Attachment #8.1
Return to Agenda

De-Carbonization / DER Report for NYSRC Executive Committee Meeting 8/13/2021

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The August 2021 edition of the De-Carbonization / Distributed Energy Resources (DER) Report covers recent events and publications from NERC, EEI/ESIG, EPRI, and the NYISO. The Interconnection Queue has been updated to reflect the End-of-June values for energy storage, solar and wind, along with a brand-new category called CSR (Co-located Storage Resources). The topics in this newsletter are covered in the following order:

- NERC July Newsletter
- NERC IRPWG Webinar on BPS-Connected Batteries / Hybrid Power Plants
- NERC IRPWG conference with presentations on various IBR functions and capabilities
- EEI/ESIG Webinar on Transmission Planning for 100% Clean Electricity
- EPRI Report on electrification Scenarios for New York's Energy Future
- EPRI Announcement to establish Hydrogen Fueled GT on Long Island
- July / August Edition of PES Magazine with focus on coordinating DERs
- NYISO Blogs – Latest Podcasts and E-Book covering support for climate initiatives and policy goals
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / CSRs

The July issue of the NERC Monthly Newsletter can be found here. This newsletter highlights an interview with Jason Blake, President and CEO of the SERC, the Southeast Regional Coordinator ERO. Blake highlighted the major impactors on the industry as the evolving generation resource mix, changing demand side characteristics of load, increased frequency of severe weather, and the relentless and sophisticated cyber security threats.

The newsletter also referred to last month's informational webinar on BPS-Connected Batteries / Hybrid Power Plants, sponsored by the NERC Inverter-Based Resource Performance Working Group (IRPWG) on July 15th. The newsletter referred to the Webinar Presentation, as well as a Video Record of the session.

In addition, IRPWG held their monthly meeting on July 22nd. Here are links for the Agenda, Meeting Minutes, and Presentations, which include:

- CIGRE Technical Brochure on Power Electronics for Secure and Efficient Operation and Control
- USF / NREL Are Solar PVs Capacitive?
- NERC / EPRI Analyzing IBR Field Event Data
- EPRI Black Start and System Restoration from IBR's

Conclusions from the EPRI Study on utilizing IBR's for Black Start include:

- Inverter based resources can provide black start services.
- There are various methods to reduce energization current of transformers
  - Soft start energization resistor method used
  - Detailed analysis to be carried out to determine appropriate soft start method
- Induction motor start-up can significantly use up inverter capacity and should be considered while sizing black start resources
- Load model interactions between different motor types can also introduce challenges during black start
- Control interactions can occur between grid forming and grid following devices

EEI / ESIG Webinar on Transmission Planning for 100% Clean Electricity

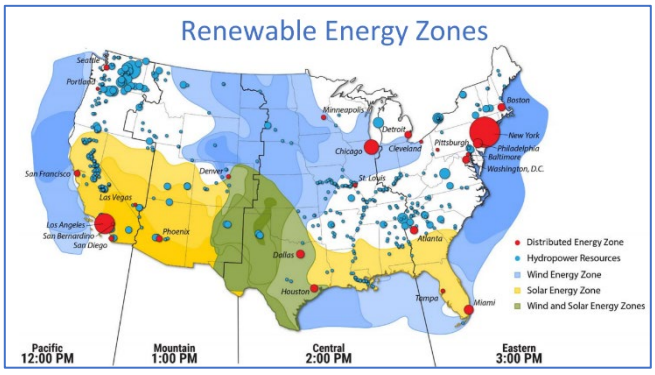
The Edison Electric Institute held a webinar on July 30th, based on a report by Dr. Debra Lew, Associate Director at ESIG (Energy Systems Integration Group), entitled *Transmission Planning for 100% Clean Electricity*. Here are links to the White Paper and summary page with supporting documentation, as well as a video recording of an earlier presentation on this topic. ESIG has an extensive Resource Library with focus on areas including DERs, System Operation and Market Design, System Reliability, and Planning Resources.

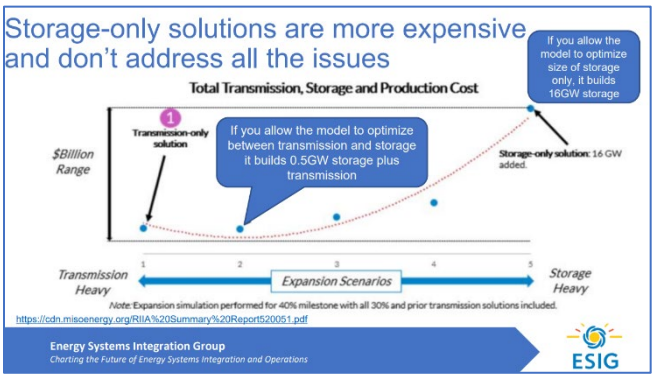
The presentation focused on 4 recent studies:

- NREL – Interconnection Seam Study
- MIT – Value of Transmission for Decarbonization (abstract only, fee to download)
- MiSO – Renewable Integration Impact Assessment
- VCE – Zero by Fifty

Observations from these studies include:

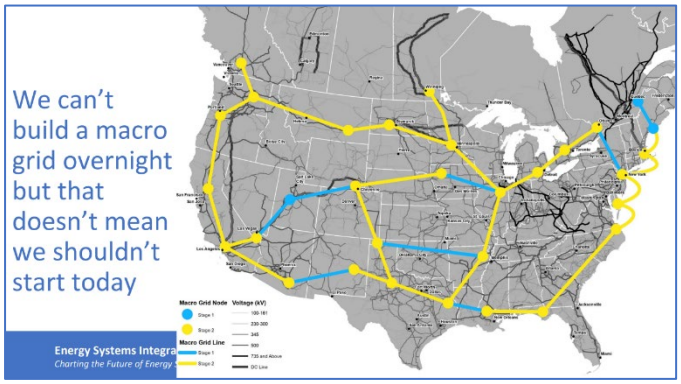
- Transmission is necessary to deliver significant levels of renewable resources
- Transmission costs are tiny when compared to capital costs of generation, storage, fuel, and Maintenance (O&M).
- Transmission contributes to resource adequacy as well as resiliency
- Transmission Infrastructure is biggest investment needed to make 50% wind work
- Storage-only solutions are more expensive and don't address all the issues
- Transmission is necessary even with high levels of DERs





The combined results of this evaluation suggests that:

- We need to create a national transmission planning authority that conducts ongoing national transmission planning from both top-down and bottom-up perspectives
- The process should be pro-active and planned to identify renewable zones and their connections
- Design a national macro grid, built in stages with planning starting now. Macrogrid advantages include:
  - Connect regions with diverse load and generation profiles
  - Have the smallest cost and footprint possible
  - Take advantage of existing surplus transmission capability
  - Be tightly integrated yet able to separate safely when necessary
  - Have a network of transmission lines to minimize risk of failure
  - Be built out in several stages



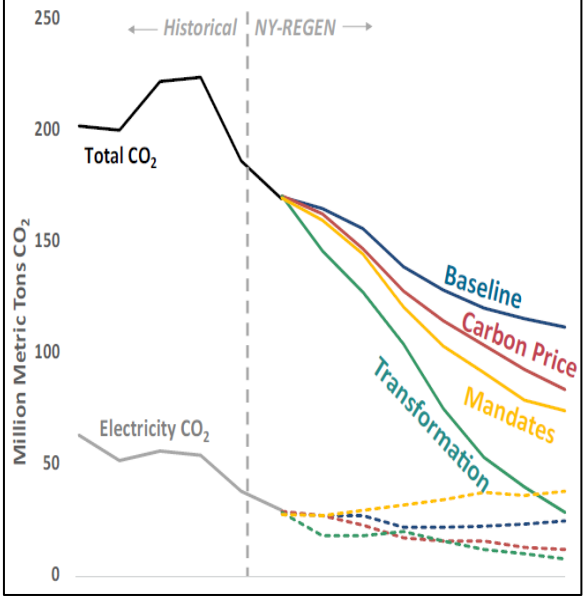
EPRI Report - Electrification Scenarios for New York's Energy Future

This publicly available Report evaluates the long-term electrification scenarios for New York State. The study incorporates the extent and timing for the adoption, infrastructure and investment needs, and associated economy- wide emission reductions, which will depend on a range of policy, economic, and technology factors.

Four scenarios were modeled and compared:

- The Baseline scenario reflects moderate improvement in technology costs and performance based on anticipated trends and EPRI research, and the attainment of pre-2019 NYS clean energy targets. Assumptions of economic growth, fuel prices, and service demand are drawn from the U.S. Energy Information Administration.
- The Carbon Price Scenario maintains Baseline assumptions on technology improvements and cost decline. Under these conditions it explores the impact of hypothetical economy-wide carbon policy in which carbon dioxide (CO2) is illustratively valued at $50/ton CO2 starting in 2020 and escalating to $216/ton CO2 in 2050.
- The Mandates Scenario explores the impact of regulatory interventions for electric end uses and additional energy efficiency. The policies would require electric technologies for all installations of building heating equipment and new vehicle purchases in 2030 onwards.

Figure 3-4: NYS changes in energy sector CO_2 emissions under each scenario



- The Transformation Scenario combines the above Mandates with a hypothetical economy-wide carbon price of CO2 illustratively valued at $100/ton CO2 beginning in 2020 (escalating to $432/ton CO2 in 2050) with elements of the expanded clean energy targets in the state's Climate Leadership and Community Protection Act.

Results of the study include:

- The NYS energy system has large potential for electrification, which, in conjunction with low-carbon electricity, can achieve substantial CO2 reductions. Electricity's role in the state economy will continue to grow over the next 30 years, with the pace and extent dependent on policy, technology, market readiness, and economic conditions. Across the study's four scenarios, electricity's share in final energy use ranges from roughly 25% to 70% in 2050, up from around 20% today.
- Energy efficiency is a key factor in reducing energy use. The study found that robust energy efficiency cuts total final energy use in NYS by 35% of what it otherwise would be in 2050; additional efficiency gains from electrification range from 9% to 21%. Energy efficiency gains are realized by both electric and direct fuel alternatives, with annual improvement rates ranging from 0.5% to 4% depending on the end-use technology.
- After energy efficiency, electrifying transportation while decarbonizing the grid with renewable energy offers the greatest potential to cost-effectively reduce CO2 emissions in NYS. Electric vehicles (EVs) and plugin hybrid electric vehicles (PHEVs) are projected to become lower cost alternatives to conventional vehicles for most drivers within the next decade, even without additional economic incentives. Almost 30% of New York passenger vehicle miles are projected to be fueled by electricity by 2030 in the Baseline scenario, increasing to roughly 75% by 2050. EV charging infrastructure is an essential component to achieving a highly electrified transportation fleet in NYS.

- In all scenarios, New York's peak demands are expected to shift toward the early mornings of the coldest winter days, primarily due to increased EV charging needs in low temperatures plus electric heat pump adoption, while summer electricity usage drops as air conditioning efficiency improvements outpace growth in service demand. In the Mandates and Transformation scenarios, with electrification of nearly all space heating and transportation, peak winter demand in 2050 could be more than twice as high as today's system peak.

EPRI LCRI Announcement: NYPA – Long Island Hydrogen-Fueled Power Generation Demonstration Project
This demonstration project will assess the impacts of different concentrations of hydrogen-natural gas blends at NYPA's Brentwood Power Station on Long Island. The project team will assess the blend's effect on reducing greenhouse gas emissions and its overall system and environmental impacts, including nitrogen oxide emissions. Collaborators on the NYPA-led project include EPRI, General Electric, and hydrogen supplier Airgas. More information can be found at the New York State Governor's website;

The July / August edition of the IEEE Power and Energy Magazine (IEEE PES Membership required) is focused on "Flexibility from the Bottom Up – The Roots of Coordinating Distributed Energy Resources. This edition of the IEEE PES Magazine can be found here. Articles in the edition include:

- Flexibility of Domestic Electric Vehicle Charging (in the United Kingdom)
- Harnessing the Full Potential of Clean Energy – SCE's DER Pilot Projects
- Network Congestion Management (Bruny Island, Australia)
- Grid and Market Services from the Edge (Australia Renewable Energy Agency)
- Aggregating Distributed Energy Storage – Cloud-Based Flexibility Services from China
- Bottom-up Flexibility in Multi-Energy Systems (Electric – Gas – Heat)

The article on *Grid and Market Services from the Edge* was of particular interest, as it focused on the interaction of real and reactive power in DER rich environments. The article discussed methods to maximize real power capability through the management of reactive power regulation of DER resources. In the diagram below, reactive power is used to enhance maximum hosting capacity. NOE stands for Nodal Operating Envelope, which represents the aggregate network limits as seen upstream from a given reference node (such as a line or station.

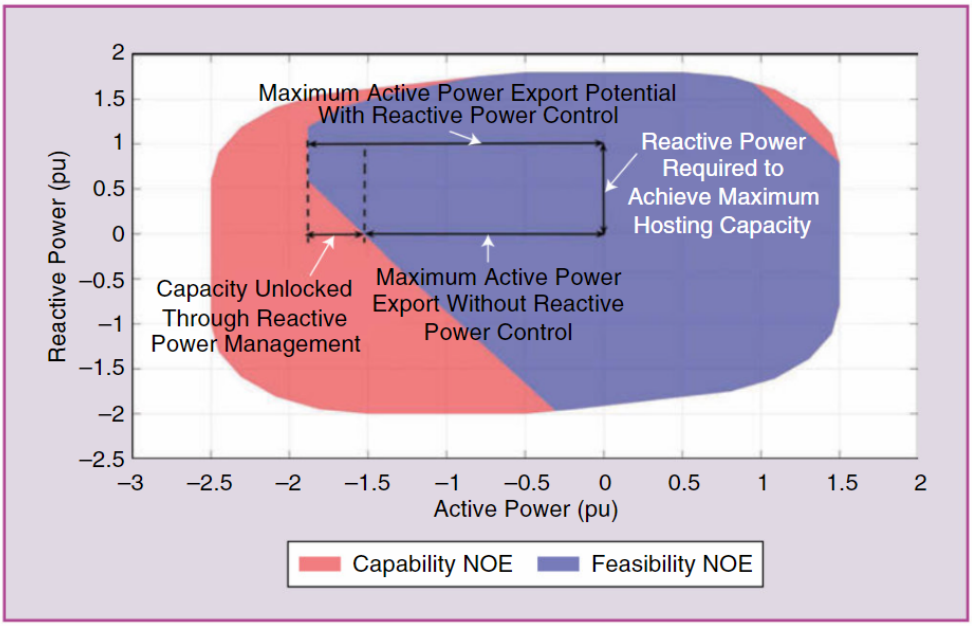


figure 8. A comparison of the capability and feasibility NOEs shown in Figure 9.

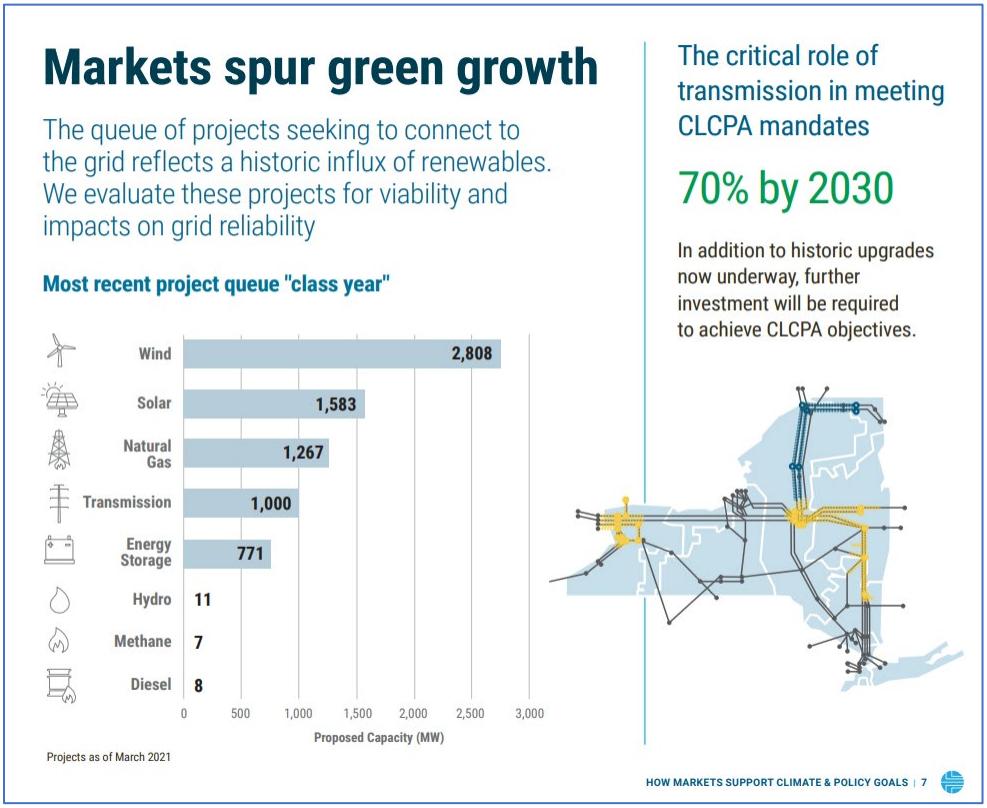
NYISO: Two Podcast Interviews and a new E-Book have been published on the Blog Page of the NYISO Website

A Podcast Interview with Gil Quiniones, President and CEO of NYPA, entitled Decarbonization, Building a Better Grid & Disaster Recovery. A summary of the interview can be found here, and the podcast can be found here. Topics include:

- Vision2030, which calls for aggressively building out NYPA's transmission system, preserving the value of its hydroelectric resources, transitioning its downstate gas generation to low to zero carbon emission resources, and helping customers reduce fossil fuel use in their own operations.
- The PEAK Coalition (a collection of environmental advocacy groups in New York City) to help retire or upgrade its gas-powered peaker plants to improve air quality in environmental justice neighborhoods. Replacement Options may include short- or long-term energy storage or the use of "green" hydrogen.

A podcast interview with Anne Reynolds, Executive Director of the Alliance for Clean Energy New York (ACE NY) and a member of the state's Climate Action Council (CAC), who has worked on numerous state programs to ease the transition to emission-free resources in New York. Reynolds observed that the CLCPA goal of electrifying New York's buildings will be an enormous task, given that they make up about a third of the state's greenhouse gas emissions. She favors a multi-level approach to ensuring reliability while moving to a clean energy economy. which should include carbon pricing, new dispatchable emission-free generation, green hydrogen, and major investments in storage, transmission improvements, demand response, and efficiency improvements.

A 10 page E-Book entitled 'How Markets Support Climate and Policy Goals", a high level overview covering the way that the NYISO markets have grown from the basic functions of electricity and capacity markets to include new strategies and incentives designed to meet policy and climate goals. Many of the graphics have been seen before, but have been placed together in this book to focus on the comprehensive nature of the NYISO strategies for the support the CLCPA goals. A Comparison of current queue data with March data below shows significant growth in the queue over the last 3 months alone.



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 July 16th, and representing the Queue as of June 31st. Note that 23 projects were added and 7 were withdrawn during the month of April. Results are tabulated below and shown graphically on the following page.

This month saw the addition of a new category with the designation of CSR or Co-located Storage Resource (CSR). Each CSR represents a combination of a single intermittent renewable generation unit and a single energy storage unit co-located behind a single Point of Interconnection. CSRs participate in the wholesale market as distinct resources, although resources that are co-located with load shall not qualify as a CSR.

CSR definition: A wind or solar Intermittent Power Resource and an Energy Storage Resource that:

(A) Are both located behind a single Point of Injection (POI)
(B) Participate in the ISO Administered Markets as two distinct Generators, and
(C) Share a set of CSR Scheduling Limits. Resources that serve a Host Load may not participate in the ISO-administered Markets as components of a CSR.

Rules governing CSRs include:

- Each unit within a CSR will have a distinct PTID/Schedule/Settlement.
- All units within a CSR will be settled at the LBMP at the POI.
- Metering will be reported on the POI, not the individual units.
- NYISO requires telemetry data from each of the CSR Generators (the ESR and the IPR).
- The telemetry data will be used by NYISO to allocate the hourly revenue grade meter data from the POI to every RTD interval of the hour and between the two CSR Generators.

Presentations on CSRs can be found as follows:

- Hybrid Storage: Tariff Revisions for Co-located Storage Resources Link
- Hybrid Storage: Market Design for Co-located Storage Resources Link

CSR-Related Topics within the presentations include:

- Definitions
- Design Overview
- Energy Market Scheduling
- Metering
- CSR Energy Market Settlements
- ICAP Mitigation Measures
- Timeline for CSR Option Deployment (up to Q4 2021)

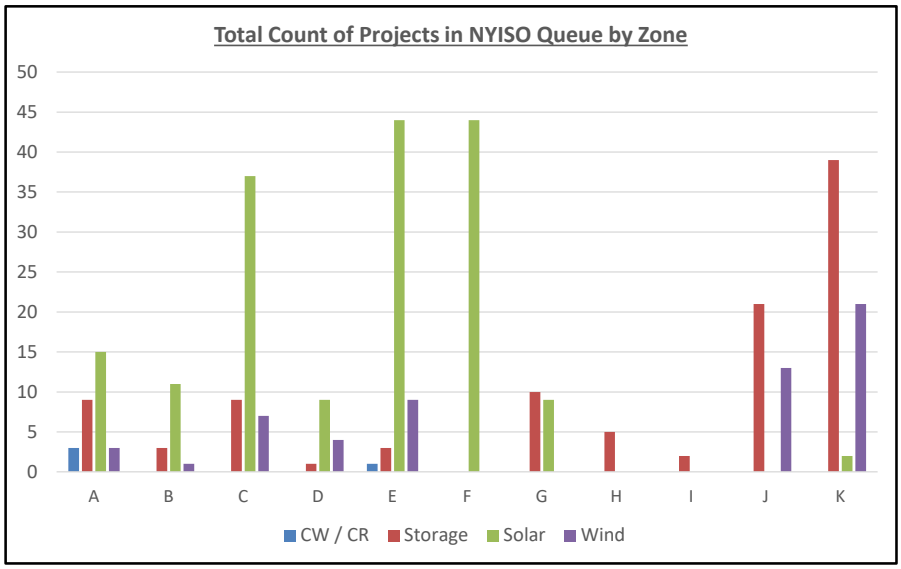
The monthly summary tables and charts are shown on the following pages.
Note that CSRs are designated as “CW / CR” in the NYISO interconnection queue, where:

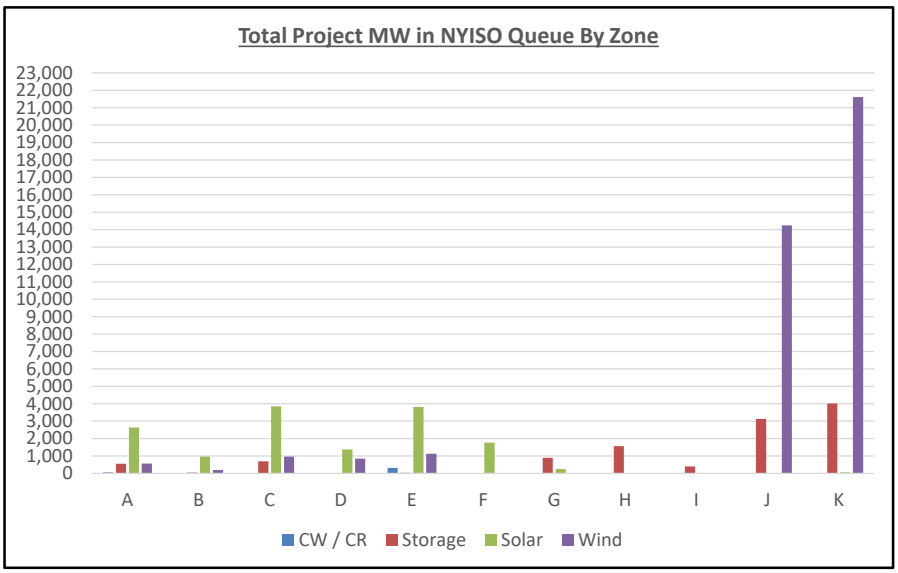
CW = CSR - ES + Wind
CR = CSR - ES + Solar

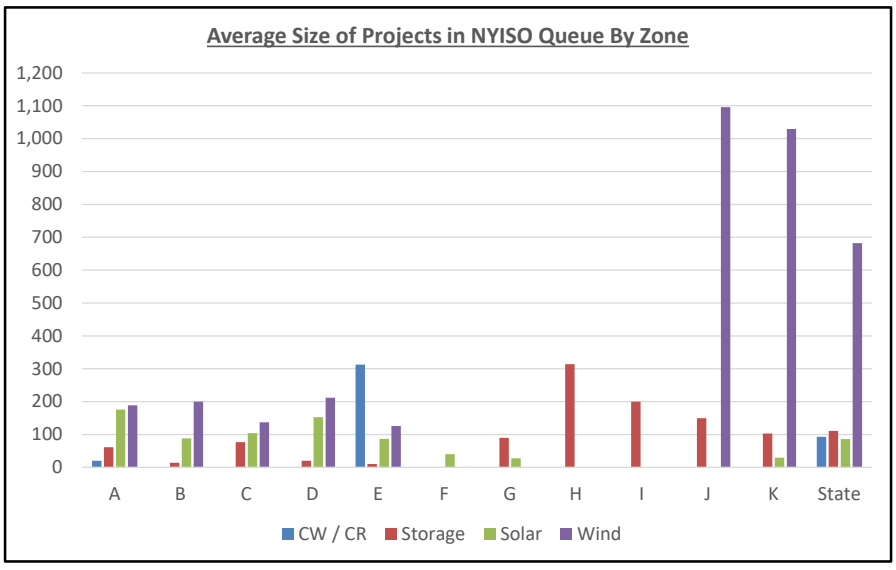
Total Projects in NYISO Queue By Zone				
Zone	CW / CR	Storage	Solar	Wind
A	3	9	15	3
B		3	11	1
C		9	37	7
D		1	9	4
E	1	3	44	9
F			44	
G		10	9	
H		5		
I		2		
J		21		13
K		39	2	21
State	4	102	171	58

Total Project MW in NYISO Queue By Zone				
Zone	CW / CR	Storage	Solar	Wind
A	60	550	2,640	566
B		41	965	200
C		689	3,852	960
D		20	1,377	847
E	313	30	3,809	1,135
F			1,760	
G		897	250	
H		1,569		
I		400		
J		3,136		14,248
K		4,009	59	21,618
State	373	11,342	14,711	39,574

Average Size of Projects in NYISO Queue By Zone				
Zone	CW / CR	Storage	Solar	Wind
A	20	61	176	189
B		14	88	200
C		77	104	137
D		20	153	212
E	313	10	87	126
F			40	
G		90	28	
H		314		
I		200		
J		149		1,096
K		103	29	1,029
State	93	111	86	682


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


Total Project MW in NYISO Queue By Zone
23,000
22,000
21,000
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
B
C
D
E
F
G
H
I
J
K
CW / CR
Storage
Solar
Wind


Average Size of Projects in NYISO Queue By Zone
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
CW / CR
Storage
Solar
Wind