

# ***Operations Performance Metrics Monthly Report***



## ***May 2019 Report***

## **Operations & Reliability Department New York Independent System Operator**

Prepared by NYISO Operations Analysis and Services, based on settlements initial invoice data collected on or before June 10, 2019.

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## May 2019 Operations Performance Highlights

- Peak load of 20,524 MW occurred on 05/20/2019 HB 16
- All-time summer capability period peak load of 33,956 MW occurred on 7/19/2013 HB 16
- 6.9 hours of Thunder Storm Alerts were declared
- 0 hours of NERC TLR level 3 curtailment
- NYISO began securing the Shoemaker-Chester 135kV (#27) facility in the Real-Time market on May 31, 2019 and in the Day-Ahead Market execution occurring on May 31, 2019 for the June 1, 2019 market day.
- The following table identifies the estimated production cost savings associated with the Broader Regional Market initiatives.

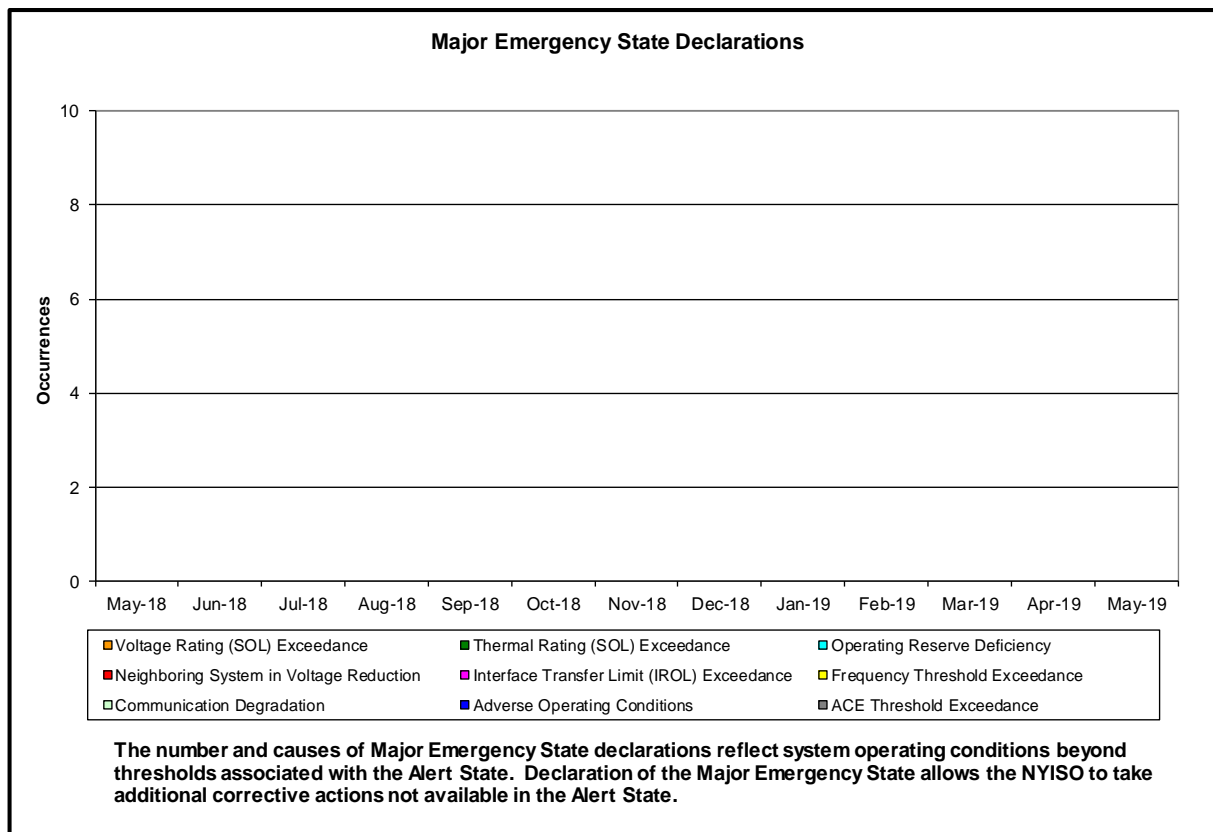
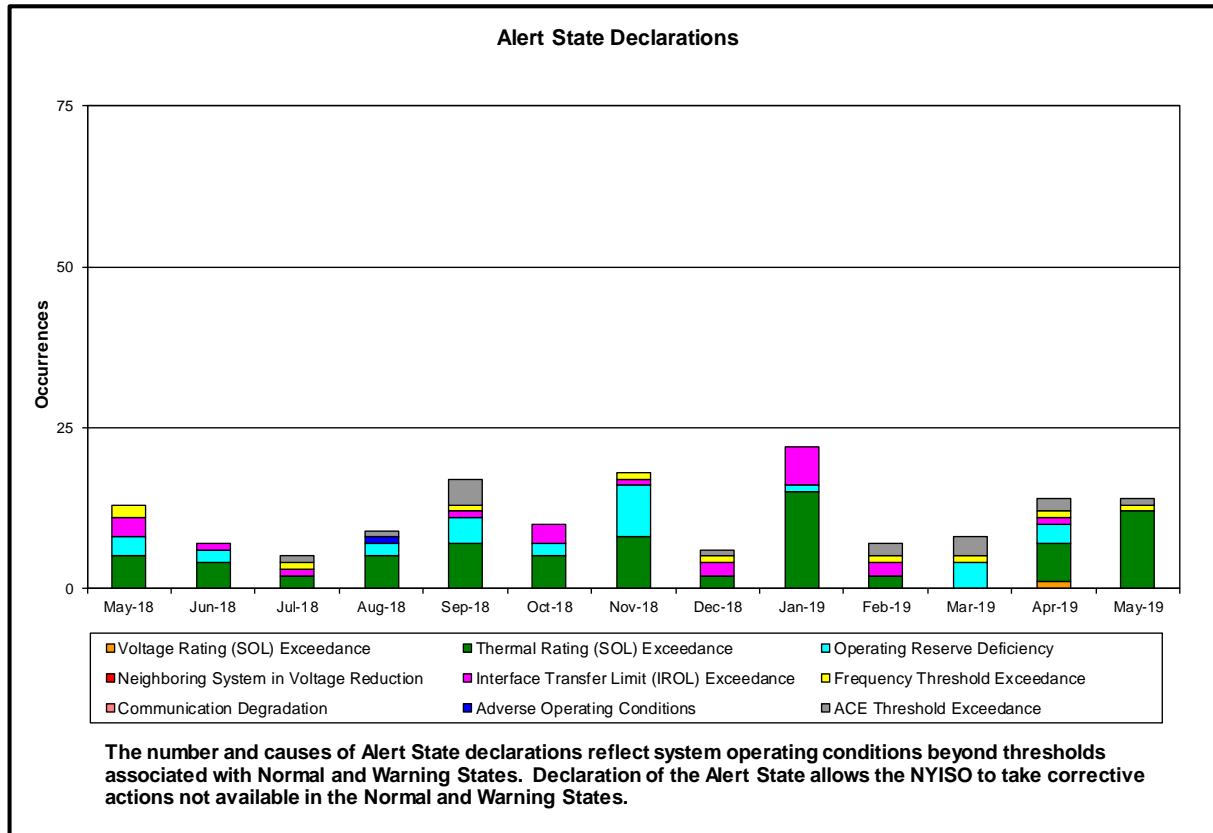
	<b>Current Month Value (\$M)</b>	<b>Year-to-Date Value (\$M)</b>
<b>NY Savings from PJM-NY Congestion Coordination</b>	\$0.42	\$5.60
<b>NY Savings from PJM-NY Coordinated Transaction Scheduling</b>	(\$0.35)	(\$0.16)
<b>NY Savings from NE-NY Coordinated Transaction Scheduling</b>	(\$0.38)	(\$0.39)
<b>Total NY Savings</b>	<b>(\$0.31)</b>	<b>\$5.05</b>
<b>Regional Savings from PJM-NY Coordinated Transaction Scheduling</b>	\$0.25	\$2.19
<b>Regional Savings from NE-NY Coordinated Transaction Scheduling</b>	\$0.00	\$0.23
<b>Total Regional Savings</b>	<b>\$0.25</b>	<b>\$2.42</b>

- Statewide uplift cost monthly average was (\$0.11)/MWh
- The following table identifies the Monthly ICAP spot market prices and the price delta.

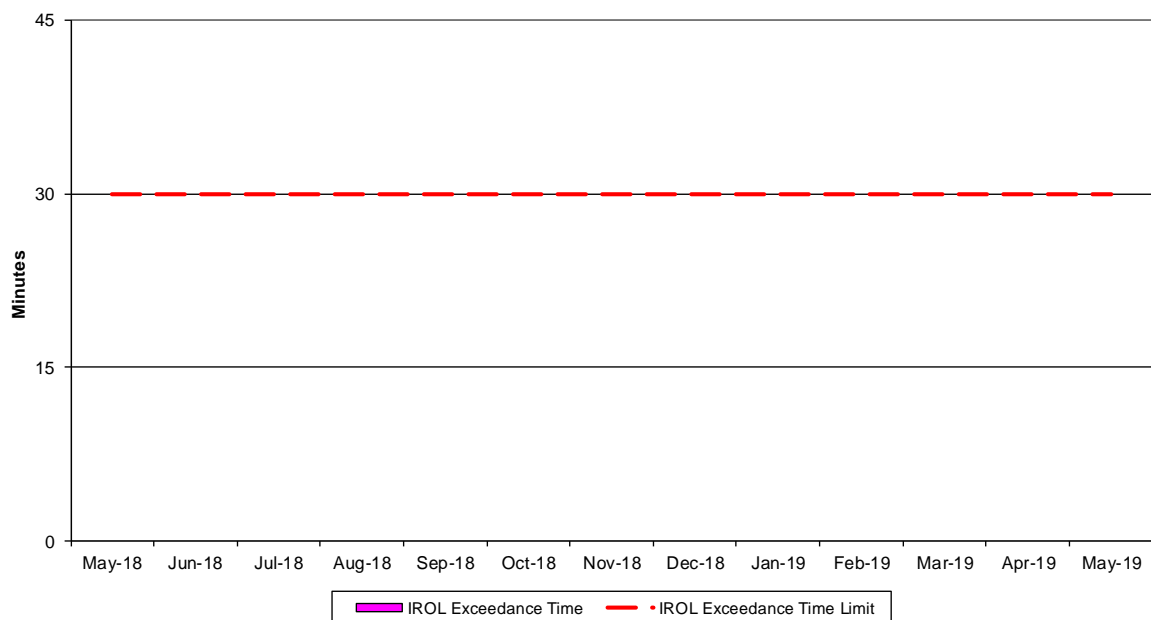
Spot Auction Price Results	NYCA	Lower Hudson Valley Zones	New York City Zone	Long Island Zone
June 2019 Spot Price	\$1.80	\$5.21	\$13.79	\$5.94
May 2019 Spot Price	\$1.14	\$5.43	\$13.92	\$5.98
Delta	\$0.66	(\$0.22)	(\$0.13)	(\$0.04)

- NYC: Price is decreased by \$0.13 due primarily to an increase in SCR UCAP Available
- LHV: Price is decreased by \$0.22 due primarily to an increase in SCR UCAP Available and decrease in Unoffered
- NYCA: Price is increased by \$0.66 due primarily to a decrease in net imports, partially offset by a decrease in Unsold

## Reliability Performance Metrics

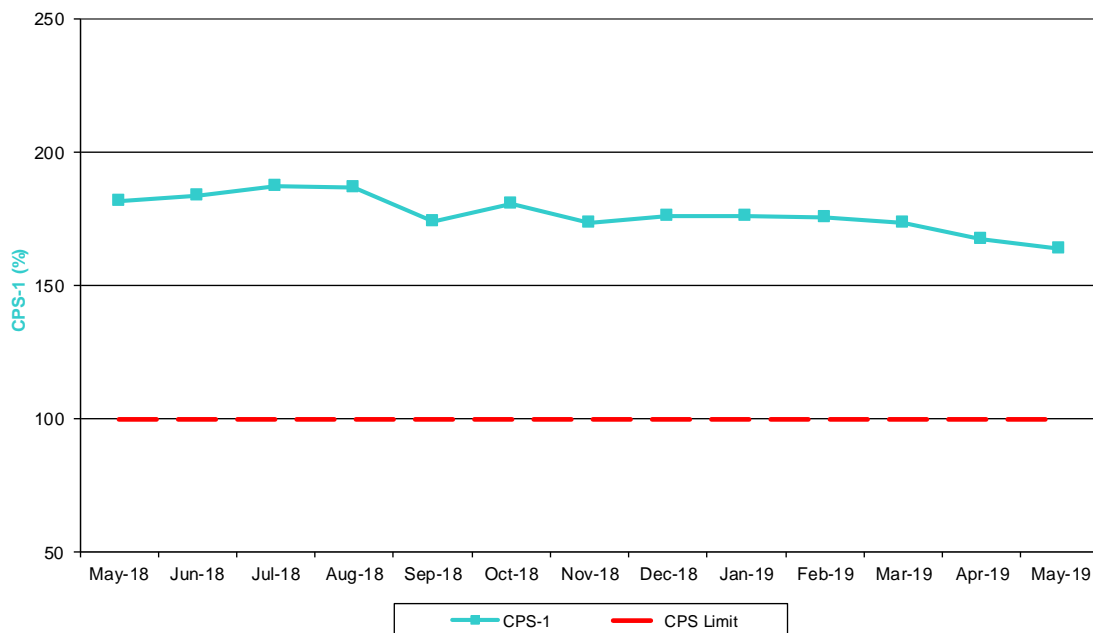


### NERC IROL Time Over Limit



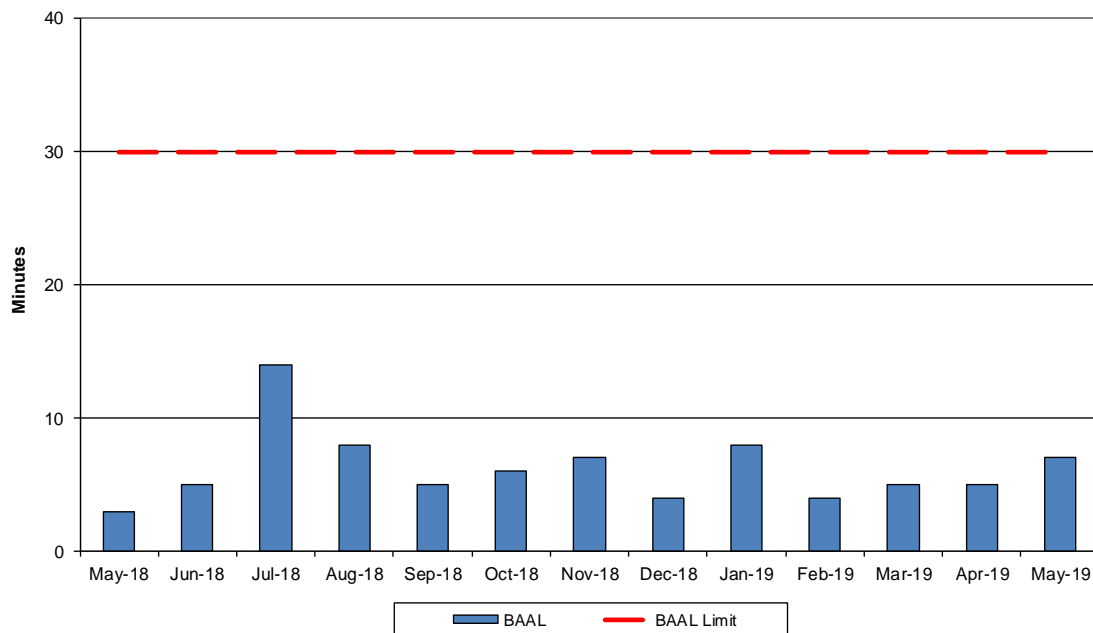
For IROL exceedances leading to Major Emergency State declarations, the maximum IROL exceedance time is identified. IROL exceedances of less than thirty minutes are considered NERC compliant.

### NERC Control Performance Standards



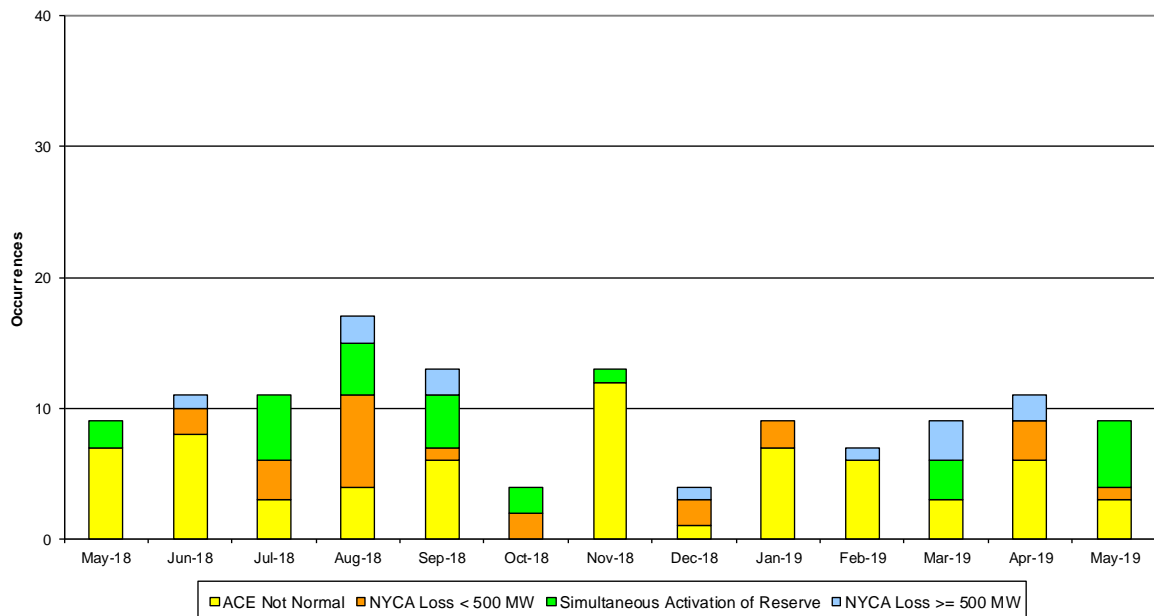
The value of NERC Control Performance Standards (CPS-1) is an indicator of the NYISO Area resource and demand balancing. Values exceeding the identified threshold are NERC compliant.

### NERC Balancing Authority ACE Limit Standard



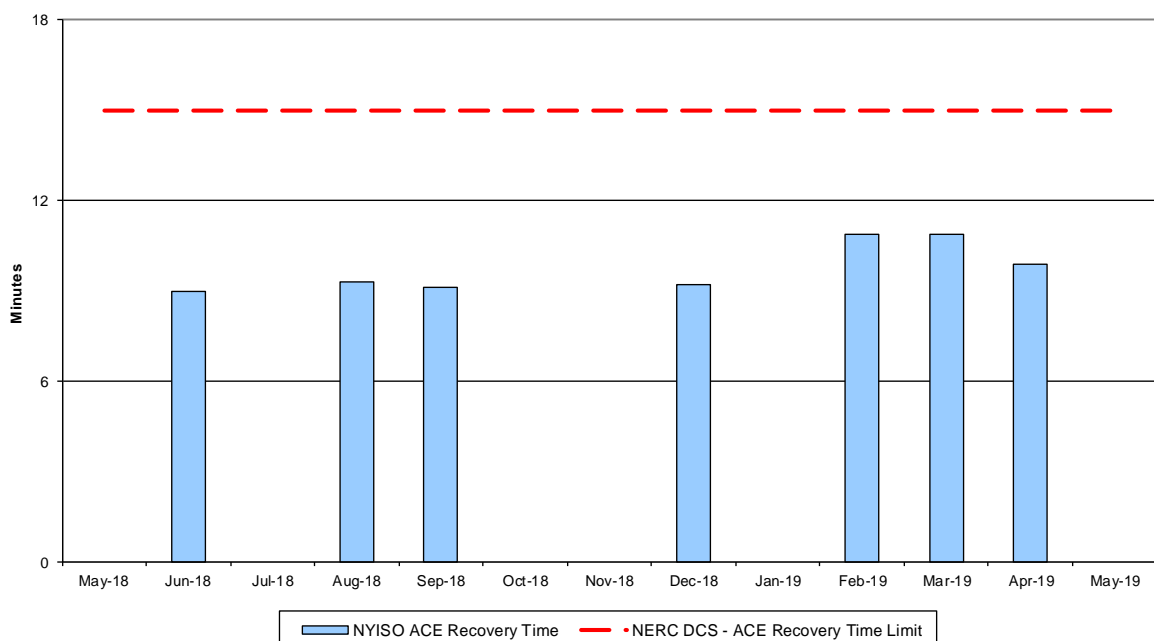
The amount of time the clock-minute average ACE exceeds the clock-minute Balancing Authority ACE Limit (BAAL) is an indicator of the NYISO Area resource and demand balancing. The maximum BAAL exceedance time is identified. BAAL exceedances of less than 30 consecutive clock-minutes are NERC compliant.

### Reserve Activations



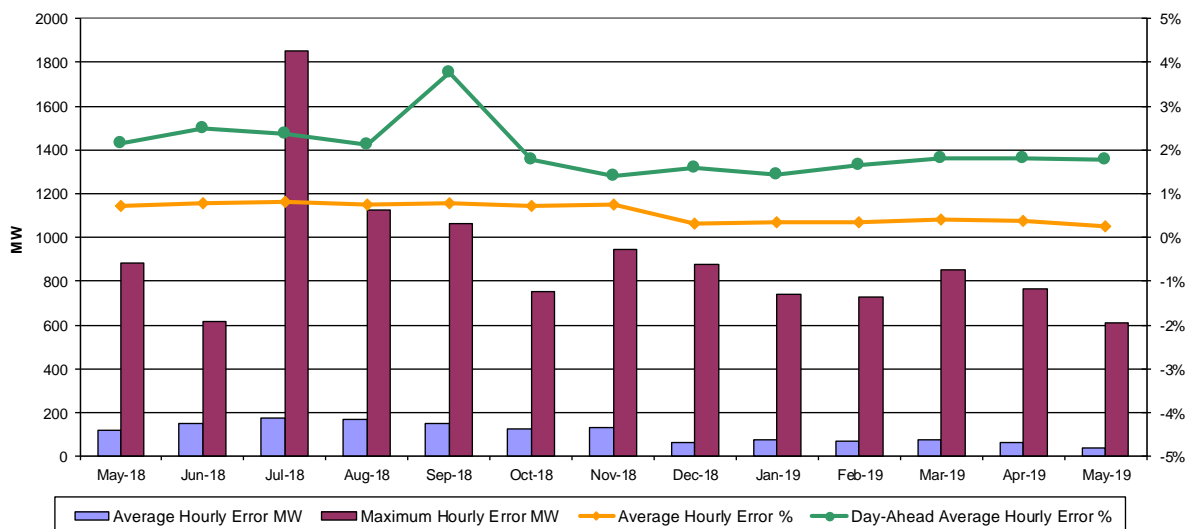
NYISO Reserve Activations are indicators of the need to respond to unexpected operational conditions within the NYISO Area or to assist a neighboring Area (Simultaneous Activation of Reserves) by activating an immediate resource and demand balancing operation.

### DCS Event Time to ACE Recovery



For NYISO initiated Reportable Disturbances, the maximum ACE recovery time is identified. Recovery times of less than 15 minutes are considered NERC compliant.

### Load Forecast Performance

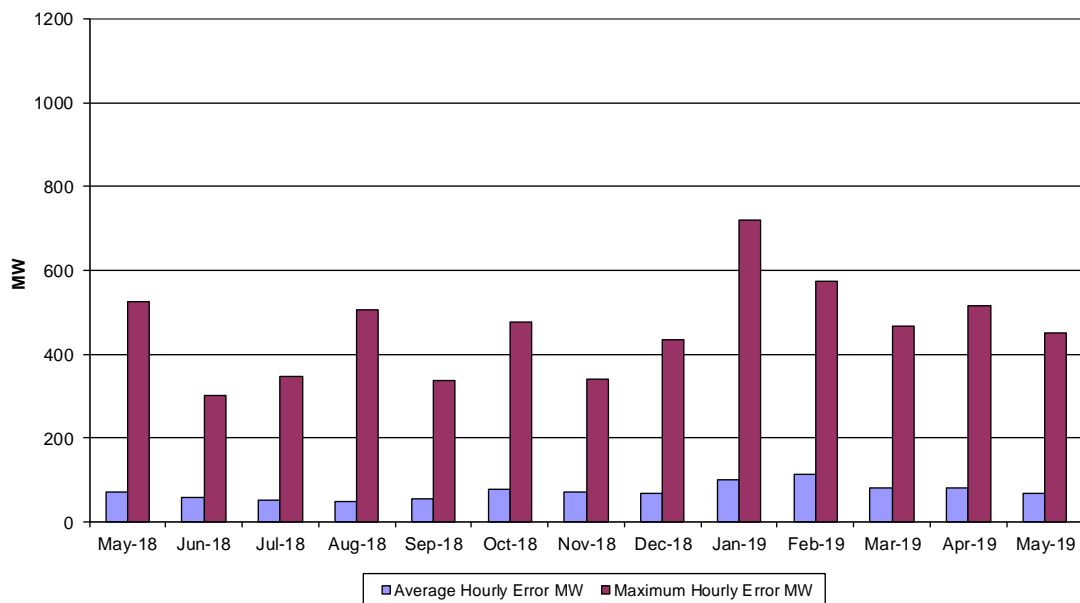


**Hourly Error MW** - Absolute value of the difference between the hourly average actual load demand and the average hour ahead forecast load demand.

**Average Hourly Error %** - Average value of the ratio of hourly average error magnitude to hourly average actual load demand.

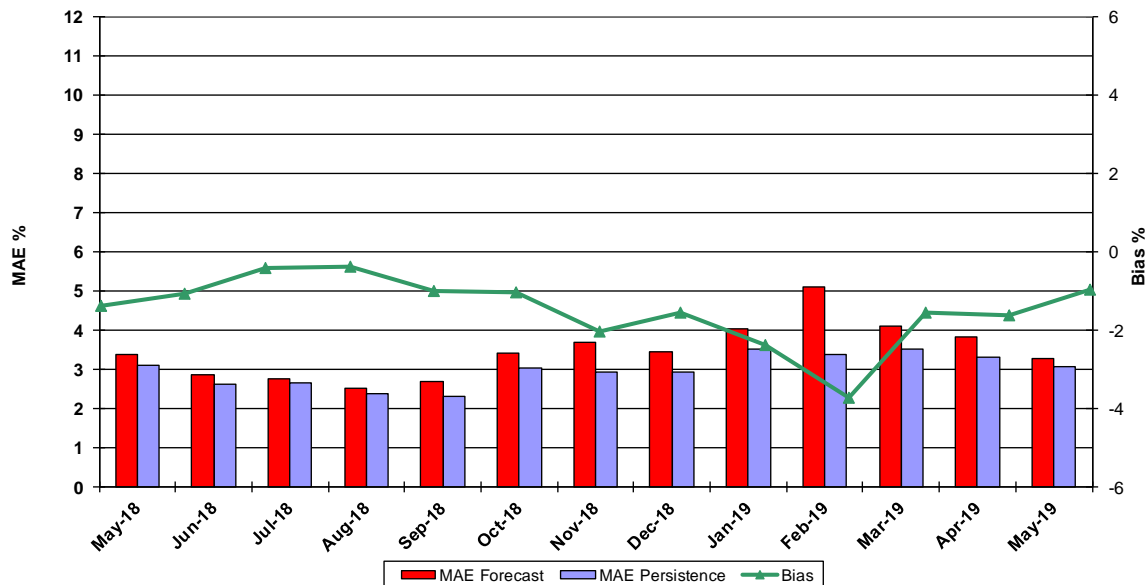
**Day-Ahead Average Hourly Error %** - Average across all hours of the month of the absolute value of the difference between actual load demand and the Day-Ahead forecast load demand, divided by the actual load demand.

### Wind Forecast Performance Hour Ahead MW Error



**Hourly Error MW** - Absolute value of the difference between the hourly average actual wind generation and the average hour ahead forecast wind generation.

### Wind Forecast Performance Hour Ahead Percent Error

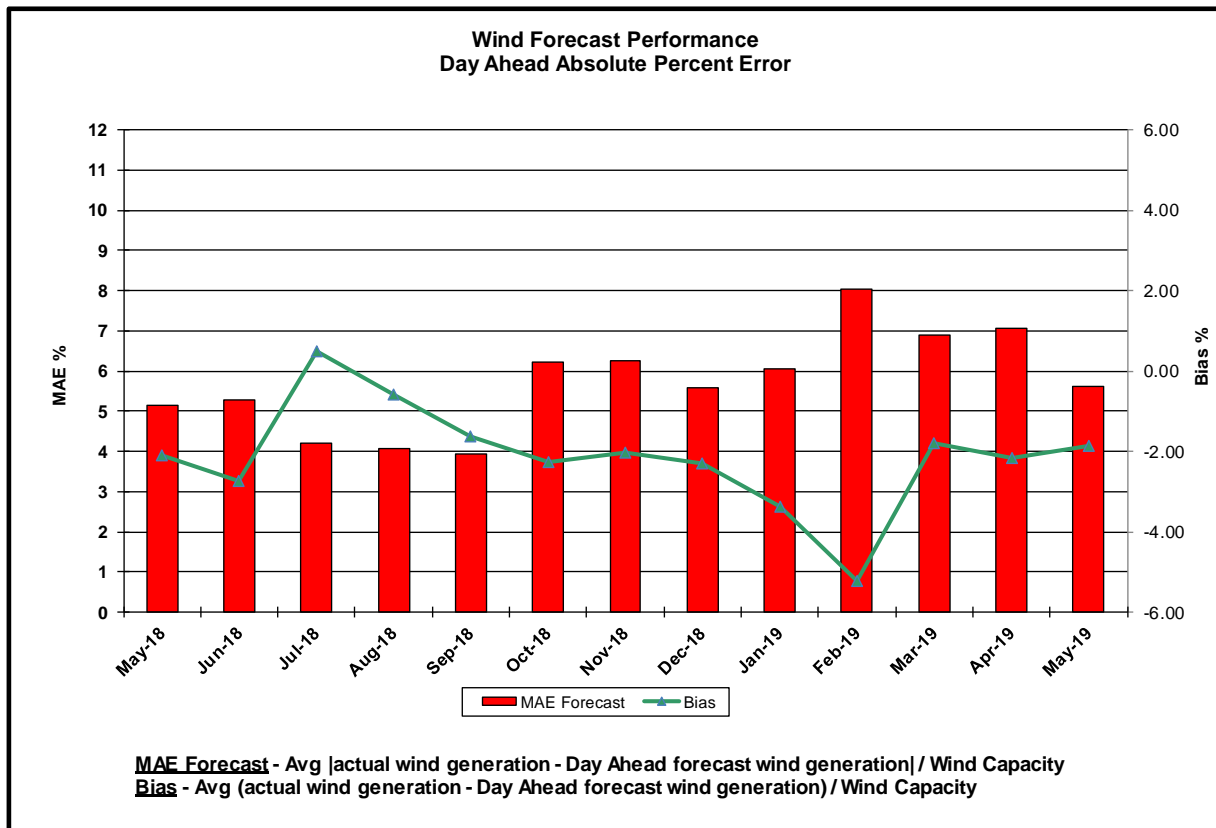
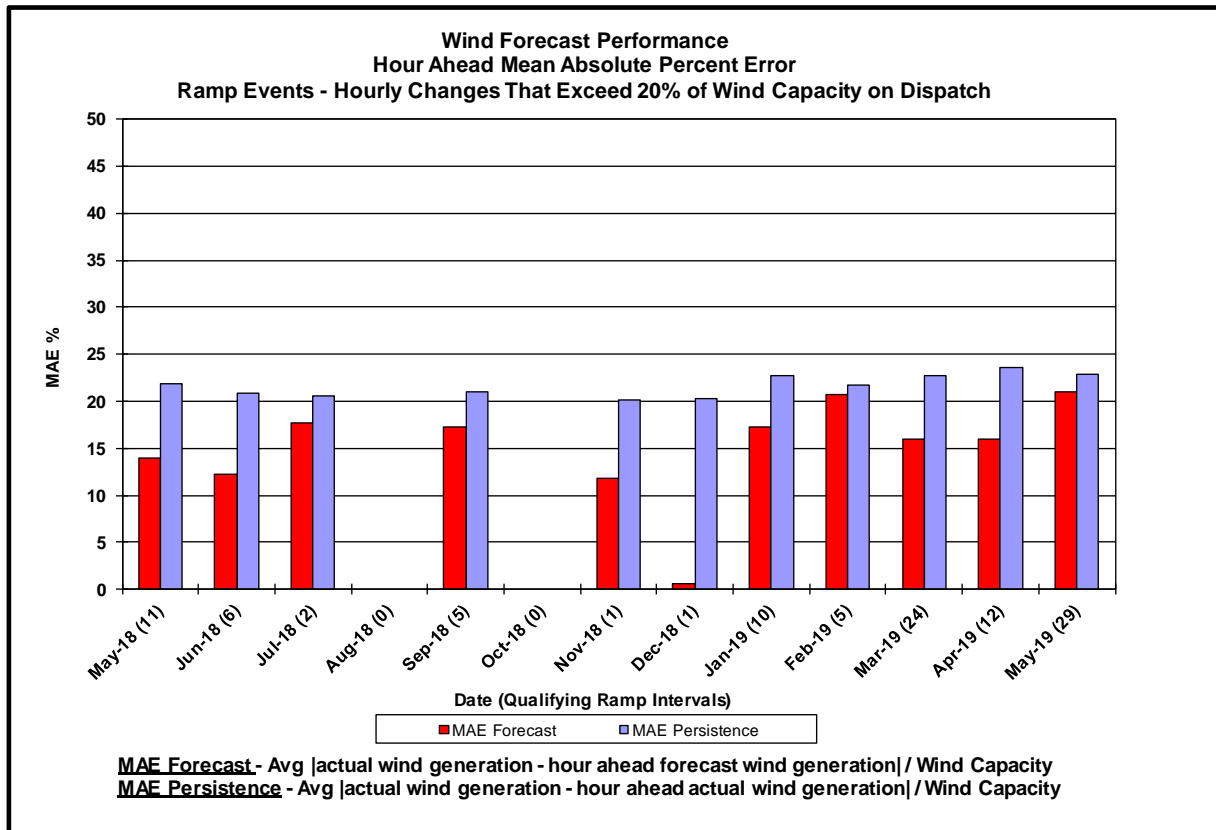


**MAE Forecast** - Avg |actual wind generation - hour ahead forecast wind generation| / Wind Capacity

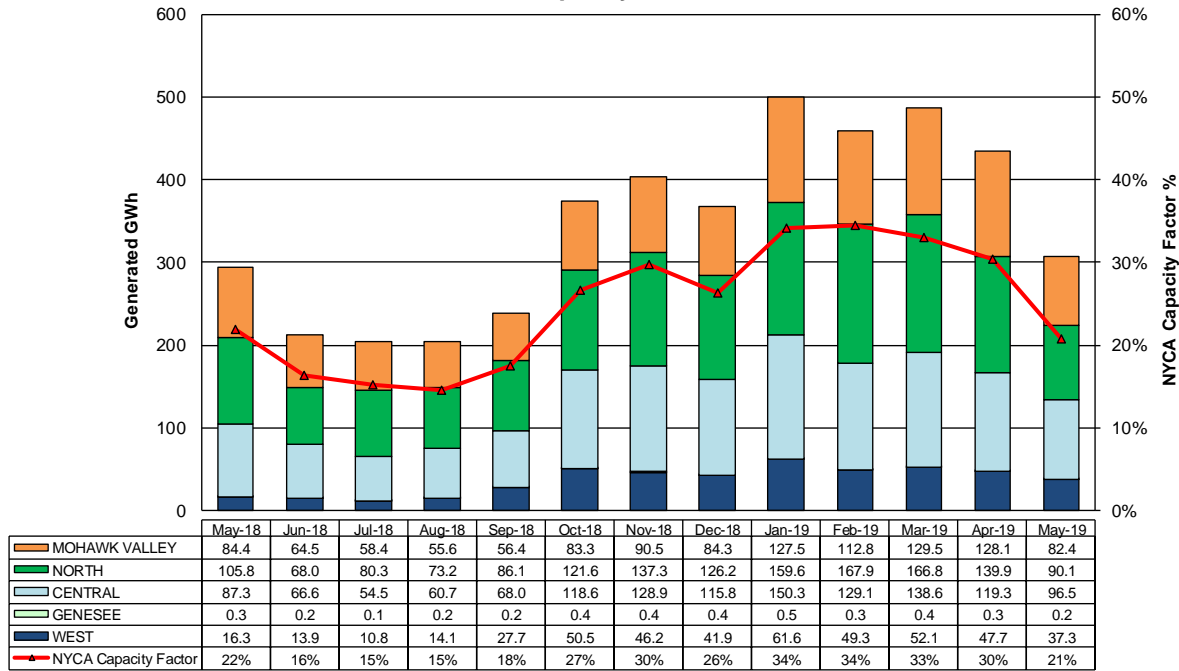
**MAE Persistence** - Avg |actual wind generation - hour ahead actual wind generation| / Wind Capacity

**Bias** - Avg (actual wind generation - hour ahead forecast wind generation) / Wind Capacity



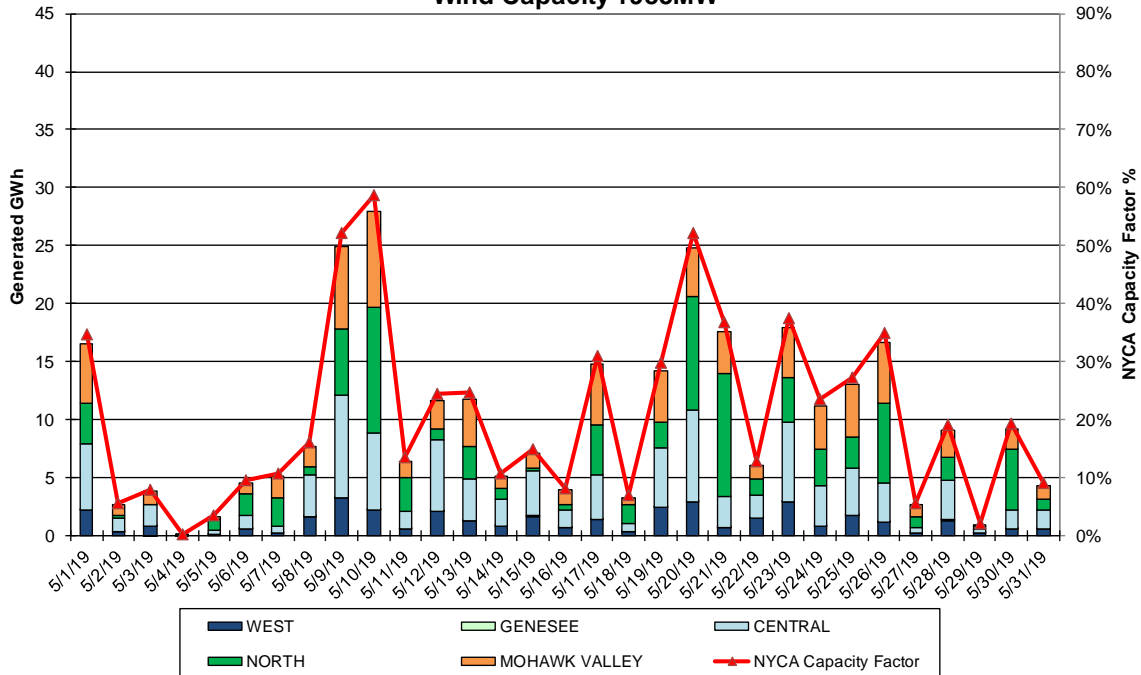


### Wind Performance Monthly Production and Capacity Factor Wind Capacity 1985MW

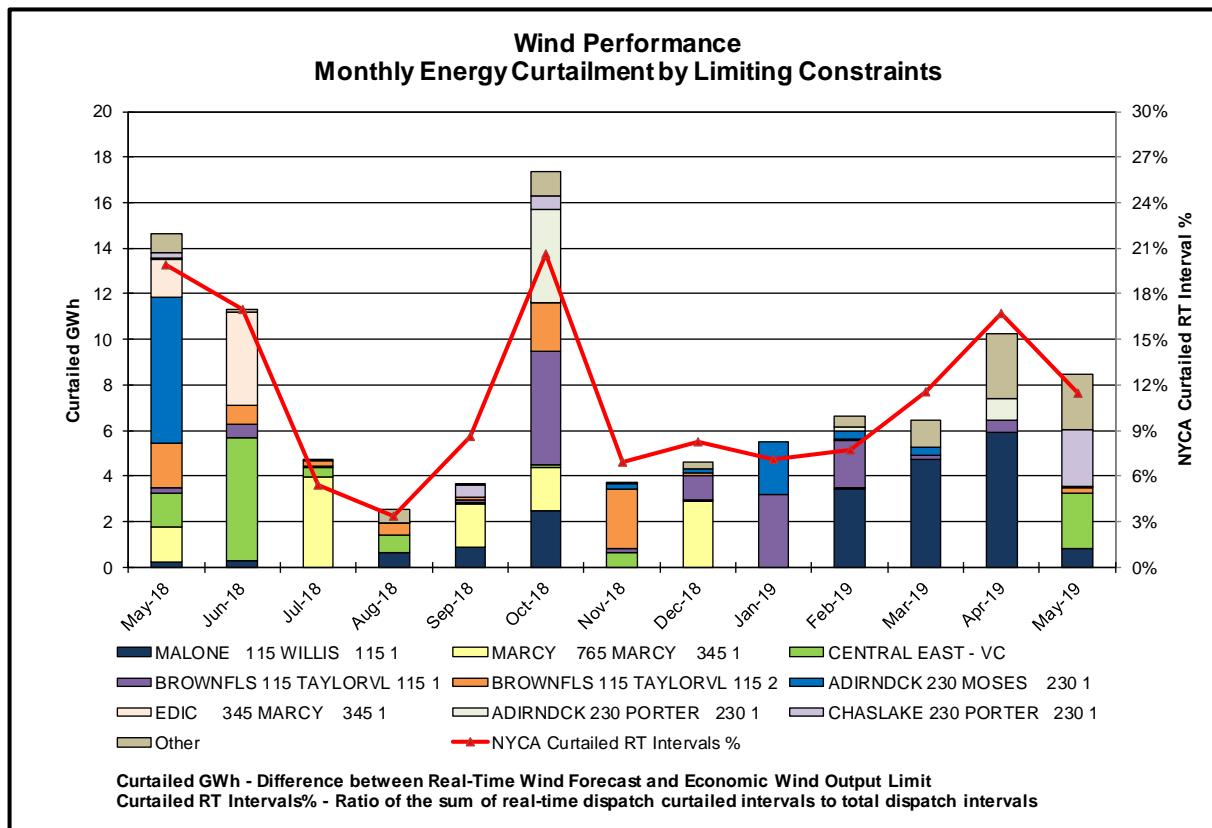
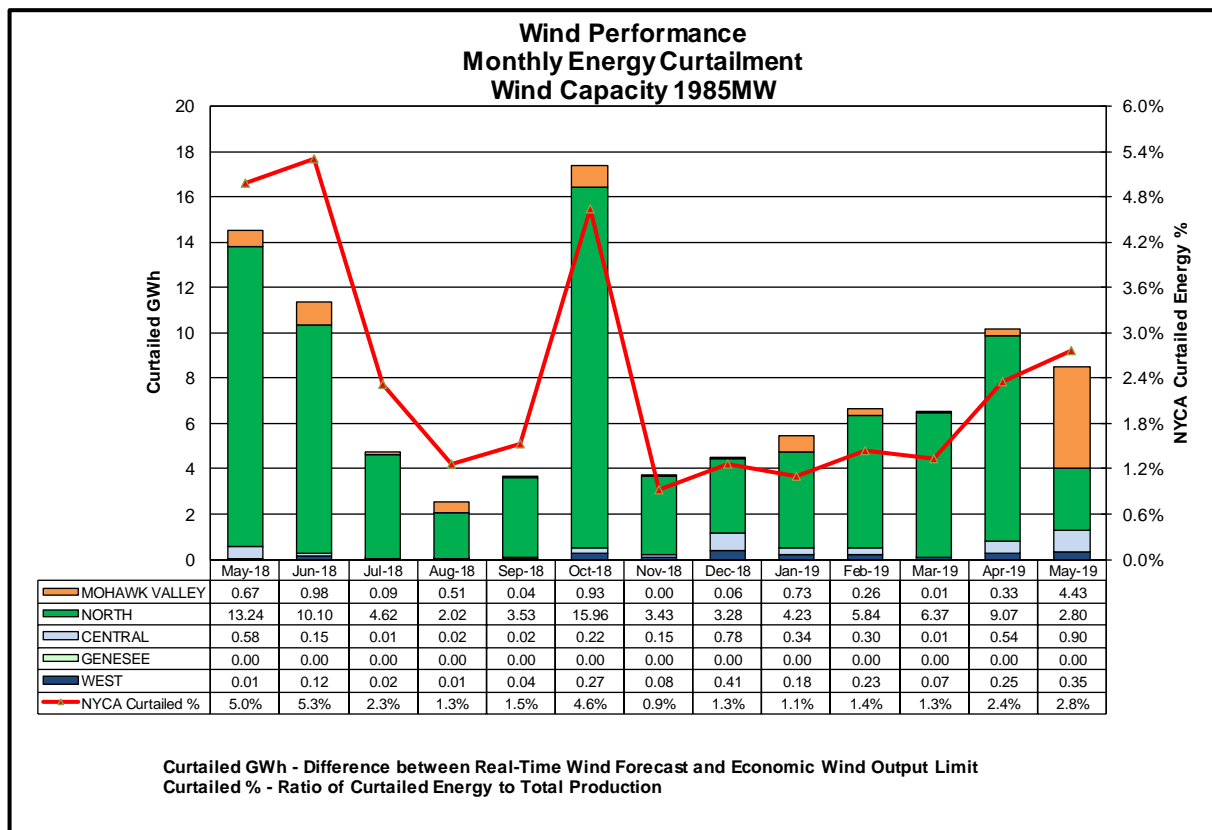


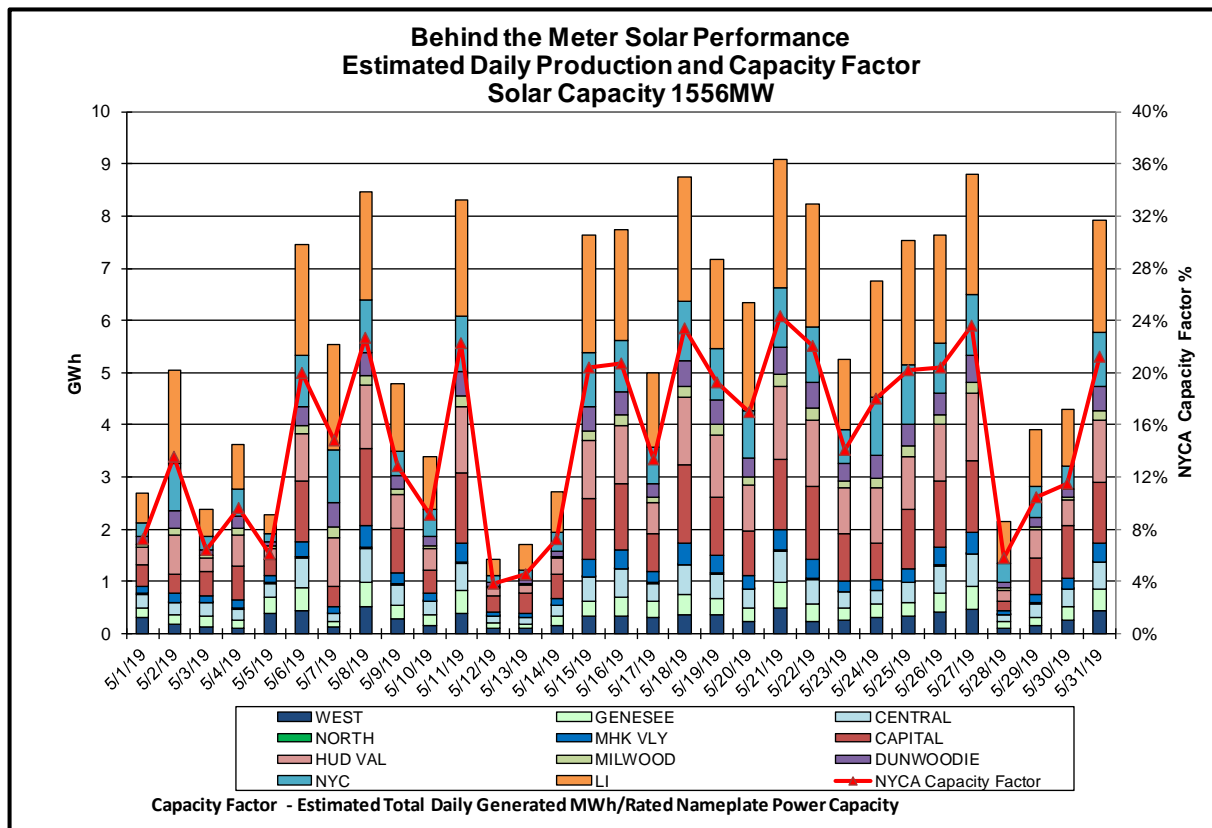
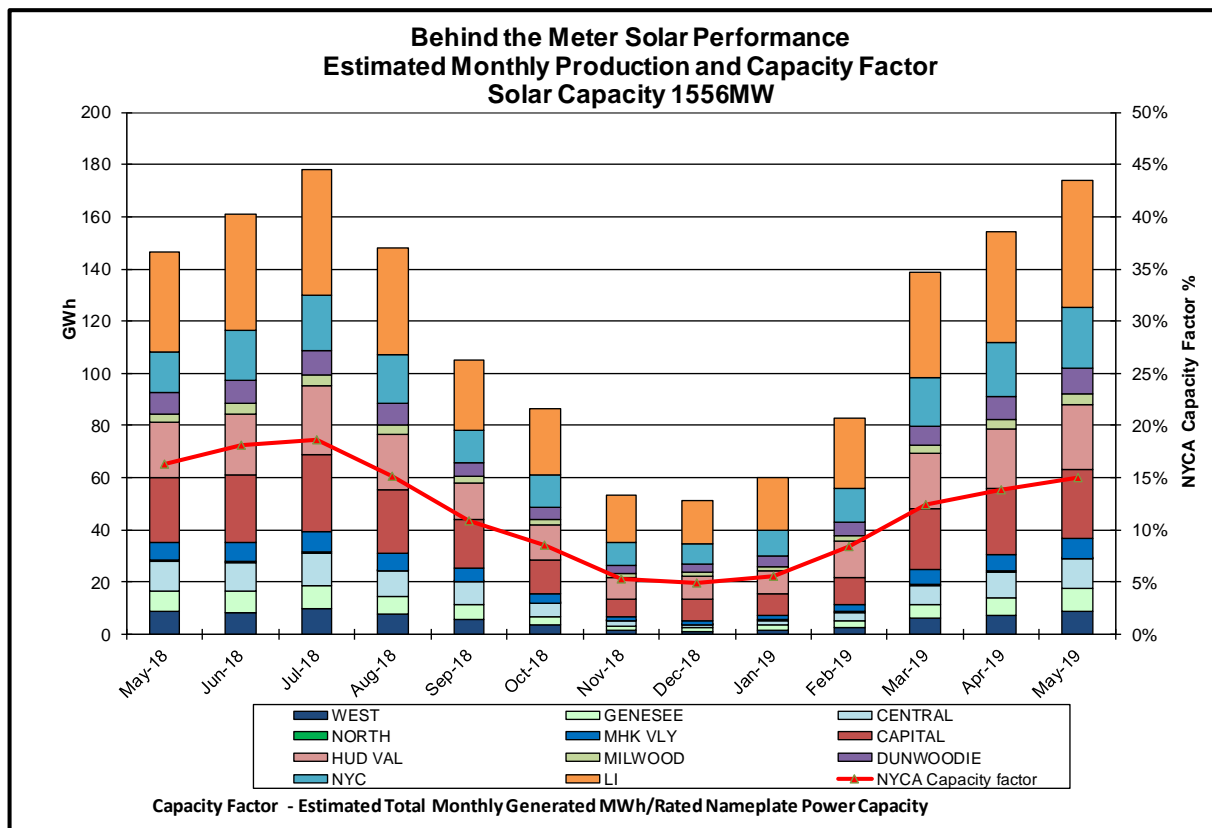
Capacity Factor - Total Monthly Generated MWh/Rated Nameplate Power Capacity

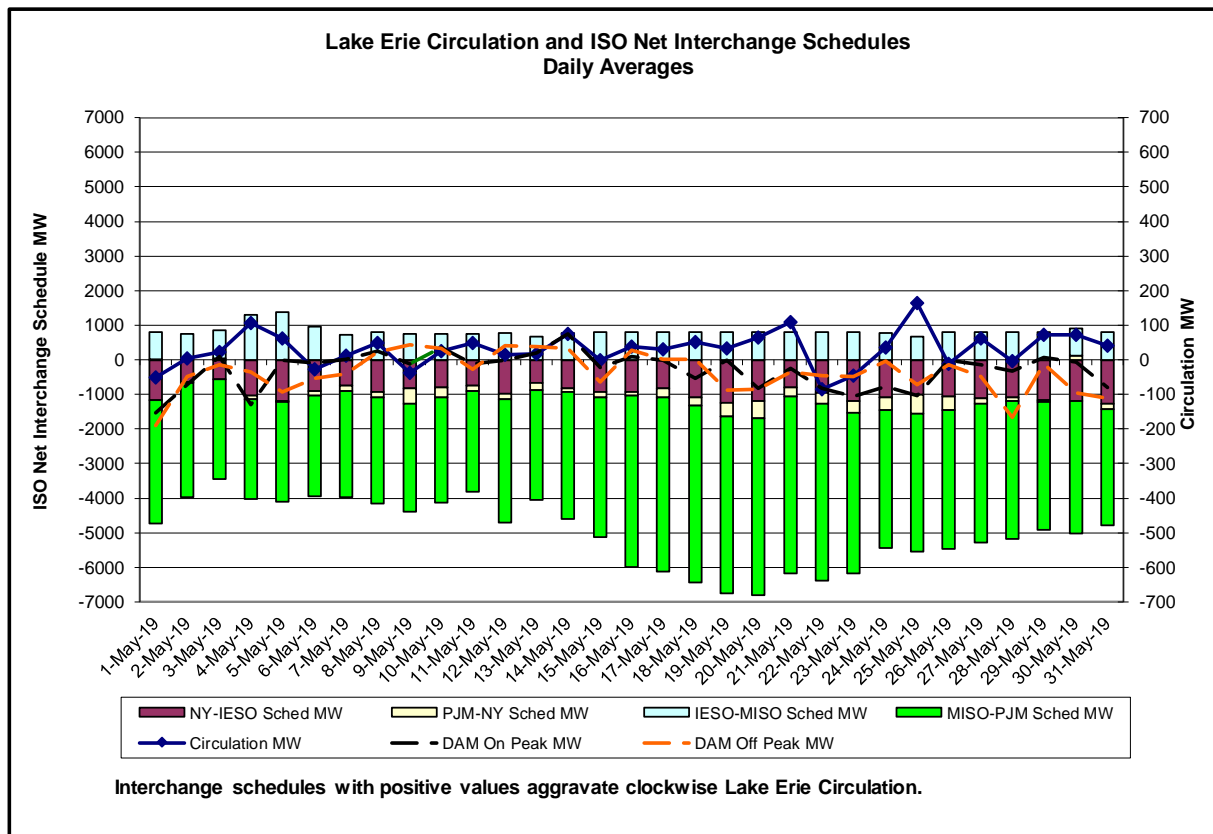
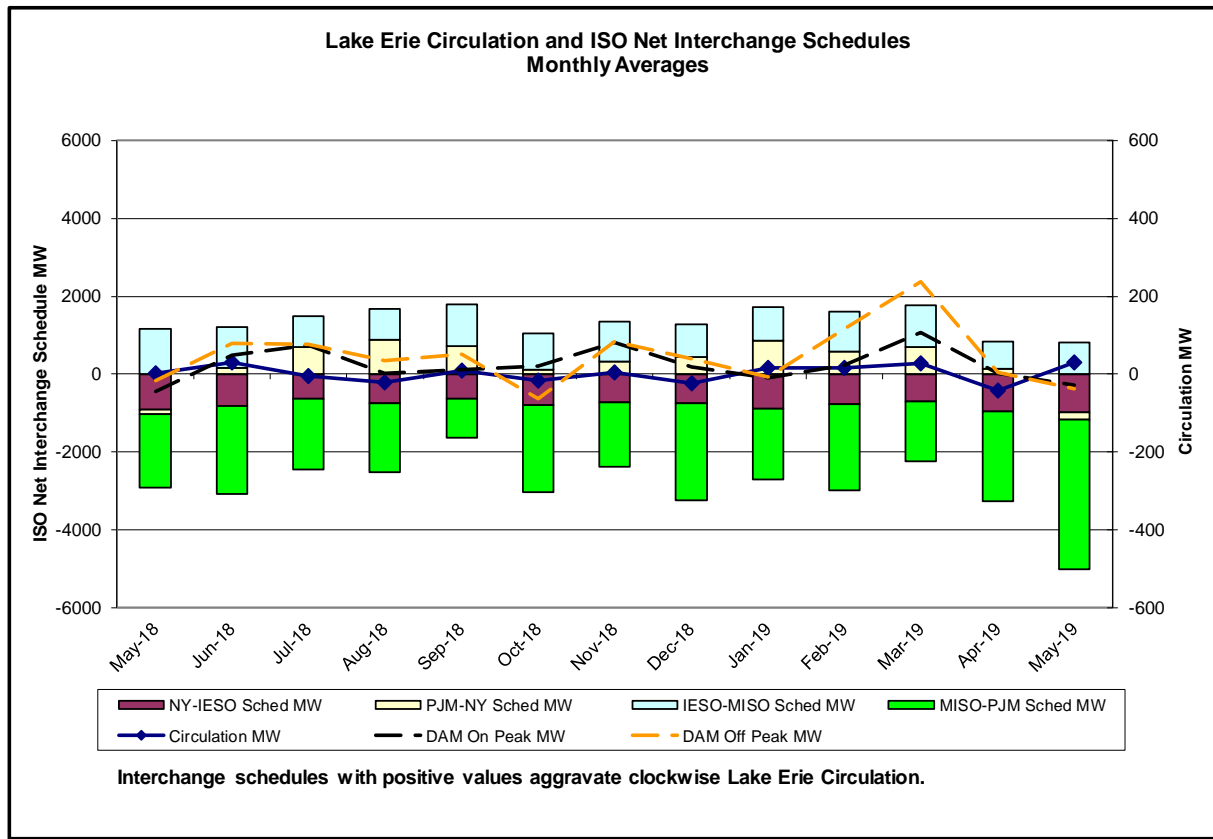
### Wind Performance Daily Production and Capacity Factor Wind Capacity 1985MW



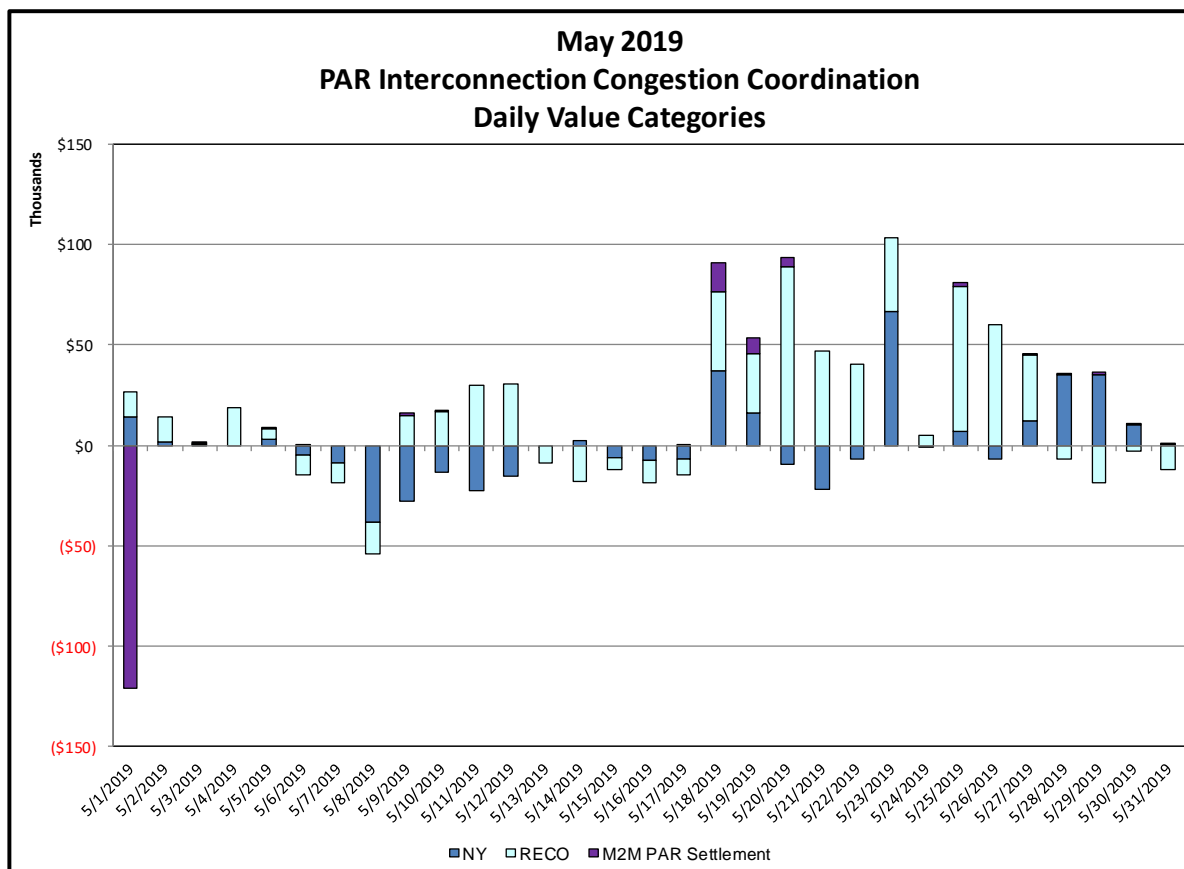
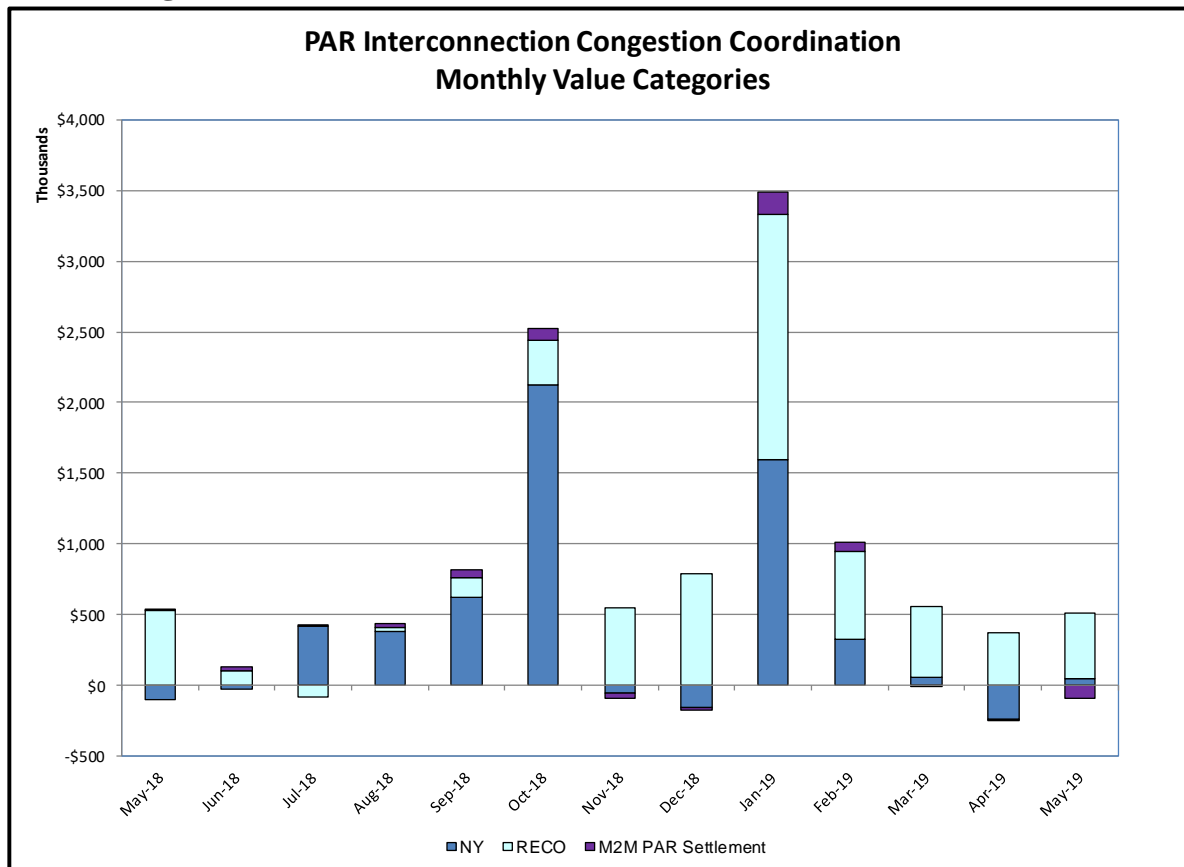
Capacity Factor - Total Daily Generated MWh/Rated Nameplate Power Capacity





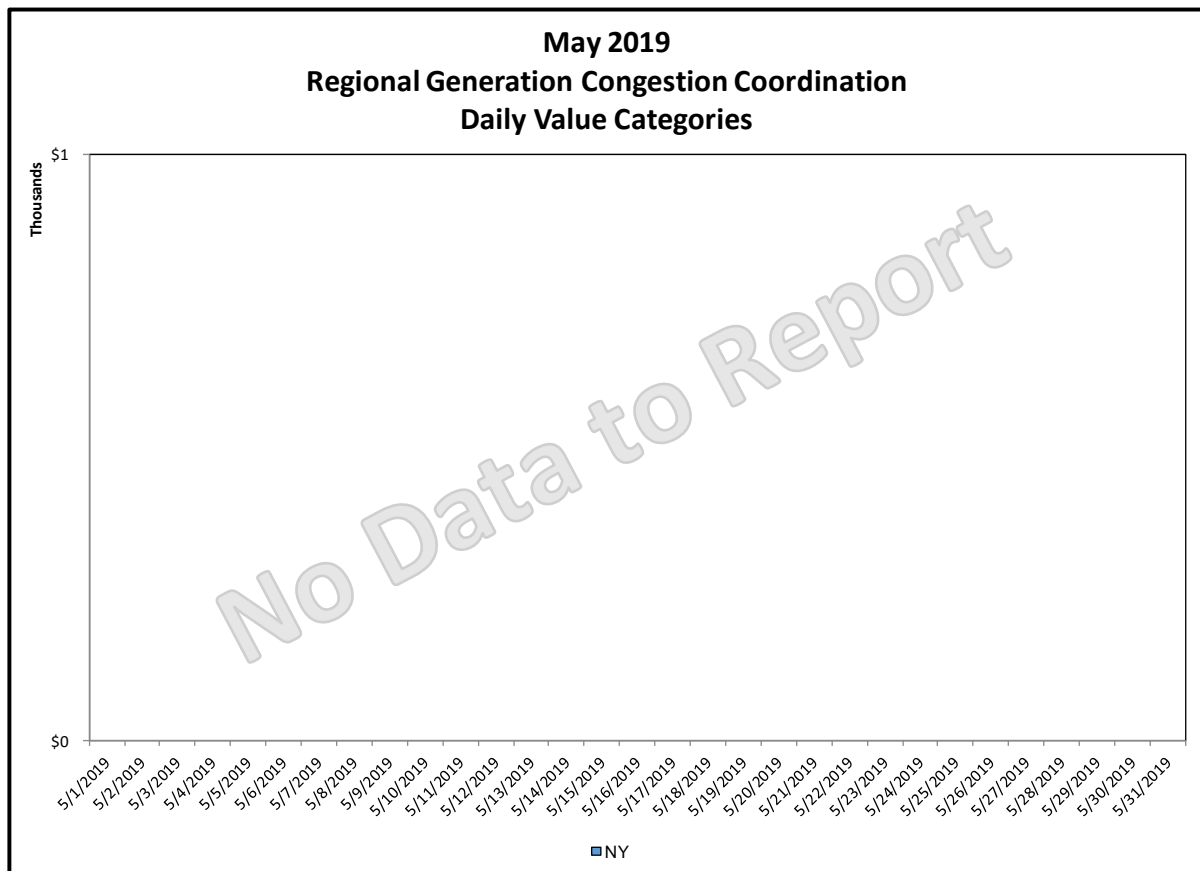
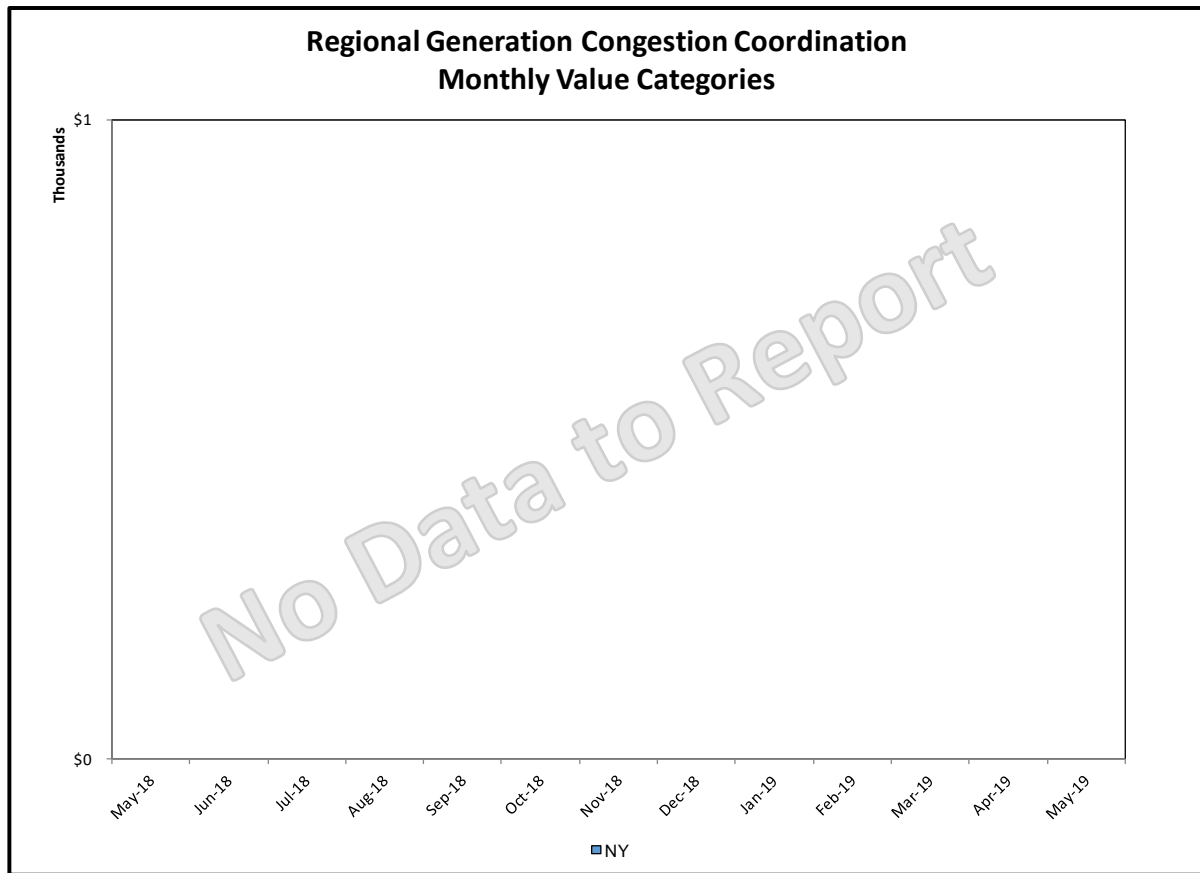


## Broader Regional Market Performance Metrics



### PAR Interconnection Congestion Coordination

<u>Category</u>	<u>Description</u>
NY	Represents the value NY realizes from Market-to-Market PAR Coordination when experiencing congestion. This is the estimated savings to NY for additional deliveries into NY
RECO	Represents the value of PJM's obligation to deliver 80% of service to RECO load over Ramapo 5018. This is the estimated reduction in NYCA congestion due to the PJM delivery of RECO over Ramapo 5018.
M2M PAR Settlement	Market-to-Market PAR Coordination settlement on coordinated flowgates. Through April 2017 this value was included in the NY and RECO categories. The positive sign convention indicates settlement to NY while the negative indicates settlement to PJM.





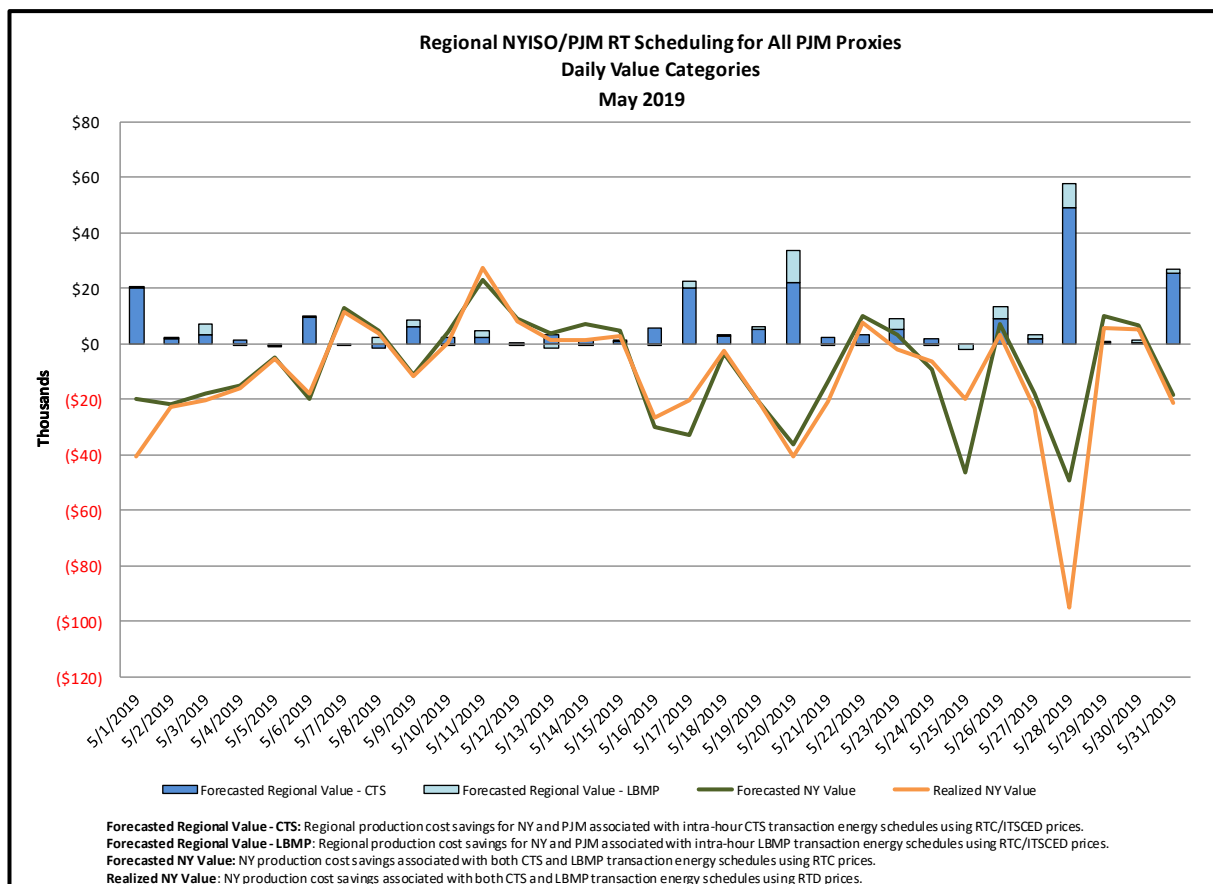
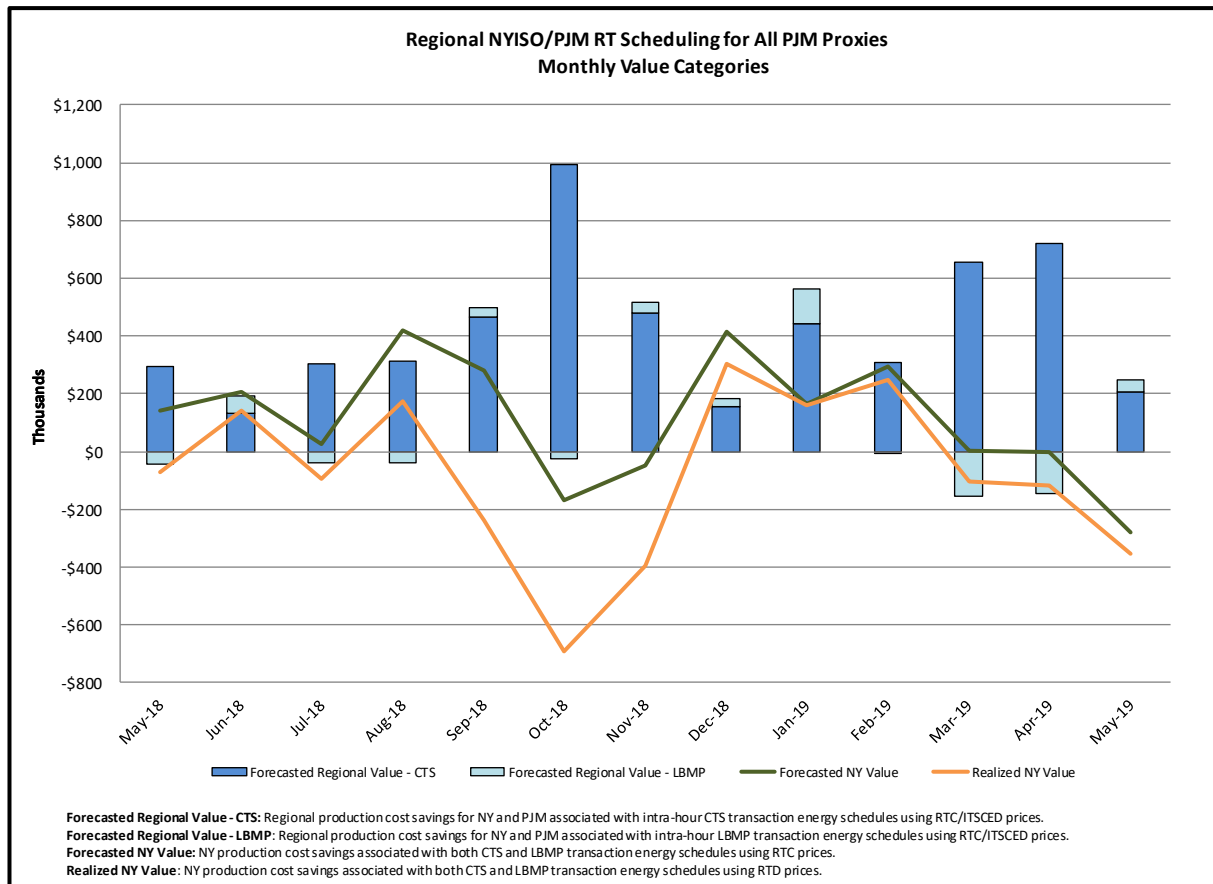
**Regional Generation Congestion Coordination**

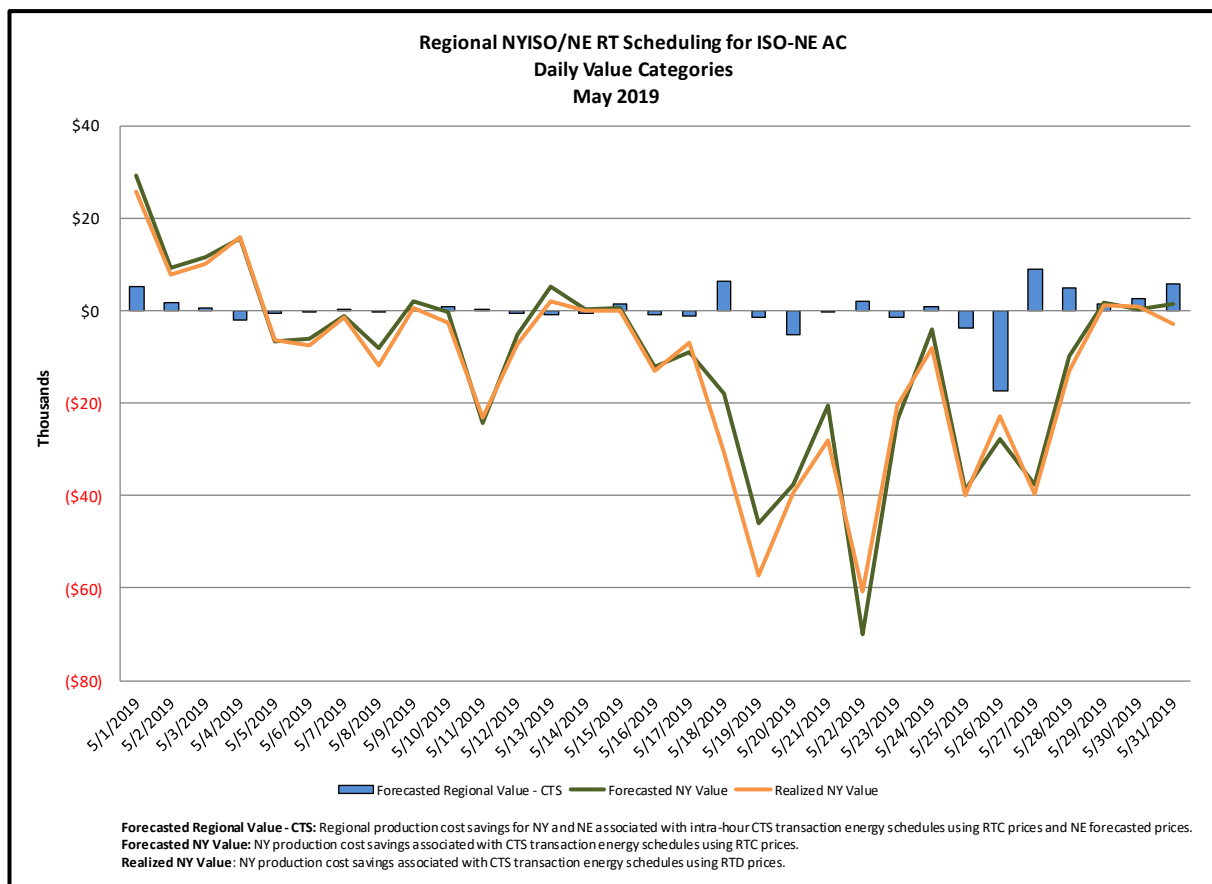
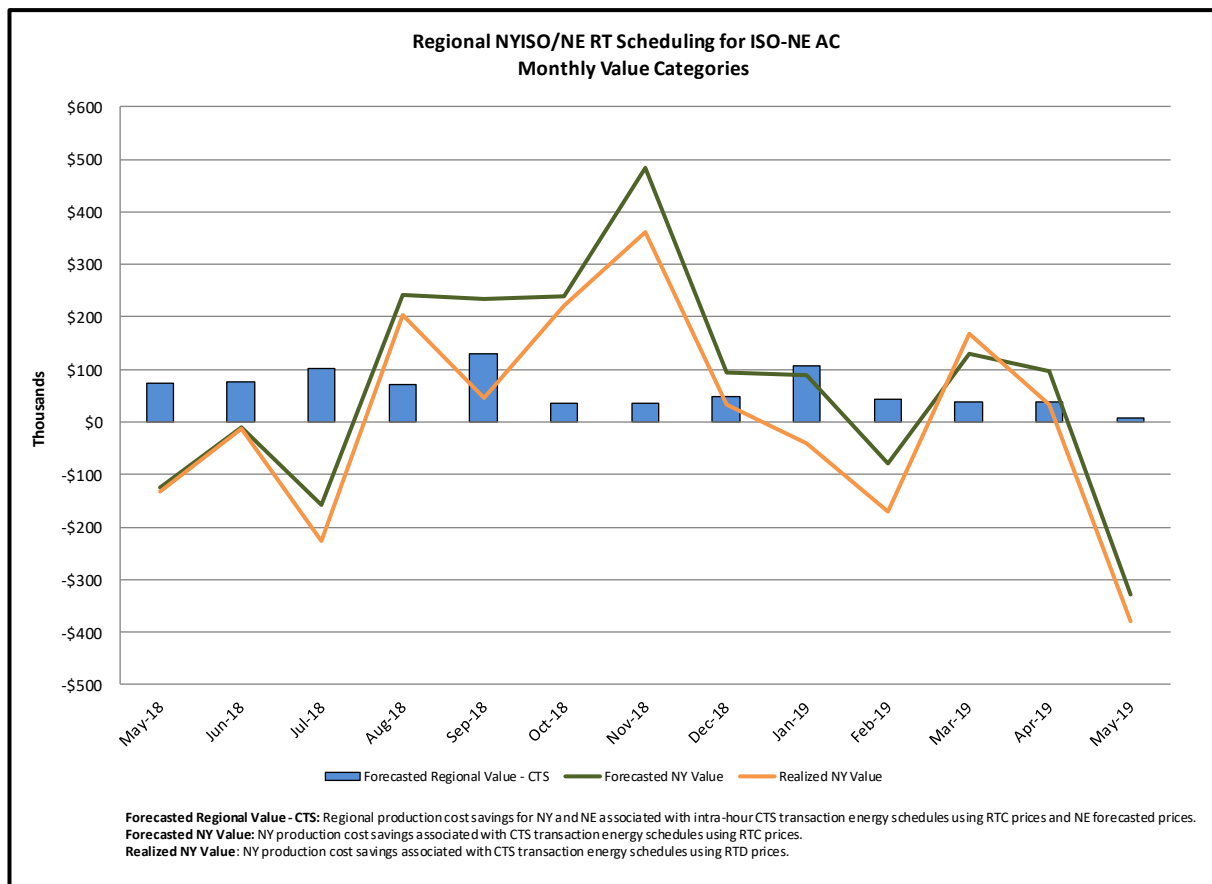
**Category**

NY

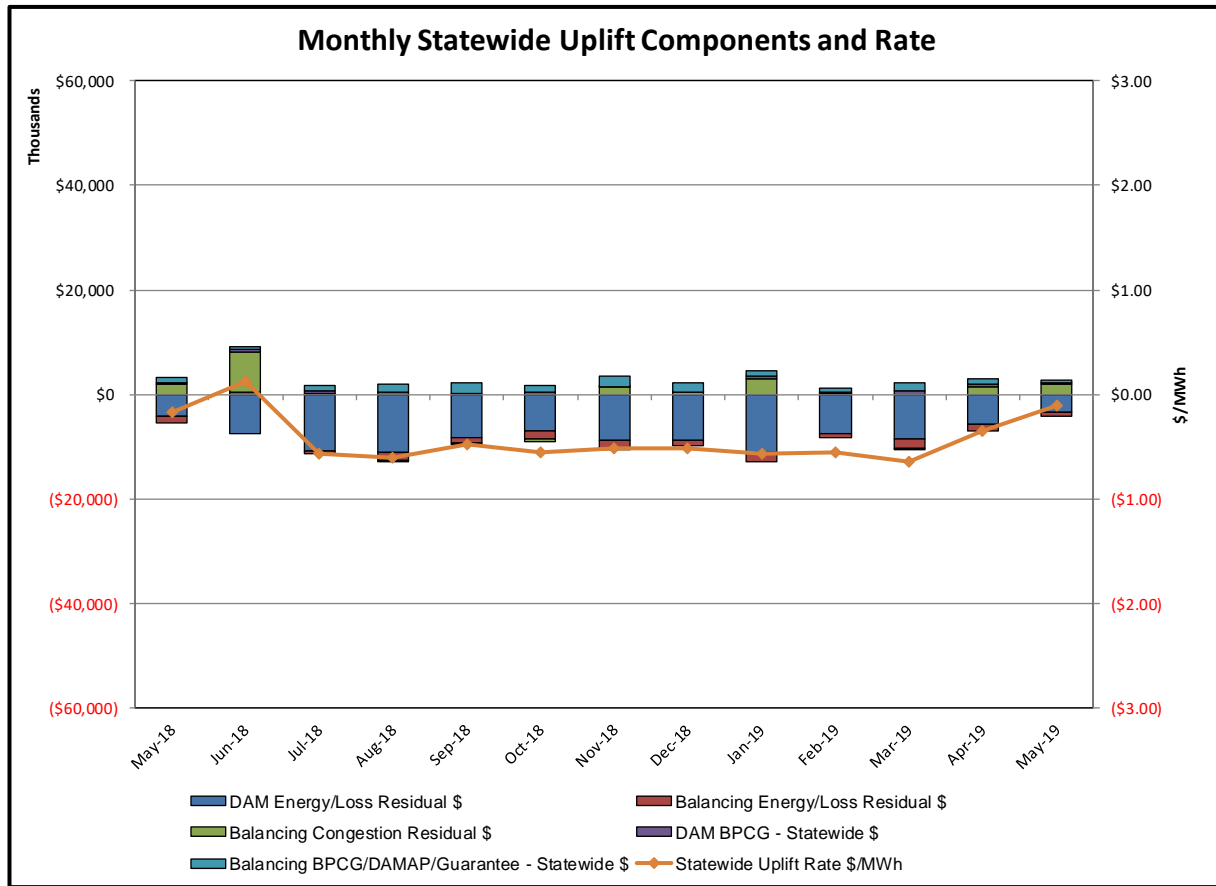
**Description**

NYISO savings that result from PJM payments to NYISO when PJM's transmission use (PJM's market flow) is greater than PJM's entitlement of the NY transmission system and NYISO is incurring Western or Central NY congestion. Additionally, NYISO savings may result from the more efficient regional utilization of PJM's generation resources to directly address Western or Central NY transmission congestion.

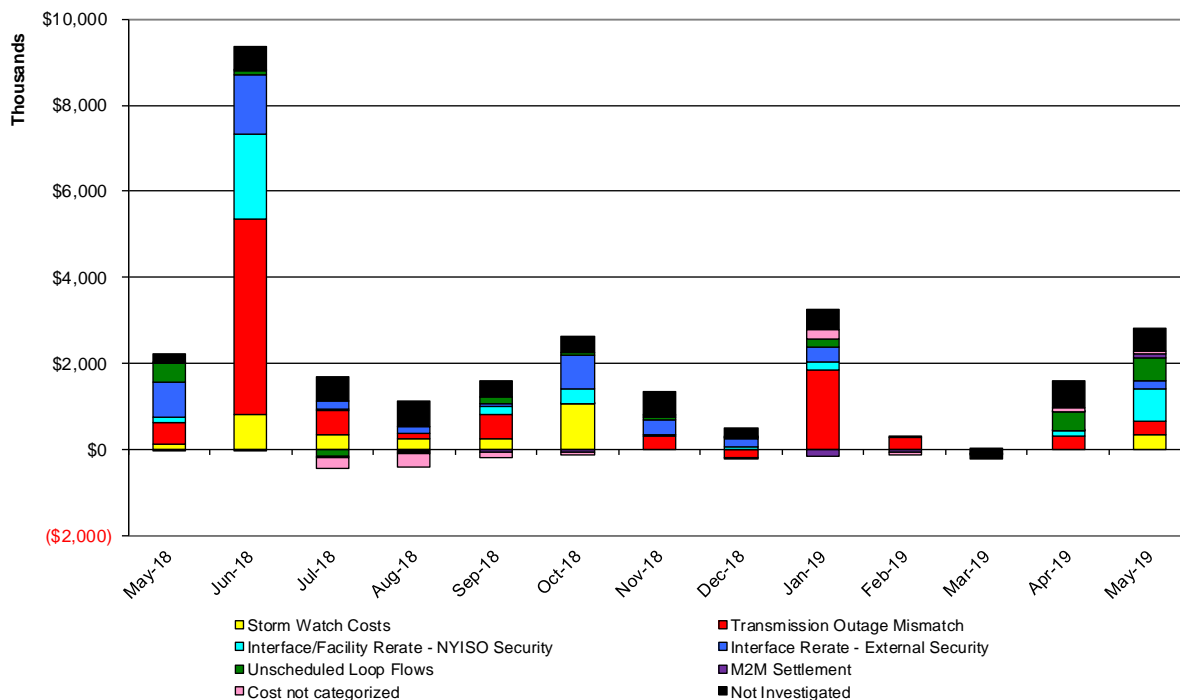




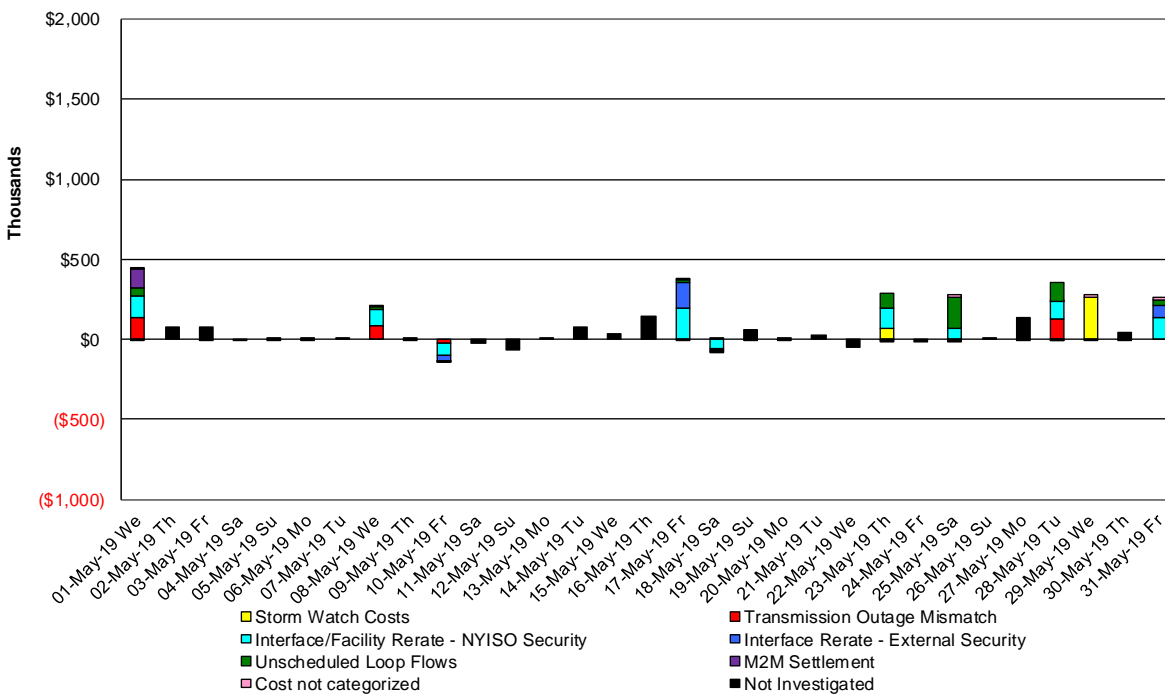
## Market Performance Metrics



### Balancing Market Congestion Residual Report Monthly Uplift Cost Categories



### May 2019 Balancing Market Congestion Residual Report Daily Uplift Cost Categories



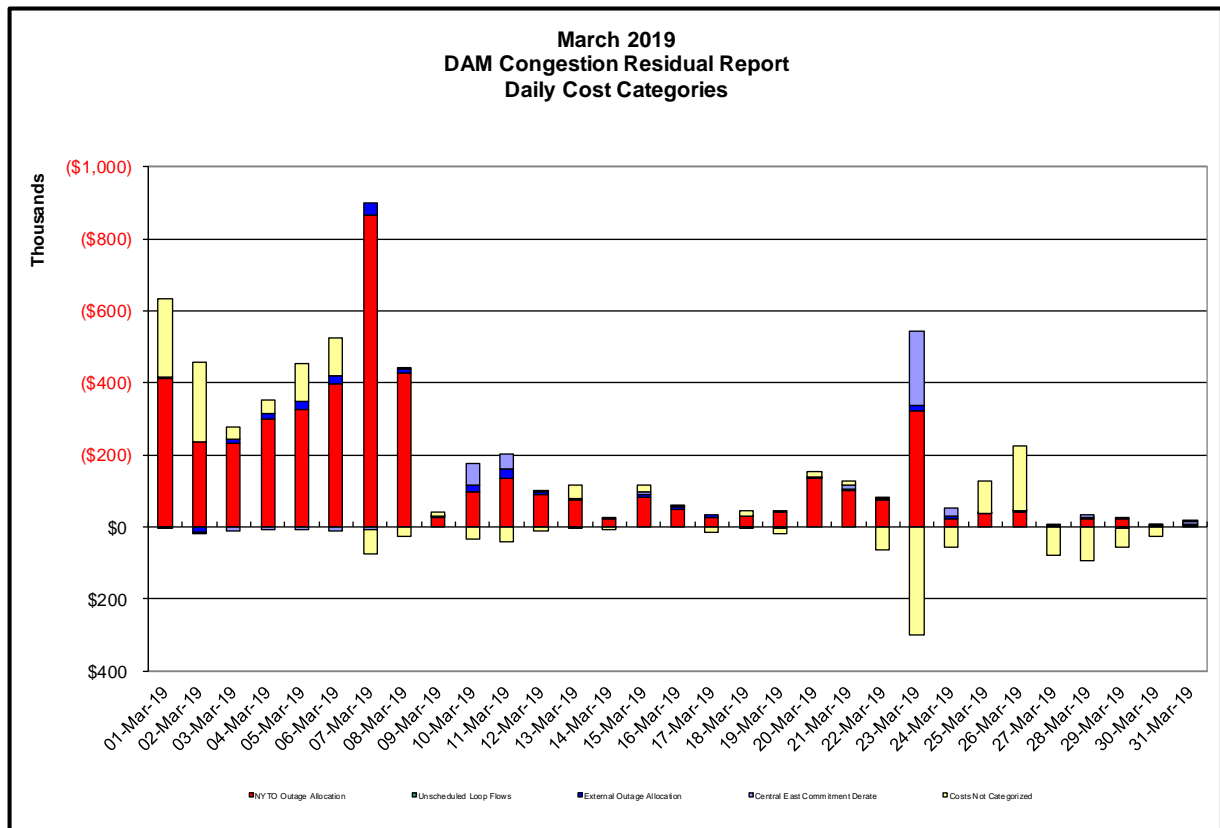
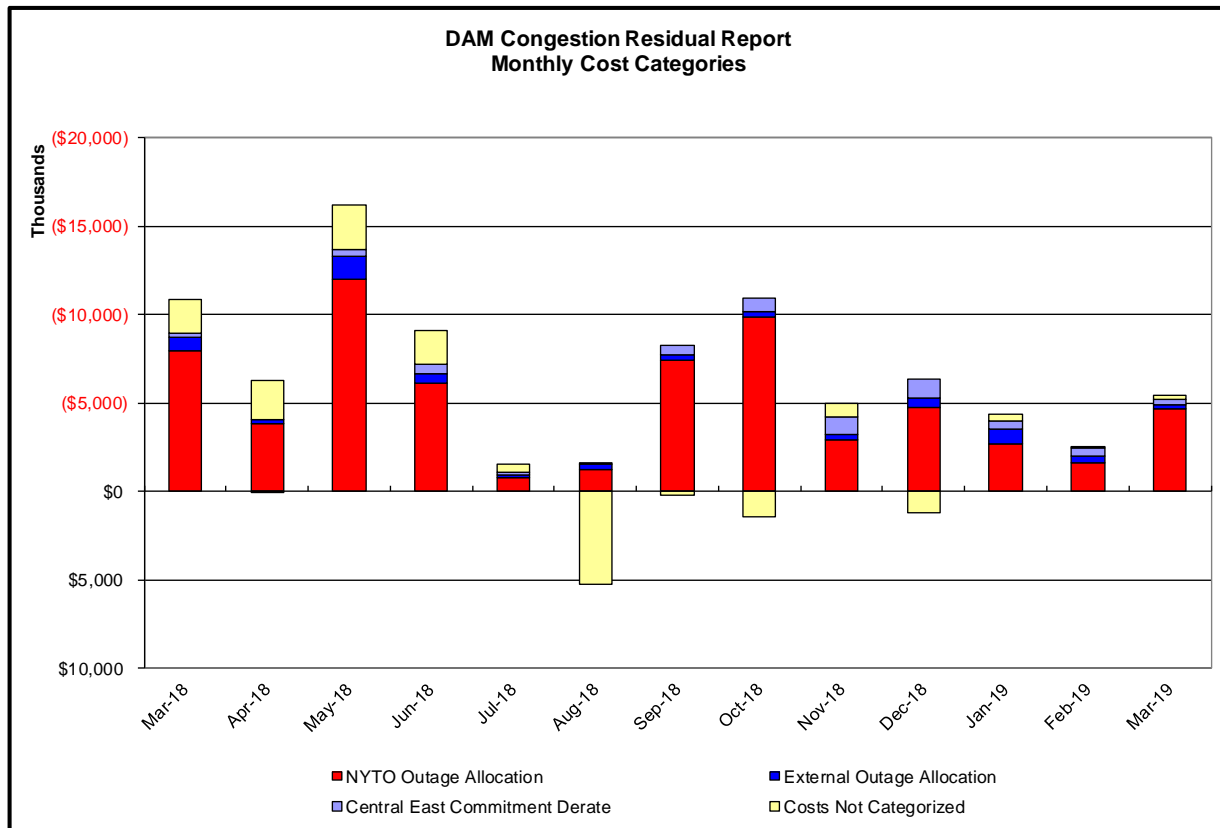
Day's investigated in May: 1,8,10,17,18,23,25,28,29,31			
Event	Date (yyyymmdd)	Hours	Description
	5/1/2019	6-14	Extended Outage Langner Road-Gardenville 115kV (#180)
	5/1/2019	8,13	NYCA DNI Ramp Limit
	5/1/2019	11,12	Derate Central East
	5/1/2019	18	Uprate Central East
	5/1/2019	10-14,16,17,19	Derate North Broadway-Erie St. 115kV (#181-922) for I/o TWR:PACKARD 77 & 78
	5/1/2019	8,10,11,16,17,19	Derate Niagara-Packard 230kV (#61) for I/o TWR:PACKARD 62 & BP76
	5/1/2019	18	NE_AC-NY Scheduling Limit
	5/1/2019	6-8,17,19	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV
	5/1/2019	7,17,19	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; Central East
	5/8/2019	10-18	Forced Outage Astoria Annex-E 13th Station 345kV (#Q35L)
	5/8/2019	16-18	Extended Outage Packard-Military Road 115kV (#130)
	5/8/2019	10,12-15,17,18	Forced Outage Farragut-Plymouth Street 138kV (#32078)
	5/8/2019	10,16-18	Derate Buffalo78-Walck Rd 115kV (#) I/o TWR:PACKARD 77 & 78
	5/8/2019	10-18,22,23	Derate MottHaven-Dunwoodie 345kV (#72)
	5/8/2019	16,17	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV
	5/10/2019	13,16,17	Early Return to Service Moses-Willis 230kV (#MW1)
	5/10/2019	13,16,17	Early Return to Service Duley-Plattsburg 230kV (#DP-1)
	5/10/2019	3,13,16-20	Uprate Central East
	5/10/2019	3,13,20,21	Uprate Dunwoodie-Shore Road 345kV for I/o NEPTUNE HVDC TIE LINE
	5/10/2019	13,16,18-20	Uprate East 179th Street-HellGate East 138kV (#15055)
	5/10/2019	13,16-21	Uprate Gowanus-Greenwood 138kV (#42232) for I/o TWR:GOETHALS 22 & 21
	5/10/2019	13,14,16-21	Uprate Geenwood-Vernon 138kV (#) for I/o TWR:GOETHALS 22 & 21
	5/10/2019	19	Uprate MottHaven-Dunwoodie 345kV (#72)
	5/10/2019	14	Derate MottHaven-Dunwoodie 345kV (#72)
	5/10/2019	3	PJM_AC-NY Scheduling Limit
	5/10/2019	13,16,17,19	NE_AC-NY Scheduling Limit
	5/10/2019	3	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; Central East
	5/17/2019	7-9,13-17	Derate MottHaven-Dunwoodie 345kV (#72)
	5/17/2019	17	IESO_AC-NY Scheduling Limit
	5/17/2019	7,8,15,16	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV
	5/18/2019	8,9	Derate Central East
	5/18/2019	5,16	Uprate Central East
	5/18/2019	5,12-14	NE_AC-NY Scheduling Limit
	5/18/2019	8,9	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; Central East
	5/18/2019	8,9	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV
	5/23/2019	14-17	Thunder Storm Alert
	5/23/2019	14,15,22	NYCA DNI Ramp Limit
	5/23/2019	23	Uprate Central East
	5/23/2019	16	Derate East Garden City-Valley Stream 138kV (#262) for I/o BUS:BARRETT 292&459&G2&IC9-12
	5/23/2019	23	Uprate FoxHills-Greenwood 138kV (#28232)
	5/23/2019	23	Uprate FoxHills-WillowBrook 138kV (#29212)
	5/23/2019	10,11,14-19	Derate FreshKills-WillowBrook 138kV (#29211)
	5/23/2019	23	Uprate FrankYong-New Broadway 115kV (#181-922) for I/o TWR:PACKARD 77 & 78
	5/23/2019	23	Uprate New Broadway-Erie St 115kV (#181-922) for I/o TWR:PACKARD 77 & 78
	5/23/2019	14,22	Derate Niagara-Packard 230kV (#61) for I/o TWR:PACKARD 62 & BP76
	5/23/2019	23	NE_AC DNI Ramp Limit
	5/23/2019	22	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; Central East
	5/23/2019	9-11,14,15,17,22	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV
	5/25/2019	6,10,13,14,20-22	Derate Central East
	5/25/2019	23	Uprate Central East
	5/25/2019	19-21	Derate East Garden City-Valley Stream 138kV (#262) for I/o BUS:BARRETT 292&459&G2&IC9-12
	5/25/2019	5,22	NE_AC DNI Ramp Limit
	5/25/2019	5	PJM_AC-NY Scheduling Limit
	5/25/2019	10-22	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV
	5/25/2019	6,10,13,14,19-22	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; Central East
	5/28/2019	12-18	Forced Outage Packard-NiagBlvd 115kV (#181-922)
	5/28/2019	10,11,13-17	Extended Outage Rainey-Vernon 138kV (#36311)
	5/28/2019	15,16	NYCA DNI Ramp Limit
	5/28/2019	10-15	Derate East Garden City-Valley Stream 138kV (#262) for I/o BUS:BARRETT 292&459&G2&IC9-12
	5/28/2019	11	Derate East Garden City-Valley Stream 138kV (#262) for I/o SCB:NEWBRDG 1380 461&BK6+4
	5/28/2019	10,12,15,16	Derate East Garden City-Newbridge 138kV (#462) for I/o NEPTUNE HVDC
	5/28/2019	10-16	Derate Lake Success-Shore Road 138kV (#368)
	5/28/2019	16	HQ_Chart-NY Scheduling Limit
	5/28/2019	12,13,15-18	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV
	5/28/2019	12,13,16,17	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; Central East
	5/29/2019	16-20	Thunder Storm Alert
	5/31/2019	13,15,16	NYCA DNI Ramp Limit
	5/31/2019	9,13-18	Derate East Garden City-Valley Stream 138kV (#262) for I/o BUS:BARRETT 292&459&G2&IC9-12
	5/31/2019	7	Derate Niagara-Packard 230kV (#61) for I/o TWR:PACKARD 62 & BP76
	5/31/2019	9,13	Derate Scriba-Volney 345kV (#20) for I/o Scriba-Volney 345kV (#21)
	5/31/2019	14-17	NE_AC DNI Ramp Limit
	5/31/2019	7,14,15	Lake Erie Circulation, DAM-RTM exceeds +/-125MW; West 115kV & 230kV

### Real-Time Balancing Market Congestion Residual (Uplift Cost) Categories

<u>Category</u>	<u>Cost Assignment</u>	<u>Events Types</u>	<u>Event Examples</u>
Storm Watch	Zone J	Thunderstorm Alert (TSA)	TSA Activations
Transmission Outage Mismatch	Market-wide	Changes in DAM to RTM transfers related to transmission outage mismatch	Forced Line Outage, Unit AVR Outages Early Line Return from Outage
Interface/Facility Rerate - NYISO Security	Market-wide	Changes in DAM to RTM transfers not related to transmission outage	Interface/Facility Rerates due to RTM voltages
Interface Rerate - External Security	Market-wide	Changes in DAM to RTM transfers related to External Control Area Security Events	TLR Events, External Transaction Curtailments
Unscheduled Loop Flows	Market-wide	Changes in DAM to RTM unscheduled loop flows impacting NYISO Interface transmission constraints	DAM to RTM Lake Erie Loop Flows exceeding +/- 125 MW
M2M Settlement	Market-wide	Settlement result inclusive of coordinated redispatch and Ramapo flowgates	

#### Monthly Balancing Market Congestion Report Assumptions/Notes

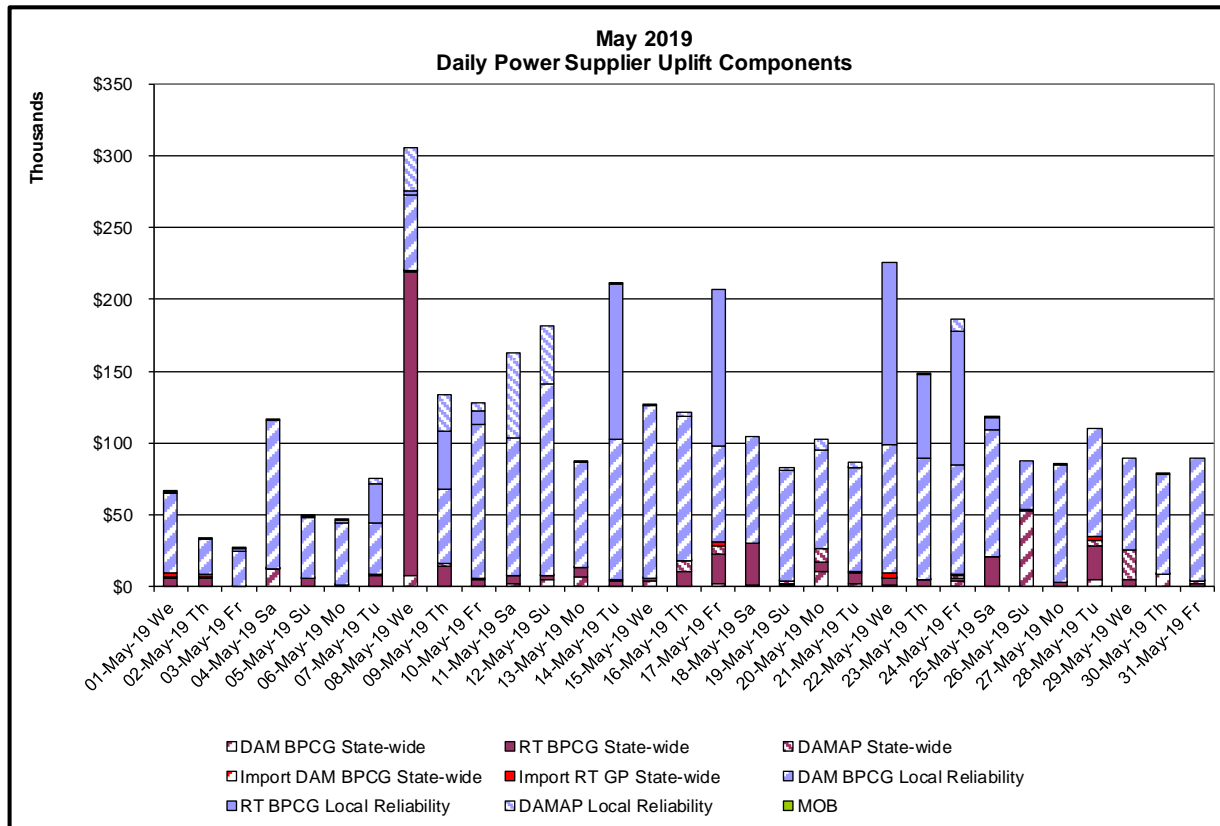
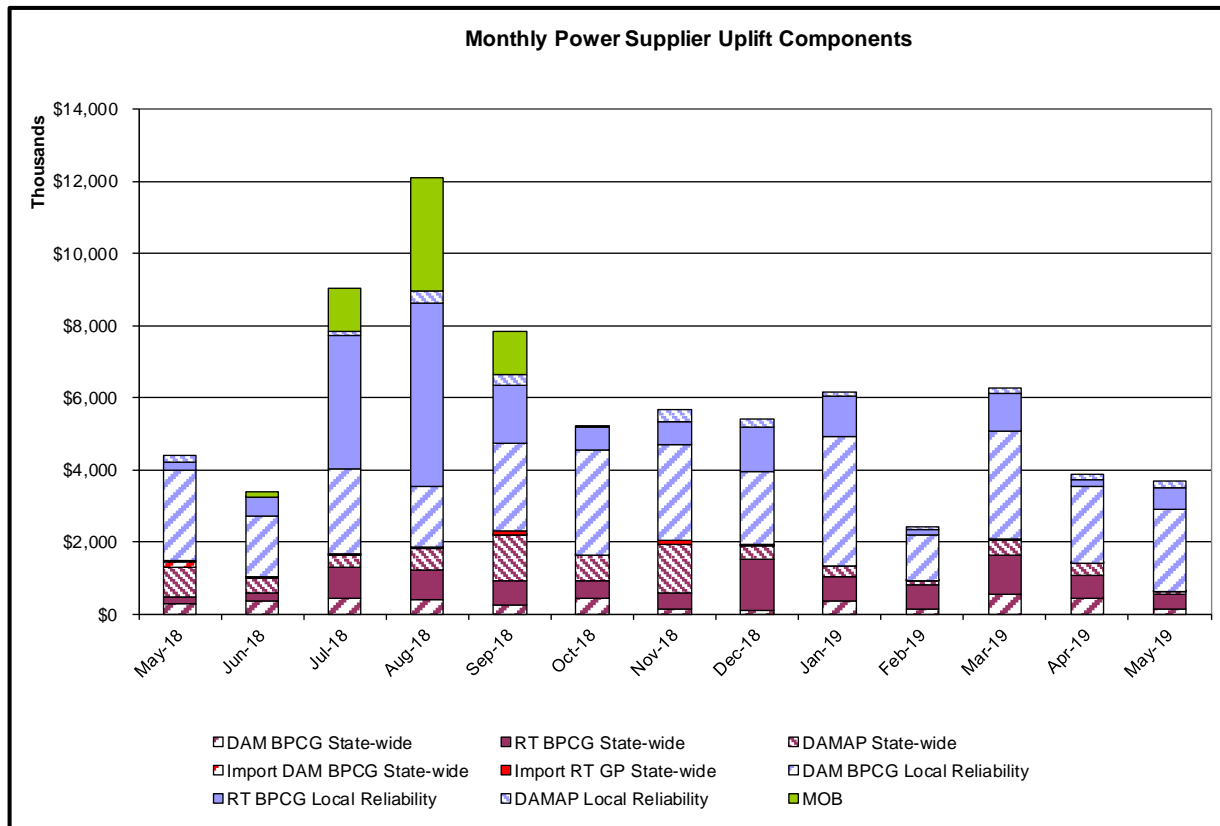
- 1) Storm Watch Costs are identified as daily total uplift costs
- 2) Days with a value of BMCR less M2M Settlement of \$100K/HR, shortfall of \$200K/Day or more, or surplus of \$100K/Day or more are investigated.
- 3) Uplift costs associated with multiple event types are apportioned equally by hour

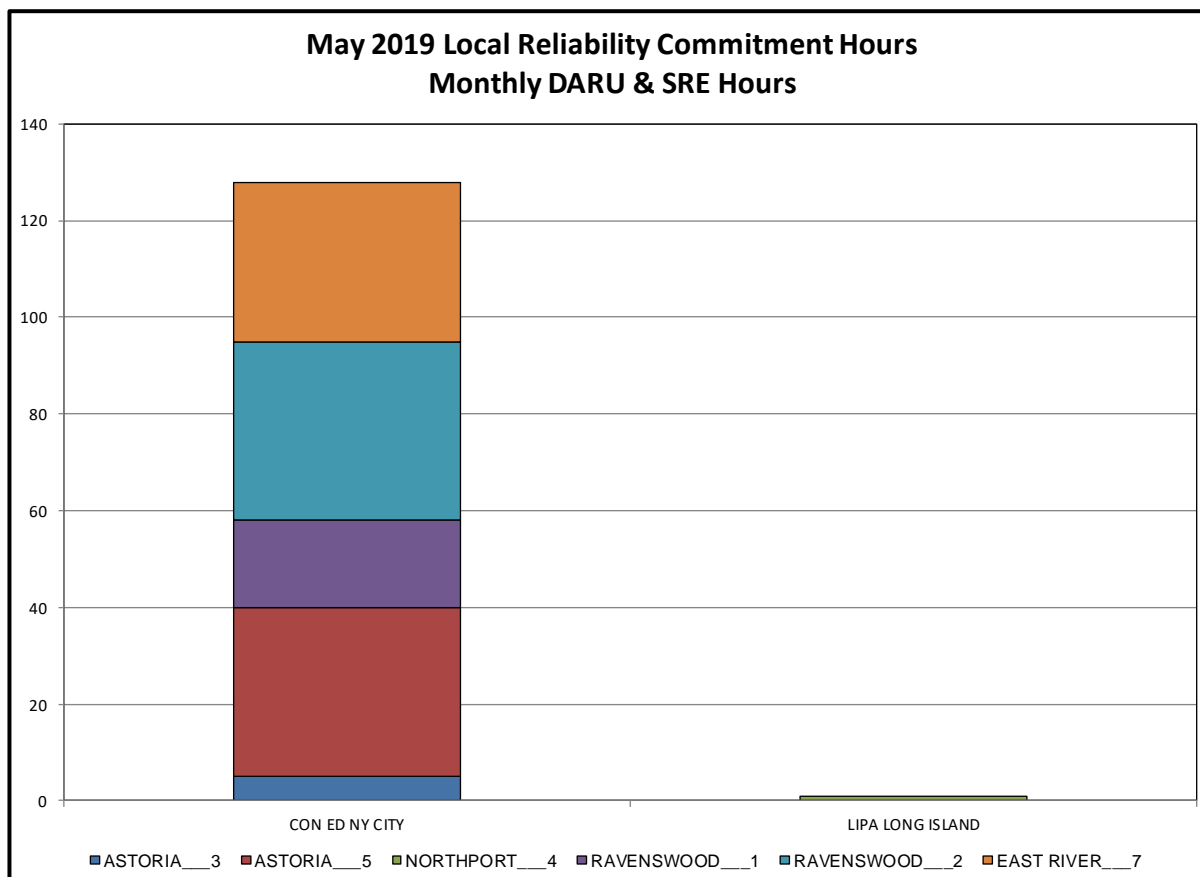
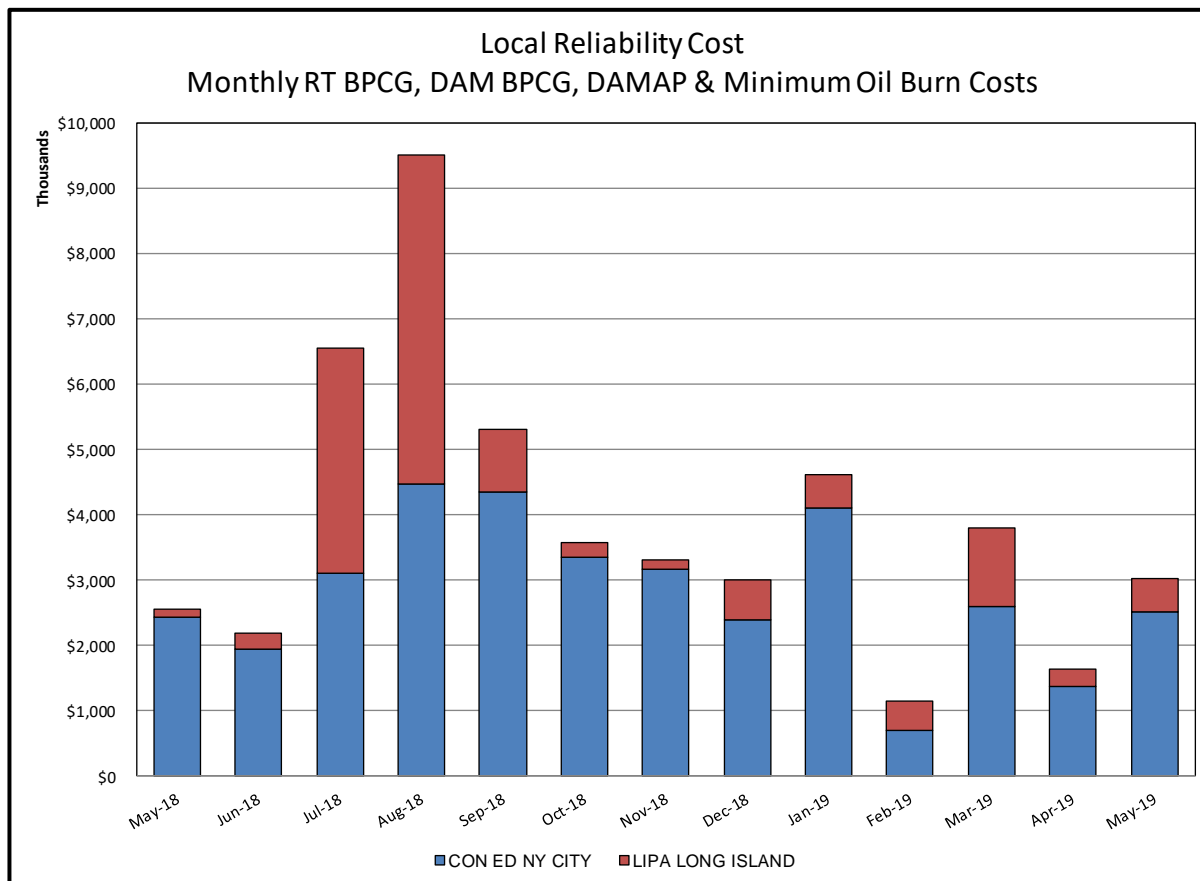


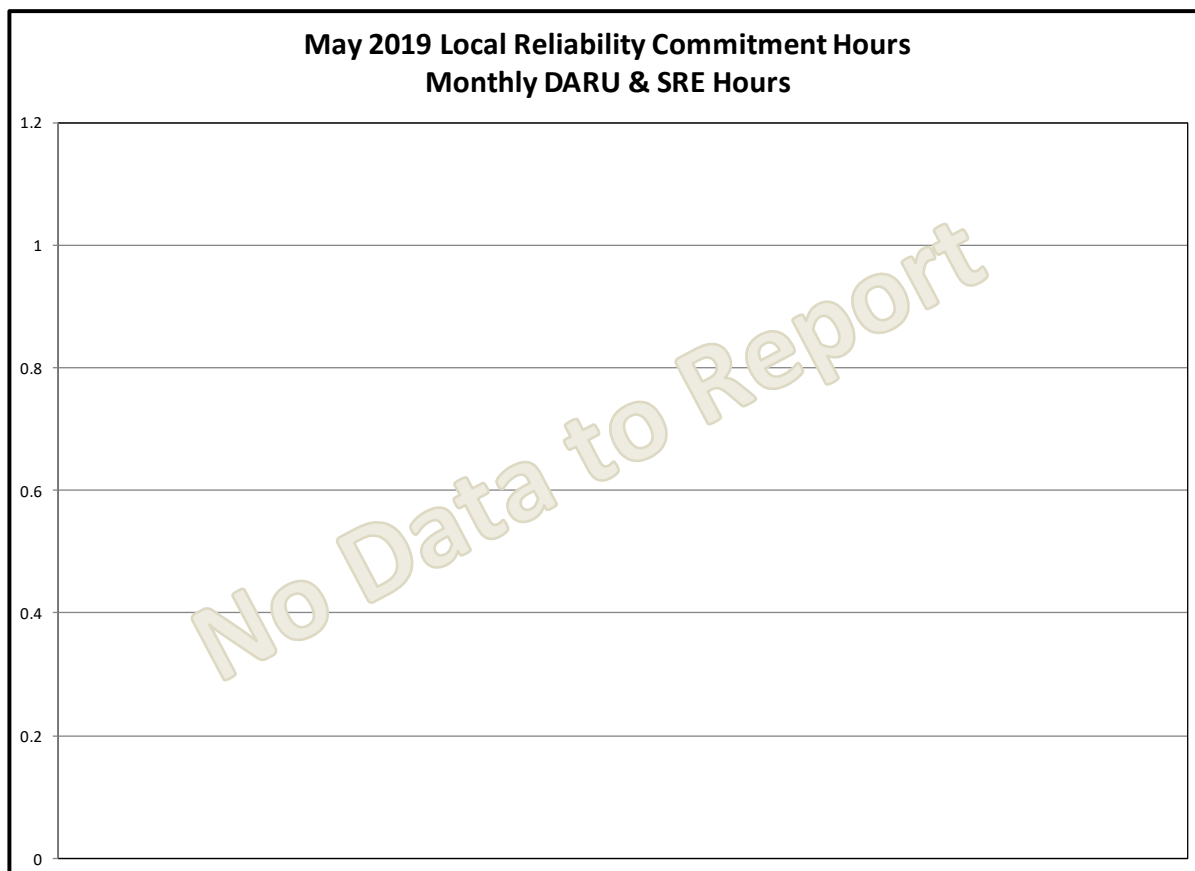
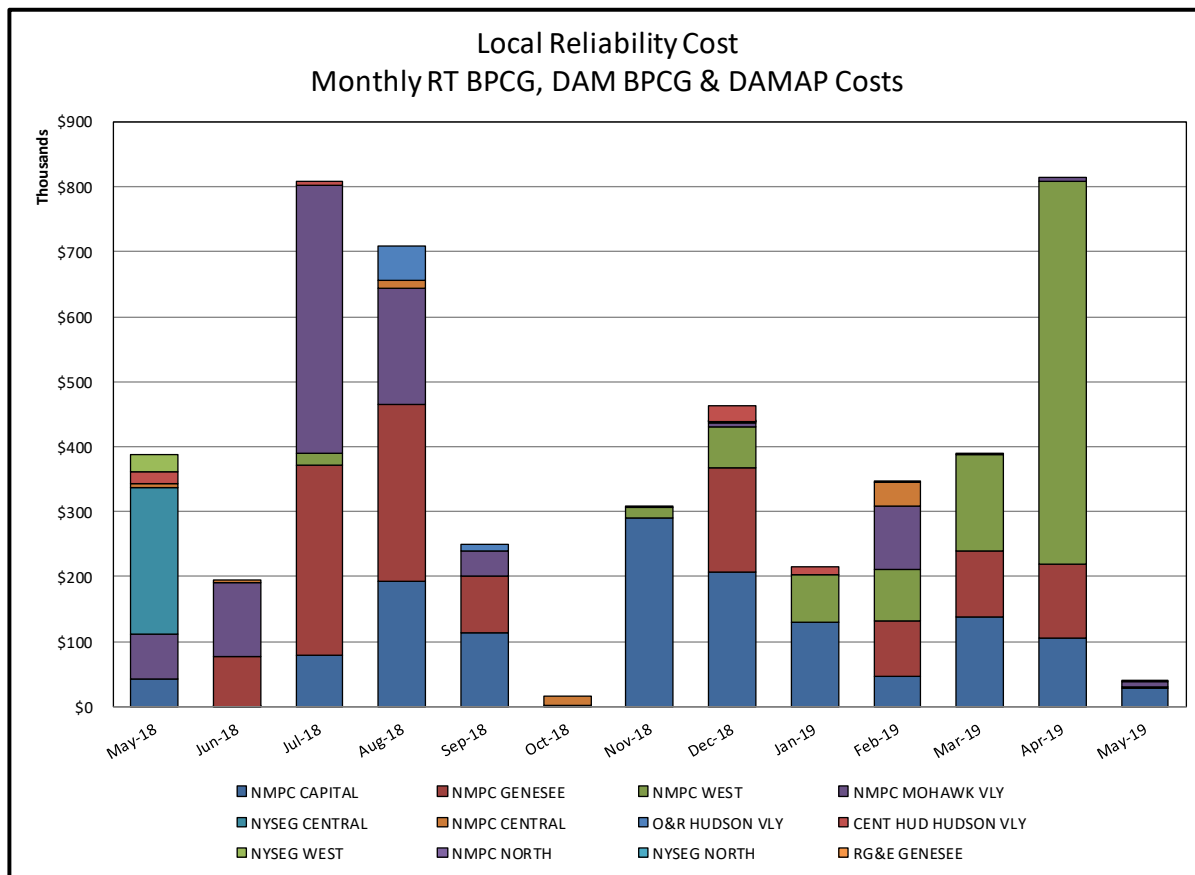


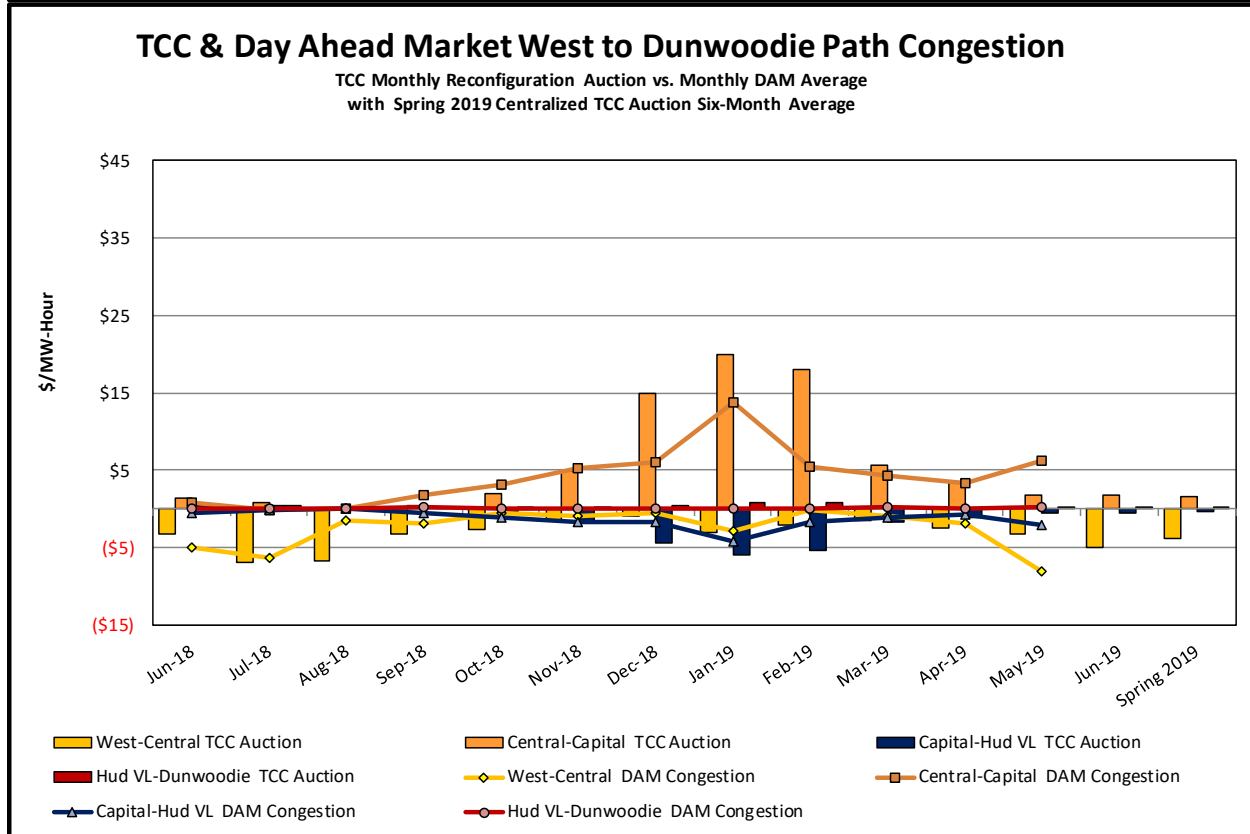
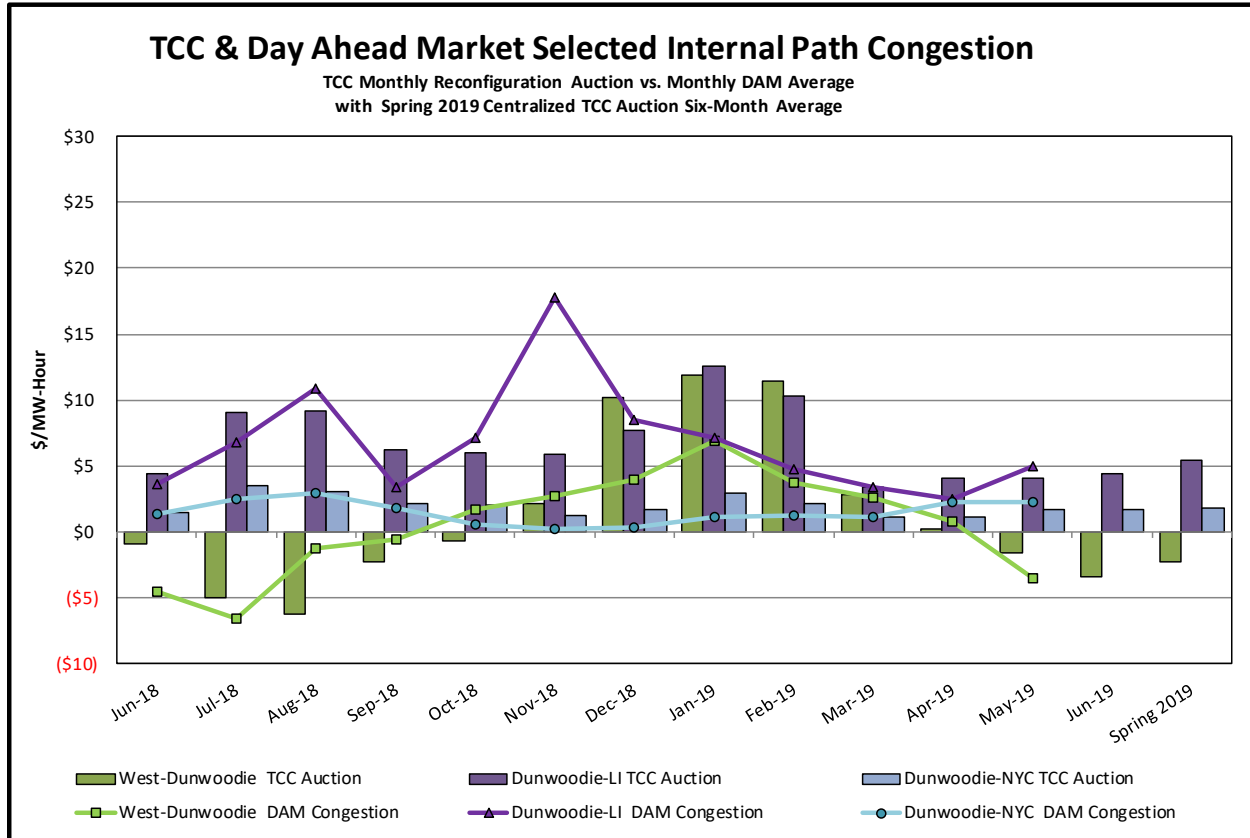
### Day-Ahead Market Congestion Residual Categories

<u>Category</u>	<u>Cost Assignment</u>	<u>Events Types</u>	<u>Event Examples</u>
NYTO Outage Allocation	Responsible TO	Direct allocation to NYTO's responsible for transmission equipment status change.	DAM scheduled outage for equipment modeled in-service for the TCC Auction.
External Outage Allocation	All TO by Monthly Allocation Factor	Direct allocation to transmission equipment status change caused by change in status of external equipment.	Tie line required out-of-service by TO of neighboring control area.
Central East Commitment Derate	All TO by Monthly Allocation Factor	Reductions in the DAM Central East_VC limit as compared to the TCC Auction limit, which are not associated with transmission line outages.	



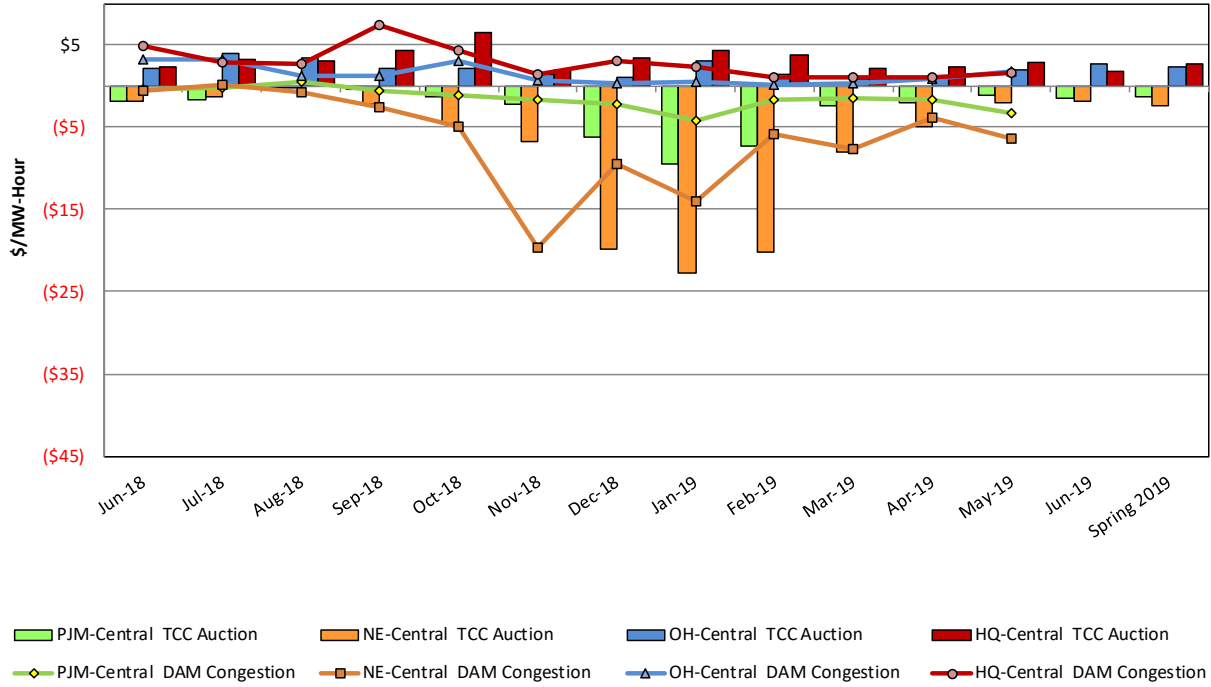




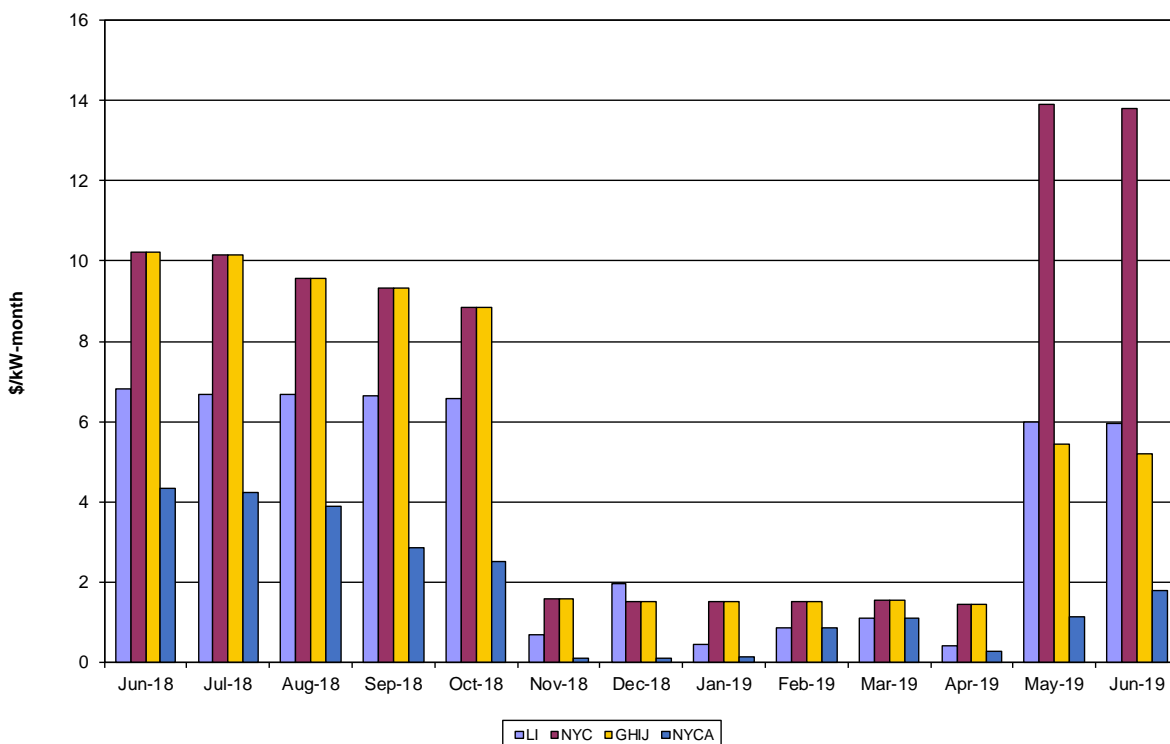


## TCC & Day Ahead Market Selected External Path Congestion

TCC Monthly Reconfiguration Auction vs. Monthly DAM Average  
with Spring 2019 Centralized TCC Auction Six-Month Average



ICAP Spot Market Clearing Price



UCAP Sales

