Wind and Power Time Series Modeling of ISO-NE Wind Plants

Introduction and Preliminary Insights

Steven Judd, PE

LEAD ENGINEER, SYSTEM PLANNING

Purpose

- Review the need for a new wind data power time series and the assumptions used to create the data.

BACKGROUND

Background

- Current studies source offshore wind data from the NREL toolkit
  - Available locations don't cover the BOEM lease areas
  - Data only available from 2007-2013
- Three different ongoing studies at the ISO need wind data
  - 2019 Economic Studies: Requests to study up to 12 GW of offshore wind in the BOEM areas highlighted the lack of locational correlation with NREL data not available for requested weather year of 2015
  - Energy Security: Wind data for Dec 2014 – Feb 2015 not available for the planned offshore facilities
  - Transmission Planning Assumptions: Historical wind data for 2012-2018 not available to use in conjunction with historical load and solar PV data for those years to examine correlation of load with forecasted penetrations of wind and solar PV

Background, cont.

- The ISO has several areas of ongoing work that would be enhanced with historical wind data output for offshore wind farms that have not been built
- Previously available data sets were no longer matching current needs for weather basis years
- Historical solar PV data for New England available since 2012
  - Does not coincide with previously available wind data

Approach to Improve Wind Data Set

- The ISO hired DNV GL to create a new historical data set for wind both onshore and offshore
- DNV GL is already performing our operational wind forecasting which includes data on wind farm layouts, turbine types, and power curves for our existing fleet
- With this initial data, they were able to set up the weather models and complete the analysis in a short period of time
- This project will allow the ISO to update the time series in the future to continue to calibrate and expand the data

DNV GL PRESENTATION

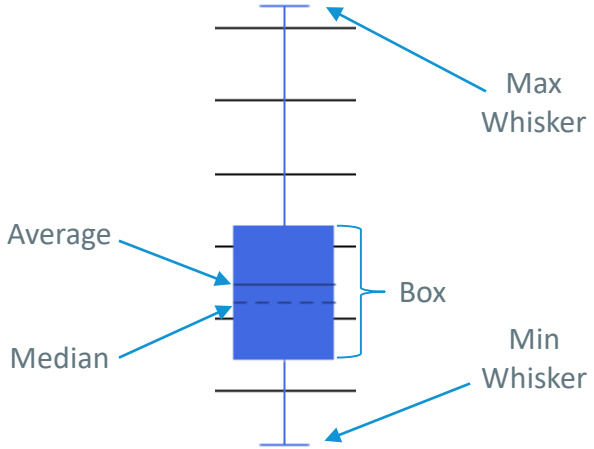
Wind and Power Time Series Modeling of ISO-NE Wind Plants

Methodology and Analysis of Results

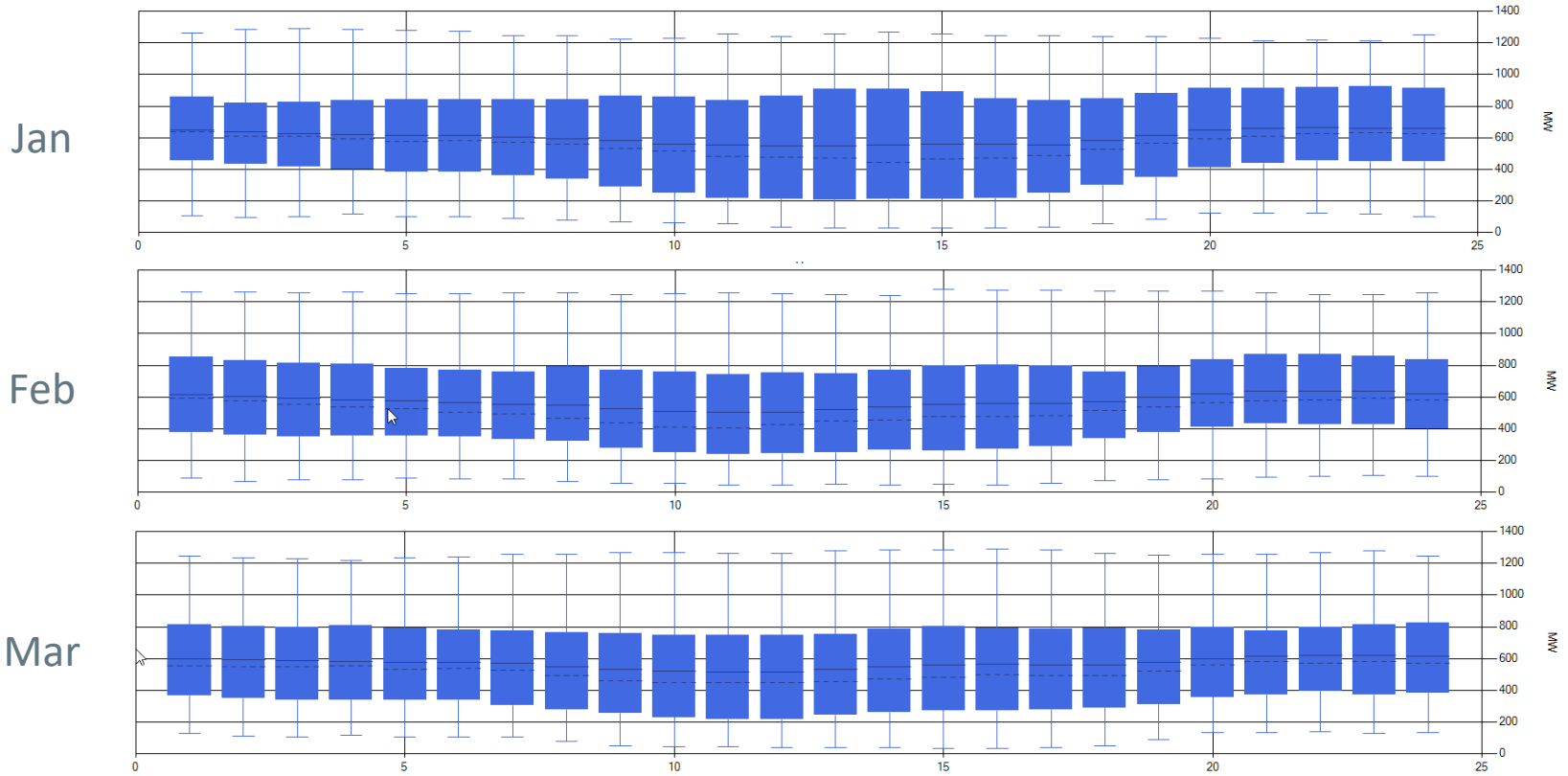
PRELIMINARY INSIGHTS

Preliminary Insights

- The next 8 slides show the hourly box plots of aggregate onshore and offshore wind in New England for 2012-2018
- Box Plot Primer
  - Whiskers: Max/Min of data
  - Box: 1st to 3rd quartile of data points
  - Solid line: Average of data
  - Dashed line: Median of data points



Onshore Wind Variability by Month (Jan-Mar, 2012-2018)



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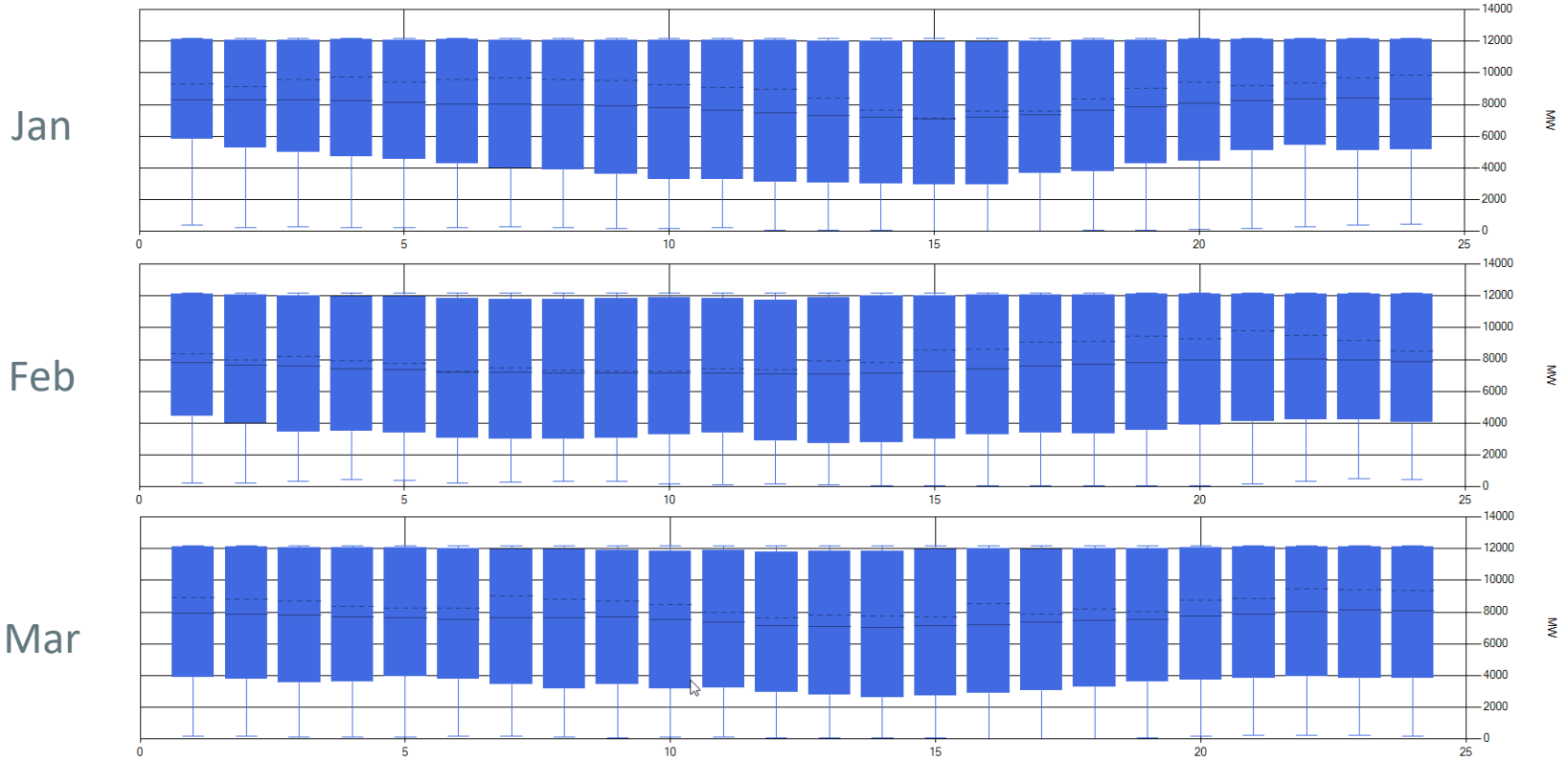
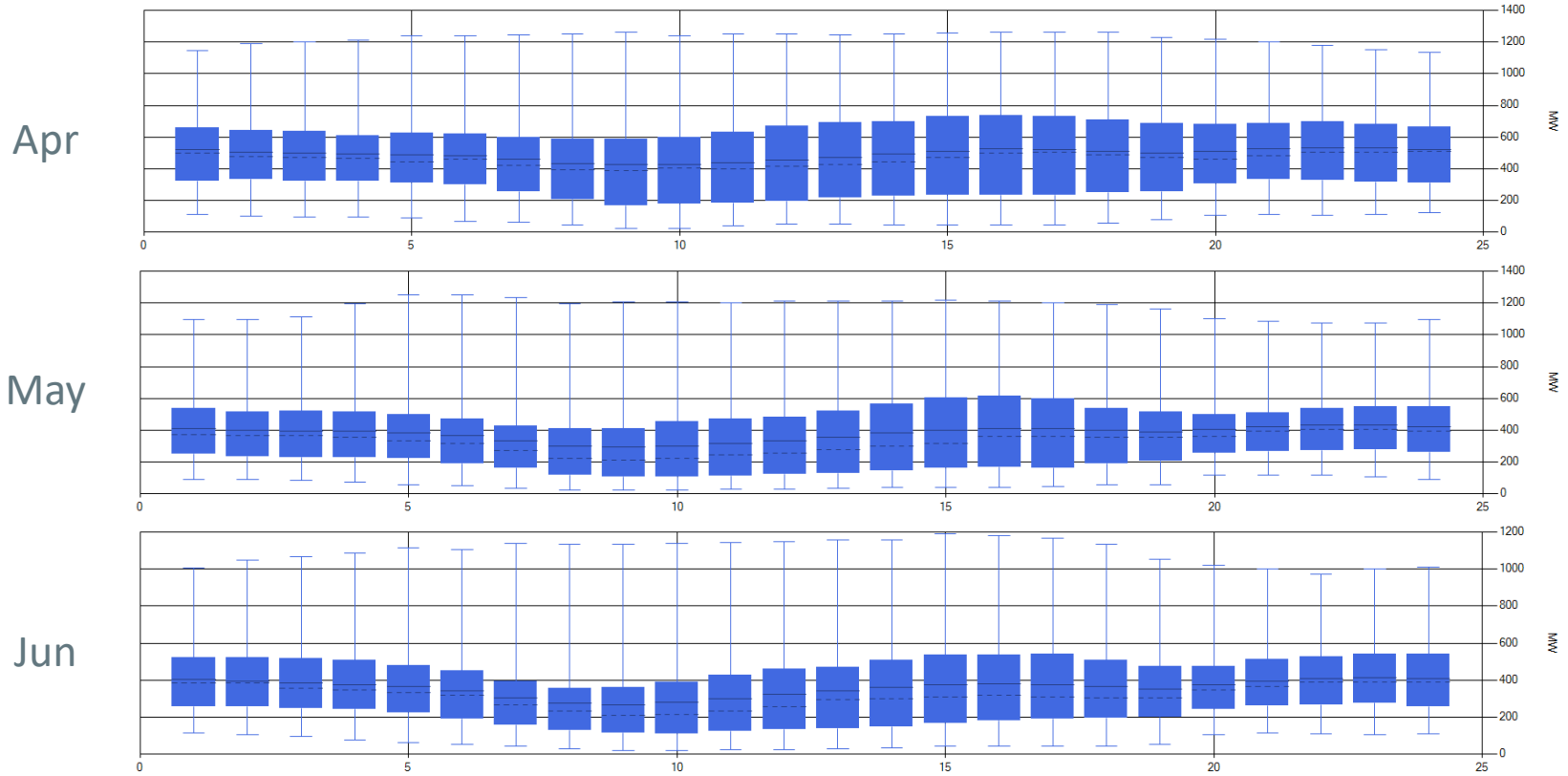
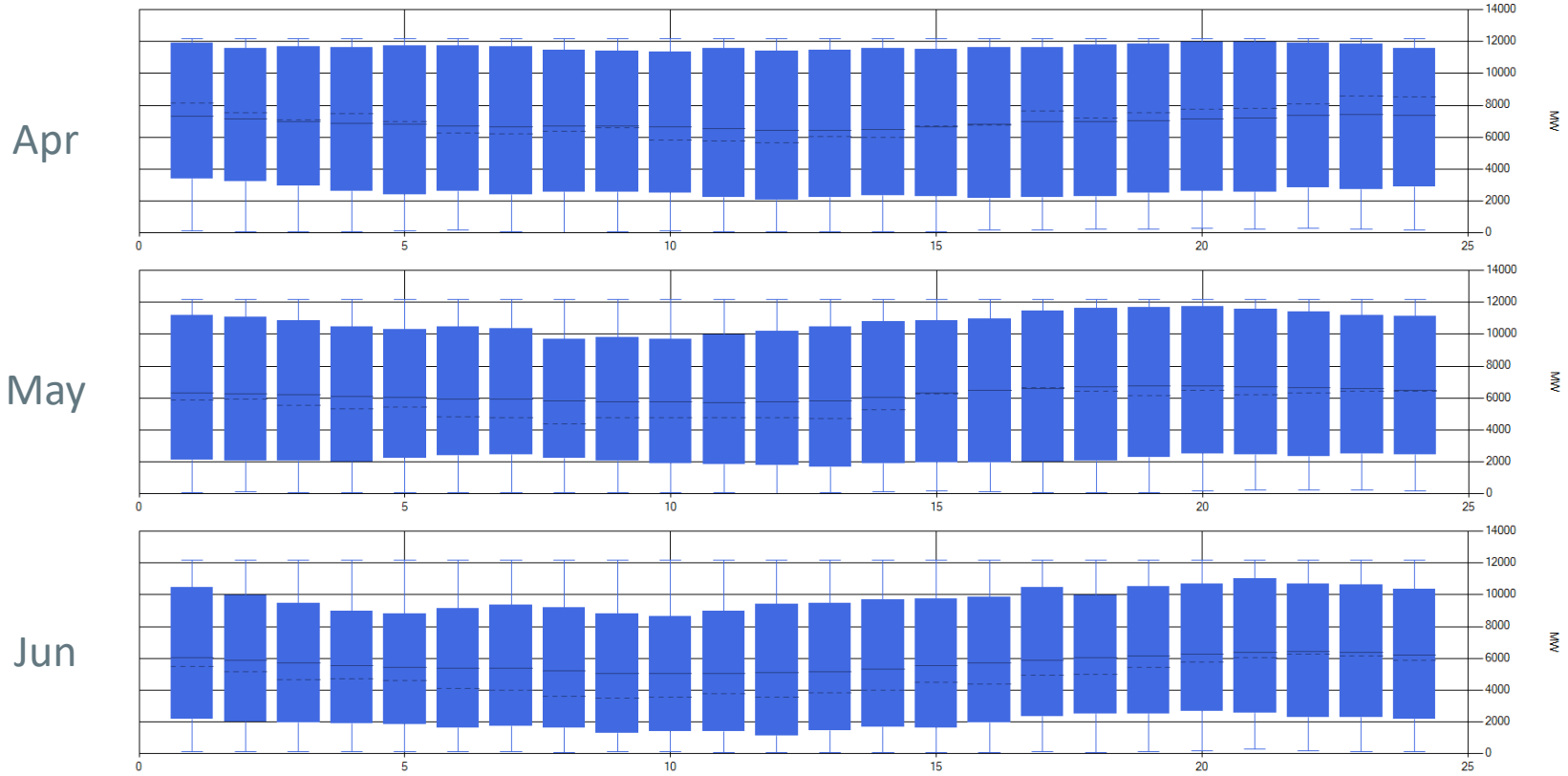


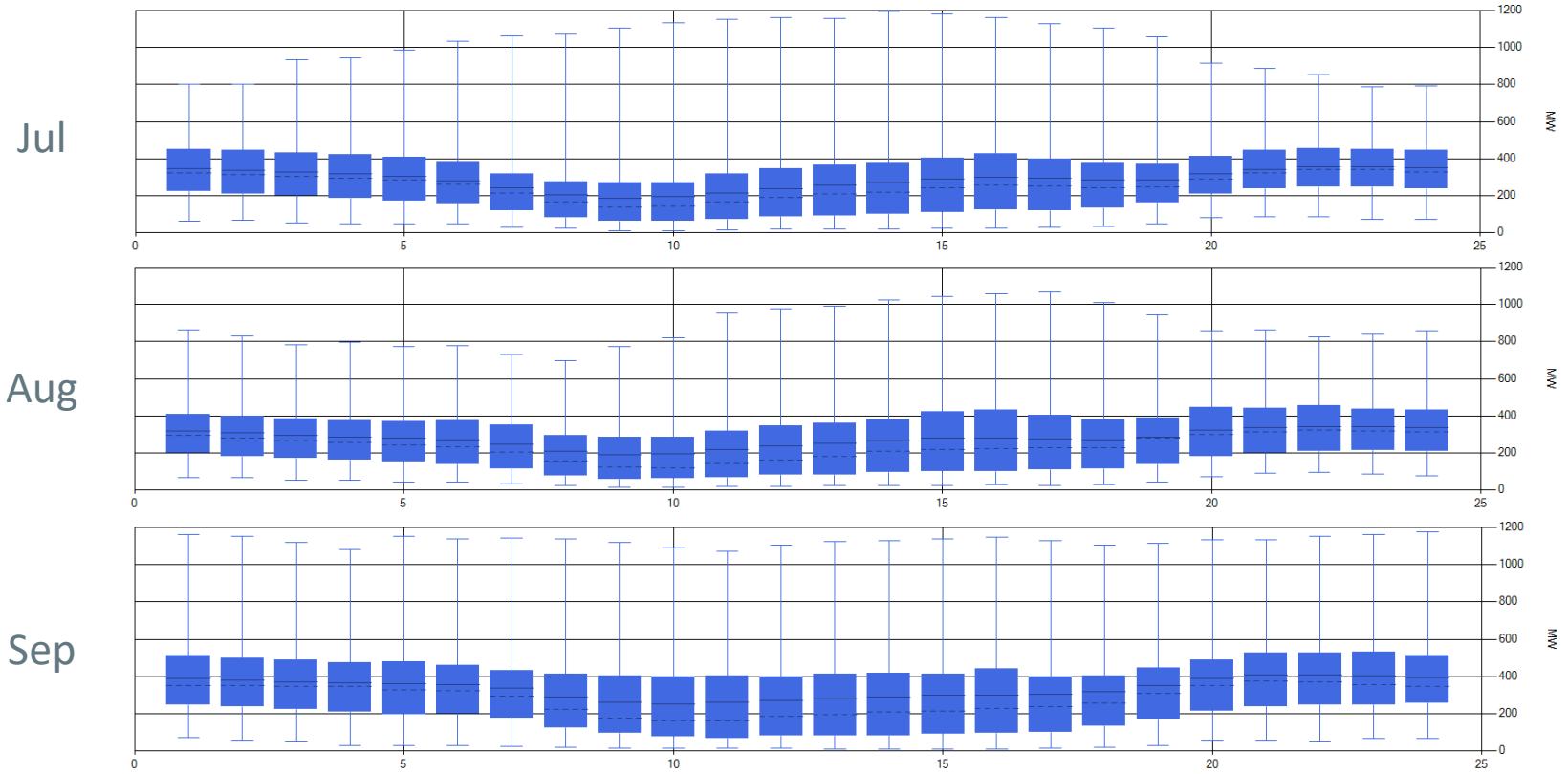
Onshore Wind Variability by Month (Apr-Jun, 2012-2018)



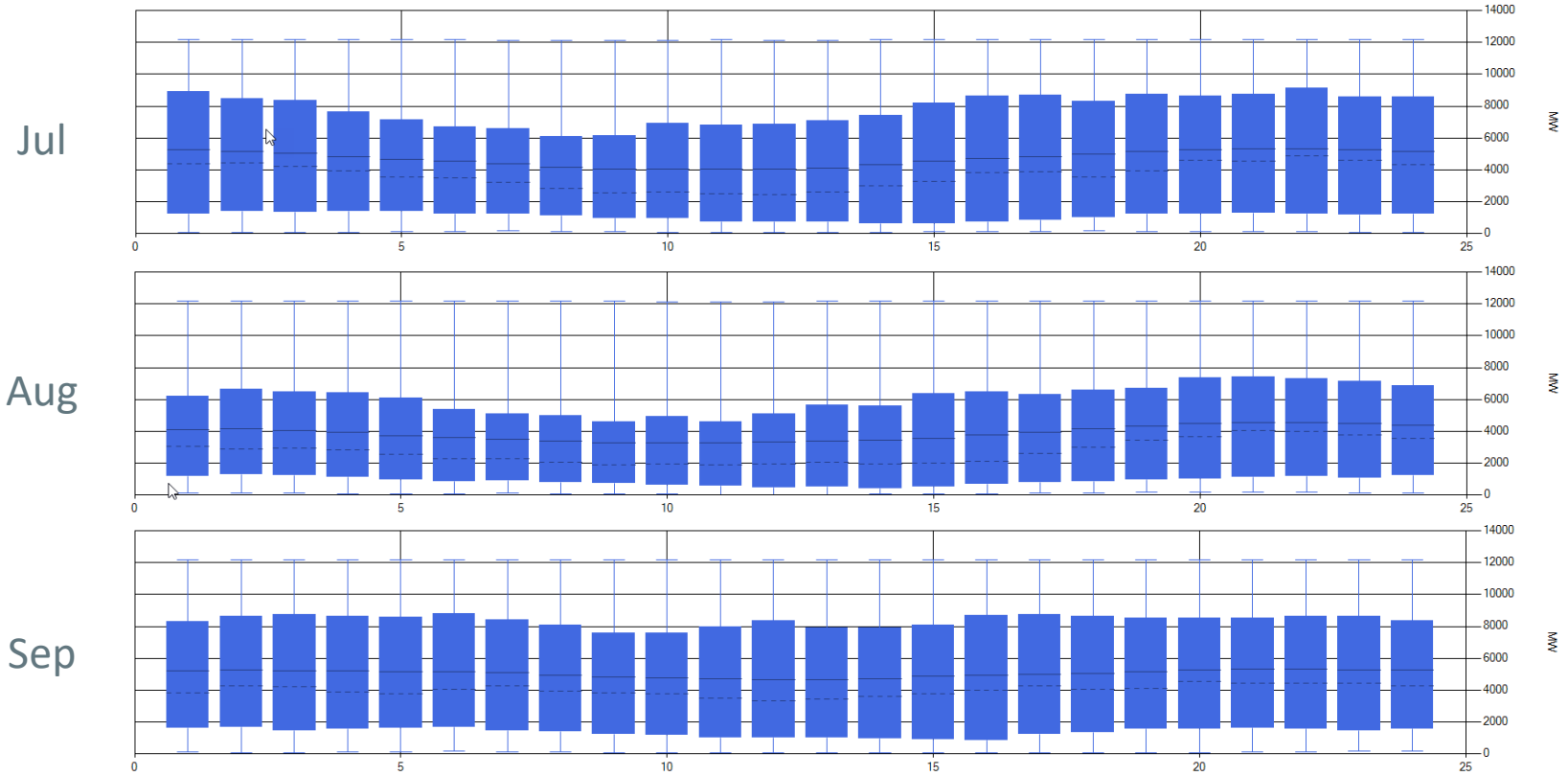
Offshore Wind Variability by Month (Apr-Jun, 2012-2018)



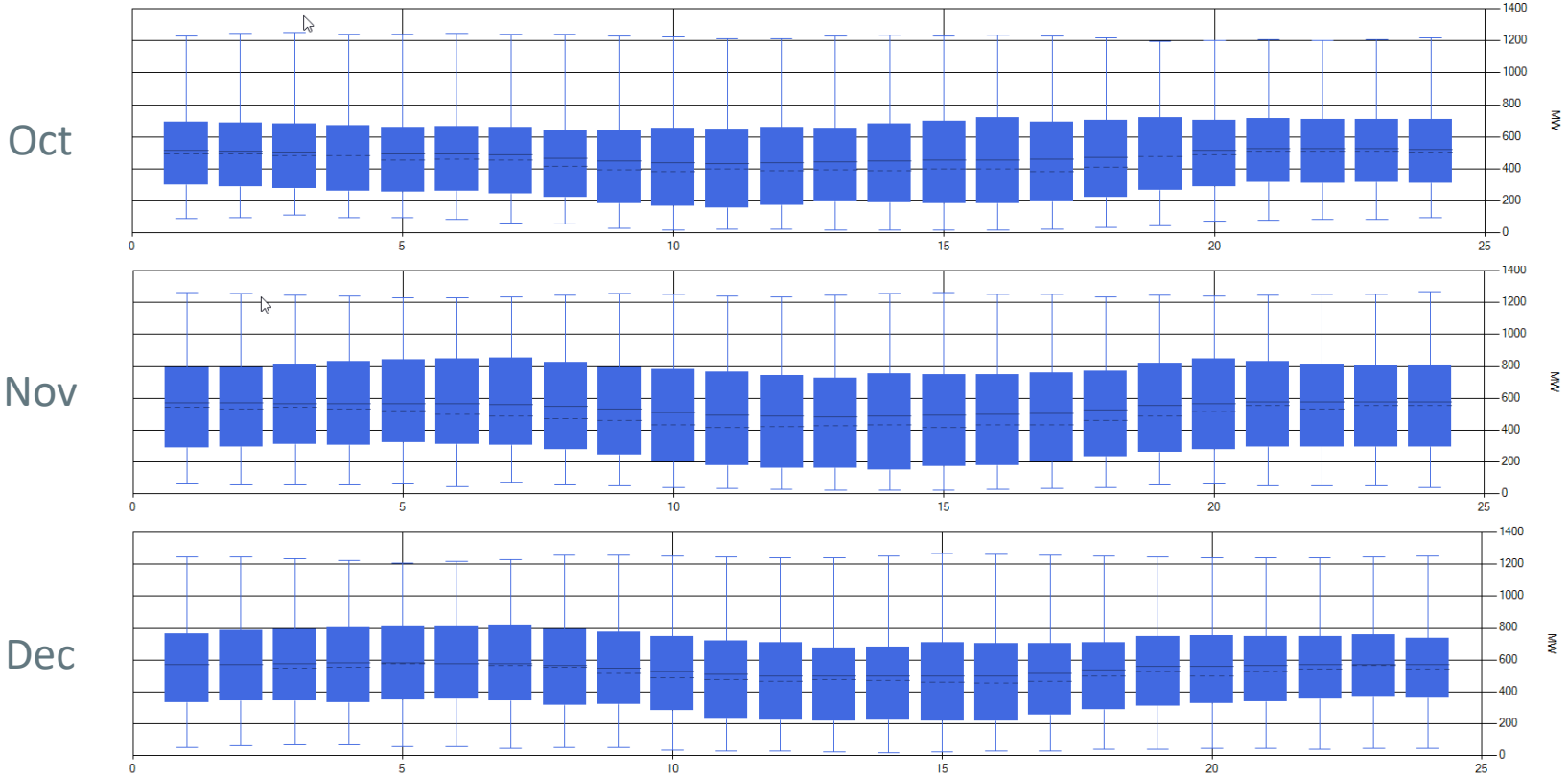
Onshore Wind Variability by Month (Jul-Sep, 2012-2018)



Offshore Wind Variability by Month (Jul-Sep, 2012-2018)



Onshore Wind Variability by Month (Oct-Dec, 2012-2018)



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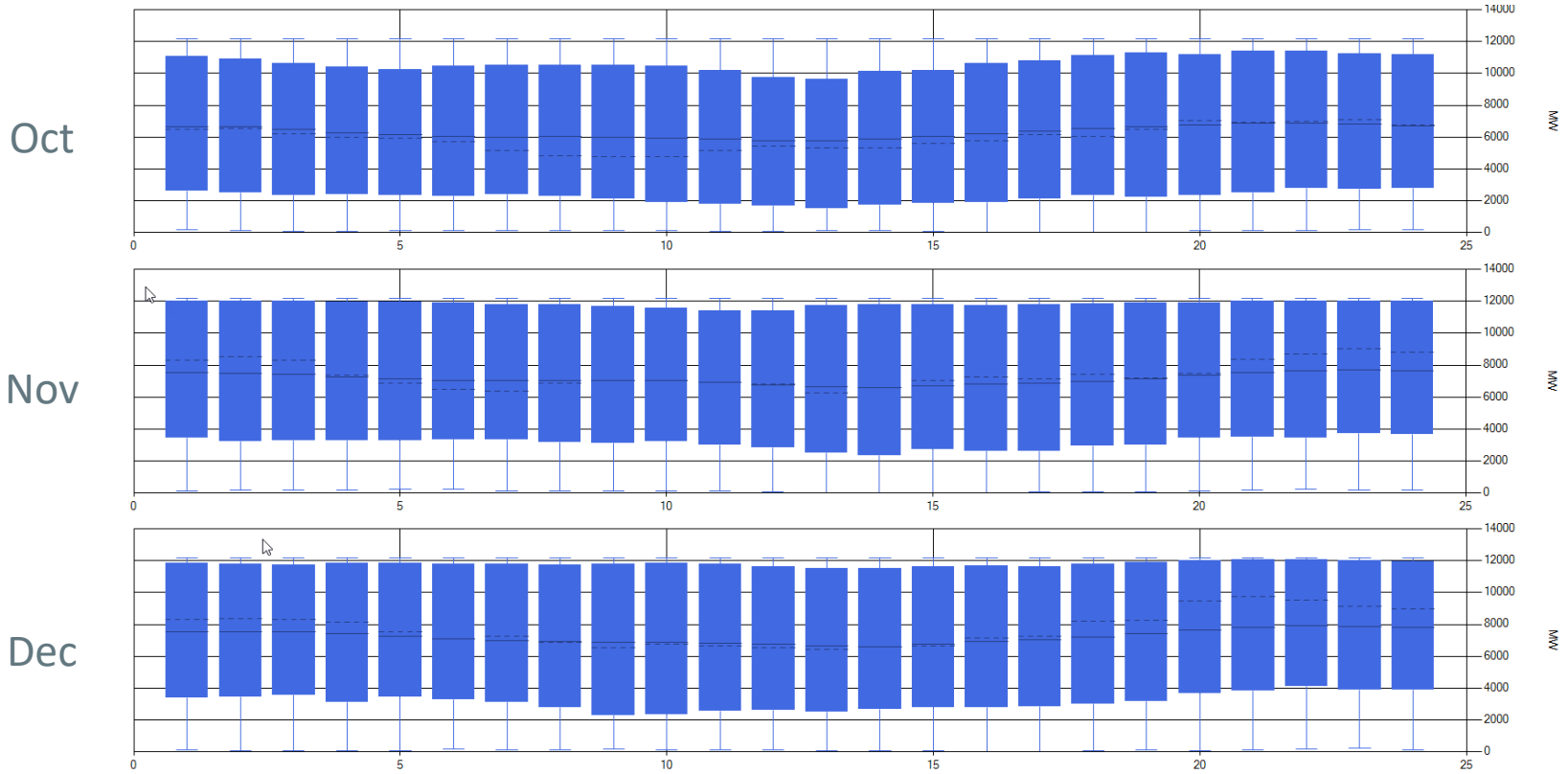
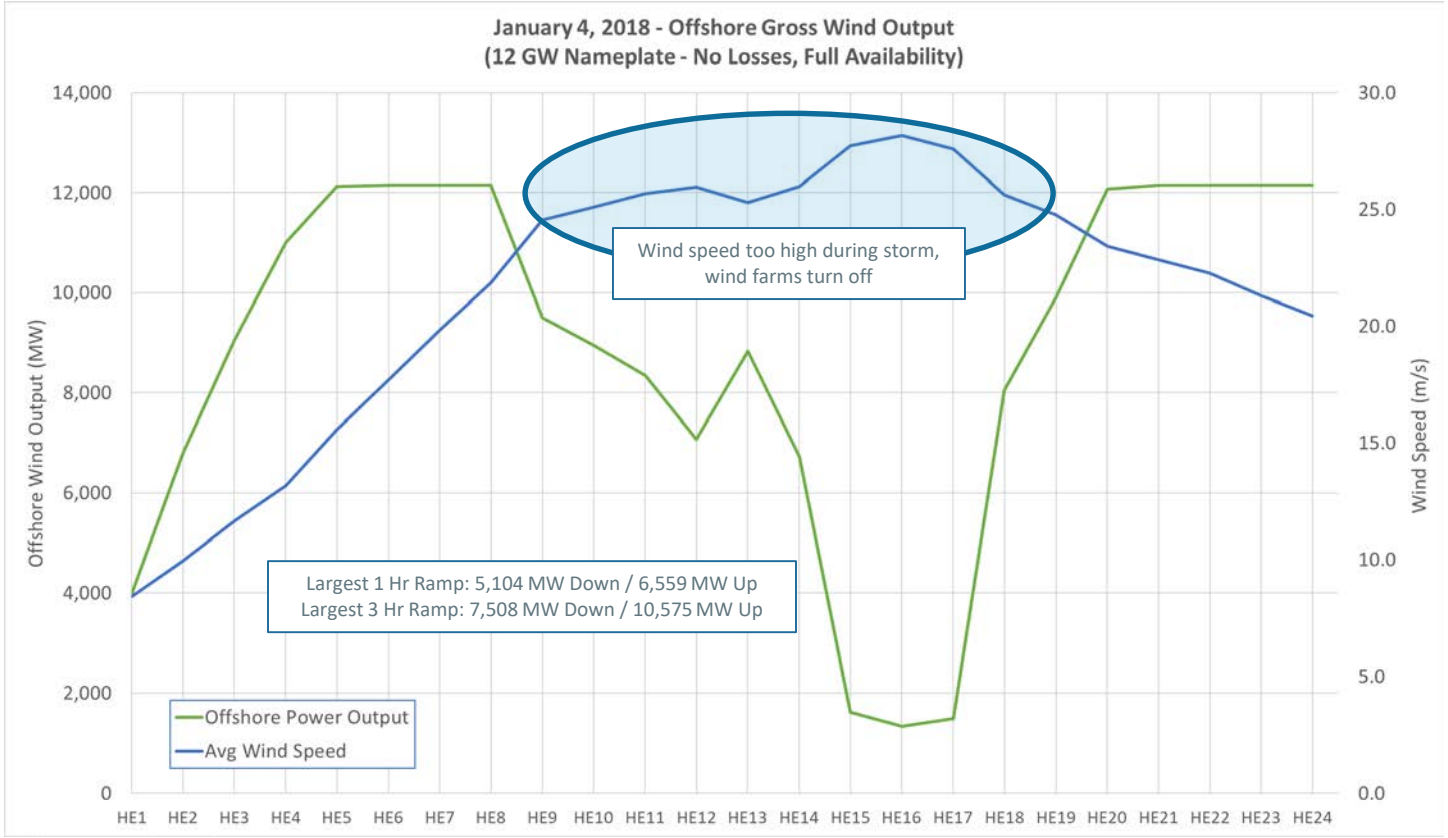
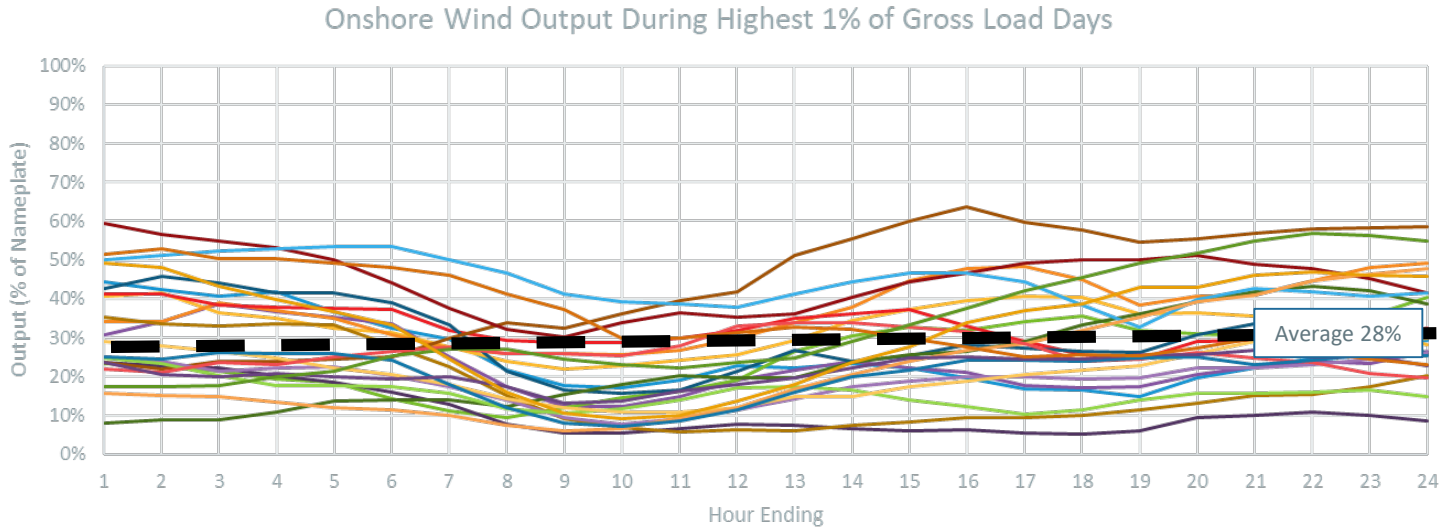


Sample Output during Jan 4, 2018 Nor'easter



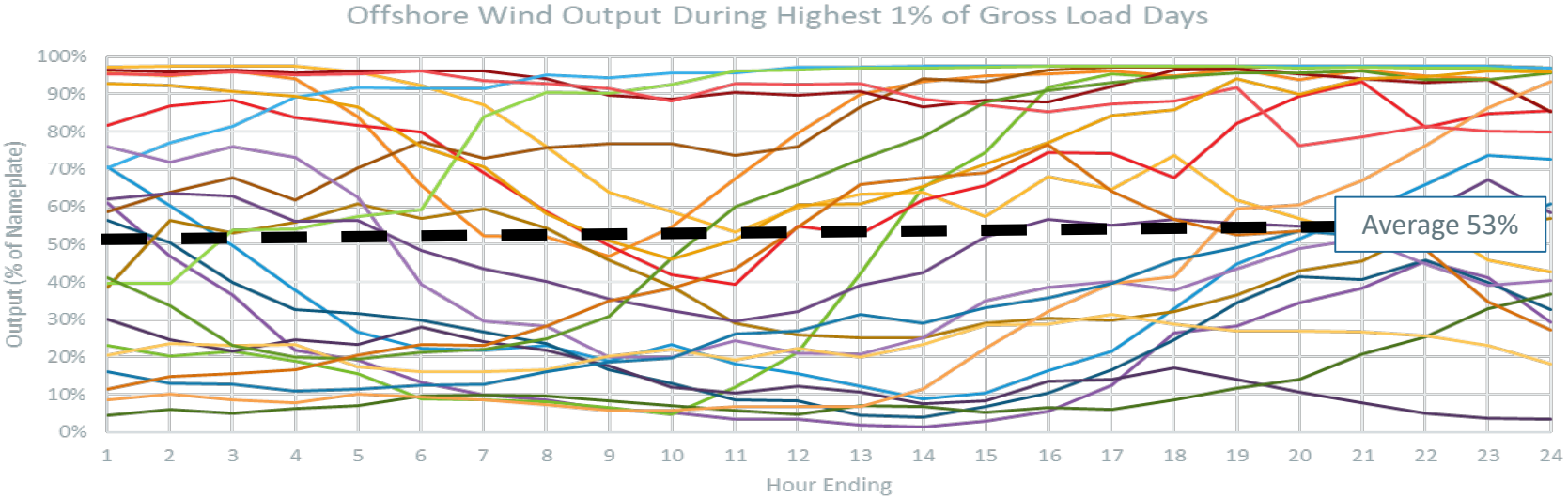
Onshore Wind Variability – Summer Peak

- Historical onshore wind for top 1% gross load days (23 out of 2,557)
  - Hourly Output Range: 63.32% down to 5.23%
  - Average output: 27.79%, Average StDev: 12.04%



Offshore Wind Variability – Summer Peak

- Historical offshore wind for top 1% gross load days (23 out of 2,557)
  - Hourly Output Range: 97.50% down to 1.47%
  - Average output: 53.47%, Average StDev: 31.53%
- For same type of summer peak weather day, offshore wind could be as high as 100% or as low as 2% for any hour of the day



NEXT STEPS

Next Steps

- Continue to review data to get a deeper understanding of behavior of onshore and offshore wind so that we can develop appropriate assumptions in our studies
- Future work for 2020 (expected by end of Q2)
  - Add 2019 data to historical set and recalibrate model based on additional historical data
  - Add new ‘future’ wind farms to offshore locations east of NH/ME in Gulf of Maine

Questions

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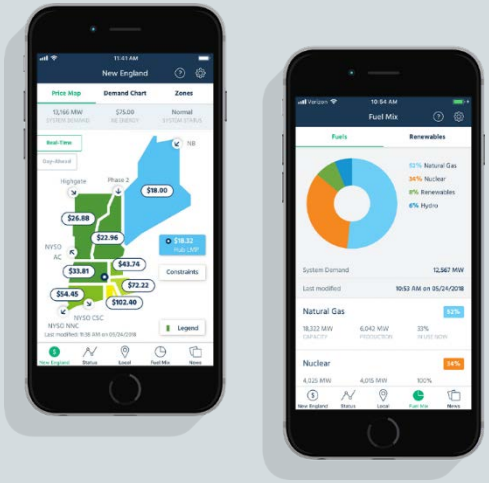

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