



Accreditation Applicant Information Booklet 2000

Photovoltaic Training
Accreditation Quality Standards,
Practices, and Auditing
Requirements

Master Trainer Accreditation
Training Institution Accreditation
Continuing Education Accreditation

Is your application complete?

Please verify that the following information is included in your application before you mail it.

- Application letter
- Application form
- Did you make a complete copy of your application for your records?
- Did you enclose your payment form and application review fee?
- Did you sign, date, and enclose the Code of Ethics?

Spring 2000

Dear Fellow Energy Training Professional:

Congratulations on your good work to date, and on your choice to pursue a third-party review and accreditation of the quality of your program. Accreditation offers a number of benefits, both to you and to your clientele. For you and your organization, accreditation offers an opportunity to review your program, its content, your resources, and your staff against objective, third-party quality standards; accreditation also provides recognition of quality in the market, opening doors to new opportunities. For your students, customers, and other interested stakeholders, accreditation provides a means to evaluate you and your program against others in the market.

With the growth in both general interest and in actual market size for renewable energy, “green” technologies, and energy efficiency, there is a rapidly expanding need for qualified practitioners and professionals who can demonstrate knowledge, skills, and experience in their areas of specialization. To support the qualification of these practitioners and professionals, it is essential that programs exist to provide qualified training in specific areas of expertise. The Institute for Sustainable Power, Inc., was organized in 1996 to work with industry, the training community, standards professionals, and other interested stakeholders to develop and implement a set of globally recognized quality standards for the accreditation of training programs and the certification of the knowledge and skills of practitioners.

Accreditation is the official qualification of an individual, institution, or organization, by auditing the candidate against objective standards and recognizing the candidate as maintaining standards of resources, instruction, and testing that qualify its graduates for appropriate credentials of knowledge, skills, and professional practice. The procedure involves the individual or organization submitting a letter of intent to pursue accreditation, along with an application for candidate status and the appropriate fees. After review, the candidate undertakes a self evaluation against the audit requirements in this manual, the results of which a qualified auditor uses to work with the candidate to determine compliance with the standards. The result of this audit is a report to the candidate of the results of audit, the achievement of accreditation, or a notice of deficiency, with the report specifying the areas requiring additional development or support.

These are evolving standards and practices, and we look forward to your input and involvement in the global quality accreditation framework for training programs in renewable energy and energy efficiency. Thank you for your interest in accreditation.

Sincerely,

Mark C. Fitzgerald
Executive Director
Institute for Sustainable Power, Inc.

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SUMMARY

This manual deals with the accreditation framework for qualifying trainers and training organizations specializing in photovoltaic (PV) practitioner training. It reviews the components of the accreditation framework and the specifics of auditing three levels of accreditation: Accredited Master Trainer; Accredited Training Institution; and, Accredited Continuing Education Program. Note: It is possible that a single organization may participate in any or all of these levels of accreditation.

Accreditation Development

The International Accreditation Standards for PV Training Institutions, PV Master Trainers, and Continuing Education Providers presented in this manual were developed in conjunction and in consultation with trade and professional organizations, in alignment with existing vocational accreditation procedures and standards for related practitioner fields (e.g., electricians, computer maintenance, etc.). The Accreditation framework presented in this manual is based on the framework of the Institute for Sustainable Power, Inc. (ISP), and the participating actors (industry, financial community, government agencies, trainers, etc.) that continue to work together to ensure the credibility of the standards and their applicability to the needs of the PV industry and international communities. The ISP acts as an objective body to qualify the compliance to accreditation.

The Accreditation parameters have been developed with input from the training community, PV industry, accreditation professionals, and financing/investment institutions, to determine the basic components of the Accreditation requirements that constitute the core resources, capabilities, and experience of the Training Institutions, Master Trainers, and Continuing Education Providers to receive Accreditation.

The Importance of Metrics

Quantifiable metrics are the key to a successful program of this type. These metrics include those to measure the usefulness of the program content, the ability and capabilities of the training organizations to successfully deliver the content to the course participants, and the successful acquisition and practice of that content by the program participants.

The development of rigorous auditing mechanisms for the Institutions and Master Trainers is critical to both the reality and perception of quality and value of the accreditations. These auditing mechanisms have been developed using the best practices available for evaluating the technical, administrative, and instructional capabilities of those seeking accreditation, regardless of their regional, national, or social circumstances. When implemented in the manner outlined in this manual, the system also ensures that the applicants are audited fairly and equitably, regardless of where the auditing occurs, by providing objective auditors and evaluation methods, with auditing verified by the ISP.

Much as with organizations accrediting traditional educational institutions to award certificates and degrees, the key to the general acceptance of proposed accreditation and certification standards is the development of metrics and parameters that are

- Appropriate
- Comprehensive
- Authoritative

- Rigorous
- Unbiased as to technology, venue, language, or application
- Measurable against an objective third-party standard
- Flexible enough to take into account local conditions and the variety of environments in which they will be used.

Accreditation Requirements

The training accreditation is available at three levels: one for professional trainers that provide instruction for training organizations and instructors (Master Trainer Accreditation); one for organizations that provide certification for student practitioners (Institutional Accreditation); and, one for providers of Continuing Education. Generally, accreditation will be based on the existence/establishment of a quality program; the experience and capabilities of the training staff; the numbers of trainers relative to the type and level of accreditation and the number of students per class; and, the available equipment, facilities, and resources. Accreditation of Master Trainers and Institutions will be for a specific period of time (initially for 3 years, with annual reviews), and will be renewable based on a review of the accreditation criteria; documentation of continuing training activities, including metrics on the numbers of participants, the rate of successful completion by the participants, a sampling of responses to random surveys of the successful and unsuccessful participants, interviews with clients, customers, and employers of the successful participants of the programs; the level of staff development and continuing education in which the instructors participate, to ensure the maintenance of their skills, both technical and instructional; and other surveys, as appropriate.

Auditing Procedures and Metrics

As noted above, there are several auditing steps in the accreditation process. The critical nature of this procedure requires strict compliance with ethics rules to avoid any possibility of conflicts of interest.

A Master Trainer or Training Organization can be accredited to offer a predefined certification through participation in the training quality assessment procedures. This requires

- a submission by the organization of a statement of intent to pursue accreditation,
- a summary of the organization's program offerings,
- a detailed assessment of the credentials and experience of the instructor staff,
- a listing of the relevant facilities, resources, and equipment available for instructional programming and for conducting skills evaluations,
- an outline of the course offering,
- a historic record of the development and presentation of the course offering, and
- references of previous program participants.

After review of these materials, an accreditation auditor, or an auditing team, performs an on-site assessment of the training program and the subject course offerings. Finally, the results of the on-site audit are passed on to a reviewer who was not a participant in the on-site audit—providing an arms-length final assessment of the candidate program.

If awarded an accreditation, the candidate organization receives a full debriefing on the findings of the auditing team, and the designation will remain in force for a period of time (3 years), with provisions for an annual review—though the review could come more or less often, depending on the program status.

If an accreditation is not awarded, the candidate organization will receive a full debriefing, including a discussion of any deficiencies, with suggestions on the development required to attain an accreditation. The candidate may then reapply for accreditation.

Master Trainer Accreditation

The Master Trainer accreditation is based on the special skills necessary to train and qualify instructors. Not only is it necessary for the Master Trainers to have the technical competence to instruct participants in aspects of PV systems installation and maintenance, these individuals must also have the knowledge and skills to instruct the candidate trainers/instructors in the most appropriate means to deliver this material to practitioners and to assess the capabilities of the student practitioners. In addition, the Master Trainer should provide or assist the trainers/instructors in obtaining or developing instructional design materials and methods; and, they must assist these instructors in integrating these materials into their instructional styles and institutional requirements.

The auditing procedures for the accreditation of a Master Trainer are noted above, with the audit details provided in Figure 1.1, below. The audit procedures vary from those of an Institutional candidate only in that the Master Trainer may not be required to have a fixed training site or a full complement of training hardware, because the training may be carried out at the site of the students/instructors being trained. However, if the candidate Master Trainer does not have either facilities or hardware, it is necessary to ensure that any site that the candidate Master Trainer trains at has the requisite facilities and hardware. Failure to ensure this will be cause for suspension or revocation of the Master Trainer's accreditation.

In auditing candidate Master Trainers, the audit team will use the worksheet on the following pages, or a local variation of that worksheet.

Criteria for Accepting or Rejecting the Application for Master Trainer Accreditation

- Documentation of an appropriate quality system
- Evidence of appropriate administrative systems (financial, documentation, etc.)
- Minimum Instructor experience, including
 - Minimum of 26 weeks as a classroom instructor
 - Minimum of 12 weeks of PV-specific classroom/hands-on training experience
 - Candidate fully certified to all requirements of the appropriate accreditation level(s)
- Client documentation forms (description of facilities, resources, equipment, etc.)
- Syllabus for each level of Instructor Training Course
- Metrics/Evaluations for each level of Instructor Training Course
- Student records and evaluation documentation
- References of Students/Clients

Accreditation is preliminary for one year, during which time the Master Trainer Accreditation Candidate must show evidence of the successful completion of the training of a minimum of 10 instructors, or of the successful completion of three (3) instructor training courses. Failure to meet this standard will result in the loss of accreditation status.

Acceptance or Rejection of the Accreditation status of a candidate is based on the evaluation of the auditor to the prescribed standards and evaluation criteria, and the review of that audit by the ISP.

Figure 1.1
MASTER TRAINER AUDIT REVIEW FORM
(attach documents and additional pages as necessary)

I) MASTER TRAINER INFORMATION

- a. Name of Candidate Requesting Accreditation:
- b. Address:
- c. Current and Previous Names, Institutions, Dates, and Locations Under Which Trainer Operated:
- d. Years (Weeks) of Experience as a Trainer/Instructor (PV and non-PV):
- e. Years of Experience as a practitioner in the Field of Photovoltaics:
- f. Years Teaching/Training in the Field of Photovoltaics:

II) GENERAL AUDIT INFORMATION

- a. Current Certifications held by Applicant:
- b. Previous ISP Certifications and Dates of Those Certifications:

III) GENERAL QUALITY SYSTEM DESCRIPTION

Quality Program (e.g., ISO/IEC Guide 62: Certifying Organizations Quality Program)

IV) PHOTOVOLTAIC INSTRUCTOR TRAINING/CERTIFICATION PROGRAM

- a. Description (or Minimum Requirements, if training at client site) of Classroom Facilities
- b. Description (or Minimum Requirements, if training at client site) of Laboratory Facilities
- c. Description of Available Resources (or Minimum Requirements, if training at client site)
 - Photovoltaic Hardware Available for Training/Laboratories
 - Resource Library
 - Linkages with Industry
 - Linkages with Community
 - Instructors/Lecturers available to assist the Candidate
- d. Number of Participants who have received ISP Trainer Certification through the Candidate's Program (if this is a renewal)

Training Institution Accreditation

Typically, accreditation is awarded to an institution rather than an individual (with the exception of Master Trainers), making the institution responsible for ensuring that the instructors it hires or retains are sufficiently well qualified. Upon accreditation, the institution is then qualified to provide a provisional certification or credential (provisional, pending review or completion of the experience requirements of participation in a number of installations) for individual practitioners, as well as to proctor (offer and monitor) examinations and evaluations for those who possess the appropriate knowledge and skills without having to take a training course. NOTE: there is no requirement that a candidate for certification must participate in a training course to qualify to take the examination.

The auditing procedures for the accreditation of a Certifying Institution are noted above, with the audit details provided in Figure 2.1, below. And, in this category, there are two variations on the accreditation: one for certifying institutions (this section); and, one for continuing education providers.

The audit procedures for an Accreditation candidate for a Certifying Institution vary from those of a Master Trainer candidate only in that the Institution must have a fixed training site and a full complement of training hardware and resources. While the institution may perform certifiable training at client sites, it must have a qualified primary facility with the appropriate hardware resources. Failure to meet this requirement will be cause for the rejection of an application for accreditation, in a new candidate, or the suspension or revocation of the Institution's accreditation, if such facilities, resources, and hardware materials become unavailable.

In auditing candidate Certifying Institutions, the audit team will use the worksheet on the following pages, or a worksheet with minor variations based on local requirements.

Criteria for Accepting or Rejecting the Application for Institutional Accreditation

- Documentation of an appropriate quality system
- Evidence of appropriate administrative systems (financial, documentation, etc.)
- Classroom/Laboratory facilities sufficiently well lighted, with proper acoustics, at comfortable temperature and ventilation levels, with sufficient instructional support materials (e.g., chalk boards/white boards/flip charts)
- Job-placement resources available to students
- Evidence of linkages with industry and the community
- Sufficient and appropriate hardware resources
- An appropriate resource library
- Appropriate Instructor/Staff Qualifications, including
 - Minimum of 13 weeks of classroom experience per instructor (not required for teaching assistants working in the classroom with the instructor)
 - Minimum of 8 weeks of PV-specific classroom/hands-on training experience (not required for teaching assistants working in the classroom with the instructor)
 - Instructor(s) fully certified to all requirements of the appropriate accreditation level(s)
- Client documentation forms (description of facilities, resources, equipment, etc.)
- Syllabus for each level of requested Certification Training
- Metrics/Evaluations for each level of requested Certification Training
- Candidate training records and evaluation documentation
- References of Students/Clients

Accreditation is preliminary for one year, during which time the Candidate Institution must show evidence of the successful completion of the training of a minimum of 40 students, or of the successful completion of four (4) certification training courses. Failure to meet this standard could result in the loss of accreditation status.

Acceptance or Rejection of the Accreditation status of a candidate is based on the evaluation of the auditor to the prescribed standards and evaluation criteria, and the review of that audit by the ISP.

Figure 2.1
INSTITUTIONAL AUDIT REVIEW FORM
(attach documents and additional pages as necessary)

I) INSTITUTIONAL INFORMATION

- a) Name of Institution:
- b) Main Campus Address:
- c) Names and Addresses of Other Campuses
- d) Names and Addresses of Other Campuses for which Accreditation is Sought
- e) Previous Names, Dates of Operation, and Locations of the Institution:
- f) Years of Operation:

- g) Number of Instructors Affiliated with the Institution (at the time of the application)
 - Full Time
 - Part Time
 - Visiting

- h) Number of Students Enrolled in the Entire Institution (at the time of the application)
 - Full Time:
 - Part Time:
 - Successful Completion Rate:
 - Job Placement Information (attach):

II) GENERAL AUDIT INFORMATION

- a) Certifications for which Accreditation have been Requested:
- b) Current Certifications/Credentials for which the Institution is Accredited:
- c) Previous ISP Accreditation's and Dates of Those Accreditations:
- d) Other Accreditations (Academic and/or Vocational):

III) GENERAL QUALITY SYSTEM REQUIREMENTS

- a) Certifying Organizations Quality Program (Waived if organization has existing accreditation from a recognized Accrediting Body)

IV) PHOTOVOLTAIC TRAINING/CERTIFICATION PROGRAM

- a) Description of Classroom Facilities
- b) Description of Laboratory Facilities
- c) Description of Available Resources
 - Photovoltaic Hardware Available for Training/Laboratories
 - Resource Library
 - Job Placement Office
 - Linkages with Industry
 - Linkages with Community
 - Visiting Instructors/Lecturers
- d) Number of Candidates Enrolled in the Program in Last Five (5) Years
- e) Number of Candidates ISP-Certified through the Program (if this is a renewal)

Continuing Education Accreditation

A major strength of any professional designation is a program of continuing education the individual must follow to retain certification. To maintain an ISP certification, individuals must, among other requirements, comply with a Continuing Education Policy. These programs help assure that those certified remain current with technical and industry advances.

For individuals or organizations pursuing accreditation to provide continuing education resources, the audit worksheet is a simplified version of the Master Trainer Worksheet, though the requirements are less stringent. The minimum requirements are that the organization has the experience, technical qualifications, instructional capability, and appropriate quality and record-keeping facilities to ensure that the candidates receive the advertised information, that the participants' knowledge is evaluated, and that their participation is recorded.

In auditing candidate Continuing Education Providers, the auditor will use the worksheet on the following page, or a worksheet with minor variations based on local requirements.

Criteria for Accepting or Rejecting the Application for Continuing Education Accreditation

- Documentation of an appropriate quality system
- Evidence of appropriate administrative systems (financial, documentation, etc.)
- Evidence of linkages with industry and the community
- Sufficient and appropriate resources necessary for the course/workshop subject
- Client documentation forms (description of facilities, resources, equipment, etc.)
- Syllabus for each course/workshop
- Metrics/Evaluations for each course/workshop being accredited
- Participant records and evaluation documentation
- References of Participants/Clients

Accreditation is preliminary for one (1) year, during which time the Candidate Continuing Education Institution must show evidence of the successful completion of a minimum of 20 students in the course/workshop, or of the successful completion of four (4) continuing education courses/workshops. Failure to meet this standard could result in the loss of accreditation status.

Acceptance or Rejection of the Accreditation status of a candidate is based on the evaluation of the auditor to the prescribed standards and evaluation criteria, and the review of that audit by the ISP.

Figure 3.1
CONTINUING EDUCATION AUDIT REVIEW FORM
(attach documents and additional pages as necessary)

I) CONTINUING EDUCATION PROVIDER INFORMATION

- a) Name of Trainer/Organization Requesting Accreditation:
- b) Address:
- c) Names and Addresses of Other Offices:
- d) Current and Previous Names, Institutions, Dates, and Locations Under Which Trainer/Training Organization Operated:
- e) Years of Experience of Trainer/Instructor (PV and non-PV):
- f) Years of Experience in the Field of Photovoltaics:
- g) Years Teaching/Training in the Field of Photovoltaics:
- h) Years of Experience in the Area Considered in this Accreditation:

II) GENERAL AUDIT INFORMATION

- a) Requested Period of Accreditation (if other than the standard 3 years):
- b) Current Certifications held by Applicant:
- c) Previous ISP Certifications and Dates of Those Certifications:

III) GENERAL QUALITY SYSTEM REQUIREMENTS

- a) Quality Program (Record Keeping, etc.)

IV) CONTINUING EDUCATION PROGRAM

- a) Title/Subject of Course/Workshop to be Evaluated
- b) Description of Classroom Facilities (or Minimum Requirements, if training is off-site)
- c) Description of Laboratory Facilities (or Minimum Requirements, if training is off-site)
- d) Description of Available Resources (or Minimum Requirements, if training is off-site)
 - Technology Hardware Available for Training/Laboratories
 - Resource Library/Handouts
 - Linkages with Industry
 - Linkages with Community
 - Assisting Instructors/Lecturers
- e) Number of Participants that have received ISP Continuing Education Credit through the Program (if this is a renewal)
- f) Copy of Examination/Evaluation used to Evaluate Participants on Completion

Staff Qualification Metrics

In reviewing and auditing a training program for accreditation, the most obvious place to start is with the instructor(s). This is the interface with the certification candidates and the direct link between these candidates and the training materials. Consequently, it is important to be sure that the instructors have the requisite experience, education, abilities, and understanding to represent and transfer the knowledge and skills required. The auditor will assess the capabilities of the instructors based on a number of criteria, ranging from education to experience to evaluations.

- **Experience as a Training Provider**
When reviewing the instructor's credentials, the auditor will look to see evidence of previous and current teaching experience, with the expectation that the instructor(s) has a minimum of one year of experience teaching this or a related subject. And, while all teaching experience is good, specific experience in vocational or trades education is a significant plus.
- **Continuing Education**
While an academic background in teaching is useful, continuing education (whether in teaching techniques or PV industry workshops) is critical to the quality and development of a training instructor. Evidence of continuing training shows a desire to remain current and/or to expand the instructor's range of knowledge and skills. This experience and enthusiasm typically translates into better capabilities on the part of the instructor and a better learning experience for the students.
- **Technology Experience**
As important as the ability to teach is the instructor's knowledge of the subject matter. In the case of PV training, it is imperative that the instructor be able to show an understanding of, and a facility with, technical issues in general, and with PV in particular. The instructor must hold a current, valid certification for the level of the courses they will teach (or must obtain that certification within the period of the first probationary year).
- **Practical Experience**
Another asset for an instructor is evidence of practical field experience. When providing training for students who expect to move quickly into the field to work, first-hand experience with PV applications gives the instructor insights into the PV industry and technology that will be extremely valuable to the students.
- **Educational Background**
While it is an asset to have an educational background or training as a teacher or in the area of instructional design or presentation, this is not a critical criterion. People from all walks of life—from actors to accountants—make wonderful presenters and teachers. And, some people with teaching credentials have less-than-stellar abilities. However, a course of study that has provided a solid grounding in the instructional development, delivery, and evaluation is extremely helpful.
- **Student Feedback**
Finally, the auditor may randomly contact previous students to provide additional perspective on the capabilities of the instructor.

Facilities Qualification Metrics

When auditing a training program for accreditation, the training institution must have sufficient facilities so as to provide the participants/candidates with the resources and environment necessary to meet the knowledge and skills competencies required for certification. As part of this process, the auditor will review

➤ **Classroom Facilities**

The candidate for accreditation must have sufficient and appropriate classroom facilities in which to properly present the instructional portions of the training. This includes classrooms that are safe, properly conditioned (heat and cold), lighted, ventilated, with appropriate ancillary facilities (toilet, storage, dining, etc.), and presentation and learning resources (desks, projectors, flip charts, etc.).

➤ **Laboratory Facilities**

The candidate for accreditation must have sufficient and appropriate laboratory facilities in which to properly present the hands-on and skills portions of the training. This includes work areas that are safe, contain appropriate safety and first aid resources, and are equipped with PV hardware that works properly and is representative of the current commercial industry.

➤ **Resource Library**

The candidate for accreditation must have sufficient reference and resource materials (bibliographic, computer, video, etc.) available and accessible that students will be able to research specific topics in greater depth.

Organizational Quality Metrics

Finally, the candidate organization must have appropriate and sufficient administrative and organizational systems in place to ensure continuity and quality in the training experience. The auditor will look at the following, relative to the requirements and best practices in the candidate's country, to determine the appropriate level of administrative and organizational systems. This will vary from country to country. However, the items noted as required constitute the necessary minimum administrative and organizational systems for accreditation.

- Legal Entity (required)
The candidate for accreditation must be a legal entity (corporation, partnership, etc.).
- Impartial and Non-Discriminatory (required)
The candidate for accreditation must show evidence that it does not discriminate against potential participants and that it has a stated policy to that effect. In addition, it must show that it will be impartial in its instruction and evaluation of all participants.
- Quality System in Place (required)
The candidate for accreditation must have an articulated and documented Quality Plan and Quality System in place.
- Resources and/or Insurance to Address Liability Issues (required where legally relevant)
In some countries, legal liability is a significant issue whenever providing a product or a service. For those countries where liability is a concern, and because of the potential liability involved in hands-on training, it may be necessary that the candidate for accreditation be able to show resources or insurance policies sufficient to cover any anticipated legal or liability issues.
- Other Accreditations
Has the candidate already been accredited by another external body, to recognized standards? If so, it is likely that there is very little additional work the auditor might have to do to evaluate such a program in an audit. Most of the work in quality development and documentation issues would have been reviewed in the other audit (if it is current).
- Job Placement Facilities (strongly recommended)
A very good indicator of the quality of a training program is the placement of its graduates into the workforce. In addition, it is an important resource for the students, in their search for work after completing their certifications. The institutions with better placement programs will develop and maintain links with industry (e.g., having industry representatives serve on the program's advisory board, inviting industry representatives to lecture to classes, etc.), to keep the lines of communication open.
- Record Keeping (required)
The documentation of the activities, academic developments, student evaluations and comments, and maintenance of the institution's quality system, is critically important to the proper evaluation of an institution by an auditor. In addition, proper record keeping and documentation are the central activities of a quality system.
- Linkages with Industry and the Community (required)
As noted in "Job Placement Facilities," above, linkages with industry are extremely important to the success of a program and its candidacy for accreditation. Industry representatives can provide timely and useful insights into the industry, and they will provide the jobs that will validate the development of the program. In addition, linkages with the community are also quite important.

Hardware Resource Requirements

To properly and competently carry out a qualified PV training program, it is necessary to have available a minimum amount of hardware (components, systems, and testing hardware) for demonstration and hands-on exercises, for practical skills evaluation, and for installation experience. At a minimum for accreditation, the training organization must have the following, along with associated specification sheets and documentation:

Training Equipment Recommendations (for all courses, unless otherwise indicated)

Equipment: Safety, Meters, Calculators, and Testing

- Safety Equipment (rubber gloves, safety glasses, wire brushes, first aid kit, fire extinguishers, etc.)
- Digital Multi-Meters (one for every two participants)
- Two battery hydrometers with battery safety and maintenance kit
- Calculators (one for every two participants) (Installation Technician I & II)
- Variable dc power supply to test and evaluate charger controllers (one per class)
- Watt power meter to measure power consumption and load efficiency (one per class)
- Solar Pathfinder or Site Selector (determining solar access) (Installation Technician I & II)

Hands-On Installation and Maintenance Equipment

- Working power electronics for installation and maintenance training (inverter for Installation Technician II, III, & IV and Maintenance Technician II & IV, only; all other equipment for all levels of certification.
- Batteries
- Matched PV modules (average one module per student)
- Assorted electrical connectors and boxes
- Solder station and equipment
- Supplies to fabricate (crimp and solder) battery cables
- Supplies to fabricate (crimp and solder) array interconnect wires
- Typical loads (e.g., ac and dc pumps, dc lights, refrigerator, radio/TV, etc.)

Examples and Samples

- Samples of mounting hardware
- Samples of wire of varying sizes
- Samples of diodes, fuses, disconnects, grounding hardware, etc.
- Samples of power electronics (regulators/charge controllers, etc.)
- Sample batteries (sealed, lead acid, etc.)
- Sample PV modules (variety of technologies and sizes)
- Samples of loads (e.g., lights, radio, black & white TV, dc pump, etc.)

Depending on the level of certification the training organization will provide, the systems hardware requirements will vary, as noted in the list above (e.g., they will be different for training organizations only certifying Solar Home Systems installers than for those certifying grid-tied systems).

Resource Library

To properly and competently carry out a qualified PV training program, it is necessary to have available a library of resource materials and documents that will provide the students and instructors with both summary and in-depth information on PV system components and loads, systems installation and maintenance, and industry information. In addition, it is important to maintain subscriptions to periodicals that provide regular and current information on new products, examples of applications and installation/maintenance techniques, and news. The following is a list of example publications and resources that could/should be part of the institution's resource library.

Sample Resource Library

A. Cabraal, M. Cosgrove-Davies, and L. Schaeffer, "Best Practices for Photovoltaic Household Electrification Programs, Lessons from Experiences in Selected Countries," World Bank Technical Paper Number 324, Asia Technical Department Series, August 1996.

DRE Specifications, Ademe, "Specifications for the use of renewable energies in rural decentralised electrification," EDF, Clamart Cedex, France, June 1997.

J. Davidson, *The New Solar Electric Home: The photovoltaics how-to handbook*, aatec publications, Ann Arbor, Michigan, 1987. 402 p.

H. de Gooijer, F.P.H. Wouters, and G. Loois, "Quality Handbook for Solar Home Systems," Ecofys, Utrecht, The Netherlands, January 1998. 34 p.

La Energia Solar (Spanish), CENSOLAR, Progensa, 1993.

S. Roberts, *Solar Electricity: A practical guide to designing and installing small photovoltaic systems*, Prentice Hall Europe, London, 1991.

Sandia National Laboratories and Architectural Energy Corporation, "Maintenance and Operation of Stand-Alone Photovoltaic Systems," December 1991, Albuquerque, NM, USA.

Sandia National Laboratories. "Stand-Alone Photovoltaic Systems: A handbook of recommended design practices." SAND87-7023, 1987, Albuquerque, NM, USA. (English and Spanish)

Sandia National Laboratories and Daystar, Inc., "Working Safely with Photovoltaic Systems." Daystar, Inc., Las Cruces, NM, USA. 27 p. (English and Spanish)

"Hybrid Power Systems: Issues and answers." 38 p.

Sandia National Laboratories. "Solar Photovoltaics for Development Applications." SAND93-1642, Albuquerque, NM, USA. 1993. 48 p. (English and Spanish)

Sandia National Laboratories. "Photovoltaic Power Systems and The National Electrical Code: Suggested practices." SAND96-2797, Albuquerque, NM, USA. 1996. 137 p.

Sandia National Laboratories. "Water Pumping: The solar alternative." SAND87-0804, Albuquerque, NM, USA. 56 p. (English and Spanish)

The Battery Council International, "Battery Service Manual." 111 East Wacker Dr., Chicago, IL 60601 USA.

G. W. Vinal, *Storage Batteries*, John Wiley & Sons. 1951. ISBN #471-90816-9.

Publications/Subscriptions

Home Power Magazine subscription, P.O. Box 520, Ashland, OR 97520 USA; URL: www.homepower.com

Renewable Energy World magazine subscription, James & James (Science Publishers) Ltd., 35-37 William Road, London NW1 3ER, UK; URL: www.jxj.com

Video/Multimedia/CD ROM and Software

Residential Solar Electricity, video, Solar Energy International, Carbondale, Colorado, USA ; URL: www.solarenergy.org

Community PV: How you can use solar power. CD-ROM. Utility Photovoltaics Group, Washington, DC1998.

The Sun's Joules, A CD-ROM Multimedia Encyclopedia for our Energy Future, CREST (Center for Renewable Energy and Sustainable Technology), Washington, DC, USA; URL: solstice.crest.org.

"Let's join hands and save energy," CD-ROM, The Electricity Generating Authority of Thailand, Bangkok, Thailand. English translation by supported by the Asia Alternative Energy Unit of The World Bank, Washington, DC, USA.

Maintaining Accreditation

The accreditation is valid only for a period of three (3) years, with annual visits and/or audits where appropriate, depending on the experience with these organizations. These audits would most often be in the form of short reports filed by the training organization to the ISP. Randomly (or, in some cases, based on reports that raise concerns), a field auditor from an objective third party, at no cost to the institution, might perform a site evaluation. The first accreditation would be probationary for the first year, so that a more thorough and experiential assessment can be made.

After any audit, the procedure is to write up an official evaluation, noting any deficiencies. If the deficiencies are deemed extreme, and depending on their severity, the organization could be placed on probation or could lose its accreditation completely, though any organization or individual would have recourse against such actions by bringing complaints and/or concerns to the ISP Board, through the proper procedures outlined in the ISP Accreditation Handbook.

Maintaining an accreditation in good standing requires more than compliance with the appropriate audit activities, though. It also requires continuing adherence to the Code of Ethics and acceptable business practices, documented through customer and student records and additional appropriate, relevant information.

Code of Ethics

Accreditation brings with it a serious responsibility and requires that those involved – in accreditation, certification, and those accredited and certified – meet the highest standards of ethics as well as the standards for technical knowledge and skills. Without ethical guidelines, and the commensurate sanctions for failing to meet those standards, any credential awarded would be suspect in the market.

All participants in an accredited institution (or a Master Trainer), no matter at what level, must read, understand, and attest their compliance in writing with the Code of Ethics. In addition, the Code of Ethics must be available to all customers and clients, along with information on specific remedies and recourse.

ACCREDITATION CODE OF ETHICS

Having received Accreditation from the Institute for Sustainable Power, Inc., I agree to adhere to the standards of professionalism and conduct set out in the ISPQ manual and other documents. Specifically, at a minimum, the organization and employees of the Accredited Institution shall

- Avoid all conflicts of interest, both in fact and in appearance;
- Maintain all confidential and proprietary information in the strictest confidence;
- Commit to bringing professionalism, accountability, and integrity to this work;
- Practice and maintain professional competencies according to the educational standards established and maintained by the ISP;
- Immediately report any and all incompetent, unethical, and/or unprofessional conduct by associates or clients to the Ethics Board of the ISP;
- Not make any statement or take any action that could bring the client the accrediting body, the process, the industry, ourselves, or the credential into disrepute.

In agreeing to these points in the ISP Accreditation Code of Ethics, I/we acknowledge that any violation of this Code or accepted standards and practices will subject me/us to the sanctions, penalties, and/or actions defined in the ISPQ Manual, the ISP Handbook, and other appropriate ISP and ISPQ documents.

Use of the Accreditation Seal

Accredited individuals or institutions may use the Accreditation Seal of the Accreditation Board of the Institute for Sustainable Power, Inc.



The Accreditation Seal must be used with discretion. It is to be used to identify institutions as being members of an internationally recognized accrediting agency. The seal may be used on letterheads, business cards, catalogs, and certificates.

Publication and Media Statements

Each candidate or accredited individual or institution, when referring to its status with the Accrediting Board of the Institute for Sustainable Power, Inc., must use the appropriate choice of the two statements that follow:

(Name of Institution) is a candidate for Accreditation with the Accreditation Board of the Institute for Sustainable Power, Inc.

(Name of Institution) is accredited by the Accreditation Board of the Institute for Sustainable Power, Inc.

Accreditation Fees

Application Fee: US\$100

This fee is to accompany the application and request for candidate status when submitted to the Institute for Sustainable Power, Inc. This fee is applicable to those applying for consideration as Master Trainer, Training Institution, or Continuing Education Provider.

On-Site Auditing Fees: Variable

Institutions must reimburse the ISP for the cost of the auditor or evaluating team visits (note: a team could be an individual or a number of individuals, as necessary, decided after consultation with the candidate organization). Reimbursable items include cost of travel, hotel/motel expenses, and meals of the visiting team and staff members or Board representatives. (There is no charge for salaries of team members, staff members, or Board representatives.) At the discretion of the Executive Director of ISP, a deposit may be required thirty (30) days prior to the visit. The Executive Director will determine the amount of the deposit based on the size of the institution and the anticipated cost of the audit. The institution shall be provided a statement of expenses incurred. Unused funds from the deposit shall be returned. Any costs exceeding the deposit must be paid by the institution within 30 days of its being presented with a detailed invoice.

In addition to the expenses mentioned above, an evaluation fee of US\$100 per team member and a US\$100 charge for necessary administrative services will be applied. Actual expenses of team and staff members or Board representatives are reimbursed in accordance with the policies and guidelines of the ISP (plus the US\$100 per team member evaluation fee and a US\$100 charge for necessary administrative services). Institutions shall not reimburse team members or Board representatives directly. The ISP will attempt to make appropriate arrangements with institutions or school systems that cannot otherwise reimburse the ISP for team expenses.

Annual Dues for Accredited Institutions Certifying Practitioners

Each new and renewing institutional candidate for Institutional Accreditation shall pay annual dues based on the previous year's enrollment (Student-Week Equivalent [SWE]) according to the following formula, with a minimum fee of US\$250: $US\$250 + (US\$5 \times SWE)$

Example: 4 courses/yr, 2 weeks each, 15 students/course = 120 SWE
 $US\$250 + (US\$5 \times 120) = US\$850$

Annual Dues for Master Trainers

Each new and renewing candidate for Master Trainer Accreditation shall pay annual dues based on the previous year's enrollment (Student-Week Equivalent [SWE]) according to the following formula, with a minimum of US\$250: $US\$250 + (US\$5 \times SWE)$

Example: 2 courses/yr, 2 weeks each, 10 students per course = 40 SWE
 $US\$250 + (US\$5 \times 40) = US\$450$

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