## De-Carbonization / DER Report for NYSRC Executive Committee Meeting 9/13/2024

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The September 2024 edition of the De-Carbonization / Distributed Energy Resources (DER) Report includes the following items:

- AP News: Federal government grants first floating offshore wind power research lease to Maine NY
- Related NREL Article: What Will It Take to Unlock U.S. Floating Offshore Wind Energy?
- The Conversation: Offshore Underwater Power Grid Could Revolutionize East Coast Electricity
- Reuters: California Wildfires Dim Solar Generation During Power Demand Peak
- Giant batteries make California's power grid stronger, reducing risk of blackouts during heat waves
- NYISO Blog: How Historic Transmission Projects Bridged an Upstate-Downstate Clean Energy Divide
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / Co-located

**AP News: Federal government grants first floating offshore wind power research lease to Maine**

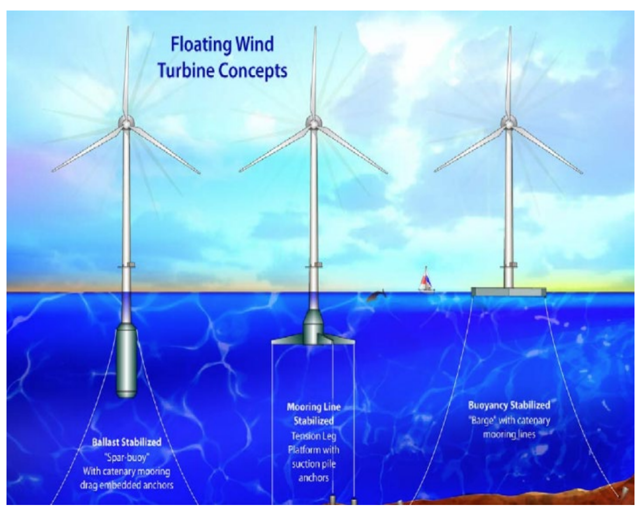
On August 19th, the federal government issued the nation's first floating offshore wind research lease to the state of Maine, comprising about 23 square miles (60 square kilometers) in federal waters. The state requested the lease in 2021 from the federal Bureau of Ocean Energy Management for a floating offshore wind research array with up to a dozen turbines capable of generating up to 144 megawatts of renewable energy in waters nearly 30 miles southeast of Portland, Maine. It will allow the state, the fishing community, oceanography experts and the offshore wind industry to thoroughly evaluate the compatibility of floating offshore wind.

As proposed, the research array will use floating offshore wind platform technology designed by the University of Maine (UMaine) and deployed by their development partner, Diamond Offshore Wind. UMain's floating platform, known as VolturnUS, was recently awarded a $12.5 million grant from the US Department of Energy.

The lease announcement follows a law Maine passed in 2023 to generate 3 gigawatts of electricity from offshore wind by 2040, most of which will come from floating projects. An environmental assessment for the project was completed prior to signing the lease. During the first 120 days of the lease agreement, the state must submit plans for how it will communicate with fishing interests, Native American tribes, and federal agencies.

According to BOEM, construction activity on the research array is not likely to occur for several years. Prior to construction, the research array is subject to environmental analysis under the National Environmental Policy Act, approval by BOEM of a research activities plan, and final approval of a Power Purchase Agreement (PPA) by the Maine Public Utilities Commission (PUC).

Democratic Gov. Janet Mills signed a bill last year that aims to see Maine procure enough energy from offshore wind turbines to power about half its electric load by 2040, and the state has selected a site to build, stage and deploy the turbine equipment. In the next decade, University of Maine researchers envision turbine platforms floating in the ocean beyond the horizon, stretching more than 700 feet (210 meters) skyward and anchored with mooring lines. Floating turbines are the only way some states can capture offshore wind energy on a large scale. In the U.S. alone, 2.8 terawatts of wind energy potential blows over ocean waters too deep for traditional turbines that affix to the ocean floor, according to the National Renewable Energy Laboratory.



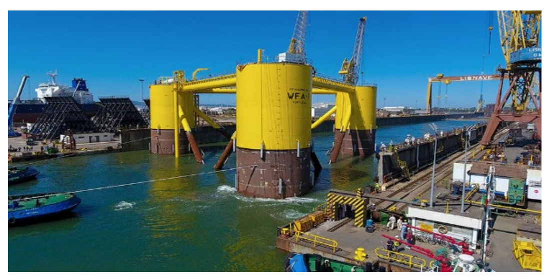
**Related NREL Article: What Will It Take to Unlock U.S. Floating Offshore Wind Energy?**
This Announcement from National Renewable Energy Laboratory (NREL) summarized a recently published report entitled The Impacts of Developing a Port Network for Floating Offshore Wind Energy on the West Coast of the United States, which focuses on what it will take to develop a system of ports. The study is one of the outcomes of the U.S. Department of Energy's focus on developing floating wind energy in the United States in support of its Floating Offshore Wind Shot.

As the first West Coast commercial-scale projects aim to be built around 2030, the United States will have to develop ports able to deploy commercial-scale floating offshore wind energy development. "Our research shows that it could take an investment of around $5 billion to $10 billion to develop the installation and maintenance ports needed to build and operate 25–55 gigawatts of floating offshore wind on the West Coast and at least another $10 billion to build manufacturing ports to support a local supply chain," said Matt Shields, an NREL offshore wind energy analyst who led the study.

Developing one staging and integration port site for offshore wind project installation could require an investment of $1 billion or more and take around 10 years. The study identifies the following five primary areas of focus to develop a West Coast ports network, which suggest that the country will need to:

- Update existing West Coast port infrastructure to manufacture technology components domestically, install projects efficiently, and contribute effectively to clean energy goals on a commercial scale.
- Encourage collaboration and communication among a huge number of stakeholders, along with an authorized decision-making entity (or entities) for strategic planning.
- Build a significant workforce to construct and operate West Coast floating wind ports and attract workers in likely port-development regions.
- Provide transparency and certainty around permitting and regulatory requirements for ports so they are less unpredictable and time-consuming, easing the approval process and helping with strategic planning.
- Grow a vessel fleet to install and service offshore wind power projects in parallel with the port network after developing requirements for U.S. shipbuilding capacity.

Image at right*: The foundation for a floating offshore wind turbine, like this one for an 8.4-megawatt turbine in Portugal, can be towed out to sea, where it can generate clean, renewable energy far offshore.*



The study's researchers analyzed the costs and benefits of port strategies. The resulting report:

- Describes the requirements for floating offshore wind energy ports that conduct manufacturing, installation, and/or service activities
- Estimates the number of ports and time frames required to construct these ports at suitable locations on the West Coast
- Calculates the required investment to support different phases of floating offshore wind projects, including manufacturing, installation, and operation
- Considers how these costs could be affected by local or foreign supply chains
- Models how the proximity of an offshore wind power project to installation and operations ports can impact the levelized cost of energy of the project
- Offers scenarios with increasing levels of floating offshore wind energy deployment and port assets on the West Coast to show how these ports could enable deployment goals to be achieved

**The Conversation: Offshore wind farms connected by an underwater power grid for transmission could revolutionize how the East Coast gets its electricity**

This Article provides an overview of how Offshore winds have the potential to supply coastlines with massive, consistent flows of clean electricity. One study estimates wind farms just offshore could meet 11 times the projected global electricity demand in 2040. In the U.S., the East Coast is an ideal location to capture this power, but there's a problem: getting electricity from ocean wind farms to the cities and towns that need it.

The U.S. Department of Energy and 10 states in the Northeast States Collaborative on Interregional Transmission are working on a potentially transformative solution: plans for an offshore electric power grid. The Atlantic Offshore Wind Transmission Action Plan envisions multiple backbone transmission lines off the east coast, from North Carolina to Maine, where dozens of offshore wind projects are already in the pipeline. Supporting at least 85 gigawatts of offshore wind power by 2050 – close to the U.S. goal of 110 GW of installed wind power by mid-century, enough to power 40 million homes and up from 0.2 GW today. The Northeast States Collaborative formalized their goals in July 2024 through a multistate memorandum of understanding.

Emerging research from the NREL and the Department of Energy, the research company Brattle and other groups suggests that an offshore electric power grid could mitigate key challenges to building new transmission lines on land and reduce the costs of offshore wind power. Cutting costs would be welcome news – offshore wind project costs rose as much as 50% from 2021 to 2023. While some of the underlying causes have subsided, such as inflation and global supply chain disruptions, interest rates remain high, and the industry is still trying to find its footing in the U.S.

Today's offshore wind projects use a point-to-point, or radial design, where each offshore wind farm is individually connected to the onshore grid. This method works if a region has only a few projects, but it quickly becomes more expensive due to the cabling and other infrastructure. Its lines are also disruptive to communities and marine life. And it requires more costly onshore grid upgrades.

Coordinated offshore transmission can avoid many of those costs with what the Department of Energy calls "meshed" or "backbone" designs. Rather than individual connections to land, many offshore wind farms would be connected to a shared transmission line, which would connect to the onshore grid through strategically placed "points of interconnection." This way, electricity produced by an offshore wind farm would be transmitted to where it is most needed, up and down the East Coast. Even better, electricity generated onshore could also be transmitted through these shared lines to move energy to where it is needed. This could improve the resilience of power grids and reduce the need for new transmission lines over land, which have been notoriously difficult to gain approval for, especially on the East Coast.

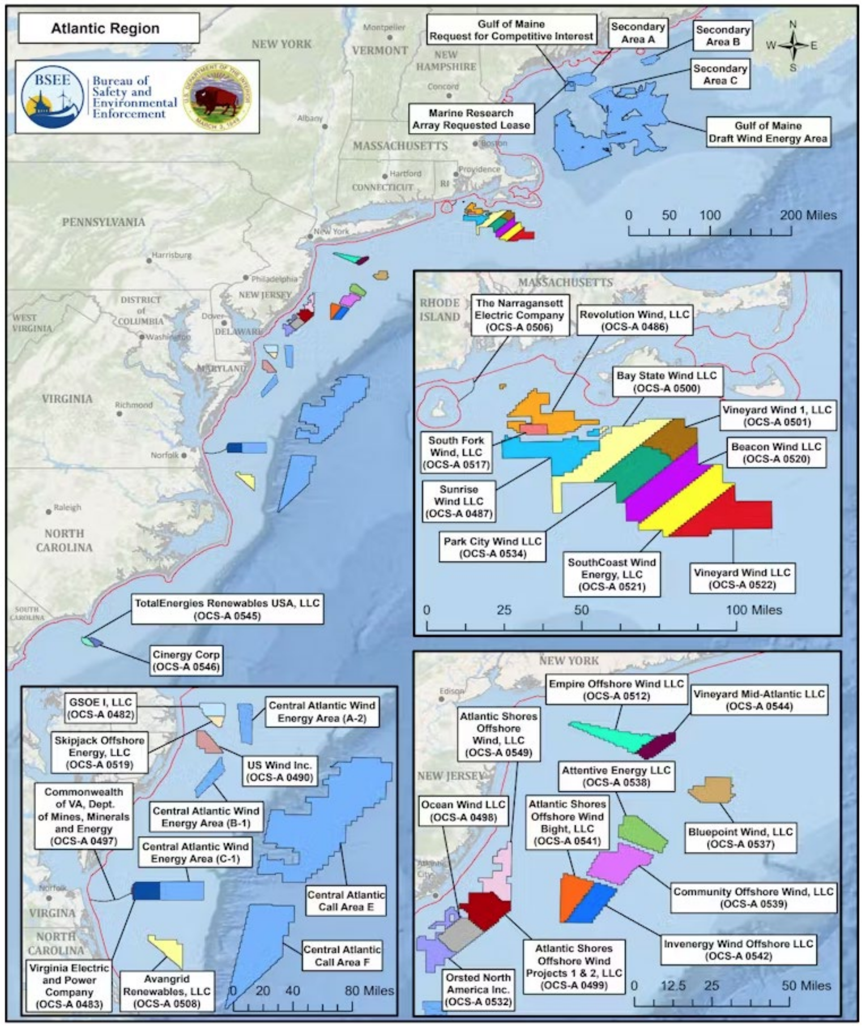
Coordinated offshore transmission was part of early U.S. discussions on offshore wind planning and development. In the late 2000s when Google and partners first proposed the Atlantic Wind Connection, an offshore transmission project, the benefits in both offshore renewables and the entire energy system were intriguing. At the time, the U.S. had just one utility-scale offshore wind project in the pipeline, and it ultimately failed. Today, the U.S. has 53 GW of offshore wind projects being planned or developed.

By enabling power from offshore wind farms and onshore electricity generators to travel to more places, coordinated transmission can enhance grid reliability and enable electricity to get to where it is most needed. This reduces the need for more expensive and often more polluting power plants. A 2024 report from the National Renewable Energy Lab found the benefits of a coordinated design are nearly three times higher than the costs when compared with a standard point-to-point design.

Studies from Europe, the U.K. and Brattle have pointed to additional benefits, including reducing planet-warming carbon emissions, cutting the number of beach crossings by a third and reducing the miles of transmission cables needed by 35% to 60%.

The image at right shows three transmission designs show the difference between intraregional systems with several land connections and interregional and backbone designs. These three were investigated by the National Renewable Energy Lab in the Atlantic Offshore Wind Transmission Study.

In the U.S., offshore transmission lines would be almost entirely in federal waters, potentially avoiding many of the conflicts associated with onshore projects, though it would still face challenges.




Building an offshore grid will require some important changes:

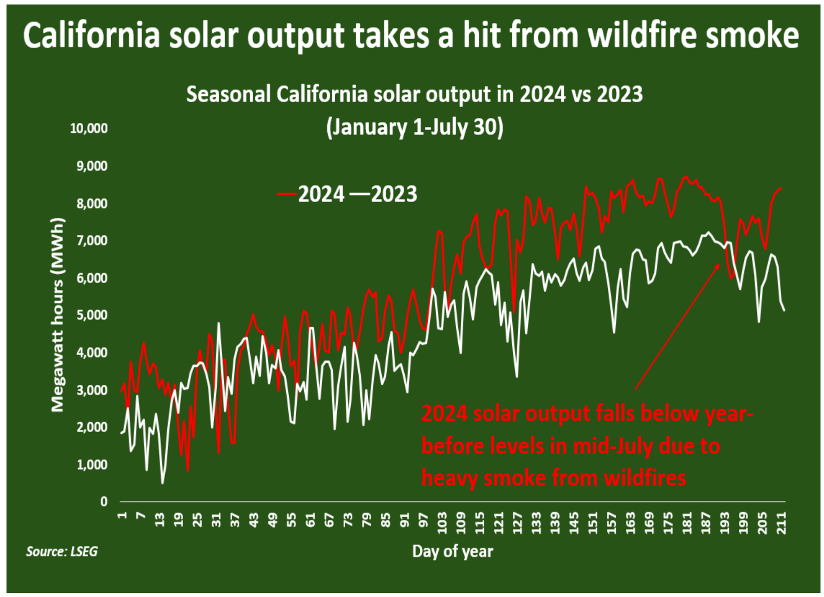
- Changing government incentives. The federal investment tax credit for offshore wind, which covers at least 30% of the upfront capital cost of a project, does not currently help pay for coordinated transmission designs.
- Planning needs to take everyone's concerns into account from the beginning. While the overall benefits of coordinated transmission designs outweigh overall costs, who receives the benefits and who bears the costs matters. For example, more expensive power generators could earn less, and some communities feel threatened by offshore development.
- Greater coordination will be needed among everyone involved to dispatch power through the regional grids. The Federal Energy Regulatory Commission's recent Order 1920, requiring power providers to plan for future needs, may serve as a blueprint, but it does not apply to interregional projects, such as an offshore transmission backbone connecting over a dozen states across three regions.

The U.S. reached an important milestone in March 2024 with the completion of South Fork Wind connected to Long Island, the country's first utility-scale wind farm, bringing U.S. offshore wind power capacity to nearly 200 megawatts. Nine more projects are under construction or approved for construction. Once built, they would bring installed capacity to over 15 gigawatts, roughly the same as three dozen coal-fired power plants.

**Reuters: California Wildfires Dim Solar Generation During Power Demand Peak**

This Article from July 31, 2024 describes how wildfires spewing smoke across much of the southwest United States are denting solar power output in the country's largest solar producer just as power demand peaks due to heavy use of air conditioners during summer. Through the first half of 2024, solar power generation in the California Independent System Operator (CAISO) network was 28% above the same period in 2023 following extensive solar capacity expansions in the state within the past year.

But CAISO's solar power output dipped below year-earlier levels this month as thick smoke from spreading wildfires darkened the skies and dimmed solar generation in mid-July. Solar output has since rebounded as winds cleared some smoke away, but 89 large active wildfires that have already scorched over 2 million acres continue to burn in the U.S. as of July 30, according to the National Interagency Fire Center (NIFC).Moreover, California is only one of 12 states currently reporting large fires, which are defined as "a fire meeting the size of the top 5% of historic daily largest fires during a typical fire season," according to NIFC.



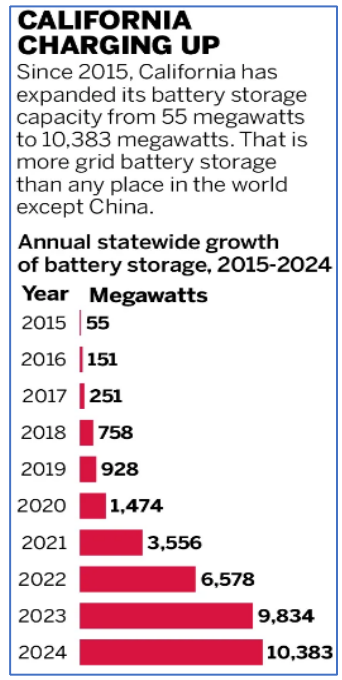

Hot, dry, and windy conditions across the southwest continue to foster further wildfire expansions, so additional disruptions to regional solar generation are likely just as household and business use of power-hungry cooling systems looks set to peak. The U.S. southwest is the top national solar power generation area due to its mainly sunny and dry climate, but is also the most active area for wildfires for similar regions. Roughly half of all U.S. utility-scale solar generation capacity is located within states included in the U.S. southwest region and so potentially stands to be impacted by wildfire break outs.


A map of wildfires across the USA and Canada can be found here: https://www.fireweatheravalanche.org/fire/

**Giant batteries make California's power grid stronger, reducing risk of blackouts during heat waves**

This [Article from Monterey Herald] discusses the impact of California's growing energy storage resources. Four years ago this week, California's power grid was so strained by a heat wave that rolling blackouts hit hundreds of thousands of residents over two days. It nearly happened again two years ago, when state officials issued 11 "flex alerts" asking businesses and homeowners to voluntarily reduce electricity use to avoid power disruptions. This year, a record heat wave scorched the state over three weeks from mid-June to July, sending temperatures across the Bay Area and the Central Valley soaring over 110 degrees. However, there was plenty of power. No warnings. No shortages. No flex alerts. A big part of the reason, experts say, is a boom in the construction of giant battery projects.

California's high-tech battery centers built with thousands of lithium-ion batteries similar to the batteries in cell phones and electric cars are solving the main shortcoming of the push for more renewable energy: the fact that the sun doesn't shine at night. Battery storage has increased sevenfold in the past five years in California, from 1,474 megawatts in 2020 to 10,383 megawatts now. A megawatt is enough electricity to run 750 homes.




Before, when the sun went down every summer evening, giant solar farms stopped producing electricity, sometimes leading to power shortages statewide in the early evening. Now, the growing number of battery storage plants across the state can store that solar power during the day when it is plentiful. The battery storage plants then release it back to the power grid in the evening as the sun goes down but hot weather keeps electricity demand high because millions of Californians are running air conditioners.

"Think of it like an energy bank account," said Elliott Mainzer, president and CEO of California Independent System Operator, an agency in Folsom that manages the state's power grid. "In the middle of the day, you are making big deposits. At the end of the day, we withdraw from that account."

Since 2020, companies in California have built more large-scale battery storage projects than any place in the world except China. Five years ago, there were 36 such plants in the state. Today there are 175, with dozens more planned or under construction. "These facilities are not sexy. They are not visible," said David Hochschild, Chairman of the California Energy Commission. "They are out of view. The footprint is very small. They are out of sight, but not out of mind. They have been the difference maker. They are the reason we haven't had flex alerts. These storage facilities have provided an incredible cushion."

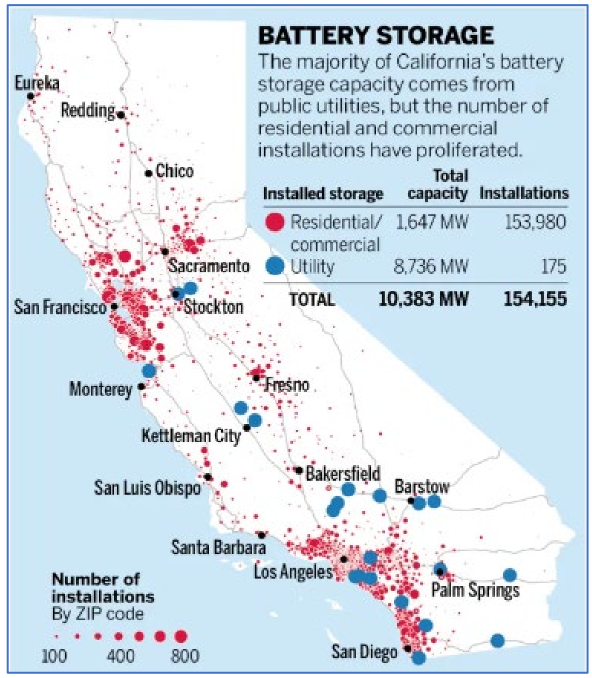
Many of the larger battery plants are in the Southern California desert, near Palm Springs, Blythe, and Lancaster. But two of the biggest are in Monterey County, located on the site of the old PG&E Moss Landing Power Plant. That natural gas-fired plant, built in 1950 and famous for its two 500-foot-tall concrete smokestacks, now is home to a 750-megawatt battery storage plant owned by Vistra, a Texas company, and a 182-megawatt plant owned by PG&E. They are two of the largest such plants in the world. Vistra says its plant is the world's largest.

The PG&E plant has 256 Tesla "Megapack" units. The gleaming white steel boxes, each about the size of a shipping container and weighing 56,000 pounds, were built at Tesla's Gigafactory near Reno. Arranged in neat rows and sitting on concrete pads, they are cooled by fans that hum in the background. The battery storage plant opened in 2022, and its storage provides enough electricity for 136,000 homes. "This is a strategic location to connect to the grid," said PG&E spokesperson Paul Doherty during a visit Thursday. "All of the wires and substations are here. And there's room to expand."

Tesla opened a new battery factory in Lathrop, south of Stockton, in 2022 that can produce about 13,000 Megapacks per year. But the technology is not without controversy. Fires broke out at the Vistra plant on Sept. 4, 2021, and Feb 14, 2022. Investigations showed that they were caused by a malfunction in a fire sprinkler system, which released water and caused several of the units to overheat.

Then in September 2022, a fire broke out at the PG&E Elkhorn battery plant. Police closed Highway 1 for 12 hours. An investigation found it was caused by an improperly installed vent shield on one of the 256 units, which allowed rainwater to get in and short out the batteries. There were no injuries to firefighters, PG&E employees, or the public.

Afterward, Gov. Gavin Newsom signed a law requiring battery storage plants in California to draw up emergency response plans with local fire departments and increase fire safety.




"Increasing the state's battery storage is essential to reaching our clean energy goals," said State Sen. John Laird, D-Santa Cruz, who wrote the bill. "But we also have to ensure that these facilities have safety systems in place to protect the health and well-being of workers and surrounding communities."

Last month, after two fires occurred at San Diego County battery storage facilities, San Diego County supervisors required county officials to draw up tighter rules that would restrict battery storage plants near homes, schools, and other facilities. And when Vistra proposed building a large battery plant in Morro Bay, citizens there put a measure on the November ballot on whether to allow it.

Such fires are rare, said Mark Jacobson, a professor of environmental engineering at Stanford University. And by helping the state's renewable energy to keep growing, they are reducing the amount of electricity generated from natural gas, which in turn reduces soot and smog. "There are 12,000 people a year in California who die from air pollution," Jacobson said. "Nothing is perfect, but if we want energy, this is the best way to do it."

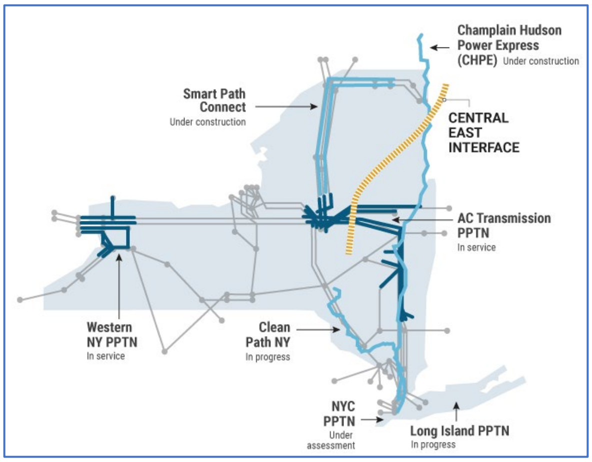
In an effort to reduce greenhouse gas emissions and air pollution, California political leaders have increasingly mandated that big utilities like PG&E, Southern California Edison, and San Diego Gas & Electric, produce more and more of their electricity from renewable energy.

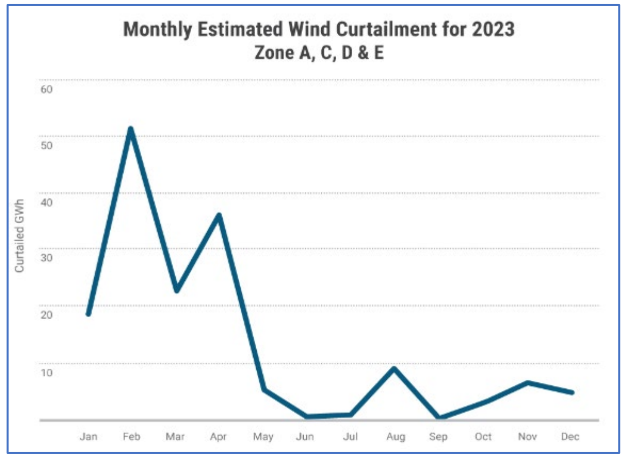
In 2018, former Gov. Jerry Brown signed a law requiring that 100% of the state's electricity come from carbon-free power like solar, wind, geothermal, hydroelectric, and nuclear by 2045. Today the state is at 61%. To make renewable energy more reliable, state regulators have required utilities to build battery storage or sign contracts with companies for it. Now the utilities are making money by buying power at cheap prices in the middle of the day when it is plentiful and selling it at a higher price in the early evening.

On some days, this year battery power has become the largest source of electricity on California's power grid. On Wednesday, a record 8,320 megawatts of battery power were on the grid at 7:35 pm, the equivalent of 16 Natural-gas-fired power plants running full power, or four nuclear power plants the size of Diablo Canyon running at peak capacity.

**NYISO Blog: How Historic Transmission Projects Bridged an Upstate-Downstate Clean Energy Divide**

This Blog Article describes how the AC Transmission Projects, completed in 2023, have improved energy deliverability in so-called “wind pockets,” parts of New York where more renewable energy is produced than can be delivered to consumers. The projects, undertaken through the NYISO’s Public Policy Transmission Planning Process, are the most significant transmission upgrades to be completed in New York in 30 years, bolstering power transfer capability across the NYISO’s Central East interface by at least 1,000 megawatts (MW).




A central corridor for the transfer of energy between upstate and downstate, the Central East interface is historically one of the most congested transmission paths in New York State. The increased capability on this interface is vital to enabling energy deliverability from existing and future renewable projects in upstate New York, according to Jason Frasier, NYISO’s Senior Manager of Transmission Planning. “The additional transfer capacity of the AC Transmission Projects will continue to ease bulk transmission congestion and hopefully encourage the development of more renewable and carbon-free resources,” said Frasier.

These infrastructure projects have facilitated other notable milestones for the NYISO’s transmission network. In December 2023, flow on the Central East interface surpassed 3,000 MW for the first time, and the line experienced a record 3,399 MW transfer during a dispatch interval in early 2024.

Wind energy accounted for about 14 percent of New York’s grid-connected renewable generation last year, but these clean energy resources sometimes cannot operate at full capacity due to transmission limitations. Following the development of Segment A of the AC Transmission Projects, the NYISO observed a reduction in wind curtailment - especially along the Central East corridor. The other transmission project, Segment B, was designed to facilitate the transfer of up to 900 MW of between Albany and the Hudson Valley.

Though a number of factors can contribute to curtailment of wind generation, congestion on the lines from central New York to the lower Hudson Valley has long been a limiting factor in expanded upstate clean energy production. In the past few years, ongoing construction for the upgrades may have also added to curtailments as it was necessary to take segments out of service while work was underway.

New York’s installed capacity of wind generation has multiplied in the last 20 years, rising from 48 MW in 2004 to 2,748 MW in 2024, with nearly all those resources located upstate. More than half of the demand on the electric grid comes from consumers in New York City and Long Island. In 2023, wind units generated nearly 5,000 gigawatt hours (GWh) of electricity. During that same period, approximately 162 GWh of wind generation was curtailed, in part, due to congestion on the grid. Of the 162 GWh curtailed, 128 GWh were curtailed in the first four months of 2023, prior to the completion of the Segment A transmission project. Wind curtailment then dropped or was eliminated in West, Central, North, and Mohawk Valley zones.

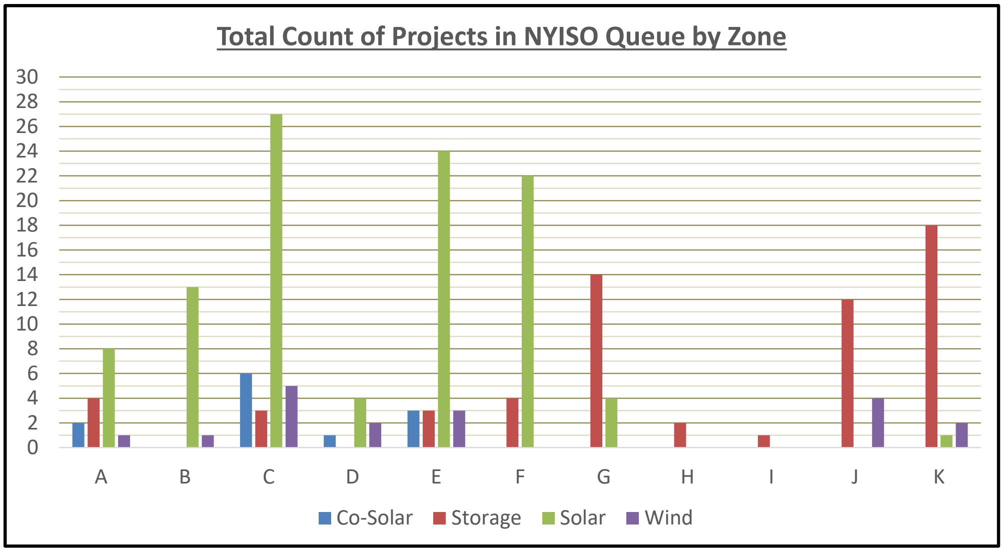
**Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)**

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 19th, and representing the Interconnection Queue as of July 31st. Note that 2 projects were added, and 31 were withdrawn during the month of July.

| Total Count of Projects in NYISO Queue by Zone | | | | |
|---|---|---|---|---|
| Zone | Co-Solar | Storage | Solar | Wind |
| A | 2 | 4 | 8 | 1 |
| B | | | 13 | 1 |
| C | 6 | 3 | 27 | 5 |
| D | 1 | | 4 | 2 |
| E | 3 | 3 | 24 | 3 |
| F | | 4 | 22 | |
| G | | 14 | 4 | |
| H | | 2 | | |
| I | | 1 | | |
| J | | 12 | | 4 |
| K | | 18 | 1 | 2 |
| State | 12 | 61 | 103 | 18 |

| Total Project Size (MW) in NYISO Queue by Zone | | | | |
|---|---|---|---|---|
| Zone | Co-Solar | Storage | Solar | Wind |
| A | 290 | 370 | 1,215 | 339 |
| B | | | 1,875 | 200 |
| C | 745 | 405 | 2,671 | 626 |
| D | 20 | | 730 | 747 |
| E | 475 | 340 | 1,776 | 232 |
| F | | 800 | 971 | |
| G | | 1,209 | 150 | |
| H | | 416 | | |
| I | | 200 | | |
| J | | 1,703 | | 3,616 |
| K | | 1,445 | 36 | 924 |
| State | 1,530 | 6,888 | 9,423 | 6,684 |

| Average Size (MW) of Projects in NYISO Queue by Zone | | | | |
|---|---|---|---|---|
| Zone | Co-Solar | Storage | Solar | Wind |
| A | 145 | 93 | 152 | 339 |
| B | | | 144 | 200 |
| C | 124 | 135 | 99 | 125 |
| D | 20 | | 183 | 374 |
| E | 158 | 113 | 74 | 77 |
| F | | 200 | 44 | |
| G | | 86 | 38 | |
| H | | 208 | | |
| I | | 200 | | |
| J | | 142 | | 904 |
| K | | 80 | 36 | 462 |
| State | 127 | 113 | 91 | 371 |


Total Count of Projects in NYISO Queue by Zone
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
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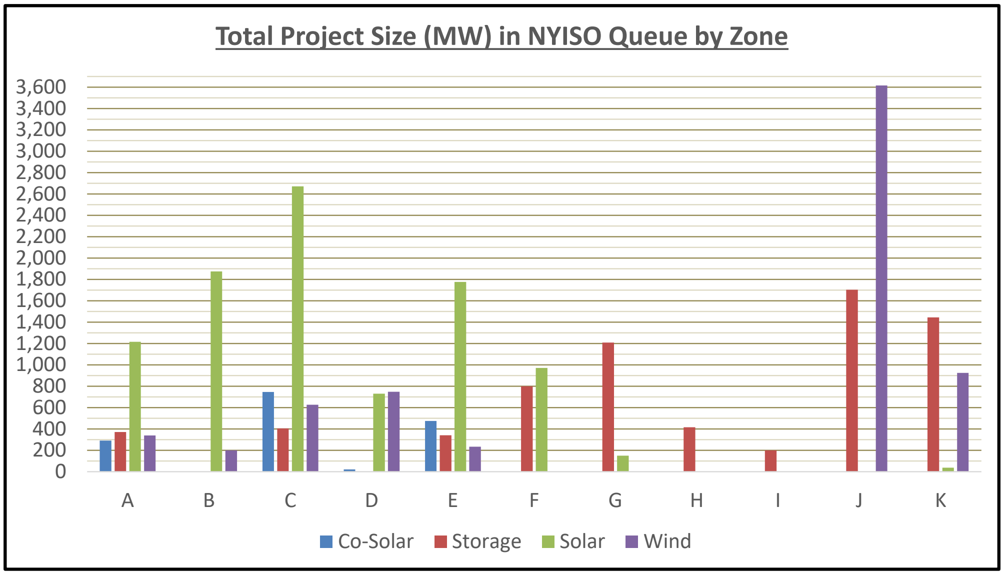
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Storage
Solar
Wind


Total Project Size (MW) in NYISO Queue by Zone
3,600
3,400
3,200
3,000
2,800
2,600
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
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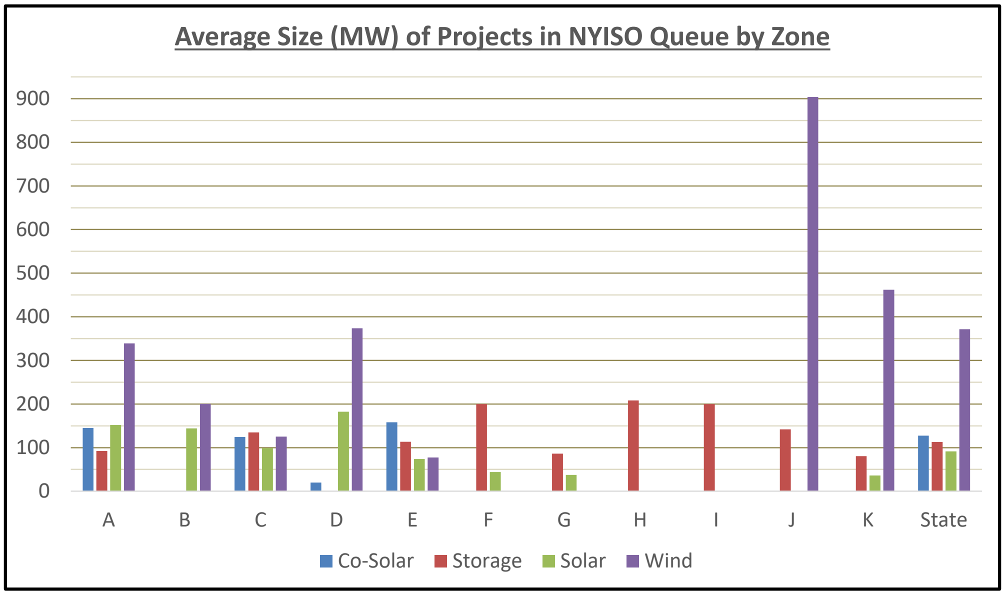
Co-Solar
Storage
Solar
Wind


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