NEW YORK INDEPENDENT SYSTEM OPERATOR

Course Catalog
NYISO Market Training




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.

The mission of the NYISO, in collaboration with its stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability;
- Operating open, fair and competitive wholesale electricity markets;
- Planning the power system for the future;
- Providing factual information to policymakers, stakeholders and investors in the bulk power system.

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.

NYISO Market Training

The NYISO's Market Training Department offers webinars associated with various NYISO project implementations, in addition to a comprehensive choice of self-paced courses and instructor-led courses on the New York energy markets and products, 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 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
- Introduction to DSS; Sessions 1-4
- Locational Based Marginal Pricing
- NAESB Digital Certificate Tutorial
- NYISO Market Place
- NYISO Member Community Guide
- Station Power
- TCC Basics; Competency Exam
- Transactions: The Basics
- Virtual Trading; Competency Exam

The Market Training team's mission is to provide NYISO market and project implementation training and education to stakeholders and NYISO employees, for the purpose of supporting the NYISO's mission to serve the public interest and provide benefit to consumers.

Instructor-Led Courses

The following is a list of our instructor-led courses, which are generally held at a NYISO facility. 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.

MT-101 Market Overview
One-day course

This is an introduction to the NYISO markets, intended to provide participants with a basic understanding of the NYISO markets and functions. It is designed for professionals who have worked in the wholesale electric industry for 6 months or less.

COURSE CONTENT

The NYISO: who we are/what we do

Shared Governance

How the NYISO works with its stakeholders, committee structure, sector voting system, how to join the NYISO governance process

Power Systems Fundamentals

How power flows on the high-voltage transmission network, location of generation vs. load in NY, operational ancillary services, impact of generation and transmission outages

Locational-Based Marginal Pricing

How LBMP is established, what are the inputs, and the three components of LBMP: energy, losses, and congestion

NYISO Market Place

Energy Market functions and features, Day-Ahead vs. Real-Time markets and their associated settlements, commitment and dispatch of resources, market timelines, transmission charges

Energy Market Transactions

The two types of transaction contracts in the NYISO energy market; also internal vs. external transactions, bidding options for evaluation by the energy market, and settlement

Ancillary Services

Purpose of both cost-and market-based AS such as voltage support, black-start capability service, reserves, and regulation. How they are settled, and how the costs are allocated

Installed Capacity

Benefits of the ICAP market, distinguishing between ICAP and UCAP, an overview of the processes involved in running the ICAP market

Demand Response

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

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 one-day Market Overview class, but is more in-depth, and also adds Virtual Trading, Price Validation, Transmission Congestion Contracts, Market Monitoring, Credit, and Settlements. As an added

bonus, you will be given a "tour" of our new world-class control room from the viewing gallery.

COURSE CONTENT

Formation of the NYISO

- Transition from Power Pool to ISO
- Regulatory Oversight and the NYISO Tariffs

Shared Governance

- How the NYISO works with its stakeholders
- Governance committee structure, the sector voting system
- How to join the NYISO governance process

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 NY
- 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

Price Validation

- The NYISO Tariff rules governing price validation
- The process of validating prices
- Where to find price correction information on the NYISO website

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
- Special Case Resources, UDRs (Unforced Capacity Deliverability Rights)
- The ICAP Demand Curve

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

Market Monitoring

- Identify the responsibilities of the external Market Monitoring Unit (MMU) and the internal Market Mitigation and Analysis Department (MMA)
- The purpose of the market mitigation measures, examples of monitored activities
- Economic vs. physical withholding
- How generator reference levels are determined, Reference Level Software
- Conduct and impact tests

NYISO Markets Financial Settlements

- Understand the Internal Settlement Process, including the timeline associated with invoice issuance, charges, payments, and disputed items
- How to read a NYISO Consolidated Invoice, know the tools available for reconciling your invoice

NYISO Credit Policy

- Mission of NYISO Credit Department
- Minimum Participation Criteria
- Operating Requirements and the Market
- Participant's activity in the NYISO markets
- Credit-related bidding requirements
- Roles of Secured Credit and Unsecured Credit
- Verification of MP's Risk Management Policies

Energy Market Summary

Review of NYISO governance, the Market Services Tariff (MST), the Open Access Transmission Tariff (OATT), Review of Power System Fundamentals, the energy and capacity markets, hedging options

NYISO Control Room Gallery Tour

NYISO staff will escort the attendees to the gallery overlooking our new 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

NYISO Website Navigation

A live demonstration of the vast amount of information available on the NYISO website, such as: system conditions, market data, NYISO services, important documents, planning studies, committee information and Stakeholder Services

MT-206 Intermediate Decision Support System

Hands-On (one-day) course

The NYISO DSS offers numerous corporate Reports, but it also offers the opportunity to create custom reports using the same NYISO settlement data, all of which is warehoused in the Business Objects software environment. In the class, participants will learn how to create those reports.

Throughout the class, participants will complete hands-on exercises using NYISO-issued laptops.

The target audience for this workshop includes individuals involved in settlement reconciliation or analysis with their organization, or those who may want to study operating data.

COURSE CONTENT

Overview of DSS
- Homepage navigation
- Folder structure
- Corporate Reports
- Options for obtaining NYISO data from DSS

Creating Custom Queries using Web Intelligence
- Review of New Report Panel
  - Data Manager
  - Results Object Pane
  - Query Filter Pane
  - Data Preview
- Selecting the right Universe(s)
- Types of Data Objects
- Prompts and Filters
- Reconciling DSS time stamps to NYISO's
- Saving and locating reports

Modifying an Existing Report
- Duplicating queries and reports
- Reading Mode vs. Design Mode
- Adding/removing data objects
- Creating variables
- The variety of methods for formatting report results

Multiple Data Providers
- Creating queries using more than one Business Objects Universe
- Data reporting options
- Merging Data

Additional Report Functions
- Inserting sections, breaks and formulas
- Creating and modifying charts
- Exporting, sending and retrieving documents
- Automated Data Delivery (ADD)
- Custom ADD
- Public Market Data

MT-304 Accounting and Billing
Three-day course

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.

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:

- NYISO Market Overview MT-101
- NYISO Market Orientation (NYMOC) MT-201

What You Will Cover:

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

Customize your learning experience

Participants can chose which of the listed topics they would like to attend; in addition, they will have the option of scheduling one-on-one time with Stakeholder Services and/or 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

Day 1 AM: Recommended for All

- Course Kick Off
- The Consolidated Invoice and DSS Overview
- Metering

Day 1 PM: Choice of one of the following

- Power Supplier (PS) Energy & Ancillary Services
- Load Serving Entity (LSE) Energy & Ancillary Services
- Transactions – Energy, Ancillary Services, Supplemental Transaction Payments & FIC

Day 2 AM: Choice of one of the following

- TO & TCC Settlements, and One-on-One Advisory Session w/ Settlements Analyst
- LSE Energy & Ancillary Services
- LSE & Transaction Customer Allocations, One-on-One Advisory Session w/ Settlements Analyst and ICAP Auction Settlements

Day 2 PM: Choice of one of the following

- PS Energy & Ancillary Services
- Virtual Trading, DSS Application Walk-Through, and One-on-One Advisory Session w/ Settlements Analyst
- Transactions – Energy, Ancillary Services, Supplemental Transaction Payments & FIC

Day 3 AM: Choice of one of the following

- PS Supplemental Payments
- Demand Response
- Transactions – Energy, Ancillary Services, Supplemental Transaction Payments & FICA

Day 3 PM: Choice of one of the following

- TO & TCC Settlements, and One-on-One Advisory Session w/ Settlements Analyst
- DSS Application Walk-Through and Virtual Trading
- LSE & Transaction Customer Allocations and ICAP Auction Settlements

Day 3 PM: Recommended for All

- Open Forum
- Workshop Close

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

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.

Required Course Prerequisite: "Locational Based Marginal Pricing" E-Learning Module," before registering for class.

The module includes a brief quiz to demonstrate learner comprehension. Documentation validating your completion of this module will be request at the time of registration.

The online module link: https://prod.liferay.earch-wcm.com/online-learning

COURSE CONTENT

LBMP Intermediate Level Re-Cap
- Key Terms and Processes
- Why show all components?
- Examples

Supply Offers
- Identify Supply Types
  - Generators
  - Demand Response Providers
  - Import Transactions
- Explain Composition; review of various offer screens in MIS

Determining NYCA Load
- NYISO Load Forecast
  - Defined
  - Explain Composition
- Load Bidding
  - Define
  - Explain Composition
    - NYCA Load Serving Entities
    - Virtual Traders
      - Virtual Suppliers as negative load
      - Virtual Load
    - Transactions'
      - Internal Bilaterals
      - Exports

Software Evaluation Process
- SCUC
  - Details of the Various Passes
    - Opportunity to Address LRR and DARU
- RTS
  - Details of the Various Passes
  - Data Inputs
    - Includes DAM carry over and RT processes
  - Explain Potential for Scheduling & Pricing Differences DAM to RT
- 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
  - Introduce PF 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 (to include thermal and voltage, etc.)
- Identify Factors that Impact Congestion
  - Outages
  - Re-Dispatching
  - Generator Shortages
- 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
- Shortage Pricing
  - When in effect & overall process
- Scarcity Pricing
  - When in effect & overall process

Uplift

- Cause & Effect
  - Supplemental Supplier Payments

Price Validation

- Purpose
- Timelines
- Process

LBMP-Putting It All Together

- Interactive Exercises
  - Variety of Scenarios
  - Actual NYISO Pricing Data

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 an 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-309 Demand Response In-Depth

Three-day course

This three-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 various Demand Response programs.

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:

- NYISO Market Overview MT-101
- NYISO Market Orientation (NYMOC) MT-201

COURSE CONTENT

Introduction to Demand Response

- Reliability vs. Economic Based Programs
- Basic Program Requirements
- NYISO Systems associated with Demand Response Programs

Metering Fundamentals

- Distinction between Meter Authority, Meter Service Provider, and Meter Data Service Provider
- Types and Purpose of Metering Devices

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

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

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

Day Ahead Demand Response Program

- Eligibility Requirements
- Enrollment Process
- Customer Baseline Load
- Day Ahead Market Bidding and Scheduling
- Measuring and Reporting Performance
- Financial Settlements

Demand Side Ancillary Services Program

- Regulation Frequency and Operating Reserves Fundamentals
- Eligibility Requirements
- Communication and Testing Requirements
- Enrollment Process
- Bidding and Scheduling
- Real Time Baseline and Response MW
- Measuring and Reporting Performance
- Financial Settlements

Behind-the-Meter: Net Generation

- Eligibility Requirements
- Enrollment Process
- Average Coincident Host Load and Adjusted Host Load
- Bidding and Scheduling
- Installed Capacity Market participation
- Testing Requirements
- Measuring and Reporting Performance
- Financial Settlements

Questions?

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