

Hurricane Sandy Preparations, Response & Recovery

A faint, light gray map of New York State is visible in the background. Overlaid on this map is a network of lines representing a power grid. The lines are thin and gray, connecting various nodes. Some nodes are marked with small colored dots in red, blue, and purple, indicating specific locations or substations within the grid.

Wes Yeomans

Vice President – Operations

Management Committee Meeting

November 2, 2012

Topics

- ◆ **Storm Preparation**
- ◆ **Sequence of Events**
 - *Infrastructure Status*
 - *Operations Recovery*
- ◆ **Storm Impacts to NYCA Loads**

ISO Preparedness Plans

- ◆ Preparedness Plans began Thursday, October 25
- ◆ Cancellation of all scheduled transmission line maintenance
 - *NY TOs cancelled internal transmission line maintenance*
 - *NYISO cancelled relevant, adjacent external transmission line maintenance*
- ◆ Scheduled and participated in several coordination conference calls with NPCC and TOs
- ◆ Monitored storm forecasts

ISO Preparations

- ◆ **Solicited generation impacts at different storm surge levels**
- ◆ **TOs & ISO scheduled reliability commitments**
- ◆ **NYISO Operations Support**
 - *Scheduled additional control room operators at the Primary Control Center and scheduled operator staffing at the Alternate Control Center*
- ◆ **Facilities and Computer Systems**
 - *Cancelled all software deployments & facility work*
 - *Scheduled around-the-clock facility staffing*

Sequence of Events – Monday 10/29/12

- 8 AM** **Declared Thunder Storm Alert in anticipation of extreme weather conditions**

- 12 PM** **NYISO SRE of two Athens units for voltage control for off-peak hours**

- 4 PM** **LI customer outages begin**
 A few Long Island transmission lines outages
 Loss of Cross Sound Cable
 LI generation capacity outages (290 MW)

- 5 PM** **LI and the start of NYC customer outages begin**
 Continued LI transmission line outages and the start of NY City transmission outages
 LI & NYC generation capacity outages (335 MW)

- 6PM** **Reports of customer outages for all Transmission Owners**
 Additional transmission line outages across all Transmission Owners
 Additional LI & NYC generation capacity outages (386 MW)
 Loss of Neptune & Northport Norwalk Cable

Sequence of Events – Monday 10/29/12

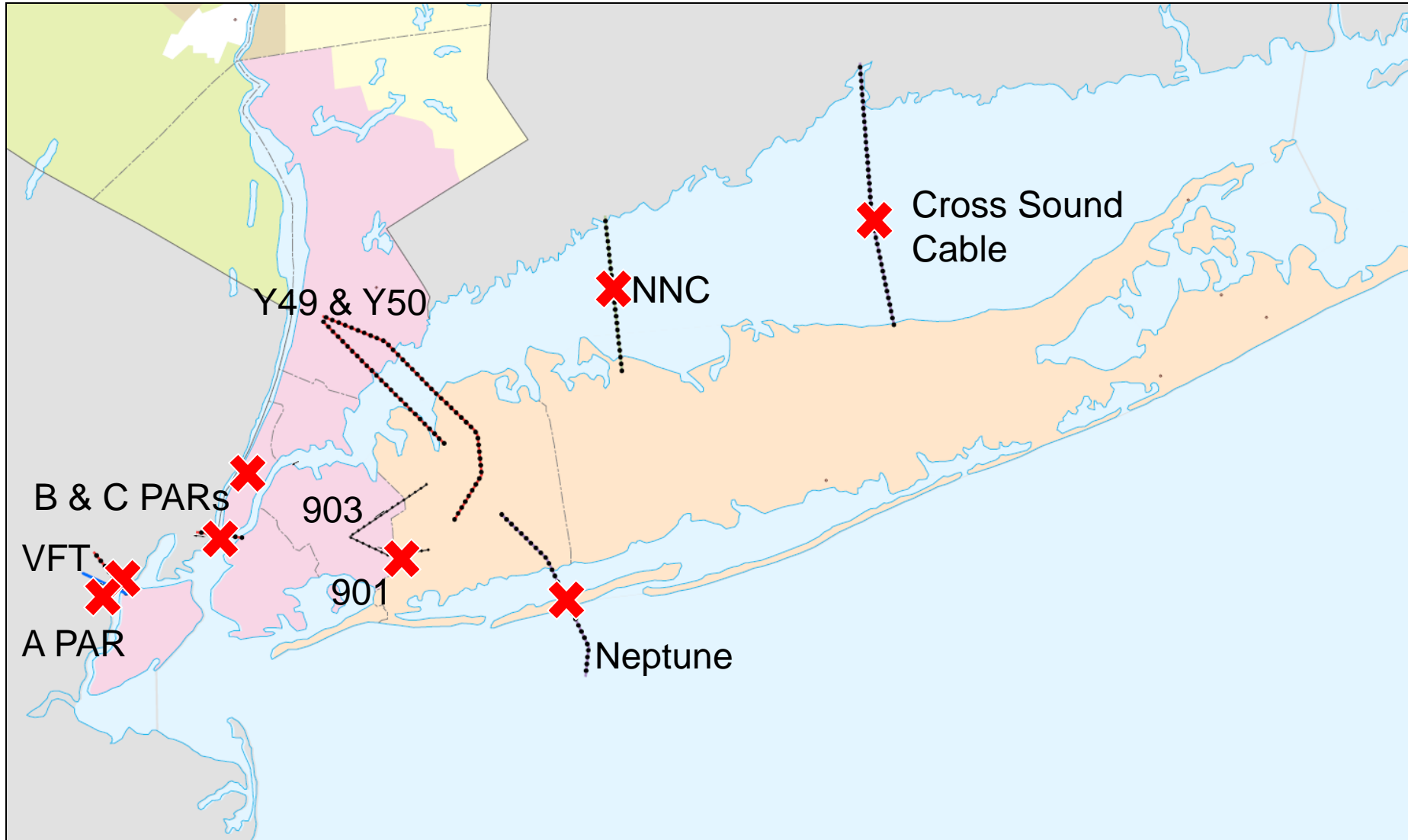
- 7 PM** **Additional customer outages including pre-emptive NYC network shutdown**
 - Additional Transmission line outages**
 - Additional LI & NYC generation capacity outages (1,518 MW)**
 - Loss of Linden-Goethals A2253 (Line A)**
 - First notifications of substation and generation personnel evacuations**

- 8 PM** **Additional customer outages**
 - Additional Transmission line outages**
 - Additional LI & NYC generation capacity outages (1,775 MW)**
 - Loss of Linden VFT (300 MW)**
 - Loss of Hudson-Farragut B3402 (Line B)**
 - Loss of Hudson-Farragut C3403 (Line C)**

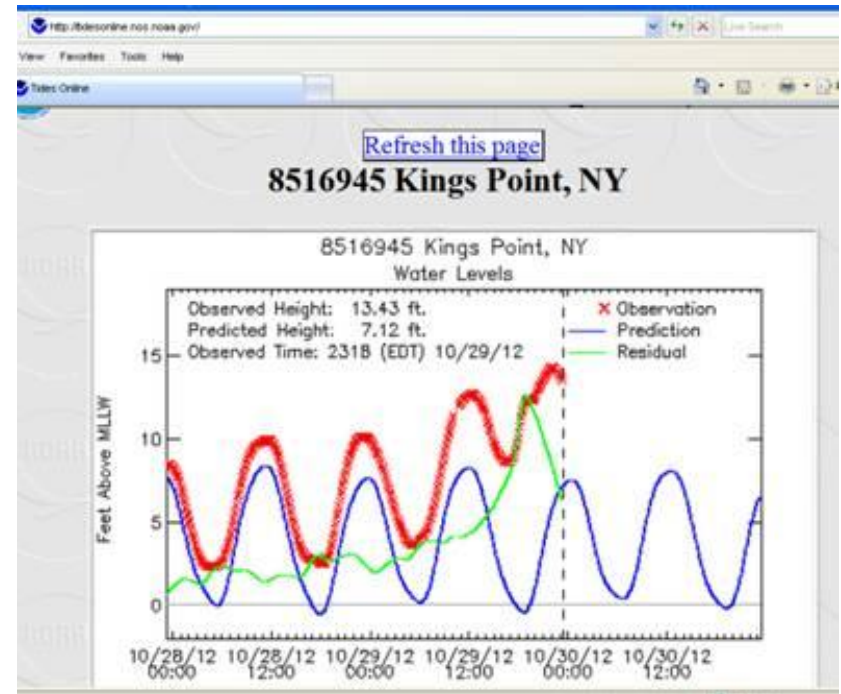
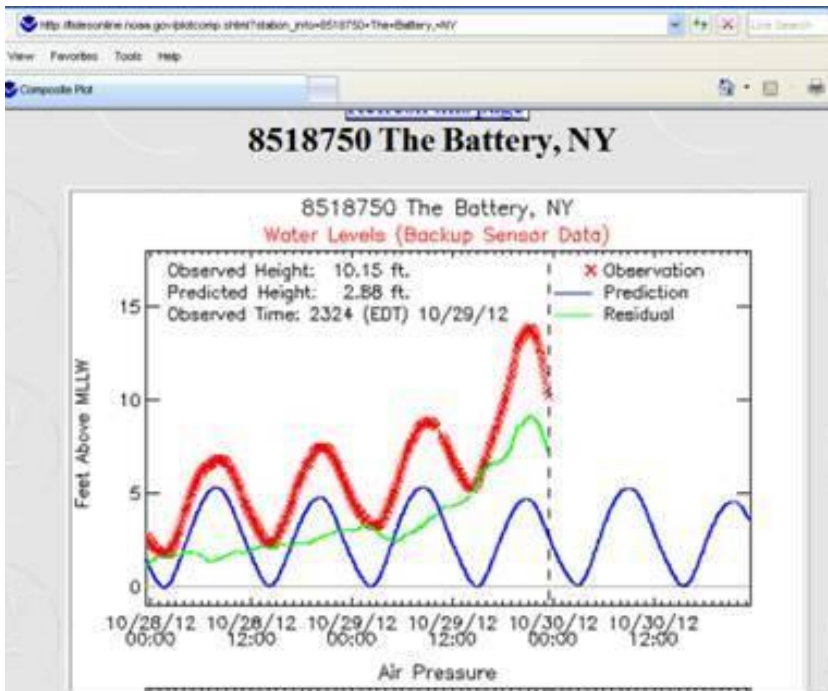
Sequence of Events – Monday 10/29/12

- 9 PM** **Additional customer outages**
Additional Transmission line outages
Additional LI & NYC generation capacity outages (342 MW)
Loss of Nine Mile 1 (622 MW), caused by loss of transmission
Loss of Indian Point 3 (1056 MW), caused by loss of transmission
High transmission voltage conditions, opened Marcy-Coopers Corners
- 10 PM** **Additional customer outages**
Additional LI & NYC generation capacity outages (100 MW)
- 11 PM** **Additional LI & NYC generation capacity outages (328 MW)**
Continued high transmission voltages, opened Coopers-Rock Tavern

NYC & LI External Interconnection Status



Monday Night Water Levels The Battery & Kings Pt, NY



Infrastructure Customer Outages Tuesday

- Over 2 million electric customers were out of service on Tuesday (10/30/12) morning – based on data from utility websites

<u>Transmission Owner</u>	<u>Customer Outages</u>
<i>Central Hudson</i>	<i>78,906</i>
<i>Consolidated Edison</i>	<i>752,153</i>
<i>LIPA</i>	<i>905,267</i>
<i>National Grid</i>	<i>20,754</i>
<i>NYSEG</i>	<i>115,040</i>
<i>Orange & Rockland</i>	<i>188,892</i>
<i>RGE</i>	<i>23,339</i>
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Total	2,084,351

Infrastructure Generator Outages Tuesday

- ♦ Some generation outages were caused by loss-of-transmission and other generation outages were caused by severe weather conditions; high winds and flooding

<u>Area</u>	<u>Generation Outage (Capacity)</u>
<i>Long Island</i>	<i>2037 MW</i>
<i>NY City</i>	<i>3037 MW</i>
<i>Upstate</i>	<i>1678 MW</i>

Infrastructure Transmission Outages Tuesday

- ◆ At one point over 90 transmission outages
 - *(27) 345 kV Transmission Lines*
 - *(3) 230 kV Transmission Lines*
 - *(11) 345/138 kV Transformers*
 - *(35) 138kV Transmission Lines*
 - *(4) Phase Angle Regulators*
 - *(11) 115 kV Transmission Lines*
- ◆ In addition, there were many transmission “trip & recloses”
- ◆ Some transmission substations were pre-emptively isolated to minimize damage
- ◆ External interconnection outages include: NNC, Cross Sound, Neptune, A Line, B Line, C Line, and VFT

Operations Recovery - Tuesday

- ◆ Continued high off peak transmission voltages
 - *NYCA off peak load as low as 9680 MW*
 - *Declared Major Emergency from 0109 to 0612*
 - *Marcy-Coopers Corners and Coopers Corners – Rock Tavern remain out*
- ◆ NYISO SRE of two Athens units and Roseton 1 for voltage control for off-peak hours
- ◆ Remained in Thunder Storm Alert until 1915
- ◆ Only three transmission lines connecting Long Island to NY City (Jamaica - Valley Stream 901 forced out)
- ◆ 1206 MWs of generation restored
- ◆ 29 transmission lines restored

Infrastructure Status Wednesday

- ◆ **Customer Outages**
 - *1.9 million*

- ◆ **Generation Capacity Outages**
 - *Long Island 1,621 MW*
 - *NY City 2,253 MW*
 - *Upstate 1,672 MW*

- ◆ **Transmission Line Outages**
 - *(25) 345 kV Transmission Lines*
 - *(1) 230 kV Transmission Lines*
 - *(29) 138kV Transmission Lines*
 - *(7) 115 kV Transmission Lines*

- ◆ **External interconnection outages include: NNC, Cross Sound, Neptune, A Line, B Line, C Line, and VFT**

Operations Recovery - Wednesday

- ◆ **Continued high off peak transmission voltages**
 - *Marcy-Coopers Corners and Coopers Corners – Rock Tavern remain out*
 - *SVCs in manual modes, including on peak hours, to mitigate high transmission voltages*
 - *NYISO SRE of two Athens units and Roseton 1 for off peak voltage control*

- ◆ **Cross Sound Cable energized**

- ◆ **Some NY City networks successfully restored**

- ◆ **924 MW Generation Capability restored**

- ◆ **11 transmission lines restored**

Infrastructure Status - Thursday

- ◆ **Customer Outages**
 - *1.6 million*

- ◆ **Generation Capacity Outages**
 - *Long Island 763 MW*
 - *NY City 2,187 MW*
 - *Upstate 1,672 MW*

- ◆ **Transmission line outages**
 - *(23) 345 kV Transmission Lines*
 - *(1) 230 kV Transmission Lines*
 - *(24) 138kV Transmission Lines*
 - *(5) 115 kV Transmission Lines*

- ◆ **External interconnections outages include: NNC, Neptune, A Line, B Line, C Line, and VFT**

Operations Recovery - Thursday

- ◆ Continued high off peak transmission voltages
 - *Marcy-Coopers Corners and Coopers Corners – Rock Tavern remain out to mitigate high transmission voltages*
 - *SVCs operated in manual mode in off peak hours to mitigate high transmission voltages*
 - *NYISO SRE of two Athens units and Roseton 1 for off peak voltage control*

- ◆ Northport – Norwalk Cable (NNC) returned to service

- ◆ 321 MW Generation Capability restored

- ◆ 3 transmission lines restored

Adjacent Regions

- ◆ **NYISO participated in many NPCC conference calls**

- ◆ **ISO-NE**
 - *3,100 MW of reliability commitments*
 - *Lost several coastal generating stations*
 - *Approximately 1.4 million customer outages*

- ◆ **PJM**
 - *4,000 MW of reliability commitments*
 - *Lost several coastal generating stations*
 - *Approximately 4.2 million customer outages*

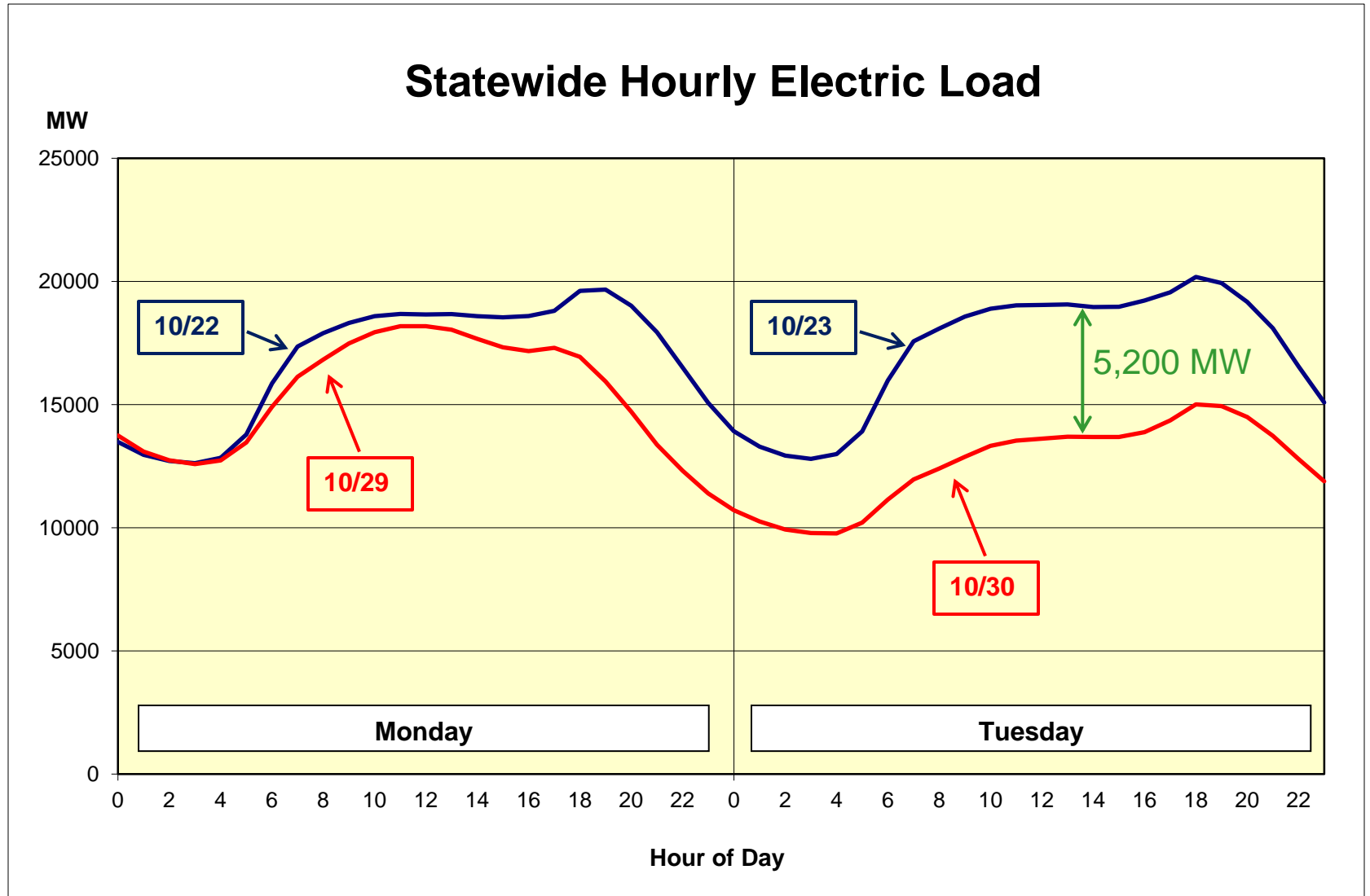
Summary

- ◆ **Despite the horrific nature of the storm and resulting devastation to the electric infrastructure, Long Island and New York City remained synchronized to the Eastern Interconnection**
- ◆ **Communications and cooperation across all Market Participants and with neighboring Reliability Coordinators was excellent**
- ◆ **Prior, during, and after Hurricane Sandy, the generation and utility asset owners contributed to the sole, primary objective of maintaining electric system reliability**
- ◆ **The auxiliary support infrastructure performance was excellent**
 - *ISO and TO Energy Management Systems worked properly*
 - *Real -Time data systems between Generators, Substations, Transmission Owners and the ISO worked properly*
 - *Phone communications worked properly*

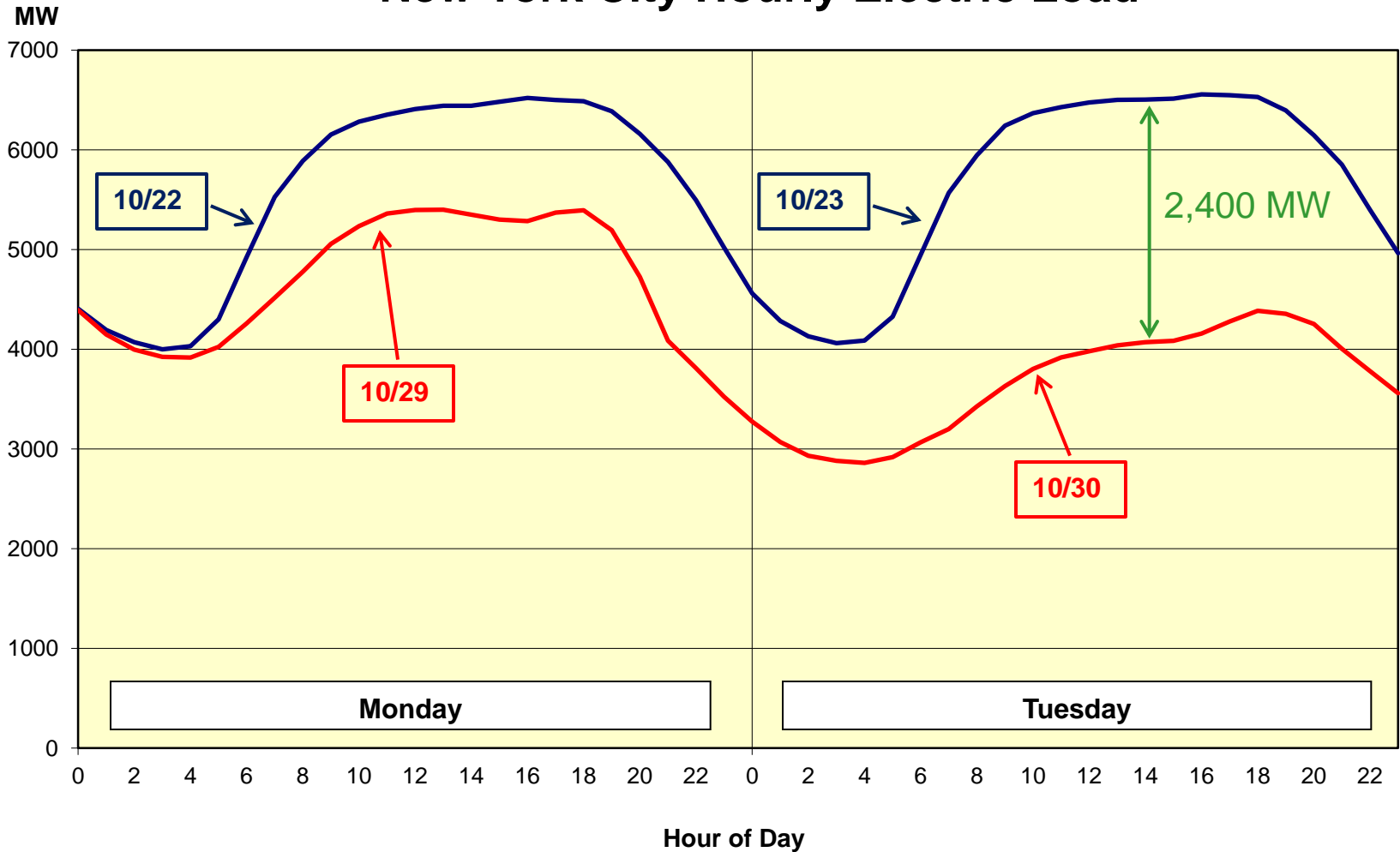
NYCA Load -- Impact of Hurricane Sandy

- ◆ **The following charts display hourly electric load for Monday (10/29/12) and Tuesday (10/30/12) when Hurricane Sandy struck New York -- compared to the hourly electric load on the same days of the previous week**

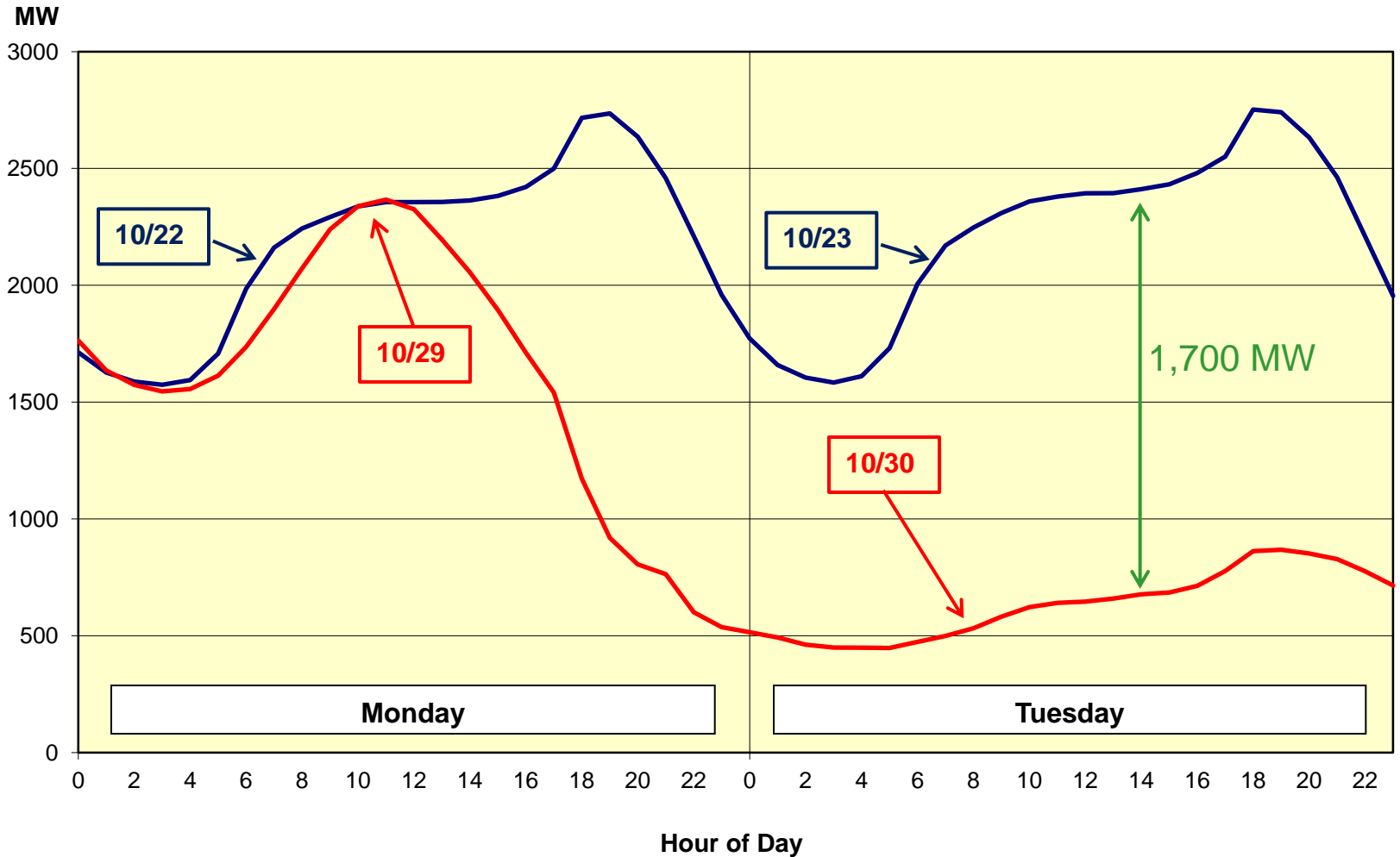
Statewide Hourly Electric Load



New York City Hourly Electric Load



Long Island Hourly Electric Load



Upstate Hourly Electric Load

