

## 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 which were updated to align with the current certification exams:

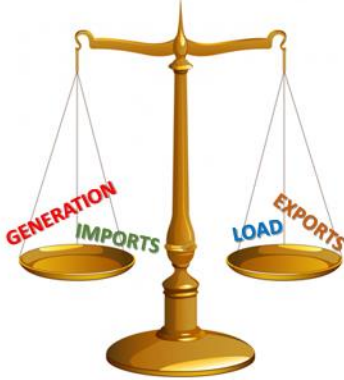
- Balancing Area Overview
- Pre-Scheduling Operations
- Energy & Ancillary Services Market Operations
- Balancing Operations
- Transmission Operation
- Emergency Operations
- System Restoration
- Control Center and Data Exchange Requirements
- Generator Operational Requirements

These online modules are also part of the PJM Certification Prep package and can be purchased individually or as a series package.

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## PJM Manual Review Series

### 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.

#### 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

Upon completion of the module, there is a final assessment to measure the satisfaction of the module objectives. Individuals must attain a passing grade of 70% on the final assessment in order to be awarded the appropriate NERC CEHs.

This module is intended for: new operating personnel working towards attaining their PJM Transmission or Generation certification and also experienced personnel working in a real-time System Operation environment who wish to expand their knowledge of operating in the PJM RTO and satisfy their PJM/NERC continuing education requirements.

#### NERC Continuing Education Hours:

TOTAL: 1.0 CEHs

Standards: 0.0 CEHs

Ops Topics: 1. CEHs

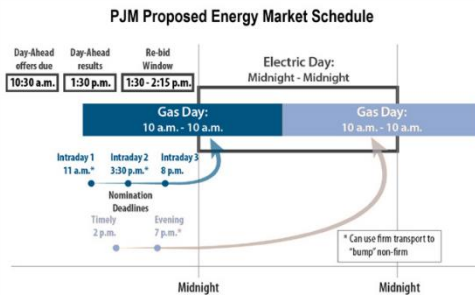
Sim: 0.0 CEHs

**\$35.00**

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## PJM Manual Review Series

### PJM Certification: Pre-Scheduling Operations - PJM Manual 10



The module reviews elements of the PJM Manual 10 - Pre-Scheduling Operations. 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.

- Section 1: Pre-Scheduling Overview
- Section 2: Outage Reporting
- Section 3: Reserve Requirements
- Section 4: Regulation Requirements
- Section 5: Maintaining Market Information

### 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: Planned, Maintenance, and Unplanned Outages
- 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

Upon completion of the module, there is a final assessment to measure the satisfaction of the module objectives. Individuals must attain a passing grade of 70% on the final assessment in order to be awarded the appropriate NERC CEHs.

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## **PJM Manual Review Series**

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### **NERC Continuing Education Hours:**

TOTAL: 1.5 CEHs

Standards: 0.0 CEHs

Ops Topics: 1.5 CEHs

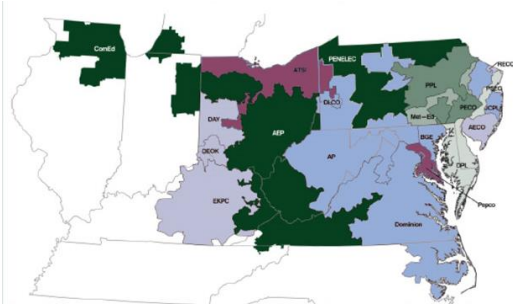
Sim: 0.0 CEHs

**\$52.50**

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## PJM Manual Review Series

### 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.

- Section 1: Overview of Energy & Ancillary Services Market Operations
- Section 2: Overview of the PJM Energy Markets
- Section 3: Overview of the PJM Regulation Market
- Section 4: Overview of the PJM Synchronized Reserve Market
- Section 4b: Overview of the Non-Synchronized Reserve Market
- Section 5: Market Clearing Processes and Tools
- Section 6: Reserve Requirements in PJM Energy Markets
- Section 7: External Transaction Scheduling
- Section 8: Posting OASIS Information
- Section 9: Hourly Scheduling
- Section 10: Overview of the Demand Resource Participation

#### 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

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## **PJM Manual Review Series**

- 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

Upon completion of the module, there is a final assessment to measure the satisfaction of the module objectives. Individuals must attain a passing grade of 70% on the final assessment in order to be awarded the appropriate NERC CEHs.

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### **NERC Continuing Education Hours:**

TOTAL: 5.0Hs

Standards: 0.0 CEHs

Ops Topics: 5.0 CEHs

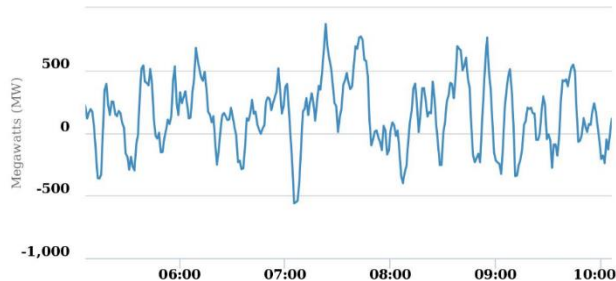
Sim: 0.0 CEHs

**\$175.00**

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## PJM Manual Review Series

### 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.

- Section 1: Overview
- Section 2: Dispatching Tools
- Section 3: System Control
- Section 4: Providing Ancillary Services
- Section 5: Transmission Facility Control

#### 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

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## **PJM Manual Review Series**

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### **NERC Continuing Education Hours:**

TOTAL: 4.0 CEHs

Standards: 0.0 CEHs

Ops Topics: 4.0 CEHs

Sim: 0.0 CEHs

**\$140.00**

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## PJM Manual Review Series

### 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.

- Section 1: Transmission Operations Requirements
- Section 2: Thermal Operating Guidelines
- Section 3: Voltage & Stability Operating Guidelines
- Section 4: Reportable Transmission Facility Outages
- Section 5: Operating Procedures for PJM RTO

### 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

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## **PJM Manual Review Series**

- Describe the PJM Transmission Acceleration Outage Process
- Identify the Index and Operating Procedures for PJM RTO

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### **NERC Continuing Education Hours:**

TOTAL: 3.5 CEHs

Standards: 0.0 CEHs

Ops Topics: 3.5 CEHs

Sim: 0.0 CEHs

**\$122.50**

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## PJM Manual Review Series

### 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.

- Section 1: Overview
- Section 2: Capacity Emergencies
- Section 3: Weather/Environmental Emergencies
- Section 4: Sabotage/Terrorism Emergencies
- Section 5: Transmission Security Emergencies
- Section 6: Reporting of Emergencies

#### 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

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## **PJM Manual Review Series**

- Describe the PJM response to fuel limitations

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### **NERC Continuing Education Hours:**

TOTAL: 5.5 CEHs

Standards: 0.0 CEHs

Ops Topics: 5.5 CEHs

Sim: 0.0 CEHs

**\$192.50**

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## PJM Manual Review Series

### 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.

- Section 1: Overview
- Section 2: Disturbance Conditions
- Section 3: System Restoration
- Section 4: Communications
- Section 5: Reserves During Restoration
- Section 6: Generation
- Section 7: Transmission
- Section 8: System Restoration Plan Guidelines
- Section 9: Cross Zonal Coordination

#### 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

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## **PJM Manual Review Series**

- 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

Upon completion of the module, there is a final assessment to measure the satisfaction of the module objectives. Individuals must attain a passing grade of 70% on the final assessment in order to be awarded the appropriate NERC CEHs.

This module is intended for: new operating personnel working towards attaining their PJM Transmission or Generation certification and also experienced personnel working in a real-time System Operation environment who wish to expand their knowledge of operating in the PJM RTO and satisfy their PJM/NERC continuing education requirements.

### **NERC Continuing Education Hours:**

TOTAL: 4.5 CEHs

Standards: 0.0 CEHs

Ops Topics: 4.5 CEHs

Sim: 0.0 CEHs

**\$157.50**

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## PJM Manual Review Series

### PJM Certification: Control Center and Data Exchange 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.

- Section 1: PJM Systems
- Section 2: Control Center Requirements
- Section 3: Data Exchange Requirements
- Section 4: Voice Communications
- Section 5: Metering Requirements

#### 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

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### **NERC Continuing Education Hours:**

TOTAL: 1.5 CEHs

Standards: 0.0 CEHs

Ops Topics: 1.5 CEHs

Sim: 0.0 CEHs

**\$52.50**

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## PJM Manual Review Series

### 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.

- Section 1: Generator Markets & Operations
- Section 2: Responsibilities of Generation Owners
- Section 3: Control Center Requirements
- Section 4: Data Exchange and Metering Requirements
- Section 5: Participation in PJM Markets
- Section 6: Pre-Operational Requirements
- Section 7: Generator Operations
- Section 8: Wind Farm Requirements
- Section 9: Generator Deactivations
- Section 10: Black Start Generation
- Section 11: Generator Data Confidentiality

#### Objectives

- State a summary of the Markets and Operations phase of the Generator Interconnection Process and identify the rules for assigning a commercial plant/unit name to new generation
- 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

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## **PJM Manual Review Series**

- 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
- Define the PJM generator data confidentiality procedures for a Transmission Owner (TO) to obtain real time generator data from PJM

Upon completion of the module, there is a final assessment to measure the satisfaction of the module objectives. Individuals must attain a passing grade of 70% on the final assessment in order to be awarded the appropriate NERC CEHs.

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### **NERC Continuing Education Hours:**

TOTAL: 3.0 CEHs

Standards: 0.0 CEHs

Ops Topics: 3.0 CEHs

Sim: 0.0 CEHs

**\$105.00**

### **PJM CBT Series Price - \$850.00 (29.5 CEHs)**

TOTAL: 29.5 CEHs

Standards: 0.0 CEHs

Ops Topics: 29.5 CEHs

Sim: 0.0 CEHs

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