Optimizing Solar Thermal Power Plant Efficiency Training Course



18 - 22 Oct 2026

Dubai

4800 € (Per Person)

Ref: #ERE2702_224380

Course Introduction / Overview:

This training course provides a comprehensive exploration of the principles and practices for enhancing the efficiency and performance of solar thermal power plants. In an era demanding sustainable energy solutions, maximizing the output of concentrated solar power (CSP) facilities is paramount. This program delves into the entire lifecycle of a solar thermal plant, from initial site assessment and technology selection to advanced operational strategies and maintenance protocols. Participants will gain a deep understanding of the critical subsystems, including the solar field, heat transfer fluid systems, thermal energy storage (TES), and the power block. The curriculum is grounded in established engineering principles, drawing on insights from leading academics like Dr. Yogi Goswami and foundational texts such as "Principles of Solar Engineering". BIG BEN Training Center has designed this course to bridge the gap between theoretical knowledge and practical application, equipping professionals with the skills to analyze performance data, diagnose inefficiencies, and implement robust optimization strategies. The focus is on achieving operational excellence, reducing the levelized cost of energy (LCOE), and ensuring the long-term viability and reliability of solar thermal power generation assets.

Target Audience / This training course is suitable for:

- Plant Managers and Operations Supervisors.
- Control Room Operators.
- Maintenance Engineers and Technicians.
- Performance and Efficiency Analysts.
- Renewable Energy Project Developers.
- Engineering Consultants.
- Process and Chemical Engineers in the energy sector.
- Technical Managers and Asset Managers.
- Research and Development Professionals in solar energy.
- Energy Policy Planners and Regulators.

Target Sectors and Industries:

- Energy and Power Generation.
- Electric Utilities.
- Renewable Energy Development.
- Heavy Engineering and Construction.
- Independent Power Producers (IPPs).
- Engineering, Procurement, and Construction (EPC) Companies.
- Technology and Equipment Manufacturing.
- Governmental Energy Agencies and Regulatory Bodies.
- Environmental and Sustainability Consulting.
- Financial Institutions investing in renewable projects.

Target Organizations Departments:

- Operations and Maintenance (O&M).
- Engineering and Technical Services.
- Project Management and Development.
- Asset Management.
- Research and Development (R&D).
- Health, Safety, and Environment (HSE).
- Quality Assurance and Control.
- Strategic Planning and Business Development.
- Procurement and Supply Chain.
- Finance and Investment.

Course Offerings:

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

- Analyze the performance of different concentrated solar power technologies like parabolic troughs and solar towers.
- Master solar resource assessment and its impact on plant design and output.
- Evaluate the design and operation of solar fields, receivers, and heat transfer fluid systems.
- Implement best practices for the operation and maintenance of solar thermal power plants.
- Optimize thermal energy storage systems to improve plant dispatchability and revenue.
- Utilize key performance indicators (KPIs) to monitor and benchmark plant efficiency.
- Develop strategies for mitigating soiling and degradation effects on solar collectors.
- Conduct economic analysis, including calculating the Levelized Cost of Energy (LCOE).
- Apply advanced control strategies for improved plant stability and performance.
- Troubleshoot common operational issues in solar thermal power systems.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to foster a dynamic and immersive learning environment that goes beyond traditional lectures. This course on solar thermal power plant optimization employs a blended approach, combining expert-led presentations with interactive, hands-on learning experiences. Participants will engage with real-world case studies of existing concentrated solar power (CSP) plants, analyzing their operational successes and challenges. Group discussions and collaborative problem-solving sessions will encourage the sharing of diverse perspectives and practical knowledge. The curriculum incorporates simulation exercises where attendees can apply performance analysis techniques to sample data sets, helping to solidify their understanding of key performance indicators and diagnostic methods. Interactive workshops will focus on developing O&M plans and optimization strategies for hypothetical plant scenarios. Continuous feedback from the instructor and peers is a core component, ensuring that participants can confidently apply the learned concepts in their professional roles. The emphasis is on practical skill development, critical thinking, and equipping attendees with actionable tools to drive efficiency improvements in their organizations.

Course Agenda (Course Units):

Unit One: Fundamentals of Concentrated Solar Power (CSP) Technology

- Introduction to solar thermal energy and its role in the global energy mix.
- Principles of solar radiation and solar geometry.
- Comprehensive solar resource assessment and site selection criteria.
- Overview of different CSP technologies: Parabolic Trough, Solar Tower, Linear Fresnel, and Dish-Stirling.
- Thermodynamic principles of solar power cycles (Rankine, Brayton).
- Key components of a generic CSP plant layout.
- Comparative analysis of CSP technologies based on performance and cost.

Unit Two: Solar Field and Receiver System Optimization

- Detailed design and engineering of parabolic trough collectors.
- Heliostat field layout, design, and calibration for solar towers.
- Analysis of solar receiver types, materials, and thermal performance.
- Heat Transfer Fluids (HTFs): properties, selection, and management.
- Strategies for optimizing solar field optical and thermal efficiency.
- Understanding and mitigating cosine losses and shading effects.
- Advanced tracking systems and control for collectors and heliostats.

Unit Three: Thermal Energy Storage (TES) and Power Block Integration

- The role of Thermal Energy Storage in enhancing plant value and grid stability.
- Types of TES systems: two-tank molten salt, thermocline, and advanced concepts.
- Design, integration, and operational strategies for TES systems.
- Thermodynamics and efficiency of the steam turbine and power block.
- Optimizing the interface between the solar field, TES, and the power block.
- Water consumption in CSP plants and strategies for water management.
- Concepts of hybridization with fossil fuels or other renewables.

Unit Four: Plant Operations, Maintenance, and Performance Monitoring

- Best practices for daily, weekly, and annual plant operations.
- Developing a comprehensive Operations and Maintenance (O&M) plan.
- Strategies for solar field cleaning and soiling mitigation.
- Key Performance Indicators (KPIs) for tracking plant efficiency and availability.
- Instrumentation, data acquisition systems (SCADA), and performance modeling.
- Predictive and preventive maintenance techniques for critical components.
- Troubleshooting common operational faults and system diagnostics.

Unit Five: Advanced Optimization, Economics, and Future Trends

- Advanced process control and automation strategies for CSP plants.
- Applying data analytics and machine learning for performance optimization.
- Economic analysis: Capital costs, O&M costs, and Levelized Cost of Energy (LCOE).
- Health, safety, and environmental (HSE) considerations in CSP plant operations.
- Regulatory frameworks, policy incentives, and market trends for CSP.
- Emerging technologies and innovations in CSP and TES.
- Course review, final assessment, and development of a personal action plan.

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 intermittency challenges of renewables, how can advanced thermal energy storage and hybridization strategies transform solar thermal plants from intermittent generators into reliable, baseload power sources?

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

This course distinguishes itself by offering a holistic, lifecycle perspective on solar thermal power plant efficiency, moving beyond purely theoretical or component-specific training. While other programs may focus narrowly on design principles, this curriculum integrates technical knowledge with the practical realities of operations, maintenance, and economic viability. A key differentiator is the profound emphasis on data-driven decision-making, teaching participants not just what to monitor but how to interpret performance data to diagnose inefficiencies and implement targeted improvements. The course uniquely bridges the gap between the solar field and the power block, treating the plant as an integrated system where optimization in one area directly impacts another. Furthermore, it places significant weight on the economic aspects, particularly the reduction of the Levelized Cost of Energy (LCOE), which is the ultimate benchmark for a plant's success. By combining rigorous engineering principles with real-world case studies and financial metrics, the course provides a multi-faceted and commercially-aware skill set that is immediately applicable for enhancing the operational excellence and profitability of solar thermal assets.