated by ECONorthwest

Figure 4: Cumulative job creation from energy savings under the medium feebate scenario over 5 years



3.3 HIGH FEEBATE SCENARIO

Once again, there is a disproportionate increase in economic output and new jobs created, compared with the percentage increase in green buildings; there is a 15% increase in the percentage of green buildings constructed each year over the Medium Feebate Scenario, but a 28% increase in economic output and jobs in the Portland area. The model projects over $14 million of output and approximately 119 annual jobs for the State. Energy impacts add about another 9 jobs statewide annually as demonstrated in Figure 5 for the first five years of operation in buildings covered by the initial year of the feebate.

Table 6. Total projected economic impacts for the High Feebate Scenario

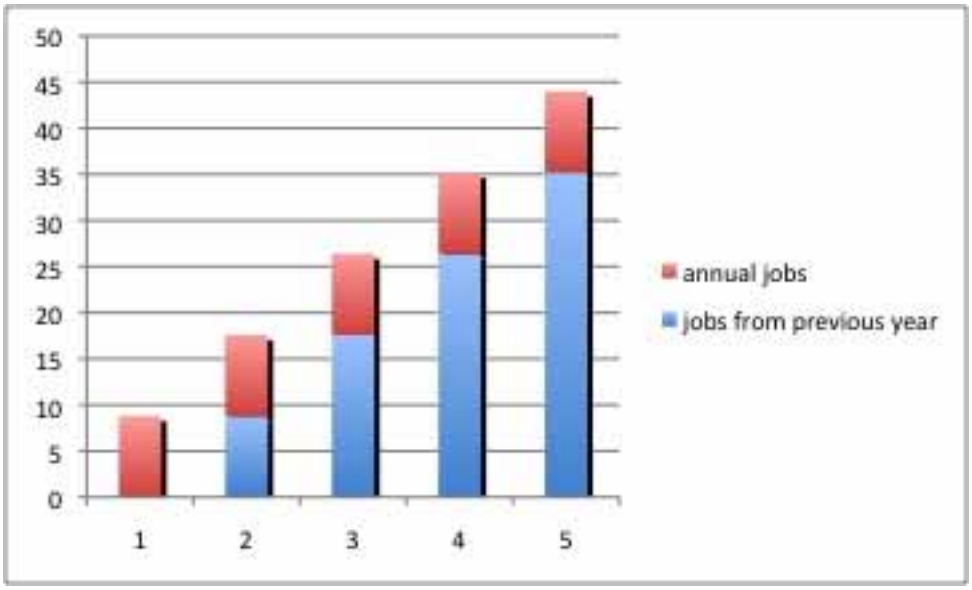
High Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$7,456,950	$2,413,790	$2,595,300	$12,466,040
Value Added				
Personal Income	$3,019,420	$912,650	$963,940	$4,896,010
Other Income	$556,070	$314,470	$529,120	$1,399,660
Indirect Business Taxes	$38,690	$92,490	$146,700	$277,880
Total Value Added	$6,633,600	$2,232,260	$2,603,700	$11,469,560
Jobs	55.6	19.7	23.7	99.0
Oregon				
Output	$7,809,810	$2,784,450	$3,558,190	$14,152,450
Value Added				
Personal Income	$3,167,110	$1,027,280	$1,340,630	$5,535,020
Other Income	$862,650	$383,060	$667,230	$1,912,940
Indirect Business Taxes	$39,730	$102,840	$202,170	$344,740
Total Value Added	$7,236,600	$2,540,460	$3,550,660	$13,327,720
Jobs	61.0	23.2	34.7	118.9

Source: Calculated by ECONorthwest

Table 7. Total projected annual energy savings impacts for the High Feebate Scenarios in 2008$

Total Impacts (Dollars)				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$556,305	$186,537	$178,505	$921,346
Value Added				
Wages	$166,192	$55,803	$66,193	$288,188
Business Income	$21,558	$10,100	$5,805	$37,464
Personal Income	$187,750	$65,904	$71,998	$325,652
Other Income	$102,366	$31,034	$34,723	$168,123
Indirect Business Taxes	$26,419	$7,943	$9,459	$43,820
Total Value Added	$504,285	$170,784	$188,178	$863,247
Jobs	4.6	1.5	1.7	7.7
Oregon				
Output	$560,734	$197,628	$240,099	$998,461
Value Added				
Wages	$166,853	$56,024	$82,982	$305,858
Business Income	$21,962	$10,469	$8,466	$40,897
Personal Income	$188,815	$66,492	$91,448	$346,755
Other Income	$102,563	$32,244	$46,969	$181,776
Indirect Business Taxes	$26,462	$8,319	$13,011	$47,792
Total Value Added	$506,654	$173,547	$242,876	$923,077
Jobs	4.7	1.7	2.4	8.8

Figure 5: Cumulative job creation from energy savings under the high feebate scenario over 5 years



3.4 TOTAL IMPACTS ACROSS SCENARIOS

Table 8 shows a summary of the combined green building and energy savings net impact projections across all scenarios for the initial year of the feebate, based on the assumptions outlined above. Total output in the Portland area ranges from $7.3 million per year to $13.4 million per year, and from 58 to 107 jobs. Annual economic output statewide ranges from an additional $8.3 to $15.2 million, and from 70 to 128 jobs. These are not insignificant numbers, and are equivalent to a new major business with good wages opening in Portland.

Table 8. Total annual impacts across scenarios for both green building and energy savings

Total Impacts Across Scenarios			
Study Area / Type of Impact	Low Scenario	Medium Scenario	High Scenario
Portland			
Output	$7,296,143	$10,338,476	$13,387,386
Value Added			
Wages	$2,310,048	$3,271,856	$4,236,128
Business Income	$545,248	$765,126	$985,534
Personal Income	$2,855,296	$4,036,982	$5,221,662
Other Income	$839,109	$1,202,939	$1,567,783
Indirect Business Taxes	$170,446	$245,983	$321,700
Total Value Added	$6,720,148	$9,522,885	$12,332,807
Jobs	58.1	82.6	106.7
Oregon			
Output	$8,263,976	$11,702,913	$15,150,911
Value Added			
Wages	$2,691,812	$3,807,854	$4,927,618
Business Income	$526,693	$740,036	$954,157
Personal Income	$3,218,505	$4,547,891	$5,881,775
Other Income	$1,121,254	$1,606,938	$2,094,716
Indirect Business Taxes	$209,171	$300,743	$392,532
Total Value Added	$7,767,436	$11,003,462	$14,250,797
Jobs	69.7	98.5	127.7

Source: Calculated by ECONorthwest

4 CONCLUSIONS

The IMPLAN analysis projects net annual growth in employment and economic output from the HPGBP. Because the program is a feebate, and pays for itself, under the assumptions of the model, the program generates employment by stimulating the economy without using taxpayer dollars. In summary, under the high scenario, ECO's analysis shows the program could lead to:

- Over $14 million in increased annual output and 119 new jobs in the Oregon economy from construction impacts in the first year of the program
- 8.8 new jobs per year created through energy savings, and approximately 44 new jobs over the first 5 years of the program
- Benefits to environmental and amenity benefits, as well as benefits to public infrastructure as evidenced from a review of the literature.

While positive, the gains in output are somewhat modest. There are several reasons for this:

- The cost of green building is no longer a major premium. As noted above, the article "Cost of Green Revisited" by Davis Langdon argues there is little to no cost for building green. The model was run in this analysis using net incremental costs over building code standards. Because these costs, and associated spending, were low, IMPLAN does not show a large increase in output. This is not necessarily bad – it shows that while green building may not create a large boost in output, green building techniques will likely become a routine part of building.
- Not all technologies and spending were accounted for in the model. This analysis focused on the most likely green buildings. However, if, for example, many buildings were to pursue solar or another costly input, output would likely rise.
- Figures do not project a likely rise in energy prices. As energy prices outpace inflation, the savings from green buildings will increase, and associated output numbers will rise accordingly. A small change in energy prices could have an enormous impact, as energy savings add up year after year over the life of the building.
- The model cannot accurately predict future impacts as energy prices, technologies, the cost of inputs, state regulations, and market conditions all change. Each of these changes has a dynamic

effect. For example, if changes in state codes require more expensive investments (higher marginal cost), then more spending might lead to more output, but the total number of square feet of new construction might decrease.

These limitations, and the limitations of IMPLAN (that it does not account for the second paycheck) could be overcome with a larger project and further analysis. Subsequent studies may endeavor to estimate value of the ripples in the pond, and expand the cost benefit analysis to include more people, more impacts, and over more time.

Appendix A: Impact results by building type and scenario

Commercial - Low Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$885,690	$301,000	$322,300	$1,508,990
Value Added				
Personal Income	$371,640	$115,610	$119,580	$606,830
Other Income	$55,710	$39,310	$65,740	$160,760
Indirect Business Taxes	$4,440	$11,040	$18,230	$33,710
Total Value Added	$803,430	$281,570	$323,130	$1,408,130
Jobs	6.8	2.6	2.9	12.3
Oregon				
Output	$927,430	$339,250	$440,930	$1,707,610
Value Added				
Personal Income	$386,710	$126,860	$163,800	$677,370
Other Income	$86,520	$35,850	$33,540	$155,910
Indirect Business Taxes	$4,620	$12,170	$25,070	$41,860
Total Value Added	$864,560	$301,740	$386,210	$1,552,510
Jobs	7.5	3.0	4.3	14.8

Commercial - Med Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$1,230,380	$417,340	$446,970	$2,094,690
Value Added				
Personal Income	$515,560	$160,240	$165,830	$841,630
Other Income	$77,830	$54,510	$91,170	$223,510
Indirect Business Taxes	$6,170	$15,340	$25,280	$46,790
Total Value Added	$1,115,120	$390,330	$448,110	$1,953,560
Jobs	9.5	3.6	4.1	17.2
Oregon				
Output	$1,288,540	$470,700	$611,500	$2,370,740
Value Added				
Personal Income	$536,490	$175,960	$227,230	$939,680
Other Income	$120,850	$50,130	$48,190	$219,170
Indirect Business Taxes	$6,430	$16,910	$34,760	$58,100
Total Value Added	$1,200,260	$418,960	$537,410	$2,156,630
Jobs	10.3	4.2	6.0	20.5

Commercial - High Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$1,579,560	$534,750	$573,310	$2,687,620
Value Added				
Personal Income	$661,640	$205,270	$212,720	$1,079,630
Other Income	$100,600	$69,830	$116,940	$287,370
Indirect Business Taxes	$7,930	$19,670	$32,430	$60,030
Total Value Added	$1,431,810	$500,040	$574,810	$2,506,660
Jobs	12.2	4.6	5.2	22.0
Oregon				
Output	$1,655,130	$603,490	$785,070	$3,043,690
Value Added				
Personal Income	$689,310	$225,600	$291,810	$1,206,720
Other Income	$156,130	$64,680	$63,840	$284,650
Indirect Business Taxes	$8,270	$21,690	$44,630	$74,590
Total Value Added	$1,543,020	$537,570	$692,090	$2,772,680
Jobs	13.3	5.3	7.7	26.3

Multi-family residential - Low Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$2,810,140	$876,690	$951,490	$4,638,320
Value Added				
Personal Income	$1,111,070	$330,520	$353,510	$1,795,100
Other Income	$228,950	$114,760	$193,960	$537,670
Indirect Business Taxes	$14,790	$34,130	$53,770	$102,690
Total Value Added	$2,465,880	$809,930	$954,750	$4,230,560
Jobs	20.5	7.0	8.7	36.2
Oregon				
Output	$2,951,650	$1,025,540	$1,306,610	$5,283,800
Value Added				
Personal Income	$1,166,580	$376,190	$493,380	$2,036,150
Other Income	$347,600	$148,980	$279,290	$775,870
Indirect Business Taxes	$15,310	$38,250	$74,220	$127,780
Total Value Added	$2,696,070	$939,610	$1,340,270	$4,975,950
Jobs	22.6	8.4	12.7	43.7

Multi-family residential - Med Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$3,911,400	$1,218,310	$1,322,840	$6,452,550
Value Added				
Personal Income	$1,545,200	$459,170	$491,490	$2,495,860
Other Income	$319,850	$159,470	$269,650	$748,970
Indirect Business Taxes	$20,590	$47,470	$74,750	$142,810
Total Value Added	$3,430,840	$1,125,280	$1,327,380	$5,883,500
Jobs	28.5	9.8	12.1	50.4
Oregon				
Output	$4,109,220	$1,426,020	$1,817,100	$7,352,340
Value Added				
Personal Income	$1,623,020	$522,970	$686,320	$2,832,310
Other Income	$485,550	$208,100	$392,630	$1,086,280
Indirect Business Taxes	$21,330	$53,240	$103,210	$177,780
Total Value Added	$3,752,920	$1,307,280	$1,868,480	$6,928,680
Jobs	31.4	11.6	17.7	60.7

Multi-family residential - High Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$5,012,670	$1,559,920	$1,694,200	$8,266,790
Value Added				
Personal Income	$1,979,330	$587,840	$629,480	$3,196,650
Other Income	$410,760	$204,190	$345,350	$960,300
Indirect Business Taxes	$26,400	$60,820	$95,740	$182,960
Total Value Added	$4,395,820	$1,440,690	$1,700,050	$7,536,560
Jobs	36.4	12.5	15.5	64.4
Oregon				
Output	$5,266,780	$1,826,510	$2,327,580	$9,420,870
Value Added				
Personal Income	$2,079,470	$669,770	$879,250	$3,628,490
Other Income	$623,490	$267,220	$505,970	$1,396,680
Indirect Business Taxes	$27,350	$68,220	$132,210	$227,780
Total Value Added	$4,809,780	$1,674,980	$2,396,680	$8,881,440
Jobs	40.2	14.9	22.7	77.8

Single family residential - Low Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$481,250	$177,890	$182,350	$841,490
Value Added				
Personal Income	$210,400	$66,600	$67,730	$344,730
Other Income	$24,860	$22,560	$37,180	$84,600
Indirect Business Taxes	$2,430	$6,690	$10,310	$19,430
Total Value Added	$448,090	$162,450	$182,950	$793,490
Jobs	3.9	1.4	1.7	7.0
Oregon				
Output	$494,100	$197,520	$247,880	$939,500
Value Added				
Personal Income	$221,520	$73,450	$94,340	$389,310
Other Income	$46,140	$28,510	$54,190	$128,840
Indirect Business Taxes	$2,290	$7,210	$14,090	$23,590
Total Value Added	$491,470	$182,620	$256,960	$931,050
Jobs	4.2	1.7	2.4	8.3

Single family residential - Med Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$672,980	$248,500	$255,070	$1,176,550
Value Added				
Personal Income	$294,430	$93,060	$94,730	$482,220
Other Income	$34,790	$31,510	$52,000	$118,300
Indirect Business Taxes	$3,390	$9,340	$14,420	$27,150
Total Value Added	$627,040	$226,970	$255,880	$1,109,890
Jobs	5.5	2.0	2.3	9.8
Oregon				
Output	$691,000	$275,990	$346,710	$1,313,700
Value Added				
Personal Income	$309,920	$102,680	$131,950	$544,550
Other Income	$64,580	$39,830	$75,810	$180,220
Indirect Business Taxes	$3,200	$10,070	$19,710	$32,980
Total Value Added	$687,620	$255,260	$359,420	$1,302,300
Jobs	5.8	2.3	3.4	11.5

Single family residential - High Scenario				
Study Area / Type of Impact	Direct	Indirect	Induced	Total
Portland				
Output	$864,720	$319,120	$327,790	$1,511,630
Value Added				
Personal Income	$378,450	$119,540	$121,740	$619,730
Other Income	$44,710	$40,450	$66,830	$151,990
Indirect Business Taxes	$4,360	$12,000	$18,530	$34,890
Total Value Added	$805,970	$291,530	$328,840	$1,426,340
Jobs	7.0	2.6	3.0	12.6
Oregon				
Output	$887,900	$354,450	$445,540	$1,687,890
Value Added				
Personal Income	$398,330	$131,910	$169,570	$699,810
Other Income	$83,030	$51,160	$97,420	$231,610
Indirect Business Taxes	$4,110	$12,930	$25,330	$42,370
Total Value Added	$883,800	$327,910	$461,890	$1,673,600
Jobs	7.5	3.0	4.3	14.8

Appendix B: Portland LEED Project Point Distribution

Portland LEED Project Point Distribution, Part 1

								SUSTAINABLE SITES																		WATER				
								Site Selection	**Development Density & Community Connectivity**	**Brownfield Redevelopment**	**Alternative Transportation**, PublicTransportation Access	**Alternative Transportation**, Bicycle Storage & Changing Rooms	**Alternative Transportation**, Fuel-Efficient Vehicles	**Alternative Transportation**, Parking Capacity	**Site Development**, Protect or Restore Habitat	**Site Development**, Maximize Open Space	**Stormwater Design**, Quantity Control	**Stormwater Design**, Quality Control	**Heat Island Effect**, Non-Roof	**Heat Island Effect**, Roof	**Light Pollution Reduction**	**Tenant Design and Construction Guidelines**	**Water Efficient Landscaping**, Reduce by 50%	**Water Efficient Landscaping**, No Potable Use or No Irrigation	**Innovative Wastewater Technologies**	**Water Use Reduction**, 20% Reduction	**Water Use Reduction**, 30% Reduction
Project Type	Building Occupancy	LEED Program	Certification Level	Size	SCORE	PROB	TOTAL	SScr1	SScr2	SScr3	SScr4.1	SScr4.2	SScr4.3	SScr4.4	SScr5.1	SScr5.2	SScr6.1	SScr6.2	SScr7.1	SScr7.2	SScr8	SScr9	WEcr1.1	WEcr1.2	WEcr2	WEcr3.1	WEcr3.2
Commercial	Hotel	LEED-NC 2.0	Silver	69,000sf	34		34	●			●	●		●	●	●	●	●	●				●						
Commercial	Hotel	LEED-NC 2.2	Silver	115,000sf	23	15	38	●	●	●	●	○		○				○	●	●	●		●			●	●
Multifamily	Apartments	LEED-NC 2.2	Silver	116,000sf	32	6	38	●	●	●	●	●	●					●	●	●	●		●	●		●	●
Multifamily	Condominiums	LEED-NC 2.2	Silver	190,000sf	41	1	42	●	●	●	●	●	●	●		●	●	●	●	●	●		●			●	●
Commercial	Office	LEED-NC 2.0/2.1	Silver		36		36	●	●		●	●	●	●			●	●		●			●	●		●	
Multifamily	Condominiums	LEED-NC 2.1	Silver	290,000sf	35		35	●	●	●	●	●	●						●				●	●			
Multifamily	Condominiums	LEED-NC 2.2	Silver	380,000sf	37	0	37	●	●	●	●	●			●	●	●	●	●	●	●		●	●		●	●
Multifamily	Condominiums	LEED-NC 2.2	Silver	260,000sf	33	4	37	●	●	●	●	●	●		●	●			●	●			●				
Commercial	Retail	LEED-CS 1.0	Silver	158,000sf	29		29	●	●	●	●							●	●		●	●	●	●			
Multifamily	Apartments	LEED-NC 2.1	Gold	147,000sf	40	2	42	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●		●	●
Multifamily	Condominiums	LEED-NC 2.1	Gold	263,000sf	40		40	●	●	●	●	●						●	●	●	●		●	●		●	●
Commercial	Hotel	LEED-NC 2.2	Gold	200,000sf	32	8	40	●	●	●	●	●	○	●					●	●	●		●	●		●	
Commercial	Office	LEED-NC 2.0/2.1	Gold	30,000sf	40		40	●	●	●	●	●		●					●	●			●	●		●	●
Commercial	Office	LEED-NC 2.0/2.1	Gold	30,000sf	43		43				●	●		●	●	●		●	●	●			●		●	●	●
Commercial	Assembly	LEED-NC 2.0/2.1	Gold	12,000sf	39		39	●			●		●		●	●	●	●	●				●	●		●	
Commercial	Education	LEED-NC 2.0/2.1	Gold	71,000sf	42		42	●	●		●	●		●		●	●	●	●	●	●		●			●	
Commercial	Office	LEED-NC 2.0/2.1	Gold	98,000sf	39		39	●				●		●		●		●		●			●	●	●	●	●
Multifamily	Condominiums	LEED-NC 2.1	Gold	270,000sf	39		39	●	●	●	●	●						●	●	●	●		●	●		●	●
Multifamily	Condominiums	LEED-NC 2.1	Gold	426,000sf	40		40	●	●	●	●	●			●	●	●	●	●	●	●		●	●		●	●
Multifamily	Condominiums	LEED-NC 2.1	Gold	600,000sf	40		40	●	●	●	●				●	●	●	●	●	●	●		●			●	●
Multifamily	Condominiums	LEED NC 2.1	Gold	576,000sf	39	8	47	●	●	●	●	●	○		●	●	●	●	●	●	●		●	●		●	●
Commercial	Office	LEED-CS 1.0	Gold	248,000sf	36		36	●	●	●	●							●	●			●	●	●		●	
Commercial	Office	LEED-CS 1.0	Gold	270,000sf	38		38	●	●	●	●	●			●	●		●	●		●	●	●	●		●	
Multifamily	Condominiums/Retail	LEED-CS 2.0	Gold	200,000sf	32	2	34	●	●	●	●						●	●	●			●	●	●		●	●
Commercial	Office	LEED-CS 2.0	Platinum	396,000sf	43	4	47	●	●	●	●	●	●	●	●	●	○	●	●	●	●		●	○		●	●
Commercial	Office	LEED-CS 2.0	Silver	47,000sf	27	8	35	●	●	●	●	●	○	●					●	●			●	●		●	
Commercial	Hotel	LEED-NC 2.1	Silver	324,000sf	33	3	36	●	●	●	●	●		●					●	●	●		●	●		●	
Commercial	Office	LEED-NC 2.0/2.1	Silver	19,000sf	33		33	●	●		●	●		●						●	●						●	●
Commercial	Education	LEED-NC 2.0/2.1	Silver	265,000sf	33		33	●			●					●		●	●		●						●	
Commercial	Retail	LEED-NC 2.0/2.1	Silver		36		36					●		●					●		●		●	●		●	●
Commercial	Office	LEED-NC 2.2	Gold	342,000sf	38	6	44	●	●		●	○	○	●				●	●	○	○		●			●	●
Commercial	Education	LEED-NC 2.0/2.1	Gold	51,000sf	45		45	●			●	●		●		●	●	●	●				●			●	●
Commercial	Office	LEED-NC 2.2	Gold	143,000sf	44		44	●	●	●	●	●		●			●	●					●	●	●	●	●
Commercial	Office	LEED-NC 2.0	Gold	19,000sf	40		40	●			●	●							●	●	●		●	●			
Multifamily	Condominiums	LEED-NC 2.1	Gold	282,000sf	39		39	●	●	●	●	●					●	●	●	●	●		●			●	●
Multifamily	Condominiums	LEED-NC 2.1	Gold	437,000sf	40		40	●	●	●	●	●			●	●	●	●	●	●	●		●			●	●
Commercial	Office	LEED-NC 2.2	Gold	60,000sf	39	11	50	●	●	●	●	●	●	●					●	●	●		●	●		●	●
Commercial	Assembly	LEED-NC 2.0/2.1	Platinum	55,000sf	54		54	●	●	●	●	●	●	●			●	●	●	●	●		●	●	●	●	●
Commercial	Group Home	LEED-NC 2.2	Platinum	27,000sf	31	20	51	●	●	○	●	●		●				●		●	●		●	○	○	●	●
Commercial	Assembly	LEED-NC 2.1	Platinum	21,000sf	51	2	53	●	●		●	○	●			●	●	●		●	●		●	●		●	●
Commercial	Office	LEED-NC 2.0/2.1	Platinum	16,000sf	52		52	●	●		●	●		●	●	●	●	●	●	●			●	●		●	●
Commercial	Hospital	LEED-NC 2.1	Platinum	417,000sf	55		55	●	●	●	●	●	●		●	●	●	●	●	●	●		●	●	●	●	●
Multifamily	Condominiums	LEED-NC 2.1	Platinum	143,000sf	55		55	●	●	●	●	●	●		●	●	●	●	●	●	●		●	●		●	●
Commercial	Education	LEED-NC 2.2	Platinum	220,000sf	37	21	58	●	●	○	●	○	●	●	○	●	○	○	○	●	○		○	○		○	○
Commercial	Assembly	LEED-NC 2.2	Platinum	20,000sf	43	18	61	●	●	●	●	●	●	●	○	○		○	○	●	○		●	○		●	●
						# of projects		43	37	29	43	35	15	23	15	22	20	32	37	33	28	4	42	28	5	39	30
						% of projects		96%	82%	64%	96%	78%	33%	51%	33%	49%	44%	71%	82%	73%	62%	9%	93%	62%	11%	87%	67%

Portland LEED Project Point Distribution, Part 2

Project Type	Building Occupancy	LEED Program	Certification Level	Size	SCORE	PROB	TOTAL		ENERGY																		MATERIALS & RESOURCES													
									Optimize Energy Performance, TOTAL POINTS EAcr1	Optimize Energy Performance, 10.5% N or 3.5% E EAcr1.1	Optimize Energy Performance, 14% N or 7% E EAcr1.2	Optimize Energy Performance, 17.5% N or 10.5% E EAcr1.3	Optimize Energy Performance, 21% N or 14% E EAcr1.4	Optimize Energy Performance, 24.5% N or 17.5% E EAcr1.5	Optimize Energy Performance, 28% N or 21% E EAcr1.6	Optimize Energy Performance, 31.5% N or 24.5% E EAcr1.7	Optimize Energy Performance, 35% N or 28% E EAcr1.8	Optimize Energy Performance, 38.5% N or 31.5% E EAcr1.9	Optimize Energy Performance, 42% N or 35% E EAcr1.10	On-Site Renewable Energy, 2.5% EAcr2.1	On-Site Renewable Energy, 7.5% EAcr2.2	On-Site Renewable Energy, 12.5% EAcr2.3	Enhanced Commissioning EAcr3	Enhanced Refrigerant Management EAcr4	Measurement & Verification EAcr5	Green Power, 35% for 2 yrs EAcr6	Storage & Collection of Recyclables MRpr1	Building Reuse, 75% of Existing Walls, Floors & Roof MRcr1.1	Building Reuse, 100% of Existing Walls, Floors & Roof MRcr1.2	Building Reuse, 50% of Interior Non-Structural Elements MRcr1.3	Construction Waste Management, Divert 50% from Disposal MRcr2.1	Construction Waste Management, Divert 75% from Disposal MRcr2.2	Materials Reuse, 5% MRcr3.1	Materials Reuse,10% MRcr3.2	Recycled Content, 10% (post-consumer + ½ pre-consumer) MRcr4.1	Recycled Content, 20% (post-consumer + ½ pre-consumer) MRcr4.2	Regional Materials, 10% Extracted & Manufactured Regionally MRcr5.1	Regional Materials, 20% Extracted & Manufactured Regionally MRcr5.2	Rapidly Renewable Materials, 2.5% MRcr6	Certified Wood, 50% of wood-based materials MRcr7
Commercial	Hotel	LEED-NC 2.0	Silver	69,000sf	34		34	~	3	•	•	•											•			•	□				•	•			•	•	•	•	•	
Commercial	Hotel	LEED-NC 2.2	Silver	115,000sf	23	15	38	~	3	•	•	•	○										•			○	□				•	○			○		○			
Multifamily	Apartments	LEED-NC 2.2	Silver	116,000sf	32	6	38	~	2	•	•												•			•	□				•	○			○		•	○		
Multifamily	Condominiums	LEED-NC 2.2	Silver	190,000sf	41	1	42	~	3	•	•	•											•				□				•	•			•	○	•	•		
Commercial	Office	LEED-NC 2.0/2.1	Silver		36		36	~	4	•	•	•	•										•				□	•		•	•	•			•		•			
Multifamily	Condominiums	LEED-NC 2.1	Silver	290,000sf	35		35	~	4	•	•	•	•										•	•			□				•	•			•	•	•	•		
Multifamily	Condominiums	LEED-NC 2.2	Silver	380,000sf	37	0	37	~	3	•	•	•											•	•			□				•				•					
Multifamily	Condominiums	LEED-NC 2.2	Silver	260,000sf	33	4	37	~	2	•	•															○	□				•	○			•	•	•	•		
Commercial	Retail	LEED-CS 1.0	Silver	158,000sf	29		29	~	2	•	•												•		•	•	□				•	•			•	•	•			
Multifamily	Apartments	LEED-NC 2.1	Gold	147,000sf	40	2	42	~	2	•	•												•	•		•	□				•	○			•		•	○		
Multifamily	Condominiums	LEED-NC 2.1	Gold	263,000sf	40		40	~	3	•	•	•											•	•		•	□				•	•			•	•	•	•		
Commercial	Hotel	LEED-NC 2.2	Gold	200,000sf	32	8	40	~	3	•	•	•											•	○		○	□				•	•			•		•	○		
Commercial	Office	LEED-NC 2.0/2.1	Gold	30,000sf	40		40	~	4	•	•	•	•										•	•		•	□	•	•	•	•	•			•		•	•		
Commercial	Office	LEED-NC 2.0/2.1	Gold	30,000sf	43		43	~	4	•	•	•	•										•		•		□				•	•			•	•	•	•		•
Commercial	Assembly	LEED-NC 2.0/2.1	Gold	12,000sf	39		39	~	3	•	•	•											•		•	•	□				•	•			•	•	•	•		•
Commercial	Education	LEED-NC 2.0/2.1	Gold	71,000sf	42		42	~	3	•	•	•											•	•		•	□				•	•			•	•	•	•		
Commercial	Office	LEED-NC 2.0/2.1	Gold	98,000sf	39		39	~	3	•	•	•											•	•	•	•	□				•	•	•		•	•	•	•		
Multifamily	Condominiums	LEED-NC 2.1	Gold	270,000sf	39		39	~	3	•	•	•											•				□				•	•			•	•	•	•		•
Multifamily	Condominiums	LEED-NC 2.1	Gold	426,000sf	40		40	~	4	•	•	•	•										•	•			□				•				•	•	•	•		
Multifamily	Condominiums	LEED-NC 2.1	Gold	600,000sf	40		40	~	4	•	•	•	•										•	•		•	□				•				•	•	•	•	•	
Multifamily	Condominiums	LEED NC 2.1	Gold	576,000sf	39	8	47	~	3	•	•	•											•	•		○	□				•	•			•	○	•	○	○	
Commercial	Office	LEED-CS 1.0	Gold	248,000sf	36		36	~	2	•	•												•		•	•	□	•	•	•	•				•	•	•	•		
Commercial	Office	LEED-CS 1.0	Gold	270,000sf	38		38	~	2	•	•												•		•	•	□				•	•			•	•	•	•		
Multifamily	Condominiums/Retail	LEED-CS 2.0	Gold	200,000sf	32	2	34	~	2	•	•												•			•	□				•	•			•	•	•	•		
Commercial	Office	LEED-CS 2.0	Platinum	396,000sf	43	4	47	~	3	•	•	•	○							•			•	•	•	•	□				•	○			•	•	•		•	
Commercial	Office	LEED-CS 2.0	Silver	47,000sf	27	8	35	~	4	•	•	•	•	○									•		•	○	□	○			•	•	○		•	○				
Commercial	Hotel	LEED-NC 2.1	Silver	324,000sf	33	3	36	~	5	•	•	•	•	•									•	•		•	□	•			•	•			○		○			
Commercial	Office	LEED-NC 2.0/2.1	Silver	19,000sf	33		33	~	5	•	•	•	•	•									•				□	•			•	•	•		•	•	•	•		•
Commercial	Education	LEED-NC 2.0/2.1	Silver	265,000sf	33		33	~	8	•	•	•	•	•	•	•									•	•	□				•	•			•	•	•	•		
Commercial	Retail	LEED-NC 2.0/2.1	Silver		36		36	~	5	•	•	•	•	•						•	•		•			•	□				•	•			•		•			•
Commercial	Office	LEED-NC 2.2	Gold	342,000sf	38	6	44	~	5	•	•	•	•	•									•	•	•	•	□				•	•			•	○	•			•
Commercial	Education	LEED-NC 2.0/2.1	Gold	51,000sf	45		45	~	6	•	•	•	•	•	•								•	•	•	•	□				•	•			•	•	•	•		•
Commercial	Office	LEED-NC 2.2	Gold	143,000sf	44		44	~	7	•	•	•	•	•	•	•							•	•	•	•	□	•			•	•			•	•	•			
Commercial	Office	LEED-NC 2.0	Gold	19,000sf	40		40	~	7	•	•	•	•	•	•	•							•			•	□	•			•	•			•	•	•	•		•
Multifamily	Condominiums	LEED-NC 2.1	Gold	282,000sf	39		39	~	7	•	•	•	•	•	•	•							•				□				•				•	•	•	•	•	
Multifamily	Condominiums	LEED-NC 2.1	Gold	437,000sf	40		40	~	5	•	•	•	•	•									•				□								•	•	•	•	•	
Commercial	Office	LEED-NC 2.2	Gold	60,000sf	39	11	50	~	4	•	•	•	•							○			•	•	○	○	□				•	•	○	○	•	•	○	○		•
Commercial	Assembly	LEED-NC 2.0/2.1	Platinum	55,000sf	54		54	~	6	•	•	•	•	•	•								•	•	•	•	□	•			•	•			•	•	•	•		•
Commercial	Group Home	LEED-NC 2.2	Platinum	27,000sf	31	20	51	~	5	•	•	•	•	•	○	○	○	○					•	○	•		□				•	•			•	○	•	○		○
Commercial	Assembly	LEED-NC 2.1	Platinum	21,000sf	51	2	53	~	10	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	□				•	•			•	•	•	•		•
Commercial	Office	LEED-NC 2.0/2.1	Platinum	16,000sf	52		52	~	8	•	•	•	•	•	•	•	•						•	•	•	•	□				•	•			•	•	•	•		•
Commercial	Hospital	LEED-NC 2.1	Platinum	417,000sf	55		55	~	10	•	•	•	•	•	•	•	•	•	•				•	•	•	•	□				•	•			•	•	•	•	•	•
Multifamily	Condominiums	LEED-NC 2.1	Platinum	143,000sf	55		55	~	9	•	•	•	•	•	•	•	•	•		•			•	•	•	•	□				•	•			•	•	•	•		•
Commercial	Education	LEED-NC 2.2	Platinum	220,000sf	37	21	58	~	6	•	•	•	•	•	•	○	○	○	○	○			•	○	○	•	□	•	•	○	•	•			•	○	•	○		•
Commercial	Assembly	LEED-NC 2.2	Platinum	20,000sf	43	18	61	~	10	•	•	•	•	•	•	•	•	•	•	○	○			•	○	•	□	•			•	•			•	○	○	○	○	•
							# of projects	~	4.58	45	45	38	26	18	12	9	6	4	3	4	2	1	42	22	18	28	0	10	3	3	44	34	2	0	42	29	39	27	6	16
							% of projects	~	AVE	100%	100%	84%	58%	40%	27%	20%	13%	9%	7%	9%	4%	2%	93%	49%	40%	62%	0%	22%	7%	7%	98%	76%	4%	0%	93%	64%	87%	60%	13%	36%

Portland LEED Project Point Distribution, Part 3

Project Type	Building Occupancy	LEED Program	Certification Level	Size	SCORE	PROB	TOTAL		IEQpr1 Minimum IAQ Performance	IEQpr2 Environmental Tobacco Smoke (ETS) Control	EQcr1 Outdoor Air Delivery Monitoring	EQcr3.1 Construction IAQ Management Plan, During Construction	EQcr3.2 Construction IAQ Management Plan, Before Occupancy	EQcr4.1 Low-Emitting Materials, Adhesives & Sealants	EQcr4.2 Low-Emitting Materials, Paints & Coatings	EQcr4.3 Low-Emitting Materials, Carpet Systems	EQcr4.4 Low-Emitting Materials, Composite Wood & Agrifiber Products	EQcr5 Indoor Chemical & Pollutant Source Control	EQcr6.1 Controllability of Systems, Lighting	EQcr6.2 Controllability of Systems, Thermal Comfort	EQcr7.1 Thermal Comfort, Design	EQcr7.2 Thermal Comfort, Verification	EQcr8.1 Daylight & Views, Daylight 75% of Spaces	EQcr8.2 Daylight & Views, Views for 90% of Spaces	Innov. Exemplary performance - SScr4.1 - mass transit stops	Innov. Exemplary performance - SScr5.2 - 50% Open Space	Innov. Exemplary performance - SScr6.1	Innov. Exemplary Performance - SScr7.1 - 100% Parking Underground	Innov. Exemplary Performance - WEcr3 - Water Use Reduction 40%	Innov. Exemplary Performance - EAcr6 - Green Power 100%	Innov. Exemplary Performance - MRcr2 - Construction Waste Mgmt 95%	Innov. Exemplary Performance - MRcr4 - Recycled Content 15%	Innov. Exemplary Performance - MRcr5.1 - Regional Materials 40%	Innov. Exemplary Performance - MRcr5.2 - Materials Extracted Regionally	Innov. Exemplary performance - MRcr7 - 95% FSC Certified Wood	Innov. Exemplary Performance - EQcr8.1 - Daylight & Views	Innov. Green Housekeeping	Innov. Education, Building as Teacher	Innov. Exterior Low VOC Plan	Innov. Integrated Pest Management Plan	Innov. Transportation Management Plan	Innov. Car-sharing for Hotel Guests	Innov. Green Site and Exterior Building Mgmt	Innov. Green Landscape Maintenance
											INDOOR ENVIRONMENTAL QUALITY														INNOVATION & DESIGN PROCESS																			
Commercial	Hotel	LEED-NC 2.0	Silver	69,000sf	34		34	~	□	□				●	●	●		●	●				●	●				●			●		●						●					
Commercial	Hotel	LEED-NC 2.2	Silver	115,000sf	23	15	38	~	□	□		●	○	●	●	●			●	○			○	○	●			●									○	○						
Multifamily	Apartments	LEED-NC 2.2	Silver	116,000sf	32	6	38	~	□	□		●		●	●	●			●	●		○	●	●				●	○	○							●	●						
Multifamily	Condominiums	LEED-NC 2.2	Silver	190,000sf	41	1	42	~	□	□		●		●	●	●			●	●	●	●	●	●				●	●								●	●						
Commercial	Office	LEED-NC 2.0/2.1	Silver		36		36	~	□	□	●			●	●	●		●			●		●	●							●						●	●		●				
Multifamily	Condominiums	LEED-NC 2.1	Silver	290,000sf	35		35	~	□	□	●			●	●	●		●			●	●	●	●				●				●					●	●						
Multifamily	Condominiums	LEED-NC 2.2	Silver	380,000sf	37	0	37	~	□	□		●		●	●	●			●	●	●	●	●	●		●		●									●							
Multifamily	Condominiums	LEED-NC 2.2	Silver	260,000sf	33	4	37	~	□	□	●	●		●	●	●			●	●	○	○	●	●				●									●	●						●
Commercial	Retail	LEED-CS 1.0	Silver	158,000sf	29		29	~	□	□											●	●		●							●	●	●				●							
Multifamily	Apartments	LEED-NC 2.1	Gold	147,000sf	40	2	42	~	□	□		●		●	●	●		●	●	●			●	●		●		●									●		●					
Multifamily	Condominiums	LEED-NC 2.1	Gold	263,000sf	40		40	~	□	□		●		●	●	●		●	●	●	●	●	●					●									●		●			●		
Commercial	Hotel	LEED-NC 2.2	Gold	200,000sf	32	8	40	~	□	□	○	●		●	●	●			●	●	●	○	●	○				●									●	●			○			
Commercial	Office	LEED-NC 2.0/2.1	Gold	30,000sf	40		40	~	□	□		●	●	●	●	●		●			●	●												●			●	●					●	
Commercial	Office	LEED-NC 2.0/2.1	Gold	30,000sf	43		43	~	□	□	●	●		●	●	●	●	●	●	●	●		●	●					●				●	●			●							
Commercial	Assembly	LEED-NC 2.0/2.1	Gold	12,000sf	39		39	~	□	□		●	●	●	●	●		●			●	●	●	●									●	●			●							
Commercial	Education	LEED-NC 2.0/2.1	Gold	71,000sf	42		42	~	□	□	●	●	●	●	●	●		●	●		●	●	●	●							●						●	●		●				
Commercial	Office	LEED-NC 2.0/2.1	Gold	98,000sf	39		39	~	□	□	●	●	●	●	●	●	●	●						●					●	●		●		●										
Multifamily	Condominiums	LEED-NC 2.1	Gold	270,000sf	39		39	~	□	□		●	●	●	●	●		●	●				●	●							●		●	●	●		●							
Multifamily	Condominiums	LEED-NC 2.1	Gold	426,000sf	40		40	~	□	□		●		●	●	●		●	●	●	●		●	●				●									●							
Multifamily	Condominiums	LEED-NC 2.1	Gold	600,000sf	40		40	~	□	□		●		●	●	●	●				●		●	●				●		●		●					●							
Multifamily	Condominiums	LEED NC 2.1	Gold	576,000sf	39	8	47	~	□	□	○	●		●	●	●	○	●	●	●	●	●	●	●				●				○					●							
Commercial	Office	LEED-CS 1.0	Gold	248,000sf	36		36	~	□	□				●		●		●			●	●	●	●							●	●	●				●							
Commercial	Office	LEED-CS 1.0	Gold	270,000sf	38		38	~	□	□				●		●		●			●	●	●	●							●	●	●				●							
Multifamily	Condominiums/Retail	LEED-CS 2.0	Gold	200,000sf	32	2	34	~	□	□				●	●	●	○	○			●			●							●	●	●				●							
Commercial	Office	LEED-CS 2.0	Platinum	396,000sf	43	4	47	~	□	□	●	●		●	●	●	●	●			●			●				●	●								●							
Commercial	Office	LEED-CS 2.0	Silver	47,000sf	27	8	35	~	□	□	○	●			●	●					●		○														●	●						
Commercial	Hotel	LEED-NC 2.1	Silver	324,000sf	33	3	36	~	□	□				●	●	●		●			●				●			●		●							●				○			
Commercial	Office	LEED-NC 2.0/2.1	Silver	19,000sf	33		33	~	□	□			●	●	●	●	●				●		●	●																				
Commercial	Education	LEED-NC 2.0/2.1	Silver	265,000sf	33		33	~	□	□				●		●					●		●	●							●		●	●				●						
Commercial	Retail	LEED-NC 2.0/2.1	Silver		36		36	~	□	□	●	●			●	●	●	●	●		●	●	●	●					●	●														
Commercial	Office	LEED-NC 2.2	Gold	342,000sf	38	6	44	~	□	□		●	●	●	●	●	●		●		●	●		○					●		●						●	●						
Commercial	Education	LEED-NC 2.0/2.1	Gold	51,000sf	45		45	~	□	□	●	●	●	●	●	●	●	●	●	●	●		●	●							●	●						●						
Commercial	Office	LEED-NC 2.2	Gold	143,000sf	44		44	~	□	□	●	●	●	●		●	●		●		●	●							●		●						●	●						
Commercial	Office	LEED-NC 2.0	Gold	19,000sf	40		40	~	□	□	●			●	●	●		●	●	●	●	●	●	●						●	●	●												
Multifamily	Condominiums	LEED-NC 2.1	Gold	282,000sf	39		39	~	□	□		●		●	●	●		●			●		●	●							●	●					●							
Multifamily	Condominiums	LEED-NC 2.1	Gold	437,000sf	40		40	~	□	□				●	●	●		●	●	●	●	●		●				●				●	●				●							
Commercial	Office	LEED-NC 2.2	Gold	60,000sf	39	11	50	~	□	□	○	●	●	●	●	●	○	●	●		●	●		●					●			○					●	●						
Commercial	Assembly	LEED-NC 2.0/2.1	Platinum	55,000sf	54		54	~	□	□	●	●	●	●	●	●	●	●	●	●	●	●	●						●		●						●	●						
Commercial	Group Home	LEED-NC 2.2	Platinum	27,000sf	31	20	51	~	□	□	●	●	○	●	●	●	○	○	●	○			○	○	●				○								○	○						
Commercial	Assembly	LEED-NC 2.1	Platinum	21,000sf	51	2	53	~	□	□	●	●	●	●	●	●	○		●			●	●	●		●			●							●								
Commercial	Office	LEED-NC 2.0/2.1	Platinum	16,000sf	52		52	~	□	□	●	●		●	●	●	●	●	●		●	●	●	●							●		●	●	●									
Commercial	Hospital	LEED-NC 2.1	Platinum	417,000sf	55		55	~	□	□	●	●	●	●	●	●	●	●			●	●					●		●		●	●												
Multifamily	Condominiums	LEED-NC 2.1	Platinum	143,000sf	55		55	~	□	□	●	●		●	●	●	●	●	●		●	●	●	●				●		●			●				●							
Commercial	Education	LEED-NC 2.2	Platinum	220,000sf	37	21	58	~	□	□		●	●	●	●	●	●	●	●		●	●									●						●	●			●			
Commercial	Assembly	LEED-NC 2.2	Platinum	20,000sf	43	18	61	~	□	□	●	●	●	●	●	●	●	●	●	●	○	●	○	●					●	○					○		●							
							# of projects	~	0	0	18	33	15	42	40	44	15	29	28	15	35	24	29	33	3	3	1	17	12	6	18	12	12	7	2	1	33	16	3	2	1	1	1	1
							% of projects	~	0%	0%	40%	73%	33%	93%	89%	98%	33%	64%	62%	33%	78%	53%	64%	73%	7%	7%	2%	38%	27%	13%	40%	27%	27%	16%	4%	2%	73%	36%	7%	4%	2%	2%	2%	2%

Appendix C: Endnotes

i http://www.sustainlane.com/us-city-rankings/categories/green-building

ii U.S. Environmental Protection Agency. http://www.epa.gov/greenbuilding/pubs/whybuild.htm

iii "Positive Returns: State Energy Efficiency Analyses Can Inform U.S. Energy Policy Assessments," Report No. E084, American Council for an Energy-Efficient Economy, June 2008, by Laitner, John A. and McKiney, Vanessa.

iv From the "High Performance Green Building Policy Staff Draft Report, August, 2008, City of Portland.

v From City of Portland Staff Report, August 8, 2008 "High Performance Green Building Policy."

vi From City of Portland Staff Report, August 8, 2008." High Performance Green Building Policy."

vii See "LEED for New Construction and Major Renovations," United States Green Building Council, Version 2.2, October 2005.

viii See "LEED for Homes Rating System." United States Green Building Council, January 2008.

ix "Cost of Green Revisited," July 2007 by Davis Langdon.

x "Positive Returns: State Energy Efficiency Analyses Can Inform U.S, Energy Policy Assessments," June 2008, American Council for an Energy-Efficient Economy by John A Laitner and Vanessa McKinnery.

xi "Doing Well by Doing Good? Green Office Buildings", Instititue of Business and Economic Research and the Fisher Center for Real Estate and Urban Economics, April 2008 by Piet Eichholtz, Nils Kok and John M. Quigley.

xii Fisk, William. "Health and Productivity Gains from Better Indoor Environments and their Relationship with Building Energy Efficiency." Annual Review of Energy and Environment. 2000. Vol. 25, pp. 537 – 566.

xiii Levin, Hal. "Commercial Building Indoor Air Quality." 1999. Produced by the Building Ecology Research Group for Northeast Energy Efficiency Partnerships, Inc.

xiv Yost, Peter. "Green Building Programs – An Overview." Building Standards. March-April 2002. pp 12-16.

xv Heschong Mahone Group. "Daylighting in Schools: An investigation into the relationship between daylight and human performance." 1999. Produced by Heschong Mahone Group, Inc. See also: Nicklas H, Bailey G. "Energy Performance of Daylit Schools in North Carolina." 2002. Produced by Innovative Design, Inc., available at http://www.innovativedesign.net/energyperformance.htm

xvi Alternatively, value added is measured as total output less purchases of intermediate goods and services. In either case, the measure of value added will be the same. However, to the extent that owners of corporations live outside the relevant study area, including corporate income will tend to overestimate the measure of value added in production.