



# Washington State's Green Economy

## A Strategic Framework

Discussion Draft  
January 2009



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in our nature.  
Community, Trade & Economic Development

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## Executive Summary

Washington state – and the rest of the nation – faces unprecedented challenges from:

- Energy security (high petroleum and natural-gas prices).
- Carbon constraints (cap and trade, or tax).
- Greenhouse-gas reduction requirements.
- Resource constraints (land, water).
- Climate-change risks.
- Environmental regulations (Puget Sound, air quality).
- Demographics (slow growth rate of work force, an aging population, migration).

These drivers will require change, force adaptation and increase our efficiency. They require Washington to continue its transition from an industrial economy to a more efficient, greener and sustainable economic model. In doing so, we also will create opportunities for economic growth.

Washington's economic future can be bright if policy leaders apply the same attention, bold action and substantial resources toward green economic development as the state is doing now for greenhouse-gas reduction.

Washington companies can create and market new products and services. And Washington's traditional companies can be the first to receive the benefits from these emerging technologies and practices.

### What is a green economy?

The green economy is best thought of as the “greening” of our existing economy through the development of new products, techniques and services that promote environmental protection and/or energy security. We have identified four major green-industry groupings: Clean energy, green building, green transportation and environmental protection

### Policy framework

In addition to definitions and a labor-market study, ESSHB 2815 (from the 2008 legislative session) asked the Washington State Department of Community, Trade and Economic Development to create a policy framework and strategies for a green economy. The following guidelines are offered to policy-makers as they align economic and environmental goals.

#### **Maintain a broad definition of green economy**

Do not limit the economic framework to clean energy or to high-tech industries.

#### **Provide clarity by using consistent language**

Use language deliberately and consistently to achieve clarity and to design policies that are easily understood. Use the definitions offered in “Definitions for a Green Economy Jobs Initiative.”

### **Aim high**

The state should set significant targets (energy efficiency, state procurement of green products, creating renewable energy, etc.) to demonstrate that there is a large and sustained market to pursue and that these markets are real. The state should make every effort to provide confidence in market sustainability through clear descriptions of needed change (goals, incentives, regulations).

### **Don't pick winners and losers**

Be technology-neutral. Do not mandate particular fuel types or certain environmental technologies. Design broad initiatives that focus on specific outcomes (carbon reductions, water quality or energy-efficiency standards). Let the market pick the winners. Build in flexibility and room for industries and institutions to make adjustments based on market conditions and new discoveries.

### **Share prosperity**

Design policies and programs that will distribute economic benefits and provide living wages, career pathways, and small-business starts all across the state. Use strategies that balance the “Triple Bottom Line” of healthy environment, vibrant economy and social equity.

### **Work with the highest returns first**

Work with the highest job-growth potentials first. Begin working immediately with the “low-hanging fruit” that are closest to market competitiveness. This will allow the state to achieve immediate employment and environmental gains, while advancing more difficult and long-term strategies for the green economy.

### **Maintain solid foundation for economic & workforce development**

Maintain a focus on the fundamentals of economic and workforce development. Many of the barriers that Washington must overcome are not specific to a green economy. Rather, the greatest challenges are those that *currently* inhibit innovation and new business development in Washington generally.

### **Be consistent**

Chart a path and stick with it (greenhouse-gas reduction goals, cap-and-trade framework, etc). Green industries, and the suppliers and manufacturers that support them, need certainty. The state must supply a long-term commitment, expressed in policy and in messages, before firms can design long-term funding plans and build capacity.

### **Use our natural advantages**

Build on existing capacities and systems in the public and private sectors. Integrate strategies into existing programs (economic development, small-business assistance, tax incentives, workforce development, research and development), rather than launch new, independent projects.

### **Coordinate and support local governments**

Strategies must be cross-cutting and systemic and must engage every aspect of supply chains and economic development planning (land use, industry and manufacturing). This will require cooperative implementation and co-design with local governments. Many local governments have already initiated sustainability policies and need help with such things as finance development and planning authority.

### **Build in-state supply chains**

Look for gaps in supply chains. Policies, programs and financial mechanisms must create – whenever practical – the development of local supply chains. Local supply chains (clusters) have the added benefit of distributed employment and transportation efficiency.

### **Consider full system effects**

Consider both short- and long-term economic and environmental effects of green-economy activities. Use sound environmental science and Life Cycle Assessments (LCA) to measure the environmental performance of products and services.

### **Push and pull**

Combine technology *push* and demand *pull*, to reap long-term financial benefits from the green economy. State government has a role in building demand for mature technologies. However, an ongoing commitment to research and development and demonstration also is required.

### **Measurement and performance**

Washington must develop its own, clear method of defining the green economy and measuring its effect. It is crucial to develop a baseline to track progress and understand changes in the entire green economy and to hold recipients of public dollars accountable for promised results.

## **Key findings**

### **Challenges**

Washington's green economy is challenged by:

- Domestic and global competition for preeminence in green technology.
- A late start in adopting renewable energy and efficiency.
- Low-cost hydro-electric power.
- An aging electrical grid.
- The need to target millions of small GHG emitters and consumers.
- The need to scale-up and aggregate green products and services across residential, commercial, industrial, agricultural and government sectors.

### **Assets**

The challenges are off-set by an abundance of assets in Washington:

- Significant private- and public-sector leadership.
- A robust global trade network.
- A concentration of organized clean-technology and high-tech firms.
- Technology spill-over from IT, biomedical and aerospace industries.
- Experience and an excellent reputation in innovation-based economy.
- Two world-class public research universities and a national lab.
- Consistently ranked as one of the top states in the nation for starting a business and for doing business.
- Diverse mix of private and public utilities committed to customer energy efficiency and conservation programs.

## **Green-industry opportunities**

Although the industries are relatively small and in the early stages of development, Washington has strong near-term and long-term economic potential in:

- Solar manufacturing
- Wind power development
- Green-building design
- Bioenergy
- Smart-grid technologies
- Solid waste and recycling
- Water conservation

## **Global trade**

The global market for green-economy technologies is projected to reach \$2.74 trillion by 2020. There are tremendous international trade opportunities for Washington's green industries. To take full advantage of that market, Washington must:

- Develop a green-industry trade strategy aimed at developing markets.
- Fund Washington's international trade programs, with targeting to green industries.
- Aggressively seek foreign direct investment in capital-intensive green industries.
- Augment Washington's international representation with trade offices in target countries.

## **Strong policy**

Firms in Washington need a clear sense of the competitive stakes and the true costs of continuing with business-as-usual. Likewise, they need a clear sense of what opportunities are available for new products and services.

The state's green policies must be strong, incontrovertible and signal a long-term, deep commitment to change. Washington must:

- Maintain a strong stance on greenhouse-gas reduction goals and a carbon-framework.
- Update the State Energy Policy and develop a state energy strategy.
- Develop a comprehensive economic analysis of the green economy and attempt to calculate net productivity.
- Have Employment Security Department continue to survey the green labor market every two years to measure employment and industry trends.
- Lead and create a broad-based and comprehensive communications and marketing plan.
- Maintain a strong commitment to the cap-and-trade framework.
- Use procurement policies to increase the early adoption of green products and provide a central organization to help aggregate the efforts of local governments.
- Create supportive policies and incentives for organized large infrastructure and research investments by utilities.

## **Regulation**

Industry standards and environmental protections create a level playing field and high-quality products. Most businesses appreciate this. However, a cumbersome regulatory process can be challenging for entrepreneurs who need to get a start-up company profitable quickly.

Washington's regulatory environment for emerging green industries needs to be less complicated and more predictable. Firms need the state to alleviate the *uncertainty* of regulation (time and predictability). Investors look for stability as a way to reduce their investment risk.

To identify the regulatory barriers that face new activities and work to smooth the way and reduce risk, Washington state should:

- Expand the Governor's Office of Regulatory Assistance (ORA) and commission the office to study and anticipate green-economy regulatory issues. Increase ORA's authority to bring state agencies to the table and compel participation in problem-solving.
- Form industry councils to anticipate and evaluate regulatory barriers and make recommendations.
- Help create apprenticeship and continuing education programs for local inspectors and planning staff.

### **Skilled work force**

The vast majority of jobs created in a green economy are in the same areas of employment that people already work in today. Washington has significant educational assets, including:

- An outstanding range of public and private universities and colleges
- An unparalleled apprenticeship training system

And yet, the state is not well-prepared to maintain or grow a labor force to support a profitable economy, green or otherwise.

To create the jobs needed to compete in a national and international green economy, Washington must realize the goals that it has already established:

- Work directly with state universities and community and technical colleges to develop and enhance Centers of Excellence in energy and environmental protection (ESSHB 2815).
- Enhance the Customized Employee Workforce Training Program to help firms meet specific gaps in their workforce capabilities, green or otherwise.
- Enhance the Job Skills Program to provide customized training for employers who want to retrain their employees in green skills.
- Fund the Green Industries Job Training Account, which will create and pilot green industry skill panels and finance the community and technical college job-training fund (ESSHB 2815).
- Support innovation in the academic environment through investments in higher education, research and technology transfer.
- 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 improve adult basic and remedial education tied to occupational skills training.
- Fully leverage the apprenticeship program and encourage development of apprenticeship beyond the construction trades, to other green industries.

## **Research, development and demonstration**

While private funding from investors and corporations can help Washington compete in some of the more mature (deployable) green-industry markets, greater public support for research, development and deployment is required. Washington should:

- Consider sponsoring one or more large-size demonstrations of emerging technologies to test synergistic systems at scale (such as Climate Benefit Districts and Green Industry Zones).
- Do more to commercialize publicly funded intellectual property by supporting green products and processes in their earliest stages and better-joining public discoveries with angel investment.
- Help companies pull things out of universities. Create an incentive for higher education to “consult” or bridge to the private sector.
- Consider allowing investor-owned utilities to establish a systems benefit charge (a non by-passable tariff) for funding research and development investments.
- Support and incent the Washington’s Innovation Partnership Zones (IPZs) focused on green industry and technologies.

## **Local economic development**

The state’s focus on industry cluster development is particularly well-suited for the green economy and should be continued with renewed vigor. Some local communities will need state assistance to identify and build green clusters. State government can assist with cluster mapping, diagnosing green economy supply chains and helping small suppliers engage in large international markets. This is especially helpful for entrepreneurs and small businesses so they can find a place in local supply chains or develop complimentary expertise.

Washington state can best assist communities with economic development by:

- Educate and train the associate development organizations (ADOs), small-business development centers (SBDCs) and local governments regarding the green economy and state environmental policies.
- Develop and support in joint marketing and business recruitment (Team Washington is an excellent prototype).
- Help to create localized networks of processors and end markets for green products, such as biofuels and recycling/remanufacturing. Revisit the former Clean Washington Center as a model.
- Help homegrown businesses to expand into the export market by providing customized market research, tailored export market plans and targeted export promotion.
- Broaden the mandate of the Office of Minority and Women Business Enterprises (MWBE) and simplify the certification process for MWBEs.

## Introduction

### Change is inevitable

Washington State must make the transition from an industrial economy to a more efficient, greener and sustainable economic model.

This is not a political statement. Washington and its firms will change production and consumption models in response to:

Energy security (high petroleum and natural-gas prices).

- Carbon constraints (cap and trade, or tax).
- Greenhouse-gas reduction requirements.
- Resource constraints (land, water).
- Climate-change risks.
- Environmental regulations (Puget Sound, air quality).
- Demographics (slow growth rate of work force, an aging population, migration).

Without a significant change, the depletion of natural resources, the loss of biodiversity and major weather events that are exacerbated by climate change will undermine many firms. The volatile price and availability of oil and natural gas, as well as the price of carbon (tax or trade), will put some firms out of business. The cost of energy will continue on an upward trend.

Regardless of today's economic uncertainty, these major risks will continue to require change, force adaptation, increase our efficiency and create opportunities for economic **growth**.

With strong state leadership, Washington's green economy stands to benefit from this confluence of trends. Washington companies can create and market these new products and services. Washington's traditional companies can be the first to receive the benefits from these emerging technologies and practices.

This document, the **Green-Economy Strategic Framework**, was requested by the Governor and the state Legislature to evaluate opportunities to grow the green economy.

### Green-Economy Strategic Framework

This document sets the stage for the 2009-2010 legislative sessions, with proposed definitions, principles and strategies.

While this framework touches on climate-change actions, it does so only for context and illustration. The science of greenhouse-gas emissions and climate change are beyond the scope of this report and the author's expertise.

The work of the 2008 Climate Action Team<sup>1</sup> (CAT) and its Implementation Work Groups provide the most focused examination of the products and processes that will help Washington achieve its greenhouse-gas reduction goals. Likewise, the Puget Sound Partnership is the state's lead organization on strategies to restore and preserve the health of the Puget Sound. This framework seeks to aid policy-makers in considering the economy and job creation as they respond to those proposals and many others. Policy-makers should respond to opportunity within a strategic framework in order to align economic and environmental goals.

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<sup>1</sup> At this time, the Climate Action Team has not released a report or formally announced recommendations. This has created a bit of challenge for the report writers and the Green-Economy Advisory Team.

## **This framework is a beginning**

This Green-Economy Strategic Framework is laying the groundwork<sup>2</sup> for developing a strategic plan for growing Washington's green economy.

Many of the recommendations contained in this framework, such as commercial finance models and improving the regulatory environment, will require additional work to refine.

Washington's economic future can be bright, if policy leaders apply the same attention, bold action and substantial resources toward green economic development as the state is doing now for greenhouse-gas reduction or the public/private partnerships that have made the state a leader in aerospace, software, etc.

## **Section 9 of ESSHB 2815: Green-Economy Jobs Initiative**

Section 9 of the bill relating to "Framework for Reducing Greenhouse Gases Emissions" calls for a comprehensive green-economy job-growth initiative.

This section directs certain state agencies to stimulate a cleaner, greener economy and to prepare our work force for the changing economy.

The five elements of Section 9 are:

### **Definitions**

How will we define what a green economy is? What is a green-collar job?

### **Labor-market survey**

What kinds of jobs are out there already, and what are the leading industries and occupations? Who's investing in new "green" jobs?

### **Workforce development planning**

What is the demand for a green-economy work force? What are the foundational skills? Where are the current and expected skill gaps?

### **Strategies for growing a green economy**

Identify the best methods and practices to stimulate green industries and new technologies.

### **Minority- and women-owned enterprises**

How can we best help all Washingtonians make a good life for themselves, their communities and our state?

The definition list is completed and is attached to this document.

The labor market survey is under way. The completed analysis will be distributed in January 2009.

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<sup>2</sup> Another phase is required, in order to incorporate the findings of the Employment Security Department's labor market analysis, as well as whatever climate strategies are advanced by the executive branch, legislators and other interested parties.

The workforce planning and training model has yet to be funded.<sup>3</sup> Community and technical colleges, four-year universities and apprenticeships are incorporating green skill sets into some of their existing programs, and this workforce system is developing some new, green programs. However, these are scattered efforts, and the system is not yet positioned to bring green training to a statewide scale. That will require funding the Green Jobs Training Account or some similar mechanism.

The evaluation of minority- and women-owned enterprises, conducted by the University of Washington, is attached to this document.

## A Definition of the Green Economy

The green economy is best thought of as the “greening” of our existing economy through developing new products, techniques and services. All industries are – and will be – in a state of transition in a carbon-constrained world. Efficiencies, new energy sources, technologies and business models will develop and be adopted over time.

A complete vocabulary can be found in the appendix of this document, in “**Definitions for a Green-Economy Jobs Initiative.**” With each industry definition, there are examples of the processes and products, a sampling of Washington companies and related jobs.

### What is Green Economy?

**Green Economy:** The development and use of products and services that promote environmental protection and/or energy security.

It is difficult to define where the green economy begins and where it ends. Defining a job or an industry as green is not black or white. The vast majority of jobs created in a green economy are in the same areas of employment that people work in today – it is more a question of whether we can improve the services provided by buildings, transportation, products and processes.

“Green” is a cross-cutting term that can be applied to activities and products that exist (or could exist) in virtually all of today’s sectors and industries. Green is a matter of degree. There are shades of green!

Washington state’s definitions deliberately shift policy language from “clean energy” to green economy. The green economy is larger than clean energy, as it includes sustainable products and processes not related to energy.

Likewise, the green economy is more comprehensive than “clean tech,” as it includes products and processes that do not require inventions or high-technology.

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<sup>3</sup> Two important but yet-to-be-funded workforce strategies were established in Section 9 of ESSHB 2815. First, the Green Jobs Training Account was established (but not funded) to competitively fund development of high-demand education and training programs for the green economy. Second, as a necessary precursor to developing education programs, HB 2815 created pilot “industry skill panels” targeted at green-economy industries. Skill panels convene industry leaders (business and labor) with the workforce development system to identify specific skill gaps and implement tactics for closing those gaps.

The definitions – and this Green Economy Strategic Framework – deliberately shift policy language from “green-collar jobs” to green economy. Our transition to a greener and more sustainable economy will certainly require new kinds of jobs and new training for workers.

Jobs alone, while an important output, do not alone define an economy. An economy involves education, research and innovation, global trade, new markets, as well as incentives and regulations.

### **Green-economy industries**

To help organize our definitions, the following industry groupings have been identified and defined:

#### **A. Clean energy**

- Efficiency
- Renewable
- Alternative

#### **B. Green building**

#### **C. Green transportation**

#### **D. Environmental protection**

- Waste management
- Water conservation

Within each of these green-economy industries, the entire supply chain is represented:

- Upstream: Research, development, and commercialization.
- Production: Generating useful energy, products and services.
- Infrastructure: Delivery systems (grid, rail, transmission, etc.).
- Consumption: Technologies and products that improve consumption (efficiency, access, etc.) for the end user.

Research, advanced materials and manufacturing are not called out as green-economy industries. Rather, these industries are key elements within the industry supply chain. They can also be thought of as “general purpose” industries that enable many aspects of our economy.

### **Agriculture and forestry**

Although we have not classified the entire forestry and agriculture sectors as green, many activities in those sectors do qualify as green practices.

If the green economy is “the development and use of products and services that promote environmental protection and/or energy security,” then forestry and agriculture – as a whole - fall outside of this definition.

However, organic farming and sustainable forest management are clearly contributors to pollution prevention, and conservation practices and recycled biomass in forestry and agriculture are certainly within the green realm. We have chosen to capture those activities in the other green-economy industry groupings, such as renewable energy, water conservation, waste management, etc.

## Green-Economy Jobs

### **Create 25,000 jobs by 2020**

Governor Gregoire set a goal to “by 2020, increase the number of clean-energy-sector jobs to 25,000 from the 8,400 jobs we had in 2004.”<sup>4</sup> Washington will achieve that goal and likely exceed it.

Even a casual review reveals that, since 2004, Washington has landed companies like REC Silicon in Moses Lake (the solar-grade silicon manufacturer that has expanded its work force to 400 people) and Gen-X (one of the largest biodiesel plants in Washington). Additionally, some clean-energy companies, such as the notable energy-efficiency engineering firm McKinstry, have expanded significantly since 2004.

Wind energy, the largest renewable energy sector in the state, has grown significantly. In fact, a third of the 1,163 megawatts of capacity now available was added in 2007 alone. Puget Sound Energy, the largest provider of wind energy in the state, operates 215 wind turbines between its Hopkins Ridge and Wild Horse sites, and expansions are planned.

### **Clean-energy jobs, or green-economy jobs?**

The clean-energy jobs goal established by Governor Gregoire in Executive Order 07-02 is still in effect and being tracked. However, the clean-energy jobs goal put the focus on just a piece of the overall puzzle. It is widely recognized that it will take more than just clean energy to achieve the twin goals of environmental protection and energy security.

A year later, ESSHB 2815 reinforced and refocused the Governor’s jobs goal by calling for 25,000 “green economy” jobs by 2020. Arguably, the green-economy term is more supportive of the overall climate-change goals.

Thus, the green-economy jobs goal evolved from the clean-energy jobs goal. But over time, our definition of the breadth of efforts needed to deal with issues of climate change broadened beyond what could be considered clean energy per se.

### **Job quality**

Whether the jobs associated with the green economy meet the criteria for “family wage,” “family supporting” or “self sufficient” is an empirical question that can be addressed only after the *number* of green jobs by industry is estimated. That labor-market analysis is under way but not yet completed by the Employment Security Department.

Clearly, the intent of the Governor and the Legislature is to create an economy that will support and create jobs with good wages and improve the standard of living across the state. Certainly, there will be lower-wage, entry-level green jobs created as well, but they must be connected to an upward career pathway to promote training and advancement. Programs and policy must be designed with living wages and wage progression in mind.

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<sup>4</sup> Governor Chris Gregoire, Executive Order 07-02, Washington Climate Change Challenge, February 07, 2007.

## **Net jobs**

The question is sometimes asked whether the state is accounting for job losses associated with the economy's transition to sustainability. In other words, when we talk about job gain, are we talking about "net" jobs?

First, we must acknowledge that the vast majority of jobs created in a green economy are the same jobs that people have today, but applied differently. They are jobs in manufacturing, machining, construction, engineering, chemistry, business services, etc.

Second, it is not feasible to calculate a net job gain for activities that are associated with the transition to a post-industrial, green and sustainable economic model. In Washington's employment security system, net job growth can be calculated only by the difference between accessions (hires) and separations. In October 2008, Washington had a net job loss of 18,000 jobs. This means there were 18,000 more separations than hires. Hires can come from growth or replacement. Thus, it is not possible to identify new jobs. A firm may grow from 90 to 100 employees over a month, but hire 25 during that month.

The labor-market analysis commissioned by ESSHB 2815 (expected in January 2009) will determine the number of green-economy jobs (as closely as possible) that currently exist. It is a "snapshot" survey. Measuring a net change was not part of the project.

However, if the survey is run again in the future, a net change can be determined. A biennial survey is recommended.

## **Will there be *more* jobs?**

The green economy is the "greening" of our economy, which means that our economy is in a state of transition. In a carbon-constrained world, products and services will need to be delivered more efficiently (cleaner and greener). That will require change, adaptation and innovation.

There is good reason to believe that a green economy will create an overall increase in jobs. The American Council for an Energy Efficient Economy (ACEEE) calculates that a dollar invested in energy efficiency creates significantly more jobs than a dollar invested in the oil economy, because efficiency-related construction, manufacturing and services are more labor-intensive than fossil-energy production.

California recently released a report on the economy-wide employment effects of its state's historical experience with energy efficiency. California found that energy efficiency created jobs throughout all energy sectors and supply chains, including oil, gas and electric power. However, for every new job foregone in these sectors, more than 50 new jobs were created across the state's economy.<sup>5</sup>

There will be an ebb and flow in jobs as the economy changes.

Many jobs will stay the same (such as manufacturing or construction), but employees will need to be "up-skilled" to stay current with new technologies. In the end, we expect a greater number of jobs, as well as increased efficiency, productivity and innovation.

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<sup>5</sup> David Roland-Holst, "Energy Efficiency, Innovation and Job Creation in California," research papers on energy, resources and economic sustainability, October 2008.

## Policy Framework: The 14 Principles for a Green Economy

The state's role in the growth and acceleration of the green economy should reflect the following principles:

### 1. Maintain a broad definition of green economy

Do not limit the economic framework to clean energy or to high-tech industries.

### 2. Provide clarity with consistent language

Use language deliberately and consistently to achieve clarity and to design policies that are easily understood. Use the definitions in this appendix: Definitions for a Green-Economy Jobs Initiative.

### 3. Aim high

The state should set significant targets (energy efficiency, state procurement of green products, renewal energy creation, etc.) to demonstrate that there is a large and sustained market to pursue and that these markets are real. Design policies and programs to provide certainty about the future and market sustainability through clear descriptions of needed changes (goals, incentives, regulations).

### 4. Don't pick winners and losers

Be technology-neutral. Do not mandate particular fuel types or certain environmental technologies. Corn-based ethanol provides an infamous example of the dangers of "picking winners."

The state should design broad initiatives that focus on specific outcomes (carbon reductions, water quality or energy-efficiency standards). This will ensure that public policy goals are reached, but prevent a narrow focus on specific, small markets. Let the market pick the winners. Build in flexibility and room for industries and institutions to make adjustments based on market conditions and new discoveries.

### 5. Share prosperity

Design policies and programs that will distribute economic benefits and provide living wages, career pathways and small-business starts all across the state. Use strategies that balance the "triple bottom line" of healthy environment, vibrant economy and social equity.

### 6. Work with the highest returns first

Work with the highest job-growth potentials first. Begin work immediately with the "low-hanging fruit" that are closest to market competitiveness. This will allow the state to achieve immediate employment and environmental gains, while advancing more difficult and long-term strategies for the green economy.

## **7. Maintain solid foundation for economic and workforce development**

Maintain a focus on the fundamentals of economic and workforce development. Many of the barriers that Washington state must overcome are not specific to a green economy. Rather, the greatest challenges are those that *currently* inhibit innovation and new business development in Washington generally. Workforce training, advanced degrees, technology commercialization, international trade and business development are foundational for today's economy as well as tomorrow's green economy.

## **8. Be consistent**

Chart a path and stick with it (greenhouse-gas reduction goals, cap-and-trade framework, etc.). Green industries, and the suppliers and manufacturers that support them, need certainty. The state must supply a long-term commitment, expressed in policy and in messages, before firms can design long-term funding plans and build capacity.

## **9. Use our natural advantages**

Leverage what we have. Build on existing capacities and systems, both in the public and private sectors. Integrate strategies into existing programs (economic development, small-business assistance, tax incentives, workforce development, research and development), rather than launching new, independent projects. By working from strengths, Washington can support existing firms and strengthen core industries and institutions. Leveraging is a business and workforce retention strategy.

## **10. Coordinate and support local governments**

Strategies must be cross-cutting and systemic, and must engage every aspect of supply chains and economic development planning (land use, industry and manufacturing). This will require cooperative implementation and co-design with local governments. Many local governments have already initiated sustainability policies and need help with such things as finance development and planning authority.

## **11. Build in-state supply chains**

Look for gaps in supply chains. As a classic example, Washington state is a global leader in producing solar-grade silicon. We also have an emerging solar consumer market, yet we have virtually no manufacturers who produce solar panels. In fact, most of the silicon currently produced at REC Silicon's \$1 billion facility is exported overseas. Policies, programs and financial mechanisms must create – whenever practical – the development of local supply chains. Local supply chains (clusters) have the added benefit of distributed employment and transportation efficiency.

## **12. Consider full system effects**

Consider both short- and long-term economic and environmental effects of green-economy activities. Use sound environmental science and Life-Cycle Assessments (LCA) to measure the environmental performance of products and services. This will better assure the desired environmental outcomes without unintended consequences. Such assessments also will help the state market its products and services as truly "green."

### **13. Push and pull**

Combine technology *push* and demand *pull* to reap long-term financial benefits from the green economy. State government has a role in building demand for mature technologies. However, an ongoing commitment to research and development and demonstration also is required.

### **14. Measurement and performance**

One study estimates 4.2 million green jobs in the United States by 2038, while another estimates 40 million green jobs by 2030. Who's right?

Washington must develop its own, clear method of defining the green economy and measuring its impact. The Employment Security Department study – commissioned by the state legislature – uses a systemic approach to define and measure green-economy jobs. That is an important first step. But it also is crucial to develop a baseline to track progress and understand changes in the entire green economy and to hold recipients of public dollars accountable for promised results.

## Washington State – Current Conditions

### Challenges

#### Competition

Nationwide, there is a rush to take advantage of new sustainable industries and promote “green jobs.” In the appendix of this report is a summary of state, regional and local climate-change initiatives, as well as pending and enacted green-jobs legislation.

According to the Climate Policy Program of the New America Foundation, as of August 2008, there were more than 530 state government executive orders, action plans, legislation and reports related to climate change currently under way. The full Climate Policy Matrix is attached to this report.

Washington is far from unique in making the connection between reductions in climate pollution, energy independence and a green economy.

In the 2007-2008 legislative cycles alone, 16 states took action on more than 24 bills with the aim to grow green jobs. Eight jurisdictions already have significant green-jobs initiatives.<sup>6</sup>

Our state is not alone in this race to capture investment capital and research funding or in its desire to become the premier location for developing and producing green-economy products. Our challenge is to help the state of Washington pull ahead in a crowded field.

#### Late start

Although Washington’s electric utilities have had a long history of investing in energy-efficiency programs and technologies, we have been a late adopter. New York State has had a New York Energy Research and Development Organization (NYERDA) for more than a decade; more than a dozen states have public clean-energy funds that support not only green-economy research and development, but a range of clean-energy technology projects and new technologies. Other states and countries have more aggressive renewable-energy standards, and they implemented them sooner.

#### Electricity prices

Washington consumers and firms have felt the effects of unpredictable, skyrocketing petroleum prices. Little doubt remains that continued dependence on petroleum is a risky venture. With Alaskan production in decline, Washington’s refineries are becoming increasingly dependent on crude oil imports from Canada and other countries.<sup>7</sup> Washington residents spend more than \$9 billion annually, almost \$25 million each day, on imported fuel.<sup>8</sup> There is clear motivation to reduce consumption and find alternatives.

Conversely, Washington has been blessed with stable and cheap electricity. Comprising close to three-fourths of state electricity generation, hydroelectric power dominates the electricity market in Washington. Washington is the leading hydroelectric power producer in the nation,

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6 National Conference of State Legislatures, State & Federal Issues: Issue Areas > Labor & Employment 2007-2008, State Green-Jobs Legislation. Accessed September 4, 2008.

7 Energy Information Administration, “Official Energy Statistics from the U.S. Government,” State & U.S. Historical Data > State Energy Profiles Washington. Accessed September 4, 2008. [http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=WA](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=WA)

8 Widely cited in Governor Gregoire’s communications. No footnote. The Governor’s Executive Order 07-02 calls, by 2020, to reduce expenditures by 20 percent on fuel imported into the state.

typically generating about twice that of the next leading state.<sup>9</sup> Roughly two-thirds of Washington households use electricity for home heating. Not surprisingly, Washington residential users have a slightly greater consumption of electrical energy.

While low electricity prices are good for Washington’s economy, it has the unfortunate side effect of dampening early adoption of efficiency measures that have significant upfront costs. Consumers and businesses find little reason to make expensive investments in building systems or new appliances, for example.

**Chart 1. Comparison of Power Generation (2006)**

Washington state	National average
76% Hydropower	7% Hydropower
7% Natural gas	20% Natural gas
6% Coal	49% Coal
9% Nuclear	19% Nuclear
	2% Petroleum
2% Renewables	2% Renewables
	1% Other

*Source: U.S. Department of Energy, Energy Information Administration.*

This presents a significant challenge, as reducing household electricity demand is one of the most powerful catalysts of efficiency-based economic growth.

It hurts our efforts in another way, too. Investors capitalize on the space created by higher prices. Price differences drive alternatives, and a demand for alternatives will create markets. Because Washington’s power rates do not create an incentive for energy efficiency and new energy supplies, the price signal that attracts investments is weak.

This abundance of relatively inexpensive hydro-generated electricity has produced challenging market conditions for energy efficiencies and renewable energies in the state. We must break free from the inertia of low-cost electricity.

**Aging electrical grid**

It is generally acknowledged that, in the absence of major improvements, the region’s current grid will have difficulty accommodating the growing demand for electricity and the new

<sup>9</sup> Energy Information Administration, “Official Energy Statistics from the U.S. Government,” State & U.S. Historical Data > State Energy Profiles Washington. Accessed September 4, 2008. [http://tonto.eia.doe.gov/state/state\\_energy\\_profiles.cfm?sid=WA](http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=WA)

contributions of wind, solar and bioenergy. This infrastructure issue will hamper Washington's most promising clean-energy industries.

Fortunately, all electricity industry players are aware of the need to improve grid technology and expand and upgrade the current transmission system. The Bonneville Power Administration has begun the process to upgrade transmission lines to handle anticipated wind projects. Other transmission owners have proposed major new lines and upgrade, and there are numerous regional and west-wide planning processes under way. Questions remain about whether these proposed upgrades can be financed and sited in a timely manner, since capital markets are shaky and BPA has a borrowing cap (although Congress is talking about raising it). There also are numerous political and jurisdictional hurdles to be overcome, but there is enough lead time to resolve these problems if everyone works together.

## **Policy challenges**

### **Small emitters**

To achieve the greatest greenhouse-gas reductions at the lowest cost, Washington must design policies targeted to millions of small emitters and consumers. The temptation is to go after big companies that are already subject to substantial regulation. But, in fact, industry and manufacturing account for a relatively small portion of greenhouse-gas emissions.

### **Aggregation and scale-up**

In addition to having millions of small end-users, Washington's green economy also is diverse in sectors of end-users: residential, commercial, industrial, agriculture and government. Washington will need to design policies that apply to all of these sectors to ensure a large market. Large numbers of small, dispersed projects – when aggregated – create huge potential. We have to bear this in mind when we design policies, programs and finance mechanisms.

### **Investment in our strengths**

To avoid repeating old economic development mistakes, Washington must focus on the base that already exists (target industries, mature institutions, etc.) and leverage limited resources. The temptation is to suddenly reshape our state as a leader in the latest hot technology. We have to leave behind old-school smokestack-chasing strategies.

## **Assets**

There are many reasons to be optimistic about Washington's future in the green economy. Our state enjoys:

- Significant private and public-sector leadership.
- A robust global trade network.
- A concentration of clean-technology and high-tech firms.
- Two world-class public research universities and a national lab.<sup>10</sup>
- Ranked the 3<sup>rd</sup>-best state for business<sup>11</sup> by Forbes Magazine.<sup>12</sup>
- Nation's first green-jobs training program, incorporated into climate-change policy.

<sup>10</sup> Created in 2008 (Section 09 of ESSHB 2815) to supplement the state opportunity grant program established under RCW 28B.50.271 and target training resources to green industry jobs.

<sup>11</sup> Based on a composite score of six elements: business costs, labor, regulatory environment, economic climate, growth prospects and quality of life.

<sup>12</sup> Forbes Magazine, "Special Report: The Best States for Business," July 31, 2008. [http://www.forbes.com/business/2008/07/30/virginia-georgia-utah-biz-cz\\_kb\\_0731beststates.html](http://www.forbes.com/business/2008/07/30/virginia-georgia-utah-biz-cz_kb_0731beststates.html)

## **Utilities**

Washington's diverse mix of private and public utilities has a long record of offering customers energy-efficiency and conservation programs. Collectively, program spending in Washington was 2.2 percent of total utility revenues in 2006, a clear sign of the state's leadership with energy efficiency as a resource

Also, Washington voters approved Initiative 937 in November 2006, which set new requirements for electricity resources, including greater use of renewable energy and conservation. Utilities now are required "to pursue all available conservation that is cost-effective, reliable and feasible."

## **Technology spill-over**

Due to Washington's success in information technology, biomedical and aerospace industries, the state enjoys an unusually good foundation of "enabling" or "utility" technologies, such as advanced manufacturing, computer science, engineering and chemistry. These are key components of the green-economy industries (green building, clean energy, water management, etc.).

The concentration of technology-based industries in Washington is well above the national average. Based on 2005 data, the latest year for which data are available to make national comparisons, Washington state has employment in these industries that is 35 percent above the national average. Aerospace and software/computer services sectors are the primary contributors to this high index.<sup>13</sup>

Even when aerospace is removed (historically Washington's largest technology-based industry), our state is still 17 percent above the national average. Non-aerospace, technology-based industries have grown in Washington state in recent years at a faster pace than nationally.

Research and development in technology fields has a concentration 38 percent above the national average.<sup>14</sup>

## **Organized clean-tech industries**

Washington has a strong base of networked clean-technology companies.

The Washington Clean Technology Alliance, based in Seattle, boasts more than 30 member organizations from energy-efficiency, renewable-energy, biofuels, green building, environmental engineering, and related business and research services. WCTA provides business development through events, trade shows, branding and building cross-sector relationships, as well as advocacy through policy leadership, communication and collaboration.

On the east side of the state, the Tri-Cities area is recognized as an emerging hub for green industries. Leveraging the legacy of Hanford's<sup>15</sup> technology infrastructure and scientific minds, the community recently launched the Tri-Cities Research District. It is home to the Pacific Northwest National Laboratory (PNNL), a national center for energy and environmental

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<sup>13</sup>William Beyers, "The Economic Impact of Technology-Based Industries in Washington state," a report prepared for the Technology Alliance, Seattle, June 2008.

<sup>14</sup> *Ibid.*

<sup>15</sup> The Hanford cleanup mission has been a significant source of high-tech jobs and innovation, but it is coming to a close. The Economic Transition Program of the U. S. Department of Energy Richland Operations Office and the Office of River Protection is tasked to help diversify the economy of community surrounding the Hanford Site so that it will be less dependent on the Hanford cleanup.

research, the U. S. Department of Energy, the Applied Process Engineering Laboratory<sup>16</sup> and Washington State University’s new Bioproducts, Sciences and Engineering Laboratory.<sup>17</sup> The Tri-Cities Research District is one of Washington’s designed Innovation Partnership Zones.

**Research institutions**

Major research universities are the principal providers of basic research in the United States. Today, two-thirds of all basic research and discovery are derived from research universities. Washington has the advantage of two such institutions, and a recent inventory of their assets revealed a strong foundation for clean technologies.

**Chart 2. Areas of research preeminence at Washington research universities that intersect commercialization opportunities.**

University of Washington	Washington State University
Biotechnology, genomics and biomedical applications	Molecular plant science and genetics
Advanced materials and nanotechnology	Chromosome biology and the science of reproduction
Clean technologies	Advanced materials
Global health	Clean-energy technologies
Information technology	Global infectious diseases at the human/animal interface
Sensor and sensor networks	The brain, behavior and performance

*Innovation research teams: Innovation Opportunity Analysis and Draft State Implementation Plan. Prepared by the Higher Education Coordinating Board for the Washington Economic Development Commission, November 2007. <http://www.hecb.wa.gov/research/documents/>*

**Innovation**

Five states — Massachusetts, Washington, Maryland, Delaware and New Jersey — are leading the United States’ transformation into a global, entrepreneurial and knowledge- and innovation-based new economy, according to The 2008 State New Economy Index.<sup>18</sup> Washington ranks second among all states.

<sup>16</sup> APEL is a 90,000-square-foot high-technology business incubator.

<sup>17</sup> BSEL is a “collaboratory” with PNNL, devoted to the scientific research and development and process engineering for bio-based product manufacturing, particularly of high-value byproducts from bio-based energy-production processes.

<sup>18</sup> The Information Technology and Innovation Foundation (ITIF) for the Ewing Marion Kauffman Foundation, “The 2008 State New Economy Index: Benchmarking Economic Transformation in the States,”www.innovationpolicy.org Washington, D.C., 2008.

## Innovation Partnership Zones

Innovation partnership zones (IPZs), established in 2007, bring together research, workforce training and globally competitive companies in close geographic proximity for a cooperative, research-based effort that will lead to new commercially viable products and jobs. Washington state has designated 11 innovation zones since the program's inception.

Remarkably, seven of the designated zones are conducting research and growing jobs for the green economy.

### **Pullman Innovation Partnership Zone—Green IT Alliance**

Smart-grid, datacenter technologies, energy-efficient technologies and architectural integration.

### **Grays Harbor Sustainable Industries**

Bioenergy, bio-based product manufacturing, particularly high-value byproducts from bio-based energy production. Creating synergies between biodiesel and petroleum-free bio-based composites and polymers.

### **Walla Walla Valley Innovation Partnership Zone**

Agriculture Center of Excellence with dual focus on water management, watershed restoration and protection, and enology / viticulture.

### **Bellingham Innovation Zone**

Low-wake, fast-ferry vessel prototypes, hydroscience, engineering and design, wake-wash energy studies, advanced composite and aluminum alloy techniques, clean-fuel catalysts (hydrotreating catalysts).

### **North Olympic Innovation Partnership Zone, Sequim**

Marine biotechnology, coastal assessment and restoration, forecasting stressors on marine and estuarine systems. Coastal security.

### **Discovery Corridor Innovation Zone, Vancouver**

Semiconductor and micro-device design, integrated circuit (IC) manufacturing and processing, display technology and multimedia. Thermodynamics, robotics, computer software. Optical transmission, high-power diode laser structures and innovative microelectronics.

### **Tri-Cities Research District**

Sustainable development, with focus on integrated electrical-thermal production, solar-dish generating systems, commercial-scale fuel cells, bioenergy production.

## Research and development investments

Research and development (R&D) expenditures in Washington state, an important indicator of technology-based industry, have outpaced the United States.

Washington has a concentration of R&D revenue that places the state ninth in the nation in terms of dollars received and sixth when the size of R&D expenditures in Washington are indexed by gross state product. Washington's ranks fourth in the nation for its concentration of industrial R&D and federally funded research and development centers, and fifth in "other nonprofits." For comparison, Washington is the 13<sup>th</sup>-most-populous state in the United States.<sup>19</sup>

<sup>19</sup> William Beyers, "The Economic Impact of Technology-Based Industries in Washington State," a report prepared for the Technology Alliance, Seattle, June 2008.

## Global trade infrastructure

Washington has tremendous trade experience and relationships, and the state is optimally located for rapid access to the West Coast, Midwest, Canada and Asia. The state's shipping infrastructure and proximity to Pacific markets, especially growing Asian economies such as China, provide opportunities for importing and exporting clean-technology products, green-energy consulting and design work in markets abroad and for joint manufacturing ventures.

### Washington's Global Ties

- Washington exports three times as much as the average state.
- Washington's total trade, including exports and imports, is more than two times the average state.
- More than \$80 billion worth of goods travel through the ports of Puget Sound each year.
- Each year, more than 11,000 international students study at our universities and community colleges.
- Washington's public universities are home to more than 100 centers working on global development issues.
- Nearly 10 percent of passengers through SeaTac Airport are international.
- 85 percent of Washington companies exporting are small- to medium-sized businesses.
- Washington's largest trading partners are China (\$26.7 billion), Canada (\$23.4 billion), Japan (\$15.9 billion), India (\$5.9 billion), South Korea (\$5.6 billion) and Taiwan (\$4.6 billion).

*Provided by the Global Trade Alliance, November 2008.*

## Business environment

State economists released the latest Economic Climate Study for Washington<sup>20</sup> and concluded that the state is doing well on key economic indicators used to determine the business climate in the state. The study provides information about Washington's competitive standing in relation to the other U.S. states. It is based on the premise that, while improving productivity is primarily the domain of Washington's business sector, appropriate state and local policies, particularly those relating to education, public safety, infrastructure, cost of doing business and the environment, are essential to promoting higher standards of living.

In this year's climate study, 32 of the 41 benchmarks and indicators were brought up to date. Over all, the state's performance was positive. Of the 29 updated benchmarks and indicators that include ranks relative to the other states, Washington's rank improved in 15 cases, regressed in 10 and stayed the same in four. Of the 30 updated benchmarks and indicators that indicate year-to-year performance, the state improved in 16 cases, worsened in 13 and stayed the same in one.

The state's performance was mixed in "Quality of Life" and "Cost of Doing Business," while the state's performance was negative in "Infrastructure." The state's performance also appeared to

<sup>20</sup> The Washington state Economic and Revenue Forecast Council, "Washington State Economic Climate Study," Volume XIII, October 2008. <http://www.erfc.wa.gov/pubs/clim08.pdf>

be mixed in “Education and Skills of the Workforce,” although only two of the eight indicators were updated and a clear picture couldn't be obtained.

## **Washington's Skilled Work Force**

### **Growing our own**

The vast majority of jobs created in a green economy are in the same areas of employment that people already work in today, dependent upon the same institutions that we rely on today – and the work forces of today will be the work forces of the green economy.

In short, to create the jobs that will be necessary to compete in a national and international green economy, we will need to solve the same workforce problems that confront us today.

Our greatest limiting factors are not specific to green jobs or the market for green products or services. The biggest barriers are those that inhibit innovation and new business development in Washington generally. Washington's economic success has led us to rely heavily on our ability to attract talent to the state. We must improve and expand our capacity to develop our own, homegrown talent.

### **Washington's educated work force**

Washington's educational assets are significant:

- Two public research universities.
- Four public comprehensive universities or colleges.
- 30 independent four-year institutions
- 34 public community and technical colleges.
- More than 300 private schools, including colleges, universities and vocational schools.
- Washington State Apprenticeship and Training Council.

Some 32 percent of Washington residents aged 25 and over have completed at least four years of college; Washington ranks 13th nationally in this category. About 85 percent of Washington's residents aged 25 and higher have completed 12 or more years of schooling; Washington ranks 14th in this category.<sup>21</sup>

On the surface, these statistics seem to indicate that Washington has an adequate and skilled work force. However, Washington is not prepared to maintain or increase the labor force needed to support a profitable green economy.

### **K-12 education**

Washington state has a severe dropout problem. Only 70 percent of ninth-graders graduate on time with their class.

Washington's high school graduation requirements are not in line with the level of preparation our students need to be successful in post-secondary education and training. Nearly half of Washington's high school graduates enrolled in our community and technical colleges are required to take non-credit remedial courses, and students who complete the minimum required high school curriculum are ineligible to attend a public four-year college or university.

### **Washington's workforce deficit**

Population trends will affect virtually all industries, but especially those in mature sectors where

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<sup>21</sup> U.S. Census Bureau.

past consolidations, mergers and seniority rules have led to large numbers of older workers approaching retirement with few younger workers lining up behind them. With the exception of renewable energy, recruiting young people into energy, manufacturing and many other industries will be harder, the pool will be smaller, and the labor force will be more ethnically diverse. Yet “because ethnic minorities have been underserved by education, they may also be less well prepared to enter careers that have become more demanding.”<sup>22</sup>

The state’s current supply of workers who have completed mid-level preparation – more than one year but less than four years of postsecondary training or education – will meet only 77 percent of the expected employer demand during 2009-2014 (a 23 percent gap). Increasing the supply of workers with mid-level preparation at the rate of population growth will not be sufficient to close the gap and meet employer demand. It will take policy changes to increase sufficiently the sub-baccalaureate capacity.<sup>23</sup>

As workers age and begin to retire, Washington’s work force is growing more slowly than in the past. At the same time, the population is becoming more diverse, bringing with it more needs for basic skill and language development, but also new opportunities that otherwise wouldn’t be possible without the synergies created through workforce diversity. We need to implement strategies that enhance the skills of low-skilled adults, ensure that more youths graduate from high school and are on track to complete at least years of education or training afterward, and reduce under-employment.<sup>24</sup>

### **Workforce challenges today**

A 2007 survey of Washington employers found that 50 percent all Washington employers had difficulty finding qualified applicants for job openings. Finding applicants with occupation-specific skills was the most common problem for these employers (e.g., they wanted to hire a registered nurse but had trouble finding one). The survey showed that the shortage of qualified workers is limiting economic growth in serious ways, including lower output and sales, lower productivity and reduced quality.<sup>25</sup>

Our higher education system has not been sufficiently responsive to the labor market.<sup>26</sup> There are numerous fields at both the two- and four-year levels where our institutions are not supplying nearly enough graduates to fill employer job openings. These high-employer-demand programs of study include health care, construction trades, computer science and other fields. While Washington is among the top states in the nation for our science and engineering workforce, our higher education system is not equipped to meet the increasing demand. Washington ranks last among the Global Challenge States in graduating people with advanced degrees and 44th in the nation for participation in science and engineering graduate programs.<sup>27</sup>

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22 Alan Hardcastle, Ph.D., “Workforce Challenges of Electric-Sector Employers in Washington and Oregon,” Washington State University Extension Energy Program, January 2008.

23 Washington Higher Education Coordinating Board, the State Board for Community and Technical Colleges, and the Workforce Training Board, “A Skilled and Educated Workforce: An assessment of the number and type of higher education and training credentials required to meet employer demand,” January 2006.

24 Workforce Training Board, “High Skill, High Wages: 2008-2018. Washington’s Strategic Plan for Workforce Development,” 2008 draft (pending release).

25 Workforce Training Board, “Washington State Employers’ Workforce Training Needs and Practices,” 2007 (pending release).

26 A bright spot is Washington’s Customized Training Program (CTP), created in 2006, which provides training assistance to businesses locating new jobs or expanding jobs in the state. Training is provided by community, technical or private career colleges. Under the CTP, the State Board for Community and Technical Colleges (SBCTC) pays the up-front costs for customized training. After training is completed, the business repays the costs to the SBCTC interest-free. After a business makes the initial payment of 25 percent to the SBCTC, it may take a state B&O tax credit equal to half of that amount. Although currently underused, there is great potential for this incentive program (B&O tax rebate), and it should be nurtured and expanded as well as targeted to green industries.

27 Technology Alliance, “2008 Policy Priorities.”<http://www.technology-alliance.com/pubspols/policies2008.html> Accessed September 2008.

## “Greening” the economy will add challenges

How will workforce development and education need to evolve to incorporate green skills?

Many of the green technologies stem from cross-discipline collaboration and applying knowledge learned in one industry and to aid other industries. However, early scans of green-economy jobs show us that the greening of the economy will likely result in both creating new jobs **and** the need for new skills in existing jobs.

Occupations like manufacturing technicians, construction, transportation technicians, building operators and many others may add new skill requirements, creating greater demands on new trainees and continuing education for current skilled workers.<sup>28</sup> These kinds of new skill requirements must be added on top of our analyses of skill gaps at the mid-level.

Current levels of public and private training to upgrade skills of incumbent workers may not be adequate for the new demand for greening current jobs. Forty percent of employers do not offer classroom training to their own employees, and the majority does not offer tuition assistance. Washington ranks near the bottom among states in providing publically funded training customized for employers.<sup>29</sup>

Skill gaps can be looked at for both **industries** (the universe of employers) and **occupations** (the universe of workers). Either way, the analyses tell us that the greening of the economy will likely place new skill demands on industries and occupations that already have skill gaps.

Because demand for skill-upgrade training grants for incumbent workers already outstrips state support, it will be challenging for the state’s education and training system to readily help businesses expand into new green products and services.

### Industry gaps<sup>1</sup>

Percent of all Washington employers reporting difficulty finding qualified applicants for job openings:

- Construction – 63 percent
- Manufacturing – 50 percent
- FIRE,<sup>1</sup> Transportation, Warehousing, Utilities, Government – 49 percent

The Governor stated in her budget proposal for 2009-11 that the community and technical college system has a “unique mission in job training and skills development essential to the state’s economic recovery.”

Community colleges and state-approved apprenticeship programs are key to the green economy, because many of the green jobs (in particular clean-energy installation and green building) require more than a high-school education but less than a four-year degree. Research shows that the “tipping point” for individuals to earn higher wages and maximize career options is

<sup>28</sup> Institute for Environmental Research & Education, “Blueprint for Green Collar Jobs in Washington State,” 2008.

<sup>29</sup> Informational interview with Bryan Wilson, Workforce Training and Education Coordinating Board, December 18, 2008.

through completing at least one year of postsecondary education and a work-related certificate of the sort that are available at a community or technical college.<sup>30</sup>

The community and technical college system has been integrating green practices into program curriculum, such as construction and manufacturing, for a number of years. It also has begun to develop new programs in response to emerging employer needs for positions such as energy auditors.

### **Occupational Gaps**

Percentage gap (i.e., unmet demand) between 2005-06 supply and projected 2009-14 demand for mid-level skilled workers.<sup>1</sup>

- Science technicians – 76 percent
- Installation, maintenance and repair – 37 percent
- Transportation – 36 percent
- Auto diesel mechanics – 29 percent
- Construction – 26 percent
- Manufacturing production – 4 percent

### **Apprenticeship**

One of Washington's assets is a strong commitment to apprenticeship, which benefits workers and businesses by combining classroom studies with on-the-job education and training under the supervision of qualified journey-level workers. More than 6,200 employers provide paid on-the-job training to assure skill development for registered apprentices in this state. Since enacting apprenticeship laws (which are unique to Washington state) apprenticeship has been expanded and has increased substantially. Over the past 12 months, approximately 18,000 Washington workers were actively engaged in registered apprenticeship education.<sup>31</sup>

Because registered apprenticeship is controlled at the local level by employers and employees, program sponsors are uniquely positioned to respond quickly to industry changes. Apprenticeships related to building and construction trade occupations comprise more than 80 percent of the registered apprenticeship activity in this state. Many of the programs are already engaged in educational efforts around green building. Examples of this include:

- Conducting and responding to building-efficiency audits and building the framework for alternative energy production in the electrical programs.
- Low- or no-flow plumbing fixtures and other water and energy-conservation measures in the plumbing and pipefitting programs.
- Heating, cooling and indoor air quality advances in the sheet-metal and HVAC programs.

<sup>30</sup> David Prince, "Increasing Student Achievement for Basic Skills Students," Research Report No. 08-1, Washington State Board for Community and Technical Colleges, January 2008.

<sup>31</sup> October 27, 2008, e-mail correspondence with Elizabeth E. Smith, Program Manager, Washington State Department of Labor & Industries, Office of Apprenticeship. smel235@LNI.wa.gov

- Water quality and runoff site-containment technique training for operating engineers.
- Living-green-roof installation in the roofers program.
- Recycled construction materials among 22 building and construction trades.

The Washington State Apprenticeship and Training Council, the regulatory board that oversees apprenticeships, has formed a Subcommittee on Green and Sustainable Apprenticeship Training, to make recommendations on how to strengthen existing training and look at new and developing green-related occupations that may benefit from the apprenticeship model for comprehensive, flexible education and training.

I-937 has an extra “kicker” for constructing renewable-energy projects using apprentices. You can count renewable-energy resource projects at 1.2 times their capacity if they’re constructed using qualified apprenticeship programs (e.g., a 100-megawatt wind farm would count as 120 megawatts for compliance with the I-937 percentage requirements for renewable energy).

As the green economy grows and new occupations appear, registered apprenticeship is a real-time education and training opportunity that allows an industry or employer to grow rapidly and to respond quickly to industry and worker needs without significant public investment. Some examples include:

- Wind-turbine technicians.
- Industrial maintenance technicians for co-generation plants,
- Power station operators for new biofuel or geo-thermal energy sources.

Because the Washington work force needs to up-skill quickly, the apprenticeship system is crucial in teaching industry-wide best practices that must be taught across all of the trades:

- Water quality
- Air quality
- Conservation
- Demolition
- Retrofit

Apprenticeship is a low-cost education and training option, because most building and construction apprenticeship programs are primarily self-funded.

### **Higher education and advanced degrees**

The Higher Educating Coordinating Board has identified four limiting factors to growing the green economy. Largely, these barriers exist for Washington’s current economic mix:

- A research base that is very focused on life sciences and global health, but is lacking sufficient capacity in energy, engineering and computer science to support existing industries and new business development.
- Inadequate capacity to support applied research and commercialize research results through stronger university/industry collaboration.
- Insufficient support for entrepreneurial assistance and training and small-business development services.
- Large gaps between current annual supply (based on Washington degree production) and forecast annual demand for degrees and certificates (average annual demand, 2011-2016).

## Higher Education Degree Gaps for the Green Economy

Gaps between supply and demand for degrees in occupations that will be crucial to the green economy:

- Computer science
- Business, management and accounting/bookkeeping
- Construction
- Transportation
- Engineering/architecture
- Research, scientists, science technology
- Auto diesel mechanics

*Higher Education and Washington's Green-Jobs Economy - Creating the Conditions for Green Jobs Growth, October 2008. Unpublished paper, prepared by HECB staff John Lederer and Economic Modeling Specialists, Inc.*

The higher education system is key to the green economy, because a significant number of green-economy occupations will require a baccalaureate degree or higher.<sup>32</sup> Also, the higher-education system has a significant responsibility for research and development, which is crucial to bring new technologies to market, as well as responsibility for small-business development, which is critical to developing in-state supply chains.

As described in a Technology Alliance report, advanced skills influence the entire continuum of innovation.

*“[Washington] will depend heavily on innovation and technology, which requires highly educated work force. Strong science, mathematic, and engineering backgrounds are frequently required for staff in [Washington’s] companies, and a pool of commercializable technologies must exist, so the absolute magnitude of research and development activity in a state or metropolitan area is also very important. Finally, without a favorable entrepreneurial climate—including investors willing to support startup technology companies and entrepreneurs and managers who know how to build them—the pool of ideas and educated work force cannot be effectively melded to grow successful companies.”<sup>33</sup>*

32 Although still awaiting the labor-market analysis by the Employment Security Department, the Higher Education Coordinating Board predicts that nearly a third of Washington’s green-economy occupations require a baccalaureate degree or higher. Forecasting forward over the next eight years, the HEC Board believes that 34 percent will require a baccalaureate degree or higher. “Higher Education and Washington’s Green Jobs Economy - Creating the Conditions for Green Jobs Growth,” October 2008. Unpublished paper, prepared by HECB staff John Lederer and Economic Modeling Specialists, Inc.

33 “Drivers for a Successful Technology-Based Economy: Benchmarking Washington’s Performance. A Technology Alliance Report,” by William B. Beyers, professor and chairman of the University of Washington Department of Geography, and Bryan Chee, director of the Education and Technology Alliance [www.technology-alliance.com](http://www.technology-alliance.com), July 2006.

## Washington's Green-Industry Opportunities

Clean Edge Research, which has been tracking the growth of clean-energy markets since 2000, reports a 40 percent increase in revenue growth for solar photovoltaics, wind, biofuels and fuel cells in 2007, up from \$55 billion in 2006 to \$77.3 billion in 2007. For the first time, three of these are generating revenue in excess of \$20 billion apiece, with wind now exceeding \$30 billion.<sup>34</sup>

Washington's clean-energy industries present potential for development, but the industries are relatively small and in the early stages of development. An October 2008 Clean Edge study identified five clean-energy sectors that provide the best opportunities for Oregon and Washington to take the lead in clean-energy capital and job creation. They are:

- Solar photovoltaic manufacturing, projected to provide up to 14,182 new jobs in the region by 2025.
- Wind-power development, expected to reach up to 4,507 new jobs.
- Green-building design services, creator of up to 12,937 new jobs.
- Sustainable bioenergy, which could account for 6,946 new jobs.
- Smart-grid technologies, an industry that could create up to 2,669 new jobs.<sup>35</sup>

In all, the study found these industries have the potential to create more than 41,241 new jobs in the Pacific Northwest by 2025.<sup>36</sup>

**Chart 3. Job-Growth Projections for Oregon and Washington**

Year	Solar photovoltaic manufacturing	Wind-power development	Green-building design services	Bioenergy	Smart-grid	TOTALS
Current	800	2,217	3,826	3,207	1,280	11,330
2010	1,863	3,043	4,284	3,224	1,491	13,905
2015	3,677	2,650	6,899	4,100	1,715	19,041
2020	9,260	3,408	10,137	5,688	2,209	30,703
2025	14,182	4,507	12,937	6,946	2,669	41,241

*"Carbon Free Prosperity 2025." Climate Solutions Inc. & Clean Edge, Inc., October 2008.  
NOTE: These numbers are based on the "medium-growth scenario".*

One of the most exciting aspects of the Clean Edge conclusions (and the majority of other recent studies) is that the top opportunities represent an array of near-term and long-term developments, as well as an array of deployment costs.

<sup>34</sup> Joel Makower, Ron Pernick and Clint Wilder, "Clean Energy Trends 2008," Clean Edge Research, March 2008.

<sup>35</sup> CleanEdge report for Climate Solutions, "Carbon-Free Prosperity."

<sup>36</sup> The report provided a range of projections. The projections presented throughout this document, Washington's Green Economy, are the most conservative Clean Edge estimates (moderate vs. high).

This rosy outlook is echoed in the October 2008 Global Insight study commissioned by the United States Conference of Mayors. In the “Green Jobs in U.S. Metro Areas” study, Global Insight makes the following projections for Washington state metropolitan areas:

**Chart 4. Current and potential green jobs by metropolitan area in Washington state**

Area	Existing – 2006	New through 2038
Bellingham	317	2,506
Bremerton-Silverdale	272	2,154
Kennewick-Richland-Pasco	979	7,750
Lewiston, ID	70	556
Longview	521	4,122
Mount Vernon-Anacortes	229	1,813
Olympia	630	4,988
Portland-Vancouver-Beaverton, OR-WA	6,714	53,122
Seattle-Tacoma-Bellevue	6,257	49,510
Spokane	648	5,128
Wenatchee	131	1,037
Yakima	470	3,718

Source: Global Insight, report for the United States Conference of Mayors. October 2008.

Note: Green jobs include Renewable Power Generation, Residential & Commercial Retrofitting, Renewable Transportation Fuels, and related Engineering, Legal, Research & Consulting.

### Energy efficiency

According to a recent research study by the American Council for an Energy-Efficient Economy,<sup>37</sup>

- Energy-efficiency activities yield an average of a nearly 2-to-1 benefit-cost ratio.
- Nationwide, a 20 percent efficiency gain by 2030 could provide an estimated 800,000 net jobs, while a 30 percent efficiency improvement might generate as many as 1.3 million net jobs.
- Efficiency-led policies, in effect an emphasis on greater energy productivity, would likely increase the nation’s economy (as measured by gross domestic product) by about 0.1 percent by 2030.

In the Fifth Northwest Electric Power and Conservation Plan, energy efficiency and conservation were established as the cheapest and most readily available resources for meeting load growth—

<sup>37</sup> “Positive Returns: State Energy-Efficiency Analyses Can Inform U.S. Energy Policy Assessments,” Washington, D.C., June 2008. [www.aceee.org/pubs/](http://www.aceee.org/pubs/)

enough to meet all load growth through 2012 and about 50 percent of load growth through 2024.<sup>38</sup>

Since 1980, the Northwest has created more than 3,000 megawatts of saved energy through:

- Weatherization.
- Building codes.
- Appliance standards.
- Lighting improvements.
- Industrial process improvements.
- Irrigation improvements.

And more can be done. While Washington state was ranked sixth amongst the states in State Energy Efficiency Scorecard for 2008 conducted by the American Council for an Energy Efficient Economy, our state gets its lowest marks for energy efficiency research and development.

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<sup>38</sup> Northwest Power and Conservation Council [www.nwccouncil.org](http://www.nwccouncil.org), "The Fifth Northwest Electric Power & Conservation Plan," Portland, Ore., 800-452-5161, 2005-07.

**Chart 5. Summary of overall state scoring on energy efficiency**

Rank	State	Utility & public benefits efficiency programs & policies score	Transportation score	Building code score	Combined heat & power (CHP) score	Appliance standards	State lead by example	RD&D	Financial & information incentives	Total score
	<b>Maximum possible points</b>	20	6	8	5	4	2	2	3	50.0
1	California	14.5	4	8	5	4	2	2	1	40.5
2	Oregon	13.5	3.5	8	5	3	0.5	0.5	3	37.0
3	Connecticut	15.5	5	4	5	3	2	0.5	1	36.0
4	Vermont	19	2.5	5	2.5	1	2	0	1	33.0
5	New York	12.5	4.5	5.5	5	1	1	2	1	32.5
<b>6</b>	<b>Washington</b>	<b>12</b>	<b>4.5</b>	<b>8</b>	<b>4</b>	<b>2</b>	<b>0.5</b>	<b>0</b>	<b>1</b>	<b>32.0</b>
7	Massachusetts	12.5	3.5	3.5	3	1	1	1	1	26.5
7	Minnesota	13.5	1	5.5	2.5	0	2	0	2	26.5
9	Wisconsin	10	0.5	8	5	0	0.5	2	0	26.0
10	New Jersey	10	3.5	5	5	1	1	0	0	25.5
11	Rhode Island	10	3	4.5	1	3	1.5	0	0	23.0
12	Maryland	5.5	3.5	4.5	3	2	1	0	2	21.5
13	Idaho	10	0	6	3	0	0	0	2	21.0
14	Iowa	10.5	0	5	0.5	0	1	2	0	19.0
15	Hawaii	8.5	5	3.5	2.5	0	2	0	0	17.0
15	Pennsylvania	1	3.5	4.5	4	0	2	0	2	17.0
15	Nevada	8.5	0	5	0.5	1	0.5	0	1.5	17.0
18	New Hampshire	7.5	0	4.5	1.5	0	2	0	1	16.5
19	Maine	6.5	2.5	2	2.5	0	1.5	0	1	16.0
19	Florida	2.5	0.5	7	3	0	2	1	0	16.0
19	Ohio	5.5	0	3.5	5	0	1	0	1	16.0
19	Texas	3	0	5	5	0	1	1	1	16.0
19	Illinois	3	0	4.5	5	0	1	0.5	2	16.0
24	Colorado	8	1	3	2.5	0	1	0	0	15.5
25	New Mexico	4	3	5	1.5	0	0.5	0	1	15.0

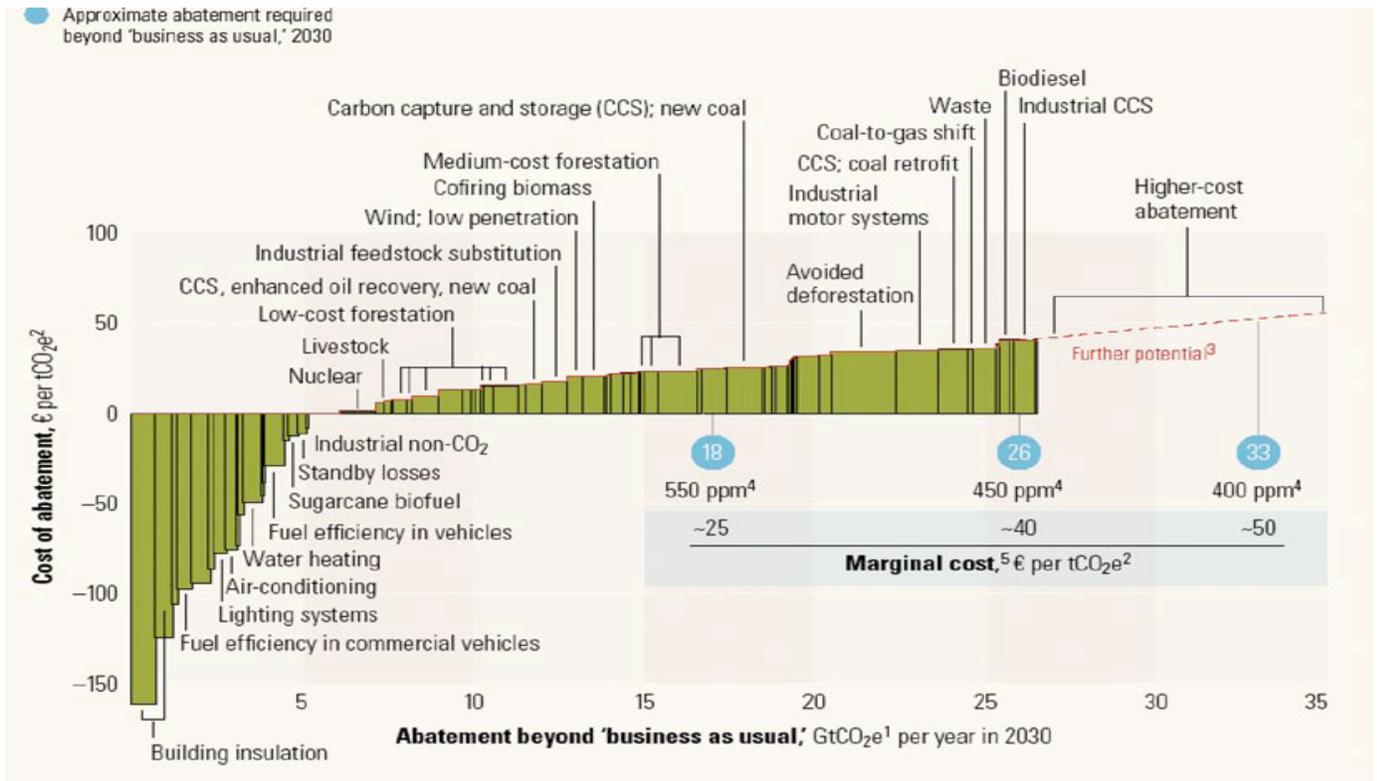
As seen in the ACEEE summary chart, while Washington state is a leader in the United States in energy efficiency, there is significant work that can be done to improve:

- Research and development.
- Utility and public benefit policies and programs.
- Appliance standards.
- State leadership in adopting energy-efficiency practices (procurement, etc.).
- Financial and information incentives.

Efficiencies provide a special opportunity for Washington’s green economy, as these products and services:

- Can be mobilized immediately.
- Reduce energy demand.
- Reduce pressure on wholesale electricity prices.
- Free capacity for new demands.
- Are labor intensive and create jobs.
- Allow households and firms to redirect their expenditures and invest in the future.

Most efficiencies can be achieved for a relatively low cost. The McKinsey cost curve<sup>39</sup> shows the relative economics (significance and cost) of each available approach to reducing greenhouse-gas emissions.



39 McKinsey Global Institute www.mckinsey.com/mgi, "The Carbon Productivity Challenge: Curbing Climate Change and Sustaining Economic Growth," June 2008.

According to the McKinsey economics analysis, in a 25-year perspective, a solid majority of identified greenhouse-gas abatements had no significant lifetime costs<sup>40</sup> **and** would not depend on any major technological developments. These measures – largely building efficiencies – either involve very little technology or rely primarily on mature technologies (such as building insulation and energy efficient lighting). The remainder – which require more investment and a longer return on investment – depend on new technologies such as carbon capture and storage, biofuels, wind power and solar panels.<sup>41</sup>

The McKinsey analysis also concludes that the power generation and manufacturing industries, while important, offer less than half of the United States' potential for reducing emissions. Ready deployment and low net-lifecycle costs are just two of the reasons that energy efficiency ranks as a top opportunity for Washington's green economy and considered to be the first line of defense in environmental protection.

### **Building efficiencies**

One of the most potent catalysts of efficiency-based economic growth is household reductions in per-capita electricity demand. By some estimates, improving U.S. residential buildings would meet a third of projected U.S. electricity demand through 2020. Every dollar invested in efficiency yields an impressive return of \$4 in reduced consumer electricity bills.

#### **Seattle Sets the Standard**

Seattle's architects are leaders in both energy-efficient and earthquake-resistant design. The city requires all new municipal buildings over 5,000 square feet to meet new state LEED (Leadership in Energy and Environmental Design) building ratings and provides financial, height and density bonuses for private projects meeting LEED. As a result, Seattle now has one of the highest concentrations of sustainable buildings in the country and a powerful sustainable building industry worth \$671 million.<sup>42</sup>

Furthermore, the 2008 Global Insight study projects that over 30-years, retrofit of the U.S. existing residential and commercial building stock would generate nearly 81,000 new jobs nationwide.<sup>43</sup>

And finally, green buildings, which typically refer to new construction, require fewer construction resources and smaller long-term energy supplies.

For all of these reasons, green buildings – both design and construction – have garnered significant attention.

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40 At a cost below or equal to 40 Euros per ton of abated greenhouse gas.

41 Per-Anders Enkvist, Tomas Naucler and Jerker Rosander, "A Cost Curve for Greenhouse Gas Reduction," The McKinsey Quarterly 2007, Number

42 Clinton Foundation, "Seattle Sets the Standard for U.S. Green Buildings," Clinton Climate Initiative.

[http://www.c40cities.org/bestpractices/buildings/seattle\\_green.jsp](http://www.c40cities.org/bestpractices/buildings/seattle_green.jsp) Accessed December 23, 2008.

43 Global Insights, "U.S. Metro Economies. Current and Potential Green Jobs in the U.S. Economy: Green Jobs in U.S. Metro Areas." Prepared for the United States Conference of Mayors and the Mayors Climate Protection Center. October 2008.

Washington's architects are global leaders the green-building industry. In 2007, Washington became one of only three states with a platinum-level LEED building, and another platinum level LEED building was completed in Olympia in 2008.<sup>44</sup>

### **Green-Building Incentives**

Substitute House Bill 3120 required the Washington State Department of Community, Trade and Economic Development to conduct a study to determine the feasibility and effectiveness of providing tax incentives to encourage green building in commercial, residential and public buildings. That report is due December 31, 2008.

Clean Edge Inc. projects that jobs in the green-building design sector can grow from an estimated 3,826 today to 12,937 in 2025.<sup>45</sup>

### **Weatherization**

A lesser-noticed but extremely powerful building efficiency is residential weatherization,<sup>46</sup> and this subset of the green-building industry is essential to jump-starting Washington's green economy.

- Residential buildings are widespread, so benefits can be felt locally in every part of the state.
- Less money is spent on utility bills, and more disposable income retained by family and kept in the community.
- The energy consumed by residential structures is substantial.
- Improvement is a better investment than demolition and replacement, which is costly and environmentally damaging.
- The work is labor intensive and creates jobs and small businesses.

Energy efficiency targeted to low-income households is an even more economically productive investment than general weatherization or, say, power generation. Building efficiency for low-income households, because of the huge economic benefit of reducing poverty, returns at least \$7 to society for every \$1 invested.<sup>47</sup>

Why? Poor people cannot pay the full cost of heating and lighting their homes. Utilities, governments and social service agencies have long helped low-income ratepayers pay their bills through such programs as charitable fuel funds or discounts, home weatherization, energy usage education, and vast amounts of debt forgiveness or management.

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44 Perkins + Will Seattle Office; Public Utility District Administration Headquarters in Olympia, 2007.

45 Climate Solutions Inc. & Clean Edge, Inc., "Carbon Free Prosperity 2025," October 2008.

46 In the 1970s, weatherization meant only ceiling insulation, lath and plastic storm windows, caulking and weather-stripping. This was called "winterization". Now, weatherization is more technically sophisticated. New diagnostic tools and techniques such as dense-pack insulation, computer energy-audit tools, blower-door technology, pressure pans, flow hoods and CO detectors were incorporated in the program to help make cost-effective weatherization decisions, identify improvement needs and choices, and prevent health and safety problems.

47 Jerrold Oppenheim and Theo MacGregor, "The Economics of Poverty: How Investments to Eliminate Poverty Benefit All Americans," developed for Entergy, 2006.

Washington's Department of Community, Trade & Economic Development (CTED) operates that state's only publically funded weatherization program for low-income people. Based on many years of documentation and experience, CTED estimates that 43 to 60 jobs are created or sustained for every million dollars invested in weatherization.<sup>48</sup> This multiplier effect benefits local communities, as CTED contracts with community-based non-profit agencies to provide weatherization and purchase supplies (lumber yards, hardware supply, insulation, glass, tools, insurance companies, gas stations, etc.).

In CTED's weatherization program for low-income households, the average cost of energy measures is \$4,000, and the need for repair funds to capture those savings averaged \$3,000.<sup>49</sup>

How much further could Washington go? From 1990 to 2007, the weatherization program has served nearly 115,000 low-income households. The 2000 census shows that the eligible population rose from 275,731 in 1990 to 300,205 in 2000. Deducting those already served from the total eligible in 2000, there are – conservatively – 185,205 low-income households to serve.<sup>50</sup> However, to fully realize the economic power of residential weatherization, middle- and upper-income households also must be targeted for efficiency upgrades.

A natural question is why these households cannot or will not make their homes more efficient. Barriers include:

- Low electricity prices and relatively low natural-gas prices. An inefficient home does not create a painful consequence.
- Investment is invisible. Unlike a new car or appliance, weatherization is not readily seen.<sup>51</sup>
- Return on investment seems too long, especially when owner-occupied households tend to move every seven years.
- There are no financing vehicles that provide easy, upfront capital (progressive loans, such as zero-interest or pay-back at time of sale, or loans paid through property taxes).
- No independent, reliable service to learn how to save energy cost-effectively.
- Split incentive, where tenants pay the energy bill and the owner lacks the incentive to spend money on efficiency.

Although there are a few energy-conservation programs that are managed at the local level for low- and moderate-income families, the waiting list can be years long. Furthermore, these services do not address the possibilities of solar and wind installation and maintenance.

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48 Information provided by Steve Payne, CTED Housing Improvements & Preservation.

49 Steve Payne.

50 Steve Payne.

51 It is one reason windows are a popular and easy sell; they're a visible improvement, even if energy savings is not significant compared to the cost.

## Testing incentives for moderate income households

Moderate-income households earn between 80 percent and 120 percent of area median income. Most moderate-income houses are not very energy efficient. How can Washington stimulate these homeowners to upgrade the energy efficiency of their homes? The answer could be found by testing a two-tiered incentive program.

1. Households between 80 percent and 100 percent average median income (AMI) would receive a one-to-one match of homeowner dollars to state dollars.
2. Households between 100 percent and 120 percent AMI would receive a two-to-one match of homeowner dollars to state dollars.

This incentive test is scalable and could be applied to as few as 10 or as many as 100 houses. Half of the households would need to fall in one income tier and half from the other income tier.

A weatherization-service provider will be selected by CTED to perform a complete energy audit on each house, including a solar hot-water assessment. This will generate a list of weatherization upgrades to bring the house to at least 50 percent more efficient than the current Washington State Energy Code.

- The local weatherization service provider will perform the work unless the homeowner would rather contract with private installers.
- The house will be tested at completion to make sure that minimum ventilation levels have been maintained.
- Energy-usage data will be collected before and after to illuminate the differences.
- Energy saved will be compared with the upgrade costs to calculate a cost per saved unit of energy.

This demonstration project would:

- Give an estimate of the cost to achieve energy savings.
- Reduce utility costs and the carbon footprint of a selected number of single family homes.
- Test a tiered market incentive program to stimulate energy retrofits and answer the question, “Is there demand for energy retrofitting among moderate-income homeowners?”

For every 10 households participating in the demonstration, it would cost:

- Energy audits @ \$500 each = \$5,000
- State-match funds, five households @ \$6,000 each = \$30,000
- State-match funds, five households @ \$4,000 each = \$20,000
- Up to five homes selected for solar hot-water installation @ \$7,500 each = \$37,500
- 100 hours for data collection, analysis from WSU @ \$75 per hour = \$7,500
- Administrative costs for local weatherization service providers @ \$200 per project = \$2,000
- 

A total of \$102,000 in state funds for every 10 households tested.

In general, the market for efficiencies (products and services) requires the state to:

- Improve the residential and commercial-building energy codes.
- Make upfront capital accessible, for both the demand side and supply side.<sup>52</sup>
- Establish rigorous standards for building efficiencies, including “whole house” weatherization.
- Consider streamlined permitting, bonus density, tax incentives and other inducements for high-performance, sustainable buildings.
- Ensure that all fund sources and programs use one set of standards and guidelines.
- Design and support an appropriate funding model.

### **Smart grid**

Smart-energy management – commonly known as “smart grid” – improves energy efficiency by integrating computer controls and alternative energy sources into traditional energy systems. Efficient energy management holds strong potential for green industry and jobs. In addition to population booms, the rapid emergence of the digital economy (Internet and computer use) challenges the power infrastructure.

At last count, there were 28 smart-energy organizations in Washington, with 1,800 employees and revenues of \$475 million.<sup>53</sup> Washington is already home to the top global manufacturer of advanced meter readers (AMR). Itron (Liberty Lake, Washington) produces more than 8 million AMR units, and there are significant research and development programs in public research universities, Pacific Northwest National Lab and utilities.

While our state lacks some of the economic incentives<sup>54</sup> of other states, Washington state and the Pacific Northwest are testing and implementing some smart-grid technologies.<sup>55</sup> Investment in smart-grid technologies here will likely be less than, or at least lag, investment by other regions that have those incentives. Compared to other regions, we have lower electricity costs, less need to manage peak demand and less-robust retail price signals. This means that smart-grid technologies generally will provide less economic benefit here in the short run and will be slower to be introduced.

With that said, Washington state is well positioned to export its innovation and technology, domestically and internationally, to regions that have significant demand for smart-grid conversions.

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52 Finance tools and cash are needed for demand-side opportunities, such as residential building efficiencies and the installation of smaller, on-site renewable power generation. Likewise, financing and cash are needed for supply-side opportunities, such as getting manufacturers up and running and moving research to the early commercialization stage.

53 Kevin Wilhelm, et al, “Clean Technology – The Answer for Washington’s Carbon-Constrained Future,” *Innovative Strategies and Climate Solutions*, 2007 (p. 20).

54 Disincentives for investment are lower electricity costs, less need to manage peak demand and less-robust retail price signals.

55 Washington State Department of Community, Trade and Economic Development, Energy Policy Division, “A Smarter Grid for Washington,” October 14, 2008.

## **Pullman Innovation Partnership Zone**

Centered on a theme of clean, energy-efficient information and datacenter technologies, the Pullman Innovation Partnership Zone (IPZ) Clean Technology Center of Excellence serves as a facility for emerging clean-technology companies that conduct collaborative research and pilot demonstration projects with universities, national labs and non-profit organizations.

The Pullman Innovation Partnership Zone (IPZ) was established in 2007 and is dedicated to solving global problems that our region is uniquely positioned to address. The Pullman IPZ executes high-profile projects that create tangible economic opportunity. The IPZ partners include:

- Green IT Alliance (nonprofit research)
- The Port of Whitman County (port)
- SprayCool (private-sector company)
- Washington State University (research university)
- Pacific Northwest National Laboratory (national lab)

The IPZ is a center of excellence, dedicated to testing and piloting projects in:

- Green IT
- Clean technology
- Alternative energy
- Sustainable architecture

The central strength of the Pullman IPZ is the certification of technologies and approaches for integrating energy efficient IT into building and landscape architecture.

**Chart 7. Renewable energy source consumption and production estimates for Washington (2007)<sup>56</sup>**

	Hydro	Wind	Bio-energy	Solar	Geo-thermal	Ocean and tide
<b>Total consumption (MWh)</b>	60 million	< 3 million <sup>57</sup>	29 million	2,500 – 4,200	3,200	0
<b>Current generation capacity (MW)</b>	20,311	1,163	400	2 – 3	0	0
<b>Current electrical production (MWh/yr)</b>	70 – 75 million	2.5 – 3 million	2 million	2,500 – 4,200	0	0
<b>Near-future (10 years) additional generation capacity (MW)</b>	100 – 500	1,000 – 2,200	300 – 800	100 – 300	50 – 100	1 – 100
<b>Near-future (10 years) electrical production (MWh/yr)</b>	0.4 – 2.2 million	2.2 – 5.8 million	2.2 – 6 million	125,000–420,000	220,000–440,000	4,000 – 400,000
<b>Fuel production (MWh/yr)</b>	NA	2-3 million	NA	NA	NA	NA

## Wind

Wind energy is currently the fastest growing alternative energy source in the country. The U.S. Department of Energy estimates that net generation in 2007 was 32.1 billion kilowatt-hours (kWh), a 21% increase from one-year earlier and a near five-fold increase since the start of the decade. Wind generation in 2007 was enough to power more than 2.9 million homes.<sup>58</sup>

Washington is currently the fifth-top producer of wind power nationally. Our wind power production grew by more than 33 percent in 2007 alone.<sup>59</sup> However, American Wind Energy Association, Washington state does NOT appear in the “Top 20” states with the most wind energy potential. Therefore, our state’s greatest potential is not related to our potential for generating wind energy, but from providing technology, innovation, and components of wind energy systems.

Wind energy firms in Washington cover the entire spectrum of the wind power industry, including production of turbine parts, turbine technology development, wind-related consulting and turbine installation.

Wind-related construction and management projects are predicted to create an additional 1,400 jobs within the state.<sup>60</sup> Although wind generation in the Northwest is expected to increase

56 A. Hardcastle, R. Kunkle & S. Waterman-Hoey, “Renewable Energy Trends and Workforce Development in Washington State, Phase I,” Washington State University, Extension Energy Program, 2008.

57 The portion of current wind production consumed in-state is not currently available.

58 Global Insight, “U.S. Metro Economies. Current and Potential Green Jobs in the U.S. Economy: Green Jobs in U.S. Metro Areas.” Prepared for the United States Conference of Mayors and the Mayors Climate Protection Center. October 2008.

59 Christine Real De Azua, “U.S. Leads in Wind Power Production, but Policy Uncertainty Weighs on Industry,” Renewable Energy World.com <http://www.renewableenergyworld.com/rea/news/story?id=53325>, August 14, 2008.

60 Kevin Wilhelm, et al, “Clean Technology – The Answer for Washington’s Carbon Constrained Future,” (p. 17) Innovative Strategies and Climate Solutions, 2007.

substantially,<sup>61</sup> turbine *manufacturing* is not likely to be a significant long-term market for Washington's wind industry.<sup>62</sup> Whereas our proximity to the Asian market is an asset for many other green-economy industries, our distance from mid-western U.S. markets is a hindrance.

The wind industry has a strong basis in Washington due to transmission infrastructure, financial incentives and comparatively cheap real estate. The most significant drivers are regional Renewable Portfolio Standards and California's large market demand. Although the future is bright, the economics are not entirely stable and are affected by a number of assumptions:

- Continuation of the federal production tax credits for several years.
- A greenhouse-gas emissions reduction framework.
- Decreasing production costs.
- The ability to integrate intermittent wind into the existing power system at reasonable costs.
- The availability of large areas for development with access to transmission at moderate costs.

Finally, it is worth noting that wind energy also has a beneficial effect in agriculture, as turbines provide farmers with new, reliable revenue to supplement their incomes when commodities markets become volatile.

### **Solar**

According to a 2008 study by Global Insight, solar panel production holds tremendous job creation potential. Production within the United States has surged over the past 10 years, growing from 46,354 peak kilowatts (capacity of manufactured devices) in 1997 to 337,268 peak kilowatts of capacity by 2007. Nationwide, there is more than seven-fold increase, and employment had risen to 4,000 jobs.<sup>63</sup>

And, the chart on the next page shows the tremendous growth and the potential of photovoltaic, as underscores the importance of Washington state's ability to attract solar manufacturers

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61 Northwest Power and Conservation Council [www.nwccouncil.org](http://www.nwccouncil.org), "The Fifth Northwest Electric Power & Conservation Plan, 2005-07," Portland, Oregon, 800-452-5161.

62 Climate Solutions Inc. & Clean Edge, Inc., "Carbon Free Prosperity 2025," October 2008.

63 Global Insight, "U.S. Metro Economies. Current and Potential Green Jobs in the U.S. Economy: Green Jobs in U.S. Metro Areas." Prepared for the United States Conference of Mayors and the Mayors Climate Protection Center. October 2008.

**Chart 8. Annual shipments of photovoltaic cells & modules (peak kilowatts)**

Year	U.S. Production	Domestic	Exports	Imports
1997	46,354	12,561	33,793	1,853
1998	50,562	15,069	35,493	1,931
1999	76,787	21,225	55,562	4,784
2000	88,221	19,838	68,382	8,821
2001	97,666	36,310	61,356	10,204
2002	112,090	45,313	66,778	7,297
2003	109,357	48,664	60,693	9,731
2004	181,116	78,346	102,770	47,703
2005	226,916	134,465	92,451	90,981
2006	337,268	206,511	130,757	173,977

Source: EIA Annual Photovoltaic Module/Cell Manufacturers Survey

Washington has just begun to produce solar panels, but is a global leader in producing solar-grade silicon, the major raw material used in producing solar products. Washington is an attractive location for manufacturing solar cells due to:

- Inexpensive hydro-power.
- Silicon production expertise developed from our information-technology industries.
- Access to a global market for finished modules.

In addition to photovoltaic panels, there are other promising technologies associated with solar-concentration energy generation.

- A Kennewick-based company generates electricity by concentrating solar power using Stirling engines.<sup>64</sup> The company has drawn more than \$57 million in funding for its research and development projects.<sup>65</sup>
- A Kent-based company focuses on developing solar-concentrator photovoltaic systems. It has commercial, state and federal customers and is a research lead in dish design and concentration photovoltaic systems.

64 A Stirling engine is fitted with a dish that collects and concentrates heat on the head of the engine, which is then used to expand gases while a radiator cools and contracts gases. This expansion and contraction powers the engine's pistons, thus providing the same energy of a traditional engine without needing any fuel other than solar energy. Also, the frictionless pistons are designed to be zero-maintenance, making them a reliable long-term alternative energy source.

65 Infinia Corporation Press Department <http://infiniacorp.com>, "Infinia Corporation Announces Additional \$7 Million Financing in Series B Round; Total Series B Round Funding at \$57 Million," April 22, 2008.

In general, solar industry sales for Washington state are expected to triple in the next three years.<sup>66</sup> In-state solar-panel manufacturing is in question, however. Despite the fact that Washington has many assets that are attractive to solar manufacturers, the state has not landed a solar manufacturer since 2002. Barriers facing the solar industry are discussed later.

## **Bioenergy**

Both biofuels and biomass make up the bioenergy sector. Clean Edge Inc. estimates that Washington's and Oregon's jobs in bioenergy will increase from 3,207 today to 6,946 by 2025.<sup>67</sup>

Washington shows promise as a potential producer in biomass-based fuels and second-generation biofuels markets. In fact, Washington is already ranked fourth among 19 Western states (after California, Texas and Oregon) for available biomass.<sup>68</sup> Cellulosic ethanol, biogas and algal fuel, in particular, promise a bright future.

Washington has an annual production of more than 16.9 million tons of underused dry-equivalent biomass, which is capable of producing energy for approximately half of the state's annual residential electrical consumption.<sup>69</sup>

It is very important to note that Washington is home to the study and development of bioenergy technologies that do not rely on agricultural crops as raw material. Our state's bioenergy primarily comes from the waste streams of forestry, agriculture and municipalities. Because agricultural and industrial wastes serve as the base for these fuel technologies, Washington stands to transform recycling programs into new energy sources. It provides a next-generation industry for logging and agriculture. This is a unique advantage for Washington. In the harvest and re-use of wastes, Washington's bioenergy industry bridges the economic and political divide between urban and rural areas and creates a true distributed economy.

Algae is another option for biofuel development. Algae can be used as biofuel, biomass or as a source of hydrogen (used to power fuel cells). The demand for algal production and processing is rapidly increasing. In 2008, Boeing and several other firms established an algal energy-trade group aimed at developing and exchanging algal products and technology.<sup>70</sup> Also, the University of Washington hosts an algal research center.

Another beneficial effect of algae production is that – aside from being a fuel source – it can simultaneously curb greenhouse gases.<sup>71</sup> Studies show that algae can be used to absorb CO<sub>2</sub> and NO<sub>2</sub> emissions from fuel-burning factories, reducing these emissions by as much as 85 percent while still using current machine technology.<sup>72</sup>

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66 Paul Davidson, "Forecast for solar power: Sunny," [http://www.usatoday.com/tech/science/environment/2007-08-26-solar\\_N.htm](http://www.usatoday.com/tech/science/environment/2007-08-26-solar_N.htm) USA Today, August 28, 2007.

67 Climate Solutions Inc. & Clean Edge, Inc., "Carbon Free Prosperity 2025," October 2008.

68 Unpublished draft of the WSU School of Economic Sciences report on "Market Incentives for Biofuels and Biofuel Feedstocks," November 2008. Commissioned by the Washington State Legislature in E2SHB 1303, an "act relating to providing for the means to encourage the use of cleaner energy."

69 M.R. Fuchs and C. Frear et. al, "Biomass Inventory and Bioenergy Assessment: An Evaluation of Organic Material Resources for Bioenergy Production in Washington State," unpublished, Washington State Department of Ecology, August 2006.

70 Northwest Public Radio, "Algae-Derived Biofuel Gets Boost from Airlines," <http://nwpr.org/07/HomepageArticles/Article.aspx?n=4009> June 20, 2008.

71 The algae serve at once to filter out CO<sub>2</sub> at industrial sites to produce energy and for agriculture. Ageance France Presse, "As Planet Swelters, Are Algae Unlikely Saviour?" July 9, 2008..

72 Ken Silverstein, "The Algae Attraction," <http://www.renewableenergyworld.com> EnergyBiz Magazine, June 27, 2008.

Sewage treatment plants also have begun to find ways to use the methane gas produced by the treatment process. Methane is a greenhouse gas with a higher effect than carbon dioxide. As a result, treatment plants “flare” (burn off) the gas so it becomes carbon dioxide. Projects are under way at several sites to reclaim the gas and use it to either produce electricity<sup>73</sup> or to replace natural gas used in the treatment process. A small number of private vendors have begun to work with the treatment plants on these processes; also, power-generation companies such as Puget Energy are interested in assisting with grants and loans.<sup>74</sup>

The organic portion of municipal solid waste constitutes 70 percent of the biomass resource currently available in the region. Biogas digesters from mixed feedstocks (animal waste plus field and food-processing waste) are already an active industry in Washington and a near-term reality.

### **Organic farming**

Just as agricultural waste streams hold special promise for bioenergy, Washington’s agricultural crops are an asset, too.

Organic farming is one of the fastest growing segments of U.S. agriculture. Washington State has the third highest number of certified organic operations of all states in the country.<sup>75</sup> The U.S. rate of growth has been more than 20 percent annually, with forecasts in the 9-16 percent range until 2010.<sup>76</sup>

The U.S. organic market is officially, relatively new, with the USDA only adopting national standards for organics in October 2002. Whereas, the European Union is more mature. However, given Washington state’s success in domestic and international export of fruits and vegetables and value-added food products, the organic food market deserves special attention.

### **Fuel cells**

Fuel cells use hydrogen and electrochemical reactions to create energy, waste heat and water.

The future potential in the state of Washington for hydrogen production and hydrogen technologies is speculative and has a long-term horizon. There are good reasons, however, to rank fuel cells as a targeted green industry.

- Eastern Washington is home to some of the world’s leaders in fuel-cell development.<sup>77</sup>
- Hydrogen can be produced through electrolysis using our state’s wide range of renewable electricity resources.
- Hydrogen can be produced with digester gas from numerous dairies and waste treatment plants in the state, thereby supplying electrical energy, heat and fuel for hydrogen vehicles.
- Hydrogen is already produced at the Moses Lake chlor-alkali plant owned by Eka Chemicals, and the governments of British Columbia and Canada have made a major investment in this technical area.

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73 The Olympian, “LOTT to reuse gas for heating,” October 12, 2008.

74 Staff interview of Lakehaven Utility District treatment engineer.

75 Jessica Goldberger, “Certified Organic Production: The Experiences and Perspectives of Washington Farmers,” WSU Department of Community and Rural Sociology. Pullman, Wash., July 2008.

76 Marsha Laux, “Organic Food Trends Profile.” Agricultural Marketing Resource Center, Iowa State University, June 2006.

77 Major fuel-cell companies based in Washington include Innovatek Inc., Neah Power, Hydrogen Power Inc. and ReliOn.

- The King County molten-carbonate fuel cell can be restarted with a fuel-cell-stack change-out, and Air Products and Chemicals, in partnership with FuelCell Energy, is conducting research on separating out the hydrogen.

According to data from FuelCell,<sup>78</sup> at least 12 fuel cells have been installed in various locations around Washington. ReliOn has produced 10 of these, UTC Power has installed one, and Fuel Cell Energy has installed one. The uses range from backup power to converting biogas to electricity, heat and hydrogen.<sup>79</sup>

Other fuel-cell investments leverage Washington state's existing industry leaders, including:

- Fort Lewis has signed up for approximately 80 fuel-cell-powered fork lifts for use on the military base. This leverages Washington's military industry cluster in the Puget Sound as well as the state's strong ports.
- Portable electronic devices powered by hydrogen micro-fuel-cell technology will be allowed on all U.S. commercial aircraft. This leverages Washington's strong communication and information-technology sectors.

### **Green transportation**

The Washington State Legislature has adopted California's clean-car standards, set statewide levels of biodiesel and ethanol contents, and called for using biofuels and plug-in electric vehicles for all public vehicles by 2015.<sup>80</sup>

Green transportation covers all-electric cars to light rail, and fuel-efficient Boeing airplanes to Paccar's hybrid technologies for medium-duty trucks. It is unlikely that Washington state will become a leader in vehicle manufacturing. It is not an existing industry in the state, and the turnover rate of vehicles takes significant time (7 percent are replaced per year).

However, Washington **is** poised to be an industry leader in the use of plug-in electric-hybrid vehicles (PHEVs) and vehicle-to-grid technology (V2G). The state's competitive advantage lies in the design and innovation of vehicles and charging/fuel systems for electric and electric-hybrid vehicles.<sup>81</sup>

For the last 30 years, enthusiasts have been converting cars and small trucks to electric operation, but this niche has experienced explosive growth in interest in recent years with the state's focus on greenhouse-gas reductions as well as volatile gas prices. This subsector of the green transportation industry has moved beyond the enthusiast to pilot projects and small businesses creating new technology and devices, converting vehicles, importing vehicles, and selling and servicing vehicles.

In Washington, a growing number of electric-vehicle demonstration projects are under way:

- Chelan School District – Plug-in bus<sup>82</sup>.
- City of Seattle, King County, Port of Seattle and Puget Sound Clean Air Agency demonstration to test the performance of urban plug-in hybrid-electric vehicles.<sup>83</sup>

<sup>78</sup> 2000 [www.fuelcells.org/](http://www.fuelcells.org/)

<sup>79</sup> David Sjoding and Erin Hamernyik, "Overview of Hydrogen and Fuel Cells in Washington State," WSU Energy Extension, Olympia, Wash., September 2008.

<sup>80</sup> ESSHB 1303, Section 202, "Effective June 1, 2015, all state agencies and local government subdivisions of the state, to the extent determined practicable... are required to satisfy one hundred percent of their fuel usage for operating publicly owned vessels, vehicles, and construction equipment from electricity or biofuel."

<sup>81</sup> PEV (pure electric vehicles), NEV (neighborhood electric vehicles) and PHEV (plug-in hybrid electric vehicles).

<sup>82</sup> For further information, contact Scott Logan at 509-682-2442.

- Port of Chelan County – Advanced Vehicle Initiatives Consortium has begun converting 14 Toyota Prius vehicles into plug-in hybrids.
- A coalition of Puget Sound governments is working together to improve its fleet operations and to create measures for “green fleets.”<sup>84</sup>

There are training programs established in Seattle, Wenatchee and Bellingham for the technicians needed to build and maintain the slowly growing fleet of electric vehicles.<sup>85</sup> The Vehicle Research Institute at Western Washington University is focused on total car design, while the technical training programs at South Seattle Community College and Wenatchee Valley Community College (WVCC) are performing conversions and training technicians. These trainees can perform service on hybrid vehicles outside of the dealer-trained networks.<sup>86</sup>

The WVCC program is associated with the NAFTC (National Alternative Fuels Training Consortium), which provides curriculum.<sup>87</sup> The program has converted 14 Toyota Prius as part of a pilot project. Each of the test vehicles is equipped with *V2Green* data loggers, GPS units and cellular modems to collect real-time vehicle performance data. The data will be analyzed and archived by Idaho National Laboratory (INL) in cooperation with the U.S. Department of Energy’s Advanced Vehicle Testing Activity. Data from this pilot project will be aggregated by INL with data from approximately 130 other Plug-in Hybrid Vehicles (PHEVs) in similar pilots throughout the nation, including 13 vehicles in the Seattle area.

The city of Wenatchee, Chelan County, Douglas County PUD, Energy Northwest, Snohomish County, the University of Washington, Benton County PUD, Walla Walla Community College, McKinstry and Green IT Alliance participated in the pilot project; each provided its own vehicle.<sup>88</sup>

The Green Car Company employs about 20 people and performs between 10 and 20 conversions a month,<sup>89</sup> while most of the other mechanics are converting one or two cars a month.

The design and manufacture of recharging stations, battery management devices, conversion kits and other components have high potential in Washington due to our innovative culture and high-tech assets. “Smart charging” software can tap into the region’s IT expertise, for example. The largest is Manzanita Micro in Kingston, which is experiencing a high level of growth, partly due to the changes in the economy. Its staff has grown from two people to eight in the last year, and they expect to grow gross revenues from \$500,000 this year by two to five times next year.<sup>90</sup> Bruce Sherry Designs in Woodinville also is involved in designing and manufacturing parts, instruments and battery-management systems with all assembly performed in Washington state. The company is growing, with 2008 being the “best year ever” for the 20-year-old company.<sup>91</sup>

There is also interest in converting larger vehicles to either hybrid operation or alternative fuels such as compressed natural gas. These efforts are in the planning stages. The Plug-in Center in

83 <http://www.seattle.gov/news/detail.asp?ID=7850&dept=40>

84 <http://www.psgreenfleets.org/>

85 South Seattle Community College, Ben Taves, 206-768-6819. Wenatchee Valley Community College, Blake Marshall, 509-682-6630. Western Washington University, Vehicle Research Institute [vri.etec.edu/](http://vri.etec.edu/).

86 Interview with Blake Marshall.

87 <http://www.naftc.wvu.edu/>

88 Wenatchee Valley Community College pilot project news release.

89 Interview with green-car company sales manager.

90 Interview with Rich Rudman, Manzanita Micro CEO.

91 Interview with Bruce Sherry, chief engineer.

Wenatchee (associated with the Port of Chelan) has organized the purchase of a plug-in hybrid electric school bus using biodiesel for fuel. The \$210,000 vehicle was purchased for the Lake Chelan School District, with the district paying \$75,000 (the cost of a regular diesel bus). Other funding sources include \$55,000 in federal funding from the HESB consortium, \$52,000 from the state Department of Ecology, \$10,000 from the Port of Chelan County and \$18,000 from various other private and public sources.<sup>92</sup>

### **Solid waste and recycling**

Like the triple-bottom-line benefits of the green-building industry, the recycling industry provides a unique opportunity for immediate reductions in greenhouse gases and energy efficiencies. It's also a distributed economy, as creating recycling jobs can effect urban and rural communities across the state. It is an industry that creates locally based materials-recovery jobs and industries. According to the Institute of Local Self-Reliance, on a per-ton basis, a recycling program creates 10 jobs for every one job at a landfill.

Wasting directly affects climate change because it is tied to global resource extraction, transportation, processing and manufacturing. When we minimize waste, we can reduce greenhouse-gas emissions in sectors that together represent 36.7 percent of all U.S. greenhouse-gas emissions. Using the same modeling used for the McKinsey abatement curve, a zero-waste approach would achieve 7 percent of the cuts in U.S. emissions needed to put the nation on the path to climate stability by 2050.<sup>93</sup>

Solid-waste and recycling industries further Washington's public policy goals for water treatment, greenhouse-gas reductions, toxic chemicals, transportation and energy generation. Cannacord Adams estimate the recycling industry accounted for about 2 percent of the \$12.36 trillion U.S. gross domestic product in 2007. The recycling industry generates more than twice the revenue of the \$100 billion waste management industry, even though much more garbage is thrown out than recycled. That's because recycled materials generate economic value, while waste disposal doesn't.<sup>94</sup>

This is a growth industry due to the very high costs for virgin materials and overwhelming demand for manufacturing materials. Recycling helps companies achieve competitive advantage and profitability.

Scrap recycling conserves natural resources. Recycling one ton of:

- Paper saves 17 trees, 79 gallons of oil, 7,000 gallons of water and 3.3 cubic yards of landfill space.
- Steel conserves 2,500 pounds of iron ore, 1,400 pounds of coal and 120 pounds of limestone.
- Aluminum conserves up to eight tons of bauxite ore and 14 megawatt hours of electricity.

Scrap recycling diverts 150 million tons from landfills and, according to the Institute of Scrap Recycling, this was a \$65 billion industry in 2006, with 50,000 employees.<sup>95</sup>

92 [http://www.plugincenter.com/index.php?page\\_id=264](http://www.plugincenter.com/index.php?page_id=264)

93 Institute for Local Self-Reliance, the Global Anti-Incinerator Alliance (GAIA) and Eco-Cycle, "Stop Trashing the Climate," [www.stoptrashingthecolimate.org](http://www.stoptrashingthecolimate.org) June 2008.

94 The Progressive Investor, "Special Report: Investing in Recycling!" Issue 52, February/ March 2008.

95 Institute of Scrap Recycling, Inc. <http://www.biggerthanthebin.org/>

Specification-grade scrap is a raw material feedstock for U.S. manufacturing:

- Two out of three pounds of steel made in the United States is manufactured using ferrous scrap.
- Sixty percent of the metals and alloys produced in the nation are made from nonferrous scrap.
- More than half of the U.S. paper industry's needs are met through the use of scrap paper, with nearly 200 U.S. paper mills using only recycled paper.
- A third of U.S. aluminum supply comes from recycled materials.

### **The Recycling Industry – At a Glance**

#### **Re-manufacture**

Re-manufacturers, which recycle old materials into new products, are the largest segment of the recycling industry. This \$180 billion industry – consisting of steel mills, plastics converters, paper mills, glass producers, composite-wood production plants, iron and steel foundries, and rubber-product manufacturers – represents 75 percent of the industry's revenue.

#### **Re-process**

Re-processors – the dealers who collect, sort, process and compact recyclables – are the second-largest segment of the industry and generate \$41 billion in sales, or 18 percent of the industry. They add value to waste materials by turning them into “products” that meet raw-material specifications.

#### **Re-use**

Re-use companies, such as motor-vehicle-part re-manufacturers, tire re-treaders and computer de-manufacturers, refurbish existing products. These firms generate \$16 billion in sales, or 6 percent of the industry.

#### **Collection**

The collection side of the industry – those that pick up curbside consumer recyclables, materials recovery facilities and material wholesalers – represent the smallest segment, generating 1 percent of revenue, about \$2 billion annually.

*Special Report: Investing in Recycling! The Progressive Investor. Issue 52: February/ March 2008*

In the latest recycling survey conducted by the state Department of Ecology, about 7.3 million tons were recycled in 2007, a 43 percent recovery rate. Both the annual tonnage levels and recovery rates have been increasing steadily over the 21 years that data have been gathered in Washington.<sup>96</sup>

<sup>96</sup> Washington State Department of Ecology, “Recycling and Diversion Data,” <http://www.ecy.wa.gov/programs/swfa/solidwastedata/recyclin.asp> 1986-2007.

There is still more opportunity and untapped potential. Although 10 years old, the 1998 recommendations of the Washington's Future of Recycling study still apply:

- Enhance the efficiency of current collection systems.
- Encourage the expansion of municipal curbside programs to include light ferrous (iron) materials, such as toaster ovens, clothes hangers, irons and other materials that have a high market value.
- Increase recycling participation levels of and the recycling services available to the commercial sector, especially small- and medium-sized businesses.
- Create programs to recycle organic materials.
- Develop recycling services focused on the construction, demolition and land-clearing waste stream.
- Increase recycling of industrial waste.
- Expand market demand to help draw materials out of the waste stream.
- Maximize recycling of municipal solid waste, which includes a high percentage of potentially recyclable materials.
- Develop the capacity to analyze the waste stream to determine the potential to recycle or to reduce materials not now being recycled, including an analysis of economic value and markets.

Perhaps the most important recommendation is to help create and then maintain a *recycling infrastructure*. That is, we must create a localized network of processors and end markets, using many of the same strategies that were used in the creation of the former Clean Washington Center.<sup>97</sup>

- An agency should be charged to develop and sustain strong markets for recycled materials through research and development, technical assistance and partnerships with Washington businesses.
- Research new technologies and best management practices for recycled materials in manufacturing.
- Work with local government economic development agencies on local market-development initiatives.
- Monitor and develop international markets for Washington materials.
- In addition to this focus on recycled material markets, the agency should work with firms to enhance waste prevention and product design for recycling.

More than two dozen U.S. communities and the state of California also have now embraced zero waste as a goal.

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97 The Clean Washington Center.

### **Case study - California**

California's Integrated Waste Management Act of 1989 created the Integrated Waste Management Board and required individual cities and counties to cut their disposal rates in half. The mechanics were left largely up to each jurisdiction.

The board provided state sweeping oversight as well as technical guidance and financial assistance on programs to increase waste diversion. Over the years, the board has awarded approximately \$413 million through more than 6,100 grants to further waste reduction and recycling activities in the state. The board reviews waste generation and disposal tonnages and annual reports submitted to the state by hundreds of cities, counties and regional waste-management compacts. In addition, waste tonnages are calculated based on landfill disposal fees collected by the State Board of Equalization and paid to the Waste Board. The Waste Board receives approximately \$1.40 for every ton of waste disposed in California landfills.

The outcome was nearly 500 cities, counties and regional waste-management compacts around the state contributing to a multi-million-dollar infrastructure of waste-handling options for residents and businesses. California enjoys a blossoming recycling-oriented economy and has seen the creation and expansion of robust markets for recyclable materials.

California has created a mainstream industry of statewide importance composed of 5,300 establishments. Recycling now accounts for 85,000 jobs, generates \$4 billion in salaries and wages, and produces \$10 billion worth of goods and services annually.

### **Environmental preservation**

There were 282 firms in Washington engaged in environmental consulting with gross revenues of over \$80 million in 2007.<sup>98</sup> There were 113 environmental-remediation (cleanup) firms operating, with gross revenues of more than \$546 million. These industries are growing. Revenues for environmental consulting increased by 17 percent in 2007 and 81 percent over the previous five years, while remediation services increased 4 percent in 2007 and 25 percent in the previous five years. Some 2,129 people were employed in environmental consulting and 6,864 in remediation.

### **Water conservation**

Water stress and shortages are driving national and global markets. Growing populations, increased demand for water by individuals and industry, and diminishing freshwater sources due to degradation and drought have created water scarcity in many regions.

General Electric expects its water-technology division to perform at the same scale as its other global business lines in medical technology, aviation or energy.. Goldman Sachs estimated GE's

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<sup>98</sup> NAICS data available from the Department of Revenue and Employment Security Department.

2007 water revenue at \$2.3 billion, enough to rank GE as the world's ninth-largest water-engineering company, according to Goldman.<sup>99</sup>

### **Walla Walla Water and Wine Innovation Partnership Zone**

Founded in 2007, this innovation partnership zone (IPZ) focuses on research-based industries that relate to the current and future economic base of the greater Walla Walla region: water and wine. Water is the ecosystem's lifeblood and the most critical resource in this region, the state of Washington and worldwide. The premium red-wine industry constitutes the most significant economic dimension of the Walla Walla region in the last decade. Taken together, there are synergistic research opportunities for agriculture and conservation.

Walla Walla Community College – one of the principles of the IPZ – opened the William A. Grant Water and Environmental Center to support an emerging community-based approach to resource management and to provide a place for sustainable water and environmental education. Since its opening in October 2007, the Water Center and its partners have made significant progress to provide education and training, to serve as a community resource and to apply innovative restoration projects in the Walla Walla area. This includes offering degrees in irrigation technology and water resource technology.

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have eight research scientists and technicians co-located in the Water Center who are engaged in applied ecosystem research initiatives.

### **Water reclamation**

Sewage treatment plants are beginning to create a new resource called “reclaimed water.” This is storm water and sewage that have been treated to a level that is acceptable for human contact, for reintroduction into the groundwater aquifer, for irrigation or to restore stream flows and wetlands. Standards and regulations are in place, and there are many projects either completed or in progress in the state, irrigating parks and golf courses,<sup>100</sup> providing water for industrial uses, and for ecological restoration.<sup>101</sup>

### **Manufacturing**

Manufacturing is a cross-cutting industry and, although not considered to be a green industry (please see Definitions for a Green-Economy Jobs Initiative), it is worthwhile to pay attention to

99 John Schmid, “GE Embracing Water Technology. Company Predicts Global Market for Treatment, Reuse System,” Milwaukee Journal Sentinel, Wisconsin, October 5, 2008.

100 LOTT partnership staff interview, “\$2.37 million plan to use reclaimed water on Tumwater course,” The Olympian, October 17, 2008.

101 King County water quality division staff interview of Carnation treatment plant supplying Chinook Bend Natural Area. “Carnation Wastewater Treatment Facility, Project Update: Spring 2008.”

a phenomenon known as “green reindustrialization.” This refers to converting Washington’s dormant industrial capacity toward green products or their component parts.

According to research conducted for the Renewable-Energy Policy Project, Washington has more than 457 firms already active in the industrial sectors that could supply component parts to meet the state’s renewable-energy goals.<sup>102</sup>

The Road to Energy Independence, a 2007 report produced by the Blue Green Alliance and The Renewable Energy Policy Project, documents thousands of jobs making parts for wind turbines, solar panels and other clean-energy technologies. These projects are based on the potential of a national renewable-electricity standard. The report breaks down renewable-energy technologies (wind, solar, geothermal, biomass) over a 10-year period and tracks that demand down to the individual industries capable of manufacturing the components. Taken together, the study estimates 8,562 manufacturing jobs would be created and/or preserved, which could revitalize Washington’s manufacturing.

Under this renewable-electricity standard scenario, the greatest number of manufacturing jobs in Washington over the next 10 years will be wind (3,902) and solar (3,190).<sup>103</sup>

We can use our existing industrially zoned business centers, in concert with the renewable-energy-production tax credit extended by Congress in October 2008, and more-comprehensive Washington state renewable-energy tax credits.

One of the best-kept secrets of Washington’s Growth Management Act was the establishment of manufacturing industrial centers (MICs). These MICs are industrially zoned properties that historically and currently are used by manufacturing and industrial businesses.

Attention to the manufacturing industry has the added benefit of addressing supply chain bottlenecks, creating regional clusters and lowering the carbon footprint of companies and products. In the example of wind-turbine manufacturing, it is estimated that 8,000 component parts are ingredients of the worldwide supply chain.<sup>104</sup>

### **Industry Readiness**

In sum, Washington green industries are in a position to grow substantially. However, not all of the industries will realize growth immediately. The diagram below shows the state of readiness for some of Washington’s green industries.

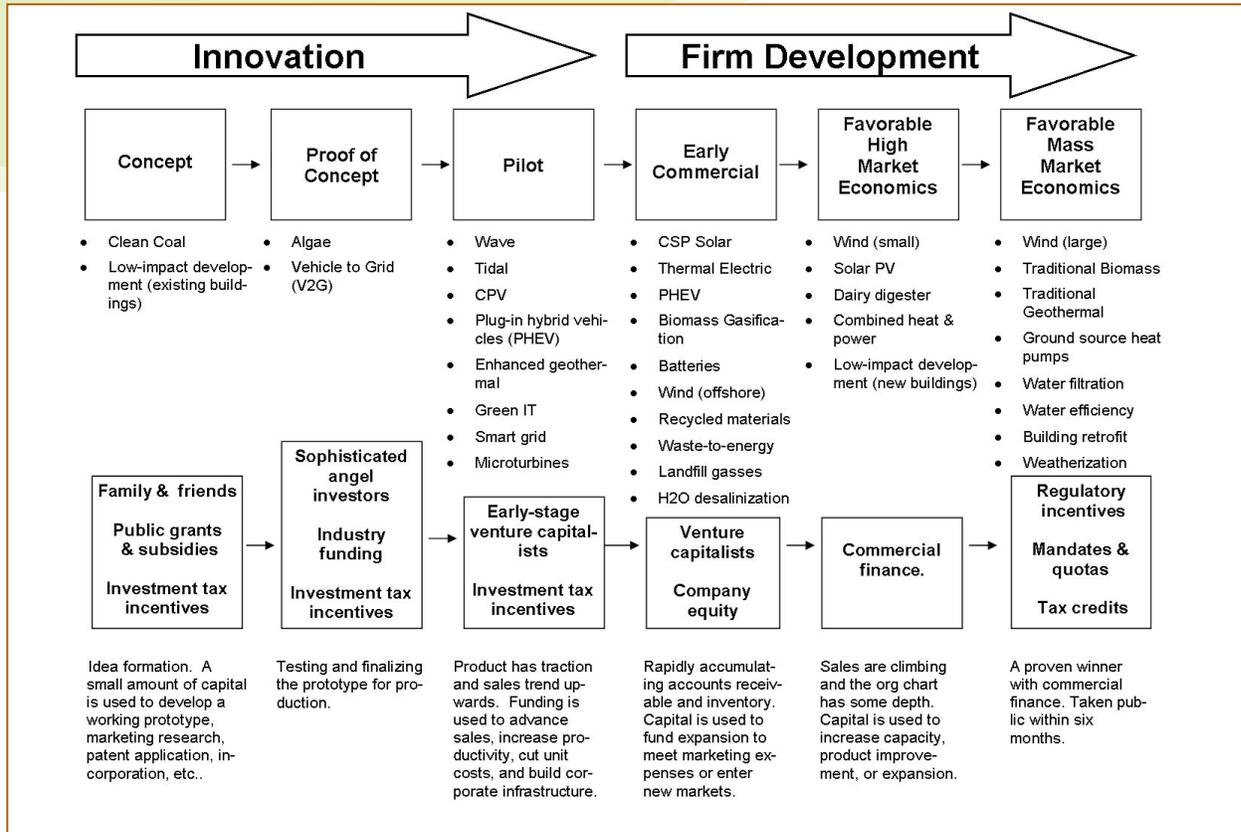
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102 Blue Green Alliance <http://www.bluegreenalliance.org/>, “Washington’s Road to Energy Independence: Building Growth in Renewable Energy Component Manufacturing,” Minneapolis, MN, 2007.

103 *Ibid.*

104 Blue Green Alliance <http://www.bluegreenalliance.org/>, “Washington’s Road to Energy Independence: Building Growth in Renewable Energy Component Manufacturing,” Minneapolis, MN, 2007.

**Chart 9. Washington green industries market readiness**



## Washington's Global Trade Opportunities

The global market volume for green-economy technologies runs to about \$1.37 trillion, according to German-based Roland Berger Strategy Consultants, with a projected \$2.74 trillion by 2020:

- Energy-efficiency technologies (appliances, industrial processes, electrical motors, insulation, etc.): \$617 billion at present; #1.23 trillion by 2020.
- Waste management/recycling: \$41 billion; \$63 billion by 2020.
- Water supply, sanitation and efficiency: \$253 billion; \$658 billion by 2020.
- Sustainable transport (more-efficient engines, hybrids, fuel cells, alternative fuels, etc.): \$247 billion; \$493 billion by 2020.<sup>105</sup>

Washington's ports could be the gateway for these products, and our manufacturers and designers have opportunities for cooperative ventures in this area.

Remarkably, the global market for solar photovoltaic products is expected to grow from 2004 levels of \$15.6 billion to \$69.3 billion by 2016.<sup>106</sup>

New global investments in energy technologies—including venture capital, project finance, public markets, and research and development—have expanded by 60 percent from \$92.6 billion in 2006 to \$148.4 billion in 2007, according to research firm New Energy Finance.<sup>107</sup>

Notably, Solar power and wind power are the two fastest-growing clean-energy sources in China – Washington's largest trading partner – and have become profitable commodities in the international market.

### Solar

Although Washington does not yet produce a significant number of solar panels, it is a world leader in silicon. If silicon production grows with the global solar market, Washington's solar silicon industry could grow from \$150 million in 2007 to more than \$600 million by 2016.<sup>108</sup>

By 2025, Clean Edge Inc. estimates the Northwest (Washington and Oregon) could garner up to 14.5 percent of global market production output.<sup>109</sup>

### Wind

Worldwide, Clean Edge expects wind industry revenue to nearly triple in the next decade, from \$30.1 billion in 2007 to \$83.4 billion in 2017.<sup>110</sup>

Wind power, the most popular form of alternative energy, offers a major trade opportunity with Asian markets. China is forecast to be the top wind-turbine maker in the world by 2009.<sup>111</sup>

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105 "Green Jobs: Toward Decent Work in a Sustainable, Low-Carbon World," report from United Nations Environment Programme. [www.unep.org](http://www.unep.org) Accessed October 2008.

106 Kevin Wilhelm et al, "Clean Technology – The Answer for Washington's Carbon Constrained Future," p. 16, Innovative Strategies and Climate Solutions, 2007.

107 Joel Makower, Ron Pernick and Clint Wilder, "Clean Energy Trends 2008," Clean Edge Research, March 2008.

108 Kevin Wilhelm et al, "Clean Technology – The Answer for Washington's Carbon Constrained Future," Innovative Strategies and Climate Solutions, 2007.

109 Climate Solutions Inc. & Clean Edge, Inc., "Carbon-Free Prosperity 2025," October 2008.

110 *Ibid.*

Some forecasters believe that China will begin *exporting* wind turbines by 2010 and challenge the current world leaders of Spain, India and Germany, as well as General Electric in the United States.<sup>112</sup>

However, even in China, wind power and turbines are an immature market. Consequently, “almost all large-scale wind power generators [must be] imported from foreign countries.”<sup>113</sup> In addition to physical equipment, there also is a growing need for alternative-energy planning expertise, as poor designs rendered more than half of the power generated by Chinese wind turbines inaccessible in 2007.<sup>114</sup>

Washington is home to some of the leaders in design, production and management of wind power. Establishing an alternative energy exchange with China could propel Washington’s wind technology exports.

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111 Alister Doyle, “China seen surging to top wind-turbine maker in 2009,” <http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=Mjc5ODM> World Business Council for Sustainable Development, January 8, 2008

112 Kevin Wilhelm et al, “Clean Technology – The Answer for Washington’s Carbon Constrained Future,” p. 17, Innovative Strategies and Climate Solutions, 2007.

113 Ibid, p. 29

114 Ibid

## Trade with China

The Chinese government has not only prioritized the import and development of clean technologies, it also has created centralized access points for potential clean-tech importers. China's federal government has established a number of interfacing programs that connect potential importers with the wide variety of potential clients in China, including regional municipalities, state-owned enterprises and private companies. Eco-industry parks (EIPs) and trade fairs are two such programs that have streamlined green-industry trade with China, making green imports more efficient and more lucrative.

There were 10 eco-industry parks in China by 2005. These zones are models in which government officials, business leaders and urban planners create zones that “fully use resources efficiently, reduce resource consumption and decrease pollutant discharges.”<sup>115</sup> In some ways, they are environmentally oriented parallels of the IPZs in Washington, as they encourage collaboration among government leaders, businesses and urban programs in centralized locations.<sup>116</sup> EIPs have consolidated, tangible locations and can be found in diverse provinces such as Guanxi, Guangdong, Shanxi, Sichuan, Shandong and Hainian. These parks are some of the government's primary targets for green-industry import development because “advanced production processes, technology, equipment and management methods are all acutely needed in [these zones].”<sup>117</sup>

As such, these zones represent sizeable markets within China that can be easily located and accessed by Washington exporters.

Furthermore, there are larger opportunities for direct foreign investment **from** China. Many Chinese companies would welcome the chance to participate in the U.S. energy market, particularly solar and wind manufacturers.

China has not yet established a dominant trading partner for green industries. Washington has the opportunity to establish economic ties to some of the largest markets in the world.<sup>118</sup>

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115 Ibid. (p. 15).

116 see page 18 for an overview of Washington's Innovation Partnership Zones (IPZs).

117 U.S. Department of Commerce, International Trade Administration, “Cleaner Production Technologies: Export Opportunities in China,” p. 15, Washington, D.C., 2005.

118 See Appendix A for a list of major shows in 2004.

## **Bioenergy**

Clean Edge projects the worldwide ethanol and biodiesel markets to grow from \$25.4 billion in 2007 to \$81.1 billion in 2017. World production of biofuels rose some 20 percent to an estimated 54 billion liters in 2007 – accounting for 1.5 percent of the global supply of all liquid fuels. In the United States, the ethanol industry is estimated to employ between 147,000 and 200,000 people from farming to biofuels plant construction and operation.<sup>119</sup>

## **Green buildings**

Many national governments have prioritized energy-efficient urban planning and building design as a means of conserving resources. In India, the *2008 National Action Plan on Climate Change* announced a “national mission on sustainable habitat,” in which government aims for more eco-friendly cities through construction of energy-efficient buildings.<sup>120</sup> Urban rebuilding in China after the massive earthquake in May 2008, has created a high demand for new, sustainable buildings with earthquake-resistant technology.<sup>121</sup>

In 2006, China introduced a new building code requiring all new buildings to reduce energy consumption by 50 percent, or even 65 percent in Beijing and Shanghai. However, China has a building stock of more than 43 billion square meters, of which only 4 percent meets the new building code’s energy efficiency standards. The building code alone will generate significant demand for green-building design and materials. This market is estimated to be worth \$1.5 trillion in U.S. dollars between now and 2020.<sup>122</sup>

## **Recycling**

Scrap has been an important export commodity from the United States for more than a century. In 2006, \$15.7 billion worth of scrap commodities exported, helping U.S. trade balances.

Scrap is the second-largest export to China in dollar value (behind electronic components).<sup>123</sup>

- 34 million tons of scrap exported
- 16 million metric tons of paper
- 13,540,000 metric tons of iron and steel
- 1,481,000 metric tons of aluminum
- 1,396,000 metric tons of nickel and stainless steel
- 803,000 metric tons of copper
- 343,000 metric tons of plastic (bottles only)
- 121,000 metric tons of lead
- 84,000 metric tons of zinc
- 7 million tires

Scrap exported to 143 countries. Leading export destinations include:

- China
- Canada
- South Korea
- Mexico
- Germany
- Taiwan

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119 Worldwatch Institute for the United Nations Environment Programme, "Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World." Washington DC. September 2008.

120 Prime Minister’s Council on Climate Change, “National Action Plan on Climate Change,” 2008.

121 Colman, Trevor, “China Will Redouble Efforts,” World Architecture News, May 19, 2008.<http://www.worldarchitecturenews.com>

122 Nicholas V. Chen, Pamir Law Group. Presentation to CTED International Trade Division, Seattle, Wash., November 19, 2008.

123 Institute of Scrap Recycling, Inc. <http://www.biggerthanthebin.org/>

## Fuel cells

The developed countries of the world are embarked upon an aggressive, well financed and deeply coordinated effort to switch from petroleum-based economies to hydrogen-based economies. Key nations in these efforts include the United States, European Union, Canada, Japan, India, China, Australia and many others.<sup>124</sup>

Global fuel-cell sales are increasing about 7 percent annually.<sup>125</sup> Fuel-cell-related employment increased 12 percent in 2006 from 6,305 to 7,074.<sup>126</sup>

The 2007 Fuel Cell Industry Survey reported that the aggregate revenues of publicly traded fuel-cell enterprises rose 59 percent in 2006 to \$46 million worldwide.<sup>127</sup> However, none of the surveyed fuel-cell companies reported profits in 2006.

Generally, hydrogen is not widely available and there is no large distribution network. The technology is also in the early stages of development in terms of cost of installation; the most common fuel cells cost about \$4,500 per installed kilowatt, whereas a diesel generator costs \$800 to \$1,500 per kilowatt, and a natural gas turbine can cost less than \$400 per kilowatt.<sup>128</sup>

However, the domestic prospects look good. According to the Hydrogen Fueling Infrastructure Assessment by General Motors, “a large hydrogen production site exists today near almost every major U.S. city,” and “53 percent of the hydrogen produced in the United States is used in oil refineries, enough to fuel 13 million fuel cell-electric vehicles.”<sup>129</sup>

## Smart grid

Rapidly developing nations with population booms, especially in urban areas, create a market for these resource management techniques. Washington also is growing, with its population forecasted to increase 44 percent from 2000 to 2030.<sup>130</sup> As companies establish protocols for handling domestic demographic shifts, they are prepared to offer similar services to growing foreign markets.

Energy management is the traditional form of “smart energy,” optimizing traditional energy and resource consumption with less focus on computerization or alternative energy sources. For example, one firm has developed programs that integrate electric and gas management with transportation consulting.<sup>131</sup>

According to Clean Edge Inc. estimates, the total global Pacific Northwest smart grid-related revenues will grow from \$3.2 billion today to \$6.7 billion by 2025.<sup>132</sup>

*“There is also a huge opportunity to build smart grids from the ground up, rather than retooling existing infrastructure, in fast-growing economies like China and India. If Washington and Oregon can lead the nation (if not the world) in proving the leading-edge concepts and building the technologies of the 21st century grid—and coordinate and harness*

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124 [www.hydrogen.energy.gov/international.html](http://www.hydrogen.energy.gov/international.html)

125 United States Fuel Cell Council/fcc.com, “2006 Worldwide Fuel Cell Industry Survey,” 2006.

126 *Ibid.*

127 Price Waterhouse Coopers <http://www.pwc.com>, “2007 Fuel Cell Industry Survey,” 2007.

128 U.S. Department of Energy, “Fuel Cell R&D,” <http://www.fossil.energy.gov/programs/powersystems/fuelcells/> May 10, 2007.

129 Washington State University Extension Energy Program, “Overview of Hydrogen and Fuel Cells in Washington State,” September 2008

130 Washington State Office of Financial Management, “Washington state County Growth Management Projections: 2000-2030,” <http://www.ofm.wa.gov/pop/gma/projections07.asp>.

131 IFC International.

132 Climate Solutions Inc. & Clean Edge, Inc., “Carbon-Free Prosperity 2025,” October 2008.

*that grid's myriad components—the region can create a robust regional industry that delivers key smart-grid products locally and around the world.”<sup>133</sup>*

### **Environmental protection**

China represents a major opportunity for Washington environmental consulting and remediation firms.

The 10 most polluted cities in the world are all in China.<sup>134</sup> Greenhouse-gas production there has topped the United States by 8 percent, and China is growing to become the largest emitter of CO<sub>2</sub>.<sup>135</sup> Seventy percent of China's rivers and lakes are polluted, and more than 300 million people have no access to clean water.<sup>136</sup> Solid-waste disposal issues and desertification also plague the fast-growing nation. Most power is provided by coal plants, and China is just beginning to climb the transportation curve in terms of privately owned vehicles.

In order to address these issues, the Chinese government has created a new Ministry of Environmental Protection (MEP) at the highest level of the government. The MEP is charged with addressing air quality, water pollution and climate-change issues.<sup>137</sup>

### **Water treatment**

The most promising markets are those in the Pacific Rim and Latin America. Gains in highly industrialized countries will be governed by stricter laws and regulations, increased recycling in manufacturing and the desire for advanced filtration and disinfection.

The global demand for water treatment products should increase substantially. The Asia-Pacific region will remain the largest water user by far (at 56 percent of the global total).<sup>138</sup>

China reached the highest rate of growth among major markets with a 17 percent annual rise through 2007. In China alone, it is estimated that its water supplies can support 650 million people, which is only half of its 1.2 billion population. China has 617 cities, 300 of which have serious water shortages.<sup>139</sup>

The water technology industry makes a wide variety of goods and is highly fragmented, since there are hundreds of product vendors and suppliers. The three top producers — Veolia Environnement (France), General Electric (U.S.) and Nalco (U.S.) — together account for only one-quarter of total shipments. Smaller firms can compete with narrow product lines that focus on niche markets.

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133 *Ibid.*

134 Robert Malone, “America’s Most Polluted Cities,” *Forbes Magazine*, March 22, 2006.

135 Netherland Environmental Assessment Agency, “China now no.1 in CO<sub>2</sub> emissions; USA in second position,” June 19, 2007.

136 Miao Hong, “China battles pollution amid full-speed economic growth,” *Chinese-embassy.org*, September 29, 2006.

137 Gang He, “China’s New Ministry of Environmental Protection Begins to Bark, but Still Lacks in Bite,” *World Resources Institute Web site*, July 17, 2008

138 Michael A. Deneen and Andrew C. Gross , “The global market for water treatment products,” *Business Economics*, January 2005.

139 Global Water Partnership, accessed November 18, 2008, at <http://www.gwpforum.org/>.

## **Desalination**

The global market for seawater and brackish water desalination<sup>140</sup> plants was worth \$1.9 billion in 2007. This is expected to increase to over \$3.6 billion by 2012. Global capacity has risen about 45 percent in the past 5 years and is slated to increase at about the same rate during the next 5 years.<sup>141</sup>

## **Global trade opportunities - conclusion**

Clearly, there are tremendous international trade opportunities for Washington's green industries. To take full advantage of that market, Washington State must:

- Develop a green industry trade strategy aimed at developing markets. China, which has a projected demand for renewable energy valued at \$398 billion USD over the next 15 years, must be at the top of the list for the state's international trade program.
- Fund Washington's international trade programs, with targeting to green industries.
- Aggressively seek foreign direct investment in capital-intensive green industries.
- Augment Washington's international representation with trade offices in target countries.

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140 Currently, less than 1 percent of the world's water supply is produced through desalination, the removal of salts from a saline source.

141 Seawater and Brackish Water Desalination (MST052A), BCC Research (www.bccresearch.com), 40 Washington Street, Suite 110, Wellesley, MA; Telephone: 866-285-7215, editor@bccresearch.com. Accessed on Business Wire, Jan 24, 2008

## Open for Business

Washington business is striving to be competitive in the global economy. Many are already using green strategies to achieve a competitive advantage. There are scores of early adopters and innovators, including Costco, PACCAR, Canyon Creek Cabinets and others that are setting the standards for businesses that want to “grow with green.”

Government will be hard pressed to catch up to these forward-thinking companies and be challenged to stay out of their way. Other companies still need to be shown the economic advantages of Washington’s transition to a greener, more sustainable economic model.

### **Business is ready**

Nearly all business leaders surveyed view national greenhouse-gas regulations as inevitable in the United States. Of these, 84 percent believe new standards will take effect before 2015, and 17 percent say they believe regulation will take effect before 2010. Worldwide, 61 percent of business executives expect climate-change solutions to boost company profits.<sup>142</sup>

As demonstrated earlier, it is now widely accepted that there are profit and employment losses from **not** addressing the environmental issues and that these losses are likely to be very serious. Large, multinational firms, as well as governments, seek to manage their risk and reduce their emissions with climate-friendly products and services.

Market opportunities in energy generation, efficiencies and transportation never looked so good.

### **Parallels between green and Lean**

The Lean<sup>143</sup> production movement in the 1980s and 1990s proved to businesses that they could gain advantage by holding down costs and reducing wasteful practices. Lean processes reduce time, result in few wasted materials, and use less floor space. And all of these gains have the added benefit of reduced energy and reduced waste.

In today’s carbon-constrained environment, this business axiom is more applicable than ever, and late adopters run the risk of falling fatally behind on innovation.

Anticipating the requirement to reduce greenhouse gas emissions, and the future cost of carbon, firms start to reduce their emissions voluntarily for the following reasons:

- Get a head start over competitors in learning what works.
- Prepare to respond rapidly once regulations do take effect.
- Better manage the costs of emissions reductions over time.
- Influence policy outcomes.
- Govern with integrity, in light of increasing concern for the environment.

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<sup>142</sup> Pew Center on Global Climate Change and the Pew Center on the States, “Climate Change 101: Understanding and Responding to Global Climate Change.”

<sup>143</sup> Lean principles come from the Japanese manufacturing industry. The term was first coined in 1988 article. Lean is the set of “tools” that assist in the identification and steady elimination of waste and improvement of production flow. As waste is eliminated and flow improves, production time and cost are reduced.

## Policy Direction

Washington state has set goals and taken action toward greening its economy.

Generally, business anticipates government programs with some anxiety, fearing that the initiative will be not wisely constructed or enforced fairly, thus placing business at a disadvantage. And yet, some of our state's business leaders ask for **stronger** policies related to climate change and green industry. Why? Because mandated markets are solid: Anything less than this presents a risk and typically lacks volume. Public policy not only determines regulatory requirements, but it also opens markets.

Government policy can provide:

- Long-term commitments.
- Consistency between rulemaking, enforcement and policy goals.
- Targeted, gradually declining subsidies.
- Publicly sponsored research and development.
- Markets through incentive, education and regulation.
- Industry standards.
- Workforce preparation.

Certainty is crucial to help firms with long-term planning. If change is inevitable, certainty about how the change will be managed becomes even more crucial to allow firms to position themselves and direct investment strategically. Firms in Washington state need a clear sense of the competitive stakes and the true costs of continuing with business-as-usual. Likewise, they need a clear sense of what opportunities are available for new products and services.

A swift and significant transition to a post-industrial, greener and more sustainable economic model will be achieved with strong leadership, rather than incremental steps.

### Let's talk business

*"We need policies that are clear, predictable, integrated and consistent."*

*"I want to know where the work is...."*

*"I want to know your ground rules. Then, please step aside."*

*"Focus on results, don't micromanage."*

*"Policies must be stable, predictable, aggressive and long-term."*

*"Establish clear regulatory objectives and call businesses to determine the most effective way to achieve the results."*

*"Make the need for change clear and irrevocable. Where there is change, there is opportunity."*

*"Aim higher. The goals established by the legislature and the Governor seem meek and mild. Signal that we're serious and that we're setting goals that won't be achievable unless we make investments. That will attract attention. California has established net-zero residential building standards by 2020, so I know that my company will profit in that state."*

*"Recognize that the global economy has accelerated the pace of change; streamline regulatory processes to allow swift decisions and reduce uncertainty."*

In addition to providing strong leadership for business development, Washington stands to receive a large influx of federal stimulus money. Federal stimulus will focus significantly on energy efficiency, green jobs and clean-energy technologies. Our record of successful investment in green technologies and practices, our substantial and growing mix of energy-efficiency, renewable and clean-tech companies and workers, and current policies position Washington state to take good advantage of this new funding. An even stronger policy framework will help put these funds to work immediately and create near-term jobs. The message from Washington, D.C., is clear: "Use it or lose it." Thus, any additional delays in policy decisions will weaken Washington state's prospects.

#### **Cap and trade: A good market signal**

Washington's membership in the Western Climate Initiative gave our state the opportunity to design the nation's most comprehensive proposed cap-and-trade system. That means regulatory predictability and a cap-and-trade system that works well for Washington state's unique characteristics (energy mix, industry, etc.).

The proposed cap-and-trade program sends a signal that Washington is a good place to focus innovation and investment in greenhouse-gas reduction strategies and technologies. In addition to reducing carbon emissions, the market-driven cap-and-trade system will *eventually* create financial resources to capitalize the green economy.

### **State energy strategy**

Washington state does not have a detailed, systematic and quantitative analysis and roadmap of energy needs and opportunities. Such a plan would provide accurate energy targets, assess the cumulative and interactive effects of energy policies currently under way, as well as assess additional conservation, efficiency and energy-generation policies and measures that will be needed to reach those targets.

RCW 43.21F.090 authorizes the Department of Community, Trade & Economic Development to periodically update the State Energy Strategy. The last update was completed in 2003 and produced an electricity policy framework for the state. With new greenhouse-gas reduction goals, an emphasis on growing new clean-energy technologies and the passage of I-937, an updated energy strategy is crucial.

Four elements of a state energy strategy should be:

- Quantitative energy analysis of all energy sectors – energy consumption and production trends, scenarios of alternative efficiency futures and the effects of policy choices on energy costs and availability.
- Links between energy and other state priorities – economic development, environmental enhancement, land-use decisions, infrastructure investments.
- Conservation, efficiency and generation policies.
- Implementation planning.

A detailed, multi-sector quantitative analysis and plan will provide clear direction to citizens, government and firms, clarifying the state's long-term intentions and energy choices.

### **Measurement and performance**

Measuring Washington's competitiveness and tracking progress toward green-economy goals is crucial. The Washington state Economic Development Commission should be enlisted to identify benchmark states and nations against which Washington should measure clean technology industry and trade. Additionally, Washington state should consider a comprehensive economic analysis of the green economy and attempt to calculate net productivity.

At the very least, Washington state should continue sampling and tracking the green-economy labor market, using the methodology established by the Employment Security Department and WSU Extension Energy Program for the Green-Economy Jobs Initiative. Beginning with the 2008 baseline data, a survey should be conducted every two years to measure growth and change.

The "green" portion of the federal economic stimulus package is expected to include future funding opportunities tied to actual performance. Hence, having a well designed and executed performance measurement system that can demonstrate energy savings, clean-energy production and, most importantly, job creation could mean more funding to Washington state in future years.

### **Communications and marketing**

An important role for government is education and advocacy. Marketing can create market "pull" for our green economy industries. Firms will benefit if the state can address the lack of understanding about consumer opportunities. For example, most people living in the Pacific Northwest lack a full understanding of the opportunities from energy efficiency and renewable

energy. Despite our accomplishments in these areas, many citizens and business do not have the resources to make well informed energy-investment choices. *“Should I buy green tags for my electricity?” “Does it make more sense to invest in upgrading my old windows or insulating my attic?” “What’s the best way for a small business to finance energy upgrades?”*

Washington needs a broad-based and comprehensive communications and marketing plan. The communication channels need to include local governments, community organizations and schools. The state can support this effort through convening a network and providing resources to develop materials. But the real work must be done by community leaders throughout the region.

### **Procurement: Government as consumer**

State and local governments, as consumers, carry substantial market influence. Their early adoption of new products and activities can sway the public and the market substantially. One report estimates that state and local agencies collectively account for more than 75 percent of American government purchasing.<sup>144</sup> Also, public buildings and infrastructure represent some of the largest power users and represent a major opportunity for early deployment of clean technologies.

Washington’s best-known early adoption of green products is LEED building standards and purchase of fuel-efficient motor pool vehicles. Washington’s Office of State Procurement implements many of these activities. Efforts have eliminated mercury switches in vehicles, made biofuels available statewide, required Energy Star certification for appliances and mandated the purchase of hybrid vehicles.

There are more than 525 local-government members of the Office of State Procurement purchasing cooperative, with access to thousands of products and services<sup>145</sup> needed by state and local governments. The Office of State Procurement provides technical assistance to local governments, regularly conducting seminars and presentations to local governments on green purchasing.<sup>146</sup> One example of the aggregate power of coordinated local procurement is the Puget Sound Governments coalition that is working together to improve its fleet operations and to create measures for “green fleets.”<sup>147</sup>

The state Department of Ecology also markets Environmentally Preferred Purchasing (EPP) to state and local government through a speaker’s bureau. The department works with government partners researching product standards and maintains a dedicated EPP Web site. The Department of Ecology also is working to implement REACH (Registration, evaluation, authorization and restriction of chemical substances)<sup>148</sup> and RoHS (Restriction of use of hazardous substances) programs, already in place in the United Kingdom and European Union.<sup>149</sup> Both of these programs seek to reduce chemicals and toxics in products sold in the European market. Washington has an opportunity to adopt similar clean-product standards that could help in marketing state produced products to European and other countries that are interested in restricting chemicals.

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144 Alliance to Save Energy, “U.S. Experience with Energy-Efficient Procurement at the State and Local Levels,” <http://www.asiapacificpartnership.org/BATFenergyefficiencyworkshop.htm> July 13-14, 2007.

145 OSP currently has more than 30 state contracts with “green/recycled” products or services, including vehicles, cleaning products, biofuels, furniture, organic fertilizers and playground equipment. A complete list could be found at [www.ga.wa.gov/purchase](http://www.ga.wa.gov/purchase)

146 Interview with OSP representative, November 6, 2008.

147 <http://www.psgreenfleets.org/>

148 REACH is a new European Community Regulation on Chemicals and their safe use. EU Web site [ec.europa.eu/ennvironment/chemicals/reach](http://ec.europa.eu/ennvironment/chemicals/reach)

149 “Restriction of the use of certain hazardous substances in electrical and electronic equipment,” RoHS Web site. [www.rohs.gov.uk](http://www.rohs.gov.uk)

## State Government – A Market Maker

Thus far, Washington state government has helped stimulate the green economy with a combination of new laws, procurement-policy changes, gubernatorial directives, executive orders and local actions. For example:

- RCW 43.19.1905(21), statewide policy, “Development of goals for state use of recycled or environmentally preferable products through specifications for products and services...”
- RCW 43.19.637 on clean-fuel vehicles, “At least 30 percent of all new vehicles purchase through state contracts shall be clean-fuel vehicles.” This is set to rise by 5 percent per year.
- RCW 43.19A on Recycled Product Procurement, Recovered Materials, Federal Product Comprehensive Guidelines for Procurement of Products Containing Recovered Materials, construction, landscaping, paper, park/recreation, transportation, vehicular products and miscellaneous products.
- RCW 43.19.538, Purchase of Products Containing Recycling Material-Preference-Specifications and Rules-Review.
- RCW 70.95M, Toxics reduction, mercury (Mercury Education and Reduction Act, MERA), mercury labeling, disposal, prohibited sales, preference for mercury-free products.
- Executive Order 90-06, Implementing the Washington Environment 2010 Action Agenda.
- Executive Order 02-03, Sustainable Practices by State Agencies, sustainability plan for vehicle use, environmentally preferable products/services purchasing, construction, energy/water use, waste reduction, and use of clean energy.
- Governor Directive 04-01, Recycling fluorescent bulbs.
- Executive Order 04-01, Persistent, Toxic Chemicals, Flame Retardants (PBDE).
- Executive Order 05-01, Establishing Sustainability and Efficiency Goals for State Operations, Green Buildings (LEED Silver), Fuel Use, Alternative Fuel Vehicles, Vehicle Fleet Management, Rental Vehicle Use, Paper Products and Energy Efficiency.
- Executive Order 07-02, Washington Climate Change Challenge, Greenhouse Gas Emissions Reductions, High Performance Green Buildings, Water Conservation, Energy Efficiency and Renewable Energy Targets.
- HB 1303 addressing school bus fleet emissions and the use of hybrid and electric vehicles.
- RCW 39.35D requiring high-performance public buildings, all new state-funded building over 5,000 square feet must meet green building criteria.
- Evergreen Sustainable Development Standard (implemented 2008) has established standard criterion for new construction and rehabilitated housing as a requirement for Housing Trust Funds grants or loans. The low-income housing stock managed by Housing Authorities and local government is substantial.

## Regulation

Governments should make every attempt to align regulation with policy goals.

Many green-economy activities involve new technologies, with diverse methodologies, operated by fairly small firms scattered across Washington state. As noted earlier, the green economy is very much focused on small emitters and consumers, within local supply chains. This complicates the siting and permitting process. Land-use regulations, in particular, are known as “the killing field” of new technologies.

For a moment, consider some of these green-economy activities:

- Waste-to-energy incinerators
- Anaerobic digesters
- Wind turbines
- Green buildings
- Wave and tidal power
- Solar collectors
- Composting
- Transmission systems (electric lines, oil and gas pipelines)

Then, consider some of the overlapping authorizing and regulatory bodies:

- Energy Facility Site Evaluation Council
- State Shoreline Act
- Growth Management Act
- Aquatic Lands Act
- State Environmental Policy Act
- Salmon Recovery and Enhancement Acts
- Regional clean-air agencies
- Local comprehensive plans
- Local zoning
- Local building codes
- County health departments
- County public works departments
- Fire marshall
- Department of Ecology
- Federal agencies (EPA, Interior, BLM, BPA, etc.)
- Federal, state and local laws

Now, imagine each jurisdiction’s varying levels of knowledge about clean technologies and their varying levels of commitment toward sustainable practices. Some of the conflicts that have surfaced include:

- Green buildings strive to harvest rainwater and repurpose it, but state water law makes rain water “waters of the state.”
- Sustainable developments have installed porous concrete in the side streets to reduce the storm drains needed, but some local building inspectors have refused to accept the material.
- Local residences have installed solar electric systems, but local building inspectors are unfamiliar with inverters and their installation.

- Entrepreneurs and activists pull organic waste from the solid-waste system and use composting to reduce waste and create beneficial biomass, but air-quality standards and local comprehensive plans are uncertain how to classify compost facilities and how to define measure or mitigate nuisance odors.

A cumbersome regulatory process can be challenging for entrepreneurs who want to get a start-up company profitable quickly. Most firms **want** the state to maintain standards and environmental protections because this creates a level playing field and high-quality products. They do not expect regulation in the green economy to be “fast tracked” or even “streamlined.”

However, the regulatory environment needs to be less complicated and more predictable. Firms need the state to alleviate the *uncertainty* of regulation (time and predictability). Investors look for stability as a way to reduce their investment risk.

### **Farm Power! How Hard Could It Be?**

**Case study:** A small firm that builds and installs dairy digesters on small farms, to process manure and food waste and generate electricity for sale to the grid.

County zoning rules make it difficult to find a site for energy production. Although the dairy digesters process mostly agricultural waste on agricultural land, the process generates power for the grid. This attracts a “utility” designation for zoning purposes.

The state’s solid-waste rules (WAC 173-350) are enforced both by the Department of Ecology and local county health departments. At this time, any discarded food is considered to be “waste.” When discarded food is put into a digester (10 percent food waste and 90 percent cow manure), the processed manure and food waste that leave the digester are considered to be “solid waste.” At this point, cow manure (traditionally seen as a valuable farm nutrient applied to fields as fertilizer) becomes a regulated waste that requiring permits from Ecology and county health departments to store, handle and land apply.

Typically, dairy farms bank manure in lagoons, which naturally give off methane, CO<sub>2</sub>, H<sub>2</sub>S and other gases. These gases vent to the atmosphere and are not regulated in any way. However, a dairy digester that is built to capture those gases and burn them to create power requires an air permit. Washington air permits require advanced modeling and best available control technology (BACT) analysis.

One small firm – composed of two individuals – has encountered and navigated these unique challenges. As a pioneer business, its experience makes the path easier for the firms that will follow. Unfortunately, delays in time and the unanticipated costs of regulation and permitting place these entrepreneurs at risk.

In this particular case, Ecology’s Solid-Waste Program has assembled a work group to look at simplifying permitting for dairy digesters.

Washington needs to identify the regulatory barriers that face new activities and work to smooth the way and reduce risk.

- Expand the Governor’s Office of Regulatory Assistance (ORA) and commission it to study and anticipate green-economy regulatory issues. Increase ORA’s authority to bring state agencies to the table and compel participation in problem-solving.
- Convene ad-hoc industry councils to:
  - Identify regulatory barriers for emerging green industries.
  - Collaborate with state, city and county governments to harmonize regulations.
  - Develop best practices and standards for green industries.
  - Propose model language for local comprehensive plans, land use plans, and building codes.
- Help to create apprenticeship and continuing education programs for local inspectors and planning staff.

### **Research and development and demonstration**

While private funding from investors and corporations can help Washington compete in some of the more mature (deployable) green-industry markets, we need greater public support for research, development and deployment. And while Washington does have a strong base of research funding, the 2008 American Council for an Energy Efficient Economy (ACEEE) Energy-Efficiency Scorecard shows that Washington is lagging in research and development directed to energy efficiency. In fact, our state scored “zero.”

Government’s role has been in fundamental and applied research, but the public sector needs to become more involved in demonstrating and commercializing the research.

Although Washington’s universities have demonstrated excellence in many areas related to the green economy, they have weak ties to the private sector and do not commercialize research-and-development advances at a competitive rate.<sup>150</sup> The recommendations<sup>151</sup> of the Washington Economic Development Commission still hold true and are applicable to the green economy:

- Publicize and promote the opportunities fostered by the 2005 Ethics Act changes.
- Recruit entrepreneurial researchers and business leaders to Washington.
- Increase capital investment in entrepreneurial activities at state universities.
- Provide access to a database of inventions.
- Encourage a culture and reward structure for collaboration within our research institutions.
- Enhance entrepreneurial training for researchers, faculty and students.
- Establish and expand entrepreneur-in-residence programs.
- Increase technology-based economic development funding.
- Expand resources statewide for technology-based economic development activities, focusing on regional capacity building.
- Develop tax recommendations to promote entrepreneurial activity.

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<sup>150</sup> Washington State Economic Development Commission, “Enhancing Washington State’s Economic Future: Commercializing Technology Developed in our Research Institutions,” 2006.

<sup>151</sup> This is an abbreviated list of the commission’s recommendations.

## **Investments: angels and venture capital**

Washington must do more to commercialize its publicly funded intellectual property.

Martin Tobias, a member of the investor group Northwest Energy Angels, reports that, “Fully a third of the companies that come through Northwest Energy Angels come through the university system.”<sup>152</sup>

Investment is flowing in North America and is flowing to clean technology and green industry. The \$5.18 billion invested in North American and European clean-tech companies in 2007 was up by more than half from the previous year, according to The Cleantech Group LLC. This was the sixth straight year of growth. The top five sectors were energy generation, energy storage, transportation, energy efficiency, recycling and waste.<sup>153</sup>

Washington ranks third nationally for clean-tech investment in the number of deals and fourth in total investment dollars, as measured by the National Venture Capital Association. Using data from the first three quarters of 2007, the association placed Washington third in the number of deals behind California and Massachusetts. It ranked fourth in dollars behind the California, Massachusetts and Texas.<sup>154</sup>

According to Rebecca Lovell, the program director for the Alliance of Angels in Seattle, that breaks down to the following investment per energy deal in Washington state:<sup>155</sup>

- \$ 23.55 M Storage
- \$ 22.25 M Transportation
- \$ 8.7 M Efficiency
- \$ 17.11M Recycling/waste

Efficiency has the highest *number*, with 41 deals. Angel investors tend to get involved in the more capital-efficient, technology-driven industries that are foundational technologies, not necessarily specific to the clean-energy sector. Energy-efficient motors, virtual IT solutions reducing server-farm energy use and nanotechnology in medical devices generating better illumination and lower energy output are just a few examples.

Because money flows to the greatest return with the least risk, government’s intervention is most needed to entice angels to invest in less-attractive ventures, at the technology development and demonstration stage.

The state needs to find ways to support the riskiest green industries in their earliest stages, to encourage angel investment. Some bridging action is needed to better join university discoveries with angel investment.

## **Support for utilities**

Traditional rate regulation in Washington state is largely based on after-the-fact regulation, rather than pre-approval. Consequently, a regulated utility (which serves less than 1/2 of the state’s customers) can invest in new technology, but take some risk that the Utilities and Transportation Commission (UTC) may find that those investments were not prudent.

Washington state has no policy, incentive or support for organized large investment by utilities.

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152 Puget Sound Business Journal (Seattle), February 18, 2008. <http://seattle.bizjournals.com/seattle/stories/2008/02/18/focus9.html>

153 *Ibid.*

154 *Ibid.*

155 Angel Network, Rebecca Lovell, Seattle, Wash.

Today, utilities know what new technology makes good economic sense because they are required to develop a very detailed integrated resource plan<sup>156</sup>. The UTC recognizes but doesn't formally approve these utility plans. Generally, utilities have a good chance of recovering research-and-development (R&D) and demonstration. However, more-expensive, long-term technologies may require financing through rates. The UTC is much less likely to approve these investments to be financed by ratepayers.

In sum, it is very difficult for investor-owned utilities to invest in long-term R&D and demonstration.

The IEA chart, Energy Research and Development Budgets, IEA Members, 1974–2006<sup>157</sup> is provided in the appendix of this report.

There has been some discussion<sup>158</sup> about allowing investor-owned utilities to establish a systems-benefit charge (a non by-passable tariff) for funding R&D investments. One model includes forming a Sustainable Energy Trust to fund distributive generation projects below one megawatt. Utilities would form an organization, “tax” their customers and pool funds for R&D. A board made up of the partner agencies (public and investor-owned utilities) would screen the R&D proposals related to renewable energy and energy efficiency.

### **Large-scale public demonstrations**

Green-industry leaders and investor-owned utilities argue that a key element to research and development is scale. There is a need for one or more large-size demonstrations of emerging technologies to test synergistic systems at scale.

Large-scale public demonstrations can provide a platform for building builders and owners to deploy smart technologies in buildings and to integrate water reclamation, heating/cooling and a diversity of renewable energy, and to create integrated infrastructure to match the electrical grid. Scaled-up and integrated demonstrations also will reveal permit and regulation conflicts that are untested in smaller scenarios.

These demonstrations provide “future proofing” and reduce risk for mass deployment. Perhaps equally important, large-scale public demonstrations capture the public imagination and provide incredible marketing opportunities for the state.

In the 1980s, the Northwest undertook a demonstration project to test the full potential of energy efficiency in a model community, Hood River, Oregon. Involving most residences, the project validated that efficiency could be a significant energy resource and spurred efficiency programs not only in the Northwest but across the United States.

Unfortunately, the United States’ largest test of a smart-grid deployment began this year under the auspices of Minneapolis-based utility Xcel Energy in Boulder, Colorado, not the Northwest.

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156 Formerly known as a “least-cost plan.”

157 International Energy Agency (IEA), online database, <http://wds.iea.org/WDS/ReportFolders/ReportFolders.aspx>, accessed February 25, 2008.

158 House Bill 2400 (2006), sponsored by Rep. Jeff Morris. Note: Another variation of this legislation will likely be introduced in the 2009 session and the bill will likely include not only electric but also natural-gas utilities.

## Climate Benefit Districts – Large-Scale Demonstration

The climate benefit district (CBD) concept is designed to provide local options to address climate change with integrated responses. It is designed to leverage community-level opportunities and provide replicable strategies.

A CBD is a neighborhood-level response integrating the essential components of livable, climate-friendly urbanism, providing:

- Walkable, transit-supported neighborhoods.
- Jobs-to-housing balance, including a mix of uses and incomes.
- Open space and green infrastructure.
- High-performance buildings.
- District-level energy and resource systems.

In concept, a city or county could create a CBD within the urban-growth area, applying sustainable-development criteria to a defined geographic area through a public process. Criteria might include:

- Neighborhood design standards aligned with LEED® ND.
- Systems and programs to maximize water conservation.
- High transit connectivity and low per-capita VMT.
- Density minimums and standards for mixed uses and affordability.
- Building efficiency in line with Architecture 2030 to reach carbon neutrality.
- Access to local, organic food and open space.

Use of recycled and local materials for new construction

With a commitment to meeting the criteria and a net reduction in per-capita greenhouse-gas emissions, a CBD would offer:

- Access to capital for high-performance, district-level infrastructure and shared facilities.
- SEPA preference, reduced risk and future proofing for high-quality private development.
- Financial and development incentives (density bonuses, tax credits, etc.).
- Verifiable, investment-grade performance eligible for carbon markets and ESCOs.
- Access to public development authority strategies, including public finance tools.

Building owners and developers in the area are engaged in retrofit and greenfield projects which create green intelligent buildings capable of partnering with the grid.

## Green Enterprise Zones – Large-Scale Demonstration

The “green enterprise zone” concept is modeled on the U.S. Department of Agriculture’s (USDA) Rural Empowerment Program. This comprehensive, long-term, strategic program is based on four principles:

- A strategic vision for change.
- Economic opportunity.
- Sustainable community development.
- Community-based partnerships.

Since the program’s inception in 1993, the USDA has created 57 empowerment zones with 100 champion communities. More than 28,000 jobs have been created or saved in the empowerment zones, and an aggregate of \$17 has been raised for every \$1 that has been granted.

If created, a green enterprise zone would be a geographic area of green economic business activity including, but not limited to, manufacturers in the green economy, green research-and-development companies, green service providers and green-building design.

The truly unique feature of the green enterprise zone would be large-scale deployment of state-of-the-art clean technology and efficiency. Site infrastructure in green enterprise zones will use technologies in green-building design, mixed-use site efficiencies, renewable energy, water conservation, symbiotic manufacturing/industrial processes, etc.

To further reduce carbon emissions, green enterprise zones would be located in proximity to major transportation corridors to maximize access, freight mobility and alternative modes of transportation.

In addition to the expected economic benefits, the state could collect a percentage of revenue from patents or new technology from green enterprise zone to repay state grants, loans and bonds.

To establish green enterprise zones, there are local and state roles. The state would need to develop a mix of incentives, ranging from B&O tax relief to workforce training grants to export assistance. Local government would need provide incentives as well, which could include streamlined review and approval for development and construction or property-tax abatement based on number of employees, etc.

## Local Economic Development

### Cluster strategies

Prior to launching the Climate Change Challenge, Governor Gregoire presciently directed Washington's economic development and workforce development systems to *“develop a plan to support coordination at the state and regional levels, with a special emphasis on key economic clusters.”*<sup>159</sup>

This emphasis on cluster industries is well suited to the growth of a green economy, as cluster theory assumes place-based economic development. It is a tactic that recognizes that different locations have different advantages and disadvantages for particular industries (natural resources such as agriculture or forestry, physical infrastructure such as electrical generation or rail, research institutions such as the Washington state University). When a cluster forms, economic concentrations emerge where conditions favor a given industry.

Economic growth is most likely to occur where there are clusters because:

- There is already a concentration of industry firms
- The geographic location is advantageous to the industry's growth
- There is a concentration of the specialized resources, including workers and industry research

Thus, *“Clusters are where economic growth is most likely to occur and where innovation is most likely to begin.”*<sup>160</sup>

Fostering green-economy clusters will help the state avoid smokestack-chasing. Clusters, as opposed to individual firms, are more likely to generate sustainable growth because they are distributed among communities and rely on natural strengths.

However, some local communities will need state assistance to identify and build green clusters. Without technical analysis, it is difficult to identify existing local assets, shift them or enhance them. Cluster mapping and management is especially helpful for entrepreneurs and small businesses so they can find a place in local supply chains or develop complementary expertise. State support also is needed for investments in joint marketing and workforce training partnerships.

A concentration on clusters will help industries make the transition. For example, solar and wind manufacturing are logical extensions of our existing information technology and advanced manufacturing industry clusters. Likewise, bioenergy is a logical extension of our agriculture and forest-industry clusters. However, these transitions are not always easy. Firms will need to retool, and this will require access to capital, confidence that an enduring market exists and technical assistance. Local economic developers will require help from the state.

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<sup>159</sup> Key actors in this alignment include the Higher Education Coordinating Board (HECB), the State Board for Community and Technical Colleges (SBCTC), the Employment Security Department (ESD), Associate Development Organizations (ADOs) and workforce development councils (WDCs).

<sup>160</sup> Workforce Education and Training Coordinating Board, “Skills for the Next Washington,” October 2008.

**Sector**

A group of industries with similar business processes, products or services, such as construction or health services, as categorized by the North American Industry Classification System (NAICS). Example: the transportation sector.

**Industry**

A specific grouping of firms with highly similar business activities. Example: the renewable-energy industry.

**Cluster**

A geographic concentration of interdependent competitive firms that do business with each other. It includes upstream suppliers of inputs – such as firms that supply materials and equipment – as well as downstream customers. A cluster also includes related entities that shape the environment within which the industry operates, such as government regulatory bodies. Example: the Grays Harbor biomass cluster.

**Small business**

Small businesses need access to information and networked systems in order to participate in the green economy. Detailed, upfront industry information is crucial. Businesses – especially small businesses – have to be assured that there is a market. State government can assist with cluster mapping, diagnosing green-economy supply chains and helping small suppliers engage in large international markets.

Create a “New to Export” program to target smaller firms looking to expand their green products and services, or join a component manufacturing supply chain. This program would provide customized market research, tailored export market plans and targeted export promotion to all companies looking to enter the export market; this would especially benefit clean-tech companies, as they would gain special access to a growing international market.

- Create a level playing field for MWBEs and small businesses
- Promote and facilitate outreach to MWBEs by support agencies
- Initiate an online forum for MWBEs and small businesses to collaborate, knowledge share and jointly bid on large contracts
- Develop a framework for identifying and nurturing Green Economy “gazelle” companies with a focus on those owned by people of color and women
- Simplify and reform the certification process for MWBEs
- Broaden the mandate of the Office of Minority and Women Business Enterprises
- Hold a state-wide minority Green Economy conference
- Create a Green Economy Unit within CTED with a primary focus on reaching out to minority- and women-owned businesses

## **Open for business - conclusions**

The state's green policies must be strong, incontrovertible and signal a long-term, deep commitment to change. Furthermore, to be "open for business," Washington must:

- Update the State Energy Policy and develop a state energy strategy.
- Develop a comprehensive economic analysis of the green economy and attempt to calculate net productivity.
- Have Employment Security Department continue to survey the green labor market, every two years, to measure employment and industry trends.
- Lead and create a broad-based and comprehensive communications and marketing plan.
- Maintain a strong commitment to greenhouse gas reduction targets and the WCI Cap and Trade framework.
- Use procurement policies to increase the early adoption of green products and provide a central organization to help aggregate the efforts of local governments.
- Create supportive policies and incentives for utilities to organize large infrastructure and research investments.
- Consider sponsoring one or more large-size demonstrations of emerging technologies to test synergistic systems at scale (Climate Benefit Districts and Green Industry Zones).
- Do more to commercialize publicly funded intellectual property, by supporting green products and processes in their earliest stages and better-joining public discoveries with angel investment and the private sector.
- Support and incent the Washington's Innovation Partnership Zones (IPZs) focused on green industry and technologies.
- Identify the regulatory barriers that face new activities and work to smooth the way and reduce risk.
- Educate and train the Associate Development Organizations (ADOs) and Small Business Development Centers (SBDCs) and local governments regarding the green economy and State environmental policies.
- Develop and support joint marketing and business recruitment (Team Washington is an excellent prototype).
- Help to create localized networks of processors and end markets for green products, such as biofuels and recycling / remanufacturing. Revisit the former Clean Washington Center, as a model.
- Help homegrown businesses to expand into the export market by providing customized market research, tailored export market plans, and targeted export promotion.
- Broaden the mandate of the Office of Minority and Women Business Enterprises (MWBE) and simplify the certification process for MWBEs

## Finance

An effective global adaptation financing strategy is clearly needed. And a federal strategy is long overdue. But Washington state can wait on neither. To jumpstart the green economy, state involvement is crucial.

There are appropriate and important roles for government in the finance of:

- Research and development.
- Capital.
- Consumer incentives (create access and increase participation).
- Market-development programs.

And these roles can be expressed through:

- Tax incentives.
- Grants and loans.
- Organizing commercial finance models.
- Generating revenue through cap and trade

### The Developmental Cycle of Finance and Firms

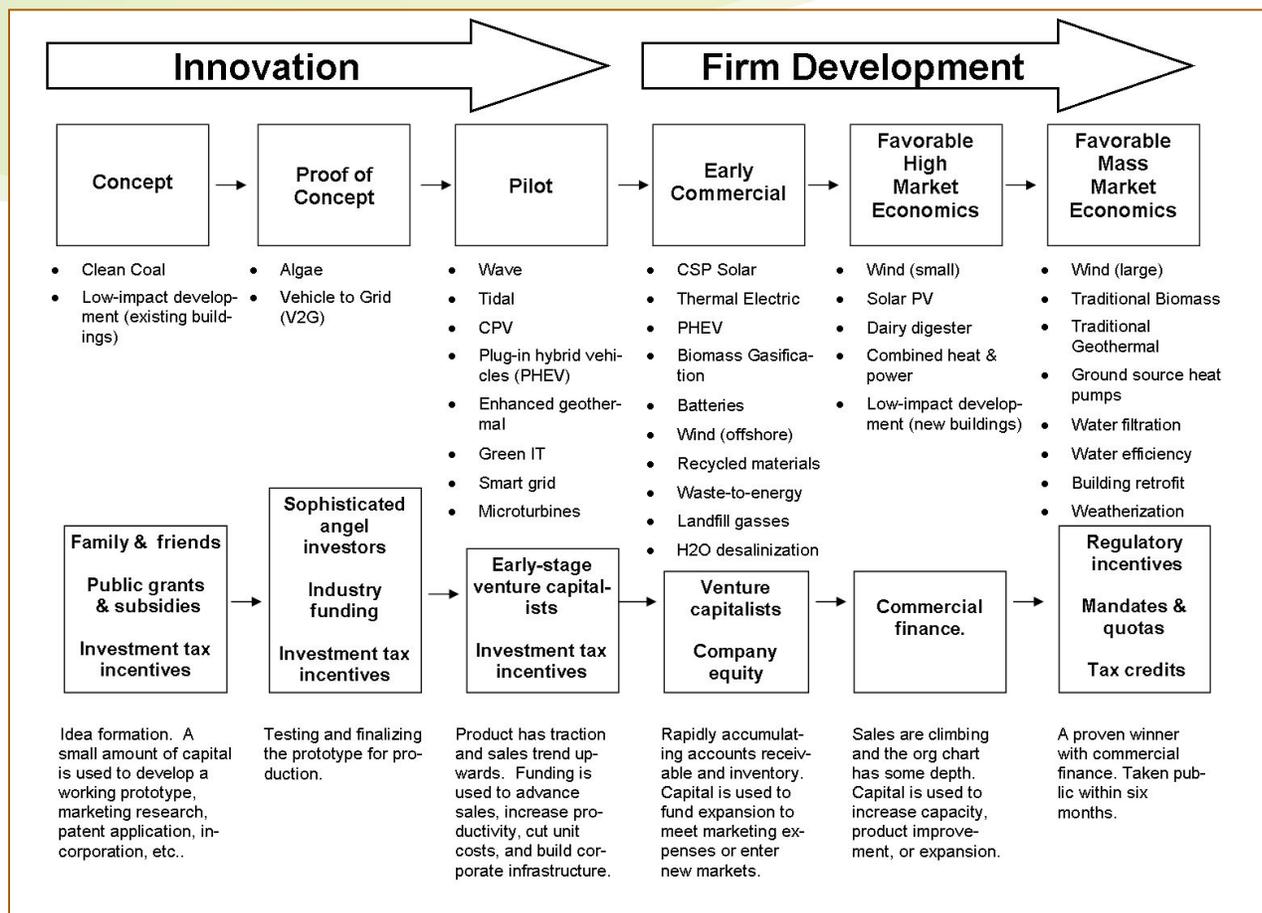
The slide on the next page is a reasonable, but not perfect or complete, representation of Washington's green-economy activities, arranged by their stage in the development cycle.

At the mature end, tax credits work well. But at the front end, direct government funding is required. New green-economy technologies are not yet self-sustaining. We have weaknesses both in the supply and the demand.

The state can play a role in what is widely referred to as the “valley of death,” where the investment gap is acute in the pre-commercial gap between pilot and early commercial. To a lesser degree, but also significant, is the pre-IPO gap, in the early stage of market development before full-scale market entry, when traditional banking finance can assist. There is a role for government in each stage of development.

For example, the benefits of research, development and demonstration (RD&D) are realized over a horizon—at least five to 10 years and as long as 20 to 30 years. States can and should contribute to the RD&D process at all stages, providing targeted assistance when it is most needed. Because energy projects are capital intensive, they are especially vulnerable to what's known as the “Valley of Death”—the funding gap between development and deployment that can halt initiatives before they get off the ground.

**Chart 10. Washington Green Industries Market Readiness**



## Capital

Our economy's "capital stock" includes everything from buildings, factories, manufacturing equipment, appliances and vehicles, to transportation, water, and energy and power infrastructure.

Creating a green economy will require comprehensive investment over many years to transform our capital stock to provide far greater efficiency and far less generation of wastes and greenhouse-gas emissions. Thousands of Washington state firms (notably energy, technology, building and manufacturing) will make substantial new investments of capital in response to change drivers previously discussed.

This is a tremendous, long-term, systemic challenge. To make the transition to a green economy, state government needs to assist these firms. There is an appropriate role for the state to develop and implement programs that target and deliver financing for green-economy projects and equipment. This also may include exploiting our trade advantage by encouraging foreign direct investment<sup>161</sup> in capital-intensive green industries.

<sup>161</sup> Foreign Direct Investment (FDI) occurs when a company from another country makes a physical investment to build a U.S. factory or acquires a lasting interest in a U.S. firm. In general, the FDI relationship consists of a parent enterprise and a foreign affiliate which together form a multinational corporation. The investment must afford the parent enterprise control over its foreign affiliate.

## Cap-and-trade emission allowances

Too many people assume that a cap-and-trade framework will fund the initiatives needed to launch a green economy. In the near-term, this is **not** realistic.

It is true that the Western Climate Initiative (WCI) has chosen to initially auction a portion of emission allowances, which will generate revenue for each jurisdiction – and jurisdictions may distribute part of their emission allowance budgets to economic sectors or activities of interest.

The WCI has agreed to set, in the near future, a minimum percentage of allowance budget or auction revenues for the following activities:

- Energy-efficiency and renewable-energy incentives.
- Research, development, demonstration and deployment of carbon capture and sequestration; renewable-energy generation, transmission and storage; and energy efficiency.
- Promoting emission reductions and sequestration in agriculture, forestry and other sectors not covered by the emission cap.

However, while the WCI cap and trade program will eventually generate significant revenue, this will not happen immediately.

- Reduction of the emission cap begins in 2012 and will be gradually reduced to give businesses and consumers time to adjust.
- The program has been designed to keep allowance prices at “reasonable levels.”
- Only a fraction of emission allowances will initially be auctioned.

In a cap-and-trade scenario, in which activities are subject to a price on carbon, Washington’s green industries are more likely to compete on economics alone. Until then (2012), growth in key sectors will slow or will lose their position for global prominence without research investment, tax credits and organized commercial finance.

Because a number of significant details have to be worked out at both the WCI and state levels, it is currently not feasible to make a reliable estimate of future emission allowance revenues or the level of investment in clean technology. Washington state should **not** wait for cap-and-trade proceeds to fund research and development, production subsidies or purchasing incentives.

## Washington Growth Fund

The Washington Economic Development Commission, reorganized by the Governor and the State Legislature in 2007, is the body primarily charged with the state's strategic planning for economic growth. As of November 2008, the commission was still drafting its first strategic plan. However, one preliminary recommendation from its Investment and Entrepreneurship Work Group is:

### **Establish a Washington Growth Fund**

*In order to ensure that leading-edge technology sectors have access to sufficient capital to advance technologies to commercial viability, it is recommended to create a Washington Growth Fund for the purpose of investing in early stage Washington-based companies with proven technologies and high commercial potential. This fund would be created by the state in partnership with the Washington State Investment Board, which will invest in a diversified portfolio of venture funds that commit to invest time, energy and capital to fund Washington-based companies. Additional legal and empirical review is needed before it is presented formally to the Governor and Legislature, particularly to address constitutional restrictions on state guarantees and credit pledges and the long-term economic benefit.”*

## **Consumer incentives**

Much of the problem with clean technologies is that consumer incentives are provided over a period of time and not up front. There is a significant cash outlay to the consumer.

Even the most economically comfortable and environmentally active individual will be somewhat taken aback at the solar system installation price ranging from \$20,000 to \$100,000. Yet, this is, in fact, the cost of installing solar cells adequate to power a small- to mid-sized home in Western Washington. There is a payback to such an installation, but it is a long one: 20 to 30 years.<sup>162</sup>

A typical case study is a photovoltaic system installed in a residential home will supply 50% of the home's electricity. However, installation costs \$90,000 (or \$62,000 after the 30% federal credit). In this scenario, the system takes 36 years to pay for itself. If an increase in property value is assumed, it could be paid off in 28 years. The actual estimated useful life of the system is 25 years.<sup>163</sup>

Clearly, Washington needs to promote finance programs to address these barriers in order to accelerate market development.

## **Market development**

The state has a role in accelerating the deployment of new products. An obvious case study is the solar-power market. In 1996, U.S. manufacturers had a 44 percent market share worldwide. By 2005, we slipped to 9 percent, lost mostly to Germany, which adopted a very aggressive marketing and consumer adoption policy.

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<sup>162</sup> Institute for Environmental Research and Education, "Pacific Northwest Energy Independent Communities: A 10-year Plan," July 2005. [www.iere.org](http://www.iere.org)

<sup>163</sup> Case study provided by CTED's Energy Policy Office. Greg Nothstein. January 2009. A solar price estimator can be found at <http://www.solar-estimate.org/index.php?page=solar-calculator>

This international case study has domestic parallels as well. ECONorthwest found that Oregon has recruited a tremendous amount of renewable energy industries. With the use of strong policy and an aggressive tax incentive program, over the next 15 years industries the industries that have been recruited by Oregon will create nearly 2,100 new jobs, boost economic output by \$178 million and cut energy costs by \$60 million.<sup>164</sup>

*“Whether for political or competitive reasons or both, Washington and Oregon have not come together to form a cohesive strategy, either for public policy direction or business development, to map out the region’s clean-tech future. As noted above, the Northwest boasts an impressive range of assets to build on as it moves toward the goal of carbon-free prosperity—with many pieces of strong political and business leadership in place. But without a comprehensive clean-tech strategy for the region, strong assets and good intentions are destined to result in piecemeal, uncoordinated efforts that fall short of the region’s ambitious goals.”*

“Carbon-Free Prosperity 2025.” Climate Solutions Inc. & Clean Edge, Inc., October 2008.

Although Washington ranked sixth on the American Council for an Energy Efficient Economy (ACEEE) efficiency scorecard, we lag behind Oregon in part because that state offers tax incentives for investments in energy efficiency. Until Washington is able to level the playing field, this border leakage will continue. Washington must be able to compete evenly with Oregon to form a powerful, regional, renewable-energy cluster. Due to Washington’s tax system (B & O tax and the lack of an income tax), it is unlikely that a tax incentive alone will level the playing field. Rather, it will require a broader menu of strategies such as systems benefit charges, state development funds, and other ideas discussed elsewhere in this framework.

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<sup>164</sup> EcoNorthwest, “Economic Impacts of Oregon Energy Tax Credit Programs in 2006,” May 2007.

## Beating Betsy - Oregon's Business Energy Tax Credit

The state of Oregon provides a subsidy of 25-35 percent of project costs!

### How BETC works

First, it is notable that the Business Energy Tax Credit (BETC) is applied to a very wide range of green economy activities – energy efficiency, renewable energy, transportation projects, fuels cells, combined heat and power, recycling, and sustainable buildings.

Oregon businesses investing in these green economy projects in Oregon can claim a (BETC) equal to 35 percent of eligible project costs (with eligible costs capped at \$10 million). And now, with recent modifications made by the Oregon Legislature, some renewable energy projects can qualify for a 50 percent tax credit!<sup>1</sup>

The 35 credit is taken either:

1. Over five years (10 percent in the first two years and 5 percent for the next three years).
2. Discounted, lump-sum, up-front cash payment from a “pass-through” partner in exchange for the five-year credit.

The pass-through option is designed to allow tax-exempt entities (e.g., schools) to benefit from the BETC by exchanging the tax credit with taxable businesses able to use the credit, and that is primarily how it has been used to date.

Even taxable entities, however, may choose to seek pass-through partners and take the BETC as a lump-sum cash payment. The pass-through cash payment is currently equal to 25.5 percent of eligible project costs (as opposed to 35 percent of eligible costs for the five-year tax credit), a discount that is set by the Oregon Department of Energy (which administers the BETC) and is revisited annually.

### How Washington can compete

Washington currently does not operate any tax programs based on project costs. Rather, our B&O tax credit programs are based on the credit on new employees and certain expenses, like research and development. However, there is no reason that Washington's B&O credit could not be based on a percentage of initial capital investment.

Oregon does not have a sales tax. In competing with Oregon, a sales-tax exemption merely puts Washington on a level field with respect to taxes on initial costs. Washington could give a B&O tax credit equal to 25-35 percent of the initial capital investment, to match Oregon's 25-35 percent income-tax-credit program. This would avoid complicated buying, discounting and net-present-value calculations.

However, in general, a B&O tax is a better incentive for industries competing in mature markets. Start-ups, or emerging industries, see less benefit in B&O tax relief unless the credits can be sold or traded. Washington could sweeten the deal by lowering the B&O rate in addition to offering a credit.

### Case study: “Where did our solar power projects go?”

Although solar energy is forecasted to be a major source of revenue and jobs for Washington state, the fact remains that Washington state has not landed a significant solar manufacturer since REC’s location in Moses Lake in 2002. However, more than 19 site searches on behalf of prospective investors have been conducted by the state and Washington economic development organizations over the past year.

The Business Recruitment unit of the International Trade office of Washington’s Community, Trade and Economic Development Department reports that, in addition to the recruitment efforts documented in the grid below, over the last five years there have been 12 additional requests for information submitted for other potential solar power projects.

**Chart 11. Solar-Power Recruitment Cases**

Company	Origin	Who got them	Investment & jobs lost	Incentives offered
Sanyo Electric	Japan	Salem, OR	\$80 million in plant investment; approx. 200 new jobs created.	Oregon provided \$20 million in BETC (Business Energy Tax Credits).
SolarWorld	Germany	Hillsboro, OR	\$400 million in plant investment; approx. 1,000 new jobs created.	Oregon provided the project \$40 million in BETC and \$1 million from the Strategic Reserve Fund for workforce training.
Schott Solar	U.S.	Albuquerque, NM	\$100 million in plant investment; approx. 350 new jobs created initially. There are plans for an additional \$400 million in investment and 1,000 additional jobs by 2012.	Schott received over \$1.8 million in job-training incentives. New Mexico was expected to allocate \$8 million toward the construction of Schott’s new plant. Schott also will be eligible for other financial incentives, such as tax credits equal to 10 percent of the wages and benefits for each new high-wage job that is created.
Evergreen Solar (2007)	U.S.	Quincy, MA	\$150 million capital investment in manufacturing plant; approx. 350 jobs created.	Massachusetts gave \$23 million in grants; up to \$17.5 million in low-interest loans; and a low-cost, 30-year lease of MTC land.
Evergreen Solar (2008)	U.S.	Midland, MI	\$55.2 million in new capital investment; 101 new jobs created over the next five years.	The Michigan Economic Growth Authority (MEGA) approved a state tax credit valued at \$1.8 million over 10 years. The city of Midland has approved a 12-year abatement worth \$3.9 million to support the project.
Hemlock Semiconductor Corp.	U.S.	Hemlock, MI	\$1 billion in plant investment (expansion); approx. 500 new jobs created. This project was an expansion of an existing Michigan company.	Michigan legislature approved an incentive package that could result in \$20.6 million to \$35.2 million a year from 2012 to 2021.
Solaicx	U.S.	Portland, OR	\$52 million in plant investment; approx. 100 new jobs.	Oregon provided \$9 million from BETC.

Chart prepared by CTED, September 2008.

**Chart 12. Washington's Green-Economy Incentives**

RCW	Incentive	Technologies	Expiration	Applicability
<b>Business &amp; Occupation Tax</b>				
<a href="#">82.04.260(1)</a>	Reduced B&O rate of 0.138 percent	Alcohol fuel, biodiesel fuel (1), biodiesel feedstock, wood biomass fuel	Biodiesel fuel and feedstock expire 7/1/2009; no expiration for alcohol and wood biomass fuels	Manufacturers
<a href="#">82.04.294</a>	Reduced B&O rate of 0.2904 percent	Photovoltaic modules, solar grade silicon	Expires 6/30/2014	Manufacturers and wholesalers
<a href="#">82.04.4334</a>	Income deducted from B&O tax	Biodiesel fuel (1), E85	Expires 7/1/2015	Retailers and distributors
<a href="#">82.04.4335</a>	Income deducted from B&O tax	Wood biomass fuel	Expires 7/1/2009	Retailers and distributors
<b>Retail Sales Tax</b>				
<a href="#">82.08.0205</a>	Exemption	Biodiesel (not defined)	No expiration	Waste vegetable oil to produce biodiesel for personal use
<a href="#">82.08.02567</a>	Exemption	Fuel cells, wind, sun, landfill gas	Expires 6/30/2009	Machinery and equipment used to generate not less than 200 watts
<a href="#">82.08.809</a>	Exemption	Clean alternative fuel vehicles	Effective 1/1/2009 to 1/1/2011	New passenger cars, light duty trucks, medium duty passenger vehicles
<a href="#">82.08.835</a>	Exemption	Solar hot water systems	Expires 7/1/2009	Equipment, installation, repair and association services for solar water-heating systems, collectors, exchangers, controllers
<a href="#">82.08.865</a>	Exemption	Biodiesel fuel (2)	No expiration	Non-highway use by farm-fuel user, does not include space or water heating for human habitation
<a href="#">82.08.900</a>	Exemption	Anaerobic digesters (primarily manure)	No expiration	Construction, repair, operation and associated services
<a href="#">82.08.955</a>	Exemption	Biodiesel blend, E85	Expires 7/1/2015	Machinery, equipment, delivery vehicles and associated services used in retail sales
<a href="#">82.08.960</a>	Exemption	Wood biomass fuel blend	Expires 7/1/2009	Machinery, equipment, delivery vehicles and associated services used in retail sales
<b>Use Tax</b>				
<a href="#">82.12.0205</a>	Exemption	Biodiesel (not defined)	No expiration	Waste vegetable oil to produce biodiesel for personal use

<a href="#">82.12.02567</a>	Exemption	Fuel cells, wind, sun, landfill gas	Expires 6/30/2009	Machinery and equipment used to generate not less than 200 watts
<a href="#">82.12.865</a>	Exemption	Biodiesel fuel (2)	No expiration	Non-highway use by farm-fuel user, does not include space or water heating for human habitation
<a href="#">82.12.900</a>	Exemption	Anaerobic digesters (primarily manure)	No expiration	Personal property and associated services used in establishing and operating
<a href="#">82.12.955</a>	Exemption	Biodiesel fuel (1), E85	Expires 7/1/2015	Machinery, equipment, delivery vehicles and associated services used in retail sales
<a href="#">82.12.960</a>	Exemption	Wood biomass fuel blend	Expires 7/1/2009	Machinery, equipment, delivery vehicles and associated services used in retail sales
<b>Public Utility Tax</b>				
<a href="#">82.16.110</a>	15¢/kWh payments, multipliers for in-state manufactured solar and wind components, up to \$2000/yr	Solar energy systems, anaerobic digesters, wind generators	Expires 6/30/2014	Individuals, businesses and local governments with grid-intertied renewable-energy systems installed on real property
<b>Leasehold Excise Tax</b>				
<a href="#">82.29A.135</a>	Six-year exemption following date operational	Alcohol fuel, anaerobic digesters, biodiesel fuel (1), biodiesel feedstock, wood biomass fuel	Expires 12/31/2009; except anaerobic digesters expire 12/31/2012	Buildings, machinery, equipment and other personal property; land on which this property is located, not including growing of crops
<b>Property Tax</b>				
<a href="#">84.36.635</a>	Six-year exemption following date operational	Alcohol fuel, anaerobic digesters, biodiesel fuel (1), biodiesel feedstock	Alcohol fuel, biodiesel fuel and biodiesel feedstock expire 12/31/2009; anaerobic digesters expires 12/31/2012	Buildings, machinery, equipment and other personal property; land on which this property is located, not including growing of crops
<a href="#">84.36.640</a>	Six-year exemption following date operational	Wood biomass fuel	Expires 12/31/2012	Buildings, machinery, equipment and other personal property; land on which this property is located, not including growing of crops

### How Do We Compare with Other States?

The Interstate Renewable Energy Council maintains a Database for State Incentives for Renewable and Efficiency (DSIRE) at <http://www.dsireusa.org/>. This database is searchable by state and by program for federal, state, local and utility incentives.

A summary of comparative tax programs in the Northwest and California is attached to this report as an appendix.

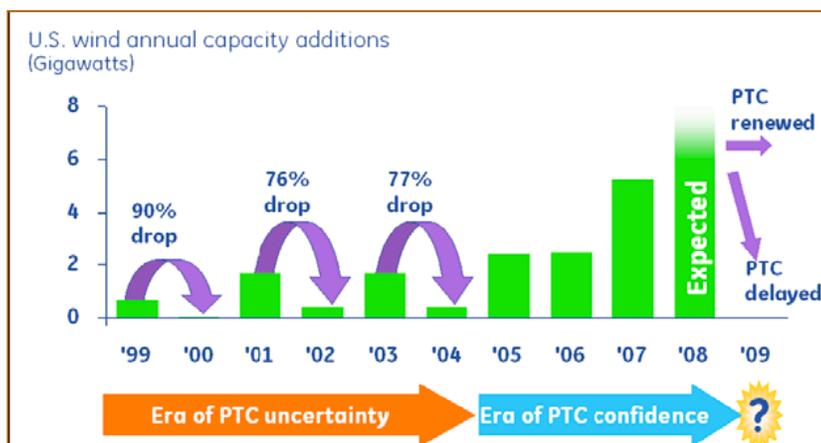
### Extending expiring tax incentives

As detailed in the chart above, four of Washington's first biofuels tax incentives, adopted in 2003, are set to expire in 2009. These include B&O reductions and deductions, retail and use-tax exemptions, and six-year property and leasehold excise-tax exemptions. Likewise, an important sales tax incentive for fuel cells, wind, solar and landfill-gas energy systems will sunset in 2009. The Joint Legislative Audit Review Committee (JLARC) reviewed the expiring incentives in the summer of 2008 and supports their extension.

There is uncertainty around the long-term extension of the federal investment tax credit and production tax credit for renewables; at the time this report was prepared, the federal extension of the Investment Tax Credit and Production Tax Credit had failed under at least eight separate votes by Congress. This has taken its toll on the industry.

The chart below illustrates the self-defeating effect of unstable or poorly designed incentives. It shows the effect of the federal Production Tax Credit's instability on the development of wind energy.<sup>165</sup>

**Chart 13. Stable renewables policy creates the environment for sustained growth**



165 Steve Taub, "GE Energy Financial Services Study: Impact of 2007 Wind Farms on U.S. Treasury," GE Energy Financial Services, 2008.

## **Guidelines for creating tax incentives**

- Establish stable, long-term incentives to encourage firms to develop and deploy new green-economy activities (R&D, capitalizing new equipment and facilities, expansion, etc.).
- Provide sufficient incentives and support to improve the cost efficiency of selected key technologies. Evaluate the level of risk at each stage of innovation and firm development, and incentivize accordingly. Refer back to the “Market Readiness” chart.
- Evaluate models that exist elsewhere.
- Phase out subsidies for industries that pollute or use natural resources inefficiently.
- Look for an existing, related Washington state tax program that could simply be expanded to include green-economy activities and industries.
- Seek exemptions and deductions, which are easier to administer than credits.
- Tie required documentation of eligibility to third-party documentation (e.g., an exemption based on LEEDS certification).
- Use an existing data base<sup>166</sup> to determine eligibility that can be used to establish who is eligible (e.g., industry or job codes or green-economy definitional list).

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<sup>166</sup> The results of Employment Security Department’s labor-market analysis are crucial to the design of tax incentives. While the Green-Economy Definition List provided in this report is a useful guideline for understanding the green economy, ESD’s identification of industry and job codes will be essential for constructing a tax program.

## Department of Revenue Principles for Tax Proposals

The following principles of sound tax policy should be considered when evaluating funding ideas to increase a current tax rate or to impose a new tax:

- Adequacy.
- Simplicity.
- Equity and fairness.
- Economic neutrality.

### **Adequacy**

A tax should raise sufficient revenue to cover costs. Adequacy requires that the amount of revenue collected over time be relatively constant, predictable and capable of producing the desired revenue.

### **Simplicity**

The tax should be easy to understand and be economical for taxpayers and governmental entities to administer. The greater the complexity, the greater the burden is on taxpayers who must comply with the tax and on the agency that administers the tax. Taxpayers will spend more time and money to determine reporting obligations and how to reduce the tax burden. The administering agency will require additional resources for administration, such as increased staff, enforcement, collection and potential litigation.

### **Equity and fairness**

Includes the elements of horizontal equity, vertical equity, and benefits received:

- Horizontal equity requires that similarly situated taxpayers receive the same treatment.
- Vertical equity is a person's ability to pay the tax and is related to whether a tax is progressive, regressive or proportional.
- A benefit received is the concept that the taxes paid by a taxpayer are matched by the benefits received by the taxpayer.

### **Economic neutrality**

Market conditions and economic efficiency dictate business decisions rather than tax law. In other words, economic neutrality prevents behavior distortion by individuals and businesses. A tax that is broad-based with a low tax rate helps to achieve economic neutrality. A broad-based tax is one that has few exemptions, deductions and credits.

### **Streamlined sales-and-use tax agreement**

Conformity with this national agreement is another important criterion for the state of Washington. The state has been working to achieve full conformity with the Streamlined Sales and Use Tax Agreement, which provides for a simpler and more uniform sales-tax system across the nation. SSB 5089 (chapter 6, Laws of 2007) allows the state to fully conform to the agreement.

*Principles of Sound Tax Policy, Prepared by the Department of Revenue, Legislation and Policy Division, June 2008. Unpublished document, prepared upon request for CTED.*

## **Adapting today's tax programs for the green economy**

Washington's current tax programs can be readily adapted to include green-economy activities.

*“Strengthening state economies through the development of clean-energy industries can be best accomplished by using existing resources and expertise rather than starting from scratch. State funding or technical assistance can make it easier for firms to expand into clean-energy technologies, providing them with flexibility while preserving current jobs. Incentives such as tax breaks or matching funds can allow firms to expand into new areas that they otherwise may have avoided as too risky.”*

*Securing a Clean Energy Future: Opportunities for States in Clean Energy Research, Development and Demonstration. A Report for the National Governors' Association. March 2008.*

### **B&O credit for green-economy R&D**

Modeled after our high-tech B&O credit, this could be a credit equal to a certain percentage (1.5 percent) of the qualified R&D expenditures. R&D operating costs include equipment and the people who use the equipment, such as computers, lab equipment, engineers and scientists.

### **B&O credit for green-economy jobs**

Modeled after Chapter 82.62, which provides a B&O tax-credit program for new employees in certain industries in rural counties, this could be a credit (e.g., \$4,000) for employment compensation packages over a specified amount (e.g., \$40,000) for specified green-economy jobs. When the compensation package is less than the specified amount, there would be a reduced credit (<\$40,000, a \$2,000 credit). This green-economy jobs credit would not be restricted to rural areas.

### **Machinery and equipment sales-&-use tax exemption**

There are many opportunities in this program, from simply adding cogeneration machinery and equipment to the exemption, or applying the exemption to many or all qualifying green-economy-industry machinery and equipment. If applied broadly, the Department of Revenue believes that a separate law would be required.

### **Green-industry sales-&-use tax deferral**

Designed to defer and ultimately waive the retail sales tax and use tax on the initial capital costs of facility construction or expansion. There are currently five deferral programs. Three are restricted to manufacturing (although they include the R&D portion of the manufacturing facility), and one is restricted to high-tech R&D. It is recommended a deferral should be designed for green-economy industries, to cover both R&D facilities and manufacturing facilities. In such a case, Company A can build an R&D facility to discover an economical way to make biofuel from algae. Then Company A or Company B can use the same program when it sets up the related manufacturing facility.

## State Involvement in Commercial Finance Systems

There is an appropriate role for the state in organizing commercial finance and thereby jumpstarting the green economy. Public investment funding should be used within a commercial structure to leverage capacities, market players and commercial finance.

Washington can and should develop and implement programs that:

- Promote development that is consistent with the state's green policy goals. Connect with and support the recommendations of the Climate Action Team and the Puget Sound Partnership, etc.
- Are consistent with the Washington state fiscal system, budgetary constraints and legal requirements.
- Build on existing capacities and systems, both in the public and private sector.<sup>167</sup>
- Are scalable, leverage significant commercial participation, require a modest state expenditure and involve the state in a catalytic development role.
- Focus on projects that are economically and commercially attractive to the lenders and borrowers. Use state funds to share and mitigate risks where this will be instrumental to these target markets.
- Take a programmatic approach to project finance by including marketing and market aggregation plans.
- Plan complementary technical assistance programs to organize the market.
- Help to prepare projects for investment.
- Build capacities of commercial parties and find ways to fill gaps, roles or risks not assumed by others.
- Support local government initiatives. Local governments are developing green-job and climate initiatives of their own. Also, future state legislation may include emission-reduction targets and mandates for local governments. There is a demonstrated need and appropriate role for the state to assist local governments with:
  - Developing program designs.
  - Finance support.
  - Networking and sharing best practices.
  - Combining efforts in congressional lobbying.

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<sup>167</sup> For example, Washington has several financing authorities (for economic development, housing, health and higher education institutions). how can these be mobilized to offer financing for green-economy projects?

## Commercial Finance Models

A wealth of program models exists for green-economy and clean-energy financing. Here are a few samples of programs that mobilize commercial financing with modest amounts of government or public funding:

### State coordination with local government

- City-sponsored non-profit offers services to energy users, contractors and financial institutions to develop, finance and implement clean-energy and water conservation projects. Example: Cambridge (MA) Energy Alliance, which is targeting a 50 percent market participation and \$100 million in investments.
- Sustainable-energy financing district, where a city issues bonds, uses proceeds to provide loans to property owners for clean-energy systems and collects loan payments on the property tax bill. Example: *Berkeley (CA) Sustainable-Energy Financing District*

### Pooled bond financing through state bonding authorities

Use existing finance authorities to issue bonds to fund capital projects in education and healthcare institutions. Technical assistance is provided to institutions to prepare projects for investment. *Examples: Iowa School Facilities Corporation energy-efficiency finance program; Ohio Building Authority Higher Education Energy-Efficiency Finance Program.*

### Finance fund

Established by the state and funded by industrial-development bonds and/or cap-and-trade auction revenues. *Examples: Delaware Sustainable Energy Utility. All states in the Northeast Regional Greenhouse Gas Initiative (RGGI) system are considering this option.*

### Development and finance authority

Established by the state, this body could have responsibility for market development and finance programs covering all sectors and could:

- Organize markets.
- Establish a fund for public co-investment alongside commercial funding.
- Develop finance programs with existing authorities (WEDFA, WHEFA, WHFA).
- Develop and promote financing solutions with utilities and local governments.

## Assessment of Finance Options

To develop a coherent finance plan for public-private partnership, Washington needs a serious assessment of program design options. It is not sufficient to try to copy the models in other states.

Washington has a very unique set of circumstances (utilities, constitutional limits on lending, finance institutions, etc.) that demand a unique array of financial tools. An assessment is needed to:

- Conduct in-depth research on green economy finance program models being implemented by other states and local governments.
- Continue interviews with key public- and private-sector stakeholders.
- Develop initial program designs with legal, budget and market analysis to inform decision-making by legislative and executive officials.
- Models that should be evaluated include:
- Pooled bond issues for target sectors and use of existing bond finance agencies<sup>168</sup> targeting public-sector, private non-profit institutions (hospitals, colleges and universities), and residential and industrial borrowers.
- State Development Finance Authority for the green economy.
- City-based programs and methods for state government to support city initiatives.
- Utility-based finance programs, building on I-937 and other utility programs.
- Green-economy finance funds or lending facilities provided by commercial financial institutions, implemented in cooperation (and possible co-financing) with public agencies.
- State-initiated technical assistance and market development programs for the green economy.

### Finance – conclusions

Washington state should **not** wait for cap-and-trade proceeds to fund research and development, production subsidies or purchasing incentives. Rather, Washington should:

- Adapt and update existing tax programs for the green economy, ensuring that eligible activities include green-economy activities.
- Consider the creation of a “Washington Growth Fund” for the purpose of investing in early stage Washington based companies, as recommended by the Washington State Economic Development Commission.
- Encourage foreign direct investment in capital-intensive green industries.
- Reauthorize the four Washington biofuels tax incentives, as well as the incentive for fuel cells, wind, solar, and landfill gas energy systems.
- **Immediately** design and implement a tax program that will allow Washington state to compete against Oregon’s BETC.
- **Immediately** conduct an intensive assessment of commercial finance design options (pooled bond issues, finance authorities, city-based and utility-based, public – private co-financing, etc.)

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<sup>168</sup> State and local governments and other political sub-divisions.

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