



Battery Energy Storage System BESS - And Solar PV Systems

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COURSE DATES AND TIMES

Battery Energy Storage System BESS Training Overview

This instructor-led course is designed for engineers, technicians, and installers who are involved in the installation, inspection, testing, and maintenance of these systems. The course covers the fundamental concepts of battery energy storage systems, including battery types and characteristics, electrochemistry basics, and battery management systems. Participants will gain an in-depth understanding of various battery energy storage technologies, including lithium-ion, lead-acid, sodium-sulphur, and flow batteries.

The course also covers the installation, commissioning, and maintenance of battery energy storage systems, including battery bank configurations, charging and discharging considerations, battery enclosures, safety requirements, and system integration and monitoring. Participants will learn about the importance of regular maintenance procedures, including inspections, cleaning, tightening connections, and replacing damaged or worn components. They will also learn about various battery testing procedures, including capacity testing, internal resistance testing, load testing, float testing, and temperature testing.

The course focuses on mitigating explosion and fire hazards associated with battery energy storage systems, including installing thermal runaway barriers, using fire suppression systems, and implementing battery management system alarms and shutdown procedures.

At the end of the course, participants will have a comprehensive understanding of lithium-ion battery banks and stackable energy storage battery systems used in solar energy storage systems. They will be familiar with the installation, inspection, testing, and maintenance procedures for these systems, as well as NFPA and other leading standards governing the control of battery storage systems. Additionally, they will have the skills and knowledge needed to mitigate explosion and fire hazards safely and to conduct comprehensive testing and maintenance of battery energy storage systems.

Learning Outcomes

At the end of the course, participants will have a comprehensive understanding of stationary lithium-ion battery banks and stackable energy storage battery systems used in photovoltaic, solar, and other renewable energy storage sites. They will be familiar with the installation, inspection, testing, and maintenance procedures for these systems, as well as NFPA and other leading standards governing the control of battery storage systems. Additionally, they will have the skills and knowledge needed to mitigate explosion and fire hazards safely and to conduct comprehensive testing and maintenance of battery energy storage systems.

WHO SHOULD ATTEND

- Solar PV installers and maintenance technicians
- Battery energy storage system designers and technicians
- Renewable energy and electrical engineers
- Electrical technologists and system designers
- Battery maintenance and testing personnel
- Project managers and quality assurance staff
- Renewable energy safety professionals
- Government and regulatory personnel in energy policy

COURSE OUTLINE

Battery Energy Storage Technologies for Solar PV Systems - Program Outline

Day 1:

Session 1: Introduction to Solar Energy Storage Systems

Battery Types and Characteristics

- Electrochemistry Basics
- Battery Cell Construction
- Battery Management Systems

Overview of Solar PV Systems

- Types of Solar Energy Storage Systems
- Market Trends in Solar Energy Storage
- Safety Considerations and Standards for Solar Energy Storage Systems

Session 2: Battery Energy Storage Technologies for Solar PV Systems

Lithium-Ion Batteries

- Construction and Operation
- Advantages and Disadvantages

- Maintenance and Safety Considerations

Other Battery Energy Storage Technologies for Solar PV Systems

- Lead Acid Batteries
- Sodium Sulfur Batteries
- Flow Batteries
- Comparison of Different Battery Types

Session 3: Stationary Battery Banks and Energy Storage Systems for Solar PV Systems

Battery Bank Configurations

Charging and Discharging Considerations

Battery Enclosures and Safety Requirements

System Integration and Monitoring for Solar PV Systems

Installation and Commissioning of Battery Energy Storage Systems for Solar PV Systems

Session 4: Battery Testing and Maintenance Procedures for Solar Energy Storage Systems

Battery Maintenance Procedures for Solar PV Systems

- Inspection of cells, connections, and terminals
- Cleaning of cells, connections, and terminals
- Tightening of loose connections
- Inspection of electrolyte levels and topping up
- Cleaning of battery racks and enclosures
- Replacement of damaged or worn components
- Record-keeping of maintenance procedures and battery performance

Battery Testing Procedures for Solar PV Systems

- Capacity testing
- Internal resistance testing
- Load testing
- Float testing
- Temperature testing
- Periodic testing of battery management systems

Mitigation of Explosion and Fire Hazards in Solar PV Systems

- Thermal Runaway Barriers
- Fire Suppression Systems
- Battery Management System Alarms and Shutdown Procedures

Day 2:

Session 5: Battery Management Systems and Control Strategies for Solar Energy Storage Systems

Battery Management System Architecture for Solar PV Systems

State-of-Charge Estimation Techniques for Solar PV Systems

State-of-Health Estimation Techniques for Solar PV Systems

Balancing and Equalization Strategies for Solar PV Systems
Overvoltage and Undervoltage Protection for Solar PV Systems

Session 6: Inspection and Maintenance of Battery Energy Storage Systems for Solar PV Systems

Inspection of Battery Racks and Enclosures for Solar PV Systems
Cleaning and Lubrication of Battery Hardware for Solar PV Systems
Battery System Grounding and Bonding for Solar PV Systems
Visual Inspection of Battery Cables and Connections for Solar PV Systems
Battery Monitoring System Testing for Solar PV Systems
Battery Performance Testing for Solar PV Systems

Session 7: Troubleshooting Battery Energy Storage Systems for Solar PV Systems

Identification of Battery Failure Modes for Solar PV Systems
Common Causes of Battery Failure for Solar PV Systems
Troubleshooting Battery Management Systems for Solar PV Systems
Troubleshooting Battery Cabling and Connections for Solar PV Systems
Diagnosing Battery Performance Issues for Solar PV Systems

Session 8: Commissioning and Acceptance Testing of Battery Energy Storage Systems for Solar PV Systems

Pre-Commissioning Preparation for Solar PV Systems
Verification of Battery Bank Construction for Solar PV Systems
Testing of Battery Management Systems for Solar PV Systems
Battery Capacity and Performance Testing for Solar PV Systems
Documentation and Record-Keeping Requirements for Solar PV Systems

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