

Generation Operation

ACTIVITY TITLE: Generation Operation

TARGET AUDIENCE:

<input checked="" type="checkbox"/> Transmission Operator	<input checked="" type="checkbox"/> Market Operator
<input checked="" type="checkbox"/> Reliability Operator	<input checked="" type="checkbox"/> Operations and Planning Eng
<input checked="" type="checkbox"/> Balancing & Interchange	<input checked="" type="checkbox"/> Supervisor/Manager/Support
<input checked="" type="checkbox"/> Generator Operator	<input type="checkbox"/> Other _____

NERC CEHs:

Operating Topics CE Hours: 16.0

NERC Standards CE Hours: 2.0

Simulation CE Hours: 2.0

Professional Related CE Hours: 16.0

NERC EMERGENCY TRAINING HOURS: 16.0 hours

ACTIVITY SUBJECT MATTER:

<input checked="" type="checkbox"/> Basic Concepts	<input type="checkbox"/> Power System Restoration
<input type="checkbox"/> Power Transfer	<input checked="" type="checkbox"/> Market Operations
<input type="checkbox"/> System Protection	<input type="checkbox"/> Tools
<input checked="" type="checkbox"/> Interconnected Operation	<input type="checkbox"/> Operator Awareness
<input checked="" type="checkbox"/> Emergency Operations	<input checked="" type="checkbox"/> Policies and Procedures

DELIVERY SCHEDULE: Activity is expected to be delivered over a 2-day period. This 2-day period is expected to consist of two 9-hour days with .75 hour allotted for lunch and .25 hour allotted for the activity assessment each day. In accordance with NERC CEP criteria, a 10-minute break every hour can be accommodated. The activity assessment will be administered does not require any additional time allotment.

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Generation Operation

A. ACTIVITY OVERVIEW

This course is intended for real-time system operators and support personnel operating on the Bulk Electric System who wish to expand their knowledge and to enhance their skills related to generation control. The activity addresses the fundamentals of the following:

NERC Standards:

The NERC Standards module reviews the following NERC Standards as related to generation and generation control: Standard BAL-001 — Real Power Balancing Control Performance, Standard BAL-002 — Disturbance Control Performance, Standard BAL-003 — Frequency Response and Bias, Standard BAL-004 — Time Error Correction, Standard BAL-005 — Automatic Generation Control, Standard BAL-006 — Inadvertent Interchange, and Standard EOP-002 — Capacity and Energy Emergencies.

Generation Equipment:

The Generation Equipment module begins with describing the principles of electric power generation. The module then identifies the operation and major systems in power producing facilities. After identifying the different types of facilities, operating parameters and characteristics of each type are reviewed. The module then explores generator governor operation and identifies the principles of operation and components of generators. The module concludes with describing the factors that influence the generator capability for both real and reactive power.

Generation Control/Balancing Concepts:

The Generation Control/Balancing Concepts module picks up where the Basic Electricity module ended. It begins by re-enforcing and then expanding on the Control Area Concepts and Area Control Error. The module then explores Regulation, Automatic Generation Control, and Generation Dispatch. After setting these foundations, NERC CPS and DCS Standards will be reviewed. The module concludes with an overview to Locational Marginal Pricing Methodology and its influences in controlling the system.

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Generation Operation

B. METHOD OF INSTRUCTION

The activity is expected to be delivered in an Instructor Led environment. The activity is expected to be delivered utilizing a PowerPoint presentation in conjunction with the various exercises that are integrated into the material.

C. ACTIVITY OBJECTIVES

Upon completion of this training activity, the trainee shall be able to:

1. Define the requirements related to the NERC BAL Standards
2. Define the guides and principles related to the NERC BAL Standards
3. Describe the principles of electric power generation
4. Identify the operation and major systems in power producing facilities.
5. Identify the different types of generation facilities.
6. Define the operating parameters and characteristics of each type of generator
7. Identify the principles of operation and components of generators.
8. Describe the factors that influence the generator capability for both real and reactive power
9. Define the function of a Control Area and the concept of “Area Control Error”
10. Explain Automatic Generation Control
11. Define the process and considerations for load forecasting
12. Describe dispatching for Control and Balance
13. Define the Locational Marginal Pricing Methodology

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Generation Operation

D. ACTIVITY CONTENT

1. NERC Standard Review
 - Standard BAL-001: Real Power Balancing Control Performance
 - Standard BAL-002: Disturbance Control Performance
 - Standard BAL-003: Frequency Response and Bias
 - Standard BAL-004: Time Error Correction
 - Standard BAL-005: Automatic Generation Control
 - Standard BAL-006: Inadvertent Interchange
 - Standard EOP-002: Capacity and Energy Emergencies
2. Generation Equipment
 - Types
 - Steam Generation
 - Units – Hydro
 - Units - Combustion Turbine
 - Units – Nuclear
 - Units – Alternate/Renewable
3. Generation Control
 - Limits
 - Nameplate Capacity
 - Operating Capacity
 - Operating Limits
 - Incremental Cost Curves
 - Production Costs
 - Scheduling and Operating Rates
 - Load Forecasting
 - Operating Modes:
 - Reserves
4. Control / Balancing Concepts
 - Control Area Concepts
 - Area Control Error
 - CPS Standards
 - DCS Standard
 - Regulation
 - AGC
 - Dispatching

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Generation Operation

E. ASSESSMENT VEHICLE

The activity assessment is accomplished through a multiple choice quiz that addresses the activity objectives and content.

F. MISCELLANEOUS ELEMENTS

None identified for this activity.

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