Comprehensive Solar PV System Design and Installation Training Course



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Sharm El-Sheikh

4100 € (Per Person)

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Course Introduction / Overview:

This course provides a comprehensive, in-depth exploration of solar photovoltaic (PV) system design and installation, tailored for professionals seeking to master the entire project lifecycle from conception to commissioning. In an era of accelerating transition towards renewable energy, the demand for skilled solar professionals has never been higher. This program, offered by BIG BEN Training Center, is meticulously structured to bridge the gap between theoretical knowledge and practical, on-the-ground application. We delve into the core principles that govern solar technology, drawing on foundational concepts outlined by pioneers like Dr. Martin A. Green in seminal works such as "Solar Cells: Operating Principles, Technology, and System Applications". Participants will move beyond basic concepts to learn the nuances of solar site assessment, advanced PV system sizing, component selection, and adherence to critical safety and electrical codes. The curriculum is designed to empower attendees with the confidence to design, manage, and install robust, efficient, and financially viable solar energy systems for residential, commercial, and industrial applications, ensuring they are well-equipped to lead in the burgeoning solar industry.

Target Audience / This training course is suitable for:

- Electrical Engineers and Technicians.
- Project Managers and Site Supervisors.
- Renewable Energy Consultants.
- System Designers and Installers.
- Facilities and Operations Managers.
- Construction Professionals.
- Technical Sales Professionals in the energy sector.
- Aspiring Solar Entrepreneurs.
- Architects and Building Planners.

Target Sectors and Industries:

- Energy and Utilities Sector.
- Construction and Real Estate Development.
- Engineering and Consulting Firms.
- Manufacturing and Industrial Facilities.
- Telecommunications.
- Agriculture and Agribusiness.
- Governmental bodies and Public Sector entities.
- Non-profit and International Development Organizations.

Target Organizations Departments:

- Engineering and Technical Services.
- Project Management Office.
- Operations and Maintenance.
- Facilities Management.
- Sustainability and Corporate Social Responsibility (CSR).
- Procurement and Supply Chain.
- Research and Development.
- Capital Projects and Infrastructure.

Course Offerings:

By the end of this course, the participants will have able to:

- Conduct a thorough solar site assessment to determine project feasibility.
- Calculate electrical loads and size a PV system accurately for various applications.
- Design complete grid-tied, off-grid, and hybrid solar PV systems.
- Select appropriate PV modules, inverters, batteries, and balance-of-system components.
- Apply National Electrical Code (NEC) standards to PV system design and installation.
- Develop comprehensive system layouts and single-line electrical diagrams.
- Manage the mechanical and electrical installation processes safely and efficiently.
- Perform system commissioning, testing, and performance verification.
- Troubleshoot and maintain solar PV systems for optimal long-term performance.
- Analyze the financial viability and return on investment for solar projects.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be immersive, interactive, and highly practical, ensuring that participants gain tangible skills they can apply immediately. We move beyond traditional lecture-based formats to create a dynamic learning environment. The course integrates a blend of expert-led instruction, detailed case studies of real-world solar projects, and collaborative group workshops. Participants will engage in hands-on design simulations using industry-standard principles, allowing them to tackle complex challenges in a controlled setting. Interactive sessions, Q&A panels, and peer-to-peer discussions are central to our approach, fostering a collaborative atmosphere where knowledge is shared and reinforced. Our instructors provide continuous feedback and personalized guidance, helping participants to connect theoretical concepts with practical implementation. This multifaceted approach ensures a deep understanding of solar PV system design and installation, from initial site survey to final commissioning, preparing participants for real-world scenarios and complex project demands.

Course Agenda (Course Units):

Unit One: Fundamentals of Solar Photovoltaic Systems

- Introduction to renewable energy and solar power's role.
- Physics of photovoltaic conversion and solar cell technology.
- Types of PV systems: grid-tied, off-grid, and hybrid.
- Overview of major system components: modules, inverters, batteries, and racking.
- Fundamentals of solar radiation, irradiance, and insolation.
- Understanding sun path diagrams and solar geometry.
- Essential electrical concepts: voltage, current, resistance, and power.
- Introduction to industry safety standards and personal protective equipment (PPE).

Unit Two: Solar PV Site Assessment and Planning

- Conducting a comprehensive site survey and data collection.
- Shading analysis techniques and tools.
- Evaluating roof and ground suitability for solar installations.
- Assessing existing electrical infrastructure and grid interconnection points.
- Calculating residential and commercial energy loads.
- Navigating local permitting, codes, and utility requirements.
- Introduction to solar design software and modeling tools.
- Creating a preliminary site plan and feasibility report.

Unit Three: PV System Design and Component Sizing

- Detailed PV module selection and string sizing calculations.
- Inverter types, specifications, and selection criteria.
- Designing grid-tied systems for maximum energy export.
- Designing off-grid and hybrid systems with battery storage.
- Deep dive into battery technologies: lead-acid, lithium-ion, and flow batteries.
- Sizing charge controllers and battery banks.
- Calculating wire sizes, voltage drop, and conduit fill.
- Designing overcurrent protection, disconnects, and grounding systems.

Unit Four: Mechanical and Electrical Installation Practices

- Best practices for installing rooftop and ground-mounted racking systems.
- Proper techniques for handling and mounting PV modules.
- Module wiring strategies and connector installation.
- Installing inverters, combiner boxes, and other balance-of-system components.
- Grounding and bonding requirements for equipment and structures.
- Implementing rapid shutdown systems as per NEC requirements.
- System labeling, signage, and creating as-built documentation.
- Walkthrough of the complete installation sequence from start to finish.

Unit Five: Commissioning, Maintenance, and Project Economics

- Step-by-step system commissioning and startup procedures.
- Performing essential electrical tests: insulation resistance, open-circuit voltage, and short-circuit current.
- Verifying system performance and utilizing monitoring platforms.
- Developing a proactive operations and maintenance (O&M) plan.
- Troubleshooting common issues in PV modules, inverters, and wiring.
- Understanding solar project financing, incentives, and tax credits.
- Calculating Levelized Cost of Energy (LCOE) and Return on Investment (ROI).
- Project closeout, client handover, and warranty documentation.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Considering the rapid advancements in battery storage technology and grid interactivity, how might the traditional distinction between grid-tied and off-grid PV system designs evolve into a more integrated, resilient energy architecture in the next decade?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by offering a holistic and deeply practical curriculum that covers the entire solar project lifecycle, from initial client consultation to long-term maintenance. Unlike programs that focus narrowly on either design theory or basic installation, we integrate these disciplines to create well-rounded professionals. Our approach emphasizes the "why" behind the "how," ensuring participants understand the complex interplay between component selection, system design, and financial outcomes. We place a strong emphasis on current industry standards, particularly the latest National Electrical Code (NEC) requirements for solar installations, which is critical for compliance and safety. The curriculum moves beyond generic examples, using detailed case studies to explore the nuances of designing systems for diverse applications, including residential, commercial, and unique off-grid scenarios. Furthermore, the course integrates crucial project management and economic analysis skills, empowering participants not only to build a system but also to build a compelling business case for it. This blend of technical depth, regulatory knowledge, and financial acumen ensures graduates are prepared to lead, innovate, and excel in the competitive solar energy market.