Power Trends 2020
The Vision for a Greener Grid

New York Independent System Operator

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
Power Trends 2020: The Vision for a Greener Grid provides information and analysis on current and emerging trends that are transforming the power grid and wholesale electricity markets.

Key Challenges:

• The COVID-19 outbreak has levied a terrible toll in human life and health, with New York a focal point of the pandemic. As New York recovers from this historic health and economic crisis, we and our colleagues in the electric supply, transmission, and distribution sectors have demonstrated an unwavering commitment to serving the citizens of this state.

• In order to achieve the transformation envisioned by the CLCPA, the NYISO and its stakeholders are providing the leadership and expertise to build the grid of the future on the three foundations of reliable operations, economically efficient markets, and forward-looking transmission system planning.

• To deliver on our mission, the NYISO firmly believes that we must continue to enhance the benefits of our wholesale markets and planning while maintaining grid reliability and delivering economical energy to industry and consumers.
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 off-shore projects, are being proposed.

• **Public policies** aimed at reducing emissions, expanding the use of renewable power resources, and accelerating energy system infrastructure investments.

• **Infrastructure** expansion and market enhancements are necessary to support achievement of public policy goals efficiently and reliably.

• **Economic influences** led by low natural gas prices and changing consumption forecasts, including uncertainties around COVID-19 and the impacts of the state’s response to this crisis on load.

• **Bolstering grid resilience** through effective operations, market design features, and planning.
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.

- **Market & Planning Enhancements**: The NYISO plans further enhancements to its markets to establish stronger price signals for resources, such as energy storage and DERs, and is implementing planning process enhancements to more flexibly respond to the increased volume of proposals from smaller resources seeking to interconnect.

- **Identifying Future Needs**: The NYISO is conducting studies to inform future market, planning and operational enhancements. Among these are the Congestion Assessment and Resource Integration Study (CARIS), which includes a scenario analyzing the CLCPA's 70X30 goal, and a Reliability Needs Assessment (RNA) examining the implications of the DEC rules on emissions from generators primarily used to serve peak load. The NYISO is also undertaking a *Climate Change Impact & Resilience Study*. 

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State of the Grid
Tale of Two Grids

Transmission constraints from central NY through the Capital District limit the ability to deliver more clean energy from upstate resources to downstate consumers.
Seasonal Electricity Demand Patterns

Daily Usage Pattern for Each Season

• Demand for electricity fluctuates throughout the day and varies by season
• Hourly demand is influenced by the time of day and weather
• Seasonal variations in demand reflect weather
2020 Resource Adequacy

Statewide Resource Availability:
Summer 2020

- Installed Reserve Margin is 18.9%
- Requires utilities, energy service companies, and other load-serving entities to purchase capacity equal to 118.9% of forecasted peak summer load
- Established by NYSRC annually
Capacity Factors

2019 Annual Capacity Factors for Non-Emitting Resources

Capacity and Energy:

- It would require 2.8 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.
Cleaner Generation


From 2000 through 2019, emission rates of:

- Sulfur dioxide (SO$_2$) dropped 99%
- Nitrogen oxides (NOX) dropped 92%
- Carbon dioxide (CO$_2$) dropped 55%
Renewables & Zero-Emissions

Production of In-State Renewables and Zero-Emission Resources Relative to 2019 Load
Integrating Behind-the-Meter Resources

• More than 2,000 MW of BTM solar installed across the state
• NYISO implemented solar forecasting tools to anticipate the contribution of solar as well as provide real-time estimates of BTM solar production.
• BTM solar resources reduce demand and lower the amount of energy delivered by the bulk power system.
Wind Energy Generation & Curtailment

- NYISO began tracking wind curtailment in 2010
- Curtained GWh – Difference between real-time wind forecast and economic wind output limit
- Additional transmission capability necessary to alleviate constraints that lead to curtailments
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.
Peak Trends

2019-2050 Forecast

The Baseline Forecast anticipates a long-term, gradual growth in summer peak demand as EV adoption begins to expand. The Low-Load Scenario assumes greater adoption of BTM solar, fewer EV purchases with more adoption of smart charging to reduce peak impacts, and reduced adoption of electrification measures. The High-Load Scenario assumes greater levels of EV purchases with no adoption of smart charging, increased adoption of electrification, and stronger economic growth.
Energy Storage Capacity & Energy Usage Forecast

2020-2040
The expected growth of energy storage capacity in New York State through 2040 as well as the projected increase in energy usage attributable to these resources. Storage resources increase net annual electricity consumption due to energy losses that arise from charging and discharging cycles.
Public Policy & the Grid
Proposed solar capacity in the NYISO’s interconnection queue has grown to more than 10,000 MW.

Proposed storage capacity in the interconnection queue grew to more than 8,500 MW.

Proposed wind has grown to nearly 21,000 MW, including offshore wind.

- **Renewables**: 70% by 2030
- **Offshore Wind**: 9,000 MW by 2035
- **Energy Efficiency**: 185 trillion British Thermal Units (BTU) reduction by 2025
- **Zero-Emission Electric Sector**: by 2040
- **Distributed Solar Energy**: 6,000 MW by 2025
- **Battery Storage**: 3,000 MW by 2030
Fuel Mix – Generating Capacity

New York Statewide Generating Capacity by Fuel Source: 2020

Upstate (Zones A-E) Generating Capacity by Fuel Source: 2020

Downstate (Zones F-K) Generating Capacity by Fuel Source: 2020
A Grid in Transition
How Carbon Pricing Works

- **New York State** sets a social cost of carbon as a price per ton of emitted CO₂ based on the impact to the environment.
- **Power plants** pay for the carbon they release into the atmosphere.
- **Generation owners** receive economic incentive to invest in low-carbon or carbon-free resources like wind, solar, and hydro.
- **New Yorkers** benefit from reduced costs and lower emissions.
DERs & The Grid of the Future

SUPPLY
- Solar
- Wind
- Generator
- Hydro
- Power Plant
- Storage

PLANNING
- Transmission

RELIABILITY
- Transmission

MARKETS

SUPPLY
- Wholesale DERs & Aggregations
- Solar
- Electric Cars
- Factories
- Storage
- Homes
- Schools

DEMAND
- Local Utilities Serve Retail
- Commercial Buildings
Resources Seeking Interconnection

Proposed Generation by Fuel Type in New York State (MW) - as of March 1, 2020

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>UPSTATE (Zones A-E)</th>
<th>DOWNSTATE (Zones F-K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>1,999</td>
<td>3,099</td>
</tr>
<tr>
<td>Dual Fuel</td>
<td>0</td>
<td>215</td>
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<tr>
<td>Wind</td>
<td>5,112</td>
<td>16,432</td>
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<tr>
<td>Solar</td>
<td>7,939</td>
<td>2,074</td>
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<tr>
<td>Storage</td>
<td>1,741</td>
<td>6,800</td>
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<tr>
<td>Other</td>
<td>900</td>
<td>93</td>
</tr>
</tbody>
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Public Policy Planning

Examining transmission investment needs driven by public policy requirements:

- Needs are identified by the NYS Public Service Commission
- Solutions are solicited and evaluated by the NYISO
Questions?