De-Carbonization / DER Report for NYSRC Executive Committee Meeting 5/14/2021

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

- NERC April Newsletter
- NERC: Modeling Guidelines published for aggregate DER's and Energy Storage / Hybrid Plants
- NERC Lessons Learned Summaries for:
    a. ATS Cascading Thermal Runaway
    b. Cold Weather Impacts on Wind Generation
- NERC Reference Document: Risks and Mitigations for Losing EMS Functions
- EPRI LCRI – Carbon Reduction Video and LCRI Research Vision Report
- NYISO Blogs – Latest articles and podcasts covering renewables and DERs
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind

The April issue of the NERC monthly Newsletter can be found here. This issue includes a statement from Jim Albright, CEO of Texas Reliability (the ERO for Texas) regarding the impact of the cold weather event in February and the need to improve. Several new Standards were announced, including FAC002-3 for Facility Interconnection Studies. Brief descriptions were provided for two new guidelines posted by the NERC Reliability and Security Technical Committee (RSTC) in March, which can be found on the NERC Committees Reliability and Security Guidelines Landing Page, and are summarized below:

> Model Verification of Aggregate DER Models used in Planning Studies:
> Areas across the North American BPS are experiencing increasing penetration levels of distributed energy resources (DERs). BPS disturbance events analyzed by NERC in 2018 and 2020 have highlighted the impacts that DERs are having on BPS performance. Transmission Planners (TPs) and Planning Coordinators (PCs) are faced with ensuring the planning assessments capture the aggregate behavior of DERs in both their steady-state and dynamic studies. This guideline provides TPs and PCs with tools and techniques that can be adapted for their specific systems to verify that the aggregate DER models created are a suitable representation of these resources in planning assessments.
>
> Performance, Modeling and Simulations of BPS-Connected Battery Energy Storage Systems and Hybrid Power Plants: This guideline provides recommended performance characteristic for BPS-connected BESSs and hybrid plants that all Generator Owners (GOs) and project developers seeking interconnection to the BPS should consider. Transmission Owners (TOs), TPs and PCs are recommended to improve their interconnection requirements and study processes for these relatively newer technologies. This guideline also covers recommended modeling and study practices that should be considered by TPs and PCs as they perform planning assessments with increasing numbers of BESSs and hybrid power plants during interconnection studies, annual planning assessments and any specialized studies needed to ensure BPS reliability

NERC Lessons Learned

NERC maintains a library of lessons learned within the hierarchy of Program Areas & Departments / Reliability Risk Assessment / Events. A recent item in the library entitled Battery Storage System Cascading Runaway has a condensed series of recommendations derived from various investigations to date. NERC considers Energy storage to a still-maturing technology, with significant risks as exemplified by the APS substation fire, while standards and regulations have developed slower than the technology and still need some improvement. A complete investigative report that containing more details and photos can be found at the APS website. Until the NFPA 855 standard has been finalized, NERC recommends that entities owning BESS should consider:

- The key to managing risk associated with the installation of a BESS focuses on a hazard mitigation analysis. This will identify gaps along with the appropriate control measures like design modifications, suppression, and training.
- The fire services should not be seeing a BESS for the first time when 911 is called. Consideration should be given to developing a pre-incident guide which will serve as the mutual platform for future training of utility personnel and the fire services
- Conduct training, familiarization tours and exercises with your local fire department. The approach laid out in previous NERC Lesson Learned 20190202 "Substation Fires: Working with First Responders" can be used as a template.

A previous document from last year entitled Unanticipated Wind Generation Cutoffs During a Cold Weather Event may be relevant when considering the forecasted growth of wind resources in New York, especially concentrated in offshore areas. The report refers to a prior event in 2019 (presumably in Canada), in which severe cold temperatures affected the ability of wind generation to operate. Wind generation was unexpectedly shutting off because the temperature fell below -21°F, the cutoff point for some wind farms to avoid mechanical damage. The steep drop in wind production led to a large deviation from planned wind production, triggering a maximum generation response. At this point, temperatures in the area were around four degrees lower than expected and wind generation output was 6 GW (50%) lower than the day-ahead forecast. The report refers to an earlier Lessons Learned entitled Wind Farm Winter Storm Issues. Lessons learned were combined from both reports and are listed below:

- Improve wind forecasting with additional resource parameters
- Obtain accurate cold cut-out temperature information for all wind farms in the system footprint.
- Wind unit owners should prepare for extreme cold weather performance and promptly communicate anticipated operating parameters and data to their BA, RC, and TOP to ensure readiness and provide situational awareness in both operations and planning.
- Wind turbine nacelle-mounted oil coolers can accumulate ice quickly in a snowstorm if the oil isn't circulating and creating heat to melt the winter precipitation. During an extreme cold weather event, even if wind turbines are not being used, they should be cycled online to provide flow of cooling oil and therefore aid in the warming of that cooling oil. Owners should consult with manufacturers about the timing needed for this cycling.
- All cooling equipment for radiators on wind turbines should be disabled for cold weather events.
- Entities should investigate the purchase of cold weather packs for wind turbines which enable them to run during extremely cold weather. The cold weather packs provide heat where needed to keep oil and other vital components at operating temperature.
- During preparation for winter operation, generator owners should evaluate their vehicle plans and ensure they have all the necessary equipment to be able to travel safely on winter roads.
- Major updates and upgrades to SCADA and other critical data servers, communications equipment and computers should be delayed if bad weather is forecasted.

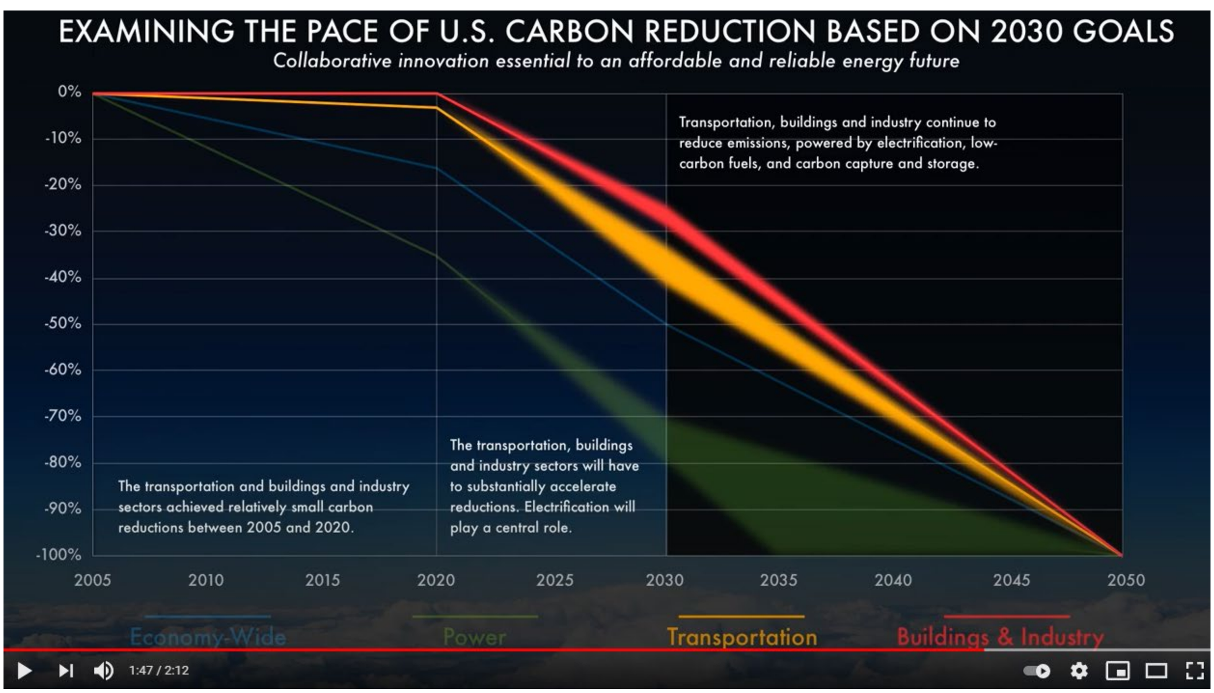
NERC Report: Risks and Mitigations for Losing EMS Functions (added to this list as an item of interest)
The purpose of this Reference Document is to identify and discuss the risk of losing EMS functions, analyze the causes of EMS events reported through the Electric Reliability Organization (ERO) Event Analysis Process (EAP), and share mitigation strategies to reduce these risks.

A key observation is that EMS losses have not directly led to the loss of generation, transmission lines, or customer load. However, the loss of EMS functionality has contributed to cascading events because it limits system operators' capability to maintain situational awareness. Some Key recommendations include:

- Overlapping coverage of situational awareness with the RC's and neighboring TOPs and BAs so that the system is being continuously monitored by additional entities outside of that immediate footprint. This is further strengthened by additional ICCP data points from generators and tie-lines that can provide visibility.
- Manning substations during EMS events so that system operators and field personnel can act as needed (open/close breakers), verify status of devices, plus verify power flows and voltages.
- Several layers of communications have been implemented as needed (e.g., phones, cell phones, satellite, radio, RCIS, WECC-wide Messaging System).

Considering the average outage time (70 minutes) of the 521 events reported by 161 NCRs from October 2013 to April 2019, it was observed that the actual EMS availability was 99.99% during the term. Therefore, the mitigation strategies described above have been proven to work effectively.

EPRI - LCRI
Short Video: Examining the Pace of U.S. Carbon Reduction Based on 2030 Goals: This 2-minute informative video is available on Youtube, and provides a series of animated graphics that clearly identifies how well each of the industry sectors have performed in their efforts to reduce carbon emissions, and how far they have to go to satisfy regulatory goals slated for 2030 and 2050. The pace of the utility sector stands out, perhaps as the only industry that can achieve these goals based on current initiatives.



Report: LCRI Research Vision: An Outline for Research, Development, and Demonstration Activities to Enable Economy-Wide Decarbonization by Midcentury: Here are the links to the 15-page Executive Summary as well as the comprehensive 78-page full report (Publicly available from the EPRI LCRI website). The report presents a framework for evaluating the efforts required to decarbonize across the entire energy economy. Areas of focus include:

- Hard to Decarbonize Applications (Long Duration Energy Storage, Industrial Sector)
- LCRI Research Portfolio:

Renewable Fuels	Hydrocarbon-Based Processes	Electrolytic Processes
Delivery and Storage	Power Generation	End Use of Low-Carbon Resources
Industry	Buildings	Transportation
Safety and environmental	Integrated Energy Systems	Technology Cost & Performance

Additional information on Historical Greenhouse Gas emissions and examples of Industrial sector Decarbonization are provided in the appendices.

Here is a graphic taken from the report, showing that the Energy Imbalances created by a significant penetration of both solar and offshore wind, clearly indicating the need for massive amounts of energy storage to ensure a reliable supply of energy.

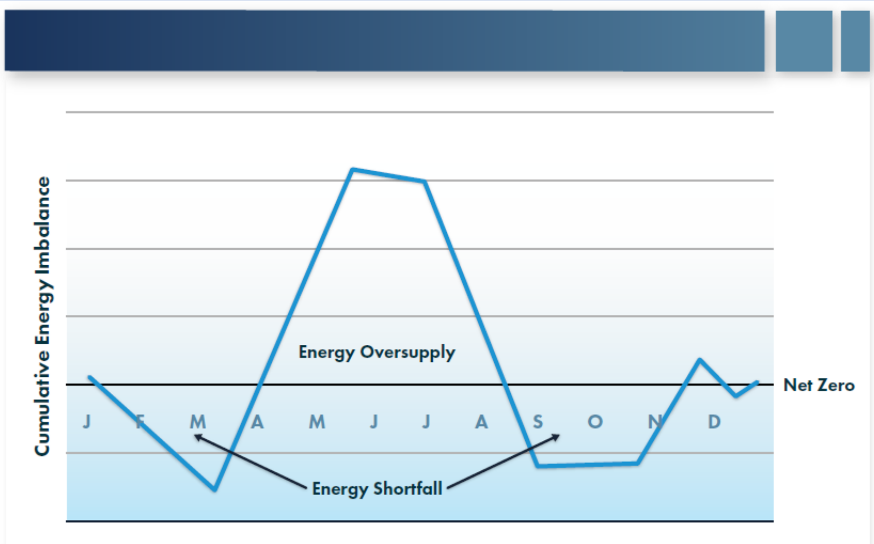


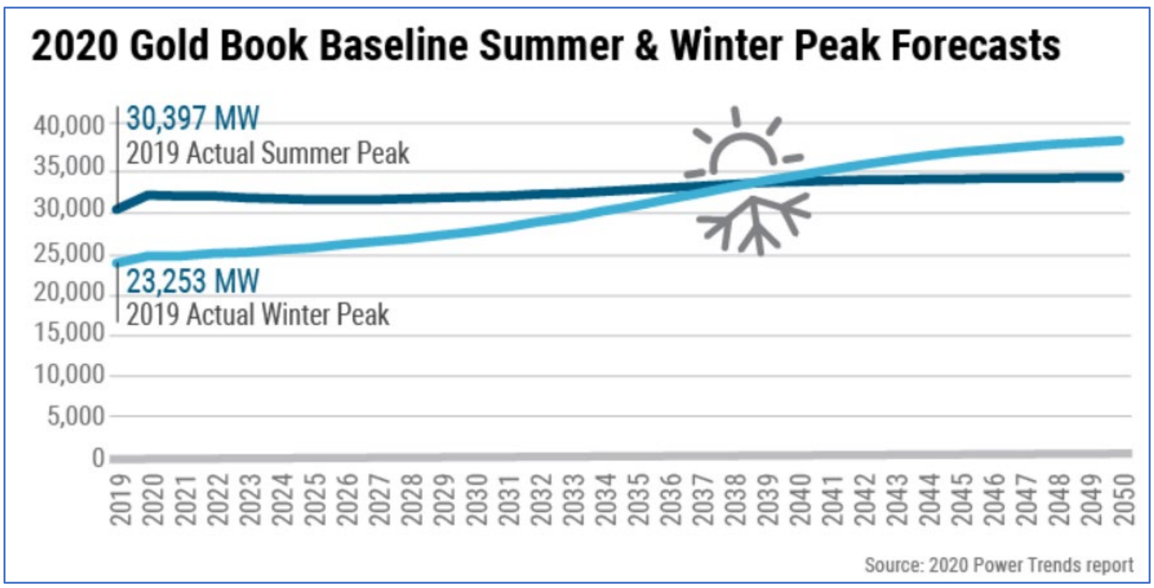
Figure 10: Energy Imbalance on the U.S. Eastern Interconnect with 40% Solar and 60% Offshore Wind (Jones 2017)

A new set of Articles, Videos and Podcasts have been published on the Blog Page **of the** NYISO Website, including the series of articles covering "The Road to 2040".

Podcast: Zach Smith on Emission-Free Grid Planning, Climate Change & the Interconnection Queue
Article: Road to 2040: How Solar on Dispatch Adds Flexibility to a Clean Energy Resource
Lessons Learned: How the 2014 Polar Vortex Helped Make the New York Energy Grid More Reliable.
This report highlights resilience measures implemented by the NYISO to date include:

- Improved operator awareness of fuel inventories and replacement fuel schedules, including a web-based application for generators.
- Changes to our tariff to increase the amount of reserve power we have available.
- Expanded generator site visits to review preparations for cold conditions.
- Reduced the number of generators that can be scheduled offline for maintenance.
- Improved outreach and coordination with the gas delivery industry, including operator awareness of the natural gas pipeline availability

The Forecasting Graphic below shows the "Break-Even Point" when the Winter Peak will overtake the Summer Peak in New York State, based on forecasts of increasing electrification.



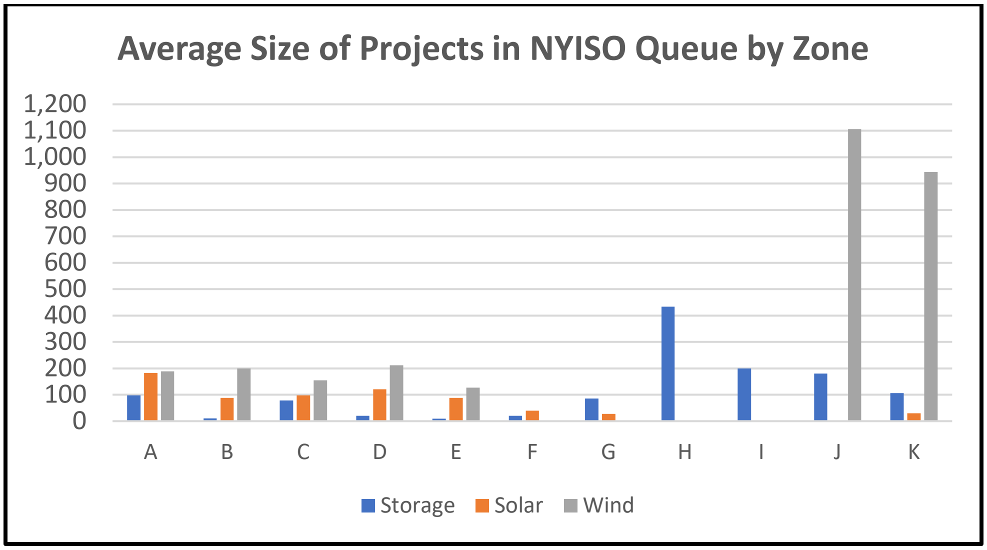
Interconnection Queue: Monthly Snapshot - Energy Storage / Wind / Solar Project Tracking

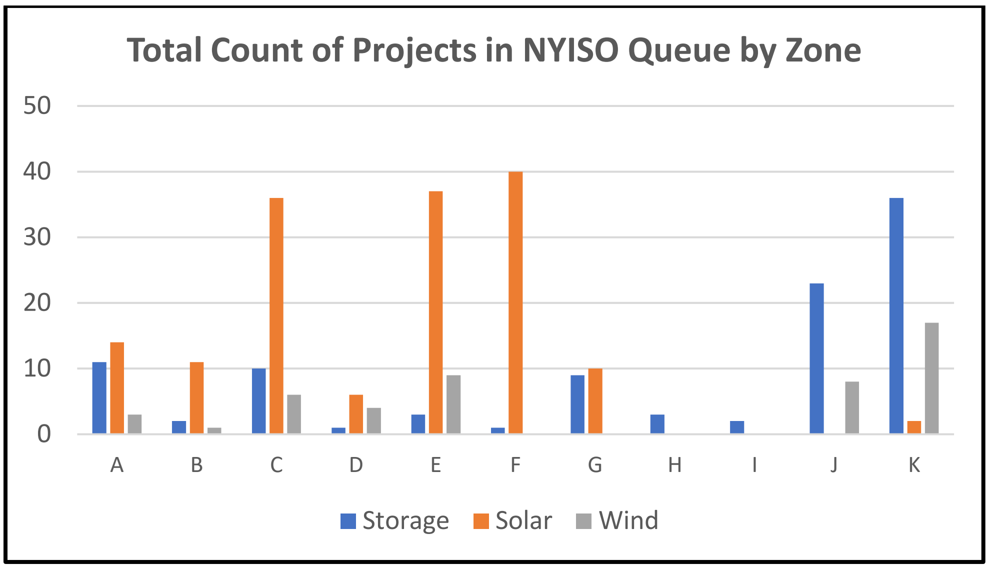
The intent is to track the growth of Energy Storage, Wind and Solar projects in the NYISO Interconnection Queue, looking to identify trends and patterns by zone and in total for the state. The information was obtained from the NYISO Interconnection website, based on information published on April 16th, and representing the Queue as of March 31st. Note that 7 projects were added and 7 were withdrawn during the month of March. Results are tabulated below and shown graphically on the following page.

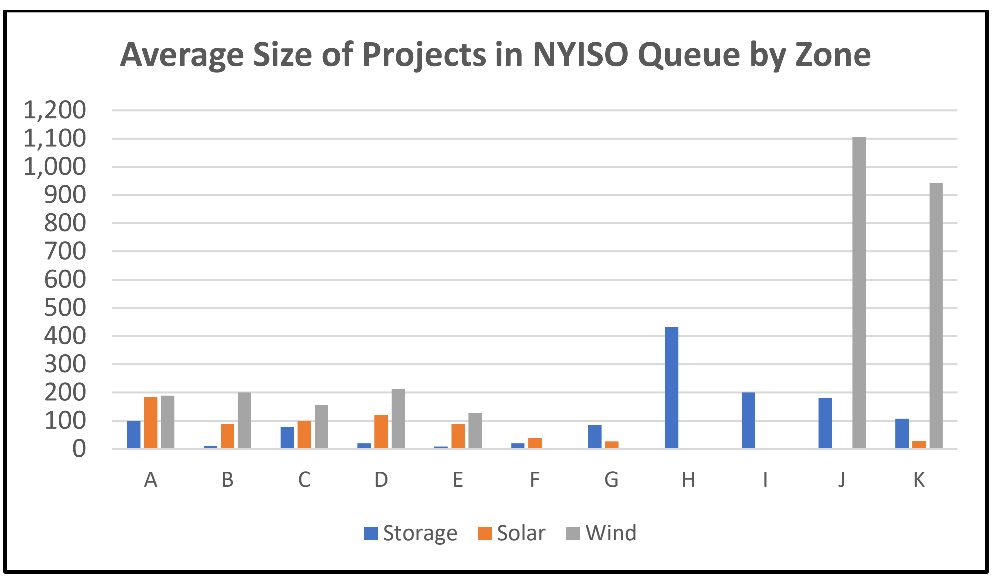
Total Project MW in NYISO Queue by Zone			
Zone	**Storage**	**Solar**	**Wind**
A	1,080	2,565	566
B	21	965	200
C	784	3,522	931
D	20	727	847
E	28	3,240	1,147
F	20	1,565	
G	771	270	
H	1,300		
I	400		
J	4,136		8,848
K	3,848	59	16,040
State	12,408	12,912	28,579

Total Count of Projects in NYISO Queue by Zone			
Zone	**Storage**	**Solar**	**Wind**
A	11	14	3
B	2	11	1
C	10	36	6
D	1	6	4
E	3	37	9
F	1	40	
G	9	10	
H	3		
I	2		
J	23		8
K	36	2	17
State	101	156	48

Average Size of Projects in NYISO Queue by Zone			
Zone	**Storage**	**Solar**	**Wind**
A	98	183	189
B	11	88	200
C	78	98	155
D	20	121	212
E	9	88	127
F	20	39	
G	86	27	
H	433		
I	200		
J	180		1106
K	107	29	944
State	123	83	595


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
Storage
Solar
Wind


Total Count of Projects in NYISO Queue by Zone
50
40
30
20
10
0
A
B
C
D
E
F
G
H
I
J
K
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
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Storage
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