De-Carbonization / DER Report for NYSRC Executive Committee Meeting 11/15/2024

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

- NERC Website: Milestone 3 Projects Highlight Scope of Issues Related to Current State of Model Quality
- Canary Media:
  - Hundreds of New Yorkers got free batteries to help clean up the grid
  - A Massachusetts town uses batteries to help its grid - and its schools
- New York Times: Arkansas May Have Vast Lithium Reserves, Researchers Say
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / Co-located

NERC Newsroom: Milestone 3 Projects Highlight Scope of Issues Related to Current State of Model Quality

This Summary from the NERC Newsroom highlights NERC's ongoing efforts to identify and address challenges associated with inverter-based resources (IBRs) as directed in FERC Order 901. NERC is developing key Reliability Standards projects to enhance IBR planning and ensure grid reliability.

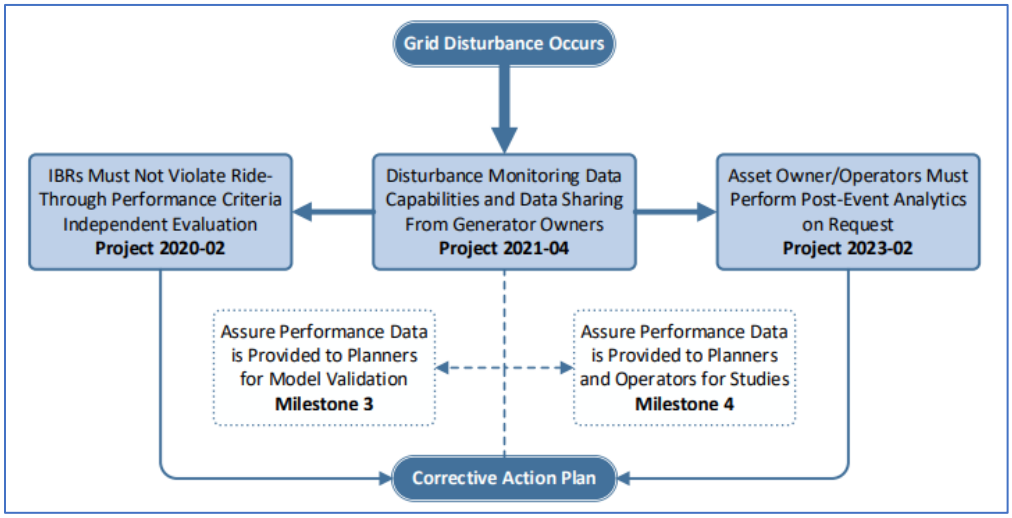
NERC's Order 901 Workplan includes four milestones designed to meet FERC's directives within the specified timeframes, each with associated dates for completion, which are consistent with the Commission's directions. These milestones are listed below, and are discussed in further detail in the plan:

- Milestone 1: Submission of Order No. 901 Work Plan (completed: January 2024)
- Milestone 2: Development and Filing of Reliability Standards to Address Performance Requirements and Post-Event Performance Validation for Registered IBRs (completion: November 4, 2024)
- Milestone 3: Development and Filing of Reliability Standards to Address Data Sharing and Model Validation for all IBRs (completion: November 4, 2025)
- Milestone 4: Development and Filing of Reliability Standards to Address Planning and Operational Studies Requirements for all IBRs (completion: November 4, 2026)

Three Milestone 2 projects were approved by the NERC Board of Trustees on October 8th:

- Project 2020-02 – Modifications to PRC-024 (Generator Ride-through)
- Project 2021-04 – Modifications to PRC-002-2
- Project 2023-02 – Analysis and Mitigation of BES Inverter-Based Resource Performance Issues

The chart below shows the interactions between the Milestone 2 projects and IBR Performance Requirements.



Milestone 3 Projects (Continued):

Milestone 3 focuses on developing and filing standards that enhance data sharing and model validation for all IBRs. This milestone has a filing deadline of November 4, 2025, with full implementation set for January 1, 2030.

NERC's Milestone 3 Summary (and Infographic) provides a high-level overview of its associated projects:

- Project 2020-06 – Verifications of Models and Data for Generators
  Addressing the verification and validation of models for registered inverter-based resources (IBR), unregistered and aggregated IBR, and aggregated distributed energy resources
  Include Standards: MOD-026, MOD-027, FAC-002
- Project 2021-01 - System Model Validation with IBRs
  Addressing system-level model verification and validation against actual system operational behavior during disturbances as well as aligning steady state and dynamic representation, where appropriate
  Includes Standards: MOD-033
- Project 2022-02 - Uniform Framework Model Framework for IBR
  Addressing development of a NERC-maintained library consisting of generic IBR model types
  Includes Standards: MOD-032, TOP-003, IRO-010
- Project 2022-04 – Electromagnetic Transient Modeling (expected to be added December 2024):
  Addressing establishment of EMT studies, as appropriate, during the interconnection process
  Includes: MOD-032, FAC-001, FAC-002

NERC's assessments indicate a need for additional model types to be used for local reliability studies, particularly throughout the interconnection process and ongoing performance validation. The projects under Milestone 3 specifically address the issues surrounding current model quality.

- Industry Engagement: Stakeholders are encouraged to engage with the drafting teams in early 2025 to facilitate a timely November 2025 filing.
- Comprehensive Approach: While not all projects directly address Order No. 901 directives, they are essential for creating a strategy for model validation and data sharing within NERC's Reliability Standards.
- Collaborative Updates: NERC's drafting teams will continue to collaborate and provide regular updates.

Other recent related activities include:

- NERC submitted its Second Quarterly Work Plan Update to FERC on August 9th.
- NERC Submitted a Compliance Filing in response to FERC's order approving Rules of Procedure (ROP) revisions on August 26th
- Standards Committee hosted NERC Ride-Through (PRC- 029-1) Technical Conference on September 4–5
- The NERC 2024 3rd Quarter Update was published on October 8th

A Milestone 3 workshop will be held on January 15–16, 2025.

Additional Supporting Links:

- NERC Summary of FERC Order 901 Milestone 2 – Standards Development Update July, 2024
- FAQs from NERC Inverter-Based Resource Webinar Series
- NERC: Major Event Reports List (Including IBR-Related)
- NERC Reliability Standards Under Development

Canary Media: Hundreds of New Yorkers got free batteries to help clean up the grid

This Article describes how Orange & Rockland (which serves some 300,000 customers in the suburbs and rural areas northwest of New York City) teamed up with Sunrun, the nation's largest rooftop solar installer, to make a compelling offer: Households signing up for solar from Sunrun could also get a free LG Chem battery pack, or a heavily discounted Tesla Powerwall.

State funding made it possible, as a 10-year trial run for tapping customers' clean energy devices to serve the broader grid. The only real catch is that the participating batteries sometimes need to discharge their stored solar power during times when it helps the grid, generally in the high-demand hours between 5 and 7 p.m. But the batteries always maintain a buffer of at least 20 percent capacity, in case customers need backup power during the night.

So far, 325 Orange & Rockland customers have installed the solar-battery systems, and a few dozen more will do so by the end of the year, Woods told Canary Media. This makes the program New York's largest virtual power plant (VPP), the industry term for aggregations of customer-owned energy devices that are digitally controlled to assist the electricity system.

The utility called on Sunrun to deliver power from the network 18 times over the summer, and will continue testing the company's ability to respond to day-ahead and same-day requests. The utility is also studying how the program helps to avoid capital-intensive upgrades for local parts of the electrical grid. This demonstration will only contribute about 2 megawatts of aggregated capacity, Woods said. But if the test run succeeds, this kind of thing could be expanded to play a much bigger role in New York's mission to cut fossil fuels out of its energy system.

New York State has set plenty of self-described "nation-leading" climate targets — 70 percent renewable power by 2030, 100 percent by 2040 — but has struggled to build large clean power plants. Officials expect to miss an interim 2030 deadline by three years, after offshore wind deals fell through and with grid-scale battery installations repeatedly lagging behind stated goals.

In contrast to those struggles, distributed solar, like the kind on the roofs of homes and businesses, has shown early success. In fact, New York hit its legally binding goal of installing 6 gigawatts of distributed solar one year ahead of schedule, as Gov. Kathy Hochul declared earlier this month.

Rooftop solar alone won't clean up the grid outside the sunny hours. But rooftop solar plus batteries can serve a broader swath of grid needs, as the new Sunrun program showcases.

The American rooftop solar industry over the years has frequently found itself in an antagonistic relationship with utilities. Solar entrepreneurs have cast themselves as cleaner, friendlier alternatives to the crusty old monopolies they hope to disrupt. Utilities, in turn, tend to throw their political weight behind reducing customer incentives for distributed energy.

This was possible thanks to a funding stream allocated years ago for Reforming the Energy Vision, a once-commonplace but now rarely uttered term for New York's collection of policy changes to overhaul the grid. The support of state utility regulators, who are legally responsible for pursuing the state's climate objectives, was also key. Orange & Rockland and Sunrun signed a contract for the project back in 2018, when home batteries were still very much an up-and-coming consumer product. They spent time developing the program, then Covid hit. But customer installations picked up two and a half years ago and gained further momentum this year.

Orange & Rockland, a subsidiary of Consolidated Edison, brought the detailed knowledge of where on its distribution grid the localized power could do the most good. The utility also pulled out some old-fashioned techniques for reaching its customers about the new proposition: It tabled at local Earth Day fairs, met with environmental groups, and printed up 40,000 trifold brochures that it mailed to every customer living in areas designated by the state as disadvantaged communities, after which 50 percent of enrollment came from those households, Woods said.

Whereas utilities elsewhere jealously guard their role in the electricity system, Orange & Rockland was content to let Sunrun lead on the mechanics of installing, owning, and operating the solar-battery systems. Sunrun has spent years installing solar and batteries, and building the software capabilities to dispatch these decentralized assets in a predictable manner. Sunrun's VPP design makes things easy from a utility perspective: Everything Sunrun needs to operate is in the house (on "the customer side of the meter," in industry parlance).

All Orange & Rockland needs to do is shoot Sunrun an email when planners want the batteries to dispatch, and the company sends the virtual commands. If email correspondence seems like a low-tech way to conduct the smart grid of the future, Rauscher pointed out that this approach saves ample time and money compared to the laborious integration with a utility's existing software controls. That makes particular sense for small-scale demonstrations like this one, or in places where long-term funding for a VPP is uncertain.

Solar and battery installations for the VPP demonstration will wrap up by the end of the year. Orange & Rockland is tracking battery response rates and measuring their effects on lowering demand peaks and deferring grid upgrades, and sharing those with regulators on a quarterly basis. Then the utility and regulators will figure out how to expand on this proof of concept.

That conversation will certainly come down to money, specifically how much it makes sense to spend to encourage battery adoption. The current program's free battery makes it one of the most generous home battery incentives in the nation. But a permanent, ongoing program would have to be collectively funded by utility customers, and that imposes a different calculus.

Not all the money will need to come from the utility, though: New York is finalizing residential battery incentives as part of its energy-storage roadmap, so state dollars will soon pay down some of the cost. And Sunrun is already monetizing the federal tax credits for solar and battery installations.

So far, the VPP has proven out some fundamentals: When customers have a compelling invitation to participate, they choose to; when the utility calls for battery discharge during high-demand summer evenings, the batteries deliver.

Additional links:

- Sunrun Investor Relations: Sunrun Investor Relations: Press Release
- Orange and Rockland Media Center: Sunrun Builds and Operates New York's Largest Residential Power Plant in Partnership with Orange and Rockland Utilities
- PV Magazine: Sunrun and New York utility embark on residential virtual power plant

Canary Media: A Massachusetts town uses batteries to help its grid — and its schools

This Article recounts how a site in Wakefield, Massachusetts will host a 15-megawatt-hour grid-connected battery that will provide multiple benefits. On a day-to-day basis, it will help clean up the grid and keep utility costs in check by reducing the need for costly peak energy. It will also supply backup power to the schools during any power outages, eliminating the need for dirty diesel-fueled generators. Plus, the battery will help the schools afford to go solar and switch their HVAC to electric heat pumps.

Getting the Energy Park Project off the ground took a lot of coordination between the two schools, city agencies, city-owned utility Wakefield Municipal Gas & Light Department (WMGLD), and a consortium of state municipal utilities contracted with a private-sector battery developer to build the project. But the payoff will be a cheaper and cleaner solution than what either the utility or the schools could have achieved on their own, said Peter Dion, general manager at WMGLD.

The idea for Wakefield's Energy Park was born out of a problem Dion started to tackle back in 2021: how to provide the energy needed for new buildings at Northeast Metropolitan Regional Vocational High School and Wakefield High School. Those new school buildings will need heating, and though it would have been cheaper for the schools to use fossil gas, that route made less sense from WMGLD's perspective. "The biggest driver of our costs on the gas side is the peak load on the coldest day of winter," Dion explained, and the amount of gas those schools would use outside those coldest days wasn't enough to recoup the cost of building the pipes to deliver it.

The schools were also eager to explore all-electric buildings, both to meet state decarbonization mandates and because they wanted to be "as green as possible," Dion said. The challenge? While heat pumps are far more energy-efficient than gas furnaces and boilers, they're still more expensive upfront — and schools have limited capital budgets to cover those higher costs. Dion and the schools began to consider where they could shave some expenses from the new school buildings to make up the difference.

Plans initially called for both schools to install diesel backup generators for the new buildings, which would have cost about $1.2 million apiece — a hefty price for equipment that only runs during emergencies. Grid-connected batteries, by contrast, can pay back their costs by storing power when it's cheap and plentiful and discharging it when it's far more valuable — like the handful of hours per year when demand for electricity on New England's regional grid reaches its peak. WMGLD deployed a 5-megawatt-hour grid battery in 2019, which has been used to cut the capacity costs that must be paid to the grid operator (ISO New England) for those peak hours.

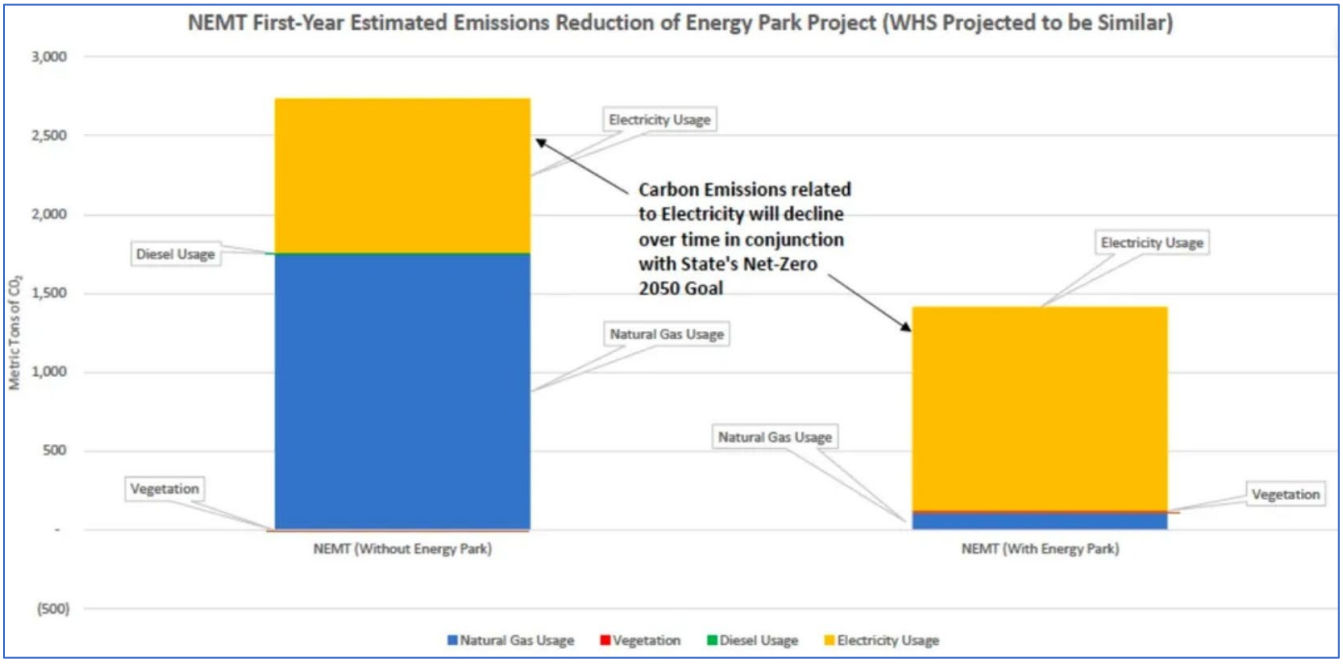
And while the batteries are meeting these grid needs, they can still be available for other purposes, like serving as backup power for buildings. That's the proposal WMGLD brought to the city's two high schools, Dion said, telling them, "We can eliminate about $1.2 million of your costs by building this Energy Park, and us being your backup generator."

Designing a utility battery that can both work for the grid and back up buildings isn't necessarily simple.
It helped that the two high schools WMGLD is working with are next door to each other, allowing the utility to build a shared grid circuit to connect them to the Energy Park. That simplifies the technical aspects of the project, Dion noted: "At each high school we'll have an emergency transformer that will be live at all times, and at moments of lost power, it will be their emergency generator."

Still, the utility has had to plan ahead for the contingency that the battery might discharge most of its stored energy for grid purposes at the moment when the grid goes out. To deal with that possibility, WMGLD added a 2.5-megawatt fossil-gas-fired generator to the Energy Park as a secondary backup. That's still cheaper than two diesel backup generators, he noted — and it will kick in only in the worst-case scenario.

WMGLD will also retain at least 7.5 percent of its battery capacity at all times, which is enough for about an hour of backup power — plenty of time to get the generator going. During normal operations, the batteries will stand at 50 percent charge, enough for about six hours of backup power. Most distribution-grid outages last no more than an hour or two, he said.

Some of that battery-charging power could come from the solar panels that WMGLD will install on the roofs of the new buildings. The utility has structured a deal that will take on the cost of that installation for the schools, in exchange for the schools agreeing to give all the solar power they don't use back to the utility at no additional cost. As a municipal utility, WMGLD has more freedom to negotiate these kinds of structures, which will allow it to pay off the cost of the installation in nine or 10 years — partly because it can use the solar power to meet its own needs during summertime, when schools are closed and "solar value is the highest" for reducing summer electricity demand. All told, the package of batteries and solar is expected to reduce total energy-related carbon emissions at the two high schools by nearly half compared to the alternative.



WMGLD won't build or own the batteries at the Energy Park — and it won't pay for them either. That's all being handled by Lightshift Energy, a Virginia-based energy-storage developer that's raised $120 million in equity and project finance and has 4 gigawatts of projects in its pipeline.

Wakefield's Energy Park is among the first in a 50-megawatt portfolio of battery projects Lightshift is developing in partnership with the Massachusetts Municipal Wholesale Electric Company (MMWEC), a "joint action agency" that would work with the state's 40 municipal utilities to procure wholesale power supplies and raise project financing. The portfolio could save participating utilities more than $200 million in capacity and transmission costs.

Cost factor is key. Municipal utilities in Massachusetts are currently dealing with rising wholesale electricity costs at the same time that they're being asked to convert more customers from fossil fuels to electricity.
In Groton, Massachusetts, Lightshift is developing two 9-megawatt-hour systems for municipal utility Groton Electric Light Department — one at a substation and another on the property of an elementary school.

NY Times: Arkansas May Have Vast Lithium Reserves, Researchers Say

This New York Times Article recounts how researchers at the United States Geological Survey and the Arkansas government announced on October 21st that they had found a trove of lithium, a critical raw material for electric vehicle batteries, in an underground brine reservoir in Arkansas.

With the help of water testing and machine learning, the researchers determined that there might be five million to 19 million tons of lithium (more than enough to meet all of the world's demand for the metal) in a geological area known as the Smackover Formation. Several companies, including Exxon Mobil, are developing projects in Arkansas to produce lithium, which is dissolved in underground brine.

Whether lithium harvesting takes hold in the region will depend on the ability of those companies to scale up new methods of extracting the valuable battery ingredient from salty water. The processing technique that Exxon and others are pursuing in Arkansas, known as direct lithium extraction, generally costs more than more conventional methods do, according to the consulting firm Wood Mackenzie.

Energy and mining companies have long produced oil, gas, and other natural resources in the Smackover, which extends from Texas to Florida. And the federal and state researchers said lithium could be extracted from the waste stream of the brines from which companies extracted other forms of energy and elements.

The energy industry, with the Biden administration's encouragement, has been increasingly working to produce the raw materials needed for the lithium-ion batteries in the United States. A few projects have started recently, and many more are in various stages of study and development across the country.

Most of the world's lithium is produced in Australia and South America. A large majority of it is then processed in China, which also dominates the manufacturing of electric vehicle batteries.

Federal researchers also have identified other potential resources that could produce large quantities of lithium, including the Salton Sea in Southern California, where Berkshire Hathaway Energy and other companies are working to extract lithium from hot liquid pumped up from an aquifer more than 4,000 feet below the ground by geothermal power plants. Exxon Mobil recently drilled exploratory wells in Arkansas and was evaluating whether it could extract lithium in a cost-competitive way. Exxon said last year that it aimed to enter production in 2027 and to be churning out enough lithium by 2030 to supply more than a million electric vehicles per year.

Lithium is already extracted from brine in Chile, one of the world's largest producers of the metal. Companies operating there typically place brine in large ponds until the liquid has evaporated, leaving behind various minerals. That process is relatively cheap, but it takes time and may affect freshwater supplies.

Several companies are hoping that direct lithium extraction will allow them to remove lithium from brine more efficiently with the help of filters and other tools. Such an approach would use less land and could have a smaller environmental impact than evaporation ponds have. But it could take mining and energy companies years to perfect the technology and apply it at a large scale.

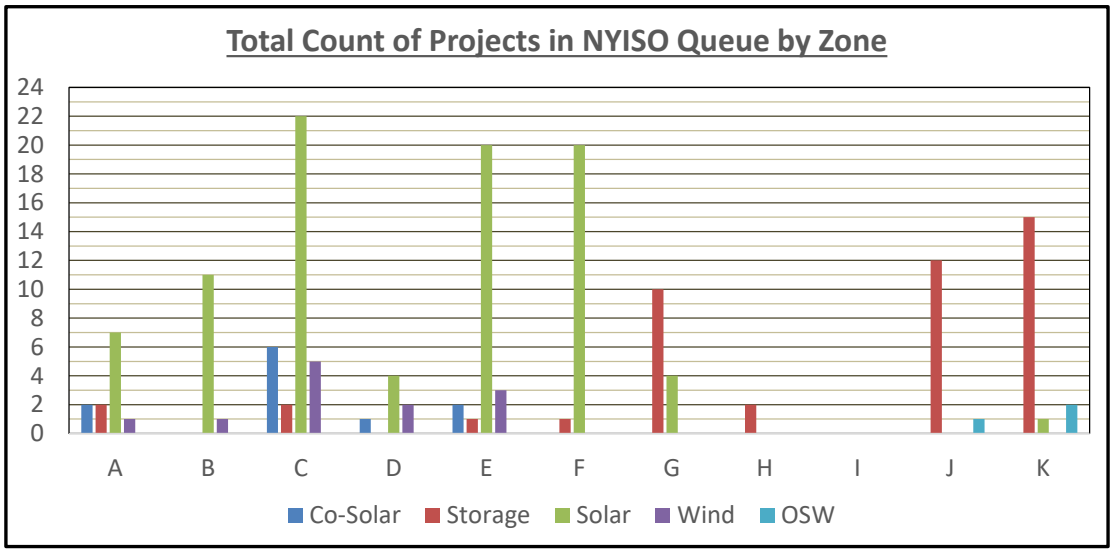
Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)

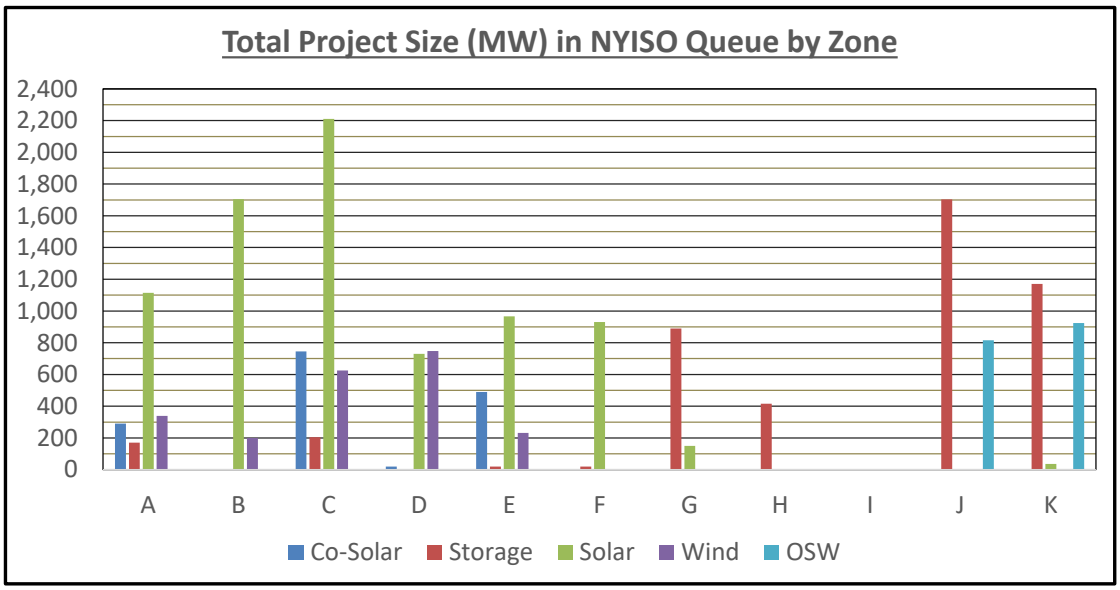
The intent is to track the growth of Co-Located Solar / Storage, Energy Storage, Solar, Wind, and Offshore Wind (OSW) projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection Website, based on information published on October 21st, and representing the Interconnection Queue as of September 30th. Note that 189 projects were added, and 24 were withdrawn during the month of September.

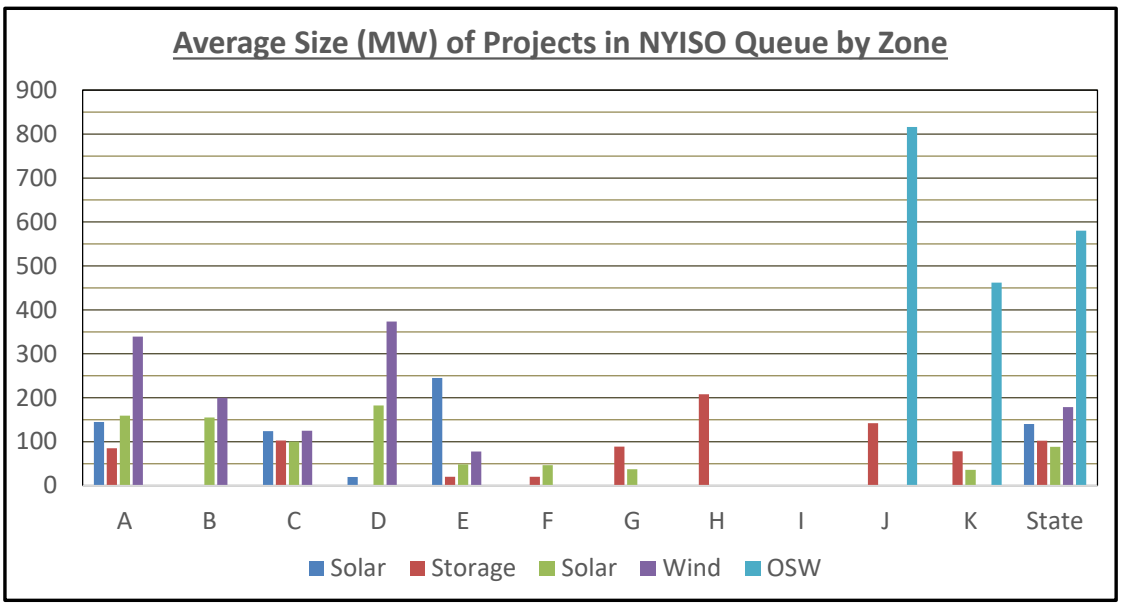
Total Count of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Storage	Solar	Wind	OSW
A	2	2	7	1	
B			11	1	
C	6	2	22	5	
D	1		4	2	
E	2	1	20	3	
F		1	20		
G		10	4		
H		2			
I					
J		12			1
K		15	1		2
State	11	45	89	12	3

Total Project Size (MW) in NYISO Queue by Zone					
Zone	Co-Solar	Storage	Solar	Wind	OSW
A	290	170	1,115	339	
B			1,705	200	
C	745	205	2,211	626	
D	20		730	747	
E	490	20	966	232	
F		20	931		
G		889	150		
H		416			
I					
J		1,703			816
K		1,171	36		924
State	1,545	4,594	7,843	2,144	1,740

Average Size (MW) of Projects in NYISO Queue by Zone					
Zone	Solar	Storage	Solar	Wind	OSW
A	145	85	159	339	
B			155	200	
C	124	103	100	125	
D	20		183	374	
E	245	20	48	77	
F		20	47		
G		89	38		
H		208			
I					
J		142			816
K		78	36		462
State	140	102	88	179	580


Total Count of Projects in NYISO Queue by Zone
24
22
20
18
16
14
12
10
8
6
4
2
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Storage
Solar
Wind
OSW


Total Project Size (MW) in NYISO Queue by Zone
2,400
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Storage
Solar
Wind
OSW


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
Solar
Storage
Solar
Wind
OSW