OES-NA Training Modules To Go

Transmission Operation

ACTIVITY TITLE: Transmission Operation

TARGET AUDIENCE:

- ☒ Transmission Operator
- ☒ Market Operator
- ☒ Reliability Operator
- ☒ Operations and Planning Eng
- ☒ Balancing & Interchange
- ☒ Supervisor/Manager/Support
- ☒ Generator Operator
- ☐ Other _____

NERC CEHs:

Operating Topics CE Hours: 16.0

NERC Standards CE Hours: 3.0

Simulation CE Hours: 2.0

Professional Related CE Hours: 16.0

NERC EMERGENCY TRAINING HOURS: 16.0 hours

ACTIVITY SUBJECT MATTER:

- ☒ Basic Concepts
- ☐ Power System Restoration
- ☒ Power Transfer
- ☐ Market Operations
- ☐ System Protection
- ☐ Tools
- ☒ Interconnected Operation
- ☒ Operator Awareness
- ☒ Emergency Operations
- ☒ 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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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 transmission equipment and control. The activity addresses the fundamentals of the following:

NERC Standards:

The NERC Standards segment of the activity reviews the following NERC Standards as related to transmission and transmission control: Standard TOP-001 — Reliability Responsibilities and Authorities, Standard TOP-002 — Normal Operations Planning, Standard TOP 003 — Planned Outage Coordination, Standard TOP-004 — Transmission Security, Standard TOP-005 — Operational Reliability Information, Standard TOP 006 — Monitoring System Conditions, Standard TOP-007 — Reporting SOL and IROL Violations, Standard TOP-008 — Response to Transmission Limit Violations, and Standard VAR-001 — Voltage and Reactive Control.

Transmission Equipment:

The Transmission Equipment segment of the activity explores the evolution of transmission components in addition to the operation of basic components which includes bulk power transmission facilities, transformers, phase shifting transformers, circuit breakers, buses, disconnects, switchgear, and reactive equipment. The module considers how the equipment interacts, their purpose, and their limitations.

Transmission Control:

The Transmission Control segment of the activity reviews the control of the transmission, sub-transmission, and distribution systems and how they relate to each other. The module then addresses identification of diagram components. System events are then identified and explored with respect to controlling reactive resources, thermal limits, system stability, and voltage profiles. The module then steps through equipment failures, actions to implement and performing various degrees of contingency analysis. This module includes exercises and demonstration utilizing the EPRI Generic Simulator.

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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 NERC TOP and VAR Standards
2. Describe the roles and responsibilities of the NERC Functional entities with regards to the TOP and VAR Standards.
3. Define the guides and principles related to NERC TOP and VAR Standards
4. Describe the types of equipment used on the transmission system.
5. Identify the operation and purpose of transmission system components.
6. Explain the issues related to operating transmission system equipment.
7. Describe the operation and uses of reactive devices.
8. Identify the components of the transmission system and their effect on control.
9. Describe the concepts involving transmission system events and their influence on power flow.
10. Define the role of reactive power in transmission control
11. Identify distribution factors and variable influences that they have in operating the transmission system.
12. Describe how equipment failures can inhibit operation of the transmission system.
13. Describe the role of studies, power flow and contingency analysis; have on the safe and reliable operation of a transmission system

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D. ACTIVITY CONTENT

1. NERC Standard Review
   - Standard VAR-001 Voltage and Reactive Control
   - Standard TOP-001 Reliability Responsibilities and Authorities
   - Standard TOP-002 Normal Operations Planning
   - Standard TOP-003 Planned Outage Coordination
   - Standard TOP-004 Transmission Security
   - Standard TOP-005 Operational Reliability Information
   - Standard TOP-006 Monitoring System Conditions
   - Standard TOP-007 Reporting SOL and IROL Violations
   - Standard TOP-008 Response to Transmission Limit Violations
2. **Transmission Equipment**
   - Transmission System Overview
   - Transmission Equipment and Operation
   - Reactive Resources and Utilization
3. *Transmission Control*
   - Voltage Control and System Events
   - Reactive Power and Surge Impedance Loading
   - Distribution Factors
   - Transmission Equipment Limits
   - Equipment Failures
   - Power Flow and Contingency Analysis

E. ASSESSMENT VEHICLE

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

F. MISCELLANEOUS ELEMENTS

The exercises included in this activity require the utilization of the EPRI Generic Simulator.