Attachment #8.1
Return to Agenda

De-Carbonization / DER Report for NYSRC Executive Committee Meeting 9/8/2023

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The September 2023 edition of the De-Carbonization / Distributed Energy Resources (DER) Report includes the following items:

- NERC publishes 2023 ERO Reliability Risk Priorities Report
- NPCC DER/VER Forum Presentations:
  - Vineyard Offshore – Introduction
  - Eversource: Transmission's Role in Enabling Offshore Wind
  - NYSERDA – New York State Offshore Wind Development
- Articles:
  - Electrek: The world's largest floating offshore wind farm is officially online
  - Multiple Articles: NY Offshore Wind Developers Seek Price Relief
  - New York Times: A Giant Wind Farm is Taking Root Off Massachusetts
  - DOI Approves Major Offshore Wind Project (Revolution off Coast of Rhode Island)
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / Co-located

NERC publishes 2023 ERO Reliability Risk Priorities Report

This newly published Reliability Risk Priorities Report (Announcement / Report) presents the results of the Reliability Issues Steering Committee's (RISC) efforts to strategically define and prioritize risk categories that impact BPS reliability. The report is published every two years. This year, the report has identified five significant evolving and interdependent risk profiles: energy policy, grid transformation, resilience to extreme events, security risks and critical infrastructure. Energy policy is a new risk profile and has broad implications across all the other risk profiles, as it can drive change in Bulk Power System (BPS) planning and operations in short time periods, affecting reliability and resilience.

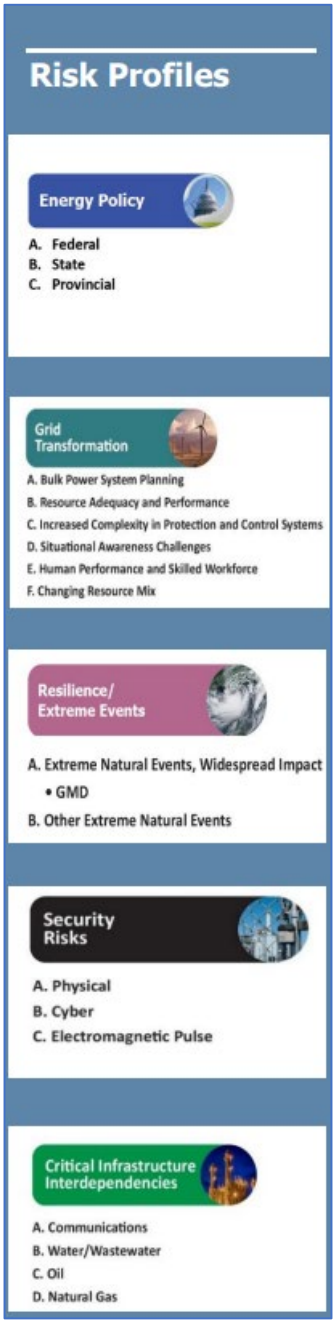
The report addresses recommendations that NERC, the ERO Enterprise and industry should take to enhance reliability, resilience, and security. Among the recommendations anticipated to have the most impact and likelihood for mitigating risk are:

- Energy Policy: NERC should continue to build on its outreach and collaboration with state commissions, with the National Association of Regulatory Utility Commissioners and with critical interdependent sectors. Communication, coordination, and collaboration with all key stakeholders should be early, consistent, and clear to bridge increasingly complex jurisdictional lines.
- Grid Transformation: NERC and industry should develop and include energy sufficiency approaches in planning and operating the grid.
- Resilience to Extreme Events: The ERO Enterprise should conduct special assessments of extreme event impacts, including capturing lessons learned, creating simulation models, and establishing protocols and procedures for system recovery and resiliency.
- Security Risks: NERC should develop guidance for industry on the best practices to mitigate the risks from cloud adoption and the use of artificial intelligence technologies.
- Critical Infrastructure Interdependencies: NERC should conduct a study to determine the percent of available generation with on-site or firm fuel capacity in each Regional Entity.

Each profile contains an overall statement the risk, underlying descriptors, recommendations for mitigation, and a heat map relating impact and likelihood for the mitigation strategies. More detailed information on the Energy Policy profile is provided in the next two pages, followed by a summary of common themes and emerging trends encompassing all five profiles.

Policy as a Reliability Risk Profile:

Given the increased legislation focus and mandates on decarbonization, decentralization, and electrification, Energy Policy will drive many rapid changes in the energy sector. There is an undeniable need to increase coordination and collaboration among all policy makers and regulators as well as on the owners and operators of the BPS. The need for this collaboration is highlighted as a risk because there is no single authority that regulates or owns all policy directives or implications and state, federal, provincial, and private jurisdictions are to be respected. Although there are numerous policy issues to mitigate, there should be a priority focus on three policy areas for reliability purposes: energy adequacy, natural gas, and electric industry.



Demonstrated risks, such as energy sufficiency as well as natural gas and electric interdependence, are becoming increasingly critical. Emerging potential risks, such as aggregate DERs, are increasingly concerning. Due to the interdependency of critical infrastructures (i.e., electricity, natural gas, water, transportation, and communications), potential reliability risks are magnified when cross industry segments and agencies act independently to create or implement policy. Development of reliability standards and processes recognizes and respects the jurisdictional authorities setting and implementing policy decisions.

Energy Sufficiency is Increasingly Critical

Existing resource sufficiency requirements and underlying studies are based on a pre-decarbonization paradigm that traditionally focused on peak capacity requirements and assumed energy sufficiency would result; traditional resource adequacy planning is capacity focused. With a higher proportion of variable and renewable fueled resources evolving, this aspect of resource adequacy must be more specifically assessed.

As the resource mix continues to rapidly change from one that was limited by rated capacity to one that is more fuel/energy-constrained, new approaches are needed to assess and ensure energy sufficiency for all hours throughout the year. Broadly impactful, long-term, and widespread weather events (geography, duration/time of year, generation technologies) are highlighting energy sufficiency issues related to changing characteristics of the resource mix and technology lag. Policy implementation timelines should actively consider the ability to ensure energy sufficiency.

Natural Gas and Electric Interdependency Increasing Impacts

Natural gas and electricity markets are significantly out of synchronism. Natural gas access is further challenged by multiple priority uses, including home heating and industrial processes. Coordination should focus on increased alignment of natural gas and electric nominations and the challenges electric generators face in accessing natural gas during critical periods, such as severe winter weather events.

Natural gas and electricity infrastructures have a high degree of interdependencies, so challenges between natural gas and electricity markets should be better addressed in a coordinated approach to risk assessment, planning, and operations. These challenges can benefit from increased cross-industry and cross-jurisdictional communication, coordination, and collaboration.

Resources From All Sides: Reliably Incorporating Aggregate DERs

DER growth is projected to continue at an increasing rate. Aggregate DERs can impact BPS reliability under certain circumstances and in some areas. NERC's role regarding distribution system resources should continue to focus on the impacts to the BPS due to the aggregate behavior of DERs and loads at the interface with the BPS. Progress is needed to better capture, communicate, and plan for the increasingly complex, dynamic nature of aggregated DERs and loads at the interface with the BPS.

The modeling of demand-side resources may require a similar level of inputs used to model supply-side resources. The rapid growth of energy storage, demand response, electric vehicles, and dynamic rate design bring new options for load flexibility that are changing the demand-side equation rapidly. As load becomes more flexible, the options to balance both the supply and demand sides of the resource adequacy calculation becomes much more dynamic and complex. More information is needed on this significant source of flexibility.

Recommendations for mitigating the risk:

Increased coordination and collaboration between federal, provincial, and state policy makers, regulators, owners, and operators of the BPS as well as with the critical interdependent sectors is needed. Communication, coordination, and collaboration should be early, consistent, and clear to bridge increasingly complex jurisdictional lines. Education for policymakers and regulators to increase awareness of the reliability implications of policy decisions is a critical need. In addition, education for the industry, as the developers of reliability standards, is needed to better understand the processes and implications of policy decisions.

Common Themes and Emerging Trends for all Five Profiles

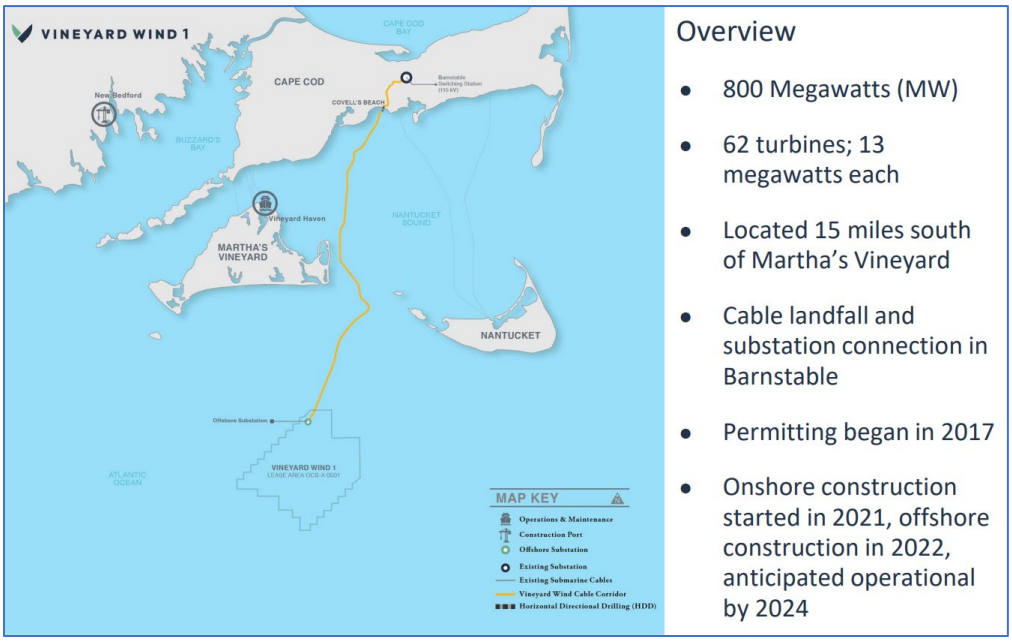
For the risks recommended for active monitoring, there is a convergence of centralized themes and emerging trends. These themes and trends underscore the increasing interdependencies between identified BPS risks as well as an increase in the potential magnitude of emerging risks. Common themes and emerging trends include:

- Collaboration is key to future BPS reliability:
  - NERC needs to be an advocate for BPS reliability by increasing communication, collaboration and coordination with federal and state policy makers, owners and operators of the BPS.
- The BPS depends on and is impacted by other infrastructure providers:
  - Interdependencies between other industries (e.g., water and communications) and fuel types for generation are vital for reliability.
- The increase in natural gas and renewable variable energy generation and the simultaneous decline in nuclear, natural gas, oil, and coal-fired generation have implications on the resource adequacy and the dynamic performance of the BPS.
- Security threats continue to increase:
  - Increased security risks (both cyber and physical) and the evolving nature of these risks are developing and changing quickly.
- Grid transformation is happening quickly. Reliability considerations must align with the pace of change:
  - Emerging technologies and how to best plan and incorporate those into a reliable, resilient, and secure BPS remains important.
  - With the accelerated pace of integrating new resources on the BPS, sufficient effort is needed to develop new system models, more advanced tools, and grid infrastructure improvements for their reliable and resilient integration.
  - Development of credible and centralized data sharing along with the right tools to proactively analyze system conditions towards development of mitigations is becoming more critical.

NPCC DER/VER Forum

On August 10th, NPCC hosted their quarterly DER/VER Forum. See links for Agenda download / Video recording / Meeting and Presentation material.

DER/VER Forum - First presentation: Vineyard Offshore (Website) and Copenhagen Infrastructure Partners (CIP private equity firm - Website). The presentation introduces three projects in various stages of development. The most advanced project is known as Vineyard Wind 1, which is located in the Massachusetts Wind Energy Area, on a land parcel about 132,370 acres in size.



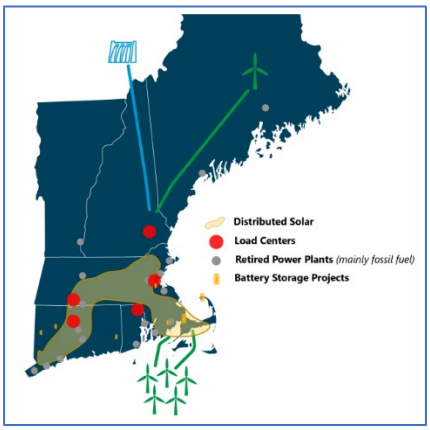
The other two Projects, Vineyard Mid-Atlantic (Excelsior Wind) off the coast of Long Island, and Liberty Wind, located further south from Vineyard Wind 1. The Capacity for each of these projects is about 1,300 MW each, with Excelsior expected to connect at East Garden City (Zone K) and Liberty expected to connect at Gowanus (Zone J).

The diagram below identifies the key steps in the Renewable Energy Process from RFI to Operation, contrasting the severe imbalances in timing associated with the early evaluation phases vs. eventual construction.

DER/VER Forum - Second Presentation: Eversource - Transmission's Role in Enabling Offshore Wind (Website)

The electric grid must be transformed to achieve Decarbonization goals. Multiple independent studies show several pathways to Decarbonization. There is widespread agreement that all cost-effective reliable outcomes require:

- Dramatic increases in electric vehicles and zero-carbon heating
- Substantial increases in solar, offshore wind, storage and energy efficiency
- Significant additional transmission capacity and a modern grid



The image at right shows challenges related to retirement of fossil plants, combined with long distances from renewable resources to load centers.

Technical & Design Considerations when Integrating Offshore Wind:

Challenges:

- Study model availability & accuracy
  - Long lead time
  - Generic models not reflective of reality
  - Short Circuit Ratio (SCR) limitations
- Voltage coordination issues between OSW (or solar) generator and grid-level tap changers, capacitors, etc.
- Sub-synchronous torsional interactions between invertor-based technologies and synchronous generators

Opportunities

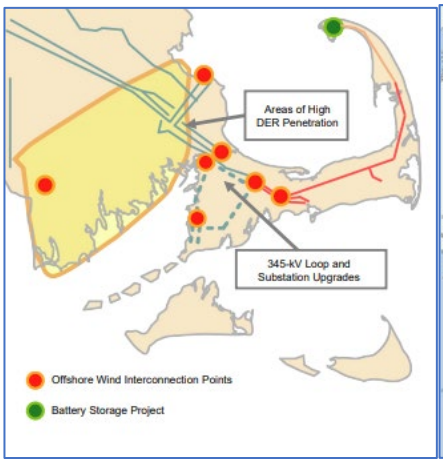
- Grid forming invertors
- Adding battery storage to provide black start capability
- Standards with regards to model development and tuning
- Regional studies that provide a Voltage Control Strategy and ensure system voltage performance and coordination
- Using PMU's and EMS system capabilities to monitor and manage transient stability

The presentation highlights the Cape Cod Solution, a project that combines Grid Reliability, Resiliency and Clean Energy in the Southeast Massachusetts Area. This co-optimized, multi-phase transmission program will improve electric reliability on Cape Cod while allowing for the integration of offshore wind energy.
The project consists of two phases:

- Phase I, a 12.4-mile transmission line, currently under construction
- Phase II enables the 800 MW Park City Offshore Wind project to interconnect

Benefits for multiple states include:

- Massachusetts residents on the Cape will receive a more resilient grid and increased access to renewable energy through future offshore wind projects.
- Connecticut customers will benefit from increased access to clean power through the interconnection of Park City Wind, an 804 MW project that will provide enough clean energy to power ~ 400,000 homes per year.
- New England residents will benefit from additional renewable resources being connected to the grid, contributing to the fight against climate change and meeting growing demand for clean energy.



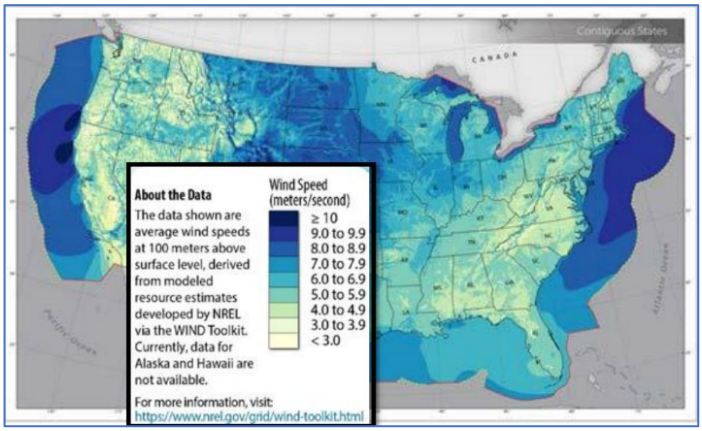
DER/VER Forum - Third Presentation: NYSERDA - New York State Offshore Wind (Website)

The Climate Leadership and Community Protection Act (Climate Act):

- Mandates a minimum of 9,000 MW of offshore wind by 2035
- Requires New York State achieve an 85% reduction in greenhouse gas emissions below 1990 levels by 2050 and 100% zero-emissions electricity by 2040
- Created a Climate Action Council (CAC) charged with developing a scoping plan to provide recommendations to meet Climate Act targets and place New York on a path toward carbon neutrality
- The CAC scoping plan suggests 16-18 GW of offshore wind energy may be necessary to ensure New York State achieves the Climate Act.

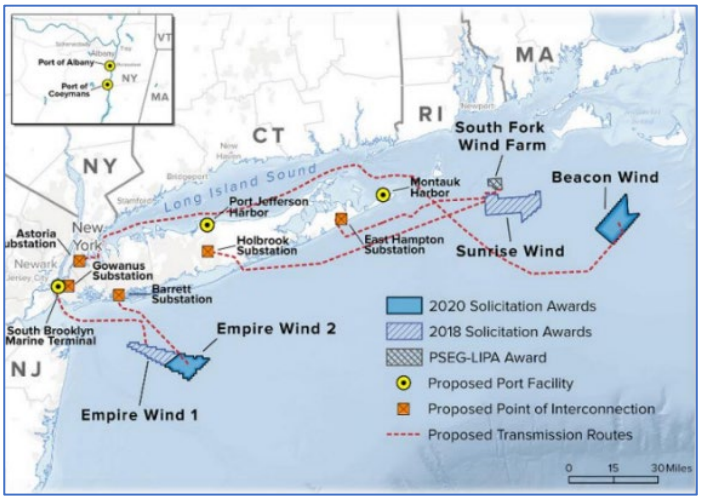
Offshore Wind presents an enormous potential for renewable, and locally produced electricity where demand is highest (80% of US population lives in coastal states)

- Significant investments in infrastructure and communities
- Major new source for thousands of short and long-term skilled jobs
- More diverse, resilient electricity supply
- Avoids harmful greenhouse gas emissions that contribute to climate change



New York State has five projects in active development representing a total of 4,362 megawatts out of 9,000 MW goal, along with a combined economic activity of $12.1 Billion :

- South Fork Wind Farm: 132 megawatts
- Empire Wind 1: 816 megawatts
- Sunrise Wind: 924 megawatts
- Empire Wind 2: 1,260 megawatts
- Beacon Wind: 1,230 megawatts



NYSERDA's Third Offshore Wind Solicitation (NY3):

- Procuring at least 2,000 MW of Offshore Wind
- First installment of $500 million of funding
- Offshore Transmission "Mesh-Readiness", Optional Storage
- Prioritized Fossil-Fuel Retirements
- Stakeholder Engagement, Labor Plans and Environmental Stewardship
- Benefits to NYS Disadvantaged Communities including Workforce Training
- $10,000 per megawatt to support regional wildlife and fisheries monitoring

Proposals for 8 Projects from 6 Developers including: Attentive Energy, Bay State Wind, Beacon Wind, Community Offshore Wind, Invenergy Wind Offshore, and Vineyard Offshore. Award notifications expected in Q4 2023, and contract execution by Q1 2024.

Electrek: The world's largest floating offshore wind farm is officially online

This Short article covers the announcement by Equinor regarding their announcement that Hywind Tampen, the world's largest floating offshore wind farm, was officially launched. It produced its first power in November last year and reached full output earlier this month. The site consists of eleven 8.6 megawatt (MW) turbines. It's located about 87 miles off the Norwegian coast in a water depth of between 853 to 984 feet. The Siemens Gamesa Turbines are direct drive units that will rise 620 feet above the water with a blade radius of 470 feet.

Equinor's 94.6 MW, $522 million project will provide electricity for the Snorre and Gullfaks oil and gas fields in the Norwegian North Sea. It is expected to meet around 35% of the five platforms' annual power needs. Equinor asserts that Hywind Tampen will reduce the need for locally produced gas power and "thus reduce annual emissions from the fields by about 200,000 tonnes of CO2, which is equivalent to emissions from 100,000 vehicles."

Norway is the world leader in electric cars per capita. It's planning 30 GW of offshore wind by 2040. But the Scandinavian country is also Western Europe's largest oil and gas producer. The petroleum sector makes up around 40% of Norway's exports and 14% of its gross domestic product.

The Norwegian government says it will work to cut the country's net emissions by 55% by 2030 from 1990 levels. That's aligned with EU targets. But unlike its EU neighbors, Norway says its move to clean energy will be gradual and that it has no intention of giving up oil and gas exploration.

Additional Links:

- Youtube Video: Hywind Tampen A to Z
- Reuters: Equinor opens world's largest floating wind farm in Norway
- Offshorewind.biz: Ocean Installer Lands Hywind Tampen Cable Installation gig
- Offshorewind.biz: Watch: Building World's Tallest Floating Offshore Wind Turbines
- Siemens Gamesa: Renewable Energy: Offshore wind in the U.S.

Multiple Articles: NY Offshore Wind Developers Seek Price Relief

In New York, offshore wind developers are asking state regulators to agree to price adjustments in existing contracts. They point out that New York has approved including similar price adjustments as part of the state's third offshore wind procurement process, and now should retroactively apply them to contracts approved in the first two procurements. The filings with the New York State Public Service Commission were made by Sunrise Wind, the developer of a 924-megawatt project off of Long Island being developed by a joint venture of Orsted and Eversource, and three wind farms going by the names of Empire Wind I, Empire Wind II, and Beacon Wind I totaling 3,300 megawatts proposed by a joint venture of Equinor and bp plc.

Articles from the NY Times, S&P Global (subscription required), and Commonwealth Magazine describe how offshore wind developers such as Orsted, Equinor, and others have warned of potential write-offs on the order of $2 billion because of supply chain problems and other issues at three giant offshore wind installations off the United States' East Coast. These announcements are the latest sign of trouble in an industry expected to supply an increasingly large portion of clean energy to meet the climate-change goals of many countries, including the United States.

The wind farms covered in the announcement would supply power to customers in New York, Connecticut, and New Jersey. These companies indicated that their projects were being hit by delays to suppliers and contractors, like wind turbine component manufacturers and the specialized ships needed to install the large machines, whose blades are as long as football fields. They stated that such delays could lead to extra costs and slower-than-anticipated receipts of revenues from the power generated by the turbines. They have also indicated that while continuation of preliminary work was still warranted, walking away remained an option.

Sharp increases in interest rates would also increase costs in the United States. Renewable energy projects require billions in investment upfront. Companies might not be able to achieve tax credits from the United States as large as original anticipated. However, the United States remains an important future market for the company and other developers. The offshore wind industry, which has been developed in countries like Denmark, Britain, and Germany in recent decades, has won favor with governments and investors looking to place large sums in clean energy.

After rapid growth, the industry has recently been upended by a variety of factors including manufacturing and logistics delays from the pandemic and inflation, which has drastically changed the economics of projects that can take a decade to move from the drawing board to an operating wind farm. In a potential indication of a souring on prospects for offshore wind in the United States, an auction of wind lease areas in the Gulf of Mexico on Tuesday produced disappointing results, attracting just two bidders.

Estimates of up to $25 billion of investment may be required in the supply chain in the next few years for the industry to meet demand peaks in the second half of the decade. The need for investment is particularly acute for vessels, where 80 percent of the capacity required to meet demand in 2030 does not exist today, and for foundations, where investments in new fabrication facilities need to be made five years or more ahead of facility completion. The shortage of supply creates significant investment opportunities, but it also means that offshore wind supply chains will remain strained for the foreseeable future, and that a strategy to pause projects to wait out current supply chain constraints is not likely to lead to reduced costs.

Additional Links:

- Commonwealth Magazine, June 7th, 2023: NY Offshore Wind Developers Also Seek Price Relief
- NY Times, August 7th, 2023: Offshore Wind Runs Into Rising Costs and Delays
- NY Times, November 22, 2022: Europe's Wind Industry Is Stumbling When It's Needed Most
- The Guardian, August 30th, 2023: Ørsted shares fall 25% after it reveals troubles in US business

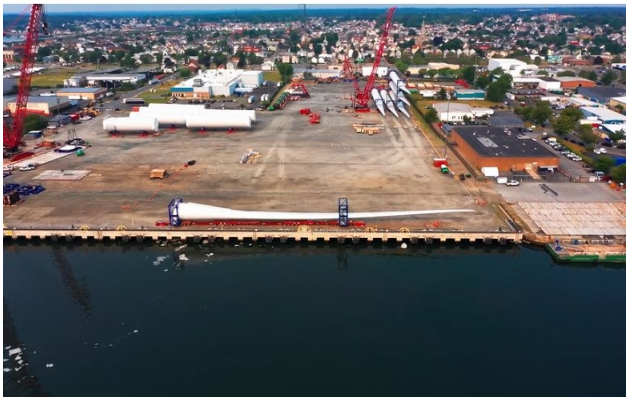
New York Times: A Giant Wind Farm is Taking Root Off Massachusetts

This NY Times Article (dated June 27th) provides more details regarding the Vineyard Wind project previously described in the NPCC Meeting presentations. In the coming months, 62 turbines, each up to 850 feet high (taller than any building in Boston) with blades about 350 feet long, will be planted on a sweep of seabed 15 miles off Martha's Vineyard.

Cables carrying electricity created by spinning rotors will land on a beach in Barnstable on Cape Cod and then head to consumers in the state. Vineyard Wind says its machines will crank out enough power to light up 400,000 homes.

Wind farms are usually built surprisingly quickly once construction starts. Klaus Moeller, the chief executive of Vineyard Wind, who is Danish, said he expected that Vineyard Wind — "touch wood" — would be completed next summer.

Europe has thousands of offshore turbines, and so much of the expertise and equipment used in Vineyard Wind's construction, including the specialized vessels used to hammer the turbine towers into the seabed, is from across the Atlantic.



Wind developers also say they are hindered by a century-old law, the Jones Act, which bans the use of American ports to launch foreign construction vessels. To comply, Vineyard Wind plans to land turbine components at a port in New Bedford, Mass., and then ship assembled machines to the site on U.S.-flagged barges — a process that adds cost.

The company also says a maintenance center for the turbines, being built on Martha's Vineyard, will create 90 full-time jobs - a significant number for a vacation destination that mainly offers residents summertime jobs.

On the other hand, many of the manufacturing jobs that offshore wind could produce in the United States have yet to materialize. While the turbines will be supplied by General Electric, the cabinlike structures called nacelles, which house the gearing and electronics, will be made in France. The first blades are coming from a factory in Canada. G.E. has said it will build two factories in New York if it receives sufficient orders.

Among opponents of offshore wind, fishing groups stand out. People in the industry say that turbines impede their ability to catch fish, and that Washington has insufficiently consulted them when awarding leases. They fear a coastline studded with wind farms.

Vineyard Wind has tried to mollify the fishing industry by chartering boats to patrol the construction zone and providing around $40 million for potential lost catches. But Seafreeze and others have filed a lawsuit seeking the suspension of the Vineyard Wind lease, arguing that in the race to secure renewable energy, the federal government ignored its own environmental rules.

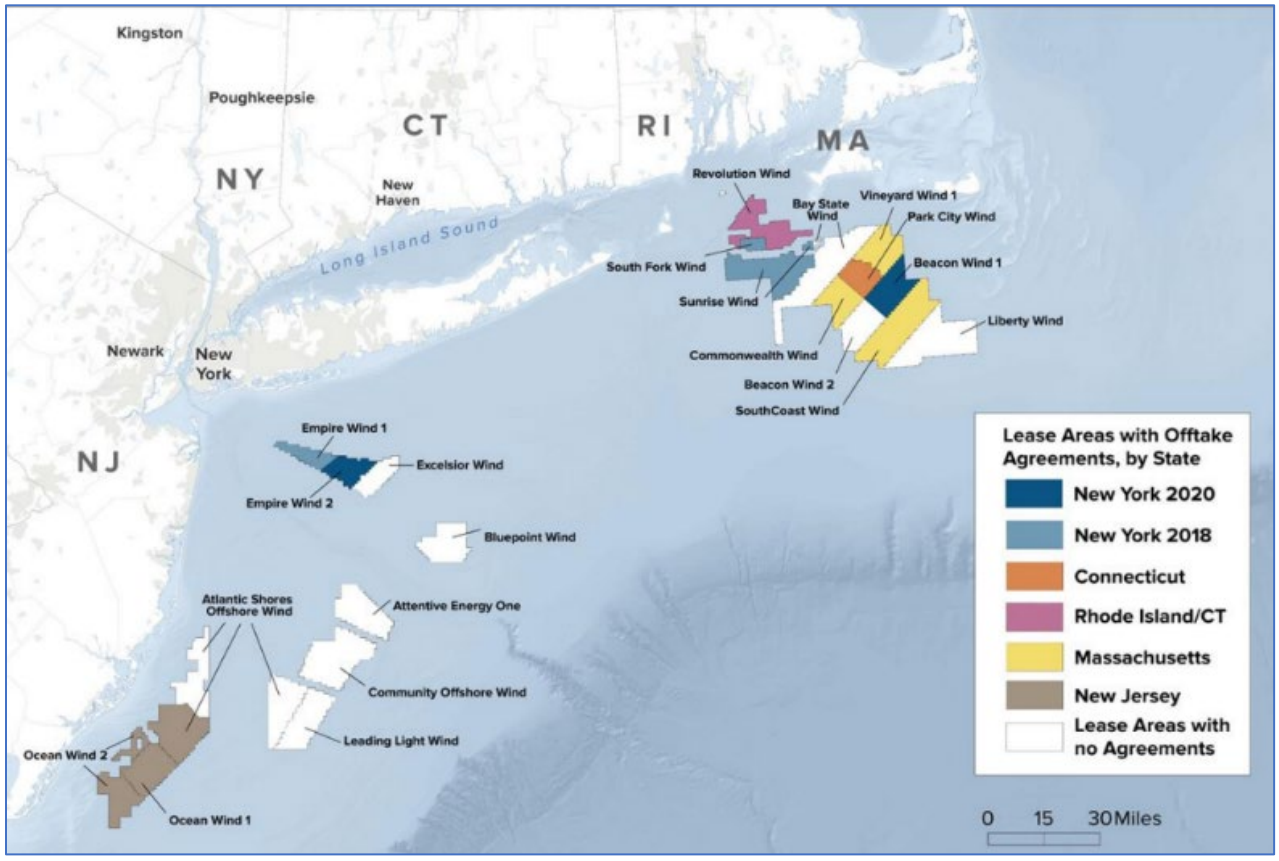
DOI Approves Major Offshore Wind Project (Revolution off Coast of Rhode Island)

On August 23rd, Environment and Energy Leader Magazine announced the Department of the Interior's (DOI) Approval of the Revolution Wind project, to be built off the coast of Rhode Island. The new project will generate about 704 megawatts of energy and will add to the President's goal of establishing 30 gigawatts of offshore wind energy by 2030.

This project follows the review and approval process for three other major offshore wind projects, including the Vineyard Wind project offshore Massachusetts, the South Fork Wind project offshore Rhode Island and New York, and the Ocean Wind 1 project offshore New Jersey. At this point, various companies have announced 18 offshore wind projects, and the DOI's Bureau of Ocean Energy Management (BOEM) is on track to complete the review of at least 16 offshore wind projects by 2025, which amounts to over 27 gigawatts of clean energy.

The project's Record of Decision calls for the establishment of fishery mitigation funds to compensate for losses incurred by fisheries in Rhode Island and Massachusetts from Revolution Wind's development. Finally, certain vessel speed restrictions and construction clearance zones will be implemented to avoid hurting protected species nearby, including marine mammals and sea turtles.

Below: Map of all Northeast Offshore Wind Lease Areas with Offtake Agreements, by State:



Additional information on Revolution Wind can be found here.

- Bureau of Ocean Energy Management: Revolution Wind
- CBS News Boston Video: Revolution Wind farm approved south of Martha's Vineyard, Rhode Island
- U.S. Environmental Protection Agency: Fact Sheet: Revolution Wind Farm Project
- Tethys: Offshore Wind Metadata – Revolution Wind

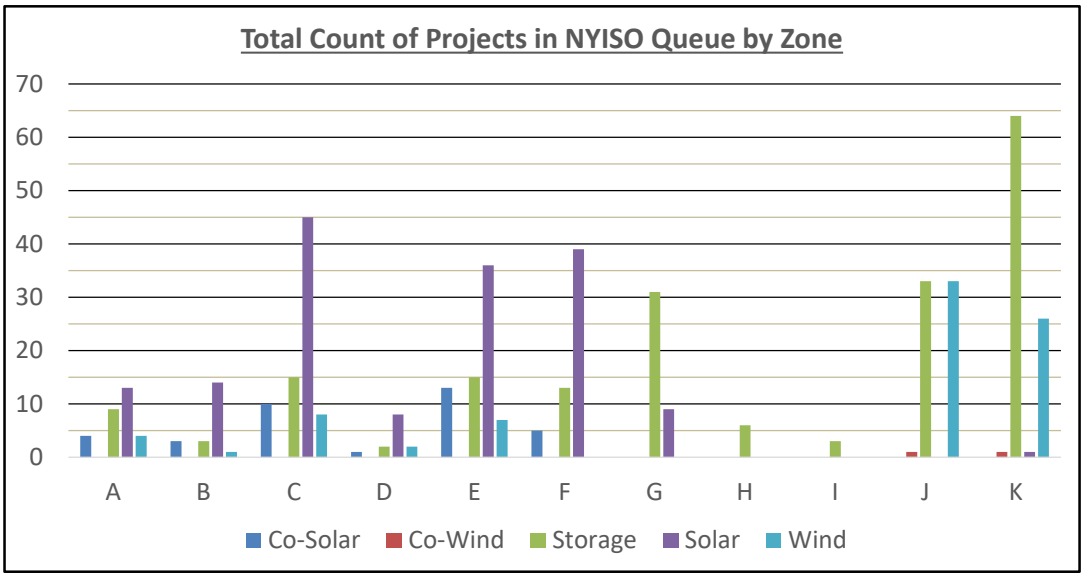
Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)

The intent is to track the growth of Energy Storage, Wind, Solar and Co-Located Storage (Solar and Wind) projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection Website, based on information published on August 20th, and representing the Interconnection Queue as of July 31st. Note that 12 projects were added, and 12 were withdrawn during the month of July.

Total Count of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	4		9	13	4
B	3		3	14	1
C	10		15	45	8
D	1		2	8	2
E	13		15	36	7
F	5		13	39	
G			31	9	
H			6		
I			3		
J		1	33		33
K		1	64	1	26
State	36	2	194	165	81

Total Project Size (MW) in NYISO Queue by Zone					
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	1,072		801	1,508	618
B	208		520	2,125	200
C	1,527		1,579	4,767	921
D	20		220	1,202	747
E	1,492		1,684	3,326	541
F	380		4,340	1,821	
G			4,411	243	
H			2,416		
I			1,000		
J		1,400	6,705		38,661
K		1,400	7,877	36	25,924
State	4,698	2,800	31,551	15,026	67,613

Average Size (MW) of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	268		89	116	154
B	69		173	152	200
C	153		105	106	115
D	20		110	150	374
E	115		112	92	77
F	76		334	47	
G			142	27	
H			403		
I			333		
J		1,400	203		1,172
K		1,400	123	36	997
State	131	1,400	163	91	835


Total Count of Projects in NYISO Queue by Zone
70
60
50
40
30
20
10
0
A
B
C
D
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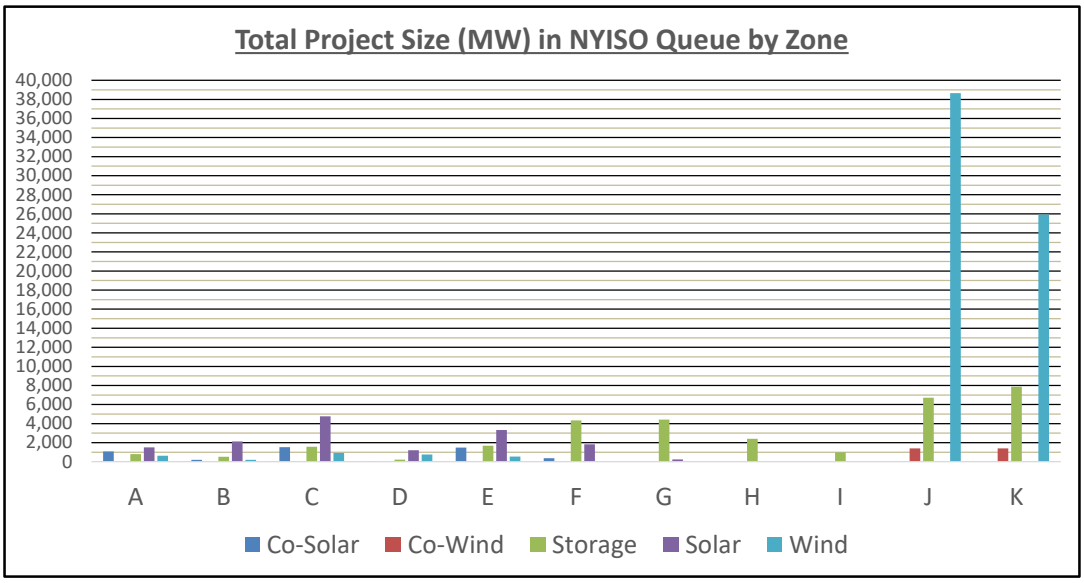
H
I
J
K
Co-Solar
Co-Wind
Storage
Solar
Wind


Total Project Size (MW) in NYISO Queue by Zone
40,000
38,000
36,000
34,000
32,000
30,000
28,000
26,000
24,000
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
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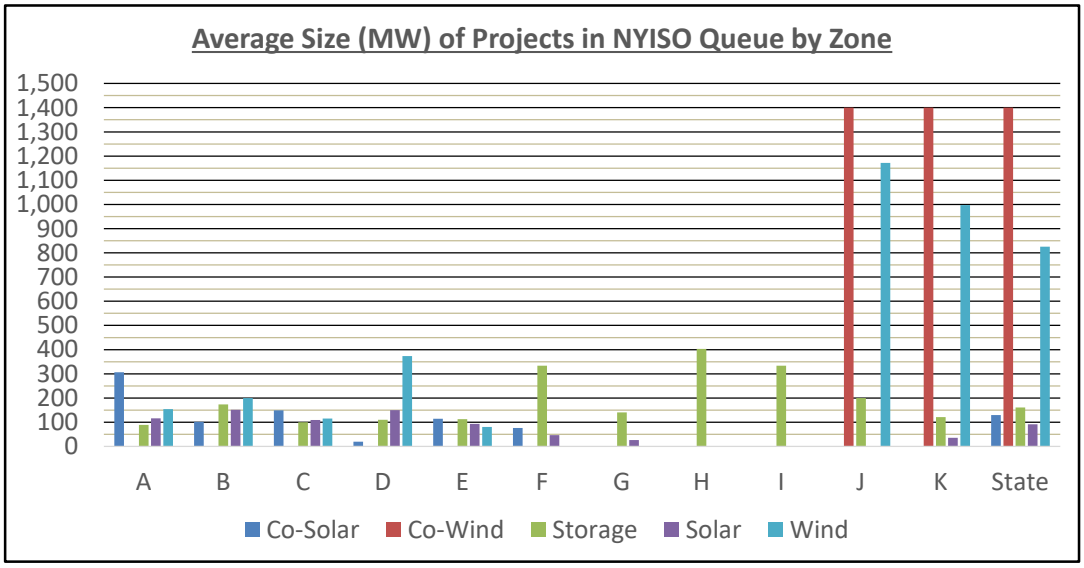
Co-Solar
Co-Wind
Storage
Solar
Wind


Average Size (MW) of Projects in NYISO Queue by Zone
1,500
1,400
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
A
B
C
D
E
F
G
H
I
J
K
State
Co-Solar
Co-Wind
Storage
Solar
Wind