October 2009

Green-Collar Jobs
Realizing the Promise

By Alan Durning and Jennifer Langston
with Lisa Stiffler and Roger Valdez
and research by Avi Allison and Jesse Burns

Sightline
INSTITUTE

SIGHTLINE INSTITUTE is a not-for-profit research and communication center—a think tank—based in Seattle. Founded in 1993, Sightline's mission is to bring about sustainability, a healthy, lasting prosperity grounded in place. Our focus is Cascadia, or the Pacific Northwest.

Alan Durning is executive director; Avi Allison is research intern; Jesse Burns is leadership intern; Jennifer Langston and Lisa Stiffler are researchers and Sightline Daily editors; and Roger Valdez is research associate.

You can learn more about Sightline at www.sightline.org and at Sightline's blog, daily.sightline.org/daily_score.

Sightline Institute
1402 Third Avenue, Suite 500
Seattle, Washington 98101

Contents

Green-Collar Jobs:
SUMMARY

The Promise

An Opportunity
Green-collar jobs can put us on the road to clean energy, economic recovery, and shared prosperity.

Defined and Counted
Green-collar workers devote their hours to boosting energy efficiency, increasing renewable energy, or reducing pollution.

Explained
Five reasons clean energy creates jobs:
1. Dollar for dollar, clean energy creates more jobs than fossil fuels.
2. Clean energy cushions the economy from volatile energy prices.
3. By reducing energy imports, clean energy locks in local job creation.
4. Clean energy improves trade balances and tempers financial shocks.
5. Clean energy reduces the financial risk of climate change.

Funded
The US federal stimulus efforts are already providing hundreds of millions of dollars to the Northwest states for clean energy and green jobs. Federal climate policy could bring similar amounts each year for decades.

The Plan
The biggest chance in the near term for green-collar job creation is in boosting energy efficiency in buildings.

Supply Workers
Two training strategies for green-collar jobs:
1. Focus on training programs that lead to credentials or certifications.
2. Create career ladders that link training, employment, and education.

Stoke Demand
Six lessons on successful programs for boosting energy efficiency in buildings:
1. Use smart marketing to educate property owners about energy efficiency.
2. Assemble partnerships; link organizations with shared interests.
3. Measure building energy use through audits and ratings systems.

4. Connect building owners with trusted contractors.
5. Create an "energy concierge" to guide property owners through the process.
6. Teach people to take advantage of their retrofits.

Secure Capital

Four solutions for financing energy-efficiency improvements in buildings:

1. Let building owners pay for retrofits on their utility or tax bills.
2. Use "green leases" and innovative strategies to unite the interests of landlords and tenants.
3. Offer family-friendly retrofit financing with conservation loans.
4. Use emerging tools to finance big projects that have long payback periods.

The Prize

To win the prize of shared prosperity through green-collar jobs that promote clean energy, the key is not one single thing; it's putting all the pieces together.

Green-Collar Jobs:
THE PROMISE

An Opportunity

"Green-collar jobs"—jobs dedicated to saving energy, producing renewable energy, or reducing pollution—can speed progress on two deeply rooted problems at once: easing our dependence on climate-warming fossil fuels and fostering lasting, broadly shared economic prosperity.

The challenge facing the Northwest, a region singularly equipped to lead a clean-energy revolution, is to realize that promise. It won't be easy.

The term "green-collar jobs"—which Sightline helped coin in 1999—describes the growing number of jobs focused on sustainable products or services: electricians installing energy-efficient lights, technicians and manufacturers making wind turbines, construction crews with caulk guns.[1] Though they can be found in all income brackets and industries, including public and community organizations, the majority are blue-collar jobs with a sustainable edge.

Green-collar jobs have tremendous potential to shelter our region's families and communities from an unstable economy. The global financial meltdown that began in 2008 revealed that the region's economic pillars had been sunk into shaky ground, as Northwest employers laid off breadwinners by the thousands. In the construction industry, no class of workers—from laborers hauling supplies to architects designing buildings—was immune from pink slips. Fortunately, creating jobs that save energy in homes and businesses, or that produce homegrown renewable energy, will boost employment while cushioning Northwest families and local businesses from the roller-coaster of volatile energy prices.

Green-collar opportunities have ripened over the past several years. A decade-long rise in energy prices, culminating in the severe gasoline price shocks of the summer of 2008, drove public concern about oil addiction and energy dependence to a level not seen since the oil shocks of the 1970s. And US federal stimulus programs are directing billions of dollars to states and local communities to boost energy efficiency, upgrade the power grid, develop renewable energy, reduce pollution, and better steward our natural resources.[2] Funding for low-income weatherization projects in Northwest states, for example, roughly doubled in 2009. And the US House of Representatives passed climate legislation in June 2009 that could provide billions of additional dollars to efficiency programs, while supporting clean energy development.

Large-scale public investments in the clean-energy economy—one based on renewables and energy efficiency—have ushered in what should be a swift and irrevocable transition away from fossil fuels. But the transition is not assured: it

may still get tangled in a set of persistent and stubborn market failures, institutional blockages, and information barriers. These obstacles have thwarted progress on energy efficiency for decades. What's needed is a set of practical solutions to these problems. Fortunately, the Northwest is well stocked with such solutions; we have what we need as a region to realize the tantalizing potential that green-collar jobs hold.

This primer starts by defining the green-job opportunity and describing why energy efficiency and renewable energy projects give a powerful boost to local job creation. It then identifies and quantifies some of the major federal and state funding sources for green jobs. It discusses successful green-collar jobs training programs. Finally, it highlights ways the Northwest can overcome barriers to the most promising near-term opportunities for green-job creation: energy-efficiency retrofits in homes and commercial buildings.

Creating jobs that save energy will boost employment while cushioning the Northwest from the roller-coaster of volatile energy prices.

Eventually renewable power, alternative fuels, sustainable farming and forestry, clean transportation, and ecosystem restoration can all play important roles in the green jobs transformation. Yet buildings, which account for nearly 40 percent of US energy consumption,[3] are where the green jobs potential is most accessible. Retrofitting them can save homeowners billions of dollars[4] and offer local employment for insulation installers, sheet metal workers, glaziers, architects, engineers, electricians, plumbers, pipefitters, and other trades idled by the housing slump.

With the right training programs, weatherization and energy efficiency work can also put entry-level and low-income workers on the path to more prosperous careers. But those most in need of work may lack even basic skills. Using green-collar jobs to build a pathway out of poverty for disadvantaged workers requires a particularly focused effort.

Ultimately, demand is the driver of job creation. Motivating landlords and homeowners to make energy-saving improvements—replacing inefficient furnaces, sealing ducts, or insulating hard-to-reach walls—isn't easy, even when it's in owners' financial interest. Outreach and financial incentives that offer property owners compelling reasons to invest in energy efficiency are crucial for creating good jobs.

The green jobs opportunity is tremendous. Yet fully realizing the potential will demand coordination among programs and policies that have traditionally been disconnected. Fitting together all of the puzzle pieces—training workers, establishing meaningful career ladders, correcting market failures, supporting clean-energy businesses, financing energy-efficiency upgrades—will take more than scattershot solutions and piecemeal approaches. With local and state governments in the US vying for federal funds and the jobs that will follow, Northwest communities gain a competitive advantage by advancing the most creative, effective, and integrated solutions. By identifying principles learned from proven successes and promising

experiments, this primer offers guidance to policymakers tasked with seizing the green jobs opportunity. It identifies the programs that can turn the promise of green-collar jobs into a payoff.

Green-Collar Jobs: Defined and Counted

Green jobs aren't always easy to recognize because they are scattered across most occupations and industries. In fact, every job can be more or less green. Many practitioners define "green-collar jobs" or "green jobs" so expansively that the term can apply to large swaths of the economy—from service industries to high-tech manufacturing—and encompass professions ranging from venture capitalists to midlevel managers to workers on assembly lines.

But for policymakers trying to seize the green jobs opportunity—matching the people who most need work with the work that most needs to be done—such broad definitions can obscure more than they reveal. There is no one-size-fits-all description of all green jobs, but for the purposes of this primer Sightline uses this working definition: green-collar jobs are those held by employees who devote a substantial share of their work hours to activities that boost energy efficiency, increase the supply of renewable energy, or prevent, reduce, or clean up pollution.

Green-collar jobs are those held by employees who devote a substantial share of their work hours to activities that boost energy efficiency, increase the supply of renewable energy, or prevent, reduce, or clean up pollution.

Of course, this definition may omit many types of important and valuable work, such as jobs in conservation and restoration of our natural heritage, bicycling and transit, and real-estate development and construction for compact, transit-friendly communities. But the definition does have solid roots: it was the one used by a landmark study performed by Washington State University and the state's Employment Security Department.[5]

This first-ever systematic green jobs review found more than 47,000 green jobs in Washington in 2008—five times more than previously estimated. Notably, the study found that green jobs were concentrated in the skilled trades; think of green-collar jobs as blue-collar jobs with added expertise in efficiency and weatherization, renewable energy, pollution remediation, and transportation.

Curiously, the distribution of Washington's green jobs is roughly the opposite of popular perceptions: very few jobs—just 4 percent of the total—are in solar or wind power or other renewable energy fields. Instead, most are in the building trades and in agriculture. In fact, the study found, Washington's leading green job is "farm laborer": employers reported 4,800 farm workers engaged in reducing and preventing pollution. Presumably, these jobs are held by laborers and specialists on farms, orchards, and ranches that have adopted organic, sustainable, or other environmentally responsible practices. Washington's second-ranked green job is electrician: 3,800 electricians show

up in the survey as having green jobs. Overall, more than half of green jobs in the survey are in energy efficiency—including electricians, construction laborers, engineers, architects, heating and air conditioning installers, roofers, glaziers, plumbers, and construction managers. Pollution mitigation and cleanup contributed about a tenth of green jobs.

In a related study,[6] Oregon's Employment Department also undertook to count green jobs, finding 51,400 positions throughout the state. This figure seems to imply that Oregon, a state with a smaller population, is outpacing Washington in green job creation. But the Oregon and Washington studies are not directly comparable, in part because the Oregon study used a somewhat broader definition of green jobs and included the public sector as well as the private sector.

Oregon's study, like Washington's, found an eclectic range of green jobs throughout the state: herdsman at an organic dairy, auto parts dismantler at a salvage yard, crew leader doing riparian restoration, sorter at a recycling plant, retail clerk at an organic nursery, carpenter working on home weatherization, truck driver for a compost and biomass company, asbestos removal worker, salmon monitoring technician, solar panel salesperson. The construction industry accounted for 17 percent of the state's green jobs, and the most common occupations were carpenters, farm workers, truck drivers, hazardous materials workers and landscapers. Overall, green jobs made up 3 percent of Oregon's total employment, or about the same as the number of people working in the state's private hospitals.

A third survey, published by the Pew Charitable Trusts,[7] used yet another method to tally green-collar jobs in each state. This survey combined a set of commercial databases to identify clean-energy companies and businesses with other environmental aims such as water conservation and pollution reduction. It found far fewer green jobs than did the more direct accounting used in the Washington and Oregon studies. By Pew's reckoning, Oregon is the Northwest's leader for jobs in green businesses, with 1 percent of its workers employed by such firms in 2007, twice the national average (see Table 1). Alaska, Idaho, and Washington were also above average in such jobs, while Montana trailed. Among these states, Pew found that Idaho's green businesses have grown the fastest over the past decade, with a scorching 10 percent average annual growth rate in employees. Oregon took the silver medal, racking up a 5 percent average annual growth rate. Other Northwest states grew their green business payrolls more slowly, at 1 percent or less per year. Whether wider definitions of green-collar jobs, such as those in

Table 1. By the most conservative measure, Oregon has the highest percentage of green jobs among Northwest states.

State	Jobs in Green Businesses (as share of all jobs, 2007)
Alaska	0.6 %
Idaho	0.6 %
Montana	0.4 %
Oregon	1.0 %
Washington	0.6 %

Source: Pew Charitable Trusts

the Washington and Oregon studies, would confirm Pew's ranking of states and growth rates is anyone's guess.

British Columbia's green jobs remain largely uncounted. One 2007 paper examined the size of the environmental business sector in Canada overall,[8] but it only estimated business revenues and used a definition so narrow that it excluded most green work.

Though definitions and counts of green-collar jobs may vary, one thing is clear: every community wants more of them, and for good reason.

Green-Collar Jobs: Explained

Clean energy—investing in energy efficiency and renewable energy—is not only a springboard to economic recovery in the short term, but also a path to a more-lasting prosperity than the debt- and speculation-financed bubble economies of the last decade. Here are five reasons—one major and four minor—that clean energy investments are a great job-creation strategy.

Reason 1: Dollar for dollar, clean energy creates more jobs than fossil fuels.
All spending creates at least some jobs; but job creation varies by the type of spending, depending on how quickly and how far the spending ripples outward through the economy. Researcher Robert Pollin and his colleagues at the University of Massachusetts Amherst found that clean energy investments are a particularly good buy for creating jobs: each $1 million in clean energy spending generates an average of 17 jobs, compared with just 5 jobs per $1 million spent on fossil fuels.[9]

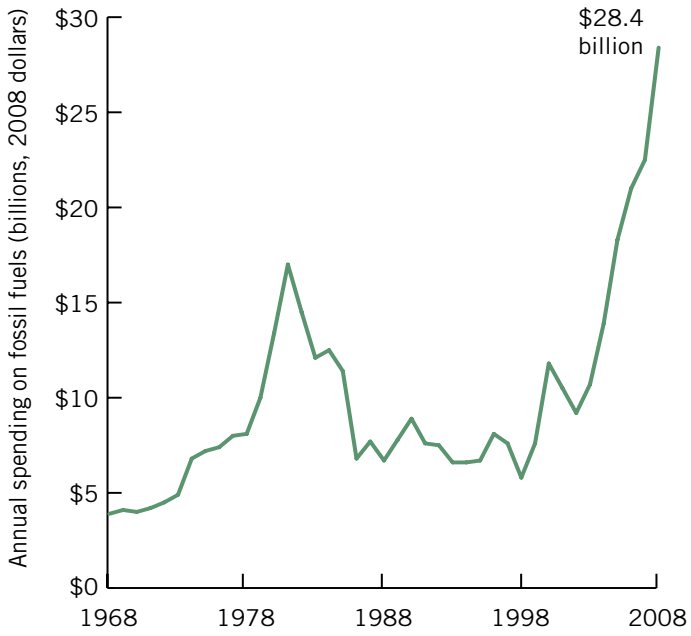
Clean energy's job-creation advantage stems, in part, from the fact that it's labor intensive: most of the money spent on home retrofits, transit, and renewable power projects flows into hiring people. But fossil fuel projects are capital-intensive, requiring far more spending on equipment, land, and energy than on wages. And compared with fossil-energy spending, clean-energy dollars tend to stay close to home, circulating between businesses and residents. By one estimate, 98 percent of US spending on energy-efficiency retrofits in buildings stays within the United States, while 17 cents of every dollar spent on oil and gas immediately leaves the country. In the Northwest, the numbers are even more skewed; because the region produces almost no fossil fuels of its own, it shipped $28.4 billion out of the region

Table 2. Clean-energy investments generate more jobs than fossil-fuel spending.

Eacn $1 million in this sector . . .	...creates this many jobs
Transit/rail	22
Building retrofits	17
Biomass	17
Solar	14
Smart grid	13
Wind	13
Coal	7
Oil and gas	5

Source: Robert Pollin et al., University of Massachusetts Amherst and Center for American Progress

Figure 1. The Northwest's fossil fuel habit cost the region more than $28 billion in 2008.



in 2008 to import fossil fuel—5 percent of regional economic output that year (see Figure 1).[10]

Clean-energy investments are an especially good way to create entry-level and mid-skill jobs, particularly in the industries that offer good chances for rising wages. Compared with spending on fossil fuels, clean-energy investment tends to create more than twice as many high-skill positions for college graduates, three times as many mid-skill positions for those with some college education, and almost four times as many low-skill positions for those with a high school diploma or less education (see Table 3). Even better, clean-energy spending generates almost seven times as many low-skill positions, particularly in the industries—such as construction, manufacturing, and utilities—that provide many entry-level workers with a pathway to family-wage careers.

Pollin and his colleagues have also estimated the jobs impacts of the February 2009 American Reinvestment and Recovery Act (or "stimulus") in combination with the Waxman-Markey American Clean Energy and Security Act (ACES), should it pass the US Senate in late 2009 or early 2010.

They estimate that the two laws together will generate $150 billion a year in new public and private clean-energy investments nationwide in the United States. (If Idaho, Oregon, and Washington receive a share of this investment in proportion with their populations, they will receive almost $6 billion a year.) Even if Americans trim a similar amount from fossil-fuel spending immediately, this shift in investment will likely net 1.7 million new clean-energy jobs—jobs that will last as long as the investments continue. In the Northwest states, the net effect might be to lower the unemployment rate by about one percentage point.[11] Furthermore, as Pollin and colleagues argue, a tightening labor market raises wages, especially at the bottom of the income ladder. A 1 percent drop in the US unemployment rate typically raises average wages by 2 percent.

Table 3. Clean energy offers good earnings potential for low-credentialed workers.

Type of job	Highest education level attained	Average wage per hour	Spending $1 million yields how many jobs?	
			Clean energy	Fossil fuels
High-credentialed jobs (e.g., architect, manager)	Bachelors degree or more	$24.50	3.9	1.5
Mid-credentialed jobs (e.g., crew chief, technician)	Some college	$14.60	4.8	1.6
Low-credentialed jobs (e.g., laborer, clerk)	High school or less	$12	8	2.2
Low-credentialed jobs in fields with good potential for earnings growth (e.g., construction, manufacturing, utilities)	High school or less	$15	4.8	0.7

Source: Robert Pollin et al., University of Massachusetts Amherst

Reason 2: Clean energy cushions the economy from volatile energy prices.
Four of the last five recessions—including the most recent one—followed big jumps in oil prices.[12] Energy price spikes send shock waves throughout the economy, hitting family budgets and business investments alike.

Clean energy and energy efficiency help get Cascadia off this fossil fuels roller-coaster by reducing the region's dependence on volatile oil and natural gas markets. Clean energy is like a shock absorber, reducing the impact of sudden price spikes.

Reason 3: By reducing energy imports, clean energy locks in local job creation.
Superefficient, low-operating-cost buildings, appliances, vehicles, transit systems, and renewable power plants yield big savings on fossil fuel bills. Consumers and businesses don't just pocket these savings. They spend them on other things, and almost all goods and services are more labor-intensive, and produce more jobs, than fossil energy. Similarly, most consumer goods and services have higher "local content" than fossil energy, meaning that the dollars stay close to home—generating even more jobs. One 2008 survey of 48 economic analyses concluded that improving energy efficiency by 20 to 30 percent in the United States would yield a net gain by 2030 of between half a million and 1.5 million jobs—permanent jobs created simply by boosting energy efficiency in cost-effective ways.[13]

Reason 4: Clean energy boosts trade balances and tempers financial shocks.
For the United States, clean-energy investments trim oil imports, easing the nation's persistent and gaping trade deficit. Controlling this trade deficit—and the gargantuan holdings of US dollar assets in China and elsewhere that finance it—will reduce exposure to a major source of instability in US and global financial markets. Backing out of these massive global trade and asset imbalances will make financial management easier and job-killing recessions both less common and less severe.[14]

Table 4. Clean-energy investment and climate policy could create almost 73,000 net jobs in the Northwest.

	Net change in number of jobs, from $150 billion/year shift from fossil fuel to clean-energy investment in United States
Alaska	3,730
Montana	6,303
Idaho	8,504
Oregon	20,931
Washington	33,505
Northwest states total	72,973

Source: Robert Pollin et al., University of Massachusetts Amherst and Center for American Progress

Reason 5: Clean energy reduces the financial risk of climate change.
Reducing damage from climate disruption is a huge economic benefit because unchecked climate change would eliminate jobs on an epic scale. Global warming is predicted to melt the summer snowpack on which Northwest irrigators depend to grow their apples, wine grapes, and other crops. Summer snowpack is the reservoir for the region's entire hydropower system, generating the lion's share of electricity on which most Northwest industry depends. Climate change is expected to worsen winter floods, summer droughts, and wildfires, further imperiling jobs on farms, in forests, and on construction sites. It will raise sea levels and could inundate low-lying lands such as parts of the Port of Seattle. It's expected to accelerate the spread of cold-intolerant tropical diseases and aggressive species; for example, it could hasten the already advanced march of forest-devastating pine beetles, which are eviscerating the timber industry of north-central British Columbia. Climate disruption could further imperil Northwest salmon, and the sport and commercial fisheries that depend on it, along with a raft of other species—indeed, entire ecosystems.[15]

In Oregon, the estimated annual cost of unchecked climate disruption will be $3.5 billion by 2020. When shared across the economy, this cost translates into a 4 percent reduction in family income at the median and a comparable loss in employment. In Washington, the estimated cost by 2020 will be $3.6 billion. Worse, according to the experts who made these estimates, they likely understate, perhaps radically, the economic blow unchecked climate disruption will bring. Dozens of costs—such as the increased health care costs associated with rising incidence of food- and waterborne diseases in a warmer world—are impossible to estimate. Furthermore, the costs and job destruction will grow rapidly after 2020 if we do not slow climate change first.[16]

By all measures, investments in clean energy will pay lasting and powerful dividends to the Northwest's families, communities, and environment. They will create good, local jobs in all income brackets, but provide particular opportunity to those at the lower end of the economic spectrum. They can trim oil imports, shelter the economy

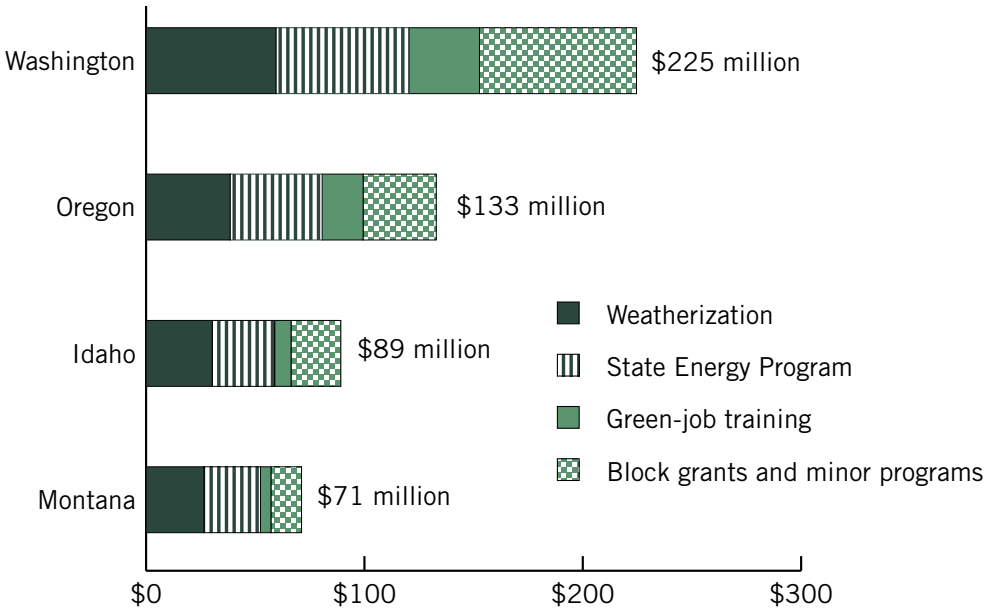
from volatile energy prices, and temper massive financial disruption from unchecked climate change. Fortunately, new funding priorities and policy decisions offer a real chance to move the economy in that direction.

Green-Collar Jobs:
Funded

In the United States, federal spending—through the February 2009 stimulus package and the regular federal budget—is providing a massive boost to clean energy projects and green-collar jobs. Private investment is adding more momentum, and proposed federal climate and energy policy would lend another giant push.

Overall, the Northwest states are guaranteed more than $500 million in clean-energy and green-collar job training investments under the federal stimulus package alone (see Figure 2). That amount includes the region's portions of US Department of Energy funds for energy efficiency and renewables.[17] For Idaho, Montana, Oregon, and Washington, for example, stimulus provisions for weatherizing low-income homes alone will double, or in some cases triple, existing budgets.[18] It also includes smaller investments through the US Department of Labor for green-job training.[19]

Figure 2. Northwest states will recieve more than half a billion dollars in federal stimulus funds for green-collar jobs and clean energy.

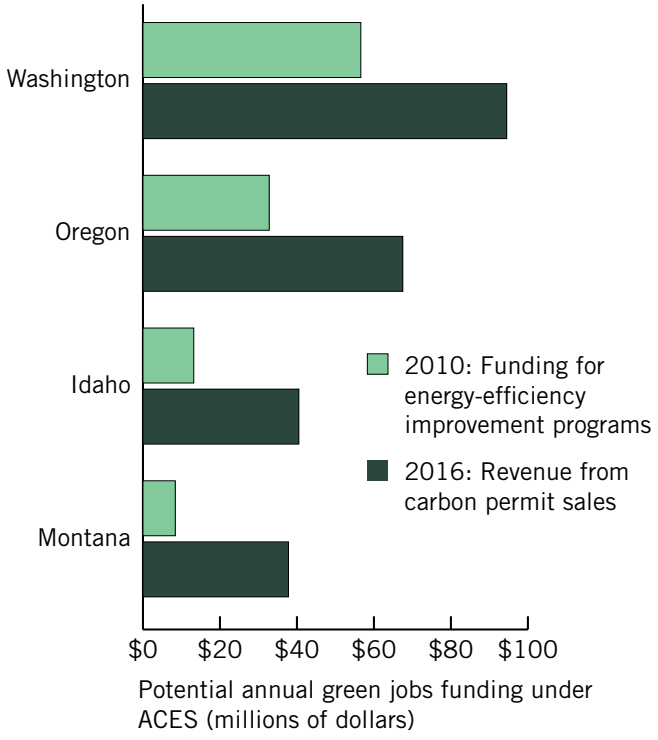


Sources: US Department of Energy, US Department of Labor

These guaranteed stimulus funds are just a small fraction of the clean-energy investment the Northwest can expect, because the region's states, cities, and companies are competing for billions more in federal stimulus grants that are still being awarded. By mid-September 2009, for example, businesses, nonprofits, and public agencies in these four states had won an additional $844 million for projects with electric transmission infrastructure, advanced batteries, and wind power.[20] Federal tax credits for families and businesses, new bonding authority for states and local governments,[21] plus new borrowing authority for the Bonneville Power Administration add to the opportunities.

If the US Senate passes the American Clean Energy and Security (ACES) bill approved by the House in June 2009, the Northwest states can expect to receive hundreds of millions of dollars more (see Figure 3). Even before ACES's central cap-and-trade feature would take effect in 2012, the bill authorizes more than $3 billion over the next few years for weatherizing and retrofitting residential and commercial buildings nationwide—worth $110 million in 2010 to the Northwest states, if the funds are spread evenly across the US population.[22] Starting in 2012, through its allocation of free carbon permits to state governments, it would direct billions of dollars more to the Northwest. The states would sell the permits and use the proceeds for efficiency and renewables, weatherization programs, work force development programs at community colleges and vocational schools, and other clean-energy investments. The Northwest states of Idaho, Montana, Oregon, and Washington would receive an estimated $240 million between them in 2016, when ACES is fully phased in.[23]

Figure 3. Federal climate legislation already passed by the House of Representatives would provide millions of dollars in green jobs funding to the Northwest



Source: American Clean Energy and Security Act of 2009

Plus, stimulus spending and climate and energy policies at the state and federal levels will spark private investment as well. One study estimates that for every $1 of public investment in economic stimulus, private investors, state governments, and local communities will chip in at least $1 and possibly as much as $1.75 in additional resources.[24]

PROFILE: GREG JORDAN

"Without the stimulus . . . I don't think I would have been given this chance."

Before Greg Jordan graduated with a degree in environmental sciences from Portland State University, he imagined he might find a job working in stormwater control or restoring wetlands.

Instead, he spent his summer on a weatherization crew doing hands-on labor—slithering through crawl-spaces, blowing insulation into wall cavities, sealing up air leaks—and loving it.

Out of a dozen program graduates, he's one of only two who were able to quickly land jobs in a tough economy. It wouldn't have happened, he said, without the nation's recently renewed attention and commitment to energy efficiency.

"Without the stimulus and the funding, I don't think I would have been given this chance," said Jordan. "The field is really just getting going. It's been around, but finally people are realizing these little things make a big difference."

He answered an ad placed by EcoTech LLC, an environmental services company with a background in pollution cleanup. It launched a new a business line in October 2008 in energy efficiency and weatherization.

"Historically, workers who do the unsexy work of energy efficiency, putting in insulation and doing air sealing, were viewed as no-skill or low-skill," said Marshall Runkel, a company partner. "That's yesterday's way of doing business."

Anyone can insulate a home poorly, as his crews have learned from finding others' mistakes. The industry could use more trained employees. And it needs to pay them enough to do quality work that will help meet the nation's carbon reduction and energy independence goals, Runkel said.

The startup division has six employees and expects that to double or triple in the next calendar year. EcoTech started getting referrals by becoming a trade ally—essentially a recommended contractor—of the Energy Trust of Oregon, which offers cash incentives for homeowners to make energy efficiency improvements.

The company has also been accepted into a pilot program that will use $2.5 million in federal stimulus funding to weatherize 500 homes in the greater Portland area.

One factor limiting EcoTech's growth so far is finding workers with weatherization

skills. It has a graduated approach to staffing, with trainees, weatherization technicians, project supervisors, and energy auditors all working together. Employees can move up that ladder as they gain skills and experience.

"The work force development is very, very important to me. . . . I have to balance the work with people who are trained to do a quality job," Runkel said. "These programs aren't going to last if we send people into people's houses and they mess it up."

Jordan, 27, is interested in making a career out of energy efficiency work. He's learning on-the-ground weatherization skills, such as how to depressurize a house, find air leaks, install floor insulation, and caulk gaps. Eventually, he'd like to run a crew, learn how to audit, and perhaps even craft policy.

For now, though, he's happy to have a job that offers a tangible benefit—to the environment and to the community—and makes him feel like he's making a difference.

"I do like the hands-on aspect of it," he said. "Each house is different, so you definitely have to be creative and kind of think on the fly."

Green-Collar Jobs:
THE PLAN

Supply Workers

If the Northwest embraces a sustainable economy powered by clean energy, keeping up with the demand for workers—a trained green-collar work force—will be a challenge. Using the clean-energy revolution to extend prosperity to workers who might otherwise be left out of an economic recovery will also require remarkable focus. It will demand expansion and adaptation of recruitment programs in underrepresented communities; training programs in community colleges and technical schools; apprenticeships in unions and businesses; and—above all—an unusual degree of coordination among public agencies, trade unions, trade associations, employers, and work force trainers.

Growing a green-collar work force will require training thousands of workers in the skills that employers need most, such as carpenters knowledgeable about green building, plumbers capable of installing commercial-scale solar water heaters, electricians educated in photovoltaics and advanced energy-system controls, machinists who can produce windmill turbines, and many similar jobs employing traditional construction and manufacturing skills toward green ends.

Serendipitously, the skills most likely to be in short supply also happen to be those corresponding to occupations that offer promising career ladders for low-income workers. The skilled trades offer some of the clearest pathways to economic security for impoverished families.

Strategy 1: Focus on training programs that lead to credentials or certifications.

In many sectors of the economy, a limiting factor on seizing the opportunities of the new energy economy is a shortage of mid-skill labor. In 2008, for example, a scarcity of qualified crew chiefs hobbled low-income weatherization programs in the Northwest.[25] A mid-skill worker is neither a laborer nor someone with a four-year degree, but rather a tradesperson or technician, usually with an apprenticeship credential, an associate's degree, or a vocational certificate.

For unskilled, low-income workers, reaching towards mid-skill work provides the surest route out of poverty. In fact, according to a sophisticated statistical analysis by the Community College Research Center,[26] training programs that lead to vocational certificates or degrees in the trades are the best public investments for boosting low-skill workers' lifetime earnings and employment prospects. In fact, the study found that standard, short-duration job training programs showed no lasting benefit for employment or income, and—somewhat surprisingly—neither did remedial education, GED courses, or English-as-a-second-language classes.[27]

Table 5. Green energy and construction training programs have proliferated in Washington and Oregon.

	College	Program (Degree)
Washington	Bates Technical College	Green construction and remodeling (certificate)
	Bellevue College	Green/sustainable design (certificate)
	Columbia Basin College	Solar/photovoltaic design (certificate)
	Cascadia Community College	Environmental technologies and sustainable practices (associate); solar PV systems and energy management (certificate)
	Clover Park Technical College	Interior design/green design (certificate)
	North Seattle Community College	Green real estate (certificate)
	Shoreline Community College	Solar/photovoltaic energy design and zero-energy building practices (certificate); training for green careers in trades (pre-apprenticeship)
	South Seattle Community College	Energy auditing (certificate)
	Seattle Vocational Institute	Construction training program (pre-apprenticeship)
Oregon	Clackamas Community College	Energy and resource management; water and environmental technology (certificate and associate)
	Lane Community College	Energy management; energy management—renewables; water conservation (associate); energy management and energy auditor (certificate)
	Portland Community College	Facilities management (certificate); solar voltaic manufacturing (certificate and associate)
	Central Oregon Community College	Sustainable building advisor (certificate)
	Mt. Hood Community College	Environmental studies (certificate and associate)
	Chemeketa Community College	Employer-specific solar training; biofuels processing (certificate, proposed)
	Columbia Gorge Community College	Renewable energy technology (certificate and associate)
	Oregon Institute of Technology	Bachelor of Science in Renewable Energy Engineering

Sources: Washington State Board for Community and Technical Colleges, Oregon Department of Community Colleges and Work force Development

Public agencies hoping to boost green-collar jobs for disadvantaged, low-skill workers should direct funding to training programs in community and technical colleges (and, as noted below, in union apprenticeships) that lead to credentials, degrees, or vocational certificates.[28]

Such programs are already sprouting in two-year institutions around the Pacific Northwest (see Table 5). Columbia Gorge Community College now offers an electronics engineering technician program. Many graduates of the first cohort are already working in the wind industry, earning from $35,000 to $60,000 a year.[29] Lane Community College, in Eugene, Oregon, trains renewable-energy technicians in a two-year program that teaches students how to improve the energy efficiency of homes and businesses and to install solar-power and wind-power systems. In Washington, programs in energy auditing, green construction, solar design, zero-energy building practices, and other fields are training new workers.

Strategy 2: Create career ladders that link training, employment, and education. Union apprenticeships, like vocational credential programs, are linked to large increases in future earnings and employment prospects because they lead directly to employment. For example, prospective electricians lucky enough to win slots in sought-after union apprenticeship programs can hope to climb a steadily rising ladder of competence, experience, education, opportunity, and earnings. They have to meet the requirements of their chosen field, but the rungs of the ladder are clear and reachable.

Sadly, this scenario is the exception, not the rule. If one lesson stands out from the research on work force training programs in the United States, it is that the work force development "system" is not a system. Consequently, it too often fails both workers and employers. Institutions do not provide a career ladder for most low-skill workers. Instead, disadvantaged and unskilled job-seekers face a gauntlet of dead-end jobs, high school completion programs, disjointed job training programs, and community and technical college course offerings. Meanwhile, many employers confront a work force with skills not matched to their needs.[30]

At their best, work-force development institutions in the Northwest states outdo this national norm, but to make green-collar employment a path to prosperity, they will have to achieve higher degrees of integration than usual. That's something they are certainly capable of. In Washington, for example, a pioneering initiative launched in 2007 is beginning to fill a shortfall in the state's supply of nurses. A partnership of health, labor, and educational organizations has launched training programs at five community colleges; each matches the college with a trade union and at least one hospital. Students receive education, colleges increase enrollment, unions increase membership, and hospitals gain skilled employees.[31]

The nurse training program is itself a career ladder. Every student—of 141 in the first class—works in a hospital during the program, and hospitals make higher-level jobs available to those who complete the program. For example, North Seattle Community College students enter school as certified nursing assistants at Northwest Hospital, make the transition to the position of licensed practical nurse, and will become registered nurses upon completion of the training. The program accommodates

the schedules and needs of working adults by scheduling its courses around hospital shifts, offering child care during classes, and teaching some courses online.[32]

Many of the same approaches used in this nurse-training program (and also recommended by national green-jobs organizations such as Green for All[33]) are integrated into Washington State's Evergreen Jobs Initiative, authorized by the state legislature in 2009, which aims to create 15,000 new green-economy jobs by 2020 and target 30 percent of the jobs to veterans, National Guard members, and low-income and disadvantaged populations.[34]

Legislation passed in 2008 directed the Washington Employment Security Department to conduct a detailed assessment of green-collar job potential in the state and identify jobs that pay competitive wages and could grow rapidly. The law also created industry-specific panels of businesses, trade associations, labor unions, educational institutions, and others to assess work force development needs. Finally, it authorized a grant-funded set of investments in work force training programs (typically, at community colleges) that target high-priority jobs. This approach is a national model because it so carefully uses public spending to help low-income workers get qualified for high-demand jobs that are directly linked to energy efficiency and greenhouse gas reductions. Although the 2008 law authorized the creation of training grants, the state has yet to fund them.

In 2009, the Legislature directed a leadership team to oversee a more detailed study that would include strategies for ensuring that green jobs pay family wages. It also directed state agencies to apply for training money available through the federal American Recovery and Reinvestment Act.

In 2009, the Oregon Legislature passed a bill that would require the State Workforce Investment Board to identify high-demand green industries and their potential to offer career pathways to entry-level workers, dislocated employees, and veterans. The board will use those industries' needs to devise work force development programs in community colleges, public universities, apprenticeship programs, and other training programs.[35] Legislation also calls for the Oregon Economic and Community Development Department to recommend financial incentives and other strategies to recruit and retain green businesses in fields such as energy efficiency, renewable energy, and pollution prevention and cleanup, and to simulate research and development.

The Green-Collar Jobs Plan:
Stoke Demand

Training programs for green-collar workers will remain academic exercises without jobs that graduates can fill. While there are many potential pathways for green jobs, the most promising near-term opportunity in the Pacific Northwest lies in retrofitting homes and commercial buildings to improve their energy efficiency.

As shown by Washington State University's survey of state green-job trends, over half of Washington's green jobs are already in energy efficiency fields. And national and regional studies have found that, using proven methods and off-the-shelf technologies,

homeowners and businesses in the US could save literally tens of billions of dollars annually in energy and utility bills.[36] The prospect of tapping into those savings creates a natural business opportunity for installing efficiency upgrades in homes and commercial buildings.

Over the long term, investments in renewable energy—solar, wind, and other clean energy sources—will also add many thousands of green jobs to the Northwest's economy. Yet it can take years of planning and permitting for such projects to take off. But with the right policies in place, jobs in home efficiency retrofits can be created almost overnight. And those jobs can be anywhere, not just in the locales that are best suited to windmills or solar panels.

The potential energy savings in buildings are enormous, but so are the obstacles.

Still, to grow employment in building retrofits, there must be far more demand for efficiency services than there is today. The potential energy savings in buildings are enormous, but so are the obstacles. With leadership and focus, Northwesterners can overcome longstanding barriers to realizing those savings. Building owners often are simply unaware of how much they spend on energy, or how much they could save if they embarked on a retrofit. They may not know whether replacing a refrigerator or floor insulation is more likely to pay off, nor do they trust salespeople to give them straight answers. They may not know which contractors do good work. They can feel overwhelmed by the array of tax breaks and rebates available to them—and the paperwork necessary to be eligible for them. In addition, deep efficiency retrofits can be disruptive for occupants, often requiring major overhauls of heating and ventilation systems, or insulation of hard-to-reach walls. And, of course, retrofits can involve sizable up-front costs, which can be difficult to finance and may only pay for themselves after years or even decades.

While each individual obstacle is surmountable, energy efficiency programs have historically failed to present all the solutions in one package. Consider, for example, a recent study of more than 150 public and utility-sponsored efficiency financing programs.[37] These programs make loans so that home and business owners can pay for energy efficiency upgrades up front and pay back the loans through savings on their energy bills. It sounds like a winning strategy for spurring efficiency investments. Yet the report makes sobering reading: the overwhelming majority of these programs have lackluster records, reaching less than 0.1 percent of their potential market each year.

Encouragingly, a few programs have shown striking success, and new, emerging models show clear promise. A review of these programs yields some key lessons that policymakers should keep in mind as they move forward with their own efforts to capitalize on the green-collar jobs opportunity in the Northwest.

Lesson 1: Use smart marketing to educate property owners about energy efficiency.

Like everyone, building owners are strapped for time and have many competing priorities vying for their attention. So even budget-conscious property owners—the ones who might consider an energy retrofit on financial grounds alone—need frequent

reminders and clear explanations of the benefits of saving energy. Without effective marketing and outreach, efficiency programs are frequently underutilized; with effective marketing, the results can be noteworthy.

Consider, for example, two standout success stories among the generally lackluster record of utility conservation loan programs. The biggest program in the United States is run by the Sacramento Municipal Utility District, which made 3,200 loans in 2007 alone, and has served about a quarter of all households in its service area since the program's launch 30 years ago. The biggest program on the continent is that of Manitoba Hydro, which made about 8,100 loans in 2007. The success of Manitoba's program despite the utility's low electricity prices is something close to astounding, and suggests similar success may also be possible in the Northwest, where electric rates are low.

The lesson of these programs is clear: marketing matters. These programs are not much different in their structure from programs in other cities. Their success stems largely from effective outreach and education strategies, coupled with efficient customer service and a serious long-term commitment from the utilities.

Among the most important ingredients of these programs' success is the deep involvement of local contractors—the people already in the field working to improve properties. In both places, contractors are the most important sales force and intermediary for the utility lending programs. Plus, these programs are efficient, well staffed and well organized. The utilities built themselves specialized departments to do conservation lending, staffed by loan officers with banking experience. In addition, these utilities offer a bundle of additional incentives beyond the loans, such as large cash rebates for energy-smart appliances.

In Sacramento, once a contractor and building owner have submitted a loan application, the utility approves or declines within 24 hours. Manitoba is almost as fast, and it has a colossal network of engaged tradespeople: 1,100 contractors and 200 retailers are enrolled in its programs. Manitoba has essentially deputized its building tradespeople as loan officers and conservation evangelists. It's a whole-systems approach that provides financing as part of the package.

Lesson 2: Assemble partnerships; link organizations with shared interests.
All too often, groups and individuals working with the same goal of green job creation work independently rather than synergistically. As a result, they often pursue slightly different and unrelated projects and priorities—which diffuses their individual efforts, rather than magnifying them.

A program called SustainableWorks, pioneered in Spokane, Washington, takes steps to solve this problem. SustainableWorks is creating large-scale, neighborhood-based energy upgrades by forging partnerships among organizations and individuals with shared interests: neighborhood groups, building owners, skilled energy auditors, reliable contractors, work force training programs, union apprenticeships in green construction, utilities, and other public and private conservation funders. The results include neighborhood-wide energy upgrades that are more thorough and less expensive, plus new jobs with better training and better career prospects over time. The

PROFILE: DEB CONKLIN

Spreading the gospel of energy efficiency

For Rev. Deb Conklin, spreading the gospel of energy efficiency is an act of faith—and an important job.

Conklin is leading an effort to reach out to residents of Spokane's South Perry neighborhood who are interested in getting energy audits and retrofitting their homes to reduce energy use. The upgrades save people money, as well as benefiting the environment.

"We're about building community and helping people build better lives," said Conklin, pastor of Liberty Park United Methodist Church in Spokane.

She's part of a program called SustainableWorks that's run by the Spokane Alliance, a coalition of churches, unions, and nonprofit organizations. After successfully boosting the energy efficiency of a half-dozen small commercial buildings, the group is doing a pilot project for homes in the Eastern Washington city. They're starting with 10 houses and plan to expand that to 100, and then 200. They ultimately want to do residential retrofits citywide and to replicate the project in Seattle and Tacoma.

Before auditors start tallying the number of drafty windows or sheet-metal workers begin insulating leaky ducts, Conklin helps homeowners take the plunge into what can be a daunting and expensive process. Without an intermediary like her, the demand for these other workers is greatly reduced.

"There are large numbers of people who really want their homes to be more energy efficient in principle and for practical reasons," Conklin said.

The biggest obstacle to homeowners that she's identified is their struggle to pull together enough money to pay for the upgrades.

In her work, Conklin helps homeowners figure out if retrofits make financial sense, directs them to reliable workers to do the job, and helps them navigate the available loans, tax credits, and grant opportunities.

As she goes door to door—or more recently at "coffee klatches" at neighborhood homes—Conklin explains to residents what retrofits are and how they work. Interested residents provide her with utility bills and with information about their homes' square footage, age, and appliances to figure out what kind of savings are possible.

Next, Conklin helps the homeowners figure out how to clear the cost hurdle. The program focuses on retrofits that will pay for themselves within 10 years through reduced energy bills. But property owners still have to finance the up-front costs.

Conklin helps owners determine if they qualify for financial assistance through the Spokane Neighborhood Action Program, or SNAP, which applies to low-income residents. She provides packets of information that explain the available tax credits. SustainableWorks is also working with the local electrical utility, Avista, to provide loans and rebates, and with the Union Credit Union in Spokane to give loans. The information packet includes a letter from the credit union's CEO inviting homeowners to call and discuss lending options.

"The cool thing about it for homeowners is if they get excited about (doing the retrofits), they don't have to walk into the bank and explain what they're talking about," Conklin said.

There's been a lot of learning on the fly, Conklin said, but she's optimistic the program will be expanded. That means hiring a full-time outreach coordinator—a job she's been doing part-time on a voluntary basis.

"For me, this is why I'm in ministry," she said. "I didn't go into it to do weddings and funerals. I went in to help people connect with deeper meanings in their lives and help people with the values that they have. Helping people who say they want energy efficiency and to help the environment—they're values that are fundamental to what it means to be a Methodist."

State of Washington found this approach so promising that it approved spending $14.5 million of federal stimulus money on similar large-scale neighborhood-based energy upgrades across the state.

On the ground, SustainableWorks is sending outreach workers door to door and engaging small building owners by signing them up for comprehensive energy audits. It's overseeing the training of auditors, and providing referrals to top-notch contractors on whom the building owner can rely to do the job well, and who have verified to SustainableWorks that they're training and hiring displaced or low-income workers into union-wage green-collar jobs. SustainableWorks is facilitating the financing of the project by helping assemble a pool of capital that can be deployed to different projects. It's educating low-income renters and homeowners about opportunities for free retrofits paid for with public dollars, while middle-class renters and homeowners are getting easier access to existing market-rate loan programs from local banks and credit unions. SustainableWorks also helps oversee and control quality on contractors' work, and it will evaluate and certify contractors' work to make sure the retrofits are completed properly.

Without effective marketing and outreach, efficiency programs are frequently underutilized.

Meanwhile, SustainableWorks is offering cross-training for electrical, plumbing, and sheet-metal workers by partnering with labor unions on apprenticeship slots and Washington State University's energy extension program on training. The aim is to give workers a deeper understanding of how energy efficiency cuts across the construction trades. That strengthens their ability to work on different types of jobs within a single home or business. The neighborhood-wide upgrades that SustainableWorks is coordinating provide an economy of scale that is key to the program's design. Focusing on dozens or hundreds of similar improvements across a neighborhood—upgrading furnaces or water heaters, for example—allows SustainableWorks to buy in bulk and make efficient use of workers' time.[38]

By supplying the pieces that "complete the circuit" in energy efficiency upgrades for small buildings, comprehensive programs modeled on SustainableWorks could unleash substantial results for job creation, family energy budgets, and our communities.

Lesson 3: Measure building energy use through audits and ratings systems.
Building owners often pass up easy opportunities for efficiency and savings because they simply don't know that those opportunities exist. These oversights are understandable; it can take a trained professional to know where to add insulation cost-effectively; which appliances to replace early and what to replace them with; the relative cost-effectiveness of solar water heaters, ground-based heat pumps, triple-paned replacement windows, and on-demand water heaters; what a waste-heat recovery system is; or which lighting systems to replace. So how are they supposed to make informed decisions about such things?

A key step in understanding which of those measures is likely to be effective in any

given home or building is an energy audit – a detailed analysis that pinpoints where the structures are losing energy through leaky windows or poor insulation or faulty seals. To be useful, they should also help homeowners identify and rank which building improvements will save the most energy and money over time.

The City of Seattle is promoting energy audits through its Green Building Capital Initiative.[39] Using federal energy-conservation grants, the program aims to get 5,000 property owners to complete energy audits in the first 18 months. The city will provide a hefty subsidy for home energy audits—marking them down from $600 to $95—and offer loans at reasonable interest rates to carry out the audits' recommendations.

Programs such as Seattle's could also require a follow-up audit, which performs the same tests after new appliances are installed or leaks are sealed. The second audit will either show an improvement in the building's efficiency, or send up a red flag about work quality. Follow-up audits also provide a reliable way to measure energy savings and reduced climate impacts.

To motivate contractors to do the work properly, agencies that subsidize retrofits with public funding can also use follow-up audits to connect payments with performance. In Vancouver, BC, the One Day program ties financial incentives that help fund home improvement projects to subsequent audits that measure the improvements' effects. That gives contractors a financial stake in ensuring the work does save energy.

Providing clear information about energy consumption arms consumers with the facts when they are choosing a home, and it motivates owners to make their properties as efficient as possible. That's the idea behind energy rating systems—the equivalent of a miles-per-gallon rating for motor vehicles—and requirements to disclose that information when a building is bought or sold.

Two scoring systems are already in the field: the Energy Performance Score and the Housing Energy Rating Score (HERS) Index.[40] The HERS Index, overhauled in 2006, is part of the federal government's Energy Star program. Developed in part by the Energy Trust of Oregon, the EPS system improves on HERS in several ways: it is easier to read, gives a better score for renewable power generated on site, provides monthly and yearly energy costs in dollar figures, and measures a home's carbon emissions.

Providing clear information about energy consumption arms consumers with the facts when they are choosing a home.

Some local and state governments are considering mandates that would require property owners to audit their homes before listing them for sale. The audit would be similar to a home inspection that informs a buyer of potential problems or issues. That requirement alone would motivate homeowners to undertake energy retrofits, as well as add value to more efficient homes.

The Washington Legislature in 2009 took a first step by passing a bill requiring information about energy consumption be disclosed when a commercial building

PROFILE: MICHAEL MCCORMICK

"If it does bust loose, I'll be ready."

Michael McCormick poured his first home foundation more than three decades ago. Since then, he's built everything from starter houses to mansions to a transplanted English castle.

At 55, he understands the importance of keeping his skills up to date. So he went back to school five years ago to update his blueprint reading skills and his knowledge of ever-changing building codes. The collapse of the Puget Sound housing market coincided with his graduation.

For nearly three years, McCormick has done whatever he could to pay the bills and advance his career: taking classes in construction management, doing odd remodeling jobs, building decks, even falling back on a former career cutting hair.

Then he heard a presidential candidate named Barack Obama talk about green-collar jobs as a way to fix the country's crumbling economy.

"I didn't know exactly what that meant, I just knew it was the direction I would go," said McCormick. "I figured he'd been listening to enough people that he had a pulse on what it was going to take to get things going again."

Since then, McCormick has done many of the right things to move his career in that direction. He's gotten training in restoring historic buildings and taken an energy auditing class at Shoreline Community College. He hopes to become accredited to verify that "green" homes are being built to national standards.

For now, though, McCormick remains laid off.

There are few laws requiring existing homes to become more energy efficient, McCormick said. Though interest among homeowners may be growing, it still seems spotty, he said. So far, the Pacific, Washington, resident hasn't seen evidence that homeowners on a large scale have been convinced that making deep and comprehensive energy efficiency investments is worth the hassle.

"Right now there's no demand. The people from the top down are saying that but no one from the bottom up is saying it," he said. "Unless that changes, it doesn't matter how much training I get."

First and foremost, money is always an issue, he said. There has to be a compelling financing mechanism that allows a building's owner to help cover the costs of an up-

front investment with the energy savings they'll realize in years to come.

Secondly, homeowners are inherently suspicious of contractors. Any utility- or government-run program needs a strong marketing plan to lay out the benefits and connect homeowners with reputable workers—including an independent energy auditor who can verify that the work has been done correctly.

"A lot of it boils down to trust," he said.

McCormick hopes that some of the energy efficiency incentives and programs being put into place right now will stimulate that demand. In the meantime, all he can do is keep looking for work and keep learning to stay competitive.

Even with his background in construction, the energy auditing class gave him an education in how buildings leak energy through wall sockets, Sheetrock cracks, and crawlspaces. He also got an introduction to the science that explains how air flows through homes, picks up pollutants, and creates conditions that can harbor mold.

He's eager to start retrofitting homes and businesses to save energy, improve their performance, and make them healthier. All he needs is demand for his services.

"If it does bust loose, I'll be ready," McCormick said. "Our country is so energy inefficient . . . Now we're being asked to change our ways, and I was one of the first ones to say 'I'll do that.'"

is sold. ACES, the federal climate and energy legislation passed by the US House of Representatives in June 2009, also provides for energy labeling as an incentive to improve existing buildings, especially when they are put up for sale or lease.

Lesson 4: Connect building owners with trusted contractors.
In choosing a contractor, trust is essential. A building owner embarking on an energy retrofit may not know whom to trust when contracting the work or buying products. Shopping for energy-using devices isn't a weekly chore, like picking up groceries. It's rare, the vendors tend to be specialized, and many of the devices must be installed by specialized tradespeople who may not have a proven track record. Most small building owners are not general contractors, engineers, or architects. And one of the biggest fears is hiring a contractor who won't deliver.

Shopping for energy-using devices isn't a weekly chore, like picking up groceries.

Successful programs must identify and connect owners with vetted companies and trained tradespeople who will do high-quality work and offer fair wages. SustainableWorks, for instance, prescreens and trains its contractors. The Energy Trust of Oregon has an extensive list of "trade allies" who specialize in insulation, windows, geothermal heat pumps, duct sealing, remodeling, plumbing, and weatherization, which saves homeowners time and hassle.[41]

Lesson 5: Create an "energy concierge" to guide property owners through the process.
Like any home improvement project, an energy efficiency retrofit presents a daunting array of decisions. To many, the work involved seems like a hassle, even if it saves money in the long run. Outlining available tax breaks on a utility website or offering a one-time rebate on refrigerators isn't likely to persuade a homeowner to embark on deep and meaningful energy conservation projects. Successful incentive programs must "hold hands" with property owners, guiding them through the maze of decisions and financing options and connecting them with the resources they need.

Too often, programs promoting energy efficiency are fragmented. Some serve low-income residents, others work only for homeowners with substantial savings. Auditors may not know much about financing. Utilities may require homeowners to find and hire contractors. Each link in the chain of a project has very little incentive to move a homeowner or landlord on to the next step. To make the process easier for homeowners, one dedicated agency should oversee all aspects of energy efficiency.

This "energy concierge" would serve as a single point of contact for each and every retrofit from beginning to end, managing contractors, guiding the financing, and gathering data to measure success.[42] It might be a community action agency like the ones that conduct low-income weatherization programs or a public development agency that has bonding authority. There could be different ones for different kinds and scales of energy efficiency work.

In an ideal scenario, a home or business owner could call one phone number, have an auditor dispatched to the door, and get detailed information about which improvements would save the most energy and money. The concierge would work with the homeowner to identify appropriate grants or loans that could be paid back on utility or tax bills, or through another "invisible" method. The concierge would dispatch contractors who have already been trained to do the work and, finally, ensure through follow-up audits that the improvements are saving energy as promised.

Offering homeowners—and perhaps owners of small commercial and residential rental buildings—an easy one-stop-shopping experience has great potential to stoke demand for energy-saving solutions.

Lesson 6: Teach people to take advantage of their retrofits.

After a building or home has been audited, retrofitted, and audited again, one last efficiency opportunity remains: training occupants to operate the building well. Subtle adjustments to thermostats, windows, and blinds are often enough to keep efficient buildings comfortable at a minimal energy cost, but mastering such adjustments is not automatic. Providing this training is another form of green-collar employment. The privately owned electric and natural-gas utility Puget Sound Energy runs such a program for schools: PSE funds Energy Conservation Specialists, who train teachers and other staff.[43] The utility had found that even when school districts were building green, high-efficiency structures, school staff often subverted the energy-saving features because they didn't understand them. Seattle Public Schools, for instance, employs two resource conservation specialists and, as of 2008, had realized $350,000 in savings from efforts to reduce electricity and natural gas consumption and improve water, sewer, and waste systems.

Successful incentive programs must "hold hands" with property owners, guiding them through the maze of decisions and financing options and connecting them with the resources they need.

The Green-Collar-Jobs Plan:
Secure Capital

Over the long haul, well-designed energy efficiency retrofits can save both building owners and tenants tremendous amounts of money. That's because the savings on utility bills keep adding up for decades, eventually paying for the up-front cost of the retrofits. But in the short term, those up-front costs can be daunting. It can take years for the energy savings to pay for the one-time cost of the upgrades.

As a result, many building owners view energy retrofits as a financial risk. After all, they may sell their properties before the energy savings pay for the costs of the retrofits.

THE GREENING OF BUILDING CODES

Communities have a powerful tool at their disposal to ensure that buildings become more energy efficient: building codes. Most decisions in the construction industry—from wiring to plumbing, paint to siding—are shaped by these detailed community standards, which aim to ensure safety, quality, and resource conservation. Strengthening energy-efficiency provisions in building codes can ensure that new construction and remodels embrace the clean-energy advantage, trimming energy bills and keeping more dollars and jobs in the local economy. Some Northwest jurisdictions have been setting good examples with energy-code updates:

- **In British Columbia**, the provincial government took steps in 2008 to green its building code, requiring new construction to meet rigorous energy and water conservation standards.[44] Vancouver also has new building efficiency requirements.[45]
- **Oregon's legislature** passed a law in 2009 requiring the creation of building codes to boost energy efficiency of new, repaired, and altered buildings.[46] The code requires a 15 to 25 percent efficiency boost in new nonresidential buildings by 2012, along with a 10 to 15 percent increase in new residences.
- **Washington's legislature** also passed a 2009 law that will require a gradual tightening of state energy codes to achieve a 70 percent reduction in energy use in new commercial and noncommercial buildings by 2031.[47] It also requires that property owners provide information about energy performance and consumption when selling a commercial building.

The American Clean Energy and Security Act (ACES, or Waxman-Markey), passed by the US House of Representatives and pending in the Senate as of September 2009, is best known for its carbon cap-and-trade system, but it also gives a sweeping upgrade to building construction codes. It strongly encourages states to boost energy efficiency requirements by 30 percent within one year of passage, 50 percent by 2015, and an additional 5 percent per year through 2030.[48] If states refuse, ACES withholds large streams of federal clean-energy revenue.

These ambitious provisions will speed the Northwest's progress toward efficient buildings, backstopping Oregon and Washington's recent building-code upgrades and helping other Northwest states catch the same green-jobs wave.

For rental properties, the financial barriers to retrofits are multiplied: when renters pay utility bills, building owners have little incentive to pay for energy retrofits; and renters have no incentive to pay for retrofits that will benefit future tenants. And moderate- and middle-income families—folks who make too much money to qualify for low-income weatherization assistance, but don't have thousands of dollars to spare—find the up-front costs of efficiency retrofits daunting.

Smart, proven financing systems can turn each of these obstacles into opportunities by allowing everyone involved—building owner, renter, and retrofit contractor—to realize immediate financial benefits from lower energy spending. Financing for retrofits and weatherization can take the form of outright grants for the work or loans. The

best programs combine grants for some low-income households with loans and public financing. All these dollars can create training and work opportunities.

Here are four of the most promising financing solutions:

Over the long haul, well-designed energy efficiency retrofits can save both building owners and tenants tremendous amounts of money. But in the short term, those up-front costs can be daunting.

Solution 1: Let building owners pay for retrofits on utility or tax bills.

The City of Portland and Multnomah County in partnership with Energy Trust and ShoreBank Enterprise Cascadia are using stimulus money to retrofit 500 homes. Clean Energy Works: Portland is a pilot project that will allocate $2.5 million of stimulus money for the retrofits, starting with 10 homes and completing another 490 retrofits in the next two years.

Clean Energy Works provides reasonable financing terms for improvements that will yield energy savings and reduce greenhouse gas emissions. The financing spreads out the costs of the improvements over time. Favorable financing means that spending $2,500 on air sealing and insulation won't devour a family's cash supply.

The loan installments are also "on bill," which makes paying back the loan relatively painless. The three local utilities—NW Natural, Pacific Power, and Portland General Electric—will incorporate the servicing of the loans in the regular billing they send out to customers.[49] For example, payments for that $2,500 air-sealing and insulation project would be spread out over time and would show up on regular energy bills. The monthly energy savings would likely be enough to offset the monthly increase to pay for the loan, or at least come close. This makes payback simple and essentially invisible, a big selling point for property owners.

Solution 2: Use "green leases" and innovative strategies to unite the interests of landlords and tenants.

Financing retrofits in rental properties is especially difficult. Many landlords see little reason to pay for retrofits when the tenants pay the energy bills. And renters don't make—or can't get financing for—investments in property they don't own. This "split incentives" problem wastes both energy and money.

One solution to the problem of split incentives is called the "green lease," an approach that lets tenants and landlords share the monthly benefits from energy-savings improvements.[50] Landlords make up-front investments in efficient appliances or similar measures that lower their tenants' utility bills. To pay for those up-front investments—and eventually earn a profit on those investments—landlords charge a little extra in rent. Yet tenants still save, because their utility bills go down more than their rent goes up.

The challenge with green leases is creating a practical financing arrangement that doesn't saddle landlords with too many headaches. And to make economic sense, green

leases must let landlords recoup the upfront costs in a reasonable amount of time. So in order to know if an investment makes sense, both landlords and tenants will need a trustworthy assessment of the potential savings. And they'll need to resolve some sticky questions: What happens if the refrigerator fails to save the energy and money that it promises? What if weatherization and new insulation generate more savings than anticipated? Despite these complications, green leases are already used in the US and Canadian commercial real-estate rental sectors.

The BC Sustainable Energy Association has another proposal to fix the split incentive problem. Its Green Landlords Project puts all the best ideas together in one place.[51] It recommends a comprehensive package of changes including energy labeling, financial incentives for landlords, training for green jobs, and effective marketing. But the most important part of the proposal is its call for an energy concierge, the dedicated agency that would oversee all aspects of energy efficiency.

The Green Landlords program also promotes the "Pay As You Save" (PAYS) method of paying for energy efficiencies. PAYS allows the costs and savings from improvements to appear on the utility bill of individual apartment units and stay with individual units until the improvement is paid for, even if a tenant moves.

Solution 3: Offer family-friendly retrofit financing with conservation loans.
Energy conservation loans are loans to pay for energy upgrades—as long as the energy savings are bigger than the loan payments, property owners come out ahead. In principle, this model could invest federal, state, or local stimulus dollars well; generate green-collar jobs in the construction trades; trim energy bills for property owners and renters; buttress sagging real-estate values; slash greenhouse gas emissions; and unlock a critical door to economic recovery.

But the challenges to successful conservation loans are daunting.

For starters, building owners lack knowledge of efficiency potential and techniques. They also don't know how big the savings will be. To compound the problem, private sector financing for energy-efficiency investments in buildings is hard to get. Guarantees are hard to come by, and banks lack the expertise to judge which lending strategies make sense. Plus, conservation loan programs rarely pay for themselves entirely. Even in Sacramento and Manitoba, which have the most successful and well-run conservation loan programs in North America, the programs' sponsors pay at least the cost of administration.

A Seattle-based nonprofit bank has devised one promising lending model—originally for replacement of leaking septic systems along Hood Canal. ShoreBank Enterprise Cascadia is legally a community development financial institution. In May 2007, it began making loans to property owners around Hood Canal to repair or replace faulty septic systems, which are one cause of the canal's periodic oxygen starvation. Capitalized with $3.5 million each from the Bill & Melinda Gates Foundation and the State of Washington, the septic loan program has now made more than 100 loans—an important start for Hood Canal.

ShoreBank Enterprise Cascadia writes the loans—which amount to 15-year second or third mortgages—on favorable terms to all borrowers. Because it's not a bank, it

can waive some normal restrictions about how much a homeowner can borrow. It also subsidizes the loans for low-income families. The version for the poorest households carries an interest rate of just 2 percent. What's more, the loan has to be paid only when the house is refinanced or sold. For families less strapped for cash, there is a 4 percent interest rate, with 2 percent of the interest deferred until sale or refinance; a straight 4 percent rate; and a straight 6 percent rate.

The loans terms are generous, because ShoreBank Enterprise Cascadia's mission—and that of its benefactors—is to replace as many faulty septic systems as it can with the same pool of money by reloaning the same capital each time a loan is repaid. Revolving loan funds, which governments are also wisely creating with federal stimulus dollars, are a smart way to reuse an initial pool of money.

Many landlords see little reason to pay for retrofits when the tenants pay the energy bills. And renters don't make—or can't get financing for—investments in property they don't own.

The same loan design can apply just as well to energy retrofits as to septic upgrades. In fact, it may work better: retrofits generate monthly bill savings that can repay the loan. ShoreBank Enterprise Cascadia hopes to launch a $20 million capital pool to fund loans in greater Seattle—an ambitious figure for a modestly sized nonprofit but a thimbleful of water compared to an ocean of need.

Solution 4: Use emerging tools to finance big projects with long payback periods. One related challenge is financing the kind of deep efficiency projects that will create a substantial number of jobs and put us on a clean energy path.

Property owners are tempted to make only the cheap, high-return retrofits—changing light bulbs and upping insulation in easy-to-reach attics. But we also need deep, comprehensive retrofits that employ skilled workers and double a building's energy efficiency, for example, by changing heating systems, insulating walls, replacing windows and doors, and installing appropriate renewable technologies such as ground-source heat pumps and solar water heaters.

Deep retrofits are expensive, even if they save the most money over the life of a building. They may pay for themselves over 20 years, rather than the 6 years or so that's typical for existing conservation loans. When the loan term is that long, many property owners wonder whether they'll ever see the financial benefit. Will they still own the building in 20 years?

This concern in particular is what inspired the creation of meter loans and local improvement districts, which allow conservation loan debt to transfer from one building owner to the next.

Meter loans (sometimes called "tarriffed improvement programs") are retrofit loans collected by a gas or electric utility on its monthly bills. The loans themselves can come from the utility or from a bank, public agency, or nonprofit. They obligate the current and any future owners of the electric or natural gas meter to pay for energy

PROFILE: BEN USKOSKI

Retrofitting rentals pays off for electricians

Ben Uskoski knew it was time to get out of the custom homebuilding business when he sold a 4,000-square-foot house on five country acres for less than it cost him to build it.

Electrical work runs in Uskoski's family. He spent the early part of his career delivering electrical supplies, then wiring homes and industrial plants. Once it became clear that the Northwest's homebuilding boom had gone bust, he got re-licensed as an electrician.

In early 2009, he answered an ad for a Tacoma company that had work to spare retrofitting rental properties. Advanced Energy Management LLC had just gotten a contract with the King County Housing Authority to replace light fixtures and other appliances in public housing complexes with more energy-efficient models.

And it needed electricians fast. The agency expected an infusion of stimulus funding for energy efficiency work and wanted to have contractors ready to go.

It was a right-time, right-place moment for Uskoski, who has six young children. Not only did the 30-year-old find a job for himself, but he landed work for eight other laid-off electricians he knew from Clark County, Washington.

"It was a huge opportunity," Uskoski said of getting in on the ground floor of a lighting retrofitting business. "I think it's a thing of the future where more and more it's going to get busier and busier."

Advanced Energy Management, a startup that launched in the fall of 2008, finds ways to shave wattage in multifamily apartment buildings or commercial spaces, changing out inefficient light fixtures or bathroom fans.

While many energy-efficiency incentive programs market to single-family homeowners, there's vast, largely untapped potential for job creation and energy saving in larger buildings, said owner Michael Kim.

Retrofitting hundreds of apartments at a time requires more employees. Kim's payroll has tripled since the beginning of 2009 to more than 20 electricians, and he expects work to get busier.

"The whole gist of the stimulus package is getting the Average Joe back to work," he

said. "It's pretty labor intensive to take out this old technology and put in new. It requires a lot of manpower."

Aside from the green jobs the work is creating, Kim said, it's also benefiting low-income tenants whose budgets are least able to withstand spikes in energy prices. The goal is to cut their electricity bills by 30 percent.

After his own experience in the cyclical home building business, Uskoski considers himself lucky to be in on what feels like a recession-proof trade. As supply and demand for energy grow increasingly out of whack, conservation will only become more important, Uskoski said.

"This seems like more of a long-term thing no matter what the economy is," he said.

improvements made to the building.

Local improvement districts are even more innovative. California has granted authority to its cities to loan money to building owners to pay for energy upgrades and solar panel installation and then to collect loan payments on property tax statements. Because local improvement district loans are structured as public spending projects for which the property owner is levied a special assessment (a type of property tax), the assessment —like other property tax obligations—transfers with the title deed on resale. Consequently, deep retrofits with long-payback periods are no longer risky investments for property owners.

We need deep, comprehensive retrofits that employ skilled workers and double a building's energy efficiency.

In Washington and Oregon, local improvement districts are legally reserved for projects that provide a public benefit—typically the construction of public infrastructure such as new transit or sewer systems. Furthermore, the normal rules require that local-improvement-district dollars go into projects on public property that remain in public ownership. So deploying local improvement districts to finance private-building retrofits will require a slate of legal reforms, including defining energy conservation or climate protection as a public benefit and waiving requirements concerning public ownership. In one scenario under consideration, a state would authorize local governments to create Climate Benefit Districts. These districts could then sell public bonds on private capital markets to raise money, and they could invest the funds in local building retrofits.

Like meter loans, local improvement districts would seem to resolve some of the challenges of financing deep retrofits for huge numbers of building owners, as part of an economic turnaround. But they are also new and untested. So far, the city of Berkeley, California, has launched a pilot project to implement this new authority. It expects to install 40 rooftop solar energy systems through the pilot. Boulder, Colorado, meanwhile, has created a local taxing district to finance building energy upgrades. Local improvement districts are a worthy experiment at this stage.

Another tool to fund large-scale energy retrofits for homes, apartment complexes, businesses, schools, or entire neighborhoods is a new federal bond program created by US law in 2008. These Qualified Energy Conservation Bonds (QECB) have not been used much yet, but they provide a promising opportunity to generate capital to support energy savings and the jobs that go with it.[52]

The 2009 US economic stimulus law included $3.2 billion in bonding authority for state, local, and tribal authorities to borrow money for energy efficiency and renewable energy projects. Northwest states have been allocated more than $132 million in bonding capacity through QECB. The list of permitted uses is broad: conservation program expenses, capital expenses to reduce energy consumption in public buildings, implementing green community programs, rural renewable energy development, alternative fuel and battery research, mass transit, green building techniques, and

public education to promote energy efficiency. QECBs come with little or no interest charge to the borrower because the benefit to the lender is in the form of federal tax credits. A city, for example, could pay no interest because the buyer benefits from tax credits.

Policymakers must focus on programs that put together all the pieces of the green-jobs puzzle.

One advantageous way to arrange this kind of loan is Green Increment Financing: using energy savings created by the project to pay off the bond. Washington's Department of Commerce has already started the process to consider project proposals, because most of the QECB money has to be tapped by the end of 2010. With such a versatile funding tool, Northwest communities should jump at the chance to create local jobs, retrofit buildings for energy efficiency and stimulate local economies in the bargain.

Green-Collar Jobs:
THE PRIZE

If the review of existing energy efficiency programs and policies shows anything, it is this: there is no silver bullet to creating green jobs. No one activity, by itself, can realize the potential for creating a cleaner and greener economy that provides work to those who most need it.

Instead, policymakers who are looking to capitalize on the near-term opportunity in creating green jobs through building retrofits must focus on programs and systems that put together all the pieces of the green-jobs puzzle:

- Green jobs training programs that lead to credentials or certification.
- Career ladders built on integrated training, employment, and formal education.
- A strong focus on marketing energy efficiency programs to property owners.
- Solid partnerships among allies, including labor, community groups, contractors, educators, and property owners.
- Requirements for energy audits before and after retrofits are completed.
- Systems for establishing trust between contractors and building owners.
- A "concierge" to help guide building owners through the retrofit process.
- Smart, proven financing solutions to reduce the risk and up-front costs of energy retrofits in buildings.

Successfully integrating these disparate pieces is no mean feat. Yet several organizations around North America have shown it's achievable. The Sacramento and Manitoba electric utilities, for example, have retrofitted up to a quarter of the homes they serve by combining smart and consistent marketing efforts through contractors with loan financing and excellent program administration. SustainableWorks has demonstrated a similar model that blends an array of community partners, although it remains a young experiment.

Yet another, larger example also shows the way: the United States' low-income weatherization program. This program, launched in 1976, has more than three decades' experience funding energy upgrades in the homes of low-income families. The program works through networks of nonprofit community action agencies and local community housing authorities. These agencies, which serve as the concierges for property owners, conduct pre- and post-retrofit energy audits, finance and supervise (or even implement) the upgrades, and monitor results. They also draw on other sources of funding, such as state agencies and energy utilities. The states and, especially, the US Department of Energy periodically review and evaluate which energy-saving strategies are most effective, which then informs future funding. Consequently, low-income weatherization retrofits are among the best-informed and -monitored around, although their execution is uneven. Even before 2009, these programs were investing as much

as $16 million a year in Idaho, Oregon, and Washington, completing about 6,000 retrofits a year. That number is doubling in 2009 and 2010, thanks to federal stimulus and potential ACES funds, but still remains paltry. The Northwest states, for example, have some 5 million residential units, of which perhaps 1 million house low-income families. Over 30 years, low-income weatherization programs have reached perhaps 4 percent of their intended market.[53]

Conceptually, low-income weatherization programs hit all the targets: providing jobs for local workers, reducing poverty, saving energy, and reducing greenhouse gas emissions. In a way, the challenge before the Northwest is to create the same kind of integrated system for all property owners that these programs already offer to owners of low-income housing.

To realize the full promise of green-collar jobs, a final challenge remains: connecting clean energy's potential with meaningful employment opportunities for all.

To support green job creation on a large scale, property owners in every income bracket must have sensible and attractive opportunities to embrace energy efficiency. From the family buying a starter home with inefficient electric heat, to the condo owner interested in renewable technology, to the landlord replacing apartment windows, the motivation to make energy-saving investments must overwhelm the barriers. The solution lies in integrated incentive programs, mandates such as building codes or point-of-sale energy ratings, and a growing suite of loans, grants, and bonds. Successful programs will combine the best practices learned from decades of low-income weatherization work—focusing on cost-effective improvements and offering small-building owners all the necessary resources—with innovative financing and marketing tools to reach new audiences.

To realize the full promise embedded in green-collar jobs, a final challenge remains: connecting clean energy's potential with meaningful employment opportunities for all. To receive the green-collar payoff, programs using public dollars to subsidize energy efficiency work can verify that contractors are training or hiring employees into living-wage green-collar jobs. Green jobs training programs can organize classroom education, fieldwork, and paid employment into meaningful career ladders. They can meet the needs of working adults with childcare and flexible schedules. They can also focus on high-growth industries that need workers and the specialized skills that will help graduates thrive in a clean energy economy.

Applying this set of solutions—on a massive scale with federal funding—can help Cascadia lead a green-collar economic recovery. But success won't be fully captured only in higher quarterly earnings or a lower unemployment rate. It will be measured by whether the Northwest increasingly offers its residents a more sustainable way to live, with greater energy independence, fewer greenhouse-gas emissions, cozier buildings with lower operating costs, and a good job for everyone who needs one.

GLOSSARY

Clean energy economy: An economy fueled by energy efficiency and renewable energy.

Conservation loan: A loan that helps pay the up-front costs of a home improvement that conserves water or energy, which is paid back over time with the money saved on utility bills.

Energy audit: A process that identifies how energy is wasted in a home or business and provides a blueprint to make it more efficient.

Energy labeling: An easy-to-understand rating that communicates how energy efficient a home or building is, similar to the miles-per-gallon rating for automobiles.

Green-collar job: A job held by an employee who devotes a substantial share of his or her work hours to activities that either boost energy efficiency and renewable energy or prevent, reduce, or clean up pollution.

Green lease: An agreement allowing a building owner and tenant to share the financial benefits from an energy efficiency upgrade.

Local improvement district: A tool that allows local government to loan money to building owners to pay for energy-saving upgrades or other public benefits and to collect loan payments on property tax statements.

Meter loan: A long-term loan paid back through monthly utility bills, which obligates current and future owners of an electric or natural-gas meter to pay for an energy-saving improvement.

On-bill financing: A mechanism that allows home or business owners to pay back a loan for an energy efficiency improvement such as a new furnace or windows through a small increase on monthly utility bills.

Pay As You Save (PAYS): A program allowing costs and savings from an efficiency improvement to appear on the utility bill of an individual apartment unit and stay with that unit until the improvement is paid for, even if a tenant moves.

Revolving loan fund: A pool of public or private funds that recycles money by making new loans as older ones are paid back, allowing an initial investment of cash to help multiple people.

Split incentive: A problem that arises when tenants in a rental building have no incentive to conserve energy or water because landlords pay their utilities, or landlords

have no incentive to invest in energy efficiency improvements because renters pay utility bills.

Subsidized low-interest loan: A loan that uses public funds to offer better interest rates or more favorable financing than what the market would normally provide, sweetening the deal for property owners to borrow money for energy efficiency improvements.

NOTES

1. Alan Durning, Green Collar Jobs, Northwest Environment Watch (now Sightline Institute), 1999, http://www.sightline.org/publications/books/green-collar-jobs/gcjobs.

2. Doug Elmendorf, "Implementation Lags of Fiscal Policy," Congressional Budget Office, June 2, 2009, http://www.cbo.gov/ftpdocs/102xx/doc10255/06-02-IMF.pdf; and Recovery.gov, "Investments by State: Tabular View," http://www.recovery.gov/?q=content/funding-notification.

3. 2008 Buildings Energy Data Book, US Department of Energy, March 2009, buildingsdatabook.eren.doe.gov/.

4. Hannah Choi Granade et al., "Unlocking Energy Efficiency in the U.S. Economy," McKinsey and Company, July 2009, http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf.

5. Alan Hardcastle, Washington State University, Extension Energy Program, "2008 Washington State Green Economy Jobs," Washington Employment Security Department, January 2009, http://www.workforceexplorer.com/admin/uploadedPublications/9463_Green_Jobs_Report_2008_WEXVersion.pdf.

6. "The Greening of Oregon's Workforce: Jobs, Wages, and Training," Oregon Employment Department, June 2009, http://www.qualityinfo.org/pubs/green/greening.pdf.

7. "The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America," The Pew Charitable Trusts, June 2009, http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf.

8. "Environment Industry: Business Sector: 2002 (Revised) and 2004," Statistics Canada, September 2007, http://www.statcan.gc.ca/pub/16f0008x/16f0008x2007001-eng.pdf.

9. Robert Pollin et al., "The Economic Benefits of Investing in Clean Energy: How the Economic Stimulus Program and New Legislation Can Boost U.S. Economic Growth and Employment," Department of Economics and Political Economy Research Institute, University of Massachusetts Amherst and Center for American Progress, June 2009, www.peri.umass.edu/economic_benefits; and Robert Pollin et al., "Green Prosperity: How Clean-Energy Policies Can Fight Poverty and Raise Living Standards in the United States," Department of Economics and Political Economy Research Institute, University of Massachusetts Amherst, June 2009, http://www.peri.umass.edu/green_prosperity.

10. "Cascadia Scorecard: Energy," Sightline Institute, http://scorecard.sightline.org/energy.html.

11. If employment increases without lowering the unemployment rate, by drawing more people into the labor force, average wages are unlikely to rise.

12. J. Andrew Hoerner and Nia Robinson, "A Climate of Change: African Americans, Global Warming, and a Just Climate Policy for the US," Environmental Justice and Climate Change Initiative, June 2008, http://www.ejcc.org/climateofchange.pdf.

13. Skip Laitner and Vanessa McKinney, "Positive Returns: State Energy Efficiency Analyses

Can Inform U.S. Energy Policy Assessments," American Council for an Energy-Efficient Economy, June 2008, http://www.aceee.org/pubs/e084.htm.

14. Robert Pollin et al., "Green Prosperity: How Clean-Energy Policies Can Fight Poverty and Raise Living Standards in the United States," Department of Economics and Political Economy Research Institute, University of Massachusetts Amherst, June 2009, http://www.peri.umass.edu/green_prosperity.

15. United States Global Change Research Program, Global Climate Change Impacts in the United States, Cambridge University Press, 2009, http://www.globalchange.gov/usimpacts, especially "Regional Climate Impacts: Northwest," http://downloads.globalchange.gov/usimpacts/pdfs/northwest.pdf.

16. Ernie Niemi et al., "An Overview of Potential Economic Costs to Oregon of a Business-as-Usual Approach to Climate Change," Climate Leadership Initiative, University of Oregon, Eugene, February 17, 2009, http://climlead.uoregon.edu/pdfs/FinalOReconomicreport.pdf; and Ernie Niemi et al., "An Overview of Potential Economic Costs to Washington of a Business-as-Usual Approach to Climate Change," Climate Leadership Initiative, University of Oregon, February 17, 2009, http://climlead.uoregon.edu/pdfs/Inaction_WA_FnlRpt.pdf.

17. "Recovery and Investment," US Department of Energy, http://www.energy.gov/recovery; and Daniel Malarkey, Washington Department of Commerce, "American Recovery and Reinvestment Act: Clean Energy Funding in Washington State," Washington State Energy Summit, May 4, 2009, http://www.commerce.wa.gov/summit/4.pdf.

18. Alan Durning, "Clean-Energy Stimulus," Daily Score Blog, Sightline Institute, May 28, 2009, http://daily.sightline.org/daily_score/archive/2009/05/28/clean-energy-stimulus.

19. "News Release: U.S. Department of Labor Announces $500 Million for 5 Grant Solicitations to Train Workers for Green Jobs," US Department of Labor, August 11, 2009, http://www.dol.gov/opa/media/press/eta/eta20090725.htm.

20. "Recovery and Investment," US Department of Energy, http://www.energy.gov/recovery.

21. Roger Valdez, "Money (and Jobs) On the Table," Daily Score Blog, Sightline Institute, August 26, 2009, http://daily.sightline.org/daily_score/archive/2009/08/26/money-and-jobs-on-the-table.

22. "H.R. 2454: American Clean Energy and Security Act of 2009," Govtrack.us, US Congress, http://www.govtrack.us/congress/bill.xpd?bill=h111-2454.

23. John Larsen et al., "Allowance Distribution to States and Energy Consumers under the American Clean Energy and Security Act (H.R. 2454, Waxman-Markey)," World Resources Institute and Georgetown Climate Center, July 28, 2009, http://www.wri.org/stories/2009/07/analysis-allowances-states-under-hr-2454; and a spreadsheet of estimated allowances distributed to each state values developed by Larsen et al. for their analysis, and provided to Sightline by Larsen et al.; and an estimated price per allowance. Estimate assumes that states sell their free permits for $13.50 each in 2016, the EPA permit price estimate cited in Larsen et al.

24. Pollin et al., "Economic Benefits of Investing in Clean Energy," http://www.peri.umass.edu/economic_benefits.

25. Durning, "Clean-Energy Stimulus," http://daily.sightline.org/daily_score/archive/2009/05/28/clean-energy-stimulus.

26. Prince and Jenkins, "Building Pathways to Success," http://www.dataqualitycampaign.org/

files/publications-building_pathways_to_success_for_low-skill_adult_students-040105.pdf.

27. Prince and Jenkins, "Building Pathways to Success," http://www.dataqualitycampaign.org/files/publications-building_pathways_to_success_for_low-skill_adult_students-040105.pdf.

28. Prince and Jenkins, "Building Pathways to Success," http://www.dataqualitycampaign.org/files/publications-building_pathways_to_success_for_low-skill_adult_students-040105.pdf.

29. Keith Schneider, "Majoring in Renewable Energy," New York Times, March 26, 2008, http://www.nytimes.com/2008/03/26/business/businessspecial2/26degree.html.

30. W. Norton Grubb, Learning to Work: The Case for Reintegrating Job Training and Education, Russell Sage Foundation, 1996; and private communication with W. Norton Grubb, University of California Berkeley, May 26, 2009.

31. "The Health Care Labor Shortage: Report of the Health Care Labor Shortage Work Group," Washington State Workforce Training and Education Coordinating Board, January 15, 2002, http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1a/6b/9a.pdf; and "Hospital Employee and Education Training (HEET)," Washington State Board For Community and Technical Colleges, http://www.sbctc.ctc.edu/college/_e-wkforcehospitalemployee.aspx; and "News: Five Community and Technical Colleges Receive Funds to Train More Healthcare Workers," Washington State Board for Community and Technical Colleges, July 21, 2008, http://www.sbctc.ctc.edu/general/_n-20080721_july_5_ctcs_receive_funds_to_train_more_healthcare_workers.aspx.

32. "Hospital Employee and Education Training (HEET)," http://www.sbctc.ctc.edu/college/_e-wkforcehospitalemployee.aspx; and "News: Five Community and Technical Colleges Receive Funds," http://www.sbctc.ctc.edu/general/_n-20080721_july_5_ctcs_receive_funds_to_train_more_healthcare_workers.aspx.

33. Sarah White and Jason Walsh, "Greener Pathways: Jobs and Workforce Development in the Clean Energy Economy," Center for Wisconsin Strategy, the Workforce Alliance, and the Apollo Alliance, 2008, http://www.greenforall.org/resources/greener-pathways-jobs-and-workforce-development-in.

34. "Final Bill Report: E2SHB 2227," Washington Legislature, http://www.leg.wa.gov/pub/billinfo/2009-10/Pdf/Bill%20Reports/House%20Final/2227-S2.E%20HBR%20FBR%2009.pdf.

35. "A-Engrossed House Bill 3300: A Bill for an Act Relating to the Green Economy, and Declaring an Emergency," Washington Legislature, http://www.leg.state.or.us/09reg/measpdf/hb3300.dir/hb3300.a.pdf.

36. Granade et al., "Unlocking Energy Efficiency," http://www.mckinsey.com/clientservice/electricpowernaturalgas/downloads/US_energy_efficiency_full_report.pdf.

37. Merrian C. Fuller, "Enabling Investments In Energy Efficiency: A Study of Energy Efficiency Programs That Reduce First-cost Barriers in the Residential Sector," University of California Berkeley, http://erg.berkeley.edu/info/thesis/Fuller_2009_ResiFinancing%20ERG%20Final%20Paper.pdf.

38. Private communication with Dave Sproull, SustainableWorks, July 2009.

39. "Green Building Capital Initiative Summary Report," City of Seattle, Office of Sustainability, April 22, 2009, http://www.seattle.gov/mayor/PDF/090422PR-GBCIpolicyReport.pdf.

40. "Energy Performance Score," Energy Trust of Oregon, http://www.energytrust.org/eps.

41. "Trade allies," Energy Trust of Oregon, http://www.energytrust.org/TA/index.html.

42. "About Green Homes Concierge," Green Homes Concierge Service, http://www.

greenhomeslondon.co.uk/about/index.aspx.

43. "Efficiency Programs & Rebates: Efficiency Programs," Puget Sound Energy, http://www.pse.com/solutions/forbusiness/pages/efficiencyComPrograms.aspx?tab=2&chapter=1.

44. "Changes to the BC Building Code, Effective September 5, 2008," Province of British Columbia, April 15, 2008, http://www.housing.gov.bc.ca/building/green/TextofCodechanges.pdf.

45. "By-law 9691," City of Vancouver, April 15, 2008, http://vancouver.ca/blStorage/9691.PDF.

46. "Enrolled Senate Bill 79: An Act Relating to Energy Use of Buildings, and Declaring an Emergency," Oregon Legislature, June 24, 2009, http://www.leg.state.or.us/09reg/measpdf/sb0001.dir/sb0079.en.pdf.

47. "Engrossed Second Substitute Senate Bill 5854: An Act Relating To Reducing Climate Pollution in the Built Environment," Washington Legislature, April 20, 2009, http://apps.leg.wa.gov/documents/billdocs/2009-10/Pdf/Bills/Senate%20Passed%20Legislature/5854-S2.PL.pdf.

48. Alan Durning et al., "Cap and Trade 101: A Federal Climate Policy Primer," Sightline Institute, July 2009 edition, http://www.sightline.org/research/energy/res_pubs/cap-and-trade-101/Cap-Trade_online.pdf.

49. "On-Bill Financing Option," San Diego Gas and Electric Company, January 2009, http://www.sdge.com/business/esc/documents/obf.pdf.

50. Beth E. Williams, "Overcoming Barriers to Energy Efficiency for Rental Housing," Department of Urban Studies and Planning, Massachusetts Institute of Technology, June 2008, http://dspace.mit.edu/bitstream/handle/1721.1/44348/276307447.pdf?sequence=1.

51. Jamie Abbot et al., "Green Landlords: Solving the Rubik's Cube of Energy Efficiency in Rental Housing," BC Sustainable Energy Association, April 3, 2009, http://www.bcsea.org/sites/default/files/GLP-PhaseI_Report.pdf.

52. "Qualified Energy Conservation Bonds," Washington Department of Commerce, June 2009, http://www.commerce.wa.gov/site/862/default.aspx.

53. Alan Durning, "Cap and Caulk: How Smart Climate Policy Can Cut Our Energy Costs," Daily Score Blog, Sightline Institute, February 27, 2008, http://daily.sightline.org/daily_score/archive/2008/02/27/cap-and-caulk-how-smart-climate-policy-can-cut-our-energy-costs.

Photo Credits

Simon in open field © Jeffrey31; *insulation3* © Old Shoe Woman; *blue collar woman* © Vanity Press; profile photos courtesy of Greg Jordan, Michael McCormick, Deb Conklin, and Ben Uskoski