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TRENDS IN PRACTITIONER TRAINING FOR THE RENEWABLE ENERGY TRADES

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ABSTRACT

As workforce development becomes more of a critical component for an expanding renewable energy economy, new training opportunities are on the increase for practitioners interested in either getting into the renewable energy trades or upgrading their professional skills.

This paper will report on the new trends in training and show how the instruction has become more highly developed. In many cases, curricula are now designed to provide teaching that leads to defined workplace knowledge, skills, and abilities. Private and academic training programs are becoming accredited specifically to renewable energy standards. Community colleges and technical schools are responding to local jobs by offering more and more renewable energy trades courses. And classes are expanding from 3 to 5 day workshops to semester-long courses resulting in one-year certificate and two-year associate degree programs at Community Colleges.

1. INTRODUCTION

The Partnership for Environmental Technology Education (PETE) and the Advanced Technology Environmental Education Center (ATEEC) have been in the forefront on energy technician workforce development. They have been working with community and technical colleges and have developed a model Energy Services and Technology Program which includes a step-by-step guide on how to establish a successful program, model one-year Certificate and two-year Associate Degree Programs, and curriculum and instructor guides. This model curriculum covers energy and addresses the optimization of production, delivery, and use of energy resources.

It was a natural progression when PETE and the Interstate Renewable Energy Council (IREC) joined forces to promote the establishment of a renewable and alternative energy workforce development foundation to ensure that the country is ahead of the curve for skilled practitioners for current and future deployment of renewable energy and alternative energy technologies.

Over the course of the past few years, IREC and PETE have been tracking trends that are emerging in renewable energy training. While the renewable energy community has been fortunate to have first-rate training available at places like the Florida Solar Energy Center, Solar Energy International, the Midwest Renewable Energy Association, the North Carolina Solar Center and others, a broader range of educational providers are now offering workforce training courses and programs for renewable energy in response to growing markets and the increase in new job opportunities.

2. TRAINING TRENDS

In early 2005, IREC, PETE and Lane Community College (a pioneer with their Energy Management and Renewable Energy Technician Programs) worked together to produce an on-line course catalog listing renewable energy programs and classes. Housed at IREC's web site, courses can be searched by state and technology. Still relatively new, the catalog carries over 150 courses offered by 30 providers in North America. New entries are frequently added.

To support the trend of increased training opportunities at the local level, 45% of the courses listed in the electronic catalog are offered by Community Colleges and Technical Schools. Twenty-eight percent are offered by 4-year colleges and 28% are given by private and non-profit training programs. Renewable energy course offerings are on the rise at Community Colleges.

In January 2006, Austin Community College (ACC) and the Texas State Energy Conservation Office advertised the offering of a 48-hour course in solar electricity. The fourteen-week class includes a hands-on installation of a photovoltaic system. Three recently-enacted actions, including the 30% federal solar tax credit in the 2005 Energy Bill, the new Texas Renewable Portfolio Standards legislation which features a 500 MW target for non-wind renewable resources, and Austin Energy's Solar Rebate Program, provide a well-timed opportunity for Texas to scale up its workforce development training in renewable energy courses.[1]

The class at Austin Community College sold out two weeks ahead of the official start date prompting ACC to offer a second section for the 2006 winter semester.

In November 2005, Hudson Valley Community College officially opened its new photovoltaic laboratory providing students hands-on experience installing photovoltaic systems, including mounting solar panels on roofs and posts. The laboratory is part of Hudson Valley's new photovoltaic installation courses which were developed with a grant from the New York State Energy Research and Development Authority. The courses, included in the college's Electrical Construction and Maintenance program curriculum, train students to install and maintain photovoltaic systems.[2]

Additional offerings at Community Colleges are being supported through grants from the National Science Foundation (NSF). Some examples include a small and large-scale wind systems program at Iowa Lakes Community College; an alternative-fueled vehicles program at Bronx Community College; educational resources for renewable technology at Madison Area Technical College in Wisconsin; and a renewable energy program by linking community college and vocational high schools through articulation agreements at Cape Cod Community College in Massachusetts. The NSF funded projects respond to technician workforce needs by developing model curriculum, offering professional development, and transferring program models to other colleges throughout the country.

In February of 2006, PETE & IREC initiated a Renewable & Alternative Energy Program/Course Survey through PETE's community college network and contacts. Trends that were highlighted include:

- New Training Opportunities. More and more Community Colleges and Technical Schools (high schools and private) are offering Renewable Energy Courses. These range from stand-alone courses, new energy certificates, associate degree programs, and customized training for business and industry.

- Duration of Training. Classes are expanding from 3 to 5 day workshops to semester-long courses.

- Enrollment. Average enrollment per course is from 12-15 students. Students range anywhere from 18-45 years of age. They may be existing college students in energy programs, other technology disciplines, existing trades people, those looking at changing careers or those who are currently working in the industry and are upgrading their skills and knowledge.

- Industry Standards. Curricula are being designed to provide teaching that leads to defined workplace knowledge, skills, and abilities. However, not all courses are designed using industry-developed content standards or industry advisory groups as guides.

- Coordination with Other Trades. Some Community Colleges are incorporating renewable and alternative energy technology into existing trade programs such as construction, electrical, Heating, Ventilation & Air Conditioning, and industrial maintenance trades programs.

- Jobs. Graduates are obtaining employment in a wide range of industry positions including PV design & installation companies, power companies, building contractors, wind energy facilities, energy consultant firms, energy equipment suppliers, HVAC firms, facilities maintenance, and building management firms.

3. MARKET ACTIVITIES IMPACTING DEMAND FOR TRAINING

In 2003, the photovoltaic industry launched a professional credential for installers. The certification program not only set competency standards, it also raised the bar for professional development.

According to the requirements established by the North American Board of Certified Energy Practitioners (NABCEP), there are several ways for an applicant to become eligible to sit for the certification exam. Each requirement stipulates specific training and/or experience.[3]

Although training is not a requirement for this certification when applicants meet the experience requirements, the exam is such that some level of training would be beneficial for most to achieve a passing score.

In addition, in order to maintain certification, the certificant must complete eighteen contact hours of continuing education within a 3-year period. At least 12 hours of training must be on technical subjects related to photovoltaics.

One of the reasons for the increase in the demand for training can be directly tied to NABCEP's initial training prerequisite plus the continuing education requirement. Advanced PV courses, courses on the National Electrical Code, safety courses and also prep courses for the NABCEP exam are now being offered on a regular basis.

In 2005, after consultation with Community Colleges, instructional designers and trainers, NABCEP rolled out their PV Entry Level Certificate of Knowledge. This certificate is a way for a student to demonstrate basic knowledge, comprehension and application of key terms and concepts of photovoltaic system operations. Schools and training programs offer a course or courses during a semester or other defined time period and then administer a NABCEP-issued exam. A candidate for the certificate has to complete this course and pass the test. While the Certificate of Knowledge by itself does not qualify an individual to install photovoltaic systems, it does recognize understanding of the basic terms and operational aspects of a PV system.

By February 2006, 14 schools and training program offer their students the NABCEP PV Entry Level Certificate of Knowledge.[4] This certificate has become a valuable marketing tool for Community Colleges and Training Programs to attract students. It gives the student the opportunity to achieve a "certificate" from a national, industry-based organization.

Terms can get confusing. NABCEP's professional certification for PV installers is a high-level designation based on professional experience and a rigorous application and written assessment process. It verifies that the certificant has met predetermined and standardized criteria. It is a mark of excellence for the PV professional and it becomes a way for consumers to differentiate among vendors.

The certificate program is a training program based on specific skill sets and learning objectives. Participants receive a certificate after attendance and completion of the course work and the passing of a test.

Both the professional certification and the certificate program have had a direct impact on the demand for practitioner training courses and programs. NABCEP is planning on introducing another professional certification this year for Solar Thermal Installers. This should also result in increased demand for solar thermal training.

4. VERIFYING THE LEGITIMACY OF WHAT'S BEING TAUGHT AND BY WHOM

As more programs are being offered by a variety of educational providers, how do potential students know that they will be taught the skills and knowledge they will need to do a good job? Do the facilities include the right equipment and hardware for training? Are there procedures that ensure safety and safe practices? Are the programs managed in a fiscally responsible way? Are the teachers qualified? These are some of the questions that come to mind as more courses are offered and enrollment increases.

For the past four years, the Interstate Renewable Energy Council (IREC) has been working closely with the Institute for Sustainable Power (ISP) to implement their international framework of standards and metrics to verify that training programs and instructors have met predetermined and standardized criteria. As of July 2005, IREC is the North American Licensee for the Institute for Sustainable Power's Quality (ISPQ) International Standard #01021 for Renewable Energy Training Accreditation and Instructor Certification programs. IREC is responsible for the full accreditation and certification cycle including processing applications, assigning registered auditors, awarding the credential, and maintaining all records of applicants, candidates and certificants.

IREC awards formal recognition for 5 ISPQ designations:

1. Accreditation for Training Programs
2. Accreditation for Continuing Education Providers
3. Certification for Independent Master Trainers
4. Certification for Affiliated Master Trainers
5. Certification for Instructors

The ISPQ Standard was developed by the Institute for Sustainable Power under the leadership of Mark Fitzgerald. Training programs and continuing education programs are accredited to, and instructors and master trainers are certified to these standards. The ISPQ International Standard #01021 describes the ethical and practical requirements for candidates, including commitments to confidentiality, non-discrimination, quality, and professionalism. The ISPQ Standard also outlines requirements for quality program management and administration. It sets forth requirements for facilities, resources, tools, and safety. It requires trainers and program

staff to have appropriate experience, defined job descriptions, and adequate training to perform their jobs competently.

Using the ISPQ International Standard #01021 as a guide, with an approved Task Analysis[5] as the content standard, IREC's ISPQ-Registered Auditors evaluate candidates for accreditation and certification through a desk and/or on-site audit. The Auditors prepare the results of their evaluation and report to the IREC ISPQ Award Committee which is responsible for the final decision on training accreditation and trainer certification.

IREC's Accreditation and Certification Programs receive counsel and oversight from a national, 10-person advisory board which includes trainers, industry, and credentialing and education experts. Its role is to provide strategic guidance to IREC as the ISPQ Licensee for North America.

To date, six organizations have been accredited by the ISPQ framework and include the Florida Solar Energy Center, Solar Energy International, SUNY Farmingdale, the Midwest Renewable Energy Association, the North Carolina Solar Center, and SUNY Delhi. There are five certified Master Trainers – Jim Dunlop, Gay Canough, Johnny Weiss, Carol Weis and Justine Sanchez.

Providing an independent external review, the ISPQ designation offers training programs and instructors the opportunity to achieve accredited or certified status that provides evidence of quality assurance, quality improvement, and fiscal stability. The ISPQ mark is a signal to students, employers, government officials and funding sources that standards for the curriculum, student services, and trainers have been met.

5. SIX RECOMMENDED CRITERIA FOR TRAINING PROGRAMS

The goal of IREC's quality assessment work is to ensure that practitioner training courses are designed to provide instruction that leads to defined workplace knowledge and skills and appropriately addresses issues of safety and codes.

Working with ISP, the Partnership Environmental Technology Education, and other educational and credentialing experts, IREC has developed 6 recommended criteria for practitioner training:

1. Practitioner training courses should provide educational, training, and skill development experiences that lead to defined workplace knowledge, skills, and abilities.
2. Training should appropriately address issues of safety, codes, and core competencies of an industry-approved task or job analysis.
3. Training should be taught in an environment with appropriate facilities, tools, and safe practices.
4. Training should offer a formal and planned learning structure where the learner receives some sort of feedback and the learner's progress is monitored.
5. Training should be taught under the administration of a legally registered entity.
6. Training should be offered by an entity that has proven administrative and managerial quality and has received third-party verification through conventional accreditation or government or trade approval or the ISPQ accreditation or similar quality assessment.

6. CONCLUSION

The increase in practitioner training across the country for the renewable energy trades is a direct result of market growth, policy decisions and public interest in alternative and clean energy resources. As more educational providers are rolling out semester courses and certificate programs, it is important that the inventory of task analyses created by a formal process of subject matter experts continues to expand. To date, there is a nationally approved task/job analysis for photovoltaic installers, solar thermal installers and one for small wind installers is under development. Other industries need to convene technical committees to develop performance, tasks, knowledge and skills requirements for their renewable energy practitioner professions.

Most of the renewable energy courses that the authors surveyed for this paper are classroom-based instruction. This does allow for hands-on, practical labs but it limits the accessibility of training opportunities. As demand increases for training, programs should not be restricted to the classroom but should include internet, on-line delivery. On-line learning for fundamental instruction as well as professional self-improvement and continuing education will allow students more choices for their training needs.

As web-based educational programs augment face-to-face learning, it will be important to establish guidelines to ensure that content and instructional approaches accomplish clearly defined course and learning objectives. IREC will work with experts and groups to develop recommendations to assist in evaluating e-learning opportunities.

And finally, it is recommended that training be expanded to include actual on-the-roof or on-site installations. Many current programs include mock build-up, tear-down installations. The suggestion is to expand these to real, customer-based installation experiences that include permitting and inspection. The New York State Energy Research and Development Authority has developed such a model with their internship program which is administered by the New York Solar Energy Industries Association.

7. REFERENCES

(1) Pulaski, Jane. Article for IREC's newsletter and web site. January 18, 2006.
(2) Press Release from Hudson Valley Community College. November 22, 2005.
(3) See Candidate Handbook. North American Board of Certified Energy Practitioners. www.nabcep.org.
(4) As of February 2006, these are the educational providers who offer the NABCEP PV Entry Level Certificate of Knowledge: Appalachian State University (NC), Austin Community College (TX), Bronx Community College (NY), Cattaraugus-Allegany BOCES (NY), Cleveland State Community College (TN), Diablo Valley College (CA), Hudson Valley Community College (NY), Kennebec Valley Community College (ME), Lane Community College (OR), North Carolina Solar Center (NC), Solar Energy International (CO), Southern Nevada Electric JATC (NV), Tri-City Joint Apprenticeship Training Committee (NY), and Ulster County BOCES (NY).
(5) The task (or job) analysis is a formal process for determining what people do, under what working conditions they do it, what they must know to do it, and the skills they must have to do it. Usually a technical committee of subject matter experts is convened to develop the task analysis. The task analysis helps establish the basis for training curricula and helps define requirements for the assessment and credentialing of practitioners.