De-Carbonization / DER Report for NYSRC Executive Committee Meeting 7/12/2024

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

- NERC Statement on FERC June Open Meeting
- NERC Announcement: ITCS Overview Provides Foundational Look at Study Approach
- New York State Public Service Commission Approves 6 GW Energy Storage Roadmap
- National Public Utilities Council Decarbonization Channel: The Cheapest Sources of Electricity in the U.S.
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / Co-located

NERC Statement on FERC June Open Meeting

At its June 27th monthly open meeting, the Federal Energy Regulatory Commission (FERC) issued an order approving Reliability Standard EOP-012-02: Extreme Cold Weather Preparedness and Operations. The order also directs NERC to develop and submit modifications to EOP-012-2 within nine months. FERC also announced a Dashboard that will track the status of recommendations from past FERC-NERC-Regional Entity analyses of performance during winter storms.

FERC also approved revisions to the NERC Rules of Procedures to address owners and operators of bulk power system-connected inverter-based resources (IBR) that previously were not required to register with NERC under the Bulk Electric System definition, subject to submitting a compliance filing. Visit NERC's Quick Reference Guide to learn more about the IBR Registration Initiative and available resources.

As part of its Inverter-Based Resource Strategy, NERC is dedicated to identifying and addressing challenges associated with inverter-based resources (IBR) as the penetration of these resources continues to increase. ERO Enterprise assessments identified a reliability gap associated with the increasing integration of IBRs as part of the grid in which a significant level of bulk power system-connected IBR owners and operators are not yet required to register with NERC or adhere to its Reliability Standards. In response, FERC issued Order RD22-4-000 in November, 2022 directing NERC to identify and register owners and operators of currently unregistered bulk power system-connected IBRs. Working closely with industry and stakeholders, NERC is executing a FERC-approved work plan to achieve the identification and registration directive by 2026. Resources are also posted on the Registration page of the NERC website.

Other Resources Include:

- NERC IBR Registration Initiative – 2024 First Quarterly Update / IBR Work Plan Progress Update
- Frequently Asked Questions – Rules of Procedure Approach to Registration of Unregistered IBRs
- NERC IBR Performance Subcommittee (IRPS) Page with Links to IBR Webinar Series and FAQs
- Quick Reference Guides: Candidate for Registration and Inverter-Based Resource Registration Initiative
- NERC Registration Page, Standards Page and Standards Under Development Page
- Learn about NERC and Join the E-ISAC

NERC Announcement: ITCS Overview Provides Foundational Look at Study Approach

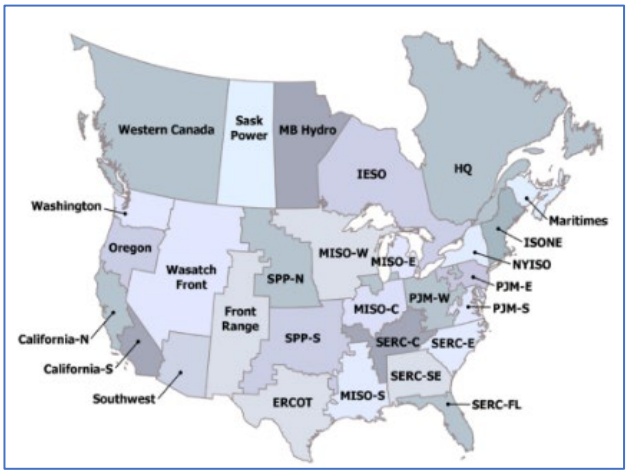
Congress, in its Fiscal Responsibility Act of 2023, directed NERC to conduct the Interregional Transfer Capability Study (ITCS). The goal of the ITCS is to identify locations between Transmission Planning Regions where enhanced transfer capability would strengthen the grid's reliability. As the United States and Canada share an interconnected bulk power system, NERC deemed that a Canadian analysis would be necessary to provide a more complete review of transmission capability.

Since then, NERC has published the ITCS Overview of Study Need and Approach, the first of four planned ITCS reports, which provides the foundation for the project by detailing transfer capability calculations and the methodology used to make recommendations for prudent additions. Related links include: Full Announcement / Infographic / Video. All project information is available on the ITCS web page.

The ITCS analyzes 12 years of weather data to make recommendations for prudent additions to transfer capability on 114 bi-directional interfaces. The study process includes significant collaboration with stakeholders, such as Transmission Planners, Planning Coordinators, Transmission Operators, Transmission Owners, state/provincial/federal partners, utilities, and trade groups.

In addition to the Overview, the project will consist of the following reports:

- Transfer Capability Analysis (Part 1): Describes the total transfer capability between neighboring Transmission Planning Regions (August)
- Prudent Additions (Part 2) and Recommendations (Part 3): Identifies "prudent additions" to transfer capability between neighboring areas and the recommendations to meet and maintain transfer capability (November)
- Canadian Analysis: Evaluates transfer capabilities from the United States to Canada and between Canadian provinces (Q1 2025)

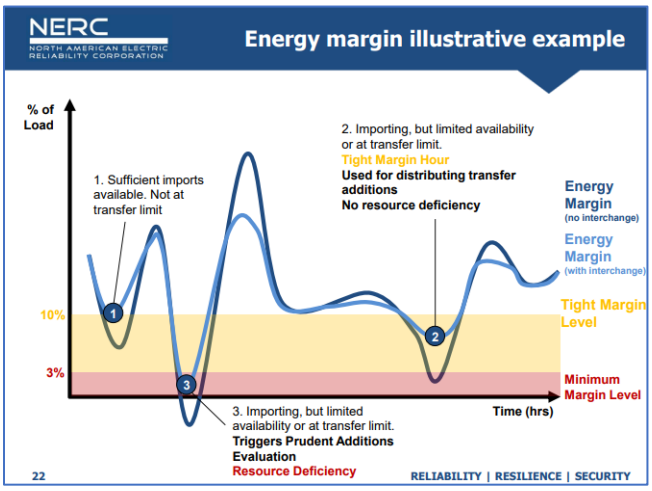


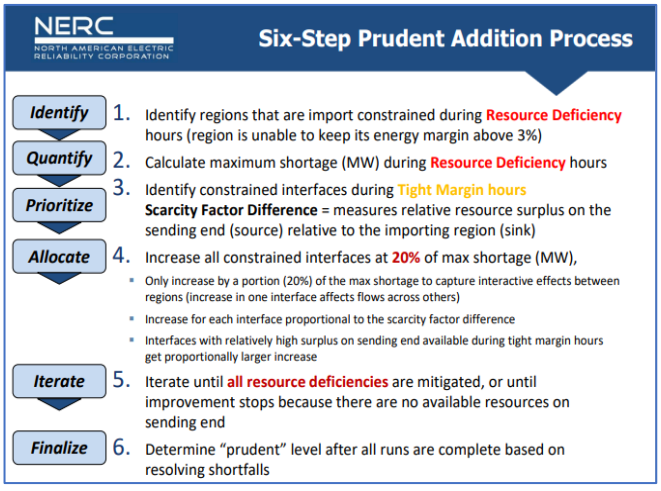
Since launching the project, NERC has developed data requests and built study cases and scenarios for transfer capability analysis, which contain the most up-to-date information on transmission topology, loads, resource forecasts, and other inputs for the Western and Eastern Interconnections. As directed by Congress, the final study will be filed with the Federal Energy Regulatory Commission by December 2, 2024.

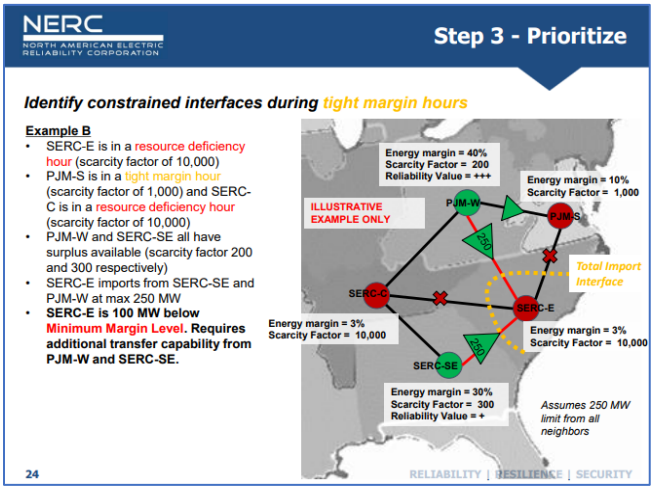
The ITCS 2024 First Quarter Update provides the following information on accomplishments and activities:

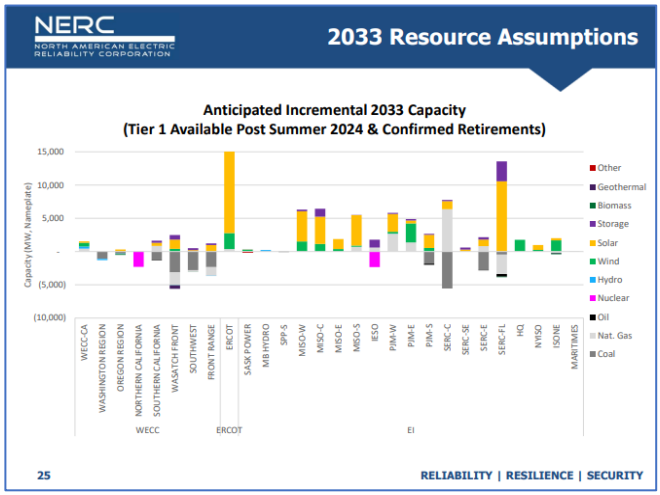
- The framework and scoping documents for the Part I transfer capability analysis and Part II prudent additions to transfer capability have been completed. The data analysis is underway and the ITCS project remains on schedule.
- The project team, consisting of NERC and the Regional Entities, submitted two data requests to industry to gather pertinent base case and energy data. All data, including from Canadian entities, has been received and used to update MOD-032 base cases. These now contain the most up-to-date information on transmission topology, loads, resource forecasts, and other useful inputs for the Western and Eastern Interconnections. Additionally, hourly energy data will be used to perform energy deficiency analysis.
- Analysis on transfer capability and energy deficiency is underway. The scenarios, which represent extreme weather conditions, have been developed, and coordination with the Department of Energy on historical weather data inputs into the scenarios will continue.

Slide extracts from the June 25th Advisory Group Meeting are shown below:









Additional Links are shown below:

- NERC ITCS Main Landing Page
- ITCS Advisory Group June 4th: Meeting Agenda and Presentation
- ITCS Advisory Group June 25th: Meeting Agenda and Presentation
- ITCS Transfer Study Scope (Part 1 – March 2024) and Review Comments
- ITCS Transfer Study Scope (Part 2 - Scenarios, Assumptions, Metrics Adequacy and Review Comments
- Transmission Transfer Capability – Reference Document
- Study Framework and Framework Review Comments

New York State Public Service Commission Approves 6 GW Energy Storage Roadmap

On June 24th, NYSERDA that Governor Hochul Announced the approval by Public Service Commission (PSC) for New York's 6 GW Energy Storage Roadmap (Downloads: Press Release / Order Establishing Updated Energy Storage Goal and Deployment Policy), which charts a pathway to achieving an expanded storage deployment target of 6 GW by 2030, as proposed in Governor Hochul's 2022 State of the State address.

The approval of the 6 GW Roadmap, submitted by NYSERDA and the New York Department of Public Service (DPS) to the PSC in December 2022 (Case 18-E-0130 In the Matter of Energy Storage Deployment Program), authorizes a comprehensive set of actions to expand New York's energy storage programs to cost-effectively unlock the rapid growth of renewable energy across the State and bolster grid reliability and customer resilience. It will support a buildout of storage deployments estimated to reduce projected future statewide electric system costs by nearly $2 billion, in addition to further benefits in the form of improved public health as a result of reduced exposure to harmful fossil fuel pollutants.

Specifically, the 6 GW Order authorizes:

- Implementation of new NYSERDA-led programs towards procuring an additional 4.7 GW of new storage projects across the bulk (large-scale), retail (community, commercial and industrial), and residential energy storage sectors in New York State.
    - 3,000 MW of new bulk storage, enough to power approximately one million homes for up to four hours, to be procured via annual competitive solicitations through a new Index Storage Credit mechanism.
    - 1,500 MW of new retail storage, enough to power approximately 500,000 homes for up to four hours, supported through expansion of NYSERDA's existing Retail MWh Block program; and
    - 200 MW of new residential storage, enough to power 120,000 homes for up to two hours, to be supported through up-front contractor grants on a $/kWh basis.

  This total of 4,700 MW, combined with the 1,300 MW of existing energy storage already being procured or under contract, will allow the State to achieve the 6,000 MW goal by 2030.
- Payment of prevailing wage as a programmatic requirement for energy storage projects with a capacity of 1 MW and above.
- A minimum of 35% of bulk and off-site retail energy storage procurements to be sited in NYISO Zones G-K, with at least 30% of total procurements in Zone J and at least 5% in Zones G, H, I, and/or K.
- A minimum of 35% of residential and on-site retail procurements be located within disadvantaged community census tracts.

With regard to timing and next steps, the 6 GW Order stipulates that:

- For the Bulk Program, NYSERDA is required to file an Implementation Plan within 120 days following the 6 GW Order date. For the Residential and Retail programs, NYSERDA is required to file an Implementation Plan within 60 days following the 6 GW Order date.
- The Implementation Plans will include topics such as program budget details, performance metrics, incentive structures, application requirements, and disadvantaged community access considerations, as well as incorporating any recommendations that come out of the Inter-Agency Fire Safety Working Group for New York.
- Both the Bulk and Residential-Retail Implementation Plans will be subject to a State Administrative Procedure Act (SAPA) public notice and comment period and subsequent consideration by the PSC.

As of April 1, 2024, New York has awarded about $200 million to support approximately 396 megawatts of operating energy storage in the state. There are more than 581 megawatts of additional energy storage under contract with the State and moving towards commercial operation.

National Public Utilities Council Decarbonization Channel: The Cheapest Sources of Electricity in the U.S.

The Decarbonization Channel is a website sponsored by the National Public Utilities Council (NPUC). The NPUC website contains a series of articles, presentations, and reports covering various aspects of decarbonization and related transitions in the United States, with links to related reports from government, research, and industry.

This review takes a closer look at an article entitled "Ranked: The Cheapest Sources of Electricity in the U.S.", published in August 2023, which looks to determine whether the transition from fossil fuels to emission-free electricity sources, such as solar, wind, and nuclear power, can be accomplished in a financially viable manner. The article starts by noting that in 2022, the U.S. electricity sector's reliance on fossil fuels contributed 1,539 million tonnes of CO_2 emissions.

Levelized cost of electricity (LCOE) is a metric used to assess the cost of generating electricity from a specific power source over its lifetime. The measure considers all of the costs associated with building, operating, and maintaining a power plant, as well as the amount of electricity that the plant is expected to produce over its lifetime. LCOE is a comprehensive way to compare the costs of various electricity generation technologies. It's also worth mentioning, however, that there is a substantial amount of tax subsidies available for clean electricity generation in the U.S., including the $161 billion in clean electricity tax credits in the Inflation Reduction Act (IRA). By leveraging these funding opportunities, the LCOE of renewables, nuclear power and energy storage systems has the potential to fall even further, bolstering their competitive edge in the market.

According to Lazard Consulting Group's 2023 analysis of unsubsidized LCOE in the U.S., both onshore wind and utility-scale solar photovoltaic (PV) technologies are more cost-effective than combined cycle natural gas power plants. In the case of onshore wind, this has been true since 2015.

Technology	U.S. Levelized Cost of Electricity, $/MWh, 2023	
	Minimum	Maximum
Onshore wind	$24	$75
Solar PV (utility scale)	$24	$96
Gas combined cycle	$39	$101
Onshore wind + 4-hour lithium storage	$42	$114
Solar PV (utility scale) + 4-hour lithium storage	$46	$102
Geothermal*	$61	$102
Coal*	$68	$166
Offshore wind	$72	$140
Gas peaking	$115	$221
Nuclear*	$141	$221

*2022 LCOE adjusted for inflation.

Overall, the data shows that most emission-free sources are cheaper than fossil fuels. There are, however, some other things to consider:

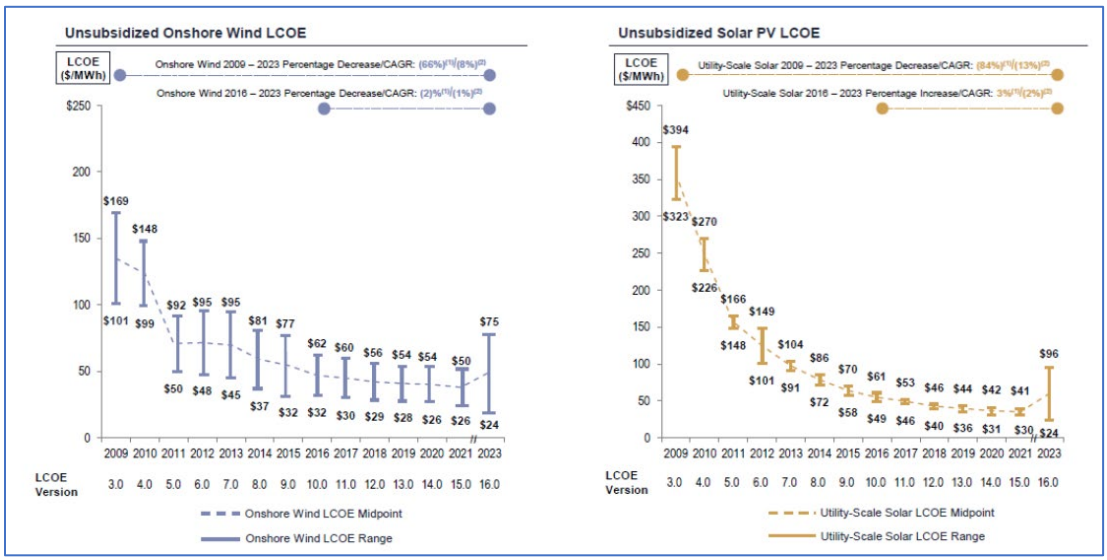
- Coupling lithium-ion batteries with intermittent energy technologies, such as wind and solar, raises costs by $6-$39/MWh. As new storage technologies, such as electrochemical batteries, mature, however, Lazard expects them to offer cost advantages to lithium-ion ones in as little as two years, especially at longer durations (6+ hours).

- While the LCOE of nuclear seems to be high, license renewals can significantly lower the marginal cost of electricity in these power plants. 88 of the 92 U.S. nuclear reactors have received such renewals in the past.
- The efficiency of generation technologies plays a significant role in LCOE. This is especially evident in the high cost of gas peaking power plants.

There are various factors that can influence the LCOE of clean electricity technologies. These include:

- Financing costs, policy incentives, and government subsidies
- Geographical location, which can influence the availability of renewable resources like sunlight and wind speed
- The availability and cost of key clean energy metals and materials, such as copper, silicon, nickel, zinc, and chromium
- The maturity of the technologies, the scale of deployment and the growth in demand
- The overall supply chain, including where most of these technologies are primarily manufactured (China), shipping costs, and disruptions due to global events, such as wars

As seen below, the combination of these factors has dramatically pulled down the LCOE of onshore wind and solar PV since 2009, with the exception of 2022-2023.



According to the International Energy Agency (IEA), however, most of these cost pressures related to inflation and supply chain challenges are easing in 2023, allowing these technologies to remain cost-competitive in today's volatile fuel-price environment.

Other publications from the National Public Utilities Council include:

- Link: Annual Utility Decarbonization Report for 2023
- Link: All Commercially Available Long Duration Energy Storage Technologies, in One Chart
- Link: The Rise in U.S. Billion Dollar Extreme Weather Disasters
- Link: Tracking U.S. Electrification, by Sector
- Link: The Price of Carbon Around the World
- Link: Unpacking Hydrogen's Role in Decarbonizing Electricity
- Link: Ranked: The Cheapest Sources of Electricity in the U.S.
- Link: The Four Benefits of Small Modular Reactors
- Link: The Average Age of Energy Projects in U.S. Interconnection Queues

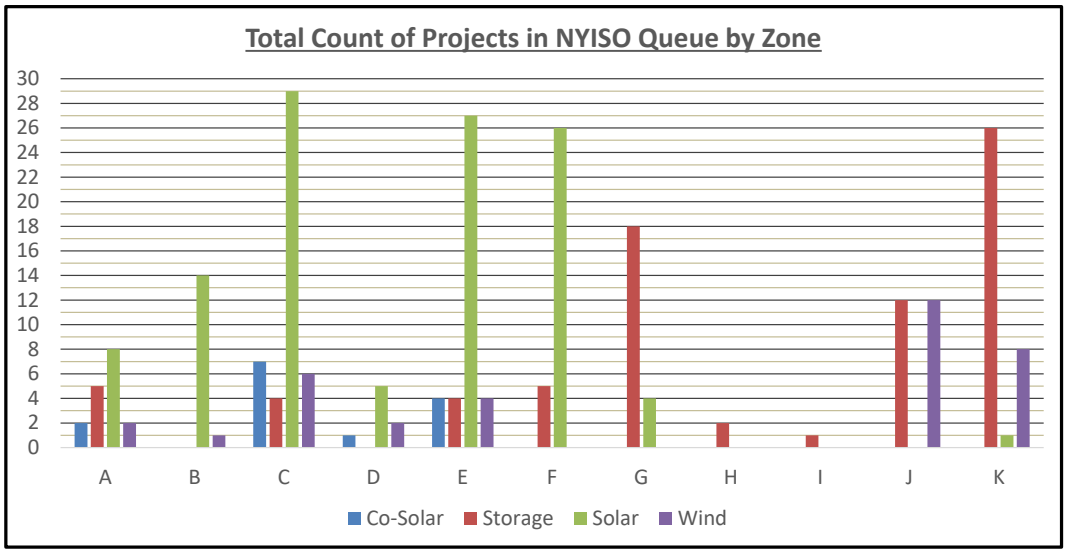
Interconnection Queue: Monthly Snapshot – Storage / Solar / Wind / CSRs (Co-located Storage)

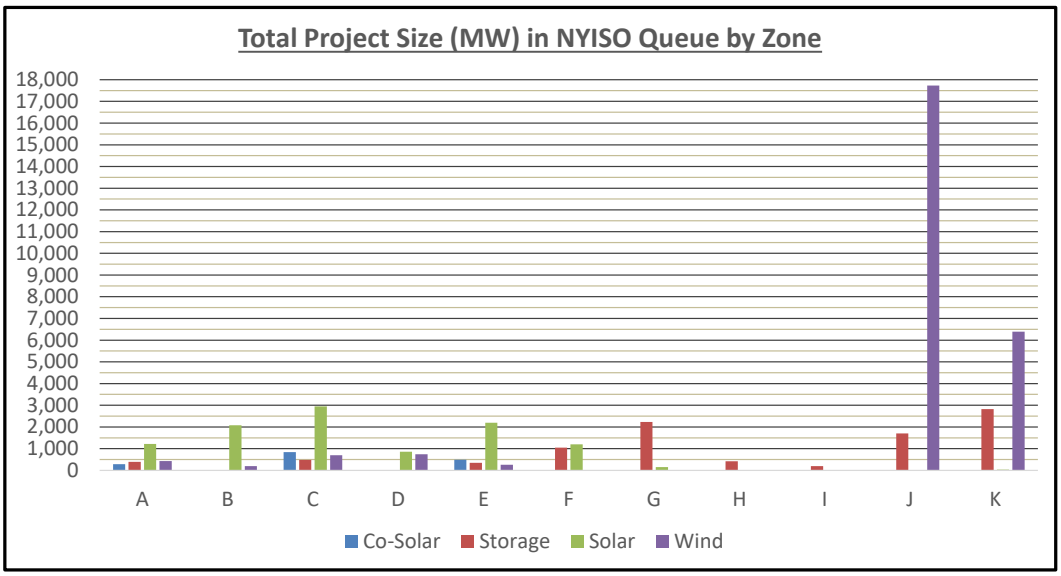
The intent is to track the growth of Energy Storage, Wind, Solar and Co-Located Storage (Solar and Wind) projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection Website, based on information published on June 20th, and representing the Interconnection Queue as of May 31st. Note that 7 projects were added, and 255 were withdrawn during the month of May.

Total Count of Projects in NYISO Queue by Zone				
Zone	Co-Solar	Storage	Solar	Wind
A	2	5	8	2
B			14	1
C	7	4	29	6
D	1		5	2
E	4	4	27	4
F		5	26	
G		18	4	
H		2		
I		1		
J		12		12
K		26	1	8
State	14	77	114	35

Total Project Size (MW) in NYISO Queue by Zone				
Zone	Co-Solar	Storage	Solar	Wind
A	290	390	1,215	427
B			2,075	200
C	845	485	2,946	701
D	20		855	747
E	495	345	2,196	258
F		1,050	1,201	
G		2,229	150	
H		416		
I		200		
J		1,703		17,726
K		2,820	36	6,390
State	1,650	9,638	10,673	26,449

Average Size (MW) of Projects in NYISO Queue by Zone				
Zone	Co-Solar	Storage	Solar	Wind
A	145	78	152	214
B			148	200
C	121	121	102	117
D	20		171	374
E	124	86	81	64
F		210	46	
G		124	38	
H		208		
I		200		
J		142		1,477
K		108	36	799
State	118	125	94	756


Total Count of Projects in NYISO Queue by Zone
30
28
26
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


Total Project Size (MW) in NYISO Queue by Zone
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
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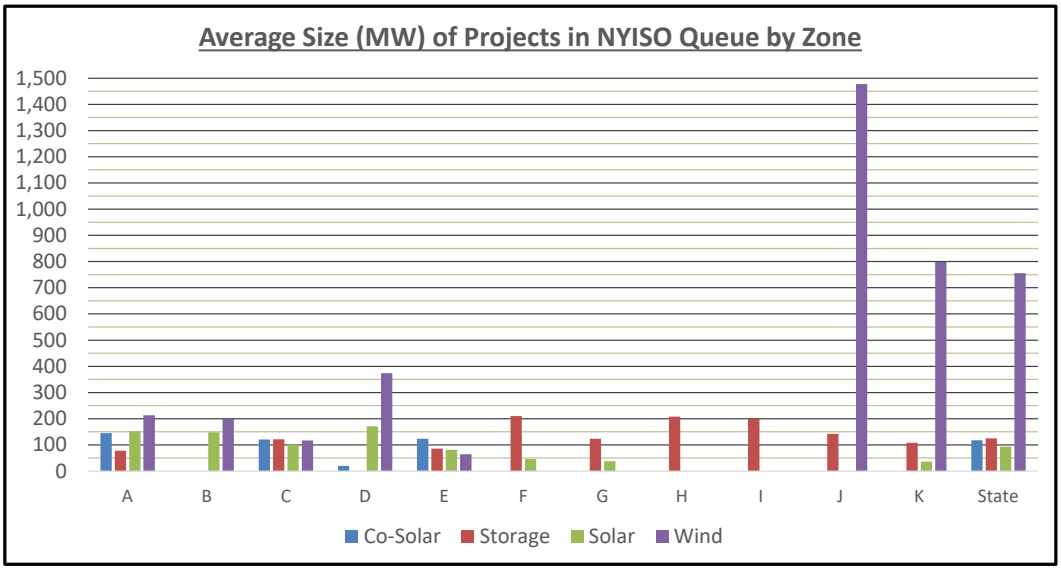
Co-Solar
Storage
Solar
Wind


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
Storage
Solar
Wind