

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

Pallas LeeVanSchaick
Potomac Economics
Market Monitoring Unit

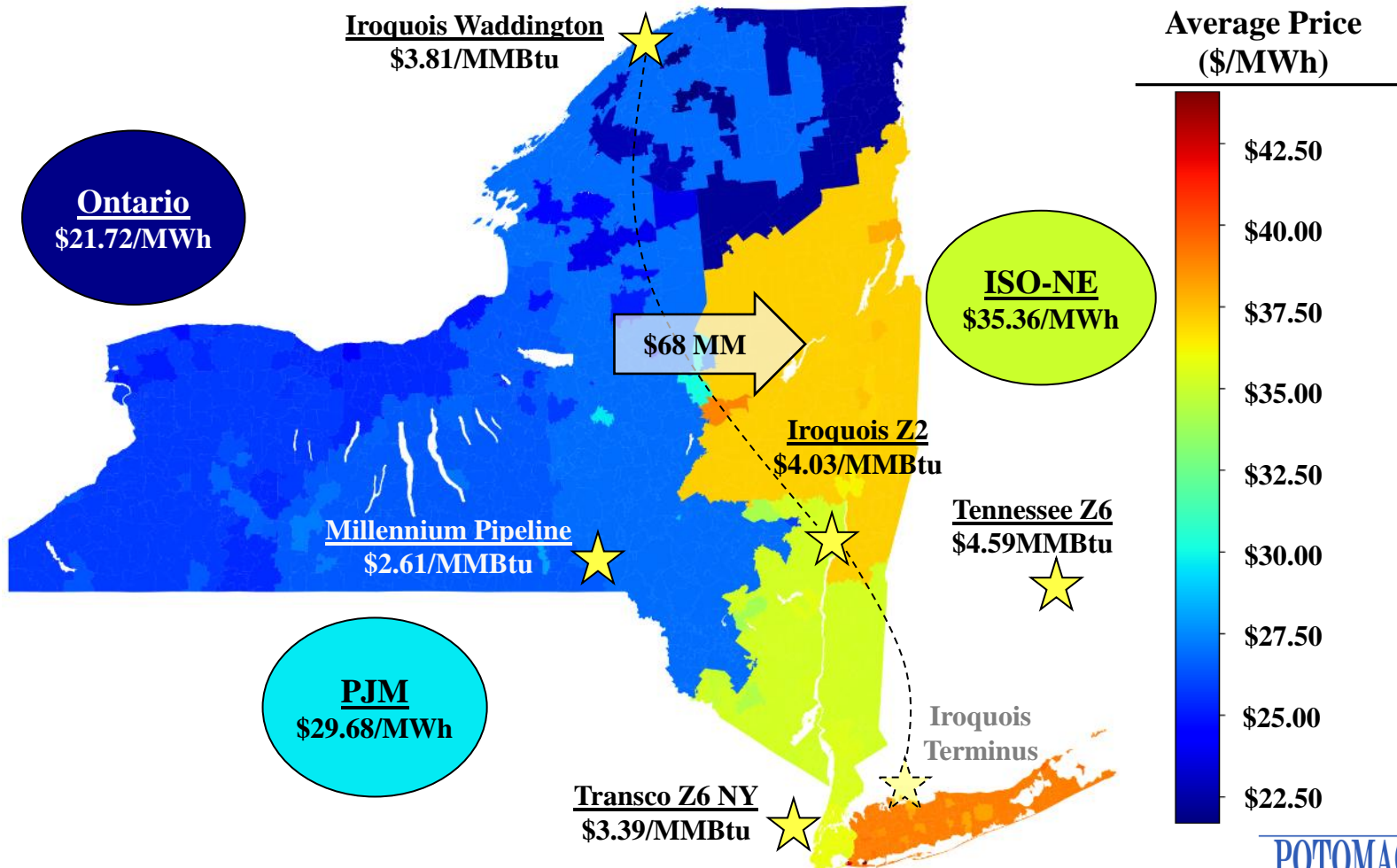
Market Issues Working Group
June 26, 2017



Highlights and Market Summary: Energy Market Outcomes and Congestion

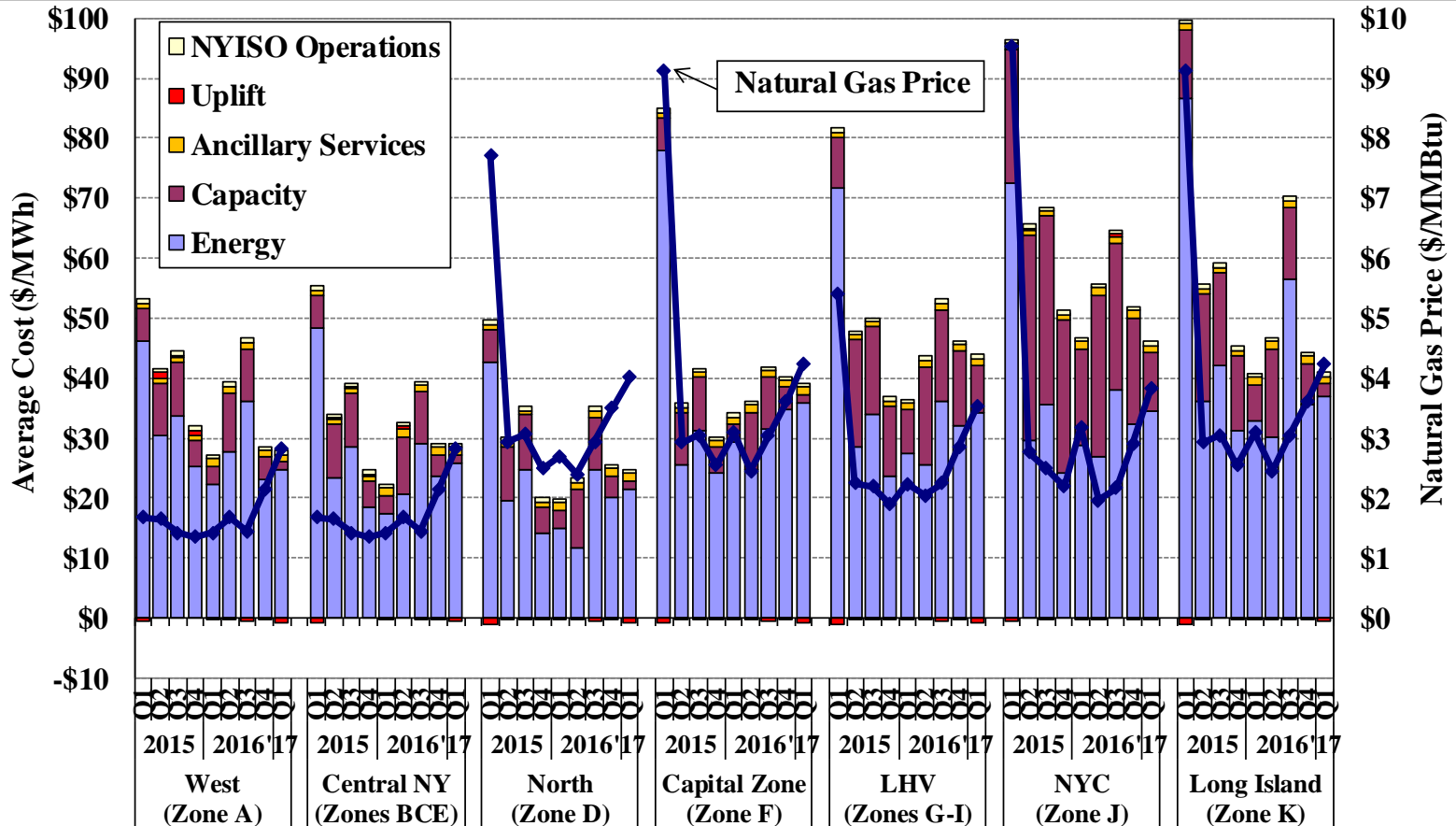
- This report summarizes market outcomes in 2017-Q1.
- The energy markets performed competitively and variations in wholesale prices were driven primarily by changes in fuel prices, demand, and supply availability.
 - ✓ However, we discuss concerns with performance of the reserve market. (see slide 5)
- The first quarter was characterized by mild winter weather conditions.
 - ✓ Average load levels was near the lowest levels in the last ten winters. (see slide 12)
 - ✓ Natural gas prices rarely increased to the level of oil prices due to scarcity.
- All-in prices averaged from \$24/MWh in the North Zone to \$46/MWh in NYC.
 - ✓ The range was due mainly to Central East congestion and capacity price differences.
 - ✓ Zone-level LBMPs rose from the previous year by 10 to 48 percent because of:
 - Higher gas prices, which rose 20-40 percent in East NY and 100+ percent in West NY. (see slide 13)
 - Nuclear generation fell ~460 MW because of more deratings & outages. (see slide 16)
 - However, these were offset by higher net imports (over 600 MW). (see slide 41)
 - ✓ Capacity costs fell 39 to 64 percent outside the Hudson Valley. (see slide 84)

Highlights and Market Summary: Energy Market Outcomes and Congestion





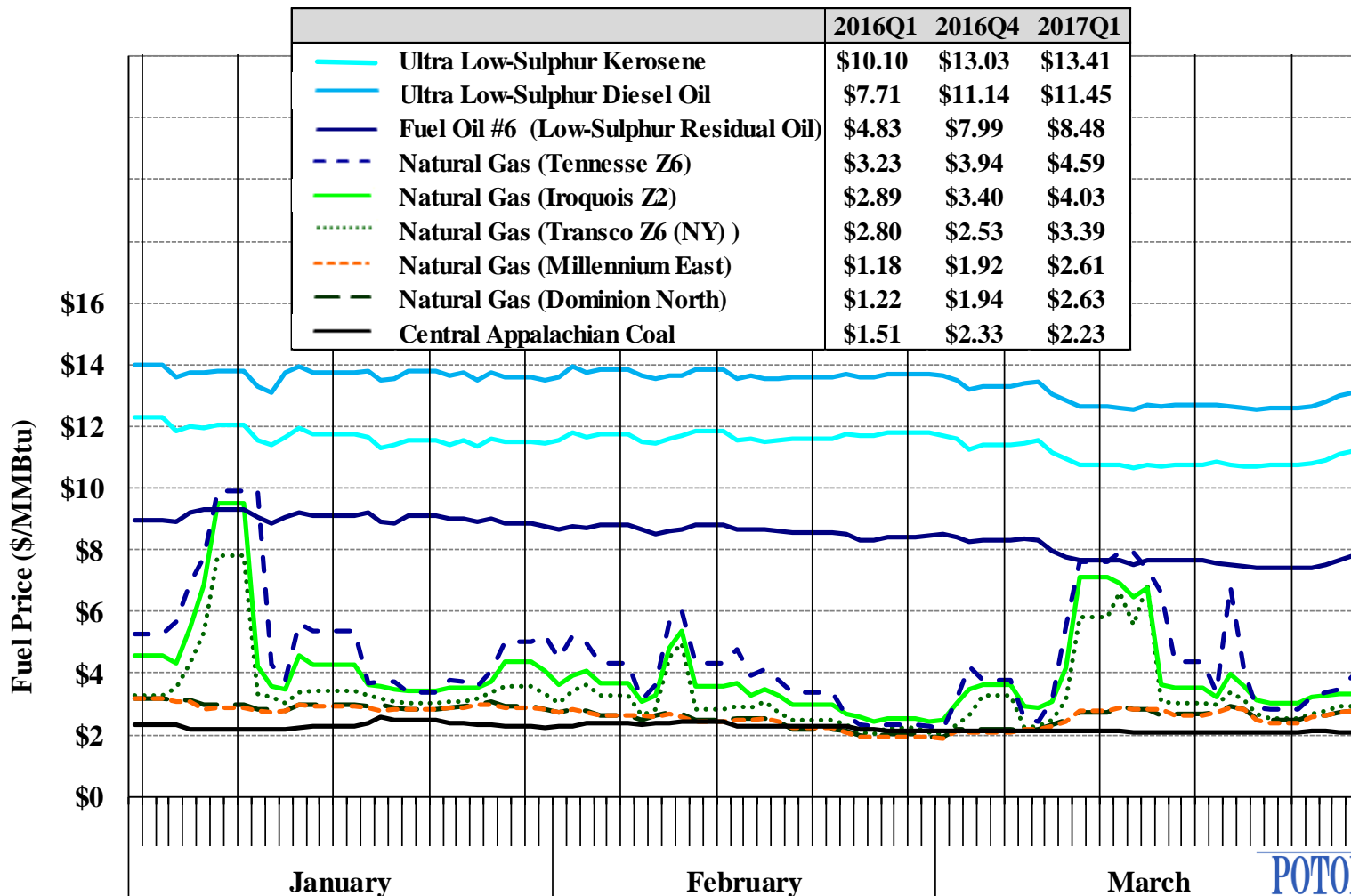
All-In Prices by Region



Note: Natural Gas Price is based on the following gas 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.

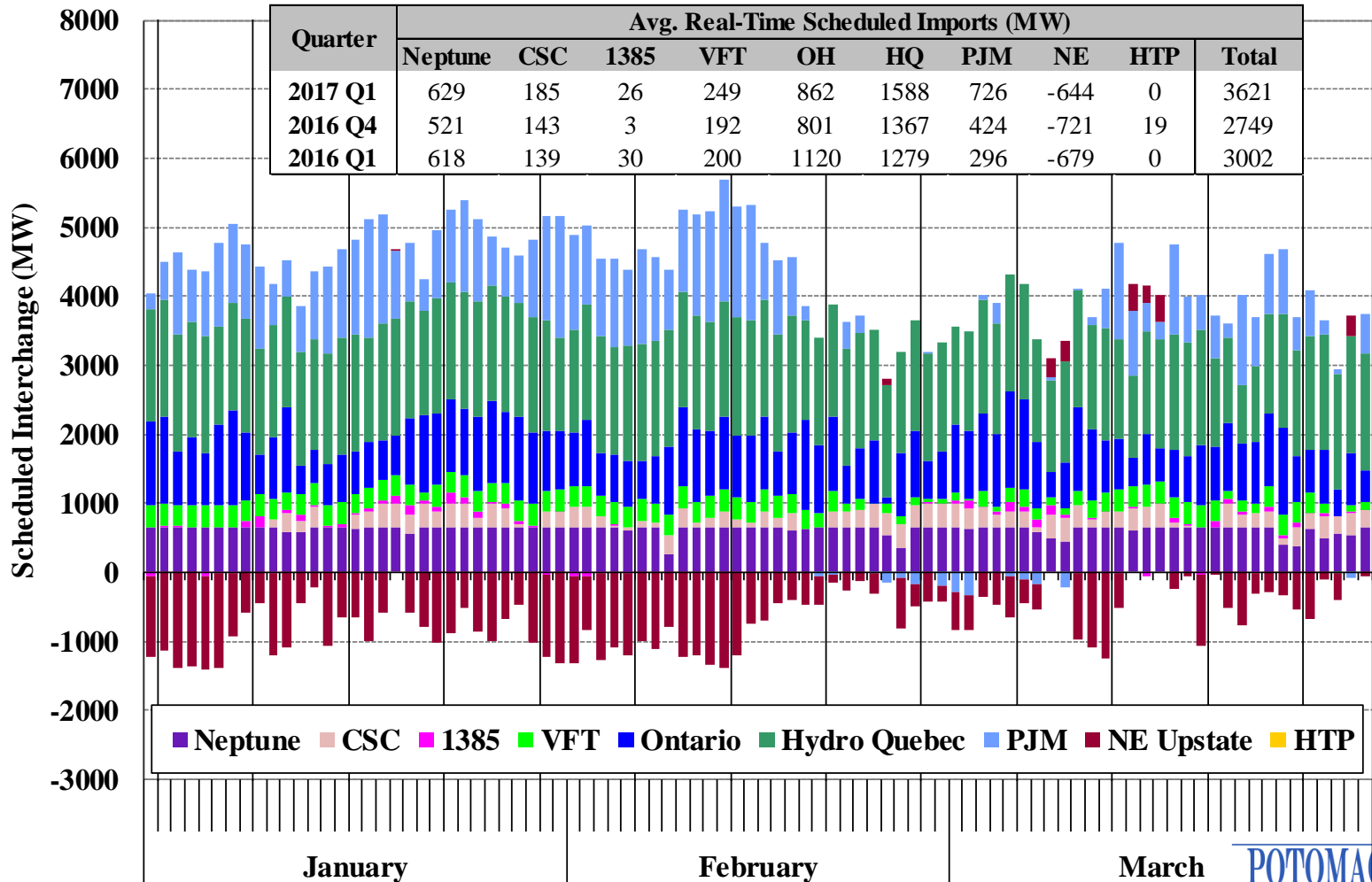


Coal, Natural Gas, and Fuel Oil Prices

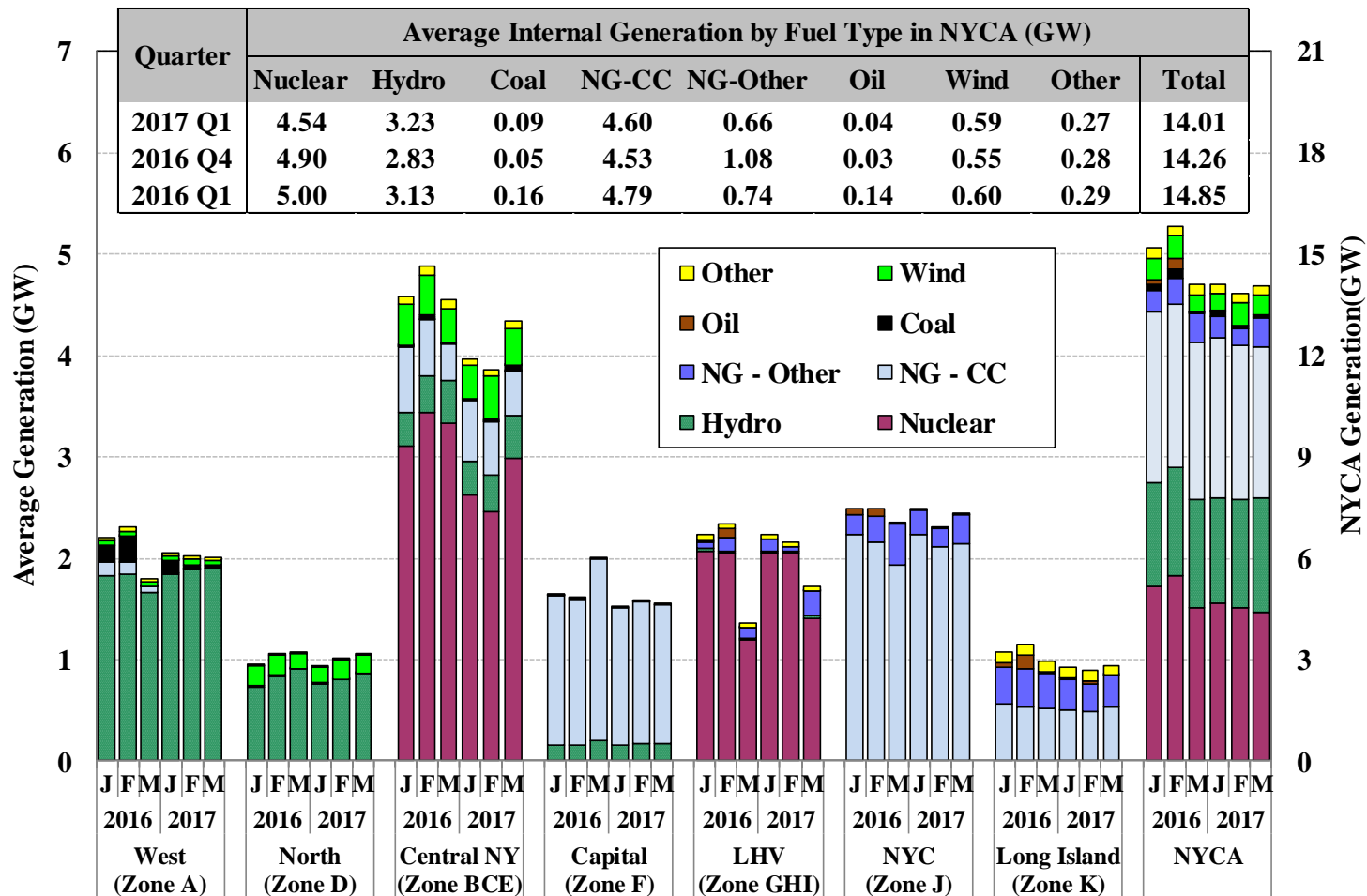


Net Imports Scheduled Across External Interfaces

Daily Peak Hours (1-9pm)



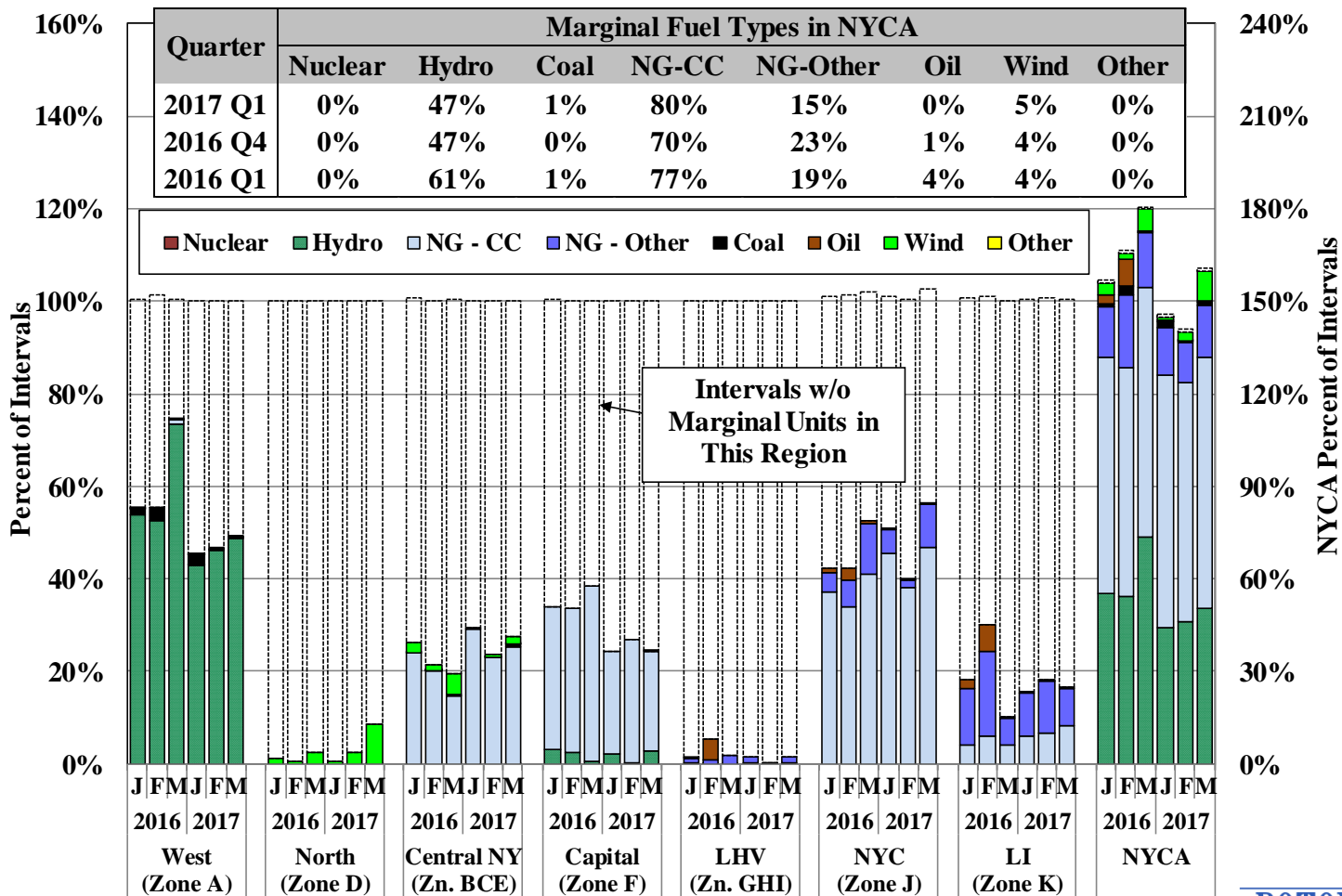
Real-Time Generation Output by Fuel Type



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 RTM



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

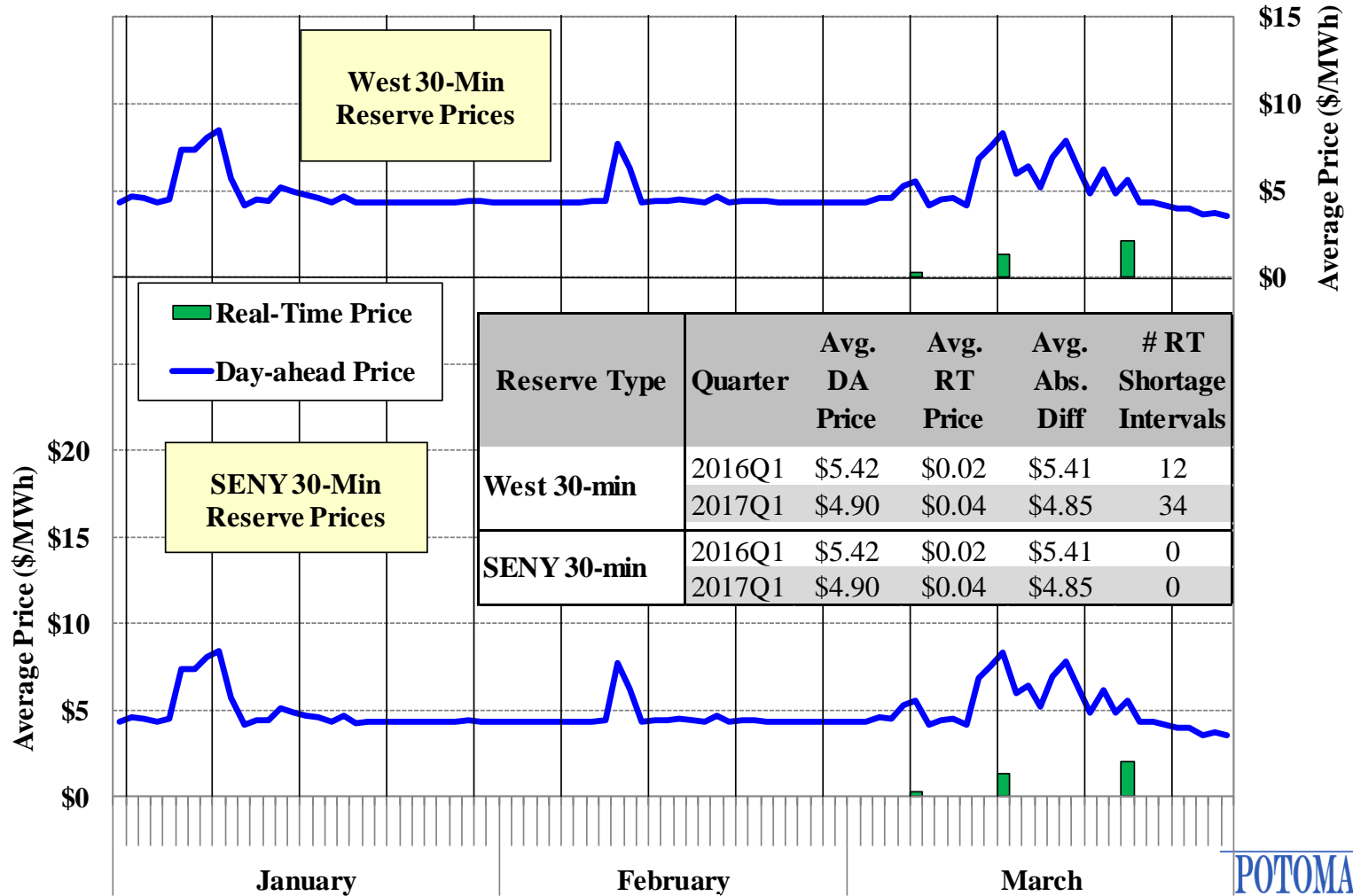


Highlights and Market Summary: Reserve Market Performance

- DA 30-minute reserve prices have been substantially elevated since the market rule change in November 2015, driven primarily by:
 - ✓ The new limitation on scheduling reserves on Long Island (down 250-300 MW);
 - ✓ Increased 30-minute reserve requirement (up 655 MW); and
 - ✓ Higher reserve offer prices from some capacity.
- We have reviewed DA reserve offers and found many units that offer 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.
 - ✓ DA offer prices may fall as suppliers gain more experience.
 - This was evident in 2017-Q1 as a large amount of reserve capacity reduced its offer prices from previous years. (see slides 31-33)
 - This has helped reduce average DA 30-minute reserve prices. (see slide 30)
- We will continue to monitor DA 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.



DA and RT Ancillary Services Prices Western and SENY 30-Minute Reserves





NYCA 30-Minute Reserve Offers in the DAM: Chart Descriptions

- The next figure summarizes the amount of reserve offers in the day-ahead market that can satisfy the statewide 30-minute reserve requirement.
 - ✓ These quantities include both 10-minute and 30-minute and both spinning and non-spin reserve offers. (However, they are not shown separately in the figure.)
 - ✓ Only offers from day-ahead committed (i.e., online) resources and available offline quick-start resources are included, since they directly affect the reserve prices.
 - ✓ The stacked bars show the amount of reserve offers in each select price range for West NY (Zones A to E), East NY (Zones F to J), and NYCA (excluding Zone K).
 - Long Island is excluded because the current rules limit its reserve contribution to the broader areas (i.e., SENY, East, NYCA) in the 30-minute reserve requirement.
 - Thus, Long Island reserve offer prices have little impact on NYCA reserve prices.
 - ✓ The black line represents the equivalent average 30-minute reserve requirements for areas outside Long Island.
 - The equivalent 30-minute reserve requirement is calculated as NYCA 30-minute reserve requirement *minus* 30-minute reserves scheduled on Long Island.
 - Where the lines intersect the bars provides a rough indication of reserve prices (however, opportunity costs are not reflected here).

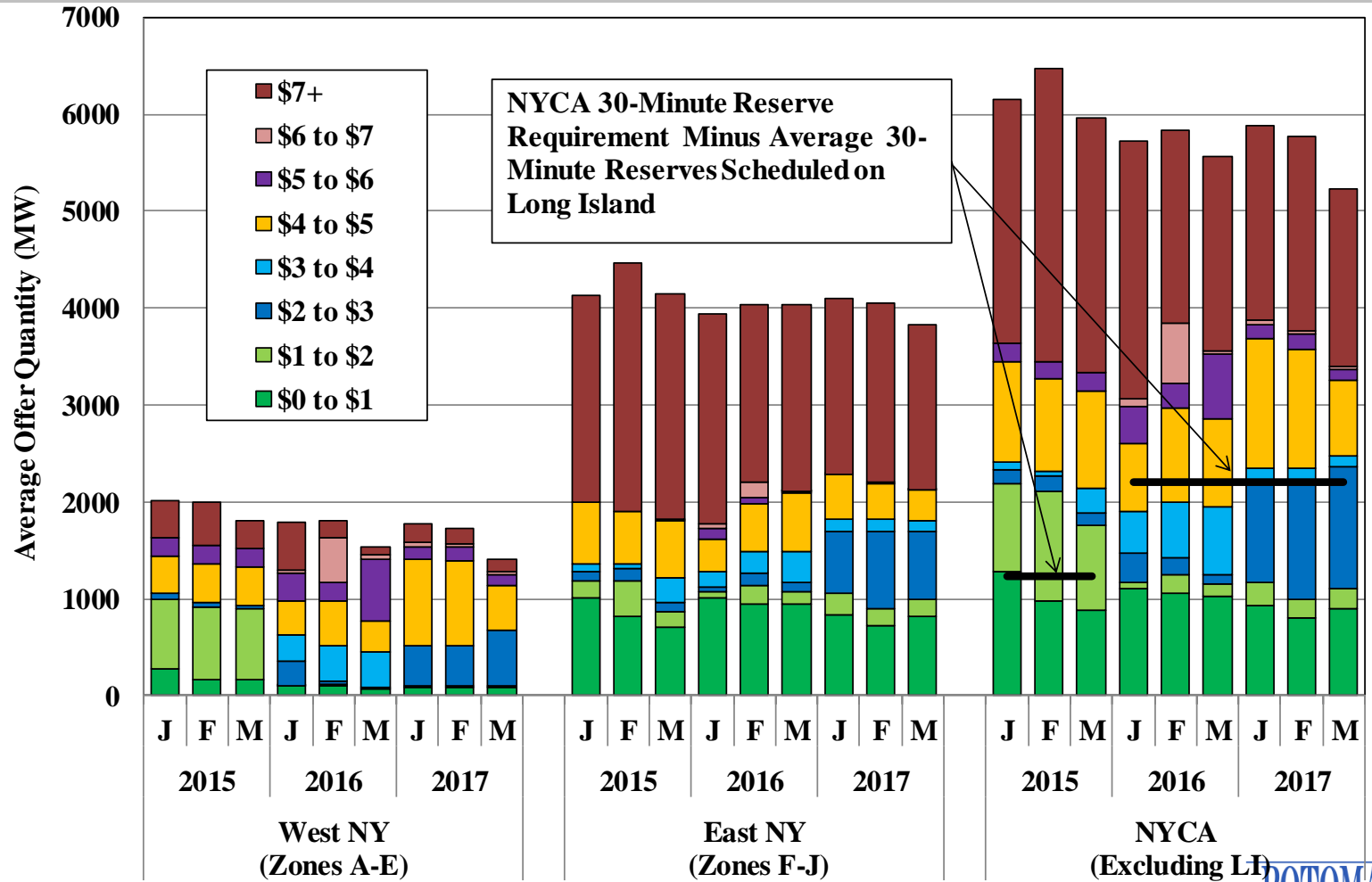


NYCA 30-Minute Reserve Offers in the DAM: Market Results

- DA 30-minute reserve prices became much higher than RT prices following the market rule change in November 2015, which was driven primarily by:
 - ✓ The increased 30-minute reserve requirement (up 655 MW);
 - ✓ The limit on scheduled reserves on Long Island (down 250-300 MW); and
 - ✓ The increased reserve offers from some capacity.
- We have reviewed DA reserve offers and found many units that offer above the standard competitive benchmark (i.e., estimated marginal cost).
 - ✓ This is partly due to the difficulty of accurately estimating the marginal cost of providing reserves.
 - ✓ Thus, DA offer prices may fall as suppliers gain more experience. Compared to the first quarter of the previous year:
 - The amount offered below \$3/MWh increased by an average of 880 MW; and
 - The amount offered below \$5/MWh increased by an average of 700 MW.
- We will continue to monitor DA 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.



DAM NYCA 30-Minute Operating Reserve Offers Committed and Available Offline Quick-Start Resources



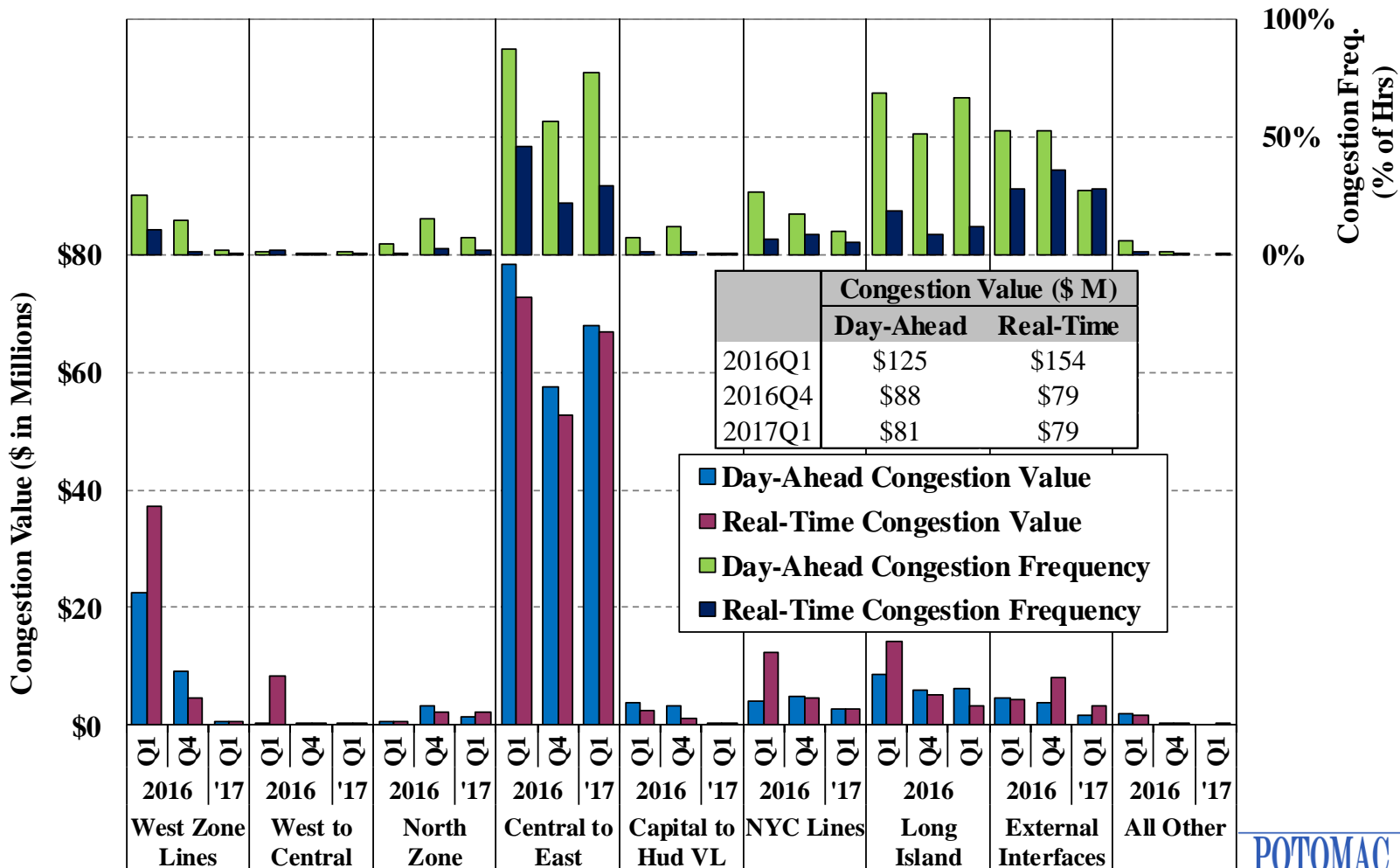


Highlights and Market Summary: Energy Market Outcomes and Congestion

- DA congestion revenue totaled \$81M, down 35% from 2016-Q1. (see slides 52-54)
 - ✓ Congestion across the Central-East interface (accounting for ~85% of congestion in 2017-Q1) fell ~10 percent from 2016-Q1.
 - Lower gas spreads between West NY and East NY (see slide 13) reduced re-dispatch costs to manage congestion across the Central-East interface.
 - Lower Ontario imports and higher PJM imports contributed to less frequent congestion across the Central-East interface as well. (see slide 41)
 - ✓ West Zone 230 kV constraints were rarely binding, which was attributable to:
 - Transmission upgrades in early 2016, which reduce congestion on 230 kV facilities;
 - More frequent congestion on 115 kV facilities, since actions to manage congestion on the 115 kV system often help reduce flows on the 230 kV system. (see slides 59-61)
 - Managing 115 kV congestion using the DA and RT market systems would result in more efficient congestion scheduling and pricing.
- RT congestion costs for the Valley Stream load pocket on Long Island fell from a year ago because of improved modeling of lines between NYC and Long Island.



DA and RT Congestion Value and Frequency by Transmission Path





Congestion on the Low Voltage Network Upstate

- In upstate New York, congestion on 230 and 345 kV facilities is generally managed through the DA and RT market systems. This provides several benefits:
 - ✓ Efficient dispatch and scheduling decisions; and
 - ✓ Transparent prices that provide efficient signals for longer lead time decisions such as fuel procurement, external transaction scheduling, and investment.
- However, 69 and 115 kV congestion is resolved in other ways, including:
 - ✓ Out of merit dispatch and supplemental commitment;
 - ✓ External interface transfer limits;
 - ✓ Use of an internal interface limit as a proxy for the facility; and
 - ✓ Adjusting PAR-controlled lines.
- The following figure shows the number of days in the first quarter of 2017 when various resources were used to manage congestion in five areas of upstate NY.
 - ✓ West Zone: Mostly Gardenville-to-Dunkirk and Niagara 230/115kV transformers;
 - ✓ Central Zone: Mostly constraints around the State Street 115kV bus;
 - ✓ Cent-Hudson: Mostly constraints on the 69kV system in the Hudson Valley;

(cont'd)



Congestion on the Low Voltage Network Upstate

- ✓ North Zone: Mostly 115kV constraints coming south from the North Zone between the Colton 115kV and Taylorville 115kV buses; and
- ✓ Capital Zone: Mostly Albany-to-Greenbush 115kV constraints.
- The West Zone contains the most frequently constrained 115kV facilities.
 - ✓ Ontario imports were limited on most days, while generation redispatch and PAR adjustments were used on a significant number of days.
 - ✓ West Zone congestion management affected other areas of New York by:
 - Reducing low-cost imports from Ontario, which raised LBMPs in other areas; and
 - Using the St. Lawrence PARs to relieve West Zone congestion tends to exacerbate congestion going south from the North Zone and across the Central East interface.
 - Thus, the actions should be done in a manner that balances the benefits of relieving congestion in one area against the cost of exacerbating congestion in another.
 - This can be done more effectively if low-voltage constraints were managed using the DA and RT market systems.
 - ✓ Although the PJM export limit bound on just 6 days, PJM imports are generally helpful for managing 115kV congestion in the West Zone and Central Zone.
 - Modeling 115kV constraints in the market systems would provide incentives for PJM imports to relieve congestion in NY.

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

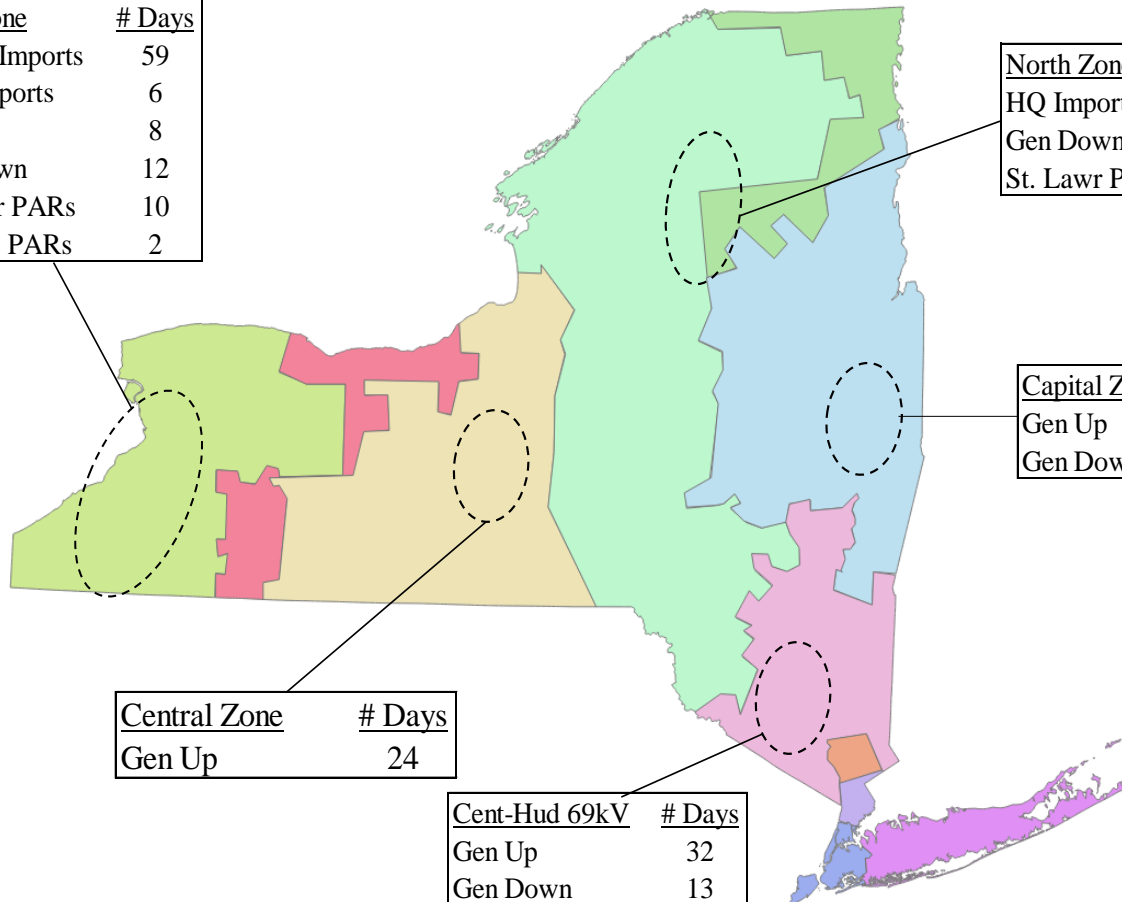
<u>West Zone</u>	<u># Days</u>
Ontario Imports	59
PJM Exports	6
Gen Up	8
Gen Down	12
St. Lawr PARs	10
Ramapo PARs	2

<u>North Zone</u>	<u># Days</u>
HQ Imports	4
Gen Down	2
St. Lawr PARs	4

<u>Capital Zone</u>	<u># Days</u>
Gen Up	1
Gen Down	4

<u>Central Zone</u>	<u># Days</u>
Gen Up	24

<u>Cent-Hud 69kV</u>	<u># Days</u>
Gen Up	32
Gen Down	13

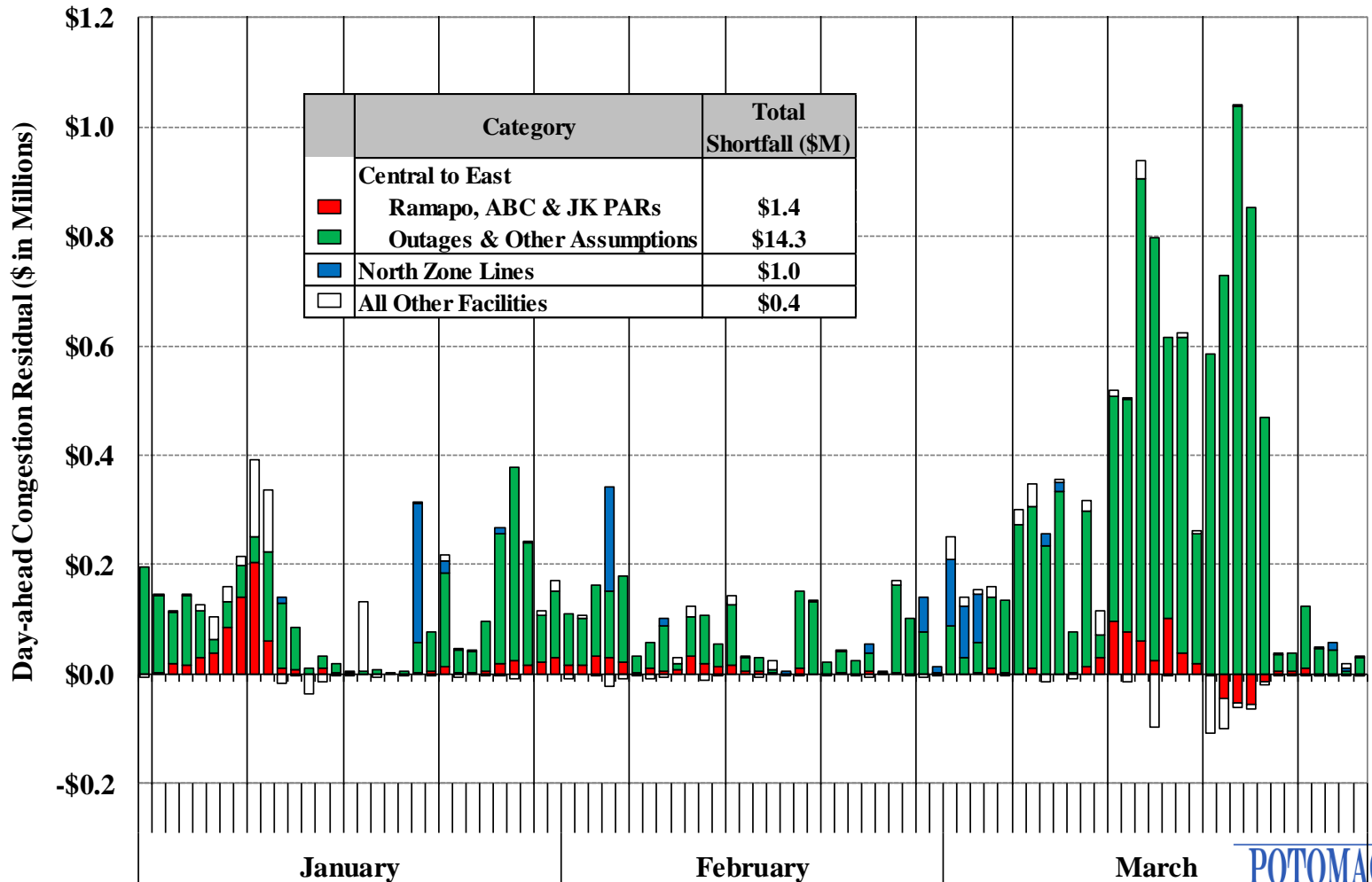




Highlights and Market Summary: Uplift and Revenue Shortfalls

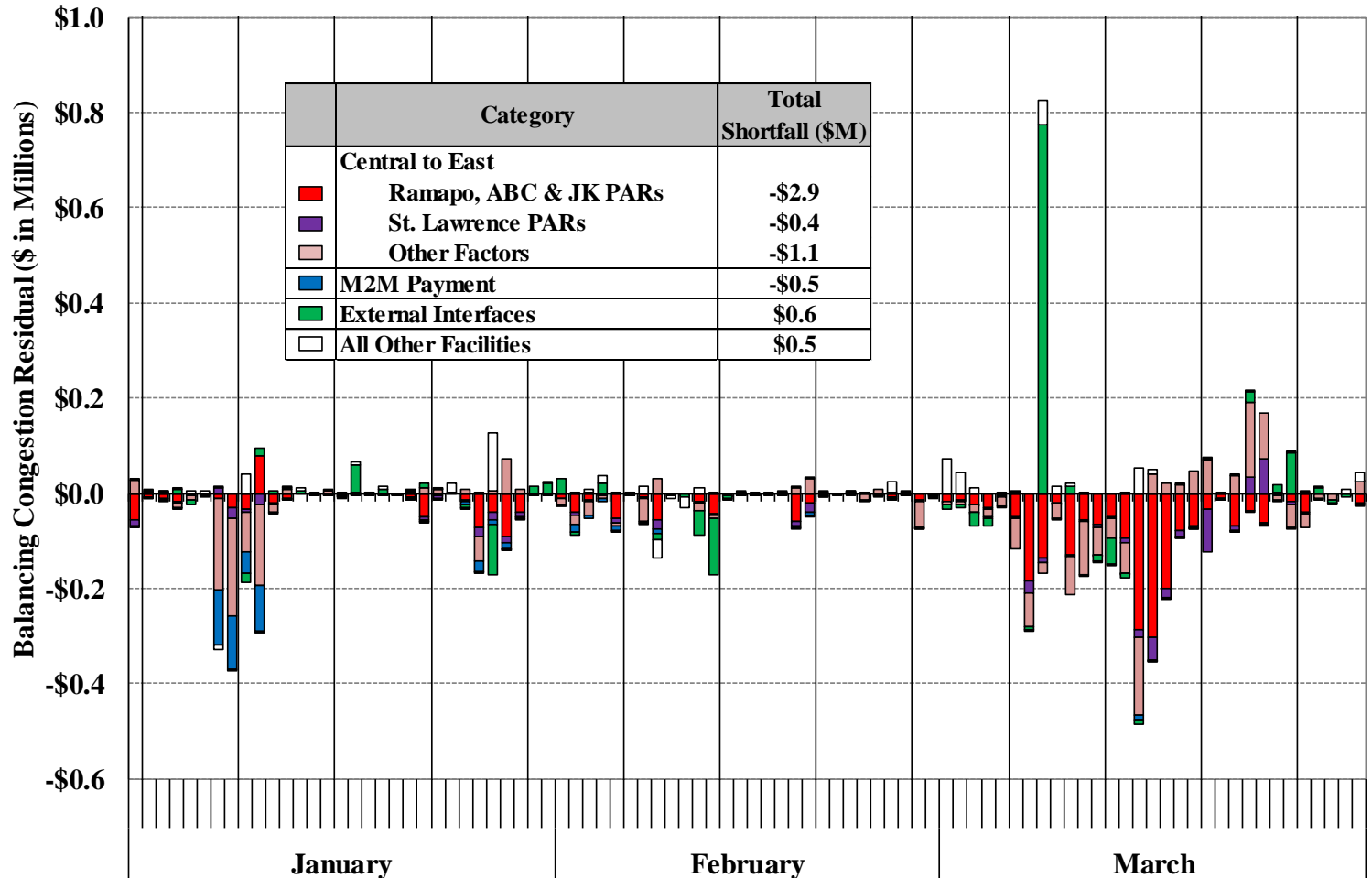
- Guarantee payments were \$8.6M, up 21% from 2016-Q1 (see slides 70-73) due to:
 - ✓ Higher gas prices that increased the commitment costs of gas-fired units; and
 - ✓ Increased supplemental commitment for reliability in NYC, due partly to more transmission outages. (see slides 65-68)
- Congestion shortfalls were \$17M in the DAM and *negative* \$5M (i.e., surpluses) in the RTM. Both were lower than in 2016-Q1. (see slides 54-55)
 - ✓ ~90% of DA shortfalls accrued on the Central-East interface as multiple transmission outages and other factors (including nuclear outages, unit commitments, and the status of capacitors and SVCs) reduced the interface limit.
 - ✓ Nearly all of RT surpluses were associated with the Central-East interface as well.
 - The RT PAR operation (including Ramapo, ABC, JK, and St. Lawrence PARs) collectively accounted for a large portion of surpluses.

Day-Ahead Congestion Revenue Shortfalls by Transmission Facility



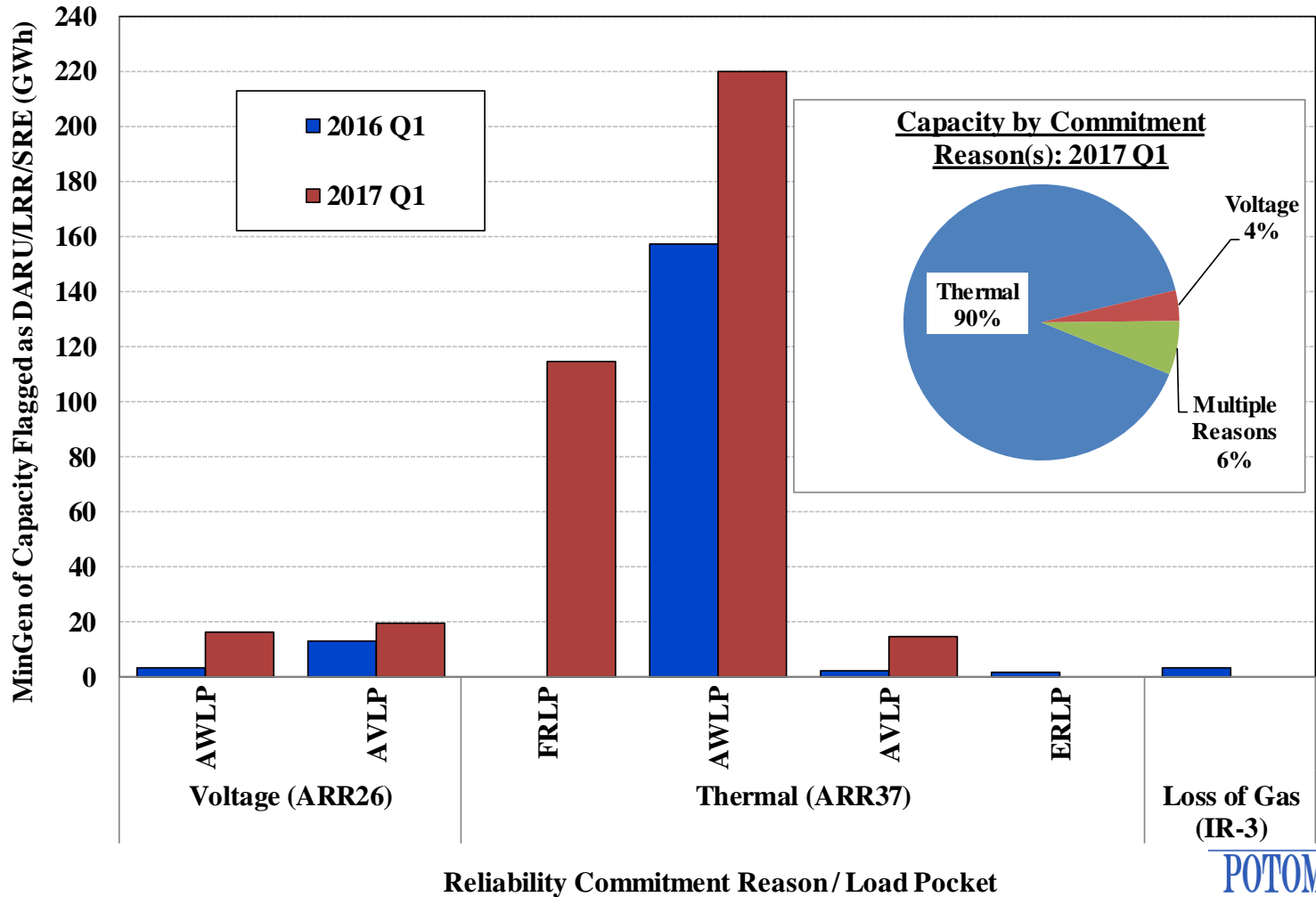


Balancing Congestion Shortfalls by Transmission Facility

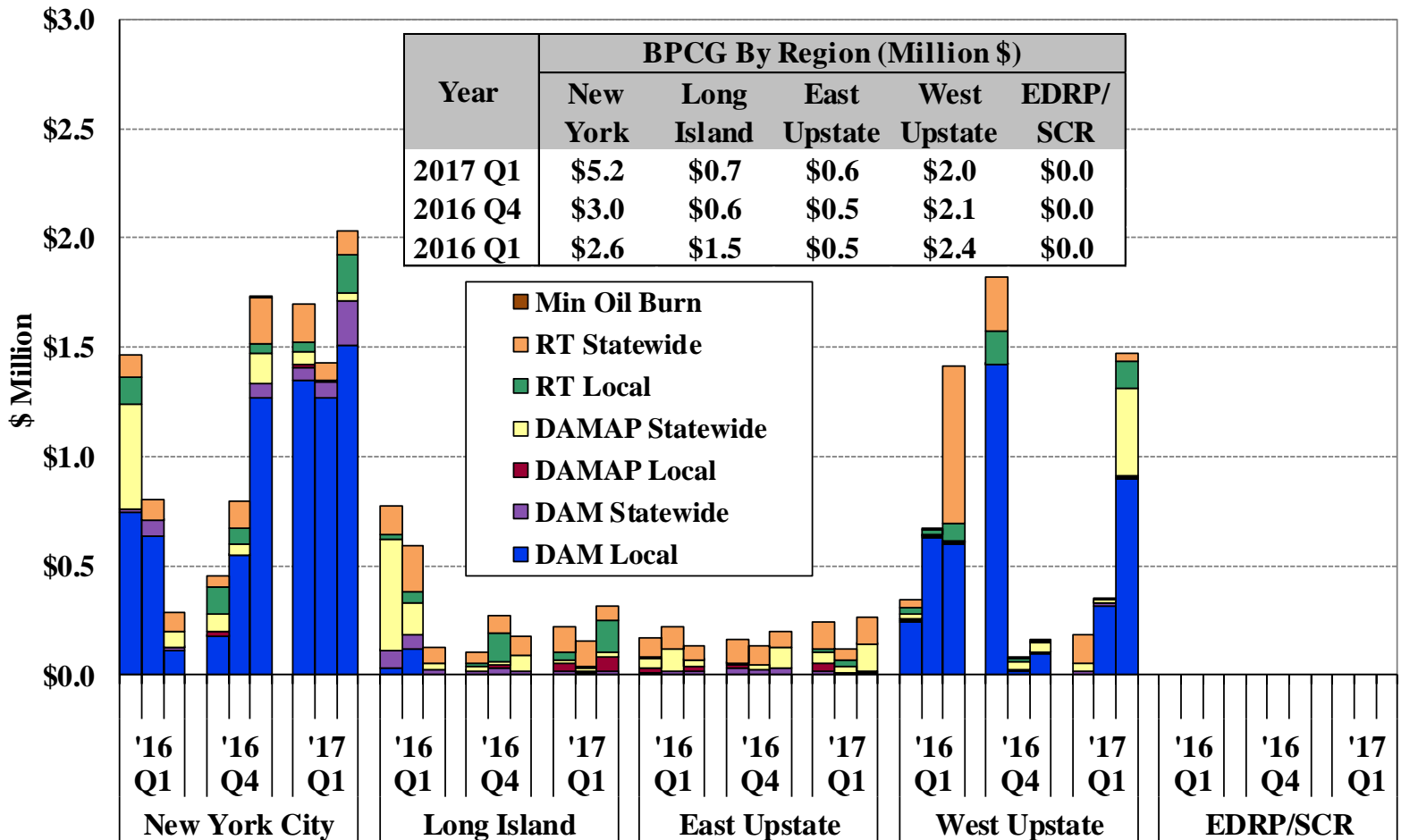


Note: The BMCR estimated above may differ from actual BMCR because the figure is partly based on real-time schedules rather than metered values.

Supplemental Commitment for Reliability in NYC by Reliability Reason and Load Pocket



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.



Highlights and Market Summary: Capacity Market

- In 2017-Q1, spot prices averaged \$0.52/kW-month in Long Island and ROS, and \$3.43/kW-month in NYC and the G-J Locality. (see slides 82-84)
 - ✓ The UCAP requirements in Long Island and NYC were not binding, leading Long Island and NYC prices to be same as ROS and G-J prices, respectively.
- Compared to 2016-Q1, average spot prices fell 41-66 percent in all regions except the G-J Locality, where average prices rose 9 percent instead.
 - ✓ The large reductions in most regions were due primarily to lower ICAP requirements that resulted from lower peak load forecast and lower LCRs.
 - However, the IRM rose, partly offsetting the reduction in the NYCA load forecast.
 - ✓ Internal supply fell as a result of the Huntley retirement in March 2016 and mothballing of multiple Astoria and Ravenswood GTs in NYC after 2016-Q1.
 - However, this was offset by a net increase of over 400 MW in average imports.
- Changes in LCRs continue to be a key driver of the most significant year-over-year capacity price changes.
 - ✓ Under the current methodology, variations in LCRs for local capacity zones are inefficient and create significant market uncertainty. It is important to establish LCRs that will procure capacity in a cost efficient manner.

Key Drivers of Capacity Market Results

	NYCA	NYC	LI	G-J Locality
Avg. Spot Price				
2017 Q1 (\$/kW-Month)	\$0.52	\$3.43	\$0.52	\$3.43
% Change from 2016 Q1	-53%	-41%	-66%	9%
Change in Demand				
Load Forecast (MW)	-209	-136	-61	-31
IRM/LCR	0.5%	-3.0%	-1.0%	-0.5%
<i>2017 Winter</i>	<i>117.5%</i>	<i>80.5%</i>	<i>102.5%</i>	<i>90.0%</i>
<i>2016 Winter</i>	<i>117.0%</i>	<i>83.5%</i>	<i>103.5%</i>	<i>90.5%</i>
ICAP Requirement (MW)	-77	-467	-117	-109
Change in ICAP Supply (MW) - Quarter Avg				
<i>Generation</i>	-270	-65	40	-55
<i>Import Capacity</i>	420			