



Reliability & Operational Performance
of Electric Power Systems



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Introduction to Electric Power Systems:

The general trend in modern electric power systems fosters competition for superior performance and efficiency in electricity production, transmission, and distribution. The reliability performance of electric power systems, together with the reliability indices of service supplied to system customers, are critical considerations in the planning and operation of power systems.

There is an increasing need for planning and operating methodologies that must be adhered to by power system operators, energy suppliers, and customers to ensure they can operate with reliability and safety. Probabilistic modeling and evaluation assessments become essential tools as traditional deterministic criteria.

Standards may only effectively capture some electric power systems' complex features and customer interactions. This comprehensive electrical power systems engineering course is designed to deepen understanding and enhance skills among professionals in the intricacies and challenges of electric power systems operation and reliability.

Moreover, the electric power system reliability and performance course will describe the appropriate sets of reliability indices to be calculated and present application examples using practical power systems and case studies, offering critical conclusions on the procedures and practices necessary to plan and operate Power Systems in a competitive market environment.

Targeted Groups:

- Professionals of Electric Power Utilities, System Operators Independent System Operators - ISOs, Regional Transmission Operators - RTOs, Transmission System Operators - TSOs.
- Professionals of Regulation Authorities.
- Professionals of Large Industrial and Commercial Companies.
- Power System Consultants.
- Researchers and Post-Graduate Students of Universities.

Course Objectives:

By the end of this electrical power system training, participants will be able to:

- Determine critical areas of power systems that require probabilistic modeling and evaluation assessment.
- Understand the main features of computational methods available for reliability modeling.
- Recognize essential reliability indices for load point and system performance quantification.
- Conduct practical reliability assessment studies.
- Compare and justify alternative schemes for power system reinforcement.

Targeted Competencies:

At the end of this electric power system reliability and performance course, the participant's competencies will:

- State-of-the-art knowledge of the available computational methods.
- Efficient computational methods can be applied to analyze reliability problems analytical techniques, simulation approaches.
- Description of the appropriate sets of reliability indices that need to be calculated.
- Presentation of application examples by using practical power systems and case studies.
- Important conclusions concerning the necessary procedures and practices for the planning and operation of Power Systems in the competitive market environment.

Course Content:

Unit 1: General Aspects of Electric Power Systems:

- Introduction to Electrical Power Systems.
- Basic principles of probabilistic modeling and reliability evaluation methods.
- Challenges and main planning issues for electric power systems.
- Analytical computational techniques.
- Simulation computational approaches.
- Reliability criteria and indices.
- Reliability parameters for various power system components.

Unit 2: Transmission System Assessment in Electric Power Systems:

- Reliability modeling of power transmission systems.
- Analytical computational technique applications.
- Criteria for total and partial continuity loss.
- Reliability indices of load points and system performance.
- Reliability cost assessment methodologies.
- Simulation computational approaches in practice.

Unit 3: Generation System Assessment in Electrical Power Systems:

- Reliability modeling of power generation systems.
- Modeling of different types of generating units and load demand requirements.
- Frequency and duration method analysis.
- Analytical Computational techniques for generation systems.
- Key system reliability indices.
- Simulation approach applications for generation systems.

Unit 4: Assessment of Composite Generation and Transmission Systems:

- Modeling for composite generation and transmission system reliability.
- Analytic computational techniques for composite systems.
- Reliability indices of load points and composite system performance.
- Assessing reliability costs.
- Utilizing simulation computational approaches in composite systems.



Unit 5: Distribution System Assessment in Electric Power Systems:

- Modeling for distribution system reliability.
- Analytical computational techniques for distribution systems.
- Reliability indices for load points and customers.
- Distribution system performance indices.
- Cost of reliability assessment strategies.
- Application of simulation computational approaches in distribution systems.

Conclusion:

This electric power systems reliability and performance course encompasses vital knowledge and skills to tackle the complexities of modern power system operation and enhance system reliability.

Participants in this electric power system reliability and performance training will leave with the qualifications necessary to guide industry practice and influence the future of electric power systems.