



# **Communication, Critical Thinking, and Restoration**

## **Background**

The class will be delivered over a 3-day period. The class is comprised of three training modules covering the areas of: Communications, Critical Thinking, and Restoration. The course consists of lecture, group and individual exercises, and use of a power system simulator. The workshop is culminated with a group exercise utilizing the EPRI Power Simulator to restore the identified systems.

## **Course Level**

Tier 1: Operators with less than 5 years experience operating on the electric system in system operations, or those who wish to refresh basic operating principles related to restoration, communications, and critical thinking.

### **Associated Tier II course:**

Restoration: Planning, Assessing & Implementing

## **Target Audience**

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 enhance their related skills. It is intended to provide attendees with the necessary training to understand the concepts and utilize the skills in performing their day-to-day tasks. The intended audience includes those operators who have less than 5 years experience operating on the electric system in system operations.

## **NERC Continuing Education Hours**

22.0 CEHs – Total  
0.0 CEHs – Standards  
22.0 CEHs – Ops Topics  
6.0 CEHs – Sim

## **NERC Emergency Training Requirement**

22.0 hours of Emergency Operations

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## **Communication, Critical Thinking, and Restoration**

### **Class Content**

The course modules' content includes:

#### ***Communications***

The Communications module addresses the fundamentals of communications, key elements that assist in good communications, obstacles that lead to poor communications, elements of good logging practices, tools for communications in System Operations, and components of data exchange used in operating the electric system.

#### ***Critical Thinking***

The Critical Thinking module addresses critical thinking and its application to system operations, components of effective reasoning, guidelines for critical thinking, keys for prioritizing, and the principles of time management.

#### ***Restoration***

The Restoration module addresses history of blackouts and their effect on society, types and characteristics of blackouts, causes of blackouts, assessing system status, key elements for restoration of load and transmission, frequency control, and interconnection of islands. This module also addresses consideration for developing a System Restoration Plan and includes exercises utilizing a system simulator.

### **Classroom Schedule**

Day 1: 8:00 AM to 5:00 PM (Lunch provided)

Day 2: 8:00 AM to 5:00 PM (Lunch provided)

Day 3: 8:00 AM to 5:00 PM (Lunch provided)

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## **Communication, Critical Thinking, and Restoration**

### **Attendee Requirements**

Attendees must sign-in for the training activity in accordance with the attendance verification process stated:

- Attendees are required to sign-in on the course sign-in sheet
- Attendees are required to provide their NERC SO Certification # on the sign-in sheet, if applicable
- Attendees are required to provide a photo ID as proof of identity
- Attendees must participate in all course activities
- Attendees must successfully complete the activity assessment and obtain at least a minimum passing grade of 70% on the assessment. If the attendee is unsuccessful in the initial assessment, a second opportunity to successfully complete the assessment following remedial instruction will be given.
- Attendees must submit a course evaluation form

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## Communication, Critical Thinking, and Restoration

### NERC Related Reliability Content Outline Tasks

#### **Generation:**

3. Monitor output of units ensuring that MW and MVAR output are within operating limits.
5. Select proper mode of automatic generation control for system conditions.
6. Suspend automatic generation control as required.
8. Communicate with generating stations regarding anticipated increases or decreases for limit changes.
9. Monitor output of units ensuring that MW and MVAR output are operating according to schedules.
10. Direct corrective actions to correct abnormal frequency.
14. Monitor response of units to the AGC signals.
18. Monitor the status and availability of generator voltage regulators and respond as required to deficiencies.
19. Administer generator start-up and shutdown schedules.
20. Respond to generation losses recognizing reliability restrictions to effectively maintain tie-line flows.
22. Ensure adequate spinning and operating reserves are on line.

#### **Balancing:**

9. Respond to generation losses recognizing economic and reliability restrictions to effectively maintain tie-line flows.
12. Monitor system load and generation.

#### **Emergency Operations:**

3. Respond to system emergencies and frequency deviations to meet local, regional and NERC DCS requirements.
5. Implement system restoration procedures.
6. Evaluate the extent of an outage or disturbance and develop a plan of restoration.
7. Notify appropriate personnel or department in event of an emergency.
8. Direct necessary actions to return the system to a secure state.
9. Provide emergency services coordination for field personnel.
11. Declare system emergencies.
13. Dispatch operating reserves to alleviate system emergency conditions.
18. Coordinate manual load shed to alleviate system emergency conditions.
22. Take action as necessary to protect the system if it becomes endangered by remaining interconnected.

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## **Communication, Critical Thinking, and Restoration**

23. Apply relief measures as necessary to permit re-synchronizing and reconnecting to the Interconnection when separated from the Interconnection.
25. Separate or shutdown generators that are unsafe to operate during or after an area disturbance.
26. Direct the restoration of the transmission system following a major system outage, load shedding, islanding or blackout.
28. Following the activation of automatic load shedding schemes:
  - a. restore system load as appropriate for current system conditions and in coordination with adjacent systems.
  - b. shed additional load manually if there is insufficient generation to support the connected load.
  - c. monitor system voltage levels to ensure high voltage conditions do not develop.
  - d. monitor system frequency to ensure high frequency conditions do not develop.
30. Following a partial or total system shutdown:
  - a. implement the appropriate provisions and procedures of the system's restoration plan in a coordinated manner with adjacent systems.
  - b. arrange for start-up and/or emergency power for generation units as required.
  - c. arrange for and utilize emergency (backup) telecommunications facilities as required.
  - d. restore the integrity of the Interconnection as soon as possible.
33. Coordinate response to system emergencies.
34. Request emergency assistance from neighboring systems.

### **System Operations:**

11. Direct and regulate the operation of the transmission system.
12. Monitor major transmission lines, flow gates and scheduling paths.
14. Supervise and coordinate system activities at switching stations, generating stations and transmission lines.
21. Analyze and authorize requests for equipment outages.
25. Monitor system parameters, such as MW, MVAR, voltage, and amps to determine system conditions.
29. Direct and/or control transmission switching.
30. Direct and control all energization and/or modification of new or existing facilities.
32. Monitor and operate transmission system within its designed capabilities.
36. Monitor the voltages, and coordinate the reactive dispatch of transmission facilities, and the interconnections with neighboring systems.
42. Enforce operational security requirements.

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## **Communication, Critical Thinking, and Restoration**

### **Guidelines and Procedures:**

13. Monitor bulk transmission elements to determine constraints and operating limit violations.
14. Coordinate manual load shed to alleviate system emergency conditions.

### **System Reliability:**

2. Respond to disturbance conditions.
8. Formulate a plan to implement corrective actions when an operating security limit violation is anticipated.
9. Formulate a plan to implement corrective actions when equipment ratings are exceeded or anticipated to be exceeded.
10. Initiate transmission loading relief procedures to relieve potential or actual loading on a constrained facility.
20. Call for interruptible loads to be shed when required.
22. Monitor and respond to transmission system equipment rating violations.
27. Initiate control actions resulting from thermal limit violations, considering the responsiveness of the system.

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