

2023-2042 System & Resource Outlook

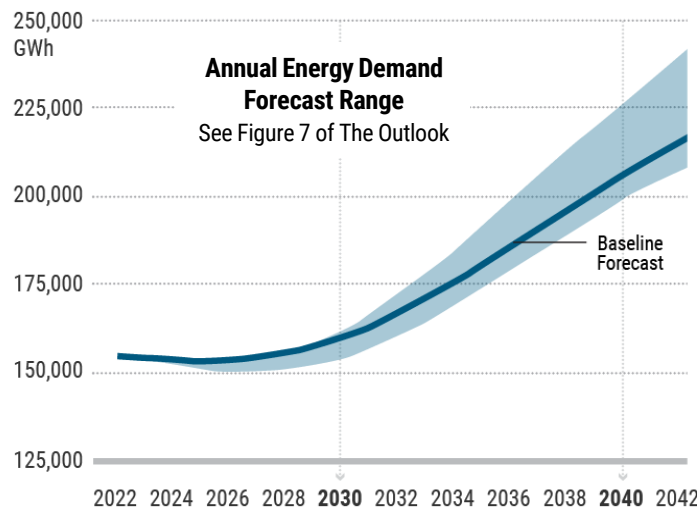
20-Year Outlook Report Identifies Resources & Transmission Needed to Meet Policy Objectives

Our second *System & Resource Outlook* examines a wide range of future scenarios to assess generation and transmission needs during the transition to a decarbonized electric system. The report identifies transmission investment opportunities and generation resource mixes for achieving public policy mandates.

Generating capacity will need to triple to meet energy goals & growth

50-90% increase in demand expected

driven by electrification of transportation and housing sectors and energy-intensive economic development projects.



3X today's 37 GW of installed generating capacity, or 100-130 GW will be needed to meet demand by 2042.

20-40 GW of DEFRs needed to replace current 25 GW of fossil-fuel generation by 2040.

DEFRs are critical to address the attributes needed to run the grid

A zero-emissions grid requires technologies that can fill in when wind and solar are unavailable. These renewable resources can pose challenges to grid operators balancing supply and demand in real time.

What are DEFRs?

Dispatchable Emissions Free Resources, DEFRs, are technologies that:

- ✓ Can be a single or a combination of technologies
- ✓ Are flexible and able to quickly provide both energy and capacity when intermittent generation is unavailable
- ✓ Have reliability attributes that today are provided by fossil fuel generators such as operating reserves, ramping, regulation, voltage support, and black start
- ✓ Must be developed and added to the system at scale to reliably serve demand

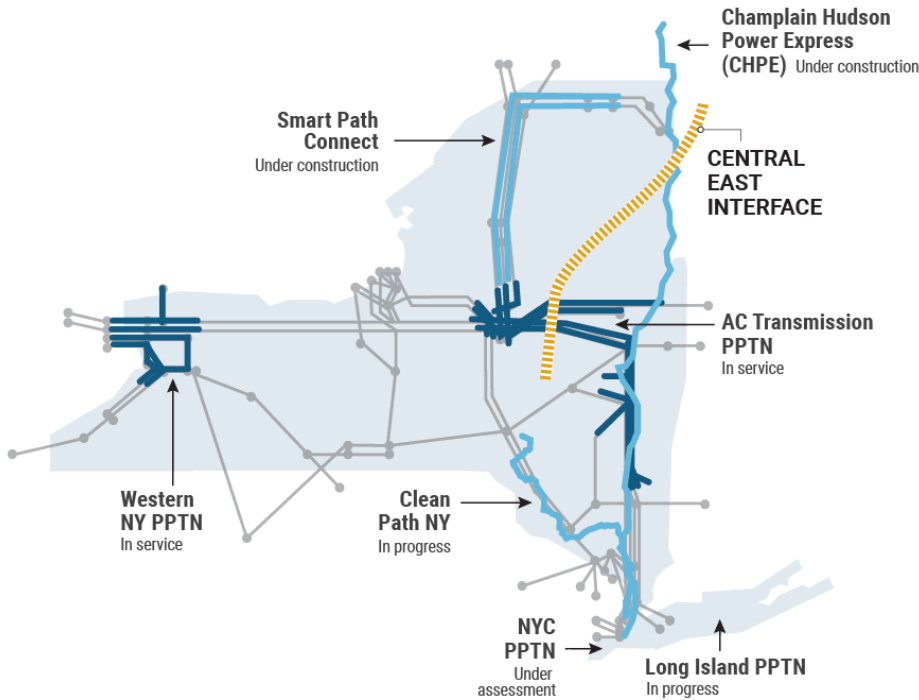
DEFR technologies may include

- ✓ Long-duration batteries
- ✓ Small modular nuclear reactors
- ✓ Hydrogen-powered generators
- ✓ Fuel cells

DEFRs are not currently available at commercial scale. Research, development and construction lead times may extend beyond the state policy timelines.

In the interim, existing generation technologies may be required to remain in operation to maintain a reliable system.

Historic transmission investments are delivering significant benefits to the grid, but more are needed



The Outlook shows that completed transmission projects advanced through the NYISO's Public Policy Transmission Planning Process (PPTN) and other state initiatives have delivered significant benefits to the high voltage system and toward the achievement of state policies.

For example, the Western New York and AC Transmission PPTNs have increased the ability to deliver power across the state. Additionally, PPTN transmission projects on Long Island and in New York City will support up to 9,000 MW from offshore wind projects.

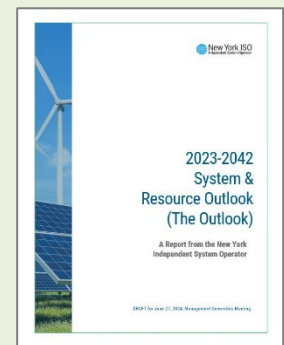
Other local transmission upgrades approved by the New York State Public Service Commission demonstrate significant benefits in the coming years. Once completed, The Outlook finds that these upgrades will be highly effective in increasing energy deliverability and decreasing congestion on the lower voltage system.

Maximizing transmission efficiency through specialized technologies

- ✓ To fully leverage the transmission system's capability as fossil generation retires, additional dynamic reactive power must be added to the grid.
- ✓ Dynamic reactive power will improve the delivery of electricity from renewable resources and alleviate congestion.
- ✓ Potential technologies options include STATCOMs, synchronous condensers, and specialized Grid-Enhancing Technologies (GETs).
- ✓ This is especially important to the Central East Interface which plays a key role in moving energy from Upstate generation pockets to downstate communities.



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