Attachment #8.1
Return to Agenda

De-Carbonization / DER Report for NYSRC Executive Committee Meeting 6/11/2021

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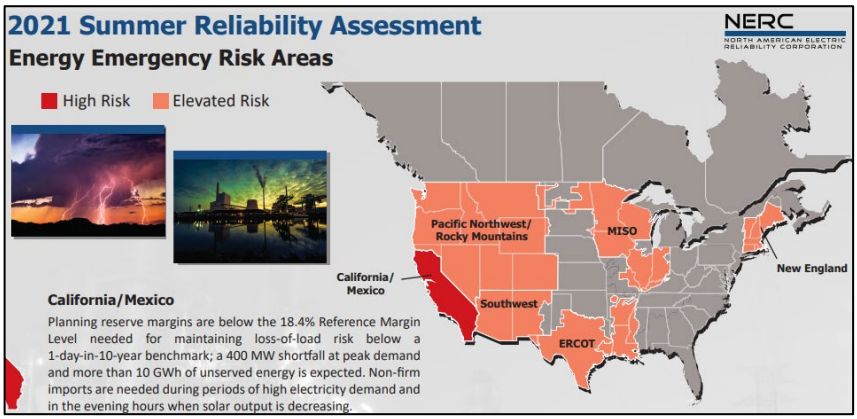
The June 2021 edition of the De-Carbonization / Distributed Energy Resources (DER) Report covers recent events and publications from NERC, NPCC, EPRI and the NYISO. The summary of the Interconnection Queue has been updated to reflect the End-of-April values for energy storage, solar and wind. The topics in this newsletter are covered in the following order:

- NERC May Newsletter
    a. Board of Trustees Meeting covering electric / gas interdependencies
    b. NERC Summer Assessment Report
- NERC SPIDER (System Planning Impacts from Distributed Energy Resources) Working Group Meeting
- NPCC May DER Forum
- EPRI LCRI – Low Carbon Fuels Primer
- NYISO 2021 Power Trends Report
- NYISO Blogs – Latest articles and podcasts covering renewables and DERs
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind

The May issue of the NERC Monthly Newsletter can be found here. This issue includes a summary of the quarterly Board of Trustees meeting on May 13th, covering the risks associated with critical infrastructure interdependencies, especially those for electric and gas infrastructures.

NERC President and CEO Jim Robb recounted that the events over the last nine months included weather extremes, supply chain compromises and the Colonial pipeline cyber-attack, indicating that the reliability and security risk to the electricity system has seen a step change increase. He noted that "If this had happened to a major natural gas line serving electricity generators under extreme cold weather conditions, the results could have been catastrophic." Robb also referenced NERC's 2017 report: Special Reliability Assessment: Potential Bulk Power System Impacts Due to Severe Disruptions on the Natural Gas System, which presciently anticipated these types of events.

The newsletter includes coverage of the NERC Summer Reliability Assessment. Separate links are provided for the Announcement, which provides an overview of the report, as well as an Infographic that shows designated Energy Emergency Risk Areas. The report warns that parts of North America are at elevated or high risk of energy shortfalls this summer during above normal peak temperatures. Areas at elevated risk include Texas, New England, MISO, and parts of the West. California is in the "high risk" category, because of its reliance on large energy imports during peak demand scenarios coinciding with reduced solar resource output in the evening hours. Most of the 3 GW of additional resources that are expected in California for this summer will be solar photovoltaic (PV) generation.



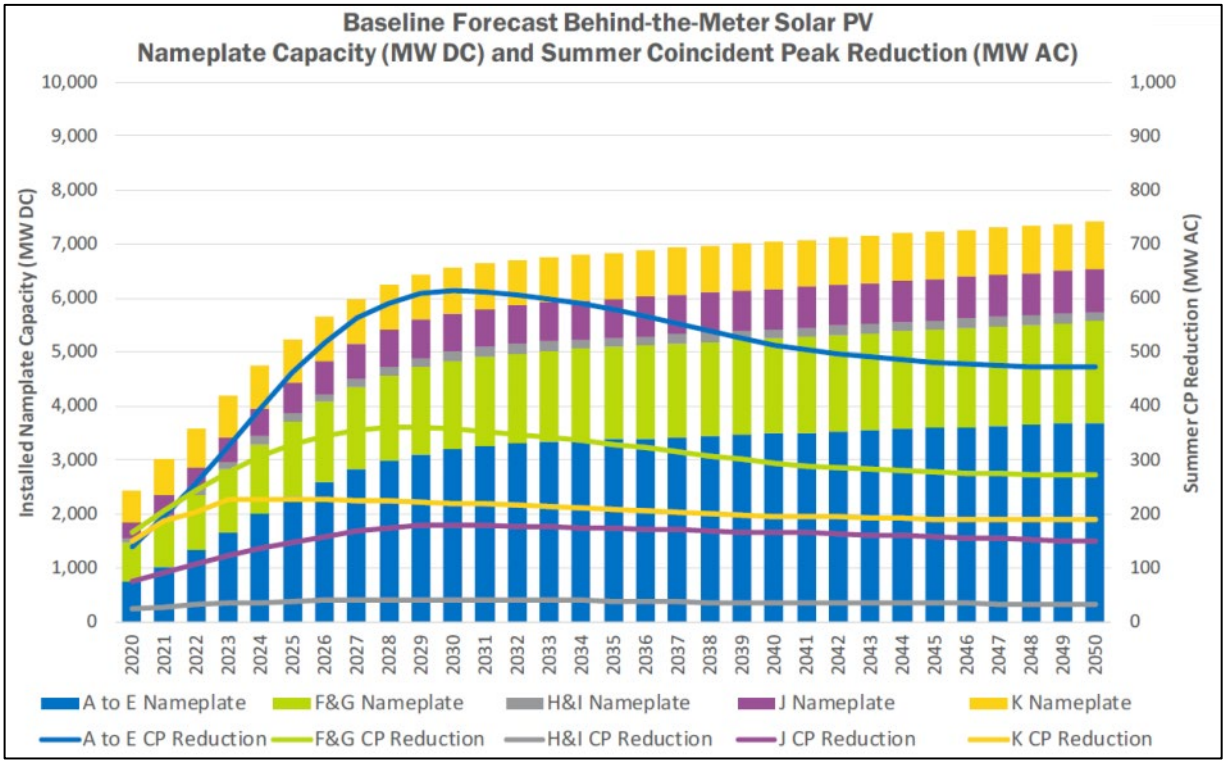
NERC SPIDER Working Group April 27th Meeting

This meeting covered a variety of topics which are listed below and can be found in the Agenda and Presentations (along with additional information in the Draft Minutes):

- SPIDER WG Update – Historical and Project Solar PV Growth
- DER Modeling Survey Results
- Telos Energy: Puerto Rico – DER Integration Study
- National Grid Rhode Island – DER Bulk Grid PSCAD Study
- Reliability Guideline Updates – Forecasting vs. Modeling for Reliability Studies
- NERC Standards Review

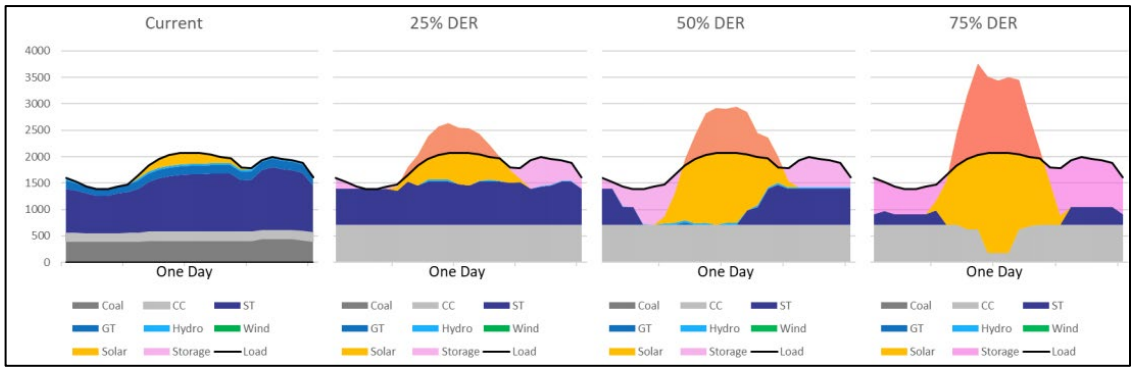
Details of the working group update, Telos Energy Puerto Rico study, and the National Grid Rhode Island DER Study are shown below.

The SPIDER Working Group Update provided a series of PV load growth curves by region showed continued growth throughout the country, typically looking out for 10 years and in some cases up to 30 years. A representative graphic for the NYISO showing growth of Behind-The-Meter Solar PV by Zone was included in the report and is shown below:



Source: https://www.nyiso.com/documents/20142/12324871/2020-Gold-Book-Forecast-Graphs.pdf

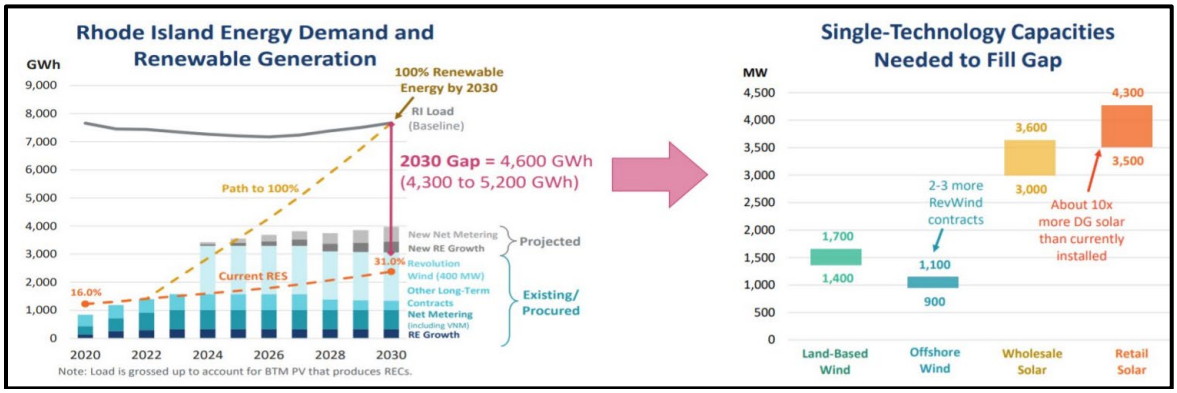
A full report on the Puerto Rico DER Integration Study was prepared by Telos Energy for Cambio, a non-profit promoting sustainable policies in leading to 100% renewable energy in Puerto Rico. Following a court battle in 2019, Cambio gained access to all of the Puerto Rico Electric Power Authority (PREPA) system data and commissioned this study, which evaluated scenarios of 25%, 50% and 75% penetration of combined renewables and batteries on the island. The study combined PSS/e with Open DSS, and Plexos for production cost modeling. Representations below show the changing mix of resources in these scenarios.
Note that the tan areas above the load curves represent excess available power or "spinning" reserve.



As expected, issues of low inertia challenged grid stability due to the significant reduction of conventional plants. The proposed mitigation of utilizing autonomous DERs for Fast-Frequency Response (FFR) helped compensate for reduced system inertia, but was not effective for zero-inertia grids. Further development would look to configure DERs to provide FFR by maintaining some power and energy reserves. Synchronous Condensers were also suggested as a supporting strategy.

The National Grid Rhode Island study was performed with the support of ISO-New England and Electranix. PSCAD was used because it can represent a detailed 3 phase model in the time domain This is a more effective tool for evaluating complex scenarios such as unbalanced faults, harmonics, and transients, particularly in systems with weak grids and high penetration of DERs. For this study, topical areas of concern included:

- Ride-through
- Control interactions/instabilities
- Impact to nearby large transmission level IBRs
- Validity/correctness of the generic DER_A model



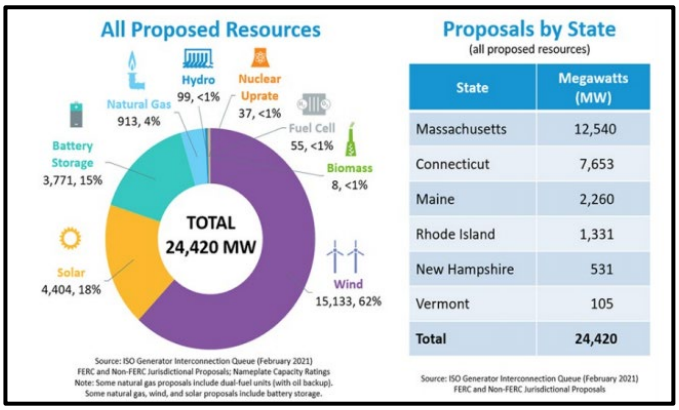
Results showed that significant instability and tripping observed in PSCAD which were not evident in the corresponding PSS/E transient stability study. In addition, high MW connection pockets had issues with control stability and ride-through, which could be attributed to a lack of voltage control from DERs. Although dynamic VAR mitigation alone (e.g. STATCOM) was not sufficient, the addition of a synchronous condenser was able to successfully assist in stabilizing controls and provide adequate voltage support.

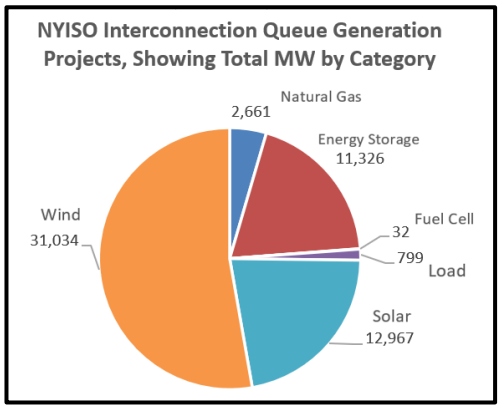
NPCC Distributed Energy Resources Forum (May 13th)

Meeting material from the NPCC DER Forum can be found here, along with a complete Video Recording of the session. Presenters and topics included:

- NPCC: FERC Order 2222 - Participation of DER Aggregations in RTO and ISO Markets
- ISO New England: Addressing How Increasing DER Impacts System Operations
- ISO New England: FERC Order 2222
- EPRI: Challenges of integrating DERs into bulk power systems: Markets and Planning
- Con Edison: DER Aggregation Registration
- Hydro Quebec HILO: Smart Energy Service for Home and Business
- Joint Utilities: Current Joint Utilities DER-Related Major Activities
- IEEE: Blockchain in Energy Standards & Initiatives

The ISO New England presentation on addressing DER impacts was particularly noteworthy. The first image located below left is from the presentation, which shows the allocation of resources within their interconnection Queue, along with a total size breakdown by member state. By comparison, the chart on the right is a calculation derived from the NYISO queue, showing a similar breakdown by resource category along with the sum of the project MW for each category. Note that the sum of all NYISO Generation Projects is about 58,800 MW.





The presentation recognized several key issues impacting the anticipated massive roll-out of DERs:

- Load Factor Impact - Net Load Readings don't capture maximum load
- Load Forecast Impact - Common DER responses to weather conditions create new contingency risks
- Difficulty detecting and clearing faults
- Inaccurate DER Modeling
- Limited support for reactive power
- Restoration Coordination and Participation
    - Difficulty in estimating amount of load to restore
    - DER uncertain performance characteristics
- Performance during Voltage Reduction
    - DERs act to mitigate voltage drop
    - Older DER facilities may trip in response to voltage drop

EPRI LCRI – Low Carbon Fuels Primer

This publicly available White Paper provides an introduction to Low-carbon fuels and energy carriers such as hydrogen, ammonia, synthetic hydrocarbon fuels, and biofuels, along with the technologies that enable their application, which could provide solutions for these difficult-to-decarbonize sectors. When produced with zero or low GHG emissions—from clean electricity, renewable feedstocks, or fossil resources with carbon capture, utilization, and storage (CCUS)—these low-carbon resources could provide pathways to decarbonization for end-use applications including:

- Maritime shipping and aviation
- Long haul and heavy-duty transport
- Provision of high-temperature heat for industry
- Provision of heat for certain segments of the building heating market

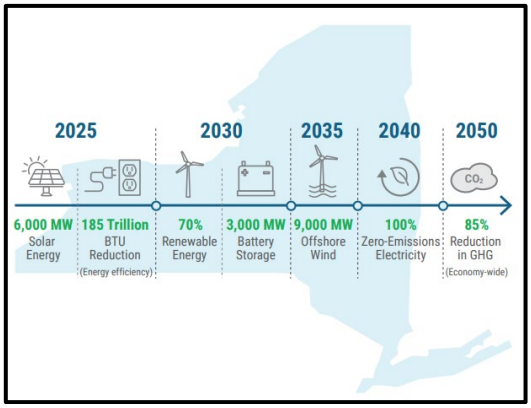
In some cases, low-carbon fuels can be delivered, stored, and used in a similar fashion as fossil fuels. This may present opportunities to repurpose existing power generation assets and fossil fuel infrastructure for the transition to a deeply decarbonized energy system. Many low-carbon fuels can be produced from electricity, making them a promising source of large-scale energy storage for the electric grid. These fuels can be transported and stored in bulk for subsequent use in electric power generation, creating options for balancing electricity supply and demand.

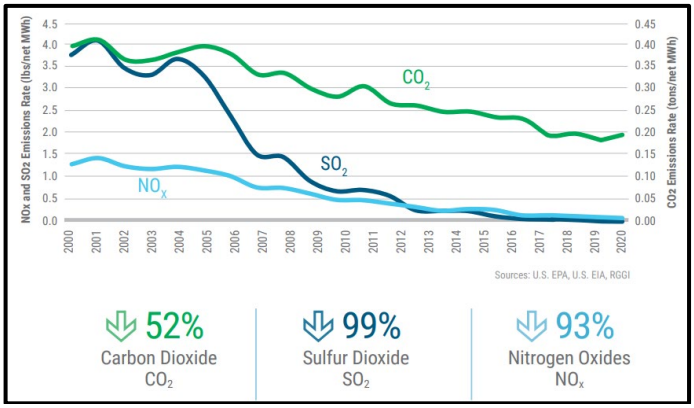
NYISO Power Trends Report:

The theme of the this year's Power Trends Report is focused on New York's Clean Energy Grid of the Future. A two page Overview highlights recent achievements in these areas:

- Energy Storage Participation Rules
- Comprehensive Mitigation Review
- DER Participation Model (FERC Order 2222)
- Hybrid Co-Located Storage Model Design
- Solar on Dispatch Participation Model
- Class Year 2019 Completion with majority of renewables of clean energy resources

Key graphics like those shown below reinforce the synergies between market forces and environmental remediation goals.



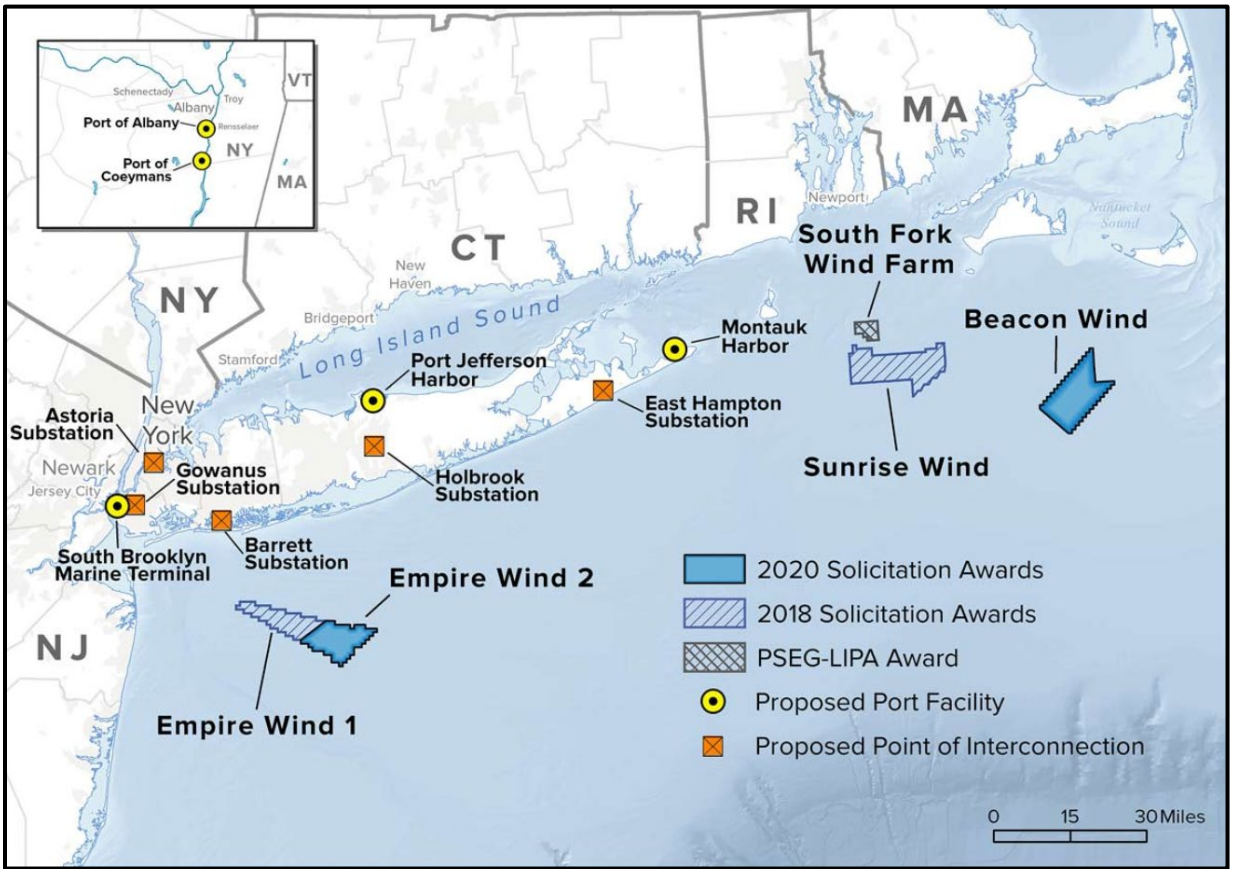


A new set of Articles, Videos and Podcasts have been published on the Blog Page of the NYISO Website

Webpage: New York's 2040 Power Grid: Addressing a Zero Emissions Grid with Market Based Solutions
Webpage: How a Natural Gas Moratorium Could Cause Bumps in the Road to an Emissions-Free Grid

Road to 2040: Offshore Wind, Clean Energy Targets, and Our Role Preparing the Grid for New Resources:
The state's Climate Leadership and Community Protection Act (CLCPA) mandates that 70% of our electricity come from renewable energy resources by 2030. This represents a major increase from the current level of 28%. The article also refers to the NYSERDA Web Page which provides details of the five New York Offshore Wind projects that are currently in active development. The projects represent about 4,300 megawatts or nearly 50 percent of the capacity needed to meet the state's offshore wind goal of 9,000 megawatts by 2035, and are listed below with approximate locations shown on the map:

Project	MW Capacity	Comm Date	Connection	Trans
South Fork	130	2022	East Hampton	AC
Empire Wind 1	816	2024	Gowanus	AC
Sunrise Wind	880	2024	Holbrook	HVDC
Empire Wind 2	1,260	2026	Barrett	AC
Beacon Wind	1,230	2028	Astoria	HVDC
Total	4,316			



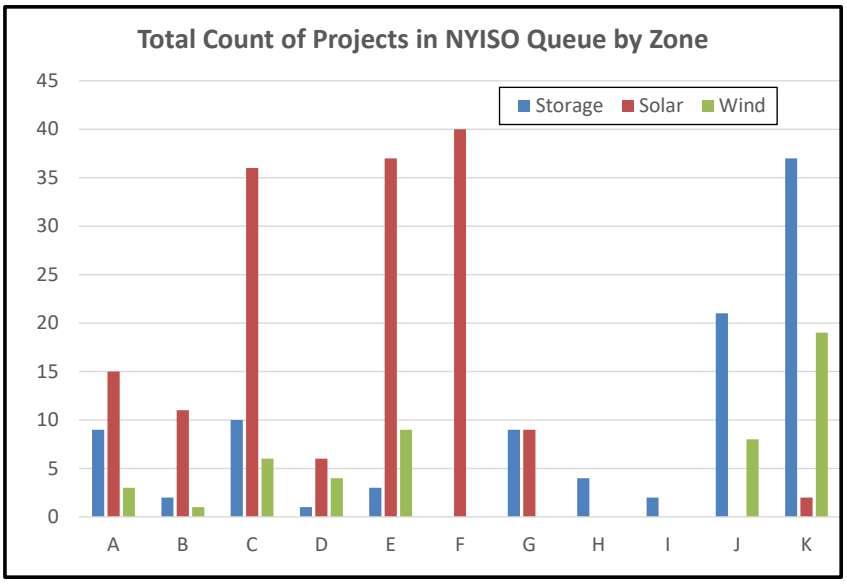
Interconnection Queue: Monthly Snapshot - Energy Storage / Wind / Solar Project Tracking

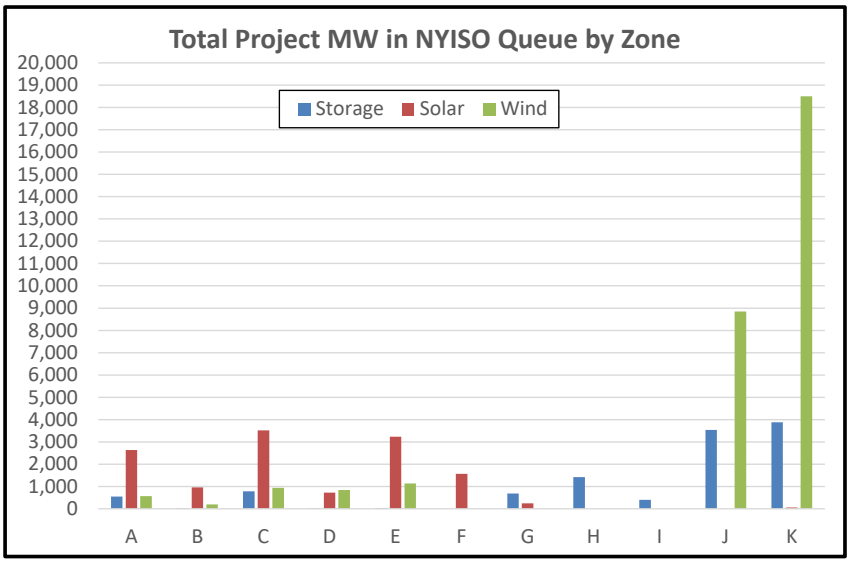
The intent is to track the growth of Energy Storage, Wind and Solar projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection Website, based on information published on May 16th, and representing the Queue as of April 30th. Note that 9 projects were added and 8 were withdrawn during the month of April. Results are tabulated below and shown graphically on the following page.

Zone	Storage	Solar	Wind
A	9	15	3
B	2	11	1
C	10	36	6
D	1	6	4
E	3	37	9
F		40	
G	9	9	
H	4		
I	2		
J	21		8
K	37	2	19
State	98	156	50

Total Project MW in NYISO Queue by Zone			
Zone	Storage	Solar	Wind
A	550	2,640	566
B	21	965	200
C	784	3,522	940
D	20	727	847
E	28	3,240	1,135
F		1,565	
G	684	250	
H	1,419		
I	400		
J	3,536		8,848
K	3,884	59	18,498
State	11,326	12,967	31,034

Average Size of Projects in NYISO Queue by Zone			
Zone	Storage	Solar	Wind
A	61	176	189
B	11	88	200
C	78	98	157
D	20	121	212
E	9	88	126
F		39	
G	76	28	
H	355		
I	200		
J	168		1,106
K	105	29	974
State	116	83	621


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


Total Project MW in NYISO Queue by Zone
Storage
Solar
Wind
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
A
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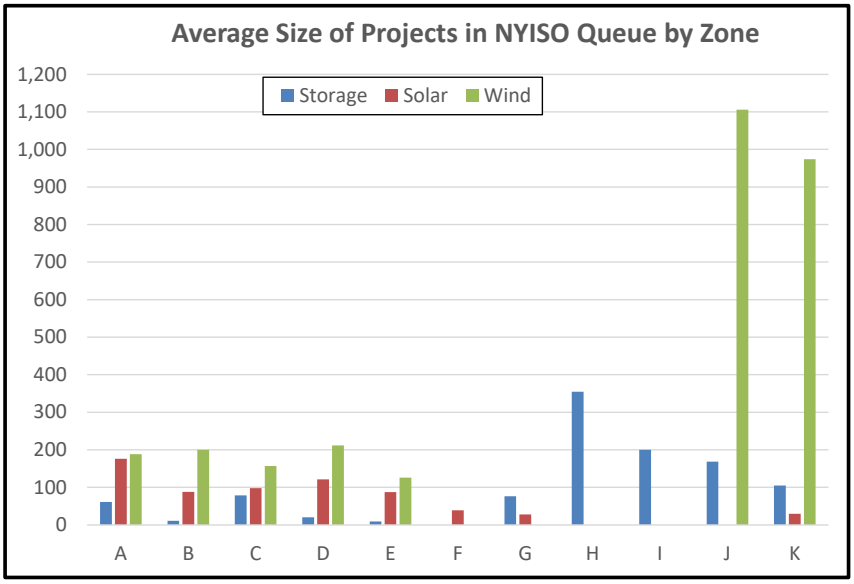
Average Size of Projects in NYISO Queue by Zone
Storage
Solar
Wind
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
A
B
C
D
E
F
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