

Power Trends 2019

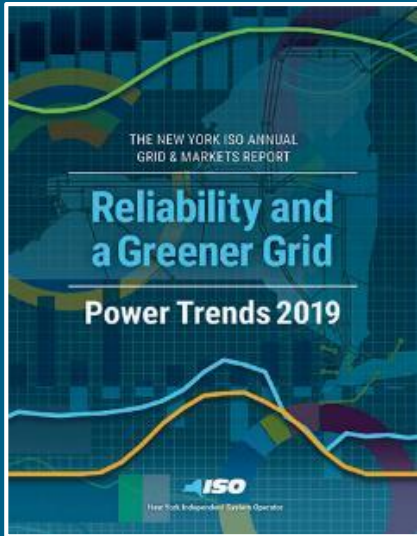
Reliability and a Greener Grid

New York Independent System Operator

Market Metrics, State of the Grid, Public Policy & the Grid,
Making Policy Work, and Grid in Transition

Power Trends 2019: Reliability and a Greener Grid

provides information and analysis on current and emerging trends that are working to transform the power grid and wholesale electricity markets.

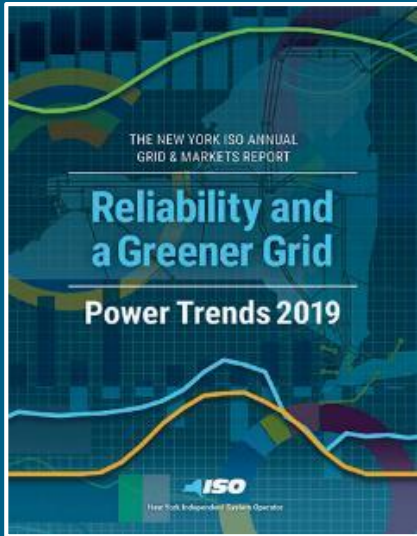


Key Challenges:

- **Aggressive public policy** goals focused on shifting patterns of demand for electricity serve to influence how investors, policymakers, and consumers view electricity production, transmission, and consumption
- Complicating achievement of these goals is the fact that these changes must be pursued in the context of a bulk power system that operates to **the strictest reliability rules in the nation**
- Underlying all NYISO processes has been the belief that open, competitive markets for wholesale electricity result in the most efficient allocation of resources and **serve New Yorkers best by minimizing the costs and investment risk**



Power Trends 2019: Reliability and a Greener Grid

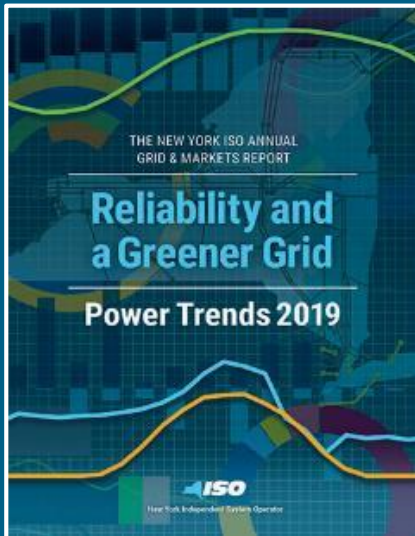


Key Trends:

- **New technologies**, such as storage and solar, are beginning to enter the wholesale markets. Distributed Energy Resources (DERs) are changing how energy is produced and consumed. New wind projects, including offshore projects, are being proposed
- **Public policies** aimed at reducing emissions and expanding the use of renewable power resources
- **Infrastructure** expansion and market enhancement are necessary to support achievement of public policy goals efficiently and reliably
- **Economic influences** led by low natural gas prices and changing consumption forecasts
- **Bolstering grid resilience** through effective operations, market design features, and planning

Power Trends 2019: Reliability and a Greener Grid

Key Opportunities:



- **Carbon Pricing:** The NYISO is developing a proposal to incorporate the societal costs associated with CO₂ emissions into its energy markets to better reflect the state's policy of reducing emissions. The proposal creates stronger incentives for efficiency improvements to existing resources, developing zero-emitting resources like wind and solar, and helping NYS more efficiently attain its clean energy goals
- **Markets Enhancements:** The NYISO plans further enhancements to its markets to establish stronger price signals for resources, such as energy storage and DERs, and is evaluating its planning processes to identify opportunities to more flexibly respond to the increased volume of proposals from smaller resources seeking to interconnect

State of the Grid

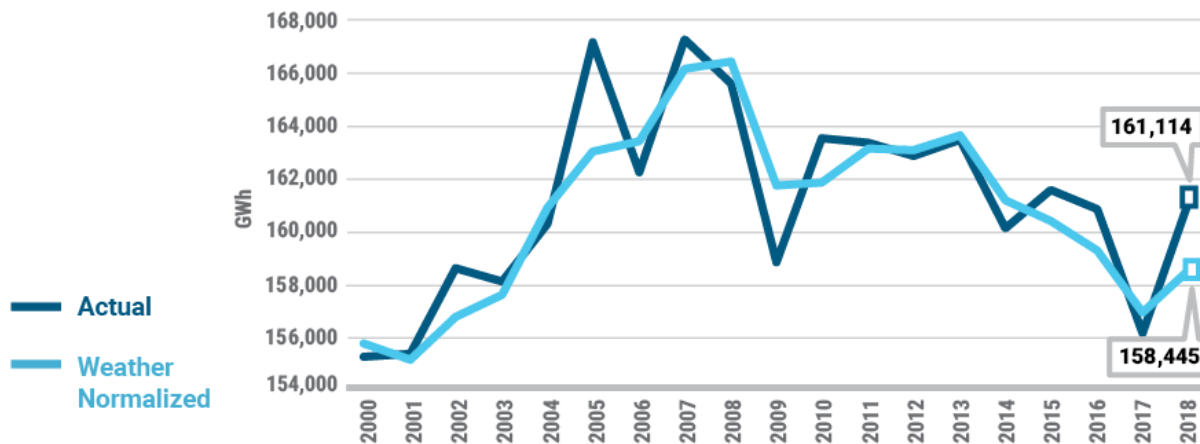
Demand Trends

2000-2018

Actual and Weather Normalized Energy Usage

- The amount of electricity supplied by the grid has generally declined since peaking in 2007
- Annual Electricity usage in New York increased by 3.03% in 2018 from 2017.
- Upstate saw the largest percentage increase (4.29%)

Annual Electric Energy Usage Trends in New York State: 2000-2018

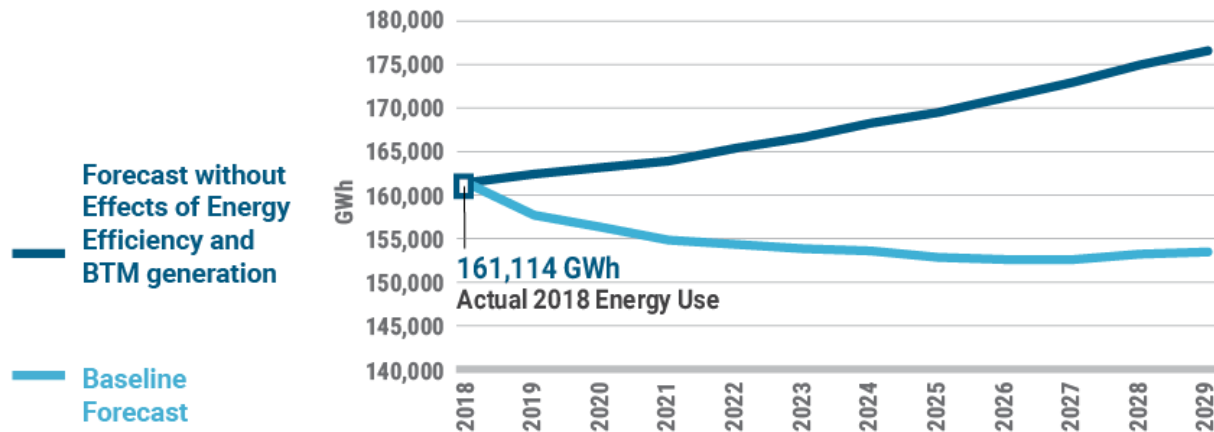


Demand Trends

2018-2029 Forecast

- Grid-supplied energy usage forecast to decrease by 4.88% in 2029 as compared to 2018
- Energy efficiency and DERs forecast to reduce grid-supplied electricity by 22,879 GWh in 2029
 - Equivalent annual consumption of ~3.2 million NY households

Electric Energy Usage Trends and Forecast in New York State: 2018-2029

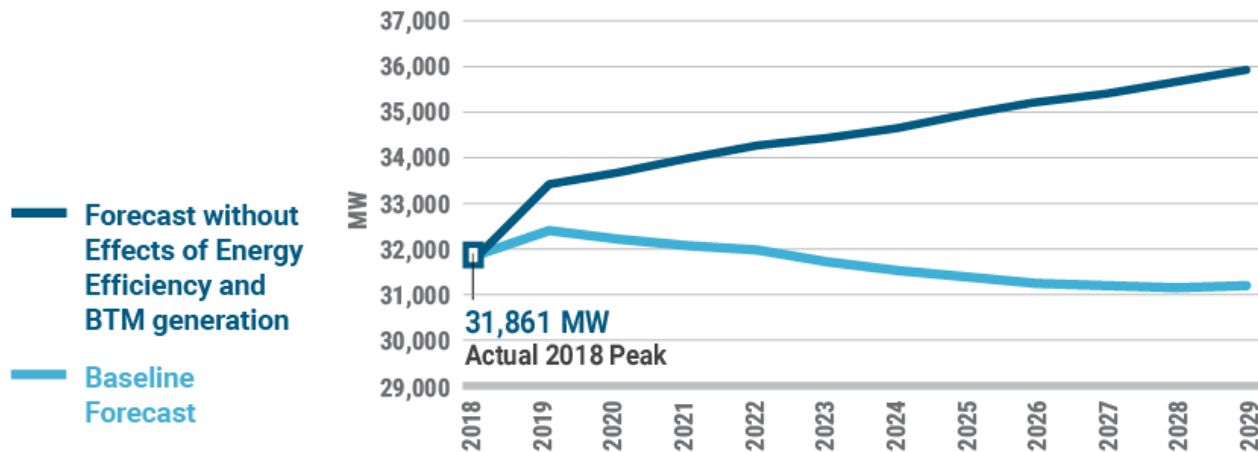


Peak Trends

2018-2029 Forecast

- Peak demand decreases 2.3% in 2029 as compared to 2018
- Energy efficiency and DERs forecast to reduce peak demand by 4,859 MW in 2029

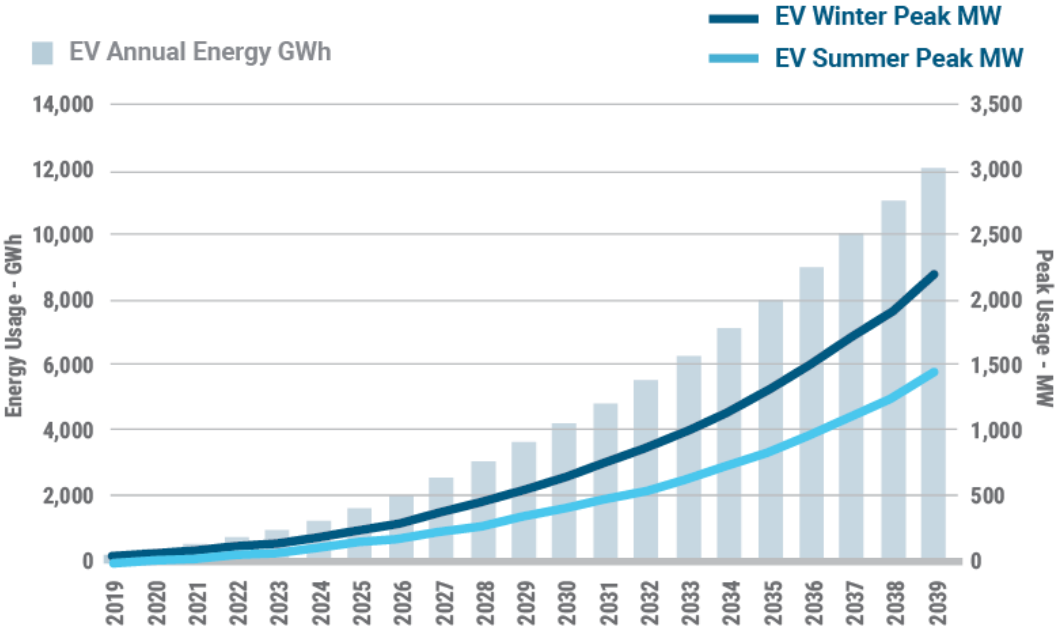
Electric Peak Demand Trends in New York State – Actual & Forecast: 2018-2029



Electric Vehicle Energy & Peak Impacts Forecast

2019-2039

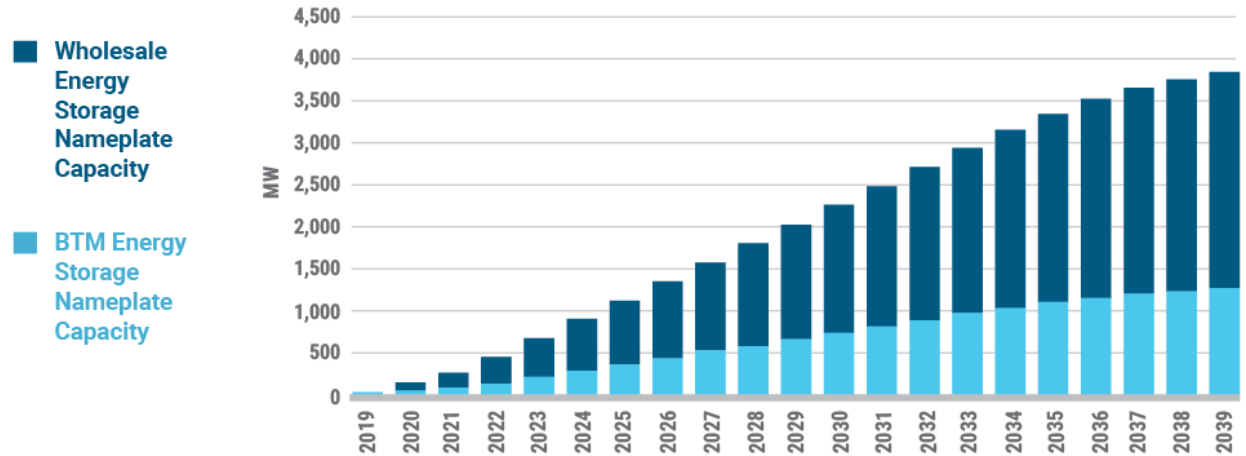
- EV adoption rates are expected to increase annual energy use on the grid by 4.2 million MWh by 2030
- Summer 2030 demand impact 410 MW
- Winter 2030 demand impact 650 MW



Energy Storage Capacity Forecast

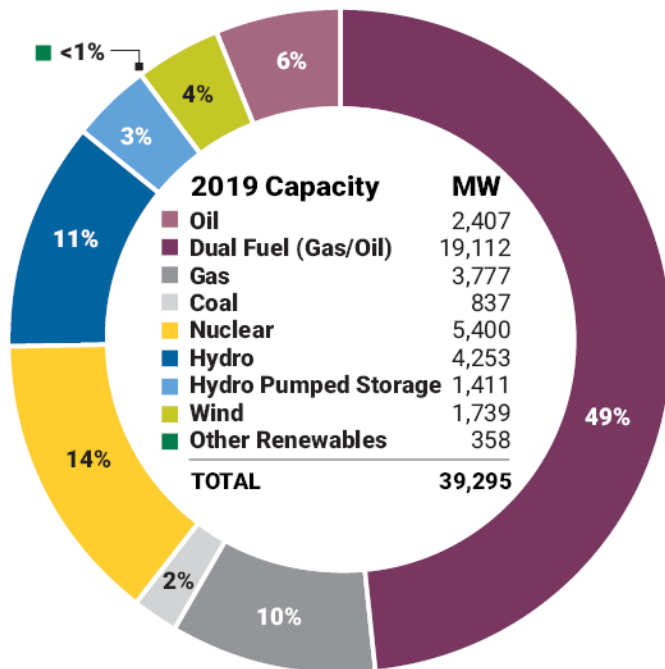
2019-2039

- The NYISO expects grid-connected storage resources to participate in wholesale markets as competitive suppliers.
- The NYISO also projects growth in behind-the-meter storage deployments that will serve to reduce peak demand

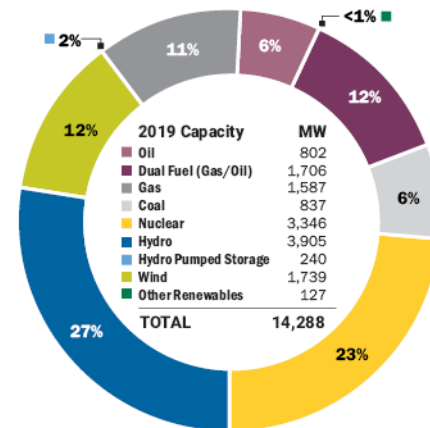


Fuel Mix – Generating Capacity

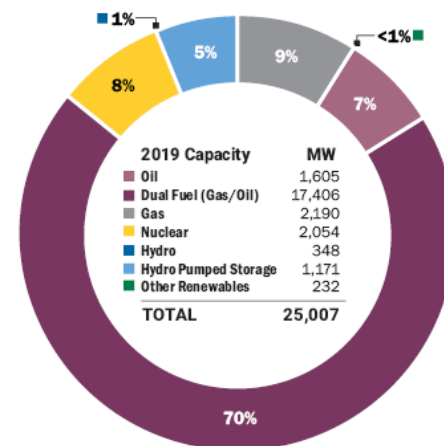
New York
Statewide
Generating
Capacity
by Fuel
Source:
2019



Upstate
(zones A-E)
Generating
Capacity by
Fuel Source:
2019

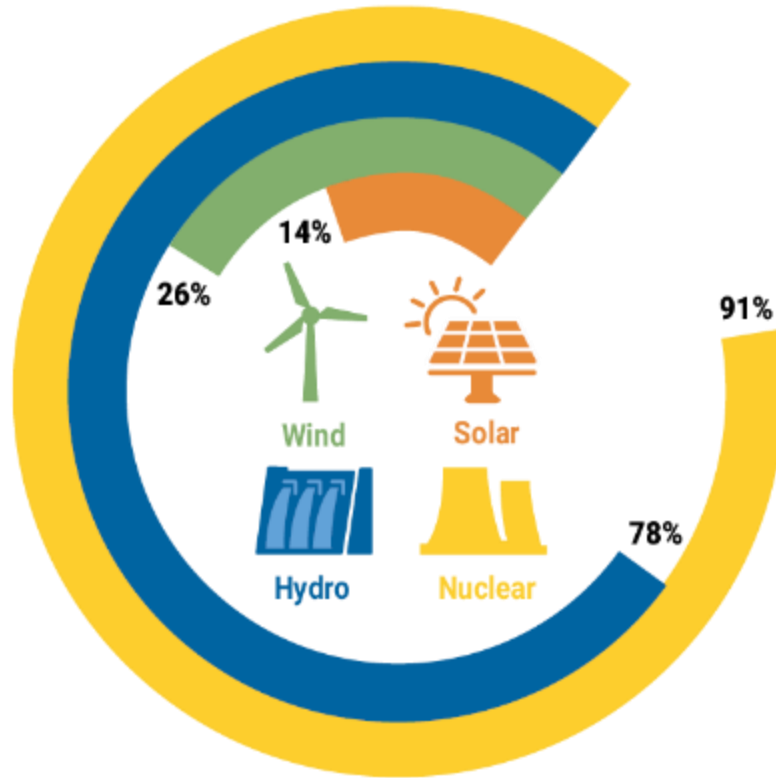


Downstate
(zones F-K)
Generating
Capacity by
Fuel Source:
2019



Capacity Factors

2018 Annual Capacity Factors for Clean Energy Resources



Capacity and Energy:

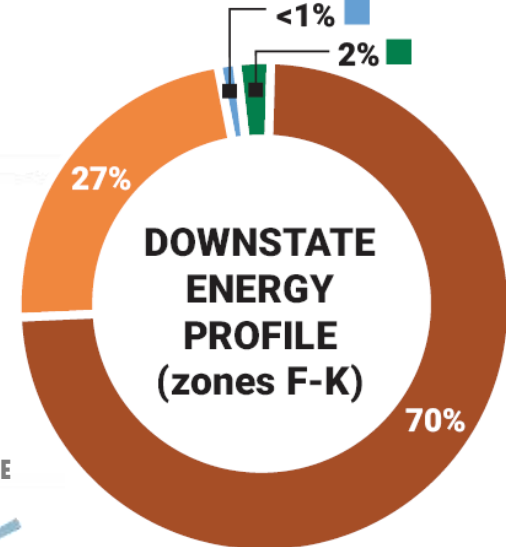
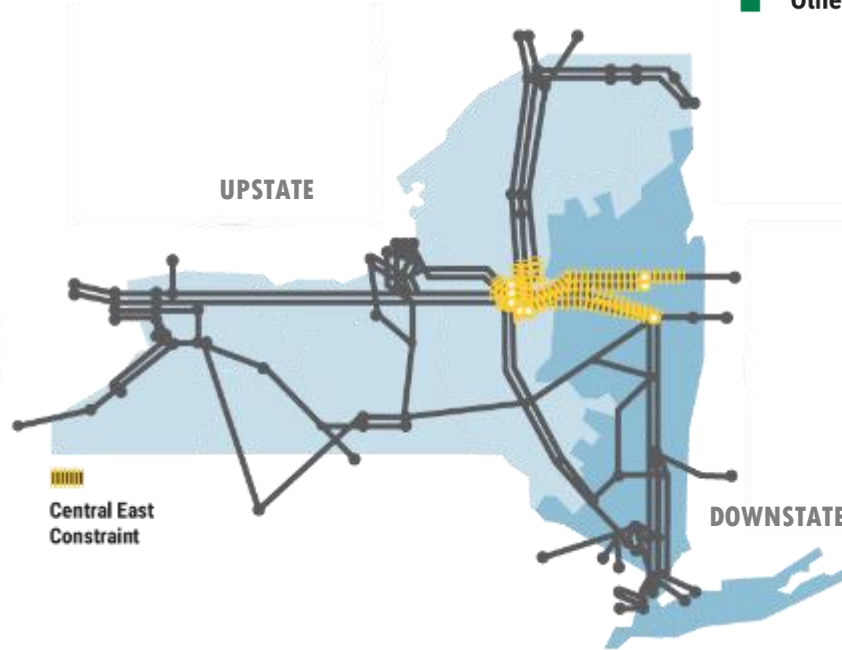
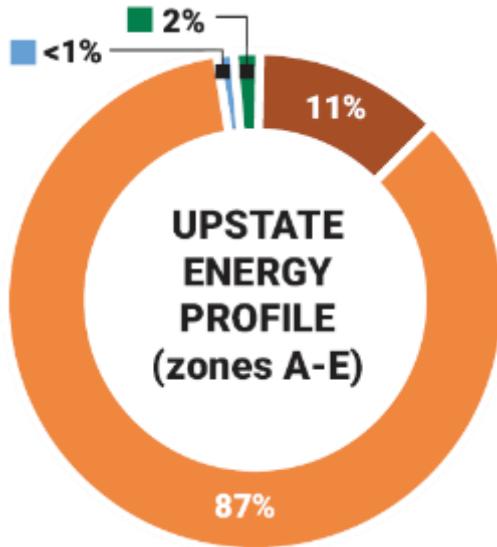
- It would require 3 MW of wind capacity to produce the same amount of energy as 1.0 MW of hydro capacity
- Production from intermittent renewables cannot be dispatched in the same manner as more conventional generation can

Tale of Two Grids

2018 Regional Energy Production Profiles

Energy Produced from:

- Fossil Fuel
- Zero Emission
- Hydro Pumped Storage
- Other Renewables



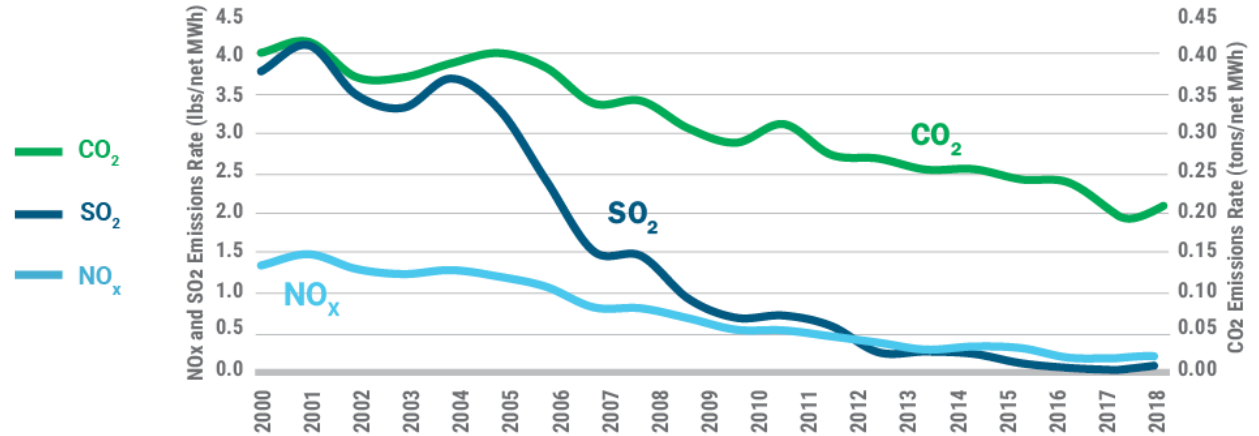
Public Policy & The Grid

Cleaner Generation

Emissions Rates from Electric Generation in New York: 2000-2018

From 2000 through 2018, emission rates of:

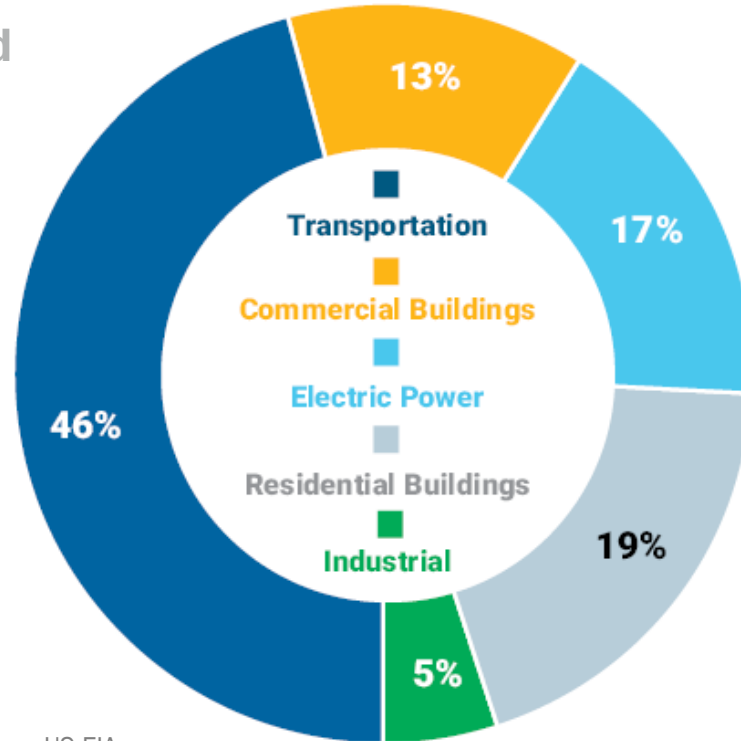
- Sulfur dioxide (SO₂) dropped 98%
- Nitrogen oxides (NO_x) dropped 89%
- Carbon dioxide (CO₂) dropped 51%



Sources: U.S. EPA, U.S. EIA

CO₂ Emissions by Sector

NYS Energy-Related
CO₂ Emissions by
Sector

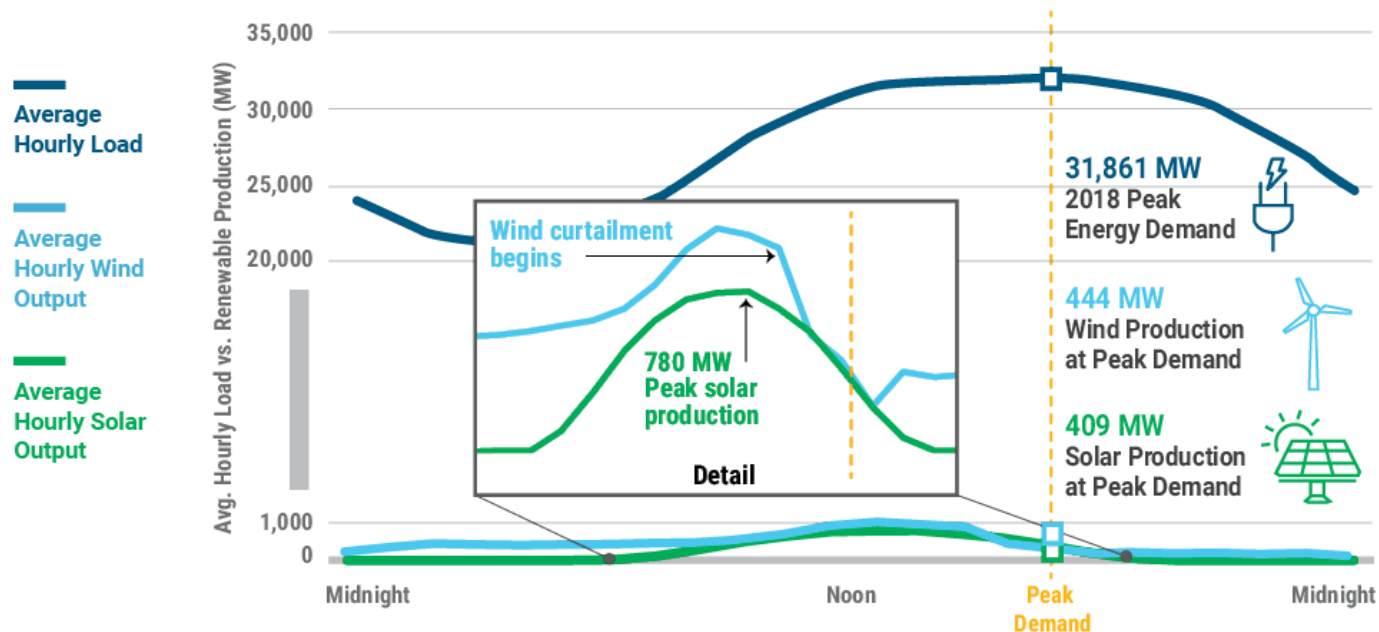


Source: US EIA

Almost half
the CO₂
emissions
come from the
Transportation
sector

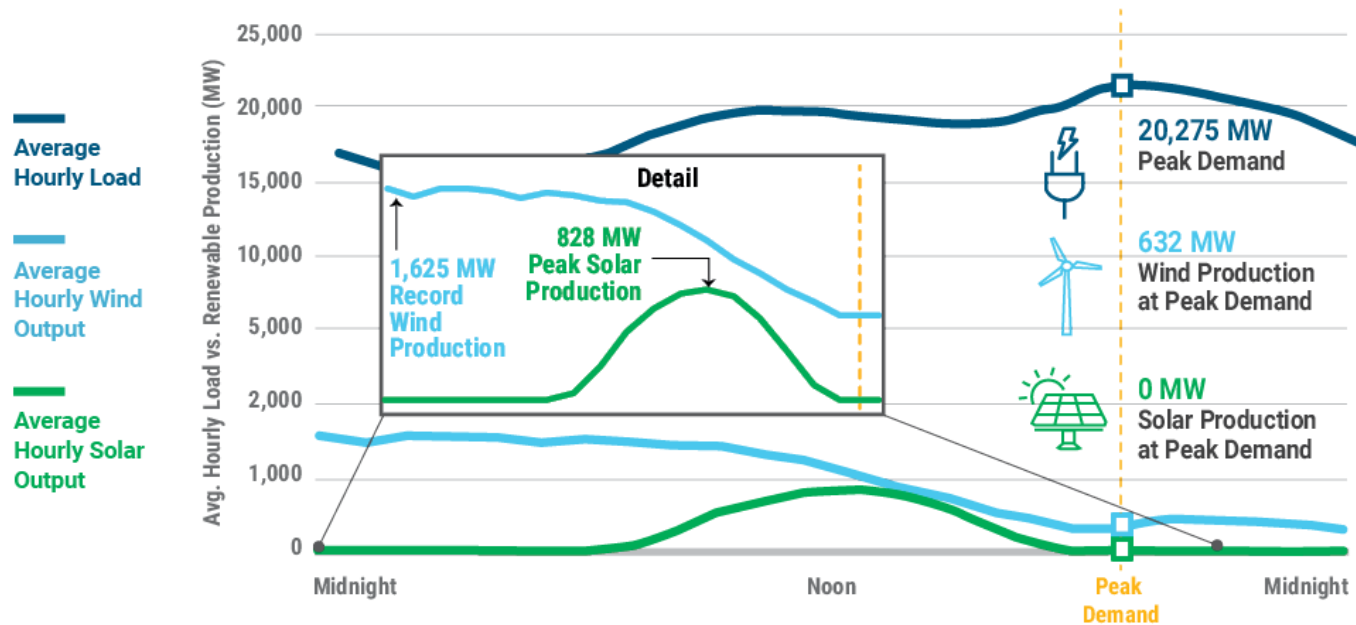
Renewable Resources at Peak Load

Intermittent Resource Contribution to Load on 2018 Peak Demand Day (August 29)



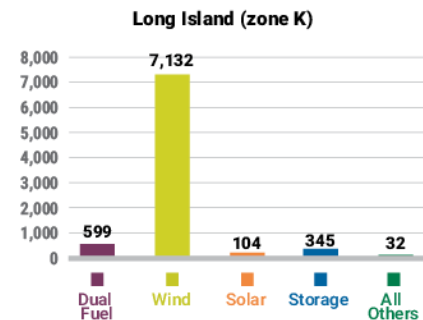
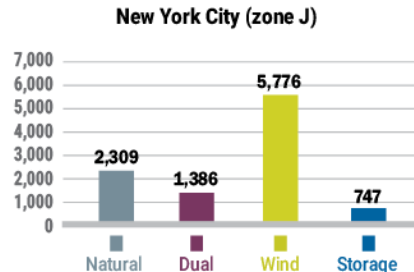
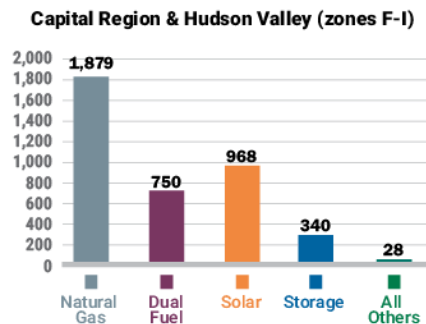
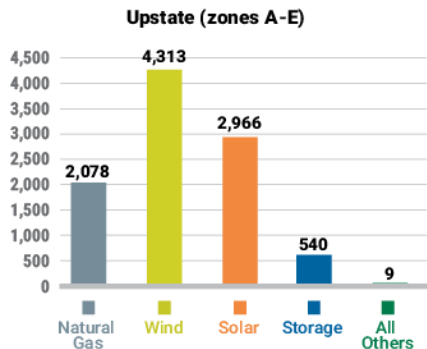
Wind Contribution After Wind Record

Intermittent Resource Contribution to Load after Record Wind Production Day (Feb. 9, 2019)



Proposed Generation

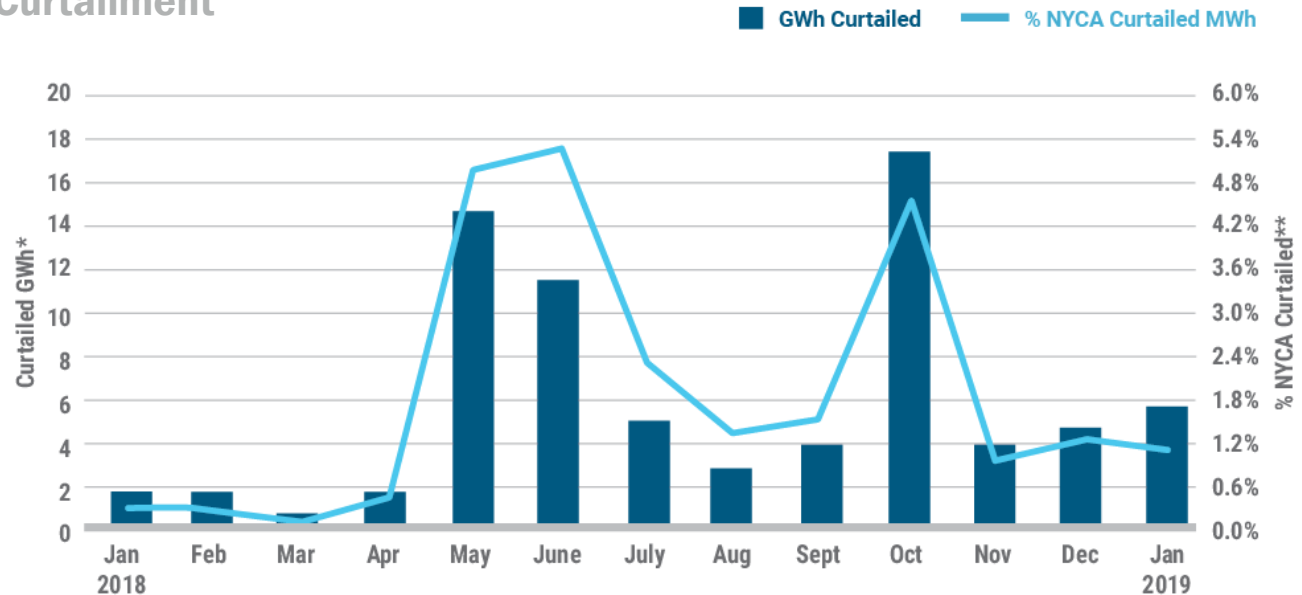
Proposed Generation by Region:
NYISO interconnection queue as of March 1, 2019



Wind Energy Curtailment

Monthly Wind Energy Curtailment

- **Curtailed GWh** – Difference between real-time wind forecast and economic wind output limit
- **% NYCA Curtailed** – Ratio of curtailed energy to total production



* Curtailed GWh - Difference Between Real-Time Wind Forecast and Economic Wind Output Limit

** % NYCA Curtailed - Ratio of Curtailed Energy to Total Production

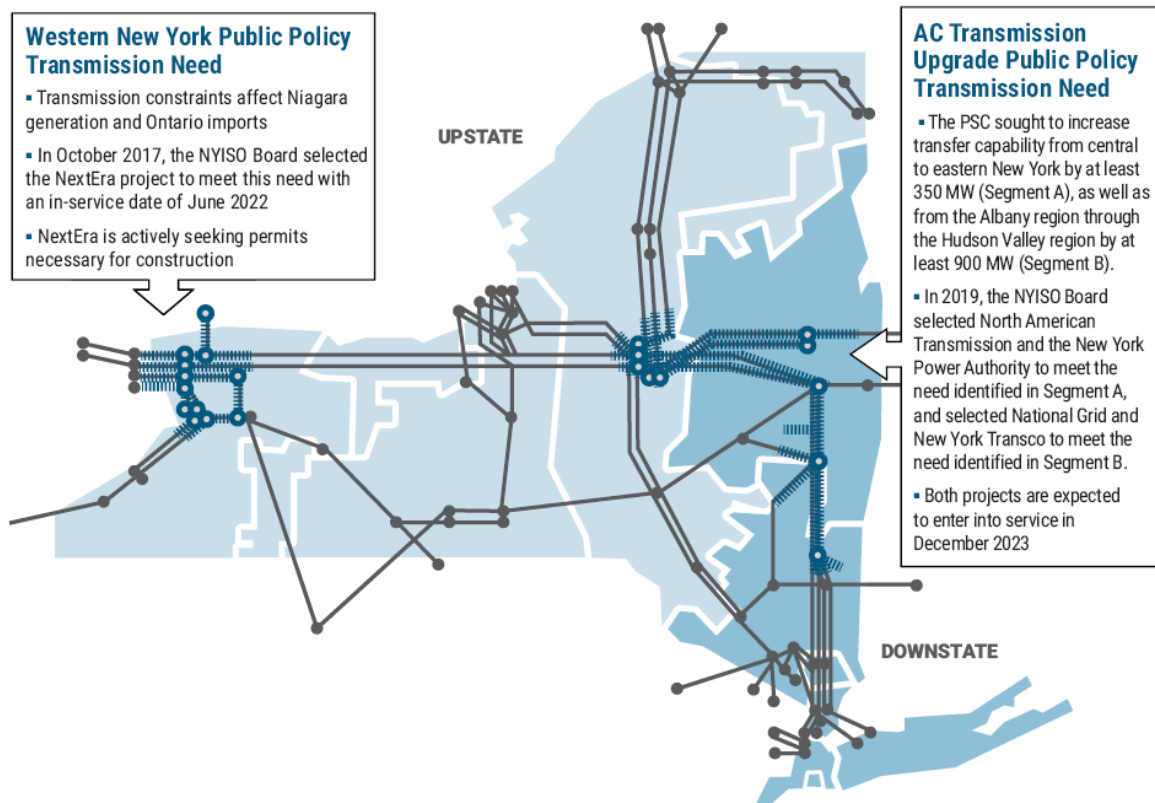
Public Policy Planning

Western New York Public Policy Transmission Need

- Transmission constraints affect Niagara generation and Ontario imports
- In October 2017, the NYISO Board selected the NextEra project to meet this need with an in-service date of June 2022
- NextEra is actively seeking permits necessary for construction

AC Transmission Upgrade Public Policy Transmission Need

- The PSC sought to increase transfer capability from central to eastern New York by at least 350 MW (Segment A), as well as from the Albany region through the Hudson Valley region by at least 900 MW (Segment B).
- In 2019, the NYISO Board selected North American Transmission and the New York Power Authority to meet the need identified in Segment A, and selected National Grid and New York Transco to meet the need identified in Segment B.
- Both projects are expected to enter into service in December 2023



Examining transmission investment needs driven by public policy requirements:

- Needs are identified by the NYS Public Service Commission
- Solutions are solicited by the NYISO

Questions?