

**Application for ISPQ Accreditation of
Photovoltaic Training Programs and Instructors**

Submitted by:

Florida Solar Energy Center
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Submitted to:

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1. Introduction

The Florida Solar Energy Center is pleased to submit this application for ISPQ accreditation of our photovoltaic training programs and instructors. We are looking forward to this independent review as an opportunity to help distinguish our programs and staff.

Our application covers all three levels of accreditation offered by ISP; Master Trainer, Training Institution and Continuing Education Provider. As a multi-disciplinary research and educational institute, FSEC has made considerable commitments in the areas of hardware and practitioner certification. Currently, FSEC is pursuing ISO 17025 accreditation by A2LA for solar thermal and PV testing services, and we believe that a similar certification by ISP for our training program will be an important complement to this.

In summary, this document includes:

- Applications for Master Trainers, Training Institution and Continuing Education Provider,
- A summary of program offerings, including objectives, descriptions, and agendas,
- A summary of the credentials and experience of the instructor staff,
- A description of the relevant facilities, resources, and equipment available for instructional programming and for conducting skills evaluations,
- A historic record of the development and presentation of the course offering, and
- Other related information

2. Master Trainer Accreditation and Audit Review

The individuals proposed for Master Trainer in this application have significant training experience and special skills necessary to train and qualify instructors. They also have the ability to instruct the candidate trainers/instructors in the most appropriate means to train and assess the capabilities of the student practitioners. All have taken workshops on instructional design and assessment, and routinely assist other instructors in developing and obtaining instructional materials, and developing courseware and training methods.

All Master Trainer candidates normally conduct training programs at the Florida Solar Energy Center with full use of training hardware, laboratories, classroom facilities and AV equipment. On occasion, instructors will conduct training programs on the road. Where these facilities do not have the requisite equipment, equipment is shipped or transported from FSEC to use in the training programs.

It is understood that 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.

2.1 Master Trainer Information

2.1.1 Names of Candidates Requesting Accreditation for Master Trainer

- James P. Dunlop, P.E., Senior Engineer, Florida Solar Energy Center
- Stephen F. Barkaszi, P.E., Senior Engineer, Florida Solar Energy Center
- Brian N. Farhi, Research Engineer, Florida Solar Energy Center
- Kevin W. Lynn, Research Engineer, Florida Solar Energy Center

2.1.2 Address and Contact Information

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922-5703 USA
Ph: (321) 638-1000
Fx: (321) 638-1010
www.fsec.ucf.edu

2.1.3 Institutions, Dates, and Locations under Which Trainer Operated

All candidates are employed by the Florida Solar Energy Center, and are faculty members of the University of Central Florida, Orlando, Florida. Approximate duration of employment for each candidate follows:

- James Dunlop: 1985 – present (16 years)
- Stephen Barkaszi: 1990-94, 1997-present (8 years)
- Brian Farhi 1997-present (4 years)
- Kevin Lynn: 1994- present (7 years)

2.1.4 Cumulative Experience as a Trainer/Instructor

Cumulative experience in PV instruction for each candidate is based on past experiences of delivering a minimum of four one-week programs per year for the duration of their service. The numbers below represent actual instruction time and time in the classroom or laboratory interacting with students.

- James Dunlop: 16 months
- Stephen Barkaszi: 8 months
- Brian Farhi: 4 months
- Kevin Lynn: 7 months

2.1.5 Years of Experience as a Practitioner and Teacher/Trainer in the Field of Photovoltaics

All candidates have practiced in the field of photovoltaics, including duties of teaching and training for the duration of their service at FSEC. See previous section for years of service for each candidate.

2.2 General Audit Information

2.2.1 Current Certifications held by Applicant

The Florida Solar Energy Center is currently undergoing audits and accreditation for testing laboratories per ISO 17025 by A2LA. Staff members James Dunlop and Stephen Barkaszi are licensed professional engineers in Florida. All candidates have baccalaureate or post baccalaureate degrees in engineering disciplines.

2.2.2 Previous ISP Certifications

There are no previous ISP Certifications applicable for any candidate or the training institution.

2.3 General Quality System Description

2.3.1 Administration

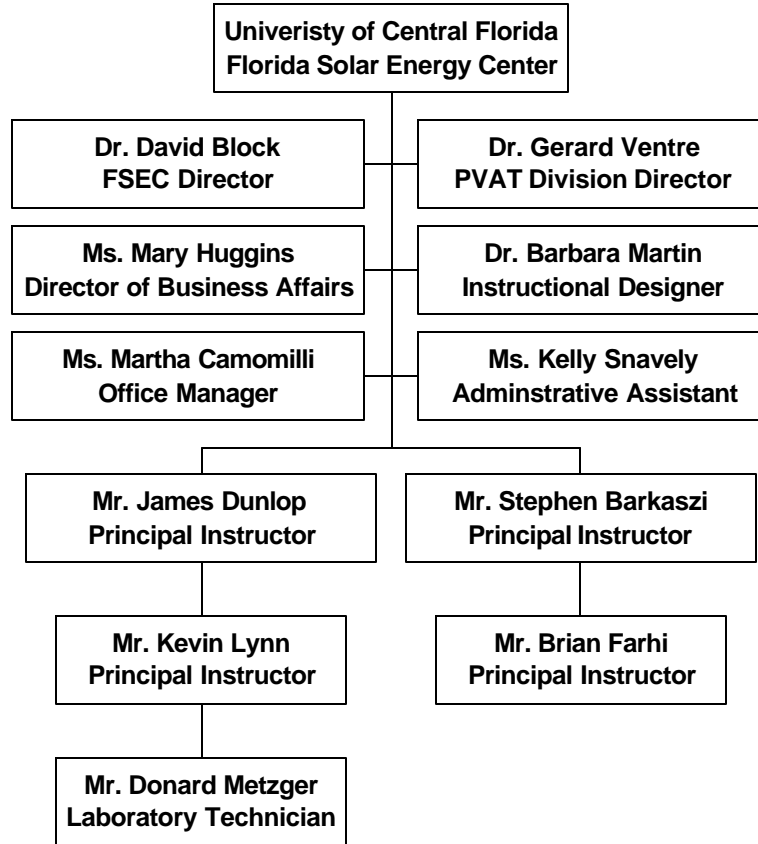
The Florida Solar Energy Center has been conducting an active continuing education program since 1975. Each year, an average of 25 to 40 workshops, short courses and conferences are conducted by the Center at the FSEC facility, around Florida, and throughout the country and internationally.

Detailed record keeping is a standard procedure in delivering each and every training program at FSEC. Divisions sponsoring the training program handle all registrations and record keeping. All financial records, including registration funds, budgets and expenses are handled by FSEC's Business Affairs Office and the University's Financial Office monitors and oversees all accounting activity to ensure that all State of Florida rules and regulations are followed. The University also routinely conducts audits of financial records, maintains quality control over all financial transactions, and closely monitors all FSEC activity.

Specific files are created in the PVAT Division for each program offered, which includes the following:

- Registration forms and correspondence with students
- Course budget, expenses and financial matters
- Student records, names and contact information, examination result and applicable contractor's license
- Completed and graded examinations
- Student/course evaluations
- Certificates and CE credits

2.3.2 Responsible Individuals and Organization



2.3.3 Approval for Continuing Education Provider

Many courses taught at FSEC are currently accredited by various organizations (e.g., the State of Florida's Construction Industry Licensing Board, the American Institute of Architects, and other organizations). To receive and maintain this accreditation, the Center must comply with rules and regulations set by these organizations.

At present, FSEC's PV training program is recognized and approved by the Electrical Contractor's Licensing Board of the Florida Department of Business and Regulation. Details of this application and approval are contained in the appendix.

2.4 Photovoltaic Instructor Training/Certification Program

All candidates for Master Trainer normally conduct training program at the Florida Solar Energy Center. FSEC properties include over 100,000 square feet of offices, laboratories and training facilities on two sites totaling approximately 30 acres.

2.4.1 Description of Classroom Facilities

FSEC has state-of-the art classroom and auditorium facilities used for conducting all types of training, workshops, meetings and other outreach activities. Classroom sessions for FSEC's PV training programs are normally conducted in the auditorium, where instructors and students have access to a variety of multitude of AV resources in a comfortable, spacious setting. The auditorium seats about 200 persons, and has desk space in the front rows for smaller groups of students to sit and spread out materials. The AV system consists of a large screen and projector, and all media forms, cameras, microphones and projections are controlled from a console at the instructor podium.

2.4.2 Description of Laboratory Facilities

FSEC operates extensive laboratories for the test and evaluation of solar thermal and PV systems and equipment, and is currently pursuing ISO 17025 Certification through A2LA. FSEC's PV laboratory facilities consist of areas for testing PV modules, components and systems, and are routinely used for exercises and demonstrations in PV training programs.

2.4.3 Description of Available Resources

2.4.3.1 Photovoltaic Hardware Available for Training/Laboratories

FSEC maintains an inventory of the latest in PV systems and equipment technology, and routinely interacts with major equipment manufacturers and system suppliers in obtaining and utilizing their newest designs and equipment expressly in PV training programs. An overview of the systems and hardware used in FSEC's PV training programs includes:

- Siemens Solar EarthSafe packaged grid-connected PV systems, (two, 2 kWp each)
- AstroPower SunUPS packaged grid-connected PV system w/ battery storage (1 kWp)
- AstroPower SunLine packaged grid connected PV system (1 kWp)
- Numerous grid-connected, battery-based and AC module inverters from all major manufacturers
- Several battery banks of various sizes and technology types
- Mounting structures, mock roof tops, mechanical and weather sealing materials
- Site survey equipment including lines, levels, tapes, markers, inclinometers, sun path calculators and checklists
- Multi-meters, oscilloscopes, power analyzers, temperature probes, irradiance meters, dataloggers
- Normal electrician tools required for array and system installations

2.4.3.2 Resource Library

A number of resources are made available to students attending FSEC PV training program. Many of these materials are publicly available documents, accessible on web servers including FSEC's and those at the national laboratories and other organizations. Some of the more important documents are given to the students at each program. Some of the more popular resources used in conjunction with FSEC's PV training programs are included in the bibliography in the appendix.

FSEC also maintains one of the most extensive energy-specific libraries in the country. Besides the traditional reference services, FSEC's library provides extensive literature searching via electronic databases and periodical indices. They also compile bibliographies to support special research projects or needs. FSEC library personnel also handle the ordering of books, documents, periodicals, and they route issues of journals and newsletters to FSEC staff other library materials, as requested.

The energy collection holdings include over 10,000 books and bound periodicals, and 70,000 documents, technical reports, subscriptions, audiovisual materials, and vertical files. Along with texts, directories, conference proceedings, journals, newsletters, and efficiency studies dealing directly with solar energy, the collection includes materials on topics such as alternative energy sources, heat transfer, building science, energy efficiency, hydrogen, and electric vehicles. Library materials in the BCC/UCF Joint-Use Library may be accessed through LINCC, Florida's Library Information Network for Community Colleges.

2.4.3.3 Linkages with Industry and Community

All candidates for Master Trainer are heavily involved in interactions with industry and the community, including areas such as product testing and evaluation, customer and project development, and acceptance testing and monitoring of PV system installations. Many ongoing business and industry relationships have been established as a result of FSEC training programs and other outreach activities.

2.4.3.4 Instructors/Lecturers Available to Assist the Candidate

All Master Trainer Candidates are available to assist others in FSEC training programs. In addition, highly qualified outside technical experts have and will continue to be utilized for regional and topic-specific training requirements.

2.4.3.5 Number of Participants who have received ISP Trainer Certification through Candidate's Program

None

2.5 Courses For Which Master Trainer Is Qualified

2.5.1 Program-Specific Course Listings

All Master Trainer candidates are seeking qualification for the course “Installing Grid-Connected Photovoltaic Systems”. All Master Trainer candidates routinely participate and are proficient in all aspects of these programs.

2.5.2 Years in which These Courses Have Been Offered

This specific course has been offered for over two years, and has been given a total of sixteen times (one-week each). In addition, FSEC has offered similar programs with an emphasis on stand-alone PV applications for many years, with well over 100 short courses given.

2.5.3 Course Descriptions

This one-week course covers the design and installation of grid-connected photovoltaic (PV) systems, and involves the actual hands-on installation of typical systems. This program is intended for electric utilities, electricians and solar contractors, with an overall goal of developing "system-knowledgeable" certified professionals to help ensure the safety and quality of PV system installations. The course format includes both classroom instruction and hands-on exercises. These exercises involve the complete step-by-step process of designing, installing and commissioning grid-connected PV systems, and are intended to develop the participant's working knowledge of PV systems and equipment. An emphasis is placed on code compliance and accepted state-of-the-art industry design and installation practice. On the final day of the five-day training program, an optional examination is administered for Florida contractors installing PV systems that utilize Florida rebate funds. The FSEC examination of installers does not fulfill requirements for licensure of solar or electrical contractors by any state local government authority.

See attached documentation for complete description, course objectives and agenda.

2.5.4 Number of Participants/Instructors Enrolled and Completing Course

Since inception of the “Installing Grid-Connected PV Systems” course at FSEC, over 100 persons have attended the one-week program and have passed the examination. Of this total, FSEC has authorized approximately 20 licensed Florida contractors to install PV systems under the Florida rebate program. Another approximately 20 persons attending this program were in some way involved as educators or instructors, for schools and universities, or for trade apprenticeship and training organizations.

2.5.5 Related Courses and Years Offered

FSEC has conducted hundreds of training programs, workshops and seminars over the last 25 years covering all areas of renewable energy and energy efficient building technologies. See attached listing of FSEC workshops and training programs offered from 1986 through 2000.

2.6 Staff

2.6.1 Resumes and Experience for Candidate Instructors

Resumes for candidate Master Trainers are attached. Refer to sections 2.1.3 – 2.1.5 for PV training specific experience and qualifications of candidate instructors.

2.6.2 Documentation of Related Continuing Education

In the past two years, all candidates for Master Trainer have attended and presented at major national conferences, and have completed the following two specific courses in technical and instructional areas:

“Electric Utility System Operation”, Professional Training Systems, Inc

“Instructional Design”, Daryl Sink and Associates

2.6.3 Number of Students per Class

The number of students per class varies but averages approximately 10-12, and is limited to no more than 16 individuals due to the nature of the hands-on exercises. All four candidates for Master Trainer routinely participate in delivering the course, and the average student-teacher ratio during class exercises is typically 4 to 1.

2.7 Surveys and Interviews

The candidates for Master Trainer and the Florida Solar Energy Center hereby authorize ISP to survey, interview or reference any individuals previously completing this training program. These surveys and interviews may include any of the following:

- Responses to random surveys of the successful and unsuccessful participants
- Interviews with clients and customers
- Interviews with employers of the successful participants of the programs
- Additional surveys, as appropriate
- Additional Information

Other specific references in the above areas will be made available upon request.

2.8 *Audit Team Information*

(Auditor/Audit Team to fill out this section)

Date of Audit:

Name of Lead Auditor:

Affiliation:

Certified Auditor Identification Number:

Expiration Date:

Other Participants in Audit Team:

Signature of Lead Auditor _____

Date _____

3. Training Institution Accreditation and Audit Review

As part of this application, the Florida Solar Energy Center is seeking accreditation as a Training Institution. It is understood that 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.

3.1 Institutional Information

The Florida Solar Energy Center is a research institute administered by the University of Central Florida, Orlando, Florida. FSEC is located in Cocoa, Florida, and has over 100,000 square feet of offices, laboratories and training facilities on two sites totaling approximately 30 acres. Since its inception in 1975, the Florida Solar Energy Center has been a principal provider of training services for renewable energy technologies at the state, national and international levels. Key staff members used in FSEC training programs have cumulative experience of over 50 years in the specific area of photovoltaic technologies, having worked closely with hundreds of project developers, equipment manufacturers, installation contractors, utilities and code enforcement officials. FSEC staff is also actively engaged in the development of industry standards, through organizations such as IEEE, UL, SRCC, and ASTM, and provides technical assistance to the Florida Department of Business and Professional Regulation in the development of examinations and licensing requirements for solar and PV contractors in Florida.

Under Florida Statutes, FSEC is responsible for testing, certifying and approving all solar energy equipment manufactured or sold in the State of Florida. In addition to fulfilling this legislative commitment, FSEC is an internationally recognized leader in renewable energy research, development and applications. FSEC currently employs over 100 scientists, engineers, technicians, support staff, and students, and is administered through the State University System under the University of Central Florida.

3.1.1 Name and Address of Institution

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922-5703 USA
Ph: (321) 638-1000
Fx: (321) 638-1010
www.fsec.ucf.edu

3.1.2 Number of Instructors Affiliated with the Institution

Approximately two dozen of FSEC's one hundred plus employees are routinely engaged in training activities ranging from installing PV systems, to solar thermal systems, to energy efficient building design. The four individual candidates for Master Trainer in this application are principally involved in conducting FSEC's PV training programs.

3.1.3 Number of Students Enrolled in the Entire Institution

FSEC's parent institution, the University of Central Florida, has a total enrollment of full and part-time students in excess of 35,000. Several hundred persons per year typically attend FSEC training programs, with a fraction of that number attending PV training programs (approximately 50-100).

3.2 General Audit Information

3.2.1 Certifications and Accreditation Request

FSEC is requesting accreditation to certify installers of grid-connected PV systems. At present, the institution holds no specific certifications or previous ISP accreditation.

3.3 General Quality System Requirements

At present, FSEC is seeking accreditation to ISO 17025 for testing laboratories. This accreditation will cover all types of solar thermal systems and equipment certification, testing of PV modules and small stand-alone systems, and for the design review and approval of packaged grid-connected PV systems. FSEC is not presently accredited to ISO 17062, but intends to seek this accreditation as soon as possible.

3.3.1 Administration

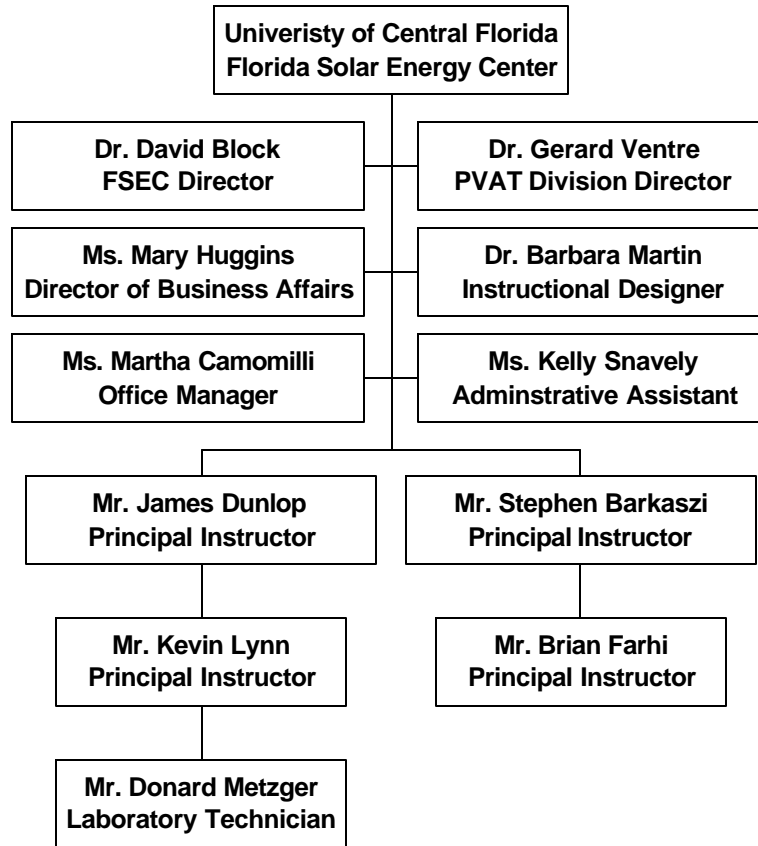
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3.3.2 Responsible Individuals and Organization



3.3.3 Approval for Continuing Education Provider

Many courses taught at FSEC are currently accredited by various organizations (e.g., the State of Florida's Construction Industry Licensing Board, the American Institute of Architects, and other organizations). To receive and maintain this accreditation, the Center must comply with rules and regulations set by these organizations.

At present, FSEC's PV training program is recognized and approved by the Electrical Contractor's Licensing Board of the Florida Department of Business and Regulation. Details of this application and approval are contained in the appendix.

3.4 Photovoltaic Training/Certification Program

3.4.1 Description of Classroom Facilities

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3.4.2 Description of Laboratory Facilities

FSEC operates extensive laboratories for the test and evaluation of solar thermal and PV systems and equipment, and is currently pursuing ISO 17025 Certification through A2LA. FSEC's PV laboratory facilities consist of areas for testing PV modules, components and systems, and are routinely used for exercises and demonstrations in PV training programs.

3.4.3 Description of Available Resources

3.4.3.1 Photovoltaic Hardware Available for Training/Laboratories

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- AstroPower SunLine packaged grid connected PV system (1 kWp)
- Numerous grid-connected, battery-based and AC module inverters from all major manufacturers
- Several battery banks of various sizes and technology types
- Mounting structures, mock roof tops, mechanical and weather sealing materials
- Site survey equipment including lines, levels, tapes, markers, inclinometers, sun path calculators and checklists
- Multi-meters, oscilloscopes, power analyzers, temperature probes, irradiance meters, dataloggers
- Normal electrician tools required for array and system installations

3.4.3.2 Resource Library

A number of resources are made available to students attending FSEC PV training program. Many of these materials are publicly available documents, accessible on web servers including FSEC's and those at the national laboratories and other organizations. Some of the more important documents are given to the students at each program. Some of the more popular resources used in conjunction with FSEC's PV training programs are listing in the appendix.

FSEC also maintains one of the most extensive energy-specific libraries in the country. Besides the traditional reference services, FSEC's library provides extensive literature searching via electronic databases and periodical indices. They also compile bibliographies to support special research projects or needs. FSEC library personnel also handle the ordering of books, documents, periodicals, and they route issues of journals and newsletters to FSEC staff or other library materials, as requested.

The energy collection holdings include over 10,000 books and bound periodicals, and 70,000 documents, technical reports, subscriptions, audiovisual materials, and vertical files. Along with texts, directories, conference proceedings, journals, newsletters, and efficiency studies dealing directly with solar energy, the collection includes materials on topics such as alternative energy sources, heat transfer, building science, energy efficiency, hydrogen, and electric vehicles. Library materials in the BCC/UCF Joint-Use Library may be accessed through LINCC, Florida's Library Information Network for Community Colleges.

3.4.3.3 Job Placement Resources

While no specific job placement resources are offered, significant contacts are made and established between customers, contractors and the industry as a direct result of the Florida rebate program and the interactions at FSEC training programs and seminars. Many project opportunities are identified and published on FSEC's web site and in collaboration with utilities and major end-users.

3.4.3.4 Linkages with Industry and Community

FSEC and its staff are heavily involved in interactions with industry and the community, including areas such as product testing and evaluation, customer and project development, and acceptance testing and monitoring of PV system installations. Many ongoing business and industry relationships have been established as a result of FSEC training programs and other outreach activities.

3.4.3.5 Visiting Instructors/Lecturers

All Master Trainer candidates are available to assist others in FSEC training programs. In addition, highly qualified outside technical experts have and will continue to be utilized for regional and topic-specific training requirements.

3.4.4 Number of Candidates Enrolled in the Program in Last Five (5) Years

Since the initial offering of the course "Installing Grid-Connected PV Systems", over 100 individuals have taken the course and passed the examination.

3.5 Courses Offerings

3.5.1 Program-Specific Course Listings

FSEC is seeking qualification for the course “Installing Grid-Connected Photovoltaic Systems”. Accreditation for other courses including ones for code officials and project developers will be sought in the near future. All Master Trainer candidates routinely participate and are proficient in all aspects of these programs.

3.5.2 Years in which These Courses Have Been Offered

This specific course has been offered for over two years, and has been given a total of sixteen times (one-week each). In addition, FSEC has offered similar programs with an emphasis on stand-alone PV applications for many years, with well over 100 short course given.

3.5.3 Course Descriptions

This one-week course covers the design and installation of grid-connected photovoltaic (PV) systems, and involves the actual hands-on installation of typical systems. This program is intended for electric utilities, electricians and solar contractors, with an overall goal of developing "system-knowledgeable" certified professionals to help ensure the safety and quality of PV system installations. The course format includes both classroom instruction and hands-on exercises. These exercises involve the complete step-by-step process of designing, installing and commissioning grid-connected PV systems, and are intended to develop the participant's working knowledge of PV systems and equipment. An emphasis is placed on code compliance and accepted state-of-the-art industry design and installation practice. On the final day of the five-day training program, an optional examination is administered for Florida contractors installing PV systems that utilize Florida rebate funds. The FSEC examination of installers does not fulfill requirements for licensure of solar or electrical contractors by any state local government authority.

See attached documentation for complete description, course objectives and agenda.

3.5.4 Number of Participants/Instructors Enrolled and Completing Course

Since inception of the “Installing Grid-Connected PV Systems” course at FSEC, over 100 persons have attended the one-week program and have passed the examination. Of this total, FSEC has authorized approximately 20 licensed Florida contractors to install PV systems under the Florida rebate program. Another approximately 20 persons attending this program were in some way involved as educators or instructors, for schools and universities, or for trade apprenticeship and training organizations.

3.5.5 Related Courses and Years Offered

FSEC has conducted hundreds of training programs, workshops and seminars over the last 25 years covering all areas of renewable energy and energy efficient building technologies. Many of these course have been specific to PV systems. See attached listing of FSEC workshops and training programs offered from 1986 through 2000.

3.6 Staff

3.6.1 Resumes and Experience for Candidate Instructors

Resumes for candidate Master Trainers and technicians involved with conducting FSEC PV training programs are attached. All have significant PV experience and qualifications relevant to this accreditation.

3.6.2 Documentation of Related Continuing Education

In the past two years, all instructors for FSEC's PV training programs have attended and presented at major national conferences, and have completed the following two specific courses in technical and instructional areas:

- "Electric Utility System Operation", Professional Training Systems, Inc
- "Instructional Design", Daryl Sink and Associates

3.6.3 Number of Students per Class

The number of students per class varies but averages approximately 10-12, and is limited to no more than 16 individuals due to the nature of the hands-on exercises. All four candidates for Master Trainer routinely participate in delivering the course, and the average student-teacher ratio during class exercises is typically 4 to 1.

3.7 Surveys and Interviews

The Florida Solar Energy Center hereby authorizes ISP to survey, interview or to seek references from any individuals previously completing or sponsoring this training program. These surveys and interviews may include any of the following:

- Responses to random surveys of the successful and unsuccessful participants
- Interviews with clients and customers
- Interviews with employers of the successful participants of the programs
- Additional surveys, as appropriate
- Additional Information

Other specific references in the above areas will be made available upon request.

3.8 *Audit Team Information*

(Auditor/Audit Team to fill out this section)

Date of Audit:

Name of Lead Auditor:

Affiliation:

Certified Auditor Identification Number:

Expiration Date:

Other Participants in Audit Team:

Signature of Lead Auditor _____

Date _____

4. Continuing Education Accreditation and Audit Review

FSEC is also requesting accreditation as a Continuing Education Provider. It is understood that this 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.

4.1 Continuing Education Provider Information

4.1.1 Name/Address of Organization Requesting Accreditation

Florida Solar Energy Center
1679 Clearlake Road
Cocoa, FL 32922-5703 USA
Ph: (321) 638-1000
Fx: (321) 638-1010
www.fsec.ucf.edu

4.1.2 Institutions, Dates, and Locations under Which Trainer Operated

All candidates are employed by the Florida Solar Energy Center, and are faculty members of the University of Central Florida, Orlando, Florida. Approximate duration of employment for each candidate follows:

- James Dunlop: 1985 – present (16 years)
- Stephen Barkaszi: 1990-94, 1997-present (8 years)
- Brian Farhi 1997-present (4 years)
- Kevin Lynn: 1994- present (7 years)

4.1.3 Cumulative Experience as a Trainer/Instructor

Cumulative experience in PV instruction for each candidate is based on past experiences of delivering a minimum of four one-week programs per year for the duration of their service. Following lists key staff persons and associated experience with actual instruction time and time in the classroom or laboratory interacting with students.

- James Dunlop: 16 months
- Stephen Barkaszi: 8 months
- Brian Farhi: 4 months
- Kevin Lynn: 7 months

4.1.4 Years of Experience as a Practitioner and Teacher/Trainer in the Field of Photovoltaics

All instructors for FSEC PV training programs have practiced in the field of photovoltaics, including duties of teaching and training for the duration of their service at FSEC. See previous section for PV-specific training experience.

4.2 General Audit Information

4.2.1 Requested Period of Accreditation

The normal three-year period of accreditation is acceptable.

4.2.2 Current Certifications held by Applicant

The Florida Solar Energy Center is currently undergoing audits and accreditation for testing laboratories per ISO 17025 by A2LA. Staff members James Dunlop and Stephen Barkaszi are licensed professional engineers in Florida. All candidates have baccalaureate or post baccalaureate degrees in engineering disciplines.

4.2.3 Previous ISP Certifications

There are no previous ISP Certifications applicable for any candidate or the training institution.

4.3 General Quality System Requirements

4.3.1 Administration

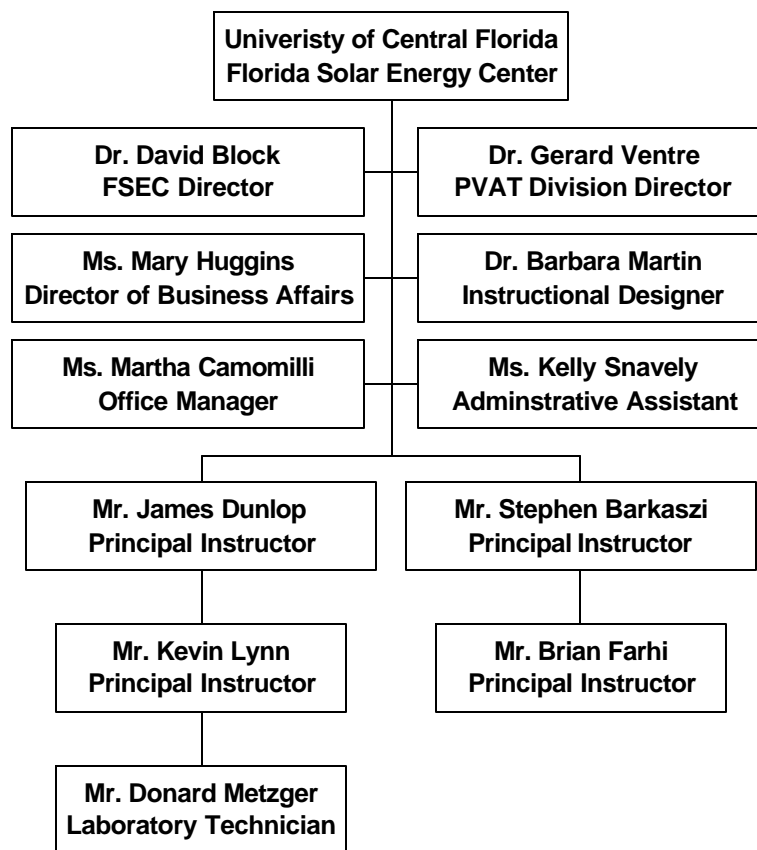
The Florida Solar Energy Center has been conducting an active continuing education program since 1975. Each year, an average of 25 to 40 workshops, short courses and conferences are conducted by the Center at the FSEC facility, around Florida, and throughout the country and internationally.

Detailed record keeping is a standard procedure in delivering each and every training program at FSEC. Divisions sponsoring the training program handle all registrations and record keeping. All financial records, including registration funds, budgets and expenses are handled by FSEC's Business Affairs Office and the University's Financial Office monitors and oversees all accounting activity to ensure that all State of Florida rules and regulations are followed. The University also routinely conducts audits of financial records, maintains quality control over all financial transactions, and closely monitors all FSEC activity.

Specific files are created in the PVAT Division for each program offered, which includes the following:

- Registration forms and correspondence with students
- Course budget, expenses and financial matters
- Student records, names and contact information, examination result and applicable contractor's license
- Completed and graded examinations
- Student/course evaluations
- Certificates and CE credits

4.3.2 Responsible Individuals and Organization



4.3.3 Approval for Continuing Education Provider

Many courses taught at FSEC are currently accredited by various organizations (e.g., the State of Florida's Construction Industry Licensing Board, the American Institute of Architects, and other organizations). To receive and maintain this accreditation, the Center must comply with rules and regulations set by these organizations.

At present, FSEC's PV training program is recognized and approved by the Electrical Contractor's Licensing Board of the Florida Department of Business and Regulation. Details of this application and approval are contained in the appendix.

4.3.4 Description of Classroom Facilities

FSEC has state-of-the-art classroom and auditorium facilities used for conducting all types of training, workshops, meetings and other outreach activities. Classroom sessions for FSEC's PV training programs are normally conducted in the auditorium, where instructors and students have access to a variety of multitude of AV resources in a comfortable setting. The auditorium seats about 200 persons, and has desk space in the front rows for smaller groups of students to sit and spread out materials. The AV system consists of a large screen and projector, and all media forms, cameras, microphones and projections are controlled from a console at the instructor podium.

4.3.5 Description of Laboratory Facilities

FSEC operates extensive laboratories for the test and evaluation of solar thermal and PV systems and equipment, and is currently pursuing ISO 17025 Certification through A2LA. FSEC's PV laboratory facilities consist of areas for testing PV modules, components and systems, and are routinely used for exercises and demonstrations in PV training programs.

4.3.6 Description of Available Resources

4.3.6.1 Photovoltaic Hardware Available for Training/Laboratories

FSEC maintains an inventory of the latest in PV systems and equipment technology, and routinely interacts with major equipment manufacturers and system suppliers in obtaining and utilizing their newest designs and equipment expressly in PV training programs. An overview of the systems and hardware used in FSEC's PV training programs includes:

- Siemens Solar EarthSafe packaged grid-connected PV systems, (two, 2 kWp each)
- AstroPower SunUPS packaged grid-connected PV system w/ battery storage (1 kWp)
- AstroPower SunLine packaged grid connected PV system (1 kWp)
- Numerous grid-connected, battery-based and AC module inverters from all major manufacturers
- Several battery banks of various sizes and technology types
- Mounting structures, mock roof tops, mechanical and weather sealing materials
- Site survey equipment including lines, levels, tapes, markers, inclinometers, sun path calculators and checklists
- Multi-meters, oscilloscopes, power analyzers, temperature probes, irradiance meters, dataloggers
- Normal electrician tools required for array and system installations

4.3.6.2 Resource Library

A number of resources are made available to students attending FSEC PV training program. Many of these materials are publicly available documents, accessible on web servers including FSEC's and those at the national laboratories and other organizations. Some of the more important documents are given to the students at each program. Some of the more popular resources used in conjunction with FSEC's PV training programs are listed in the appendix.

FSEC also maintains one of the most extensive energy-specific libraries in the country. Besides the traditional reference services, FSEC's library provides extensive literature searching via electronic databases and periodical indices. They also compile bibliographies to support special research projects or needs. FSEC library personnel also handle the ordering of books, documents, periodicals, and they route issues of journals and newsletters to FSEC staff other library materials, as requested.

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4.3.6.3 Linkages with Industry and Community

All candidates for Master Trainer are heavily involved in interactions with industry and the community, including areas such as product testing and evaluation, customer and project development, and acceptance testing and monitoring of PV system installations. Many ongoing business and industry relationships have been established as a result of FSEC training programs and other outreach activities.

4.3.6.4 Instructors/Lecturers Available to Assist the Candidate

All Master Trainer Candidates are available to assist others in FSEC training programs. In addition, highly qualified outside technical experts have and will continue to be utilized for regional and topic-specific training requirements.

4.3.7 Copy of Examination/Evaluation used to Evaluate Participants on Completion

See attached

4.4 Courses/Workshops Related To PV Education

FSEC is seeking accreditation as a Continuing Education Provider the course "Installing Grid-Connected Photovoltaic Systems". Accreditation for other courses including ones for code officials and project developers will be sought in the near future. All staff members that routinely participate in these programs are proficient in all aspects of PV systems technology.

4.4.1 Years in which These Courses Have Been Offered

This specific course has been offered for over two years, and has been given a total of sixteen times (one-week each). In addition, FSEC has offered similar programs with an emphasis on stand-alone PV applications for many years, with well over 100 short courses given.

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The Florida Solar Energy Center hereby authorizes ISP to survey, interview or to seek references from any individuals previously completing or sponsoring this training program. These surveys and interviews may include any of the following:

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- Interviews with clients and customers
- Interviews with employers of the successful participants of the programs
- Additional surveys, as appropriate
- Additional Information

Other specific references in the above areas will be made available upon request.

4.7 Audit Team Information

(Auditor/Audit Team to fill out this section)

Date of Audit:

Name of Lead Auditor:

Affiliation:

Certified Auditor Identification Number:

Expiration Date:

Other Participants in Audit Team:

Signature of Lead Auditor _____

Date _____

5. 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 FSEC's PV training programs, especially the four candidates for Master Trainer have read and attest to the following code of ethics. The Code of Ethics will be made available to all customers and clients, along with information on specific remedies and recourse.

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.

James P. Dunlop, P.E. _____

Stephen F. Barkaszi, P.E. _____

Kevin W. Lynn _____

Brian N. Farhi _____

Donard A. Metzger _____

Martha Camomilli _____

6. Certification Standards, Testing and Governance

A principal reason FSEC conducts these training programs is to help improve the quality and safety of PV installation – by help establish a knowledgeable and highly skilled workforce. The examination presently offered in conjunction with this course is targeted toward Florida contractors participating in the Florida Rebate program. FSEC’s authorization exam is just one of several quality assurance measures required to receive these funds.

FSEC places considerable emphasis on implementing a fair, yet rigorous approach for authorizing installation contractors participating in Florida rebate program. These requirements are based on industry standards and a validated job/task analysis recently completed by FSEC and subject matter experts throughout the U.S.

A task analysis is a descriptive list or a flowchart of the skills (tasks) that verifies what the installer does under specific working conditions, and the skills they must have to do it. A validated task analysis forms the basis of the decision making process that allows a certification agency (person or group) to classify installers as competent or not. The tasks (and their importance) define the basis for the training elements, the criteria for examination questions and the metrics for qualifying competent installers. The tasks fall into three primary categories:

Knowledge: Background, technical and professional information about the technology and its applications.

Intellectual skills: Concepts and rules that are applied to the installation task, including problem solving, diagnostics and troubleshooting.

Physical skills: Psychomotor skills that the installer must acquire to perform an actual installation task, such as fastening, making connections and taking measurements.

6.1.1 Certification Standards

While it is not necessary in all cases to take a test to be certified, it is preferred. A valid test gives the certification agency assurance that the person being certified can perform the tasks and skills specified in the job/task analysis. In lieu of or in addition to a test, a certification program can set as its standard that a person must do any one or all of the following:

- take a course
- take a series of courses
- present a work sample
- have a specified experience or educational level

Based on these standards, FSEC proposes three levels of certification for this project, based on the mix of skills specified in the task analysis and taught in the training programs:

Minimum Certification: A person has taken the installer training course; this training reflects the skills identified in the task analysis, but there is no formal assessment of knowledge and skills (i.e., they do not take or pass the examination).

Intermediate Certification: A person has passed a test that reflects the skills on the task/job list; the person may or may not have taken a specific course. Certain requirements may be established for those wishing to opt out of training to take the exam, for example specific education and/or experience.

Full Certification: A person has passed a test for intermediate certification and has successfully completed a given number of installations based on a checklist that reflects the physical and performance skills covered in the task analysis and training programs. Continuing education and/or a certain number of successful installations in a given period may also be required to maintain full certification

6.1.2 Certification Test

The items on the certification exam and performance checklist reflect the skills covered in the training programs and task analysis. Each item on the checklist will be matched to a specific skill or task that will be tested.

Parallel forms of the certification tests are used to allow for the re-testing of students who fail the examination the first time. Parallel forms are required so that there is no test/re-test contamination. All forms of the examination (original and parallel forms) test the same battery of knowledge and skills based on the task analysis, and are retained by the testing administrators after grading. The same certification exam used to test students who take the proposed training will also be used for installers who do not want to take the training course. The installation task and required competency is the same regardless of whether the installer takes the training or not.

For those candidates failing to pass the initial examination, FSEC offers to host a review and a re-test session on the Saturday morning immediately following the one-week training program. This allows individuals to retake the exam within three days of their initial effort, and allows for review of areas needing remediation. Provisions are made to identify the subject areas needing remediation during the grading of the tests.

6.1.2.1 Governance and Administration

While certification will be initially provided by the organization providing the training (i.e., FSEC), a preferred option for the long term would be for an independent agency to provide and maintain installer certifications. An independent agent, recognized by industry, can provide a level of objectivity separate from the agent who provides the training.

Some of the tasks that the certification agent is responsible for include:

- setting standards for certification,
- establishing passing scores for examinations,
- testing administration procedures,
- setting remediation and re-testing procedures,
- determining disclosure (what information will be given to candidates),
- appeal and exclusion processes (including grandfather clauses),
- establishing fees,
- complying with government regulations, etc.

In most states, certification and experience are generally prerequisites for obtaining licensure to practice a given trade. Presently, FSEC training programs are accepted by the Florida Department of Professional Regulation (DBPR) for continuing education credits required of electrical contractors. Although FSEC provides training and this certification, and has provided input to DBPR on matters of content for examinations, it does not license or regulate contractors. Requirements for contractor licensing in Florida are attached to this application.

7. Appendix

7.1 *Samples from Resource Library*

7.1.1 Documents

- Interconnecting Small Photovoltaic Systems to Florida's Electric Utility Grid - FSEC Recommendations, August 2000
- Florida Photovoltaic Buildings Program: Highlights of Sandia's Photovoltaics Program, Volume 2 - 2000
- Installing Photovoltaic Systems: A Question and Answer Guide, Florida Solar Energy Center, May 1999
- The 1999 National Electrical Code and New Standards Clarify Requirements for Installing PV Systems in the US: Highlights of Sandia's Photovoltaics Program, Volume 2 - 1999
- IEEE Std 929-2000 – Background, Implications and Requirements, John Stevens, Sandia National Laboratories
- Connecting to the Grid: A Guide To PV Interconnection Issues, Chris Larsen, Bill Brooks and Tom Starrs, Third Edition, 2000
- An Historic Opportunity for Photovoltaics and Other Distributed Resources in Rural Electric Cooperatives, Thomas Hoff and Matthew Cheney
- A Consumer's Guide to Buying a Solar Electric System, National Renewable Energy Laboratory, U.S. Department of Energy, September 1999
- The U.S. Photovoltaic Industry Roadmap, April 2001
- Making the Most of Residential Photovoltaic Systems, Florida Solar Energy Center, September 1999
- 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
- Sandia National Laboratories and Daystar, Inc., "Working Safely with Photovoltaic Systems." Daystar, Inc., Las Cruces, NM, USA
- "Hybrid Power Systems: Issues and Answers."
- Sandia National Laboratories. "Solar Photovoltaics for Development Applications." SAND93-1642, Albuquerque, NM, USA. 1993.

- Sandia National Laboratories. "Photovoltaic Power Systems and The National Electrical Code: Suggested practices." SAND00-2797, Albuquerque, NM, USA. 2000
- The Battery Council International, "Battery Service Manual." 111 East Wacker Dr., Chicago, IL 60601 USA.

7.1.2 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
- Solar Energy Journal, Solar Energy Industries Association
- Solar Today, American Solar Energy Society

7.1.3 Codes and Standards

- National Electrical Code, 1999 Edition, NFPA 70, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269
- IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Qualification of Photovoltaic (PV) Modules, IEEE Std. 1262-1995.
- IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Utility Interface of Photovoltaic (PV) Systems, IEEE Std. 929-2000.
- IEEE Standards Coordinating Committee 21, IEEE Guide for Terrestrial Photovoltaic (PV) Power System Safety, IEEE Std.1374-1998.
- IEEE Standards Coordinating Committee 21, IEEE Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems, IEEE Std. 937.
- Underwriters Laboratories, Standard for Safety: Flat-Plate Photovoltaic Modules and Panels, Standard UL 1703
- Underwriters Laboratories, Standard for Static Inverters and Charge Controllers for Use in Photovoltaic Power Systems, Standard UL 1741

Attachment from FSEC Library

7.2 Course Objectives, Description and Agenda

7.3 Student Records, Evaluations and Budgets

7.4 Training Objectives, Scope and Task Analysis

7.5 Sample Examination and Certificate

7.6 Instructor Resumes

7.7 Selected References

7.8 Historic Program Offerings

7.9 Contractor Licensing Requirements in Florida

7.10 Electrical Contractor's Licensing Board CE Approval