Attachment #5.3
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April, 12 2023 - DRAFT

Off Shore Wind Data Review – Summary of NYSRC Preliminary Findings

At the March 10, 2023 NYSRC Executive Committee meeting, the Extreme Weather WG presented a preliminary analysis of Off Shore Wind (OSW), highlighting various issues which could have a significant impact on the design, operation and reliability of the NYS power system. It is noted the NY Climate Leadership and Community Partnership Act (CLCPA) calls for the installation of 9,000 MW of OSW by 2035, increasing to 18,000 MW by 2050. NYSERDA and LIPA have already contracted approximately 4,500 MW, which are under development with near term in-service dates[1]. Further NYSERDA expects to award the winner of its July 27, 2022 solicitation for at least an additional 2000 MW of OSW in spring 2023.[2]

At the February NYISO ICAP WG meeting, NYISO made available 21 years of hourly wind data at seven wind development sites, extending from New Jersey to Rhode Island prepared by its weather service provider DNV. Analysis of this data by NYSRC yielded the following preliminary findings [3]:

1) Wind lulls, defined as periods of each hour of wind output less than 20% for extended periods of 24 hours or longer, occur about 30 times per year on average. Wind lulls of 48 hours or longer occur on average about seven times per year, and wind lulls of 72 hours or longer occur on average two times per year.
2) About 70% of these wind lulls over the 21-year period occurred during the peak four month summer period from June to September.
3) OSW under development off the coast of downstate NY is expected to exceed 4,500 MW output by the mid to late-2020s. The magnitude of wind lulls observed reduces this output by up to 4,500 MW for the duration of the wind lull event. By 2035, NY plans to install 9,000 MW of OSW, which will further increase the impact of wind lulls. It is worth noting the largest contingency currently considered by NYISO for operating reserves/ramping is loss of approximately 1,300 MW.
4) Large-scale OSW development is concentrated in the downstate NY region with limited transmission flexibility.
5) Wind lulls of up to 86 hours with an average energy output of less than 5% rated output occurring across all seven sites were observed in the DNV dataset.
6) Wind lull events are highly correlated interregional events extending from NJ to Rhode Island, thus the impact of wind lulls also extends to OSW located in PJM and NE.
7) Similar to NY, policy makers from PJM and New England are also moving forward with large OSW policies to address decarbonization, with proposals in each region also totaling tens of thousands of MW, in addition to NY CLCPA plans for 9,000-18,000 MW between 2035-2050.

[1] New York's Offshore Wind Projects - NYSERDA
[2] 2022 Solicitation - NYSERDA
[3] Installed Capacity (ICAP) Working Group - NYISO

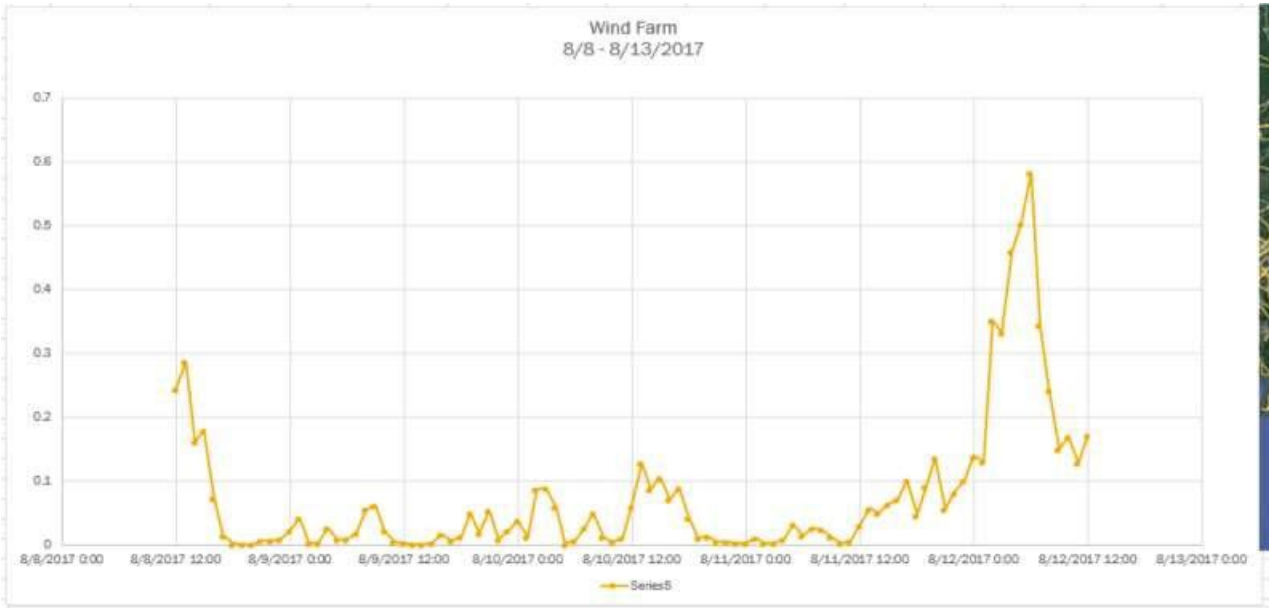
8) The reliability of the traditional interconnected power system design relies on diversity of forced outage rates and independence of outage events. Correlation of interregional wind lulls eliminates diversity of loss of power output events associated with OSW and alters this aspect of system design.
9) Interregional wind lulls impacting thousands of MWs of interregional OSW located in PJM, NY and NE could simultaneously reduce reserve sharing and emergency assistance available for support from neighboring control areas impacting operational reliability and resource adequacy.
10) Preliminary findings have also identified periods of correlated OSW wind lulls coincident with simultaneous solar lulls in downstate region. It is noted the CLCPA calls for the installation of 10,000 MW of solar by 2030.
11) Decarbonization aspects of CLCPA reduces diversification of alternate energy sources presently in the electric sector including natural gas and petroleum and will reduce energy diversification available to society as a whole as more end uses rely upon electricity. Electrification of the NY economy is also projected to significantly increase electric load. Under CLCPA, electric load is projected to double in the next 20 years, which will substantially increase societal reliance on electricity as a reliable energy source. [4]
12) Mandatory time of use rates shifting load have been enacted by some utilities, notably LIPA, starting in 2024, with the intent of altering daily load cycle shapes to extend usage to hours traditionally non-peak hours [5]. It is anticipated additional utilities will follow this practice in the near term.

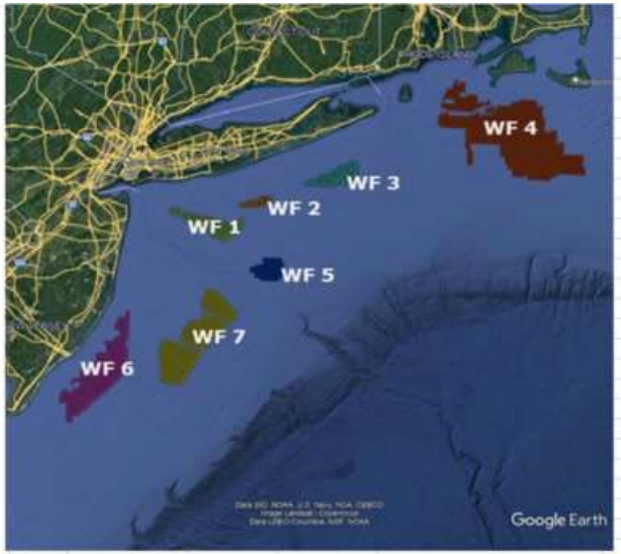
In summary, the magnitude, duration, and widespread geographic impacts identified by this preliminary analysis are significant. This highlights important reliability considerations associated with OSW which should be accounted for in upcoming reliability assessments, retirement studies, and system adequacy reviews to ensure sufficiency of system design to handle the large OSW volume expected to become operational in the next 5-10 years.

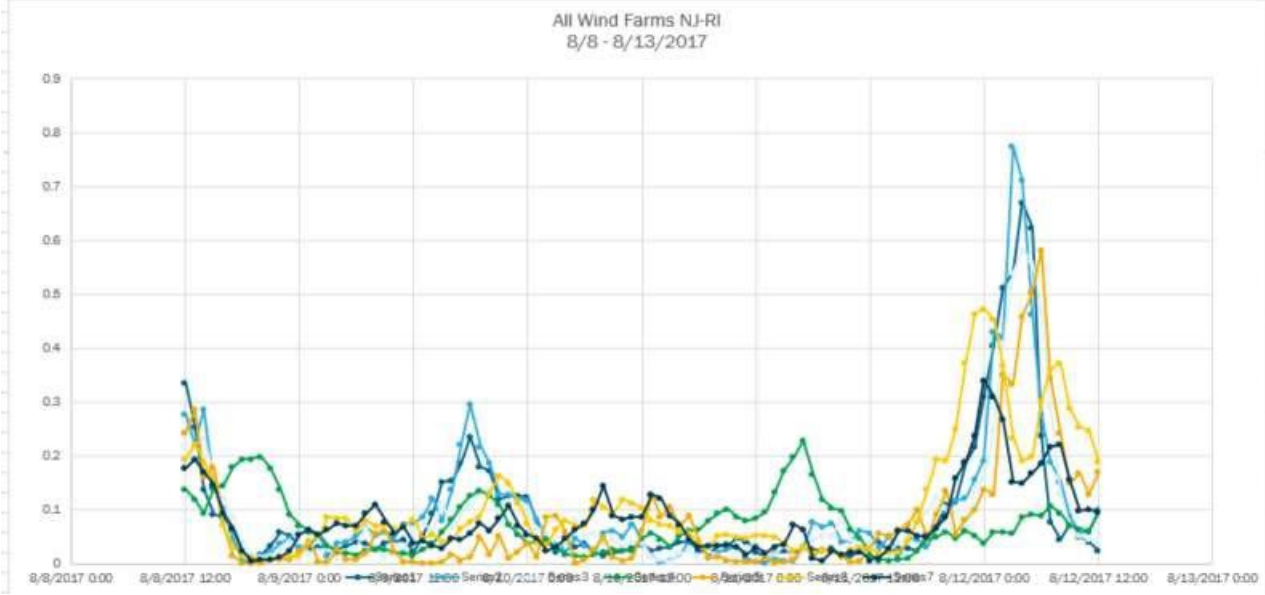
Furthermore, the results of this analysis suggest it is important for NYISO and its weather service provider to continue to conduct additional studies to identify correlations among decarbonized sources such as OSW, terrestrial wind, solar, and electric demand. This is important to ensure sufficient backup to address wind lulls and other correlated loss of supply events as the renewable energy rapidly increases as a portion of the overall energy mix. More detailed analysis is required to understand what other features of a renewable-dominated electrical grid will need to be present to guarantee sufficiency to meet expected demand at all times.

The NYSRC will support NYISO and NYS in conducting these near-term investigations and in taking associated actions to ensure the reliability of the NY power system.

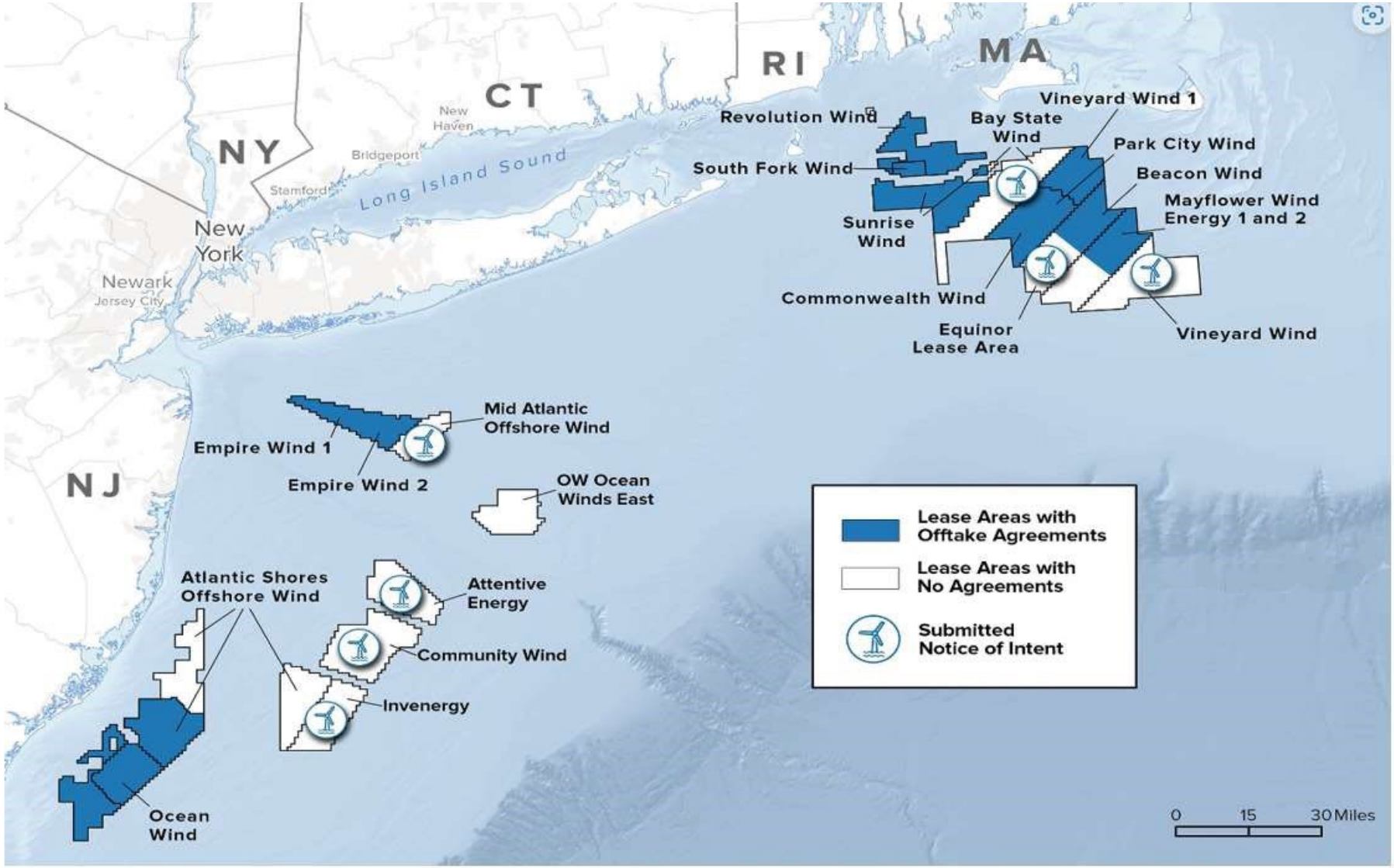
[4] Draft Scoping Plan - New York's Climate Leadership & Community Protection Act (ny.gov)
[5] Time of Use Rate Plans (TOU) - PSEG Long Island (psegliny.com)

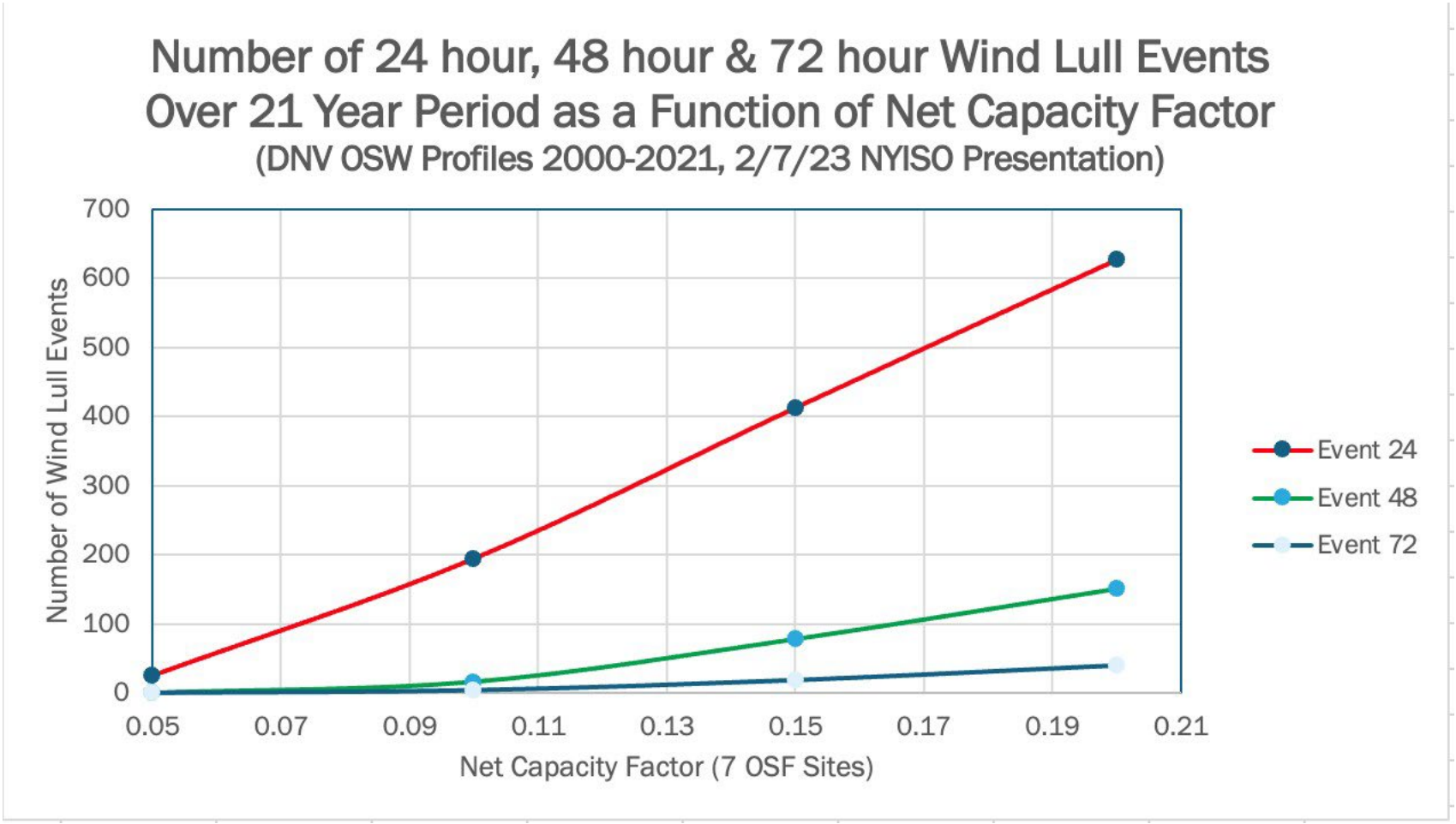


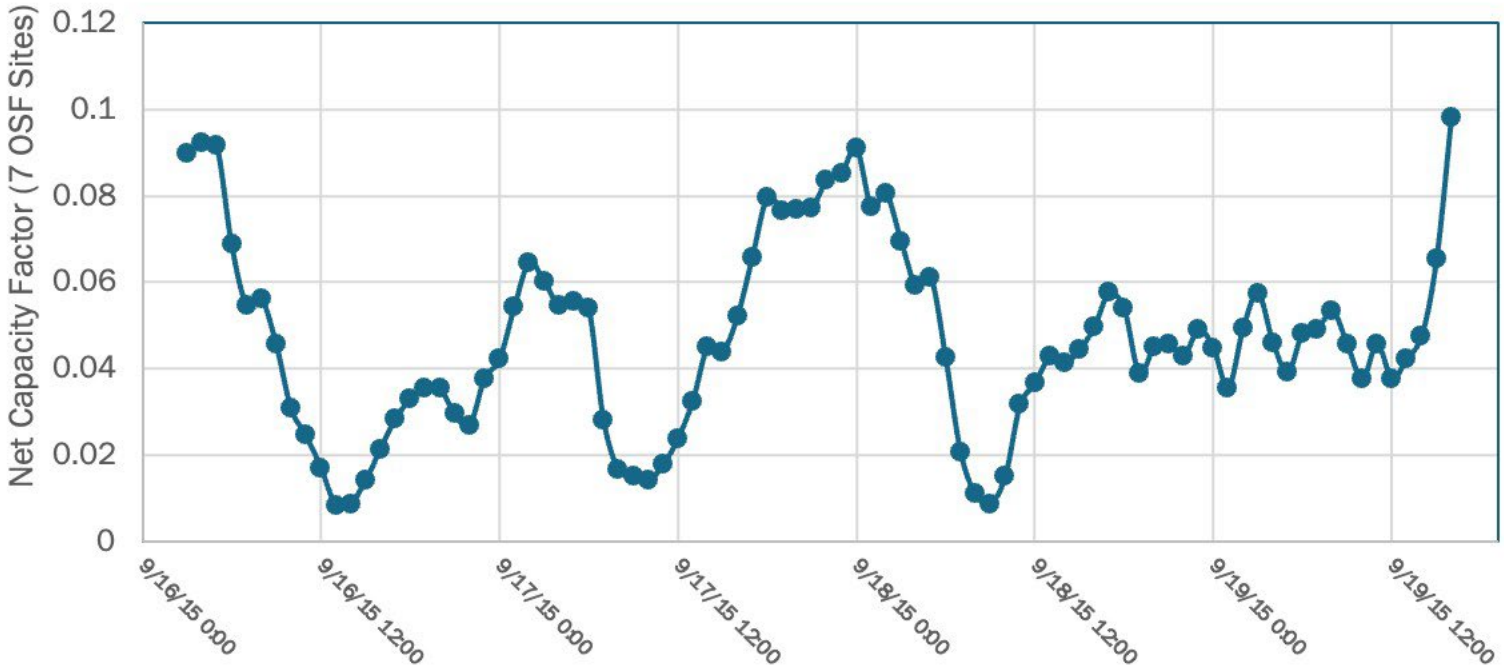




Wind Plant Nar	Capacity (M	Turbine Cou	Sub Area
Wind Farm 1	2,100	140	New York Harbor
Wind Farm 2	390	26	Long Island Shore
Wind Farm 3	1,530	102	Long Island Shore
Wind Farm 4	16,095	1,073	Long Island East End
Wind Farm 5	1,260	84	Long Island Shore
Wind Farm 6	6,075	405	New York Harbor
Wind Farm 7	6,615	441	New York Harbor
	34,065		


NY
CT
RI
MA
NJ
New Haven
Bridgeport
Stamford
Long Island Sound
New York
Newark
Jersey City
Revolution Wind
Bay State Wind
Vineyard Wind 1
South Fork Wind
Park City Wind
Beacon Wind
Mayflower Wind Energy 1 and 2
Sunrise Wind
Commonwealth Wind
Equinor Lease Area
Vineyard Wind
Mid Atlantic Offshore Wind
Empire Wind 1
Empire Wind 2
OW Ocean Winds East
Atlantic Shores Offshore Wind
Attentive Energy
Community Wind
Invenergy
Ocean Wind
Lease Areas with Offtake Agreements
Lease Areas with No Agreements
Submitted Notice of Intent
0
15
30 Miles


Number of 24 hour, 48 hour & 72 hour Wind Lull Events
Over 21 Year Period as a Function of Net Capacity Factor
(DNV OSW Profiles 2000-2021, 2/7/23 NYISO Presentation)
Number of Wind Lull Events
700
600
500
400
300
200
100
0
0.05
0.07
0.09
0.11
0.13
0.15
0.17
0.19
0.21
Net Capacity Factor (7 OSF Sites)
Event 24
Event 48
Event 72


Longest (86 Hour) Wind Lull Event Over 21 Year Period
with a Net Capacity Factor < 0.1
(DNV OSW Profiles 2000-2021, 2/7/23 NYISO Presentation)
Net Capacity Factor (7 OSF Sites)
0.12
0.1
0.08
0.06
0.04
0.02
0
9/16/15 0:00
9/16/15 12:00
9/17/15 0:00
9/17/15 12:00
9/18/15 0:00
9/18/15 12:00
9/19/15 0:00
9/19/15 12:00

From: Weissman, Joanna <Joanna.Weissman@pseg.com>
Sent: Tuesday, March 28, 2023 12:08 PM
To: Dahl, Curt (Tran Function) <Curt.Dahl@pseg.com>
Subject: Start of Wind Lull -- Distribution by Month

Here is a distribution of starting months for any wind lull of 24 hours or greater.

Row Labels	Continuous Lull Starts
Jan	6
Feb	3
Mar	1
Apr	4
May	5
Jun	9
Jul	36
Aug	51
Sep	35
Oct	22
Nov	14
Dec	8
Grand Total	194


12-2014 Combined Lull
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
-
% output
12/19/14 12:00 AM
12/19/14 3:00 AM
12/19/14 6:00 AM
12/19/14 9:00 AM
12/19/14 12:00 PM
12/19/14 3:00 PM
12/19/14 6:00 PM
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12/23/14 6:00 PM
12/23/14 9:00 PM
Date
Profile_avg_OSW
SOLAR_PV