NYISO Market System Evolution

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Overview

- NYISO Overview
- Major Developments
- Complimentary Products
- Platform Evolution at the NYISO
- NYISO Architecture Evolution
Introduction to the NYISO

- Responsible for open administration of wholesale electricity markets, reliable operation the bulk electricity grid, and electric system planning
- Complex marketplace featuring co-optimized market clearing systems
- Most generation has been divested
- NYISO market volume projected to exceed $10 billion this year ($60 billion since inception)
- Unique challenge: New York City is the world’s biggest and most complex load pocket
- Unique geography makes it the “Hub of the Northeast”
NYISO at the Crossroads

Graphic not to scale
Evolution of the NYISO

- Northeast Blackout (November 9) (1965)
- NYPP Control Center Begins Operation (1970)
- FERC Orders 888 & 889 Issued (1996)
- NYISO Begins Operation (December 1) (1999)
- NYISO Market Transactions since inception total more than $60 billion (2007)

1997: NYPP files NYISO Proposal
NYISO Metrics

- New York State population -- **19.2 million**
- 2007 load -- **167,337 GWH**
- Required Installed Capacity -- **38,966 MW**
- Record peak -- **33,939 MW** (Aug. 2, 2006)
- Over **335 generating units** modeled
- **10,775 miles** of high voltage transmission
- Over **$60 billion** in market transactions
- More than **325 Market Participants**
NY Electricity Markets

- Bilateral (forward) Contracts 45%
- Day-Ahead Market 51%
- Real Time 4%

NYISO Market Transactions total over $60 Billion since 1999
Generation Fuel Mix

New York has three primary sources of renewable electric generation.
New Transmission

New Transmission Lines

CSC (330 MW)

Neptune (660 MW)
New Generation

Megawatts (MW) by NYISO Zone 1999 thru 9/2007*

* Name Plate Rating

TOTAL: 6208.9 MW
Major Developments

- SCUC Development
  - Security Constrained Unit Commitment (SCUC) software co-optimizes energy and ancillary service (reserve & regulation) bids for least cost solution
  - Developed with ABB to support NYISO start-up in 1999

Input Bids & Forecasts
- GEN Supply
- LSE
- Virtual
- Regulation
- Reserve
- Bi-laterals
- Import/Exports
- Demand Response

Output
- Least Cost Solution
- Meet Reliability Requirements
- Clearing Prices
  - LBMP (GEN & Zonal)
  - Reserve
  - Regulation
- GEN Schedule
- Transmission Schedule
- Bilateral Transactions
- Reserve Commitment
- Regulation Commitment
Major Developments (Cont.)

- SMD2 Project
  - Comprehensive platform replacement in 2005
  - New EMS implementation based on ABB RANGER Platform
  - Integration of Day Ahead and Real-time Markets and scheduling system on common platform/model
  - Real-time Scheduling System (RTS) co-designed by NYISO and ABB staff
Real-time Scheduling System

Input
• RT Bids
• Updates
• DAM Commitments

Bids
• RT Supply Bids

Updates
• Transmission Model
• Zonal Load Forecast
• Changes in Operation

RTC

RTD

Output
• Least Cost Solution
• Meet reliability requirements

Real Time Commitment
Real Time Dispatch
Software

Output
• Clearing Prices
  • LBMP (GEN & Zonal)
  • Reserve
  • Regulation
• RT Commitment
  • 15 min Advisory
• RT Dispatch
  • Energy---5 min
  • Reserve---5 min
  • Regulation---6 sec
Major Developments (Cont.)

- SMD2 Project (Cont.)
  - Following first year of operation on SMD2 market platform, Independent Market Advisor reported, “With the implementation of the new real-time spot markets on February 1, 2005, the New York ISO (“NYISO”) now operates the most complete and efficient set of electricity markets in the U.S.”.

- Ongoing Development
  - Continued evolution of the application suite and market rules
“I can only invent under powerful incentive. No competition means no invention.”

Thomas Edison

NYISO Markets have produced:

- **Operating Benefits**
  - Greater generator availability (less forced outage, reduced maintenance outages)
  - Reduction of reserve margin from 21% to 15%
- **Greater penetration of green energy**
- **Demand Response products**
- **Generation and transmission additions where needed**
Complimentary Products

- Operational Tools
  - *Wind Forecasting System* (2008)

- Market Enhancement Systems
  - *Comprehensive Bid Management System* (2006-09)
    - Enhancement to bidding and scheduling interface
  - *Operational Data Store* (2007)
    - Change Data Capture (CDC) Technology
Complimentary Products (Cont.)

- **Finance**
  - *Settlement System Replacement (2007)*
    - Rules-based market settlement engine
  - *Meter Data Exchange (2007)*
  - *Credit Management System (2008-2009)*

- **Auxiliary Markets**
  - *Capacity market auction automation (2006)*
  - *TCC market auction automation (2005-2007)*

- **Business Intelligence**
  - *Settlements Datamart (2005)*
  - *Pricing Datamart (2007)*
  - *Market Monitoring Datamart (2008)*
Platform Evolution

- **SPIDER - RANGER**
  - Consolidation of market and EMS applications onto one platform
  - Common Information Model (CIM)

- **True64 – HPUX**
  - Alignment of applications across product areas to improve vendor supportability
  - Platform Virtualization

- **NMR2 Upgrade**
  - Maintain ABB software baseline currency

- **Certification**
  - Third party certification of regulatory compliance
NYISO Architecture Evolution

- Multi-Year Architecture Strategy
  - Initiated in 2002, revised annually

- IT Service Management
  - Service Strategy (ITIL)

- Service Oriented Architecture
  - Business Process Management
  - Policy / Access Management
  - Data Integration / Services
2004 Progress

The MDEX portal
OASIS Graphing
Remote Administration
E-Marketplace
Personalization
Infrastructure (BMC Patrol)
Process Automation
CMS
CRM

Market Monitoring
Application Server

Production Channel
Simulation Channel

Real-Time Market
Ranger

Data Management
Analysis Tools

MIS
Billing
Identity Management

DB
OLAP Server

Data Warehouse

10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
(Per the revised plan)
2006 Progress

- **EAI**
  - Data Warehouse
  - OLAP Server

- **OLAP Server**
  - Market Monitoring
  - Application Server
  - Personalization

- **Application Server**
  - Internet
  - NYISO LAN

- **Internet**
  - Firewall

- **Firewall**
  - Production Channel
  - Simulation Channel

- **Production Channel**
  - Real-Time Market
  - Ranger

- **Real-Time Market**
  - DB

- **DB**
  - SMD2 - Ranger Integration Improved toward Real Time Data Delivery and Service Oriented Architecture

- **Ranger**
  - TCC Awards

- **TCC Awards**
  - Virtualization of QA and Development Environments

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- **Virtualization of QA and Development Environments**
  - Infrastructure
  - Process Automation

- **Infrastructure**
  - CMS
  - CRM

- **CMS**
  - CRM

- **CRM**
  - Billing Simulator evolves into a new billing system

- **Billing Simulator**
  - Bid Management System, TCC Tiered Software Architecture and Security Architecture

- **Bid Management System, TCC Tiered Software Architecture and Security Architecture**
  - Identity Management

- **Identity Management**

- **New**
  - Updated
  - Complete
  - Unaffected
Future State Architecture Vision

NYISO Key Roles

- Manage the Grid
- Operate Markets
- Resource Planning
- Authoritative Information Source

Technology Architecture End Game

- Operations
- Energy Markets
- Financial
- Auxiliary Markets
- TCC Markets
- Business Intelligence

Service Oriented Architecture & Application Integration

- Servers and Storage
- Networks and Communications
- Facilities
- Worker Productivity
- Corporate Applications

Progression

- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011

Shared Enterprise Services

- Business Process Mgmt
- Data Services
- Service Policy Management
- Access Management
- Data Integration
- Service Lifecycle Mgmt
More Information

- **New York ISO Home Page**
  - [www.nyiso.com](http://www.nyiso.com)

- **New York Market Orientation Course (NYMOC)**
The New York Independent System Operator (NYISO) is a not-for-profit corporation that began operations in 1999. The NYISO operates New York’s bulk electricity grid, administers the state’s wholesale electricity markets, and performs comprehensive reliability planning for the state’s bulk electricity system.

www.nyiso.com