Designing Solar PV 1

Learning Objectives

- Perform job site analyses to determine mechanical and electrical integrity and suitability in the selection of an appropriate location for a PV system installation
- Perform customer and load analyses to determine most suitable PV system installation.
- Analyze the electrical and mechanical load details of buildings, solve simple problems involving energy efficiency and perform PV system sizing calculations.
- Draw accurate wiring diagram configurations to represent the electrical and mechanical design of specific PV system projects.

Job Task Analysis

Review Customer Expectations

Apply Calculations and Formulas

Determine proper Array Orientation

Comprehend basic performance characteristics

Comprehend basic system sizing methods

Solar Radiation

- The Sun
  - Define the following key solar power terms; active solar, passive solar, photon,
- Solar Radiation
  - Irradiance, Insolation, kWh, kWh/M^2, W/M^2, Solar Constant, Solar Noon, Zenith, Air Mass, Pyranometer, Pyrheliometer
- PV Array Orientation
  - Altitude, azimuth, Angle of Incidence, Latitude, Equinox, Solstice, Magnetic Declination, Peak Sun Hours, Shading, Weather, Solar Path Diagram
  - Tracking vs Fixed tilt

Introduction to Photovoltaics

- Definition
  - Identify how electricity is generated, explain PV effect
  - Explain PV principles
  - Describe other forms of R.E. wind, hydro, solar thermal, geothermal, fuel cells

Basic Site Survey

Estimating Home Energy Needs

- Identify electrical loads that may be shifted to a more appropriate energy source
- Identify electrical appliances that may be replaced by more energy efficient ones
- Explain the appliance energy star rating system
- Calculate electrical load requirements
- Explain how to compile load calculation information
- Explain the standard load calculation method
- Identify the optional load calculation method
- Explain how to use a load summary worksheet
- Identify peak consumption periods
- Identify the maximum projected load
- Calculate the whole home monthly and yearly projected load

Roof structure: identify the shape and dimensions of structures, taking note of objects that may provide shade

- Measure distances between major system components
- Record roof height and roof access, and take photos
- Note obstructions

Explain photovoltaic module performance

- Series modules
- Parallel modules
- Series/parallel arrays
- Maximum power point
- Short circuit current
- Open circuit voltage
- Temperature coefficient
- Load resistance
- Temperature
- Dirt on panels
- Solar intensity
- Sun Tracking
- Half cut panels

Understand System Performance

- Describe inverter characteristics
- Describe controller characteristics

Battery sizing calculations

- Describe battery characteristics and types
- Theory of operation
- Types
- Features
- Sizing
- Safety issues
- ohms law
- power
- Kirchhoff’s laws
- dwelling unit calculations
- identify transformer calculations