

Educating and training solar technicians runs the gamut from intensive weekend courses through multicourse certificate programs to 2-year degree programs. Community colleges, vocational and technical schools, electrical trade unions, and nonprofit organizations offer training, and specialized training is available at small independent centers. Solar product manufacturers and distributors also conduct installer training, although the training is often for product-specific applications. The type and length of training required depend entirely on the prerequisite skills, abilities, and experience of the individual as well as the job requirements of the desired occupation. Critical skills such as the ability to do proper electrical work or sophisticated plumbing could require extensive formal training or work experience. Tasks that require fewer critical skills can be performed by entry-level employees or through on-the-job training opportunities such as apprenticeships under the direct supervision of experienced journeymen workers. Brief training sessions such as weekend courses for people with little or no experience should be viewed as introductory instruction for prospective technicians. These courses don't adequately prepare job-seekers to immediately start work as installers. Unless students are experienced construction tradesmen, such as journeyman electricians or plumbers, graduates of short courses will most likely require extensive on-the-job training and possibly more institutional education.

Established education and training institutions can add solar courses to existing curricula, develop specialized solar training programs, or offer continuing education courses to address solar energy workforce employment opportunities. The amount of practical or work experience an individual has is an important part of any technology program that prepares participants for immediate entry into the workforce. Virtually all U.S. colleges, universities, and community colleges offer continuing education courses. Solar technology permitting and inspection is an example of an appropriate solar-related topic for a continuing education course. Such a course would help installers and inspectors understand local variations in code requirements. Construction trade apprenticeship programs at community colleges or vocational tech institutions are offered in many trades, including electrical, roofing, ironworks, carpentry, air conditioning, plumbing, sheet metal, surveying, welding, and swimming pool construction. Community colleges and vocational tech institutions have the opportunity to introduce cross-disciplinary training into the curriculum. For example, **photovoltaic** (PV) installers need both electrical and roofing training, and **solar water heating** (SWH) technicians need both plumbing and roofing skills.

Associate in applied science (AAS) degree programs stress technology to prepare students for employment in a specific occupation such as a PV technician. AAS programs don't require general education credits and aren't generally intended to prepare pupils for an undergraduate degree. Two-year associate of science (AS) degree programs are intended for career preparation. An AS degree can also be transferred from the community college to a 4-year program such as a bachelor of science in engineering technology. These programs are well suited for students considering pursuing PV system design or energy management.

All solar education and training programs should have the facilities, curricula, and materials to prepare students for postgraduation jobs in the solar industry. The best programs offer internship, apprenticeship, or cooperative on-the-job training opportunities, leveraged with resources of the local industry and government. Solar installation jobs call for mechanical abilities that require "learning by doing" outside the classroom. As an example, The Interstate Renewable Energy Council (IREC) offers Institute for Sustainable Power Quality (ISPQ) training accreditation. The ISPQ standard—which is internationally recognized for renewable

energy training programs—specifies requirements for competency, quality systems, resources, and qualification of a curriculum against which trainers and training programs can be evaluated. ISPQ-accredited programs rely on extensive, hands-on work that can be performed only in adequate training facilities. IREC currently offers ISPQ accreditation for training programs, accreditation for continuing education providers, certification for independent master trainers, certification for affiliated master trainers, and certification for instructors.

BENEFITS

A robust solar workforce education and training program is a critical pillar in developing a local solar energy industry. Training programs help ensure consistent installer competency and, through increased consumer satisfaction, can help drive additional growth in local demand for solar installations. In addition, in many cases, solar energy training can transform the careers of individuals formerly employed in the electronics, construction, and manufacturing industries.

Implementation Tips and Options

- Identify organizations and institutions in the community that are conducting training and education in solar energy.
- Collaborate with local education and training institutions to identify gaps, needs, and barriers in the development of a robust solar workforce.
- Encourage training institutions to achieve accreditation through ISPQ. The ISPQ requirements are designed to accomplish the following:
 - Teach individuals the knowledge and skills required for a professional trade.
 - Ensure that graduates have a predictable level of expertise.
 - Make sure that facilities are adequate and safe for training.
 - Ensure that the training organization has appropriate financial resources and that administrative and management procedures and policies are in place and practiced.
- Contact local training providers to ensure that they know about the activities sponsored by DOE's Solar Instructor Training Network. Local instructors might be eligible to receive specialized training, equipment upgrades, model curricula, and other assistance.
- Work with local institutions to develop solar curricula that match learning objectives with skill sets required by local employers.
- Encourage local training institutions to offer nationally recognized licensing/certification programs (see [3.5, Installer Licensing & Certification](#)).
- Evaluate how a local solar training program can help meet broader municipal economic development or workforce-training objectives.
- Implement local government programs that encourage using locally trained solar installers.

Examples

New Orleans, Louisiana: Facilitating the Louisiana CleanTech Network–Louisiana Technical College Partnership

A significant part of New Orleans’ comprehensive plan for the expansion of solar technology is educating and training a solar energy workforce. Nonprofit Louisiana CleanTech Network (LCTN), in partnership with Louisiana Technical College (LTC), offers a solar technology installation course that gives students hands-on experience. The course is a combination of lecture and training covering real-world solar applications, *National Electrical Code* (NEC) information, explanations of state and federal tax credit incentives, and Louisiana solar installation contractor requirements. The class includes 48 hours of professional training in two 3-day sessions and covers the learning objectives for NABCEP’s entry-level PV program. All course graduates receive the LCTN certificate of training, which satisfies one of Louisiana’s solar system installation contractor requirements.

San Francisco, California: Developing Community Workforce Development Training Programs

The San Francisco Office of Economic and Workforce Development (OEWD) has been working with City College of San Francisco to develop a Green Skills Academy that will offer vocational skills training and placement services; create and implement a targeted outreach strategy to recruit participants from four neighborhoods in the highest-poverty areas in the city; and design and implement an intensive and long-term job readiness training program that will help enrolled participants from targeted communities succeed in the Green Skills Academy and ultimately find their way to economic self-sufficiency through employment in green industry.

OEWD has also developed the TrainGreenSF (www.traingreensf.org) program to connect community-based organizations offering green training for low-income residents and worker referrals from their programs with the solar, energy efficiency, recycling, and green transportation employers who want to hire from the pool of workforce development graduates.

Beginning on July 1, 2010, residents wanting to receive San Francisco’s GoSolarSF incentive (www.solarsf.org) for installing a PV system were required to use a contractor who employs staff from city workforce development training programs and is certified by OEWD.

Visit www.solaramericacommunities.energy.gov for more inspiring examples from communities across the United States. 

Additional References and Resources

WEB SITES

Florida Solar Energy Center: Education

www.fsec.ucf.edu/en/education/cont_ed/bldg/index.htm

The center’s building research division offers numerous training and certification courses for a variety of practitioners and professionals as well as the public. The Web site lists PV and solar thermal course offerings.

GoSolarSF: Solar Energy Incentive Program

www.sfwater.org/mto_main.cfm/MC_ID/12/MSC_ID/139/MTO_ID/361

The San Francisco Public Utilities Commission administers the GoSolarSF Program and maintains the GoSolarSF Program Web site. The Web site includes details of the incentive program and a list of workforce development program installers.

Interstate Renewable Energy Council University Courses & Training Providers Directory

www.irecusa.org/irec-programs/workforce-development/education-information

IREC supports market-oriented services targeted at education, coordination, procurement, workforce development, and consumer protection, along with the adoption and implementation of uniform guidelines and standards. The Web site contains information about renewable energy courses at universities, a training catalog, resources for curriculum development, and information about ISPQ accreditation.

National Partnership for Environmental Technology Education

www.nationalpete.org

The National Partnership for Environmental Technology Education is a nonprofit organization that helps facilitate, augment, and broker partnerships with educational institutions, industry, and government. The Web site includes resources for establishing strong environmental practices and programs at educational institutions.

North American Board of Certified Energy Practitioners

www.nabcep.org

NABCEP is a volunteer board that includes representatives of the solar industry and the trades, NABCEP certificants, renewable energy organizations, state policy makers, and educational institutions. NABCEP offers certifications to renewable energy professionals throughout North America, and information on NABCEP-certified installers in the area.

North Carolina State University Renewable Energy Technologies Diploma Program

www.continuingeducation.ncsu.edu/RenewableEnergy.html

This continuing education program is geared toward electrical contractors; building and electrical inspectors; builders and architects; small business owners; landowners; plumbers; heating, ventilating, and air conditioning (HVAC) firms; and other entities interested in gaining a greater level of professional training and understanding in renewable energy. The Web site includes course and workshop listings and registration information.

Solar Energy International: Solar Training & Renewable Energy Education

www.solarenergy.org

Solar Energy International (SEI) is a nonprofit organization based in Colorado with a mission to help others use renewable energy and environmental building technologies through education. The SEI Web site lists the training courses available online and at locations worldwide.

The Southwest Technology Development Institute: Education & Training

www.nmsu.edu/~tdi/Photovoltaics/EducAndTraining/EducTrain.html

This institute is one of the key renewable energy educational organizations in the United States, producing trained project developers, electrical inspectors, engineers, homeowners, and bankers, among others. Courses range from practical, hands-on courses to detailed engineering, financing, and economic development courses.

U.S. DOE Solar Instructor Training Network

www.eere.energy.gov/solar/instructor_training_network.html

The Solar Instructor Training Network addresses the need for high-quality, local, and accessible training in solar system design, installation, sales, and inspection. The network leads an effort to create a geographic blanket of training opportunities in solar installation across the United States. Instructors have access to a variety of training resources and could be eligible for sponsored professional development.

PUBLICATIONS

Renewable Energy Training: Best Practices & Recommended Guidelines

Interstate Renewable Energy Council, February 2010

This report is an update to the September 2008 edition, and contains recommended training guidelines, training criteria, assessment tools, task analyses, credentialing programs, and other related resources for renewable energy training programs. The report includes recommended facilities, hardware, and materials for PV and SWH training programs.

Report: www.irecusa.org/wp-content/uploads/2009/10/BestPracticesFormatted2010Final2410.pdf

Photovoltaic Systems

National Joint Apprenticeship and Training Committee, 2010

In partnership with American Technical Publishers, the National JATC (NJATC) created a comprehensive textbook on designing, installing, and evaluating residential and commercial PV systems. It covers the principles of PV and describes how to effectively incorporate PV systems into standalone or interconnected electrical systems. The content includes system advantages and disadvantages, site evaluation, component operation, system design and sizing, installation requirements, and recommended practices.

Textbook (available for purchase): www.JimDunlopSolar.com