CSE AAETI

RESIDENTIAL TRAINING

DECENTRALISED RENEWABLE ENERGY (DRE)

DESIGN, INSTALLATION AND MAINTENANCE OF SOLAR MINI-GRID SYSTEMS

DATES: February 15-17, 2023 | **LAST DATE TO APPLY:** January 25, 2023
VENUE: Anil Agarwal Environment Training Institute (AAETI), Nimli, Rajasthan

TRAINING MODULE

Day 1 - FEBRUARY 15, 2023	
Session 1: Introduction and Health & Safety of Solar PV Plants	
10:00 – 10:45 Hours	**Introduction and Health & Safety of Solar PV Plants** ■ Introduction to the Course ■ Workplace Health & Safety ■ Common hazards and controls ■ General safety measures **Electrical Basics and Circuits** ■ Introduction to electrical circuits - series circuits, parallel circuits, combining series and parallel circuits ■ Characteristics of DC and AC electricity
Session 2; Part 1: Solar Energy (Solar Resources)	
10:45 – 11:15 Hours	■ Solar resource ■ Solar radiation ■ Measuring solar radiation ■ Solar radiation data ■ Solar window ■ Peak Sun Hours ■ Capturing solar radiation ■ Optimum positioning for off-Grid PV system – Azimuth, tilt angle
11:15-11:35 Tea break	
Session 2; Part 2: Solar Energy (PV Cells and Modules)	
11:35 – 12:30 Hours	■ Working principle of PV cell ■ PV Cell Electrical Characteristics ■ PV Modules ■ Quantifying PV Module Performance ■ Types of PV Modules technology ■ PV Module Protection ■ Module Reliability ■ PV Module specifications ■ **Q n A**

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Session 2; Part 3: Solar Energy (PV Array Efficiency and Output)	
12:30 – 13:00 Hours	■ Losses in PV system ■ Output of a PV Array
13:00-13:45 Lunch break	
Session 3: Energy Storage	
13:45 – 14:30 Hours	■ Electricity storage ■ Purpose of batteries in PV systems ■ Battery characteristics ■ Battery technologies ■ Combining batteries ■ Battery control systems ■ Other energy storage technologies ■ Safe handling & disposal of batteries
Session 4: Power Conversion Equipment	
14:30 – 15:15 Hours	■ DC to DC Conversion – System controllers and regulators ■ DC to AC Conversion – Inverters ■ Types of Inverters ■ Inverter power ■ Matching of solar PV array, inverter, and MPPT
15:15-15:35 Tea break	
Session 5: Mini-grid Site Selection and Demand Assessment	
15:35 – 16:45 Hours	■ Clustering mini-grid sites ■ Population density vs. mini-grid size ■ Load assessment ■ Identifying Base Loads ■ Metering for mini-grids
Session 6: Mini-grid Community Engagement	
16:45 – 17:15 Hours	■ Introduction to Community Engagement ■ Community Engagement Process ■ Community Engagement Tools
End of Day 1	

Day 2 - FEBRUARY 16, 2023

Session 7: General Mini-Grid Design Principles	
09:30 – 10:15 Hours	■ System design principles ■ Sizing of the PV array for mini-grid ■ Establish design criteria ■ Design Process ■ Determine system configuration ■ Design iteration and optimization ■ Drawings and balance-of-system ■ Overview of mini-grids PV system design

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Session 8: Sizing System Equipment	
10:15 – 11:00 Hours	■ Calculate total daily energy demand ■ Qualification criteria for battery inverter selection ■ Select battery inverter ■ Qualification criteria for battery selection ■ Effect of operating temperature on battery sizing ■ Depth of discharge vs cycle life of batteries ■ Selection of battery
11:00-11:20 Tea Break	
Session 9: Design and Optimization	
11:20 – 12:05 Hours	■ Design and Optimization of Solar Off-Grid and Mini-Grid Systems
Session 10: Site visit	
12:05 – 12:50 Hours	■ Site visit of 150 kWp Solar PV Plant on AAETI Campus
12:50-01:35 Lunch break	
Session 11: Economics and Business Opportunities for Mini-Grids	
13:35 –14:20 Hours	■ Initial system cost ■ Ongoing or recurring cost ■ Life cycle cost analysis ■ Levelized cost of electricity ■ Business model and implementation strategy ■ Source of funding
Session 12: Mini-grid Energy Generation Performance Monitoring	
14:20 –14:50 Hours	■ Data Collection ■ Analysis ■ Performance indicators
14:50-15:10 Tea Break	
Session 13: System Wiring and Protection	
15:10 –15:40 Hours	■ Cable selection and sizing ■ Types of protection devices ■ Earthing protection of Solar Mini-Grid system ■ Lightning protection
Session 14: Mini-Grid Installation, Maintenance and Troubleshooting	
15:40 – 16:40 Hours	■ Installation of PV array ■ PV mounting system ■ Commissioning ■ Maintenance of components ■ Shutdown procedure ■ Troubleshooting of plant
End of Day 2	

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Day 3 - FEBRUARY 17, 2023	
9:30 – 10:00 Hours	**Assessment Test**
10:00 – 11:00 Hours	**Guest Lecture:** Sustainable mini-grids: the perspective of developers
11:00-11:20 Tea break	
11:20 – 11:50 Hours	**Feedback**
11:50 – 12:30 Hours	**Certificates distribution and Vote of Thanks by** Dr. Koshy Cherail, Programme Director, Renewable Energy
12:30-13:15 Lunch break	
13:15 Hours onwards	**Dispersal from AATI Campus**