

Planning for a Grid in Transition

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Climate Action Council

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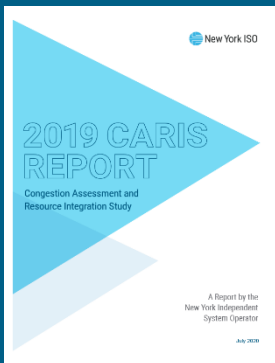
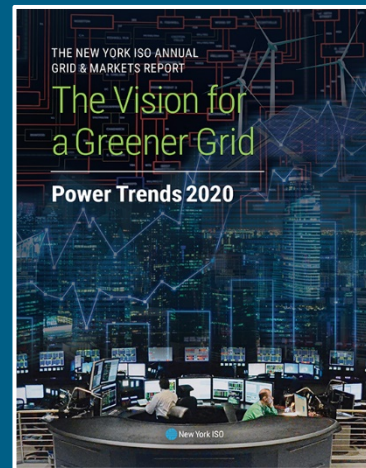
Our mission, in collaboration with our stakeholders, is to serve the public interest and provide benefit to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policymakers, stakeholders and investors in the power system



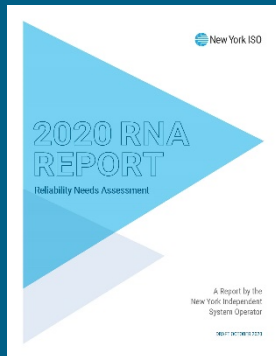
The Vision for a Greener Grid

- Delivering on our mission: the Grid is the platform for success of the CLCPA.
- We believe State policy goals can be achieved while maintaining grid reliability.
- In support of the CLCPA objectives, we are hard at work identifying future needs of the system.
- The NYISO is conducting studies to plot the most productive way forward while maintaining reliability and keeping costs low for consumer during this difficult time.



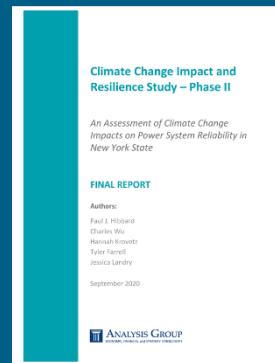
Congestion Assessment and Resource Integration Study (CARIS):

includes a scenario analyzing the CLCPA's 70X30 goal:



Reliability Needs Assessment (RNA)

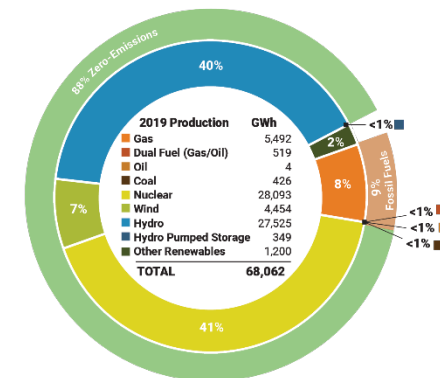
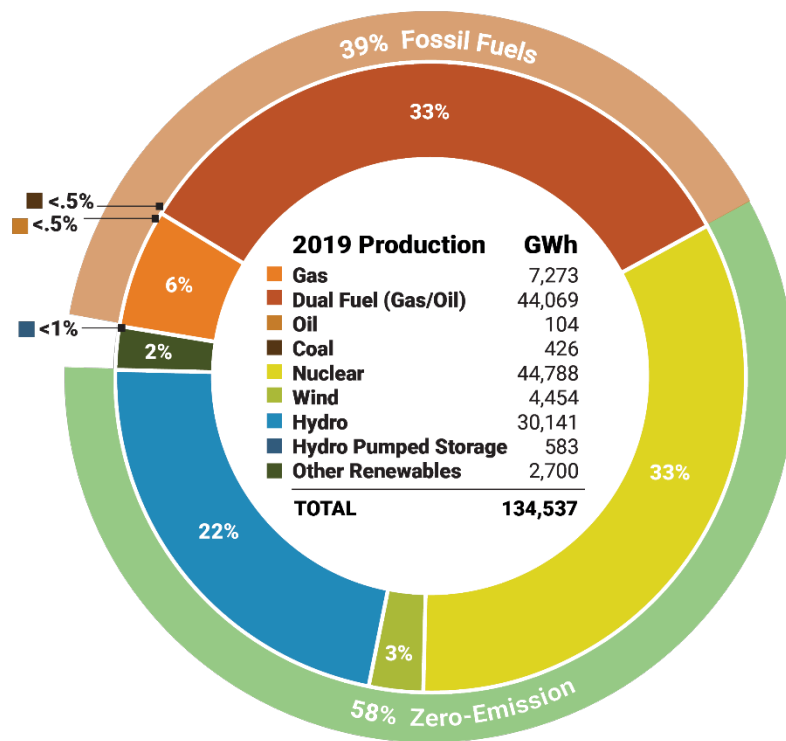
examines the DEC rules on emissions from generators used to serve peak load;



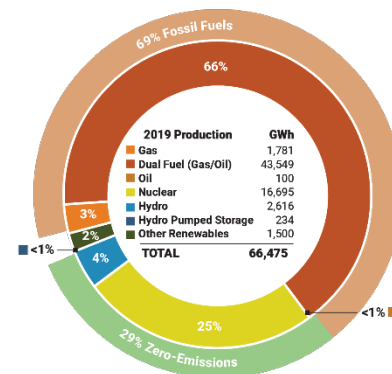
The NYISO has also undertaken a **Climate Change Impact & Resilience Study**

New York 2019 Energy Production

New York
Statewide
Energy
Production
by Fuel
Source:
2019



Upstate
(Zones A-E)
Energy
Production
by Fuel
Source:
2019



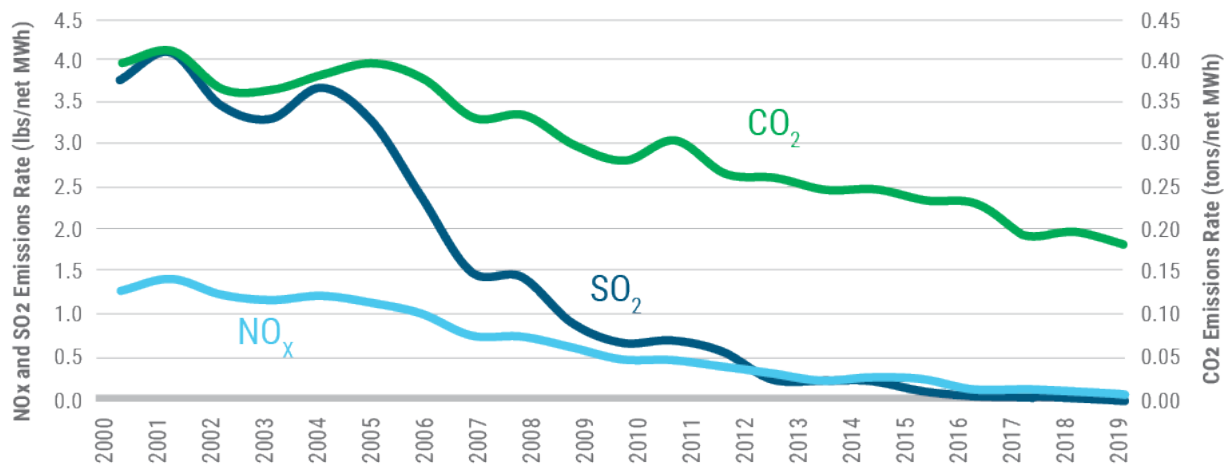
Downstate
(Zones F-K)
Energy
Production
by Fuel
Source:
2019

Cleaner Generation but Much More To Do

Emissions Rates from Electric Generation in New York: 2000-2019

From 2000 through 2019, emission rates of:

- Sulfur dioxide (SO₂) dropped 99%
- Nitrogen oxides (NO_x) dropped 92%
- Carbon dioxide (CO₂) dropped 55%



A Grid in Transition – Path Forward

- **The NYISO's wholesale markets can serve as an effective platform for achieving New York State environmental objectives.**
 - Through active engagement with stakeholders and policymakers, the NYISO is developing design improvements to meet the future challenges expected to arise with high levels of intermittent renewable and distributed energy resources.
- **The plan includes a set of market design enhancements that work together coherently and efficiently to satisfy New York's changing grid reliability needs.**
 - Nine areas of market design opportunities across three main points of focus require immediate attention and are recommended for implementation in the next five years, through 2024.

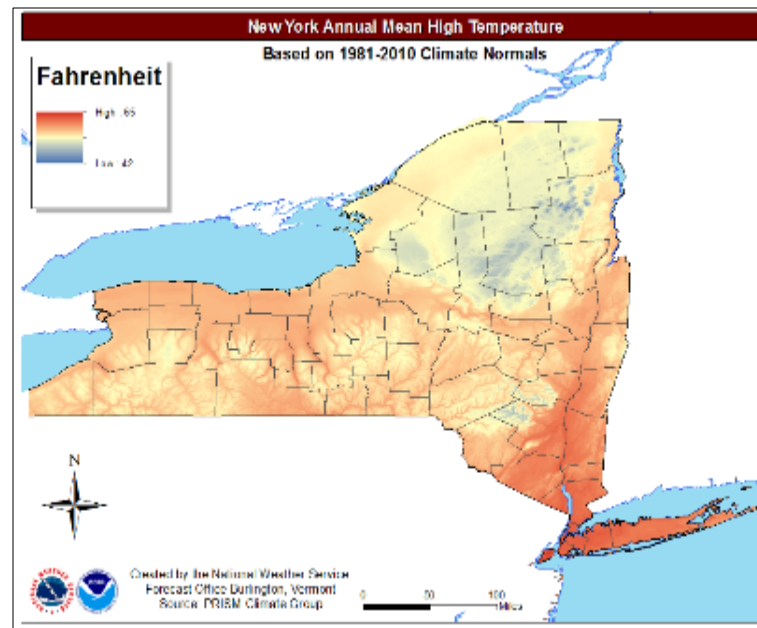


Grid in Transition

Demand Trends

Climate Change Study – Phase 1

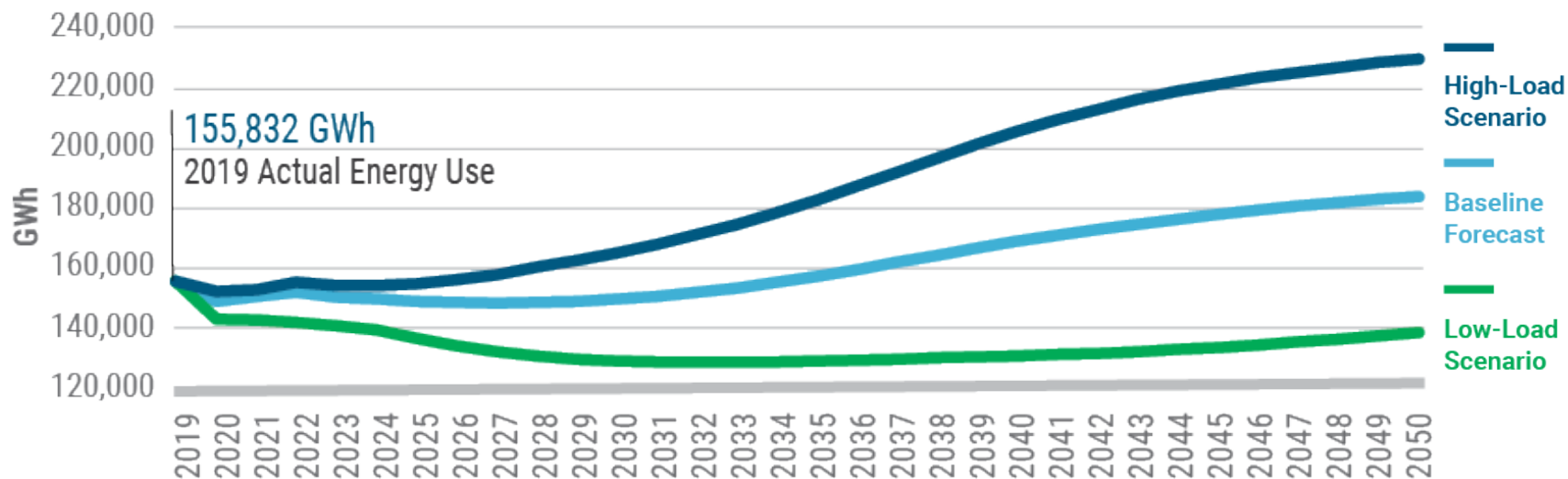
- Evaluate temperature trends and state climate impact studies
- Develop long-term energy, peak, and hourly load shapes that reflect the potential impact of climate change
- Construct additional forecast scenarios that reflect state policy goals and include climate change impacts
- Develop long range models to incorporate into future studies



Demand Trends

2019-2050 Forecast

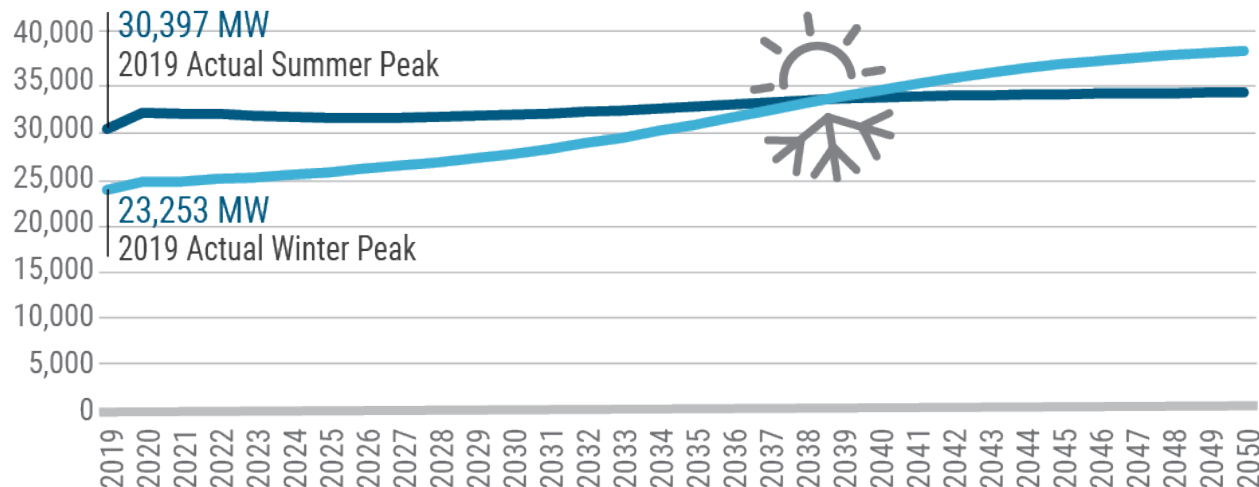
Electric Energy Usage Trends and Forecast in New York State: 2019-2050



Electrification Policies & the Grid

The NYISO leveraged assumptions from its climate change study about electrification to inform its *2020 Gold Book* winter and summer peak load forecasts. Notably, the NYISO's forecasts suggest that the impacts of EVs and increased reliance on electricity for heating will lead to the system peak shifting from summer to winter as early as 2039.

2020 Gold Book Baseline Summer and Winter Peak Forecasts



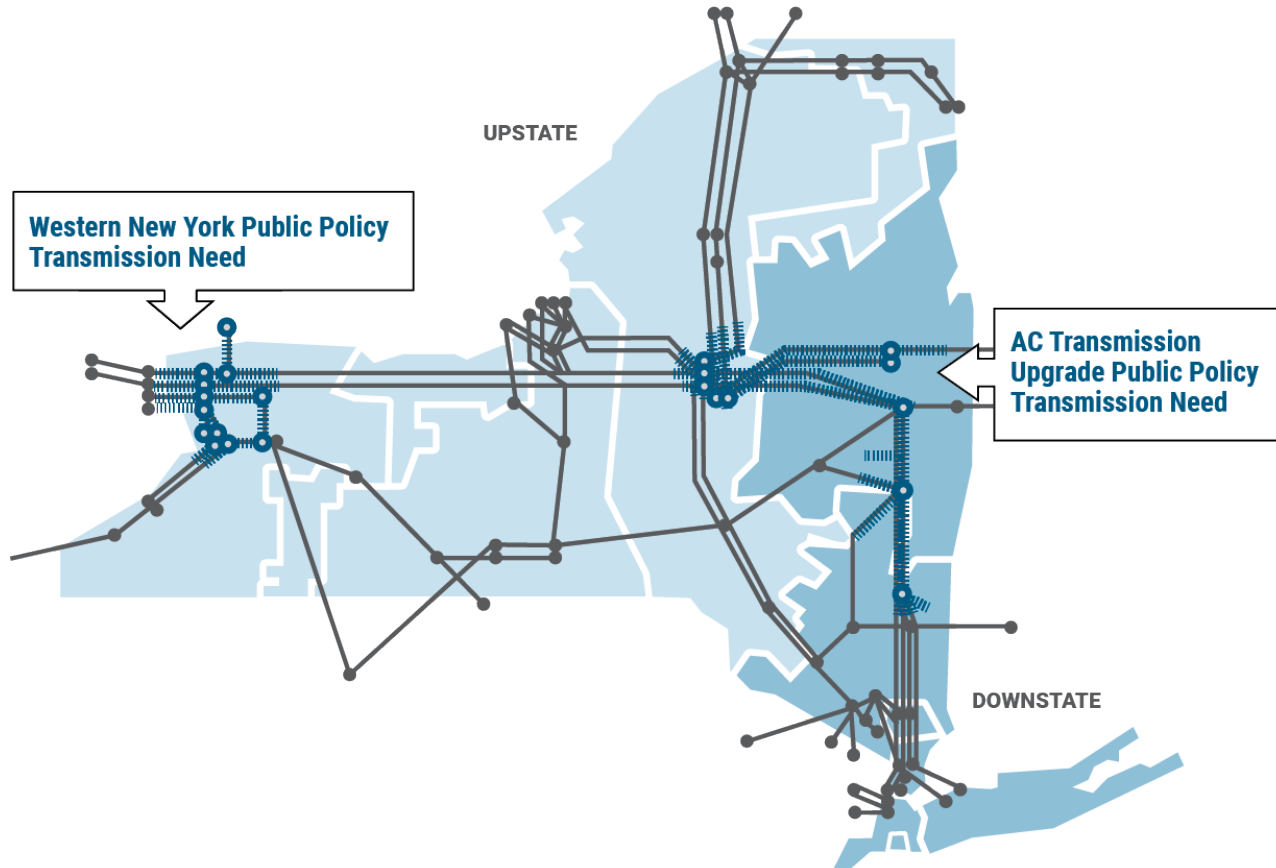
Current System Reliability Needs

- Deficiencies in reliable system performance are currently projected during the 2023 - 2030 time period.
- These deficiencies (primarily in the New York City area) are primarily driven by expected reductions in available generation capacity to comply with NOx emission regulations.
- The magnitude and nature of the deficiencies are driven by the ten-year load forecast in combination with insufficient transmission or generation to serve the forecasted load.
- The deficiencies can potentially be addressed by combinations of solutions including generation, transmission, and load reduction measures (energy efficiency, demand response, etc.)
- The NYISO continues to reassess the load forecast in light of COVID-19 and the associated evolving impacts to the economy and demand on the electric grid.

Grid in Transition

Transmission

Public Policy Transmission

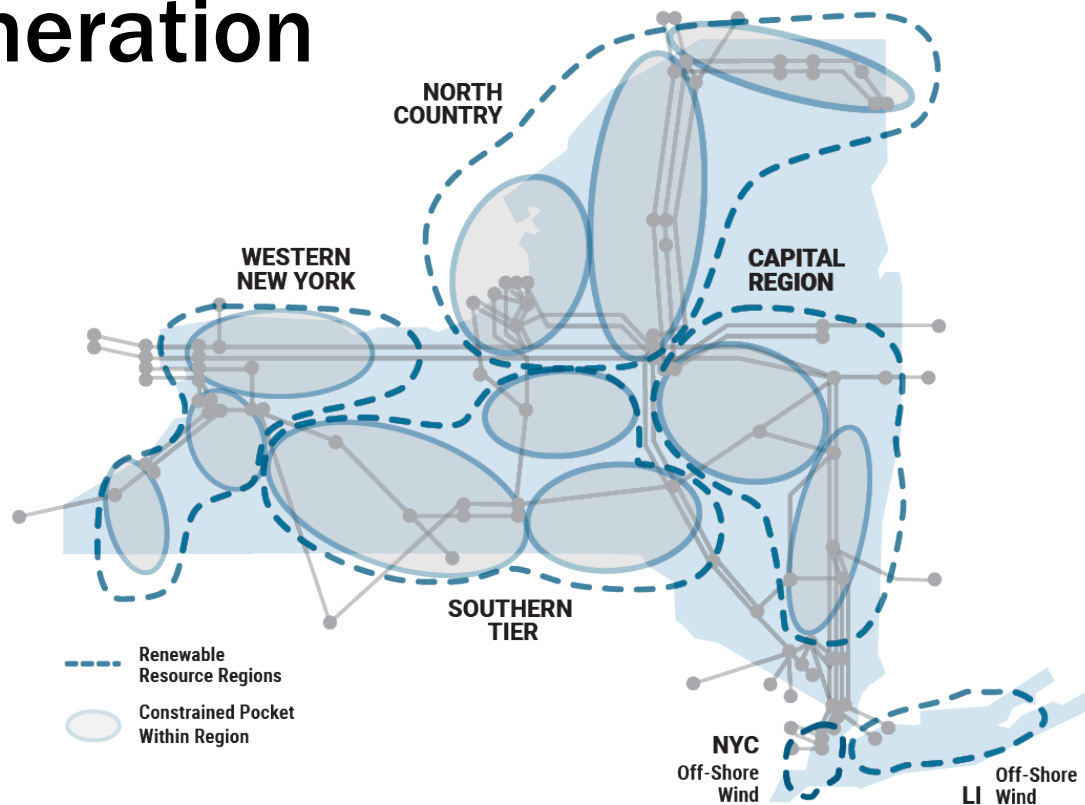


Most Significant Investment in Decades:

- Increase flow of hydro and imports from Ontario from Western NY to the eastern NY
- Increase flow from upstate to downstate by ~1,000 MW

Renewable Generation Pockets

- Transmission constraints that may prevent renewable energy delivery.
- Renewable generation would be curtailed due to insufficient bulk and local transmission capability to deliver the power.
- Additional transmission expansion, at both bulk and local levels, will be necessary to efficiently deliver renewable power to New York consumers.

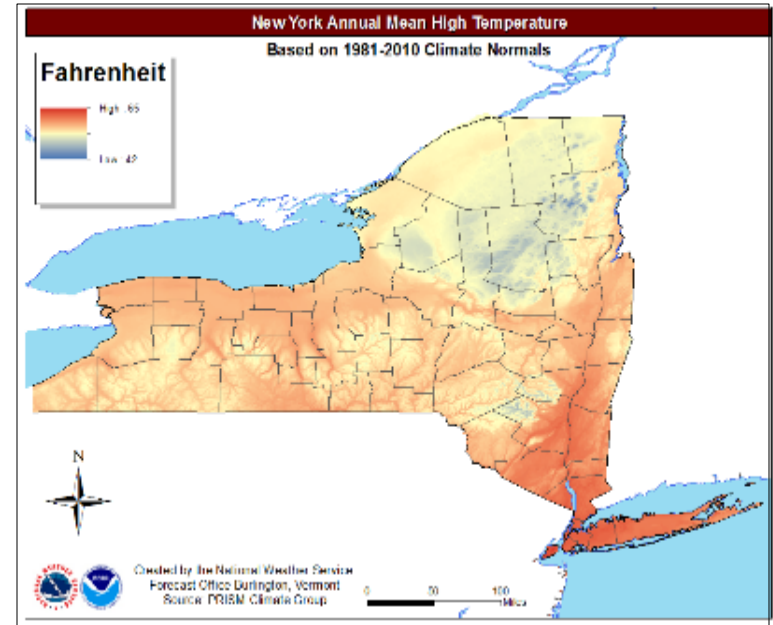


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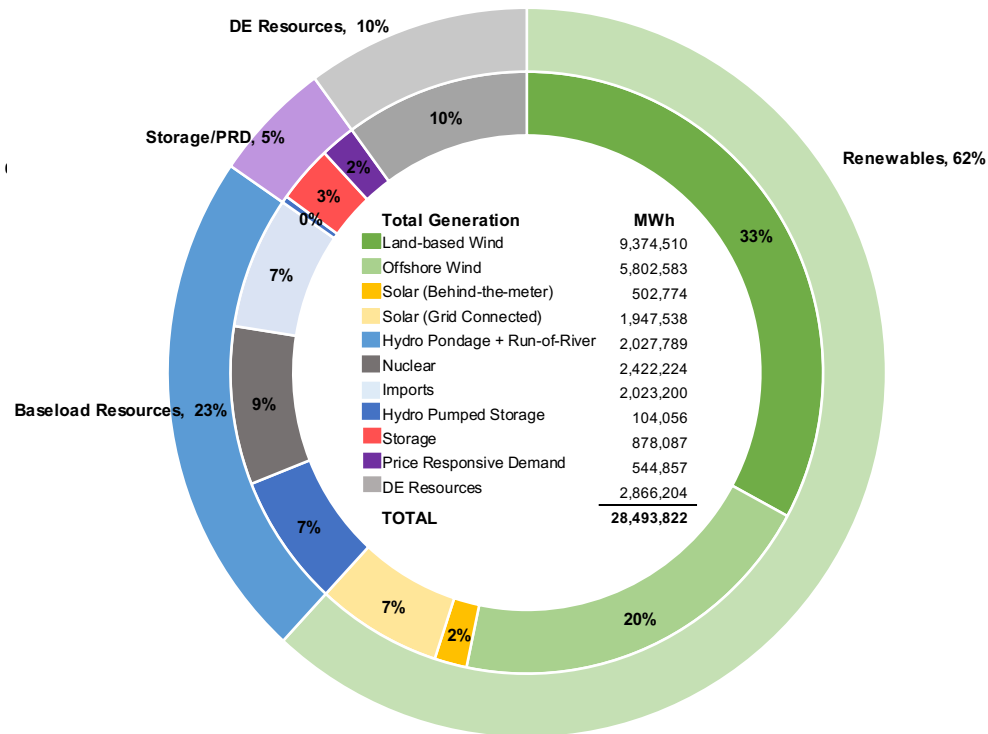
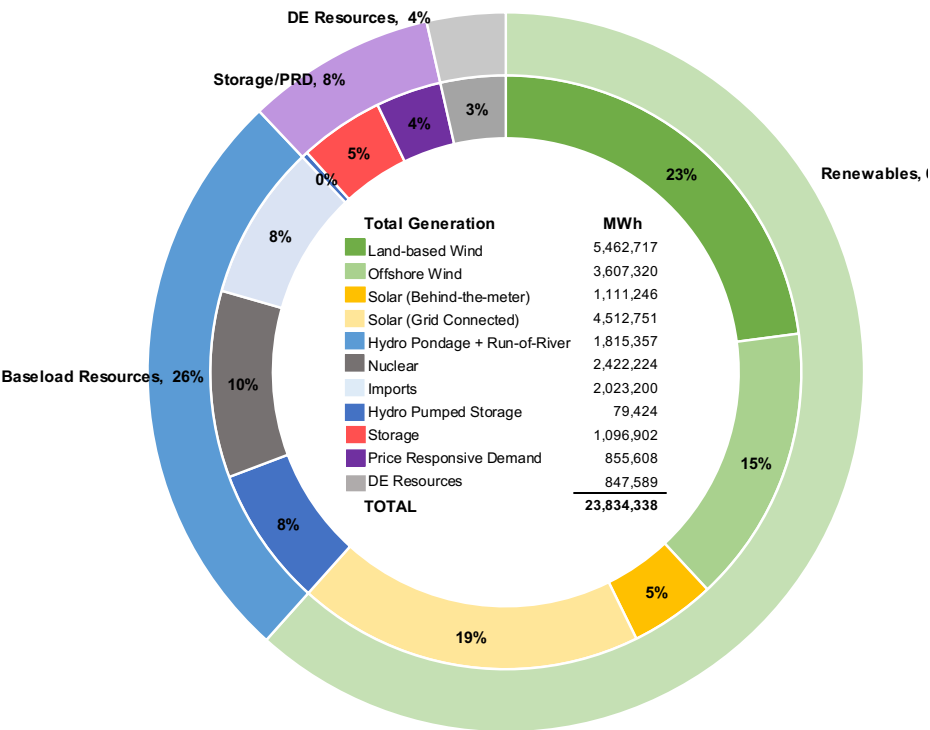
Supply

Climate Change Study – Phase 2

- Examines various generation scenarios that could meet policy objectives in 2040
- Uses an hourly, deterministic evaluation tool for the purpose of considering various potential impacts on the electric grid
 - Study examines whether the bulk power system is able to serve load and meet reserve requirements under a variety of conditions
- Assesses the resiliency of the grid for climate events such as periods of extreme temperatures, wind lulls, and severe storms

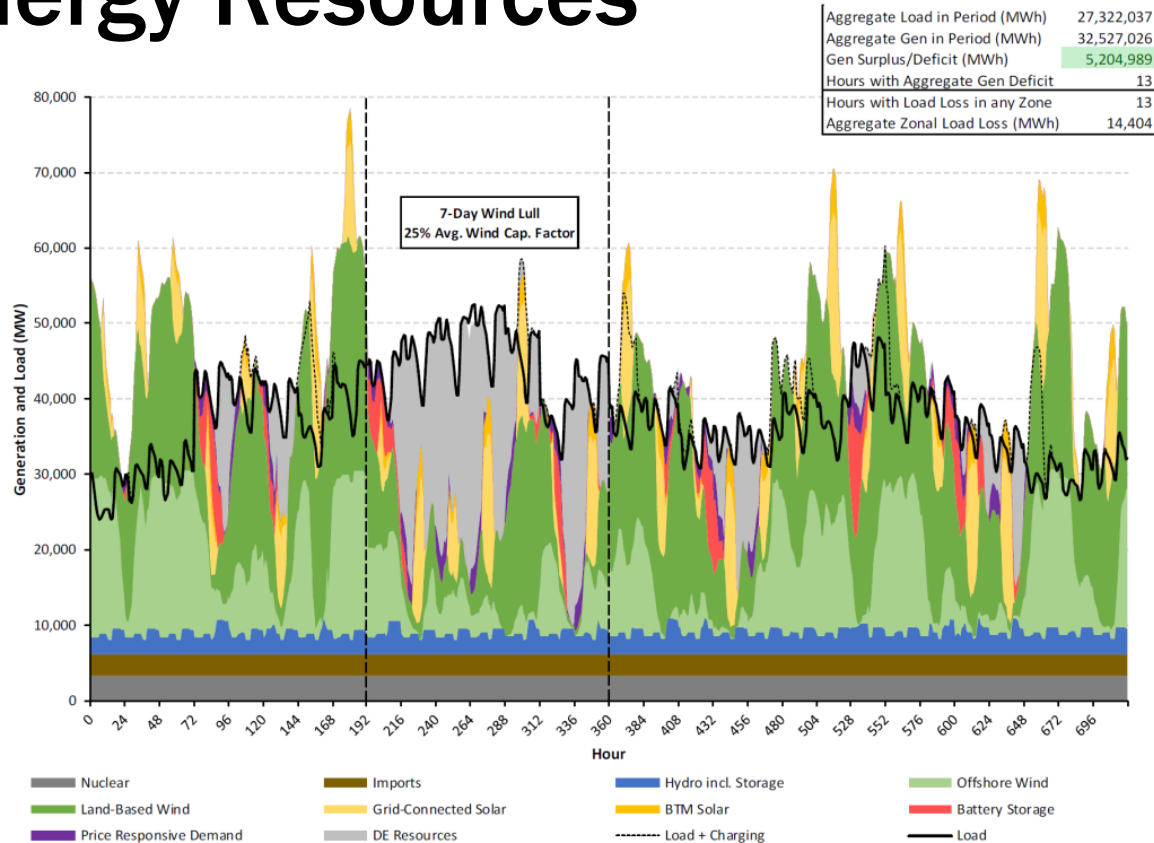


Resource Mix by Seasonal Modeling Period



Dispatchable Energy Resources

- Large quantity of installed dispatchable energy resources needed in a small number of hours
- Dispatchable resources must be able to come on line quickly, and be flexible enough to meet rapid, steep ramping needs



Grid in Transition

Conclusions

Key Takeaways

- The intermittency associated with wind and solar resources presents a fundamental challenge to relying on those resources to exclusively meet electricity demand.
- Transmission investment, at both bulk and local levels, will be necessary to efficiently deliver renewable power to New York consumers.
- The current system is heavily dependent on existing fossil-fueled resources to maintain reliability. Eliminating these resources will require investment in new and replacement infrastructure, and/or the emergence of a zero-carbon fuel source for thermal generating resources.
 - Market solutions to drive investment
 - Development of innovative new technologies
- The dispatchable and emissions-free resources needed to balance the system must be significant in capacity, able to ramp quickly, and be flexible enough to meet rapid, steep ramping needs.
- Battery storage resources help address variability from renewable resources, but based on current technology, periods of reduced renewable generation rapidly deplete battery storage resource capabilities.

Questions?