

Hurricane Sandy Preparations, Response & Recovery

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Management Committee Meeting

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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)**

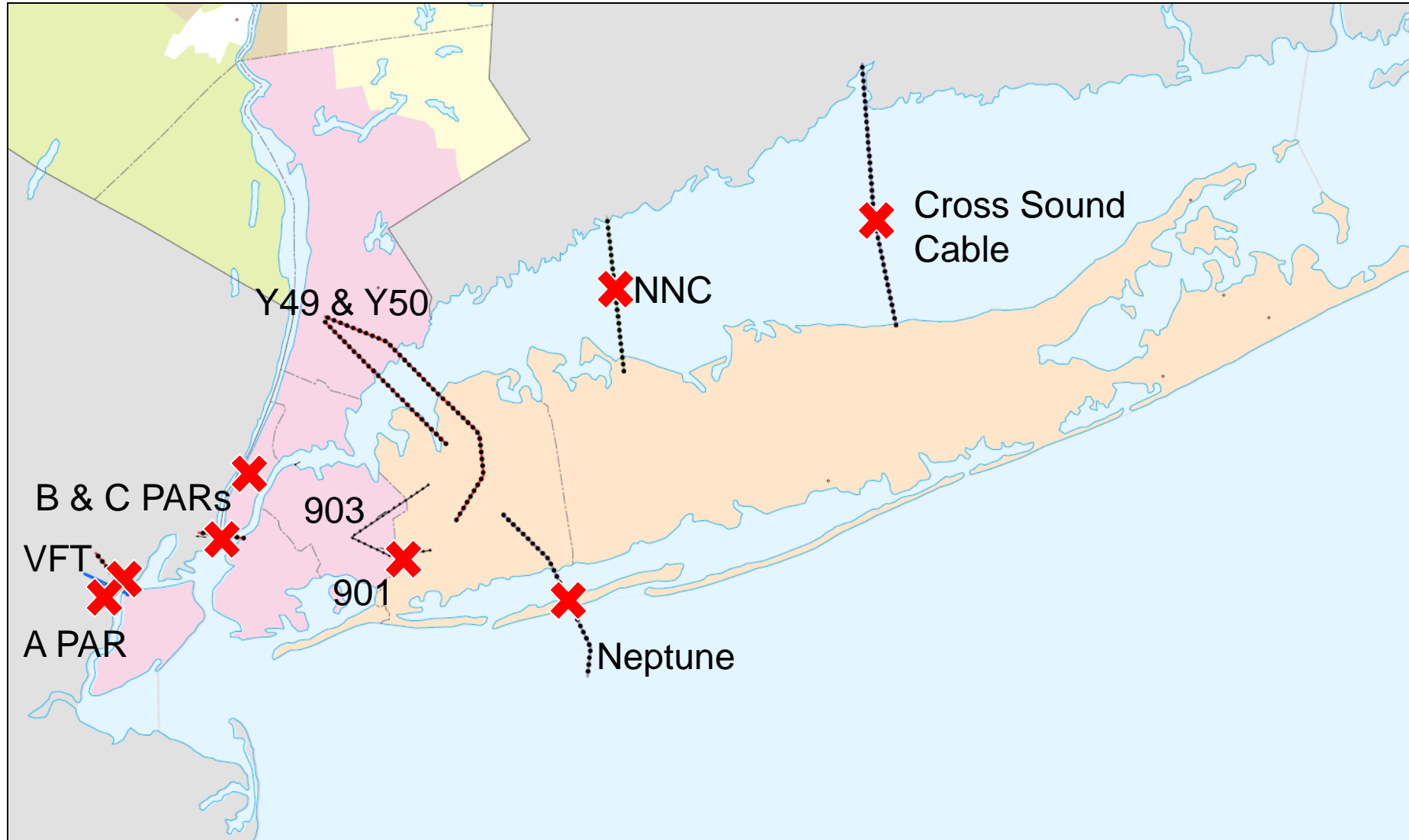
Sequence of Events – Monday 10/29/12

- 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

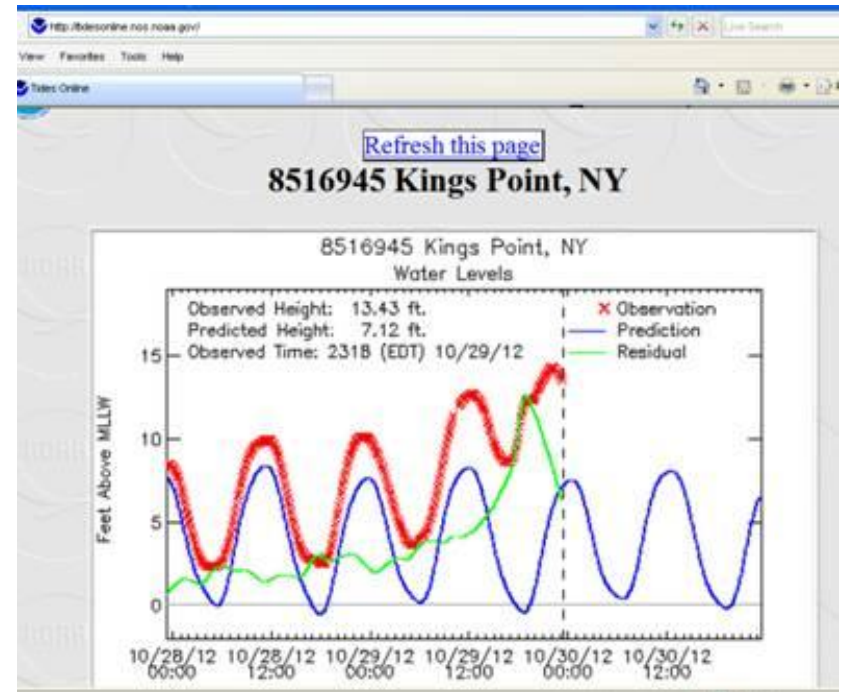
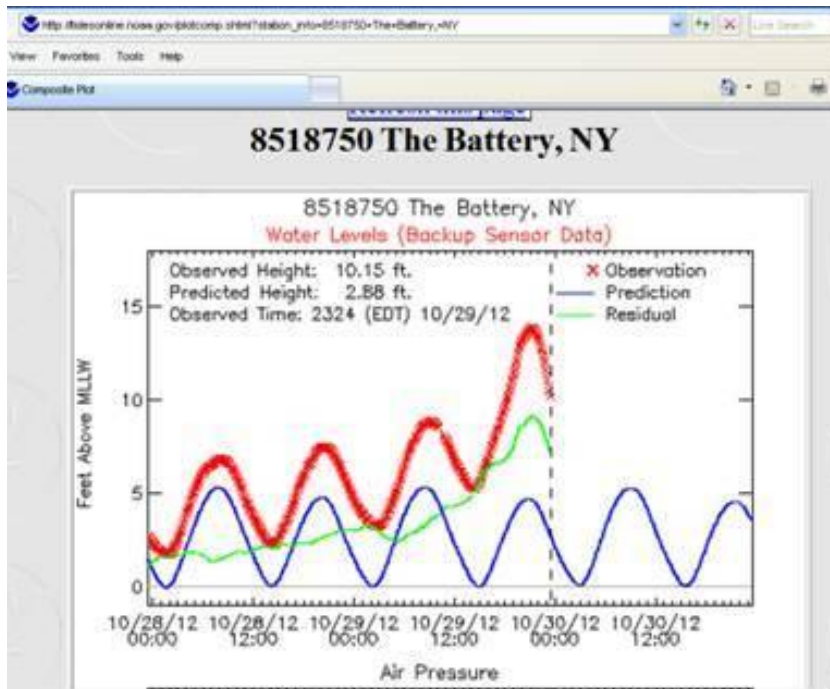
- 10 PM** **Additional customer outages**
Additional LI & NYC generation capacity outages (100 MW)

- 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*

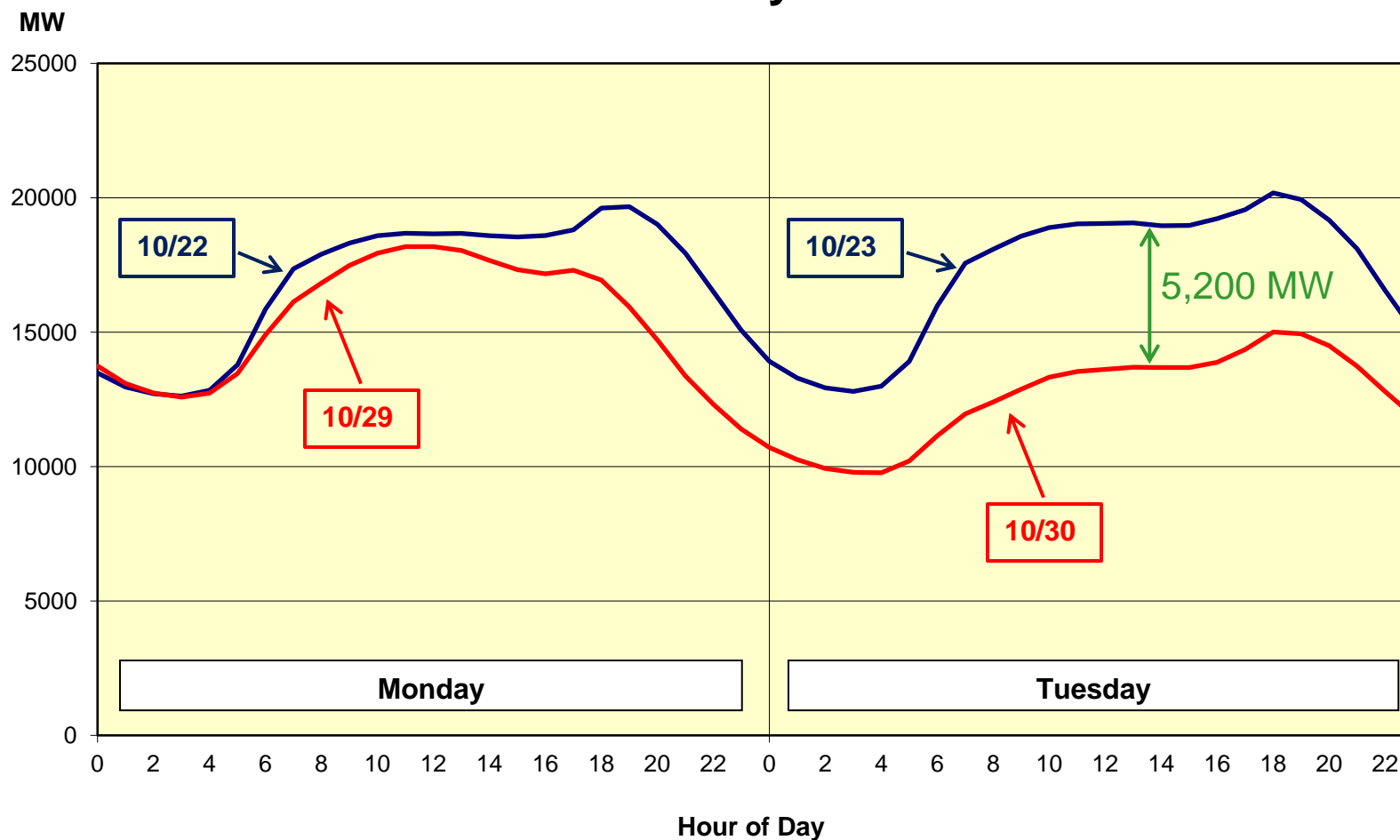
Summary

- ♦ **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*

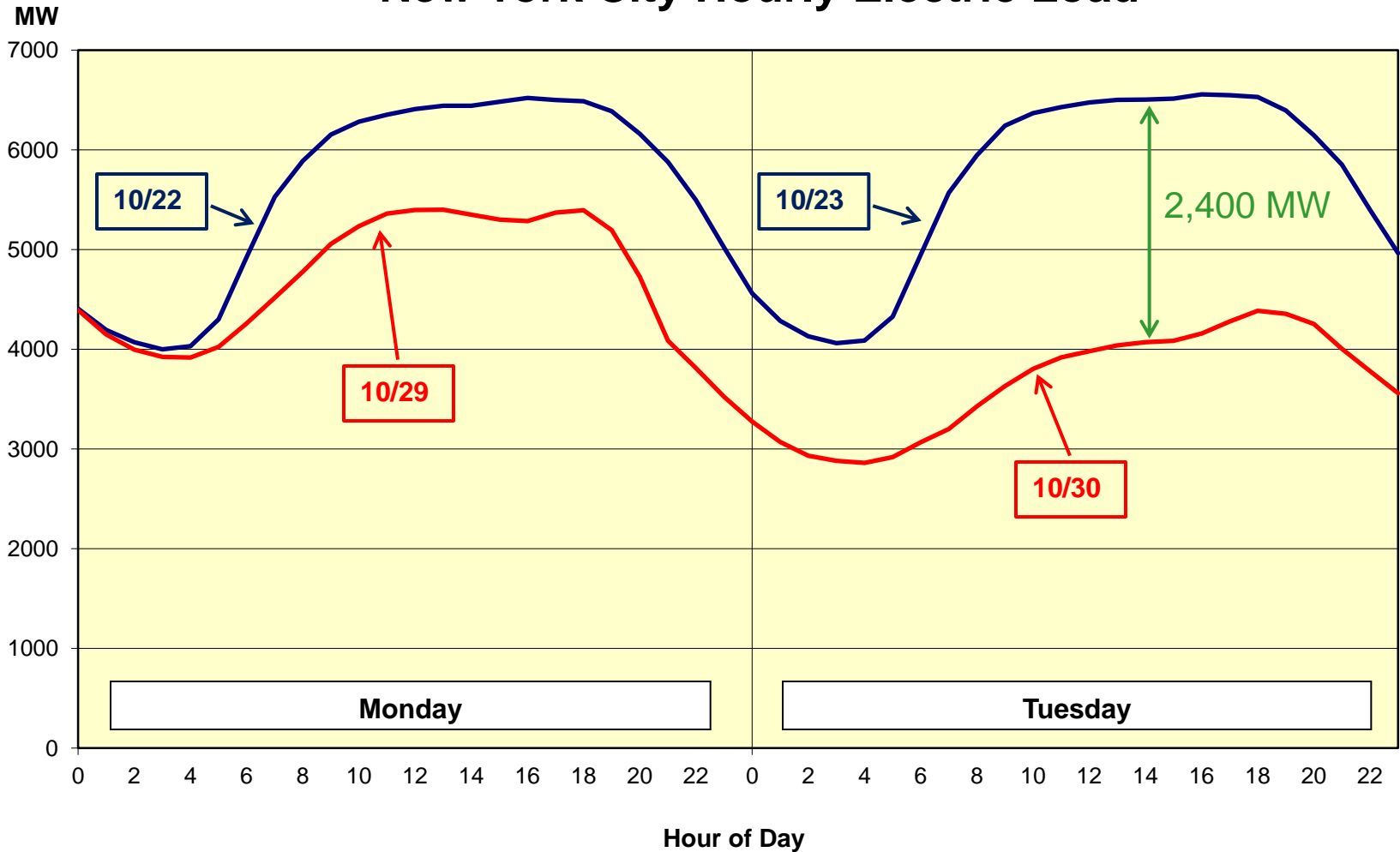
NYCA Load -- Impact of Hurricane Sandy

- ◆ **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**

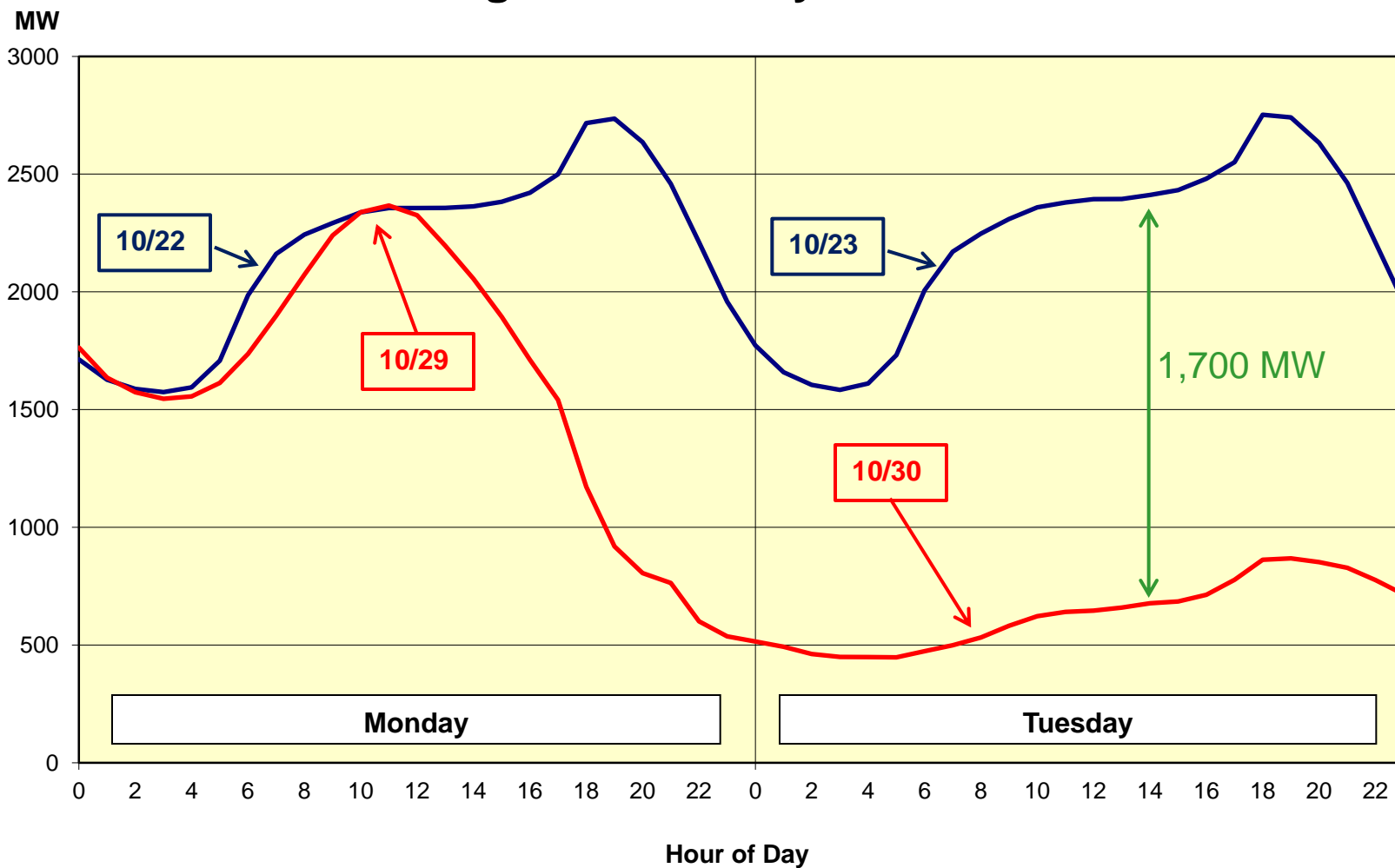
Statewide Hourly Electric Load



New York City Hourly Electric Load



Long Island Hourly Electric Load



Upstate Hourly Electric Load

