ISO-NE 2020 Summer Review

Electric/Gas Operations Committee

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MANAGER, FORECAST & SCHEDULING, SYSTEM OPERATIONS

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ISO-NE'S FORECAST FOR 2020 SUMMER OPERATIONS

ISO-NE's Forecast for 2020 Summer Operations

- ISO New England (ISO-NE) projected adequate electricity supplies to meet peak consumer demand this summer under both typical and extreme weather conditions.
  - 50/50 Reference Peak Forecast = 25,125 MW
  - 90/10 Extreme Peak Forecast = 27,084 MW
  - Both forecasts reflect a reduction of 787 MW of PV and 3,312 MW of energy efficiency at the peak hour
- ISO-NE had more than 35,000 MW of projected capacity available to meet New England's consumer demand for electricity.
  - Only 28 MW of new generation were expected by June 1, 2020:
    - 24 MW solar & 4 MW fuel cell
- ISO-NE has well-established Operating Procedures to maintain bulk power grid reliability.
  - Supply- & demand-side, capacity and load relief
  - Imported emergency power from neighboring regions
  - Calling on power system reserves
  - Voluntary energy conservation

ISO-NE'S 2020 SUMMER ACTUAL PEAK DEMANDS AND NET ENERGY FOR LOAD

ISO-NE's 2020 Summer Actual Peak Demands and Net Energy for Load

	MAY 29	JUNE 23	JULY 27	AUGUST 11
Monthly Peak Demand*	16,294 MW	21,135 MW	24,736 MW	23,983 MW
Average** Temperature ---------- Average** Dew Point	77° F ------ 67° F	85° F ------ 65° F	93° F ------ 65° F	89° F ------ 68° F
Monthly Net Energy for Load	8,212 GWh	9,840 GWh	12,265 GWh	11,436 GWh

* *Monthly Peak Demand Data is hourly integrated peak from telemetry, not Revenue Quality Metered data*

** *8-City Weighted Average*

PRE-SUMMER OPERABLE CAPACITY ANALYSIS (50/50 & 90/10 DEMAND FORECASTS)

2020 Summer Operable Capacity Analysis – 50/50 Load

50/50 Load Forecast (Reference)	June - 2020[2] CSO (MW)	June - 2020[2] SCC (MW)
Operable Capacity MW [1]	29,897	31,079
Active Demand Capacity Resource (+) [5]	366	452
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	1,101	1,101
Non Commercial Capacity (+)	5	5
Non Gas-fired Planned Outage MW (-)	1,196	1,234
Gas Generator Outages MW (-)	719	723
Allowance for Unplanned Outages (-) [4]	2,800	2,800
Generation at Risk Due to Gas Supply (-) [3]	0	0
Net Capacity (NET OPCAP SUPPLY MW)	26,654	27,880
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	25,125	25,125
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	27,430	27,430
Operable Capacity Margin	-776	450

[1]Operable Capacity is based on data as of **May 25, 2020** and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. The Capacity Supply Obligation (CSO) and Seasonal Claim Capability (SCC) values are based on data as of **May 25, 2020.**

[2] Load forecast that is based on the 2020 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **June 6, 2020.**

[3] Total of (Gas at Risk MW) – (Gas Gen Outages MW).

[4] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

[5] Active Demand Capacity Resources (ADCRs) can participate in the Forward Capacity Market (FCM), have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.

2020 Summer Operable Capacity Analysis – 90/10 Load

90/10 Load Forecast (Extreme)	June - 2020[2] CSO (MW)	June - 2020[2] SCC (MW)
Operable Capacity MW [1]	29,897	31,079
Active Demand Capacity Resource (+) [5]	366	452
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	1,101	1,101
Non Commercial Capacity (+)	5	5
Non Gas-fired Planned Outage MW (-)	1,196	1,234
Gas Generator Outages MW (-)	719	723
Allowance for Unplanned Outages (-) [4]	2,800	2,800
Generation at Risk Due to Gas Supply (-) [3]	0	0
Net Capacity (NET OPCAP SUPPLY MW)	26,654	27,880
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	27,084	27,084
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	29,389	29,389
Operable Capacity Margin	-2,735	-1,509

[1]Operable Capacity is based on data as of **May 25, 2020** and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. The Capacity Supply Obligation (CSO) and Seasonal Claim Capability (SCC) values are based on data as of **May 25, 2020.**

[2] Load forecast that is based on the 2020 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **June 6, 2020.**

[3] Total of (Gas at Risk MW) – (Gas Gen Outages MW)**.**

[4] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

[5] Active Demand Capacity Resources (ADCRs) can participate in the Forward Capacity Market (FCM), have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.

MONTHLY SYSTEM OPERATIONS HIGHLIGHTS

System Operations Highlights – May 2020

Weather Patterns	Boston	Temperature: Below Normal (1.2°F) Max: 83°F, Min: 34°F Precipitation: 2.21" – Below Normal Normal: 3.49"	Hartford	Temperature: Below Normal (1.1°F) Max: 83°F, Min: 31°F Precipitation: 1.62" - Below Normal Normal: 4.35"

Peak Load:	16,294 MW	May, 29, 2020	18:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	Note
None for May 2020			

System Operations Highlights – June 2020

Weather Patterns	Boston	Temperature: Above Normal (1.6°F) Max: 92°F, Min: 47°F Precipitation: 2.66" – Below Normal Normal: 3.68"	Hartford	Temperature: Above Normal (2.2°F) Max: 94°F, Min: 37°F Precipitation: 1.24" - Below Normal Normal: 4.35"

Peak Load:	21,135 MW	June 23, 2020	18:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	Note
None for June 2020			

System Operations Highlights – July 2020

Weather Patterns	Boston	Temperature: Above Normal (1.9°F) Max: 95°F, Min: 59°F Precipitation: 1.74" – Below Normal Normal: 3.43"	Hartford	Temperature: Above Normal (4.4°F) Max: 99°F, Min: 58°F Precipitation: 0.98 - Below Normal Normal: 4.18"

Peak Load:	24,736 MW	July 27, 2020	18:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	Note
None for July 2020			

System Operations Highlights – August 2020

Weather Patterns	Boston	Temperature: Above Normal (2.2°F) Max: 94°F, Min: 60°F Precipitation: 2.28" –Below Normal Normal: 3.25"	Hartford	Temperature: Above Normal (3.0°F) Max: 96°F, Min: 53°F Precipitation: 2.2" - Below Normal Normal: 3.83"

Peak Load:	23,983 MW	August, 11, 2020	18:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

Procedure	Declared	Cancelled	Note
M/LCC 2	8/4/2020	8/10/2020	Tropical Storm Isaias

2020 SUMMER PEAK DEMAND HOUR CAPACITY ANALYSIS

2020 Summer Peak

2020 Summer Peak Demand occurred on July 27, 2020.

- Two heat waves in New England, one week apart, with peak days on July 20th and July 27th, forecast peak demand at 24,500 MW and 25,500 MW respectively.
- Actual peak loads on both days were lower than forecast at 23,862 MW and 24,736 MW.
  - Regional weather forecasts for both days were for higher temperatures.
- The power system operated normally during these peak periods with good operational performance of transmission, generation, and load assets, as well as control centers throughout New England and the broader interconnection.

2020 SUMMER NATURAL GAS ISSUES

2020 Summer Natural Gas Issues

- May 2020
  - No gas issues or reductions reported by any gas-fired generators
  - No Operational Flow Orders (OFOs) declared by any N.E. Pipeline
  - Algonquin Gas Transmission (AGT) completed their enhanced inspections that required pressure restrictions at various points on the pipeline. They are anticipating follow-up work, including pipeline replacement outages and additional inspections during their upcoming planned maintenance season in the spring/summer 2020.
- June 2020
  - No gas issues or reductions reported by any gas-fired generators
  - No OFOs declared by any N.E. pipeline
  - Same performance / maintenance issues for AGT as declared in May 2020.

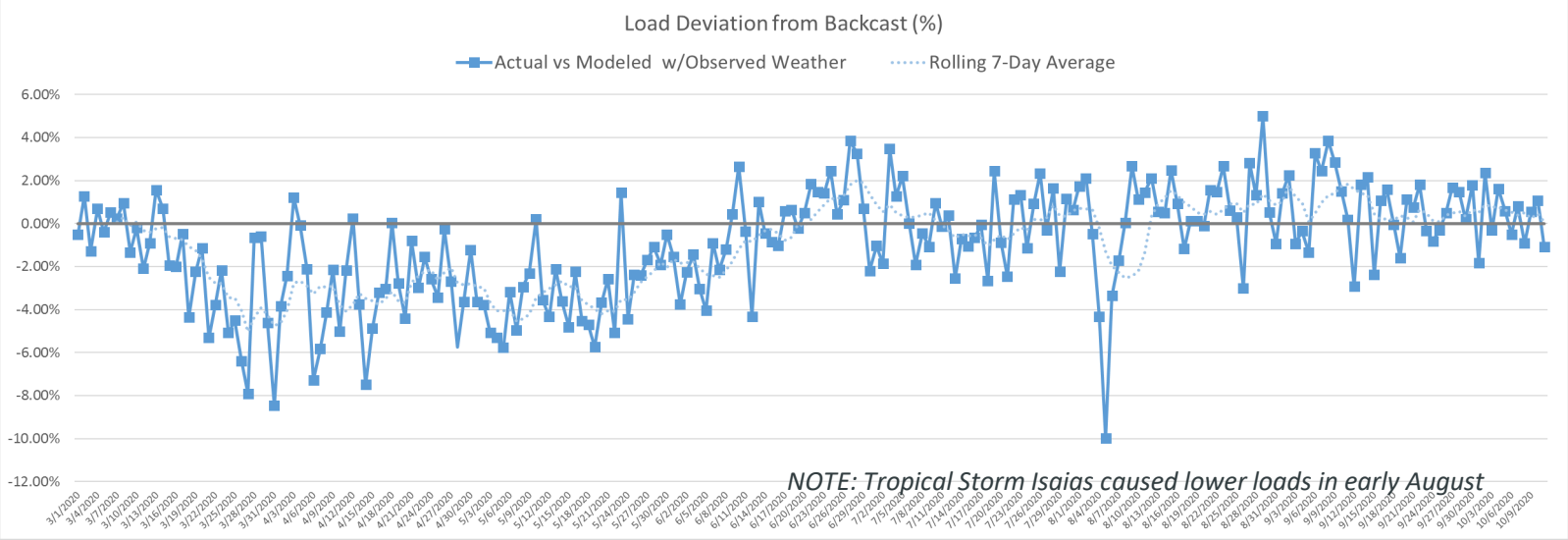
Summer 2020 Natural Gas Issues – cont'd

- July 2020
  - 3 gas issues and 0 incident reported by gas-fired generators
    - Total reported electric energy reduction from the 3 issues ~ 107 MWh
  - 4 OFOs declared by N.E. pipelines
    - AGT from July 18 through 31
    - Iroquois Gas Transmission System (IGTS) from July 18 - August 1
    - Tennessee Gas Pipeline (TGP) from July 20 - 21 and July 27 - 30
  - Same performance / maintenance issues for AGT as declared in May 2020.
- August 2020
  - 2 gas issues and 0 incidents reported by gas-fired generators
    - Total reported electric energy reductions from the 2 issues ~ 83 MWh
  - 3 OFOs declared by N.E. pipelines
    - AGT from August 11 through 13
    - IGTS from August 10 through 14
    - TGP from August 11 through 13, and 1 meter specific OFO on 5 power plants
  - No performance or maintenance issues reported by any N.E. pipeline

2020 SUMMER PANDEMIC OBSERVATIONS

2020 Summer Pandemic Observations

- ISO-NE maintained an *"untrained load model"* for back-casting load used in comparison to actual COVID-19 loads
  - Early demand (March through May) was 3-5% lower than loads would have been, absent the pandemic
  - Air conditioning demand in June through early September, coupled with re-opening policies, resulted in loads that were close to or exceeding forecast loads for summer weather conditions



2020 Summer Pandemic Observations

- ISO-NE forecasters continue to refine load models, using additional variables and more frequent model retraining
  - Accuracy was off the mark early in the pandemic response but has improved as a deeper set of weather and load data has been accumulated over the last several months

- ISO-NE published a weekly report on the impact to load during the pandemic and intends to continue that report while information is still relevant
  - https://www.iso-ne.com/markets-operations/system-forecast-status/estimated-impacts-of-covid-19-on-demand/

2020 SUMMER RECAP/CONCLUSIONS

2020 Summer Recap/Conclusions

- COVID-19 was the focus of summer operations for 2020
  - Likely to continue to impact operations until mid-2021, perhaps longer
- Peak loads were generally in line with forecasts given the weather conditions on the peak day
- Regional natural gas system maintenance and operations were minimally impactful on power system operations for 2020

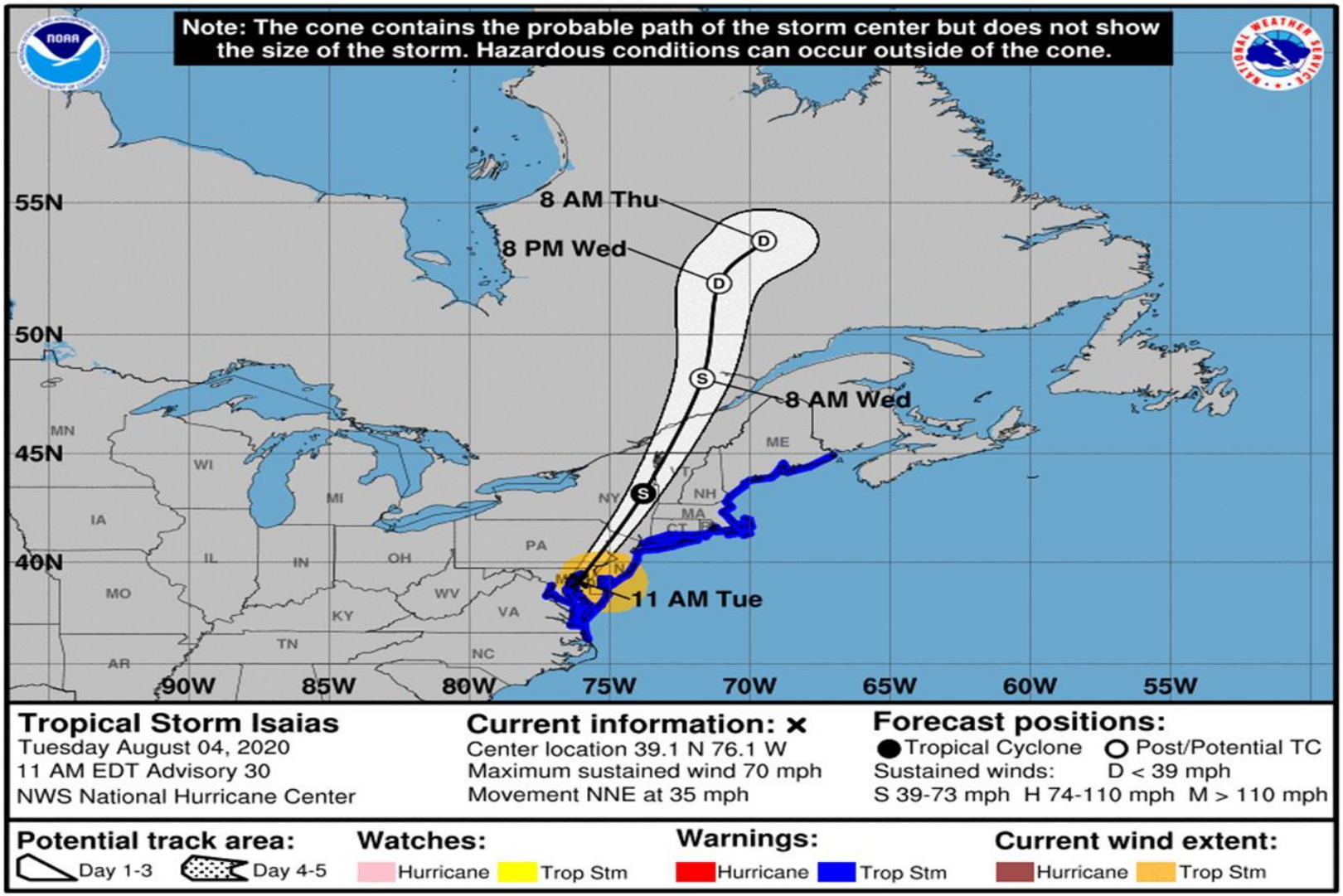
Questions

APPENDIX 1
TROPICAL STORM ISAIAS – OVERVIEW

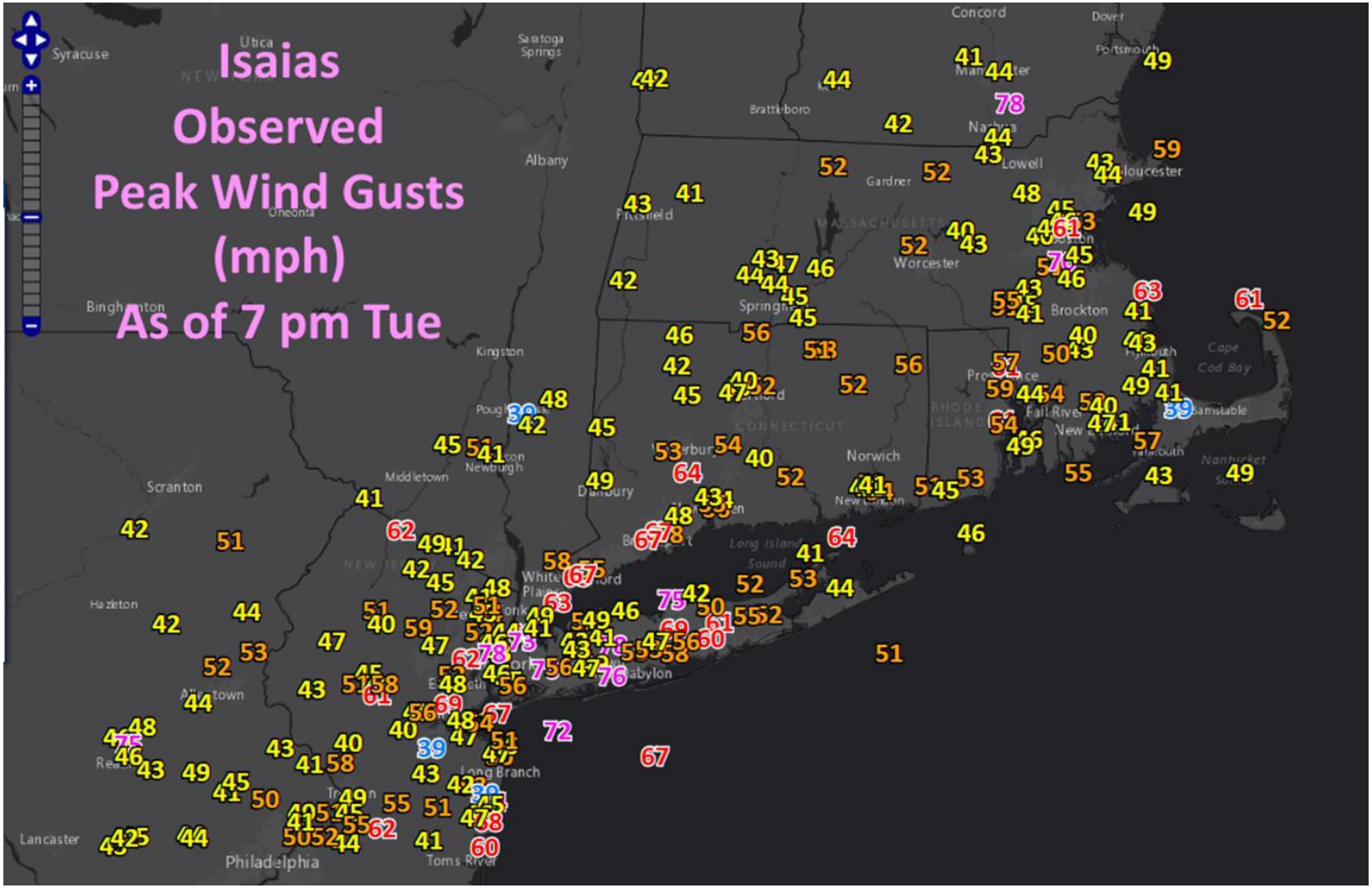
Tropical Storm Isaias – Overview

- Isaias hit New England on August 4, 2020
- The bulk power system was operated reliably by ISO and LCC System Operators, as well as Generator and Demand Operators before, during, and after the storm
- Approximately 1.2 million customers were without power at the peak of the storm
- 32 Transmission outages at the peak of the storm
  - Mainly in southwest and central CT

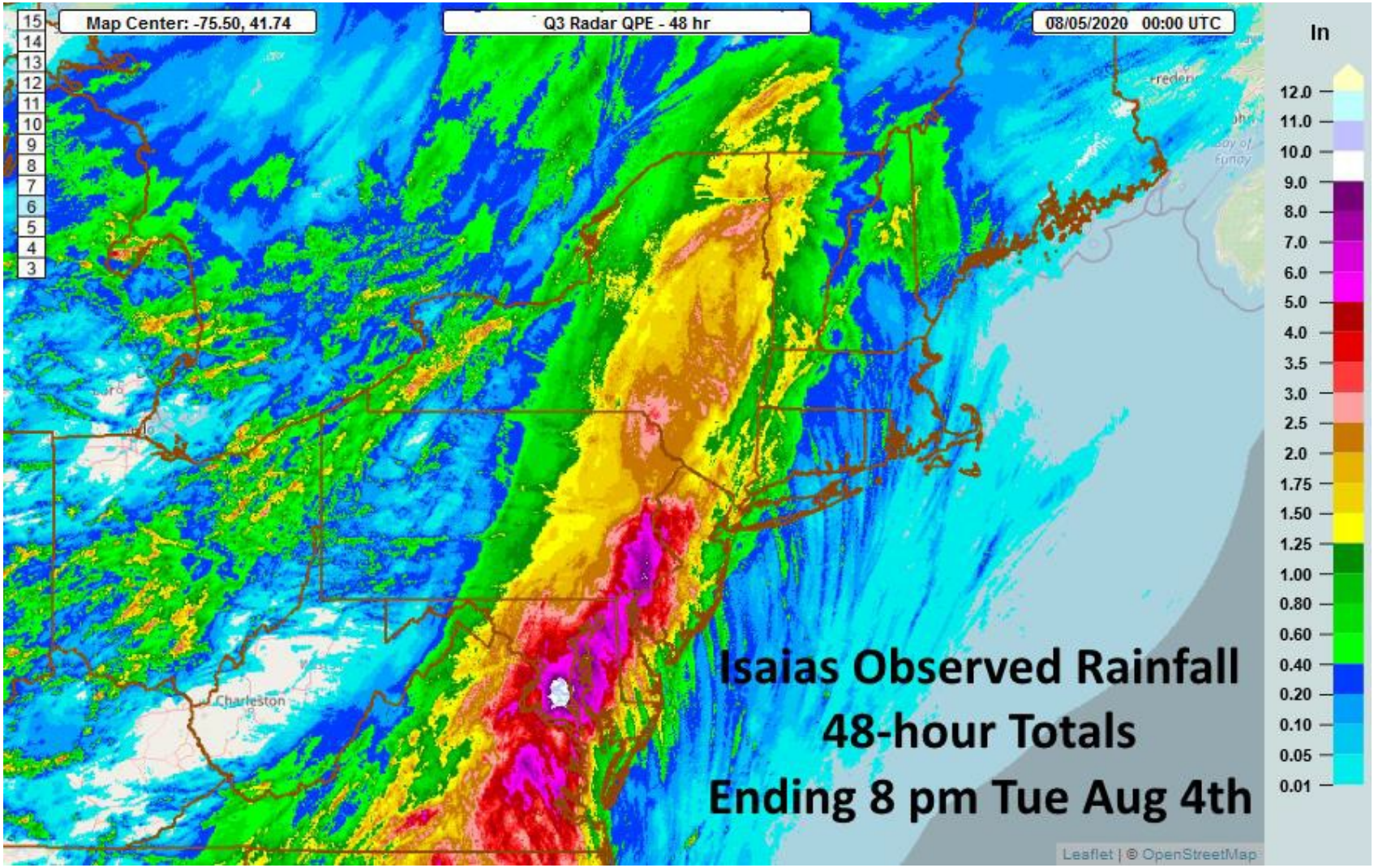
Forecasted Storm Path – August 4, 2020



Observed Wind Gust Map



Observed Rainfall



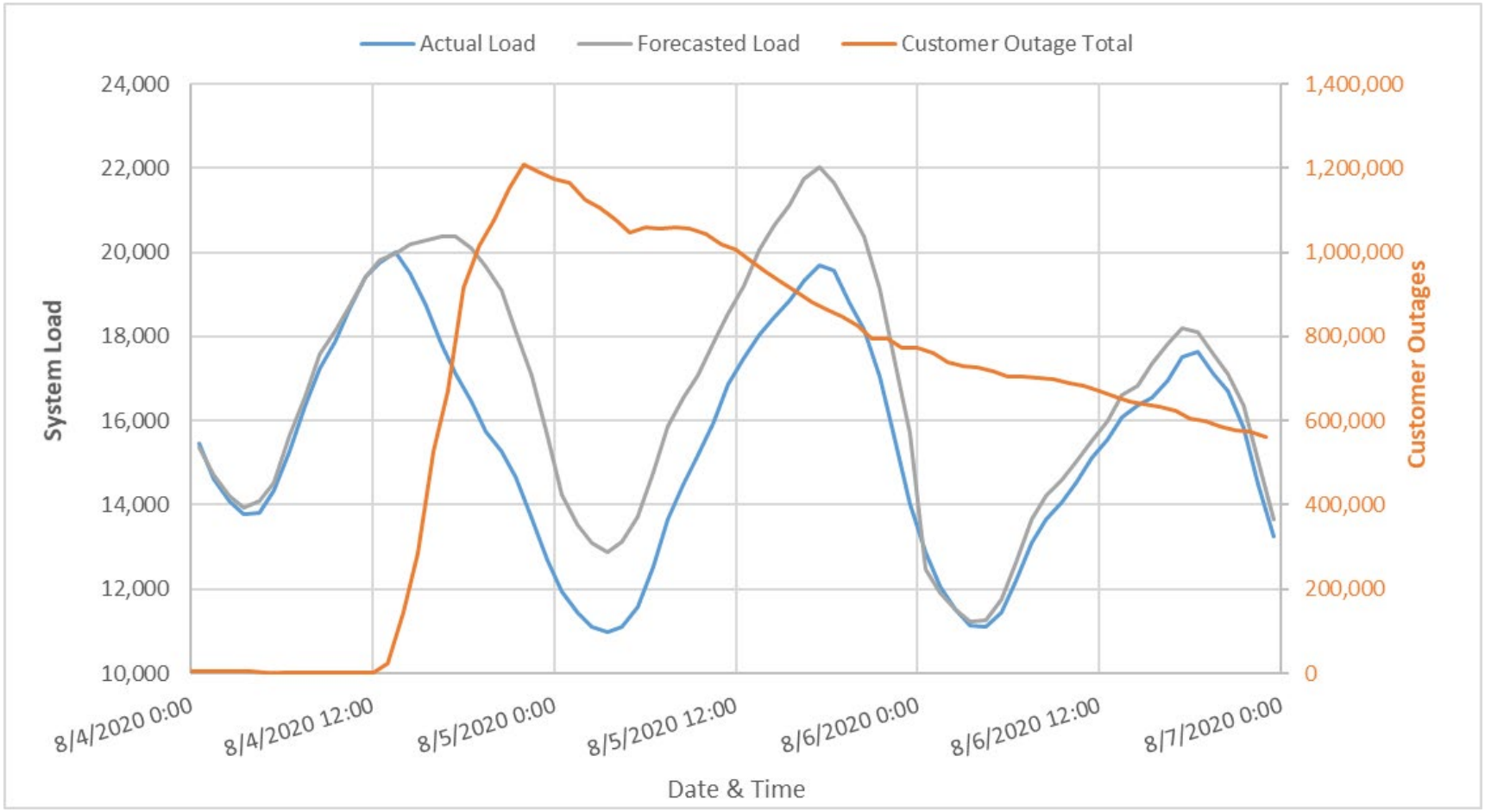
Operations Coordination

- Coordination and Preparation Efforts:
  - Master/Local Control Center (LCC) Heads
  - NPCC Reliability Coordinators
  - Nuclear Plants
  - Natural Gas Pipelines & LNG Facilities
- Declaration of M/LCC 2 (Abnormal Conditions Alert) on August 4, 2020
- Enhanced staffing at all Local Control Center facilities

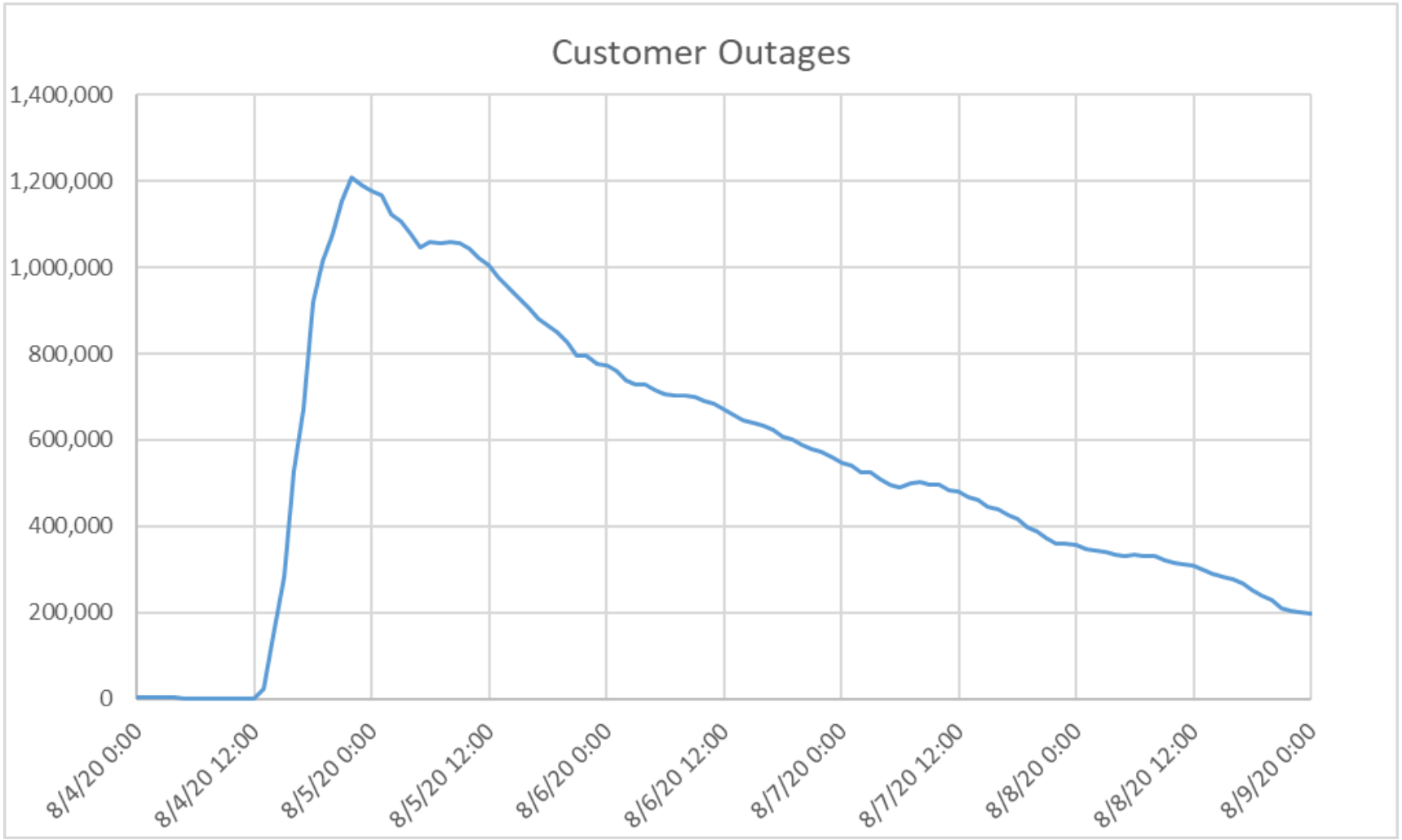
Other Actions and Events

- M/LCC 2 – Abnormal Conditions Alert was declared at 15:40 on Tuesday, August 4, 2020 and continued until 21:00 on Monday, August 10, 2020
  - Scheduled outages of both generation and transmission were recalled and postponed if possible
  - Some outages selectively taken in accordance with M/LCC 2
- ~1,200 MW of capacity was "locked-in" Connecticut due to numerous line outages
- 2 large resources took significant reductions during the event

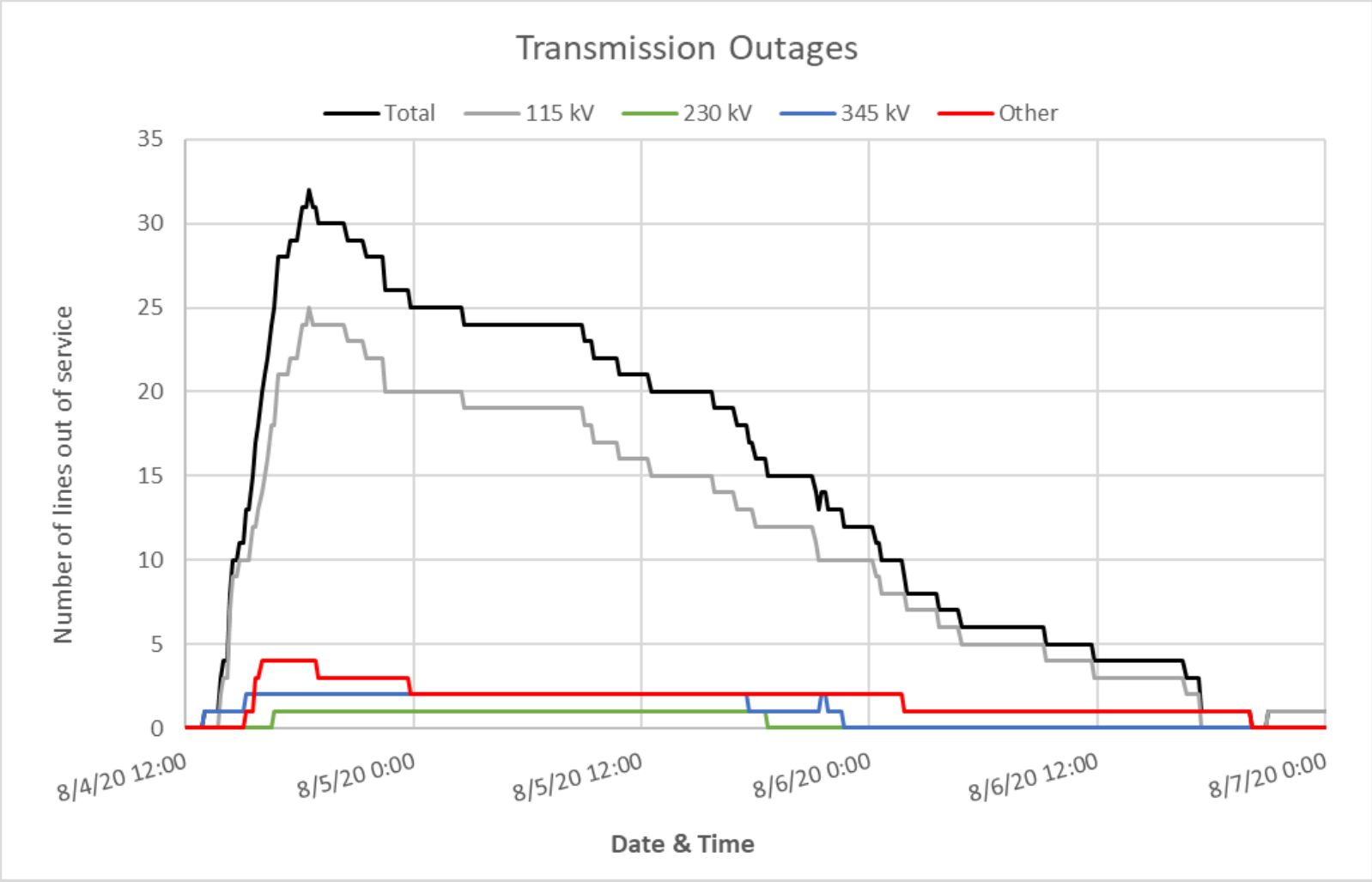
Demand Forecast vs Actual



Customer Outages



Transmission Equipment Outage Trend



Other category consists mainly of 69 kV equipment but also contains a 138 kV element

Questions