Ancillary Services Shortage Pricing

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July 10, 2019, Krey Corporate Center

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Agenda

- Background
- Objective
- Anticipated Benefits
- Review of Current Ancillary Services Shortage Pricing
- Overview of PJM and ISO-NE Shortage Pricing and Capacity Performance Incentives
- Proposed Analysis Overview
- Timeline

Purpose of today's meeting

- Review the current shortage pricing mechanisms in NYISO markets
- Provide an overview of shortage pricing in neighboring markets (ISO-NE and PJM)
- Solicit feedback on the analysis proposed for assessing the potential need for changes to current shortage pricing values in NYISO markets

Previous Presentations

Date	Working Group	Discussion points and links to materials
12-17-14	MC	Comprehensive Shortage Pricing
04-10-18	Market Issues Working Group (MIWG)	Ancillary Services Shortage Pricing Reserve Procurement for Resilience
05-09-18	Market Issues Working Group (MIWG)	Ancillary Services Shortage Pricing
05-31-18	Market Issues Working Group (MIWG)	Ancillary Services Shortage Pricing : Market Design Concept Proposal
01-24-19	Market Issues Working Group (MIWG)	Operating Reserve Background
05-22-19	Market Issues Working Group (MIWG)	2019 Master Plan: Draft & Discussion
03-27-19	MC	Establishing Zone J Operating reserve requirement

Background

Background- A Grid in Transition

- The New York Control Area is transitioning to a grid with increased weather-dependent resources on the system as environmentally focused public policies shape the way energy is supplied and consumed in New York.[1]
- The primary future challenge arises from the variability and unpredictability of wind and solar generation resources and the potentially large quantities of each.
  - Energy and ancillary services products must continue to support reliable operations as the system evolves.

For further discussion, please see the report "Reliability and Market Considerations for a Grid in Transition" at the following link:
https://www.nyiso.com/documents/20142/6785167/Grid%20in%20Transition%20DRAFT%20FOR%20POSTING.pdf/74eb0b20-6f4c-bdb2-1a23-7d939789ed8c

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Background- A Grid in Transition

- **As the penetration of weather-dependent generation technologies increases, the grid will need responsive and flexible resources that provide Ancillary Services, such as reserves, to address expected and unexpected changes in net load.**
  - Effective pricing of energy and ancillary services products to reflect system conditions and operational needs is crucial.
  - Reserve prices fall when and where this grid reliability service is not needed or when there is ample supply.
    - In this way, and by fostering competition, prices help to maintain grid reliability at the lowest cost.

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Background

- **In 2017, the NYISO conducted a preliminary review of the market design concepts proposed in the Market Assessment with 50% Renewables (2017 Market Assessment).**
  - Highlighted the critical importance of resource flexibility and quick response capability to respond to increases in un-forecasted changes in load and supply resulting from increasing levels of intermittent, weather-dependent supply resources
- **The Market Monitoring Unit (MMU) has recommended reviewing shortage pricing in its recent State of the Market reports[1].**
  - MMU noted that pay-for-performance capacity rules implemented in PJM and ISO-NE may provide financial incentives for exporting power to neighboring areas during stressed operating conditions
- **The 2017 Analysis Group Capacity Resource Performance in NYISO Markets: An assessment of Wholesale Market Option report (Performance Assurance Report) recommended further assessment of changes that "specifically increase revenues of generating units that perform well during shortage or scarcity conditions"**
  - 2018 NYISO Management Response to the Performance Assurance Report recommended further evaluation of shortage pricing to ensure provision of appropriate incentives for improved resource performance during stressed operating conditions.

1. See Recommendation #2017-2 in the 2017 and 2018 SOM reports

Background

- **In response to the foregoing factors, the NYISO recommended " Re-evaluating Ancillary Services Shortage Pricing" as one of the four design concepts to be developed during Q1 and Q2 2018**
  - "Market Design Concept" presented at the May 31, 2018 MIWG/ICAPWG meeting.
- **The initial project milestone for 2019 was "Study Complete" by Q4 2019.**
  - Given the anticipated benefits of this effort, the NYISO is proposing to accelerate this project to "Market Design Complete" by the end of 2019.

Project Objective

- To evaluate the NYISO's current Ancillary Services shortage pricing values, considering the implications of the grid of the future and the payment incentives in neighboring markets.

Anticipated Benefits

- **Ancillary Services are expected to become more important with the increases in weather dependent generation.**
- **Shortage prices should:**
  - Reflect the value of the flexibility that Ancillary Services, such as reserves and regulation provide to maintain system reliability.
  - Support reliability and incent supply during critical operating periods when conditions are tight across a broader region.
  - Reduce the potential need for out of market actions by better reflecting the full cost of serving load within market prices
  - Signal future investment by providing locational and temporal price signals that accurately reflect system conditions.
- **Shortage pricing assists in providing incentives for resource flexibility, responsiveness and availability to support grid reliability.**

Ancillary Services Shortage Pricing Overview

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Ancillary Services Shortage Pricing Overview

- **What is Shortage pricing?**
  - Shortage pricing is the method employed to efficiently price energy and operating reserves when market conditions are tight.
  - Mechanism employed to establish a price above which the optimization will choose to be deficient of certain products/services rather than procure resources at costs that exceed established values.

Ancillary Services Shortage Pricing Overview

- **What is its purpose?**
  - In the short-term, shortage pricing should incent performance of existing resources and help maintain reliability
  - In the long-term, shortage pricing informs efficient resource investment decisions

Ancillary Services Shortage Pricing Overview

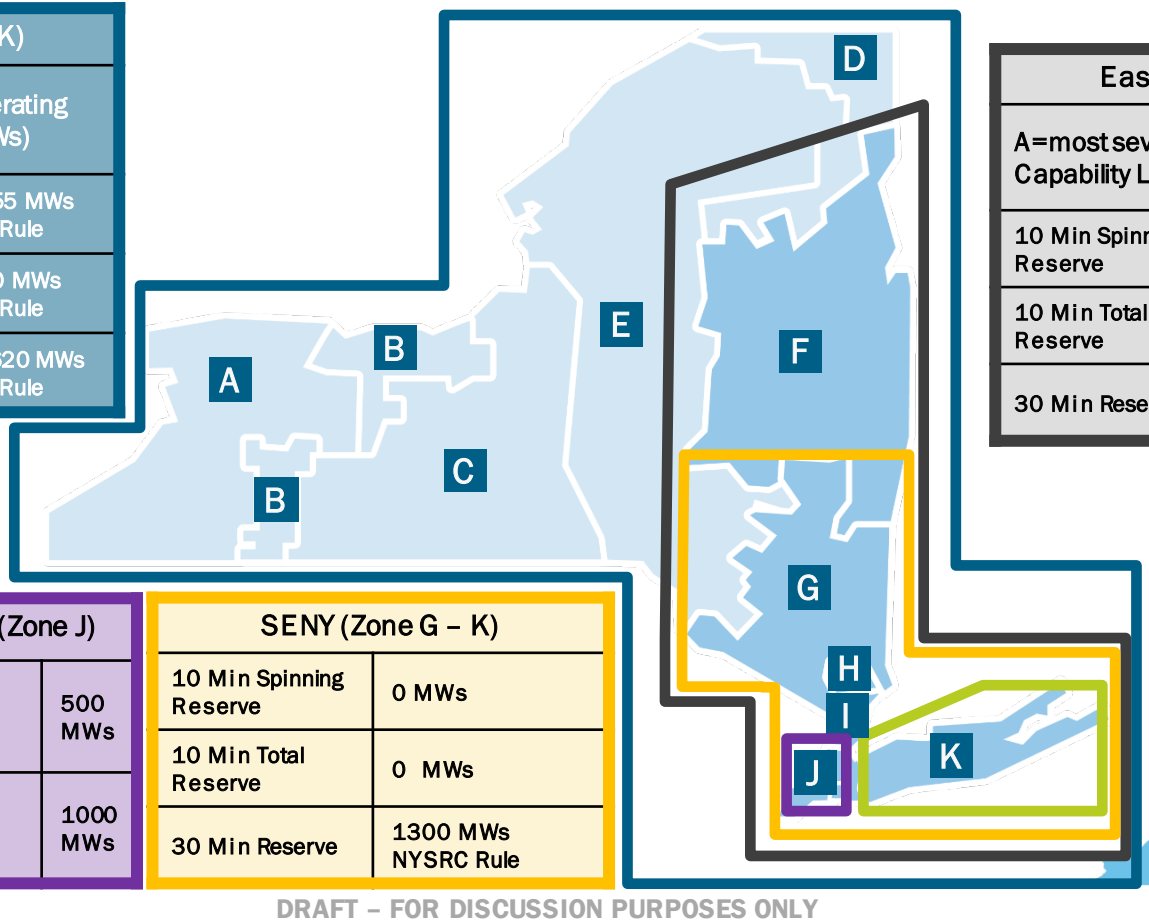
- NYISO currently has fifteen Operating Reserve Demand Curves, one for each Operating Reserve requirement.[1]
  - Each Operating Reserve Demand Curve applies to both the Day-Ahead Market and the Real-Time Market for the relevant product and location
- A single Regulation Service Demand Curve applies to both the Day-Ahead and Real-Time Markets.
- Shortage pricing is triggered whenever the system runs short of Regulation Capacity or any reserve product requirement (or if the cost to procure such service/product exceeds the established shortage pricing values).

1. For further information on the locational reserve requirements, please see the document at the following link: https://www.nyiso.com/documents/20142/3694424/nyiso_locational_reserve_reqmts.pdf/ab6e7fb9-0d5b-a565-bf3e-a3af59004672

Current NYISO Operating Reserve Requirements

NYCA (Zone A – K)	
A=most severe NYCA Operating Capability Loss (1310 MWs)	
10 Min Spinning Reserve	½ A=655 MWs NYSRC Rule
10 Min Total Reserve	A=1310 MWs NYSRC Rule
30 Min Reserve	2xA=2620 MWs NYSRC Rule

A	WEST
B	GENESE
C	CENTRL
D	NORTH
E	MHK VL
F	CAPITL
G	HUD VL
H	MILLWD
I	DUNWOD
J	N.Y.C.
K	LONGIL



East (Zone F – K)	
A=most severe NYCA Operating Capability Loss (1310 MWs)	
10 Min Spinning Reserve	¼ A=330 MWs NERC, NPCC Rule
10 Min Total Reserve	1200 MWs NYSRC Rule
30 Min Reserve	1200 MWs NERC, NPCC Rule

NYC (Zone J)	
10 Min Total Reserve	500 MWs
30 Min Reserve	1000 MWs

SENY (Zone G – K)	
10 Min Spinning Reserve	0 MWs
10 Min Total Reserve	0 MWs
30 Min Reserve	1300 MWs NYSRC Rule

Long Island (Zone K)	
10 Min Spinning Reserve	0 MWs
10 Min Total Reserve	120 MW NERC, NPCC Rule
30 Min Reserve	270 – 540 MWs Max limits NYSRC Rule

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Current NYISO Regulation Service Capacity Requirements

- **Regulation Capacity requirements for NYCA vary by hour and by season.[1]**
  - April- May: 175 – 250 MW
  - June- August: 175 – 275 MW
  - September- October: 150 – 275 MW
  - November- March: 150 – 300 MW

1. The NYISO Regulation Service Capacity requirements by month and hour can be found at the link below: https://www.nyiso.com/documents/20142/3694424/nyiso_regulation_req.pdf/6efc0df8-edc2-41bc-9e39-5fed576ba7bc

Current NYISO Ancillary Services Demand Curves

- **Ancillary Services clearing prices are determined considering the demand curves along with resource bids**
  - The reserve demand curve values below apply during periods when the EDRP and/or Special Case Resource program have not been activated.

New York Region	Type	Demand Curve Amount (MW)	Demand Curve Price ($)
NYCA	Regulation	25.0 80.0 remainder	$25.00 $525.00 $775.00
NYCA	Spinning Reserve	All	$775.00
NYCA	10 Minute Reserve	All	$750.00
NYCA	30 Minute Reserve	300.0 655.0 955.0 remainder	$25.00 $100.00 $200.00 $750.00
Eastern New York (EAST)	Spinning Reserve	All	$25.00
	10 Minute Reserve	All	$775.00
	30 Minute Reserve	All	$25.00
Southeastern New York (SENY)	Spinning Reserve	All	$25.00
	10 Minute Reserve	All	$25.00
	30 Minute Reserve	All	$500.00
New York City (NYC)	Spinning Reserve	All	$25.00
	10 Minute Reserve	All	$25.00
	30 Minute Reserve	All	$25.00
Long Island (LI)	Spinning Reserve	All	$25.00
	10 Minute Reserve	All	$25.00
	30 Minute Reserve	All	$25.00

*The current reserve demand curve prices for each region are shown in section 6.8 of the Ancillary Services Manual and are also set forth in Section 15.4.7 of Rate Schedule 4 of MST: https://www.nyiso.com/documents/20142/2923301/ancserv.pdf/df83ac75-c616-8c89-c664-99dfea06fe2f

Shortage Pricing and Capacity Market Performance Incentives in Neighboring ISOs/RTOs

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ISO-NE – Ancillary Services Shortage Pricing

- **ISO-NE currently procures four reserve products.**
- **If all four reserve constraints were violated, the maximum reserve price would be $2,800/MWh**
  - Local 30-Minute Operating Reserve (TMOR)
    - $250/MWh shortage pricing value
  - System 30-Minute Operating Reserve (TMOR)
    - Minimum TMOR $1,000/MWh shortage pricing value
    - Replacement Reserve $250/MWh shortage pricing value (does not cascade with other reserve shortage prices)
      - Replacement reserves are an additional quantity of 30-minute Operating Reserves, beyond minimum requirement
  - System 10-Minute Non-synchronized Reserve (TMNSR)
    - $1,500/MWh shortage pricing value
  - System 10-Minute Spinning Reserve (TMSR)
    - $50/MWh shortage pricing value
- **Regulation shortages are priced at $100/MWh**

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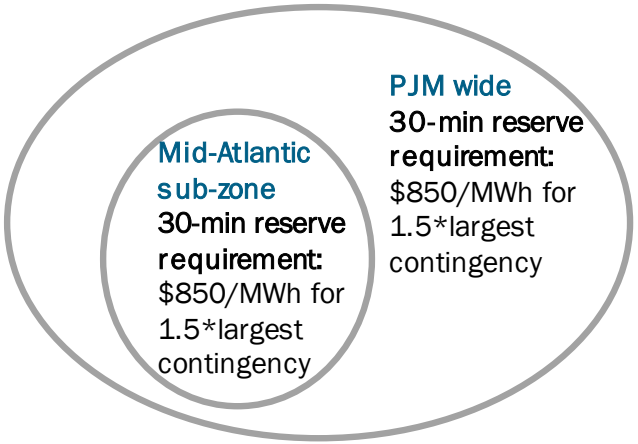
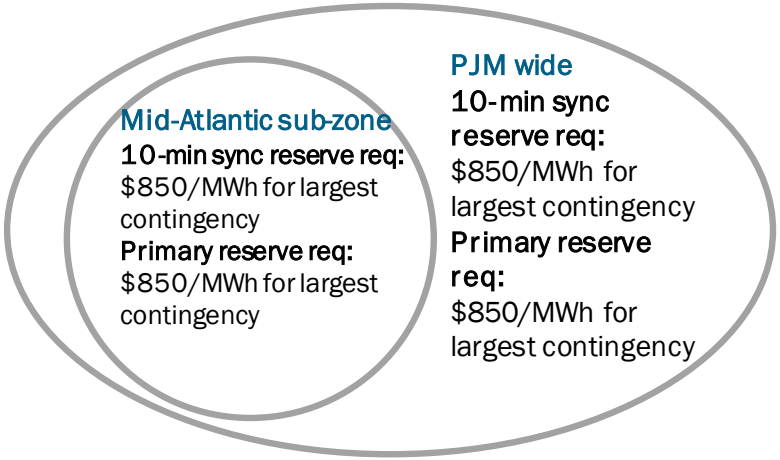
PJM- Current Ancillary Services Shortage Pricing

In day-ahead



In real-time



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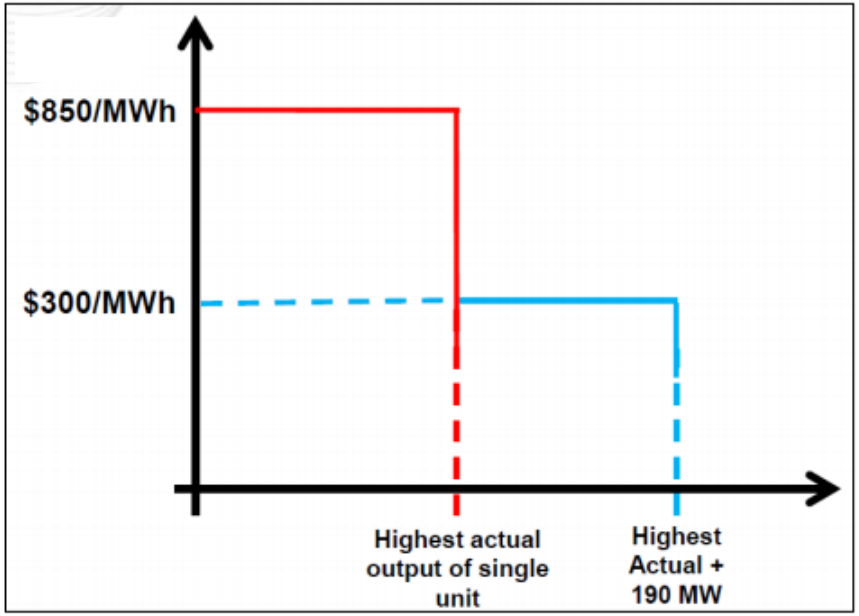
PJM- Current Operating Reserve Demand Curves



- 190 MW beyond the largest contingency/1.5 times the largest contingency (for primary reserves and 30-minute reserves respectively) is priced at shortage value of $300/MWh

PJM- Current Ancillary Services Shortage Pricing

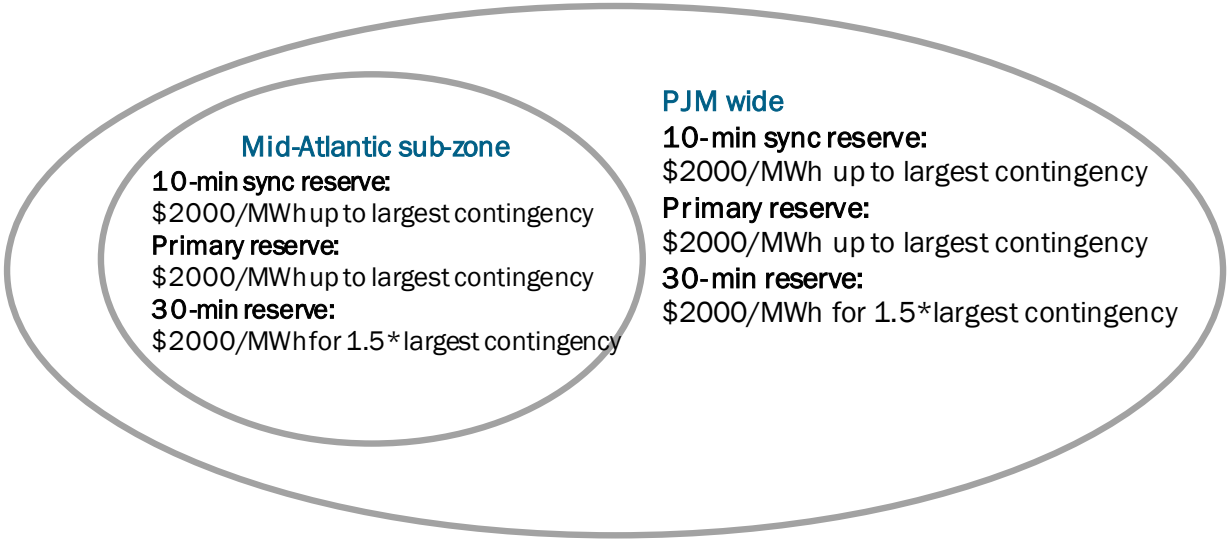
- **PJM co-optimizes energy and reserves**
  - The day-ahead market only secures the applicable 30-minute reserve requirements
  - The real-time market only secures the applicable "primary reserve" requirements (total 10-minute reserves) and "synchronous reserve" requirements (10-minute spinning reserves)
- **In real-time, the maximum reserve price would be $1,700/MWh if the system were short both primary and synchronous reserves**
  - Primary reserve shortages valued at $850/MWh
  - Synchronous reserve shortages valued at $850/MWh
- **Regulation shortages are priced at $100/MWh**

PJM- Proposed Operating Reserve Demand Curves

- **In March 2019, PJM filed a proposal with FERC seeking to revise certain pricing values to better align shortage pricing with the value of maintaining system reliability (FERC Docket EL19-58).**
  - The proposed changes filed by PJM remain pending at FERC
  - The following two slides summarize the revised shortage pricing values and reserve demand curves proposed by PJM
- **PJM is also considering further enhancing its reserves demand curves with the probability of loss of load and value of lost load concepts.**

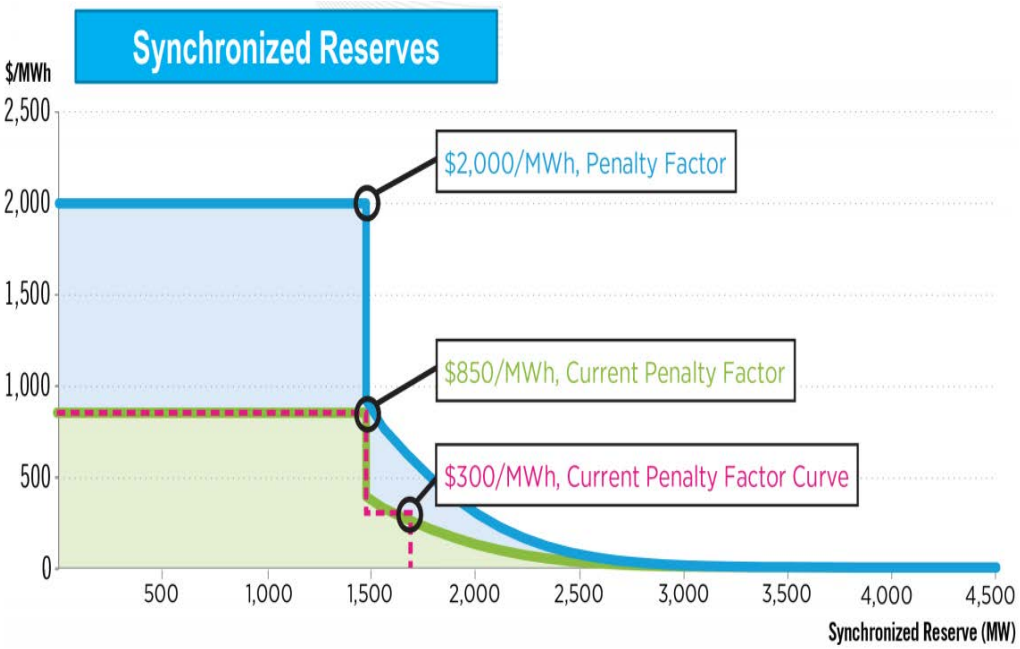
PJM- Proposed Operating Reserve Demand Curves

- In day-ahead and real-time



- If all six reserve constraints were violated in the system and reserve zone, then the maximum reserve price would cascade to $12,000/MWh

PJM- Proposed Operating Reserve Demand Curves



- $2000/MWh Penalty Factor for all products
- Beyond the largest contingency/1.5 times the largest contingency (for primary reserves and 30-minute reserves respectively) the slope of the demand curve will be based on a statistical model of forecast errors in wind and solar forecasting

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Capacity Market Performance Incentives

- PJM and ISO-NE have introduced capacity market performance incentives that are designed to financially reward resource performance during critical operating periods

Pay for Performance at ISO-NE

- **Pay-for-Performance is effectuated when ISO-NE is in a scarcity condition which is a deficiency of:**
  - 10-minute non-spinning reserve (TMNSR), and/or
  - 30-minute operating reserve (TMOR)
- **During a scarcity condition suppliers are also evaluated for their contribution to the condition**
- **For every MWh provided (via energy and/or reserves) during a scarcity condition suppliers that perform receive an additional performance payment**
  - The rate for this payment is the performance payment rate (PPR) and is currently $2,000/MWh
    - This rate increases in future years

Pay for Performance at ISO-NE

- **ISO-NE will gradually increase its Performance Payment Rate from 2018 to 2024 according to the following schedule:**
  - 2018-2021: $2,000/MWh
  - 2021-2024: $3,500/MWh
  - 2024 onward: $5,455/MWh

Pay for Performance at PJM

- PJM calculates a Non-Performance Charge Rate (NPCR) that is distributed from non-performers to performers.
- Non-Performance Charge Rate is based on yearly Net CONE (for CP commitments) or yearly Weighted Average Resource Clearing Price (for Base commitments) and a divisor (i.e., an assumed 30 Emergency Action hours per year).
  - NPCR is expressed in $/MWh to be multiplied by a unit's Performance Shortfall to calculate the assessed penalty charges
- Non-Performance Charge Rate for shortfall due to Capacity Performer commitments ($/MWh) = [modeled LDA Net CONE ($/MW-day in ICAP terms) for which the resource resides * 365 days/30
  - LDA = locational deliverability area (i.e., a capacity zone)
- If LDA Net CONE = $300/MW-day, the Non-Performance Charge Rate = [$300/MW-day * 365 days]/30 = $3,650/MWh
  - For 2016/17 DY, RTO NPCR is $1,896.30/MWh = (50%)*($311.72/MW-day)*(365 days)/30 hours)
  - For 2017/18 DY, RTO PCR is $2,420.23/MWh = (60%)*($331.54/MW-day)*(365 days)/30 hours)

Note: Capacity Performance (CP) Resources must be capable of sustained, predictable operation that allows resource to be available to provide energy and reserves during performance assessment hours throughout the Delivery Year
Base Capacity (Base) Resources are those capacity resources that are not capable of sustained, predictable operation throughout the entire Delivery Year; but are capable of providing energy and reserves during hot weather operations

Capacity Market Performance Incentives - Summary

	Capacity Market Performance Incentives	
	ISO-NE	PJM
Start Date	June 2018	June 2016
Effective	During 10-min non-spin and 30 min operating reserve shortages	During emergency conditions*
Price incorporated into LMP?	Yes	No
Load directly charged?	No	No
Who pays?	Under-performing capacity market resources	Under-performing capacity market resources
Who is paid?	Any over-performing resource	Any over-performing resource
2019/2020 performance $/MWh rates	$2,000/MWh	$2,420.23/MWh

*Emergency Actions refer to any actions for locational or system-wide capacity shortages that either utilizes pre-emergency mandatory load management reductions or other emergency capacity, or initiates a more severe action, including but not limited to, a Voltage Reduction Warning, Voltage Reduction Action, Manual Load Dump Warning, or Manual Load Dump Actions

Overview of Proposed Analysis

Analysis Considerations for Shortage Pricing Values

- When determining the appropriate shortage pricing levels for New York, the NYISO is considering analyzing the following factors:
- Commitment costs of units needed to serve load under strained system conditions
  - **Objective:** For shortage pricing to appropriately reflect the costs of units needed to meet reliability
  - **Approach:** To analyze data for a select number of past events when system conditions were strained and quantify the costs incurred by the units in excess of LBMP revenues.

Analysis Considerations for Shortage Pricing Values

- **Cost of out-of-market (OOM) actions**
  - **Objective:** For shortage pricing to reflect the appropriate costs of OOM actions to maintain reliability during stressed operating conditions.
  - **Approach:** Quantify and analyze the OOM actions taken during a select number of past events when system conditions were strained.
- **Neighboring markets shortage pricing levels**
  - **Objective:** For shortage prices to efficiently incent resources to provide energy to the NYISO under strained system conditions.
  - **Approach:** To understand the approach and rationale neighboring regions have used to increase their shortage pricing levels and the extent to which those reasons could extend to the NYISO.

Preliminary Observations: ISO-NE Pay-for-Performance Event Review

- NYISO is currently reviewing market outcomes and actions taken to serve load on September 3, 2018, when hot weather and strained grid conditions triggered shortage pricing in NYISO and ISO-NE.
  - ISO-NE pay-for-performance incentives were triggered
  - Uplift payments were required for certain resources in New York to recover operating costs

Preliminary Observations: ISO-NE Pay-for-Performance Event Review

- **ISO-NE pay-for-performance incentives were in effect.**
  - Applicable ISO-NE pay-for-performance incentive rate was $2000/MWh (scheduled to rise to $5,455 in 2024)
- **ISO-NE suffered a capacity deficiency and forced generation loss from 15:40 to 18:15**
- **ISO-NE cut Cross-Sound Cable exports to Long Island (330 MW) from 16:00 to 20:00.**
  - NYISO undertook OOM action in response by starting certain peaking resources on Long Island.
- **ISO-NE made emergency purchases from NY (up to 251 MW from 17:00 to 18:00).**
  - NYISO was experiencing 30-minute reserve shortages, resulting in emergency purchases from Ontario in order to provide requested emergency energy to ISO-NE.
- **The export limit to ISO-NE was temporarily increased from 1,400 MW to 1,650 MW to facilitate the emergency purchase.**
- **NYISO curtailed several export transactions to PJM (< 100 MW).**
  - NYISO and ISO-NE both experienced shortages of 30-minute reserves.

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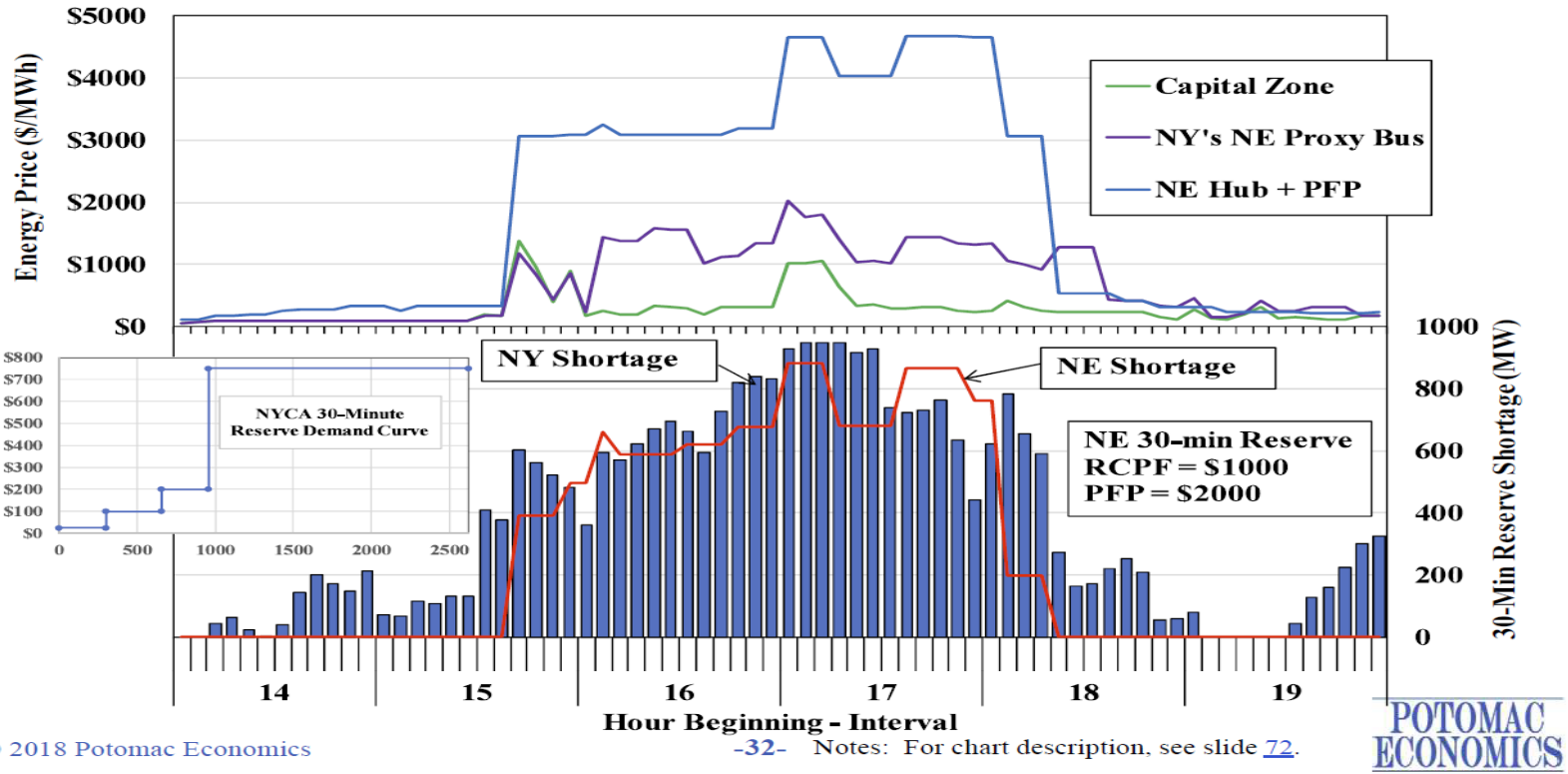
Preliminary Observations: ISO-NE Pay-for-Performance Event Review

- **Energy prices in NY rarely exceeded $200/MWh, while energy prices plus pay-for-performance incentives ranged from $3,000/MWh to $4,700/MWh in ISO-NE.**
- **ISO-NE had substantially higher market incentives during shortages because:**
  - The demand curve value for the system-wide 30-minute reserves requirement is set at $1,000/MWh for any amount of shortage in ISO-NE, while it is set at below $200/MW in NY when the shortage is less than 955 MW (expect if SCRs/EDRP have been activated).
  - Pay-for-performance incentive of $2,000/MWh is ISO-NE is in addition to reserve shortage pricing.

Preliminary Observations: ISO-NE Pay-for-Performance Event Review



 Notes: For chart description, see slide 72.

POTOMAC ECONOMICS

Source: Potomac Economics Quarterly report (Q3, 2018) on the NYISO markets

Timeline

- **July 2019**
  - Present preliminary analysis and methodology.
- **August – October 2019**
  - Discuss potential adjustments to:
    - Current shortage pricing levels
    - NYCA 30-minute curve pricing values during SCR/EDRP activations
    - NYC 30-minute reserve demand curve pricing and NYC reserve requirement during Thunderstorm Alerts (TSAs)
- **November 2019**
  - Seek stakeholder approval of the completed market design enhancements at BIC and MC
- **2020**
  - Seek to implement approved shortage pricing enhancements

Questions?

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits 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 policy makers, stakeholders and investors in the power system

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