Two-Week Solar PV Design and Installation Workshop

Description

This workshop is designed to provide participants with the theoretical and technical knowledge of designing and installing both off-grid and grid-tie solar PV systems. There are several hands-on training labs included in this workshop.

Morning classes start daily at 9:00 am and run until 12:00pm. Afternoon classes will begin at 12:45 and will run until 4:00 pm.

Module 1: Electrical Basics

Students will learn about voltage, current, resistance, power and energy. They will learn how to use Ohm's law to perform various calculations. Participants will learn about series and parallel connections. Required components of a circuit will be discussed as well as open and closed circuits.

Module 2: Photovoltaics

Students will learn about the Photovoltaic effect. They will learn about solar module construction and the difference between mono-crystalline, poly-crystalline and amorphous types.
Students will understand how to interpret module spec sheets, the IV curve, module degradation as well as learn the effects of solar radiance and temperature change on a module's output.

Module 3: Solar Resource

Students will learn how to read a sun-path chart as well as understand solar azimuth and solar altitude. Terms such as solar insolation, PV potential and solar noon will be explained as well as the required calculations will be taught in order to properly size a "grid tie" system using the location's PV potential.

Module 4: Site Evaluation

Students will be taught which tools are required and how to perform a proper site assessment. Software such as Solar Pathfinder Assistant, Helioscope or Aurora will also be looked at. Students will be taught how to perform a shading analysis as well as generate a site efficiency report.

Module 5: Grid-Tie Inverters & String Sizing

Students will learn the function of an inverter. Central, string and micro-inverters will be looked at and the advantages of each will be considered. Students will also learn how to properly size strings taking into account temperature correction and code requirements.

Module 6: Methods of Attachments

Students will learn the differences between ballast, flush and ground mounted systems. Pole mounts as well as both single and dual axis trackers will be looked at and when it would be advantageous to use them.

Module 7: BOS (Balance of System)

The term balance of system refers to everything that is required to complete an installation aside from the solar modules and electronics.

Devices such as surge arrestors, combiner boxes, disconnect switches, fuses and breakers, along with wire, system labels and SLDs will be looked at and discussed in detail.

Module 8: Wire and OCD (over-current device) Sizing

Students will learn to identify what are the PV source and output circuits as well how to properly size the wire required for each. Participants will also learn about the environmental effect, the 80% rule, voltage drop, and how to de-rate for temperature and conduit fill.

Module 9: Grounding

Students will learn why systems are grounded and what bonding is? They will learn the proper terminology and correct techniques for bonding and grounding a system. Arc-fault protection and rapid shutdown requirements will also be discussed in detail.

Module 10: Batteries

Students will learn about the various types of batteries as well as understanding battery capacity and battery chemistry. Proper battery handling, maintenance, care and safety will also be discussed in detail.

Module 11: Charge Controllers

Students will take an in depth look at the function of a charge controller as well as the importance and difference in the various charging stages. Participants will be able to interpret charge controller spec sheets as well as choosing the proper charger for the system. Features such as MPPT and multi-stage charging will be discussed in detail.

Module 12: Off-Grid Inverters

Students will learn about pure sine and modified sine inverter/chargers. Students will also learn how to interpret the spec sheets of these inverters and choose the proper one for the project. Participants will learn the importance of and also how to properly program an inverter to function efficiently.

Module 13: Load analysis

Students will learn the proper method for sizing an off-grid system. They will be able to perform a load calculation and calculate the daily energy requirements the system must meet.
Participants will learn about "Days of Autonomy", "Depth of Discharge" and how to incorporate these into sizing a system.

Module 14: System Commissioning

Students will learn how to properly commission a system. They will be shown what PPE is required to be worn while commissioning as well as things to check for while starting up a system for the first time.

Module 15: Safety Module

Students will learn about the various hazards a solar installer may encounter. Electrical safety, choosing proper P.P.E, WHMIS over view, working outdoors, and ladder safety will be discussed in detail. Students will also be taught the skills required to work on a roof safely.

Module 16: Section 64

Upon completing this module students will have a good understanding of section 64 of the CEC. In addition they will know what is required for systems to be safe and meet the requirements of the electrical codebook.

Module 17: System Trouble-shooting

Students will be taught some trouble shooting techniques and the tools required to effectively troubleshoot a system. Various examples will be demonstrated.

Module 18: Preparing A Quote and Material List

Students will be taught how to prepare a quote from costing out the job to preparing a cover letter and also including estimates on system performance.

Module 19: Industry Leaders (Manufacturers and Distributors)

Students will be given names of industry leading manufacturers and distributors and a list of the products they carry.

Module 20: Required & Specialty Tools of the Trade

Students will be shown the tools required to preform everything from a site visit and completing a quote, to installing the actual system.

Hands-On LAB

Students will be required to participate in several hands-on training labs.

In the first lab students will get divided into groups of two and each group will get a solar module, inverter, battery and charge controller. They will then draw up an SLD for the system and wire it including any over current protection that is required. The students when finished will commission the system with the help of the instructors.

During the second hands-on lab students will install modules on one of the many indoor roofs. They will learn the proper techniques as well as "tricks of the trade". Students will work with micro-inverters as well as a system utilizing a string inverter and optimizers.

Hands-On LAB (Continued)

During a third hands-on lab, students will be taught how to assemble a ground mount and install the modules and wire up to the combiner box.

Course Review

On the day before the test there will be a lengthy review of the material taught throughout the course/workshop. Students can ask that specific questions from the homework be reviewed or taught/explained again.

Final Exam – 3 hours allowed. The first part of the test is closed book. There are 20 questions both multiple choice and definitions. The students have 30 minutes to complete this portion. The second part of the test is open book and students have 2.5 hours to finish. This portion is short answer and design questions with calculations.

Exam is optional however no certificate will be awarded if exam is not passed. (A mark of 70% is a pass)

Homework is given out each day. It will be taken up in class the next morning. The exam is very similar to the assignments.