ICS Attachment #2 – For EC Approval

Resource Production Coincidence White Paper

New York State Reliability Council

Installed Capacity Subcommittee

Introduction

As the grid evolves, intermittent resources will take up an increasing share of the supply mix required to maintain a reliable and cost effective grid. These resources may include renewable weather-dependent resources such as front-of-the-meter ("FTM") solar photovoltaic ("PV"), onshore wind, and offshore wind, and other intermittent resources such as run-of-river hydro and landfill gas. The New York State Reliability Council ("NYSRC") Executive Committee is committed to understanding the impact of high renewable resources penetration on the reliability of the New York bulk power system. As a part of that commitment, the NYSRC Installed Capacity Subcommittee ("ICS") expressed interest in evaluating the degree to which intermittent, and especially weather-dependent, resource production correlates over a coincident period to determine how these correlations affect New York bulk power system reliability.

This study tests the correlation of onshore wind, FTM solar PV, landfill gas, and run-of-river hydro to determine whether correlation exists and, if so, whether such correlation is important to model in the IRM Study. This comparison focuses on the 2014 – 2018 period based on data availability.

Separately, this study evaluates the coincidence of onshore wind production data (*i.e.,* NYISO billing-quality meter data) and offshore wind production, as determined for the High Renewable Whitepaper. This comparison focuses on the 2012 period based on data availability.

Background

To model intermittent resources, the NYISO uses historical and modeled "shapes[1]". Solar PV, onshore wind, run-of-river hydro, and landfill gas production "shapes" draw from historical production data. For each of these resources, there are shapes for each calendar year in the period 2014-2018.

The GE MARS program, for each iteration, will pick a shape year for each resource. In previous IRM studies, the NYISO did not apply coincidence between resources. That means, for example, MARS could have picked the 2014 shape for solar PV, 2018 for onshore wind, and 2016 for run-of-river hydro.

For offshore wind, due to a lack of historical data, the NYISO utilizes modeled data. There is a shape for each calendar year in the period 2007-2012.

[1] A "shape" is a hourly profile of production in MW over the course of a year; 8,760 data point for each hour.

Methodology

The purpose of this study is to:

1) force coincidence between land-based intermittent resources and measure the effect on the New York's bulk power system reliability, and
2) investigate patterns of low production hours between onshore and offshore wind

Solar PV, Onshore Wind, Run-of-river Hydro, and Landfill Gas

The NYISO began the evaluation using the 2020 IRM Technical Study Final Base Case ("FBC"), which satisfies the loss of load expectation ("LOLE") criterion of 0.1 as discussed in the 2020-2021 IRM report[2]. The FBC, in which none of the intermittent resources were made coincident, was used as a control. The second case modified the base case such that solar PV and onshore wind were made coincident. This means that for each of the years between 2014 and 2018, solar PV and onshore wind shapes were guaranteed to have the same shape year picked for each iteration (*i.e.,* if MARS picked 2016 wind, it would be also pick 2016 solar). The third case modified the second one such that solar PV, onshore wind and run-of-river hydro were made coincident. The final case modified the third case such that solar PV, onshore wind, run-of-river hydro, and landfill gas were made coincident. The NYISO recorded the New York Balancing Area ("NYBA") LOLE for each of these four cases, as well any changes in capacity requirements from the FBC.

Onshore and Offshore Wind

The offshore wind shapes cover the period 2007-2012, which does not overlap with the period for which there is data for other resources. Therefore, the same analysis could not be performed to determine the effect that the coincidence of onshore and offshore wind would have on reliability. However, the NYISO does have 2012 historical onshore wind data, which enables examination of the relationship between onshore and offshore wind production through the use of scatter plots.

[2] http://nysrc.org/PDF/Reports/2020%20IRM%20Study%20Body%20Final%2012-9-19.pdf

Results

Solar PV, Onshore Wind, Run-of-river Hydro, and Landfill Gas

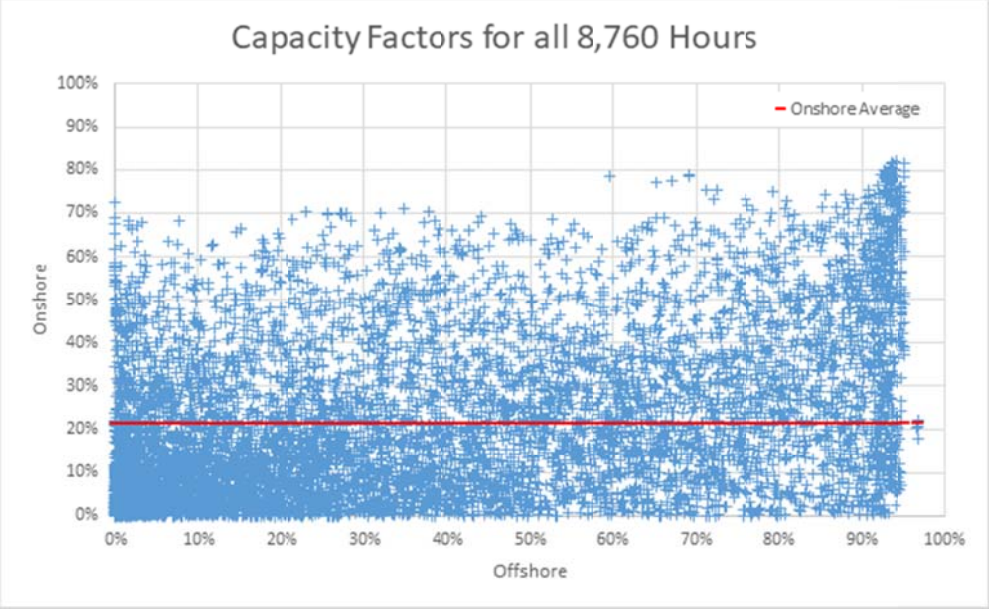
Case	NYBA LOLE	IRM	Zone J	Zone K	G-J Locality
FBC, no coincidence	0.100	18.9%	83.4%	101.8%	98.0%
Wind & Solar PV coincidence	0.100	18.9%	83.4%	101.8%	98.0%
Wind, PV& RoR coincidence	0.100	18.9%	83.4%	101.8%	98.0%
Wind, PV, RoR & LFG coincidence	0.100	18.9%	83.4%	101.8%	98.0%

Each of the three runs in which resources coincide yielded no significant changes in New York Balancing Area (NYBA) LOLE, and no changes in capacity requirements.

Onshore and Offshore Wind

In the following scatter plots, each data point represents one hour, and communicates the capacity factors both onshore and offshore at that hour.

Figure 1



It is evident in Figure 1 that there are several hours in which low offshore wind production coincides with higher onshore wind production, and *vice versa*. This implies that a strong relationship does not exist between production hours of the two resources and the chart shows that the preponderance of hours in 2012 have capacity factors where both onshore and offshore wind are relatively low (*i.e.*, ≤ 20%, the densest portion of the graph). This analysis suggests that while coincident low production for these

resources occurs far from the majority of the time, and are not strongly correlated, there are a significant number of low production occurrences.

Figures 2 and 3 show the same data as in Figure 1, but only for hours in which offshore wind production is less than or equal 10% and 5%, respectively.

Figure 2

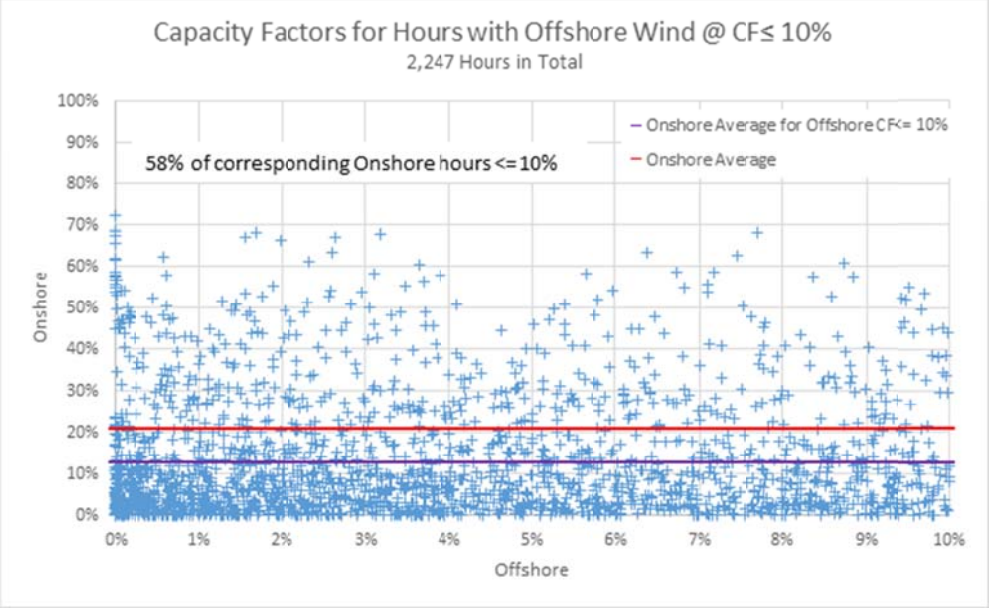
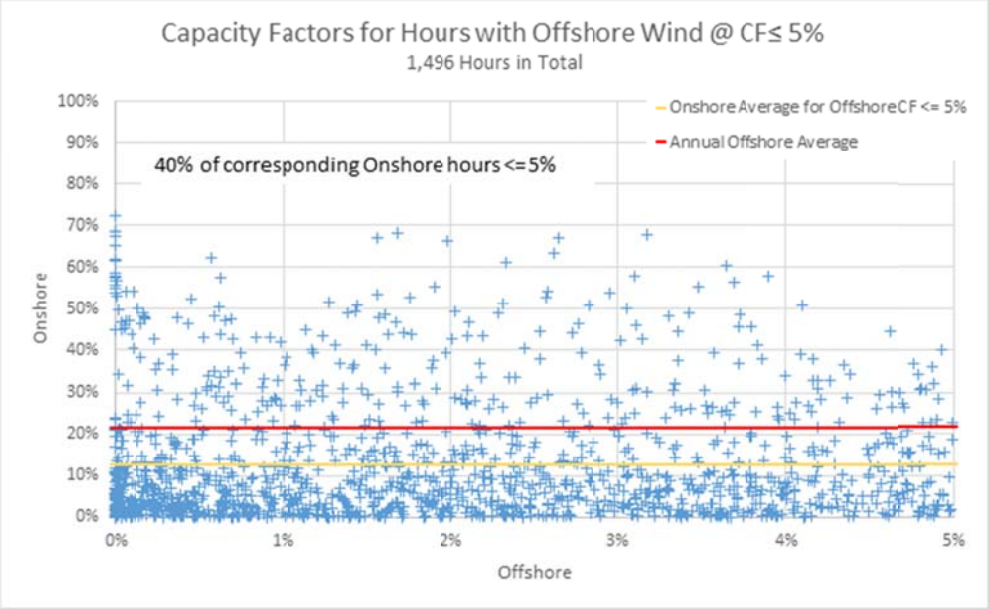


Figure 3



Both of these graphs show that, on average, when the analysis excludes hours with relatively high amounts of offshore wind, onshore output is more likely to be relatively low, even if there are multiple

instances of high onshore capacity factors. These graphs support the need to gain further understanding of the effect that low production coincidence has on reliability.

Recommendations

Forcing MARS to pick the same years for each of these resources has an insignificant effect on New York Balancing Area LOLE and no effect on capacity requirements. This project sought to determine the degree to which production from these resources are coincide, and how that coincidence affects NY bulk power system reliability.

The analysis reveals that both the coincidence and its effect on reliability are negligible. However, as New York State law and policy mandates substantial buildouts of both wind and solar resources, it will be important to monitor the effect that the coincidence of those resources has on reliability. Therefore, the NYISO recommends that the 2021 IRM adopt the practice of including coincidence of FTM solar PV and onshore wind data.

In terms of onshore and offshore wind, the NYISO's study suggests that there is limited correlation between the two resources that was not already captured in the High Renewable Whitepaper. However, as with solar, there will be substantial buildout of these two resource types in the coming future. Accordingly, the NYISO recommends that as more offshore wind data becomes available, the IRM study should adopt methods to examine the effect that the coincidence of these two resources has on reliability.