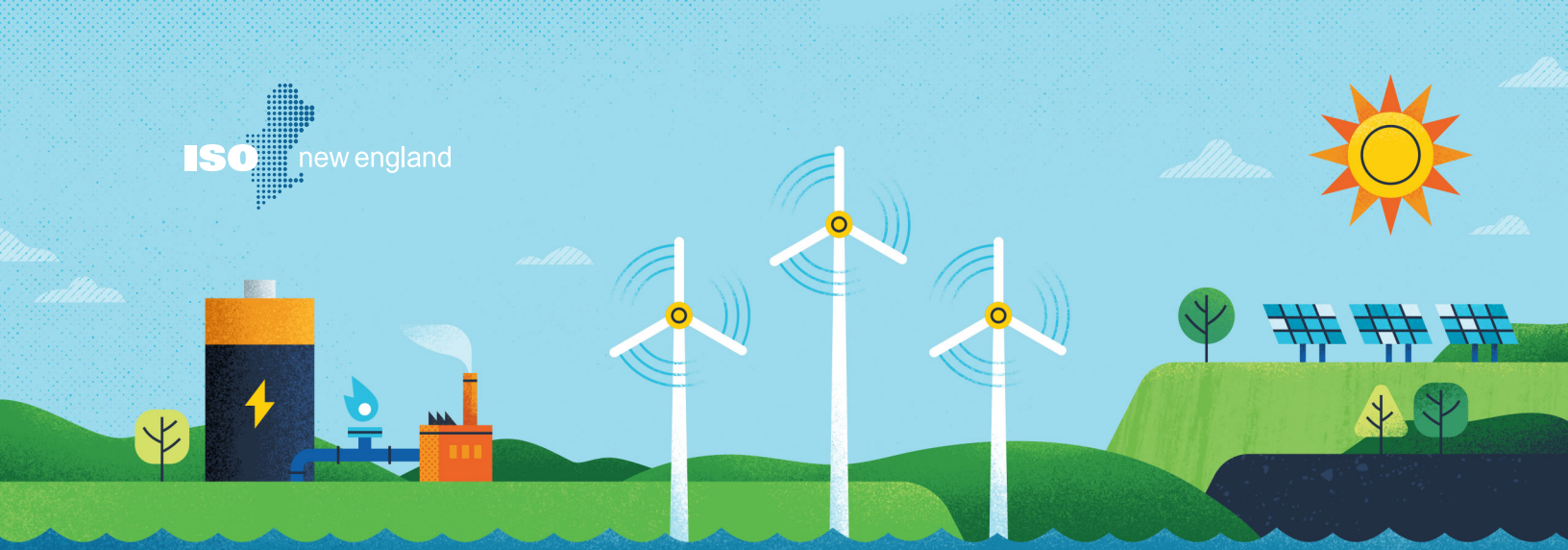

Future Grid Reliability Study

PHASE 1

The New England States have set ambitious decarbonization goals to combat climate change over the next several decades. The rapid electrification of heating and transportation will drive unprecedented demand for electricity, and the ongoing shift to variable, renewable resources will further transform the electric grid of the future.

"A reliable future grid depends upon innovative approaches to decarbonization."

ISO New England's Future Grid Reliability Study examines the region's decarbonizing grid. This innovative study analyzed 32 scenarios, each a particular version of the 2040 grid, to identify key gaps and reliability issues. Though specific results for each scenario varied, the exclusive reliance on new wind, solar, and battery resources as a pathway toward a carbon-neutral economy will pose significant reliability challenges.

The specific order of events during this transition will impact reliability. Existing oil, propane, and other high emission heating systems are likely to be electrified before natural gas heating, while simultaneously, the region's fleet of electric vehicles rapidly expands. The resulting growth in demand for electricity will drive natural gas-fired resource use and continue the grid's reliance on gas during peak winter periods in ways that will exceed current supply and pipeline capabilities.

The Simulated 2040 Grid: Key Takeaways

Challenges for Energy Adequacy

The 2040 grid will require more natural gas or stored fuels than is possible under current supply levels and infrastructure. The stored fuels of the future may not necessarily be carbon emitting, but they must be dispatchable.

The large amounts of battery energy storage systems in the 2040 grid will not be able to charge sufficiently under predicted load curves.

The retirement of the region's nuclear generators poses a challenge to grid reliability and state decarbonization goals.

Need for Resource and Demand Flexibility

High electrification and aggressive retirements of existing dispatchable resources will severely deplete available reserves and regulation. The grid has traditionally relied upon this backup energy to maintain balance and ensure reliability.

Flexibility in both supply and demand would help preserve the system's balance. Flexible EV charging, for example, could help flatten overall demand and supply variability by directing portions of the region's EV fleet to charge at specific times.

Changing Resource Mix Diversity

As the proportion of variable energy resources increases, and as the grid becomes winter-peaking, rules and regulations related to grid operation and modeling assumptions related to all types of resources will need to change and remain fluid.

The reserve margin – the extra resources needed to keep the system reliable in times of stress – will need to increase by an order of magnitude by 2040.

Additional takeaways regarding the structure of future economic studies and modeling tools can be found in the full FGRS Phase 1 report, available at www.iso-ne.com.

KEY FINDINGS

>100%

Increase in 2040's assumed winter demand peak, compared to the grid's all-time peak.

36 Days

Frequency of natural gas demand exceeding pipeline supply in 2040.

6 Million Tons

Amount by which CO_2 emissions will exceed state goals due to the retirement of nuclear resources.

875%

Increase in electrification of heating and transportation between 2031 (based on the latest Forecast Report of Capacity, Energy, Loads, and Transmission) and the 2040 study assumptions.