



On-Line Learning Course Catalog



Spark! by OES-NA enables system operators to experience quality online learning tools right at their desks 24 hours a day, 7 days a week!

OES-NA's online learning modules are delivered through our Spark! portal. Because each module is delivered on an individual basis via the Internet, individuals have the ability to set their own pace and schedule. Registered students are provided with 12 months from the time of registration to complete each online learning module.

Our Spark! modules offer: friendly navigation, review activities throughout the module, easy access to supporting documentation via the course resources tab, instant feedback during quizzes, comprehensive final assessments, and friendly, professional support.



OES-NA is proud to be able to offer NERC continuing education credits for the successful completion of our online learning modules. For this reason, however, the following requirements must be adhered to:

- Students must sign-in using their private individual log-in and password to access the module.
- Students are required to provide their NERC SO Certificate # and other applicable contact information during the registration process.
- Students must complete all module material individually.
- Students must successfully earn a score of at least 70% on the final activity assessment.
- Students must submit a course evaluation form. (Level of completion is not measured, but full completion is appreciated.)



Communications

This online course is delivered through Spark! By OES-NA. The course is intended to provide system personnel and support personnel with an understanding of the criticality of communications and how it relates to operating the Bulk Electric System. The course stresses the keys to good communications and identifies the obstacles that are encountered that can lead to poor communications. The course steps through the various topics associated with communications, roles in communication, obstacles, logging, and tools used for communication in a real-time operating environment. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Identify the keys to assist in good communications
- Explain the obstacles that lead to poor communications
- Describe the components of data exchange used in operating the electric system
- Identify the tools for communications in System Operations
- Identify the elements of good logging practices

NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



Critical Thinking

This online course is delivered through Spark! By OES-NA. The course is intended to provide system personnel and support personnel with an understanding of the criticality of critical thinking, prioritizing, and time management in operating the Bulk Electric System. The course defines critical thinking and its application to system operations, identifies the components of effective reasoning, describes the guidelines and process for critical thinking, explores the keys for prioritizing, and explains the principles of time management. It is intended to provide operating personnel with the knowledge and skills in addressing operational issues that arise in a real-time operational environment. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Define critical thinking and its application to system operations
- Identify the components of effective reasoning
- Describe the guidelines for critical thinking
- Identify the keys for prioritizing
- Explain the principles of time management

NERC Continuing Education Hours:

TOTAL: 1.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.0 CEHs - Sim: 0.0 CEHs



Frequency Control

This online course is delivered through *Spark!* By OES-NA. The course is intended to provide system personnel and support personnel with an understanding of frequency control in operating and managing the Bulk Electric System. The course identifies frequency control fundamentals, system components and their operation related to frequency, AGC or automatic generation control, time error, NERC control performance, impacts of frequency deviations, and system protection for under-frequency conditions. It is intended to provide operating personnel with the knowledge necessary for maintaining system frequency. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Identify frequency control fundamentals
- Identify system components and operation
- Define automatic generation control
- Define Time Error
- Define under-frequency protection
- Identify impact of frequency deviations
- Identify NERC control performance

NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs

Generation Control

This online course is delivered through *Spark!* By OES-NA. The course is intended to address aspects related to generation control and maintaining it with respect to the operation of the Bulk Electric System. Topics covered in this course include: function of a Balancing Area, “Area Control Error” Concepts, NERC Performance Standards, Automatic Generation Control, process for load forecasting, dispatching related to control and balance. It is intended to provide operating personnel with the knowledge necessary for maintaining generation and load balance. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Define the function of a Balancing Area
- Identify the “Area Control Error” Concept
- Define Performance Standards
- Identify Dispatching for Control and Balance
- Review the process for load forecasting
- Define Automatic Generation Control



NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 1.5 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



Generation Equipment

This online course is delivered through Spark! By OES-NA. The course is intended to provide system personnel with an explanation and understanding of the Generation Equipment operating on the Bulk Electric Power System. The course steps through the various topics associated with generation equipment that includes: principles of electric power generation, operation and major systems in power producing facilities, various types of generation facilities, generator operating parameters and characteristics, operation of generator governors, and factors that influence generator capability. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Describe the principles of electric power generation
- Identify the operation and major systems in power producing facilities
- Identify the different types of generation facilities and their impact on operations
- Describe the factors that influence the generator capability for both real and reactive power
- Review the operation of generator governors
- Identify the principles of operation and components of generators
- Review the operating parameters and characteristics of each type of generator

NERC Continuing Education Hours:

TOTAL: 2.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 2.5 CEHs - Sim: 0.0 CEHs



Generation Operations

This online training course consists of 12 lessons. The first 7 lessons establish a clear understanding of the concepts of controlling generation on the Bulk Electric System. Topics covered in this portion of the course includes: generation equipment, steam plants, environment and water systems, turbines, generators, generation control, and system



operators and dispatching. The final 5 lessons step through various NERC standards related to generation control. This class is intended for: new operators to the system that will have the responsibility of generation control; transmission operators who want to expand their knowledge of generation control; individuals who desire the overall philosophy of controlling generation and its impacts to the Bulk Electric System; and those individuals trying to understand generation control as part of NERC Certification Preparation.

Module Objectives:

- Describe the principles of electric power generation and its utilization in supporting the operation of the Bulk Electric System.
- Define the operating parameters and characteristics of each type of generator and how their operation impacts the operation of the Bulk Electric System.
- Identify the operation and major systems in power producing facilities and they impact the resource's ability to support the operation of the Bulk Electric System.
- Identify the principles of operation and components of generators and the impacts on System Operations when they have problems.
- Identify the different types of generation facilities and considerations for utilization in controlling the power system.
- Define the operating parameters and characteristics of each type of generator and the considerations for their utilization in operating the power system.
- Define the function of a Balancing Area and the concept of "Area Control Error".
- Explain Automatic Generation Control.
- Define the process and considerations for load forecasting.

- Describe dispatching for Control and Balance.
- Define the Locational Marginal Pricing Methodology
- Define the guides and principles related to the NERC EOP-011 Standard
- Define the guides and principles related to the NERC BAL Standards
- Describe the requirements, measurements and compliance elements associated with the NERC EOP-011 Standard
- Describe the requirements, measurements and compliance elements associated with the NERC BAL Standards

NERC Continuing Education Hours:

TOTAL: 10.0 CEHs - Standards: 3.0 CEHs - Ops Topics: 10.0 CEHs - Sim: 0.0 CEHs



Generator Operator Restoration Training

This online course is delivered through Spark! By OES-NA. As identified in the NERC Standard EOP-005, each Generator Operator with a Blackstart Resource shall provide a minimum of two hours of training every two calendar years to each of its operating personnel responsible for the startup of its Blackstart Resource generation units and energizing a bus. This computer-based training course addresses aspects related to the general responsibilities of Generating Operating Personnel in their role of supporting real-time operations with regards to system restoration. Topics covered in this online course include: History of Blackouts, Types of Blackout, Blackout Causes, NERC Responsibilities, Authorities, and Standards, Frequency and Voltage Control, Load Pick-ups, Synchronization of Islands, Generating Operating Personnel Responsibilities. Each lesson area in this course is culminated with a review and a quiz. Individuals must attain a passing grade of 70% on each quiz in order to be awarded the appropriate NERC CEHs.



Module Objectives:

- Explain the history of blackouts and their impacts on society
- Identify the types of blackouts
- Identify the causes of blackout events
- Explain the responsibilities and authority of NERC
- Identify the requirements of the NERC Standards for Restoration
- Identify the role of Generator Operating Personnel during a system restoration event
- Describe restoration considerations from the NERC Restoration Reference Document
- Identify requirements and process for island synchronization

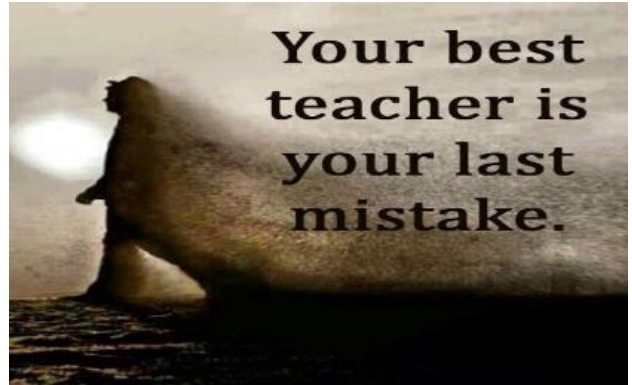
NERC Continuing Education Hours:

TOTAL: 2.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 2.0 CEHs - Sim: 0.0 CEHs

Lessons Learned Series 1

Each lesson learned module includes all of the following elements:

- Identifies the applicable NERC Functions
- Describes the Event
- Corrective Actions Taken
- Lessons Learned
- Thinking for the Future



The Series 1 module covers the following lessons learned events:

- Backup Control Center Operation and Training
- Failover Configuration Leads to Loss of EMS
- Human Error Leads to Evacuation of Primary Control Room
- Severe Flooding Damages Transformer Substations
- Tie Line Relay Coordination

Module Objectives:

- Identify the benefits of lessons learned
- Utilize system event reports to evaluate one's own system vulnerabilities
- Identify lessons learned from system events
- List company actions to avoid future operational mishaps

NERC Continuing Education Hours:

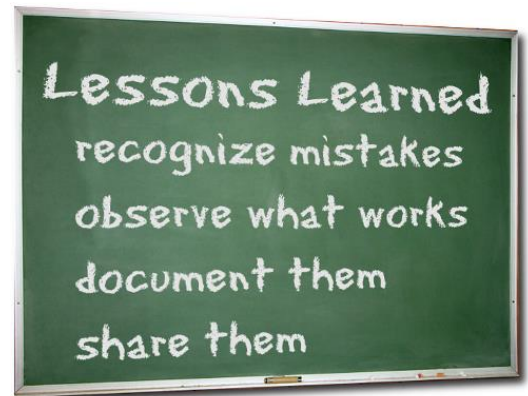
TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



Lessons Learned Series 2

Each lesson learned module includes all of the following elements:

- Identifies the applicable NERC Functions
- Describes the Event
- Corrective Actions Taken
- Lessons Learned
- Thinking for the Future



The Series 2 module covers the following lessons learned events:

- Transmission Relaying – Relay Setting Issue
- Dispatched Reduction in Generation Output Causes Frequency Deviation
- Loss of SCADA Operating and Monitoring Ability
- Slow Circuit Breaker Operation Due to Lubrication Issues

Module Objectives:

- Identify the benefits of lessons learned
- Utilize system event reports to evaluate one's own system vulnerabilities
- Identify lessons learned from system events
- List company actions to avoid future operational mishaps

NERC Continuing Education Hours:

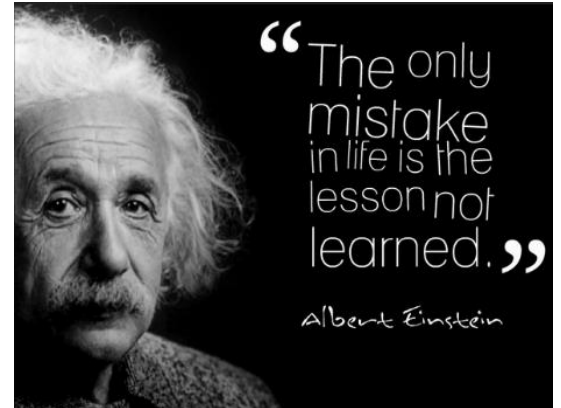
TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



Lessons Learned Series 3

Each lesson learned module includes all of the following elements:

- Identifies the applicable NERC Functions
- Describes the Event
- Corrective Actions Taken
- Lessons Learned
- Thinking for the Future



The Series 3 module covers the following lessons learned events:

- Generator Trip While Performing Frequency Response
- Loss of Wind Turbines due to Transient Voltage Disturbances
- Auxiliary Power Loss to STATCOM Leads to UVLS Operation
- Inadequate Battery Configuration Management Damaged a Generating Station and Tripped an HVDC Conversion Station

Module Objectives:

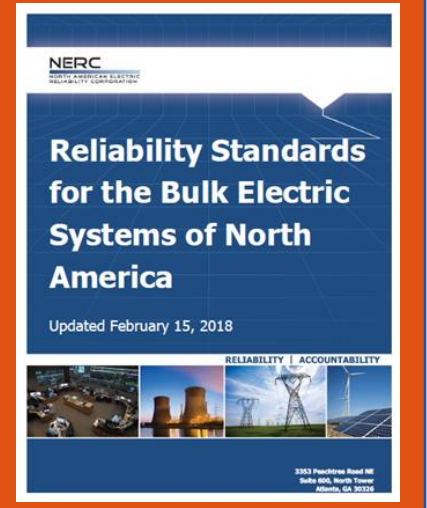
- Identify the benefits of lessons learned
- Utilize system event reports to evaluate one's own system vulnerabilities
- Identify lessons learned from system events
- List company actions to avoid future operational mishaps

NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs

NERC Standards NOW!

Our NSN modules provide the most current NERC Standards in effect at the current time! These modules are intended to provide System Operating Personnel with the current requirements imposed by NERC for maintaining a safe and reliable bulk electric system. These modules will ensure that your personnel - both in and out of the control room - are aware of the NERC criteria for operations. In addition to maintaining personnel knowledge, the CEHs earned for the completion of the modules can be utilized for maintaining NERC Certification Credentials.



These online training courses identify and explain the following elements related to the standards:

- Purpose
- Applicability
- Requirements
- Measures
- Compliance
- Violation Severity Levels



Our NERC Standards NOW! Modules cover the latest NERC Standards that are in effect. These include the following modules:

- NSN: BAL – Resource and Demand Balance
- NSN: CIP – Critical Infrastructure Protection
- NSN: COM – Communications
- NSN: EOP – Emergency Operations
- NSN: INT – Interchange Scheduling and Coordination
- NSN: IRO – Interconnection Reliability Operations and Coordination
- NSN: PRC – Protection and Control
- NSN: TOP – Transmission Operations
- NSN: VAR – Voltage and Reactive

NSN: BAL (Resource and Demand Balancing)

The course is intended to provide system personnel with an explanation and understanding of the NERC Resource and Demand Balancing Standards. The course steps through each of the BAL standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Resource and Demand Balancing.

Module Objectives:

- Define the requirements related to the NERC BAL Standards
- Define the guides and principles related to the NERC BAL Standards
- Describe the measurements and compliance elements associated with the NERC BAL Standards

NERC Continuing Education Hours:

TOTAL: 3.5 CEHs - Standards: 3.5 CEHs - Ops Topics: 3.5 CEHs - Sim: 0.0 CEHs



NSN: CIP (Critical Infrastructure Protection)

The class is intended to provide system personnel with an explanation and understanding of the NERC Critical Infrastructure Protection and Communication Standards. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Critical Infrastructure Protection and Communication.

Module Objectives:

- Define the requirements related to NERC CIP Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the CIP Standards
- Define the guides and principles related to NERC CIP Standards

NERC Continuing Education Hours:

TOTAL: 8.5 CEHs - Standards: 8.5 CEHs - Ops Topics: 8.5 CEHs - Sim: 0.0 CEHs

NSN: COM (Communications)

The class is intended to provide system personnel with an explanation and understanding of the NERC Critical Infrastructure Protection and Communication Standards. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Communication.

Module Objectives:

- Define the guides and principles related to NERC COM Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the COM Standards
- Define the requirements related to NERC COM Standards

NERC Continuing Education Hours:

TOTAL: 2.0 CEHs - Standards: 2.0 CEHs - Ops Topics: 2.0 CEHs - Sim: 0.0 CEHs

NSN: EOP (Emergency Preparedness and Operations)

The course is intended to provide system personnel with an explanation and understanding of the NERC Emergency Preparedness and Operations standards. The course steps through each of the EOP standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a standard review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Emergency Preparedness and Operations.

Module Objectives:

- Define the requirements related to NERC EOP Standards
- Define the guides and principles related to NERC EOP Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the EOP Standards

NERC Continuing Education Hours:

TOTAL: 3.5 CEHs - Standards: 3.5 CEHs - Ops Topics: 3.5 CEHs - Sim: 0.0 CEHs

NSN: INT (Interchange Scheduling and Coordination)

The course is intended to provide system personnel with an explanation and understanding of the NERC Interchange Scheduling and Coordination Standards. The course steps through each of the standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a standard review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.

Module Objectives:

- Define the requirements related to NERC INT Standards
- Define the guides and principles related to NERC INT Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the INT Standards

NERC Continuing Education Hours:

TOTAL: 2.0 CEHs - Standards: 2.0 CEHs - Ops Topics: 2.0 CEHs - Sim: 0.0 CEHs

NSN: IRO (Interconnection Reliability Operations and Coordination)

The course is intended to provide system personnel with an explanation and understanding of the NERC Interconnection Reliability Operations and Coordination Standards. The course steps through each of the standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a standard review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Interconnection Reliability Operations and Coordination.

Module Objectives:

- Define the requirements related to NERC IRO Standards
- Define the guides and principles related to NERC IRO Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the IRO Standards

NERC Continuing Education Hours:

TOTAL: 4.5 CEHs - Standards: 4.5 CEHs - Ops Topics: 4.5 CEHs - Sim: 0.0 CEHs

NSN: PRC (Protection and Control)

The course is intended to provide system personnel with an explanation and understanding of the NERC Emergency Preparedness and Operations standards. The course steps through each of the EOP standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a standard review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Protection and Control.

Module Objectives:

- Define the requirements related to NERC PRC Standards
- Define the guides and principles related to NERC PRC Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the NERC PRC Standards

NERC Continuing Education Hours:

TOTAL: 6.5 CEHs - Standards: 6.5 CEHs - Ops Topics: 6.5 CEHs - Sim: 0.0 CEHs



NSN: TOP (Transmission Operations)

The course is intended to provide system personnel with an explanation and understanding of the NERC Transmission Operations standards. The course steps through each of the 4 standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a standard review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Transmission Operations.

Module Objectives:

- Define the requirements related to NERC TOP Standards
- Define the guides and principles related to NERC TOP Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the NERC TOP Standards

NERC Continuing Education Hours:

TOTAL: 3.5 CEHs - Standards: 3.5 CEHs - Ops Topics: 3.5 CEHs - Sim: 0.0 CEHs

NSN: VAR (Voltage and Reactive Control)

The course is intended to provide system personnel with an explanation and understanding of the NERC Transmission Operations and Voltage and Reactive Control standards. The course steps through each of the standards and associated Attachments. Each lesson identifies and explains the following elements for that particular standard: Purpose, Applicability, Requirements, Measures, and Compliance. Each lesson is culminated with a standard review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs. The class is intended for System Operators and any personnel who wish to gain knowledge of NERC Standards related to Voltage and Reactive Control.

Module Objectives:

- Define the requirements related to NERC VAR Standards
- Define the guides and principles related to NERC VAR Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the NERC VAR Standards

NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 1.5 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



Operations Support Personnel Awareness Training

This online course is delivered through Spark! By OES-NA. As identified in the NERC Standard PER-005-2, each RC, BA, and TOP shall use a systematic approach to develop and implement training for its identified Operations Support Personnel on how their job function(s) impact those BES company-specific real-time reliability-related tasks performed by their System Operating Personnel. This online training course addresses aspects related to the general responsibilities of Support Personnel in their role of supporting real-time operations. Topics covered in this course include: Training Requirement Overview, System Limits, System Studies and Plans, ACE and Frequency Implications, Restoration Planning, Switch Order Writing, and Communications, Reporting, and Training. Each lesson area in this course is culminated with a review and a quiz. Individuals must attain a passing grade of 70% on each quiz in order to be awarded the appropriate NERC CEHs.



Module Objectives:

- Identify the implications of NERC Standard PER-005-02 on Operations Support Personnel across the industry
- List the steps that can be utilized for complying with the NERC Standard requirements for identifying Operations Support Personnel Awareness Training
- Explain the benefits to reliable operations from the completion of the Operational Support Awareness Training
- List the general areas of involvement that Operations Support Personnel have with regards to impacting real-time reliability related tasks performed by System Operating Personnel

NERC Continuing Education Hours:

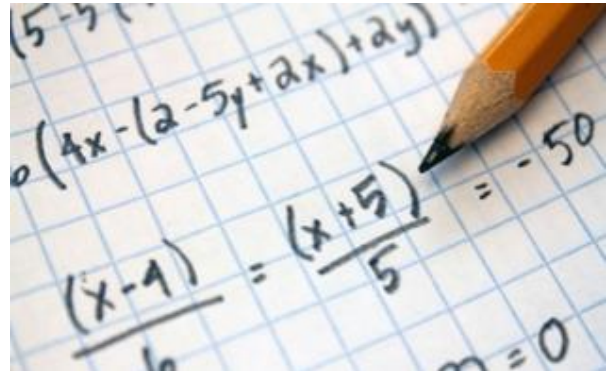
TOTAL: 2.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 2.5 CEHs - Sim: 0.0 CEHs





Power System Mathematics

The course is intended to address aspects related to mathematics and its use in operating the Bulk Electric System. It is intended to provide students with the basics of mathematics and the various situations that it may have to be utilized by System operating Personnel. Topics covered in this course



include: basics of mathematics, use of mathematics in Balancing, uses of mathematics related to voltage control, mathematics and its use in operating the transmission system, and how mathematics could be used during restoration. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.

Module Objectives:

- Identify the basics of mathematics
- Define the use of mathematics in Balancing
- Identify uses of mathematics related to voltage control
- Describe how mathematics is used in operating the transmission system
- Identify uses of mathematics during restoration

NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs

Restoration

The course is intended to address aspects related to restoration of the Bulk Electric System. It is intended to provide students with the basics of restoring the system following an event that caused a full or partial shutdown of the system. Topics covered in this course include: history of blackouts and their impacts on society, various types of blackouts, causes of blackout events, key elements for performing an assessment following a blackout, and possible issues encountered during a system restoration with regards to load and transmission restoration, in addition to frequency control. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Explain the history of blackouts and their impacts on society
- Identify the types of blackouts
- Identify the causes of blackout events
- Explain the key elements for assessing the system following a blackout
- Define the issues relating to system restoration with regards to load and transmission restoration and frequency control

NERC Continuing Education Hours:

TOTAL: 3.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.5 CEHs - Sim: 0.0 CEHs



Switching and Clearances

This course is intended to provide System Operators with the necessary training to understand their role, switching equipment, switching and clearance terminology, review of switching errors and steps for prevention, and switching procedure review. The module consists of seven segments: NERC Standards, Communications, Transmission Equipment, Transmission Switching, Switching Terminology & Procedures, Errors and Prevention, and Exercise/Assessments. The module includes several switching exercises that must be completed as part of the module assessment

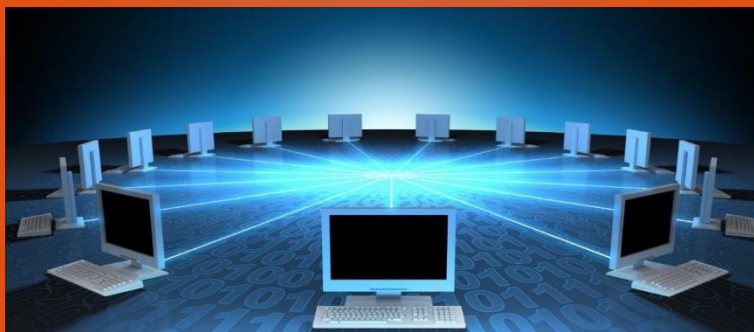


Module Objectives:

- Identify the NERC Standards and their implications during switching activities
- Identify the importance of communications during switching activities
- Describe the transmission equipment utilized for switching transmission equipment
- Explain key considerations and precautions when performing switching activities
- Identify switching terminology that is used within the industry
- Describe sample switching procedures that are used within the power industry
- Identify how switching errors can occur and steps to reduce or prevent errors

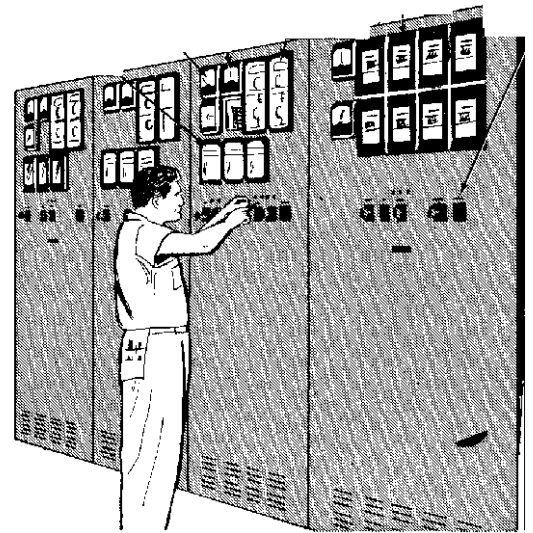
NERC Continuing Education Hours:

TOTAL: 6.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 6.5 CEHs - Sim: 0.0 CEHs



Switchmen Restoration Training

This course is intended to provide System Switchmen with the necessary training to understand their role and the operating principles associated with system restoration as required by NERC Standard EOP-005. The course also provides System Operating personnel with an awareness of how Switchmen support their task in restoring the system following a full or partial system blackout event. Topics covered in this course include: History of Blackouts, Types of Blackout, Blackout Causes, NERC Responsibilities, Authorities, and Standards, Synchronization of Islands, System Switchmen Responsibilities. Each lesson area in this course is culminated with a review and a quiz. Individuals must attain a passing grade of 70% on each quiz in order to be awarded the appropriate NERC CEHs.



Module Objectives:

- Identify the role of switchmen during system Restoration event
- Identify the types of blackouts
- Identify the causes of blackout events
- Explain the responsibilities and authority of NERC
- Explain the history of blackouts and their impacts on society
- Identify requirements and process for island synchronization
- Describe restoration considerations from the NERC Restoration Reference Document
- Identify the requirements of the NERC Standards for Restoration

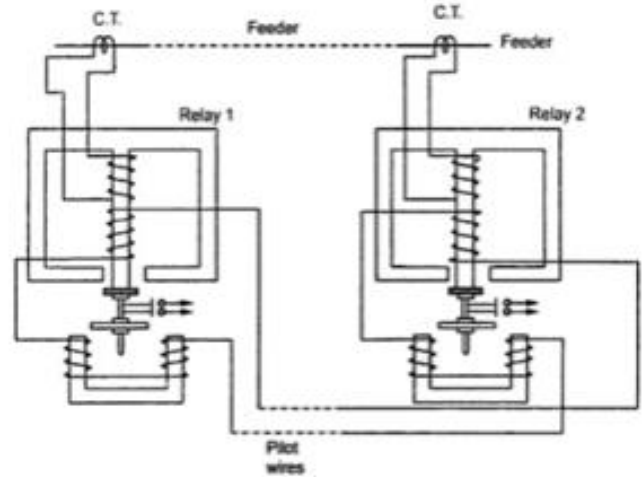
NERC Continuing Education Hours:

TOTAL: 2.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 2.0 CEHs - Sim: 0.0 CEHs



System Protection

The course is intended to address aspects related to restoration of the Bulk Electric System. It is intended to provide an overview to system protection utilized on the Bulk Electric System. It is intended to provide students with the basic understanding relay protection. Topics covered in this course include: fundamentals of system protection, construction and operation of system



protection, various types of relays and their application, and synchronizing equipment. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.

Module Objectives:

- Define synchronizing equipment
- Define the construction and operation of system protection
- Identify the types of relays
- Identify the fundamentals of system protection

NERC Continuing Education Hours:

TOTAL: 1.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.0 CEHs - Sim: 0.0 CEHs



System Operations and the Generator

The course is intended for Generator Operators and System Operating Personnel to provide insight into the role of the generator in operating the Bulk Electric System. The course explores the operation of the power system relating to balancing, voltage control, and restoration. In addition, the course explores terminology that is used between Plant Operating Personnel and System Operating Personnel with an attempt to identify different terms that have a common meaning. The course also identifies the roles and responsibilities of the parties to operating the BES which includes the Reliability Coordinator, Balancing Authority, Transmission Operator, and Generation Operator.



Module Objectives:

- Identify the generator attributes to the power system
- Identify the operational limitations and capabilities of generators
- Explain the impacts of generator operations on the power system for balancing
- Identify the implications of generator trippings to maintaining system reliability
- Define the role of generators in maintaining frequency in the power system
- Explain the operation of generators in isochronous control
- Identify the importance of generators maintaining voltage schedules
- Explain the operation and attributes of the generator's AVR
- Describe the generator's support for voltage in relationship to its D-Curve
- Describe the function of blackstart generation
- Explore the elements of islanded operations
- Identify the roles of NERC Functional Entities

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 0.0 CEHs

Transmission Control

This online training course consists of 11 lessons. The first 5 lessons establish a clear understanding of the concepts of transmission control of the bulk electric system under normal and emergency conditions. Topics covered in this portion of the course include: structure of the transmission system, system events, reactive power, distribution factors, system congestion, thermal, voltage and stability limits, equipment failures, power flow, contingency analysis, as well as, controlling actions and devices. The final 6 lessons step through various NERC standards related to transmission operations and voltage and reactive control. This class is intended for: new operators to the system that will have the responsibility of transmission operations; generation operators who want to expand their knowledge of transmission operations; individuals who desire the overall philosophy of controlling transmission and its impacts to the Bulk Electric System.



Module Objectives:

- Identify the components of the transmission system and their effect on control
- Describe the concepts involving transmission system events and their influence on power flow
- Define the role of reactive power in transmission control
- Identify distribution factors and variable influences that they have in operating the transmission system
- Describe how equipment failures can inhibit operation of the transmission system
- Define the guides and principles related to NERC TOP and VAR Standards
- Define the requirements related to NERC TOP and VAR Standards
- Describe the roles and responsibilities of the NERC Functional entities with regards to the NERC TOP and VAR Standards
- Describe the role of studies, power flow and contingency analysis; have on the safe and reliable operation of a transmission system

NERC Continuing Education Hours:

TOTAL: 9.0 CEHs - Standards: 4.0 CEHs - Ops Topics: 9.0 CEHs - Sim: 0.0 CEHs

Transmission Equipment

The course is intended to provide an overview to the Bulk Electric System and the transmission facilities that exists. It is intended to provide students with the basics understanding of the components of the transmission system. Topics covered in this course include: power transformers, instrument transformers, transmission lines, circuit breakers and switches, bus configurations, reactive devices, and data communication and meters. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Identify power transformers
- Identify data communication and meters
- Identify transmission lines
- Identify circuit breakers and switches
- Identify bus configurations
- Identify reactive devices
- Identify instrument transformers



NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



Voltage Control

The course is intended to provide an overview to the Bulk Electric System and the transmission facilities that exists. It is intended to provide students with the basic understanding of the components of the transmission system. Topics covered in this course include: reactive power flow, causes of low voltage, causes of high voltage, effects of low voltage, effects of high voltage, and the purpose and operation of voltage control equipment. Each lesson is culminated with a review and quiz. Upon completion of the lessons, there is a final assessment that individuals must attain a passing grade of 70% on the final assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Identify flow of reactive power
- Define causes of low voltage
- Define the purpose and operation of voltage control equipment
- Identify effects of low voltage
- Identify effects of high voltage
- Define causes of high voltage

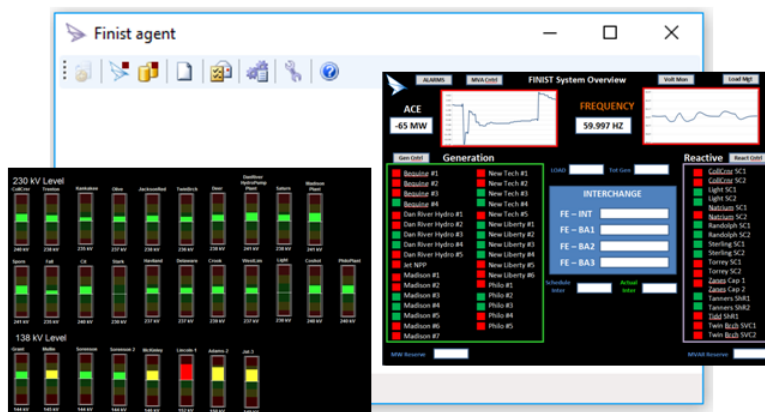
NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



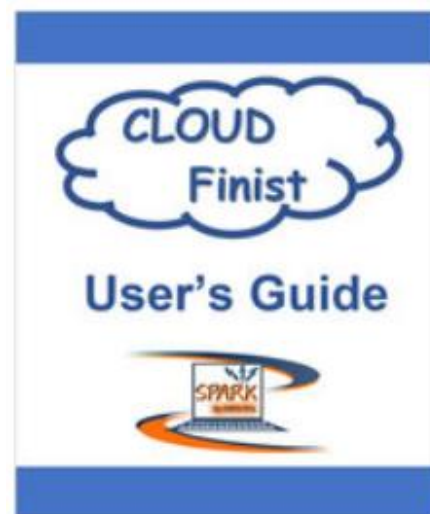
On-Line Learning Simulation Training

Spark by OES-NA, in conjunction with Monitor Electric brings you on-line simulation training activities. The opportunity to earn simulation CEHs through *Spark!* by OES-NA is here to stay. The current available on-line simulation modules includes: Voltage Control, Congestion Management, Balancing and Control, Geomagnetic Disturbances, Relay Operations, and Restoration.



Cloud Finist Tutorial

The course is intended to provide system personnel with an explanation and understanding of the Cloud Finist model, it's display, it's navigation, and identification of the model equipment. The module also identifies the operation of the various power system equipment that is available for utilization of control actions in operating the simulated power system. As a pre-requisite to the Spark by OES-NA's Cloud Finist on-line simulation training, all Students registering for any Cloud Finist modules must first complete the Cloud Finist Tutorial module.



NERC Continuing Education Hours:

TOTAL: 1.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.0 CEHs - Sim: 1.0 CEHs





Cloud Finist Voltage Control I

As part of the NERC Certification program, certified individuals are required to attain 30 CEHs related to simulation technology as part of their credential maintenance. Spark by OES-NA is proud to now provide this training through it's Cloud Finist on-line simulation training activities. The Cloud Finist



Voltage Control I module explores the area of voltage control on the Bulk Power System. This module includes tools for controlling voltages, concepts related to surge impedance loading, and actions to implement for both high and low voltage conditions. This module provides a unique opportunity to implement the identified actions in a robust system simulator in order to complete two simulation activities related to voltage control on the Cloud Finist simulator model. All students registering for this module must first complete the Cloud Finist Tutorial module.

Module Objectives:

- Identify the tools available for controlling system voltages
- Describe the principles associated with surge impedance loading
- Describe actions to take for high and low voltage conditions
- Demonstrate system actions to be implemented in a simulated environment

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs

Cloud Finist Voltage Control II

This Cloud Finist online course is delivered through Spark! By OES-NA in cooperation with Monitor Electric. The course is intended to provide system personnel with an explanation and understanding of Bulk Electric Power system voltage control equipment and concepts.



This module provides a unique opportunity to earn NERC CEHs related to simulation. The module provides a brief overview of voltage control equipment and then requires students to complete two simulation activities. As part of the activity completion, students are required to document both what they observed in the simulator, in addition to the actions that were implemented. Individuals must complete 100% of the assessment in order to be awarded the NERC CEHs.

Module Objectives:

- Identify the tools available for controlling system voltages
- Demonstrate system actions to be implemented in a simulated environment

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs

Cloud Finist Balancing and Control I

This online course steps through a brief review of the Balancing Authority and their role in maintaining generation/load balance. The module defines a balancing area, identifies the responsibility of a Balancing Authority, and describes the actions to take for high and low frequency conditions. The module then provides a unique opportunity to complete two simulation activities related to balancing and control on the Cloud Finist simulator model.



Module Objectives:

- Define what a balancing area is
- Identify the obligations of the Balancing Authority
- Describe action to take for high and low frequency conditions
- Demonstrate system actions to be implemented in a simulated environment

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs



Cloud Finist Congestion Management I

This Cloud Finist online course is delivered through Spark! By OES-NA in cooperation with Monitor Electric. The course is intended to provide system personnel with an explanation and understanding of Bulk Electric Power system congestion management concepts, principles, and actions. This module provides a unique opportunity to earn NERC CEHs related to simulation. The module provides a brief overview



of congestion management options, the equipment utilized, and additional action considerations. The module then requires students to complete two simulation activities. As part of the activity completion, students are required to document both what they observed in the simulator, in addition to the actions that were implemented. Individuals must complete 100% of the assessment in order to be awarded the NERC CEHs.

Module Objectives:

- Identify the tools available for controlling congestion management
- Describe thermal limits and how they relate to congestion management
- Describe actions to take regarding thermal limits
- Demonstrate system actions to be implemented in a simulated congested management scenario

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs





Cloud Finist Congestion Management II

The course is intended to provide system personnel with an explanation and understanding of Bulk Electric Power system congestion management concepts, principles, and actions. This module provides a unique opportunity to earn NERC CEHs related to simulation. The module provides a brief overview of congestion management options, the equipment utilized, and action considerations. The module then requires students to complete two simulation activities. As



part of the activity completion, students are required to document both what they observed in the simulator, in addition to the actions that were implemented. Individuals must complete 100% of the assessment in order to be awarded the NERC CEHs.

Module Objectives:

- Identify the tools available for controlling congestion management
- Describe actions to take regarding thermal limits
- Demonstrate system actions to be implemented in a simulated congested management scenario

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs



Cloud Finist Restoration I

This online course steps through a review of elements contained in the NERC Restoration Reference document related to power system restoration. The module explores the system assessment following an

event that has caused a full or partial system shutdown. The review then proceeds to the restoration process, switching approaches, restoration island building, synchronizing, and load pick-ups, voltage and frequency control, and finally, island synchronization. The module then provides a unique opportunity to complete two simulation activities related to balancing and control on the Cloud Finist simulator model.

Module Objectives:

- Explain the key elements for assessing the system following a blackout
- Define the issues relating to system restoration with regards to load and transmission restoration and frequency control
- Demonstrate the implementation of a restoration process on the Finist simulator

NERC Continuing Education Hours:

TOTAL: 5.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 5.0 CEHs - Sim: 5.0 CEHs



Cloud Finist Restoration II

This online course steps through a review of elements contained in the NERC Restoration Reference document related to power system restoration. The

module provides a brief overview to a system assessment following an event that has caused a full or partial system shutdown. The review then proceeds to the restoration process, switching approaches, restoration island building, synchronizing, and load pick-ups, voltage and frequency control, and finally, island synchronization. The module then provides a unique opportunity to complete two simulation activities on the Cloud Finist simulator model.

Module Objectives:

- Identify the key elements for assessing the system following a blackout
- Explain the issues relating to system restoration with regards to transmission restoration
- Explain the issues of load and frequency control relating to system restoration
- Demonstrate the implementation of a restoration process on the Finist simulator

NERC Continuing Education Hours:

TOTAL: 5.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 5.0 CEHs - Sim: 5.0 CEHs



Cloud Finist Relay Operation I

The course is intended to provide system personnel with a brief explanation and understanding of Remedial Action Schemes and UFLS schemes on the Bulk Electric Power system. This module also provides a unique opportunity to earn NERC CEHs related to simulation. The module provides a brief overview of the operation and utilization of RAS and UFLS schemes and then requires students to complete two simulation activities.



Module Objectives:

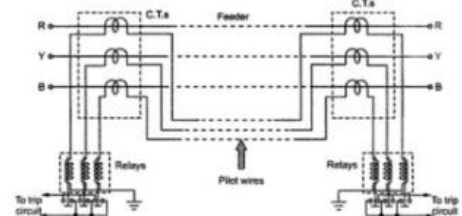
- Identify the principles and operation of remedial action schemes or RAS
- Identify the principles and operation of underfrequency load shedding schemes
- Demonstrate a System Operators response to relay operations on a power system

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs

Cloud Finist Relay Operation II

The course is intended to provide system personnel with an explanation and understanding of relay schemes utilized on the Bulk Electric Power system. This course provides a unique opportunity to earn NERC CEHs related to simulation. The course provides a brief overview of differential, distance, and breaker failure relay schemes and then requires students to complete two simulation activities. As part of the activity completion, students are required to document both what they observed in the simulator, in addition to the actions that were implemented. Individuals must complete 100% of the assessment in order to be awarded the NERC CEHs.



Module Objectives:

- Identify the principles and operation of differential and distance relays
- Identify the operation and reason for breaker failure relay schemes
- Demonstrate a System Operators response to relay operations on a power system

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs

Cloud Finist GMD

This online course steps through an explanation and understanding of geomagnetic disturbances and their impact on the Bulk Electric Power system. The module provides a brief overview of what GMDs are, how they develop, how they impact the BES, and



how the GMD activity is identified and disseminated. The module then provides a unique opportunity to complete two simulation activities related to GMDs on the Cloud Finist simulator model.

Module Objectives:

- Explain what a Geomagnetic Disturbance is
- Describe the impacts of Geomagnetic Disturbances on the power system
- Describe actions to take in the event of a Geomagnetic Disturbance
- Demonstrate system actions to be implemented in a Geomagnetic Disturbance event

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 3.0 CEHs



Decision Making Skills for System Operators

This 16-hour on-line class is intended to provide participants with necessary decision-making skills that can be utilized in fulfilling their everyday role in real-time operations. Participants are expected to already possess the basic principles of operating in an interconnected system. The participants will be required to utilize their knowledge of system operations and apply this knowledge while integrating the concepts identified for making decisions. The module then provides a unique opportunity to complete simulation activities on the Cloud Finist simulator model.



Module Objectives:

- Define the elements for consideration in making time critical decisions
- Identify the characteristics of intuitive skills utilized during operational situations
- Describe the decision-making model and how it is utilized during scenarios that involved System deficiencies, dispatching of personnel, restoration of system equipment, environmental hazards, planned outage processing, nuclear feeds during restoration, and terrorist threat on a nuclear facility
- Explain the situational awareness bubble, advanced team decision making concepts, and demonstrate team decision making skills

NERC Continuing Education Hours:

TOTAL: 16.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 16.0 CEHs - Sim: 8.0 CEHs





Emergency Response & Reporting

This on-line course is intended to provide participants with necessary response and reporting skills that can be utilized in fulfilling their everyday role in real-time operations. The course will identify actions to implement during emergency conditions. The participants will be required to utilize these actions to mitigate system events and then complete any NERC or DOE reporting requirements. Exercises will utilize the Finist Simulator system. The situations presented in the exercises will deal with various system events.



Module Objectives:

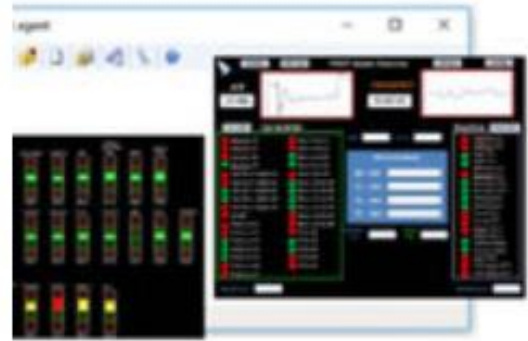
- Identify the NERC requirements with regards to reporting
- Identify the DOE requirements associated with reporting power system events and actions
- Explore the elements of the NERC and DOE reporting vehicles
- Identify actions to implement in response to system events and emergencies
- Utilize the FINIST Simulator to demonstrate the implementation of actions for responding to events
- Complete associated reporting forms for simulation activities

NERC Continuing Education Hours:

TOTAL: 3.5 CEHs - Standards: 3.5 CEHs - Ops Topics: 3.5 CEHs - Sim: 3.5 CEHs

Operations Through Simulation

This 16-hour on-line class is designed for real-time System Operating Personnel, Generating Plant personnel, and Operations Support personnel. The class reviews various concepts related to voltage control, congestion management, response to relay operations that includes distance and differential relays, balancing, communications, restoration, and geomagnetic disturbances. It consists primarily of simulation activities that provide the student with extensive opportunity to implement actions on the simulator and see the system response to those actions.



Module Objectives:

- Identify reactive devices and their utilization for voltage control
- Demonstrate the use of reactive devices in controlling voltages on a system simulator
- Monitor power flow in conjunction with power transfer limits
- Demonstrate the use of system equipment to control congestion on the transmission system
- Identify the guidelines of Restoration
- Demonstrate the actions required for restoration on a simulator system
- Identify relay protection schemes
- Demonstrate the responses required for distance and differential relay operations
- Identify the actions required for balancing resources and load in controlling ACE and frequency
- Identify the implications of GMD activity on the Bulk Power System
- Implement actions in response to identified GMD activity

NERC Continuing Education Hours:

TOTAL: 16.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 16.0 CEHs - Sim: 15.0 CEHs

Preventing Errors in Emergency Conditions

This online course steps through an explanation and understanding of geomagnetic disturbances and their impact on the Bulk Electric Power system. The module provides a brief overview of what GMDs are, how they develop, how they impact the BES, and how the GMD activity is identified and disseminated. The module provides a unique opportunity to complete two simulation activities related to GMDs on the Cloud Finist simulator model.



Module Objectives:

- Define risks and manage resources in addressing emergency conditions
- Describe the process to communicate intent, voice the intent, and resolve conflict
- Describe process for resolving conflict for improving the decision-making process
- Describe how decisions get made and why they are not always perfect
- Identify how to recognize ineffective teamwork

NERC Continuing Education Hours:

TOTAL: 16.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 16.0 CEHs - Sim: 8.0 CEHs

Proactive Approach to System Emergencies

This on-line course is intended to provide participants with an overview to natural disasters. It then identifies proactive responses to hurricane and wildfire events. The course will identify specific actions implemented pre-emptively by power system organizations. The participants will be required to utilize these actions in a simulated environment. Exercises will utilize the Finist Simulator system. The situations presented in the exercises will deal with real-time system events.



Module Objectives:

- Identify natural disasters and their impact on the power system
- Explore the steps that electric utilities take in preparing for natural disasters
- Identify actions that can be implemented on a preemptive basis
- Utilize the FINIST Simulator to demonstrate responding to natural disasters

NERC Continuing Education Hours:

TOTAL: 4.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 4.0 CEHs - Sim: 4.0 CEHs

PJM Manual Review Series

The online PJM Manual Review series explores the PJM Manuals relevant to the PJM Energy Markets and Transmission Operations. The Energy Market manuals review the rules, procedures, and requirements for PJM Market & System

Operations, in addition to PJM Members that buy, sell, schedule and deliver electric power through the Energy & Reserve Markets within the PJM region. The Transmission Manuals provide resources, guidelines and requirements for Transmission Operations and member companies within the PJM region, as well as, provide coordination information for PJM neighbors. The series includes the following modules:

- Balancing Area Overview
- Pre-Scheduling Operations
- Energy & Ancillary Services Market Operations
- Balancing Operations
- Transmission Operation
- Emergency Operations
- System Restoration
- Control Center and Data Exchange Requirements
- Generator Operational Requirements



PJM Certification: Balancing Area Overview

The module provides an overview to balancing area operations and its relationship to the interconnection. The overview includes the concepts associated with area control error and tools available to utilize as control mechanisms. The module concludes with identification of control performance standards and actions available to assist in meeting the standards.



Module Objectives:

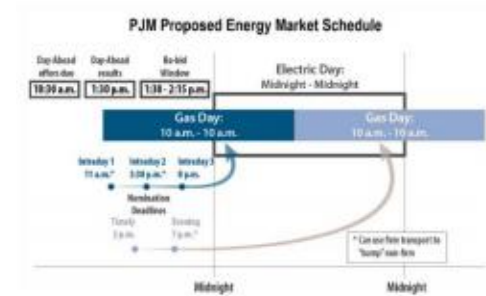
- Describe how PJM fits into the overall scheme of the electric grid
- Identify what defines PJM as a Balancing Area
- Explain the PJM Balancing Authority obligations

NERC Continuing Education Hours:

TOTAL: 1.0 CEHs - Standards: 0.0 - CEHs Ops Topics: 1.0 - CEHs Sim: 0.0 CEHs

PJM Certification: Pre-Scheduling Operations - PJM Manual 10

The manual review focuses on the PJM OI and PJM Member pre-scheduling activities. The review includes roles and responsibilities of the PJM System Operators and PJM Members with regards to: Pre-Scheduling, Outage Reporting, Reserves and Reserve Objectives, Regulation Requirements, and Maintaining Market Information.



Module Objectives:

- Describe the scope and purpose of pre-scheduling
- Identify the PJM and PJM Members' pre-scheduling responsibilities
- Define the elements of PJM Outage categories
- Identify the types of reserve in the PJM Markets and Operations
- Identify how the PJM Reserve Requirements are determined
- Define the PJM Seasonal Reserve Requirements
- Describe PJM Regulation Market and Regulating resources
- Identify the rules related to PJM Regulating Resource Availability

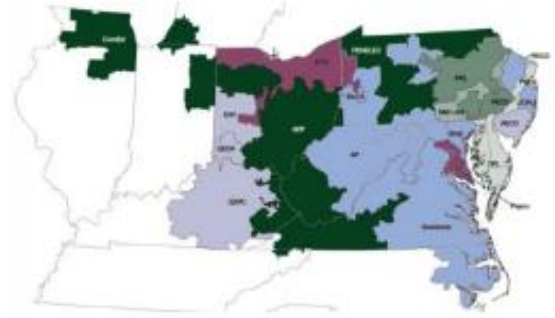
NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs

PJM Certification: Energy & Ancillary Services Market Operations - PJM Manual 11

The module reviews elements of the PJM Manual 11 - Energy & Ancillary Services Market Operations. The manual review focuses on the day ahead and hourly scheduling activities that are performed by PJM and PJM Members. The review includes the description of the rules and procedures for scheduling resources.

The module then provides an overview for Scheduling Operations, the PJM Two Settlement System, and the PJM Regulation Market. The review identifies the scheduling philosophy, tools, strategy, and methodology.



Module Objectives:

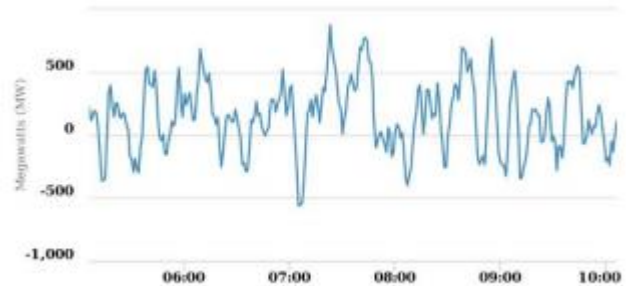
- Describe scope and purpose of the PJM scheduling process
- Identify the PJM staff and Market Participants' scheduling responsibilities
- Describe the PJM Energy Markets
- List the PJM Two-Settlement Market Business Rules
- Describe the PJM Regulation Market
- List the PJM Regulation Market Business Rules
- Describe the PJM Synchronized and Non-Synchronized Reserve Markets
- List the PJM Synchronized and Non-Synchronized Reserve Markets' Business Rules
- Describe the PJM scheduling philosophy
- Identify the tools that are used during the scheduling process
- Identify how the PJM regulation and synchronized reserve requirements are determined
- Describe how the PJM marketing information is processed
- Identify the process that PJM may utilize a net interchange cap to manage interchange during emergency conditions
- Identify how interchange schedules may be adjusted on an hourly basis
- Describe the Demand Resource Participation in the PJM Energy Market
- List the Demand Resource Registration Requirements and Energy Market Participation
- List the Demand Resource Metering and Settlement Data Requirements

NERC Continuing Education Hours:

TOTAL: 5.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 5.0 CEHs - Sim: 0.0 CEHs

PJM Certification: Balancing Operations - PJM Manual 12 Review

The module reviews elements of the PJM Manual 12 – Balancing Operations. The manual review focuses on the real-time operation of the PJM Energy Market. The module then describes how PJM dispatches and controls capacity resources and how PJM monitors transmission facilities. The module concludes with a description of how PJM provides ancillary services.



Module Objectives:

- Identify PJM and PJM Member roles and responsibilities
- Describe the PJM Balancing Center tools used for dispatching and operations
- Describe the information that is passed on to market accounting
- Identify how PJM adjusts PJM RTO Scheduled Resources
- Describe how PJM corrects for time error and accumulated inadvertent interchange
- Describe how PJM monitors and restores reserves
- Explain how PJM determines and assigns regulation
- Describe how a generating unit is tested and qualified for regulation service in the PJM Market
- Describe how PJM ensures and monitors Black Start Service
- Explain how PJM control for reactive limits, controls voltage, and responds to overloaded facilities
- Describe PJM's role in regional reliability coordination

NERC Continuing Education Hours:

TOTAL: 4.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 4.0 CEHs - Sim: 0.0 CEHs



PJM Certification: Transmission Operations

The module reviews elements of the PJM Manual 3 – Transmission Operations. The Transmission Operations review focuses on specific transmission conditions and procedures for the operation of PJM designated transmission facilities. The review then explores transmission operations requirements, thermal operating guidelines, voltage and stability operating guidelines and identification of reportable transmission facility outages.



Module Objectives:

- Describe the PJM's transmission guidelines
- Describe PJM's RT Reliability Model
- Describe PJM Transmission Facilities and Transmission Owner facilities
- Identify the guidelines for modifying facilities list
- Explain the PJM Thermal Operating criteria
- Describe the PJM voltage, voltage related transfer, and stability limits
- List the actions for low and high voltage
- Describe PJM's transfer limits, stability operation, and Interconnection Reliability Operating Limits(IROLs)
- Identify the PJM load relief expectations
- Identify the PJM general principles of scheduling outages and how the Transmission Owner schedules a transmission facility outage
- Explain how PJM processes a Transmission Outage Request
- Describe the PJM Transmission Acceleration Outage Process
- Identify the Index and Operating Procedures for PJM RTO

NERC Continuing Education Hours:

TOTAL: 3.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.5 CEHs - Sim: 0.0 CEHs



PJM Certification: Emergency Operations - PJM Manual 13

The module reviews elements of the PJM Manual 13 – Emergency Operations. The Emergency Operations manual review focuses on PJM and PJM Members expected responses to emergency conditions. The emergency conditions explored include conditions requiring manual or automatic action to maintain system frequency or to prevent loss of firm load, equipment damage, or tripping of system elements that could adversely affect the reliability of an electric system or the safety of persons or property.



Module Objectives:

- Describe the PJM RTO policy statements for emergency conditions
- Identify the PJM system alert and emergency actions
- Define the PJM Reserve Requirements by Control Zone
- Identify the PJM and Member responses to capacity shortage situations and capacity excess situations
- Identify the conditions that warrant conservative operation
- List the PJM responses to thunderstorms, tornadoes, other severe weather, and geo-magnetic disturbances
- Describe the PJM conditions that warrant conservative operation
- List the actions that PJM may take in the event of these potential and/or realized manmade threats
- Identify the PJM response to potential Heavy Load/Low Voltage conditions
- Define the PJM implementation of Capacity Related Emergency Procedures to control Transmission Constraints
- Describe the use of the Post Contingency Local Load Relief Warning and Action
- Define the PJM reporting requirements to the Department of Energy, NERC, and Capacity or Energy Shortages to FERC
- Describe the PJM response to fuel limitations

NERC Continuing Education Hours:

TOTAL: 5.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 5.5 CEHs - Sim: 0.0 CEHs

PJM Certification: System Restoration - PJM Manual

36 Review

The module reviews elements of the PJM Manual 36 – System Restoration. The System Restoration manual review focuses on PJM and PJM Members expected actions during a system restoration event. The module explores the various disturbance conditions and the assessment required to determine the system conditions. The module identifies the restoration process, communications required during the process, and the PJM reserve requirements. The manual review addresses issues and considerations related to generation and transmission facilities during the restoration effort. The manual identifies the PJM restoration plan guidelines and culminates with the identification of the cross zonal coordination.



Module Objectives:

- Describe the PJM policy statements for emergency conditions
- Identify the PJM responses to internal problems without separation and with separation
- Explain how PJM and the Transmission Owners/Generation Owners restore the PJM RTO, including a description of the emergency procedures
- State the PJM communications guidelines for use during a restoration
- Describe how PJM determines synchronous and dynamic reserves during a restoration
- Identify the utilization of generation during restoration, cranking power, start-up, and frequency control
- Describe how PJM provides voltage regulation and control during the restoration process and the synchronizing process phases
- Explain how PJM determines a standard content guideline for restoration plan guidelines
- Identify how PJM works with the TOs to identify cross-zonal coordination opportunities

NERC Continuing Education Hours:

TOTAL: 4.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 4.5 CEHs - Sim: 0.0 CEHs

Requirements - PJM Manual 1 Review

The module reviews elements of the PJM Manual 1 – Control Center and Data Exchange Requirements. The manual review focuses on the requirements for control centers that are signatories to the PJM Operating Agreement. The review describes the telecommunication linkages to PJM and the recommended characteristics of these control center computer systems and facilities. It then identifies computer services and systems at PJM and touches on meter accuracy standards.



Module Objectives:

- Describe the PJM control center systems
- List the PJM different categories of control centers
- State an overview of PJM Member responsibilities
- Identify the PJM requirements for Control Center computer systems and communications
- List the PJM requirements for control center physical facilities and control center staffing
- recommendations
- Define the data exchanged between PJM and PJM Member's EMS systems and Synchrophasor systems
- List the system information that is available to Market Participants
- Identify the system data exchanged over telephone and facsimile machines
- Describe the use of backup communications systems when operating in the PJM RTO

NERC Continuing Education Hours:

TOTAL: 1.5 CEHs - Standards: 0.0 CEHs - Ops Topics: 1.5 CEHs - Sim: 0.0 CEHs



PJM Certification: Generator Operational Requirements - PJM Manual 14 Review

The module reviews elements of the PJM Manual 14 – Generator Operational Requirements. The manual review focuses begins with identification of the requirements for generator participants to connect to the PJM system. The module then describes communication and data requirements of PJM and Local Control Centers. The review then touches on defining telecommunication protocols, redundancy requirements, accuracy and periodicity of data, generator obligations, and reporting requirements.



Module Objectives:

- List significant obligations of Generation Owners in the PJM Balancing Authority
- Describe the PJM generation control center categories, requirements for generation owners, and their voice communication requirements
- Identify the PJM computer system data exchange methodology and requirements and the rules pertaining to generator metering
- List the marketing options available to Generator Owners
- Describe the PJM required/mandatory services for Generator Owners
- Identify the PJM marketing tools that are currently available
- Describe the PJM two-settlement system
- State the role of Generation in the PJM pre-scheduling and scheduling processes
- Identify the resource commitment process
- Describe the PJM data exchange testing procedures and required training procedures
- Identify the pre-operational requirements of Generation for coordination with dispatch
- State the switching requirements for all equipment a Generator Resource owns, operates or controls
- List the Generator information and reporting requirement
- Identify the PJM requirements and procedures for Generator synchronization and disconnection
- Describe the Wind Farms data requirements and PJM Wind Power Forecasting service
- State the PJM black start selection process and Reliability Backstop process

NERC Continuing Education Hours:

TOTAL: 3.0 CEHs - Standards: 0.0 CEHs - Ops Topics: 3.0 CEHs - Sim: 0.0 CEHs