PSC Case 15-E-0302

PSC: Motion by the Commission to Implement a Large Scale Renewable Program and Clean Energy Standard Comments Submitted by The New York State Reliability Council

The New York State Reliability Council, LLC (NYSRC) commends the Public Service Commission's initiative in undertaking an examination of this very important issue and appreciates the opportunity to submit its comments.

The NYSRC is a not-for-profit corporation responsible for promoting and preserving the reliability of the New York State's bulk power system by developing, maintaining and, from time to time, updating the Reliability Rules which must be complied with by the New York State Independent System Operator (NYISO), and all market participants in the NYISO's wholesale electricity market. In addition, the NYSRC is responsible for monitoring compliance with the Reliability Rules and establishing the annual statewide Installed Capacity Requirement (ICR) for the New York Control Area.

Background

Historically, the New York State bulk power system had a robust mix of synchronous generation ranging from base-loaded coal and nuclear plants to mid-range oil and gas fired units to predominantly gas/oil fired peaking generation. These units were dispatchable at the direction of the NYISO. In addition, there were run-of-river, pondage and pumped storage hydro plants which could supplement the rest of the system to satisfy the overall demand reliably. During the past two decades wind and solar-powered generation have been added. Although there were initial concerns about their intermittency, studies showed that under the current reliability rules the balance of the system had sufficient flexibility to accommodate a reasonable penetration of these resource types (i.e., 10% to 20%). The Climate Act requirement proposes to realize 70% renewable electricity by 2030. The system resource mix will shift from one described above to one consisting primarily of solar, wind and battery storage along with the existing hydro and nuclear generation. While it is an admirable goal, reaching it while maintaining system reliability will be challenging. In the past 20 years, the system has added roughly 2500 MW of qualifying utility scale wind and solar generation representing less than 5% of the energy requirements. The system also currently has approximately 4,300 MW of behind-the-meter solar generation.

The Need for Non-Emitting Renewable Resources

New York's Climate Leadership and Community Protection Act (Climate Act) sets forth the State's Energy Roadmap which calls for New York to achieve 70% renewable electricity by 2030 and 100% zero-emissions electricity by 2040. These renewable resources, mainly wind and solar, are generally not dispatchable in the way that traditional fossil-fueled units are dispatchable. Dispatchability is the ability of a generation resource to respond to the directions of the system operator (i.e., the NYISO) in order to maintain system reliability. The NYISO estimates that between 45 Gigawatts and 27 Gigawatts of DEFRs will be needed by 2040, depending on the amount of demand at that time, with a large amount needed by

2035. The NYISO states that is important to note that the lead time necessary for commercialization, development, permitting and construction of DEFR power plants will require action much sooner if the Climate Act targets are to be achieved. [1]

The NYSRC recently completed a White Paper that reviewed offshore wind data and uncovered the frequent occurrence of wind lulls from 24 to 86 hours. These wind lulls should be considered as part of this proceeding since DEFRs might be a resource to supplement wind lull gaps. For your convenience, a copy of the NYSRC's White Paper is attached.

The NYSRC agrees that a large amount of DEFRs will be needed in order to meet the State's electricity emission reduction targets and maintain electric system reliability.[2] These DEFR resources have not yet been adequately defined nor has the timeframe for their availability been determined. Further, how these resources will supplement wind, solar and energy storage to ensure system reliability. These are all important considerations for this proceeding.

Responses to Questions Posed in the Order

1. How should the term "zero emissions," as used under PSL §66-p(2)(b), be defined?

   NYSRC understands this is an important question, however, we believe it is premature to attempt to define it at the beginning of the stakeholder process. Full stakeholder debate is needed to arrive at a workable, sustainable definition.

2. Should the term "zero emissions" be construed to include some or all of the following types of resources, such as advanced nuclear (Gen III+ or Gen IV), long-duration storage, green hydrogen, renewable natural gas, carbon capture and sequestration, virtual power plants, distributed energy resources, or demand response resources? What other resource types should be included?

   All of the resources identified should be part of the consideration. It is important to identify the attributes that must be realized and determine if specific resources/technologies are able to provide those attributes in a manner that supports safe grid operation and system reliability.

3. How should a program to achieve the Zero-Emission by 2040 Target address existing and newly constructed nuclear energy resources. Should the program be limited to specific types of nuclear energy technologies and exclude others?

[1] At the NYISO website at:
https://www.nyiso.com/documents/Planning-Reports/2021-2040/System-Resource-Outlook-Report/September-22-2022

[2] NYSRC website at:
https://www.nysrc.org/PDF/Documents/Inverter%20Based%20Resources%20White%20Paper%20-%20EC%20Approved%207-8-2022.pdf

NYSRC believes both existing and newly emerging nuclear technology should be part of the Zero-Emission by 2040 discussion.

4. Should new measures adopted to pursue compliance with the Zero-Emission by 2040 Target focus exclusively on generation and resource adequacy, or should they also encompass a broader set of technologies that could be integrated into the transmission or distribution system segments, or installed and operated behind-the-meter?

   All technologies should be considered.

5. Should any program to achieve the Zero-Emission by 2040 Target specify subcategories of energy resources based on particular characteristics, such as ramp rates, the duration of their operational availability, or their emissions profile with respect to local pollutants?

   NYSRC supports attribute categories that are important to determine if a potential resource provides either a full or partial solution.

6. What role does technology innovation need to play to meet the CLCPA's Zero-Emission by 2040 Target?

   This is an important emerging area that requires a predetermined period of regular review in coordination with the NYSPSC, NYSERDA, NYISO and NYSRC. We need to match emerging technology to system needs.

7. Should life cycle emissions impacts be considered when characterizing energy resources? If so, how?

   As we have seen, the cost of the clean energy transition is significant. The life cycle of emerging technologies, and life cycle of emissions should be part of the consideration.

8. Given that the feedstocks and other resources required to produce renewable natural gas are limited and will be in demand in other sectors of New York's economy, how should this fuel be considered in the context of this proceeding?

   NYSRC believes all technologies should be part of the consideration. The challenge is enormous to get to a zero-carbon generation portfolio. The magnitude of the contribution and specific application of any one technology should not be predetermined at the onset of the proceeding.

9. In what ways might a program to meet the Zero-Emission by 2040 Target require reexamination and possibly revision of different tiers of the Clean Energy Standard? Should one or more of the policy approaches that have been used to implement the CES be considered to meet the Zero-Emission by 2040 Target?

   Ultimately - New York's objective should be to realize the CLCPA requirements at the lowest cost possible while maintaining safe and reliable operation for the consumers. Ultimately, which technologies meet this objective is still a work in progress. It is possible that an emerging technology could create the need to reexamine tiers within the CES.

10. What is necessary to align a program to meet the Zero Emission by 2040 Target with the priority of just transition embedded within the CLCPA?

    Just transition is already embedded in the clean energy transition. We do not believe any alignment is necessary at the beginning of the proceeding. It is possible that information developed within the proceeding might lead to additional consideration of this question.

11. How might the benefits of a program to meet the Zero Emission by 2040 Target be measured for the purpose of ensuring that, consistent with PSL §66-p (7), it delivers "substantial benefits" to Disadvantaged Communities?

    A ZERO Carbon by 2040 Target is desirable for all New Yorkers including Disadvantaged Communities. What is critical is that it is accomplished in a manner that minimizes the consumer cost impact while maintaining safe, and reliable electric service for everyone.

12. NYISO has adopted an effective load carrying capacity (ELCC) rubric and treatment of Zones J and K as load pockets with special resource adequacy requirements. How should these and other NYISO market rules inform the design of a program meant to support the development and deployment of resources capable of achieving a zero emissions grid?

    The NYSRC has no comments at this time.

13. What additional studies, if any, should the Commission undertake with respect to the development and deployment of resources capable of achieving a zero emissions grid?

14. The NYSRC has no comments at this time.

Given that New York is not the only jurisdiction investigating options and opportunities for the research, development, and deployment of new technologies capable of achieving a zero emissions grid, how should the state seek to coordinate with and otherwise draw upon efforts that are underway elsewhere?

NYSPSC should consider a technical conference for those jurisdictions to share their findings and lessons learned or utilize planned meetings to provide these updates.

The NYSRC recommends that the NYSPSC's initial evaluation should be open ended with respect to technologies considered, and further a process should be developed to regularly review new emerging technologies on a predetermined interval. (For example - every 1-2 years). The industry is experiencing unprecedented change and this type of process would capture the level of the change and potential possibilities.

The program to achieve zero-emissions should be based on characteristics of the zero-emission resources that will ensure electric system reliability.

The NYSRC agrees that many of the attributes provided by traditional resources including 24/7 operating capability, ramping response, aggressive start times, and reliable operation are important attributes that DFERs need to provide with the penetration of new clean intermittent resources to the New York electric grid.

In the interim until DFERs are properly defined and commercialized, decisions regarding retirement of existing resources must be carefully technically analyzed to ensure system reliability and public safety is maintained throughout New York State. This becomes even more important as many renewable energy projects are delayed in realizing commercial operation and electrification efforts in other sectors (buildings and transportation) will further increase electric load demand.

As the electric grid resource mix changes coupled with the new demands on the electric system due to climate related variables - the exact operating profile of a DFER is still to be determined. For example, our grid is no longer just impacted by several weather-related conditions (wind, flood, extreme heat, extreme cold), but rather the same grid could be impacted by lack of wind or lack of sunshine for extended periods. The DFERs are expected to fill these gaps to ensure energy supply and energy demand are properly balanced for both reliability and public safety purposes.

The program to meet the zero-emissions target by 2040 should be reexamined if there is any question that the identified zero-emission resources would not meet electric system reliability criteria.

The Commission should consult with the NYISO and the NYSRC regarding the identification of new zero-emission technologies that will satisfy system reliability criteria.

Observations

1. While the Commission has recognized that existing nuclear generation is a zero-emission technology, it has not addressed new nuclear generation facilities under PSL §66- p (2). We understand that research efforts are underway to develop new types of reactors, but the status and cost of these technologies are uncertain. NYSRC supports the idea that new types of reactors should be part of the evaluation.

2. Further, we understand that hydrogen technologies are being researched and tested for their potential contribution to a zero-emission grid. Current demonstration projects show that hydrogen blending can reduce gas-fired power plant emissions. NYSRC supports the evaluation of emerging hydrogen technology. It potentially has applications in multiple sectors including energy production, as well as offering another resource to reduce the expected electric load growth in other sectors which must decarbonize such as transportation, and commercial/industrial applications.

3. As for biofuels, the Commission notes that DEC considers the emissions from the combustion of biomass to contribute to gross emissions under the CLCPA.30 This is relevant to, though not necessarily determinative of, whether the use of biomass as fuel for power plants can be considered zero emissions for the purpose of compliance with PSL §66-p (2), or net-zero for purposes of the CLCPA's separate net-zero emissions target. NYSRC supports the idea that biofuels should be considered as part of this proceeding.

Conclusion

The NYSRC strongly supports the Commission's undertaking an examination of the zero-emitting resources that will be needed to provide sufficient and reliable electricity service for

New York consumers in the future and agrees that both the NYSPSC and NYSDEC need to be engaged in this process. Ultimately, both play an important role in analyzing such technologies.

Reliability and public safety are critical for any electric grid. New York has experienced outstanding performance in these areas over many decades. Power reliability and power quality support our state's economic progress and provide a competitive advantage over other power systems with less favorable performance. It is essential that the sufficiency and reliability of New York State’s electric power grid be maintained.

The NYSRC appreciates the opportunity to submit these comments and respectfully requests their consideration by the NYSPSC n

Offshore Wind Data Review - NYSRC Preliminary Findings

Final Draft – NYSRC Executive Committee Approved 7/14/2023.

1.0 INTRODUCTION

This paper presents preliminary analyses performed by the NYSRC Extreme Weather Working Group on high resolution data characterizing Offshore Wind (OSW) performance recently provided by NYISO and its consultant DNV. This is of particular importance given rapid transformation of the NY power system to decarbonized intermittent renewable resources including large scale offshore wind resources.

The NY Climate Leadership and Community Protection Act (CLCPA) calls for the installation of 9,000 MW of OSW by 2035, while the CLCPA scoping plan calls for up 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 summer 2023.[2.]

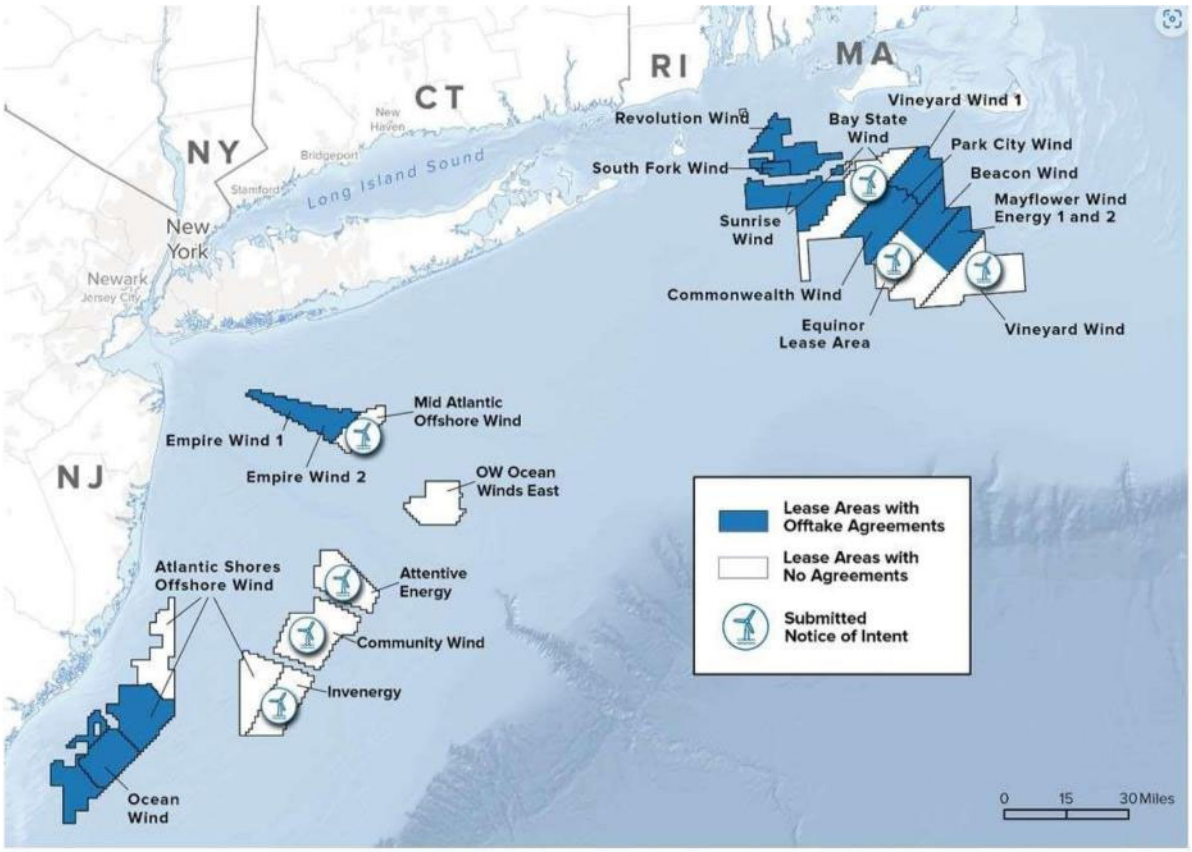
The intent of this paper is to address OSW related aspects of NYSRC goals set forth in the Executive Committee-approved Extreme Conditions White Paper dated 7/8/22. The goal is to "identify actions to preserve NYCA reliability for extreme weather events and other extreme system conditions" and create a corresponding action plan to "evaluate the potential need for new resource adequacy and transmission planning design rules for planning the system to meet extreme weather and other extreme conditions." This paper includes recommendations designed to maintain reliable performance of the NYS electric system in the face of a changing climate. The focus of this paper is wind intermittency and the availability of OSW resources. It is envisioned additional study phases will be undertaken as further data becomes available.

[1] New York's Offshore Wind Projects - NYSERDA

[2] 2022 Solicitation - NYSERDA

2.0 OFFSHORE WIND DEVELOPMENT

The following figure shows areas of contracted wind resources under active development. OSW under development off the coast of downstate NY is expected to exceed 4,500 MW nameplate by the mid-2020s. Further NYSERDA expects to award the winner of its July 27, 2022, solicitation for at least an additional 2000 MW of OSW in summer 2023. Ultimately the NY CLCPA calls for the installation of 9,000 MW of OSW by 2035, with the CLCPA scoping plan envisioning up to 18,000 MW by 2050. It is noted large-scale OSW development is concentrated in the downstate NY region, which has limited transmission flexibility to withstand large output swings associated with intermittency of wind resources.[3]



3 Transmission expansion projects proposed for this region are not anticipated to be in-service prior to the 2030's timeframe (e.g., LI PPTN).

In addition, other regions including PJM and ISONE are also contracting similarly large amounts of OSW off the coast of NJ (7.5 GW by 2035 increasing to 11.0 GW by 2040) and Rhode Island/ Massachusetts (8.0 GW by 2035), respectively. In total PJM member States have announced OSW targets totaling 24 GW by 2035, and 32.7 GW by 2040 as summarized below[4]:

		GW	GW
PJM	**State Goals**	**by 2035**	**by 2040**
NJ	7.5 GW by 2035; 11 GW by 2040	7.5	11
MD	1.568 GW by 2030; 8.5 GW by 2035	8.5	8.5
VA	5.2 GW by 2034	5.2	5.2
NC (state goal -- not all in PJM)	2.8 GW by 2030; 8 GW by 2040	2.8	8
Total announced targets for PJM member states		**24**	**32.7**
		GW	**GW**
ISO-NE	**State Goals**	**by 2035**	**by 2040**
CT	2 GW by 2030	2	2
MA	5.6 GW by 2035	5.6	5.6
RI	430 MW	0.4	0.4
Total announced targets for ISO-NE Member States		**8**	**8**

4 NREL Offshore Wind Market Report, 2022 Edition, https://www.energy.gov/sites/default/files/2022-09/offshore-wind-market-report-2022-v2.pdf; New Jersey Department of Environmental Protection, https://dep.nj.gov/offshorewind/; Maryland POWER Act, https://mgaleg.maryland.gov/2023RS/fnotes/bil_0001/sb0781.pdf

2.1 OFFSHORE WIND DATA

At the February 7, 2023, 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 consultant DNV. DNV performed analysis of wind data translating meteorological data into detailed power profiles for each site including loss considerations. DNV assumed a generic 15 MW offshore turbine design consisting of 236 m rotor diameter and 150 m hub height with turbine layout of one nautical-mile spacing. This is representative of the type of turbines proposed for installation in the next three to five years. DNV also performed extensive benchmarking and validation of its modeling against other data profiles to verify the veracity of the data set. In total the data provided in this file represented over one million modeled wind power observations which was made publicly available to the NYSRC and other stakeholders in the form of a spreadsheet file. [5] NYISO is also working on an additional effort to obtain similar data sets for terrestrial wind & solar data, etc. NYISO is targeting summer 2023 timeframe for this to be available.

5 Installed Capacity (ICAP) Working Group - NYISO

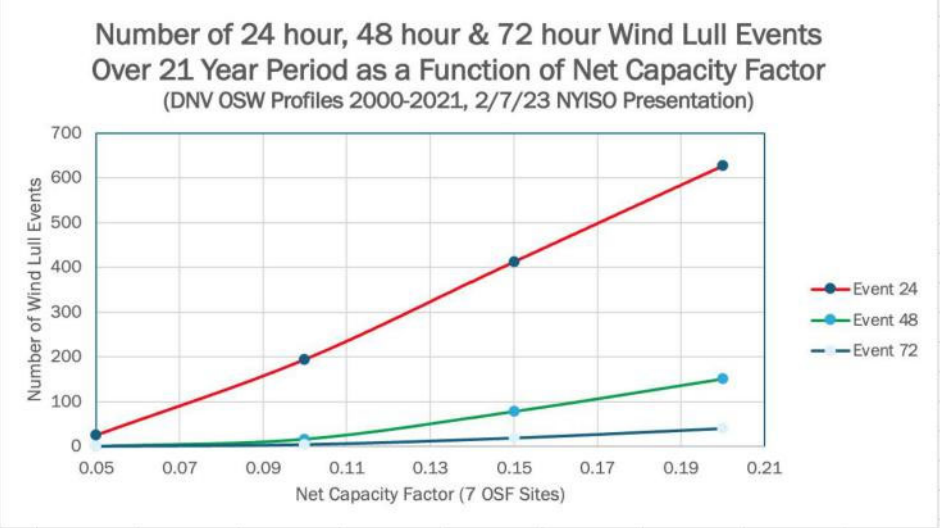
3.0 SUMMARY OF ANALYSIS AND PRELIMINARY FINDINGS

Members of the NYSRC Extreme Weather WG performed preliminary analysis of Offshore Wind (OSW), highlighting various results which could have a significant impact on the design, operation, and reliability of the NYS power system. This included frequency analysis, interregional impacts, and cursory analysis of combined wind/solar events. Analysis of this data by NYSRC Extreme Weather Working Group yielded the following significant findings.

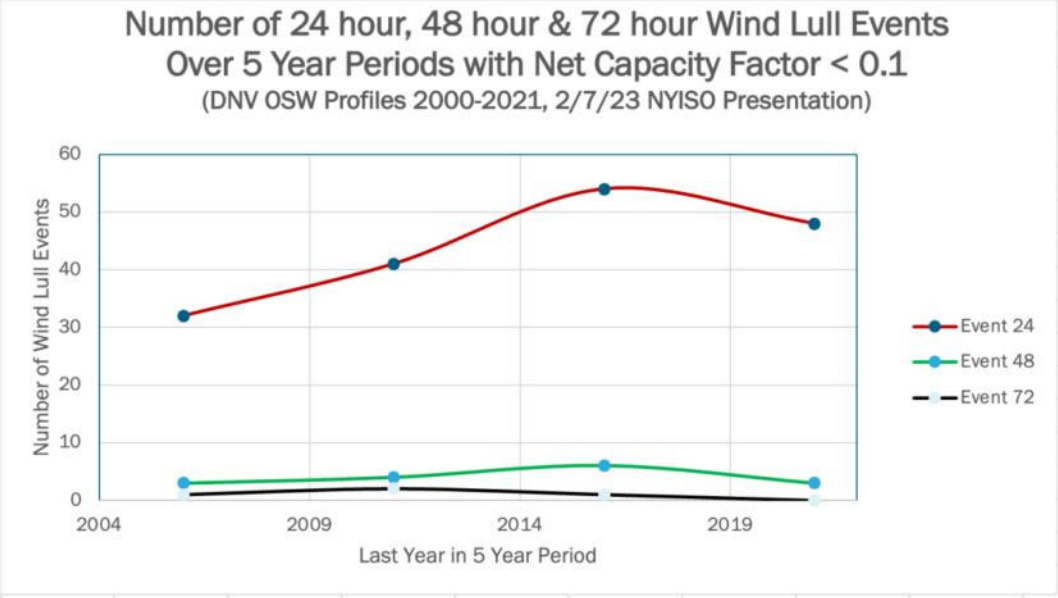
3.1 WIND LULL FREQUENCY ANALYSIS

Analysis was performed on OSW data to determine exposure to periods of reduced power output associated with wind intermittency which could impact NYCA operation and design, i.e., "wind lulls." The table below summarizes the results of this analysis. As shown wind lulls, defined for the purposes of this analysis as periods of each hour of wind output of less than 5%-20% for extended periods of 24 hours or longer, occur about thirty 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.

It is noted that events which occur on average thirty times per year represent highly likely occurrences inconsistent with extreme weather characterization and which warrant normal design consideration.



The number of wind lulls varies significantly over the 21-year data studied. Dividing the DNV data into five-year tranches results in the number of 24-hour wind lull events with net capacity factor less than 10% varying from a low of about thirty to a high of 55 events. Individual annual events indicate even high volatility.[6]



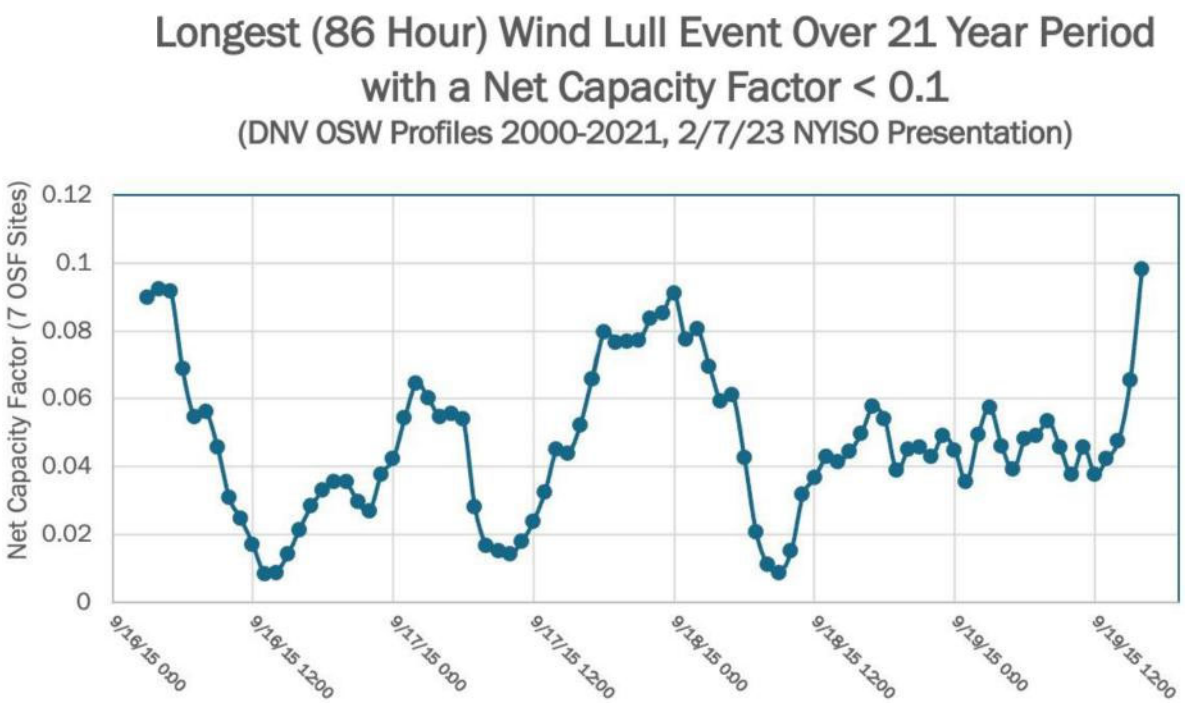
6 NYSRC Resource Adequacy studies uses a five year hourly MW data for front of meter wind, solar, run of river hydro, and 5 years data for other models pertinent to LOLE calculations including thermal forced outage rates.

An analysis was also performed to determine coincident wind lulls with summer peak load periods which are particularly important relative to reliability. About 70% of these wind lulls over the 21-year period occurred during the peak four-month summer period from June to September.

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

Lastly an analysis was performed to identify the most persistent wind lull experienced in the 20-year wind data with net capacity factor less than 10% for the entire period ***across all seven wind sites***. Analysis indicates wind lulls of up to 86 hours with an average energy output of approximately 5% net capacity factor occurring across all seven sites were observed in the DNV dataset (this compares to an average annual net capacity factor of approximately 45%). While data associated with longer periods than 21 years were not readily available it may be appropriate to characterize this as a 1/20-year extreme weather event.[7]

7 Metrological experts on the Extreme Weather Working Group have suggested a 70-year analysis should be performed to obtain a fuller understanding of range and return period of events.



It is noted OSW under development off the coast of downstate NY is projected to exceed 4,500 MW nameplate by the mid to late-2020s. The magnitude of wind lulls observed may reduce this output by up to approximately 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 resources curtailed during wind lull events. This will be compounded by interregional impacts discussed in Section 3.2 of this paper. It is worth noting that the largest contingency currently considered by NYISO today for 10-minute operating reserves is loss of 1,310 MW.

3.2 INTERREGIONAL IMPACTS

NY relies on emergency assistance from neighboring regions to achieve reliable system design, thus continued availability of surplus power from these areas is an important consideration. [8] Similar to NY, policy makers from PJM and New England are also moving forward with policies to install large scale wind power to address decarbonization and planned shutdown of thermal units, with proposals in each region also totaling tens of thousands of MW. As noted in Section 3.0, OSW off the coast of the state of New Jersey is targeted at 7.5 GW by 2035 increasing to 11.0 GW by 2040, and similarly OSW off the coast of Rhode Island/ Massachusetts is targeted at 8.0 GW by 2035. In total PJM member States have announced offshore wind targets totaling 24 GW by 2035, and 32.7 GW by 2040.

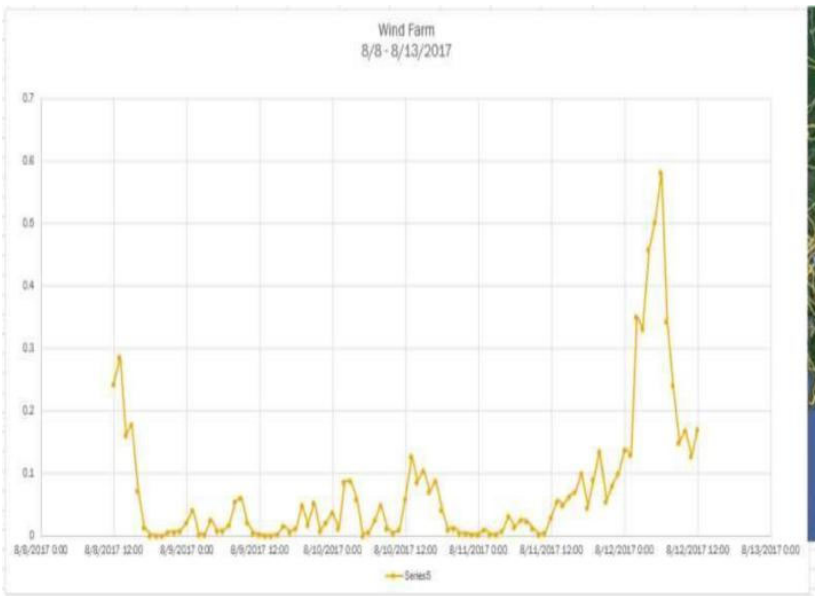
The analysis below finds wind lull events to be highly correlated interregional events extending from NJ to Rhode Island. As shown, the impact of wind lulls does not respect control area boundaries and affects OSW located in PJM extending past NY into NE simultaneous reducing OSW output for the duration of the wind lull events across all regions.

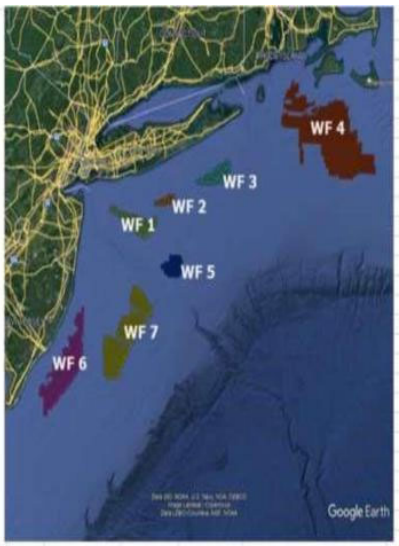
It is noted reliability of the traditional interconnected power system design relies on diversity of forced outage rates and independence of outage events. The correlation of interregional wind lulls eliminates diversity of loss of power output events associated with OSW and alters this aspect of system design.

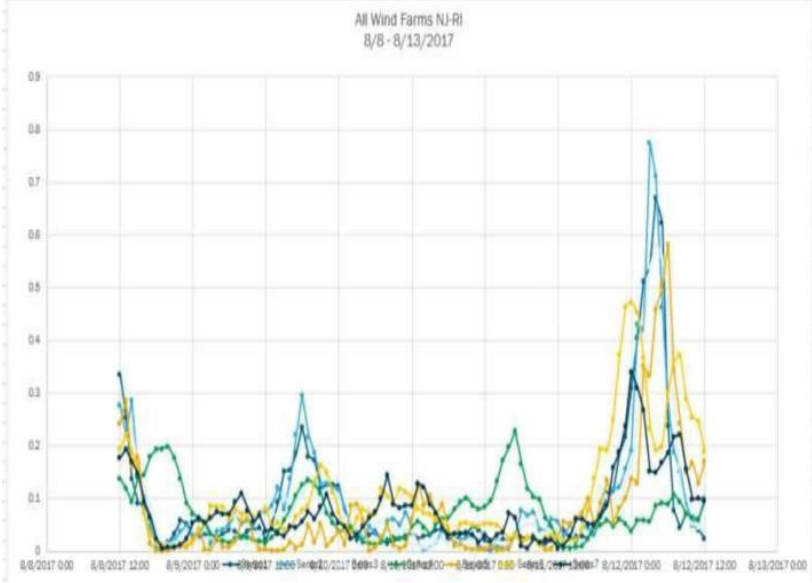
Interregional wind lulls simultaneously impacting tens of thousands of MWs of interregional OSW located in PJM, NY and NE could reduce reserve sharing and emergency assistance available for support from neighboring control areas significantly impacting operational reliability and resource adequacy.

[8] An IRM sensitivity study implies level of emergency assistance by comparing the difference between the interconnected base case IRM and isolated NYCA sensitivity case. Typically, this difference is about 8%, meaning consideration of emergency assistance from external control areas reduces NY reserve margin requirements by 8%.

The below plot shows the wind farm locations analyzed by DNV and correlated reduction in wind power output across all seven (7) sites during an interregional wind lull event which occurred August 8, 2017 - August 13, 2017.







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		

The NYISO notes that the current modeling practice for both the IRM and the reliability planning MARS models is that the wind and solar shapes are removed from the neighboring.

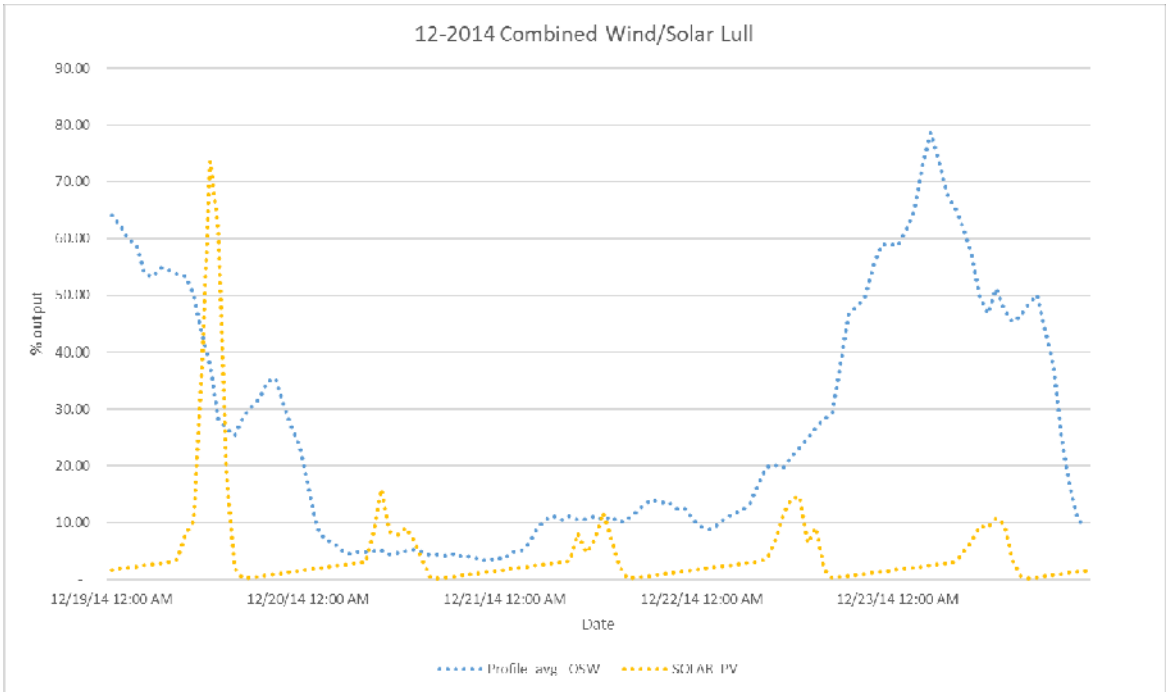
systems with the goal of limiting reliance on external areas. Additionally other steps are taken with to limit reliance on external areas, such as: neighboring areas are set to be at a high LOLE between a 0.1 - 0.15 event-days/year range, the top three summer peak load days of the external areas are modeled as coincident with the NYCA top three peak load days; the emergency operating procedures (EOP) steps from external areas are removed; the load forecast uncertainty (LFU) is applied to neighboring systems; the same historical load years are used for external areas and NY (to capture coincidence in the shapes); and implemented a statewide emergency assistance from the neighboring systems limit of 3,500 MW additional to the tie limits.

3.3 COMBINED WIND/SOLAR CORRELATED EVENTS

Another area of concern of the Extreme Weather WG is coincidence of wind lulls with other extreme weather phenomena. Previous analysis performed by the Installed Capacity Subcommittee (ICS) assessed the reliability impact of correlated land-based wind (LBW) and solar resource performance and did not identify an impact but recommended further examination of OSW.[9] Very Preliminary findings have identified periods of simultaneous OSW wind lulls coincident with solar lulls in downstate region.

While only cursory analysis was performed into this consideration due to limited data availability the analysis below highlights one illustrative event that occurred 12/19/14 – 12/22/14. The point of this analysis is to demonstrate the possibility of combined wind and solar lull events does exist and to highlight this as an area requiring future investigation.

It is noted the CLCPA calls for the installation of 10,000 MW of solar by 2030.

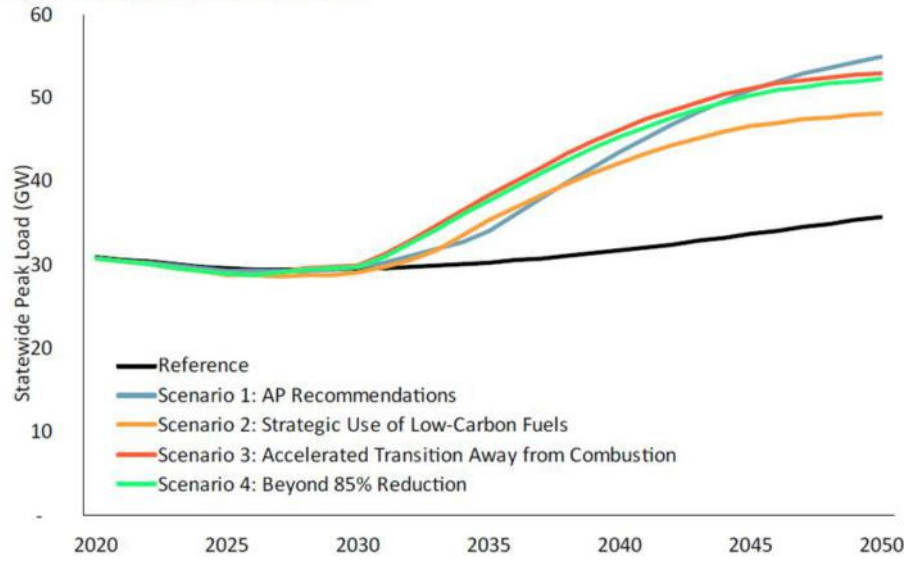


[9] AI 12 - Correlation of Intermittent Resources

3.4 OTHER CONSIDERATIONS - ELECTRIFICATION

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 nearly double in the next 20 years, which will substantially increase societal reliance on electricity as a reliable energy source when alternate sources of energy are reduced or eliminated as shown below. [10] The 2023 NYISO Gold Book baseline load forecast similarly shows winter peak doubling by 2050 with projected winter peak load exceeding summer forecast by over 30%. Moreover, the NYISO Gold book also shows under a "high demand policy scenario" projected winter peak load could triple by 2050 (approximately 25 GW to 75 GW). It is noted this represents more than twice the current NYCA peak summer load level (approximately 32 GW compared to 75 GW)[11] [12].

Figure 17. Statewide Peak Load Growth[12]



10 Draft Scoping Plan - New York's Climate Leadership & Community Protection Act (ny.gov)

11 https://www.nyiso.com/documents/20142/2226333/2023-Gold-Book-Public.pdf

12 Winter loads will become increasingly weather dependent as the penetration of electric heat pumps expands. The NYISO is exploring how best to capture this phenomenon through the use of non-static load forecast uncertainty models in MARS.

It is also recognized there is a need for extensive build-out of renewable technologies and other resources to support increased demand from electrification. The NYISO's "2021-2024 System & Resources Outlook" which based on discussions with stakeholders, including state agencies for various year 2040 scenarios, identified the need extensive build-out of existing renewable technologies including significant DEFR's to address a NYCA resource requirements totaling 111 – 124 GW.[13]

Lastly 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 traditionally non-peak hours which may reduce the impacts of electrification[14].

[13] https://www.nyiso.com/documents/20142/33384099/2021-2040-Outlook-Report.pdf/a6ed272a-bc16-110b-c3f8-0e0910129ade [nyiso.com]

[14] Time-of-Day (TOD) Rate Plan - PSEG Long Island (psegliny.com)

3.5 RESILIENCY /RESOURCE ADEQUACY IMPACTS

The preliminary findings discussed in this white paper have obvious implications to the near-term reliability and resiliency of the NY power system. The current reliability procedures were developed for dispatchable generation with well understood forced outage rates with the presumption that outages are independent of each other. Increasing levels of wind and solar correlated generation are changing the paradigm. To mitigate these impacts the NYSRC has started to consider changes to maintain continued reliable operation of the NY power system. These include potential new Reliability Rules for addressing wind lulls in system design and requirements for new data reporting associated with proliferation of new intermittent renewable generation technology. Similarly, discussions for considering these findings in NYSRC resource adequacy studies (i.e., NYSRC Policy 5.0) have been initiated with more to follow. There also is a longer-term resiliency concern. In addition to the primary concern regarding the correlation between high loads and low renewable resource availability, the resiliency of electric system resources is a concern particularly if there are trends towards more extreme weather.
events. These concerns will also be considered by Extreme Weather WG.

The NYISO notes[15] that the current reliability planning MARS offshore wind models account for a certain level of wind lull by the fact that the model reflects five years of artificial hourly MW data (*e.g.,* DNVGL, NREL-GE, etc.) until real production hourly data becomes available. Additionally, both the IRM and the reliability planning MARS models reflect rolling five years of production hourly MW data for each existing front-of-meter land-based wind and solar plant in NY. The planning MARS models also use five years of hourly MW data to discreetly model behind-the-meter solar, as forecasted in the NYISO's each Gold Book for each study year. For proposed land-based and solar plants, the nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating. During the simulations, one shape per replication is randomly selected (equal probability assigned for each of the five shapes) in the Monte Carlo process for each replication and study year; approximately 2000 replications are simulated for each study year in order to determine the NYCA LOLE (event-days/year), which is compared with the NYSRC and NPCC criterion of 0.1 event-days/year to determine whether

[15] February 2023 EWWG NYISO's presentation of the reliability planning models assumptions: Resource Planning MARS Models Overview

there are actionable Reliability Needs. These models were and continue to be used for the 2022 Reliability Needs Assessment - 2022 RNA[16] - and Short-Term Assessment of Reliability - STAR[17]. Between the bi-annual RNA and the quarterly STARs, the NYISO reliability planning team evaluates ten future study years. These models also inform other planning, markets, and operations processes at the NYISO and externally.

16 2022 RNA Report: https://www.nyiso.com/documents/20142/2248793/2022-RNA-Report.pdf

2022 RNA Appendices: https://www.nyiso.com/documents/20142/34651464/2022-RNA-Appendices.pdf

17 2023 Q1 STAR: https://www.nyiso.com/documents/20142/16004172/2023-Q1-STAR-Report-Final.pdf

4.0 NEXT STEPS

The results of this analysis suggest it is important 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 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.

At the April 28, 2023, Extreme Weather meeting the NYISO indicated it is working with its consultant DNV to provide data sets describing hourly input terrestrial wind and solar to perform additional analysis. This data is projected to become available during the summer 2023 period.

5.0 SUMMARY

The magnitude, duration, and widespread geographic impacts identified by this preliminary analysis are quite significant and will be compounded by load growth from electrification. This highlights the importance of reliability considerations associated with OSW and wind lulls 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 five to ten years.

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

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