

Photovoltaics

Overview: Photovoltaics Workshop involves hands-on experience on two emerging fields - Renewable energy and Electrical Energy Efficiency.

Session 1: Introduction to

Why Renewable Energy?

- Conservation & Efficiency
- Basics of Electricity
- Solar Thermal
- Solar Electricity
- Wind Power
- Micro-Hydro
- Other Renewable Energy Technologies
- Appropriate Technology for the Developing World
- Economics of Renewable Energy

Session 2: Basic Principles and Concepts of Power

- Power equations
- Basic electricity. Relationship of Watts, Volts and Amps
- Ohm's Law
- Electrical circuits
- How batteries work
- Direct and alternating currents
- Electrical safety
- How to conduct a load assessment

Session 3: Basic Principles and Concepts of Photovoltaic's

- How photovoltaic cells work
- Solar cell efficiency
- Factors affecting cell performance
- Types of photovoltaic cells
- Advantages and disadvantages of photovoltaic technology
- Solar panel specifications
- Photovoltaic System Components
- Inverters (square wave, modified square wave, sine-wave)
- Battery systems
- Battery Systems
 1. Types of batteries
 2. Determining nominal voltage
 3. Calculating Amp hour storage requirements
 4. Depth of discharge
 5. Temperature adjustments
 6. Battery bank sizing calculations
 7. How batteries are charged
 8. Battery storage and maintenance issues
 9. Equalization
 10. Measuring state of charge
 11. Battery safety issues
- Charge Controllers
- Maximum Power Point tracking
- Lightning and over current protection
- Disconnects

Session 4 : Standard system configurations

- Stand-alone systems
- Grid-tied systems
- Grid Interactive
- Grid Fallback
- Hybrid systems

Section 5: Designing a PV system

- Load requirements
- Calculating electrical use
- Load variations
- Cycling loads
- Phantom loads
- Induction motors issues
- Selecting a panel
- Understanding panel specifications
- Determining system inefficiencies
- Wiring selection and voltage drop issues
- Temperature adjustments
- Estimating the size of the array
- Calculating the number of panels given specifications and load requirements
- Determine maximum voltage of system and adjust for temperature variations
- Conduct string calculations
- Grounding, bonding and over-current issues
- Circuits in PV systems and ampacity requirements for each circuit
- Pricing the system as designed (current costs, incentives)
- Connecting to the grid
- Troubleshooting problems

Session 6: Projects

- Solar Inverter
- Solar Charger
- Automatic Street Light
- Solar Tracking Instrument
- Query
- Competition
- Certificate Distribution

Session 7: Projects

- Query
- Certificate Distribution