New York ISO
Independent System Operator

Scarcity Pricing

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Demand Response Reliability-Based Programs

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Remote Learning

Session Objectives

- Define Scarcity Pricing and state its purpose
- Explain the link between Scarcity Pricing and Operating Reserves
- Calculate a Scarcity Reserve Requirement
- Describe the Scarcity Pricing methodology
- Illustrate effect of Scarcity pricing on Real Time price during a Reliability based Demand Response Event

Scarcity Pricing Defined

- **Scarcity pricing is a mechanism employed by the NYISO that establishes a price when reliability-based Demand Response events are deployed**
  - Supplement generation when Operating Reserves are forecast to be short or when there is an actual Operating Reserve Deficiency
- **Scarcity pricing rules apply to the following Demand Response events:**
  - Special Case Resource (SCR) activation
  - Emergency Demand Response Program (EDRP) activation
- **This scarcity pricing mechanism**
  - Creates consistent prices and schedules during SCR/EDRP events and aligns pricing outcomes with operator actions
  - Ensures SCR/EDRP resource participation in a reliability-based event is factored into calculating the Real Time prices
    - Without Scarcity Pricing, dispatching SCR/EDRP resources when system conditions are stressed may lower the real-time prices, leading to inefficient price signals

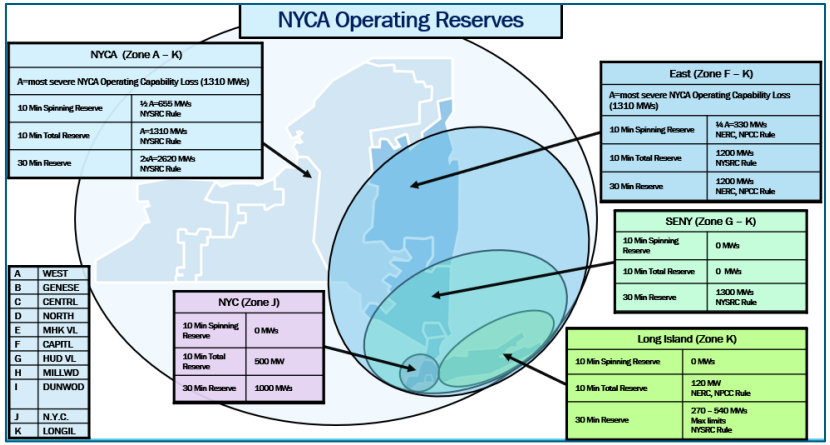
Operating Reserves Service

- Backup Generation in the event of a System Contingency
  - NYSRC Total Operating Reserve Requirement:
    - Must Procure ≥ to 1.5 x times the Largest Single Contingency (in MW)
      - Largest Single Contingency is 1310 MWs

- NYISO Procures 2 x Largest Single Contingency
  - 2 x 1310 = 2,620 MWs of Total Reserves each Market Day
    - Regional/Locational Requirements
    - Time/Product Type Requirements

Operating Reserves Product Types and Locations

- Operating Reserves Products:
  - 10-minute Spinning Reserve
  - 10-minute non-Synchronous
  - 30-minute Reserve Spinning & Non-Synchronous
- Locational Operating Reserves
  - Locational requirements for:
  - East of Central East (Zones F-K)
  - South-Eastern New York (Zones G-K)
  - Long Island (Zone K) and NYCA wide



Operating Reserves Pricing Methodology

- During a normal operating day, Operating Reserves suppliers are selected through a co-optimized real-time commitment process that minimizes the total bid cost of Energy, Demand Reduction, Regulation Service, and Operating Reserves
- Real Time Operating Reserves Market Clearing Prices are calculated for each product type and location

Reserve Shadow Price = Availability Bid + LOC i.e. (Energy LBMP – Reserve Unit Energy Offer)

Operating Reserves Cascading Shadow Prices

Reserve Product	Cascading Shadow Prices used for Market Clearing Price (MCP)
MCP for WEST 30-Minute Reserves	= SP1
MCP for WEST 10-Minute Non-Synchronized Reserves	= SP1 + SP2
MCP for WEST Spinning Reserves	= SP1 + SP2 + SP3
MCP for EAST 30-Minute Reserves	= SP1 + SP4
MCP for EAST 10-Minute Non-Synchronized Reserves	= SP1 + SP2 + SP4 + SP5
MCP for EAST Spinning Reserves	= SP1 + SP2 + SP3 + SP4 + SP5 + SP6
MCP for SENY 30-Minute Reserves	= SP1 + SP4 + SP7
MCP for SENY 10-Minute Non-Synchronized Reserves	= SP1 + SP2 + SP4 + SP5 + SP7 + SP8
MCP for SENY Spinning Reserves	= SP1 + SP2 + SP3 + SP4 + SP5 + SP6 + SP7 + SP8 + SP9
MCP for N.Y.C. 30-Minute Reserves	= SP1 + SP4 + SP7 + SP10
MCP for N.Y.C. 10-Minute Non-Synchronized Reserves	= SP1 + SP2 + SP4 + SP5 + SP7 + SP8 + SP10 + SP11
MCP for N.Y.C. Spinning Reserves	= SP1 + SP2 + SP3 + SP4 + SP5 + SP6 + SP7 + SP8 + SP9 + SP10 + SP11 + SP12
MCP for L.I. 30-Minute Reserves	= SP1 + SP4 + SP7 + SP13
MCP for L.I. 10-Minute Non-Synchronized Reserves	= SP1 + SP2 + SP4 + SP5 + SP7 + SP8 + SP13 + SP14
MCP for L.I. Spinning Reserves	= SP1 + SP2 + SP3 + SP4 + SP5 + SP6 + SP7 + SP8 + SP9 + SP13 + SP14 + SP15

Scarcity Reserve Requirement

Revised Reserve Requirement

- **When SCR/EDRP resources are deployed, a** revised **Real Time 30-minute Operating Reserve requirement is calculated**
  - The Scarcity Reserve Requirement will be applicable:
    - For all Real-Time intervals during which NYISO has activated SCR/EDRP resources
    - In load zone(s) that SCR/EDRP resources are deployed
- **To meet revised 30-minute requirement, RTC and RTD procure additional 30-minute reserves in load zone(s) where SCR/EDRP resources are deployed**
  - Additional 30-minute reserves is known as 'Scarcity Reserve Requirement'
  - Collection of zones (or potentially a single zone) in which SCR/EDRP is activated is known as a 'Scarcity Reserve Region'

Revised 30-minute Reserve Requirement = 2620 MW + Scarcity Reserve Requirement

NOTE

For more information, refer to MST Section 15.4.6.2

Scarcity Reserve Requirement

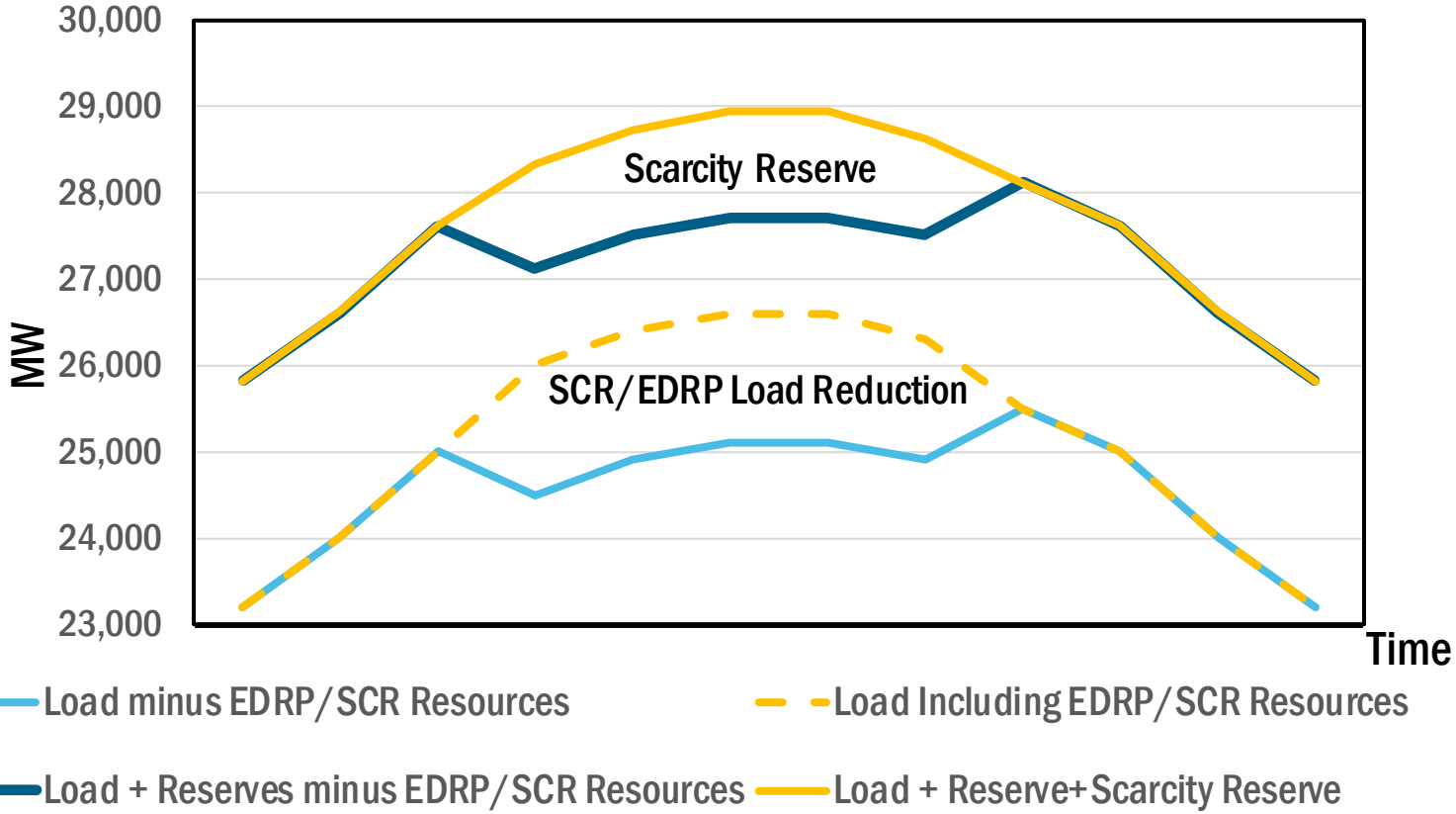
- **Expected load reduction from SCR/EDRP resources is used as an input in calculating the Scarcity Reserve Requirement within each Scarcity Reserve Region**
  - Amount of scarcity reserves procured will be set equal to the Expected SCR/EDRP MW less the Available Operating Capacity for the Load Zones included in a Scarcity Reserve Region

Scarcity Reserve Requirement =(Expected Load Reduction by SCR/EDRP Resources – Available 30-60 Minute Reserves)

NOTE

For more information, refer to MST Section 15.4.6.2

Scarcity Reserves - Illustration



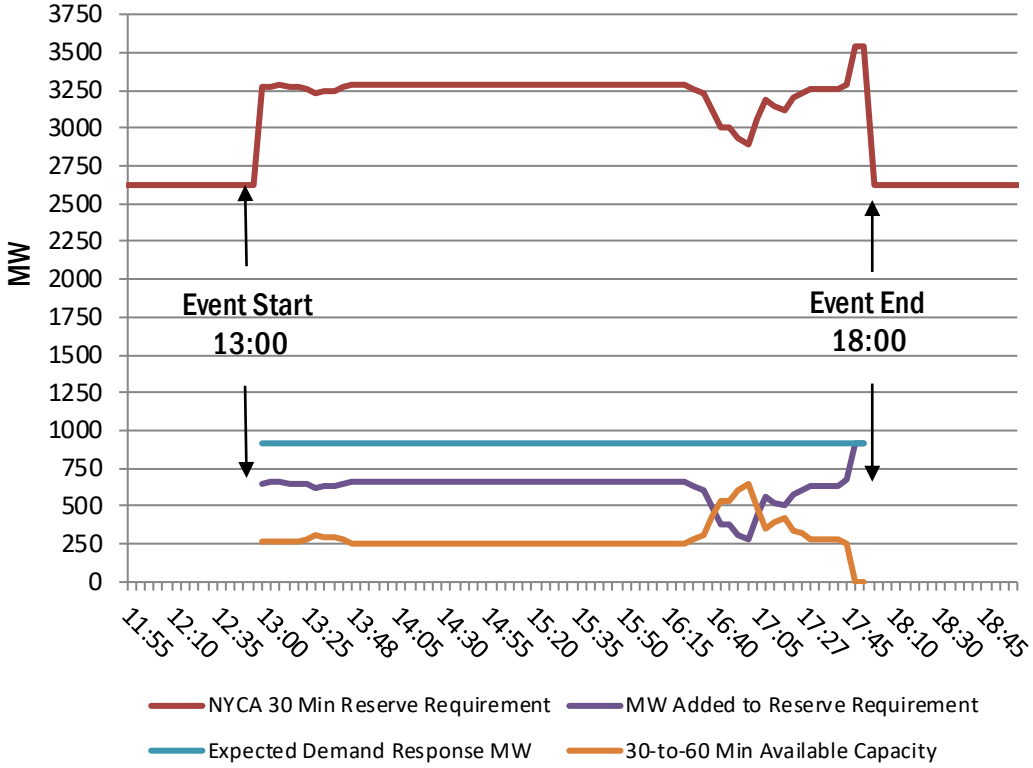
Scarcity Pricing Methodology

Scarcity Pricing Methodology

- **Operating Reserves Market Clearing prices will be calculated using the revised 30-minute requirements, and the Operating Reserve demand curves, adjusted in Real Time to account for the Scarcity Reserve Requirement**
  - According to the rules set forth in the MST, NYCA 30-minute reserve demand curve values priced at less than $500/MW will be set to $500/MW in real-time during SCR/EDRP activations
  - Market Clearing prices will be calculated for every 5-minute RTD time interval for the duration of the event

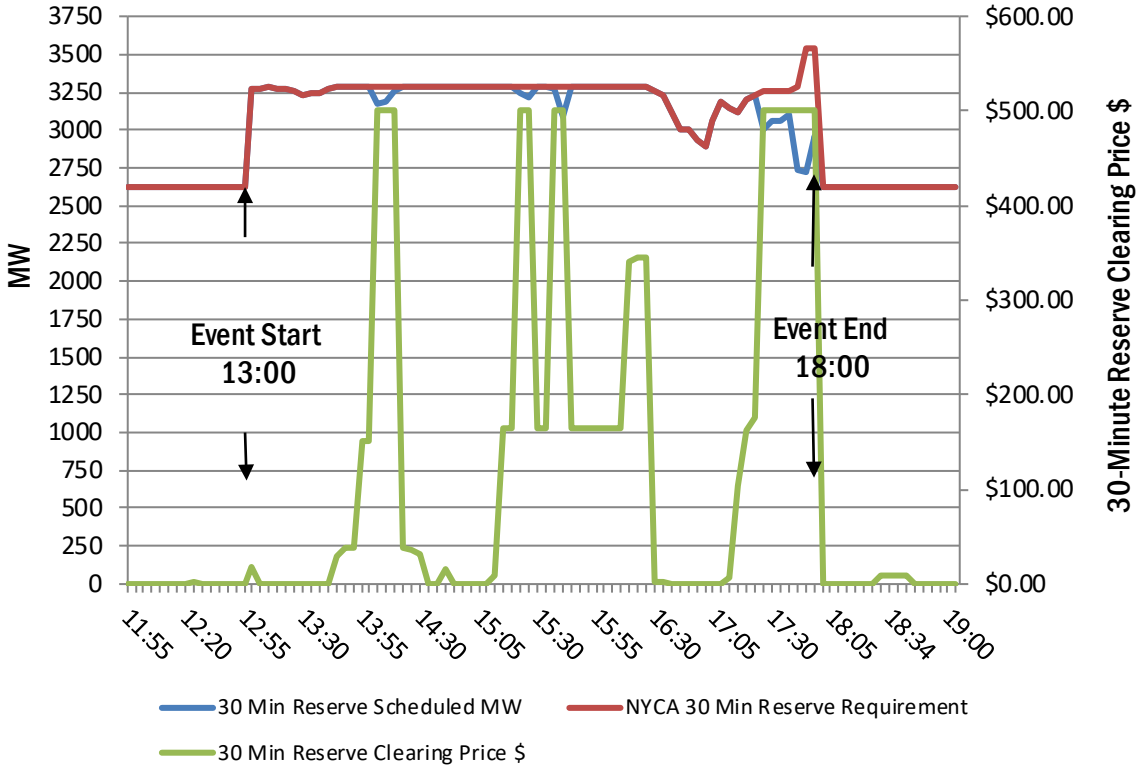
Scarcity Pricing- Example

- SCR/EDRP Reliability Event deployed by NYISO on August 12th, 2016
- NYISO activated SCR/EDRP resources NYCA wide, from 13:00-18:00 due to projected Reserves shortage
- Revised 30-minute Reserve requirement was calculated as discussed above



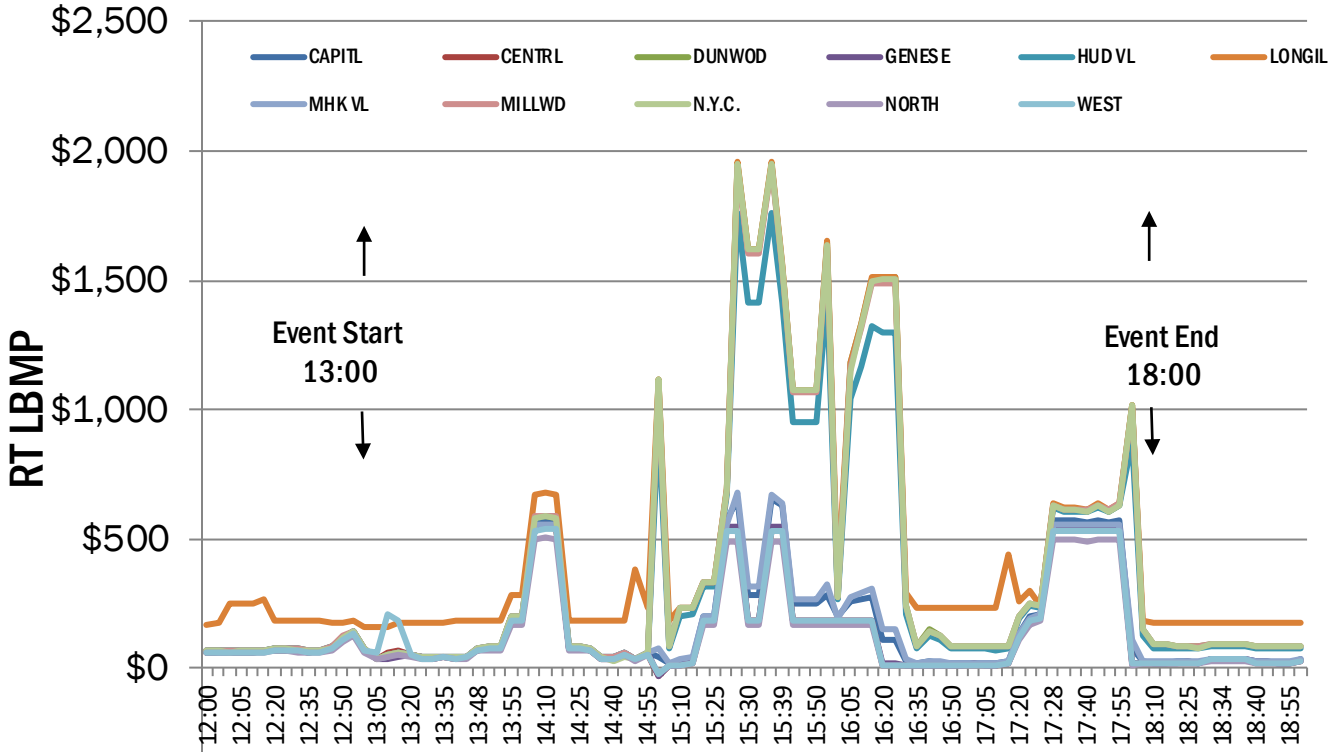
Scarcity Pricing- Example

- 30-minute Reserves procured at every 5-minute interval for event duration
- 18 Real Time pricing intervals with $500 clearing price for NYCA 30-minute reserves
- Scarcity pricing reflects the consistency between the price signals and actual system needs



Scarcity Pricing – Example

Zonal RT-LBMP for the 18 Real Time pricing intervals with $500 clearing price for NYCA 30-minute reserves



Summary of Scarcity Pricing Mechanism

Normal Operating day – 2620 MW of Operating Reserves

Real Time Market Clearing price for all Operating Reserves products

Operating Reserves forecast to be short or actual shortage

NYISO deploys SCR/EDRP resources

Additional 30-minute Operating Reserves procured in Real Time in SCR/EDRP deployment zone(s)

Scarcity pricing rules used to calculate Market Clearing prices for revised 30-minute reserves

Additional Resources

- Tariffs – OATT & MST
- Day Ahead Scheduling Manual
- Transmission and Dispatching Operations Manual
- Market Participant User's Guide
- Technical Bulletins