Highlights from the 2020 State of the Market Report for the NYISO Markets: Energy & Ancillary Services Market Issues

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Introduction

- As the Market Monitoring Unit for NYISO, we produce an annual State of the Market (SOM) Report to:
  - ✓ Evaluate the performance if the markets;
  - ✓ Identify market flaws or market power concerns; and
  - ✓ Recommend improvements in the market design.
- Given the breadth of the report, this presentation covers only highlights from our 2020 SOM Report related to energy and ancillary services markets, including:
  - ✓ A summary of E&AS market outcomes;
  - ✓ High priority recommended market enhancements for the:
    - – Energy and ancillary services markets

Schedule

- The 2020 SOM is being presented at several meetings:
  - ✓ May 26: Management Committee
    - Overview
  - ✓ June 9: MIWG/ICAPWG
    - Public Policy focus
  - ✓ June 17: MIWG/ICAPWG
    - Capacity Market focus
  - ✓ June 25: MIWG/ICAPWG
    - Energy and Ancillary Services focus
  - ✓ TBD: Details on the capacity accreditation recommendation
  - ✓ TBD: Concerns with locational capacity market requirements
  - ✓ Additional slots can be scheduled if there is interest.

Market Outcomes

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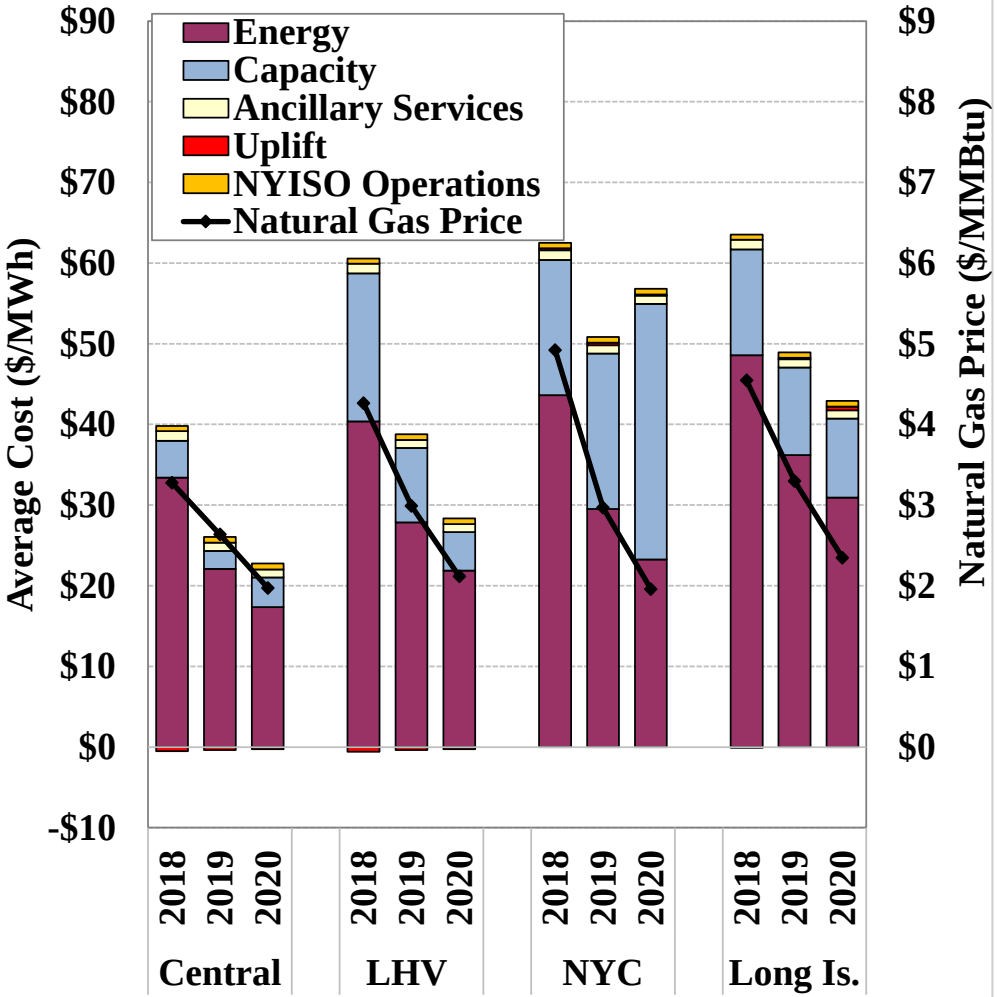
Market Outcomes: All In Price Trends



- Energy prices have fallen because of:
  - ✓ Gas prices; and
  - ✓ Lower demand due to weather, COVID, and long-term trends
- The most significant congestion was:
  - ✓ Central East interface
  - ✓ In Long Island
  - ✓ Across West Zone
  - ✓ From North to Central

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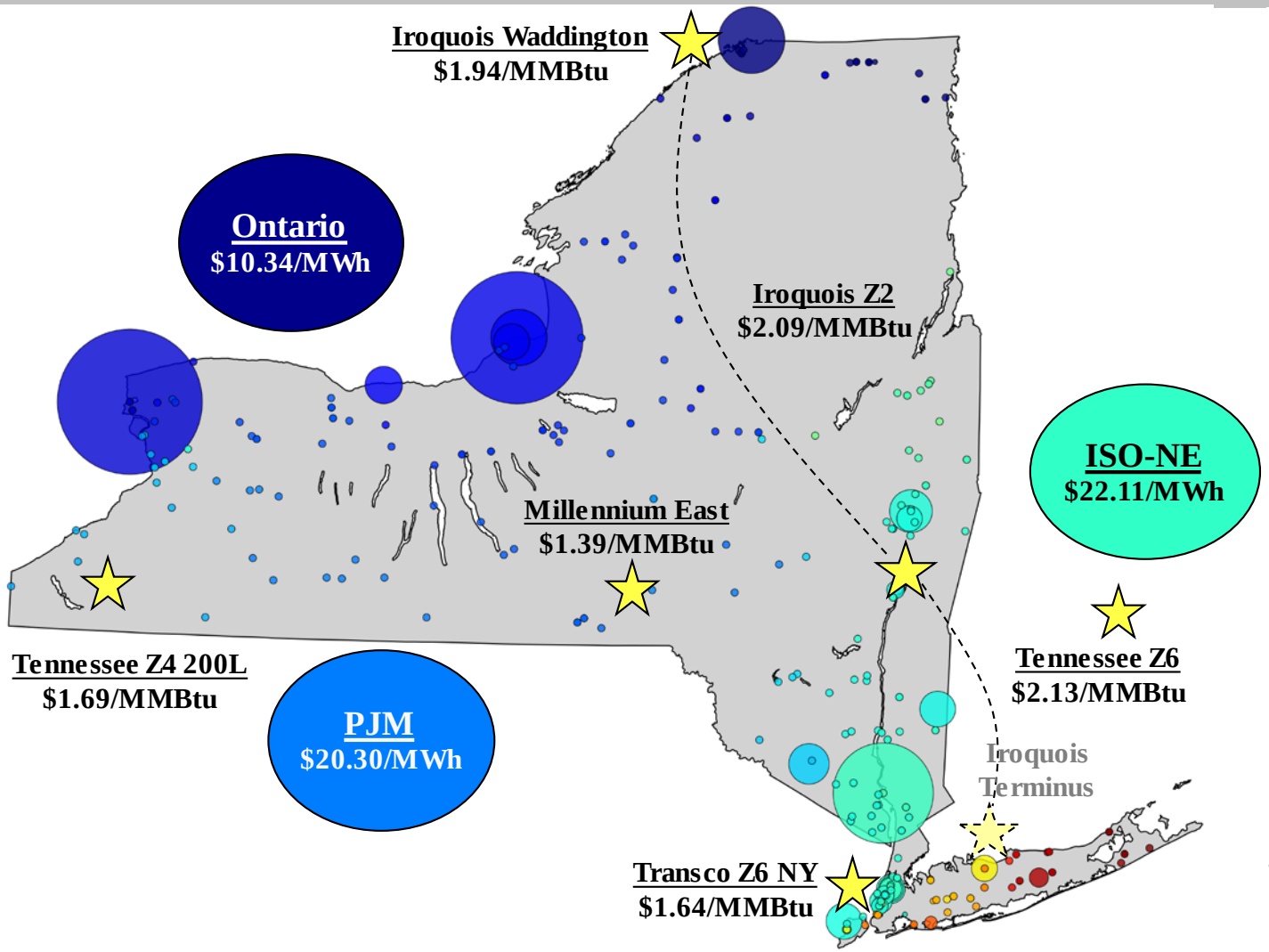
Market Outcomes: Congestion Patterns



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Recommended Market Enhancements

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Prioritizing Market Enhancements

- Unprecedented levels of policy-driven investment expected over the coming decade
- The NYISO should focus on enhancements that:
  - ✓ Guide renewable investment to where it is most deliverable
  - ✓ Provide incentives for investment in flexible resources that help with:
    - Integrating intermittent renewables, while
    - Maintaining reliability
  - ✓ Encourage retirement of inflexible existing generators
- Accomplishing this will require prudent improvements to better value energy and ancillary service providers.

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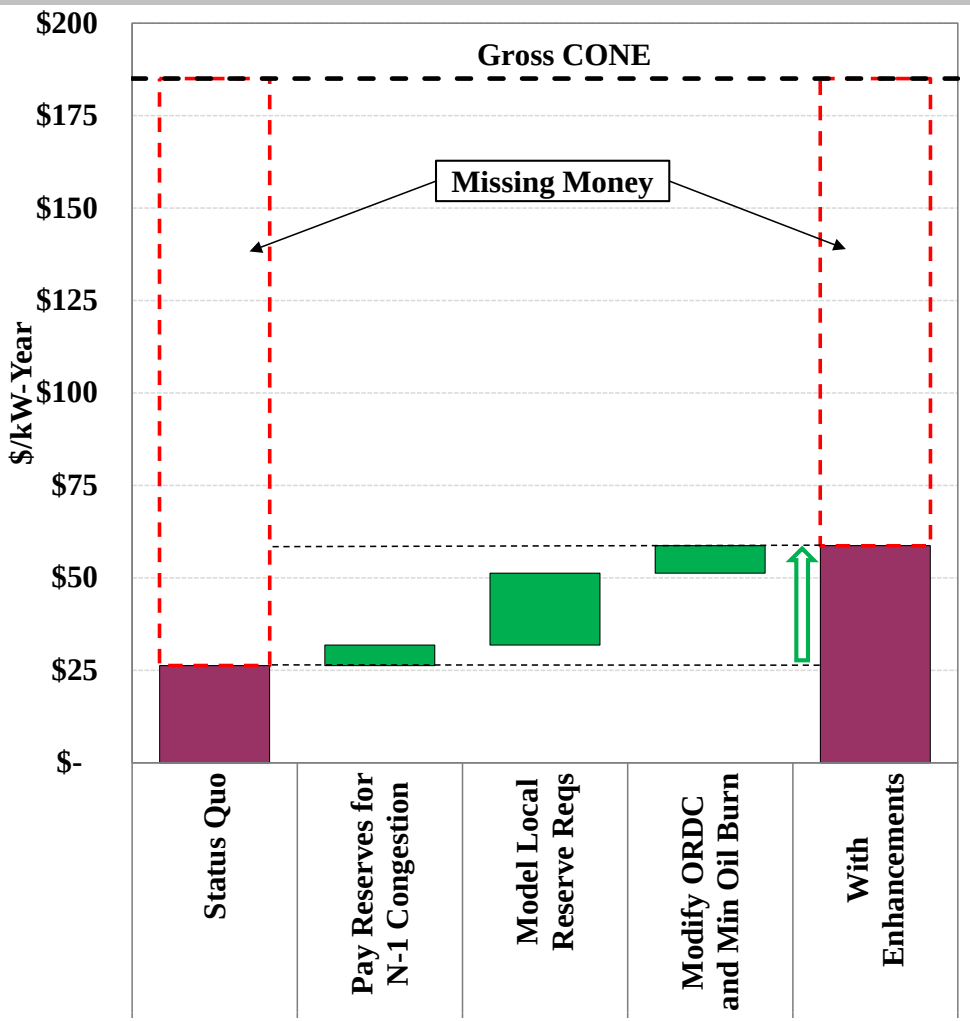
Investment Signals: Enhancing Incentives for Key Attributes

- Increasing E&AS net revenues for flexible units would:
  - ✓ Reduce the capacity revenues needed to maintain reliability
  - ✓ Encourage older inflexible units to retire
- The NYISO is working on addressing four recommendations:
  - ✓ 2015-16: Dynamic reserve requirements
  - ✓ 2017-1: NYC locational reserve requirements
  - ✓ 2016-1: Compensate reserves that increase transfer capability
  - ✓ 2017-2: Reserve demand curve increases
- The incentive effects are estimated in the following three slides based on system conditions from 2018 to 2020.
  - ✓ Increased penetration of intermittent generation will accentuate these incentive effects.

Investment Signals: Impact of Pricing Incentives on Net Revenues



- Results show impact on NYC Frame unit.
- Recommendations boost net revenues by 123 percent.
  - ✓ Reduces Net CONE
- Largest impact from modeling local reserve requirements
- Effects increased by future peaker retirements and intermittency

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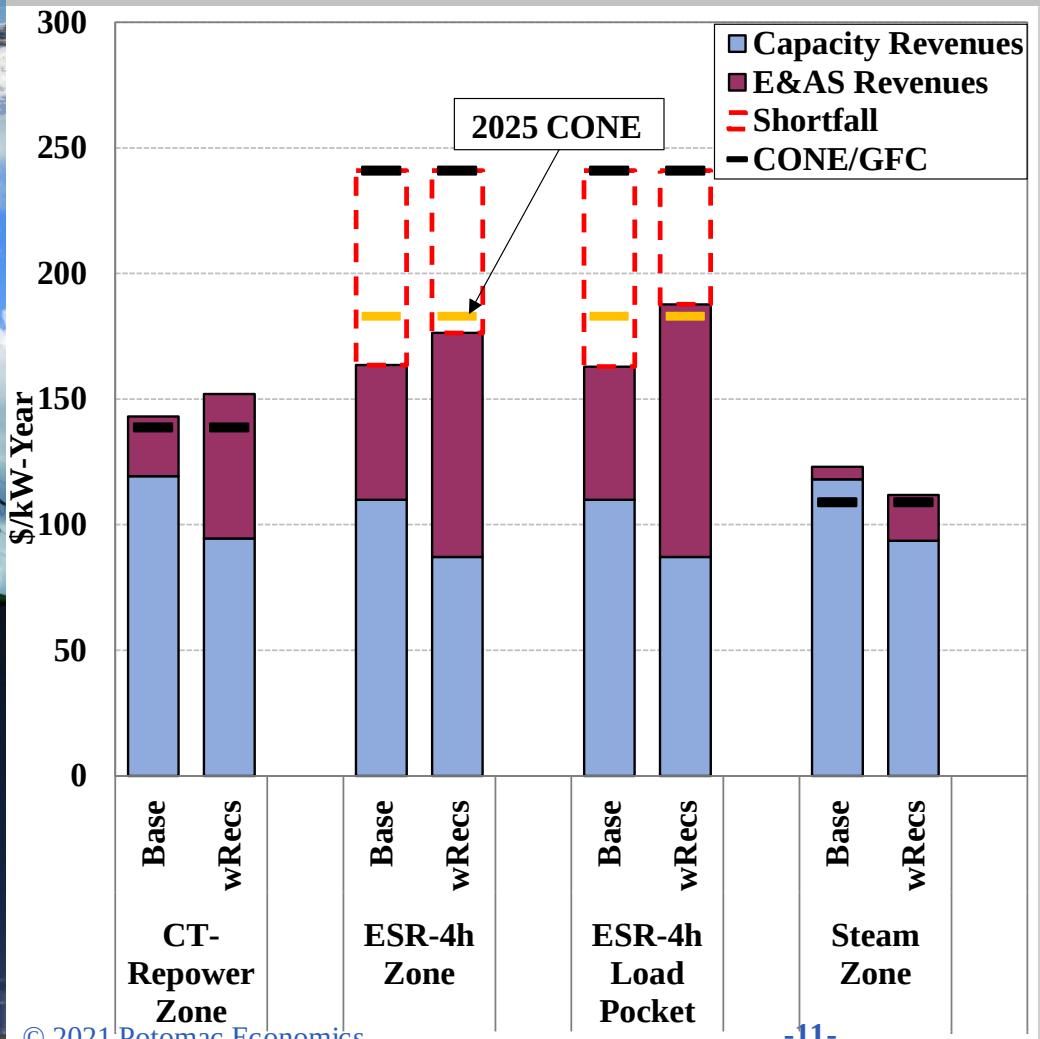
Effects of Energy & Ancillary Services Market Enhancements in NYC



- Incentives shift value from capacity to energy and reserves
  - ✓ Net benefit for newer, flexible technologies
  - ✓ Net detriment to older, inflexible technologies
- Emphasizes the importance of locational incentives

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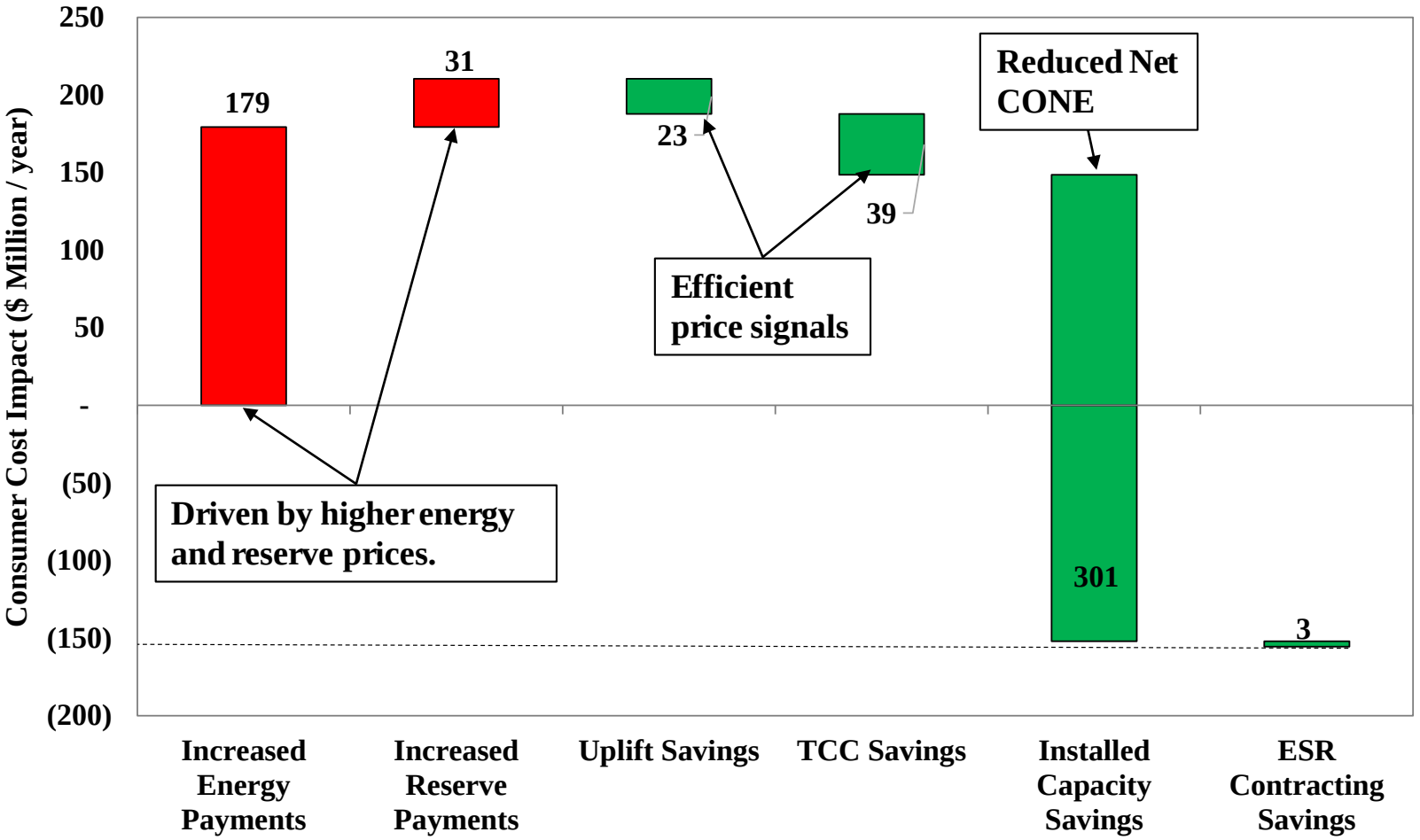
Effects of Energy & Ancillary Services
NYC Consumer Costs



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Energy Market Enhancements: Reserves for NYC Congestion Management

	Transmission Facility	Average Constraint Limit (MW)			Additional Reserves	
		N-1 Limit Used	Seasonal LTE	Seasonal STE	Above LTE	Percent Increase
345 kV	Gowanus-Farragut	1064	834	1303	230	28%
	Motthavn-Rainey	1050	833	1298	217	26%
	Dunwodie-Motthavn	1101	857	1309	244	28%
	Sprnbrk-W49th ST	1305	977	1541	329	34%
	Farragu-E13th ST	1128	943	1347	184	20%
	Goethals-Gowanus	962	748	1241	214	29%
138 kV	Foxhills-Greenwd	311	247	376	64	26%
	Gowanus-Greenwd	348	317	378	31	10%
	Vernon-Greenwd	257	237	278	20	8%

- Nearly 70 percent ($40 million) of real-time congestion during 2020 occurred on constraints that would have been loaded above LTE after a single contingency.

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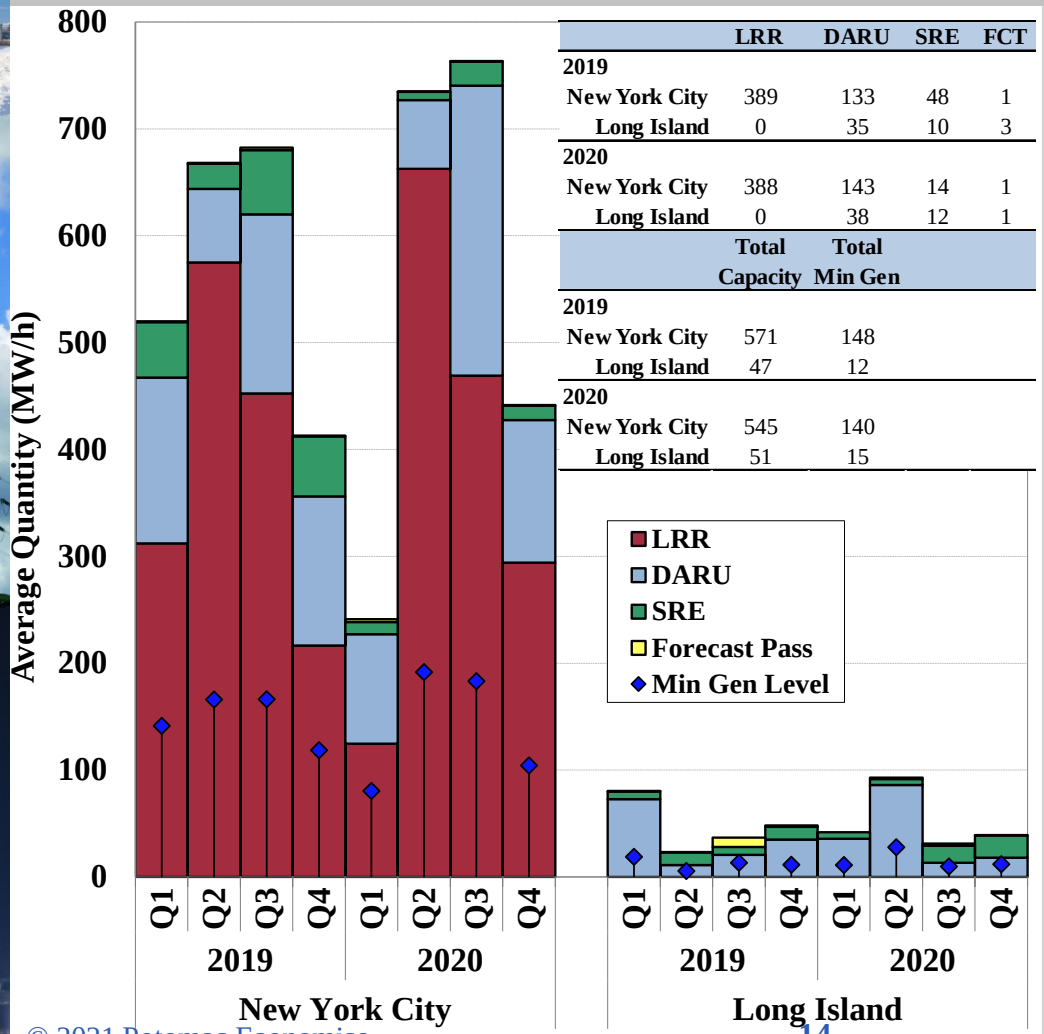
Energy Market Enhancements: Supplemental Commitments for Reserves

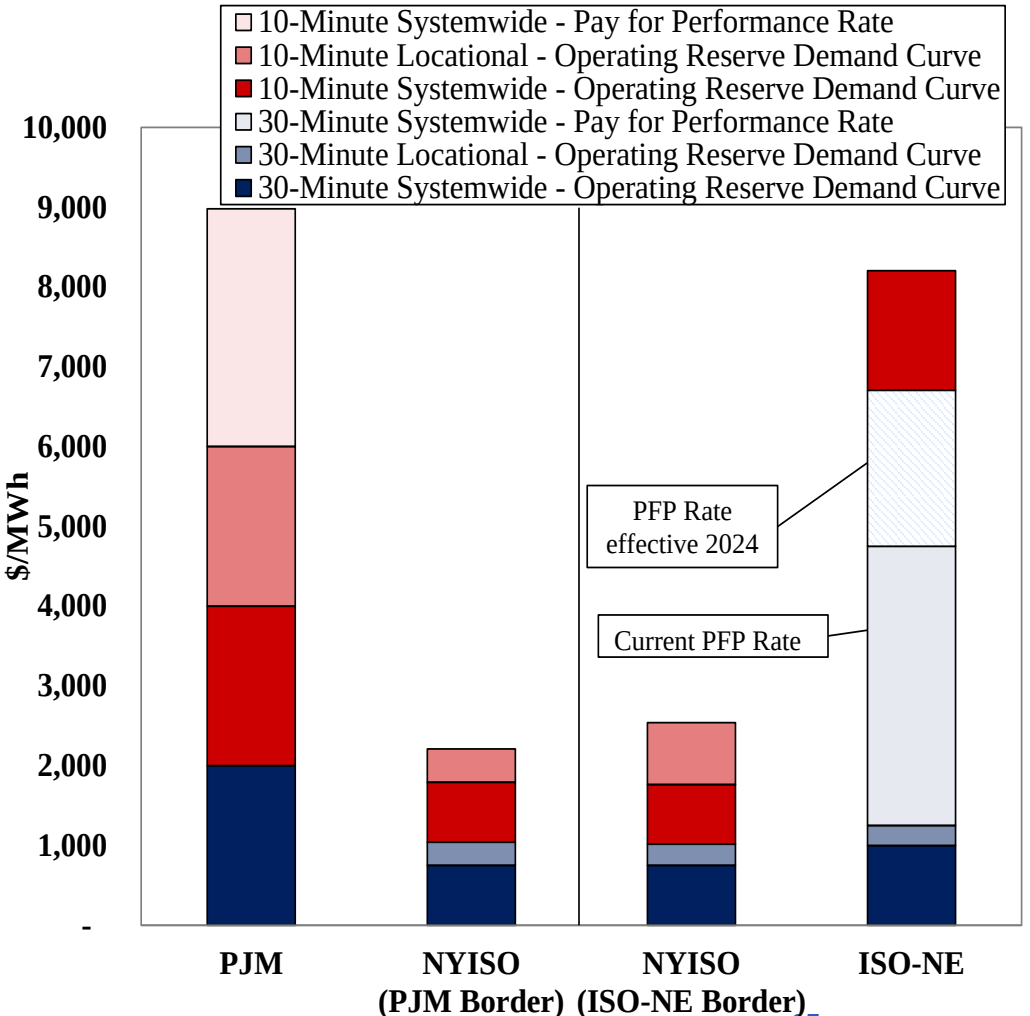


	LRR	DARU	SRE	FCT
2019				
New York City	389	133	48	1
Long Island	0	35	10	3
2020				
New York City	388	143	14	1
Long Island	0	38	12	1

	Total Capacity	Total Min Gen
2019		
New York City	571	148
Long Island	47	12
2020		
New York City	545	140
Long Island	51	15

- Frequent NYC ST and CC commitments for reserves.
- DARU and LRR commitments account for:
  - ✓ 45 percent of NYC ST run hours
  - ✓ 42 percent of NYC ST energy
- Local energy and reserve prices are understated because they do not reflect these costs
- Model reserve constraints that drive these commitments

Energy Market Enhancements: Shortage Pricing Disparities and Associated Risks



- Different regional 30-min shortage adders:
  - ✓ NYISO: $1,000
  - ✓ PJM: $2,000
  - ✓ ISO-NE: $6,700
- 10-min shortage adders:
  - ✓ NYISO: $2,450
  - ✓ PJM: $9,000
  - ✓ ISO-NE: $8,200
- Recommend levels that would stop OOM actions to maintain reliability and reflect reliability value.

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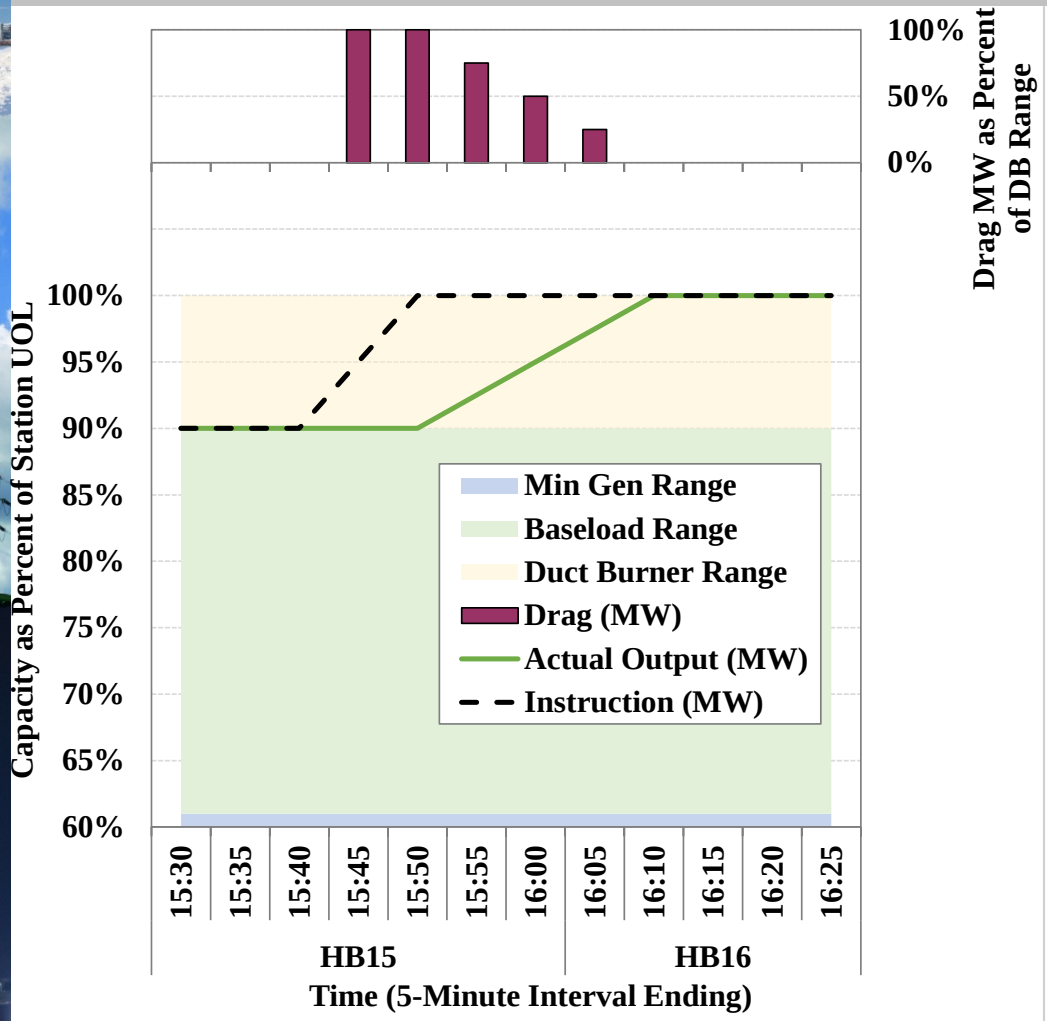
Energy Market Enhancements: Considerations for Fixed-Block Output

- A few of our recommendations address complications that arise due to fixed-block generation such as peaking units and duct-firing ranges of combined cycle units.
  - ✓ 2020-1: Consider enhanced scheduling in real-time of duct-firing capacity.
  - ✓ 2020-2: Eliminate offline fast-start pricing from RTD
  - ✓ 2012-13: Adjust RTD and RTC look ahead evaluations to be more consistent with gas turbine commitment ramp requirements.
- The following three charts illustrate issues that relate to these recommendations:
  - ✓ Issues with modeling duct burners as "incremental energy step" in the combined cycle output range.
  - ✓ Efficiency of offline GT fast-start pricing performance.
  - ✓ GT commitment efficiency and performance.

Energy Market Enhancements: Consider Duct Burner Modeling Enhancements



- Duct burners include >760 MW Summer Capacity.
- Currently considered 10-minute and regulation capable.
- Physical characteristics to consider:
  - ✓ Duct Burner start time (>10 minutes)
  - ✓ Slower ramp rate
  - ✓ Limited responsiveness (AGC)

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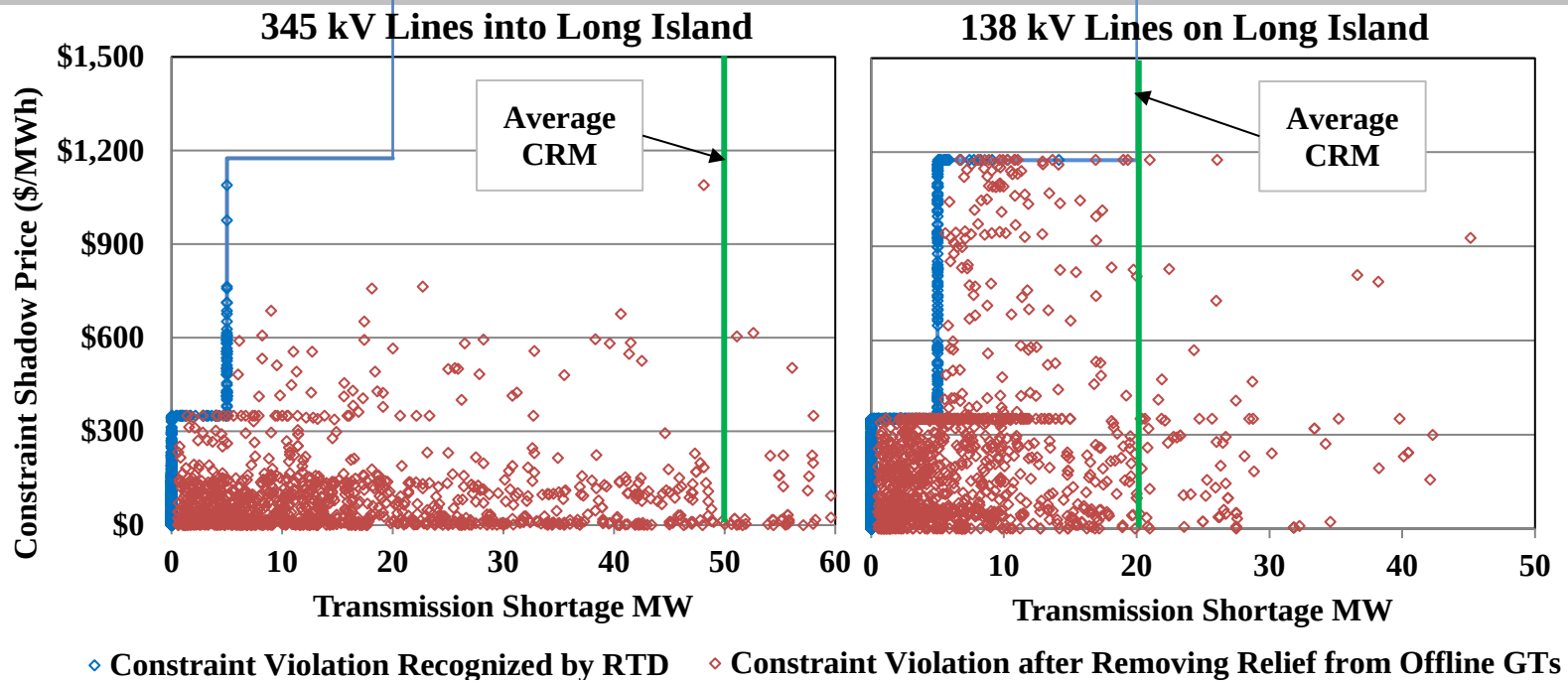
Energy Market Enhancements: Offline GT Price-Setting Elimination



- Offline GT pricing treats offline GTs as able to respond to dispatch instructions when they cannot actually do so.
- Use of offline GT pricing indirectly leads to artificially low transmission limits (and flows) in areas more reliant on peaking units.

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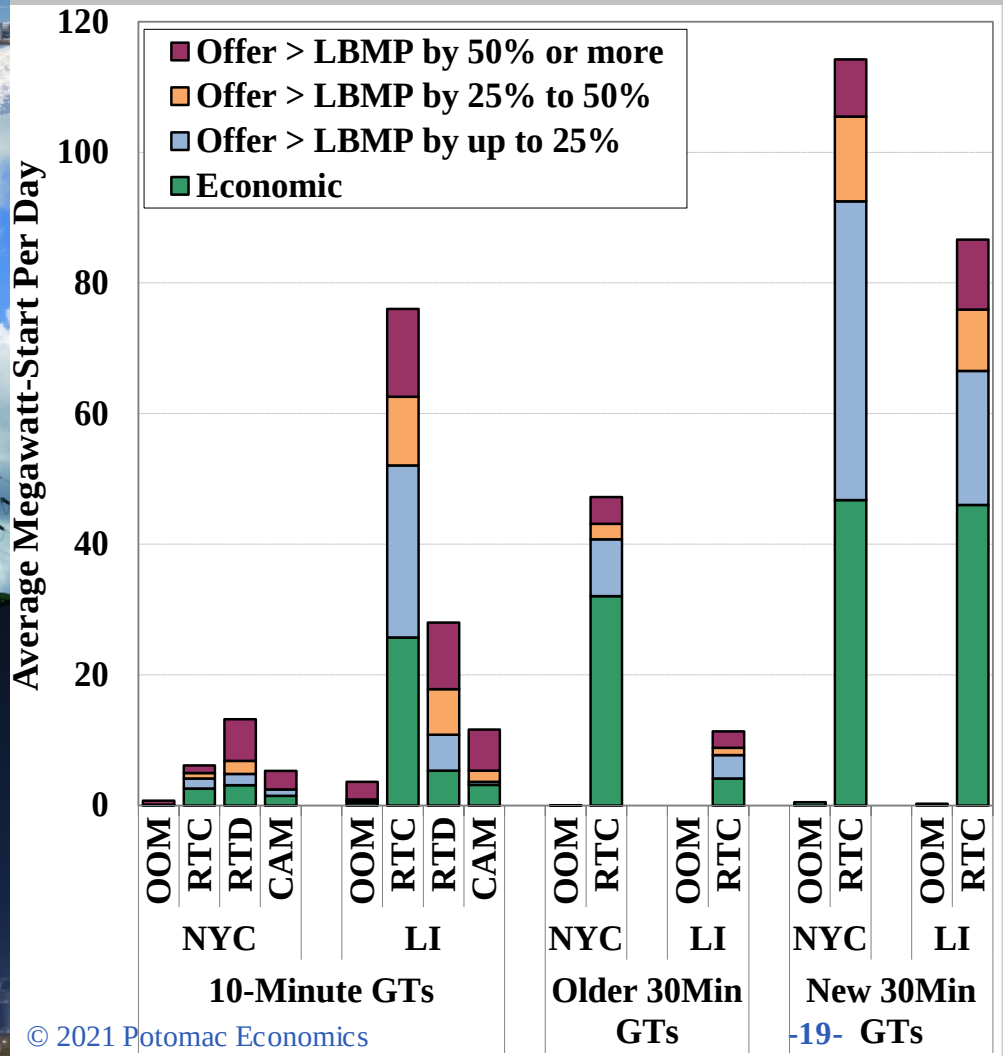
Energy Market Enhancements: GT Commitment Efficiency



- Overcommitment of GTs leads to:
  - ✓ Depressed prices
  - ✓ Higher uplift
- Only 42 percent of GT starts were clearly economic.
- Two reasons for inefficient GT commitments:
  - ✓ RTC/RTD divergence
  - ✓ Current offline fast-start price setting rules

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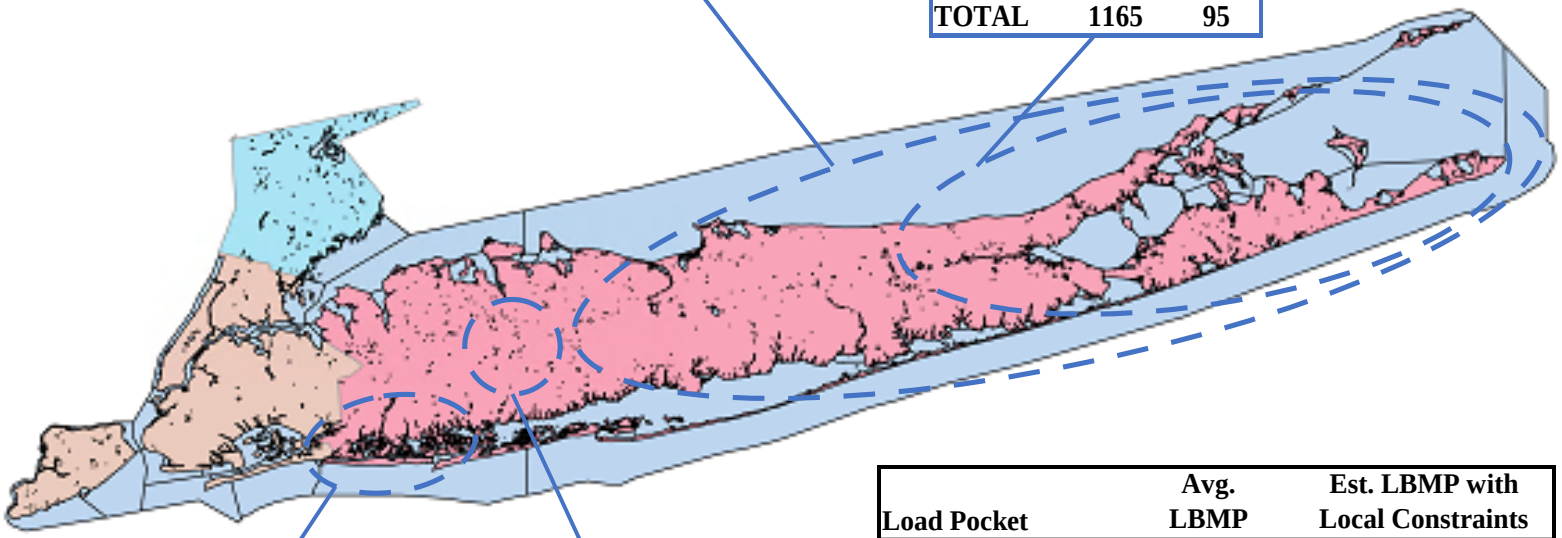
Energy Market Enhancements: Modeling Constraints on Long Island

- OOM actions were frequently taken to manage low voltage constraints on Long Island.
- OOM actions can:
  - ✓ Make transmission bottlenecks less transparent to investors
  - ✓ Suppress energy and ancillary service prices
- Modeling low-voltage constraints in the market software would:
  - ✓ Facilitate more efficient PAR operations
  - ✓ Reduce inefficient oil-fired genreation
    - 320 hours in East of Northport pocket of potentially avoidable oil-fired peaker output.
- The NYISO began to secure two 69-kV circuits in mid-April 2021.
  - ✓ This was a positive step towards implementing elements of our Recommendation #2018-1.
- The following slide outlines OOM actions in Long Island for low voltage issues during 2020.

Energy Market Enhancements: Modeling Constraints on Long Island

East of Northport	#Hours	#Days
69kV	480	51
138kV	1336	124
TOTAL	1529	132

East End	#Hours	#Days
69kV	114	13
138kV	2	1
TVR	1115	90
TOTAL	1165	95



Valley Stream	#Hours	#Days
69kV	1050	79
138kV	4513	284
TOTAL	5040	291

Brentwood	#Hours	#Days
69kV	312	54
138kV	0	0
TOTAL	312	54

Load Pocket	Avg. LBMP	Est. LBMP with Local Constraints
Brentwood	$27.97	$28.54
East End	$31.45	$48.13
East of Northport	$30.68	$35.62
Valley Stream	$29.15	$33.70

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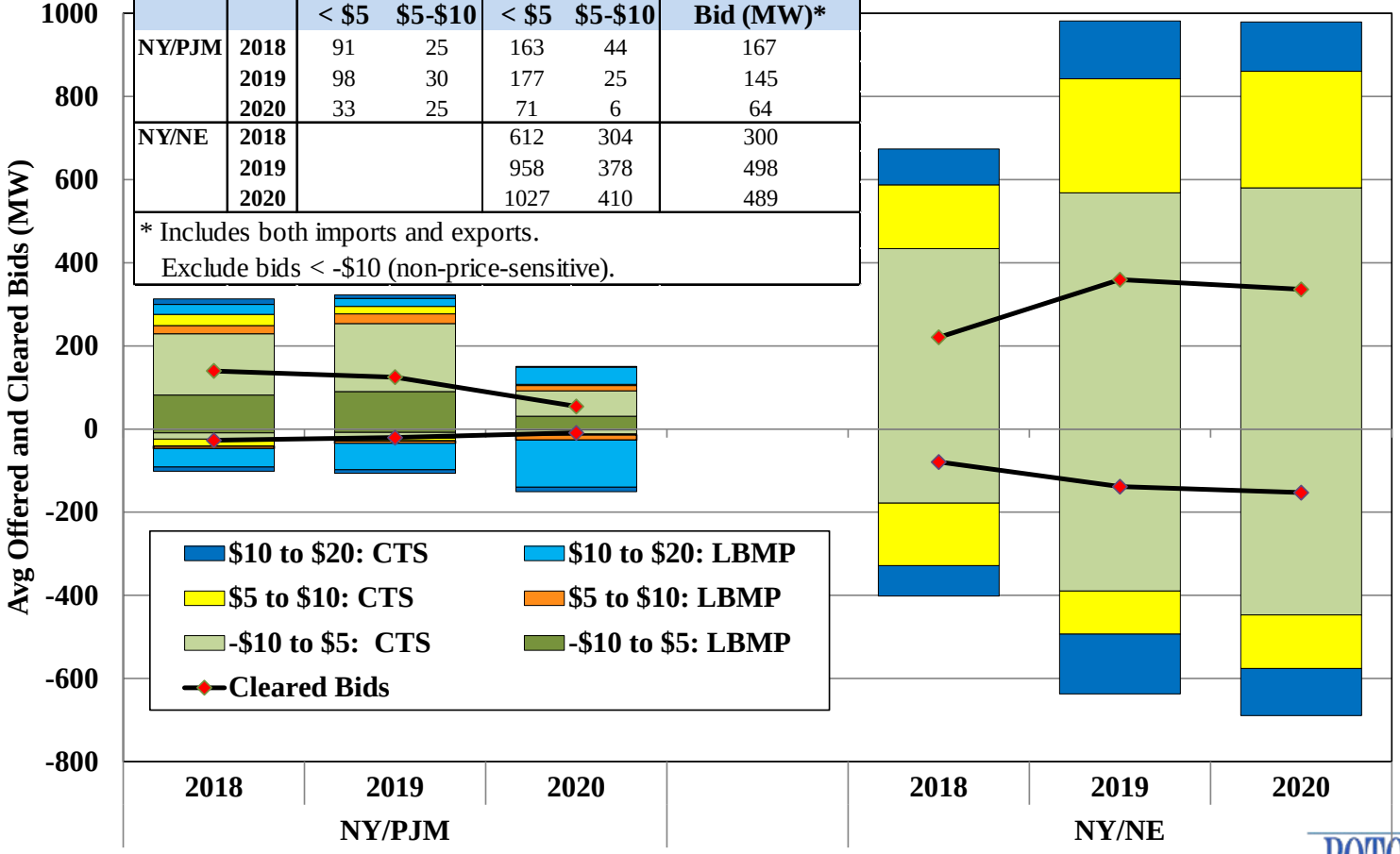
Energy Market Enhancements: Assessment of CTS Transaction Bids and Offers

		Avg Price-Sensitive Bid MW*				Avg Cleared Price-Sensitive Bid (MW)*
		LBMP-Based		CTS		
		< $5	$5-$10	< $5	$5-$10	
NY/PJM	2018	91	25	163	44	167
	2019	98	30	177	25	145
	2020	33	25	71	6	64
NY/NE	2018			612	304	300
	2019			958	378	498
	2020			1027	410	489

* Includes both imports and exports.
Exclude bids < -$10 (non-price-sensitive).



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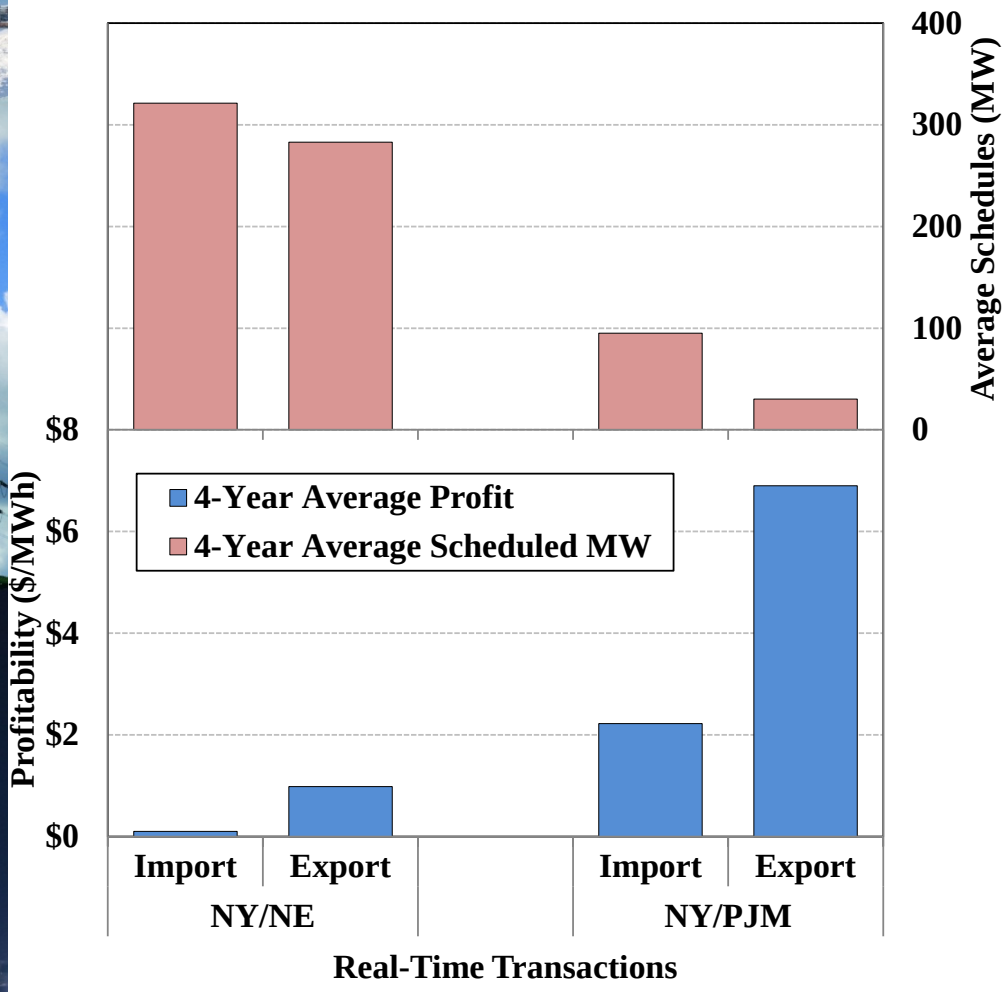
Energy Market Enhancements: CTS Transactions Profitability



- #2015-9 would eliminate fees for CTS transactions at NY-PJM border.
- Elimination of fees would improve use of NY-NE interface.
- CTS transactions do not drive transmission investment costs
- Lower fees would:
  - ✓ Encourage price-sensitive scheduling
  - ✓ Potentially increase revenue collection
  - ✓ Help integrate renewables

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