NC CLEAN ENERGY TECHNOLOGY CENTER

ASPV: Advanced Solar PV Design and Installation 2024

Prerequisite

Completion of FSPV: Fundamentals of Solar PV Design and Installation, in-person or online course offered by the NC Clean Energy Technology Center; a comparable PV fundamentals course; or working knowledge of solar PV (i.e. already working in the industry) is required to register for this advanced course.

Course Description

This 40-hour advanced photovoltaics course covers advanced topics on design and installation of residential and commercial PV systems and delves into the details of electrical standards and codes. The bulk of this weeklong workshop covers topics relating to the National Electrical Code® (NEC) requirements for PV systems and prepares the participant for proper code compliance, wire sizing, equipment specifications, permit processing, commissioning, and other necessary steps in the design and installation phases of residential and commercial systems. Activities in this workshop include designing a multiple inverter commercial PV system, from choosing equipment to processing forms, and a tour of commercial PV systems.

WHO SHOULD ATTEND THIS COURSE

- Residential and Industrial Solar System Installers and Designers
- Electricians
- Professional Engineers
- Energy Professionals
- Code Officials
- Emergency Service Providers
- Facility Energy Managers
- Architects and Building Designers

CONTINUING EDUCATION INFORMATION FOR 2024

- 32 PDHs are approved by the NC Board of Examiners for Professional Engineers and Land Surveyors (NCBELS)
- 40 LU|HSW are approved by the American Institute of Architects (AIA), course code ASPV2024
- 24.0 CEs are approved by the North Carolina Board of Examiners for Electrical Contractors (NCBEEC)
- This course is approved by the North American Board of Certified Energy Practitioners (NABCEP) for initial exam application JTA credits and recertification credits. For more information about approved credits, visit the course listing.

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COURSE OUTLINE

Day 1	**Review system design: Grid-Direct** • 3-line wiring diagram review • Deratings – PV Watts review, energy production calculations • Review string sizing • Basics of electrical services and interconnection choices • Lab IV curve and environmental effects vs derates; IV curve tracer; Shading live system; Calculate performance / inverter efficiency, Pathfinder

Day 2	**Review and Introduction to Code**
	• Review lab in-class
	• Review inverter choices for grid-direct small, mid-size and larger systems, and discuss maximizers
	• NEC 690: In-depth look at the 2017 NEC codebook -
	  ○ 690.16(B) Fuse servicing
	  ○ 690.4(E) & (F) Circuit routing
	  ○ 690.7(A) Informational note on ASHRAE data
	  ○ 690.8(B) (1) and (2) Overcurrent devices and conductor ampacity
	  ○ 690.11 Arc-fault protection
	  ○ 690.13 Exception 2 - Disconnecting means - all conductors
	  ○ 690.16(A) and (B) Disconnecting and servicing fuses
	  ○ 690.31(B) PV wire conduit fill calculations
	  ○ 690.31(E) DC circuits inside a building

Day 3	**Conductors, Disconnects, and Boxes** NEC discussion continued: • What to expect in NEC 2020 • Transformer-less inverters & ungrounded arrays • Conductor Sizing • Required disconnects, combiner specifications, mechanical drawings • In depth supply and load side connections • Grounding, Article 250, 690 Section V • Sizing EGC, GEC, and grounding electrode system design • Code required labeling
Day 4	**Connections, Grounding, Labeling, and Commercial Site Analysis** • Site analysis (rooftop or ground) • Flat roof racking options/concerns • Ground mount racking options • Picking a tilt angle – inter-row shading • Safety procedures / Installation best practices / Lock out tag out • Commissioning • LAB on ground fault troubleshooting
Day 5	**Site Analysis** • Ground fault blind spot, what, why and methods for mitigation o Residual current monitoring • Commercial systems - Design and draw a 3 line wire diagram for a complex system • Monitoring options inverter, third party, wireless, etc • Common install errors/code violations **Tour FREEDM Systems Center on NC State Centennial Campus**