High Renewable Resource Modeling Whitepaper

New York State Reliability Council –

Installed Capacity Subcommittee Work Product

Draft, October 29th, 2019

Introduction

As the grid evolves, it will integrate intermittent renewable resources that will provide a greater and greater share of the supply mix. These intermittent renewable resources include solar PV, on-shore wind, and off-shore wind, which can supply electricity to the grid to meet demand. Renewable resources can promote more carbon-neutral operation of the electric grid, particularly when situated to energy duration limited resources, such as batteries. Intermittent renewable resources participate in the New York Independent System Operator, Inc. (NYISO)-administered energy and capacity markets. As part of their large scale integration, the NYSRC is working to ensure that tools to measure grid reliability are enhanced to appropriately account for the change in resource mix that is anticipated.

The New York State Reliability Council and the NYISO continue to look for ways to integrate intermittent renewable resources into New York's wholesale electricity markets and harness the value that these resources can bring to the grid, while maintaining reliability and resource adequacy for New York electric consumers.

At the same time, the characteristics of intermittent renewable resources often differ from existing capacity resources (*e.g.*, non-dispatchable generation as opposed to conventional generation). As a result, the NYSRC is exploring in the IRM study the impacts on the NYCA IRM of integrating greater amounts of intermittent renewable resources.[1] This whitepaper is motivated in part by both the need for enhanced tools and methods to model the evolving supply mix. The NYISO expects that if additional modeling tools become available in the future, they could be evaluated within the NYSRC ICS study/whitepaper framework.

Methodology

The NYISO began the evaluation using the 2020 IRM Technical Study Preliminary Base Case, which satisfies the LOLE criterion of being less than or equal to 0.100, and is discussed in the 2019-20 IRM report.[2]

[1] The NYSRC establishes the resource adequacy requirement applicable to the New York Control Area, wherein the grid is designed to meet annual projected peak load, plus a minimum reserve margin requirement to account for unanticipated generator or transmission outages. This margin, called the Installed Reserve Margin (IRM), secures generation capacity beyond the forecasted peak demand to meet a contingency. The IRM is determined by the New York State Reliability Council with technical assistance from the NYISO. The IRM value for 2019-2020 is 17.0%.

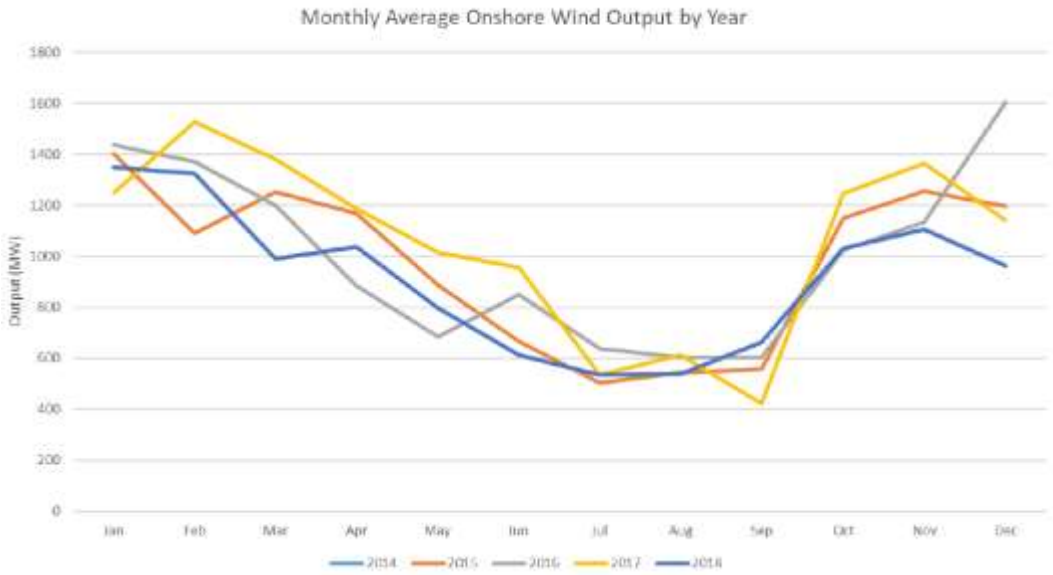
[2] Available at: http://nysrc.org/pdf/Reports/2019%20IRM%20Study%20Body-Final%20Report[6815].pdf.

Incremental renewable resource ICAP was added to this case, specifically, 4,000 MW of incremental on-shore wind and 4,000 MW of solar, consistent with the 2018 IRM sensitivity's resources locations and output shapes (see the table below), as well as 4,000 MW of off-shore wind, evenly split between Zones J and K. The location of both on-shore wind and solar were based on the New York State Department of Public Service's projection of wind and solar installations[3]. Resource quantities were scaled on a zonal basis to the 2,000 MW that were evaluated in the 2018 IRM sensitivity case. More plainly, resources were only distributed across zones that had substantial renewable build outs in the Clean Energy Standard Environmental Impact Statement.

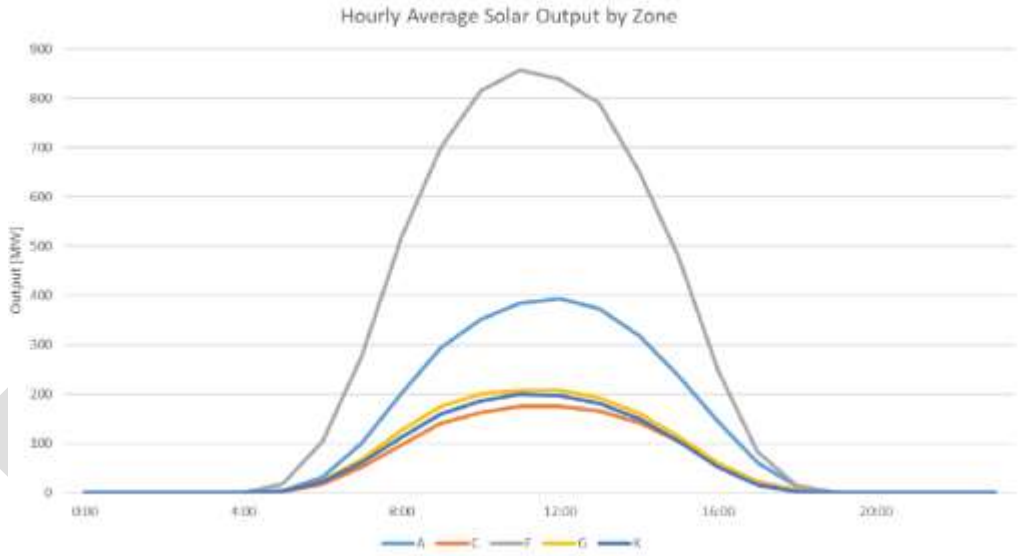
Zone	Solar (MW)	On-Shore (MW)	Off-Shore (MW)	Total (MW)
A	874	1,030		1,904
C	406	994		1,400
D		894		894
E		1,082		1,082
F	1,884			1,884
G	448			448
J			2,000	2,000
K	388		2,000	2,388
Total	4,000	4,000	4,000	12,000

In order to prepare on-shore wind data, the NYISO used five years of billing-quality meter data (January 1st, 2014 to December 31st, 2018), and utilized data from wind facilities that had CRIS rights. The NYISO scaled up production curves from the IRM base case to model 4,000 MW of incremental onshore wind.

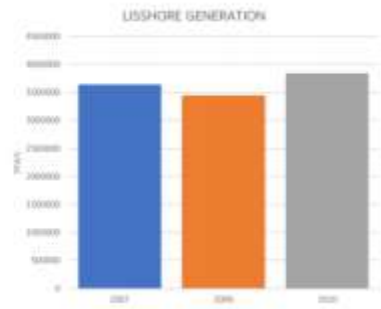
[3] Slide 32 from http://www.nyiso.com/public/webdocs/markets_operations/committees/bic_miwg/meeting_materials/2017-04-24/MIWG%20Public%20Policy%20Update%2020170424.pdf

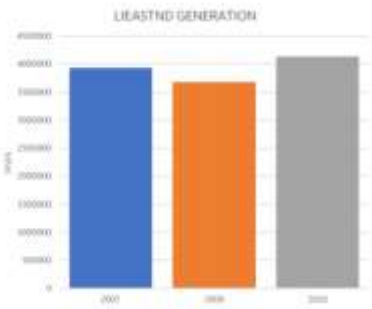


For solar data, the NYISO used normizled CARIS 2019 solar PV profiles, ands scaled up the MW by zone.

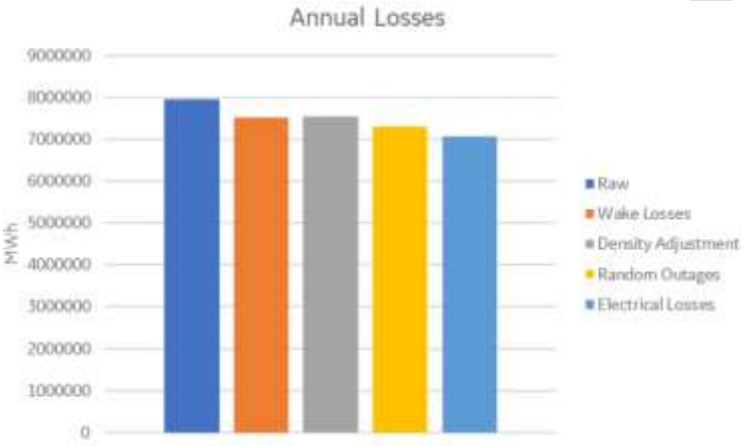


Off-shore wind data were prepared in conjunction with GE. The data reported as a part of this summary included meteorological conditions (*i.e.*, wind speed, temperature pressure) and power production modeled at three locations (NY Harbor in Zone J, and LI Shore and LI East End in Zone K), over the period 2007 to 2012 (some of the years are shown below).

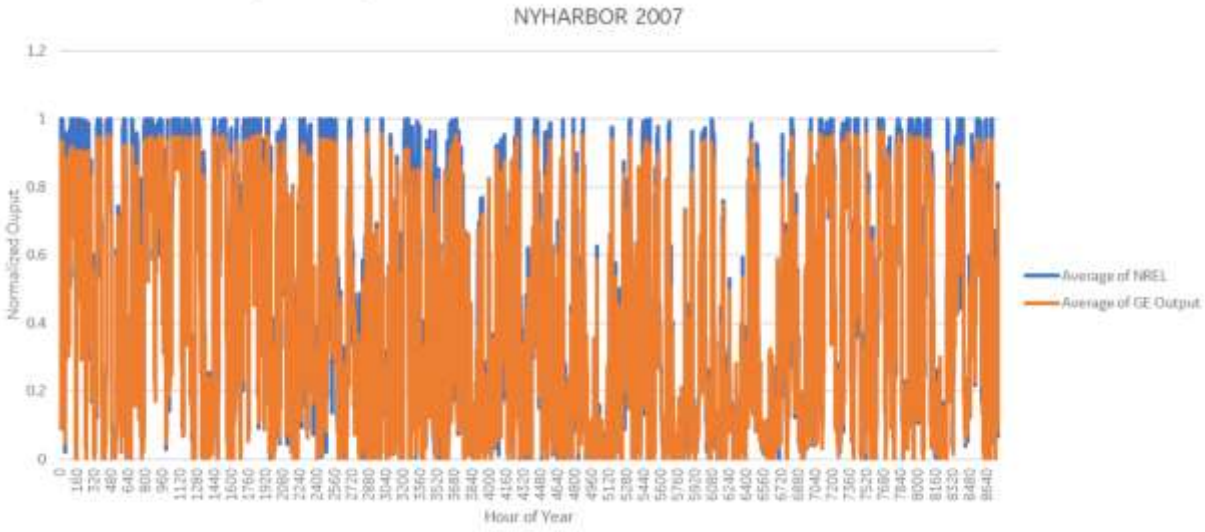




Also included were projected annual losses from the following sources: wake losses, electrical losses, random losses, etc.



From these modeled inputs, output data was calculated and presented as 8,760 hourly shapes, an example of which is shown below.



Results