Attachment #8.1
Return to Agenda

De-Carbonization / DER Report for NYSRC Executive Committee Meeting 9/9/2022

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

- NERC August Newsletter:
  - Panhandle Wind Disturbance Joint NERC / Texas RE Report
  - White Paper recommends Simulation Improvements and Techniques for DER Planning
  - Technical Reference Draft on Calculating Extreme Cold Weather Temperatures
- EPRI Presentation: North American Utility Electric Transportation Charging Infrastructure
- EPRI Consumers Guide: Modern Heat Pumps for Heating, Ventilation, and Air Conditioning
- NYISO Blog: Podcast: U.S. Energy information Administration on Recent Energy Price Impacts.
  Article: Grid Reliability Requires a Careful Transition from Fossil Fuels
- Snapshot of the NYISO Interconnection Queue: Storage / Solar / Wind / Co-located Storage

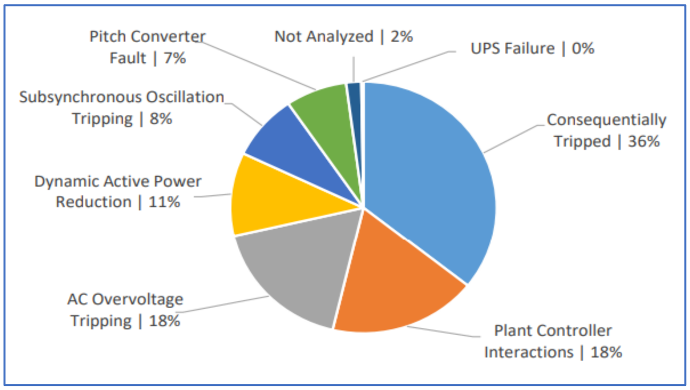
Highlights from the August NERC Monthly Newsletter (Link) include:

NERC and Texas RE publish Panhandle Wind Disturbance Joint Report

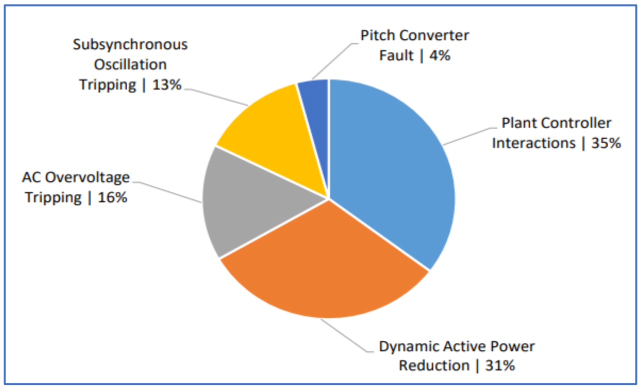
On August 10th, NERC Announced the publication of joint disturbance report, Panhandle Wind Disturbance: Joint NERC and Texas RE Staff Report, which studies an event involving the loss of wind resources in the Texas Panhandle area that occurred on March 22, 2022. While the event did not meet the qualified criteria for a Category 1i event per the Electric Reliability Organization (ERO) Event Analysis Process, the ERO Enterprise conducted an analysis of this event due to the high risk of inverter-based resource performance issues.

The pie charts below show the various root causes leading to the reduction of Wind Plant power output following two distinct phase-to-phase faults that occurred about a half hour apart on the same day.

Fault 1:



Fault 2:



At a high level, recommendations include:

- Improvements to Interconnection Process
- NERC Standards updates are needed to address performance gaps in Inverter-based resources
- Strong reinforcement of need for a performance-based generator ride-through standard
- Reinforcement of need for a Standard to complement PRC-004, focused on analyzing and mitigating abnormal performance issues, specifically for BES inverter-based resources.
- ERCOT to follow-Up with affected facility owners for corrective actions
- ERCOT to perform detailed model quality review for all inverter based resources including all protections
- ERCOT to perform thorough model validation effort

White Paper on Recommendations for Simulation Improvements and Techniques for DER Planning

The NERC System Planning Impacts of Distributed Energy Resources Working Group (SPIDERWG) has developed a number of guidelines and studies relating to Distributed Energy Resource (DER) integration, and published the results in a White Paper entitled Recommendations for Simulation Improvement and Techniques Related to DER Planning. The document provides recommendations that may be pertinent to power system software developers, and outlines some of the related literature that may aid in developing further software improvements and techniques.

This white paper is broken down into three sections.

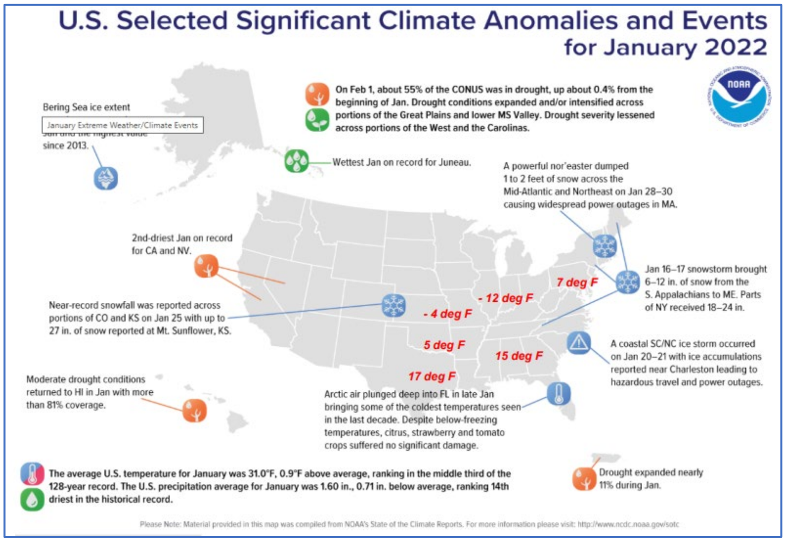
- PART I provides an overview of SPIDERWG efforts to quantify and qualify the manner in which DERs are changing the system planning process. This section also provides a review of related literature from government, industry, academic sources.
- PART II identifies a number of issues related to the representation of DERs in power system planning models that may strain the existing capabilities of power system software.
- PART III discusses the seams that exist between typical power system planning analysis (e.g., transmission versus distribution studies, positive-sequence load flow versus electromagnetic transient analysis) and how DERs may necessitate new software solutions that stitch these seams together.

NERC Webinar: Cold Weather Grid Operations, Preparedness, and Coordination

NERC posted the Slide Presentation and Video Recording from a webinar held on August 16th, covering Project 2021-07, entitled Extreme Cold Weather Grid Operations, Preparedness, and Coordination.

The presentation notes the following as a basis of concern:

- During the week of February 14, 2021, for over two consecutive days, ERCOT averaged 34,000 megawatts (MW) of generation outages, nearly half of ERCOT's 2021 all-time winter peak load of 69,871 MW.
- This was the largest controlled firm load shed event in U.S. history (23,418 MW), third largest MW load outage (behind the August 2003 and August 1996 blackouts).
- This was the fourth event in the past 10 years which jeopardized bulk-power system reliability due to unplanned generating unit outages which escalated due to cold weather



The 2021-07 Standard Drafting Team drafted a technical reference document, Calculating Extreme Cold Weather Temperature, which is available on the NERC Project Page. This document is an example of how to calculate the Extreme Cold Weather Temperature with the National Oceanographic and Atmospheric Administration NOAA weather data and is intended to support the revisions proposed by the drafting team in EOP-012-1.

EPRI Presentation: North American Utility Electric Transportation Charging Infrastructure

This Presentation (available to participating members) highlights the latest trends in the sales and usage of electric vehicles, as well as the programs established by utilities around the country. A nation-wide overview of utility electric vehicle charging infrastructure and market support actions provides the following information for Con Edison, O&R, and New York Power Authority (NYPA):

Con Edison:

- Con Edison's Electric Vehicle programs include: $287M light-duty EV make-ready program to incentivize utility and customer-side infrastructure upgrades needed to develop commercial and multifamily light duty EV charging stations. Incentives can go towards L2 or DCFC stations with a minimum of 2 plugs. Incentives vary based on charger type, public accessibility, and location. The program is available through 2025.
- $9M Medium-Heavy Duty Fleet Pilot make-ready program. Incentives for utility side work available when you install direct current fast chargers for medium/heavy duty fleets in utility Territory. The program is available through 2022.
- $6.4M EV Fast Charging per Plug Incentive provides incentive to eligible DCFC charging stations in their initial years of operations.

O&R

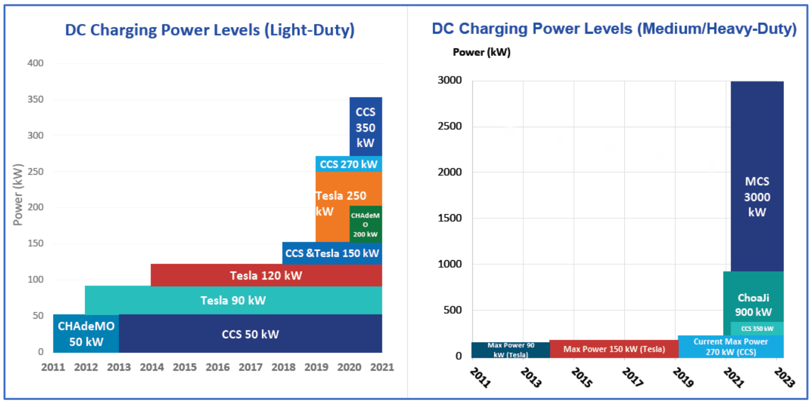
- O&R's Electric Vehicle Programs include $1.7M Public DCFC per plug incentive up to 40 stations. Incentive starts at $11k per plug rated at 75 kW or greater and would decline ratably over a seven-year max payment period.

NYPA

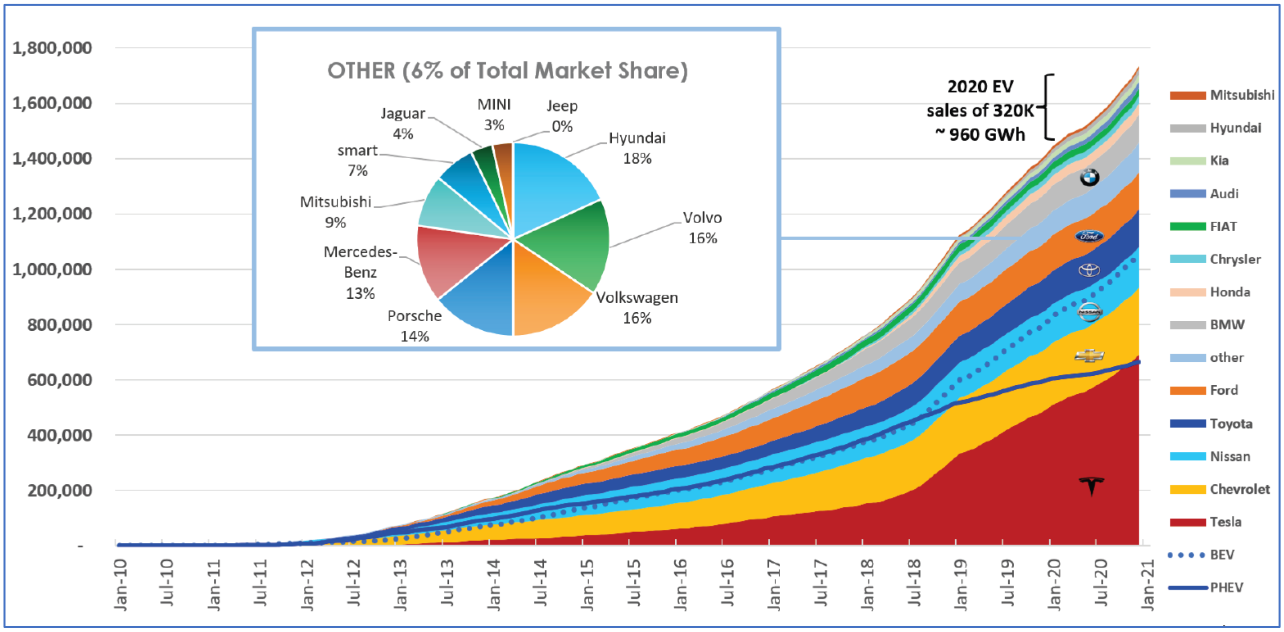
- NYPA's $250M "EVolve NY" program has a goal of making EV travel throughout NY easy, affordable, and accessible to all, by building out fast chargers at key highway and urban locations. NYPA additionally seeks to stimulate and complement private sector market activity in fast charging, for which investment is currently low. Phase 1 comprises $40M for 150kW+ DC Fast Chargers (DCFC), Urban Charging Hubs, and our first EV Model Community (Fairport, NY) by the end 2021. End of 2021 goal is 150-200 150kW+, universal access DC fast chargers (range is dependent on additional market activity) at up to 50 locations (~4 chargers per location). For corridors, target distance between chargers is 50 miles, on average. Charging stations will be located on key travel corridors and urban hubs, with safety, retail, food, and refreshment options available.
- Phase 2 involves installation of up to 800 DC Fast Chargers by 2025, as spelled out by the 2020 State of the State Address (again, dependent on additional market activity).
- NYPA's "Evolve NY" program is completely market-based, which is rare among other utility investments—no ratepayer/rate-based funding is included in our $40M in spend for Phase 1. 150 150kW+ DC Fast Chargers would result in New York having the 2nd largest 150kW+, universal-access network in any state in the US (CA has the most).

The graphic on the right shows the annual increasing capacity of DC charging stations by type.

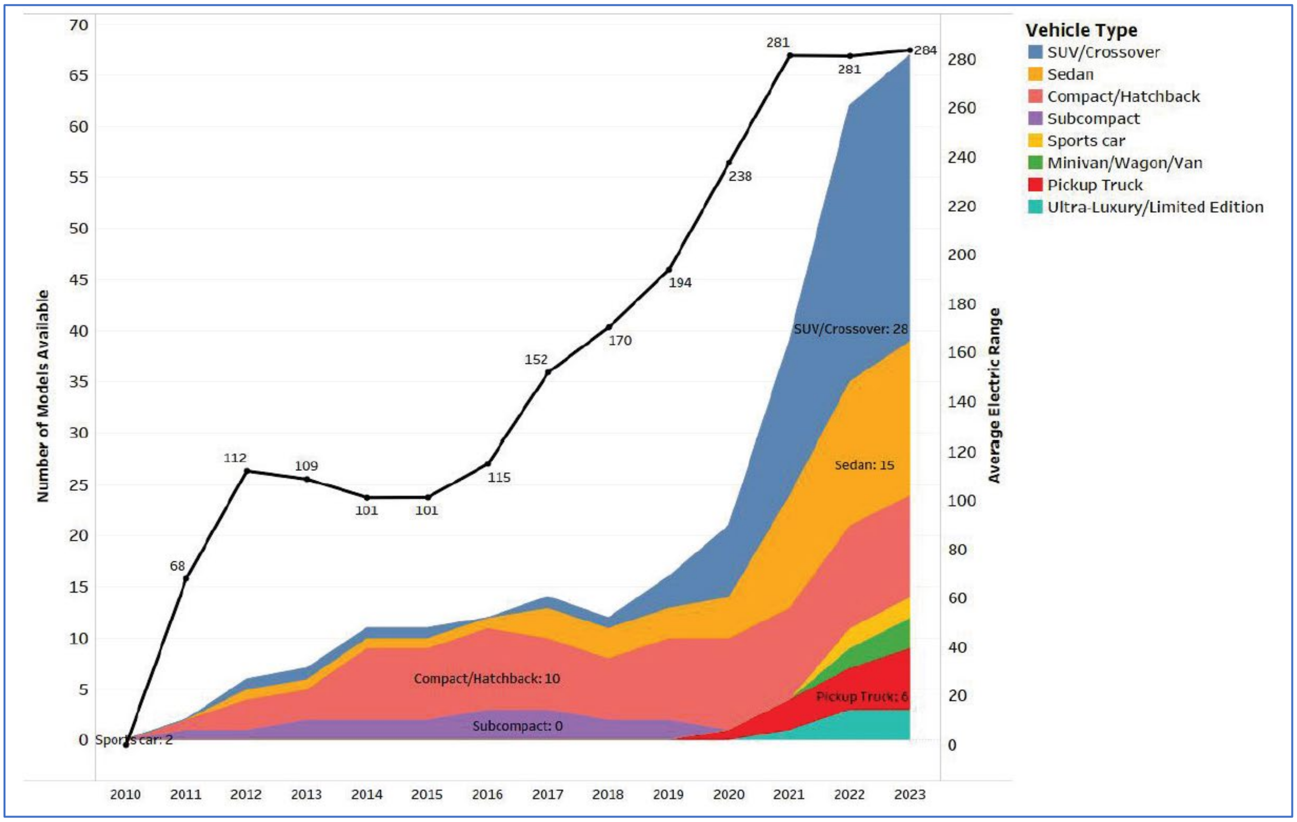
Note that the larger size stations can enable support for larger capacity electric vehicles, faster charging times and / or higher count of vehicle chargers per site.



The figure below shows the annually increasing count of electric vehicles by category since 2010. There are currently expected to be 127 models available by the year 2023.



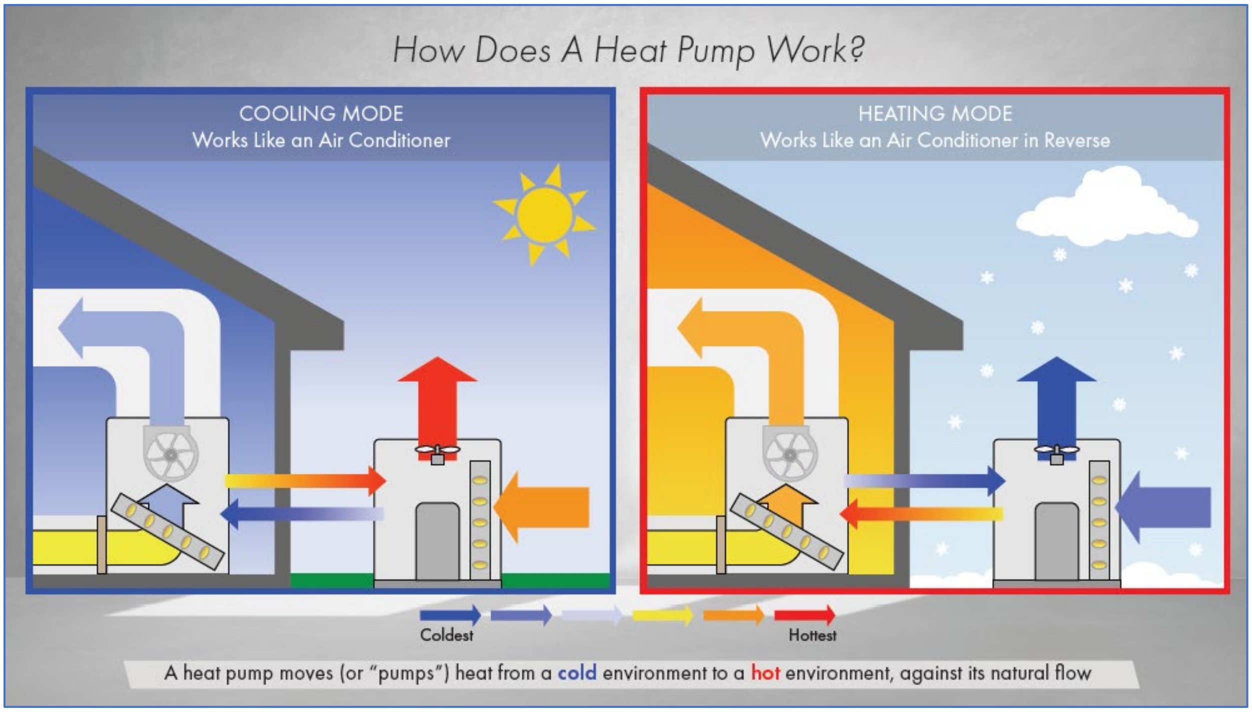
The figure below shows the annual increase in the number of Battery-Only Electric Vehicle (BEV) models available within each category of vehicle type. The line represents the increasing average annual electric range for all vehicles, which is expected to increase over the next few years.



EPRI: Consumers Guide to Modern Heat Pumps for Heating, Ventilation, and Air Conditioning

This Guide (Link to download page) provides detailed information regarding the state of the art technology for various types of heat pumps, and methods for determining the type of heat pump based on physical space requirements in building and local environmental conditions. Heat pumps can also be used in cars, water heaters, and clothes dryers. In most cases, the cost to install a heat pump is comparable to an air conditioner and furnace.

A heat pump is a device used to warm (and also cool) buildings by transferring thermal energy (heat) from a cooler space to a warmer space. They work in a similar fashion as air conditioners, in that they alternately compress and condense a refrigerant circulating between two distinct zones of temperature. Heat pumps can be configured to either extract heat from cold or the reverse, thus eliminating the need for two separate seasonal systems. The technology has been proven to be effective in terms of energy efficiency and operating ranges. Currently 12%+ of all homes in the U.S. use heat pumps for heating.



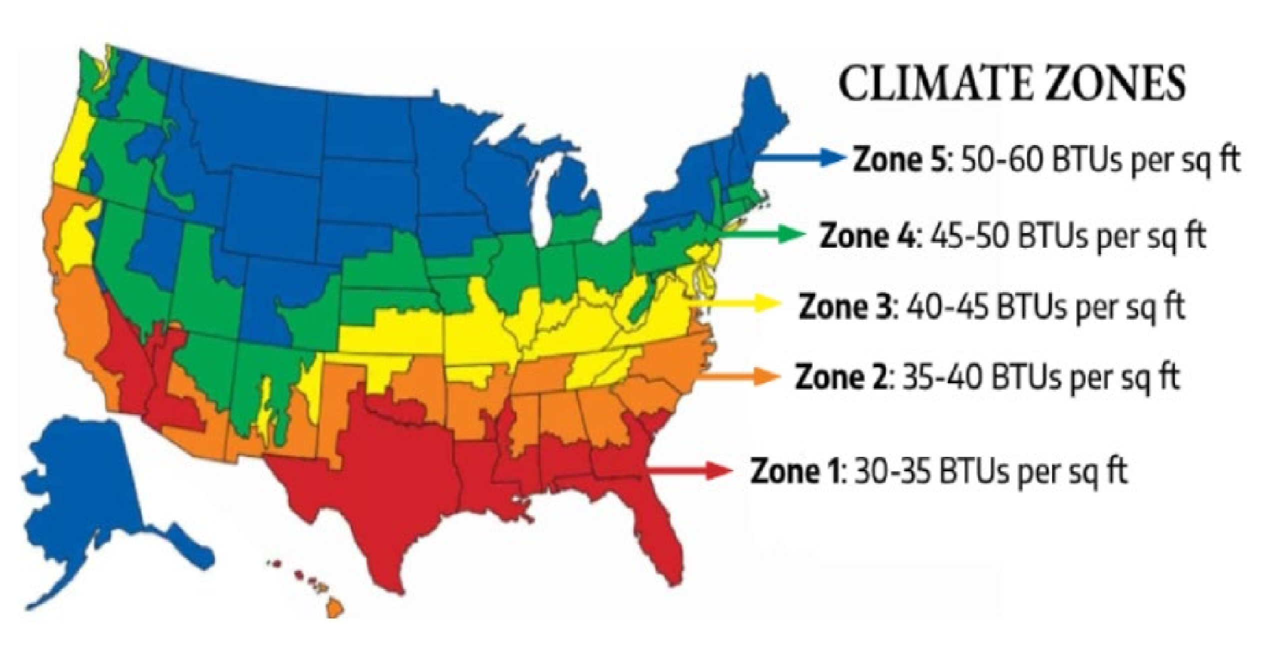
Heat pumps are rated according to Heating Season Performance Factor (HSPF) and/or Seasonal Energy Efficiency Ratio (SEER), which are the standard efficiency ratings for heating and cooling. Generally, higher HSPF and SEER numbers are considered better.

Some factors affecting cost include:

- System Needs – Size/age of home, climate, insulation, sun exposure
- Product Features – Efficiency (single vs. multi-speed), warranty, thermostat
- Backup Heat Source – Cost and availability of fuel
- Retrofit vs. New – Size/condition of existing ductwork, electrical panel, etc.
- Installer Charges – Familiarity with technology elected, tax credits, rebates
- Local Energy Prices – Electricity (kWh) and potential demand (kW) charge

Additional technical information on HVAC system behavior can be found at this EPRI Link entitled "Operating Dynamics of Heating and Cooling Systems During Extreme Temperatures - Thermal and Power System Considerations"

The capacity of a heat pump drops at low outdoor temperatures, but newer models offer better low-temperature performance. Depending on the local regional climate, a heat pump may need back-up heating (electric or gas) for the coldest periods. However, cold-climate heat pumps can operate as low as -5°F without back-up heating.



There are four basic categories of Heat Pumps:

Unitary Split: Single speed split systems are the most common heat pumps and look exactly like air conditioners. The indoor unit connects to the central ducting of the home. The compressor can be single-speed, two speed or variable speed, and efficiency of the system increases with speed options.

Packaged: Packaged heat pumps contain all components in a single “package” and connect to the home’s ductwork. They are installed outside the home, making them a good option for those with limited indoor space. These are typically installed on the ground but could also go on rooftops.

Mini-Splits and Multi-Splits: Mini-splits are smaller versions of unitary splits and typically condition a single room. The indoor unit can be ducted or ductless (wall-mount, floor-mount, cassette) so ductwork may not be needed. Multi-splits are similar systems that have multiple indoor units connected to a single outdoor unit. Most mini-splits and multi-splits have variable speed compressors, making them some of the most efficient products available.

Other Types include window-mounted (usually smaller capacity for single rooms), Ground-sourced (associated with a buried outdoor heat exchanger), and water-sourced (typically associated with a pond or lake-based heat exchanger).

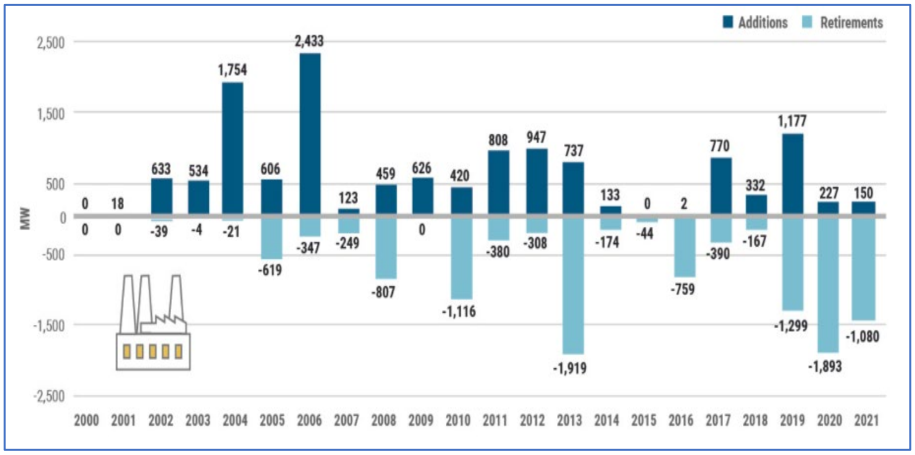
NYISO: Announcements on the Blog Page of the NYISO Website:

The latest features from the NYISO Blog Page include the following:

Power Trends Podcast: Kevin Lanahan, NYISO VP of External Affairs and Corporate Communications, interviews Dr. Tyler Hodge, Senior Economist in the Office of Energy Analysis, and Corrina Ricker, a Certified Data Scientist on the Natural Gas Markets team, regarding the Federal Energy Information Administration's (EIA) latest Short Term Energy Outlook (STEO). Hodge explains the relationship between fuel costs and energy prices, and how recent geopolitical factors are creating uncertainty about energy supply. Ricker explains the relationship between the economic slowdown resulting from the pandemic and how the demand for natural gas has more recently outpaced the growth in supply, leading to higher prices. Both analysts also share price forecasts in the STEO based on various economic data for the next several months, and discuss the expected growth of clean energy resources on a national basis.

Article Grid Reliability Requires a Careful Transition from Fossil Fuels:
This article reflects on material presented in the NYISO's 2022 Power Trends Report and Datasheet.

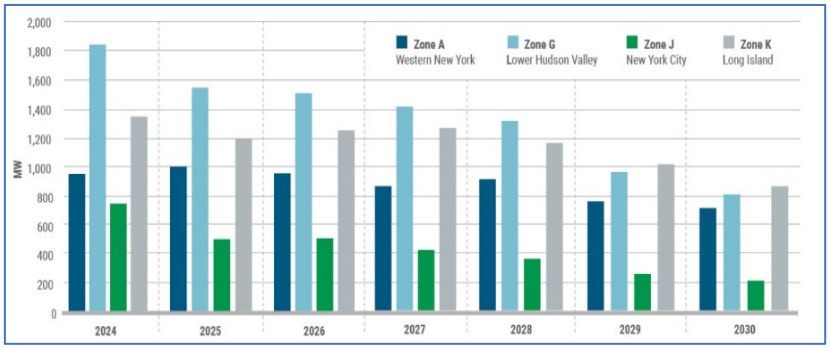
The NYISO is forecasting reliability margins to shrink in upcoming years in several regions of the state. Over the last 3 years, over 4,200 MW of generation have already been removed from the New York grid, including 2,000 MW of emission-free nuclear power, along with flexible fossil fuel resources located close to New York City. At the same time, only 1,500 MW of new resources were added to the grid, most of which based on more intermittent solar/wind, located further away from areas of higher demand.



Improving transmission will help. Plans for new energy storage resources will also help provide a cushion, but batteries do not generate electricity and can only provide power for a few hours.

Extreme weather, notably an extended heat wave, creates its own concerns. Models show possible weather-related risks to reliability in New York City as soon as 2028. This is due to expected increased demand from air conditioning during hotter days.

The grid will also need sufficient flexible and dispatchable resources to balance variations in wind and solar resource output. These resources need to be long-duration, dispatchable, and emission-free. Essentially, they will have the attributes of fossil generators (responding quickly to rapid system changes) without the emissions. Such resources are not now commercially available and may not be for many years.



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 August 19th, and representing the Queue as of July 31st. Note that 14 projects were added, and 4 were withdrawn during the month of July. Results are tabulated below and shown graphically on the next page.

Total Count of Projects in NYISO Queue by Zone

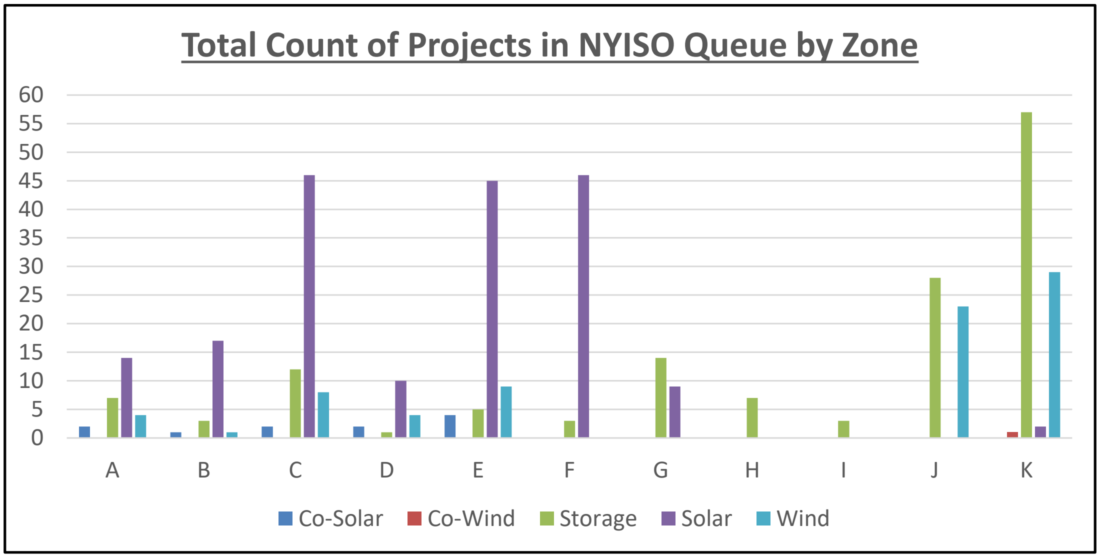
Zone	Co-Solar	Co-Wind	Storage	Solar	Wind
A	2		7	14	4
B	1		3	17	1
C	2		12	46	8
D	2		1	10	4
E	4		5	45	9
F			3	46	
G			14	9	
H			7		
I			3		
J			28		23
K		1	57	2	29
State	11	1	140	189	78

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		41	2,521	200
C	70		1,204	5,054	1,063
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			4,815		26,626
K		96	5,782	59	26,968
State	1,153	96	18,460	17,972	57,406

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		14	148	200
C	35		100	110	133
D	20		20	167	212
E	163		14	98	121
F			98	42	
G			110	28	
H			466		
I			333		
J			172		1,158
K		96	101	29	930
State	105	96	132	95	736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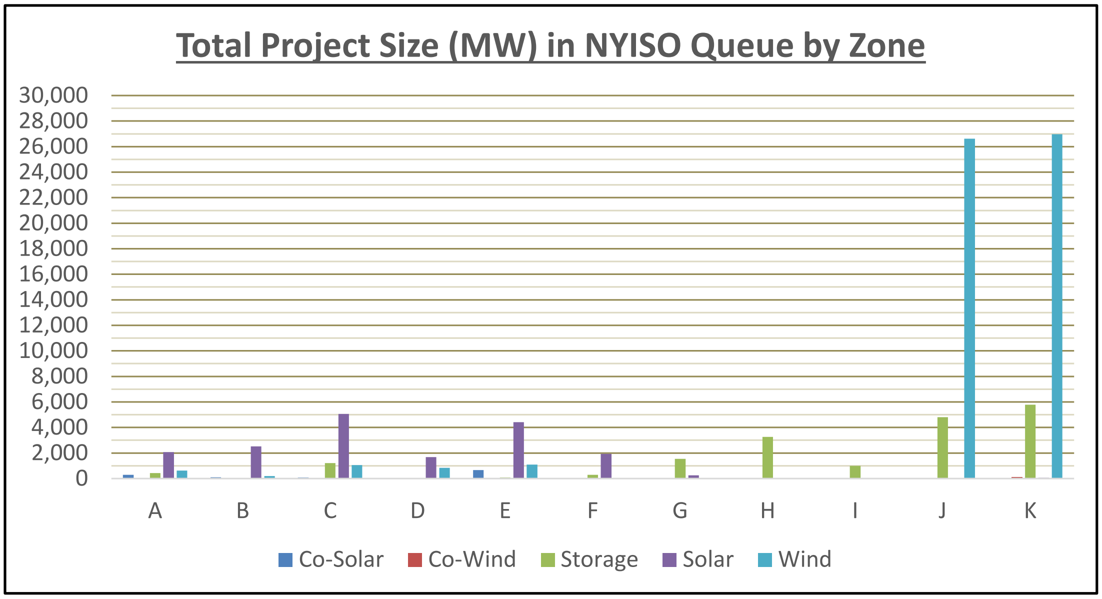
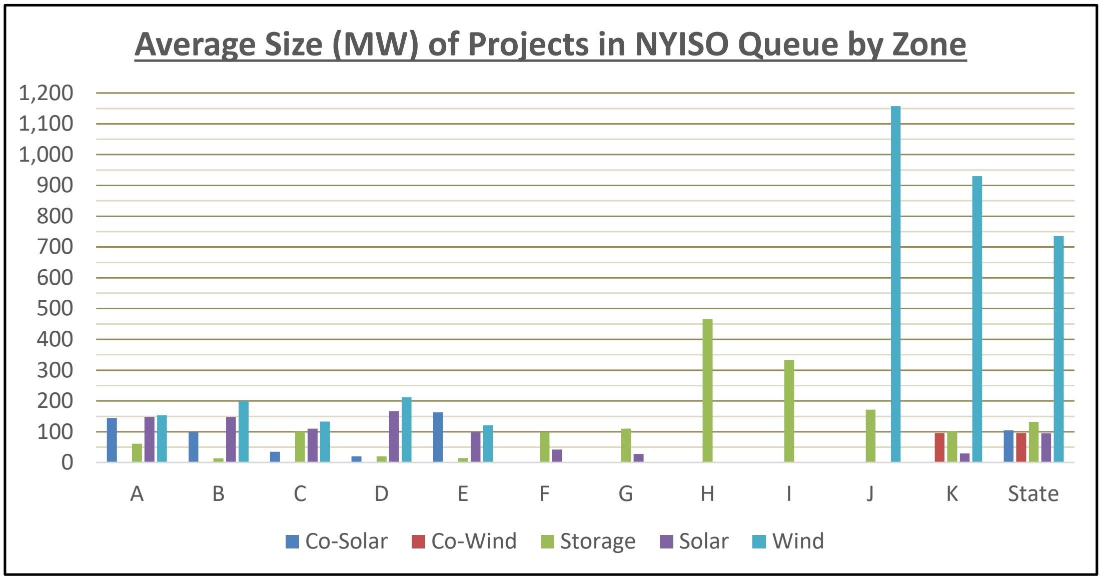

Total Project Size (MW) in NYISO Queue by Zone


Average Size (MW) of Projects in NYISO Queue by Zone