RE GENERATION LLC

"Fundamentals of Design and Installation of Photovoltaic Systems" Course

Instructor Information

David Del Vecchio
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David Del Vecchio has over 16 years of experience and 250 MW of design, installation, operations and maintenance of photovoltaic systems under his belt. He earned a Bachelor of Science in Mechanical Engineering with Honor from the Georgia Institute of Technology in 1992. David has designed and installed off-grid systems with solar/wind/hydro/generator hybrid systems, commercial rooftops and large-scale ground mounted solar farms. David became certified by NABCEP as a Certified PV Installation Professional in 2005. He became certified as an IREC Certified Master Trainer for Photovoltaics in 2010. David has been President of Solar Seed, Inc., since 2006. In this capacity, David provides 3rd party services with design assistance, training, construction QC, inspections and commissioning, performance verifications, operations and maintenance. As a sought-after PV trainer in NC, David teaches for the NC Clean Energy Technology Center, Central Carolina Community College, and for Solar Energy International based in Colorado. He also teaches in Canada, Hawaii and the British Virgin Islands. From October 2011 to March 2014, Del Vecchio was the Senior Engineer for Strata Solar in Chapel Hill. Strata is an EPC operating in the utility ground-mount space as well as the commercial rooftop space. Responsibilities involve quality control: starting with equipment customization and specification, design and engineered drawings, construction QC throughout the project, and commissioning the system. He also creates operations and maintenance protocols as well as protocols for commissioning methods and construction detail procedures.

Course Information

Course Description

This is a 40 hour NABCEP approved course offered by RE GENERATION LLC. The course takes place over 5 days with 8 hours of instruction per day. The first four days are cumulative technical theory in a classroom format. This course offers the NABCEP PV Entry Level Exam and is based on NABCEP's Entry Level Learning Objectives for PV installers. This weeklong course will cover solar fundamentals and how to site a PV system, electrical load analysis and how to size a PV system. The lectures of the REPV workshop are dedicated to the technical aspect of photovoltaics, including system types, components, and applications. This course will cover all of the entry level learning objectives outlined by the North American Board of Certified Energy Practitioners (NABCEP). The course covers the best practices for design, installation, maintenance and troubleshooting for PV systems. The course is a NABCEP approved course and as such we offer the NABCEP PV Entry Level Exam at the conclusion of this course.

Required Text & Materials

- Solar Energy International- "Solar Electric Handbook: PV fundamentals and Applications"
- 40 hour custom curriculum covering the NABCEP PV Entry Level Learning Objectives, NEC 2011 and following topics in the SEI manual listed above

Structure

This is an onsite course that will be provided using classroom lectures and a hands-on lab.

STUDENT LEARNING OUTCOMES. ***Students will be able to:***

1. Identify photovoltaic system components and system types
2. Calculate electrical energy and power
3. Identify optimum sites for solar electric systems
4. Calculate electrical loads
5. Correctly size system components
6. Design series and parallel configurations for solar equipment
7. Design a basic grid-tie PV system
8. Estimate PV system energy production
9. Understand PV system specification sheets
10. Understand safety standards of installing PV systems
11. Identify your competency level regarding the tasks on the NABCEP Solar PV Task Analysis (Reference printout in notebook) and gauge readiness to take the NABCEP PV Entry Level Exam based on NABCEP Entry Level Learning Objectives. (see NABCEP notes below)

Module	Date	Topic	Assignment Due
1	Day 1	Photovoltaic Principles • Overview and history of PV • Trends and emerging technologies • Overview of PV system components and system types • Basics of electricity, power and energy review, electrical load analysis • Solar site analysis	Read assigned SEI manual chapters.
2	Day 2	PV Module Basics and Performance Considerations • Module specifications and performance calculations • Wiring modules- series/parallel • Racking types and considerations Grid-Direct Systems • Grid-direct inverter considerations • Grid-direct system sizing • Grid-direct system energy production calculations	Read assigned SEI manual chapters. Take and pass first quiz. Assignment 1- Fill out and submit solar site assessment.
3	Day 3	Wiring, Grounding, and Balance of System Components • Conductor considerations and wire sizing • Grounding • Overcurrent protection, combiner boxes and disconnects	Read assigned SEI manual chapters. Assignment 2- Fill out series/parallel wiring diagram

		Battery-based Systems • Battery-based inverter considerations • Battery basics and specifications • Charge controllers • Sizing battery-based systems	
4	Day 4	Safe installation and commissioning, maintenance and servicing techniques • Data monitoring • Safety and Commissioning • Expedited permitting process • Safety Prep for outdoor lab	Read assigned SEI manual chapters. Take and pass second quiz. Assignment 3- Fill out permitting form.
5	Day 5	Hands-on Lab • Balance of System worksheet • Lay out racking • Mount and Wire up PV panels • Wire inverter and A/C and D/C disconnects • Power up Live Grid-tied PV system • Safety and Commissioning	Fill out Balance of System worksheet from racking to commissioning

Attendance

Policy

Students are responsible to keep up with course materials and meet course required deadlines. Attendance will be taken at every class. Students must be present **90%** of the class in order to receive credit for the course.

Assignments & Quizzes **In order to pass the class students must, at a minimum:**

1.) Achieve a minimal **75%** pass rate on all quizzes (450 questions in total)

2.) Submit all assignments/exercises fully completed

Students who successfully complete course:

1.) Receive a Certificate of Completion for the course

2.) Be eligible to sit for the NABCEP Certificate of Knowledge Exam

3.) Have satisfied the entry level education requirements on the pathway to becoming NABCEP certified

4.) Be eligible for continuing education credits: 40 hours for PDH and 24 for Licensed Electrical Contractors

If you have concerns or suggestions for this course, please contact Maria O'Farrell, Training Program Owner (mdofarre@ncsu.edu@ncsu.edu).