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DEFINING THE WORKFORCE DEVELOPMENT FRAMEWORK & LABOR MARKET NEEDS FOR THE RENEWABLE ENERGY INDUSTRIES

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ABSTRACT

The framework for creating a strong workforce for the renewable energy industries is built on a multi-prong approach that connects labor market needs, occupational and training standards, educational providers, and third-party programs that verify competencies.

Gathering labor market information is the starting point for developing a workforce development strategy. Labor market studies focus on what kind of jobs are in the renewable energy industries, where these jobs are, and what are the trends. Once occupational profiles are defined, then setting competency standards becomes a foundational element for workforce development. Formal processes determine what people do for specific jobs, under what working conditions they do it, what they must know to do it, and the skills they must have to do it.

Quality training for the workforce is a critical component to support labor market needs. Providers for training and education fall into 4 different categories: providers of short courses and workshops; community colleges and vocational institutions; apprenticeship programs; and 4-year colleges and universities.

The final component in this framework is developing third-party verification of workers and instructional activities. This has become the era of accountability. Self declaration of competency is no longer enough validation for consumers, financers, policy makers and others to have confidence in services or products. In the renewable energy field, certification programs have been developed for practitioners and instructors and an accreditation process is in place for training programs.

This paper looks at these four major elements of building a framework for workforce development, describes the activities underway, identifies gaps and opportunities, and proposes next steps.

1. LABOR FORECASTS & JOB TRENDS

In the summer of 2003, the Interstate Renewable Energy Council (IREC) started tracking current data and reports dealing with the economic impacts – specifically employment – of solar and renewable energy deployment. The goal was to get a handle on what kind of jobs are in the renewable energy industries; what are the forecasts; and where the employment opportunities are.

Renewable energy market growth results in new local jobs and broadens the capabilities of existing trades and services. IREC's survey[1] starts out by citing studies that show the overall market forecasts for renewable energy are encouraging.

The 2003 study by Navigant Consulting states that the wind and PV markets have seen a 15-25% annual growth over the past five years.[2] The report predicts that renewable energy use will more than double over the next decade in the United States and Canada, with wind and biomass comprising about 85 percent of that growth. Paul Maycock, in his 2002 World PV Market Update, writes that the United States photovoltaics industry made progress on several fronts in 2002. PV production increased by 20%. PV installations in the United States increased by 53%, reaching 44 MW. 2002 was also the third year in the past 15 years in which the growth rate exceeded 30%.[3] And, the American Wind Energy Association reports that nearly 1,700 megawatts of new wind electric generating capacity were installed in the United States in 2003.[4]

One of the most thorough labor estimates is the 2001 report by the Renewable Energy Policy Project (REPP) titled "The Work That Goes Into Renewable Energy."[5] This report found that wind and solar electricity production offer 40% more jobs than coal. On an energy capacity basis, PV employs the most workers among the renewables that were examined, followed by wind and biomass co-firing. The report identified that module assembly is the leading activity for photovoltaics followed by systems integration and installation. Much of the labor requirements for wind power relate to the manufacturing and assembly of wind turbine components. The leading activities in job creation are blade manufacturing, installation, and tower and gearbox manufacturing.

The 2001 U.S. Photovoltaic Industry Roadmap states that the PV industry currently employs some 20,000 American workers and projects that by 2020, this workforce will grow to 150,000, as the roadmap is implemented.[6]

The American Wind Energy Association says that the US wind industry directly employs more than 2,000 people. They estimate that every megawatt of installed wind capacity creates about 2.5 job-years of direct employment and about 8 job-years of total employment (direct and indirect). The Danish Wind Turbine Manufacturer's Association estimates that wind power creates 22 direct and indirect jobs for each MW of installed capacity – five jobs per MW for installing the turbines and 17 jobs per MW related to manufacturing.[7]

State employment data and forecasts tend to be dependent on the availability and intensity of incentives – rebate and buy-down programs, requirements for renewable energy portfolio standards, tax credits, etc. The IREC survey gathered information from Arizona, California, Massachusetts, Nevada, New York, Ohio, Texas and Vermont. Some highlights include:

State	Highlights	Reference
ARIZONA	Arizona impacts of construction of solar energy projects through 2002: • $28.2 million of Arizona output of goods and services • $8.6 million of Arizona earnings • 274 person years of Arizona employment	Costs, Benefits, and Impacts of the Arizona Environmental Portfolio Standard. The Arizona Cost Evaluation Working Group for the Arizona Corporation Commission. June 30, 2003.
CALIFORNIA	Full realization of the RPS goals would create an estimated 119,000 person-years of employment for Californians over the lifetimes of the plants built through 2017. • Jobs from steady growth in the use of solar panels would add 2,700 person-years of employment. • Overseas renewable energy markets would create an estimated 4,300 jobs for Californians by 2010 and 9,700 by 2017.	Renewable Energy and Jobs: Employment Impacts of Developing Markets for Renewables in California. Environment California Research & Policy Center. July 2003.
NEVADA	Nevada calculates that based on the RPS, from 2003-2013, there will be: Wind 3,757 (FTE) PV 23,140 (FTE) Biomass Co-firing 89 (FTE) Geothermal 243 (FTE) Total 27,229 (FTE)	Comments files by the Nevada AFL-CIO and REPP, January 18, 2002, NV Public Service Commission.
TEXAS	Construction of a Texas wind farm requires intensive effort of up to 300 workers during a period spanning six to twelve months. Combined with Texas-based manufacturing and services, the TX wind industry employed more than 2,500 workers during 2001. After construction, wind plants retain employees to manage and operate the site for the life of the wind farm.	What Renewable Energy Means to Texas. Prepared by Virtus Energy Research Associates. August 19, 2002.
VERMONT	• Vermont could produce 10% of its electric energy from half a dozen wind farms in the state, with a total of about one hundred and fifty 1.5 MW wind turbines. • The development and construction of the wind farms would require a capital expenditure of 342 million dollars. • The development phase would create 140 jobs. The construction phase, about six years, would create about 300 jobs. Operations thereafter would create 40 high-paying jobs.	The Economic Benefits of Windfarm Development in Vermont. Prepared for Renewable Energy Vermont by Doug Hoffer. October 2002.

2. OCCUPATIONAL & TRAINING STANDARDS

There are two formal processes that are being used by the renewable energy and academic communities to develop competency and content standards for practitioners and training programs.

The North American Board of Certified Energy Practitioners (NABCEP) is using the task analysis as the foundational document for their certification programs. The task analysis, usually developed by a group of subject matter experts, defines a general set of knowledge, skills and abilities typically required of practitioners. The purpose of the task analysis is to have defensible data supporting performance standards and assessment tools (such as exams, work samples, etc.).[8]

Dr. Barbara Martin, in a 2002 ASES paper, writes that "Certification standards have three components: (a) a list of the tasks and skills, or competencies, that are required of the candidate; (b) the conditions under which the candidate will perform the tasks; and (c) the acceptable criteria for performing the tasks."[9]

In June 2002, NABCEP released the Task Analysis for Solar (PV) System Installers, which includes eight major tasks and 58 subtasks. (See www.nabcep.org for the Task Analysis.) The NABCEP PV Technical Committee went through ten drafts of the Task Analysis before it was approved by the Board of Directors. A second NABCEP technical committee has been convened for the development of a Solar Thermal Task Analysis. Discussions are also underway for the formation of a technical committee to develop a Small Wind Installer Task Analysis. Even if the task analysis doesn't lead to a full certification program, it does help establish the requirements for accrediting training and educational programs and in developing curricula.

Another process for establishing standards is the DACUM method. The DACUM (Developing A Curriculum) process uses interviews, focus groups, and surveys to develop training material and programs. DACUMs are mainly used for identifying instructional needs, instructional program planning, curriculum development, training materials development, creating and revising job descriptions and standards, and career guidance. Colleges use the DACUMs as a proven way to develop curriculum topics. [10]

NextEnergy, a non-profit corporation located in Michigan, is working with an education coalition that includes a community college and three universities. In 2003, they undertook a research effort using the DACUM panel process that utilized industry and academic experts to identify the tasks that need to be taught to students. There were four DACUM panels held covering automotive fuel cells, renewable energy sources, hydrogen, and stationary and micro fuel cells.[11]

Cape Cod Community College is also applying the DACUM method. In August 2003, the college convened a focus group of industry representatives to assist in validating the need for an education and training program for renewable energy technicians and to assess the labor market needs in the southeastern Massachusetts service area. The resulting report listed potential job titles and skills, and offered program implementation recommendations.[12]

3. TRAINING & EDUCATIONAL PROVIDERS

Providers for training and education fall into 4 different categories: providers of short courses and workshops; community colleges and vocational institutions; apprenticeship programs; and 4-year colleges and universities.[13]

On February 25, 2004, IREC, along with the Partnership for Environmental Technology Education (PETE) and NABCEP, held a practitioner curriculum coordinating meeting. About forty representatives of community colleges, training programs, and states, spent the day discussing critical curriculum needs for renewable energy practitioners and then developed a series of action steps.

Many community colleges and training institutions are offering certificate and degree programs in renewable energy. Lane Community College in Eugene, Oregon offers a two-year degree program, titled Renewable Energy Technician Program, focusing on PV and solar thermal installation. Owens Community College in Toledo, Ohio offers a 40-hour PV installer/apprentice training program. Oakland Community College in Michigan has four degree options in environmental systems technology including customized curricula for renewable energy designers, salespeople and technicians. San Juan College in New Mexico offers a concentration in photovoltaic system design and installation as a 1-year certificate or a 2-year AAS degree. Crowder College in Missouri offers 4 courses – solar thermal systems, passive solar, solar electric systems, and alternative fuel vehicles. Ulster County BOCES, a New York public school that has programs for adult students, offers both a 210-hour and a 40-hour PV program. The Farmingdale Solar Energy Center at the Farmingdale State University of New York offers a variety of workshops and has earned the Institute for Sustainable Power (ISP) accreditation designation. Great Lakes Renewable Energy Association offers PV Systems Integrator/Installer Apprenticeship and Certified PV Systems Integrator/Installer certificates. [14]

Many more schools have or are planning renewable energy programs.

Other regional and state training institutions, such as the Midwest Renewable Energy Association, the North Carolina Solar Center, the Florida Solar Energy Center, and the Northeast Sustainable Energy Association, offer workshops and short courses. The Florida Solar Energy Center and the Midwest Renewable Energy Association have also been awarded ISP accreditation.

A pre-meeting survey showed that 63% of courses currently given are part of formal academic offerings and that courses are directed at various levels – certificate, associate, undergraduate and professional education.

Over 50 curricula needs were identified at the February meeting. At the time of the writing of this paper, participants were in the process of ranking the critical curriculum areas. Once they are identified, efforts will be directed at forming curriculum development groups with content experts, instructional designers, and educators. These groups will also look at developing renewable energy modules for other professional and trade educational programs.

There were other results of the meeting. The group will continue to meet, network, and coordinate activity as an ad hoc committee. A web-based catalog will be created to include training and courses in renewable energy to facilitate a one-stop resource for prospective students. IREC plans to organize these actions.

4. VERIFYING COMPETENCIES AND PERFORMANCE

There are a number of national and regional programs underway that certify renewable energy practitioners and instructors and accredit training programs. While many trades and professions have set competency standards over the years, it has only been in the last few years that standards for professional practice and assessment methods have been introduced to the renewable energy field.

Certification is a voluntary process by which a nongovernmental agency or association grants recognition to an individual who has met certain predetermined qualifications specified by that agency or association.[15] Key words here are *voluntary* (unlike mandatory government licensing) and *individual* (certification is not for a company or an educational program). Both the North American Board of Certified Energy Practitioners and the Great Lakes Renewable Energy Association offer a credential for practitioners. The Institute for Sustainable Power offers a credential for teaching instructors.

Accreditation, on the other hand, is a process by which an association or agency grants public recognition to a school, institute, college, university or specialized program of study that have met certain established qualifications or standards.[16] Accreditation is not for an individual. The Institute for Sustainable Power also accredits training and continuing education programs.

The NABCEP voluntary certification program has been developed and designed carefully following professional credentialing guidelines. Standards, developed by subject matter experts, have been set and the eligibility requirements are reasonably achievable being based on extensive input from stakeholders and deliberation among installers. NABCEP has built a transparent, non-discriminatory program implemented with fair procedures and due process. NABCEP-Certified Solar PV installers are required to specify, configure, install, inspect and maintain a solar electric system that meets the performance and reliability needs of customers, incorporates quality craftsmanship, and complies with all applicable safety codes and standards.

The NABCEP program was launched in June 2003 with the release of the application for the Solar PV Installer credential. At the time of writing this paper, NABCEP has gone through two application cycles and has offered one exam. The inaugural application and exam phase resulted in 62 candidates receiving the NABCEP Solar Electric credential.[17]

In order for applicants to sit for the exam, there are a number of requirements including prerequisites of related experience and/or education. There are seven entry tracks for the PV credential. Applicants are required to apply through one of the seven tracks. Over the course of two exam registrations, the background of candidates is as follows: 34% are from contracting backgrounds; 23% have professional engineering backgrounds; 22% have met requirements based on at least four years of experience; and 21% have met requirements from the training/technical degree track.[18]

Since 1996, the Institute for Sustainable Power has developed, assessed, and qualified trainers and training programs in more than 30 countries. In the United States, four institutions have received the ISP accreditation designation and two people have become certified master trainers. While these numbers are small, there are other institutions and instructors that have expressed interest in going through the ISP application and audit process. States are also interested in building a strong training

infrastructure. For example, New York is currently funding the development of three programs that are pursuing ISP accreditation.

5. CONCLUSIONS & NEXT STEPS

Over the past few years, the solar photovoltaic industry took a giant step in setting competency standards for its installers. It was a proactive move with a clear message for consumers, financers, and public officials that the Industry stresses safe and quality services, consumer protection and ethical business practices. Other renewable energy industry sectors need to move ahead with adopting objective, evidence-based, reasonably achievable professional standards.

The deployment of renewable energy technologies promotes indigenous employment opportunities for a wide range of occupations. Creating jobs and keeping them local are outcomes of renewable energy growth that need to be better defined and publicized. However, current job information tends to be sketchy and does not drill down to specific job classifications and types. Funding should be directed to broadening the Energy Services Careers Model, designed and defined by the Partnership for Environmental Technology Education, to include renewable energy occupational areas and technician-level occupational titles. Surveys, focus groups, and other industry and stakeholder interviews should be organized to better articulate the range of manufacturing, system integrators, installers, maintenance, marketing and sales, policy, and research and academic jobs.

Curriculum needs, once they are better defined, should be developed based on job standards and expert input to ensure consistent and quality instruction. Web-based training should be implemented to make quality learning more accessible. Curriculum should also focus on retraining for tradespeople interested in upgrading their knowledge and skills.

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