GROWING WASHINGTON'S GREEN ECONOMY:
PROGRESS, OPPORTUNITIES AND CHALLENGES

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The Washington State University Extension Energy Program (WSU Extension Energy Program) is a recognized leader in energy research, development and technology transfer. The WSU Extension Energy Program works with government agencies, power marketers, utility consortiums, educational institutions, private businesses and industries on projects that promote energy conservation, research, development of renewable energy sources, and economic and workforce development.

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Executive Summary

This paper describes the opportunities and challenges Washington faces in furthering the state's green economy, and identifies how workforce development can best help the state achieve the economic, social and environmental benefits of a green economy.

As states and nations search for ways to stimulate their economies and create a vibrant future, the notion of a "green economy" is intuitively appealing. It seems to promise economic growth while simultaneously increasing energy security, enhancing environmental protection and generating good jobs. Understanding the strategic components of a green economy, however, is a complex task. Yet many current economic development and revitalization plans – including those of Washington – target jobs tied to goods and services that boost clean energy or energy efficiency, or that prevent or mitigate environmental pollution.

Washington has been at the forefront of such efforts historically, and the state can benefit by continuing to lead with policy, programs and other innovative approaches to achieve the goals of a green economy. Progress has been made to better align the various state and regional economic development plans and strategies intended to attain these goals, and to improve coordination between economic and workforce development. However, the plethora of economic development plans and strategies in use makes true alignment more challenging and underscores the need for even greater emphasis on this important component of economic development: A green economy requires a well-developed workforce and an innovative workforce education system to support it.

The report concludes with a number of observations and recommendations, offered as points for further discussion concerning state and local policy, education and training program development. These recommendations also seek to underscore the importance of aligning economic and workforce development initiatives to augment the state's green economy:

- **Improve policy and program alignment between economic and workforce development in the state**: Legislation calling for improved coordination between economic and workforce development has shown early evidence of better alignment and outcomes, but many existing strategies are being used. Although this offers some advantages, a more uniform approach may enhance efforts to align state-level economic and workforce development.
- **Balance economic and workforce development assets and priorities:** Although improved coordination has occurred, there is still a tendency to prioritize business development without fully considering workforce needs. Greater effort should be focused on assessing and highlighting the potential of our state's human resources and workforce development system as central features of Washington's economic development framework. To further enable this approach, Washington should:

- ***Continue to assess the state's economic and human assets***: Take stock of the human resources we have now and will have in the future, and more deliberately apply that information to attract new businesses and support expansion opportunities that benefit Washington citizens. Washington's workforce resources should be more clearly expressed in state economic goals.
- ***Continue to align the state's education and training system more directly with economic development strategies***: Boosting the role of education and training in economic development puts the state's providers on call to be more responsive to employer needs, and makes education a full partner in the economic development process.

- **Connect industry's needs to education and training entities and workers:** Washington is recognized nationally for its success utilizing industry skill panels, skill standards, centers of excellence, and industry cluster strategies, which should be continued or adapted to support economic development. The salience of workforce development as an incentive for retaining or expanding companies and employment will differ by industry; in the current fiscal climate, marketing workforce education to support economic development should be done strategically and cost-effectively.
- **Unify industry's voice to help align economic and workforce planning:** Business and labor have consistently encouraged better coordination and more cooperative and efficient operation of public workforce training programs, and good progress has been achieved. Augmenting industry's voice in economic development planning should help identify common priorities and expectations of industry partners about how enhanced coordination can best be accomplished, and define the specific outcomes that this coordination should produce across the state.
- **Recognize the demand for new, more extensive skills**: Most green workplaces seek employees with broader skill sets and a wider range of capabilities than in the past. Even though green technical skills are not so different from traditional ones in many trades, employers expect employees to perform work using methods that promote sustainability. White-collar workers are now expected to have a broader knowledge of green design concepts, sustainable business practices, and related policy and regulatory requirements. This knowledge is key to adapting to a marketplace in which more customers are demanding green products and services, especially those that are sustainably produced.
- **Continue ensuring that workforce development programs are demand-driven, competency-based and accessible:** Achieving green economy goals will require anticipating the workforce education and training needs of industry partners and moving nimbly to fill them with aspiring student interns, apprentices, and qualified new hires, while also re-tooling existing workers to adapt to technology and skill changes. One key to attracting new employers or expanding capacity is showing that the state and its training providers employ a systematic, integrated approach that delivers standards-based, demand-driven training in ways that maximize access by employers, employees and future workforce entrants.

- **Continue to invest in workforce education and training infrastructure:** Significant cuts in government services have affected education and training programs that are crucial to revitalizing and expanding the state's green economy. Our human resources are the "seed corn" of our economy, assets that we must wisely nurture and grow. Smart, efficient investments in apprenticeships and in two- and four-year colleges that offer training in high-demand engineering, technical, scientific, and many non-technical areas should be made to help Washington's green economy thrive.
- **Invest in research and development:** Utilize our best insights into potential markets for clean/green technologies and products that now exist or are likely to grow, and for which we can and should compete. Maintain consistency with other state and national economic strategies to continue a holistic planning approach and avoid planning (and training) silos.
- **Evaluate performance:** Continue to examine how state policies, regulations and incentives are affecting green industries and new business startups. Examine how publicly funded projects are evolving and adapting to economic conditions.

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Growing Washington's Green Economy: Progress, Opportunities and Challenges 2011

As a unifying concept, the notion of a "green economy" is intuitively appealing: boost economic growth through the development of new technologies and services that will help increase energy security, enhance environmental protection, and generate good jobs. Beneath the surface, however, understanding the strategic components and potential of the state's green economy is a complex task.

The concept is multifaceted, with several substantial economic drivers that do not always appear to be connected to each other. Organizations use the term "green economy" in varying ways, which has made it hard to define universally. That, in turn, has made it hard to measure its scope and growth – or to measure them consistently. Still, however it is defined, the green economy is meant to represent a combination of restructured, redirected and newly emerging economic sectors that are responding to burgeoning interest in clean energy, energy efficiency and environmental goals. As such, the green economy poses very real opportunities on many fronts. Recognizing that, the economic development efforts of multiple nations, states and regions are showcasing green economy initiatives for the myriad economic, environmental and social benefits they confer, goals collectively referred to as the "triple bottom line."

Washington has been at the forefront of such efforts historically, and the state can benefit by continuing to lead in policy, programs, and other innovative ways to instigate new developments that are intended to achieve the goals of a green economy. An important component of economic development – often underemphasized – is a well-developed workforce education system, which should be integral to all of the plans, strategies and initiatives intended as vehicles to meet these goals.

A skilled workforce enables productivity and growth. The availability of a well-integrated education and training infrastructure is essential to supporting the emerging green economy. Any well-conceived economic development strategy incorporates workforce development, but with green initiatives, it is particularly important to integrate workforce development more fully to make the results more potent, robust and beneficial to individuals and the state.

This paper describes the opportunities and challenges Washington faces in furthering the state's green economy, and identifies how workforce development can best support green economy goals and realize the promise of a green economy.

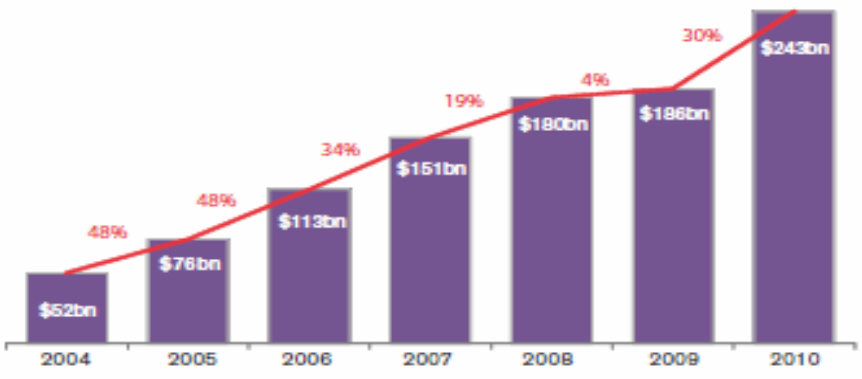
Part I. A Green Economy: The Goal

The Promise of the Green Economy

In 2009, the Pew Center on the States published an economic study of the *clean economy*, which it defined as an economy that "generates jobs, businesses and investments while expanding clean energy production, increasing energy efficiency, reducing greenhouse gas emissions, waste and pollution, and conserving water and other natural resources."[1] The report observed that the professional and blue-collar jobs in the clean economy had grown by 9.1 percent from 1997 to 2007, compared to 3.7 percent growth in total jobs.

Issuing the report in 2009, Pew researchers recognized that the recession had slowed growth in all sectors, but they still contended that the future of the clean/green economy was bright. Their chief evidence lay with venture capital investments, which they presented as a bellwether for general investor interest and a signal that the sector would continue to have strong growth potential. They reported that venture capital investment in clean economy sectors exceeded $1 billion in 2005 and was continuing to grow into 2008. It declined considerably less (down 48 percent) in the first months of the recession than all other investments (down 61 percent).

Their optimism seems confirmed three years later with consistent reports from Bloomberg and other sources regarding the strength of green economy investments.[2] Results of the New Energy Finance Summit (2011), for example, illustrate investors' continued confidence in clean energy's economic promise. Analysts reported the continued growth of global investment in the sector, up 30 percent from 2009 to 2010, to $243 billion (Figure 1). The growth reflected broad investment of $51 billion by China, which is investing heavily in clean energy options to meet its growing demand for energy. Growth also continues in specific sectors globally, such as the 120 percent increase in rooftop solar expenditures and the effects of federal



Source: Bloomberg New Energy Finance
Note: Includes corporate and government R&D, and small distributed capacity. Adjusted for reinvested equity. Does not include proceeds from acquisition transactions.

FIGURE 1. GLOBAL TOTAL NEW INVESTMENT IN CLEAN ENERGY 2004 – 2010

stimulus spending in the United States.[3] Bloomberg projects that global investments in clean energy generation will soon exceed investments in fossil fuels.

Moving to the specific evidence of employment, the Brookings Institute recently estimated that the green economy employed 2.7 million workers in the United States. These jobs are distributed throughout an assortment of industries, many of them traditional but encompassing new sectors, products or techniques. A small and potentially critical segment includes new industries responding to energy and environmental challenges – and providing solutions. These include renewable energy technologies, emissions controls and smart grid applications needed to effectively integrate new energy sources and boost energy efficiency.

The strength of this sector may not be readily apparent. According to Brookings, "The clean economy grew more slowly in aggregate than the national economy between 2003 and 2010, but newer 'clean tech' segments produced explosive job gains and the clean economy outperformed the nation during the recession."[4]

Specifically, Brookings estimated growth of 500,000 jobs in the green sector between 2003 and 2010, representing an average annual growth rate of 3.4 percent. While this rate of growth was slower than the overall economy in that period, it included industries hard hit by the real estate recession (especially building and construction-related industries). Other industries in the green sector (notably wind energy, solar photovoltaics (PV) and smart grid technologies) grew substantially in the same period (on a percentage basis), but started with small shares of the total economy.

Competing with this strong but uneven green growth were segments of the general economy that grew steadily and were less affected by the recession (such as health care). From 2008 to 2009, however, the clean economy grew faster than the rest of the economy, expanding at a rate of 8.3 percent. According to Brookings, this robust growth was due, in part, to federal stimulus investments in clean energy projects.

Some researchers have argued that the direct and indirect (ripple-effect) job-creation potential of sustained public- and private-sector investments in energy efficiency and renewables could generate large numbers of new jobs over the next decade.[5] Pollin (2009) predicted that such investment could generate up to 1.7 million jobs, depending on the extent of public- and private-sector support. Pollin and other researchers also posit that net job growth due to clean energy investment would considerably exceed net job growth that would come from investments in established fossil fuel-related sectors.

Brookings also noted characteristics of the green economy of interest to Washington:

- *Manufacturing is integral to the green economy*. Brookings calculated that 26 percent of green jobs were in manufacturing companies, compared to only 9 percent of all U.S. jobs. Examples included manufacturing electric vehicles, green chemical products, organic food processing,

energy-efficient lighting products, sustainable forestry products and energy-saving appliances – most of which are manufacturing-intensive.

- *The green economy is a valuable export asset.* The value of the exports of companies in the green economy was twice the average value of other American exports on a per-job basis. Leading examples included exports in biofuels, green chemicals, electric vehicle technologies, wind turbine components, battery technologies, solar PV, fuel cells, air and water purification technologies, and recycled-content products. Indeed, a common theme in many of Washington's economic development proposals is to produce and sell clean technology products to export markets.

The Brookings report noted the benefits of green employment, including the opportunities that green jobs have offered lower- and semi-skilled workers. They calculated median wages in the clean economy as 13 percent higher than in the general economy, in part because clean energy jobs were found to be in better-paying industries and higher-paying occupations. Researchers also found that clean energy jobs were much more likely to be in middle-wage "green collar" occupations than those in the general economy. These occupations – often in goods-producing, construction and other technical sectors – also represented a disproportionate number of well-paid jobs that were filled by workers with less formal education than their peers in the economy as a whole.

Discussion of the geography of green jobs, however, illustrated the competition Washington faces. Brookings found that green jobs are strong in several regions. The West has the highest employment in green occupations as a percentage of its workforce, but the largest concentration of green jobs is in the South: 7 of the 21 states that reported more than 50,000 green jobs were southern states. As individual states, California had the highest overall number of green jobs, and Alaska and Oregon had the most green jobs relative to the size of their total workforce.

In other geographic variations, metropolitan areas led green employment. Brookings reported that the most green jobs – and growth – are combined in the nation's 100 largest metropolitan areas. Those areas accounted for 64 percent of all green jobs in 2010 and 75 percent of the green jobs created from 2003 to 2010. There was no single metropolitan green economy, however. Different areas were marked by concentrations of certain subsectors: areas like New York City reported high concentrations in mass transit and the service sector; mid-western and southern cities (Louisville, Cleveland, Greenville) had a green manufacturing focus. Green public-sector jobs were strong in several state capitals (Harrisburg, Sacramento, Raleigh), and several cities were noted for multi-faceted "balanced" clean economies, notably Atlanta, Salt Lake City, Los Angeles and Portland.

Brookings credited the regional specializations to the effect of industry "clustering," a concept with which Washington's economic planners are already familiar. They reported that, overall, clustered establishments grew at a rate that was 1.4 percent faster each year than non-clustered (more isolated) establishments. Examples included clustering of professional environmental services in Houston, solar photovoltaics in Los Angeles and fuel cells in Boston.[6]

Issues of Definition and Measurement

The good news in these reports is only as reliable as the data they rest upon, of course. And comparing studies of the green economy can be frustratingly complicated. In the last decade, the surge of interest in "green" launched a variety of independent, often disconnected, efforts to define what a green economy would be. In fact, rather than abating, efforts to define and measure continue to proliferate. For instance, this year the California Employment Development Department listed all the studies it tracks on the clean economy – and the "digest" was 24 pages long.[7]

Efforts to measure the green economy were inevitably complicated by the variability of definitions. Some definitions have been lofty, some imminently practical. Some focused on energy sustainability, some on ecological balance. Many concentrated on defining the "economy" by defining its occupations, usually those that produce, install or maintain green products. Others concentrated on describing business practices that maximized efficiency and, thus, were – or will become – more cost effective than current procedures.

The range of definitions can be illustrated easily. As much vision as definition, the United Nations Environment Programme (UNEP), for example, promoted a sweeping designation, envisioning a global economy that is "low carbon, energy efficient and socially inclusive." The UNEP argued that the current disenchantment with the old economic policies, considered to have brought on the global recession, has contributed to a general willingness to consider new ways of doing business. At the same time, the practical requirements of "going green," which require developing effective tools and techniques, must be met. Advances such as creating affordable, effective alternative energy; lower carbon transportation options; cost-effective waste management and closed-cycle manufacturing make it possible to consider moving from pilot projects to broad implementation of green policies.

While the UNEP definition is not a universal one, its argument that the benefits from green policy implementation could be seen – and replicated – illustrates the importance of efforts to measure the impact of specific green practices.

Unfortunately, the multitude of independent efforts to define *green* also complicates efforts to measure their size, scope and effect. The deviations in definition rendered the results largely incomparable. Careful, justifiable work was often done, but not done following a common set of standards or guidelines.

Further, reports such as the UNEP report present evidence that discrete green practices have measurable impacts. They did not attempt, however, to assess the effect of cumulative implementation, such as in a state or national economy.

Impact of Definition on Measurement

Comprehensive measurement, however, *is* a goal in Washington State. Understanding the importance of uniformity in public analysis, the state has consistently employed the same definition of the green economy since it first attempted to systematically measure employment in the green sectors in 2008. While the definition has evolved from a simple list of discrete occupations into a set of broad categories, industries and occupations, it remains essentially the same as the definition used in early 2009 in publications by the state Department of Community Trade and Economic Development (now Commerce) and the Employment Security Department (ESD). In fact, Washington's definition has been used as a foundation for identifying and measuring green economy jobs by a number of states and research projects.[8] Here is the definition used in Washington State:

> *Green jobs are defined as those where employees are directly and predominantly engaged in at least one of four core areas of the economy:*
>
> a. *Increasing energy efficiency*
> b. *Producing renewable energy*
> c. *Preventing and reducing environmental pollution*
> d. *Providing mitigation or cleanup of environmental pollution*

Using these four green core areas in the *2008 Green Economy Jobs Report,* ESD reported over 47,000 private-sector jobs in those occupations, which is considered to be a conservative estimate.[9] In the update released in 2010, more than 99,000 jobs were reported in the same categories for both private and public employment, representing 3.3 percent of total employment in the state (covered by unemployment insurance), up from 1.6 percent in 2008. This represents a gain of over 15,000 jobs (32.4 percent). The result surprised analysts, who noted that green jobs were more widely spread across the economy than previously reported. They also surmised that in the context of the economic recession, the increases likely came from greater awareness of what constituted a green job, as well as new hiring or changes in the products and services offered by the reporting employers. Compared to the initial study, the 2010 study also surveyed a wider range of industries covering the state's total economy.

Washington's results, however, stand alone. They are not replicated in other studies because, even with a focus on elements as concrete as employment and business activity, it is difficult to find agreement among researchers about what to include and measure. In separate reports, the National Governor's Association (NGA) and the Pew Trusts reported fewer green jobs than did Washington's 2008 study (see Table 1). The 2009 NGA study considered green business to include:

> *Businesses that provide products and services that do the following: Provide alternatives to carbon-based energy sources, conserve the use of energy and all natural resources, reduce pollution (including GHG emissions) and repurpose waste.*

NGA's report is largely based on pre-recession figures, but its method of comparing states is instructive. They chose to measure how concentrated employment was in an industry, which "indicates an area of strength and comparative advantage for a state." (This may be particularly useful following the Brookings evidence that clusters matter in green economy growth.) For NGA, "concentrated" meant that the percentage of total employment in a particular segment is higher than the national average. Their analysis of Washington noted, for example, that:

- *Washington's energy infrastructure is more than six times more concentrated than the U.S. average.*
- *With nearly 5,900 jobs, air and environment accounts for the largest employment of Washington's green segments. Other green segments with high employment levels include recycling and waste (3,500 jobs) and water and wastewater (2,000 jobs).*
- *Between 1995 and 2007, Washington's concentration in transportation increased by 72 percent. Over this period, employment concentration increased nearly 50 percent in Green Building and more than 20 percent in research and advocacy.*[10]

Pew's *The Clean Energy Economy* report, which also contained information on each state, used the following definition:

> *A clean energy economy generates jobs, businesses and investments while expanding clean energy production; increasing energy efficiency; reducing greenhouse gas emissions, waste and pollution; and conserving water and other natural resources. The clean energy economy cuts across five categories: (1) clean energy, (2) energy efficiency, (3) environmentally friendly production, (4) conservation and pollution mitigation, and (5) training and support.*

In these categories, Pew determined Washington had 2,008 clean energy economy businesses and 17,013 jobs in 2007, as shown in Table 1.

As noted earlier, some of the differences between ESD estimates and those of national-level studies are likely due to differences in green job definitions, but also study sampling procedures, including whether the research relied primarily on survey data taken directly from employers (such as the ESD study), or on secondary databases from existing sources. Each approach offers advantages and limitations that can affect study estimates.

While the NGA, Global Insight and Pew Trusts reports illustrate the vagaries inherent in counting green economy jobs, they each predicted growth in the green sector fueled by continued venture capital investment, business innovations, and policy- and consumer-driven demand. A closer look at projections as part of the discussion of current and projected employment – particularly in light of the recession – is provided below.

TABLE 1: DIFFERENT GREEN ECONOMY JOB ESTIMATES FOR WASHINGTON, 2006-2010

SOURCE	GREEN JOBS				
	2006	2007[11]	2008	2009	2010
Pew Trusts (2009)	16,384				
National Governors Assn. – Pew Trusts (2009); Collaborative Economics (2009)		17,013			
Washington State – ESD (2009-2011)			47,194	99,319	Underway
U.S. Conference of Mayors – Global Insight (2008)	17,238[12]				
Brookings Institute – Battelle (2011)[13]					83,676

Eventually, some consensus will be forced on the states because the Bureau of Labor Statistics (BLS) has issued a definition for national use. For now, Washington will continue to rely on its state-mandated measurement using the current definition and survey methods in 2011. This will preserve consistency in Washington's data, which the state legislation requires for tracking changes in green economy jobs.

Discussions are ongoing about state-national data comparisons and the efficacy of a national survey design. The BLS sample of employers from each state will be considerably smaller than Washington's. In addition, using the BLS definition and study design will bifurcate what Washington employers report to include not only jobs that produce green products and services, but also businesses that employ green practices, such as lean manufacturing.[14]

The Promise in Washington

Regardless of the details of the definition and the structure of its measurement, Washington's economy was predisposed to develop green "drivers," derived from the state's historic energy and environmental industries and its entrepreneurial and innovative culture. Indeed, Washington's green future is inextricably tied to its unique blend of natural resources, especially hydropower, which now provides two-thirds of the electricity produced in the region. Massive investments in hydropower infrastructure during the 1930s and the creation of the Bonneville Power Administration (BPA) enabled the provision of inexpensive power that has helped support development in the state for over 50 years.

During that time, concern about the impact of hydroelectric power generation on the state's other natural resources, such as salmon and wildlife habitat, grew in concert with national concerns about energy independence and the region's ecology. These concerns fueled congressional action, resulting in the Northwest Power Act of 1980. The Act focused attention on ecological impacts and strategies to meet regional power demand through energy efficiency and use of renewables. One requirement was the adoption of a regional conservation and electric power plan, which is regularly updated. The current Sixth Power Plan sets aggressive targets for regional energy conservation to meet 58 percent

of new demand by 2014 and 85 percent of demand by 2029. The collective actions of BPA and utilities have yielded $2.2 billion in energy savings for the region.[15]

Washington continues to participate actively in regional efforts to address climate change and develop clean energy solutions through its leadership in regional initiatives and the state's Renewable Portfolio Standard (RPS). The RPS requires utilities to provide an increasing proportion of green power through 2020.[16] Substantial federal and state investments and incentives for energy efficiency and renewables, which are intended to stimulate job creation and new efficiency gains through weatherization, are still underway.[17]

What these reports and accounts make obvious is that Washington has a long history of commitment to its environment and to progressive energy policy. And, if we accept findings from the Brookings report as one indicator of progress, it appears that these early initiatives have paid off:

- Washington's clean economy ranks 10th nationally among all states.
- Washington's clean economy makes up 2.8 percent of all jobs in the state, putting it 10th nationally on this measure. (For 2009, ESD found the clean economy makes up 3.3 percent of all jobs in the state.)
- The median wage of $46,457 for Washington's clean economy jobs is higher than the overall statewide median wage of $43,322.

But the new reports make very clear that other states and nations are also increasingly concerned about – and acting on – plans to strengthen and sustain green economic development, suggesting that ***Washington is not alone in its pursuit of those goals.***

Indeed, Pew's most recent report suggests that the entire United States may be losing ground to other countries in the quest to grow a clean energy economy, making the need to compete globally a centerpiece of the Obama Administration's proposal to create a more secure energy future.[18] Because these competitors are employing a wide array of strategies and increasing their public and private investments and policy focus, Washington will need to defend its preeminent position.

To ensure that Washington's green economy continues to thrive and expand, the state will need to employ green economic development strategies that support the state's traditional environmental, energy and social objectives. The green economy is complex, as is defining the best course of action to reach that goal. This approach begins with assessing the state's strengths, understanding the challenges, and charting a course of action to meet them. As this report suggests, a central feature of Washington's strengths and its challenges lies in developing its human capital.

Part II: Assessing Washington's Strengths

Among Washington's many strengths is its established commitment to policy that preserves its ecological balance, strengthens and diversifies its energy industry, and addresses economic and social goals. Its political structure retains its populist roots and its legislative culture remains largely progressive. It sustains an unusually effective balance of business and labor interests with an equally strong emphasis on public-private partnership. The state has developed highly regarded innovations in workforce development at state and regional levels, and a highly effective community and technical college system. It hosts a national research laboratory, two exceptional research universities and has, thus far, preserved a commitment to educational access for all. Like every state today, Washington struggles with the cost of its commitments, but the critical conversations in which it is now engaged should be informed by its history and its longstanding goals.

Washington's industry base consists of leading companies and entrepreneurs in many sectors that tie directly to the green economy. This leadership pushes the state into areas beyond its historical anchors in energy and the environment. Ranging from research and development, commercial leadership positions in aerospace and information technology, and construction to life sciences, health care and agriculture, the state is a well-established global leader in many industry sectors. And as the nation's fifth largest exporter, Washington's economic future is inextricably linked to its success in capturing more of the clean/green export market.[19]

Washington has attracted generous green economy investment. By one account, Washington saw over $635 million in clean technology venture capital investment between 2006-2008, ranking the state fourth behind California, Massachusetts and Texas.[20] During the same period, the state ranked first in employment growth (5.65 percent) and revenue growth (13.45 percent) of venture-backed companies.[21] There is also evidence that Washington clean tech entrepreneurs and investors believe that the market for clean technology is likely to increase for the foreseeable future.[22] Taken together, these features underscore the inherent capacity of Washington industries to compete in the clean technology arena and the willingness of investors to help position Washington businesses for success.

Washington has a robust workforce education system. The state's well-established registered apprenticeship system offers myriad education and training programs in traditional trades and crafts, as well as in new and emerging industries that lead to journey-level certification and employment. Washington's 34 community and technical colleges also offer a broad range of industry-endorsed professional and technical programs, and this network of colleges is able to deliver training and education to Washington's citizen through its many campuses and coordinated on-line offerings. The state's six four-year universities, including two major research institutions, provide baccalaureate and advanced degrees and certificates through academic and professional programs across the state.

With these existing resources in place, Washington is well-positioned to identify, create and deliver programs that are deemed essential to moving the state's green economy forward.

Washington's Policy Framework – Setting Our Goals

Washington is well positioned to demonstrate how a state can address simultaneously the critical needs of the environment, the economic realities of its energy demands, gainful employment growth, and education services for its citizens in an economy under stress. Seen as an intersection of climate, energy, labor market and social equity issues, the green economy faces formidable challenges, but these are matched by significant opportunities. But effective policy leadership is essential.

Washington's Policy Leadership

Washington State has a long list of policies and legislation that support the greening of the state's economy. In the last five years alone, a number of major state legislative actions have addressed a broad range of related topics, including the adoption of stronger greenhouse gas emission standards, building energy codes that increase energy efficiency, and growing the state's clean technology sector.[23] Some are long-standing regulations that have been regularly updated and others are more recent and reflect growing support for clean energy and energy efficiency.

- The Washington State Energy Code, which was established in 1977 and enhanced many times, sets the minimum standard for energy efficiency for newly constructed buildings. Since it was enacted, the code has been credited with a large proportion of the total energy savings achieved in the state.[24]
- On a per capita basis, Washington has the most buildings of any state that meet the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) standard,[25] and the state is a national leader in conservation, as evidenced by national rankings such as *Forbes Magazine* and the American Council for an Energy Efficient Economy (ACEEE). [26]

AVIATION

An excellent example of an industry sector creating a nexus of green energy, ecological policy and economic benefit is the Northwest aviation industry. The locus of aviation innovation and the existence of abundant biomass options make this region a logical place to lead innovation in the industry.

According to the May 2011 report of Sustainable Aviation Fuels Northwest (SAFN), the development of alternative jet fuels is both a global economic and national security issue. Test flights have already succeeded in using biofuel blends in commercial and military aircraft. SAFN recommended further developing direct biomass conversions and biomass blends.

Supported since 2009 by the state legislature through the Department of Natural Resources, the initiative recently announced a five-year, $40 million grant from the U.S. Department of Agriculture. Grant partners include Washington State University, which also researches the use of forest byproducts as feedstock, and the University of Washington, which is conducting a supply study due in fall 2011.

- Washington voters passed Initiative 937 (I-937), a RPS enacted in 2006, that requires that 15 percent of the power sold to Washington consumers must come from renewable resources by 2020. Beyond the hydroelectric power that is the energy backbone of the state's economy, solar, wind, biomass and certain hydroelectric facility upgrades are the primary targets of the state's RPS. Washington was the first state in the nation to include energy efficiency targets as well as renewables. Qualifying Washington utilities are required to achieve all cost-effective energy savings.[27]

From this came a flurry of legislative activity, as summarized in Table 2.

TABLE 2. WASHINGTON STATE LEGISLATIVE ACTIVITY, 2008 – 2011

2008	
Climate Change and Green-Collar Jobs Bill	Washington became the fourth state in the nation to adopt legally binding global warming pollution limits to create a cleaner, greener economy. Washington became the first state to make workforce training a key feature of its climate policy.
Governor's Executive Order	Required reductions in greenhouse gas emissions and creation of green jobs.
ESHB 2815	The Green Economy Jobs Growth Initiative was one component of this bill, which established a goal of increasing the number of clean energy jobs in the state to 25,000 by 2020; directed specific actions related to the green economy by a number of state agencies; established a Green Industries Job Training Account in the State Treasury for green economy competitive grants; and identified six categories of targeted workers.
2009	
E2SHB 2227	Established the Evergreen Jobs Initiative and the Evergreen Jobs Leadership Team.
SB 5854	Gradually raises efficiency standards for new building construction while improving energy efficiency in existing public buildings through insulation, better windows and improved heating and cooling systems.
SHB 2420	The state's essential forest products industry ordered studies by the Employment Security Department and the Workforce Training and Education Coordinating Board to determine employment projections and identify education and skill standards for existing and emerging employment.
2010	
SB 5649	Specifically targets and supports the median-income residential retrofit market and pilots a structure and support system to enable market growth in this arena. From this, and despite low electrical rates, Washington is ranked sixth among states by the American Council for an Energy Efficient Economy for strong energy efficiency policies.[28]
ESSHB 2658	Directed Washington's Department of Community, Trade and Economic Development – now Commerce – to update the State Energy Strategy. Among the guiding principles of the strategy were reducing the state's dependence on fossil fuels and improving efficiency in the transportation sector by adopting electricity as a transportation fuel, providing support for electric vehicles and deploying charging infrastructure.
2011	
ESSHB 5764	Created ***Innovate Washington*** to respond to the technology transfer needs of existing businesses and coordinate clean technology initiatives in the state.

Implementing the Legislation

Setting a Strategic Framework

The goals established for E2SHB 2227 provide a good example of what followed from this legislation. In January 2009, the Evergreen Jobs Leadership Team (EJLT) received a draft paper, "Washington State's Green Economy – A Strategic Framework," from its member agency, the Department of Community, Trade and Economic Development, or CTED (now Commerce). This was the initial effort to integrate many elements of the green initiative, more broadly cast than energy and jobs, and to challenge state leadership to a systemic approach. Its goals included:

- Create 15,000 new green economy jobs by 2020.
- Target 30 percent of the jobs to veterans and disadvantaged populations.
- Secure and invest federal funds, particularly American Recovery and Reinvestment Act (ARRA) funds.
- Prepare the workforce to take advantage of green economy job opportunities.
- Make the state a net exporter of green industry products and services.
- Capitalize on existing partnership agreements, both public and private.

The report also noted that although the entire forest products and agricultural industries were not originally classified as green, certain activities such as organic farming and sustainable forest management fall within the green realm.[29]

Economic Development Policy: Opportunities and Challenges

The opportunities of the green economy are attractive to economic development planners. While economic development is defined and implemented in a variety of ways, it is generally understood to be a package of policies, regulations, incentives and initiatives intended to create an environment that will foster economic growth. Economic development plans are created at every level, from international regions to local municipalities. Some efforts focus on general economic viability for an area, but many seek specifically to increase the economic well-being of those who are furthest behind the normal standard of living for the area. In practical application, economic development efforts commonly converge on policies that address lending, permitting and regulation, transportation and infrastructure, labor markets and employment.[30]

With the main focus on regulation and operations policy, it is easy to neglect the development of the state's human capital. But doing so ignores the economic asset of human resources, which can be developed and sustained through training, education, and other methods to ensure that people have the skills needed to participate in the emerging green economy.

Despite this frequent oversight, the connection between economic and workforce development is crucial, as expressed by the Corporation for a Skilled Workforce:

> *Today far too many communities and people cannot find good jobs and firms struggle to develop talent. The technology revolution has left much of our workforce without the skills they need to succeed in the 21st century economy, while the global marketplace has brought intense new competition to companies that used to be reliable sources of American jobs.*
>
> *Training for entry-level employment is not the only need. Not only are advanced technical and professional skills in need throughout the economy, they are of particular importance as economic sectors develop and change. Assisting those without jobs is a vital task, but so is preventing displacement for workers employed by changing industries.*
>
> *The acceleration of change in the global economy has also put a premium on agility. Today individuals must commit to lifelong learning to stay relevant in the marketplace. Companies need to retool for rapid shifts as the landscape changes. And communities have to constantly prepare for what comes next as local industries expand and contract.*[31]

Economic Development in Washington

The state has charged Commerce with a simple mission: *grow and improve jobs in Washington.* Its vision, adopted from the Washington Economic Development Commission, is elegant and visionary:

> *Make Washington the most attractive, creative and fertile investment environment for innovation in the world as a means of achieving long-term global competitiveness, prosperity and economic opportunity for all the state's citizens*.

Common themes among the plans include policy recommendations, tax incentives and partnership development.

What is less common is a clear focus on how to ensure that Washington's workforce has access to the education and training they need to enter the emerging green economy or to help incumbent workers retain jobs and advance careers as their industry evolves.

Workforce development is featured in Commerce's four Global Goals *(Improve performance of the education system to better match workforce skills to employer needs),* but the strategies and objectives of its strategic plan are remarkably modest:

> *Objective 1: Increase Commerce engagement in this area.*
>
> > *1.1: Dedicate resource to understanding the employer perspective on our system and generate ideas and help implement change that addresses that perspective.*

This report offers ways in which the objective might be made more fulsome. Additionally, while Washington has acknowledged the need to coalesce economic and workforce development, by

design at least, another common challenge remains: unifying all the critically interested and specialized partners. At worst, too many discrete plans with too many points of leadership can endanger the effectiveness of any of their strategies unless they are carefully aligned. Washington's traditional reliance on divisions of labor and distributed leadership make this an issue that could moderate individual efforts to stimulate and support the state's green economy. With care, it is possible to avoid the "too many cooks in the kitchen" condition, and align efforts to ensure they result instead in a "many hands make light work" scenario that also produces better results.

Finding Workforce Development in Washington's Plethora of Plans

Currently, Commerce, the Washington Economic Development Commission, the Workforce Board, the Puget Sound Regional Council, local workforce development boards, local and regional planning bodies and municipal institutions all have economic development plans or strategies in place.[32] Some of those plans focus on green jobs or clean technology (see below).[33]

Several strategic plans and advisory reports issued recently mention workforce development as an economic development issue, though without consistency or overt coordination with green economic planning. The most prominent state-wide examples include:

- The Washington Economic Development Commission plan that speaks most directly to the role of "talent development" in ensuring that Washington has a workforce that is innovative and will be effective in moving our economy into the future. The Commission is working regionally to identify "Innovation Partnership Zones," which are related to an industry cluster approach to economic development.[34]
- The Department of Commerce 2009 report on Washington's Green Economy encouraged state support for specific workforce training strategies, such as the job skills program, centers of excellence, apprenticeship, adult basic education and training programs in high-demand fields. The same report also notes, however, that with regard to supporting economic development efforts, the state "is not well prepared to maintain or grow a labor force to support a profitable economy, green or otherwise."[35]

In a recently released study of emerging business models in the energy efficiency industry, the Department of Commerce highlighted a variety of ways in which Washington businesses are delivering a range of services to residential and commercial customers. They included businesses that utilized ARRA funding and those that developed on their own.

Commerce recommended several next steps to broaden and sustain the energy efficiency sector, including recognizing the importance of supporting, collaborating and overseeing energy-related construction contractors; extending and/or mandating energy use disclosures; and requiring time of sale/lease upgrades.

See Emerging Business Models_FinalVersion_9-20-11.pdf

- The Navigant report for the Clean Energy Leadership Council investigated tax incentives, demonstration projects, and research and development investments. While research and training providers are cited as essential partners in economic development, this plan does not address workforce development explicitly.[36]
- *High Skills/High Wages*, the state's workforce development plan, has an industry sector approach and identifies the "Workforce Development System" in Washington as seven agencies:

    - The Workforce Training and Education Coordinating Board (Workforce Training Board), authors of the report,
    - State Board for Community and Technical Colleges (SBCTC),
    - Office of Superintendent of Public Instruction (OSPI),
    - Employment Security Department (ESD),
    - Department of Social and Health Services (DSHS),
    - Department of Labor and Industries (L&I), and
    - Department of Services for the Blind.

    No explicit connection to economic development agencies or initiatives is mentioned in this definition, although the plan clearly intends to strengthen the link between employer needs and worker training, with an emphasis on emerging industries and high-wage technical jobs.

Key Partner: Washington's Building and Construction Trades

The focus of Washington's ARRA State Energy Sector Partnership grant investment is upgrading the skills of building and construction trades' workers as a direct investment in energy conservation and green building. ESD reports that of the top ten green occupations in Washington in 2009, half are occupations of the building trades: electricians, construction laborers, plumbers and pipefitters, carpenters and HVAC installers.

Over 90 percent of building equipment specialty trade/subcontractor employment in Washington is in electrical wiring or plumbing/heating/cooling systems – industries in which energy technology is changing rapidly. As Washington researchers have noted, this affects all green and energy-related growth, as future growth in renewables will also depend on our ability to supply a well-qualified workforce to design, build, operate and maintain renewable energy plants and equipment.

- The Puget Sound Regional Council's plan, which is based on 2004-2005 data, calls out seven industry clusters and identifies six foundations of economic development, one of which is workforce. Their focus on workforce development is through a higher education committee, which mainly targets four-year universities. In 2011, their higher education committee recommended an education funding policy, which was adopted, giving the universities tuition-setting authority.

Other key players in the state's economic development and workforce worlds include the Association of Washington Business (AWB) and the Washington Economic Development Council (WEDC). Neither

has an explicit economic development plan, although both are consistently active in the development of state policy in economic and workforce development.

The Washington State Labor Council (WSLC) and its union affiliates are also active in state policy discussions about economic development, especially regarding job creation and apprenticeship training. Both the WSLC and AWB are partners on the Workforce Training Board. The WEDC supports activity of regional economic development councils, and includes the current Director of Commerce and the Executive Director of the Workforce Training Board.

This trend toward overlapping representation illustrates a deliberate attempt to align these systems that began with interconnecting the leadership and making each party more aware of the goals of the other; the move toward greater coordination is also required by Substitute House Bill 1323, passed in 2010.[37] Yet, for all the efforts to connect these different parties, it is difficult to determine the extent to which increased exposure and conceptual alignment among these players has forged a stronger connection between economic and workforce development in the programmatic and operational work of the individual partners.

Moving From Policy to Program

Washington has moved legislative policy beyond reports and plans into program strategies. The *Energy Strategy Plan UPDATE* details what is needed to meet the state's carbon reduction initiative. Its targets, which also address the job creation potential of different policy options, cannot be met without a skilled workforce.

Most recently, Innovate Washington – created by the ESSHB 5764 – began to pursue various economic development opportunities in the state, beginning with clean technology. This is an essential activity to pursue new development related to clean energy and other targeted sectors, but it could also present an opportunity to ensure that workforce training to targets and supports the needs of the sector.

Section 2 of the state's *Energy Sector Strategic Plan* (ESSP) is aligned with its workforce development plan, *High Skills, High Wages 2008-2018*, which identifies workforce strategies that include industry clusters and 11 industry-focused centers of excellence. The Pacific Northwest Center of Excellence for Clean Energy (PNCECE) at Centralia College and the Center of Excellence for Aerospace and Advanced Materials Manufacturing at Everett Community College are two well-known examples.[38]

Washington's State Energy Sector Partnership

In 2009, the Washington State Legislature enacted the *Evergreen Jobs Act,* (ESSHB 2227) establishing a comprehensive green economy jobs growth initiative to create 25,000 new green-economy jobs by 2020. The Act also created the EJLT, responsible for deploying federal training and education funds to support the goals of the Act. As part of its mission, the EJLT serves as the State Energy Sector Partnership (SESP), as identified in the state's applications for American Relief and Recovery Act (ARRA) energy grants**.**

The EJLT is co-chaired by the deputy directors of the Workforce Training Board and Commerce. Members include a broad spectrum of representatives with workforce education and training expertise from business, labor, education and government.[39] In its first year of activity, the EJLT helped define green jobs and coordinate state efforts to apply for targeted ARRA jobs and job training grants. Washington was very successful in competing for the federal stimulus funds, acquiring its leadership share through state, regional and local applications that generated over $150 million in ARRA funds. The EJLT tracked the progress of these grant programs as they were implemented throughout the state. [40] [A summary of projects and current status appears in Addendum 1.]

Critical Partnerships:
Center of Excellence/Smart Grid

Washington State and the Pacific Northwest are gearing up to provide more green power, but the existing electrical power system was not set up for efficient delivery of variable wind and solar power. Upgrading the existing power grid to be "smarter" means producing and implementing new technologies to better balance intermittent renewable energy sources and more efficiently use baseload power from hydro, gas and coal.

Recognizing the need to ensure a skilled smart grid workforce, the DOE in 2010 awarded over $11 million in stimulus funds to the Pacific Northwest Center of Excellence for Clean Energy, a Washington State University-University of Washington partnership, and power system training company IncSys. These partnerships are undertaking projects to develop and launch education and training to support smart grid implementation through 2013.

- The state received over $27 million in U.S. Department of Labor (DOL) and Department of Energy (DOE) green job training competitive ARRA grants.
- Washington received 54 percent of its total ARRA green job request for competitive grant funds.
- 8,935 Washingtonians will be served through ARRA green jobs training and placement.
- 1,418 Washingtonians are currently in training or have been trained through ARRA green jobs training efforts.
- The state will use nearly $67 million in DOE-administered ARRA funds for low-income weatherization projects. Of those funds, $10.4 million will go toward weatherization-related training and technical assistance activities. To date, these funds have weatherized over 8,200

low-income households and have created or retained nearly 200 full-time-equivalent (FTE) jobs per quarter.

- The State Energy Program at Commerce has invested over $60 million of federal funds plus additional leveraged funds to accelerate job creation and retention in green sectors, which will create 4,078 jobs (2,386 of which are temporary).

By the end of 2011, these investments created or retained nearly 2,000 jobs in Washington. Although total job creation was lower than expected for the year, grant activities are still underway and continued monitoring by the EJLT and reports from project leadership has helped fine-tune the state's green economic strategy and enhanced job creation and retention efforts.

Part III. Business and Workforce Conditions

Complementing Washington's policy commitment, clean energy demand and state of readiness to address industry need is our state's business and workforce strength. As noted earlier, *Forbes* magazine recently ranked Washington the second best state in the nation for business, largely due to its prospects for growth and the quality of its workforce. But growth in Washington's workforce (3,568,900 as of August 2009), robust through the last decade, has constricted particularly as the rate of in-migration slows.[41]

. . . Although many companies continue to look outside the state for skilled labor, Washington is increasingly dependent on its ability to educate and train its residents to meet its economic needs. At the same time, the workforce is also increasingly diverse and steadily aging.

Although many companies continue to look outside for skilled labor, the state is increasingly dependent on its ability to educate and train its residents to meet its economic needs. At the same time, the workforce is also increasingly diverse, and steadily aging.[42] Both changes pose challenges as education and training entities must attract and serve new types of students – incorporating language and support services and basic skill education – while simultaneously creating and expanding the energy-related technical curriculum.

Looming retirements also threaten to worsen the skilled labor shortage. Washington's two older worker cohorts (ages 45-54 and 55+) both grew as a percentage of the total workforce from 1991 to 2006. (The age 45-54 cohort increased 5 percent while the 55+ cohort increased 6 percent.)[43] There are disproportionate numbers of older-aged workers in established industry sectors such as energy and manufacturing, and older workers who were in the construction industry in 2006 may not return from the economic downturn. While economic hardship may slow the pace of retirement in many professions, elongated careers are less feasible in construction and other skilled trades. Delayed retirements may provide a temporary buffer against a labor shortage in some jobs, but the ranks of retirement-eligible workers continue to rise, and skilled workers may actually leave in larger numbers as the economy improves.

These factors accelerate the need to reach out to and train younger workers and those underrepresented in the trades. Although significant gender imbalances remain, there is progress: women, for example, comprised 46 percent of Washington's workforce in 2000 and will account for almost half of "net additions" to the labor force between 2000 and 2030.[44] There is also evidence that opportunities in non-traditional trades will be taken up by women. In Washington, when construction was one of the fastest growing occupations (doubling the number of total jobs from 1990 to 2000), the number of women employed in the sector tripled. And their overall share of employment in the sector rose from 12 percent to 16.5 percent between 1990 and 2007.[45]

The state's labor force will also become more racially and ethnically diverse. However, much more attention is needed to prepare, launch and retain these future prospects who, as part of a smaller pool of working-aged candidates, may be heavily recruited by employers from many industry sectors.

Skill Gaps Continue

Washington, like the rest of the nation, continues to struggle with skill gaps at all education levels.[46] Studies by the state's Workforce Training Board identify general and specific skill gaps, as reported by employers in a number of industries and occupations. Many of these occupations and skills directly and indirectly support key green economy sectors in the state.[47]

. . . Continued budget cuts will likely limit the ability of institutions to add capacity or new enrollments in many programs.

As Washington reaches out to further develop its green economy, it will be important to determine current skill gaps and consult with specific industry sectors to anticipate what new knowledge and skills will be required in the future. Employing a systematic approach, such as using industry-specific skills panels and developing occupational skill standards, can enhance our ability to fortify and extend workforce development strategies for specific sector needs, particularly for green and other emerging industries. Washington's policy-makers largely accept that educational inequality becomes income inequality, worsening the have/have not gap in America.

Although much of the green economy needs highly skilled technicians, it also relies on the type of college graduates in shortest supply: those with science, technology, engineering and mathematics (STEM) majors.[48] By national standards, Washington has a high percentage of bachelors and graduate degree holders, but the higher education system in the state produces comparatively few of those degrees itself. Gaps in these fields force employers to recruit outside the state and country to fill key positions. While Washington's colleges and universities have seen some gains in STEM program enrollments, employers and academics continue to be concerned that degree production in programs such as computer science and several engineering fields may not meet future demand.[49] Although there have been increases in the number of relevant degrees granted, continued budget cuts will likely limit the ability of institutions to add capacity or new enrollments in many programs.

Further, at all levels there is a need for a basic set of core green skills, similar to those identified for information technology (IT) and other industries. The ESD *2009 Green Economy Jobs* report tackled the issue of whether green jobs were more or less like other jobs, and the results resembled those from early IT surveys: it depends on the job. Employers for whom green tools and techniques are easily adapted to the workplace may prefer an emphasis on the often-cited SCANS skills or other basic employment necessities.[50] The more challenging skills to identify, codify and create training to address will be those with the highest need for specialized workers. It is not too soon to improve understanding of those skills. In the end, competing successfully in the green economy will require

that Washington employers rely even more on the talent of their workers: the advent of new clean technologies continues to accelerate, and a continued shift toward knowledge-intensive work and work processes is raising the bar for employers and employees alike.

Green in Practice

Green skills are not only a concern of green employers – nor are these skills only to be learned by workers. Just as IT skills proliferated from the high-tech industry to all sectors of the economy, large numbers of workers will need basic familiarity with green practices and tools, regardless of the sector in which they are employed. Moreover, business operators need information about and training in green operating principles such as "Lean" or Six-Sigma, which are methods for reducing waste, saving energy, preventing pollution and enabling companies to meet ever more stringent regulations and more intense global competition.

Businesses not yet considered green must also plan for changing demands from their customers as the green movement spreads, even in the face of an economic contraction. Consumer preferences and expectations are shifting. And in addition to a growing demand for green products and services, there is growing evidence that more consumers expect companies to also *operate* in a sustainable fashion that promotes social and environmental outcomes and produces economic results.[51]

The Economic Downturn: An Inconvenient Truth

Despite the state's strong political commitment, business strengths and workforce assets, the national recession led Washington to experience declines in several key sectors of its economy, including sectors critical to the green economy. While the state's general economic strength reduced many of the drastic effects felt elsewhere in the nation and temporarily delayed declines, the same general business and employment contractions were eventually experienced here.

From 2008-2009, personal income dropped in Washington, although it remained above the national average largely because it was sufficiently higher than the United States average when the recession started (see Table 3).[52] The per capita income growth rate fell by over five percentage points during the same period, though the 2009 decline was less than the national drop of 2.6 percent.

On the upside, median earnings grew while the national rate fell somewhat. And, while Washington's unemployment rose at the same rate as the nation's, the state rate remained lower than the national average. Eventually, however, the recession exacted a larger toll on the state's economy; the total employment growth rate in Washington fell to -4.5 percent in 2009, a steep fall from growth of over 2.6 percent during 2005-2007.[53]

TABLE 3: SELECTED ECONOMIC INDICATORS IN WASHINGTON AND THE U.S., 2008-2009

	Washington		U.S.
	2008	2009	2009
Average Personal Income	$43,732	$42,933	$39,626
Income Growth Rate (Per Capita)	3.7%	-1.8%	-2.6%
Unemployment Rate	5.3%	8.9%	9.3%
Total Employment Growth Rate	0.9%	-4.5%	-4.4%

Adding to the general economic challenges were expectations of employment demand that did not materialize, particularly for several occupations related to residential and commercial energy retrofits. Nearly the full force of publicly funded workforce training projects seemed to focus on that sector through much of 2009, during the initial effort to re-skill workers in construction, manufacturing and other sectors who were displaced by the recession. Optimism about green hiring resulted in programs that trained more workers for energy audits, weatherization and similar occupations than could be placed. In the fall of 2010, for example, the Seattle area Workforce Development Council surveyed 194 regional companies about hiring in green occupations and found that they expected only 42 openings during the next year.[54]

Seattle's $20 million federal grant to create jobs and provide energy efficiency services across a range of residential, commercial and industrial sectors, including weatherizing low-income housing, has focused on ensuring that contractors follow "high road" standards to promote quality work and new jobs. This important foundational work continues, but some recent news reports have focused on the lack of short-term results; to date, few new jobs have been generated or projects completed.[55]

Some of the anticipated openings vanished with state spending retrenchments, such as jobs expected through Referendum 52, which would have permitted $505 million in public bonds for energy efficiency projects in the state's K-12 schools. Similarly, reduced credit supply has limited planned expansions and tabled green projects, with companies unwilling to add workers during the downturn.

It is worth noting that Washington is not alone in this realm. The failure to match new investments in education and training for green jobs with anticipated employment is a national problem that has plagued most states and communities, some more severely than others. For instance, California Governor Jerry Brown sought to develop a half-million clean technology jobs by the end of the decade, but the state has reportedly spent only half of its $186 million of stimulus funds on weatherization projects, and after investing $59 million in federal, state and private funds on green jobs training, fewer than one thousand job placements have been made.[56]

Recovery in Washington

Despite these conditions, the green economy in Washington appears resurgent as the economy begins to improve. And it is improving, despite the wild, seemingly unending short-term gyrations in national financial markets and consumer confidence. Data from the U.S. Bureau of Labor Statistics, as analyzed by Commerce, indicates that unemployment in Washington in 2010 was slightly lower than the national average, whether measured as a simple percentage of the civilian labor force without employment or as the more complex cohort of unemployed workforce plus those employed part-time because of the lack of full-time positions and the marginally attached (those not employed who seek and are available for work).[57] The number of long-term unemployed is also lower in Washington than in those states with which it is frequently compared (North Carolina, California, Oregon, Massachusetts, Colorado and Virginia). It trails only Idaho and Texas for short-term unemployment (less than five weeks).

At least part of Washington's strength results from the strong job growth it was experiencing all the way to the end of 2008. By spring 2010, the state was again gaining more jobs than it was losing, although the gains were still considerably lower than the total jobs available in 2008 and did not satisfy employment demand.

Although Washington's economy continues to struggle, it appears that confidence in hiring in some green sectors is returning. Although based mostly on anecdotal reports by employers, much of the employment demand is for technical and professional workers. Some well-known examples include the following:

- Over the last year, Light Doctor of Mountlake Terrace has increased its business by 70 percent, largely due to incentives provided to homeowners by the Snohomish County Public Utility District. However, the people hired were electricians and skilled workers, not auditors or general weatherization workers.[58]
- McKinstry, a full-service firm that designs, builds, operates and maintains commercial and institutional buildings, helped clients secure over $45 million in ARRA grants, resulting in $200 million in McKinstry projects. The influx of federal funding cast a positive light on the benefits of energy efficiency and demonstrated the potential of the industry to make a significant impact on employment and the economy. McKinstry now employs over 1,600 people and generates over $400 million in revenue annually.[59]
- In 2010, Puget Sound Energy (PSE) began constructing its newest and largest wind energy facility near Pomeroy in Garfield County. Phase 1 of the Lower Snake River Wind Project is scheduled to be completed in 2012. The facility's 149 wind turbines will produce 343 megawatts of renewable energy – enough to power 100,000 homes – while also contributing to the local economy. Construction crews averaging 150 workers are now on-site each day.[60]

Once completed, the site will directly employ around 25 permanent operations and maintenance workers. Permits have also been secured by PSE for possible expansions at its other wind energy sites in eastern Washington.

- Boeing's recent order from Southwest Airlines for the newest-generation 737 MAX adds to an already large production backlog of more than 900 aircraft that will require substantial new hiring for technical, management and support jobs. This new work will also boost business among Boeing's large regional network of supplier companies.[61] The 737 MAX will incorporate new high-efficiency, low-emission engines; aerodynamic refinements and durability enhancements that will boost its operational efficiency.

Resurgent Clean Energy

Investments in clean energy remain strong, attracting new venture capital. Investors acknowledge that the need for clean energy is critical and that many nations are investing robustly in clean energy – alternative energy in particular. According to the recent *Clean Energy Trends* report, solar photovoltaics and biofuels continued to grow especially well through 2010.[62] And the Pew Trusts strongly challenge the United States to be mindful of investments made by other nations. China, Brazil, the United Kingdom, Germany and Spain benefit from national policies to reduce pollution and stimulate investment in renewable energy; their governments have invested 3 to 5 times more than the United States as a percentage of gross domestic product (GDP). As a result, those countries are poised to compete globally for clean energy jobs and manufacturing.[63] Although the impact of private-sector investment can vary among countries depending on the influence of markets and the role of government in their economies, government policy can drive support for clean energy and stimulate investment.

From their research, the Pew Trusts assert that the value of leadership in the clean energy economy is evident:

- Global investment growth of 230 percent since 2005.
- An economic decline of only 6.6 percent in 2009, despite the worst financial downturn in over half a century.
- $162 billion invested in clean energy around the world in 2009.
- Governments prioritizing clean energy within economic recovery funding, the bulk of which will reach innovators, businesses and installers in 2010 and 2011.
- Clean energy investments forecast to grow by 25 percent to $200 billion in 2010.

The Strength of Washington's Green Economy Drivers

Washington's green economy has expanded to include virtually all of the state's industries, but it is worth recognizing its deep historical roots in energy production. Electricity consumption represents just under half of the state's total energy use. Three-quarters of the state's electricity production comes from hydro power, which has helped to keep the state's electricity rates among the lowest in the nation.[64] But despite its benefits, hydro exacts a cost on the environment, and most of the state's major hydro resources are already developed. As demand for electrical power grows, developing our capacity to conserve energy and generate new power from renewable sources will create new opportunities to grow the green economy.

It is also worth noting that much of our non-electrical energy is neither clean nor home-grown. Washington is heavily dependent on fuel imports. Most of the state's total energy consumption is in petroleum used for transportation, which has an enormous effect on the state's greenhouse gas emissions and associated environmental impacts. Thus, Washington's energy sector poses some significant challenges – and opportunities – for developing new, clean energy sources, markets and environmental solutions that can be extended beyond its borders.

In addition to energy, the state is well-positioned to leverage its vast natural resource assets, diverse industrial base, high-tech leadership and strong public support for environmental protection in ways that have already helped to focus regional and state green economy initiatives. Pursuing these opportunities in smart, strategic ways is essential to leverage our strengths and ensure that our effort to extend the state's green economy to new markets, industry sectors and jobs is built on a foundation that ensures success.

Part IV. Continuing Challenges and Opportunities

Overall, conditions for business in Washington remain sound despite the recession, and signs of recovery are becoming evident. Challenges remain, however, many centered on the critical issue of job creation, which has progressed far more slowly than anticipated. The economic downturn focused attention on the promise of recovery through the green economy. Yet the downturn continued, striking especially hard in sectors committed to becoming greener, such as the building and construction trades. Whether the green economy is truly growing, and how much potential it has, are now critical questions for sustaining commitment to Washington's green economy strategies.

Other conditions hampering growth include business investment that is low: venture capital investments in Washington's clean tech sectors have been cast as weak compared to other clean tech benchmark states.[65] Concerns about state and federal regulation and an uncertain policy environment that may not provide adequate or stable incentives for growth in green industry sectors and jobs continue to be raised as impediments to sustained action in a challenging economic environment.[66] Of course, all of these issues affect another looming challenge underscored by this report: the need to recognize, leverage and build upon the state's green economy workforce.

These challenges to the state's economic recovery are formidable. Despite its inherent appeal and potential, the green economy is not a panacea for Washington. There are limits to how much any single sector can ameliorate the dislocations of the recent recession, much less resolve underlying social, economic and environmental problems. Still, the green economy offers the prospect of growth in good-paying jobs and entrepreneurial opportunities for many more. Understanding exactly what can be expected is essential for avoiding inflated expectations or overlooking potent options to spur the recovery.

Opportunities for Green Economy Employment: Clean Energy Sectors

Washington's policies and new markets are stimulating an expansion in clean energy-related employment, but this demand can be difficult to see in traditional labor market analyses that do not yet measure green and energy efficient occupations discretely. And, the prolonged recession has dampened what was anticipated by many to be a more rapid recovery marked by new job growth. But it is worth noting that long-term estimates for many green economy sectors remain positive. Nationally, increased demand in clean energy sectors is anticipated, although continuing uncertainty about overall economic conditions may moderate short-term growth rates.[67]

Energy Efficiency Services Sector

Broad, diverse sectors such as energy efficiency continue to be viewed by many analysts as among the best bets for job creation as the economy begins to recover and new investments are made. In addition, the savings from energy efficiency are often redirected to other activities that increase employment.[68] Researchers at the Lawrence Berkeley National Laboratory (LBNL) suggest expanding the definition of energy efficiency to include the energy efficiency services sector (EESS) because of the multi-disciplinary nature of the institutions, companies and occupations that support it.[69] Indeed, energy efficiency is the largest single sector in most definitions of the green economy, and it continues to offer enormous potential to reduce greenhouse gases and support a clean, green future.[70]

According to the ACEEE May 2008 report, efficiency-related investments generated an estimated 1.63 million jobs in the U.S. in 2004 – approximately twice the number of jobs in the energy supply sector (electrical power generation, transmission and distribution).[71] The 2009 American Solar Energy Society report estimated that over 3.7 million jobs existed in the energy efficiency industry in 2007, with a ripple effect on employment in the broader economy that boosted the total to over 8.5 million jobs.

As noted earlier, there are great disparities among employment estimates due to definitions and measurement. By whatever measure, employment in the energy efficiency sector is substantial, encompassing large numbers of jobs that cut across several industries, such as construction, professional services and manufacturing. From this large and diverse base, even modest increases in new business activity can boost job growth considerably.

To be sure, the current economic climate has dampened new investments in energy efficiency, and assumptions about growth and employment in this important sector may change. Even so, pre-recession estimates about the potential for new business activity and job creation may still be reasonable indicators of future potential.[72] The U.S. Environmental Protection Agency's *National Action Plan for Energy Efficiency* (2008) sets forth the long-range goal of achieving 50 percent of new load growth through energy efficiency by 2025.[73] In *Greener Pathways: Jobs and Workforce in the Clean Energy Economy* (2008), White and Walsh estimated that 10 jobs are created for every $1 million invested in energy efficiency measures.[74]

LBNL forecasts job growth in energy efficiency based on estimates of future investments, including a potential quadrupling of direct energy efficiency jobs from just over 100,000 person-year equivalents in 2008 to over 400,000 by 2020. The greatest increase likely will be for insulation-related contracting, with as many as 200,000 jobs by 2020. Energy services companies, government and utility efficiency programs, and weatherization programs all could grow substantially. Even LBNL's most cautious estimate predicts that the energy efficiency workforce will double by 2020.[75]

The Northwest Power and Conservation Council's 6th Plan (2009) also forecasts continued growth in the number and size of Northwest homes, which would boost energy demand. The 6th Plan used 2007 data that may no longer reflect consumers' tastes, but their assertion of continued strong demand for homes with energy-demanding electronic and information capabilities appears accurate, as reported by some analysts.[76]

According to LBNL, about 30 percent of the EESS employment is in ratepayer-funded programs, including those who administer the programs and contractors who implement them, such as the building and construction workers who design and install energy efficiency measures and appliances. Another 5 percent of the jobs are funded by federal and state low-income weatherization programs, and another 10 percent of the jobs are funded by companies that develop, install and maintain energy efficiency products (including electricians and HVAC contractors). The largest share of employment – about half – is related to the installation of building insulation. These lower-wage jobs are the typical entry point for new workers, initially requiring limited training and skills.

However, Washington's weatherization position is somewhat unique, having been driven and supported by Northwest utilities and BPA since the 1980s. This is particularly true for residential retrofits for low-income households, which would not otherwise have been able to participate in the energy efficiency initiative. In fact, Washington's long-standing commitment to weatherization has been a complicating factor in more recent efforts to stimulate additional employment. Basic training in the skills of home retrofit might readily employ workers in states where fewer weatherization projects have already been accomplished. But in addition to a slow roll-out of weatherization funding, the need for weatherization workers in Washington may be less than in other states because the existing weatherization sector and labor force is experienced and intact, able to adapt to increased demand without adding many new hires.

It is difficult to assess the impact of the downturn on these industries, although nearly every sector associated with housing has been hard hit. LBNL's case studies, conducted by surveying employers in a variety of energy efficiency services in California, Massachusetts, the Pacific Northwest and Connecticut, observed that most energy efficiency service providers were very small companies – often with fewer than 10 employees – including small consulting firms but also some very large engineering firms. This recession may have been particularly hard on the smaller firms. Many of the companies reported significant difficulty finding the staff they need to meet demand or expand. In fact, hiring for any position other than entry-level was reported as one of the major obstacles to growth in the sector. Anecdotal evidence from Washington companies and feedback from regional energy efficiency employers is consistent with the challenges LBNL identified.[77]
Among the challenges were:

- Engineers with relevant skills are in short supply. The skills sought include training in fluid and thermodynamics; knowledge of building energy systems; and optimizing the performance of

existing HVAC, refrigeration or industrial process systems. Even expanded training as a result of ARRA investments rarely targeted engineering programs.[78]

- An even greater shortage of workers qualified for management positions that required engineering experience with high-efficiency technologies.
- Lack of preparation for and/or awareness of the energy efficiency field among engineers and related skilled trades, where too few in the building and construction industry are aware of the impact of energy efficiency on their workforce.
- A looming retirement drain, threatening not only the ability to do current work but also the ability to train those entering the field. According to LBNL, this is compounded by the shortage of education and training programs that focus on energy efficiency, which creates an even more significant role for on-the-job mentoring.

Even as policy and economic concerns continue to limit demand for energy efficiency improvements, the LBNL report predicts substantial growth for the EESS between 2008 and 2020, possibly quadrupling employment. One implication is that current employees will need additional training about energy efficiency to meet new demand, and additional employees will be needed. Optimistically, LBNL asserts that the EESS could account for 1 percent of the national workforce by 2020, and perhaps 3 percent of the building and construction industry, even considering the severe effects of recession on those occupations.[79]

Equipping Washington's energy efficiency workforce with skills essential to support long-term growth in this sector will require paying close attention to the employees who are adapting to a changing market. And, while many new jobs are likely to be at the entry level, current and future shortages of qualified employees at all levels – from engineers and program managers to technicians and skilled trades workers – may severely limit the ability of Washington employers to support this important sector of the state's green economy. As one industry advisor notes:

> *In spite of the economy, the green building movement continues to evolve at a rapid pace… Evolving our workforce through training is necessary for us to continue being a leader in the green building industry and the timing is appropriate so our workforce is better prepared when the upswing in building occurs.*
>
> *excerpted from Sellen Construction*

> *Sellen Construction is a 65-year-old, Seattle-based construction company that currently employs over 700 people in the Puget Sound, of which 524 are union trades people. We believe our early adoption of green building practices has been a significant differentiator, helping us maintain a reasonable project workload in a down economy. In spite of the economy, the green building movement continues to evolve at a rapid pace, with our clients pursuing deeper shades of green to help improve their building portfolios and bottom line. Two years ago 18% of our annual billable volume was made up of LEED certified projects; last year it was 49%, and*

this year (2009) it's almost 90 percent of our annual volume. This was a rapid shift for our industry and we don't see that trend reversing. In fact, we see the guidelines getting more stringent and clients pushing for more green building systems. The need for evolving our workforce through training is necessary for us to continue being a leader in the Green building industry and the timing is appropriate so our workforce is better prepared when the upswing in building occurs.[80]

Washington's Green Manufacturers

The U.S. Department of Commerce defines sustainable manufacturing as the creation of manufactured products based on the use of processes that are economically sound, non-polluting, conserve energy and natural resources, and are safe for employees, communities and consumers. Companies that have innovated quality control and improved management by committing to International Organization for Standardization (ISO 9000) principles now also adhere to Lean Manufacturing and Six Sigma, which aim to reduce waste and boost efficiencies. While these methods are used to reduce costs and boost product quality and productivity, companies have also employed them to improve their flexibility in new market conditions, prevent or reduce environmental pollution, and enhance their overall competitiveness.

The market conditions have been influenced in turn by shifting consumer preferences and completely new markets created by demand for goods and services that promote environmental protection and a clean energy future. These market forces have spurred growth opportunities for manufacturers, helping to preserve and create new, good-paying manufacturing jobs in local communities.[81]

Employment growth in manufacturing had slowed even before the recession, so projections for slight increases in many manufacturing sectors are important to note. These are good-paying jobs that represent a substantial portion of the state's economic base, accounting for over 250,000 jobs in 2010.[82] Governor Gregoire's Project Pegasus, which is aimed at ensuring that Boeing's production of next-generation 737 commercial aircraft (the 737 MAX) remains in the state, proposes a number of incentives tied to workforce development and confirms the importance of employment in the aerospace cluster to the state's economy.[83] A recent contract agreement by Boeing and the Machinist's Union ensures that production will remain in Washington; however, the Governor has pledged to urge the Legislature to support the initial plan, which includes tax incentives but also efforts to invest in education and training to increase the availability of technical workers and engineers to fill current and future job openings at Boeing and its suppliers.

This strategic approach is especially powerful because it recognizes that sustaining and expanding manufacturing in new technologies requires a commitment to workforce development, and particularly to education and training in advanced skills. As we rely more on new technologies and processes to manufacture products with advanced materials, as is common in the aerospace industry,

employees must have a heightened awareness of how their actions can affect the quality and even the basic properties of the materials they produce. Strategies that more directly tie economic growth to the preparation of a skilled manufacturing workforce can be powerful tools for attracting and retaining high-wage, high-skill jobs, but it is not clear whether this type of deliberate approach is more often the exception than the rule.

Renewable Resources

Renewable energy is an industry that is drawing increasing attention and investment, although the total number of jobs in Washington (as variously measured by Navigant Consulting, Pew, Brookings and the ESD) is small, likely under 5,000. Still, it is a growth area with strong potential, especially given Washington's natural resource base, staunch public support for renewable energy development, and current public and private-sector investments and infrastructure in renewable technology and installation. For Washington, renewable energy offers new business and job creation potential that can be developed further as part of the state's growing green economy.

The potential for renewables to support economic and job growth is evident in the national summary of employment reported by the Environmental and Energy Study Institute.[84] Brief updates for Washington are included below:

- **Wind**: The American Wind Energy Association (AWEA) reported that wind and related fields employed 85,000 in the United States in 2010, although subsequent information suggests that 75,000 may be more accurate. Washington brought its first utility-scale project online in 2001, and the state currently ranks sixth among all states in total overall wind power installation, at over 2,300 MW.[85] New installations and expansions over the next few years by Puget Sound Energy and other developers will boost the total considerably. Although the largest number of new jobs will be in the design and construction of new sites, operations and maintenance employment will also grow as these new facilities are completed.
- **Solar**: According the Solar Foundation, there were 93,000 employees in 2010 and an increase of 26 percent is expected for 2011. Most utility-scale solar photovoltaic projects in Washington are small demonstrations; however, there are a growing number of residential, commercial and industrial-scale projects for new construction, electrical generation and solar hot water. Consequently, the number of solar designers, manufacturers and especially installers has grown.
- **Bioenergy**: An estimated 14,000 workers in Washington are employed in the bioenergy industry, with approximately 52,000 in biodiesel (in 2008) and 70,000 in the ethanol industry. In-state production of feedstock for electricity production, biofuel production and thermal energy is receiving increased emphasis in Washington. The production of aviation biofuels has great promise for the state, and new demonstration projects and interest in bio-based green chemistry and processes are likely to drive expanded capacity in this sector.

- **Hydroelectric**: Navigant Consulting reported 200,000 to 300,000 direct jobs in the United States hydro industry in 2010. Although much of Washington's major hydro resources are already developed, and large hydro is not counted as a renewable resource under the state's renewable portfolio standard, small hydro is included as a qualified renewable. Also, upgrades to existing hydro facilities will generate new, albeit temporary, employment.
- **GeoThermal**: The GeoThermal Energy Association reported 5,200 employees in the United States in 2010 and expected that number to increase by 2,800 in 2011. The number of geothermal applications in Washington is currently limited to hot spring resorts and ground source heat pumps. Technology advances and new demonstration projects could spur growth in this sector.
- **Ocean and Tidal**: The Pacific Northwest has among the most promising ocean and tidal energy resources in the United States. However, electric power generation from these sources has not yet proven to be commercially viable. A few small demonstration projects are now underway that, if proven successful, may spark growth in this emerging sector.

Green Economy and Workforce Development

The great challenge today, of course, is reduced state support for education and training, a distinct disadvantage in supporting an emerging industry. Budget cuts – deep and continuing – require that education and training providers discover their own version of Lean processes, and that public-private partnerships evolve quickly to meet emergent needs. The success of green industries requires systemic and sustained skills development that is responsive to the needs of industry and the needs of non-traditional and incumbent workers who are essential to the current and future workforce.

> *The decline of training opportunities blunts the state's Energy Sector Strategy promoted by Governor Gregoire, which sets a goal of 25,000 new green economy jobs to be created by 2020. The strategy targets 30 percent of these jobs for veterans, members of the National Guard, and low-income and disadvantaged populations.*

New industries, new products and new techniques all require workers with new skills. Thus, maximizing development of the green economy requires addressing workforce development needs. This is particularly true during an economic downturn, when individuals may struggle to meet tuition costs and the strained budgets of education and training institutions limit their ability to develop and revise training programs. In Washington, public agencies and key private-sector partners are working together to determine how existing funds could be directed to support the green economy and to consider new policies and potential funding to support green economy growth.

The full array of action steps and strategies listed in Addendum 1 were initially created to take full advantage of potential opportunities and meet the state's and sector's recruitment and training needs of workers in the state and the energy sector.[86] The overarching targets include:

- Improve the K-12 pipeline of green skilled workers
- Increase green skills among new and incumbent workers of the skilled trades
- Mobilize post-secondary contributions
- Continue focused planning for green/energy efficient economic development

Although some notable progress has been made on many fronts, to date no systematic analysis has been conducted to assess what results have been achieved, what challenges remain, or what new directions or opportunities should be pursued to achieve these goals within the context of a constrained state economy.

These issues present contradictory challenges for growing the green economy in Washington: high unemployment, jobs that go unfilled for lack of trained workers, and cuts in education and training programs that are needed to sustain the recovery and ensure the prosperity of these green industries, companies and employees. But solutions are at hand as well, as discussed in the next section.

Part V. The Way Forward: Observations and Recommendations

Washington's early commitment to clean energy and environmental protection readily combines into a green economy objective, although planning and implementation are complex. The advantage of our history and political leadership fostered early gains for the state in employment, business stimulation and public investments – including federal and state funding – that helped improve the quality of life for many Washingtonians. Naturally, these efforts should be sustained and the challenges that have emerged from initial implementation should be addressed.

Fortunately, many of the state's existing economic, environmental, ecological, education and workforce plans address this green economy objective. For clarity and efficiency, though, the visions and intent of these plans need more cohesion and a more overt unity of action. Among the typical goals these plans have already set are:

- **Invest in research and development** to produce new and enhanced clean/green technologies that can be commercialized and sold in growing export markets. That goal is consistent with national (Pew, Brookings, White House) and state (Clean Energy Leadership Council-Innovate Washington and Economic Development Commission) strategies. It utilizes insights about where new markets for green/clean technologies and related products and services now exist or are likely to grow, and for which we should and can compete.

  Research and development innovations generate the spark that ignites new opportunities and revitalizes stagnant economies, including new business startups, industry sector recoveries and expansions. These are key to new job creation.

- **Evaluate performance**
  - Continue to examine how state policies, regulations and incentives affect green industries and new business startups. Good things are already happening, but in the current economic climate, competition will only increase. It is

Example: R&D Investments

A $250,500 grant from the M. J. Murdock Charitable Trust to Washington State University-Vancouver will create a renewable energy option track in the School of Engineering and Computer Science. It will combine courses from mechanical engineering, computer science and electrical engineering, allowing students with a major in one of these programs to complete the renewable energy option.

Eight new courses will be created, two new laboratories equipped, a clean room created, and three additional laboratories upgraded to address new technologies for the field. Courses will begin spring quarter 2012.

Additionally, 150 area secondary students will explore related careers through an annual outreach program with local schools.

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always prudent to ask whether additional changes or enhancements are needed to give Washington's green businesses an edge, while also ensuring that its environmental and social equity goals can be more readily attained.

- Examine how publicly funded projects are evolving and adapting to economic conditions. For some clean energy economic development and workforce-related projects, economic shifts should drive changes in goals and activities – even during the life of a project – to ensure value-added results.

These are important topics, and there are many perspectives about where to focus. Indeed, detailed recommendations about how to spark innovation and support Washington's green economy through research and development, state policies, regulatory changes and incentives are a mainstay of existing state economic development plans and recommendations. Do they go far enough?

A primary finding of this paper is that it is critically important to continue to:

- Fine-tune the alignment of current state economic development initiatives with workforce development, and
- Clarify opportunities and the state's role in workforce education to achieve green economy goals.

Therefore, the following should be added to the goals above.

Improve policy and program alignment between economic and workforce development

Legislation passed in 2009 (Substitute House Bill 1323) required enhanced coordination of workforce and economic development initiatives among state agencies and local workforce development organizations. The 2010 progress report issued by state partners provides some early evidence of improved coordination and enhanced outcomes.[87] The report also reveals the multi-layered and sometimes difficult task of aligning and integrating efforts of multiple agencies, agendas and stakeholders for collective action when different, pre-existing versions of industry sectors and new cluster strategies are used. Allowing many different approaches to operate simultaneously provides some measure of flexibility for workforce and economic development stakeholders and provides overlap between state and regional cluster and sector targets. But attempting to reconcile the different approaches further would likely enhance the clarity, efficiency and measureable outcomes of these efforts.

A more uniform approach may also help align the different industry targets and time horizons among state-level plans. The state Economic Development Commission (EDC) 2009 economic strategy report, for instance, emphasizes emerging, long-term R&D and sector innovations. It cites "talent development" among its three main economic development pillars central to an innovation-driven

economic development model.[88] The report also describes a range of workforce trends and skills issues and cites a number of broad recommendations, including increasing the emphasis by schools on science, technology engineering and math (STEM) and developing high-level professionals such as scientists and academic researchers. Consistent with this focus, the EDC plan does not address the more immediate employment and skill needs of existing companies and workers, or the acute need for skilled workers in mid-level careers in the skilled trades, production or service sector occupations. In contrast, many workforce development programs and solutions focus on shorter-term employment and skill needs, and may lack the resources or information needed to anticipate the need for new programs or services that a new or emerging industry cluster might require.

The differences among the targets, emphasis and timeframes of these plans are understandable. The use of cluster strategies, sector analyses and data on industry and labor market trends can be effective tools to identify workforce development assets, respond to short-term requirements and anticipate future needs. This information, then, can help reduce the lag time between new workforce demand, program development and the preparation of a well-trained workforce. At the same time, the disparities among economic and workforce development planning likely complicates efforts to better-align these efforts conceptually and practically, especially at the state level.

Finally, how well existing sector models, cluster strategies and other approaches will help enhance state- and regional-level coordination remains a work in progress; the SHB 1323 progress report noted that regional workforce development councils and associate development organizations (such as economic development councils) have already developed regional industry clusters, and these regional partnerships appear to have made good progress in defining economic targets and coordinating economic and workforce development activities. The report noted that regional clusters are sometimes outside those identified by state-level organizations because they leverage additional local-level economic data or other inputs that sharpen the focus on local conditions.

Because cluster strategies are methodologically embedded in regional geographies, they may offer greater value for regional coordination and decision making than for the state. Regardless, it seems likely that greater clarity and uniformity across organizations and levels in the uses of industry sector and cluster models would further enhance the alignment of state and regional economic and workforce development action, and the attainment of shared outcomes.

Balance economic and workforce development assets and priorities

SHB 1323 also helped to raise the stature of workforce development as a necessary foundation and catalyst for state and regional economic development. Although economic development and workforce development sector leaders have clearly been working to improve coordination, there is a tendency to prioritize business development without fully considering workforce needs. While all state economic development initiatives recognize the importance of a skilled workforce, in practice

this often appears as a secondary priority and may lack sufficient attention as a strategic element in support of state green economy goals. Greater effort should be focused on highlighting the potential of our state's human assets and workforce development system as central features of Washington's economic development framework. To further enable this approach, Washington should:

Amplify the advantages of our workforce and human assets

Take stock of the human resources we have now and will have in the future, and more deliberately use that information to target and attract new businesses or promote expansions. Providing and supporting a trained workforce signals to employers that the state will be receptive to its needs. Additionally, if the overarching goal of economic development is to benefit all citizens and the state, then the interests, skills and capabilities of its workforce should also help to drive state economic targets and strategies. Economic development investments should, in a more systematic way, articulate the capabilities of the state and also the needs of its citizens. Washington's human resources should be more clearly and consistently expressed in state green economic goals and actions, and used more prominently to support business and job growth.

Align the state's education and training system more directly with economic development strategies

Including education and training in economic development discussions offers many advantages beyond improved coordination: it puts the state's education and training system on alert to be more nimble and responsive to employer needs, and to better assess programmatic actions needed to benefit training recipients and employers. Most importantly, it makes education a full partner in the economic development process that it is expected to support.

SHB 1323 has called for greater coordination among economic and workforce development stakeholders; good progress has been made, especially at the regional level. Washington would likely be more effective in matching economic development activities with labor supply if the strengths (and gaps) of the training system were an acknowledged part of the economic development planning process – making it better able to anticipate holes that need filling and help develop our key competitive advantage – our skilled workforce.

Commerce, in collaboration with state and regional economic development, industry, labor and workforce education partners, provided early leadership in fashioning a strategic framework for Washington's green economy. Many of those recommendations are worthy of continued development.[89] Commerce is also instrumental in supporting Washington's clean energy policy goals and the businesses that will market new products and services and provide employment under a more sustainable economic model. The continued emphasis by Commerce on the value of a skilled

workforce – including the education and training infrastructure needed to support it – provides another important vehicle for aligning state economic and workforce education goals.

Connect industry's needs to workers and education/training entities

Washington is recognized nationally for its success in utilizing industry skills panels, skills standards, centers of excellence and industry cluster strategies; these should be continued or adapted to support innovation zones. The best practices of the earlier models should be preserved and utilized. At the same time, the salience of workforce development as an incentive for retaining or expanding employers such as utilities, construction firms and health care organizations will differ from the interests of those from other sectors that would be desirable to attract. This can be done through an industry cluster model or other approaches that leverage the workforce education and training system.

Marketing Washington's workforce and the state's education and training capacity to existing industries and companies and supporting new startups may be a cost-effective strategy to boost job creation in the current fiscal climate; there is compelling evidence that this approach is more effective and efficient than trying to lure firms to relocate from other states.[90]

Unify industry's voice to help align economic and workforce planning

The state's Workforce Training Board exists to increase the involvement of business and labor in the state's workforce training and education planning. Business and labor, which have consistently encouraged better coordination and more cooperative and efficient operation of public programs, are available to assist the state in unifying economic and workforce development. These discussions are productive and should continue in earnest.

Engaging industry in discussions about coordination is important for building partnership between the public and private sector, identifying common priorities and setting expectations about specific outcomes and how to achieve them. Augmenting and unifying industry's voice in economic and workforce development planning should be an important state oversight and advisory role for Workforce Training Board.

Recognize the demand for new, more extensive skills

Green economy employers seek talent that has broad skill sets and flexibility, particularly the ability to adapt to conditions that frequently change due to new technologies, shifting consumer preferences and a new social organization of work. The new workplace requires the familiar SCANS skills, which too often are not available among the workforce, plus a new understanding of systems, sustainability principles and procedures.[91]

Green skills are not so different from traditional skills in many trades, where training is provided when new technologies are introduced. Most green workplaces, however, seek broader skill sets and a wider range of capabilities than in the past, including the ability to perform work using methods that promote sustainability. For many white-collar workers, a broader knowledge of green design concepts, sustainable business practices, and related policy and regulatory requirements has become integral to adapting to a marketplace in which more customers are demanding green products and services, especially those that are sustainably produced.

State and regional stakeholders need to incorporate knowledge of the "new green basics" into the programs and curricula they offer to students, incumbent workers and employers. Economic development/workforce sponsors should require grant recipients to show how they will identify and incorporate green basics into their programs.

Ensure that workforce development is demand-driven, competency-based and accessible

Continue developing strategies that design and deliver education and training needed by industry, workers and new labor force entrants. Achieving green economy goals will require anticipating the workforce education and training needs of industry partners; moving nimbly to fill them with aspiring student interns, apprentices, and qualified new hires; and re-tooling existing workers to adapt to technology and skill changes. That means supporting a more systematic approach of organizing education and training around standards, credentials and certificates that demonstrates in-demand skills and competencies.

One key to attracting new employers or expanding capacity is demonstrating that the state and its training providers employ a systematic, integrated approach that delivers demand-driven training that maximize access by employers, employees and future workforce entrants. Ideally, this workforce education and training system should be:

- Informed by data on regional labor markets, industry clusters, employment and jobs. This will help ensure that programs are demand driven, reflecting what green economy sectors require and matching incumbent workers and job seekers through local and regional labor markets. Connecting economic data with real-time information from industry clusters and employers will help match training content and specialty certificates to market shifts and opportunities.
- Built on Washington's skill panels, which already provide an avenue for gathering and understanding regional data and for building employer-labor-education-government partnerships so they agree on direction.
- Based on industry-defined standards that can be used to certify knowledge and skills. Skill standards are available in many industry sectors and should continue to be used to design

workforce education programs, verify skills and promote portability across programs and institutions.

- Increasingly accessible by employers, students, job seekers and workers who want to advance their careers via distance learning, customized training, applied learning options, flexible scheduling, industry-sponsored internships, and other methods. The goal is to make it easier to provide education and training to those who need it, when and how it best fits their schedules and circumstances.
- Provided in modules that enable learners to take programs or courses in smaller, connected learning segments and that offer "stackable" certificates, which document that the learner has completed a set of specific competencies or skills.
- Integrated with existing national, regional and state certificates that are recognized by industry groups. This approach will help avoid creation of competing or redundant certificates and assessments, while ensuring that workforce programs are relevant, portable and serve as effective skill development tools for entire industries, individual companies, labor organizations and workers.
- Certifying skills via assessments that verify the required skills and knowledge. These assessments can involve hands-on demonstration, fact-based testing or other methods that enable certification regardless of where the knowledge and skills were acquired (on the job, college programs, or other means).
- Providing wrap-around services to support low-income and underrepresented groups who are key elements of the future workforce. Improve their access to and completion of applicable training programs and improve their placement rates in green economy jobs.
- Anticipating the looming future impact of:
  - Demographics and industry retirement trends, including a predicted reduction in the total size of the state's workforce through 2030, which will impact key industries such as manufacturing and energy at all occupational levels.
  - Changing social characteristics and expectations of each succeeding generation: how they work, how they learn, and how to attract, prepare and connect them with employers for careers in high-demand industries and occupations.

Continue to invest in workforce education and training infrastructure

The current economic climate continues to force our state to make many hard choices. Significant cuts have been made in all government services, including education and training programs that are essential to revitalizing and expanding the state's green economy. Continued investments in education and training at all levels are necessary if Washington is to effectively compete in the green economy.

Our human resources represent the "seed corn" of our economy, assets we must wisely nurture and grow. Even with limited resources, smart, efficient investments in high-priority programs and services

should be made to ensure that the most potent green economy opportunities available to Washington's businesses and citizens can be realized. Existing gaps in two- and four-year college engineering, technology, science and many non-technical disciplines should be filled, and the curricula that support them should be enhanced to ensure that the future workforce is equipped to help Washington's green economy thrive.

Addendum 1. Washington's Energy Sector Strategy

Washington's Original Energy Sector Strategy

In 2009, Washington State applied for and received a $5.9 million State Energy Sector Partnership (SESP) education and training grant from the U.S. Department of Labor under the American Recovery and Reinvestment Act of 2009. Below is a summary from the original application, in which the state's overall plan for growing the state's green economy is iterated.

In 2008, Governor Gregoire set a goal of creating 25,000 new green economy jobs by 2020, targeting 30 percent of these jobs for veterans, members of the National Guard, and low-income and disadvantaged populations. The actions outlined below were created to take full advantage of opportunities and meet the state's and sector's recruitment and training needs.

TARGET: Improve the K-12 pipeline of green skilled workers

- Increase the number of school districts that provide high school students with an exploratory Career and Technical Education course called Green Sustainable Design & Technology.
- Create an articulated K-20 pipeline of sequenced math, science and green technology courses in high school that connect directly to postsecondary training courses that lead to energy efficiency and renewable energy occupations.
- Support plans to pilot energy sector foundation skills standards in an Alternative Energy Technology curriculum; disseminate to other Skill Centers and high schools across the state.
- Expand apprenticeship preparation opportunities for youth, including green skill pre-apprenticeships for the building trades and wind technician occupations.

TARGET: Increase green skills among new and incumbent workers of the skilled trades

- Invest in *Build It Smart's* green skill enhancement for registered apprentices and journey workers in our state's building and construction trades.
- Create state standards for weatherization training programs.
- Support skills certification laddering for green trades employees; expand the number and use of portable skills certifications.
- Conduct an assessment to define and segment energy efficiency from other green economy jobs, establish skill standards and specify job classifications (NEET recommendation #5).

- Expand the capacity of community and technical colleges to deliver training for renewable energy occupations (wind, solar, biomass, and hydro efficiency upgrade technologies) and energy efficiency in building sustainability management, deconstruction and commercial energy efficiency retrofits.
- Create and pilot Green Industry Skill Panels as proposed in HB 2227. Conduct labor market and industry analyses, recommend strategies for recruitment, identify training needs of industry and small businesses, and leverage and align other funding sources.
- Support the International Brotherhood of Electrical Workers' plans to establish a regional wind technician training center in Richland to support wind technician apprenticeships.
- Support the Aerospace Machinist Joint Apprenticeship Training Committee's statewide plans to provide green manufacturing training for employment in Washington's aerospace industry.
- Support postsecondary education programs that enhance skills in preventing or reducing pollution for the state's agricultural and forestry workforce.
- Create training opportunities in repair and maintenance of light rail, biofuel cars, and plug-in electric-hybrid vehicles and vehicle-to-grid technology transportation.

TARGET: Mobilize postsecondary contributions

- Support innovation by investments in higher education, research, and technology transfer.
- Work directly with state universities and community and technical colleges to promote Centers of Excellence in energy and environmental protection (ESSHB 2815).
- Link two-year college programs with next-level certificates and degree programs at four-year institutions for interested students, incumbent workers and dislocated workers in engineering, technical management and other high-demand professions.
- Support the use of American Recovery and Reinvestment Act (ARRA)/Workforce Investment Act (WIA) 10 percent funds as an incentive for local Workforce Investment Boards (WIBs) to invest in community colleges' capacity to provide training in alternative energy and energy efficiency.
- Increase high-demand degree production in two- and four-year colleges, with an emphasis on occupations with the highest correlation with green jobs.
- Continue to expand adult basic education and skills training (I-BEST) programs.
- Enhance the Customized Employee Workforce Training Program to help firms meet specific gaps in their workforce capacities, green and otherwise.
- Enhance the Jobs Skills Program to provide customized training for employers who want to retrain their employees in green skills.

- Fund the Green Industries Job Training Account to create and pilot green industry skill panels and finance the community and technical college job-training fund (ESSHB 2815).

TARGET: Continue focused planning for green/energy efficient economic development

- Further align the State Energy Plan, High Skills, High Wages Strategic Fund, WIA and Wagner-Peyser Plan.
- Engage the State Energy Sector Partnership (SESP) team to continue updating the plan on an annual basis.
- Survey the green labor market biannually to measure employment and industry trends.

Addendum 2. ARRA Energy Grant Goals and Updates

Apprenticeship and Nontraditional Employment for Women (ANEW)

ANEW received $60,000 to provide training to women who were low-income, unemployed, veteran, at-risk, and/or with a criminal record. Training was provided in industrial safety, OSHA policies and procedures, first aid/CPR, and an introduction to green jobs. By June 2011 the project was completed.

Employment Security Department

Received $1 million to create tools and reports to assist job seekers and placement professionals seeking to transition workers to green jobs. The revamped tools will be available for use in November 2011.

Green Light

The Workforce Development Council of Seattle-King County received an ARRA Pathways Out of Poverty Grant to support the training and placement of disadvantaged populations in green construction, manufacturing and weatherization. Training is being conducted for youth 18-24 through SODO, Inc., a King County Work Training Program, and for adults through a South Seattle Community College green manufacturing program. The project is supported by the Manufacturing Industrial Council, which assists with post-training internships. The project is midway through its training projections.

H-CAP, Inc.

Received an ARRA Partnership grant of $500,000 for "From Entry Level to Green Career," a project to create a green career ladder and training for environmental science workers, particularly to support greener hospitals and medical facilities. A two-year (1/2011 - 2012) collaborative project of partners in Seattle, Los Angeles, New York City, and Baltimore, the project will train 300 workers in the Seattle area (175 have been trained as of June 2011) in green practices. This training will be combined as needed with English as a Second Language, career development and college preparation assistance. The core curriculum contains up to 12 hours of instruction in energy and water conservation, waste reduction, less toxic cleaning practices, control of infection, injury prevention and communication skills. In Seattle, participating partners are Swedish and Northwest hospitals, SEIU 1199NW and the SEIU 1199NW Trust.

Oregon Manufacturing Extension Partnership

This grant of $959,000 supports Southwest Washington partners' efforts to retool manufacturers into green and renewable energy companies by reskilling the workforce.

Northwest Energy Efficiency Council (NEEC)

A U.S. Department of Labor (DOL) grant for $3.8 million supports the Sound Energy Efficiency Development Project (SEED), which is providing training in five Washington counties: King, Snohomish, Pierce, Kitsap and Clallam. Ten training providers are engaged in training that includes green construction technicians, building operator and building assessment certifications, energy accounting and project management, energy assessment and auditing, and commercial lighting auditors. As of June 2011, 530 participants had begun training.

Pacific Northwest Center of Excellence for Clean Energy at Centralia College

Recipient of a $5 million DOE award, PNCECE is a partnership of public and private utilities, BPA, the Pacific Northwest National Laboratory, organized labor, and postsecondary institutions from Washington, Oregon, Idaho, Montana and Utah. They are working to regionalize a Washington model of energy training satellites to support the workforce needs of Smart Grid implementation and to design and implement a training and recruiting portal to serve the region. Training focuses on pre-apprenticeship, apprenticeship, train the trainer, and incumbent worker training and professional development. Foundation trainings and career information workshops have been conducted for youth. Incumbent worker training in Smart Grid technologies and job hazard analysis is occurring through utility training programs.

Incremental Systems Corporation

Received $3.6 million to develop real-time simulations for training smart grid operators (PowerSimulator^{TM}). Real-time simulations will be updated with case studies from the nine North American Electric Reliability Corporation's regions so that system operators, engineers, and students can experience and learn to prevent major power system events. As a demonstration, the simulations will be used to train and certify 120 military veterans and place them in energy industry jobs. Known as Power4Vets, the project is successfully training and placing veterans who have earned certifications from the Nuclear Energy Regulatory Commission.

Workforce Development Council of Seattle-King County

WDCSKC received a $3.6 million ARRA grant to provide green training to low-income and unemployed job seekers, particularly for deconstruction and materials use, green construction, and sustainable manufacturing.

Workforce Training and Education Coordinating Board

Received a $5.9 million State Energy Sector Partnership grant to train targeted populations in green building-related occupations, including the construction trades, and to support veteran transition to the trades through Washington's **Helmets to Hardhats** liaison. Three Workforce Development Councils – Seattle-King County, Snohomish County and the Spokane Area – administer funding for training. This training is provided by Joint Apprenticeship Training Councils in the building and construction trades statewide and by regional programs and colleges that offer energy efficiency and green-related training courses. Training topics include Master Builders Career Connection, sub-arc welding, energy audit specialist, commercial light auditor, energy accounting specialist and other certificate training.

Washington State University and the **University of Washington**

Jointly received $2.5 million in ARRA Smart Grid funding to develop the Northwest Workforce Training Center in Electric Power Engineering. The center will strengthen B.S., M.S. and PhD degrees specializing in power engineering and will create undergraduate and graduate programs in clean energy and smart grid engineering. Partners include a national laboratory, utilities, business, industry and the Bonneville Power Administration.

The Low-Income Weatherization Assistance Program

Washington received $59.5 million for low-income weatherization funded by ARRA through the U.S. Department of Energy (DOE). A portion of that funding ($10.4 million) was prescribed for weatherization-related training and technical assistance. Washington's weatherization program incorporates energy and resource conservation, energy efficiency improvements, weatherization-related repairs, indoor air quality improvements, health and safety improvements and client conservation education. Through September 2010, weatherization service providers have logged over 16,000 hours of training in these job categories. As of December 17, 2010, nearly 8,200 low-income households had been weatherized and nearly 200 FTEs have been retained or created each quarter.

In August 2010, Commerce won an additional $7 million of competitive funds from ARRA-DOE to supplement the existing Weatherization Assistance Program. The Sustainable Energy Resources for Consumers (SERC) funding is augmenting the work of 11 local weatherization contractors, which will install renewable energy systems and energy efficiency technologies in the homes of residents. Installation may include solar heating systems, solar photovoltaic panels, insulation technologies, high-efficiency appliances, tankless hot water systems, high-efficiency combination boilers for hot water and heat, and ductless heat pump systems. Local contractors are expected to complete 915 units with SERC funds.

Addendum 3. Other Green Program Initiatives

The Low-Income Weatherization Assistance Program

Washington received $59.5 million for low-income weatherization funded by ARRA through the DOE. A portion of that funding ($10.4 million) was prescribed for weatherization-related training and technical assistance. Washington's weatherization program incorporates energy and resource conservation, energy efficiency improvements, weatherization-related repairs, indoor air quality improvements, health and safety improvements, and client conservation education. Through September 2010, weatherization service providers logged over 16,000 hours of training in these job categories. As of December 17, 2010, nearly 8,200 low-income households had been weatherized and nearly 200 FTEs have been retained or created each quarter.

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The State Energy Program

By September 2010, the State Energy Program had invested $60.9 million ARRA-DOE funding in loans and grants to accelerate green job creation and retention. The investment is expected to generate 4,078 jobs, approximately 2,386 of which will be temporary. Most leverage at least a one-to-one match in funding. SEP-funded projects include:

- Renewal Energy Composite Solutions, LLC in Clark County, which received a $1 million grant to switch a portion of a boat manufacturing plant to small wind turbine production. This project will create 101 permanent and 99 temporary jobs and leverage $5 million in additional funding.
- Barr-Tech, LLC in Lincoln County, which received a $1.5 million loan and a $500,000 grant for an anaerobic digester to process local food waste. The project will create 117 permanent and 41 temporary jobs and is expected to leverage $9.7 million in additional funding.
- GR Silicate Nanofibers and Carbonates in King County, which received a $1.4 million loan for the use of nano-materials to reduce greenhouse gas emissions by capturing carbon

dioxide gas from the Grays Harbor Paper flue and converting it to calcium carbonate for use in paper. This project will create 15 permanent and 280 temporary jobs and leverage $5 million in additional funding.
http://www.energy.wsu.edu/EnergyLibrary/RecoveryActFunding.aspx

Energy Efficiency Jobs in Schools and Jobs Referendums in Washington

During the 2010 legislative session, the supplemental capital budget included $100 million for energy cost savings grants in public schools and higher education facilities. Commerce coordinated $50 million of the competitive *Jobs Act for Public K-12 and Higher Education* grants. The immediate goal of the funds is to create jobs; the long-term goal is to reduce the energy costs at state education facilities. The Superintendent of Public Instruction awarded the other $50 million for performance-based contracts at school facilities that will deliver operational cost savings to these facilities. More information on the outcomes of those programs will be included in future reports.

Higher Education

Washington's colleges and universities participate directly in green economy development as they create new courses and programs to meet employer needs. They educate the future workforce and stimulate business and technical innovation in their laboratories. They also take part by challenging their own traditional practices. Washington's legislature has required state entities to be more energy efficient, but colleges are going further with efforts to infuse sustainability concepts and methods in courses.[92] They still need to sharpen their focus in workforce education programs (and across the academic/workforce divide), but some noteworthy initiatives are already underway.

Sustainability Initiatives

The American Association of Community Colleges (AACC) officially adopted the United Nations' resolutions for global sustainability. By aligning with the United Nation's Decade of Sustainable Education, the AACC is encouraging its member institutions to develop approaches that enable people to develop the knowledge, values and skills to participate in decisions that will improve the quality of life now without damaging the planet for the future.

Colleges and universities around the country created an Association for the Advancement of Sustainability in Higher Education (AASHE). This organization is founded on the idea that education has a responsibility for training the workforce of the future, for whom sustainability skills are essential. Currently, about one-third of Washington's two-year colleges are participating members in this organization and more continue to join. Those colleges include:

- Bellingham Technical College
- Cascadia Community College
- Centralia Community College
- Edmonds Community College
- Everett Community College
- Green River Community College
- North Seattle Community College
- Olympic College
- Shoreline Community College
- South Puget Sound Community College
- The Spokane Community Colleges
- Wenatchee Valley Community College
- Whatcom Community College
- Yakima Valley Community College

Three of the state's universities are also members: University of Washington, Washington State University and Western Washington University.

Thirteen of Washington's college Presidents signed on to the American College and University Presidents Climate Commitment, which is a result of work by AASHE. By signing, they are agreeing to a statement that includes this text:

> *Campuses that address the climate challenge by reducing global warming emissions and by integrating sustainability into their curriculum will better serve their students and meet their social mandate to help create a thriving, ethical and civil society. These colleges and universities will be providing students with the knowledge and skills needed to address the critical, systemic challenges faced by the world in this new century and enable them to benefit from the economic opportunities that will arise as a result of solutions they develop.*
>
> *We further believe that colleges and universities that exert leadership in addressing climate change will stabilize and reduce their long-term energy costs, attract excellent students and faculty, attract new sources of funding, and increase the support of alumni and local communities.*[93]

As signors of this Commitment, colleges are required to submit detailed reports that track colleges' sustainability progress across several dimensions, including curriculum development and research tied to sustainability education and integration.

Since colleges and universities are not lacking in organizations to join or reports to file, active participation in these initiatives – and practicing sustainability internally – requires new investments of time and resources to cover membership fees, data collection and analysis,

report preparation and local implementation activities. All of these investments have implications for resource allocation, staffing and coordination, which can be an added burden on these institutions, especially in the current economic climate. But despite challenges that may dissuade these institutions from fully participating in sustainability activities, colleges across the nation continue to initiate and build upon their investments in sustainability in operations, staffing and in the classroom.

Acronyms and Abbreviations

AACC	American Association of Community Colleges
ACEEE	American Council for an Energy Efficient Economy
ANEW	Apprenticeship and Nontraditional Employment for Women
ARRA	American Recovery and Reinvestment Act
AWB	Association of Washington Business
AWEA	American Wind Energy Association
BLS	Bureau of Labor Statistics
BPA	Bonneville Power Administration
Commerce	Washington State Department of Commerce (formerly CTED)
CTED	Washington State Department of Community, Trade and Economic Development
DOE	U.S. Department of Energy
DOL	U.S. Department of Labor
DSHS	Washington State Department of Social and Health Services
EESS	Energy efficiency services sector
EJLT	Evergreen Jobs Leadership Team
ESD	Washington State Employment Security Department
ESSP	Energy Sector Strategic Plan
FTE	Full-time-equivalent
GDP	Gross domestic product
HVAC	Heating, ventilation and air conditioning
IT	Information technology
LBNL	Lawrence Berkeley National Laboratory
LEED	U.S. Green Building Council's Leadership in Energy and Environmental Design
L&I	Washington State Department of Labor and Industries
NEEC	Northwest Energy Efficiency Council
NGA	National Governor's Association
OSPI	Office of Superintendent of Public Instruction
PNCECE	Pacific Northwest Center of Excellence for Clean Energy
PV	Solar photovoltaics
R&D	Research and development
RPS	Renewable Portfolio Standard
SAFN	Sustainable Aviation Fuels Northwest
SBCTC	State Board for Community and Technical Colleges

SCANS	Secretary's Commission on Achieving Necessary Skills, established by the U.S. Secretary of Labor
SEED	Sound Energy Efficiency Development Project
SERC	Sustainable Energy Resources for Consumers
SESP	State Energy Sector Partnership
SESRC	Social and Economic Sciences Research Center
STEM	Science, technology, engineering and mathematics majors
WDCSKC	Workforce Development Council of Seattle-King County
WEDC	Washington Economic Development Council
WSLC	Washington State Labor Council
WSU	Washington State University Extension Energy Program
Workforce Training Board	Workforce Training and Education Coordinating Board
UNEP	United Nations Environment Programme

ADDENDA

Notes

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[11] Values for 2007 are identical among these reports because the same data sources, methodologies and contractors were used.

[12] Global Insight's estimates included the combined Portland-Beaverton (OR) and Vancouver (WA) metropolitan area, and likely overstates the total; however, estimates for Washington State (17,238) target metropolitan areas only, which may understate the actual number of green jobs.

[13] The Brookings-Battelle analysis, which used many of the same secondary data sources as the Pew reports, estimated that in 2003 Washington had 69,106 green jobs.

[14] http://www.bls.gove/green/

[15] Northwest Power and Conservation Council Sixth Power Plan: http://www.nwcouncil.org/energy/powerplan/6/default.htm

[16] Washington has been an active participant in the West Coast Governors' Global Warming Initiative, the Clean and Diversified Energy Initiative sponsored by the Western Governors Association, and the Western Climate Initiative, which has promoted a "cap and trade" program to reduce emissions. State voters passed Initiative 937 (I-937) in 2007, requiring larger utilities, which serve about 84 percent of the state's load, to obtain 15 percent of their electricity from new renewable resources by 2020 and to undertake all cost-effective energy conservation. See: http://apps.leg.wa.gov/RCW/default.aspx?cite=19.285

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[24] Washington State Building Code Council: http://www.sbcc.wa.gov/

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For the ACEEE ranking on green energy policies: http://www.theolympian.com/southsound/story/610086.html.

[27] For a complete description and details about determining cost effectiveness of efficiency measures: http://www.cted.wa.gov/site/1001/default.aspx.

[28] American Council for an Energy-Efficient Economy website: http://www.aceee.org/node/820.

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[32] Various resources from Department of Commerce were used as examples: www.commerce.wa.gov/site/413/default.aspx; Washington Economic Development Association with downloadable 2010 Report: www.wedaonline.com; Washington's Economic Development Commission provides links to resources at: www.wedc.wa.gov/Publications.htm; the state's workforce development plan, *High Skills/High Wages*: http://www.wtb.wa.gov/Activities_HighSkills.asp; Access *Vision 2040* from the Puget Sound Regional Council: http://psrc.org/growth/vision2040; a central link to the state's workforce development councils: www.washingtonworkforce.org/WDCs/index.php;

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[38] In 2010, Centralia College and consortia partners were awarded a $5 million Smart Grid workforce development grant from the U.S. Department of Energy, expanding its scope from a Washington center of excellence to include regional energy industry, labor and education partners from five Pacific Northwest states.

[39] Members include: Deputy Assistant, Employment Security Department, representing WIA and Wagner-Peyser; Washington Workforce Association, a coalition of the state's 12 local Workforce Development Councils and One Stop Career Center delivery systems; representatives of the State Energy Office, Department of Labor and Industries/Apprenticeship division; local community action agencies, responsible for federally funded low-income weatherization; the State Board for Community and Technical Colleges; the Higher Education Coordinating Board; Washington Department of Veterans Affairs; the Washington State Labor Council and the Washington State Building and Construction Trades Council. Business Team members from industry (McKinstry) and utilities (Puget Sound Energy) bring comprehensive understanding of the energy sector.

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[74] "Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy," Sarah White and Jason Walsh, Center for Wisconsin Strategy, The Workforce Alliance, The Apollo Alliance (2008): www.greenforce.org/resources.

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[76] *Connected consumer electronics sales to exceed 100 million units annually by 2013*, Parks Associates (May 2009): http://www.parksassociates.com/Blog/category?category_id=6&year=2009&month=05.

[77] In 2008, regional utility executives comprising the Northwest Energy Efficiency Task Force issued a subcommittee report, "Building the Workforce of the Future," which identified concerns about the availability and skills of the current and future energy efficiency workforce at all levels. See: http://www.nwcouncil.org/energy/neet/workgroups/5/NEET%20WG5%20Prel.%20Report%20&%20Recommendationss-abridged.pdf.

[78] Washington State University and the University of Washington did apply for and receive joint funding to expand engineering program offerings (see Addendum 2), but these funds were not specifically for energy efficiency.

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[89] *Washington State's Green Economy: A Strategic Framework*, 2009 Discussion Draft (January), Community, Trade and Economic Development (now Department of Commerce).

[90] *Job Creation on a Budget: How Regional Industry Clusters Can Add Jobs, Bolster Entrepreneurship, and Spark Innovation*. New York: Brookings-Rockefeller project on state and metropolitan innovation (2011).

[91] SCANS define a variety of foundational skills important for success in the workplace. See: http://wdr.doleta.gov/SCANS/whatwork/whatwork.pdf.

[92] For example, since 2009 Washington's colleges have been required to submit a greenhouse gas report and subsequent climate action plans to the Department of Ecology (RCW 70.235.060). This state law requires all state agencies, including colleges, to reduce greenhouse gas emissions significantly below 2005 levels over the next 40 years, with regular strategy, methodology, and results-based reporting requirement that will include research and the provision of compliance data by individual institutions.

[93] http://www.presidentsclimatecommitment.org/ .

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