

Workforce Implications of Renewable Energy

May 2003

Overview

Building on the March 2003 report entitled *Renewable Energy: Strategic Opportunities for the Great Central Valley*, Collaborative Economics examined possible workforce implications and promising workforce development examples, culminating in a May 14, 2003 workshop at the Great Valley Center annual conference. This summary describes workforce implications of renewable energy and potential workforce development strategies, including examples identified from a national scan of innovative strategies. The key conclusions from this follow-up research and workshop are the following:

- Renewable energy has the potential to be a significant source of job creation, with a range of workforce needs by job function and in different technology areas, and with impacts in other sectors of the economy.
- The quality of region's workforce will be a strong determinant as to whether the renewable energy industry will grow in the Central Valley.
- Some states and regions are already operating innovative workforce development programs in renewable energy, which can serve as examples for the Central Valley as it builds its own capacity to prepare people for this economic opportunity.

Workforce Implications of Renewable Energy

Renewable energy can be a significant source of job creation. For example, a 40 million gallon ethanol plant creates 1,400 construction jobs and 40 people to run the facility. In addition, the multiplier effect on other jobs in the community can often exceed direct employment. For example, the same ethanol plant described above could generate 4,500 local jobs and \$10 million in local wages due to multiplier effect. In comparison with fossil fuels, renewable energy also tends to produce more wealth that remains in the local economy.

According to the U.S. Department of Energy (*Dollars from Sense: The Economic Benefits of Renewable Energy*, 1997, p. 2):

There are two main reasons why renewable energy technologies offer an economic advantage: (1) they are labor-intensive, so they generally create more jobs per dollar invested than conventional electricity generation technologies, and (2) they use primarily indigenous resources, so most of the energy dollars can be kept at home.

According to research done by EPRI (the Electric Power Research Institute, a non-profit consortium founded and supported by electric utilities), the California Energy Commission, and others, the most conservative projections show significant employment benefits from new renewable energy development in California. As cited in *Renewables Work* (CALPIRG Charitable Trust, 2002, p. 5):

Building 5,900 MW of renewable energy capacity would lead to the equivalent of 28,000 year-long construction jobs and 3,000 permanent operations and maintenance jobs. Over thirty years of operation, these new plants would create 120,000 person-years of employment.

While precise estimates of employment impact are very difficult to determine, most agree that the impacts could be significant. Assuming that there could be a significant impact on Central Valley employment, the next question is: what kind of impacts?

The answer is that the development and application of renewable energy technology in the Central Valley will require both more and different kinds of workers in the future. The workforce implications of renewable energy will vary by job function and technology area. In terms of job function, a growing renewable energy industry will require personnel in:

- Research and Development
- Product Design
- Product Manufacturing
- Sales (retail and wholesale)
- Installation
- Operations and Maintenance

The specific needs and occupations will vary by renewable energy technology and related applications (see Figure 1), including:

- Renewable technologies (solar, biomass, wind)
- Low emissions technology
- Gas to liquid diesel
- Fuel cells
- Conservation (the cheapest renewable energy, also labor-intensive)
- Solar energy built into new residential construction
- Distributed self-generation, requiring similar skills sets across various technologies
- The nexus between different renewable energies

In addition, the preparation and support of fledgling entrepreneurs in renewable energy is a critical “workforce” need in the Central Valley.

Variety of Jobs by Renewable Technology

Wind Power	Biomass	Solar Power
<ul style="list-style-type: none"> ▪ Meteorologists identify appropriate sites ▪ Engineers design the wind plant with utility company & community ▪ Construction workers build the wind plant ▪ Mechanical and Electrical technicians operate and maintain the wind turbines ▪ Scientists conduct research to improve the design and efficiency of wind turbines 	<ul style="list-style-type: none"> ▪ Chemists, microbiologists, biochemists, engineers conduct research & development ▪ Engineers & construction workers are needed to design and build bioenergy plants ▪ Equipment operators run plants ▪ Engineering technicians maintain plants ▪ Truckers transport biomass to facilities 	<ul style="list-style-type: none"> ▪ Electrical engineers, materials science engineers develop solar panel systems ▪ Sales forces sell equipment to end-users ▪ Electrical technicians install and maintain equipment ▪ Architects design solar buildings

Potential Workforce Development Strategies

To prepare residents for these growing and varied job opportunities, the Central Valley will need to pursue both near-term and longer-term strategies (see Figure 2). Based on the findings of the March 2003 report and subsequent research, the highest-priority near-term need would be to enhance the skills of current workers—such as training farm operators to use bio-digesters. As the renewable energy industry develops further, there will be a growing need to prepare workers for new occupations—such as photovoltaic installers. Over the long-term, the region will need to grow its science and engineering workforce to ensure that it captures the full range of job functions in the growing renewable energy industry.

A national scan of workforce development programs related to renewable energy suggests that other states and regions are ahead of the Central Valley. However, the Central Valley can examine these models, adapting programs and forging collaborations to meet its own workforce development needs in renewable energy.

Some leading examples include:

- *Florida Solar Energy Center*—The Center is the largest state-supported research and training institute nationally in the area of renewable energy and building energy efficiency. It offers courses for continuing education units (CEUs) in the following areas: photovoltaics, solar water heating, home energy rating certification, energy-efficient building strategies, duct leak diagnosis and repair, and alternative fuel vehicles. In addition, the Center develops curricula for national and international training on renewable energy, in partnership with other organizations, and has distance education and group videoconferencing capabilities.
- *Green Energy Ohio*—A partnership of the Great Lakes Renewable Energy Association and Florida Solar Energy Center, Green Energy Ohio is a 5-day Photovoltaic (PV) Installer Apprentice Program. It is designed for individuals beginning a career as a PV system integrator, combining classroom sessions with field experience to introduce students to distributed generation technologies and interconnection issues, with a focus on solar energy. The Program requires a high school diploma, basic knowledge of electricity, and competence in arithmetic.
- *Sonoma State University Energy Management and Design*—The Energy Management and Design Program provides either a BA or BS Degree in Environmental Studies, offering a curriculum that is a synthesis of architecture, engineering, computer science and energy policy. All EMD students are required to complete an internship, which provides valuable experience in a professional setting. The program has several external relationships, including the California Energy Commission, Lawrence Berkeley National Laboratory, PG&E, SMUD, California Association of Building Energy Consultants, and the Northern California Solar Energy Association. Graduates work in private consulting firms,

solar and renewable energy business, private corporations, non-profit organizations, government agencies, and utilities.

- *E7 Sustainable Energy Development Scholarship*—The purpose of scholarship is to support outstanding students in their pursuit of advanced studies in sustainable energy development. Applicants submit detailed information about their academic accomplishments, relevant work experience, a personal statement, and in the case of Post-Doctoral candidates, a research proposal. Masters level students receive scholarships of up to \$US 20,000 per year and Post-Doctoral students receive scholarships of up to \$US 25,000 per year.

Variety of Workforce Development Strategies Needed

Near Term

Enhance skills of current workers

- Train farm operators to use biodigestors
- Educating building inspectors & construction workers

What

How

- Short workshops
- Vendor training
- Extension of on-the-job training
- Others

Medium to Longer Term

Prepare workers for new occupations

- Photovoltaic installers
- Fuel cell careers
- Energy efficient building design

- Community college programs
- Apprenticeships
- Industry/education partnerships
- Others

Grow science & engineering workforce

- Bachelor's & master's degree programs
- Interdisciplinary—environment, engineering, economics

- University Programs
- Renewable energy fellowships
- Others

Opportunities for Regional Collaboration

At the May 14, 2003 Workshop, participants suggested the following opportunities for regional collaboration as potential next steps:

- Focus on identifying and meeting specific, near-term training needs, working with existing Valley employers and education and training institutions.
- Create a Valley guide to available renewable energy programs and incentives (including local, state, and federal sources). Currently, there is no centralized source of information specific to the Central Valley.
- Fund R&D and demonstrations in the Valley, securing federal resources, aimed at solving Valley problems. Examples: develop a center of excellence in biomass conversion or one in renewable and low-emission technologies, collaborations of researchers, existing vendors, and entrepreneurs.
- Create an “affinity group” to organize around specific opportunities, tapping the contributors to the Great Valley Center’s renewable energy report and subsequent workshop.