

Highlights from the Quarterly Report on the New York ISO Electricity Markets Third Quarter of 2017

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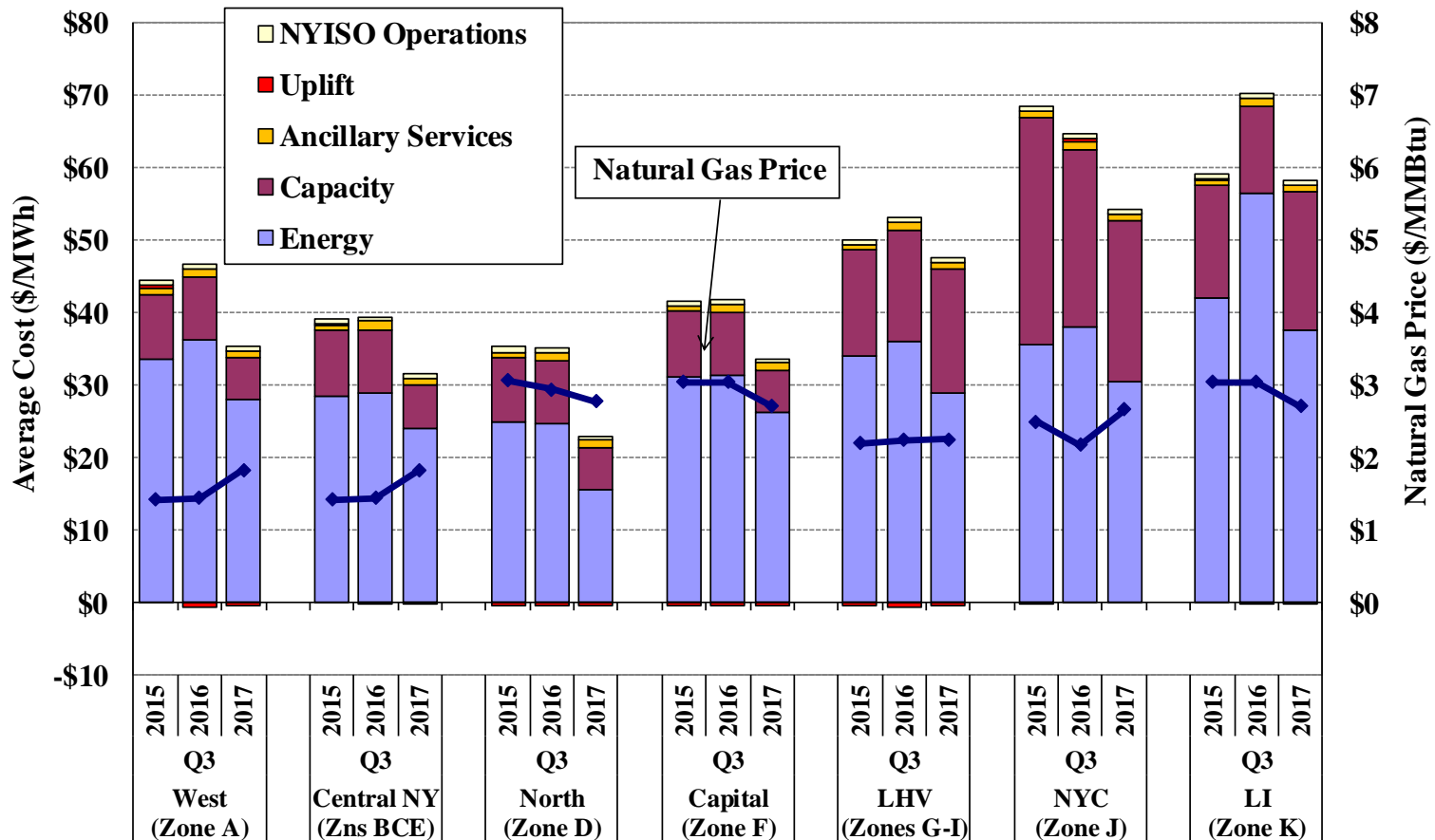


Highlights and Market Summary: Summary of Market Outcomes

- This report summarizes market outcomes in the third quarter of 2017.
- The energy markets performed competitively and variations in wholesale prices were driven primarily by changes in fuel prices, demand, and supply availability.
- Energy prices fell 16 to 30 percent across the state compared to the third quarter of 2016 because of the confluence of supply and demand factors:
 - ✓ Mild summer temperatures and lower load levels (down 1.8 GW on average);
 - ✓ Lower natural gas prices in most of East NY and New England (down 12 to 19 percent);
 - ✓ Higher output from nuclear and hydro units (up 640 MW on average);
 - ✓ Reduced congestion into Long Island from fewer transmission outages; and
 - ✓ Increased congestion out of the North Zone from more transmission outages.
- These factors also contributed to substantially lower ancillary service prices and uplift costs.
- Although most prices and costs were down substantially compared to last year, we continue to identify potential market performance improvements.



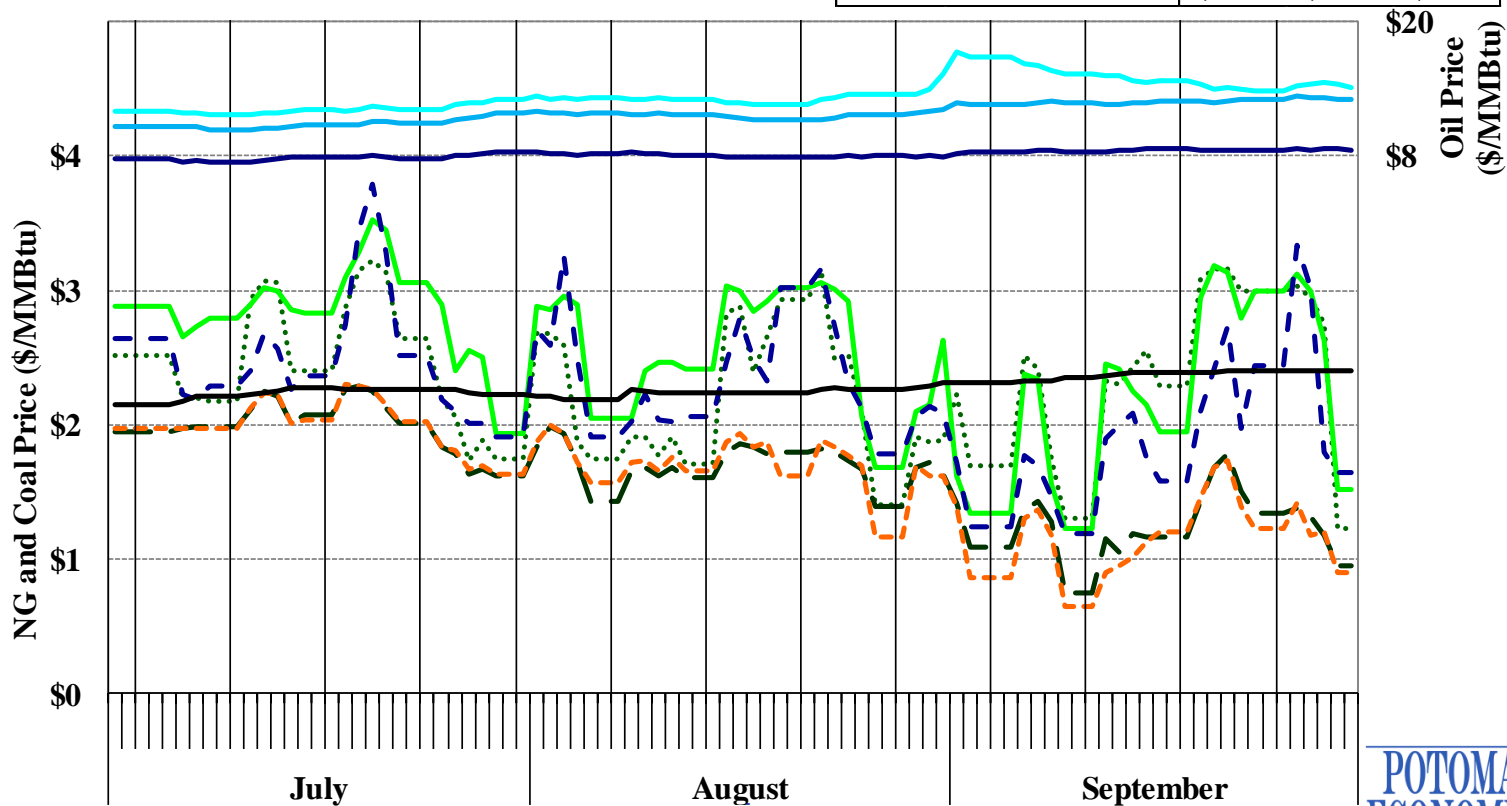
All-In Prices by Region



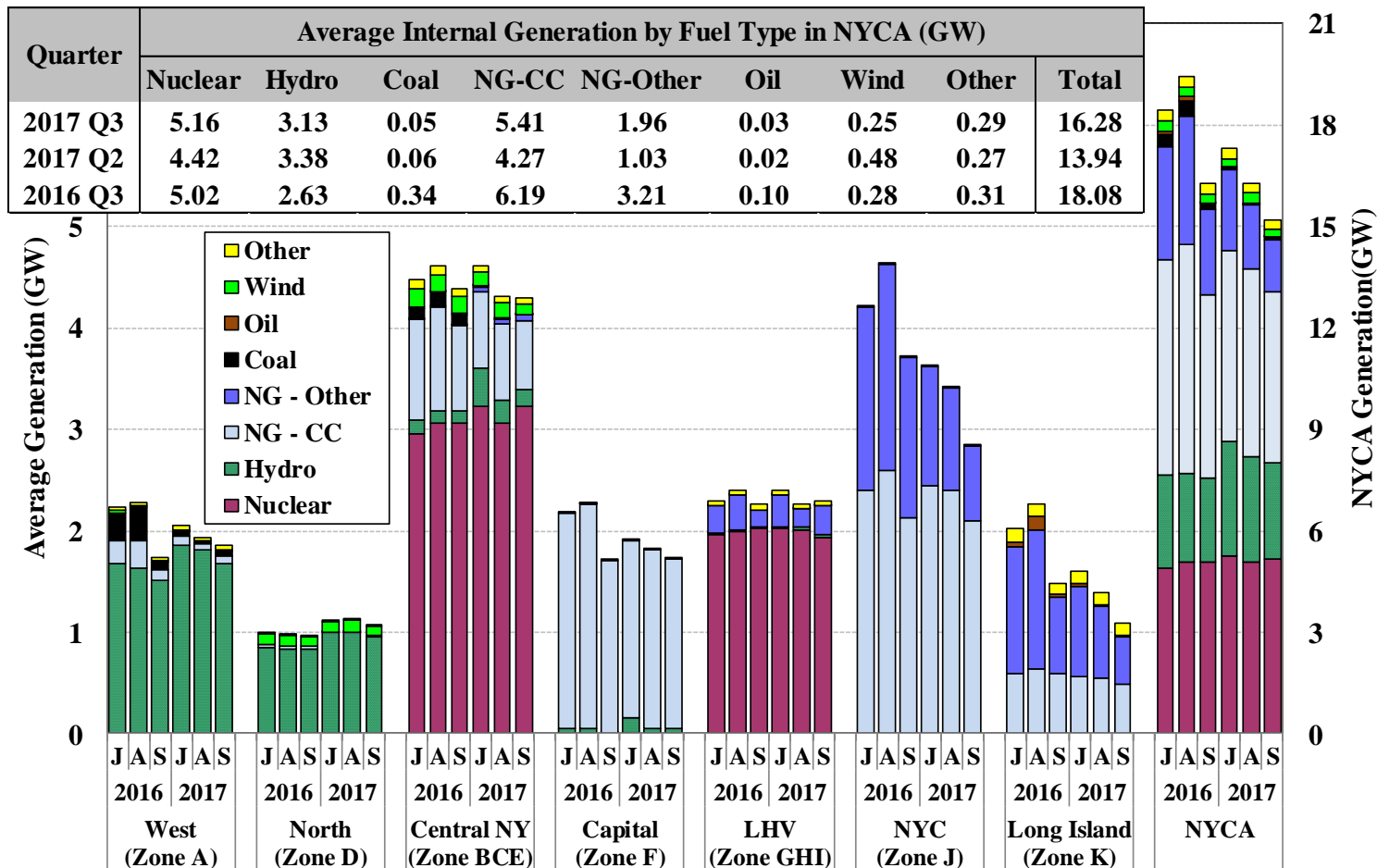
Note: Natural Gas Price is based on the following indices (plus a transportation charge of \$0.20/MMBtu): the Dominion North index for West Zone and Central NY, the Iroquois Waddington index for North Zone, the Iroquois Zone 2 index for Capital Zone and LI, the average of Millennium East and Iroquois Zone 2 for LHV, the Transco Zone 6 (NY) index for NYC. A 6.9 percent tax rate is also included NYC.

Coal, Natural Gas, and Fuel Oil Prices

Oil and Coal Prices				Natural Gas Prices			
	2016Q3	2017Q2	2017Q3		2016Q3	2017Q2	2017Q3
Ultra Low-Sulfur Kerosene	\$12.87	\$12.32	\$13.46	--- Tennessee Z6	\$2.74	\$2.95	\$2.22
Ultra Low-Sulfur Diesel Oil	\$10.02	\$10.83	\$11.79	— Iroquois Z2	\$2.84	\$2.94	\$2.50
Fuel Oil #6 (Low-Sulfur Residual Oil)	\$7.22	\$7.72	\$8.12 Transco Z6 (NY)	\$1.84	\$2.65	\$2.30
Central Appalachian Coal	\$1.81	\$2.08	\$2.28	- - - Millennium East	\$1.25	\$2.38	\$1.60
				- - - Dominion North	\$1.25	\$2.43	\$1.63



Real-Time Generation Output by Fuel Type

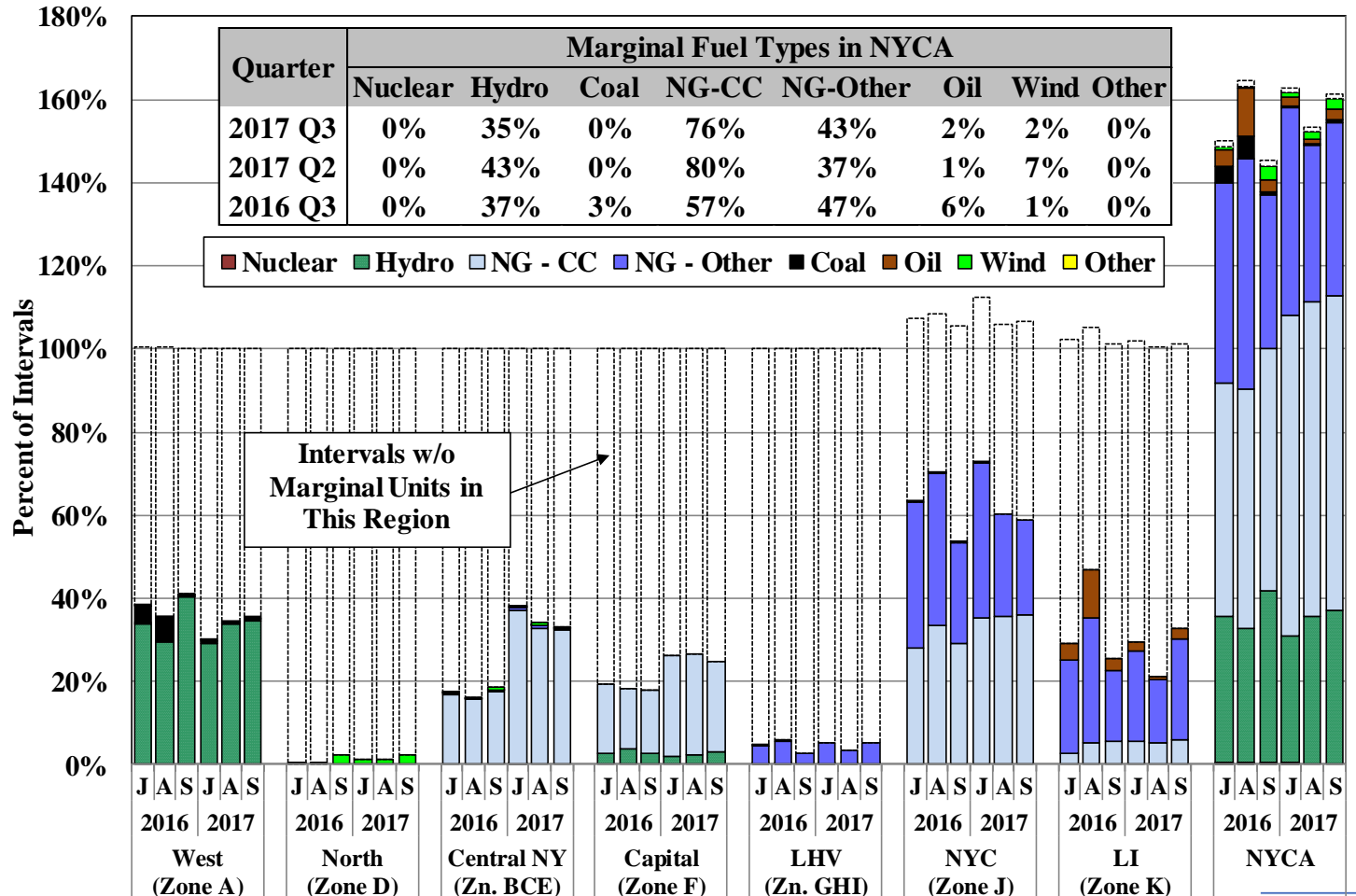


Notes: Pumped-storage resources in pumping mode are treated as negative generation.

“Other” includes Methane, Refuse, Solar & Wood.



Fuel Type of Marginal Units in the Real-Time Market



Note: "Other" includes Methane, Refuse, Solar & Wood.

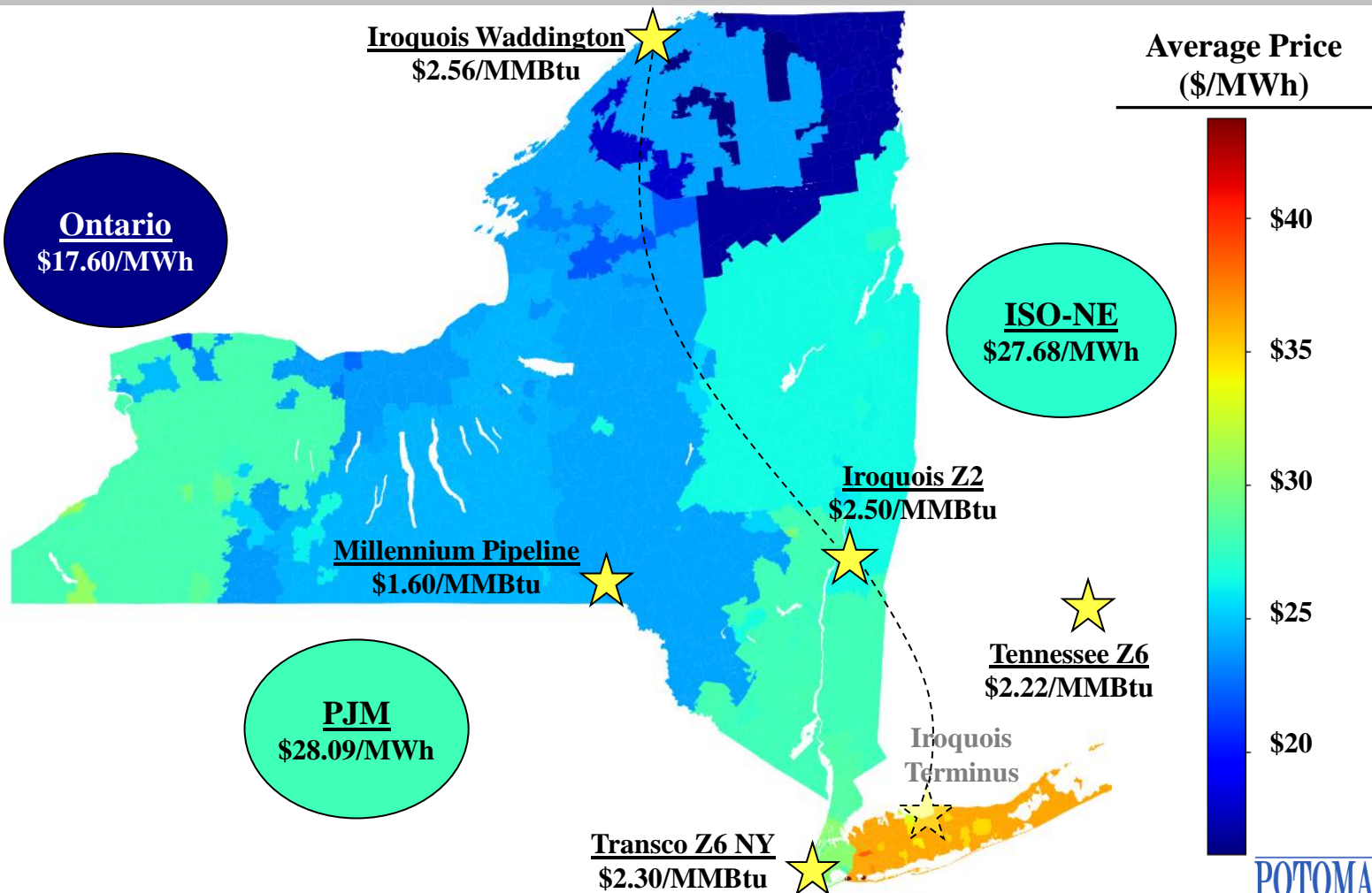


Highlights and Market Summary: Congestion Patterns

- Day-ahead congestion revenue totaled \$104 million, down 20 percent from last year partly because of lower load levels. (slides 48 & 53)
 - ✓ West zone lines accounted for the most congestion (25 percent) as Ontario imports and hydro output met with bottlenecks while flowing toward East NY.
 - ✓ NYC lines accounted for 20 percent, increasing because of higher gas prices relative to other regions and the expiration of the ConEd-PSEG wheel.
 - ✓ Long Island accounted for 17 percent, although this was down dramatically because of fewer major transmission outages than in 2016-Q3.
- Flows from the North Zone accounted for 21 percent of real-time congestion as:
 - ✓ Transmission outages and derates and hydroelectric output both increased, and led to several extreme negative pricing events. (slides 20 & 22).
- Actions used to manage 115kV congestion in western and northern New York led to import limitations from Ontario and Quebec, as well as congestion on the 200+kV system in other parts of the state. (slides 68 – 70)
 - ✓ The costs and reliability effects of this congestion could be reduced by modeling the 115kV constraints in the day-ahead and real-time market systems.



Highlights and Market Summary: Energy Market Outcomes and Congestion



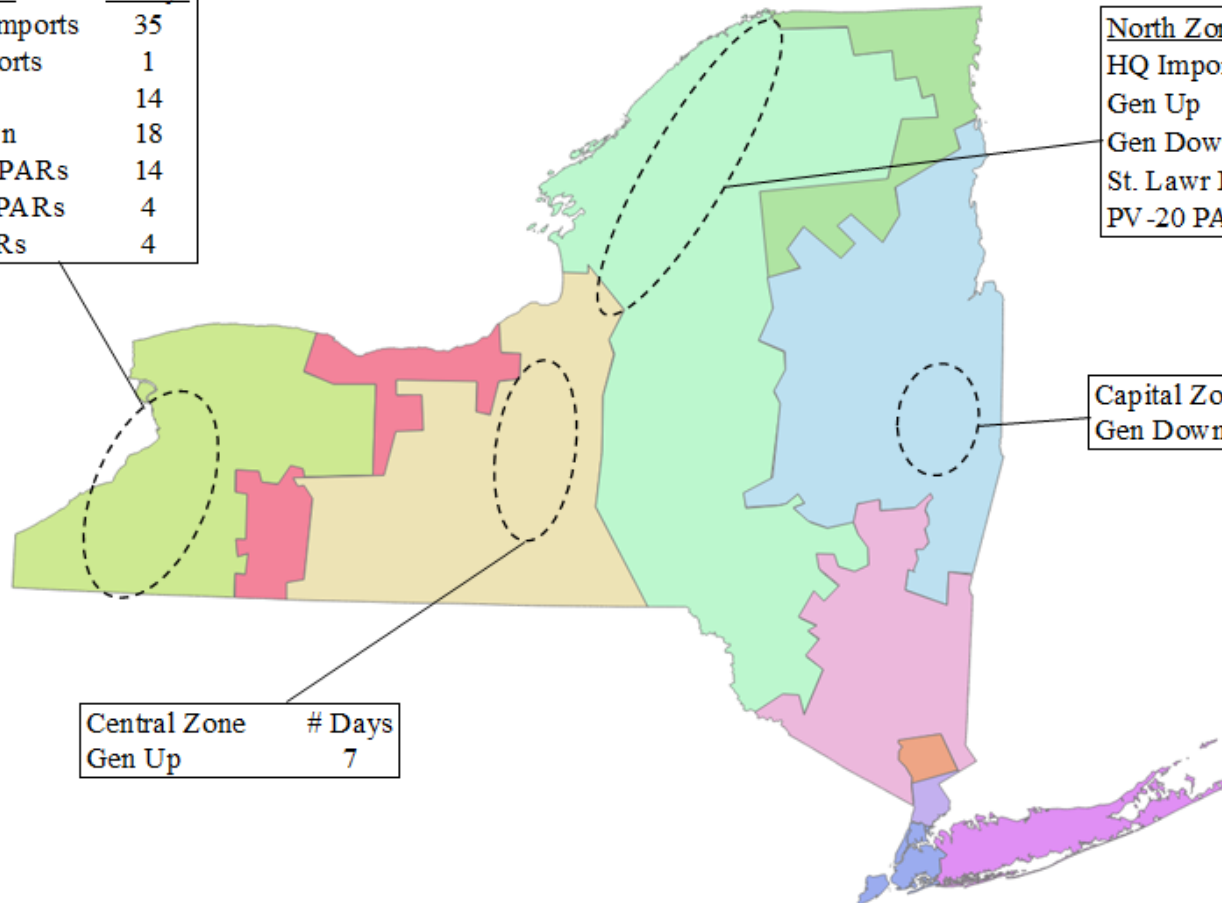
Constraints on the Low Voltage Network Upstate: Summary of Resources Used to Manage Congestion

West Zone	# Days
Ontario Imports	35
PJM Exports	1
Gen Up	14
Gen Down	18
St. Lawr PARs	14
Ramapo PARs	4
ABC PARs	4

North Zone	# Days
HQ Imports	14
Gen Up	7
Gen Down	29
St. Lawr PARs	9
PV-20 PAR	3

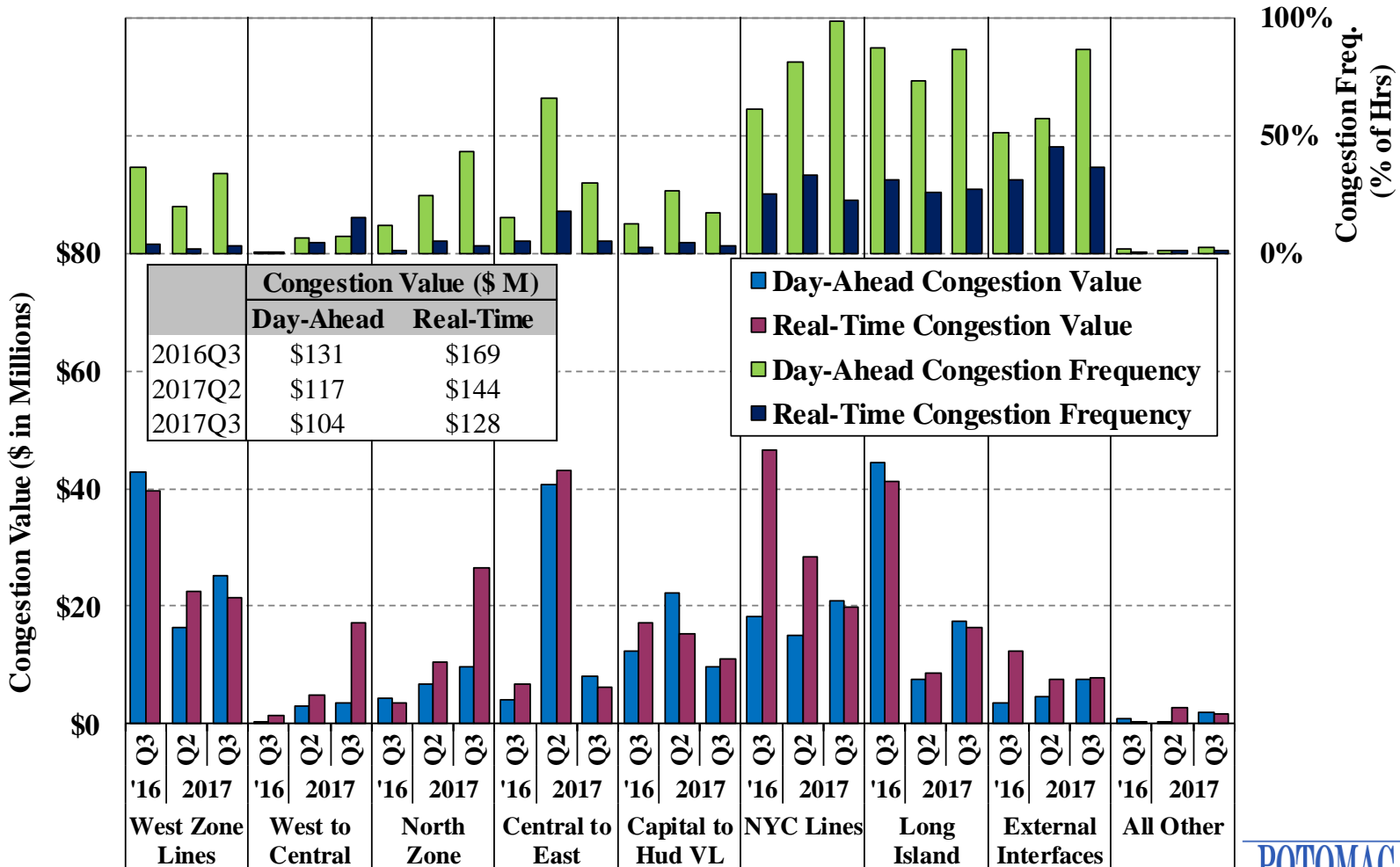
Capital Zone	# Days
Gen Down	36

Central Zone	# Days
Gen Up	7



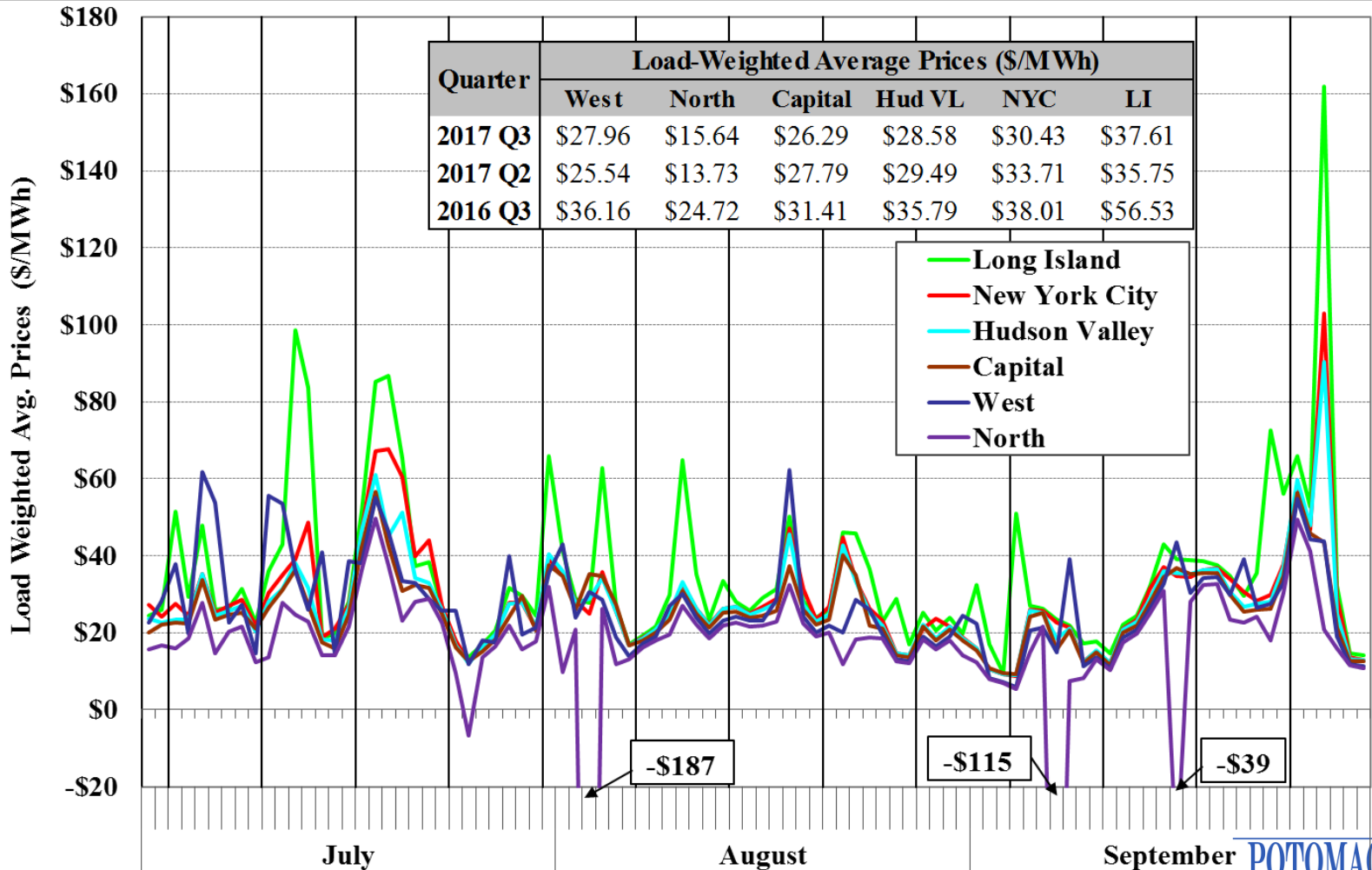


Day-Ahead and Real-Time Congestion Value by Transmission Path





Real-Time Electricity Prices by Zone





Highlights and Market Summary: Congestion Management and Pricing

- The M2M PAR coordination process expanded in May after the 1,000 MW ConEd/PSEG Wheel expired. (slides 60 – 67)
 - ✓ Congestion increased through Millwood and into New York City.
 - ✓ In general, the A/B/C and J/K lines were operated more efficiently.
 - ✓ However, we observe that these PARs were often not utilized to help manage congestion, being adjusted only 1 to 5 times per day on average.
- The NYISO improved the transmission shortage pricing in June (slides 56 – 59) by:
 - ✓ Modifying the second step of the GTDC from \$2,350 to \$1,175/MWh; and
 - ✓ Removing the feasibility screen and apply the GTDC to all constraints with a non-zero Constraint Reliability Margin (“CRM”).
 - ✓ As a result, constraint relaxation has been much less frequent (6 percent of violations this quarter vs 59 percent last year) average constraint shadow prices during transmission shortages fell moderately in most areas.
 - Constraint relaxation leads to inefficient prices that are volatile and uncorrelated with the severity of congestion.
 - ✓ Despite improved pricing outcomes, constraint shadow prices still did not properly reflect the importance of some transmission shortages. Accordingly, we continue to recommend developing constraint-specific transmission demand curves.

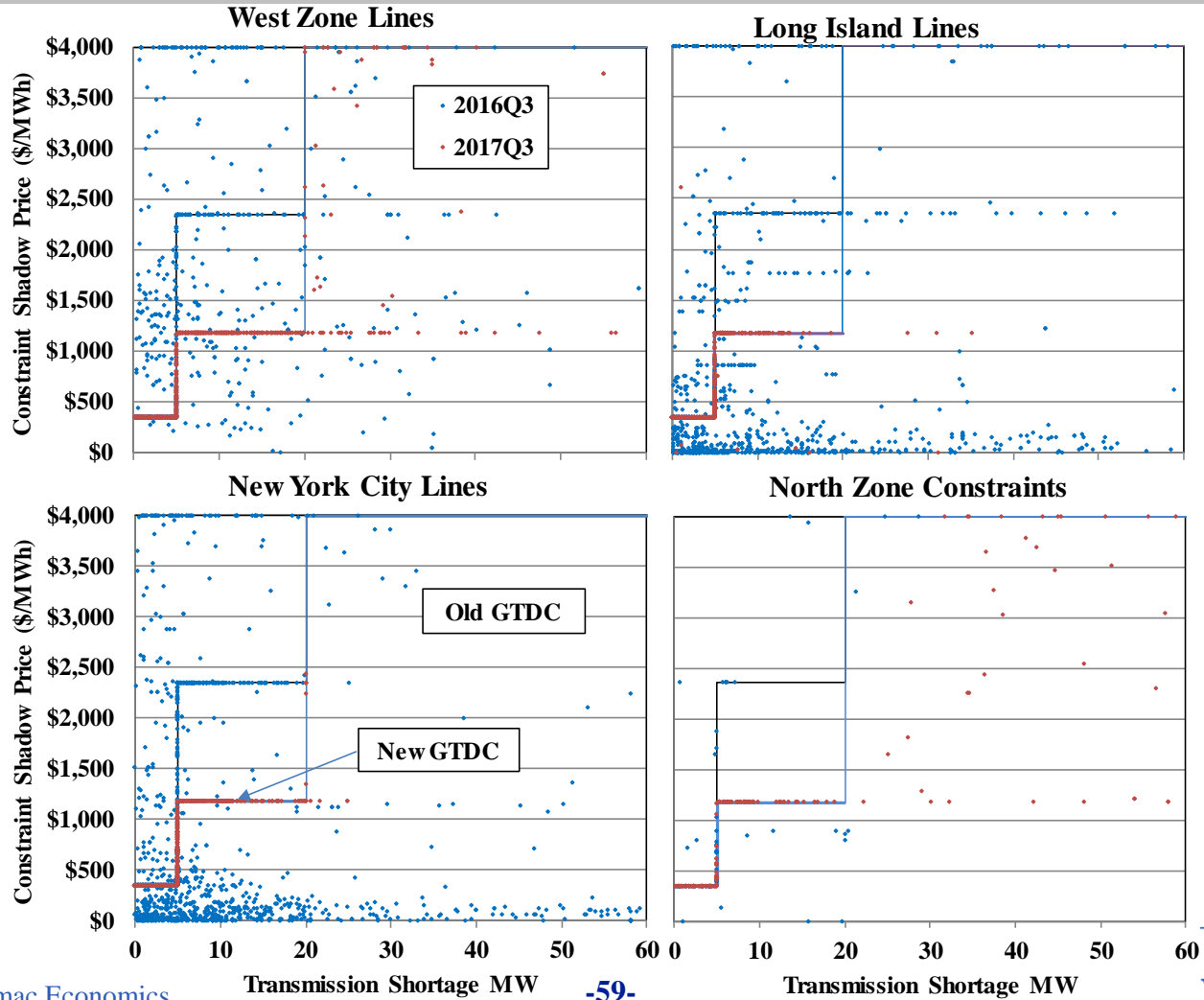
PAR Operation under M2M with PJM: Summary Results

M2M PAR		Average Flow/Limit (MW)			Avg. TAP Moves Per Day	# of 30-min Intervals Where Cong. Diff. of (NY - PJM) :	
		Target Flow	Actual Flow	Seasonal Limit		> \$10	< -\$10
Goethals/ Farragut	A	91	173	540	3.5	1.7	2.0
	B	84	117	508	3.7	1.4	1.5
	C	110	137	508	5.0	1.4	1.5
Waldwick	E	-75	-46	609	1.3	1.6	1.8
	F	-94	-61	557	1.4	1.6	1.8
	O	-94	-97	549	1.4	1.6	1.8
Ramapo	4500	134	167	575	2.3	1.8	1.8

Note: The Ramapo PAR 3500 is not included here because it just returned to service in mid September from an over-a-year-long outage.



Congestion Management with the GTDC Transmission Shortage Pricing



Congestion Management with the GTDC

Summary of Transmission Shortage

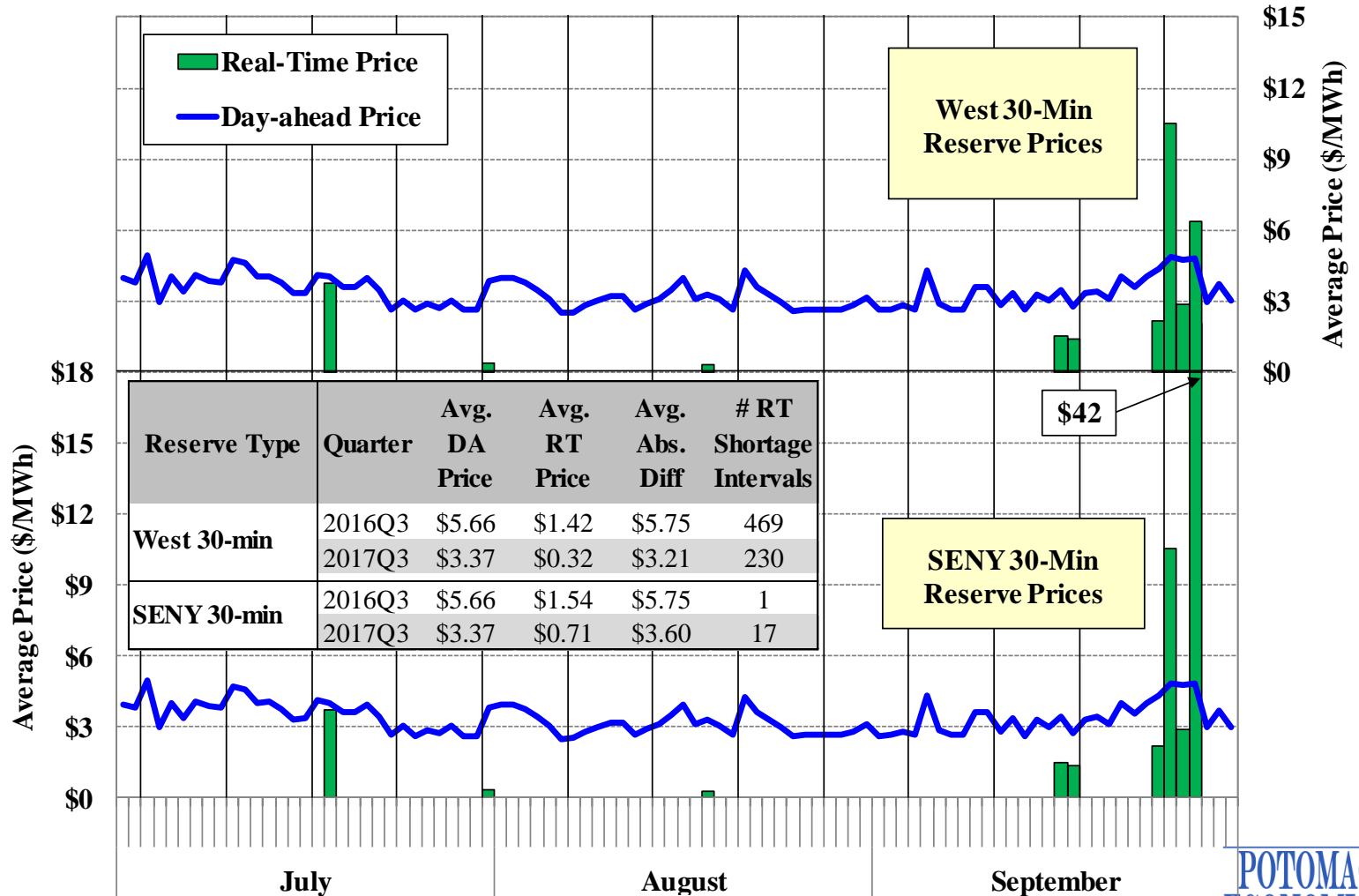
Location of Constrained Facilities	CRM = 0?	Shortage Handling	# of Constraint-Intervals		Avg Shadow Price (\$/MWh)		Avg Shortage (MW)	
			2016Q3	2017Q3	2016Q3	2017Q3	2016Q3	2017Q3
West Zone	Y	Relaxation Only						
	N	Relaxation & GTDC	10	55	\$2,414	\$2,331	31	32
		Relaxation Only	339		\$1,936		14	
		GTDC Only	291	518	\$867	\$784	4	7
SubTotal			640	573	\$1,457	\$932	10	9
New York City	Y	Relaxation Only	21		\$2		58	
	N	Relaxation & GTDC	2	5	\$3,020	\$1,352	24	110
		Relaxation Only	852		\$706		14	
		GTDC Only	795	1043	\$797	\$575	4	4
SubTotal			1670	1048	\$743	\$578	10	5
North Zone	Y	Relaxation Only						
	N	Relaxation & GTDC		69		\$2,598		72
		Relaxation Only	19		\$1,578		13	
		GTDC Only	58	156	\$655	\$670	4	5
SubTotal			77	225	\$883	\$1,261	6	26
Long Island	Y	Relaxation Only	495	8	\$166	\$444	23	10
	N	Relaxation & GTDC	25	3	\$2,614	\$1,175	37	31
		Relaxation Only	439		\$967		15	
		GTDC Only	345	640	\$680	\$531	4	4
SubTotal			1304	651	\$619	\$533	16	4
All Other	Y	Relaxation Only	3	12	\$2,995	\$2,679	87	152
	N	Relaxation & GTDC	1	3	\$2,633	\$2,738	26	280
		Relaxation Only	24		\$2,306		34	
		GTDC Only	80	100	\$1,122	\$772	7	8
SubTotal			108	115	\$1,451	\$1,022	15	30
Grand Total			3799	2612	\$844	\$723	12	8



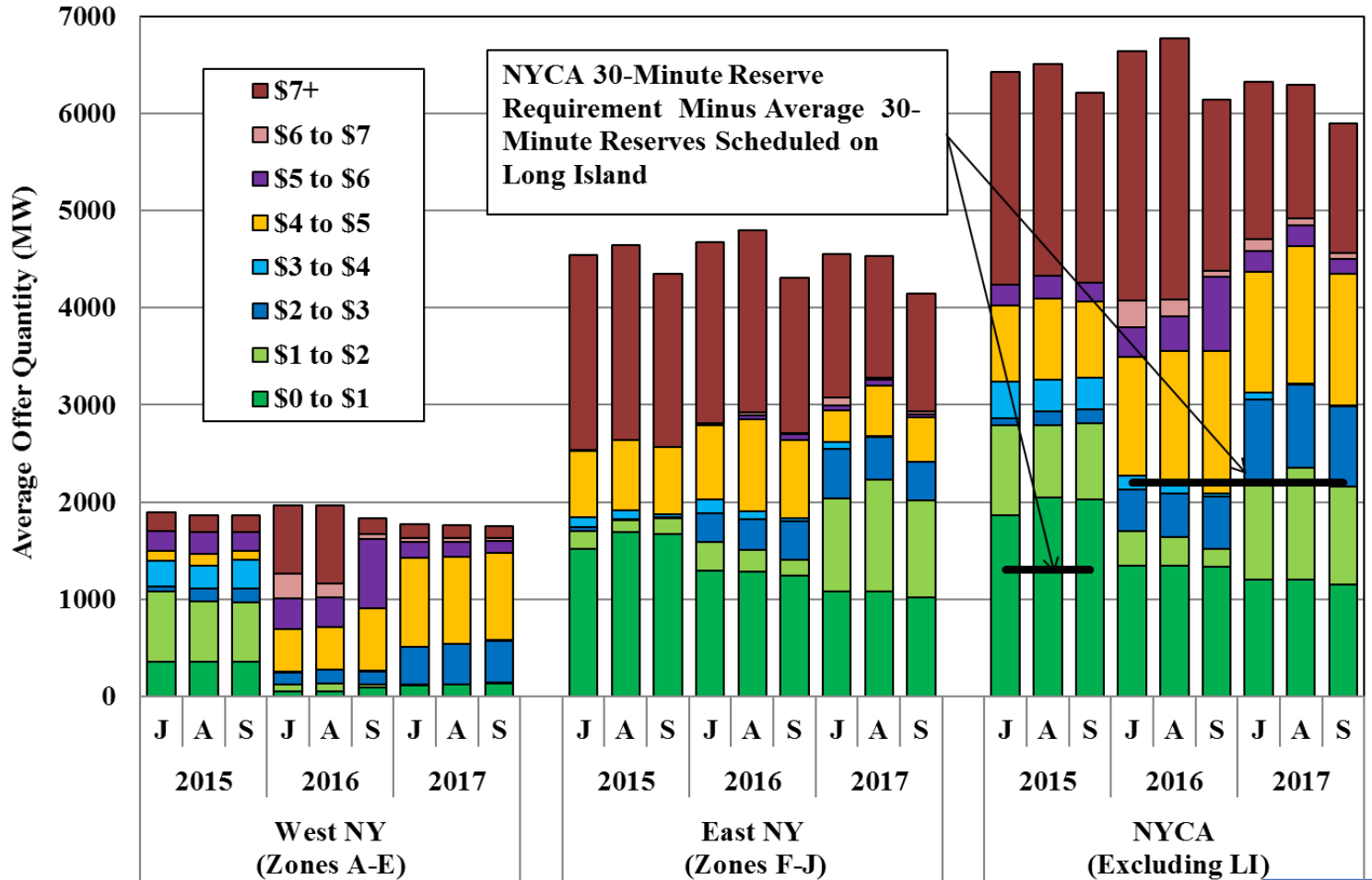
Highlights and Market Summary: Reserve Market Performance

- Day-ahead reserve prices fell by 28 to 44 percent from a year ago, consistent with lower load levels and lower LBMPs. (slides 26 – 29)
 - ✓ The reduction was primarily attributable to the decrease in reserve offer prices. (slide 32)
- After reserve market design changes in November 2015, we have observed offers above the standard competitive benchmark (i.e., estimated marginal cost).
 - ✓ This is partly because it is difficult to accurately estimate the marginal cost of providing operating reserves.
- However, day-ahead reserve offer prices have gradually fallen as suppliers gain more experience.
 - ✓ This quarter, a large amount of reserve capacity (particularly from fast-start resources in East NY) further reduced its offer prices. (slides 30 – 32)
- We continue to monitor day-ahead reserve offer patterns and consider potential rule changes including whether to modify the existing \$5/MWh “safe harbor” for reserve offers in the market power mitigation measures.

Day-Ahead and Real-Time Ancillary Services Prices Western and SENY 30-Minute Reserves



Day-Ahead NYCA 30-Minute Reserve Offers Committed and Available Offline Quick-Start Resources

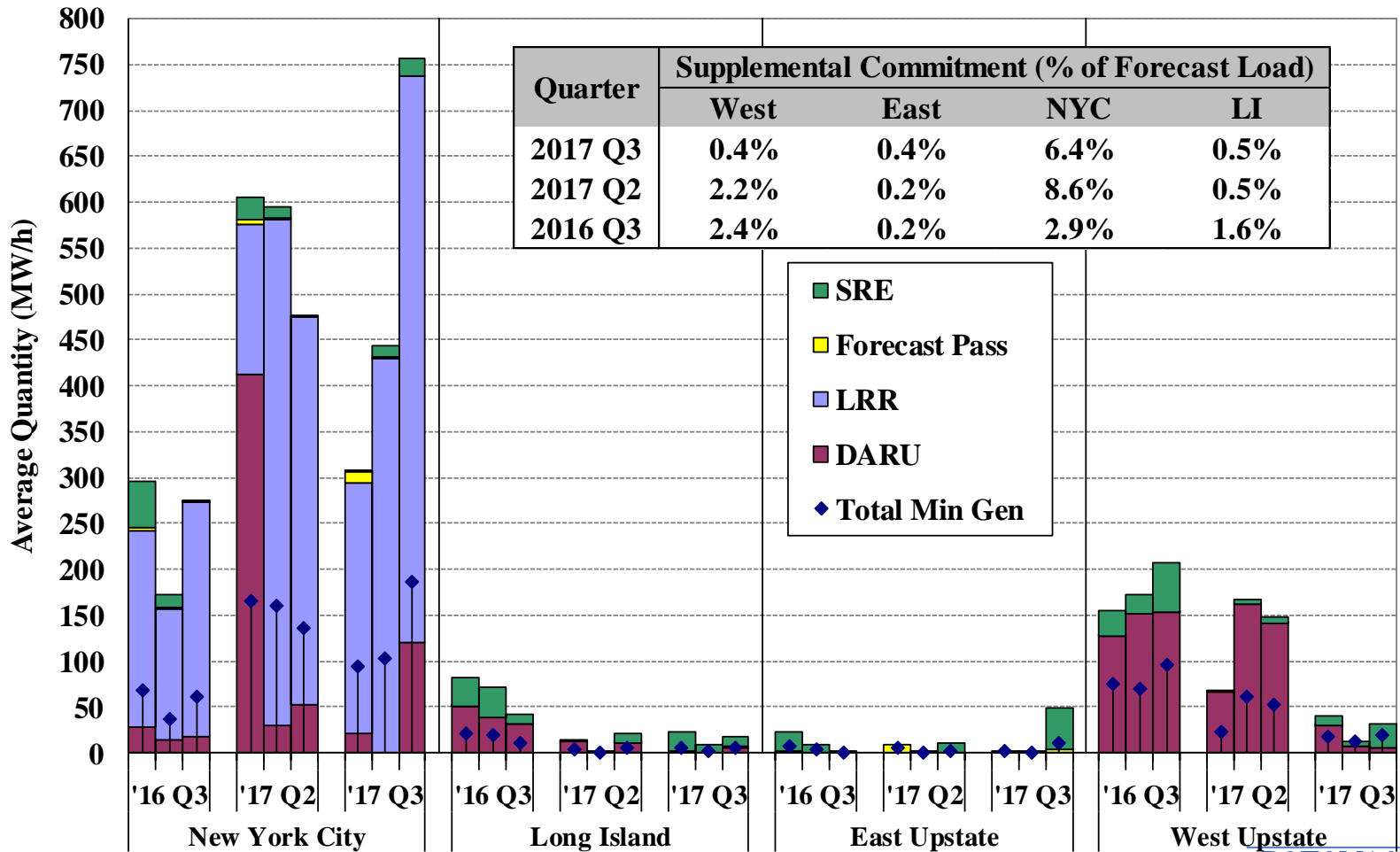




Highlights and Market Summary: Uplift and Revenue Shortfalls

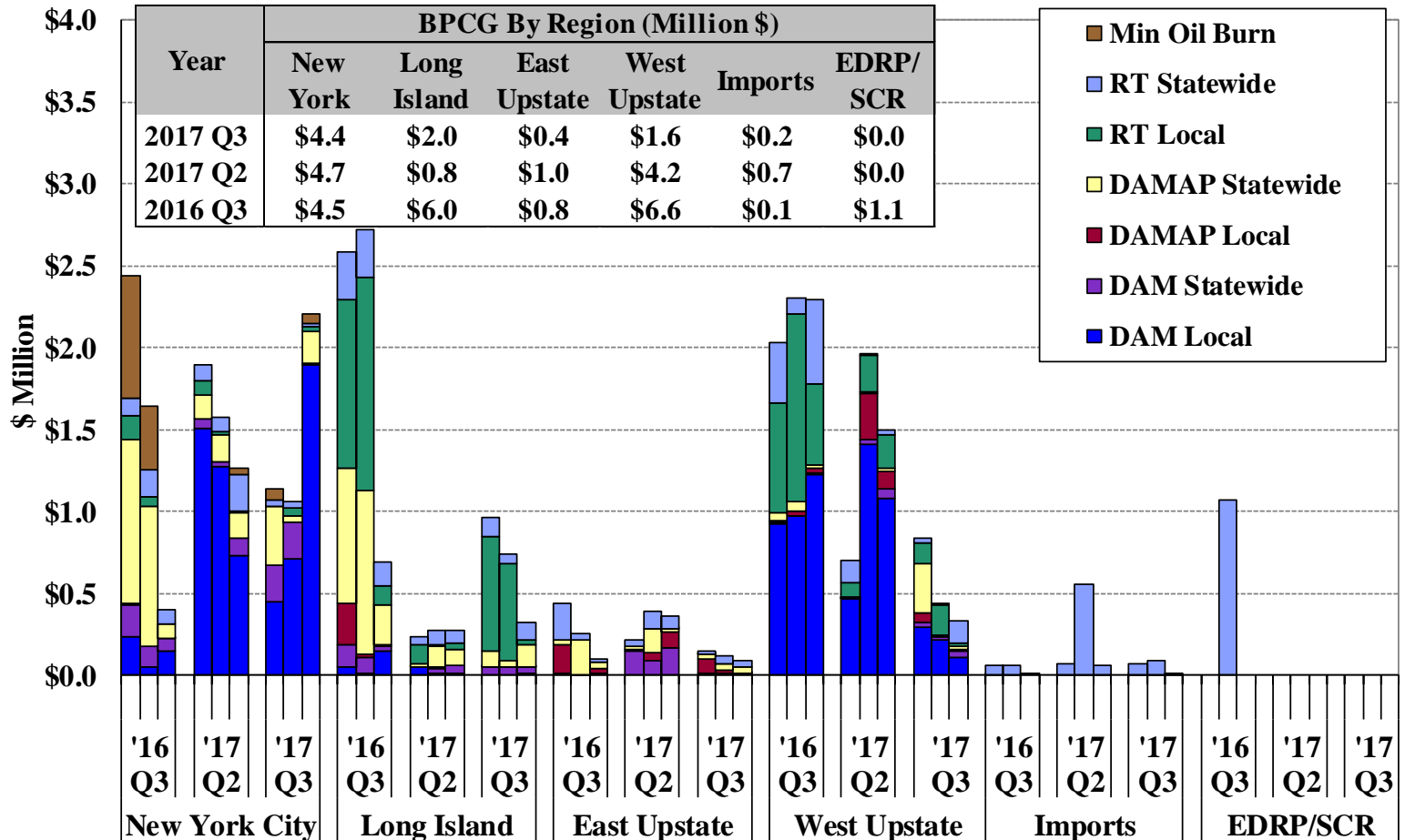
- Guarantee payments were \$8.5 million, which was down 55 percent from 2016-Q3. (slides 79 – 82)
 - ✓ The reduction was reflective of lower load levels, fewer transmission outages in LI, and transmission upgrades in the Central Zone, which led to reduced supplemental commitments and OOM dispatches in most areas. (slides 74 – 78)
 - ✓ However, guarantee payments remained comparable in NYC.
 - Reliability commitment rose in NYC because units that were often needed for local reliability became less economic due to lower load levels and higher gas prices.
- Congestion shortfalls were \$10 million in the day-ahead market (down 50 percent from last year) and \$9 million in the real-time market (comparable to last year).
 - ✓ Transmission outages accounted for the vast majority of DAM shortfalls.
 - \$9 million (~ 90%) was allocated to the responsible TO. (see slides 49 & 50 for a list of major transmission outages)
 - ✓ Nearly 90 percent of balancing shortfalls were associated with transmission facilities in the North Zone and the West Zone. (slides 51 & 55)
 - North Zone accounted for 61 percent, most of which occurred on two days as a result of unexpected events.
 - West Zone accounted for 21 percent due to high and volatile loop flows.

Supplemental Commitment for Reliability by Category and Region



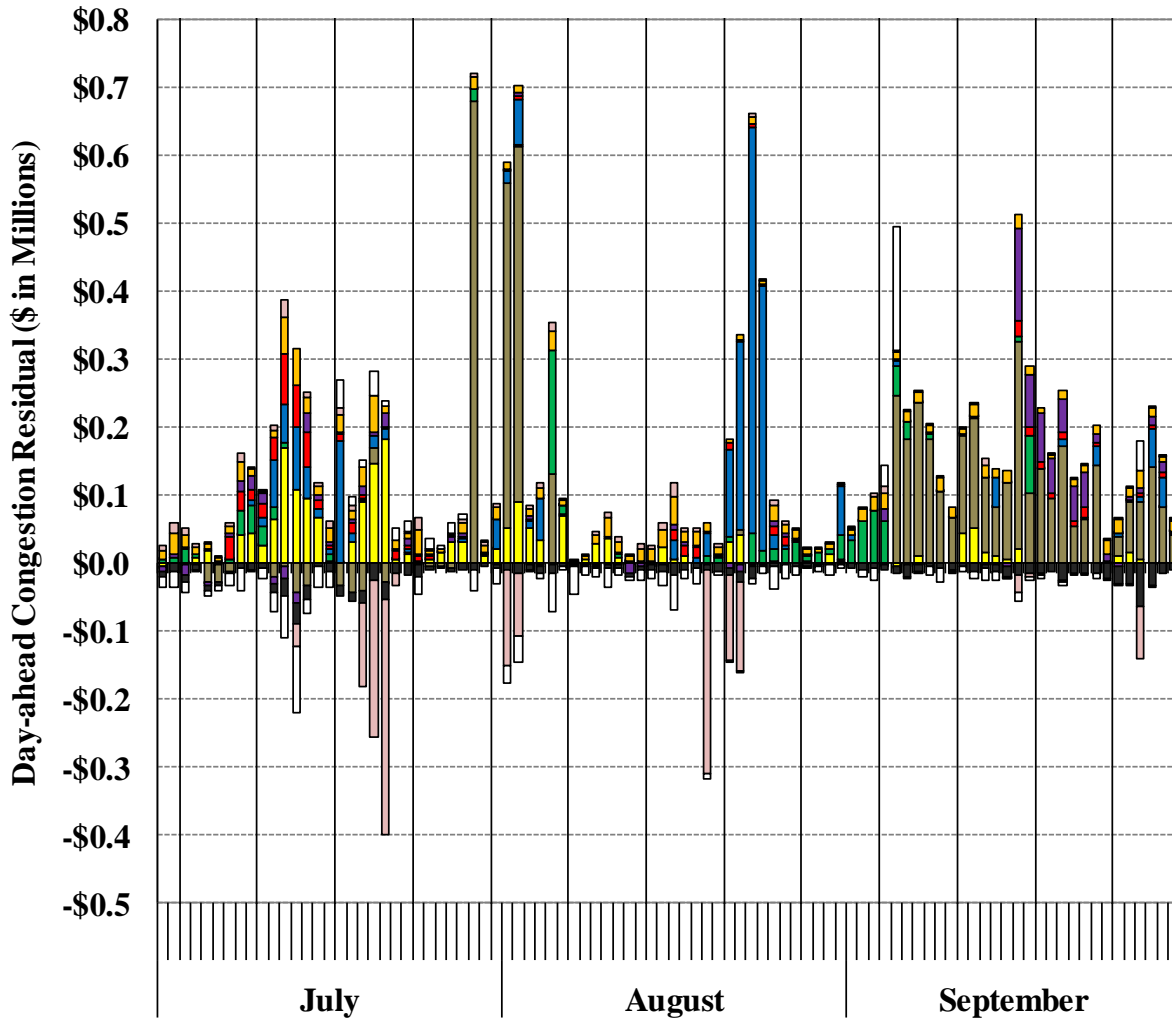


Uplift Costs from Guarantee Payments By Category and Region



Note: BPCG data are based on information available at the reporting time that can be different from final settlements.
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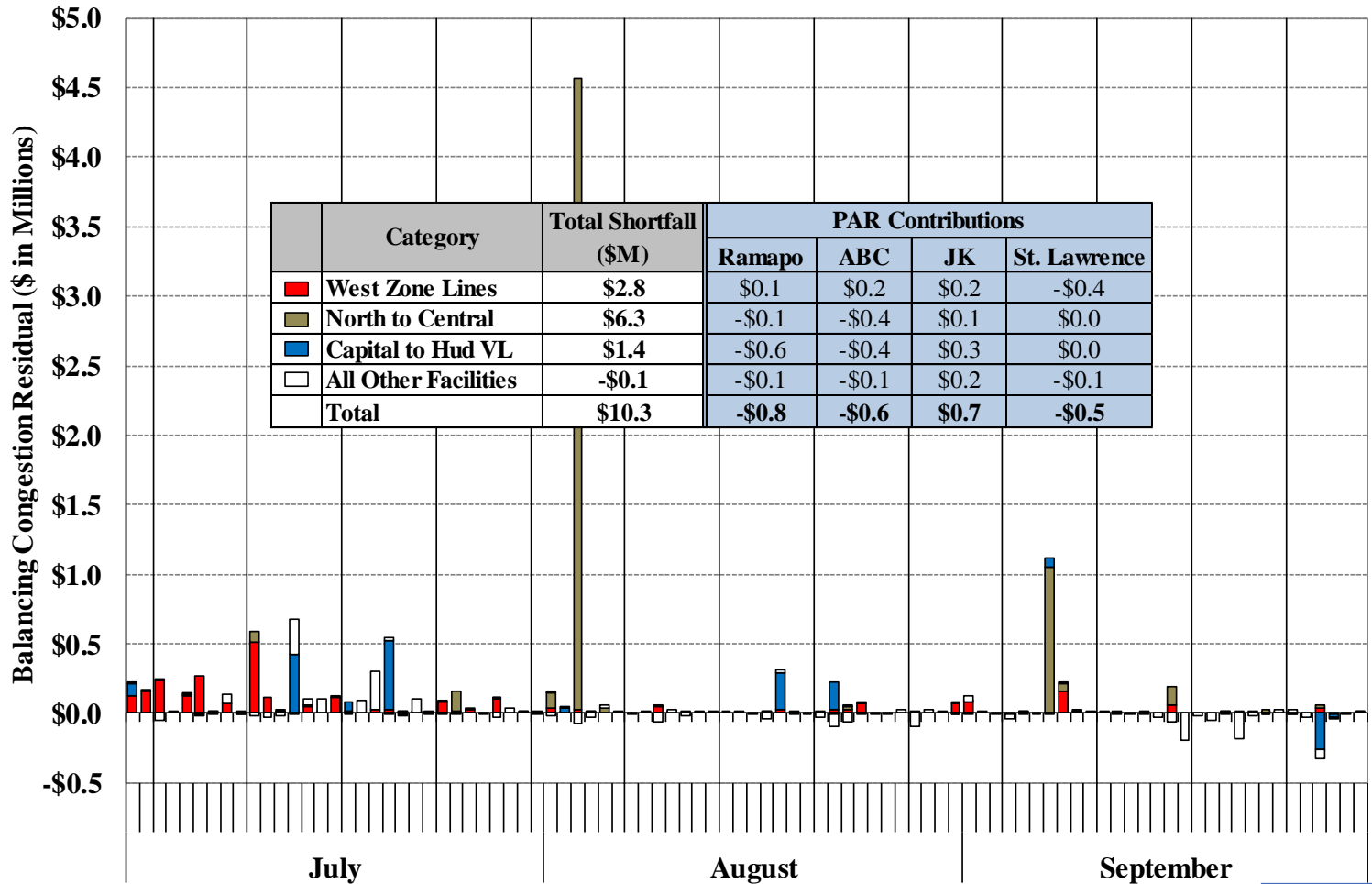
Day-Ahead Congestion Revenue Shortfalls by Transmission Facility



	Category	Total Shortfall (\$M)
	West Zone Lines	\$2.0
	North Zone Lines	\$4.7
	Central to East	\$1.1
	Capital to Hud VL	\$2.5
	NYC Lines	
	ABC PARs	\$0.6
	Other Factors	\$0.7
	Long Island Lines	
	901/903 PARs	-\$1.1
	Excess GFTCC	\$1.4
	Other Factors	-\$1.3
	All Other Facilities	-\$0.7



Balancing Congestion Shortfalls by Transmission Facility



Note: The BMCR estimated above may differ from actual BMCR because the figure is partly based on real-time schedules rather than metered values.



Highlights and Market Summary: Capacity Market

- In this quarter, spot prices ranged from \$2.21/kW-month in ROS to \$9.97/kW-month in NYC. (slides 91 – 93)
- Compared to last year, average spot prices fell 18 percent in NYC and 41 percent in ROS, but rose 6 percent in the G-J Locality and 51 percent in Long Island.
 - ✓ Changes in the Demand Curve Reference Points (which reflected changes to the unit Net CONE assumptions for the proxy unit from the latest Demand Curve Reset process) were a primary driver for the three Localities.
 - ✓ While the change in ICAP supply was a dominant factor for ROS price changes.
 - The amount of internal ICAP supply increased modestly from a year ago.
 - The increase reflected higher DMNC test values, the revival of the Greenidge 4 Unit and new wind capacity upstate.
 - Cleared import capacity rose 350 MW from a year ago, primarily from PJM.
 - Cleared import capacity from Ontario increased by an average of 105 MW, which, however, was offset by a similar amount of reduction from New England.
 - ✓ IRM/LCRs rose in all regions as a result of the recent NYSRC study.
 - However, the peak load forecasts fell across all regions, neutralizing the price impact from higher IRM/LCRs.