Content Community Connection

United States
The Electricity Forum Inc.
742 Pre Emption Road
Geneva, NY 14456
Tel 289-387-1025

Canada
The Electricity Forum
1885 Clements Rd, Unit 218
Pickering, ON L1W3V4
Tel 905-686-1040
Fax 905-686-1078
Toll Free 855-824-6131

36 Hour (6 Days) Renewable Energy Systems Training - Solar PV System Design (Feb. 1-2, 2024), Wind Power Systems Engineering (Feb. 8-9, 2024), Renewable Energy Grid Integration (Feb. 15-16, 2024)

Course details: https://electricityforum.com/electrical-training/renewable-energy-systems-training

COURSE DATES AND TIMES

Our 36-hour Renewable Energy Systems Training is actually three separate courses: Solar PV System Design, Wind Power Systems Engineering, and Renewable Energy Grid Integration. The three courses together are designed to help both junior and experienced electrical engineers understand electrical power systems as they apply to industrial, commercial and institutional buildings and facilities. NOTE: Course Includes FULL Demo Power System Analysis Software License.

Renewable Energy Systems Training Course - Our 6 day (36 hours) live online instructor-led course is actually a series of three courses:

1. Solar PV System Design - Feb. 1-2, 2024

2. Wind Power Systems Engineering - Feb. 8-9, 2024

3. Renewable Energy Grid Integration - Feb. 15-16, 2024

Embark on a transformative journey into the world of renewable energy with our comprehensive 36-Hour (6 Day) training course, encompassing three meticulously crafted courses scheduled for February 2024. This live online instructor-led course is an exceptional opportunity for energy professionals seeking to delve into the rapidly evolving sector of renewable energy.

The first course, Solar PV System Design (Feb. 1-2, 2024), delves into the intricacies of photovoltaic technology. Participants will gain a robust understanding of solar panel design, installation techniques, and system optimization. This course is particularly beneficial for PV system owners, PV system technicians, electrical project designers, consulting electrical engineers, industrial, commercial, institutional electrical engineers, electrical project managers, and installation and operating engineers who require knowledge of solar PV systems.

Following this, the Wind Power Systems Engineering course (Feb. 8-9, 2024), focuses on the technical aspects of wind energy. This course offers a deep dive into wind turbine technology, site assessment, and the integration of wind power into existing energy systems. It's ideal for electrical engineering professionals in the renewable energy sector, environmental scientists, and policy makers who are keen on harnessing wind energy for sustainable development.

The final course, Renewable Energy Grid Integration (Feb. 15-16, 2024), explores the challenges and strategies related to integrating renewable energy sources into the existing power grid. Participants will learn about grid stability, energy storage solutions, and regulatory frameworks. This course is especially relevant forElectric Utility Planning Engineers, Electrical Engineers, Grid Integration Specialists, Energy Policy Makers, Renewable Energy Consultants, Microgrid Developers, Energy Storage Solution Providers, Regulatory Professionals, Utility Managers and Operators, Research and Academic Professionals, Project Developers in Renewable Energy, and Smart Grid Technology Providers.

Three Courses In One

Taking these courses together offers a holistic view of the renewable energy landscape. Participants will emerge with a comprehensive understanding of the key renewable energy technologies and their practical applications. They will also gain insight into the latest trends, challenges, and opportunities in the renewable energy sector.

This package is tailored for a broad audience, including professionals looking to pivot or advance in the renewable energy sector, entrepreneurs exploring sustainable business models, and educators or students seeking to enrich their understanding of renewable technologies. Additionally, it's an invaluable resource for government officials and policy makers tasked with shaping the future of energy in their jurisdictions.

Our 36-hour (6 Days) Renewable Energy Systems Training course package of three courses offers a rare amalgamation of technical knowledge, practical skills, and strategic insights, making them an indispensable asset for anyone serious about contributing to the renewable energy revolution.

Course #1. Solar PV System Design - Feb. 1-2, 2024
www.electricityforum.com/electrical-training/solar-pv-design-training

Solar PV System Design Training - Our 12-Hour (2-Day) live online, instructor-led workshop introduces students to the National Electrical Code (NEC 2023) and CE Code

(2024) photovoltaic system standards as well as other international standards that pertain to the safe and efficient design of grid-direct Solar PV Systems. This course foruses primarily on both residential and commercial-scale systems. However, the NEC and CE Code requirements for Solar PV Systems, including most design parameters and best practices are applicable to all types and sizes of Solar PV installations, including large utility-scale projects.

This Solar PV System Design Training course will examine the following requirements for disconnects:

- Overcurrent protection
- Proper wire sizing
- Grid interconnection requirements and calculations
- Grounding, ground-faults, and surge protection
- Calculations and examples for system sizing, inverter selection, and electrical configuration
- Ground and roof mount details
- Labeling and data acquisition systems

The objectives of this 3-day Solar PV System Design course are to:

- Provide an introduction to Solar energy
- Describe various PV systems and their components
- Explain operation of modules and electrical characteristics
- Go through a site assessment including shade analysis
- Explain the theory of both grid-connected and off-grid systems
- Size and design few grid-connected PV systems
- Size and design few off-grid PV systems
- Utilize the Canadian Electrical Code to design systems safely
- Design and install a 1.5kW string inverter system
- Design and install a 1.5kW micro inverter system

You will learn in details about:

- PV Electrical Design Basics
- PV Module Fundamentals
- PV System Sizing Principles
- PV System Electrical Design
- You will learn how to design solar power systems and reduce or eliminate energy bills.

Course #2. Wind Power Systems Engineering - Feb. 8-9, 2024
www.electricityforum.com/electrical-training/wind-power-engineering

Wind-based electrical generation is the fastest growing renewable energy technology at

present and is becoming a significant portion of the energy mix. This 12-hour (2-day) course gives an overview of wind power system technologies.

As the world pivots towards sustainable energy solutions, wind energy has emerged as a leading and rapidly-growing renewable technology. This intensive 12-hour course delves deep into the world of wind energy engineering, offering participants a comprehensive understanding of wind farm development, from initial site selection to integration into the electric grid. The course combines a mixture of technical and practical components, enabling students to gain insight into the intricacies of wind turbine systems, both onshore and offshore, and to explore the prospective challenges and opportunities within the wind energy sector.

Learning Outcomes:

- Grasp fundamental concepts of wind engineering and turbine technology.
- Dive deep into the mechanical and electrical components that make up wind turbines.
- Investigate the distinctions, challenges, and advantages of both onshore and offshore wind technologies.
- Acquaint oneself with prevalent electrical and mechanical challenges in wind turbine design and their subsequent solutions.

Who should attend

- Renewable energy professionals looking to broaden their expertise.
- Electrical and mechanical engineers interested in wind power system engineering.
- Utility professionals keen on understanding wind power grid integration.
- Energy consultants and analysts wanting to understand wind power projections and metrics.
- Environmental professionals and advocates exploring sustainable energy solutions.
- Policy-makers and urban planners considering wind power in regional planning.
- Students and researchers in wind power-related fields.

Course #3. Renewable Energy Grid Integration - Feb. 15-16, 2024
www.electricityforum.com/electrical-training/renewable-energy-grid-integration-training

This intensive 12-Hour (2 day) course offers participants a deep dive into the transformation from traditional power structures to modern, smart grids that are rapidly incorporating renewable energy sources.

Day 1 starts with an exploration of how electric grids have evolved over the years, highlighting the mounting significance of renewables. It then transitions into a detailed analysis of intermittent renewable resources, such as solar and wind, discussing their variability and reliability. Participants will gain insight into the critical aspects of grid stability and reliability, emphasizing the necessity for frequency and voltage control, inertia, and ancillary services. The day wraps up by addressing the growing importance of grid storage solutions, from batteries to pumped hydro, and the emergence of demand response and distributed energy resources in grid stability.

On Day 2, the course pivots to the hardware and software technologies enabling smooth grid integration of renewables. Participants will familiarize themselves with advanced inverters,

FACTS, PMUs, and the indispensable software technologies guiding grid management. A special segment is dedicated to microgrids, presenting their diverse use-cases and their potential in a renewables-heavy grid system. The day also delves into the crucial aspects of policy, regulations, and market mechanisms that shape renewable integration globally. Concluding the course, we cast our gaze forward, identifying future trends and research areas, from electric vehicle grid impacts to AI's role in grid management.

This course is tailored for electric utility planning engineers, electrical engineers, and professionals engaged in integrating renewables into the contemporary smart grid. Engage in captivating sessions, insightful discussions, and a holistic learning experience.

LEARNING OUTCOMES

- Understanding of Modern Grid Evolution: Gain a comprehensive understanding of the transformation from traditional power systems to contemporary smart grids, especially with the increasing integration of renewable energy.
- Proficiency in Intermittent Renewables: Achieve a solid grasp of the characteristics, variability, and reliability of intermittent renewable resources like solar and wind, and the challenges they pose to grid integration.
- Insight into Grid Stability and Reliability: Understand key concepts related to maintaining grid frequency, voltage control, the importance of inertia, and the need for ancillary services to ensure grid stability.
- Knowledge of Storage Solutions: Acquire a deep understanding of various energy storage technologies, their roles in the grid, and the economic dynamics governing their implementation.
- Familiarity with Demand Response and DER: Learn about the crucial role of demand response in mitigating intermittency, and gain knowledge about different types of distributed energy resources and their impact on grid stability.
- Proficiency in Grid Integration Technologies: Understand the hardware and software solutions, from advanced inverters to energy management systems, that facilitate the seamless integration of renewables into the grid.
- Comprehensive Knowledge of Microgrids: Gain insights into microgrid operations, their diverse applications, and their importance in supporting grids with a high penetration of renewables.
- Understanding of Policy and Regulatory Landscape: Learn about the policies, regulations, and market mechanisms that influence renewable integration and gain exposure to global best practices.
- Awareness of Future Trends: Gain foresight into the imminent shifts in the energy sector, including the integration of electric vehicles, decentralized energy markets, and the application of AI in grid management.
- Holistic View of Grid-Renewable Dynamics: Develop a well-rounded perspective on how renewables interact with the grid, encompassing technical, economic, policy, and future-oriented aspects.

WHO SHOULD ATTEND

WHO should attend

Solar PV System Course

- PV System Owners
- PV System Technicians
- Electrical Project Designers
- Consulting Electrical Engineers
- Industrial, Commercial, Institutional Electrical Engineers
- Industrial, Commercial, Institutional Electricians
- Project Managers
- Installation And Operating Engineers Who Require Knowledge Of Solar PV Systems.

Wind Power Technologies Systems Course

- Renewable energy professionals looking to broaden their expertise.
- Electrical and mechanical engineers interested in wind power system engineering.
- Utility professionals keen on understanding wind power grid integration.
- Energy consultants and analysts wanting to understand wind power projections and metrics.
- Environmental professionals and advocates exploring sustainable energy solutions.
- Policy-makers and urban planners considering wind power in regional planning.
- Students and researchers in wind power-related fields.

Renewable Energy Grid Integration

- **Electric Utility Planning Engineers:** Those who design and strategize the layout and future developments of electric utilities.
- **Electrical Engineers:** Professionals involved in the design, development, and maintenance of electrical systems and equipment.
- **Grid Integration Specialists:** Experts focused on integrating various energy sources, especially renewables, into the main grid.
- **Energy Policy Makers:** Individuals involved in crafting and implementing energy policies, especially those concerning renewable energy sources.
- **Renewable Energy Consultants:** Those who provide advisory services in the field of renewable energy implementation and grid connection.
- **Microgrid Developers:** Professionals designing and developing smaller, localized energy grids that can operate both independently or in conjunction with the main grid.
- **Energy Storage Solution Providers:** Experts in energy storage technologies like batteries, pumped hydro, and flywheels.
- **Regulatory Professionals:** Individuals from agencies that oversee and regulate power generation, distribution, and grid integration.
- **Utility Managers and Operators:** Those responsible for the daily operations, management, and long-term planning of utilities.
- Research and Academic Professionals: Academics and researchers focusing on renewable energy, grid technologies, and related fields.
- **Project Developers in Renewable Energy:** Professionals involved in setting up renewable energy projects like wind farms, solar parks, and more.
- **Smart Grid Technology Providers:** Companies and their representatives offering technologies and solutions for modernizing and making grids "smarter."
- **Energy Economists:** Those analyzing the economics of energy generation, distribution, and consumption.
- **Stakeholders in Renewable Energy Projects:** Investors, landowners, and others with a vested interest in the success of renewable energy projects.

- This course provides invaluable insights and knowledge beneficial to a wide spectrum of professionals in the energy sector, particularly those focusing on the modern evolution of the grid with an emphasis on renewables.

STUDENTS RECEIVE

Students receive

- 100-Page Digital Renewable Electrical Handbook - Value $20 (details below)
- 3.6 Continuing Education Unit (CEU) Credits (36 Professional Development Hours)
- A **FREE** Magazine Subscription (Value $50)
- **$100** Coupon toward any future Electricity Forum event (restrictions apply)
- Course Materials in PDF Format

COURSE OUTLINE

Solar PV System Design Training Course Outline

DAY ONE

Module 1 – Introduction to Solar Energy

- Overview of the PV industry past and present including history of PV
- Common and required terminology in both industry and NEC and CE Code
- Climate change and it's mitigation through policy world-wide
- Environmental impacts
- Energy efficiency and reduced consumption
- Why energy efficiency is important when it comes to PV

Module 2 – Solar PV Systems and Electrical Components

- Examine the differences between DC current and AC current
- Examine basic components for electrical and PV systems
- Certification of equipment
- Components required for different types of PV systems (ex. grid- connected and off-grid battery based systems)
- Grid connected and off grid differences
- How a grid-connected PV system works, looks and behaves and discuss how a grid-connected system works with different types of regulations
- Micro inverters vs string inverters

Module 3 – Solar PV Modules and Electrical Theory

- In-depth understanding of how a PV module is constructed.
- Processes a module goes through for testing
- STC (Standard Test Conditions) and labeling
- PV cell/module produces electricity from sunlight
- Different types and materials used in the construction of PV cells (ex.
- Mono-crystalline and polycrystalline cells)
- Specific terminology required for the design of PV systems
- Series/parallel circuits and how they relate to not only PV modules/arrays and the design but to the safe installation of an entire PV system
- Temperature and irradiance fluctuations can have a significant effect on PV cells, modules, arrays and the design of PV systems (there will be labs for testing modules at this point)
- I-V (current-voltage) curve characteristics of modules, arrays, and PV
- system designs
- MPPT (Maximum Power Point Tracking) and it's uses

DAY TWO

Module 4 – Site Analysis and Mounting Solutions

- Discuss site analysis, planning, and implementation
- Use the Solar Pathfinder and Solmetric Suneye via demonstration labs to determine site shading
- Discuss the different instruments and tools required for solar site analysis
- Discuss the need to understand the following factors and how they apply to PV
- System and yearly energy production:
- Azimuth (orientation)
- Magnetic declination
- Tilt angle
- Shading, debris, other losses
- Roof type (material and condition)
- Roof structure
- Solar resource data from various sources

Module 5 – Off Grid Solar PV Systems

- Equipment and components used in off-grid PV installations
- Different Solar PV system designs and configurations
- Sizing calculations for PV array and battery bank sizes
- Proper installation methods for PV arrays, battery banks, and additional equipments.

Case study of Off-Grid PV System fully designed

COURSE SCHEDULE:

Start: 10 a.m. Eastern Time
Finish: 4:30 p.m. Eastern Time

Wind Power Engineering Course Schedule

Day 1

Wind Power Fundamentals (1 hour)

- The evolving role of wind power in sustainable energy.
- Wind resources in North America: A snapshot.
- Wind resource evaluation and site selection

Wind Power (2 hours)

- Mechanisms of wind energy conversion.
- Unpacking concepts: Annual Energy Production (AEP), capacity factor, and the power curve.
- An in-depth look into wind turbine components and structures.
- Designing optimal wind farm layouts.

Mechanical System (1 hour)

- Aerodynamics and design principles behind wind turbine blades.
- The role of pitch and yaw systems.
- Drive train and gearbox systems.

Electrical System (1hour)

- Wind turbine generators
- Direct drive generators
- Transformers
- Converter systems

Offshore wind (1 hour)

- Why offshore wind? The rationale, benefits, and challenges.
- Introduction to floating offshore wind systems.

Day 2:

Design for harsh environment (1 hour)

- Lightning protection system design
- Aerodynamic noise
- Converter systems and electrical noise
- Predictive maintenance systems
- The role of drones in wind blade inspection.

Grid Integration (2 hour)

- Unpacking collector systems and High Voltage Direct Current (HVDC) for offshore wind.
- Understanding IEEE Standards in grid integration.
- Techniques and technology: Fault Ride-Through, voltage and frequency ride-through, and the integration of energy storage systems.

Case Studies and Real-World Applications (2 hours)

- Calculating Annual Energy Production
- Power quality issues in small wind farms
- Lightning protection system, grounding, and bonding.
- Bearing issues caused by converter harmonics.
- Real-world applications of course concepts.

Final Assessment and Q&A Session (1 hour)

- Assessment to gauge knowledge gained from the course.
- Q&A session to clarify doubts and deepen understanding of topics covered.
- Key points from the course during the wrap-up session.
- Feedback on assessment performance and areas for improvement.

COURSE TIMETABLE:

Start: 10 a.m. Eastern Time
Finish: 4:30 p.m. Eastern Time

Renewable Energy Grid Integration Training - Course Outline

Day 1

Introduction to Modern Electric Grids

- Traditional vs. Modern Power Systems
- Role of Renewables in Today's Power Grid
- Challenges with High Penetration of Renewables
- Evolution of Smart Grids and their Benefits
- Distributed Energy Resources (DERs) and their Impact on the Grid

Basics of Intermittent Renewable Resources

- What are intermittent resources? (Solar, Wind, etc.)
- Factors affecting their variability
- The capacity factor and reliability
- Integration challenges of intermittent resources
- Impact of climate and geographical factors on generation

Understanding Grid Stability & Reliability

- Grid Frequency & Voltage Control
- Concepts of Inertia and Grid Resilience
- Need for Ancillary Services
- Impact of Renewable Energy on Grid Operations
- Measures to Enhance Grid Resilience with Renewables

Grid Storage Solutions

- Types of energy storage (Batteries, Pumped Hydro, Flywheels)
- Storage for short-term vs. long-term needs
- Economic considerations & Market dynamics
- Grid Integration of Storage Systems
- Impacts and Challenges of Multi-storage Systems

Demand Response & Distributed Energy Resources

- Role of DR in mitigating intermittency
- Types of DR programs and their impact
- Distributed generation and its role in grid stability
- Benefits and challenges of implementing DR
- Emerging Technologies in DR

Day 2

Grid Integration Technologies: Hardware

- Advanced Inverters for renewable integration
- Grid-following and Grid-forming inverters
- FACTS (Flexible AC Transmission Systems)
- Phasor Measurement Units (PMUs) & Wide-Area Monitoring Systems
- Integration of Sensor Technologies for Real-time Grid Monitoring

Grid Integration Technologies: Software

- Advanced Energy Management Systems (EMS)
- Distribution Management Systems (DMS)
- Fault Ride-Through, Voltage and Frequency Ride-Through
- Data analytics and prediction tools for renewable generation
- Cybersecurity in Grid Management

Microgrids & Resilient Grid Architectures

- Basics of Microgrid Operation
- Use-cases: From rural electrification to urban resilience
- Role in supporting a grid with high renewable penetration
- Challenges in Microgrid Design and Operation
- Energy Management in Microgrids

Policy, Regulations, and Market Mechanisms

- Role of policy in enabling renewable integration
- Market mechanisms to incentivize grid stability (Capacity markets, Ancillary services)
- Global best practices and case studies
- Impact of International Agreements on Grid Integration Policies
- Economic and Social Impacts of Renewables Policy

Future Trends & Research Directions

- Integration of electric vehicles & their grid impacts
- Transactive energy & decentralized markets
- Innovations on the horizon: Advanced grid modeling, AI in grid management, etc.
- Renewable Energy in Urban Planning and Smart Cities
- Challenges and Future Prospects of Grid Decarbonization

Course Schedule

Start: 10 a.m. Eastern Time
Finish: 4:30 p.m. Eastern Time

Contact us Today for a FREE quotation to deliver this course at your company's location.

https://electricityforum.com/onsite-requestforquote