Solar Energy International
Renewable Energy Education Program

2009 Hands-On Workshops and Online Courses

Celebrating over 18 years of hands-on education!

Offering workshops in over 20 locations around the world!

www.solarenergy.org
Greetings from SEI!

What an exciting time for all of us involved with renewable energy education. This 19th year catalog describes our hands-on workshops and online courses . . . This year SEI is active in Colorado, throughout the US, around the world, and on the internet.

SEI serves those pursuing a green career and is also committed to helping folks learn how to incorporate renewable energy into their own lives.

Tuition from our workshops and courses help support our charitable outreach programs.

Solar, wind, water power and sustainable building are happening worldwide. Clearly the time has come. Please come learn with us and help build a sustainable future.

Thanks,

Johnny Weiss
Cofounder & Executive Director, SEI

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“SEI provided me with the knowledge and understanding I need to enter the PV industry with confidence.”
- PV Design & Installation workshop participant, 2008

Symbol Key

Workshops with a hands-on component.

Courses that can be taken over the internet (as well as in-person).

Workshops held outside of the United States.
SEI Workshops

Why choose SEI to get my training?

SEI's Renewable Energy Education Program teaches the practical use of solar, wind, and water power. Our workshops give individuals the knowledge and skills to design, install, and maintain renewable energy systems, and to build state-of-the-art solar homes that are efficient, practical, and earth-friendly.

Educational Philosophy

SEI believes that people learn by doing. Our instructors are leaders in their fields, bringing participants the most up-to-date information in renewable energy technologies. Classroom and laboratory work is enhanced by case studies, tours, and practical hands-on field work.

SEI Experience

SEI professionals have project and training experience in the Americas, Asia, Africa, Europe, the Middle East, and the Caribbean. For over two decades, SEI staff have delivered services to the Pan American Health Organization, non-governmental organizations, foreign, national and state governments, utilities, universities, and individuals seeking the benefits of renewable energy.

SEI Instructors

SEI has set a high standard when choosing instructors. Our instructors have extensive field experience, and are passionate about teaching – the best combination out there! Many of our instructors are SEI alumni who trained with us, worked for years in the field, and then returned to teach with us. All of our instructors are currently in the field and bring their personal knowledge of design and installation experience into the classroom. Many of our PV instructors hold NABCEP Installer Certification and/or ISPQ Certified Trainer Certification. Check out our talented list of instructors online at www.solarenergy.org.

NABCEP Certification and ISPQ Accreditation

SEI is accredited by the Institute of Sustainable Power and Quality (ISPQ). The SEI 'Certificate of Completion' from the PV100 or PV102 workshops (in-person or online) fulfills NABCEP’s education requirement for taking the NABCEP PV Certificate of Knowledge exam. SEI’s PV200 or PV202 workshops (in-person or online) fulfills the education requirement for taking the NABCEP Solar PV Installer Certification exam. Both NABCEP exams include grid-tied and battery-based systems. If participants have ONLY taken the PV102 session, they should complete supplemental reading on battery-based systems before taking the NABCEP PV Certificate of Knowledge exam.

Get College Credits

The Consortium for Education in Renewable Energy Technologies (CERET) offers certificates in renewable energy. Certificates are granted through Madison Area Technical College (MATC). SEI’s online courses qualify for college credits through MATC and towards a renewable energy certificate.

“SEI is the cutting edge in green technology; we should all bend a learning ear towards them if we expect our grandchildren to have a sustainable world in which to live.”

- Building for the Future Online participant 2008

"SEI offers the most comprehensive, intensive, and practical training available in the country."

- Richard Perez, Publisher, Home Power magazine

www.solarenergy.org • 970-963-8855
Hands-On and Online Training

Eco Campus

In 2005 SEI purchased a beautiful 7-acres of land in Paonia, Colorado. Our goal is to create the renewable energy 'Eco-Campus' we have envisioned for over a decade. While the 'final product' may be some years away, we have already hosted many of SEI’s 'hands-on' workshops there. From Photovoltaics to Wind Power to Natural Building workshops, we are ready to take 'Hands-on' to a whole new level.

In SEI’s PV Lab Yard, our participants do not just install the array or wire the battery bank, but work on all aspects of the lab systems. Small student groups rotate from component to component and tear-down, dissect, and re-install lab-based systems. From detailed solar site analysis to conduit sizing, SEI participants do it all. Currently, three diverse PV systems challenge and occupy participants with the latest 'cutting edge' equipment.

In 2007 the SEI Eco-Campus evolved even further with the installation of an ARE 110 Wind Generator atop a 106-foot-tall tilt-up tower. This, in addition to our PV systems, solar hot water system, solar hot air system, and low head, high flow micro-hydro system has allowed us to have a 100% renewable office. The SEI Natural Building Program contributed as well with a new straw bale shed and cob bench for the PV Lab Yard. We look forward to more fun and exciting projects at our Eco-Campus in the years to come.

Online Courses

SEI’s Online Courses cover the same topics as the in-person workshops, minus the hands-on component. Lessons include exercises, homeworks, and quizzes to test student comprehension. There is also an online discussion board where students can network with each other and post questions for the instructors. SEI uses the Blackboard Academic Suite™, the industry’s leading online education platform, ensuring a dynamic and fulfilling experience, with anywhere/anytime course access and around the clock tech support.

Currently SEI Online courses include:

- Photovoltaic Design & Installation
- Advanced Photovoltaics
- Building for the Future

Coming soon - Renewable Energy for the Developing World!

"The courses are to the point, enlightening, and use the internet to its full extent. I'm happy I chose SEI."

- Hal Howes, Advanced PV Online, 2008

Online Requirements

At the minimum you need:

Hardware

- 128 MB of RAM
- 2 GB of free disk space
- Sound card with speakers (for courses with multimedia)
- Ethernet or wireless network card (for high-speed Internet connection) or 56K modem (for dial-up Internet connection)
- T1, DSL, Cable, or satellite high-speed connection (56K dial-up will work, but the online course system will run slowly).
- Access to a DVD player

Software

- A modern, up-to-date internet browser
- A valid e-mail account
- Java JRE plugin
- Adobe Acrobat Reader
- RealPlayer
- QuickTime
- Flash Player
- Shockwave Player
- Windows Media Player

all downloadable free from the web

Workshops with this symbol can be taken over the internet, as well as in person
Workshop Policies

Workshop Atmosphere
Workshop size is limited to an appropriate student-teacher ratio. We work hard and ask that you do the same. SEI stresses safety and consideration. People from different cultures attend our workshops, and we expect that all participants treat people of different backgrounds and abilities with respect. Our workshops are taught in English unless otherwise noted.

Enrollment
Workshops are filled on a first-come basis. Workshop size is limited. To reserve a space, send your entire tuition. Please check the website or call before you register to make sure there is space available. Workshops are subject to cancellation due to low enrollment.

Materials
Workshop tuition includes all workshop materials. You will receive a notebook, and in some cases an additional textbook and/or DVD, upon your arrival at the workshop.

Lodging & Logistics
SEI has campuses in Carbondale and Paonia, Colorado. Carbondale is a small town in the heart of the Rockies, thirty miles west of Aspen. Denver is a three hour drive east through the mountains. Paonia is a community one hour southwest of Carbondale. Workshops are held at both facilities.

Many of our workshops are held in other parts of the country and the world. Local logistics and lodging for each workshop venue are available on our website and via e-mail.

Meal Plan
Occasionally a workshop will offer an optional meal plan for an extra cost. Please check SEI’s website for details.

Waiting List
If a workshop is full we will place you on the waiting list. There is no charge to be on the waiting list. If space becomes available, we contact the first person on the list. You then have 24 hours to register before we move on to the next person.

Cancellation Policy
If you cancel prior to 30 days before the workshop start date, 50% of your total tuition is non-refundable, plus the cost of any material you receive prior to the workshop. A written cancellation is required.

If you cancel within 30 days of the beginning of the workshop, your entire tuition is non-refundable.

Transfers
If you choose to transfer your space to someone in your company or family, a $100 administration fee is charged.

If SEI Cancels a Workshop
Rarely, SEI must cancel a workshop due to low enrollment, instructor illness or other unforeseen circumstances. We will notify you if a workshop for which you have registered has been cancelled. You may then enroll in another workshop (based on availability) or receive a full refund of tuition. Notification of cancellation will normally occur one month prior to the beginning of the workshop; in rare cases, however, it may be less. SEI is not responsible for losses incurred on housing, travel or other arrangements.

Financial Assistance
SEI has a limited number of partial tuition scholarships available for international and low-income participants. We also offer a work/trade program for people taking 8 weeks or more of workshops. Review our website and contact us for an application.
Why Choose SEI to get my Sustainable Building Training?

**Design:** It’s the first step to a truly sustainable home. If a home is designed properly, the need for supply side renewable energy systems decreases.

**Efficiency:** It’s the step that each of us can take today on our existing homes and businesses. For every $1 spent on efficiency, there’s an associated $3-$5 savings on the cost of a renewable energy system.

Our sustainable building program offers both hands-on workshops and online courses that will help you understand the home design principles that make use of both cutting-edge and established methods and materials for sustainable building. Our sustainable building workshops are suitable for those interested in becoming professionals in the field of solar design and for those design professionals interested in meeting their clients’ demand for sustainable design.

The instructors in SEI’s sustainable building program combine many years of professional sustainable building design and construction experience. If you are a home-owner or professional involved in home design or construction, or just generally interested in gaining the skills necessary to transition into the building sector, you will want to take part in SEI’s informative and high quality sustainable building program.

For a complete understanding of sustainable building principles and renewable energy, SEI recommends taking the workshops in the following order:

- **Step 1:** Efficient design will reduce your need for renewable energy systems.
- **Step 2:** For retrofits or new construction, super insulation combined with thermal mass will reduce your heating & cooling.
- **Step 3:** Solar hot water systems pay for themselves quickly by reducing the need for propane, electricity or natural gas.
- **Step 4:** Finally, installing a solar-electric system will reduce your carbon footprint.

### SB101: Building for the Future: Sustainable Home Design

This course covers the principles behind designing and building residential structures that achieve optimal year-round comfort, reduce energy consumption, improve indoor air quality and limit environmental impact. Participants will be able to identify a range of solutions that will result in a sustainable and comfortable home. This workshop is for owner-builders in the pre-design stage, architects, builders, designers, contractors, and for anyone interested in this vast field of study.

**Topics Include:**
- Site Analysis
- Building Orientation
- Building Science
- Moisture & Air Leakage
- Super-Insulation Strategies
- New Window Technologies
- Passive Solar Design
- Energy Efficient Lighting & Appliances
- Indoor Air Quality
- Back-up Heating Systems
- Healthy/Green Building Materials
- Domestic Solar Hot Water
- Renewable Energy Options
- Practical Building Techniques

"There is no comparison between what I know now and what I knew (or didn't know) before. I plan to take what I learned in this course and apply it not only in my own home design, but also to buildings in the charities that I support and assist in Eastern Europe."

- Building for the Future Online participant 2008

**In-person Sessions**
- **Tuition:** $745
- **May 11 - 15 (M-F)**
- **Carbondale, CO**
- **code:** SB101

**Online Sessions**
- **Tuition:** $695
- **February 23 - April 5**
- **code:** SB101.OL
- **October 12 - November 22**
- **code:** SB101.OL

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SB105: Build it with Bales: Intro to Straw Bale Construction

Straw bale construction is now in use in all 50 U.S. States and in over 40 countries around the world. This building technique uses straw, the leftover stalk from grain production, to construct high performance residential and commercial buildings. Homeowners, architects, and builders alike are tapping into the extremely energy efficient, versatile and beautiful method of straw bale building.

During this two-day workshop, we will cover basic design principals, as well as a variety of styles and techniques used in the evolving field of straw bale construction. Participants will gain hands-on experience assessing a good straw bale for construction and prepping bales for wall construction. This course is designed for future homeowners, architects, builders, designers who want a foundation in the principles and guidelines of straw bale construction. No prior building or design experience is required and people of all skill levels will benefit greatly from the information in this workshop.

Topics include:
- The history of straw bale construction
- Qualities of straw bale buildings
- Styles of straw bale wall systems
- How to evaluate bales for building
- Design considerations
- Status of building codes, insurance & financings
- Basic construction techniques
- Fundamentals of plaster finishes

In-person Sessions
Tuition: $250

May 8 - 9 (F-Sa)
Carbondale, CO
code: SB105

SB201: Straw Bale Construction & Natural Plaster

Take the next step in your understanding of designing & building straw bale homes. If you are serious about building a straw bale home, in the planning & design phase, ready to build, or a professional looking to expand your design/build knowledge then you will want to take this course. Designed to follow the two-day Build it with Bales workshop, this five-day hands-on workshop takes a deeper look at the design and detail considerations for straw bale construction. Expand your knowledge of the variety of styles and techniques of building with straw bales and learn more about the role and application of earthen plasters.

In this workshop we will construct a small straw bale structure from the foundation to the roof. Tours of straw bale homes and guest instructors round out this amazing workshop designed for the homeowner and building professional. No prior building or design experience is required although people of all skill levels will benefit greatly from the information and hands-on activities of this class.

Topics include:
- Building codes
- Planning & design considerations
- Detailing for moisture
- Construction techniques
- Variations of foundation styles
- Window & door openings
- Roof styles and techniques
- All about bales
- Insurance & financing
- The continuum of plasters
- Mixing earthen plasters for basecoats
- Introduction to earthen finish and lime plasters and tools
- Preparation of walls for plaster

This workshop was a tremendous opportunity with two experienced & innovative instructors.

- Straw Bale & Natural Plaster workshop participant, 2008

In-person Sessions
Tuition: $745

August 31 - Sept. 4 (M-F)
Paonia, CO
code: SB201
Solar Electricity Workshops

Why Choose SEI for Photovoltaic (PV) Education?

SEI’s PV Program is our fastest growing program. We are focused on training individuals who are serious about getting into the PV industry. We are very proud of our curriculum and the quality of instruction participants receive.

SEI Curriculum

SEI began developing and offering Photovoltaic (PV) curriculum in 1991 and has over 18 years of educational experience within the expanding solar-electric industry. Several times per year, our curriculum is thoroughly reviewed and updated by industry experts in order to keep current with continually evolving equipment choices, system design standards and best practices. We contract with educational experts to ensure that our instructional methods are designed to help increase retention of the material presented. Following along with SEI’s textbook (see below), the class engages in classroom worksheets, quizzes, exercises and discussion, which makes highly technical information easier to understand. SEI has a strong philosophy and history of reinforcing concepts through integrating hands-on labs and exercises into classroom work.

Photovoltaics Design & Installation Manual

SEI’s Photovoltaics curriculum uses our textbook, Photovoltaics: Design and Installation Manual. Filled with examples and practice exercises, this practical manual provides an excellent introduction to solar electricity, system design and installation methods. The textbook is now available in Spanish.

NABCEP PV Installer Certification

The SEI ‘Certificate of Completion’ from the PV100 or PV102 workshops (in-person or online) fulfills NABCEP’s education requirement for taking the NABCEP PV Certificate of Knowledge exam. SEI’s PV200 or PV202 workshops (in-person or online) fulfills the education requirement for taking the NABCEP Solar PV Installer Certification exam. Both NABCEP exams include grid-tied and battery-based systems. If participants have ONLY taken the PV102 session, they should complete supplemental reading on battery-based systems before taking the NABCEP PV Certificate of Knowledge exam.

See www.nabcep.org or for more information

PV Lab Training Facility

In 2005, SEI purchased a beautiful 7-acre parcel nestled in the North Fork River Valley of Paonia, Colorado. This educational facility is equipped to provide hands-on experiential learning and to showcase the potential for renewable energy technologies, especially photovoltaics. Our PV training program explores the various system types (batteryless grid-tied, grid-tied with battery back-up, and stand-alone) and mounting techniques (roof mount, pole mount, and ground mount) commonly found in the PV industry.

Safety is SEI’s Top Priority

SEI promotes safe working practices and strives to ensure that safety is a major focus of our educational program. SEI believes that PV installation should only be performed by qualified personnel. All workers must be competent and realize the dangers involved with electrical work. SEI’s PV workshops provide participants a strong foundation on the theory of design, installation, and safe working practices. SEI strongly recommends working with a qualified contractor, organization, or business after completing coursework to build upon these fundamental concepts and gain additional knowledge and skills required to perform safe, code-compliant work in the PV field.

ISPQ Accreditation

SEI’s PV workshops are accredited through the Institute of Sustainable Power & Quality (ISPQ), which is overseen by the Interstate Renewable Energy Council (IREC). The ISPQ provides a set of standards for evaluating different training programs. These standards were developed as a framework for comparing the course content and training quality of renewable energy, energy efficiency, and distributed generation technology courses.

See www.irecusa.org for more information

Earn College Credits

The Consortium for Education in Renewable Energy Technologies (CERET) offers certificates in renewable energy. Certificates are granted through Madison Area Technical College (MATC). SEI’s online courses qualify for college credit through MATC towards a renewable energy certificate.

See www.ceret.us for more information
Solar Electricity Workshops

Which PV workshops are right for me?

If you want a wholistic understanding of renewable energy, we suggest you start with the Sustainable Building workshops (p.7)
If you are only interested in Solar Electricity, start here with a Level 1 workshop before continuing to the next levels.

Options for PV Installer, Sales, or Design
To gain both a strong foundation of PV design, and hands-on experience installing systems and wiring components choose one of these options.

1. If you are not sure what type of market you will be working in, or you want a comprehensive understanding of all system types, then we suggest the 6-day or 10-day PV Design & Installation (PV100) to start. In this class you will get an in-depth overview of grid-tied, grid-tied with battery backup, and stand-alone systems combined with the experience of installing these systems in our PV lab facility. The workshop includes classroom lectures and labs for the first week of instruction with the PV Lab Week (equivalent to PV200) for the second week to provide installation experience. You should then take Advanced PV (PV202).

2. If you can’t take time off of work, consider taking PV Design Online (PV100) which has the same material as the in-person workshop, without the hands-on component. You should couple this with the PV Lab Week (PV200) workshop to get hands-on experience. You should then take Advanced PV (PV202).

3. In the United States, the batteryless grid-tied market is the fastest growing sector of the PV industry. Many businesses focus solely on batteryless grid-tied installations. If you know that you will be working in an urban area, with a focus on batteryless grid-tied installations, the Grid-tied PV (PV102) class is for you! This course covers design criteria focused on grid-tied systems coupled with a working lab demonstration. By eliminating the battery-based sections from the curriculum, participants walk away with a more focused concentration of the most popular PV system on the market. After completing this workshop, you can enroll in the PV Lab Week (PV200) to get more hands-on experience. You should then take Advanced PV (PV202).

4. If you are looking to start your own installation business, we recommend you complete one of the three options mentioned above and the Solar Sales, Marketing, & Economics (PV204) workshop. This will send you well on your way to starting your own solar business!

Pick your PV track
If you are serious about entering the PV industry we strongly recommend completing the entire program through one of these tracks.

Options for people looking to change careers
(but not sure how to best fit into the solar industry)

A great option for you is PV100 (online or 6 or 10-day in-person) or PV102 because it will give you an overview of the different system types, and a foundation of how to design your own system. This is a great place to start and figure out your niche in the industry.

“A terrific organization which has been a pioneer in PV education. There isn’t anywhere else in the world you can learn so much about PV in such a short period of time from people who know it all. SEI’s the place I’d send anyone who wants to learn solar installation.”

- Women’s PV Design & Installation workshop participant 2008

NABCEP Certificate of Knowledge Exam:
After completing PV100, PV102 and/or PV200 or PV202 you are eligible to sit for the NABCEP entry level Certificate of Knowledge exam. This exam covers batteryless and battery-based systems. If participants have only taken the PV102 course, they should complete supplemental reading on battery-based system topics before taking the exam.

SEI strongly recommends working with a qualified contractor, organization, or business after completing coursework to build upon these fundamental concepts and gain additional required knowledge and skills in order to perform safe, code-compliant work in the PV field.

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PV100: PV Design & Installation

Participants will learn the fundamental concepts required for working safely with PV systems, and will design residential-sized, code compliant, batteryless grid-tied and stand-alone systems.

This in-person workshop or online course will provide an overview of the basic PV system applications. The goal of this session is to create a fundamental understanding of the core concepts necessary to work with both residential and commercial PV systems. Topics include: system components, site analysis, PV module criteria, mounting solutions, safety, and commissioning. Participants will learn the fundamentals of sizing a residential batteryless grid-tied system, wire sizing, overcurrent protection, and grounding. This session will also review fundamental design criteria for off-grid stand-alone systems including specifying batteries, controllers, and battery-based inverters. These concepts will be expanded upon in PV202.

6-day In-Person Sessions
Tuition: $995

February 16 - 21 (M-Sa)
Tucson, AZ
code: PV100

February 23 - 28 (M-Sa)
Tucson, AZ
code: PV100

March 16 - 21 (M-Sa)
Austin, TX
code: PV100

10-day In-Person Sessions
Tuition: $2,095

May 4 - 15 (M-F)
Paonia, CO
code: PV100

June 1 - 12 (Women’s PV) (M-F)
Paonia, CO
code: PV100

July 6 - 17 (M-F)
Paonia, CO
code: PV100

August 10 - 21 (M-F)
Paonia, CO
code: PV100

Online Sessions
Tuition: $795

Jan. 12 - Feb. 22
code: PV100.OL

Feb. 2 - March 15
code: PV100.OL

March 16 - April 26
code: PV100.OL

April 20 - May 31
code: PV100.OL

May 11 - June 21
code: PV100.OL

NABCEP Training Hours: 65

“高酰胺的亲和性，以及深度的细节到的 curriculum. Since SEI is one of the few, and best, institutes for this type of training, it’s well worth the money.”
- PV workshop participant, 2008
PV100: PV Design & Installation cont.

Workshop Options

Online course
A comprehensive six week course that covers all of the material presented in the in-person workshop, without the hands-on experience. The course is co-taught by two instructors, ensuring prompt attention and encouraging interaction between students and the instructors. SEI utilizes the Blackboard Academic Suite™, the industry leading online education platform, ensuring a dynamic and fulfilling experience, with anywhere/anytime course access and around the clock tech support.

6-day workshop
Install a real-world PV system in the field during approximately two days of the workshop. The participants will have the opportunity to work on different parts of the installation and get a glimpse into the real-world installation challenges commonly encountered. The modest class size will enable participants to get a limited but valuable hands-on experience.

10-day workshop
Combines five days of classroom learning with five days of hands-on installation practice at SEI's world-class PV Lab training facility in Paonia, Colorado. Participants will install, tear-down, dissect, and reinstall several PV systems. The small participant-to-instructor ratio, paired with the lab setting, creates an ideal environment for a true hands-on PV experience.

Women-Only workshop
A workshop geared specifically towards women and taught by women. This workshop is intended to provide women with a supportive learning atmosphere. Both women with little or no hands-on electrical experience and women already working in technical fields find it helpful and rewarding networking with other women interested in and/or working in renewable energy.

This workshop covers all the same material as the 10-day coed workshop. Participants have included licensed electricians, engineers, teachers, students, and homemakers.

“This was the strongest, most interesting and diverse group of women I’ve ever been around. The instruction was absolutely fantastic. I cannot believe how much I learned in these 2 weeks”
- Women’s PV workshop participant, 2008

PV102: Grid-Tied Photovoltaics

Participants will learn the fundamental concepts required for working safely with PV systems and will design a residential-sized, code compliant, batteryless grid-tied solar-electric system.

This workshop provides an overview of the basic PV system applications, with a major focus on batteryless grid-tied systems. The goal of this session is to create a fundamental understanding of the core concepts necessary to work with both residential and commercial batteryless grid-tied PV systems. Topics include: system components, site analysis, PV module criteria, mounting solutions, safety, and commissioning. This session also covers the fundamentals of sizing a residential batteryless grid-tied system, wire sizing, overcurrent protection and grounding. These topics will be expanded upon in PV202. All participants continuing on to PV202 will need to read supplemental material on battery-based design.

Participants will be able to perform the following:
- Perform power and energy calculations
- Perform a load analysis for a batteryless grid-tied system
- Implement electrical efficiency measures to reduce system size
- Diagram an array in series and parallel configurations
- Obtain and apply module specifications
- Determine module and array performance given various conditions
- Determine the azimuth and altitude angle of the sun and evaluate shading potential
- List the pros and cons of different mounting structures
- Interpret and apply data from equipment specification sheets
- Size a residential batteryless grid-tied system
- Identify wires and components on a three-line diagram of a residential grid-tied system
- List the order of commissioning/decommissioning and the potential safety hazards of a batteryless grid-tied system
- Draw a block diagram of the different system types
- Perform detailed site analysis utilizing commercially available tools

SEI's PV Design & Installation Manual is included in the tuition.

In-Person Sessions
Tuition: $895

February 23 - 27 (M-F)  Fontana, CA  code: PV102
April 20 - 24 (M-F)  Califon, NJ  code: PV102

March 30 - April 3 (M-F)  Salt Lake City, UT  code: PV102

NABCEP Training Hours: 32.5
PV200: PV Lab Week

Safely install, test, and commission residential solar-electric systems at the SEI lab facility in Paonia, CO.

This hands-on workshop offers five (5) days of supervised installation practice on solar-electric systems at SEI’s world-class PV lab training facility in Paonia, Colorado. This is the ultimate hands-on PV installation experience! Participants will install, teardown, dissect and reinstall components of stand-alone, batteryless grid-tied, and grid-tied with battery back-up systems.

This lab workshop will focus on safe PV installation and commissioning practices. The low participant-to-instructor ratio and comprehensive lab setting create a great opportunity for a quality hands-on PV installation experience. The lab yard includes roof, ground, and pole mount systems. PV Lab Week is the logical next step for participants who have taken PV 100 (online or as a 6 day class) or PV 102 and want more hands-on experience.

Prerequisites: PV100 or PV102

PV202: Advanced PV: Design Criteria & NEC Compliance

Apply the National Electric Code (NEC) to solar-electric systems and specify design criteria for both residential and commercial systems.

This classroom oriented session expands upon PV100 and PV102. It focuses on the National Electric Code (NEC), including grid interface calculations, grounding considerations and wire sizing. Participants evaluate system performance under various operating conditions. Commercial system design elements, including inter-row shading, inverter selection, and data monitoring solutions, are covered. In-person lectures are combined with system design exercises. There is NO significant hands-on component (except in the workshop on Guemes Island which includes an installation). The in-person workshop consists of five days of classroom lecture with tours of working systems.

Tuition includes a 2008 NEC Code book.

Participants will be able to perform the following:

- Evaluate grid-tied system production
- Perform a commercial site evaluation for a grid-tied system
- Perform NEC service panel bus bar calculations
- Calculate and diagram appropriate series fusing
- Determine NEC required workspace clearances
- Size appropriate disconnects and overcurrent protection
- Calculate spacing between modules to eliminate inter-row shading
- Perform uplift force and lag bolt strength calculations
- Evaluate different commercially available data monitoring options
- Identify all required NEC labeling for solar-electric systems
- Size grounding wires and grounding electrode conductors to NEC standards
- Draw a three-line diagram of a residential grid-tied system and a residential battery-based system
- List the pros and cons of AC coupled and DC coupled systems
- Identify the sizing considerations for stand-alone systems
- Perform sizing calculations for a battery-based system
- Calculate maximum charge rates for batteries

In-Person Sessions

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<td>April 20 - 24 (M-F)</td>
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<td>Paonia, CO code: PV200</td>
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<td>June 8 - July 19 code: PV202</td>
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Online Sessions

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<td>Sept. 21 - Nov. 1 code: PV202.OL</td>
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NABCEP Training Hours: 32.5

Tuition: $995

Guemes Island, WA code: PV202

*tuition: $995

NABCEP Training Hours: 32.5

www.solarenergy.org • 970-963-8855
Solar Electricity Workshops

PV204: Solar Sales, Marketing, & Economics

Learn how to sell and market residential PV systems, and to demonstrate to the customer that solar energy is a remarkably sound investment.

Learn secrets for setting up a solid and effective sales team, then generating cost effective leads for and with them. The strategic insights you’ll glean from this course will save and/or earn you thousands in avoided mistakes and increased sales. This rigorous interactive workshop is designed to help you make the most accurate and compelling financial case possible for the value of PV systems. The class is focused on residential systems in CA, NJ, CT, HI, NC, and other states with attractive economics (adjusted for location).

Topics include:
• Understanding basic marketing and the solar market segments
• Promotion strategies, lead generation, & marketing tools
• Setting up and running sales organizations
• Staffing, asset control, termination & legal issues
• Working the sales funnel from lead screening to presenting and closing
• Costs & sales commission rates
• Connecting with customers
• Analyzing, calculating, and explaining "payback" on solar systems
• Analysis of and maximizing benefit from the important variables such as system performance, incentives, and utility tariffs
• Overview of tools available for financial analysis
• Interactive use of the OnGrid Tool for examples

All participants will receive a demo copy of the OnGrid Tool (license agreement required).

In-Person Sessions
Tuition: $495

March 2 - 3 (M-T)
Fontana, CA
code: PV204

April 17 - 18 (F-Sa)
Califon, NJ
code: PV204

PV205: Solar Water Pumping

This two-day hands-on workshop covers pumping technologies, PV modules, system sizing, and component selection. Includes pump descriptions and comparisons with information on trackers, linear current boosters, and other associated equipment. The workshop will include laboratory exercises and a system tour.

In-Person Sessions
Tuition: $395

May 28 - 29 (Th-F)
Paonia, CO
code: PV205

“Another example of how SEI is leading the way in renewable energy education!”

- 2008 Solar Water Pumping workshop participant
ST101: Solar Hot Water

Participants in this workshop will learn the theory, design considerations and installation techniques necessary to install and maintain a solar domestic hot water system. Passive solar water heaters, drainback systems, antifreeze systems, and photovoltaic powered systems are all discussed in depth. Pool heating systems and an introduction to space heating systems are covered as well. Also included are safety considerations, code compliance, system sizing, and understanding solar collector performance in a variety of climates and applications.

Solar collectors, mounting systems, pumps, blowers, controls, storage tanks, heat exchangers, maintenance and more are subjects covered with each type of system as appropriate. Lessons learned from the history of the solar thermal industry are an integral part of the workshop. Hands-on installation training and/or tours of working solar heating systems are also part of the program.

Topics Include:
- Safety Procedures
- Passive Batch Water Heaters
- Closed Loop Anti-Freeze Systems
- PV Powered Pumped Systems
- Space Heating
- Radiant Floor Heating
- Pool Heating
- Mounting Strategies
- Maintenance
- Lessons Learned
- Tours of Working Systems

"The classroom material, instruction, and the hands-on and tours were great. I'm glad I took the class and I'm looking forward to more!"

- Solar Hot Water workshop participant, 2008

In-Person Sessions

**February 18 - 20 (W-F)**
Fontana, CA
code: ST101
Tuition: $595

**March 30 - April 2 (M-Th)**
Guemes Island, WA
code: ST101
Tuition: $745

**May 18 - 22 (M-F)**
Carbondale, CO
code: ST101
Tuition: $895

**September 8 - 11 (T-F)**
Carbondale, CO
code: ST101
Tuition: $745

ST201: Solar & Radiant Heating

Become a part of the burgeoning radiant heating industry and a rapidly emerging solar marketplace. This 3-day workshop provides critical information to design practical and efficient solar and radiant heating systems for energy and cost savings with comfort of underfloor heating.

Topics Include:
- Radiant Heating Basics
- Radiant Construction Details
- Solar Fundamentals
- System Designs
- Collector Mounting
- Heat Load Analysis
- Sizing Collectors
- Control Strategies
- Installation Standards
- Performance & Cost

"Up to date and relevant . . . well worth my time in this busy construction season."

- Solar & Radiant Heating Workshop participant 2007

Tuition includes a Solar & Radiant Heating Design Guidebook and a Solar Heating Calculator

In-Person Sessions

Tuition: $695

**September 14 -16 (M-W)**
Carbondale, CO
code: ST201
Tuition: $745
# Workshop Calendar

## January

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## May

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**PV Design Online**

- Jan 12 - Feb 22
- Feb 2 - Mar 15
- Mar 16 - Apr 26
- April 20 - May 31
- May 11 - June 21
- June 1 - July 12
- July 6 - Aug 16
- Aug 3 - Sep 13
- Sep 14 - Oct 25\n
**Advanced PV Online**

- Jan 19 - Mar 1
- Mar 23 - May 3
- April 27 - June 7
- June 8 - July 19
- July 20 - Aug 30
- Aug 24 - Oct 4
- Sep 21 - Nov 1

**Building for the Future Online**

- Feb 23 - April 5
- Oct 12 - Nov 22

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www.solarenergy.org  970-963-8855
### Workshop Calendar

#### March

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- **Solar Sales - CA**: 1
- **RE tour in Cuba**: 8
- **PV - TX**: 15, 22
- **Grid-Tied PV - UT**: 22
- **SHW - WA**: 29

#### July

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- **PV - CO**: 6
- **Advanced PV - CO**: 12
- **Solar Sales - CA**: 8
- **Grid-Tied PV - UT**: 20
- **SHW - WA**: 23

#### August

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- **Wind Power - CO**: 2
- **PV - CO**: 10, 21
- **Solar Sales - CA**: 30
- **Grid-Tied PV - NJ**: 20
- **PV Lab Week - CO**: 24

#### November

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- **Sustainable Community Dev. - Nicaragua**: 8
- **Grid-Tied PV - UT**: 15
- **SHW - WA**: 12
- **Solar Sales - CA**: 1

#### December

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- **Check website for more PV workshops October through December**: 24
- **PV Lab Week - CO**: 28
- **Solar Sales - CA**: 30
- **AT for DW - Mexico**: 29

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- **Photovoltaics**
- **Wind Power / Micro-Hydro**
- **Solar Thermal**
- **Sustainable Building**
- **Rural Development**
- **Other**

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Wind Workshops

WP101: Residential Wind Power

Participants in this workshop will learn to design and install residential wind systems, up to 100 kWh/day in capacity. The workshop will cover system sizing, site analysis, installation and safety issues, and hardware specification.

Learn about the different available residential wind turbines, how they work, and the advantages and disadvantages of each.

Topics Include:
- Site analysis
- Towers and tower economics
- How residential wind generators work
- Grid-tied systems
- Off-grid wind/PV hybrid systems
- Wind system sizing
- Legal issues and zoning
- Installation and safety considerations

Topics NOT included:
- Do-it-yourself Wind Turbines
- Vertical Axis Wind Turbines
- Roof Mounting and Short Towers
- Commercial Turbines

“The spectacular synergy of the instructors made for an unforgettable week chock full of useful info one cannot find elsewhere on this continent: info to spread in the quest for clean energy and dignity.”
- Residential Wind Power workshop participant, 2007

In-Person Sessions
Tuition: $895

August 3 - 7 (M-F)
Paonia, CO
code: WP101

WP201: Wind-Electric Systems Maintenance and Repair

Wind-electric systems often require the most maintenance and have the most problems of any renewable electricity system. This workshop includes a brief review of basic wind-electric system design principles and practice, and then focuses on maintenance, troubleshooting, and repair of these systems.

This is an advanced workshop, intended for experienced wind-electric system users, designers, and installers, or for those who have attended SEI’s Residential Wind workshop.

Classroom sessions will complement extensive hands-on work. Workshop participants will work on real-world wind-electric systems, including tilting down a tower, climbing and working on freestanding and guyed towers, and working on wind turbines and balance of systems components. At least half of this workshop will be hands-on work.

Topics include:
- Wind Energy Basics Review
- Tower Inspection & Safety
- Tilting & Climbing Towers
- Turbine Removal
- Troubleshooting & Repair
- Electrical & Mechanical Repair
- System Maintenance
- System Operation & Upgrade

Prerequisite: WP101 or permission of instructor

In-Person Sessions
Tuition: $895

April 6 - 11 (M-Sa)
Guemes Island, WA
code: WP201
WP102: **Homebuilt Wind Generators**

This workshop will guide participants through the process of building a small wind turbine from scratch. Brief sessions each day on wind generator theory will be followed by shop sessions. The workshop group will construct one to three working wind generators.

Participants will gain hands-on experience carving wooden blades, winding coils, wiring, and fabricating a complete wind turbine. The turbine built in the workshop will produce up to 1,500 watts in higher winds. Participants will learn how to adapt this and other designs for other voltages, and how to scale the design concepts up or down to meet their needs.

**Topics Include:**
- Designing & carving wooden blades
- Alternator theory and design
- Winding coils
- Fitting magnets into homebuilt alternators
- Governing systems
- Yaw and tail design & construction
- Wiring & fabrication
- Construction details

"This workshop is an amazing gathering of many of the most important thinkers and tinkerers of the micro-wind field. Having access to these amazing people is truly inspiring and helps one reach a level of understanding that one can’t get anywhere else."

-- Home Built Wind Generators workshop participant, 2007

**In-Person Sessions**

Tuition: $895

April 13 - 18 (M-Sa)
Guemes Island, WA
code: WP102

MH101: **Micro-Hydro Power**

This workshop will cover design considerations as they apply to both low and high head micro-hydro systems. The focus will be on core concepts that may be applied to a wide range of hydro applications. Participants perform preliminary system sizing for mechanical and electrical power generation of 50-watt to 100-kilowatt capacities. The course combines class lectures with site tours and lab exercises. Hands-on exercises include: methods of flow measurement, determining head, analyzing and assembling small functioning systems.

**Topics Include:**
- Safety Procedures
- System Components
- Turbine Types
- AC and DC Systems
- Site Analysis
- System Design
- Battery Storage
- Controls
- Troubleshooting
- Maintenance
- Hybrid Systems
- Case Studies

“The five day micro-hydro workshop was the best practical session I have taken in a long time!”

- Bernard Amadei, founder, Engineers without Borders and Micro-hydro workshop participant 2007

**In-Person Sessions**

Tuition: $895

June 22 - 26 (M-F)
Paonia, CO
code: MH101

www.solarenergy.org • 970-963-8855
AT101: Electric Car Conversion

This workshop will guide participants through the complete process of converting a vehicle to electric power. Classroom sessions will be combined with hands-on shop sessions. By the end of the workshop, the group will have completed a running electric car conversion capable of highway speeds and 60-80 miles range.

Topics include:
- Expected performance
- Overall layout
- Testing & troubleshooting
- Choosing a suitable chassis
- Wiring
- Driving & Maintenance
- Components and their functions
- Designing & fabricating support structures

In-Person Sessions
Tuition: $895
October 26 - 31 (M-Sa)
Guemes Island, WA
code: AT101

Biodiesel

Piedmont Biofuels Coop and The Abundance Foundation bring you 5 days of Biodiesel Fundamentals:

From humble beginnings as a biodiesel co-op to commercial biodiesel production, Piedmont Biofuels has first hand experience with all scales of sustainable biodiesel production. Piedmont Biofuels is the smallest BQ9000 certified producer in the world.

Recognized nationally as fuel quality experts and internationally for biodiesel education programs, Piedmont Biofuels will instruct you on biodiesel production, plant design, methanol recovery, glycerin refining, fuel quality testing, regulatory and safety issues and the fundamentals of the biodiesel business. Come experience life in a local economy!

“The people and the tours were inspiring. The instruction and the hands-on labs were invaluable. Thank you for creating such a comprehensive workshop that was focused on sustainability!”

- Biodiesel workshop participant, 2008

In-Person Sessions
Tuition: $700
October 26 - 30 (M-F)
Pittsboro, NC

This workshop is taught independently by Piedmont Biofuels. For more information and to register PLEASE CONTACT THE ABUNDANCE FOUNDATION at http://theabundancelfoundation.org/biodiesel-workshop-2009/ or call 919-533-5181
RE101: Intro to Renewable Energy

This workshop will introduce renewable energy technologies and strategies to homeowners, contractors, and renewable energy advocates.

**Topics Include**

- Solar, Wind, Hydro Site Analysis
- Residential RE System Sizing
- PV, Wind, and Hydro Equipment
- Controllers, Batteries, Inverters
- Energy Efficiency
- Solar Cooking
- Solar Hot Water
- Passive Solar Design
- Tours of Local RE Systems
- Resources for Further Study

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**In-Person Sessions**

**Tuition:** $150

**April 4** (Sat)  
Guemes Island, WA  
**code:** RE101

**October 10** (Sat)  
Guemes Island, WA  
**code:** RE101

Participants can receive 2 extended studies credits through Mesa State College (included in the cost of workshop). Significant others receive 50% discount on tuition for this workshop! (materials will be shared)

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**RE105: Renewable Energy for Educators**

This workshop focuses on the impacts that our energy use has on the planet and how to best teach youth about solutions: energy conservation, efficiency, and renewable energy technologies. Each day will include a hands-on element that can be employed in the classroom. In addition, participants will walk away with practical knowledge they can apply in their own lives.

This workshop has been designed to meet the 5th - 9th grade Colorado Science Standards. However, educators working with students in any grade are welcome to participate.

**Each participant will receive:**

- Access to SEI's renewable energy kits
- Curriculum and lesson plans
- Teaching tools and materials
- Experience creating hands-on projects
- Exposure to successful existing projects

**In-Person Sessions**

**Tuition:** $450

**June 22 - 25** (M-Th)  
Carbondale, CO  
**code:** RE105

**Meal/Lodging Plan:** TBA

Participants can receive 2 extended studies credits through Mesa State College (included in the cost of workshop).

SEI would like to thank our many sponsors who believe in youth education. Their generous donations have helped minimize the cost of this workshop for educators.

Please contact us if you are a youth educator and need further financial assistance to attend this specific workshop.

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“**This is a terrific intro to renewable energy. It exceeded my expectations, and my expectations were high!”**

- Intro to Renewable Energy participant, 2007

“I’ve wanted to incorporate renewable energy into my teaching but haven’t had a lot of confidence. With this workshop I’m confident I’ll be implementing RE next year.”

- Renewable Energy for Educators participant, 2008
Rural Development Workshops

Program Overview

Renewable energy technologies can greatly improve the lives of people in developing countries. Solar cooking, food drying, and water purification can help people live healthier, safer lives. Renewable energy technologies can also give people access to electricity which can improve education, health care, agriculture and industry. SEI’s Rural Development workshops teach about the different technologies and applications appropriate for developing world communities, and how to implement projects in a sustainable way.

The tuition for each workshop held outside of the United States includes food, lodging, and in-country transportation.

Which workshop is right for me?

We suggest taking the Renewable Energy for the Developing World workshop held in Colorado as a first step. This workshop will introduce you to the different applications, and present case studies from around the world. Then to get some hands-on practical experience, follow that workshop with one of our international hands-on workshops.

Each international workshop has a different focus, described below. For more information please read the entire description of the workshop in the following pages and on our website.

- Solar Electricity for the Developing World
  Learn about and install PV systems for rural communities at an environmental retreat in Costa Rica

- Renewable Energy for the Developing World - Hands-on
  Get your hands on a variety of appropriate technologies at an intentional community in Costa Rica

- Sustainable Community Development
  Discover how a rural community can become a model of sustainable development at an award winning community in Nicaragua

- Appropriate Technology for the Developing World
  Learn about small scale sustainable energy and resource management in Chiapas, Mexico

- Ecology, Permaculture, & Renewable Energy
  Study and practice sustainable agriculture and renewable energy at an organic farm in Ecuador

- Renewable Energy & Energy Education in Cuba
  See first-hand the incredible progress Cuba has made in sustainable development.

Part of the tuition for these workshops goes towards the renewable energy systems that we implement and to fund our partner NGOs.

In-Person Sessions

RD101: Renewable Energy for the Developing World

This workshop explores different applications for renewable energy technologies in developing countries. Participants will learn how to successfully accomplish sustainable development projects with renewable energy. Effective technology transfer methods will be presented, as well as setting up infrastructure and the economics and financing of renewable energy projects.

Case studies will be presented by guest speakers from around the world on solar cooking, rural household electrification, rural health care, and micro-enterprises using renewable energy.

Topics Include:

- Solar Cooking
- Biomass
- Rural Electrification
- PV for Rural Health Care
- Technology Transfer
- Microenterprises
- Financing Household Solar Energy
- Integrating Women
- Project Funding
- Case Studies

“Great diversity of perspectives on how to approach renewable energy development work. The workshop included an impressive list of guest speakers and a good coverage of all the issues involved.”

- RE for the Developing World participant, 2008

In-Person Sessions

Tuition: $745

June 15 - 19 (M-F)
Carbondale, CO
code: RD101
RD102: Solar Electricity for the Developing World

Learn to design and install photovoltaic systems for the developing world. Workshop participants learn system sizing, site analysis, hardware specification, and component selection. The workshop covers typical applications and case study examples. Install and upgrade real-world systems with current renewable energy equipment. This workshop is open to all who want to use PV and for those seeking employment in the solar industry.

Held at Rancho Mastatal, an environmental learning center and retreat located in the last virgin rainforest of Costa Rica’s Puriscal County. Participants will stay at the center where they build using natural building techniques, including bamboo and cob, and support the use of renewable energy systems. Rancho Mastatal practices and promotes living responsibly in the tropics, while educating its visitors about the significance and majesty of the world’s disappearing tropical forests. Take advantage of this great opportunity to enjoy one of Costa Rica’s most undiscovered regions while learning about renewable energy.

The course is taught in both English and Spanish.

“Not only a great PV learning experience, but an unforgettable cultural experience as well.”

- Solar Electricity for the Developing World participant, 2007

In-Person Sessions
Tuition: $1350

January 1 - 9 (Th-F)
Costa Rica
code: RD102

January 2 - 10, 2010* (Th-F)
Costa Rica
(price to be determined)
code: RD102

Price includes dorm bed or camping, all meals and in-country transportation. Private accommodation may be available at additional cost. Contact Rancho Mastatal. Ask about options for family members not taking the workshop. www.ranchomastatal.com

*tentative dates for 2010

www.solarenergy.org • 970-963-8855

RD201: Renewable Energy for the Developing World - Hands-On

Held at Fundación Durika, a private reservation of approximately 18500 acres located 17 kilometers northeast from Buenos Aires city. This fascinating region has not been well explored, mainly due to the terrain difficulties and that there are not enough infrastructures available to the visitor. For this reason the Fundación Dúrika offers to the real naturalist a special opportunity to know and enjoy this part of Costa Rica, as very few people have done before in the past. The community is totally vegetarian, and no drugs or alcohol are allowed.

Join us for this special experience, not only to learn about renewable energy, but to learn about a different way of life, and challenge your assumptions about how we can best live on the planet. Participants must be willing to leave behind drugs, alcohol, meat, hot showers, and other amenities of 20th century life for a week of experiential learning.

Topics include:

• Discussion and tours of solar, wind, and hydro-electric systems
• Building solar ovens with a women’s cooperative
• Building a methane biodigester
• Social & cultural issues of working in the developing world

The course is taught in both English and Spanish.

In-Person Sessions
Tuition: $1450

Jan. 31 - Feb. 9 (Sa - M)
Costa Rica
code: RD201

Food, lodging & in-country transportation included in tuition.

photo by Tyler Stableford
Rural Development Workshops

**RD202: Sustainable Community Development - Renewable Energy for Rural Villages**

Held in conjunction with Grupo Fenix, an organization which recently won the UN based SEED Award for Entrepreneurship in Sustainable Development. The SEED Award is an annual international competition, designed to support locally-led, innovative, entrepreneurial partnerships in developing countries, which have the potential to make real improvements in poverty eradication and environmental sustainability.

Participate in hands-on learning in a small Nicaraguan village, Sabana Grande, Madriz, which has taken up the challenge of becoming a solar community with Grupo Fenix. Live with families in Sabana Grande who can show you the benefits of and obstacles to using solar energy in their community.

The systems you build will strengthen the community’s ability to develop sustainable businesses within the community. Solar technicians from Sabana Grande are instructors in the course, and community members will give optional classes on medicinal herbs and cooking with soy.

**Topics include:**
- The design & installation of a solar-electric system
- Building solar ovens with a women’s cooperative
- Constructing solar battery chargers
- Medicinal plant tours
- Social & cultural issues of working in the developing world

“My life is richer after experiencing life in the community of Sabana Grande and becoming familiar with the creativity, perseverance, and beauty of Grupo Fenix and el Centro Solar.”

- Sustainable Community Development participant, 2008

**In-Person Sessions**

Tuition: $1,250

Nov. 7 - 14 (Sat-Sat)
Nicaragua
code: RD202

**RD203: Appropriate Technology for the Developing World**

This workshop provides an overview of technologies which promote small scale sustainable energy and resource management systems in the developing world.

With an emphasis on the unique challenges presented by international project work, this workshop is ideal for organizations working in rural areas, people wanting to get involved in sustainable development work, and those who wish to reduce their own ecological impact.

**Topics include:**
- Biosand Water Filters
- Micro-Hydro Power
- Methane Biodigestors
- Ecological Water Treatment Systems
- Rainwater Catchment
- Financing Issues
- Tours of Existing Systems

Cosponsored by the International Renewable Resources Institute

www.irrimexico.org

**In-Person Sessions**

Tuition: $1,250

April 19 - 25 (Sun-Sat)
Chiapas, Mexico
code: RD203

The tuition for this workshop includes food, lodging, and in-country transportation from San Cristobal de Las Casas.
RD204: Ecology, Permaculture, & Renewable Energy

This workshop combines sustainable agriculture and renewable energy at an inspiring organic farm on the Ecuadoran coast. Visit the UN designated eco-city of Bahia de Caraquez to tour some of their many ecological projects, and spend 5 days at the Rio Muchacho organic farm. Rio Muchacho demonstrates a combination of organic agriculture, permaculture, local traditional moon planting, renewable energies, and recycling of almost everything.

While at the farm participants will have classes on permaculture and composting, install a solar-electric system, and build a bicycle powered water pump. There will also be tours of the methane biodigester used for cooking fuel and the solar grain and coffee dryer. Optional activities at the farm include milking cows, harvesting fruits and vegetables, making cups, spoons, and jewelry from local plants, swimming in the river, or making chocolate from the bean to the cup.

The course is taught in both English and Spanish.

In-Person Sessions

Tuition: $1350
September 12 - 20 (Sa-Su)
Ecuador
code: RD204

* Plan to arrive in Quito, Ecuador by the evening of September 11.

Renewable Energy and Energy Education in Cuba

Join SEI and Global Exchange for a Renewable Energy and Energy Education Tour in Cuba.

Cuba’s high priority on renewable energy, energy efficiency, and energy education have led the World Wildlife Fund to declare Cuba the only country in the world to achieve sustainable development due to their high development level and low ecological footprint.

Meet with energy representatives from NGO’s, the government, and educational institutions. Visit renewable energy sites, and see first hand how Cuba has become a model of sustainable energy development, on this licensed and legal trip*.

* all US participants must be employed in the energy industry or be a graduate student in a related field to comply with the license.

In-Person Sessions

Tuition: $2350
March 8 - 15 (Su-Su)
Cuba

The tuition for this delegation includes lodging, most meals, in-country transportation, and round trip flights from Cancun, Mexico to Havana, Cuba.

To register for this delegation contact Global Exchange:
(415) 255-7296 or leslie@globalexchange.org
SEI’s Outreach Programs

Solar in the Schools
Our current patterns of over consumption are unsustainable, yet few of us have been educated about how our actions have a direct impact on this planet, what that means for our future, and how we can begin to be a part of the solution. SEI’s Solar In the Schools (SIS) Program aims to give K-12th grade youth and their teachers the tools they need to begin to make a difference in our energy future. We offer regional classroom presentations, web based resources, Renewable Energy installations at schools, hands-on science kits, and hands-on teacher trainings (see page 18). In 2008 SEI gave interactive presentations about resource conservation, energy efficiency, and renewable energy to over 2,500 youth. With the help of our volunteers, our donors, and our many partners, the SIS program aims to be the best resource for Renewable Energy Youth Education.

"Please bring the Solar In the Schools program back to our school this year. Our 7th grade teaching team has decided to focus on energy earlier in the year based on your program and the resources you have given us. Thanks for being the spark!"

-Glenwood Springs Middle School Teacher

INVEST
SEI offers alumni an opportunity to participate in INVEST, International Volunteers in Environmentally Sustainable Technologies. SEI alumni can apply to volunteer overseas with one of our partner organizations to help bring renewable energy technologies to communities in the developing world. Volunteers install PV systems on rural health centers, teach rural farmers about solar water pumping, install micro-hydro and wind systems to power rural communities, or help build sustainable houses; all this while meeting new people and learning new cultures. SEI’s partner INVEST organizations work in Nepal, Nicaragua, Thailand, Guatemala, Tanzania, and Costa Rica.

Native American Program
SEI works with Native Americans to help them satisfy their energy and housing needs, and has trained people from the Western Shoshone, Lakota Sioux, Yurok, Zuni, Hopi, Skull Valley Goshute, and Chippewa Nations. In 2008, SEI returned to Newe Sogobe (Western Shoshone) Territories in Nevada for the 15th Protecting Mother Earth Conference organized by the Indigenous Environmental Network (IEN). SEI was honored to participate alongside indigenous peoples from around the world in this important gathering to discuss solutions around indigenous-based environmental protection and ecological knowledge. SEI staff members set up an interactive solar camp with solar ovens, a solar attic fan, solar water fountain, and a battery-based PV charging station. They also offered several PV and energy efficiency trainings, and joined friend and ally PennElys GoodShield of Sustainable Nations for a straw bale construction workshop.

Scholarships
Traveling to the United States has become increasingly hard for our international participants, due to visa requirements and the cost of airfare. We try to offset these costs to eligible developing country residents by offering tuition scholarships. SEI also offers partial tuition scholarships to low-income participants from industrialized nations. Contact us for an application.

Work-Trade Program
For the past 18 years SEI has been utilizing the skills and enthusiasm of its diverse work-traders (interns) from around the country to strengthen and grow the organization. In fact, a large majority of the current staff were once work-traders! To become eligible as a work/trader you must take a minimum of 8 weeks of our Renewable Energy Education Program. SEI will trade 50% of total tuition in exchange for work. For more information see our website.
Books

**Biodiesel America**
by Josh Tickell, Yorkshire Press, 2006 - $30

Biodiesel America shows that an abundance of available, economically viable, and profitable energy solutions exist. At the forefront of these new energy technologies is biodiesel, a fuel that could bring over one million jobs back to rural America, invigorate our economy, and create a stable domestic fuels supply.

**Building Green**
by Clarke Snell & Timothy L. Callahan, Lark Books, 2006 - $30

A photo-packed, amazingly complete, start-to-finish guide to "green" housebuilding. More than 1,200 close-up photographs, along with in-depth descriptions, follow the real construction of an alternative house from site selection to the addition of final-touch interior details.

**Chasing the Sun**
by Neville Williams, New Society Publishers, 2005 - $19

An inspiring story of delivering solar electricity to 50,000 families in eleven countries. Neville Williams shows how intelligent, local solutions can be found to meet energy needs of communities across Asia and Africa.

**Code Check: Electrical**
by Redwood Kardon, Douglas Hansen, and Michael Casey
Taunton Press, 2008 - $18

Hundreds of code facts for electrical wiring at your fingertips. This book will help to speed up work, reduce code violation callbacks, and avoid accidental violations of unfamiliar electrical codes. This completely updated 5th edition includes a summary of the changes in the 2008 code and is cross-referenced to the International Residential Code.

**Design of Straw Bale Buildings**
by Bruce King, Green Building Press, 2006 - $40

A design manual for practicing professionals and teachers. This book provides truly useful information to architects, engineers, building officials, and builders who want to design intelligently with plastered straw bales.

**The Home Energy Diet: How to Save Money by Making Your House Energy-Smart**
by Paul Scheckel, New Society Publishers, 2005 - $19

A book that helps readers take control of their personal energy use and costs so they can save money, live more comfortably, and help the environment.

**The Homeowner's Guide to Renewable Energy**
by Dan Chiras, New Society Publishers, 2006 - $28

This book covers the many ways we can slash energy bills while improving comfort in our homes. It covers: solar hot water, solar space heat, passive cooling, solar, wind and micro-hydro generated electricity, and emerging technologies such as hydrogen, fuel cells, methane digesters and biodiesel.

**Microhydro: Clean Power from Water**
by Scott Davis, New Society Publishers, 2004 - $23

Highly illustrated and practical, this book covers micro-hydro principles, design and site considerations, equipment options, and legal, environmental, and economic factors. It covers both AC and DC systems.

**More Straw Bale Building**
by Chris Magwood, Peter Mack, and Tina Therrien, New Society Publishers, 2005 - $33

A book tackling all the practical issues: finding and choosing bales; sound building plans; roofing, electrical, plumbing, and heating systems; building code compliance; and special concerns for northern climates. One of the most comprehensive and practical books on the subject to date.

**NEC 2008: National Electrical Code NFPA 70**
by NFPA, National Fire Protection Association - $75

This is a must for anyone working in photovoltaics. This softbound book gives you the clearest set of rules that govern the electrical industry. It will help you reduce the risk of fire and electrical shock from improper installations, and is loaded with solutions designed to provide better safeguards against hazards. These codes are the industry standard.

**Photovoltaics: Design & Installation Manual**
by SEI, New Society Publishers, 2007 - $60

A textbook manual on how to design, install and maintain a photovoltaic (PV) system. This new updated and revised manual offers an overview of solar electricity, and a detailed description of PV system components. It includes chapters on analyzing sites and sizing and installing systems. The manual also includes detailed appendices on system maintenance, troubleshooting, and insolation data for over 300 sites around the world. Used as the textbook in SEI's PV Workshops. Also available in Spanish!

**Photovoltaic Systems**

A comprehensive reference and guide to the installation of residential and commercial photovoltaic (PV) systems.

**Rural Energy Services**

A book addressing the policy, market, and sustainability aspects of defining and selecting technologies that will meet the energy demands of rural villages in a sustainable and reliable way.

**The Solar Food Dryer**
by Eben Fodor, New Society Publishers, 2005 - $15

The Solar Food Dryer describes how to use solar energy to preserve your summer's harvest. Includes: Complete step-by-step plans for building a high performance, low cost solar food dryer from readily available materials, solar energy design concepts, food drying tips, recipes, and more!

**Solar Hot Water Systems: Lessons Learned**
by Tom Lane, Energy Conservation Services of North Florida, 2002 - $68

This book will help people who want to use currently available solar water heating products with success, and help them avoid the mistakes of the past. Aimed at the contractor who wants to know what works successfully, and the homeowner who wants basic facts for comparison shopping.

**The Solar House**
by Daniel D. Chiras, Chelsea Green, 2002 - $30

This book provides home builders with all the necessary tools for successful solar design. Dan Chiras explains the principles of natural conditioning - heating and cooling with passive solar techniques.

**Solar Water Heating**
by Bob Ramlow and Benjamin Nusz, New Society Publishers, 2006 - $25

A book designed for those who want to install their own solar thermal system. It presents the basics of solar water heating, including energy conservation and energy economics. It covers types of solar collectors, solar water and space heating systems and solar pool heating systems, system components, installation, operation and maintenance, system sizing and siting.
**Resources for Teachers & Students**

**Energy for Keeps: Electricity from Renewable Energy**  
by Marilyn Nemzer, Deborah Page & Anna Carter, Energy Education Group - $20  
An introduction to renewable energy for everyone who uses electricity—from students to energy policy makers. Technologies covered include biomass, geothermal, hydropower, ocean, solar and wind power. A CD is included with student activities and more.

**Greening School Grounds**  
Edited by Tim Grant and Gail Littlejohn, New Society Publishers - $17  
There is enormous potential to transform the barren expanses of asphalt of most school grounds into natural spaces for playing and learning. Schoolyard “greening” is an excellent way to promote hands-on learning about the environment through projects that benefit schools and increase green space and biodiversity.

**Teaching About Climate Change - Cool Schools Tackle Global Warming**  
Edited by Tim Grant and Gail Littlejohn, New Society Publishers - $13  
This book offers a framework for teaching fundamental environmental concepts and a variety of activities that can be undertaken in school, at home, or in the community. Topics include: experiments that demonstrate the greenhouse effect, and hands-on explorations of energy and transportation alternatives.

**Videos & More**

**Clean Energy News: Buying a Solar Electric System DVD**  
by Dave Bowden, Sustainable Media Network, 2006 - $25  
A highly targeted tool that answers the most commonly asked questions posed by potential photovoltaic system buyers. It educates prospective customers on the nuts and bolts of buying a PV system by explaining pricing, economics, design considerations and technology of PV systems.

**Solar Pathfinder**  
by Solar Pathfinder - $250  
The Solar Pathfinder gives an entire year’s solar potential for a given site in just seconds. This non-electronic instrument is ready-to-use and includes: a printed manual, 20 Sunpath Diagrams (latitude & application specific), angle estimator (for determining altitude and azimuth), white marking pen, a rugged carrying case and a tripod.

**Kill-A-Watt Meter EZ**  
by P3 International - $60  
An electricity usage monitor. This meter allows you to measure how much electricity your appliances consume and how efficient they really are. You can figure out your electrical expenses by the day, week, month, or year. The knowledge you gain can save you thousands of dollars! Used in PV Design Online course.

**SEI T-shirt**  
by SEI - $20  
100% organic cotton/hemp t-shirt with SEI’s logo on front and multi-colored sun on back. Available in S, M, L, XL  
Colors: Cranberry, Black, Sand, Olive, Midnight Blue  
(call first to determine availability)

**Wiring a House**  
by Rex Cauldwell, Taunton Press, 2002 - $25  
A reference book on home wiring for homeowners, electricians, and apprentices. Updated and revised to include material on home generators, lightning protection, and electrical code changes.

**Your Green Home**  
by Alex Wilson, New Society Publishers, 2006 - $18  
A book written for homeowners planning a new home—whether you are working with an architect or builder, or serving as your own general contractor. Intended to improve the overall environmental performance of new houses being built, the book sets out to answer some of the big-picture questions relating to having a home designed and built—and getting what you want.

**Teaching Green - The Elementary Years**  
by Tim Grant and Gail Littlejohn, New Society Publishers - $23  
Teaching Green - The Elementary Years emphasizes the need to teach young people the skills, knowledge and values of active environmental citizenship and includes 50 kid-tested teaching strategies that promote interdisciplinary hands-on learning about natural systems and foster critical thinking about global issues, both local and global. Designed for grades K-5.

**Teaching Green - The Middle Years**  
by Tim Grant and Gail Littlejohn, New Society Publishers - $23  
Teaching Green - The Middle Years emphasizes the need to teach young people the skills, knowledge and values of active environmental citizenship and includes 50 kid-tested teaching strategies that promote interdisciplinary hands-on learning about natural systems and foster critical thinking about global issues, both local and global. Designed for grades 6-8.

**Your Solar Home Guidebook - The Art and Science of Heating, Cooling, and Powering Your Home with the Sun**  
by the Rahus Institute, A Rahus Institute - Solar Schoolhouse Publication, 2006 - $18  
A comprehensive curriculum for youth including everything from passive solar design to solar electricity and system sizing. This book is full of hands-on projects for teachers to implement in the 4th through 9th grades.
I would like to order the following books:

- Biodiesel America $30
- Building Green $30
- Chasing the Sun $19
- Code Check Electrical $18
- Design of Straw Bale Buildings $40
- The Home Energy Diet $19
- The Homeowner’s Guide to RE $28
- Manual Fotovoltaica $60
- Microhydro $23
- More Straw Bale Building $33
- NEC 2008 National Electric Code $75

Subtotal from SEI Store: $___________

Sales Tax (2.9% for Colorado residents only) $___________

Shipping & Handling: United States: $___________

International or special postal request call for price quote $___________

Total Due: $___________

Please print your information clearly!

SEI, PO Box 715
Carbondale, CO 81623
tel: 970-963-8855 • fax: 970-963-8866
www.solarenergy.org

Resources for teachers and students:

- Energy for Keeps $20
- Greening School Grounds $17
- Teaching Climate Change $13
- Teaching Green - Elementary $23
- Teaching Green - Middle $23
- Your Solar Home Guidebook $18

Other Items:

- Clean Energy News DVD $25
- Kill-A-Watt Meter EZ $60
- Solar Pathfinder $250
- SEI T-shirt $20

S M L XL XXL
Cranberry - Black - Sand - Olive - Midnight Blue
please circle size and color above
(mark 1st & 2nd choice of color)

US shipping & handling prices (US Postal Service*)

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*For service other than USPS call for pricing

☐ Check (payable to SEI) enclosed.
☐ Please charge my: ☐ Visa ☐ MasterCard ☐ American Express

Card Number: ___________ Exp. ___________ Security Code: ___________

Signature: ____________________________

Name: ________________________________

Address: ______________________________

City: ___________________ State: _______ Zip: ____________

Country: ____________________________

Telephone: __________________ Fax: __________________

E-mail: ____________________________
Membership levels and benefits

Friend - $50
Receive the SEI enewsletter, a bumper sticker, and the knowledge that you are supporting SEI's invaluable charitable programs.

Supporting - $100
Receive the SEI e-newsletter, a bumper sticker, a $50 discount to use on any SEI workshop of your choice, and a 1-year subscription to either Home Power magazine or E magazine.*

Community - $250
Receive the SEI e-newsletter, a bumper sticker, three $50 discounts on SEI workshops**, and a 1-year subscription to either Home Power magazine or E magazine.*

Business - $500
Receive the SEI e-newsletter, a bumper sticker, three $50 discounts on SEI workshops**, your name or business listed on SEI's website, and a 1-year subscription to either Home Power magazine or E magazine.*

Corporate - $1,000
Receive the SEI e-newsletter, a bumper sticker, five $50 discounts on SEI workshops**, your name or business listed on SEI's website, and a 1-year subscription to either Home Power magazine or E magazine.*

Sustaining - $5,000
Receive the SEI enewsletter, a bumper sticker, five $50 discounts on SEI workshops**, your name or business listed on SEI's website, a 1-year subscription to either Home Power magazine or E magazine, and provide scholarships for 2 people from low income communities to attend SEI workshops.

Sign me up!
I want to join SEI and help support RE education around the globe.

☐ Friend - $50  ☐ Community - $250  ☐ Corporate - $1,000
☐ Supporting - $100  ☐ Business - $500  ☐ Sustaining - $5,000

Support SEI's Charitable Programs
Please make a donation to one of SEI's charitable programs. Your support will help us bring renewable energy technologies to those in need.

☐ Solar in the Schools  ☐ INVEST (International Volunteer Program)
☐ Scholarship for women's program  ☐ General scholarship fund
☐ Native American program  ☐ Scholarship for people from lesser developed countries

Total due for membership: $ ___________
Additional amount I am donating to an SEI charitable program: $ ___________
Total enclosed: $ ___________

☐ Check (payable to SEI) enclosed.  ☐ Please charge my: ☐ Visa  ☐ MasterCard  ☐ American Express
Card Number: ___________________________  Exp. ___________  Security Code: ___________________________
Signature: ____________________________________________________________________________________________
Name: ________________________________________________________________________________________________
Organization: _________________________________________________________________________________________
Address: _____________________________________________________________________________________________
City: ______________________________________ State: ______ Zip: ______ Country: _________________
Telephone: ________________________________ Fax: ______________________________
E-mail: ____________________________________________________________________________________________
Website: __________________________________________________________________________________________
For $100 memberships and above, select ONE magazine subscription:
☐ Home Power magazine  ☐ E magazine (US members only)
International members: add $10 for Canada and Mexico, add $20 for other countries
<table>
<thead>
<tr>
<th>Workshop code</th>
<th>Workshop name</th>
<th>Location</th>
<th>Dates</th>
<th>Tuition</th>
<th>Other Fees (Food, lodging, NAPBCEP)</th>
<th>Total Cost</th>
</tr>
</thead>
</table>

**Cancellation Policy:**

- Enrollment is based on a first come basis. In order to reserve a seat, we must first receive your full tuition. Please check the website or contact us beforehand to make sure there is space available.

- If you cancel 30 days prior to workshop start date, 50% of your total tuition is non-refundable, plus the cost of any material you receive prior to the workshop.

- If you cancel within 30 days of the beginning of the workshop, your entire tuition is non-refundable.

- If you choose to transfer your space to someone in your company or family, a $100 administration fee is charged.

- I have read and understand SEI's cancellation policy.

Total Amount Due: ________________

☐ Check payable to SEI enclosed  ☐ Charge my credit card: ☐ Visa  ☐ MasterCard  ☐ AmEx

Card #: ___________________________________________ Exp. Date: ____________________ Security Code: ______

Signature: ___________________________________________ Gender:  ☐ Male  ☐ Female

Name: ___________________________________________ Phone: _________________________

Address: ___________________________________________ Fax: _________________________

City: __________________________ State: ______ Zip: ______ Country: ________________

Email: ___________________________
To:

Renewable Energy Education for a Sustainable Future

2009 Workshop Catalog

SOLAR ENERGY INTERNATIONAL

"SEI is highly regarded and the reputation is well deserved. Now I can brag that I am SEI trained!"

- Eric Shidell, SEI alum 2008