2018 State of the Market Report for the NYISO Markets: Review of Recommendations

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MIWG/ICAPWG Meeting
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Schedule for 2018 SOM Report

- May 8 – Full report posted on NYISO website
- May 13 – High-level presentation to BIC
- May 17 – More detailed presentation at ICAPWG/MIWG
- Feedback from stakeholders is welcome at any time:
  - ✓ Comments will be addressed in one-on-one telecon or in an ad hoc working group presentation

Energy Market Enhancements:
Pricing and Performance Enhancements

Energy Market Enhancements: Pricing and Performance Enhancements

Number	Section	Recommendations	Current Effort	High Priority
Energy Market Enhancements – Pricing and Performance Incentives				
2018-1	V.B	Model in the day-ahead and real-time markets Long Island transmission constraints that are currently managed by NYISO with OOM actions and develop associated mitigation measures.		
2017-1	VIII.D, IX.H	Model local reserve requirements in New York City load pockets.	✓	✓
2017-2	VIII.D, IX.B	Modify operating reserve demand curves to improve shortage pricing and ensure NYISO reliability.	✓	✓
2016-1	VIII.D, IX.D	Consider rules for efficient pricing and settlement when operating reserve providers provide congestion relief.		
2016-2	VIII.D, IX.D	Consider means to allow reserve market compensation to reflect actual and/or expected performance.	✓	
2015-9	VI.D	Eliminate transaction fees for CTS transactions at the PJM-NYISO border.		
2015-16	IX.B	Dynamically adjust operating reserve requirements to account for factors that increase or decrease the amount of reserves that must be held on internal resources.		
2015-17	IX.B	Utilize constraint-specific graduated transmission demand curves to set constraint shadow prices during transmission shortages.	✓	

Pricing & Performance Enhancements: Rec 2018-1 Modeling Constraints on Long Island

- OOM dispatch for low-voltage constraints on Long Island:
  - ✓ 119 days led to ~$10 million in uplift
- OOM actions:
  - ✓ Make transmission bottlenecks less transparent and
  - ✓ Suppress E&AS prices
- Congestion pricing would increase LBMPs:
  - ✓ 17 percent in East of Northport load pocket
  - ✓ 44 percent in East End load pocket
- **Modeling local constraints provides: better pricing signals, better investment signals, and reduced emissions.**

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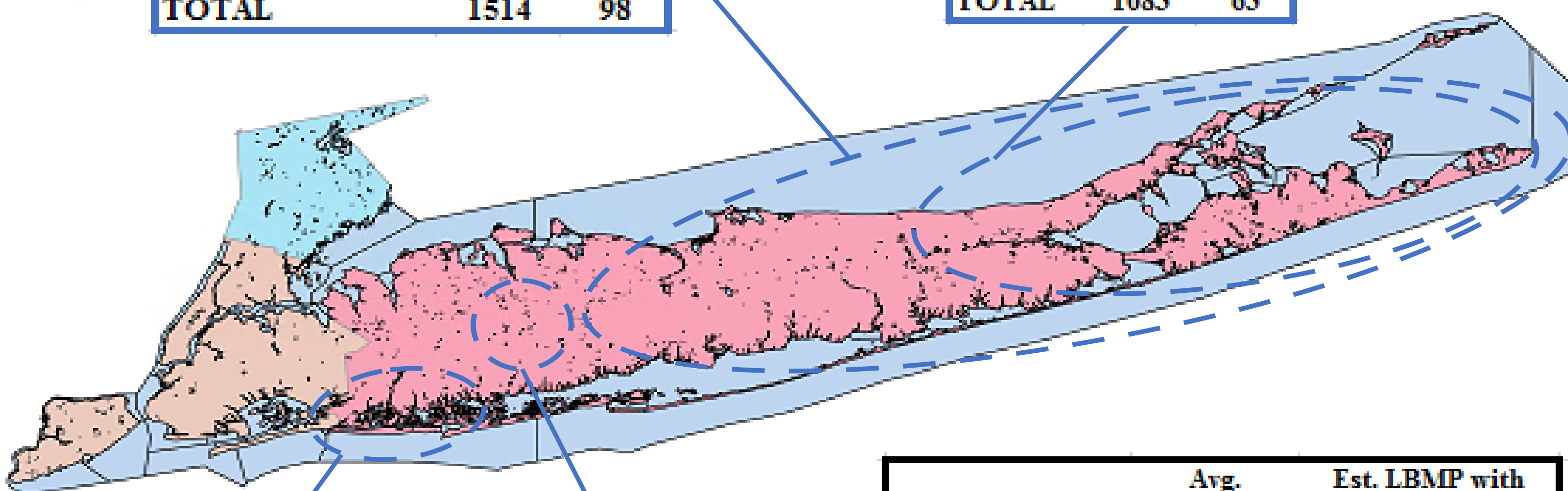
Pricing & Performance Enhancements: Rec 2018-1
Modeling Constraints on Long Island

East of Northport	#Hours	#Days
69kV	647	64
138kV	1079	64
TOTAL	1514	98

East End	#Hours	#Days
69kV	159	12
138kV	792	33
TVR	623	56
TOTAL	1083	63



Valley Stream	#Hours	#Days
69kV	399	40
138kV	7583	329
TOTAL	7667	333

Brentwood	#Hours	#Days
69kV	339	53

Load Pocket	Avg. LBMP	Est. LBMP with Local Constraints
Brentwood	$43.72	$43.95
East End	$46.18	$66.61
East of Northport	$43.99	$51.30
Valley Stream	$51.87	$52.18

Pricing & Performance Enhancements: Rec 2017-1 Model Local Reserve Requirements in NYC

- NYISO's should consider:
  - ✓ Whether changes are needed for mitigation measures.
  - ✓ Amount of reserves needed in DAM depends on whether sufficient energy is scheduled to satisfy forecast load
    - – Consider adjusting the reserve requirement to account for any under-scheduling of energy.
  - ✓ Whether local reserve requirements would be appropriate for maintaining reliability following the loss of multiple generators due to a sudden natural gas system contingency

Pricing & Performance Enhancements: Rec 2017-1 Model Local Reserve Requirements in NYC

Area	Average Marginal Commitment Cost ($/MWh)
NYC 345 kV System	$2.01
Selected 138 kV Load Pockets:	
Astoria West/Queensbridge	$5.18
Vernon	$4.23
Greenwood/Staten Is.	$3.39

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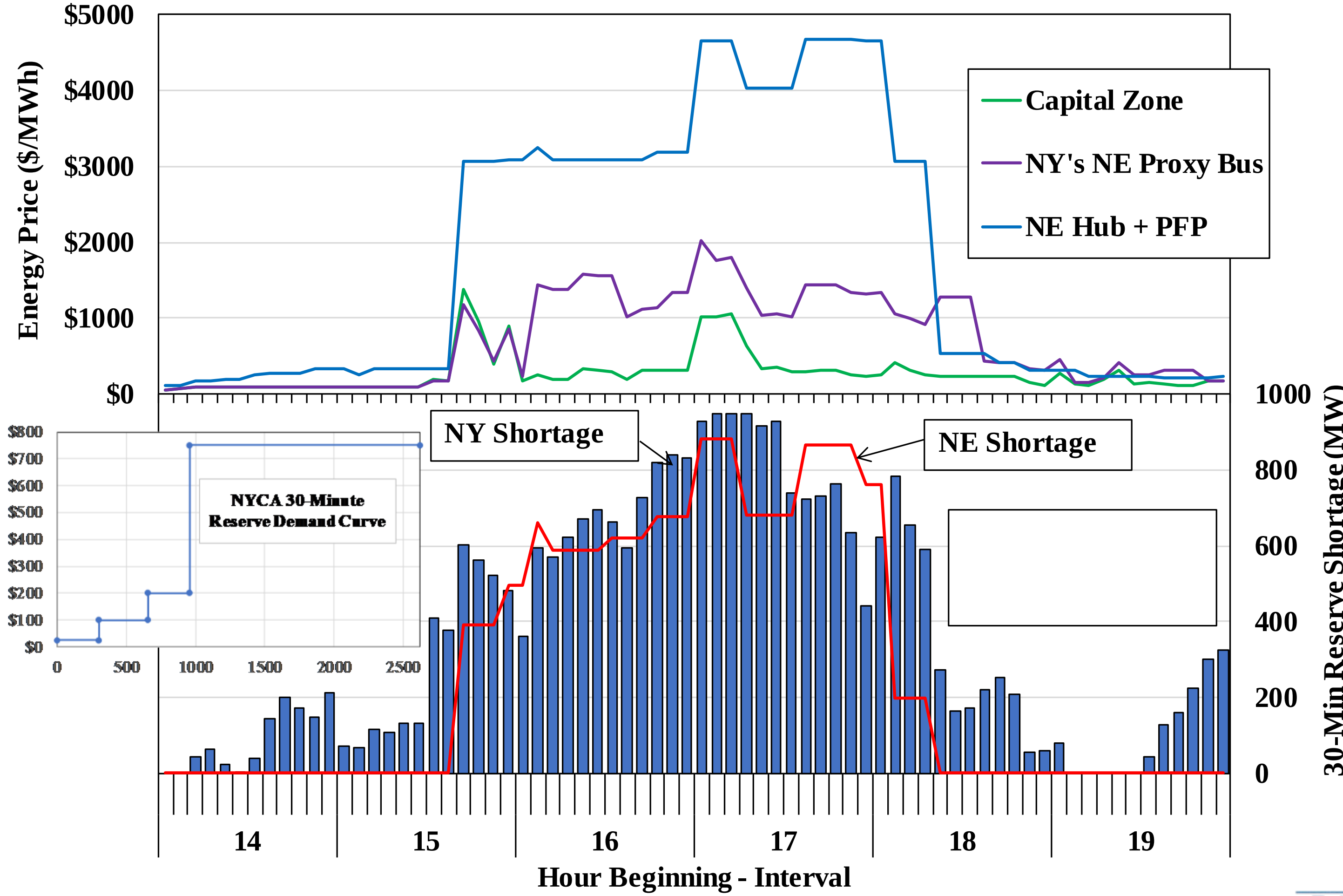
Pricing & Performance Enhancements: Rec 2017-2 Modify ORDCs to Improve Shortage Pricing

- ISO-NE and PJM are phasing-in PFP rules from 2018 to 2022.
  - ✓ Shortage compensation will rise to $3,000 to $8,000 per MWh during reserve shortages.
- NYISO should modify ORDCs so that:
  - ✓ Clearing prices rise to levels that are efficient given the value-of-lost-load and the risk of load shedding
  - ✓ The real-time market schedules available resources such that NYISO operators do not need to engage in out-of-market actions to maintain reliability

Pricing & Performance Enhancements: Rec 2017-2 Modify ORDCs to Improve Shortage Pricing



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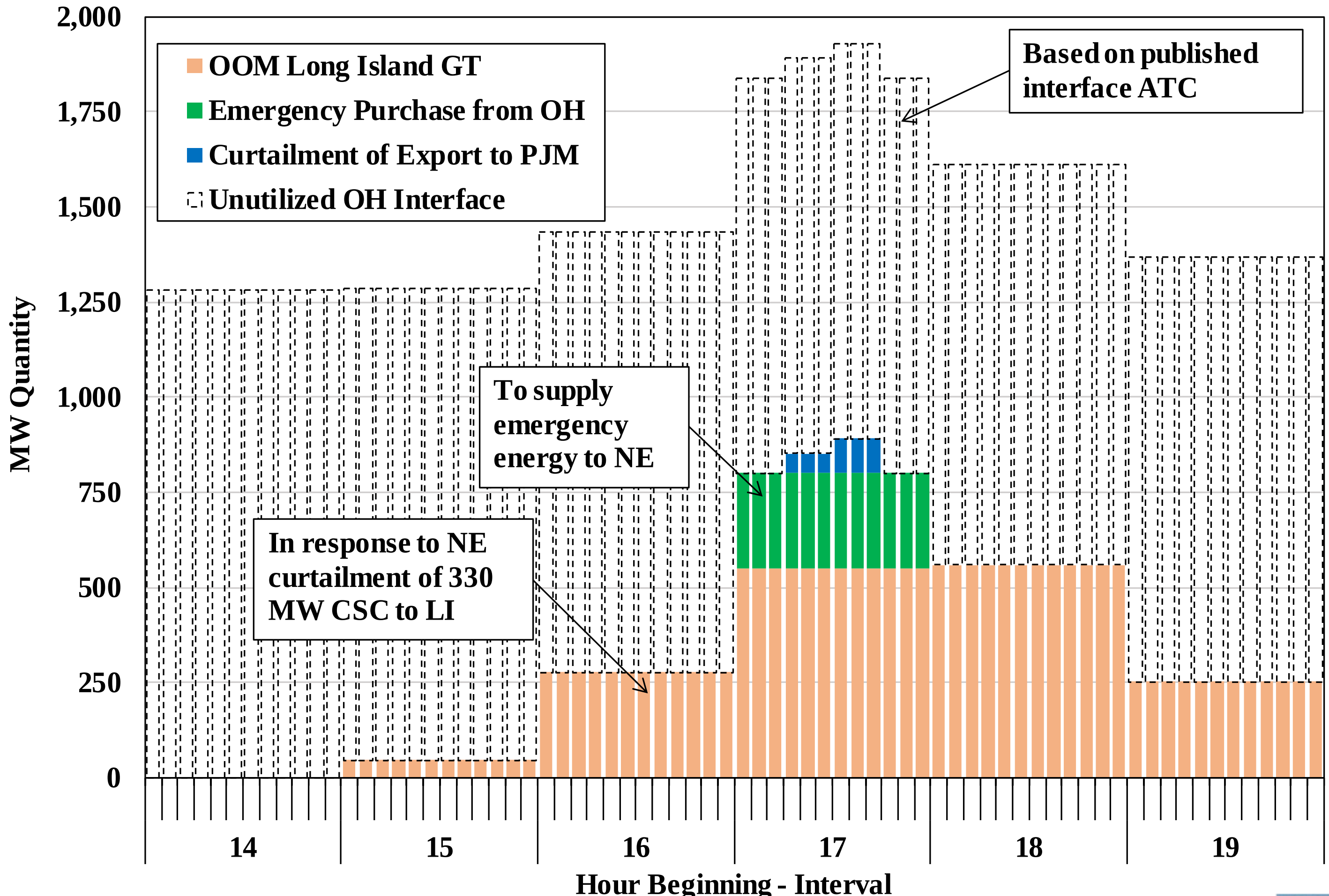
Pricing & Performance Enhancements: Rec 2017-2 Modify ORDCs to Improve Shortage Pricing



Pricing & Performance Enhancements: Rec 2016-1 Compensate Reserves for Congestion Relief

- Reserves in NYC allow higher transmission flows into NYC.
  - ✓ For example: a line with 900 MW LTE rating is operated to 1,200 MW when sufficient reserves are available to reduce flows post-contingency
    - – This allows NYC to rely more on imports
  - ✓ Compensation for reserve units that relieve congestion would provide incentives for units to be available and reliable.
    - – This would be similar to congestion payments to energy providers.

Pricing & Performance Enhancements: Rec 2016-1
Compensate Reserves for Congestion Relief

Transmission Facility		Average Constraint Limit (MW)		
		N-1 Limit Used	Seasonal LTE	Seasonal STE
345 kV	E13th ST-W49th ST	1227	993	1568
	Farragut-Gowanus	1069	829	1301
	Gowanus-Goethals	971	737	1233
	Motthavn-Dunwodie	1074	854	1307
	Motthavn-Rainey	1038	833	1298
	W49th ST-Sprnbrk	1236	950	1540
138 kV	Vernon-Greenwd	252	234	268
	Gowanus-Greenwd	344	317	369
	Foxhills-Greenwd	310	246	375

Pricing & Performance Enhancements: Rec 2016-2 Reserve Compensation Should Reflect Performance

- Reserve providers are compensated the same regardless of how they perform when deployed by the NYISO.
- The market does not provide efficient performance incentives to generators that are frequently scheduled for reserves.
- NYISO should consider discounting reserve awards based on past performance.
  - ✓ For example, a 10-MW fast start unit that starts and reaches its instructed output level 80 percent of the time could be scheduled for up to 8 MW of reserves.
  - ✓ As part of this effort, the NYISO should consider whether changes would be warranted for any of its operating reserve requirements to account for this adjustment

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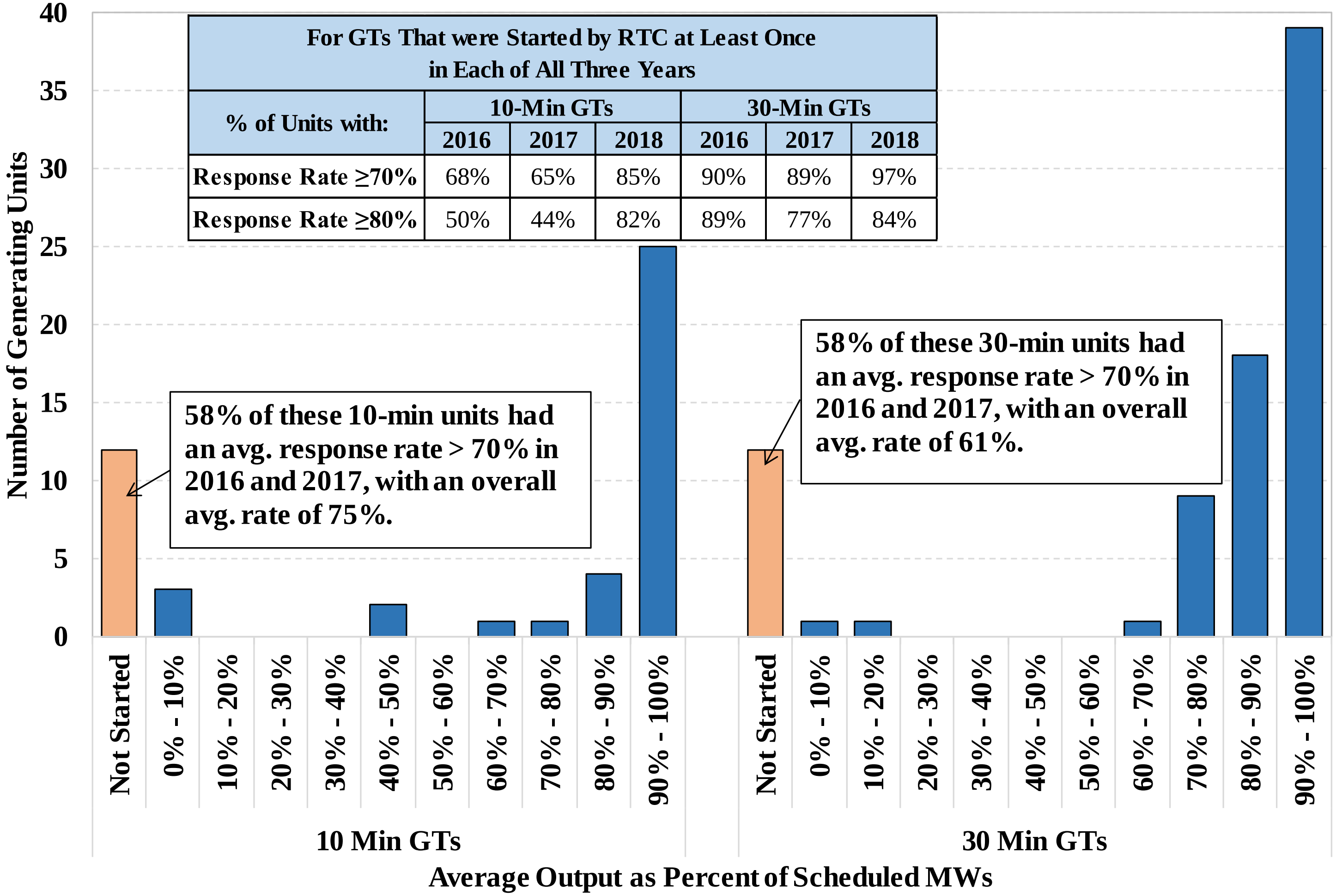
Pricing & Performance Enhancements: Rec 2016-2 Reserve Compensation Should Reflect Performance

For GTs That were Started by RTC at Least Once in Each of All Three Years

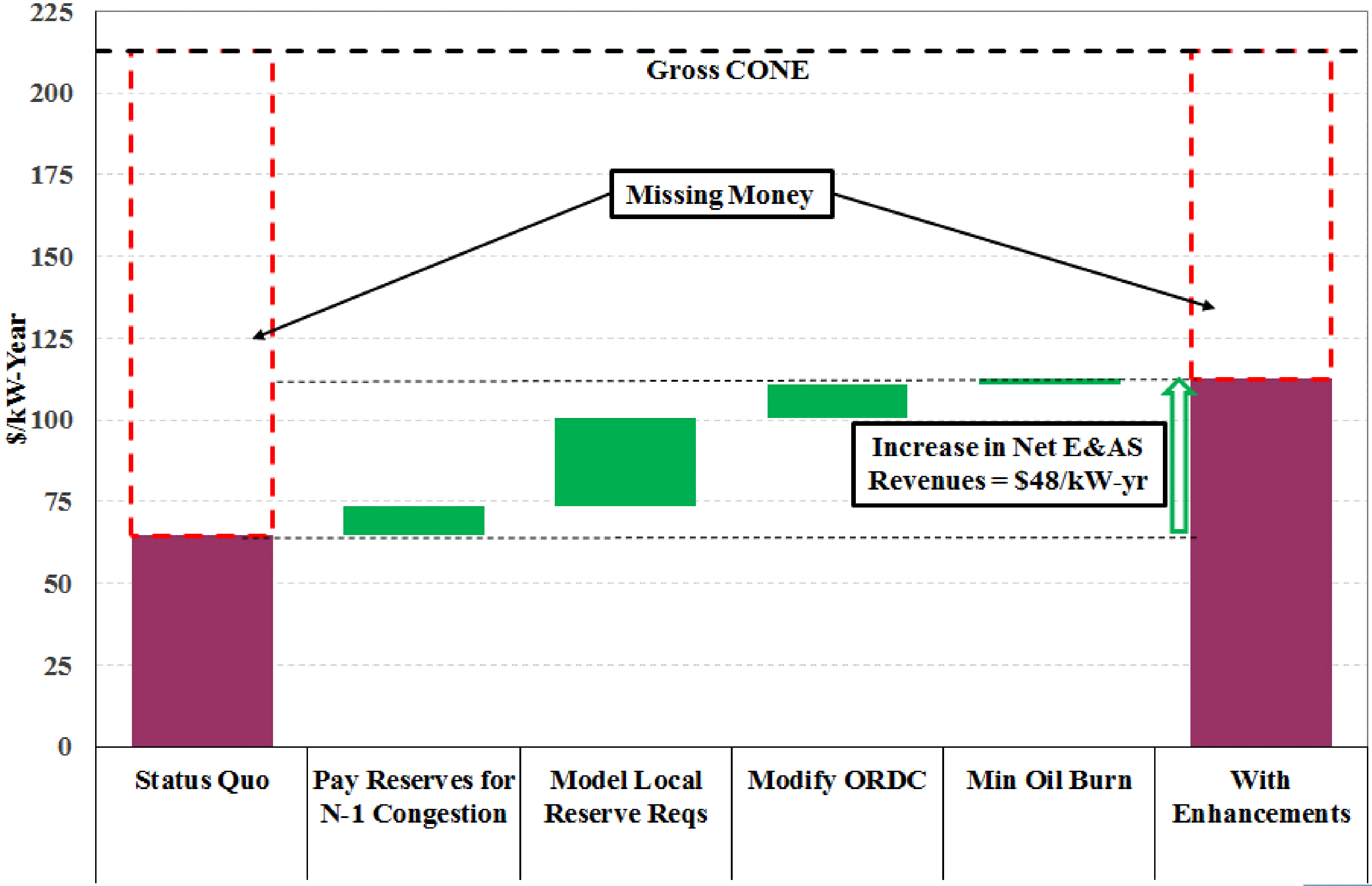
% of Units with:	10-Min GTs			30-Min GTs		
	2016	2017	2018	2016	2017	2018
Response Rate ≥70%	68%	65%	85%	90%	89%	97%
Response Rate ≥80%	50%	44%	82%	89%	77%	84%



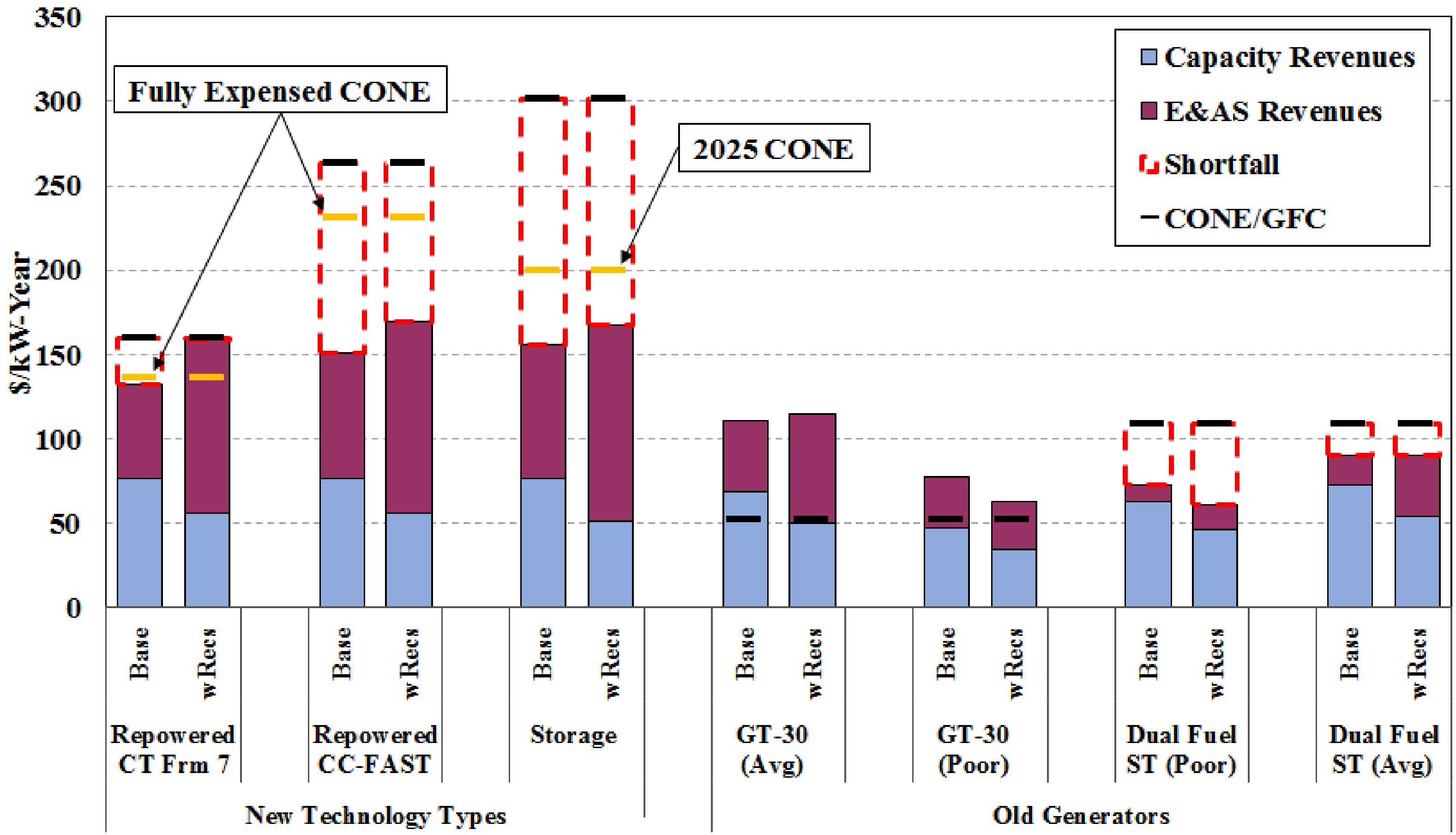
Pricing & Performance Enhancements: Enhancing Incentives for Key Attributes

- Increasing E&AS net revenues for flexible units would:
  - ✓ Reduce the capacity revenues needed to maintain reliability
  - ✓ Shift incentives toward repowering older units with:
    - Newer more flexible & fuel-efficient generation
    - Battery storage resources
- Recommended actions:
  - ✓ 2017-1: NYC load pocket reserves
  - ✓ 2017-2: Reserve demand curve increases
  - ✓ 2016-1: Compensate reserves that increase NYC import capability
  - ✓ 2016-2: Compensate reserves based on performance

Pricing & Performance Enhancements: Enhancing Incentives for Key Attributes



Pricing & Performance Enhancements: Enhancing Incentives for Key Attributes



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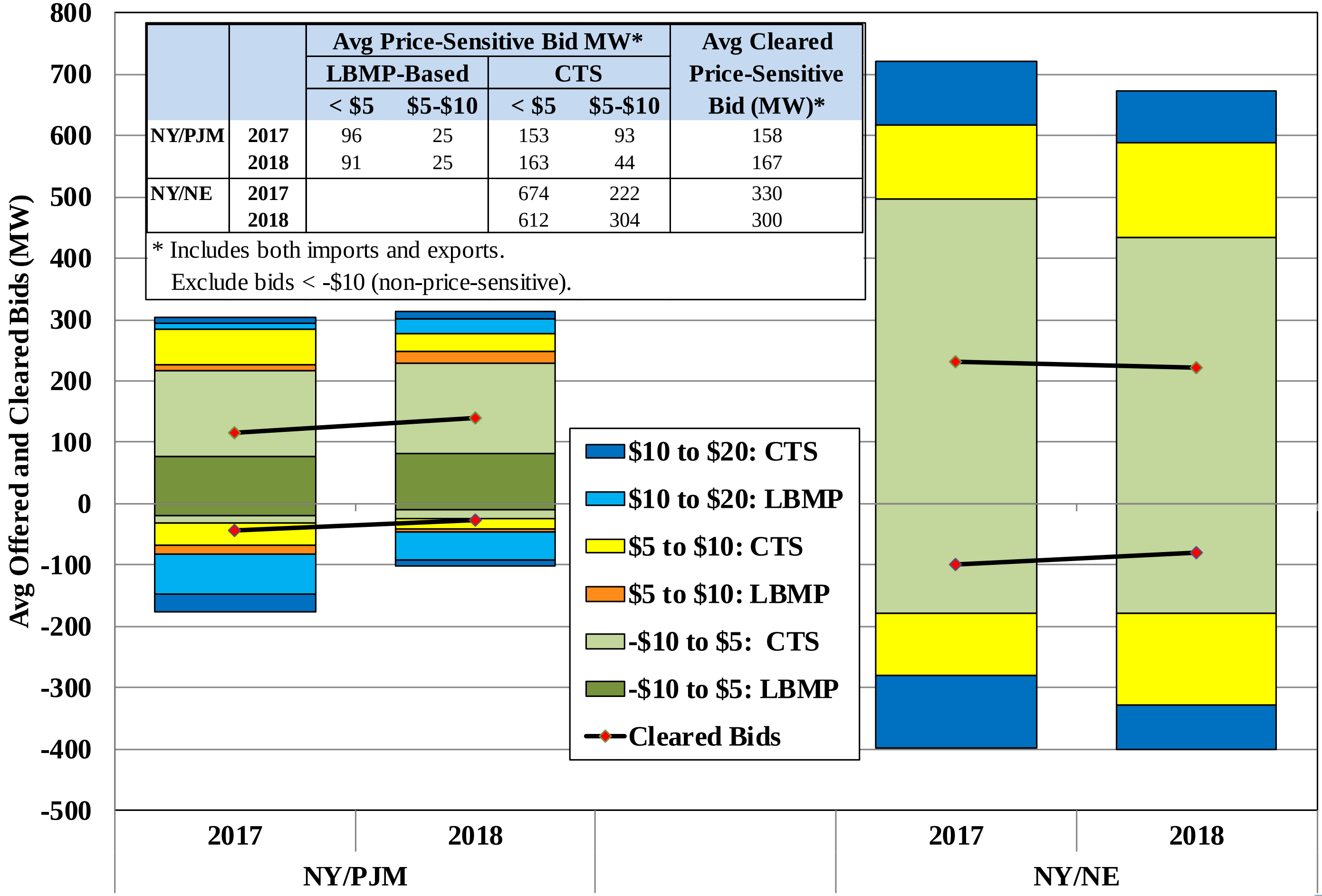
Pricing & Performance Enhancements: Rec 2015-16 Dynamic Reserve Requirements

- Recognize that internal reserve need depends on available import capability and size of largest supply contingency.
- Ex1: 300 MW load pocket reserve requirement can be met by:
  - ✓ 200 MW of internal reserves, plus
  - ✓ 100 MW of imported reserves (i.e., unutilized import cap)
- Ex2: Suppose 300 MW load pocket reserve requirement rises when a large generator increases output above 250 MW
  - ✓ It is not efficient for the generator to increase output if unless MC < LBMP – RCP
  - ✓ For example, if MC = $44, LBMP = $50, and RCP = $10, the generator should not be dispatched up.

Pricing & Performance Enhancements: Rec 2015-17 Model Constraint-Specific GTDCs

- NYISO implemented a big improvement in June 2017.
  - ✓ The use of constraint relaxation was reduced dramatically
  - ✓ Congestion prices are more stable and predictable
  - ✓ However, this does not lead to efficient real-time prices that reflect the reliability consequences of violating the constraint.
- NYISO should prioritize transmission constraints according to:
  - ✓ Importance of the facility,
  - ✓ Severity of the violation,
  - ✓ Duration of the transmission constraint violation

Pricing & Performance Enhancements: Rec 2015-9 Eliminate Fees for CTS Transactions



		Avg Price-Sensitive Bid MW*				Avg Cleared Price-Sensitive Bid (MW)*
		LBMP-Based		CTS		
		< $5	$5-$10	< $5	$5-$10	
NY/PJM	2017	96	25	153	93	158
	2018	91	25	163	44	167
NY/NE	2017			674	222	330
	2018			612	304	300

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

Energy Market Enhancements: Market Power Mitigation Measures

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Energy Market Enhancements: Market Power Mitigation Measures

Number	Section	Recommendations	Current Effort	High Priority
Energy Market Enhancements – Market Power Mitigation Measures				
2017-3	IX.B	Modify mitigation rules to address deficiencies in the current rule related to uneconomic over-production.		
2017-4	III.B	Modify mitigation rules to deter the use of fuel cost adjustments by a supplier to economically withhold.		

Market Power Mitigation Measures: Rec #2017-3 Mitigation of Uneconomic Over-Production

- Evolving market conditions have revealed gaps in the existing mitigation rules. These have not been exploited significantly, but we recommend rule changes to address the gaps.
- 2017-3: Deter generators from over-producing to benefit from negative real-time prices. To illustrate, suppose a generator:
  - ✓ DAM: 200 MW schedule at $20/MWh
  - ✓ In RTM: Transmission outage or loop flows require generator to back down
    - – Self-schedule 160 MW and LBMP = -$300/MWh.
    - – RT buy-back MWs at cost of -$12,000/hour.

Market Power Mitigation Measures: Rec #2017-3 Penalties for Inflated FCAs

- 2017-4: Deter generators from submitting inflated fuel cost estimates to drive up LBMPs.
  - ✓ Attachment H of the Market Services Tariff documents the mitigation measures applicable to these recommendations.
  - ✓ §23.3.1.4.6.9: NYISO may revoke use of the automated Fuel Cost Adjustment tool if submissions are found to be biased.
  - ✓ §23.4.3.3.3 sets financial penalties when a generator is found to have biased FCAs that impact either:
    - Guarantee payments
    - Market price paid to the generator
    - *Does not address the price impact of biased FCAs that result in a generator not being scheduled.*

Energy Market Enhancements: Real-Time Market Operations

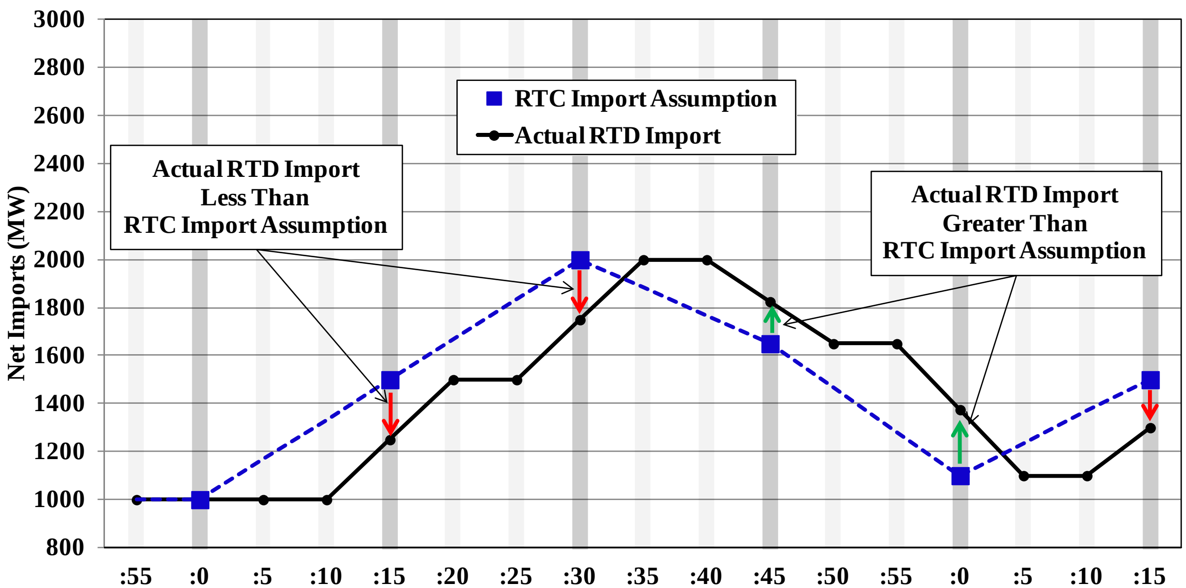
Energy Market Enhancements: Real-Time Market Operations

Number	Section	Recommendations	Current Effort	High Priority
Energy Market Enhancements – Real-Time Market Operations				
2014-9	VI.D, IX.G	Consider enhancing modeling of loop flows and flows over PAR-controlled lines to reflect the effects of expected variations more accurately.		
2012-8	IX.E	Operate PAR-controlled lines between New York City and Long Island to minimize production costs and create financial rights that compensate affected transmission owners.		
2012-13	VI.D, IX.G	Adjust look ahead evaluations of RTD and RTC to be more consistent with the timing of external transaction ramp and gas turbine commitment.		

RT Market Operations: Recs 2014-9 & 2012-13 Scheduling of Imports & Peaking Units

- 2012-13: Adjust look ahead evaluations of RTD and RTC to be more consistent with the timing of external transaction ramp and gas turbine commitment.

Illustration of External Transaction Ramp Profiles in RTS



Other Issues:

- RTC and RTD look aheads do not evaluate 5-minute ramp
- RTD cannot keep on a GT even to avoid a shortage.

RT Market Operations: Recs 2014-9 & 2012-13
Drivers of RT Price Volatility

	Power Balance	West Zone 230kV Lines	Central East	Dunwoodie - Shore Rd 345kV	Intra-LI Lines	NYC Load Pockets	North to Central
Average Transfer Limit	**n/a**	**586**	**2423**	**816**	**280**	**310**	**321**
Number of Price Spikes	**663**	**989**	**223**	**304**	**653**	**3501**	**556**
Average Constraint Shadow Price	**$256**	**$729**	**$368**	**$310**	**$483**	**$559**	**$520**
Source of Increased Constraint Cost:	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**	**(%)**
Scheduled By RTC	**62%**	**10%**	**52%**	**60%**	**57%**	**36%**	**11%**
External Interchange	30%	10%	18%	41%	14%	18%	11%
RTC Shutdown Resource	23%	0%	24%	16%	29%	9%	0%
Self Scheduled Shutdown/Dispatch	8%	0%	9%	3%	14%	9%	0%
Flow Change from Non-Modeled Factors	**7%**	**70%**	**34%**	**19%**	**29%**	**55%**	**56%**
Loop Flows & Other Non-Market	1%	50%	8%	11%	21%	27%	44%
Fixed Schedule PARs	0%	20%	25%	7%	7%	27%	11%
Redispatch for Other Constraint (OOM)	6%	0%	1%	1%	0%	0%	0%
Other Factors	**31%**	**20%**	**14%**	**21%**	**14%**	**9%**	**33%**
Load	17%	10%	7%	10%	7%	0%	11%
Generator Trip/Derate/Dragging	8%	0%	6%	11%	7%	9%	0%
Wind	7%	10%	1%	0%	0%	0%	22%

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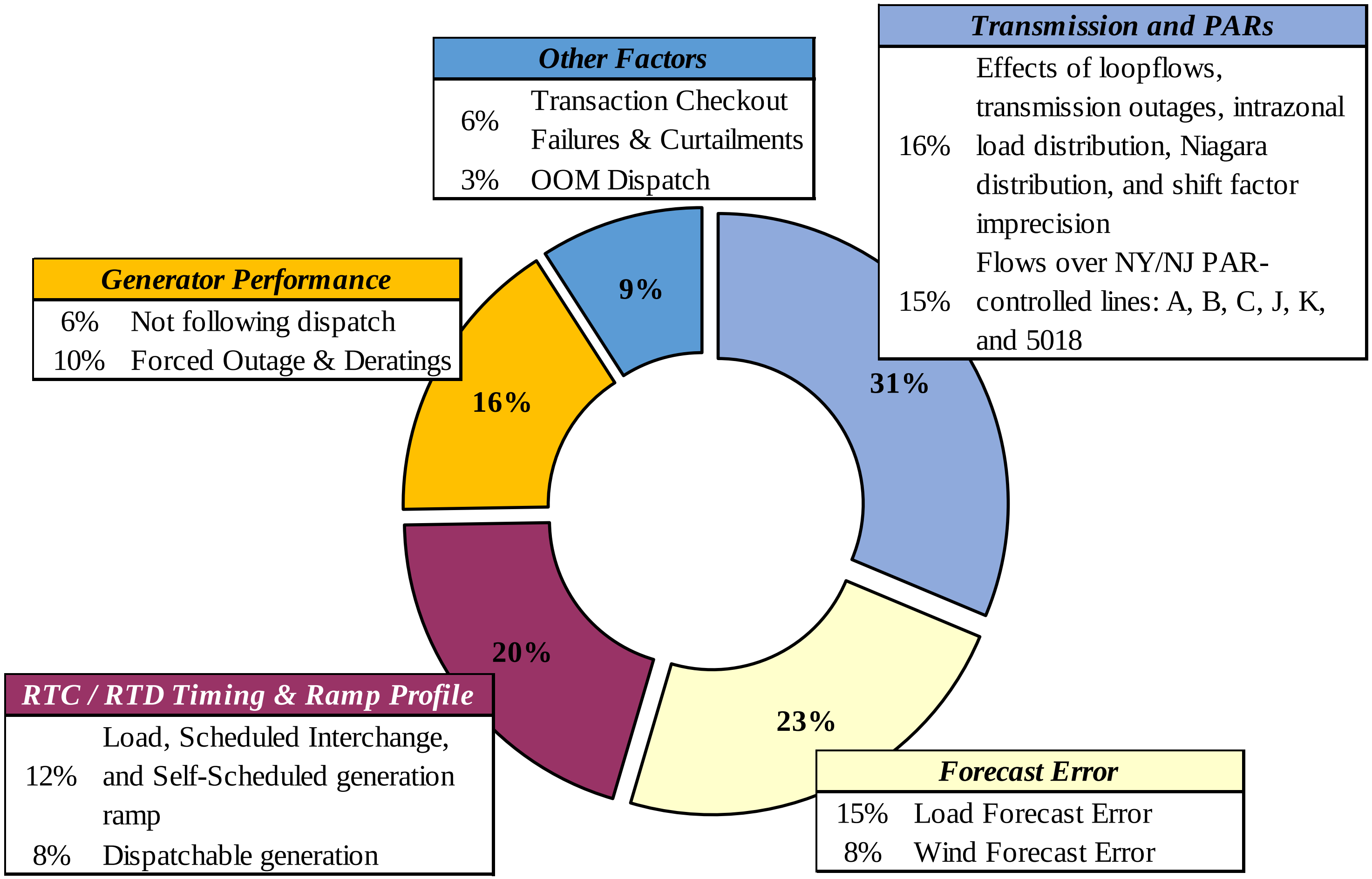
RT Market Operations: Recs 2014-9 & 2012-13 Drivers of RTC/RTD Divergence



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RT Market Operations: Recs 2014-9 Enhanced Modeling of Loop Flows & PARs

- NYISO should consider biasing loop flow assumption because:
  - ✓ The cost of an over-forecast is usually greater than
  - ✓ The cost of an under-forecast of the same magnitude
- Unmodeled flows result from two unrealistic assumptions:
  1. Pre-contingent flows over PAR-controlled lines are not influenced by generator redispatch, and
  2. PARs are continuously adjusted in real-time to maintain flows at a desired level, but:
     - Most PARs are adjusted in fewer than 4 percent of intervals.
  - ✓ Eliminating these unrealistic assumptions would reduce the frequency of transient price spikes and improve consistency between RTC and RTD.

RT Market Operations: Recs 2012-13
Adjust Look Ahead Evaluations in RTC & RTD

- NYISO should consider one or more of the following:
  - ✓ Add two evaluation periods to RTC and RTD to accurately anticipate the ramp needs for a de-commitment or interchange
  - ✓ Adjust timing of evaluation periods to be more consistent with the ramp cycle of external interchange.
  - ✓ Enable RTD to delay the shut-down of a gas turbine for five minutes when it is economic to remain on-line.
  - ✓ Align ramp rate in look-ahead evaluations of RTC and RTD for steam turbine generators with typical performance.
  - ✓ Address inconsistent ramp assumptions in RTD's physical and pricing passes when units ramp down from DAM schedule.
  - ✓ Modify ramp limits for units providing regulation service (since regulation deployments may lead the unit to move against its five-minute dispatch instruction).

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RT Market Operations: Recs 2012-8 Operate NYC-to-Long Island Lines Efficiently

- 901 & 903 lines are scheduled based on pre-NYISO contract
- In 2018, these were scheduled in the inefficient direction 90 and 94 percent of the time.
  - ✓ Usually increases steam turbine output in Long Island, displacing CCs and imports to NYC from upstate
  - ✓ Increased production costs by an estimated $16 million
    - – Similar to savings from repowering a 300 MW steam turbine with CC capacity
- Recommend exploring changes to the agreements or to identify how the agreements can be accommodated within the markets more efficiently.
- Recommend creating a financially right as compensation.

Planning Process Enhancements

Planning Process Enhancements

Number	Section	Recommendations	Current Effort	High Priority
Planning Process Enhancements				
2015-7	VII.E	Reform the CARIS process to better identify and fund economically efficient transmission investments.		

Planning Process Enhancements: Rec 2015-7 Reform to Identify Economic Transmission

- Administrative: (reduce 80% voting & $25M thresholds)
- Capacity market benefits – Should be based on marginal reliability value
- Economic retirement and new entry – To avoid unrealistically high or low wholesale price outcomes
- Forecasting enhancements:
  - ✓ Gas system modeling
  - ✓ Electric system outage modeling
  - ✓ Reserve market modeling
  - ✓ Local reliability requirements
- Quantify life-cycle costs (and cost-savings)

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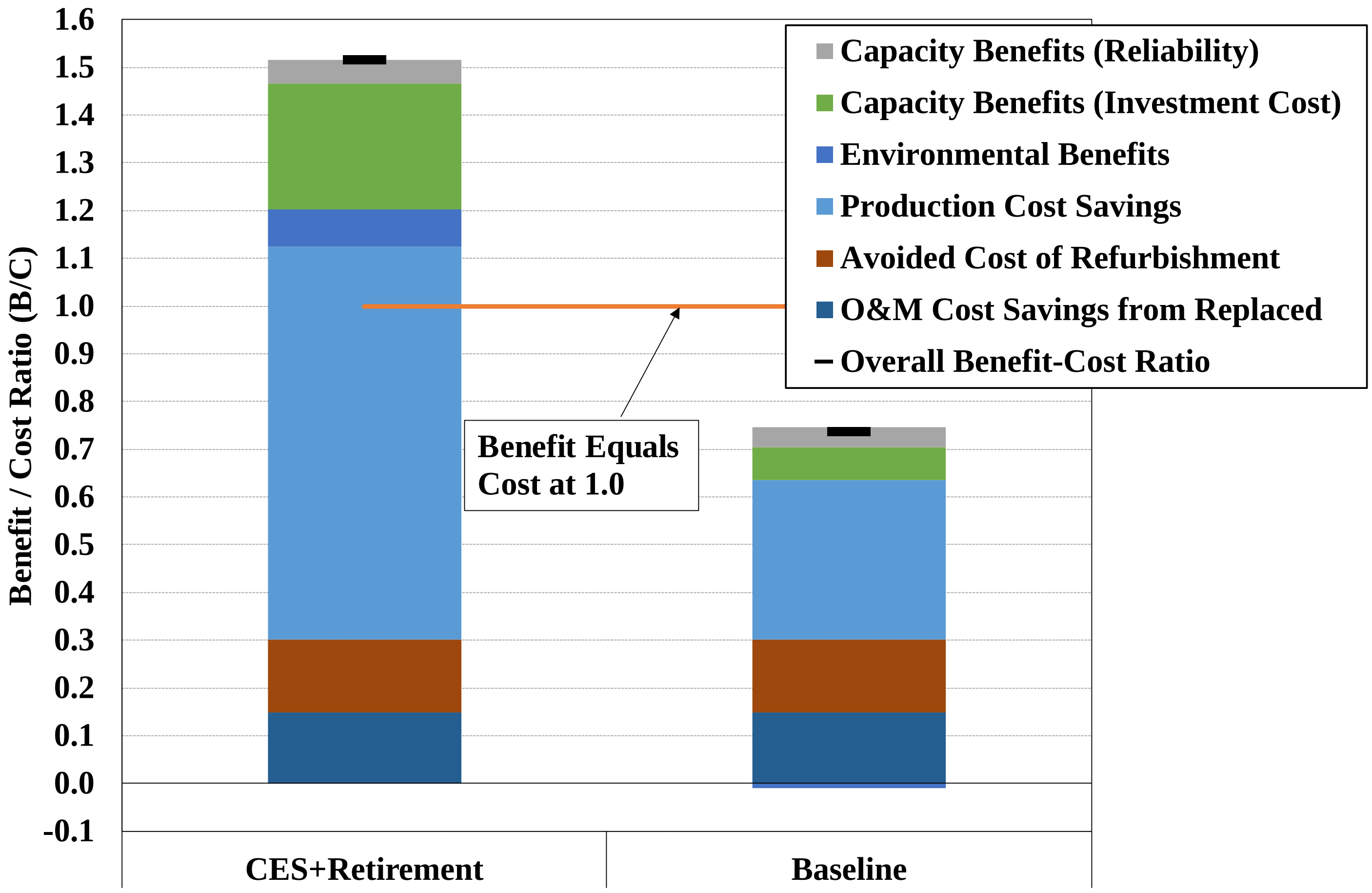
Planning Process Enhancements: Rec 2015-7 Reform to Identify Economic Transmission

Figure 1: Results for the T027 and T019 Combination



Capacity Market:
Design Enhancements

Capacity Market Recommendations: Market Design Enhancements

Number	Section	Recommendations	Current Effort	High Priority
Capacity Market – Design Enhancements				
2013-1c	VII.D	Implement locational marginal pricing of capacity (“C-LMP”) that minimizes the cost of satisfying planning requirements.		✓
2012-1a	VII.D	Establish a dynamic locational capacity framework that reflects potential deliverability, resource adequacy, and transmission security requirements.		
2012-1c	VII.C	Grant financial capacity transfer rights between zones when investors upgrade the transmission system and help satisfy planning reliability needs without receiving a cost-of-service rate.		

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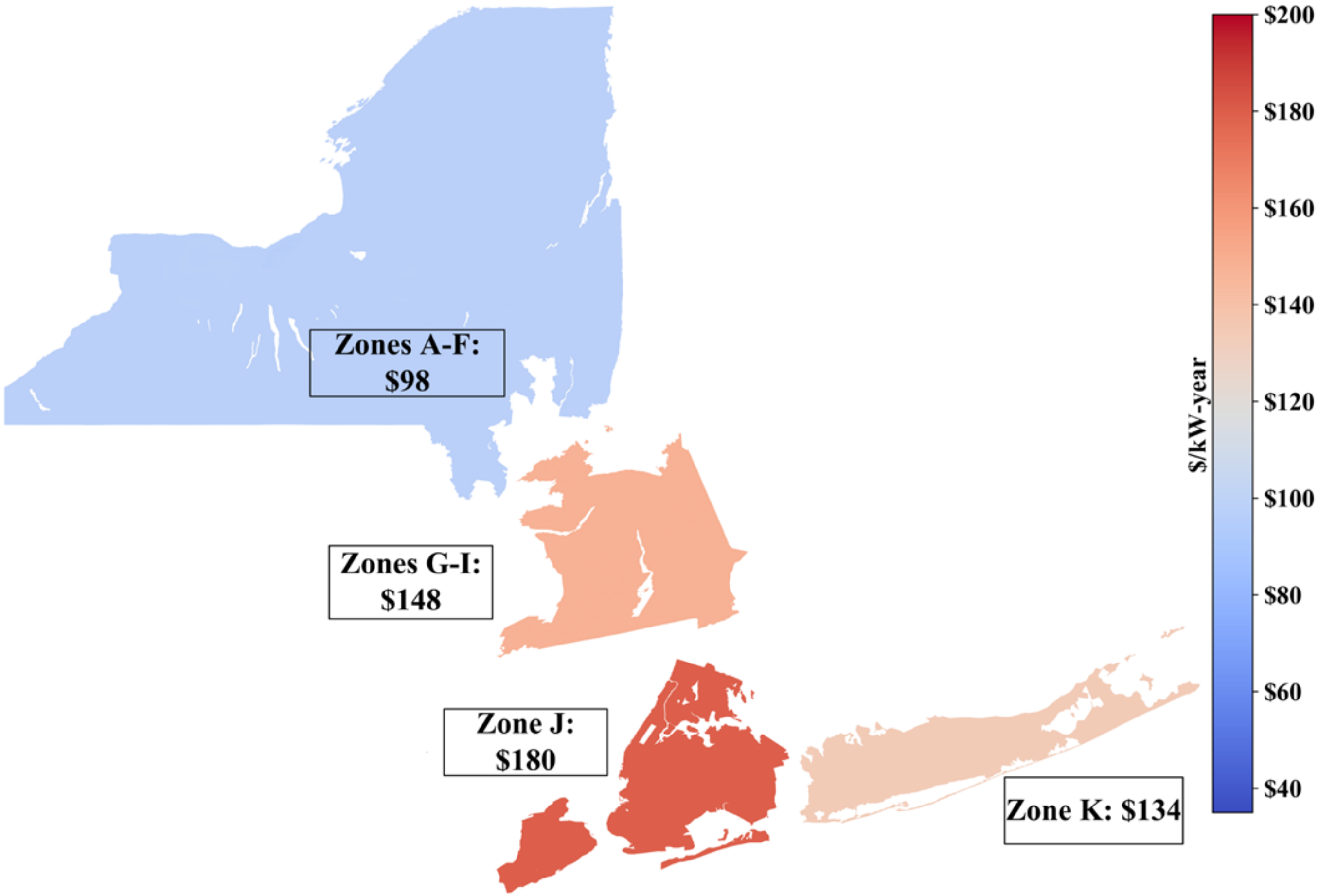
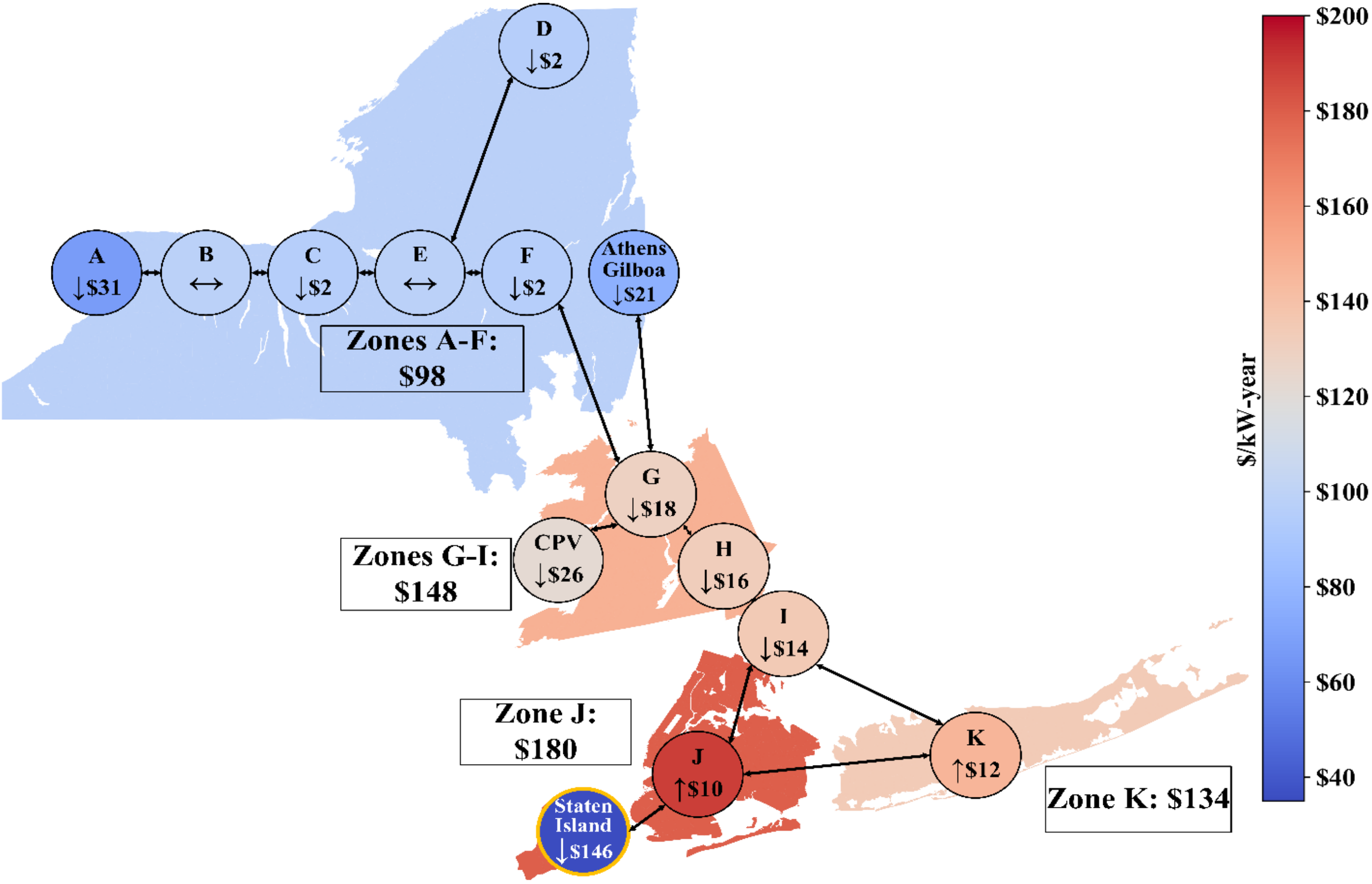
Capacity Design Enhancements: Rec 2013-1c
Locational Capacity Price Signals

- The capacity market can only produce four prices and provides incentives for:
  - ✓ Excessive investment in some export-constrained areas
  - ✓ Insufficient investment in import-constrained load pockets, or in areas that improve reliability elsewhere (e.g., Long Island)
- The current capacity market is:
  - ✓ Administratively burdensome
  - ✓ Hard to adapt to policy-induced changes in resource mix
  - ✓ Hard to adapt to new technologies
  - ✓ Makes the interconnection process more complex
- Locational pricing based on marginal reliability value is less complicated to administer and adaptable to changing conditions

Capacity Design Enhancements: Rec 2013-1c
Current Locational Capacity Price Signals



Capacity Design Enhancements: Rec 2013-1c Improved Locational Capacity Price Signals



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Capacity Design Enhancements: Rec 2012-1c Transmission Investment Incentives

- NYISO markets should:
  - ✓ Compensate merchant investors for capacity value of transmission upgrades that expand capability between pricing areas
- Benefits:
  - ✓ Achieve cost savings by lowering barriers to entry (that favor generation and demand response over transmission).
  - ✓ Substantially reduce the need for out-of-market public policy investment.

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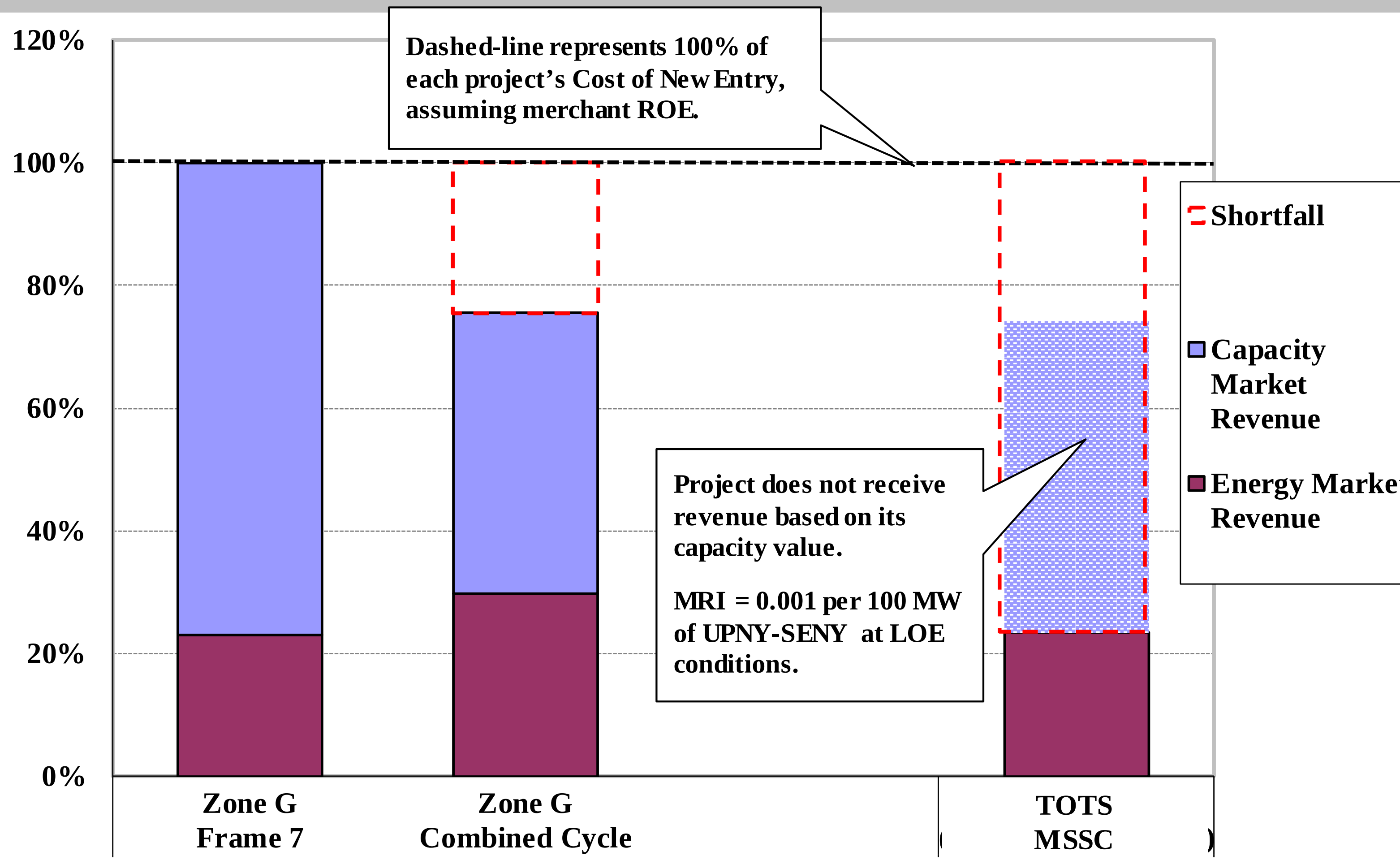
Capacity Design Enhancements: Rec 2012-1c Transmission Investment Incentives



Capacity Market:
Market Power Mitigation Measures

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Capacity Market: Market Power Mitigation Measures

Number	Section	Recommendations	Current Effort	High Priority
Capacity Market – Market Power Mitigation Measures				
2018-2	III.C	Modify the Competitive Entry Exemption to allow contracts that are determined to be competitive and non-discriminatory.		
2018-3	III.C	Consider modifying the Part A test to exempt a New York City unit if the forecasted price of the G-J Locality is higher than its Part A test threshold.		
2018-4	III.C	Develop tariff provisions to perform Mitigation Exemption Tests outside the Class Year process for resources that are smaller than 2 MW.		
2013-2d	III.C	Enhance Buyer-Side Mitigation Forecast Assumptions to deter uneconomic entry while ensuring that economic entrants are not mitigated.		

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Capacity Mitigation Measures: Rec 2018-2 Modify Competitive Entry Exemption

- CEE is designed to allow exemption if not state-subsidized
- Under current rules, developers agree not to contract with certain entities with exceptions (e.g., interconnect agreement).
- Recommend expanding exceptions to include power supply agreements that can be determined to be open to new and old resources, competitive, and non-discriminatory.
- For example, if the utility runs an auction to buy power that is competitive and open to all suppliers, the NYISO could determine that the resulting power supply agreement will not serve as a conduit for subsidies to the seller.

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Capacity Mitigation Measures: Rec 2018-3 Modify Part A Test for NYC Projects

- The Part A test of BSM evaluations is designed to exempt a project whose capacity is needed to satisfy the local capacity planning requirement where the project would locate.
- Thus, a New York City generator would be exempt if it was needed to satisfy the LCR for New York City.
- However, a New York City generator would not be exempt if it was needed to satisfy the LCR for the G-J Locality.
- Given the large resource mix changes that are expected in the coming years, we recommend modifying the Part A test to test a New York City generator against the larger G-J Locality requirement in addition to the New York City requirement.

Capacity Mitigation Measures: Rec 2018-4 Develop Provisions for <2-MW Resources

- The BSM measures are currently applied within the Class Year process, which was designed for conventional generators that take years to develop and bring into commercial operation.
- However, new projects do not need to go through the Class Year process to obtain injection rights if they are smaller than 2 MW.
- Moreover, battery storage projects and other short lead-time projects are capable of entering in just a few months.
- We recommend the NYISO develop a set of procedures and requisite tariff changes for applying the BSM measures outside the Class Year process, perhaps on a quarterly cycle.

Capacity Mitigation Measures: Rec 2013-2d Enhance Forecast Assumptions

Issue	Rec
Interconnection costs may be inflated for some Examined Facilities (Part B test)	T
Starting Capability Period is unrealistic for most Examined Facilities (Part A & B tests)	T
Treatment of some Existing Units at risk of retiring or mothballing is unrealistic for some units (Part A & B tests)	T
Treatment of Examined Facilities seeking Competitive Entry Exemption may be inconsistent with developers' expectations (Part A & B tests)	T
Treatment of exempt Prior Class Year Projects in the Interconnection Queue may be unrealistic (Part A & B tests)	I
Modify Part A test procedure to exempt Zone J projects if they are needed to satisfy the G-J Locality's capacity requirement (Part A test)	T