

# COMMUNITY JOBS IN THE GREEN ECONOMY



· Apollo Alliance  
· Urban Habitat  
·  
·  
·

## Apollo Alliance

The Apollo Alliance aims to improve America's security, technological leadership, economic strength, and shared prosperity by achieving sustainable American energy independence through efforts at the national, state and local level. Named after President Kennedy's challenge in the 1960s to land a man on the moon within a decade, the Apollo Alliance has a bold strategy to direct \$300 billion in targeted investments towards achieving sustainable energy independence within a decade.

Apollo's 10-point plan to achieve energy independence includes promoting advanced technology and hybrid cars, encouraging high performance building, increasing the use of energy efficient appliances, expanding renewable energy development, and improving transportation options. Our plan is supported by key national leaders in the labor, environmental, and business sectors, as well as by communities of color who are traditionally most harmed by existing energy policies.



**Apollo Alliance**  
[www.apolloalliance.org](http://www.apolloalliance.org)

## Urban Habitat

The mission of Urban Habitat is to build power in low-income communities and communities of color by combining education, advocacy, research, and coalition building to advance environmental, economic, and social justice in California's Bay Area.

Urban Habitat envisions a society where all people live in economically and environmentally healthy neighborhoods. Clean air, land, and water are recognized as fundamental human rights. Meaningful employment honors a worker's right to dignity and a living wage with benefits. Effective public transportation and land-use planning connect people to the resources, opportunities and services to thrive. Affordable housing provides a healthy and safe home for all. And quality education prepares visionary leaders to strengthen our democracy with new ideas, energy, and commitment.

Urban Habitat convenes the Social Equity Caucus (SEC), the Bay Area's only body dedicated to promoting a regional vision for social justice. SEC members represent economic, social, and environmental justice community-based groups, as well as labor, public health, advocacy, faith, and youth organizations.

The Bay Area faces a two-dimensional job crisis: many people can't find jobs and are stuck in a near permanent state of unemployment and an equally large number of people have jobs and work full-time but earn wages which are insufficient to decently raise a family. The goal of the SEC's newest campaign is to increase job quality in the Bay Area's low-income communities and communities of color.



**Urban Habitat**  
[www.urbanhabitat.org](http://www.urbanhabitat.org)

## Acknowledgements

This report was written by Kate Gordon, Jeremy Hays, Leon Sompolinsky, Elizabeth Tan, and Jackie Tsou. Design by Karyn Matchey. The generous support of the Nathan Cummings Foundation and the Energy Foundation made this report possible. Many thanks to friends of the Apollo Alliance and Urban Habitat around the country, who offered advice, reviewed drafts, contributed photos and inspired this project with their important work.

For additional copies of this report please email: [publications@apolloalliance.org](mailto:publications@apolloalliance.org)



# FOREWORD



Van Jones

President, Ella Baker Center for Human Rights  
Member, Apollo Alliance National Steering Committee

Van Jones and Ella Baker Center for Human Rights Co-convene the Oakland Apollo Alliance with the International Brotherhood of Electrical Workers Local 595.

See: [www.ellabakercenter.org/OaklandApollo](http://www.ellabakercenter.org/OaklandApollo) for more information on their inspirational work.

The clean-energy, “green economy” is now exploding into a billion-dollar sector—with more growth predicted.

But the green economy can do more than create business opportunities and consumer choices for the rich. It can also create job opportunities for the poor. It can do more than improve the bottom line for big corporations. It must improve the life prospects for struggling communities.

The national effort to curb global warming and oil dependence can simultaneously create good jobs, safer streets and healthier communities. That is the chief moral obligation in the 21<sup>st</sup> century: to build a green economy strong enough to lift people out of poverty.

We have the technology. Investors are lining up. The only question is: do we have the political will to make government support the transition—and the moral commitment to ensure that the new “green wave” in fact “lifts all boats?”

We have no “throw-away” resources or species. Nor do we have any “throw-away” children. All of creation is sacred, and all our people are precious. And we must act again as if we know this truth.

When we do so, our dying blue-collar towns and neighborhoods will bloom again—as dignified, “green-collar” meccas. Urban youth, too often fodder for prisons, could instead be trained to create zero-pollution products, heal the land and harvest the sun. Urban America can be put back to work, rebuilding our cities for the clean-energy future.

We dream of clear skies over our major port cities. Where idling ships once fouled the air, we see solar-powered energy stations that let docking sea vessels power up cleanly. We imagine trucks purchasing cleaner bio-diesel blends, to take the fair trade goods off the ships without polluting the neighborhood.

We envision eco-industrial parks on land once blighted by prisons. We dream of struggling cities like Watts, Detroit and Newark blossoming as Silicon Valleys of green capital. We dream of a multi-ethnic, grassroots movement transforming urban America by creating jobs, reducing violence and honoring the Earth.

Some will call this unrealistic. They will advise urban America to keep its dreams small. But that cynicism is the problem, not the solution.

Those communities that were locked out of the last century’s pollution-based economy must be locked into the new, clean and green economy. This report represents a guiding light on that journey.



# INTRODUCTION

**T**his report, a collaborative effort between the Apollo Alliance and Urban Habitat, is a reflection of our shared belief in the potential of the “green economy” to generate quality jobs in our nation’s low-income communities and communities of color. We believe that America can move toward energy independence while simultaneously creating high-skill and high-wage jobs for residents of low-income urban communities—residents who have not historically benefited from economic development strategies. To achieve this goal, we must take advantage of America’s land, sun and wind resources, high-skilled workforce, strength in ingenuity and innovation, and creative partnership-building potential.

We believe that through investment at the national, state and local level in four key areas—renewable energy, alternative cars and fuels, high performance buildings and infrastructure, and equitable development—America can build a clean energy future. More important, we know that this future will be built on the shoulders of all Americans—farmers, workers, entrepreneurs, businesspeople, and consumers—and that every American must reap its economic and environmental benefits.

In this report, we present an overview of key industries in the green economy, as well as discussions about the necessary workforce development infrastructure needed to train workers to take advantage of these opportunities. We also provide some case studies of Americans who are already employed in these jobs. Finally, we present strategies that cities can use to take advantage of this new economic development engine. Our goal is to provide a roadmap for community organizers, economic development practitioners, labor representatives, and city managers who wish to learn about and create high quality, green jobs in their communities.<sup>1</sup>

## Report Summary

- 1** **Section I** describes our vision for a green economy that ensures equitable development.
- 2** **Section II** outlines a range of “green industries” that currently exist in the U.S., and the types and number of jobs associated with each industry. As this report will illustrate, many high-skill, high-wage jobs are available through the energy efficiency, renewable energy, and renewable fuels sectors. However, high-quality, family-supporting jobs do not necessarily follow from every investment in green industry. Cities must proactively and explicitly prioritize and encourage the development of local jobs across all skill sets, in order for green economic development to achieve equitable outcomes for residents. Cities also play an instrumental role in building partnerships and crafting workforce training programs to prepare their local residents for jobs in the green economy.
- 3** **Section III** presents some strategies and policies to help cities ensure new green jobs are accessible to all residents. These strategies and policies represent the many ways in which cities can tailor a green economic development plan to suit their specific needs. Here we also look at how two California cities, Los Angeles and Richmond, are starting the journey toward a cleaner, greener, more equitable future.



# I. THE VISION

## The Vision for a Green Economy and Equitable Development

**A**merica's energy economy is not working. Our addiction to fossil fuels has dire consequences, from global warming to roller coaster energy bills to expensive power outages that cripple our business economy. Meanwhile, low-income urban communities—the sites of most of our dirty power generation—continue to be plagued by poor education and health, high crime, limited employment opportunities, and a diminishing affordable housing stock.

For years, many people saw these situations as unrelated. However, it has become clearer and clearer that investing in clean energy technology can also create good jobs, and that these jobs are clustered in high-density urban areas. An early Apollo Alliance study shows that major national investments in the four priority areas—renewable energy, alternative cars and fuels, high performance buildings and infrastructure, and equitable development—would result in almost three and a half million “green jobs” for Americans. “Green jobs” are those that are directly related to local investments in energy efficiency, renewable energy, and renewable fuel sectors. For instance, a city that decides to install a wind turbine to generate clean power creates “green jobs” in every sector of the wind industry, from component part manufacturing to turbine installation to sales to operating and maintenance. Because the wind turbine is located in the city, many of these jobs are local. Moreover, many of these jobs, especially in the construction and manufacturing sectors, do not require a college degree but are relatively high-wage. Thus the clean energy economy has the potential to provide valuable opportunities to the millions of unemployed and displaced workers who live in our communities.

### **Vision:**

**A green economy that benefits all Americans and is strong enough to lift people out of poverty**

If cities want to realize this potential, policymakers and communities must explicitly ensure that the benefits of the clean energy economy include low-income workers and people of color. As the green economy continues to grow, it is important to ask some hard questions, including:

- What makes for a successful green economy?
- Who benefits from green economic development policies and practices?
- What policies and practices will ensure that green jobs will go to the under- or unemployed in our low-income communities?

Unless cities candidly address these issues, much of the green economy's most important features, including the opportunity to create decent jobs for low-income Americans, will be lost. For this reason, Urban Habitat and the Apollo Alliance are committed to advancing a green economy that is rooted in the principles of equitable development. Equitable development is premised on the notion that a city's development practices result in affordable housing, safe, reliable public transit, living-wage jobs, quality education, a clean environment, and quality health care for all city residents. In practice, equitable development goes beyond the physical development of a place—for example, the construction of various types of buildings, placement of buildings, and activities within those buildings. Truly equitable development must also meaningfully engage residents, workers, community organizations, businesses, and organized labor in planning and decision-making processes, before the first brick is laid.

Equitable green economic development presents a unique opportunity to address three essential goals simultaneously: a healthy environment, a vital economy, and social equity. We hope this report helps illustrate how that opportunity can become reality.



## II. THE JOBS

**W**e've said that the green economy can create jobs. But what kind of jobs are they? What skill levels? And will they be within low-income workers' reach? In this section we hope to answer some of these important questions, by detailing the types of jobs available in three major areas: energy efficiency and green buildings, renewable energy, and renewable fuels.

### Energy Efficient Buildings

Energy efficiency projects are a huge win for local communities, from both an environmental and a jobs perspective. Incorporating energy efficiency concepts into building design, construction, and retrofits can reduce energy use—and energy bills—significantly. It can also create jobs in energy efficient product manufacturing and installation, as well as general construction jobs.

Here we discuss two primary ways to bring jobs in energy efficiency into a community: through new efficient construction (also known as “green building”) and through energy efficiency retrofits on existing buildings.

### Green Building

Green building is the practice of constructing healthier and more resource-efficient structures by improving the ways buildings use energy, water, and materials.<sup>2</sup> Green buildings, also called “high performance” buildings, incorporate both the efficient use of existing energy supplies and the installation of renewable energy systems where appropriate. The main jobs associated with green or high performance building are in the manufacturing of efficiency components and renewable energy systems, and in construction.

Green building creates demand for a whole range of specially manufactured products and technologies. As the demand for green buildings increases, so will the manufacturing jobs that supply green products. These jobs include those with manufacturers of energy efficiency and low-waste systems, such as compact fluorescent lights, waterless urinals, water filtration systems, permeable concretes, insulation, flooring, and low-chemical paints and carpets. They also include jobs with manufacturers of small-scale renewable products such as solar PV panels, solar hot water heaters, small wind turbines, and geothermal heat pumps.



*“We understand that the future of development lies with a new approach to building and we see the opportunities to create new businesses and new jobs while building a better, healthier more sustainable Boston.”<sup>2</sup>*

—Boston Mayor Thomas M. Menino  
on Green Building

## Energy Efficiency Retrofit Jobs

- Auditing energy use in existing buildings
- Manufacturing materials and devices
- Installing efficient lighting and heating systems
- Installing insulation, windows, and appliances



Employees of California Youth Energy Services conduct energy audits and install materials to help low-income households save energy and money.<sup>4</sup>

Of course, green building also involves jobs in construction. Construction workers on green building projects do many of the same types of jobs as construction workers on any building site, though some of these jobs may require special training or certification to work with green products and technologies.

While green building projects employ construction workers, they may not necessarily create many more jobs than a regular “non-green” construction project would create. That’s because it takes the same size crew of carpenters, laborers, plumbers, electricians, roofers, etc. about the same amount of time to build a regular building as it does to build a green building, once the green materials and technologies have been obtained and assuming that the construction crew is trained in green building practices.

However, despite the fact that green building may not create many additional construction jobs, it does have the potential to create entry level job opportunities for low income and people of color when cities implement a combination of policies that promote green building, job training, and labor standards. We describe these policies more in section three of this report.

## Energy Efficiency Retrofits

An energy efficiency retrofit involves upgrading or replacing lights, heating and cooling systems, insulation, windows, and other components of an existing building so that the building will use less energy. Energy efficiency retrofit projects always create new jobs because such projects involve work on existing buildings that wouldn’t have been done otherwise. Jobs in energy efficiency retrofits include manufacturing the construction materials and devices designed to make buildings more efficient, such as compact fluorescent light bulbs, motion sensors, thermostats, efficient windows and window treatments, and efficient appliances. Energy efficiency retrofits also create construction jobs and high-skill auditing jobs.

Common construction activities in residential, commercial, industrial, and institutional retrofit projects require a wide range of trained construction workers. Heating, ventilation, and air conditioning (HVAC) system installation is probably the most highly skilled and labor-intensive job associated with retrofits. HVAC work employs pipefitters, sheetmetal workers, HVAC technicians, commissioning engineers, and electricians. Lighting projects range from installing efficient bulbs to replacing fixtures. The first requires little training; the second is a higher-skill activity performed by licensed electricians. Motors used for large scale heating and cooling systems and other applications need to be installed and replaced by licensed electricians. Construction workers are needed to install more efficient windows, plumbing fixtures, appliances, and insulation.

Energy audits of existing buildings are a necessary part of energy efficiency retrofits and a source of high quality employment. Auditors provide technical and financial information to consumers about how to reduce their energy bills, and at what cost. Actions can range from reducing energy consumption to installing energy efficient devices, to switching to renewable energy and fuel sources. Energy auditors also work with Home Energy Efficiency Rating Systems to verify that suggested energy systems are installed correctly. Energy auditing is a high-skill job that requires training and certification and can become a well-paying career.

An important set of retrofit jobs are those in the weatherization industry, which employs and trains workers specifically to retrofit homes and businesses to lower heating and cooling bills. The U.S. Department of Energy estimates that for every \$1 million invested in weatherization programs in low-income communities, 52 jobs are created in those communities.<sup>5</sup> Weatherization projects alone require workers to do a range of jobs including installing insulation, improving furnace systems, reducing air flow through buildings, repairing chimneys, installing control devices on water heaters and other appliances, reducing hot water flows in showers, and improving lighting systems.

**Energy efficiency retrofit projects create new, local jobs. The Los Angeles Apollo Alliance estimates that retrofitting 100 of the City's older buildings will create job opportunities for 2,000 people.**

## Green Economy Worker—Li Ling Young

Li Ling Young participated in the Step Up for Women employment training program offered by Northern New England Tradeswomen (NNETW) in the fall of 1996. Her previous employment included swimming instruction and fast food restaurant work. She had always been interested in construction, but was unaware of opportunities to learn construction skills until she heard about the Step Up program.

Following Step Up, she was hired by a weatherization contractor as part of the Department of Labor's On-the-Job Training Program. She worked there for two years (increasing her hourly pay from \$7.00 to \$11.00), and during that time became aware of the world of energy efficiency and the work of Vermont Energy Investment Corp. (VEIC).

She was hired by VEIC in 1999 as an Energy Specialist. This position required residential construction knowledge, an understanding of how energy is used in buildings, and math and analytical skills.

Li Ling estimates that VEIC has invested several months of training and conferences worth several thousands of dollars during her time there. She is now a Project Manager earning \$22/hour, working with developers, architects and builders, homeowners and tradespeople. She enjoys having an educational role—"giving people access to solid information that informs their decisions."

Li Ling loves her job and plans to continue working with energy and buildings. She thinks the existence of Efficiency Vermont (a program of VEIC which helps consumers save money and preserve the environment) is significant for Vermont's low income residents and an asset to the building community. "Efficiency Vermont positions Vermont's economy for the future. By addressing the greatest political, economic and technical challenge of the next fifty years, Vermont is leading the way for other states and even other countries."



Li Ling Young

### Green Economy Career Pathway:

Minimum wage work ⇨

Specialized employment training program ⇨

Training ⇨

Independent employment =

Satisfying career and over 300% increase in wages



# Generating electricity using clean renewable energy sources creates more jobs than using fossil fuels.

Renewable energy technologies were a \$40 billion global industry in 2005. The industry is projected to quadruple in size over the next ten years.<sup>6</sup>

## Jobs in Solar PV

- Manufacturing parts for solar PV systems
- Assembling solar panels
- Installing solar panel systems on rooftops
- Maintaining and repairing solar PV systems

## Renewable Energy

Renewable energy is power generated from naturally replenished sources like the wind, the sun, and plants. In this section we describe four different renewable energy technologies. Table 1 demonstrates that the use of these renewable energy technologies creates more jobs per megawatt (MW) of electricity generated than typical natural gas power plants.

### Solar PV

Solar technology allows us to harness the sun’s power and turn it into electricity. Every bit of solar power that we create allows us to use a little less power from fossil fuel sources such as coal-fired power plants. The major component of solar energy technology is the photovoltaic (PV) cell. PV cells assembled in modules, also called solar panels, are professionally installed on buildings and other structures to catch the sun’s rays and transform them to electricity. This electricity can be used directly by the building or fed into the power grid.

The solar PV industry offers numerous job opportunities for skilled laborers such as roofers, electricians, and sheet metal workers—workers who currently play no role in traditional energy generation.<sup>7</sup> In fact, PV technology requires more manufacturing and construction labor per MW installed than any other renewable energy source. The manufacture of PV cells and the assembly of solar panels accounts for approximately 80% of all jobs in this sector, while installation of the solar panels accounts for most of the remaining jobs.

Specific jobs in solar PV include manufacturing the component parts to be assembled into solar PV systems, including metals, glass, raw silicon (often leftovers from computer industry), batteries, inverters, wiring, and roof mounting structures that hold the solar panels in place. In addition to manufacturing, there are also jobs in assembling the solar panels prior to installation. Assemblers connect cells with one another and add glass and plastics to produce the finished solar panel. Systems integrators put the solar panel together with wires and prepare it for installation. Installers set the solar panel on the roof by connecting it to the inverter, and connecting the inverter to the power grid. Maintenance workers provide routine maintenance and repairs to this entire system of solar panels. And there are other associated jobs in sales and in the transportation of component parts and completed solar panels.

**Table 1: Jobs in Renewable Energy per Megawatt (MW) of Electricity**

Power Source	Manufacturing* (jobs/MW)	Construction & Installation (jobs/MW)	Operation & Maintenance (jobs/MW)	Total Jobs/MW
Solar PV	15.2	7.1	0.1	22.4
Wind	3.5	2.6	0.3	6.4
Solar Thermal	N/A	5.7	0.2	> 5.9
Geothermal	4.8	4.0	1.7	10.5
Natural Gas**	N/A	1.0	0.1	> 1.1

\* Includes component manufacturing.

\*\* Natural Gas is not considered a renewable energy. It is included here for comparison.

Source: Renewable Energy Policy Project.<sup>8</sup>

## Wind Energy

Because of the size of the turbines and the complex machinery inside them, wind power can bring many jobs to a community. Experts predict that for every 1000 megawatts (MW) of wind power generated, 3500 manufacturing jobs will be created.<sup>9</sup> Major activities in the wind industry include blade manufacturing, turbine and gearbox manufacturing, and tower and turbine installation. As in the solar industry, most of the manufacturing is segmented, meaning that most jobs (70%) are in component part manufacturing rather than in complete wind turbine system manufacturing. Many existing manufacturing firms already produce similar component parts for other purposes, and could likely transition to producing component parts for wind turbines in order to meet increased demand. Parts include: turbine blades, towers, gearboxes, electronic systems, brakes, and generators. Increased demand for wind energy will also require manufacturing of accessory equipment like anemometers for wind measurement, cables, and mechanical wind-driven pumps. Some manufacturers also produce machines under 50 kilowatts for home and single community use.

Developing wind farms, with many towers and turbines working together, creates a range of good construction jobs. Skilled workers build access roads and other infrastructure necessary for the wind farm. These skilled workers erect towers, install turbines, and connect the electricity to the grid.

Wind tower operators and maintenance workers are responsible for the upkeep of the huge turbines year after year, and perform functions such as blade cleaning and repair work. Utility workers maintain the lines connecting wind turbines to the power grid.

In addition to the numerous jobs in manufacturing, construction, operation and maintenance, demand for modern wind energy creates jobs for professionals and niche firms. Wind assessment and mapping consultants locate sites with good wind resources. Environmental service consultants conduct environmental impact assessments for planned wind developments. Re-powering firms replace outdated wind turbines with new models.

**Wind energy could ultimately supply 20% of the nation's electricity, employing tens of thousands of people in associated manufacturing, construction, and maintenance jobs.**



### Wind Energy Jobs

- Manufacturing parts for wind turbines and towers
- Constructing wind farms
- Operating and maintaining wind turbines

Enacting policies to boost demand for wind power, the State of Pennsylvania convinced the Spanish wind company Gamesa to open a manufacturing facility in a part of the state that has been hit hard by the decline of the steel industry. The facility will create over 500 good paying jobs.



geothermal heat pump

## Solar Water Heater Jobs

- Manufacturing parts
- Assembling finished heating systems
- Installing the heaters
- Providing regular maintenance
- Marketing and selling systems to consumers

## Geothermal Heat Pump Jobs

- Manufacturing equipment and parts
- Installing the heat pump system

Geothermal heat pump installation is labor intensive and creates local jobs at a range of skill levels.

## Solar Water Heaters

Like PV cells, solar water heaters convert the sun's rays into energy, in this case into heat for hot water systems in commercial buildings and private homes. Solar water heaters are generally very simple devices: sunlight strikes and heats an "absorber" surface within a "solar collector." Either a heat transfer solution or simply regular water flows through tubes attached to the absorber and picks up its heat. The heated water is then stored in a separate tank (often a conventional water heater tank) until needed. Traditional hot water heaters provide any additional heat that may be needed. In general, solar water heating systems can reduce the use of grid electricity by up to 80% and lower water heating bills substantially.<sup>10</sup>

The jobs related to the use of solar hot water heaters include: manufacturing the component parts that will be assembled into completed solar hot water heaters, assembling the finished heating systems, installing the system in a building, and providing regular maintenance. There are also jobs in sales and transportation.

## Geothermal Heat Pumps

Geothermal energy systems work by accessing the Earth's heat—which can reach 7000 degrees Fahrenheit—to produce electricity, or to heat water or air directly. Geothermal heat pumps transfer heat from the soil to buildings in winter and from buildings to the soil in summer, using an environmentally friendly heat exchange fluid similar to antifreeze. This process is very efficient, reducing electricity consumption by 30% to 60% in any given building. These pumps can be used in any kind of building, from a house to a factory, so long as the natural resources exist. In addition to heating and cooling, geothermal heat pumps can be used to heat water.

Because underground temperatures are fairly constant, geothermal energy is a renewable resource that many people are starting to use in homes and businesses across the United States. In addition, as home heating and cooling costs rise, a number of cities are exploring using geothermal heat pumps to heat and cool their municipal buildings.

Geothermal heat pumps are installed on individual buildings, so they tend to generate local installation and maintenance jobs. In one Canadian study, experts approximate that for every 1000 pumps installed in private residences, 150 jobs are created, most in lower-skill industries.<sup>11</sup>

Specific jobs associated with the use of geothermal heat pumps include: manufacturing mechanical equipment and primary metal supplies (such as wall shaft casings, drilling equipment, and power plant equipment), manufacturing polyurethane pipes through which heat exchange liquids are pumped, and manufacturing the heat pumps themselves. There are also jobs in installation and maintenance. Installers dig trenches and wells, install pipe loops, and perform electrical and duct work. Installation jobs can be performed by most HVAC contractors, and include trench digging, backhoe operation, pipe fusing, and backfilling.



Many unions have state-of-the-art training programs to prepare workers for careers in the renewable energy sector.

## Michelle Penny

Michelle Penny is a first semester electrician apprentice in IBEW Local 569 in San Diego, California. Beginning at the age of 15, Michelle held a variety of jobs in the service industry. She worked hard to make ends meet with jobs in food service, security and landscaping. When she was in high school Michelle took a drafting class that sparked her interest in building and construction. Now, years later, her IBEW training scholarship is allowing her to fully develop her talents.

A lifelong resident of Spring Valley, California, 25-year-old Michelle is a single mom who is raising her two children in the same community where she grew up. It means a lot to Michelle that with a good paying job she can be a part of making her community safer and healthier. “My kids are the future. I am a strong female role model for them, and I am using my skills and creativity to build a cleaner energy future for them.”

For Michelle, a career as an electrician allows her to meld her enjoyment of physical labor with intellectual challenge. She sees her apprenticeship as a ticket to a secure future. “A new economic sector is being built around renewable energy. Commitment to new energy technologies and my IBEW training will allow me to have a lifelong career in the electrical industry. Electricity makes the world go round. I know that my skills will always be needed.”

Michelle is being trained on the job and in the classroom with state-of-the-art energy technology to prepare her for where the industry is today as well as what it will look like in the future. When she attends her apprenticeship classes Michelle earns college credit without having to pay tuition, and when she completes her apprenticeship Michelle will be qualified to perform any aspect of electrical work covered by the National Electrical Code. Whether engineering and installing a solar system, providing motor controls, or troubleshooting electrical systems, Michelle will have mastered the skills needed to be a successful journey-level electrician.



Michelle Penny

“A new economic sector is being built around renewable energy... Electricity makes the world go round. I know that my skills will always be needed.”

### Green Economy Career Pathway:

Low-wage work ⇒

Training program ⇒

Union apprenticeship =

Good wages, benefits, and a secure future in a growing industry



## Renewable Fuel Jobs

- Growing and harvesting crops for feedstock
- Collecting waste oils for feedstock
- Manufacturing parts for production facilities
- Constructing production facilities
- Working in the production facility
- Distributing and marketing fuel

In the state of Washington, where recent policies created reliable markets for biofuels, Imperium Renewables is building a large biodiesel refinery at the Port of Grays Harbor. The construction of the refinery is creating 250–350 union jobs in an area that has suffered job loss with the decline of the timber industry. After it is up and running, the plant will employ 50 permanent workers.

## Renewable Fuels: Ethanol and Biodiesel

A key part of the green economy is domestically-produced renewable fuel. The two most common renewable fuels in use today are ethanol and biodiesel, both of which produce less greenhouse gas than conventional gasoline or diesel.

Ethanol is a fuel made from either sugar-based plants, such as corn, or from cellulose-based plants such as switchgrass. Ethanol is commonly used as a fuel additive in mixes of 90% gasoline and 10% ethanol (called “E10”), which can be used in any gasoline vehicle. However, “flex-fuel” vehicles that have been designed to run on either gasoline or ethanol can run on mixes of 85% ethanol (“E85”) and more. Biodiesel is a renewable fuel created mostly from plant oils (such as soybean, canola, or mustard), animal fats, or used cooking oil. It can be used in standard diesel engines as a substitute for diesel fuel, or an additive to diesel.

Many of the jobs in the biofuels sector are in plant growing and production, meaning that they are most often located in rural areas near farmland. Biofuel production can be a good economic development tool in these places, especially if the production facilities are owned by local farmers who can earn money both by selling their crops and the fuel produced from those crops.

In urban areas, jobs in this sector can include waste oil collection from area businesses, biodiesel production, and distribution. There are also manufacturing and construction opportunities associated with ethanol and biodiesel production facilities.

Major jobs associated with biofuels include growing and collecting feedstock, manufacturing parts for production facilities, constructing the biofuel facilities, producing fuel in the facilities, and distributing the final product. Growers who currently farm corn, soy, canola, and other raw plant material can tap into the biofuels market when selling these commodities. Many growers are also cooperative owners of biofuel production facilities. In urban areas, municipal employees or private contractors can collect waste vegetable and animal oils from area restaurants and processing plants to use in biodiesel production. Component manufacturers make many of the parts used in biofuel production facilities. For instance, metal fabricators make the steel tanks used to refine and store ethanol and biodiesel. Construction workers build the plants that turn plant matter or oils into biofuels. Estimates for construction jobs on average-sized ethanol or biodiesel plant projects range from 75 to 200 jobs, for 12 to 18 months, though newer and bigger plants may create up to 400 construction jobs.

Workers at biofuel production facilities perform a range of functions. An average ethanol plant produces about 40 million gallons of ethanol a year and employs around 35 people in the following types of jobs: general manager, plant manager, maintenance supervisor, plant operators, purchasing manager, lab manager and technicians, craftsmen, laborers, and instrument technicians.<sup>12</sup> Biodiesel plants employ fewer people, around 28 workers for an average plant making 30 million gallons per year. Jobs in these plants are similar to those in ethanol plants, though ethanol plants have the potential to hire more skilled lab workers and technicians as they move from fuel-only facilities into more sophisticated chemical operations.



## III. CREATING GOOD JOBS

**N**ow that we've laid out the types of jobs that make up the clean energy economy, the big question remains: how can we bring those jobs to our cities and communities? And just as important, how can we ensure that low-income residents can access these new high-quality, family-supporting jobs—especially those residents who are currently unemployed or underemployed, or who have barriers to employment such as limited language skills or a history of incarceration?

In this section we explore policies cities can enact to jump-start the clean energy economy. We also look at job quality and job training programs that can help ensure the benefits of this new economy are shared with local residents, especially in low-income and underserved communities.

### Growing the Clean Energy Economy in Your City

America's cities have a unique opportunity to take advantage of the growing interest in a new green economy. Cities are directly in control of thousands of buildings and vehicles that can be retrofitted or upgraded using new energy-saving technologies and renewable fuels. City governments have the power to negotiate clean energy practices with utilities that serve them. Land use policies can be a tool for encouraging developers to build green or to attract green manufacturing and industry. Cities can also use their bond ratings and control over local tax structures to provide financial incentives for renewable energy and energy efficiency programs.

Cities across the country have used a variety of innovative strategies to advance these goals. The Apollo Alliance recently released a report, *New Energy for Cities*, detailing many of these strategies, and providing case studies—with contact information—for each strategy.

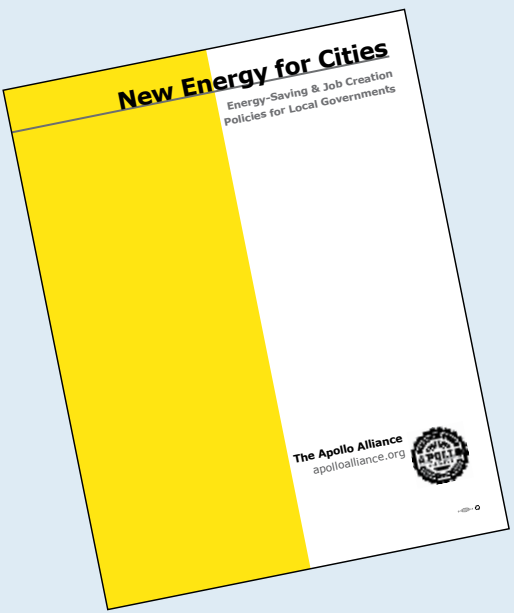
The Apollo Alliance and Urban Habitat believe all cities should embrace Apollo's Four-Point Plan for a cleaner energy future, which includes using concrete strategies to bring quality jobs to low-income communities and communities of color.

**1 Invest in Renewable Power**  
By 2025, generate the maximum feasible amount of regional electricity in the state from new clean, renewable, sources, through policies and programs that prioritize in-state production, workforce development, and good jobs.

**2 Create High-Performance Buildings**  
Revitalize communities by auditing and renovating all state buildings that fail to meet minimum energy efficiency standards, requiring efficient and green construction practices in all new public and private buildings, reducing energy consumption, and creating good jobs and job training for state residents.

**3 Drive Toward Energy Independence**  
Reduce oil consumption by promoting clean, renewable fuel alternatives and efficient motor vehicle technologies through policies and programs that prioritize in-state renewable fuel production and good jobs.

**4 Build High-Performance Cities**  
Promote low-energy, high-performance cities and communities connected by regional public transportation networks, through policies and programs that prioritize local hiring and good jobs.



The manufacturing, construction, installation, and maintenance of renewable energy and energy efficiency systems will happen almost entirely in metropolitan areas. The physical infrastructure America needs to build these new technologies—factories, universities, and research parks—is in or near cities. The workers who provide a strong foundation for America’s clean energy future already live near this infrastructure. Best of all, because union densities are higher in cities, clean energy jobs in the city are far more likely to be good-paying union jobs than jobs created outside the city.

The Apollo Alliance’s *New Energy for Cities* publication is available on the web at [www.apolloalliance.org](http://www.apolloalliance.org).

Some of the most far-reaching and effective strategies include:

- Installing renewable power systems, such as solar PV and small wind turbines, to power municipal buildings and publicly-financed projects such as affordable housing developments.
- Updating city building codes to require green and efficient building practices.
- Auditing all city buildings and performing retrofits on older structures; providing incentives to private owners to retrofit their buildings.
- Collecting waste vegetable oil and converting it to biodiesel in municipally-owned facilities.
- Converting city vehicle fleets, including city and school buses, to biodiesel, flex-fuel, or hybrid vehicles.
- Directing municipal utilities, or negotiating with private utilities, to increase renewable energy generation.

Many of these strategies—whether energy efficiency measures or renewable energy systems—involve up-front capital costs that will result in reduced energy use and savings over time. For that reason, the Apollo Alliance *New Energy for Cities* report recommends a number of financing options, from bonding initiatives to low-interest loans, for cities to use to fund clean energy projects. Also, though the Apollo plan creates millions of new jobs in manufacturing, installation, construction and services, cities and communities must actively work to make sure these jobs are high-skill jobs paying a family-supporting wage, and that they are accessible to low-income, traditionally under-served workers. One way to do this is to attach job quality and job training standards in all new energy policies.

The next section more fully explores these important job standards.

### **Capturing High-Quality Jobs for Community Residents**

Many of the clean energy strategies that we recommend in *New Energy for Cities* involve some sort of government subsidy or tax break to private companies that produce, buy, sell or distribute energy efficient or clean energy products. Cities can and should attach job quality and job training standards to these types of subsidies to achieve greater public benefit. Essentially, these standards require that any business receiving a government subsidy or tax credit must provide employees decent, family-supporting wages and/or benefits. These standards ensure that new jobs created will be “high-road” jobs: providing a decent income and health benefits, and helping residents avoid the “hidden taxpayer costs” that occur when working families rely on government subsidies like food stamps, Medicare, and the Earned Income Tax Credit. They also ensure that when jobs are created, they will benefit those who need them most.



## Apprentice Utilization Requirements

By offering worker recruitment, classroom instruction, and on-the-job training and job placement, state-approved apprenticeship programs provide a gateway to quality jobs for workers from disadvantaged communities. Training academies can help workers with little education, unstable employment backgrounds, or a history of incarceration to gain important skills and credentials. To date, requirements to use apprentices have been most successfully integrated into Project Labor Agreements (PLAs), the agreements between units of government and contractors carrying out publicly funded projects. For example, PLAs can require contractors to use apprentices for a specified percentage of all hours worked.

## Local Hiring Policies

By requiring employers who benefit from public financing or subsidies to reserve a percentage of jobs for local residents, local hiring strategies tie economic development to local training and employment opportunities. For example, some cities have required developers using public money to ensure that 50% of all construction jobs go to locally-owned businesses that include apprenticeship programs for local residents, or have required developers to go to local companies first for all jobs before contracting outside the community. This ensures residents in economically isolated communities benefit from the investments happening in their community.

## Wage Policies

Local governments can tie public subsidies to wage standards that require employers to pay good wages to employees working on the project. Wages can be tied to the state or regional median or average wage, or to the prevailing wage in a particular geographical area and industry, or to a “sustainable” or living wage standard. Another option is for local governments to require businesses to provide health benefits to employees, or to pay for a specific percentage (50–80 percent) of employees’ health care costs. The idea behind these standards is that people who work in communities across America should be able to live decently and raise their families in those communities.

Studies show public projects in states with such laws save taxpayer dollars.<sup>13</sup> In contrast, contractors in states with no prevailing wage laws tend to hire inexperienced workers in an attempt to keep down payroll costs. However, occupational injuries soar on these projects and the use of low-wage workers routinely results in increased supervision, maintenance and cost overruns.

## Further Resources on Job Training and Workforce Development

### Apprenticeship utilization and job standards:

For the Apollo Alliance’s page on applying apprenticeship utilization standards to clean energy policies and projects, see: [www.apolloalliance.org/strategy\\_center/model\\_legislation/aur.cfm](http://www.apolloalliance.org/strategy_center/model_legislation/aur.cfm).

For model legislation providing minimum standards for jobs created through state subsidies, see: [www.cfpa.org/issues/legislation.cfm/issue/HighRoad.xml](http://www.cfpa.org/issues/legislation.cfm/issue/HighRoad.xml).

For a collection of papers demonstrating the effect of prevailing wage requirements on construction costs, see: [www.bctd.org/political/davisbacon/wagelaw.html](http://www.bctd.org/political/davisbacon/wagelaw.html).

For a compilation of studies on prevailing wage, apprenticeship standards, and living wage standards, see: [www.lecet.org/Legislative/prevaling\\_wage/law\\_studies.htm](http://www.lecet.org/Legislative/prevaling_wage/law_studies.htm).

### Workforce training and workforce intermediaries:

Rubinstein Gwen, and Andrea Mayo. 2006. Training Policy in Brief: An Overview of Federal Workplace Development Policies, Washington, D.C.: The Workforce Alliance.

Giloth, Robert P. (Ed.) 2004. Workforce Development Politics: Civic Capacity and Performance, Philadelphia: Temple University Press.

Giloth, Robert P. (Ed.) 2005. Workforce Intermediaries for the Twenty-First Century, Philadelphia: Temple University Press.



## Community Benefits in Milwaukee

In Milwaukee, residents of the Park East neighborhood worked with the city to make sure that when two downtown freeway ramps were demolished, the land would go to a high-density, mixed-use development including affordable housing and mass transit. The Community Benefits Agreement the residents signed with the city also included a commitment to green building and good labor standards both for construction workers and for those who will ultimately work in the development's commercial buildings. The Park East CBA, including legislative language, can be found at [www.wisconsinsfuture.org/workingfamilies/econdev/index.htm](http://www.wisconsinsfuture.org/workingfamilies/econdev/index.htm). For more information on community benefits agreements generally, see [www.communitybenefits.org](http://www.communitybenefits.org).



Milwaukee's Park East neighborhood after two freeway ramps came down in 2004.



New development plan for Park East, put together by neighborhood residents and city planners, including affordable housing, transit, green building principles and high-wage job guarantees.

## Energy Credits for Job Standards or Job Training Programs

Renewable energy legislation can be a vehicle for linking renewable energy certificates (RECs) to state-approved apprenticeship programs or wage programs. Extra RECs can be earned when matched with apprenticeship utilization requirements.<sup>14</sup>

For example, in November 2006 Washington State passed a Renewable Portfolio Standard requiring the state's larger utilities to either produce a certain amount (15%) of power from renewable sources by 2020, or buy "Renewable Energy Credits" to offset their non-renewable power use. If, while developing a new renewable energy facility, a utility includes an apprenticeship program to train new workers, the utility can get extra credit toward meeting the renewable energy goal set by the state. This provision, which was originally proposed in the failed 2002–03 Energy Portfolio Standard bill, was developed and recommended by the Washington State Labor Council, Seattle King-County Building Trades, and the United Steelworkers, District 11.

## Community Benefits Agreements

Community Benefits Agreements are another powerful tool for ensuring that issues of community and economic justice are advanced by economic development efforts. CBAs link public subsidy in the development process to specific community enhancements that benefit the broader community.

Milwaukee's Park East neighborhood provides a good example of a clean energy/good jobs CBA. When two freeway ramps were torn down on the northern side of downtown Milwaukee, city activists and unions formed a coalition to ensure that any new development incorporate transit access, good jobs, and environmental benefits. The Good Jobs and Livable Neighborhoods Coalition and the City of Milwaukee ultimately signed a CBA conditioning the sale of city land freed up by the freeway demolition on a number of community benefits, including access to mass transit, prevailing wage for construction jobs, living wage for post-construction jobs, and green design principles incorporated into all proposals.



## Workforce Development: Regional Training Partnerships and Workforce Intermediaries

A key component of any green economic development strategy is developing the skilled workforce needed to fill these new green jobs. Because the energy efficiency and renewable energy industries are relatively new, communities have the opportunity to develop new strategies and policies to help workers access the manufacturing, construction, and operating and maintenance jobs that make up these industries. How communities approach workforce development for green jobs is crucial, as these programs can make the difference between a “high-road” economy with good, family-supporting jobs filled by local workers, and a “low-road” economy with imported, low-wage labor.

Traditional approaches to workforce development often focus on increasing job access and providing limited job training. But for economic and workforce development programs and policies to truly contribute to vibrant local and regional economies, they must embrace the twin goals of 1) encouraging employers to hire locally, provide a living wage and create family-supporting jobs and 2) helping workers with job placement and long-term worker retention.

One way to address these two goals is through public-private regional partnerships known as “workforce intermediaries.” Workforce intermediaries (WIs), also known as “regional training partnerships,” are partnerships among regional economic development stakeholders, including businesses, unions, technical and community colleges, job training programs, community organizations, and local and state workforce development officials. Rather than being one-size-fits-all approaches, they are place-specific partnerships that work to develop and implement pathways for career advancement and family-supporting employment for low-skill workers.

These approaches are only just beginning to be applied to industries in the green economy. For instance, Wisconsin is just starting to look at developing career ladders for workers in the ethanol industry. However, there is no reason that communities cannot start to build bridges among employers, workers, and training programs in other green industries, such as energy efficiency and renewable energy.



## Some Examples of Successful Workforce Intermediaries

**The Wisconsin Regional Training Partnership (WRTP)**, with partnerships in manufacturing, construction, hospitality, health care and finance, has trained 6,000 workers and placed 1,400 job seekers into high wage employment. The Partnership includes the Milwaukee Area Technical College, the Private Industry Council and a range of community based organizations.

**Project Quest** in San Antonio, TX, has placed over 1,400 people into high wage jobs, working with COPS/Metro, a community based organizing network, negotiating resources from state and local governments, and helping develop new ways of teaching at the local community college.

**The Seattle Jobs Initiative** has placed 3,000 job seekers, combining job training and placement programs with human service integration, industry-specific economic development programs (often called “sectoral partnerships”), and a network of culturally diverse community organizations.



### Key Policy Question

Can the business establishments that generate green products and services, as well as the manufacturers and service providers that supply them, expand in Los Angeles to create good paying jobs that benefit local residents equitably?

Economic Roundtable, Jobs in L.A.'s Green Technology Sector, on the web at [www.economicrt.org/publications.html](http://www.economicrt.org/publications.html).

## Identifying High-Growth, High-Potential Green Industries

At this point, readers may be thinking, “This all sounds great—but how do I get started?” For many cities and communities, clean energy economic development is a very new concept, and it may be difficult to decide which of the many renewable energy and energy efficiency sectors to focus on first. Two California cities, Los Angeles and Richmond, offer examples of how cities can begin to transition to a greener economy.

### Los Angeles

The City of Los Angeles recently took a hard look at the potential job opportunities that would result from developing its “green technology sector.” The Los Angeles Workforce Investment Board, Community Development Department, and Department of Water and Power commissioned a study to identify which sectors of the energy economy the city already has in place; and then to determine which of these sectors currently provide high-quality jobs and career ladder opportunities. Of particular interest to the city were the solar, wind, and biomass sectors, and all the possible manufacturing and construction jobs that go along with these sectors.

Once this analysis was complete, the city was able to decide which industries to target with policies and programs designed to maximize their role in the local clean energy economy. Ultimately, the city concluded that Los Angeles has a large and diverse industrial base that is well-suited to the manufacturing and construction industries necessary for developing green technologies, and also that many of these industries have average wages of at least \$2500/month. This information will allow the city to target public investment and incentives toward those industries, while at the same time building a workforce development system to train urban residents to fill those emerging green technology jobs.

In a parallel effort, Los Angeles Apollo—run through the social justice organization SCOPE—has been working to identify public buildings in the city that are ripe for renovation and retrofitting. Los Angeles Apollo hopes to spearhead an effort to do energy efficiency retrofits on these buildings, through a program that offers apprenticeship programs and job training to local residents.

### Richmond

Just like Los Angeles, many other cities across the country are recognizing the cross-cutting ways in which green jobs are addressing issues in their communities. In California’s Bay Area, the City of Richmond is one such example.

Richmond is a city in need of a new economic plan. The city’s heyday was in the 1940s, when the Kaiser Shipyards employed tens of thousands of workers building ships and launching them from Richmond’s port. When the war ended, these jobs went away, and Richmond has been struggling ever since. Though the city has seen some positive revitalization efforts, most of these are aimed at higher-income residents. The rest of the city is still plagued by a lack of high-quality employment opportunities, diminishing affordable housing stock, and high crime rates. Moreover, Richmond is home to several high-polluting industries, which have a negative effect on the health of its residents, especially its low-income residents who live near these industrial zones.

As Richmond looks to the future, it is faced with a unique opportunity to employ equitable green economic development to not only revitalize and renew the city, but also to address some of the deeper economic and health issues that have impeded the city's growth. In 2005, the City of Richmond was presented with a unique opportunity to become involved in the Green Wave Initiative, an investment program offered by the State Treasurer's Office for industries in the emerging green technology industries. The city subsequently approached Urban Habitat to research the potential for green economic development to bring quality jobs to Richmond residents. In February 2006, the City of Richmond, in collaboration with Urban Habitat, crafted a resolution to illustrate the city's commitment to green economic development. This resolution formally established Richmond's position that "economic opportunity, environmental integrity and societal equity are the foundation upon which sustainable cities can build a better quality of life for their residents." Furthermore, the resolution detailed the following essential elements of a sustainable community:

- **Ecological Integrity:** satisfying basic human needs such as clean air and water; protecting ecosystems and biodiversity; pollution prevention strategies.
- **Economic Security:** local reinvestment; meaningful employment opportunities; local business ownership; job training and education.
- **Empowerment and Responsibility:** respect and tolerance for diverse views and values; viable non-government sector; equal opportunity to participate in decision-making; access to government.
- **Social Well-Being:** a reliable local food supply; quality health services, housing and education; creative expression through the arts; safety from crime and aggression; respect for public spaces and historic resources; a sense of place making a contribution to the community.

Urban Habitat has continued to work with the city and to provide policy and procedural recommendations as Richmond moves forward with its green economy plan. These recommendations, which include a combination of energy policy ideas and commitments to job quality and job training, highlight the multi-faceted approach necessary to a truly equitable green economic development process.

Green economic development cannot provide guaranteed solution for all of Richmond's economic and environmental woes, but it may be able to make significant contribution toward the city's health and prosperity.

**Richmond's industrial base, access to shipping lanes, and labor supply provide a solid foundation for green economic development.**



Photo courtesy [www.philip.greenspun.com](http://www.philip.greenspun.com).

*“Economic opportunity, environmental integrity and societal equity are the foundation upon which sustainable cities can build a better quality of life for their residents.”*

– Richmond City Council Resolution on Green Economic Development



# CONCLUSION

The emerging green economy holds great promise for America's cities, and especially for our low-income, heavily minority urban communities. Every aspect of clean energy development, from manufacturing to construction, operating and maintenance, can create good jobs, clean up the air and water, and save consumers money on their energy bills. Every city and community in the United States has some potential to capitalize on this new economy, whether through good wind or solar resources or through retrofit programs to bring old, dilapidated buildings up to energy efficiency codes.

But this promise will not be realized without communities getting involved in the details of green economic development. To ensure good, local jobs that are accessible to low-skilled workers, we need to push policymakers to tie local and state tax credits and incentives to labor standards such as prevailing or living wage. We need to make sure our governments invest in the worker training programs necessary to move low-skilled workers into good jobs, and that they include local hire and apprenticeship programs in city projects. And we need to make sure that communities have a seat at the table when economic development decisions are being made.

The Apollo Alliance and Urban Habitat are committed to fighting for a clean energy future that benefits not only businesses and the environment, but also workers and low-income communities. We hope this report serves as a framework for states, cities and neighborhoods invested in these same fundamental ideals.



# RESOURCES

## Reports on Jobs Related to Energy Efficiency or Renewable Energy

Apollo Alliance “The Apollo Jobs Report: Good Jobs & Energy Independence” (January 2004) available at: [www.apolloalliance.org](http://www.apolloalliance.org)

Economic Policy Institute “Clean Energy and Jobs: A Comprehensive Approach to Climate Change and Energy Policy” (September 2002) available at: [www.epinet.org/studies/cleanenergyandjobs.pdf](http://www.epinet.org/studies/cleanenergyandjobs.pdf)

Redefining Progress “Smarter, Cleaner Stronger: Secure Jobs, A clean Environment, and Less Foreign Oil” (October 2004) available at: [www.redefiningprogress.org/bluegreen/SmartCleanStrong\\_National.pdf](http://www.redefiningprogress.org/bluegreen/SmartCleanStrong_National.pdf)

Renewable and Appropriate Energy Laboratory of University of California, Berkeley “Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?” (April 2004) available at: [www.rael.berkeley.edu/files/2004/Kammen-Renewable-Jobs-2004.pdf](http://www.rael.berkeley.edu/files/2004/Kammen-Renewable-Jobs-2004.pdf)

Renewable Energy Policy Project “The Work that Goes into Renewable Energy” (November 2001) available at: [www.repp.org/articles/static/1/binaries/LABOR\\_FINAL\\_REV.pdf](http://www.repp.org/articles/static/1/binaries/LABOR_FINAL_REV.pdf)

Renewable Energy Policy Project “Wind Turbine Development: Location of Manufacturing Activity” (September 2004) available at: [www.repp.org/articles/static/1/binaries/WindLocator.pdf](http://www.repp.org/articles/static/1/binaries/WindLocator.pdf)

Union of Concerned Scientists “Renewing America’s Economy” (2005) available at: [www.ucsusa.org/assets/documents/clean\\_energy/Renewing-Americas-Economy-2005.pdf](http://www.ucsusa.org/assets/documents/clean_energy/Renewing-Americas-Economy-2005.pdf)

World Wildlife Fund “Clean Energy: Jobs for America’s Future” (October 2001) available at: [www.worldwildlifefund.org/climate/publications/clean\\_energy\\_jobs\\_2001.pdf](http://www.worldwildlifefund.org/climate/publications/clean_energy_jobs_2001.pdf)

## Green building

U.S. EPA’s Green Building, available at: [www.epa.gov/greenbuilding/](http://www.epa.gov/greenbuilding/)

U.S. Green Building Council, available at: [www.usgbc.org](http://www.usgbc.org)

## Energy Efficiency Retrofits

American Council for an Energy Efficient Economy, available at: [www.aceee.org](http://www.aceee.org)

Apollo Alliance “Jobs in Energy Efficiency” (2003) available at: [www.apolloalliance.org/strategy\\_center/model\\_legislation/eejobs.cfm](http://www.apolloalliance.org/strategy_center/model_legislation/eejobs.cfm)

## Solar PV

U.S. DOE Solar Energy Technologies Program “Photovoltaics” (2006), available at: [www1.eere.energy.gov/solar/photovoltaics.html](http://www1.eere.energy.gov/solar/photovoltaics.html)

Real time information on the output of IBEW 569’s solar array, available at: [www.view2.fatspaniel.net/FST/Portal/SullivanElectric/local/EndUserView.html](http://www.view2.fatspaniel.net/FST/Portal/SullivanElectric/local/EndUserView.html)

## Wind

American Wind Energy Association, available at: [www.awea.org/resources/](http://www.awea.org/resources/)

## Solar Water Heating

U.S. DOE Building Technologies Program “Solar Hot Water Heating” (2006) available at: [www.eere.energy.gov/buildings/info/components/waterheating/solarhot.html](http://www.eere.energy.gov/buildings/info/components/waterheating/solarhot.html)

U.S. DOE Solar Energy Technologies Program “Solar Heating” (2006) available at: [www1.eere.energy.gov/solar/solar\\_heating.html](http://www1.eere.energy.gov/solar/solar_heating.html)

## Geothermal Heat Pumps

Renewable Energy Policy Project “Geothermal Energy for Electric Power: A REPP Issue Brief” (December 2003) available at: [www.crest.org/articles/static/1/binaries/Geothermal\\_Issue\\_Brief.pdf](http://www.crest.org/articles/static/1/binaries/Geothermal_Issue_Brief.pdf)

US DOE Energy Efficiency and Renewable Energy “Geothermal Technologies Program” (2006) available at: [www1.eere.energy.gov/geothermal/](http://www1.eere.energy.gov/geothermal/)

## Renewable Fuels

David Morris “Ownership Matters: Three Steps to Ensure a Biofuels Industry That Truly Benefits Rural America” (Institute for Local Self Reliance, 2006) available at: [www.newrules.org/agri/ownershipbiofuels.pdf](http://www.newrules.org/agri/ownershipbiofuels.pdf)

US DOE Energy Efficiency and Renewable Energy “Biomass Program” (2006) available at: [www1.eere.energy.gov/biomass/](http://www1.eere.energy.gov/biomass/)

## City Energy and Jobs Policy

Apollo Alliance “New Energy for Cities” (2006) available at: [www.apolloalliance.org/state\\_and\\_local/](http://www.apolloalliance.org/state_and_local/)

## Job Standards

Good Jobs First “The Policy Shift to Good Jobs” (2003) available at: [www.goodjobsfirst.org](http://www.goodjobsfirst.org)

## Local Hiring Policies

PolicyLink “Local Hiring Strategies” available at: [www.policylink.org/EDTK/LocalHiring/default.html](http://www.policylink.org/EDTK/LocalHiring/default.html)

## Wage Policies

Dan Gardner “The Truth about Prevailing Wage” (Oregon Bureau of Labor and Industries) available at: [www.boli.state.or.us/BOLI/WHD/PWR/docs/pwrtruth.pdf](http://www.boli.state.or.us/BOLI/WHD/PWR/docs/pwrtruth.pdf)

## Apprenticeship Utilization

Apollo Alliance “Apprenticeship Utilization” (2003) available at: [www.apolloalliance.org/strategy\\_center/model\\_legislation/aur.cfm](http://www.apolloalliance.org/strategy_center/model_legislation/aur.cfm)

State Building and Construction Trades Council of California, “Building California Construction Careers” available at: [www.buildingc3.com](http://www.buildingc3.com)

## Job Training and Workforce Development Programs

EnergyIdeas Clearinghouse “Education and Training Links for Renewable Energy Careers” (2006) available at: [www.energyideas.org/pages/default.cfm?o=h,ps&c=z,126](http://www.energyideas.org/pages/default.cfm?o=h,ps&c=z,126)

Helmets to Hardhats, Program for veterans to transition to careers in the trades, available at: [www.helmetstohardhats.org](http://www.helmetstohardhats.org)

National Joint Apprenticeship and Training Committee of National Electrical Contractors Association (NECA) and International Brotherhood of Electrical Workers (IBEW) available at: [www.njatc.org](http://www.njatc.org)

## Community Benefits Agreements

Center on Policy Initiatives “Unprecedented Community Benefits Agreement Approved by City Council: Ballpark Villages Project Sets New Standards for Affordable Housing and Jobs” (2004) available at: [www.onlinecpi.org/CBA.html](http://www.onlinecpi.org/CBA.html)

Los Angeles Alliance for a New Economy “Los Angeles Sports and Entertainment District Project Community Benefits Program” available at: [www.laane.org/docs/policy/cbas/cba\\_lasports.pdf](http://www.laane.org/docs/policy/cbas/cba_lasports.pdf)

Partnership for Working Families available at: [www.communitybenefits.org](http://www.communitybenefits.org)

## Endnotes

1. The term “green economy” is often used to describe a broader range of economic activities than those we address here. While we focus on the energy sector in this report, we recognize that the larger “green economy” includes a range of products and practices related to improving or preserving the natural environment and the quality of the air, water, and food in our communities.
2. For more information on green building, see The U.S. Green Building Council’s web page at [www.usgbc.org](http://www.usgbc.org), and the U.S. Environmental Protection Agency’s Green Building web page at [www.epa.gov/greenbuilding/](http://www.epa.gov/greenbuilding/).
3. Boston Redevelopment Agency, “Mayor Menino Awards ‘Green Building Grants’” (Press Release, August 11, 2004), available at [www.cityofboston.gov/BRA/press/PressDisplay.asp?pressID=236](http://www.cityofboston.gov/BRA/press/PressDisplay.asp?pressID=236).
4. California Youth Energy Services (CYES) is a project of the Rising Sun Energy Center. For more information, see the Rising Sun Energy Center website at [www.risingsunenergy.org](http://www.risingsunenergy.org).
5. U.S. Dept. of Energy/EERE, “Weatherization Assistance Program: Improving the Economies of Low-Income Communities” (last update August 2006), available at [www.eere.energy.gov/weatherization/improving.html](http://www.eere.energy.gov/weatherization/improving.html).
6. Joel Makower et al, “Clean-Energy Trends 2006” (Clean Edge: March 2006), available for download at [www.cleandedge.com/reports-trends2006.php](http://www.cleandedge.com/reports-trends2006.php).
7. Virinder Singh and Jeffrey Fehrs, “The Work that Goes into Renewable Energy” (Renewable Energy Policy Project: November 2001).
8. Data in this table is from two reports: Masashi Shibaki, “Geothermal Energy for Electric Power: A REPP Issue Brief” (Renewable Energy Policy Project: December 2003), available at: [www.crest.org/articles/static/1/binaries/Geothermal\\_Issue\\_Brief.pdf](http://www.crest.org/articles/static/1/binaries/Geothermal_Issue_Brief.pdf); and George Sterzinger and Matt Svrcek, “Component Manufacturing: Ohio’s Future in the Renewable Energy Industry” (Renewable Energy Policy Project: October 2005), available at [www.crest.org/articles/static/1/binaries/Ohio%20Manufacturing%20Report\\_2.pdf](http://www.crest.org/articles/static/1/binaries/Ohio%20Manufacturing%20Report_2.pdf).
9. George Sterzinger and Matt Svrcek, “Wind Turbine Development: Location of Manufacturing Activity” (Renewable Energy Policy Project: September 2004).
10. U.S. Dept. of Energy/EERE, “Building Toolbox: Solar Hot Water Heating” (last update June 2006), available at [www.eere.energy.gov/buildings/info/components/waterheating/solarhot.html](http://www.eere.energy.gov/buildings/info/components/waterheating/solarhot.html).
11. Jose Etcheverry et al, “Smart Generation: Powering Ontario with Renewable Energy” (David Suzuki Foundation: 2004), available at [www.energy.sintef.no/prosjekt/Annex29/Publikasjoner/GSHPs\\_OntarioReport2004.pdf](http://www.energy.sintef.no/prosjekt/Annex29/Publikasjoner/GSHPs_OntarioReport2004.pdf).
12. Hosein Shapouri and Paul Gallagher, “2002 Ethanol Cost-of-Production Survey” (USDA: July 2002).
13. Oregon Labor Commissioner Dan Gardner, “The Truth about Prevailing Wage,” available at [www.boli.state.or.us/BOLI/WHD/PWR/docs/pwrtruth.pdf](http://www.boli.state.or.us/BOLI/WHD/PWR/docs/pwrtruth.pdf) (last viewed February 20, 2007); see also Dale Belman and Paula B. Voos, “Prevailing Wage Laws in Construction: The Cost of Repeal to Wisconsin,” (UW-Milwaukee: Oct. 1995).
14. Renewable Energy Certificates are also known as RECs, green tags, green energy certificates, or tradable renewable certificates. These certificates represent the technological and environmental attributes of electricity generated from renewable sources, and are usually sold in 1 megawatt-hour (MWh) units. A certificate can be sold separately from the megawatt-hour of generic electricity with which it is associated. This flexibility enables customers to offset a percentage of their annual electricity use with certificates generated elsewhere.



