De-Carbonization / DER Report for NYSRC Executive Committee Meeting 8/12/2022

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The August 2022 edition of the De-Carbonization / Distributed Energy Resources (DER) Report includes the following items:

- NERC July Newsletter: Extreme Weather, Inverter Issues, and Cyber Threats Pose Challenges
  Upcoming EPRI/ESIG/NAGF/NERC - Joint Generator Interconnection Workshop
- NYSERDA releases 3rd offshore wind solicitation
- Joint Utilities File Advanced Technology Working Group Proposal with the PSC
- Interdisciplinary MIT Study: The Future of Energy Storage
- NYISO Blog: Article: Reliability and the Grid of the Future
  Article: New Transmission Investments Add a New Chapter to the "Tale of Two Grids"
  Video: Grid of the Future – Episode 4: Preparing for Climate Change
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / Co-located Storage

Highlights from the July NERC Monthly Newsletter (Link) include:

Extreme Weather, Inverter Issues, and Cyber Threats Pose Unprecedented Challenges to the Grid

The grid withstood an unprecedented combination of challenges in 2021 - extreme and sustained weather events, increasingly sophisticated and severe cyber and physical threats and the urgent need to reliably integrate the rapidly growing fleet of inverter-based resources that tested grid reliability, resilience and security. In spite of these conditions, NERC's 2022 State of Reliability, which looks at past performance, found that grid operators maintained grid reliability with one notable exception - the February 2021 Texas and South-Central United States cold weather event that led to the largest controlled load shed event in North American history.
Links: Full Announcement | 2022 State of Reliability Report | Infographic

EPRI, ESIG, NAGF, and NERC Announce Upcoming Joint Generator Interconnection Workshop

This major online workshop by the Electric Power Research Institute (EPRI), the Energy Systems Integration Group (ESIG), the North American Generator Forum (NAGF) and NERC will cover the important relationships between interconnection process reforms and new standards for inverter-based resources. The workshop will provide education on both topics and how they interact for improving the generation interconnection process and ensuring more economic, sustainable and reliable operation of the future grid.

Interconnection queues around the United States are backlogged by approximately 1,500 GW of generation projects facing multi-year study delays. FERC recently issued two proposed rulemakings to address some of these challenges — "Building for the Future through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection" and "Improvements to Generator Interconnection Procedures and Agreements" - with comments to FERC due this fall. Separately, recent NERC disturbance reports have indicated gaps in interconnection studies, modelling, and interconnection requirements for inverter-based resources. Also, the new IEEE 2800 standard for "Interconnection and Interoperability of Inverter-Based Resources Interconnecting with Associated Transmission Electric Power Systems" has recently been approved and, if used, will provide additional benefits for both reliability and the interconnection study process.

The workshop includes three, half-day online sessions on August 9, 10 and 11. You will need to register separately for each half-day session you plan to attend. Materials and recordings to all sessions for those that registered at the conclusion of the workshop. There is no charge.

- Day 1: The Interconnection Process 1:00–4:00 p.m. Eastern, August 9, 2022
- Day 2: Interconnection Studies and Modeling 1:00–4:00 p.m. Eastern, August 10, 2022
- Day 3: IBR Interconnection Requirements and Next Steps 1:00–4:00 p.m. Eastern, August 11, 2022

NYSERDA releases 3rd offshore wind solicitation

On July 27, NYSERDA released its third offshore wind solicitation, with an intention of procuring at least 2,000 MW of capacity. Previous solicitations resulted in contracts for 1,696 MW in 2018 and 2,490 MW in 2020. Under the solicitation, projects will receive favorable evaluation if they interconnect at points that do not exacerbate existing congestion and minimize risks and impacts to support the delivery of at least 6,000 MW of wind into New York City.

In a departure from prior RFPs, developers must include bids using fixed or indexed Offshore Renewable Energy Credits (ORECs) that use HVDC cables and are capable of connecting to a meshed offshore transmission network). Bidders have the option to propose sharing interconnection costs with NYSERDA up to a certain level. In addition, energy storage can be incorporated into proposals and may receive a favorable evaluation. Proposers can own the energy storage or partner with a developer that will own the storage; energy storage projects owned by a utility, NYPA, or LIPA are not eligible for this partnership treatment.

Notably, the solicitation references the Brooklyn Clean Energy Hub and encourages bidders with New York City Delivery Points to consider Alternate Proposals that interconnect at the Hub. Only proposals using the Hub are exempt from submitting an interconnection request with NYISO before bidding. NYSERDA may revise the RFP based on future Commission orders.

Other features of the solicitation include:

- Supply Chain Investment Plans (SCIPs) are required and will support the development of a strong, local supply chain that will not only create jobs for New Yorkers but help bolster the State's standing as a regional hub for offshore wind manufacturing.
- High voltage direct current (HVDC) technology will be required for all projects where cables will be installed in areas of constraint. If HVDC is used, projects must be Meshed Ready to strengthen reliability and provide redundancy. These features also permit more flexibility for future offshore wind projects.
- Proposals must include Stakeholder Engagement Plans and New York Workforce and Jobs Plans to ensure alignment with the principles of a just transition outlined in the Climate Leadership and Community Protection Act ("Climate Act").
- The solicitation sets a minimum U.S. iron and steel purchase requirement for all projects awarded to encourage domestic steel production and requiring developers to provide opportunities for U.S.-based steel suppliers to participate in the growing offshore wind industry.
- Proposers may submit plans to repurpose existing downstate fossil-based electric generation infrastructure to enhance future system reliability and support more renewable energy on the grid. Proposers must submit a timeline and studies to support the proposal that consider local requirements and plans to address the just transition of generation plant workers.
- This solicitation allows for economic benefits associated with Energy Storage and other clean energy and decarbonization investments. Investments may include pilot and demonstration projects that complement offshore wind development, including innovative storage projects such as Clean Electrolytic Hydrogen.

For more information on NYSERDA's existing portfolio of projects – Sunrise Wind (924 megawatts), Empire Wind 1 (816 megawatts), Empire Wind 2 (1,260 megawatts) and Beacon Wind (1,230 megawatts) – see NYSERDA's New York's Offshore Wind Projects webpage.

Joint Utilities File Advanced Technology Working Group Proposal with the PSC

On July 20, the Joint Utilities submitted a Research and Development Plan for Advanced Technologies to the PSC (Download Link). The plan was filed in compliance with a PSC order implementing the Accelerated Renewable Growth and Community Benefit Act.

The plan makes recommendations on the governance and makeup of an Advanced Technology Working Group, which would be comprised of DPS Staff and NYSERDA, the four investor-owned electric utilities, NYPA and LIPA, and the NYISO. The plan also plan provides a framework for developing a common statewide approach for vetting and deploying beneficial technologies – initially focusing on Dynamic Line Ratings, Power Flow Control technologies and Energy Storage. The proposed framework has three steps:

1. Technology Survey and Screening
2. Technical and Economic Assessments and
3. Identification of Deployment Locations.

The proposed budget breakdown (with NYSERDA as source of funding) and time frames are shown below:

Activity Type	Examples	Timeframe	Preliminary Budget
Program Support	• Program administration, facilitation, and reporting • Develop guidance documentation • Technology Scouting and Assessments for Beneficial Technologies	2022 - 2026	$2 million (NYSERDA)[9]
Studies and Analysis	• EPRI study to identify and develop analytical tools for energy storage valuation • System modeling	2023 - 2026	
Laboratory Testing	• Use of NYPA Advanced Grid Innovation Laboratory for Energy (AGILe) • University or national laboratory testing	2023 - 2026	
Demonstration Projects	• Long-term energy storage demonstration • Thermal energy storage demonstration	2023 - 2026	$15 million (NYSERDA)[10]

The report highlights several utility energy storage projects currently underway by the utilities in the state:

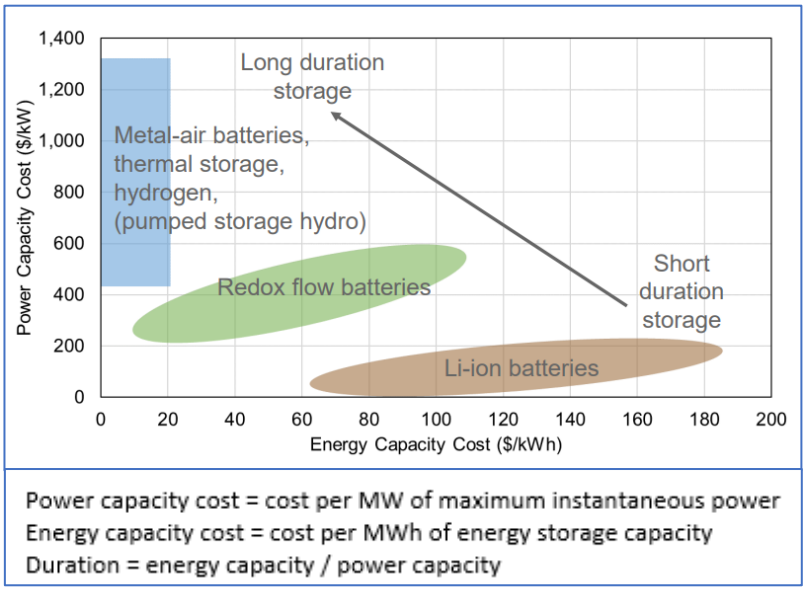
- Orange & Rockland Utilities is developing co-located storage with new distribution substations.
- Avangrid: Proposals for transmission connected energy storage projects and analysis, including NYISO market participation, submitted in response to the NYSEG and RG&E Bulk Power Energy Storage Request for Proposal using DER-VETTM using customized input templates to automate the process.
- Con Edison is advancing the Fox Hills 30 MWh Energy Storage Project, which will provide substation load relief, assist with system ramp-up associated with solar intermittency (PV-duck curve) and participate in the NYISO market services.
- Con Edison established a 2 MW / 10.5 MWh Battery Energy Storage System (BESS) system to provide distributed peak reduction and substation/sub-transmission feeder load relief.
- National Grid and Convergent Energy & Power completed a solar-plus-storage system that combines 10MW / 40MWh energy storage with 15 MW of solar generation to provide a non-wires alternative to customers in Cicero, New York.
- National Grid is exploring an RFP for a 20 MW bulk storage project to alleviate n-1 or outage situations on the T&D system.
- National Grid recently put two 2MW/3MWh energy storage systems into service at East Pulaski and North Troy to support distributed peak reduction, wholesale market participation, and power quality.

Interdisciplinary MIT Study: The Future of Energy Storage

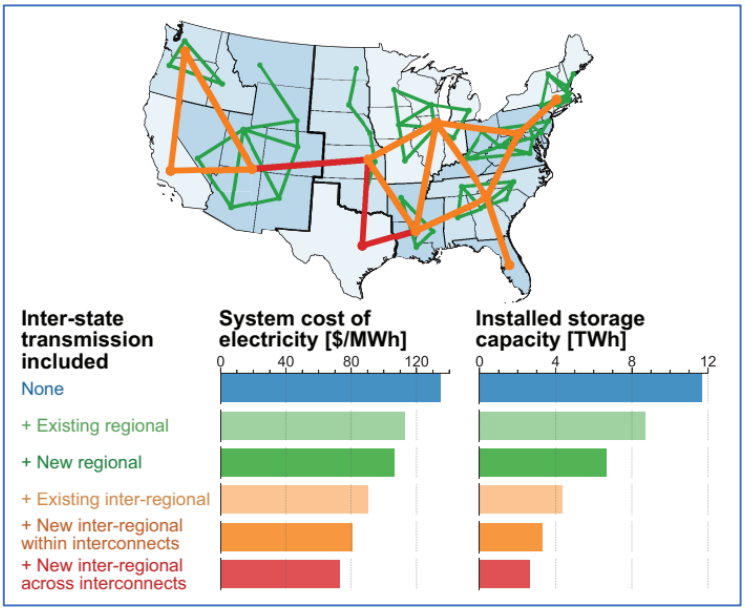
The MIT Energy Initiative (MITEI) recently released The Future of Energy Storage Report (Announcement / Press Release / Executive Summary / Presentation / Full Report – 400 pages), which represents the culmination of more than three years of research by faculty, scientists, engineers, and researchers at the Massachusetts Institute of Technology. While it focuses on the mid-century time horizon, the report also examines the range of technologies that will be important in the unfolding decarbonization of the electric grid. These include electrochemical, thermal, compressed air, and pumped storage technologies, as well as hydrogen. The report further addresses the role the federal government should play in advancing new technologies and adapting regulation to accommodate a future in which storage plays a prominent role.

Example graphics from the report are shown below:

The blue region, with high power and low energy capacity costs, includes thermal, chemical (e.g., hydrogen), metal-air battery, and pumped hydro storage technologies. Lithium-ion batteries fall in the brown area, with low power, but high energy-capacity costs; flow batteries fall in the intermediate, green region. In addition to the two parameters displayed in this figure, other cost and performance attributes, e.g., charge and discharge efficiencies, are also important when comparing storage technologies within and across each class.



Power capacity cost = cost per MW of maximum instantaneous power
Energy capacity cost = cost per MWh of energy storage capacity
Duration = energy capacity / power capacity



The figure on the left shows the impacts on "System Cost of electricity" (SCOE) and optimal storage deployment, if the country is modeled as:

- *Isolated states (blue bars)*
- *Isolated zones with new regional transmission (green bars)*
- *Fully interconnected system with different levels of inter-regional transmission (orange and red bars).*

There are three sets of recommendations from the presentation as follows:

Message #1: Federal R&D policy should focus on long-duration storage technologies to support affordable, reliable future electricity systems.

- Lithium-ion batteries possess high energy density, high power density, and high roundtrip efficiency, facilitating their near-ubiquitous commercial use in electric vehicles and their widespread use in shortduration (today typically 4 hours or less) electricity system storage applications.
- To enable economical long-duration energy storage (> 12 hours), DOE should support research, development, and demonstration to advance alternative storage technologies that rely on earth-abundant materials.
- Thermal storage retrofits of fossil energy power plants can provide near term benefits in providing electricity storage capacity while eliminating CO2 emissions from these generators.
- Hydrogen's role as a form of energy storage for the electricity sector will likely depend on the extent to which hydrogen is used in the overall economy, which in turn will be driven by the future costs of hydrogen production, transportation, and storage, and by the pace of innovation in hydrogen end-use applications.

Message #2: Storage can make regionally-tailored, net-zero electricity systems affordable

- The complex role played by storage and its impact on system costs and greenhouse gas emissions means that more sophisticated analytical tools are needed to plan, operate, and regulate the power systems of the future, and to ensure that these systems are reliable and efficient.
  - This effort should be led by DOE in cooperation with independent system operators and regional transmission organizations (ISOs/RTOs).
  - The available scope for load flexibility and demand response to reduce grid storage needs and associated costs must be included.
  - The current likelihood that cost-effective transmission projects to bring generation from areas with high-quality VRE resources to major load centers will be delayed or rejected suggests the need for statutory and regulatory changes to reduce barriers to transmission expansion.
- Coal-dependent emerging market and developing economy countries that lack access to abundant low-cost gas or gas infrastructure, such as India, represent a very large future market for energy storage
  - These countries should aggressively deploy storage and VREs now, starting with Li ion

Message #3: Market Designs and Policies Need to be Reformed to Enable Equitable & Efficient Decarbonization

- Necessary Wholesale-Level Reforms (FERC, ISOs, States) for Efficient Production
  - Increased spot market volatility will make market designs without price caps & capacity markets even less attractive than at present
  - Need to redesign capacity markets to value wind/solar generation and storage properly
  - Payments for capacity, subsidies need to be lump-sum to avoid distorting dispatch
  - Customer premises generation & storage need to see wholesale prices on the margin (perhaps via aggregators) to avoid distorting wholesale energy & other markets
- Necessary Retail-Level Reforms (States) for Efficient Consumption
  - More volatile wholesale markets imply much higher social cost of today's time-invariant rates
  - Efficient economy-wide decarbonization requires retail rates to be very low at the margin when wholesale spot prices are low to encourage electrification
  - Also need incentives to cut demand when wholesale prices are high, but charging per-kWh retail rates equal to wholesale prices would involve intolerable risk
    - Research/experimentation needed on reducing consumer risk while preserving incentives. Examples include fixed charges, insurance schemes, load management, etc.

NYISO: Announcements on the Blog Page of the NYISO Website:

Features from the Blog Page of the NYISO Website are as follows:

Article: Reliability and the Grid of the Future provides a quick summary of the current challenges facing the New York power grid, along with the methods used to maintain reliability, such as the Short-Term Assessment on Reliability (STAR), performed quarterly, which focuses on identifying reliability needs up to five years out, and the Bi-annual Reliability Needs Assessment (RNA) looks ahead to 10 years out. STAR looks to quickly evaluate changes to the system, such as generator deactivations, changes to the transmission system, or changes in demand that could affect reliability. The RNA looks at both the adequacy of energy resources and limitations of the transmission grid to determine whether the grid will be able to supply enough power to meet demand. There are currently more than 400 proposed supply, transmission, and load projects in our Interconnection Queue, under which their impact on the grid is analyzed. All the while, policies are put in place at the local, state, and federal levels which must also be considered and adhered to in interconnecting new resources and maintaining reliability.

Article: New Transmission Investments Add a New Chapter to the "Tale of Two Grids"
The Empire State Line, a 20-mile, $181-million project developed and operated by NextEra Energy Transmission New York, was the first project to be completed using the Public Policy Transmission Planning Process (PPTPP) approved by the FERC under Order No. 1000. The 345 kV line will improve access to renewable hydroelectric energy from the Niagara Power Plant. On July 11, NYISO President and CEO Rich Dewey joined New York Governor Kathy Hochul and officials from project builder NextEra Energy Transmission to celebrate the opening of this vital electric link. Other new transmission projects approved or under consideration through this process include:

- The AC Transmission Project, a 150-mile, $1.2 billion upgrade, now under construction, that will increase delivery of clean power generated in northern and western New York to downstate customers through transmission improvements made in the Hudson Valley, Capital Region and other nearby areas.
- The Long Island Offshore Wind Export Public Policy Transmission Need, which calls for investment in the onshore transmission system downstate to prepare it to be better able to deliver offshore wind energy. This project is currently in the process of evaluating proposals for selection of the more efficient or cost-effective transmission solution.

Video: Grid of the Future – Episode 4: Preparing for Climate Change
Karen Wayland (CEO of GridWise Alliance) and Paul Hibbard (Principal of the Analysis Group and author of the NYISO's *Climate Impact Study*) and others discuss the background and key recommendations from the study. Additional information can be found on the Grid of the Future Webpage.

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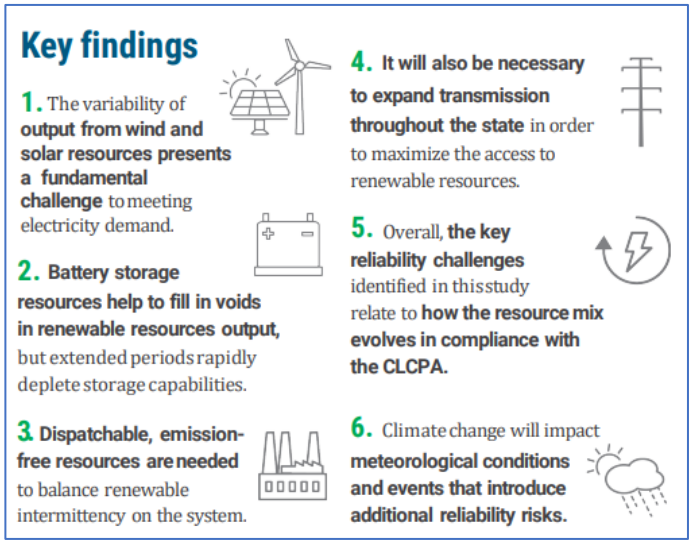
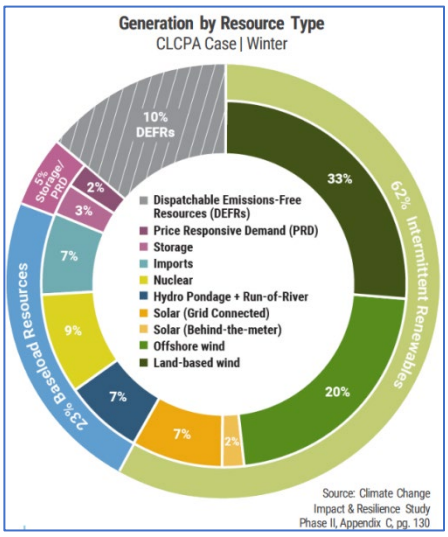




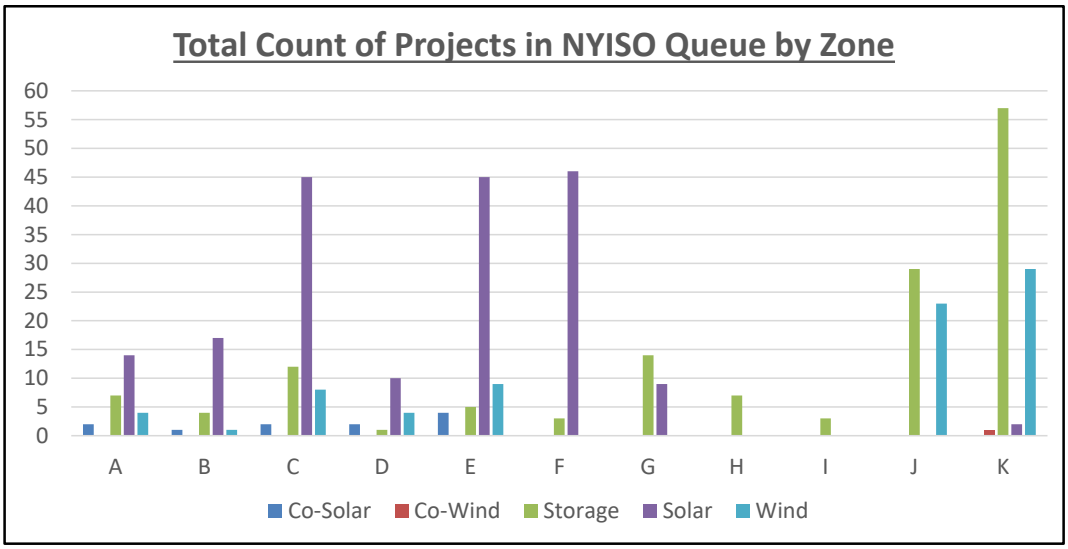
Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)

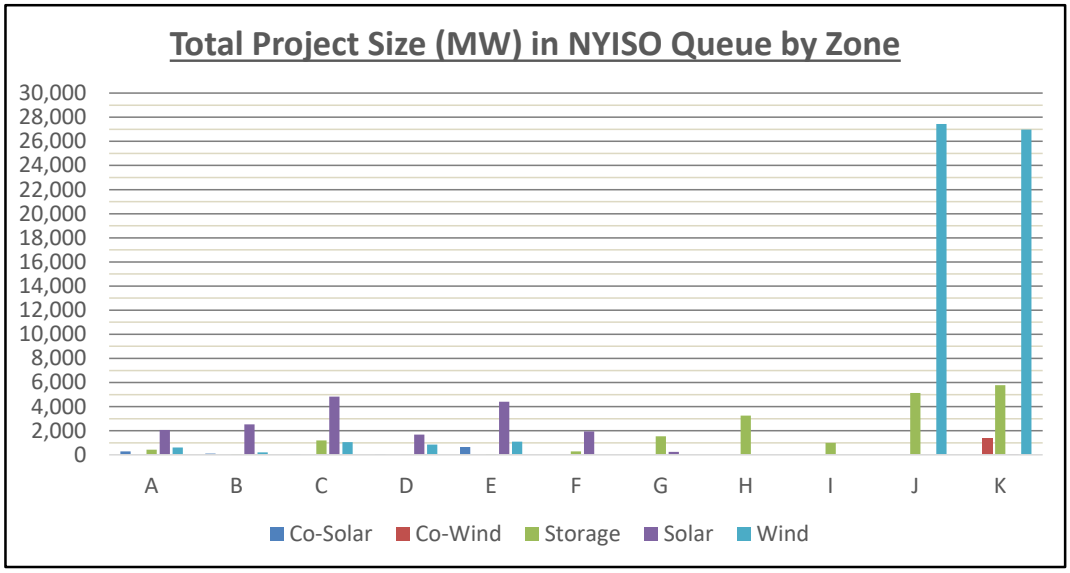
The intent is to track the growth of Energy Storage, Wind, Solar and Co-Located Storage (Solar and Wind now in separate categories) projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection Website, based on information published on July 20th, and representing the Queue as of June 30th. Note that 12 projects were added, and 5 was withdrawn during the month of May. Results are tabulated below and shown graphically on the next page.

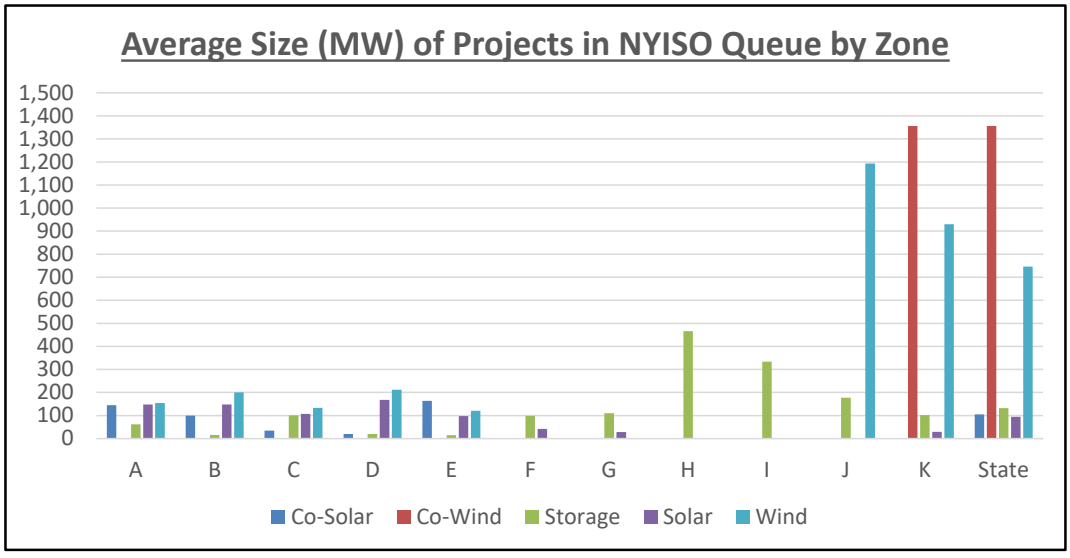
Total Count of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	2		7	14	4
B	1		4	17	1
C	2		12	45	8
D	2		1	10	4
E	4		5	45	9
F			3	46	
G			14	9	
H			7		
I			3		
J			29		23
K		1	57	2	29
State	11	1	142	188	78

Total Project Size (MW) in NYISO Queue by Zone					
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	290		430	2,070	615
B	100		61	2,521	200
C	70		1,204	4,832	1,062
D	40		20	1,674	847
E	654		72	4,407	1,087
F			295	1,937	
G			1,541	250	
H			3,260		
I			1,000		
J			5,141		27,442
K		1,356	5,782	59	26,968
State	1,153	1,356	18,806	17,750	58,221

Average Size (MW) of Projects in NYISO Queue by Zone					
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	145		61	148	154
B	100		15	148	200
C	35		100	107	133
D	20		20	167	212
E	163		14	98	121
F			98	42	
G			110	28	
H			466		
I			333		
J			177		1,193
K		1,356	101	29	930
State	105	1,356	132	94	746


Total Count of Projects in NYISO Queue by Zone
60
55
50
45
40
35
30
25
20
15
10
5
0
A
B
C
D
E
F
G
H
I
J
K
Co-Solar
Co-Wind
Storage
Solar
Wind


Total Project Size (MW) in NYISO Queue by Zone
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
0
A
B
C
D
E
F
G
H
I
J
K
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