Implementing Smart Grids in Modern Power Systems Training Course



14 - 18 Dec 2026

Cape town

4600 € (Per Person)

Ref: #ERE8781_273960

Course Introduction / Overview:

The global energy landscape is undergoing a monumental transformation, moving away from traditional, centralized power grids towards a more intelligent, resilient, and sustainable infrastructure. This shift is driven by the urgent need for grid modernization to accommodate renewable energy integration, enhance operational efficiency, and improve reliability. The Smart Grid stands at the heart of this evolution, representing a complex ecosystem of advanced technologies, communication networks, and data analytics. This course provides a comprehensive exploration of modern power systems and the strategic implementation of smart grid technologies. As detailed by experts like Janaka Ekanayake in works such as "Smart Grid: Technology and Applications," the transition requires a deep understanding of both foundational principles and cutting-edge innovations. BIG BEN Training Center has designed this program to equip professionals with the necessary skills to navigate this complex domain, covering everything from Advanced Metering Infrastructure (AMI) and Distributed Energy Resources (DER) to cybersecurity protocols and regulatory frameworks. Participants will gain a holistic perspective, enabling them to lead and contribute to the development of the next generation of power grids, ensuring a secure and efficient energy future.

Target Audience / This training course is suitable for:

- Electrical Engineers and Power System Engineers.
- Utility Managers and Grid Operators.
- Energy Policy Makers and Regulators.
- Project Managers in the energy and utility sectors.
- IT and Cybersecurity Professionals in utilities.
- Renewable Energy Integration Specialists.
- Technology Consultants and System Integrators.
- Asset Management Professionals.
- Researchers and Academics in power systems.

Target Sectors and Industries:

- Electric Power Generation, Transmission, and Distribution Utilities.
- Renewable Energy Companies (Solar, Wind, etc.).
- Engineering, Procurement, and Construction (EPC) Firms.
- Energy Technology and Software Development Companies.
- Governmental Energy Ministries and Regulatory Commissions.
- Large Industrial and Commercial Facilities with significant energy consumption.
- Telecommunication Companies providing network infrastructure for grids.
- Consulting Firms specializing in energy and infrastructure.

Target Organizations Departments:

- Grid Planning and Operations.
- Engineering and Technical Services.
- Information Technology (IT) and Operational Technology (OT).
- Cybersecurity and Network Security.
- Project Management and Implementation.
- Regulatory Affairs and Compliance.
- Asset Management and Maintenance.
- Research and Development (R&D).
- Corporate Strategy and Innovation.

Course Offerings:

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

- Analyze the fundamental architecture and components of smart grids.
- Evaluate various smart grid technologies, including AMI, SCADA, and DERs.
- Develop strategies for the seamless integration of renewable energy sources.
- Design and implement robust cybersecurity measures for critical grid infrastructure.
- Apply data analytics techniques for enhanced grid monitoring and decision-making.
- Understand the principles of demand-side management and energy storage systems.
- Assess the economic feasibility and create business cases for smart grid projects.
- Navigate the complex regulatory and policy landscapes governing grid modernization.
- Manage the lifecycle of a smart grid implementation project effectively.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be immersive, practical, and highly interactive, ensuring participants can translate theoretical knowledge into real-world capabilities. This course moves beyond traditional lectures by incorporating a dynamic blend of expert-led presentations, in-depth case study analyses of global smart grid deployments, and collaborative group workshops. Participants will engage in hands-on simulation exercises that mimic grid operation challenges, allowing them to test strategies for fault detection, load balancing, and cybersecurity threat response in a controlled environment. Interactive sessions encourage open dialogue and peer-to-peer learning, where professionals from diverse backgrounds can share insights and experiences. Our approach emphasizes problem-solving and critical thinking, with continuous feedback from instructors to guide learning. The program is structured to build confidence, providing attendees with not just the 'what' and 'why' of smart grids, but the critical 'how' of successful implementation, ensuring they leave with actionable skills and a strategic mindset ready to be applied in their respective roles.

Course Agenda (Course Units):

Unit One: Foundations of Modern Power Systems and Smart Grids

- Introduction to conventional power grids and their limitations.
- The evolution towards a smarter grid and key drivers for change.
- Defining the smart grid concept, vision, and benefits.
- Smart Grid Architecture Model (SGAM) and its domains.
- Key components and functional layers of a smart grid.
- Understanding the roles of generation, transmission, and distribution.
- Challenges and opportunities in grid modernization projects.

Unit Two: Core Smart Grid Technologies and Infrastructure

- Advanced Metering Infrastructure (AMI) and smart meters.
- Supervisory Control and Data Acquisition (SCADA) systems for modern grids.
- Energy Management Systems (EMS) and Distribution Management Systems (DMS).
- Communication networks and protocols (e.g., IEC 61850).
- Distributed Energy Resources (DERs) and their impact on the grid.
- Energy Storage Solutions (ESS) including battery and pumped-hydro.
- Phasor Measurement Units (PMUs) and Wide Area Monitoring Systems (WAMS).

Unit Three: Smart Grid Operations, Control, and Data Analytics

- Demand-Side Management (DSM) and demand response programs.
- Volt/VAR Optimization (VVO) for efficiency and power quality.
- Grid data analytics and the role of big data in operations.
- Advanced fault detection, isolation, and service restoration (FDIR).
- Power quality monitoring and mitigation techniques.
- Ensuring power system stability with high renewable penetration.
- Predictive analytics for asset management and maintenance.

Unit Four: Renewable Integration, Microgrids, and Cybersecurity

- Challenges of integrating variable renewable energy (VRE) sources.
- Microgrid and nanogrid architecture, operation, and control.
- The role of smart grids in supporting electric vehicle (EV) infrastructure.
- Building grid resilience against physical and cyber threats.
- Common cybersecurity vulnerabilities in smart grid systems.
- Cybersecurity standards and best practices (NIST Framework, NERC CIP).
- Developing a multi-layered defense-in-depth security strategy.

Unit Five: Project Implementation, Policy, and Future Trends

- Planning and managing smart grid implementation projects.
- Conducting cost-benefit analysis and building a business case.
- Navigating regulatory policies and market structures.
- Interoperability and the importance of international standards.
- The role of Artificial Intelligence (AI) and Machine Learning (ML) in future grids.
- Exploring transactive energy and blockchain applications.
- The future outlook for smart cities and integrated energy systems.

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:

As distributed energy resources become more prevalent, how might the traditional centralized utility model need to evolve to maintain grid stability and ensure equitable energy access?

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

This course distinguishes itself by offering a holistic, strategy-focused perspective that extends beyond mere technical specifications. While many programs concentrate solely on the engineering aspects, this training integrates the critical pillars of technology, policy, cybersecurity, and project management into a unified curriculum. We emphasize the practical challenges of implementation, using real-world case studies to explore why some smart grid projects succeed while others fail. This approach moves participants from theoretical understanding to strategic application. Furthermore, the course is intentionally forward-looking, dedicating significant time to emerging trends such as AI in grid management, transactive energy models, and the integration with smart city initiatives. This ensures that participants are not only equipped to handle today's challenges but are also prepared to lead the next wave of grid innovation. The vendor-agnostic content focuses on fundamental principles and international standards, providing professionals with versatile and enduring skills that are applicable across different technology platforms and geographical regions, fostering a deeper, more adaptable expertise.