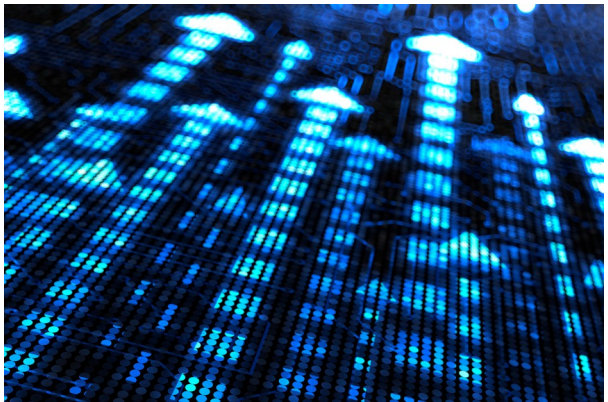


# **NYISO Market Training Course Catalog**





## About the NYISO

The NYISO is an independent, not-for-profit organization responsible for operating the state's bulk electricity grid, administering New York's competitive wholesale electricity markets, and conducting comprehensive long-term planning for the bulk power system.

We manage the flow of power on 11,000-plus miles of electric transmission lines on a continuous basis, 24 hours-a-day, seven days-a-week. As the administrator of the wholesale electricity markets, we conduct auctions that match the power demands of electric utilities and energy service companies with suppliers offering to sell power resources. The NYISO's market structure and grid operations are designed to dispatch the least costly power available to meet demand and maintain essential reliability requirements of the electric system.

Our markets trade an average of \$7.5 billion in electricity and related products annually.

The NYISO is dedicated to transparency in how we operate, the information we provide to the public, and our role as an impartial broker of New York's wholesale electricity markets. We are governed by an independent Board of Directors and a committee structure comprised of a diverse array of market participants and stakeholder representatives.

Our system of shared governance provides all market participants a voice in the operation and evolution of the marketplace. Under NYISO's collaborative process, representatives of these market participants have voting power in exercising responsibilities that include preparing NYISO's annual budget; reviewing and recommending candidates for NYISO's board vacancies; developing and adopting technical guidelines for operation of the bulk power system; market design and system planning.

**The mission and vision of the NYISO is to ensure power system reliability and competitive markets for New York in a clean energy future. Working together with stakeholders to build the cleanest, most reliable electric system in the nation.**

### **Our Role includes:**

- Reliable operation of the bulk power grid
- Administration of open and competitive wholesale electricity markets
- Planning for New York's energy future
- Advancing the technological infrastructure of the electric system



## NYISO Market Training

The NYISO's Market Training Department offers education and training opportunities associated with various aspects of New York wholesale energy market administration and NYISO project implementations. We have introductory courses for new market participants or interested parties, and there are advanced courses to further develop market knowledge. Courses are updated and scheduled on a regular basis to keep participants abreast of new market features and products. Market Participants can use this e-catalog as a reference for selecting an instructor-led course. Course materials, including those for various topics not listed here, are posted on our website.

## Project Implementation Webinars

Market Training's webinars offer detailed insight on the implementation of projects associated with NYISO key initiatives. The information presented ranges from market rule changes, to new or enhanced NYISO applications, to new products and services. Training webinars are announced to the marketplace by Market Training via email and are conducted shortly before a project implementation. They are designed to provide you with an opportunity to become familiar with the coming changes and pose any questions regarding those changes to the relevant NYISO subject matter experts.

## Online Learning

The Online Learning section of the NYISO Market Training webpage offers a comprehensive choice of self-paced courses on the New York energy markets and products narrated courses that you can complete from home or work, at your own pace. Begin your self-paced learning about the NYISO anywhere, anytime!

### Online Learning Courses Include:

- Behind-the-Meter: Net Generation
- Co-Located Storage Resources Model
- DSS Course Suites: 101 & 201 Level
- Energy Storage Resources Model
- GADS Portal: An Introduction
- NAESB Digital Certificate Tutorial
- NYISO Interconnection Process
- Market Overview Course Suite: 101
- TCCs: The Basics & Competency Exam
- Virtual Trading: The Basics & Competency Exam
- Wind and Solar Intermittent Power Model

**The Market Training team's mission is to provide NYISO market and project implementation training and education to stakeholders and NYISO employees, in support of power system reliability and competitive markets.**





## Instructor-Led Courses

The following is a list of our instructor-led courses, either held at a NYISO facility or via WebEx. During these, you will interact directly with NYISO staff, including subject matter experts. If you have questions about our training offerings or would like to schedule on-site training at your location, please reach out to the Market Training Department at 518-356-6274, or by sending an email to [training@nyiso.com](mailto:training@nyiso.com).

### MT-201 NY Market Orientation Course

Three and a half-day course

Designed for those with more general NYISO market experience, but who may feel the need for a refresher, or to fill in the gaps they may have regarding specific areas of the market. It covers the same subjects as our Market Overview e-Learning course suite, but is more in-depth, and also adds Virtual Trading, Transmission Congestion Contracts, Market Monitoring, Settlements and Invoicing, and Future Market Initiatives. As an added bonus, you will be given a “tour” of our new world-class control room from the viewing gallery.

#### COURSE CONTENT

##### Formation & Governance

- Transition from Power Pool to ISO
- Regulatory Oversight and the NYISO Tariffs
- How the NYISO works with its stakeholders
- Governance committee structure, the sector voting system

##### Power Systems Fundamentals

- How power flows on the high-voltage transmission network, the physical components of the New York Control Area (NYCA) power system

- Load distribution vs. location of generation in New York
- Operational ancillary services
- Impact of generation and transmission outages

##### Locational Based Marginal Pricing (LBMP)

- How LBMP is established
- Differences between day-ahead and real-time markets
- The three components of LBMP-energy, loss, and congestion
- Contributing congestion factors

##### NYISO Market Place

- Energy Market functions and features
- Commitment and dispatch of resources, market timelines, transmission charges
- Day-ahead vs. real-time markets and associated settlements

##### Energy Market Transactions

- The two types of contracts in the NYISO energy market
- Internal vs. external transactions
- Bidding options for evaluation by the market
- Settlement



### **Ancillary Services**

- Cost-based AS such as voltage support and black-start capability service
- Market-based AS such as reserves and regulation
- Settlement and allocation of costs

### **Virtual Trading**

- Mechanics of the virtual market, including virtual bidding scenarios and associated settlement
- Virtual supply vs. load bids, impact on Day-Ahead Market prices
- Hedging with VT

### **Installed Capacity**

- Role of ICAP, the 3 types of NYISO auctions and clearing prices, ICAP vs. Unforced Capacity
- Requirements for different NYCA entities-including retail providers
- Determining how much an ICAP supplier can sell

### **Demand Response**

- Rationale for Demand Response in NY
- The two categories of DR- Reliability-Based and Economic-Based
- DR participation requirements, settlement

### **Transmission Congestion Contracts (TCC)**

- TCC fundamentals and how to obtain TCCs
- TCCs cashflows, including the TCC auction process and congestion rents
- TCCs as a hedge against congestion costs... or as an investment
- Examples of gains and losses

### **Additional NYISO Services**

- The responsibilities of the external Market Monitoring Unit (MMU) and the internal Market Mitigation and Analysis Department (MMA)
- The purpose of the NYISO Credit Policy
- The processes associated with administering a Consolidated Invoice
- The roles and responsibilities of NYISO Stakeholder Services and Member Relations

### **Future Market Initiatives**

This module looks at both short-term and long-term NYISO initiatives that are underway to transform today's power grid toward a grid with increased renewable, intermittent, and distributed energy resources

### **NYISO Control Room Gallery Tour**

NYISO staff will escort the attendees to the gallery overlooking our state-of-the art control room, where a member of NYISO Operations Training will provide a detailed explanation of the technological features and capabilities of the facility

## MT-304 Accounting and Billing Five-day Webinar

**This course provides detailed knowledge of the settlements associated with Power Suppliers, Load Serving Entities, Transactions, Virtual Trading, Demand Response and Transmission Owners. Using the terminology and syntax of the NYISO Decision Support System (DSS), the structure of each training section starts with a listing of the most granular data inputs. Next, we show you how these raw inputs are used mathematically to develop the “intermediates,” and we then complete the calculation by using the intermediates to produce the final settlement number. Scenarios are used to put the calculations in the context of real-world situations.**

### What You Will Cover:

- The Consolidated Invoice
- DSS Reporting
- The Metering Process
- All Customer Settlement Types
- Coming Attractions

### Customize Your Learning Experience

Participants can choose which of the listed topics they would like to attend; in addition, they will have the option of scheduling one-on-one time with NYISO Settlement Experts

### COURSE CONTENT

For each module, you will start with the basic billing determinants and progress through the intermediate calculations and settlement algorithms

### Recommended Course Prerequisites

To fully achieve the Accounting and Billing course objectives and maximize your learning effectiveness, it is recommended that participants either have six months work experience with the NYISO Market settlements or have completed one of the following:

- Market Overview eLearning Suite
- NYISO Market Orientation Course (NYMOC) MT-201

### Recommended For All:

- Course Kick Off
- The Consolidated Invoice and DSS Overview
- Metering
- Open Discussion Forum
- Workshop Close

### Building Your Learning Track:

#### Choose any or all from the following workshop topics:

- Power Supplier (PS) Energy & Ancillary Services
- PS Supplemental Payments
- Load Serving Entity (LSE) Energy & Ancillary Services
- Transactions – Energy, Ancillary Services, Supplemental Transaction Payments & FIC
- LSE & Transaction Customer Allocations
- Transmission Owner & TCC Settlements
- Virtual Trading Settlements
- Demand Response Settlements
- ICAP Auction Settlements
- DSS Application Walk-Through



## **MT-305 Intermediate ICAP**

### **Two-day course**

**This course delves into the workings of the NYISO Installed Capacity Market and the benefits it provides. Both providers and consumers of ICAP will learn what is required to participate in this market, how auctions are conducted, and financial settlement elements.**

### **COURSE CONTENT**

#### **Amount of Capacity Required**

- How the amount of ICAP required for the New York Control Area (NYCA) is established
- The processes behind determining the NYCA Forecasted Peak Load and Installed Reserve Margin (IRM)

#### **Amount of Capacity Available**

- The definition and purpose of the Dependable Maximum Net Capability (DMNC) test
- Generators' DMNC data submittal process

#### **Generator Outage Scheduling**

- Why generator outage schedules need to be coordinated from a reliability perspective
- The outage scheduling process
- Outage submittal methods, both manual and automated

#### **Capacity Supply Qualified to Offer**

- How ICAP is translated into UCAP
- Generator forced outages and derates
- External capacity resources; Import Rights vs Unforced Deliverability Rights
- ICAP supplier obligations in the energy market

#### **Load-Serving Entities' (LSE) Obligation to Procure ICAP**

- NYCA and Locational (New York City and Long Island) minimum Installed Capacity requirements for LSEs
- How Locational requirements can change each Capability Year
- ICAP to UCAP

#### **NYISO's ICAP Market Auctions**

- Pre-auction preparation
- Capacity Certification
- The different auctions
  - Capability Period Auction
  - Monthly Auction
  - Spot Market Auction
- Capacity settlements

#### **Demand Curve**

- Supply and demand curve basics
- Rationale behind the ICAP Demand Curve
- Basics on developing the Demand Curve
- The Demand Curve and ICAP Market clearing prices

#### **In-City (NYC) Mitigation**

- Supplier portfolio aspects
- Purpose of supply-side and buyer-side mitigation

#### **Generator Performance Monitoring**

- Bidding, scheduling, and notification requirements

#### **Panel Discussion**

- A time for your questions!
- A panel of NYISO experts on ICAP



## MT-306 LBMP In-Depth

### Three-day course

**This course provides attendees with a more detailed understanding of the processes used to produce locational-based marginal prices in the NY wholesale market, in addition to a closer look at the various factors that impact NYISO's pricing methodology.**

#### **Recommended Course Prerequisites**

To fully achieve the Demand Response In-Depth course objectives and maximize your learning effectiveness, it is recommended that participants either have six months work experience with the NYISO Markets or have completed one of the following:

- Market Overview eLearning Suite
- NYISO Market Orientation Course (NYMOC) MT-201

## COURSE CONTENT

### **LBMP Intermediate Level Re-Cap**

- Key Terms and Processes
- Why show all components?
- Examples

### **Inputs Determining LBMPs & Schedules**

- Physical Supply Offers
- Determining NYCA Load
- Energy Market Transactions
- Market Based Ancillary Services
- Demand Response
- Virtual Trading

### **Bid & Offer Evaluation Process**

- Intro to DAM & RT Software
  - Security Constrained Unit Commitment
  - Real Time Software
- Data Inputs
  - Includes DAM carry over and RT processes
  - Explain Potential for Scheduling & Pricing Differences DAM to RT
- RTC & RTD
  - Inputs & Process Timelines
- RTD-CAM
  - Various Modes
- SRE
  - Explain Purpose & Timeline
  - Identify Impact

### **Details of the Energy Price Component**

- Energy Price Setting Unit
  - Process for determining
  - Marcy Reference Bus Role
  - Statewide Concept
- Application of "Next MW" Theory
  - Example (using real NYISO data)

### **Details of the Loss Price Component**

- Concept Behind Physical Losses
  - Percentage of Total NYCA Losses
  - Introduction to Power Flow Model
- Physical Loss Translates to Financial Loss
  - Reason Behind Translation
- Tariff Loss Calculation
  - Generator Perspective
  - LSE Perspective
- Application of Loss Calculation
  - Examples (using real NYISO data)





## Details of the Congestion Price Component

- Concept Behind Constraints
  - Common Congestion Points
  - Line Limitations
- Identify Factors that Impact Congestion
  - Outages
  - PARs
  - Re-Dispatching
  - Generator Shortages
  - Transmission Demand Curves
- Tariff Congestion Calculation
  - Generator Perspective
  - LSE Perspective
- Application of Congestion Calculation
  - Examples (using real NYISO data)

## Additional Pricing Rules

- External Proxy Buses
  - When in effect & overall process
- Market Based Ancillary Services
  - Regulation & Frequency Response
    - Capacity & Movement
  - Operating Reserves
    - Cascading/Nested Prices
  - Shortage Pricing
    - When in effect & overall process
  - Scarcity Pricing
    - When in effect & overall process

## Uplift & Residuals

- Cause & Effect
  - Supplemental Supplier Payments
  - LSE Allocations

## Price Validation

- Purpose
- Timelines
- Process

## LBMP-Putting It All Together

- Interactive Exercises
  - Variety of Scenarios
  - Using Real-World NYISO Data

## Panel Discussion

- A time for your questions!
- A panel of NYISO experts on LBMP

## MT-307 Generating Availability Data System

Half-day course

**This course is for those who are responsible for submitting GADS data for their unit(s) to the NYISO. Students will learn what the NYISO's reporting requirements are for use in calculating unit derating factors for the Installed Capacity (ICAP) Market, as well as for reliability studies. Please note that we make time for a panel discussion at the end of the presentation; here students will have the chance to ask questions of a panel of experts from NYISO staff, including a representative of the Scheduling Department, as well as our resident GADS expert!**

## COURSE CONTENT

### NYISO and GADS

- Understand how NYISO uses NERC GADS data that it receives from the MP
- The three types of GADS data: Design, Event, and Performance
- NYISO's requirements vs. NERC's\*

**\* PLEASE NOTE: This is a course on how GADS data is used by the NYISO – not a course on fulfilling generators' NERC GADS requirements.**



## Design Data

- Data Structure
- Identifies the unit as a unique entity

## Event Data

- Data Structure
- What is an “Event” in GADS world?
- Specific data for each unit event
- Deratings and outages
  - Planned
  - Maintenance
    - Types of forced outages and derates
- Allowable state transitions
- Events spanning periods
- Cause Codes
- Plant boundaries and Outside Management Control

## Coordinating Generator Outages with the NYISO

- Requirements and rationale
- Annual Maintenance Submittals
- The outage scheduler application (TOA)

## Performance Data

- Data Structure
- Performance Data – summary of unit operation for a month
- Importance of consistency with submitted Event Data
- Inactive unit reporting

## Typical Data Errors

- Missing data, date and time issues, incorrect Event characterization

## Available Software

### NYISO and GADS Data: EFORd Calculation

- Equivalent Forced Outage Rate on demand and the NYISO ICAP Market

### Penalties

- For noncompliance with GADS reporting to NYISO
- Failure to submit data
- Inaccurate data

### Scenarios and GADS Reporting

- Simple outages, forced vs. maintenance outages vs. planned outages

### Demonstration of NYISO’s GADS Portal

- Access requirements
- Options
- Basic process
- Additional Resources

### Panel Discussion

- A time for your questions!
- A panel of NYISO experts on GADS (as used by the NYISO) and outage scheduling



## MT-310 Reliability-Based Demand Response

Two-day course

**This two-day course is designed to provide insight on the intended benefits of Demand Response, and to address the various processes and activities associated with both participation in and management of the Reliability-Based Demand Response programs.**

### Recommended Course Prerequisites

To fully achieve the Demand Response In-Depth course objectives and maximize your learning effectiveness, it is recommended that participants either have six months work experience with the NYISO Markets or have completed one of the following:

- Market Overview eLearning Suite
- NYISO Market Orientation Course (NYMOC) MT-201

## COURSE CONTENT

### Introduction to Demand Response

- Demand Response Defined
- Two Categories of Demand Response Programs
- NYISO Systems associated with Demand Response Programs

### Metering Methodologies

- Metering Authorities
- Types and Purpose of Metering Devices

### Special Case Resources

- Eligibility Requirements
- Enrollment Process
- Customer Baseline Load
- Measuring and Reporting Performance
- Calculating Performance Factors
- Notification, Reporting, and Verification associated with Event Response
- Installed Capacity market Participation
- Financial Settlements

### Emergency Demand Response Programs

- Eligibility Requirements
- Enrollment Process
- Customer Baseline Load
- Measuring and Reporting Performance
- Notification Reporting, and Verification associated with Event Response
- Financial Settlements

### Scarcity Pricing

- Purpose
- Methodology
- Effect on Real Time Prices

### Targeted Demand Response Program

- Purpose and Conditions for Deploying
- Notification, Reporting, and Verification associated with Event Response
- Financial Settlements





## **Distributed Energy Resources**

- Purpose and Benefits
- Anticipated Changes Resulting from DER
- Project Status Update
- Implementation Timeline and Next Steps

### **Questions?**

**Want to schedule on-site training?**  
**Please contact the Market Training Team!**

Call 518-356-6274 or  
email [training@nyiso.com](mailto:training@nyiso.com)



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