



## Solar Training Outline

- **Business of Solar**

The economics of the future of solar is discussed on a local, national and international level. Creating chronological protocols for projects from start to finish. Developing relationships within the industry, and understanding the economics of return on investment.

- **How Solar Works**

How solar modules convert the photons from the sun into electrical current.

1. Understanding DC power and its relationship to AC power. Series and Parallel circuits in a DC system.
2. The solar window, understanding peak sun hours and solar irradiation.
3. Wiring Solar Modules and Battery banks.
4. Wire sizing and over current protection, grounding and lightening protection for both AC and DC.

- **Solar Modules Choices and Characteristics**

Not all solar modules are created equal, we teach how to choose the right module for the application. The internal components and construction of modules and how they work.

- **Site Evaluations- Shading Analysis**

Sites must be evaluated to determine their viability for solar. A number of factors need to be measured:

1. Space availability; accurate measurements must be taken of where the solar array will be placed and note any restrictions.
2. A complete shading analysis to determine the solar resource available and how to generate detailed reports. The solar pathfinder is a tool that is taught to the students.
3. Evaluating the condition of the site; does the surface need work prior to installation, is the ground suitable for excavation.
4. Distances to electrical sources and loads.

- **Off Grid System Design**

Stand alone solar powered systems must be designed in a very specific way, starting with loads and the consumption of a location and working through the components such as charge controllers, inverters and batteries. We teach the complete process as students will design an actual system in the classroom.

- **Off Grid Balance of System**

These systems also need disconnects, wiring and system labels. Programming these systems to operate efficiently is essential. We teach the proper way to maximize the output through the proper programming.

- Grid Tied System Design

The current program for grid tied systems is Net Metering, this is where the utility agrees to exchange power from the producer (person generating solar power) and the utility themselves. This program is discussed extensively along with the design, installation and application process. The designing and sizing of the components is critical in assuring the system works to its maximum potential. These components include string inverters, power optimizers and micro inverters.

- Roof Top Simulation

Students will work on an existing roof to install all the components in a grid tied system: racking, solar modules, wiring, inverters, optimizers and disconnects.



- Pole and Ground Mount Simulation

Students will assemble all the framing, racking, modules, batteries and disconnects and wire into an off-grid simulation that will be turned on within the classroom environment.





- [Mechanical Attachments-Solar Racking](#)

The students learn how to design and plan the layout of a solar array. Attaching the complete racking and rail system for the solar modules.

- [Mounting Solar Modules](#)

The students learn the process of how to wire and attached the modules to the racking system, wire management is essential to ensure the system remains working for years.

- [Permits and Suppliers](#)

Dealing with wholesale suppliers, what is a good deal and a deal to be avoided, advantages and disadvantages to choosing local components. Working with local electrical and building departments.

- [Job Preparedness](#)

Developing a daily protocol for work to be done that particular day. Creating tool checklists for each aspect of the job. Understand specialty tools such as crimpers and multi meters.

- [Workplace Safety](#)

Understanding the job and the dangers associated with each aspect. Developing safety plans to comply with the regulations. Working with Personal Protective Equipment and its uses.

- [Over Current Protection](#)

How to correctly size and use fuses and breakers within both off grid and grid tied systems.

- [Grounding](#)

To be code compliant grounding is an important aspect of solar powered systems. The students will ground the components and equipment such as modules and racking.

- [Wiring](#)

Wire management is an important aspect of installing a system, sizing the wire correctly and learning appropriate choices of wire in different applications.

- [Commissioning](#)

When the systems are fully installed the students will learn the correct and safe method of commissioning (turning on) the system.

- [Maintenance and Cleaning](#)

Troubleshooting systems with problems and doing regular maintenance including module cleaning is discussed.

- [Review](#)

There is time after the hands-on is completed to answer any questions the students have for the purpose of clarification and information gathering.