

ISO NEW ENGLAND'S INTERCONNECTION PROCESS AND INTEGRATING OFFSHORE WIND AND STORAGE IN THE REGION

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ISO New England

ISO New England (ISO) Has Two Decades of Experience Overseeing the Region's Restructured Electric Power System

- **Regulated** by the Federal Energy Regulatory Commission (FERC)
- **Reliability Coordinator** for New England under the North American Electric Reliability Corporation (NERC)
- **Independent** of companies in the marketplace and **neutral** on technology



ISO New England Performs Three Critical Roles to Ensure Reliable Electricity at Competitive Prices

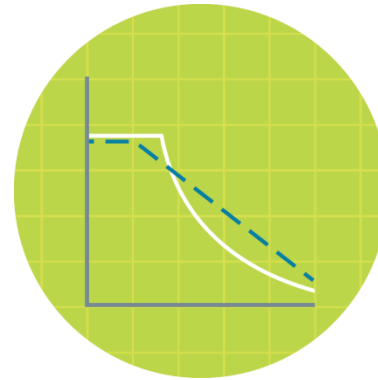
Grid Operation

Coordinate and direct the flow of electricity over the region's high-voltage transmission system



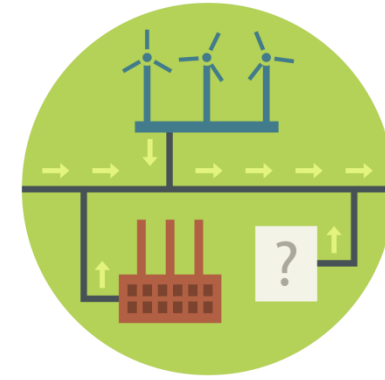
Market Administration

Design, run, and oversee the markets where wholesale electricity is bought and sold



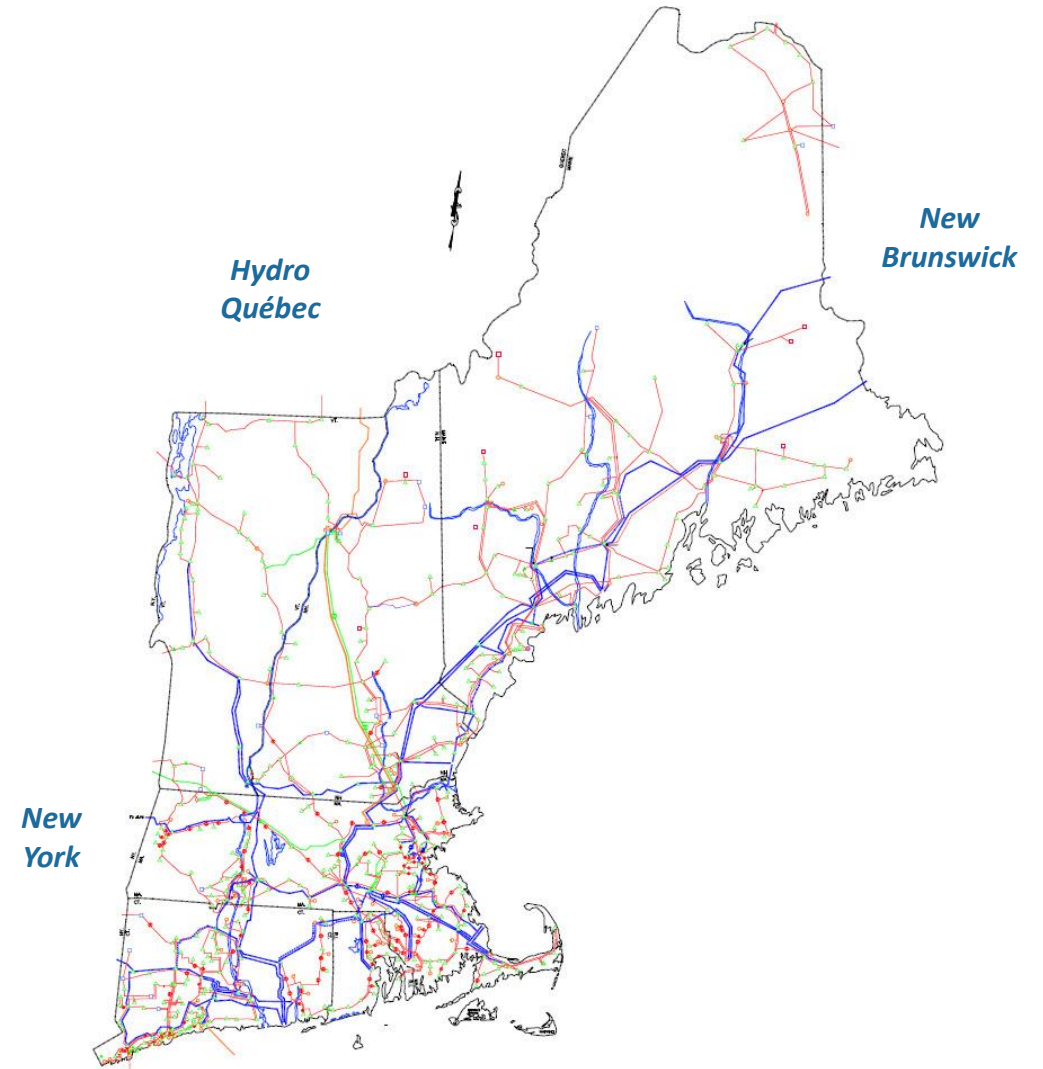
Power System Planning

Study, analyze, and plan to make sure New England's electricity needs will be met over the next 10 years



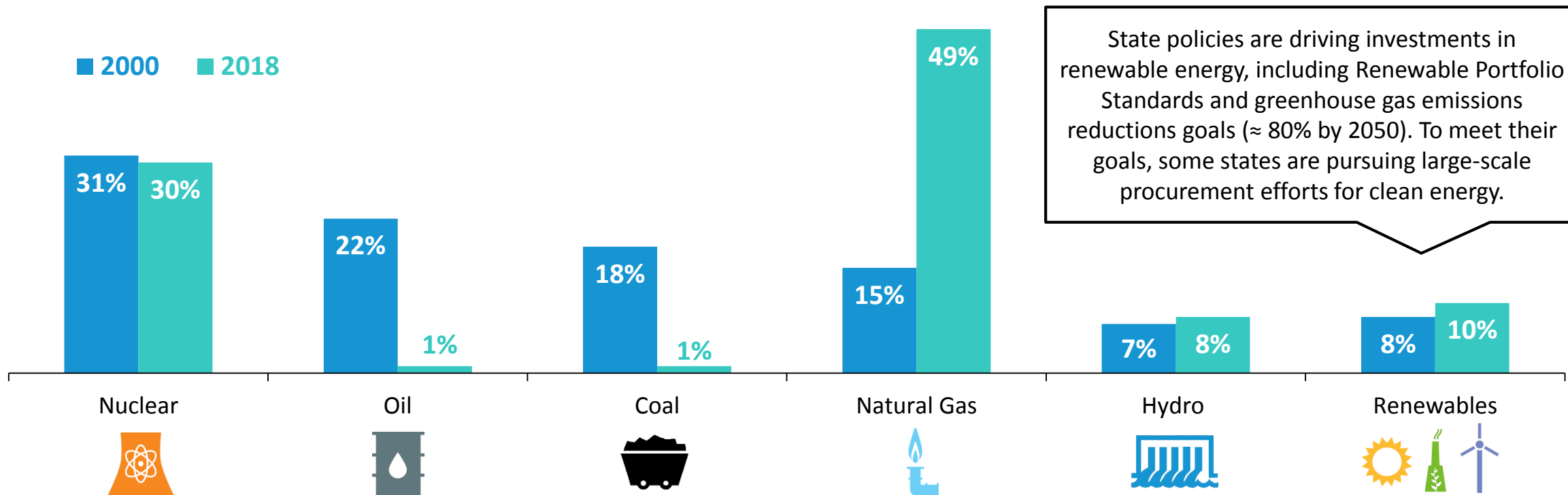
New England's Transmission Grid Is the Interstate Highway System for Electricity

- **350 dispatchable generators** in the region, with roughly 31,000 MW of generating capacity
- **9,000 miles** of high-voltage transmission lines (115 kV and above)
- **13 transmission interconnections** to power systems in New York and Eastern Canada
- **17%** of region's energy needs met by imports in 2018
- **\$10.6 billion** invested to strengthen transmission system reliability since 2002; **\$1.7 billion** planned
- Developers have proposed multiple transmission projects to access **non-carbon-emitting resources** inside and outside the region



The Fuels Used to Produce Energy in New England Are Shifting Due to Economic and Environmental Factors

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2018)



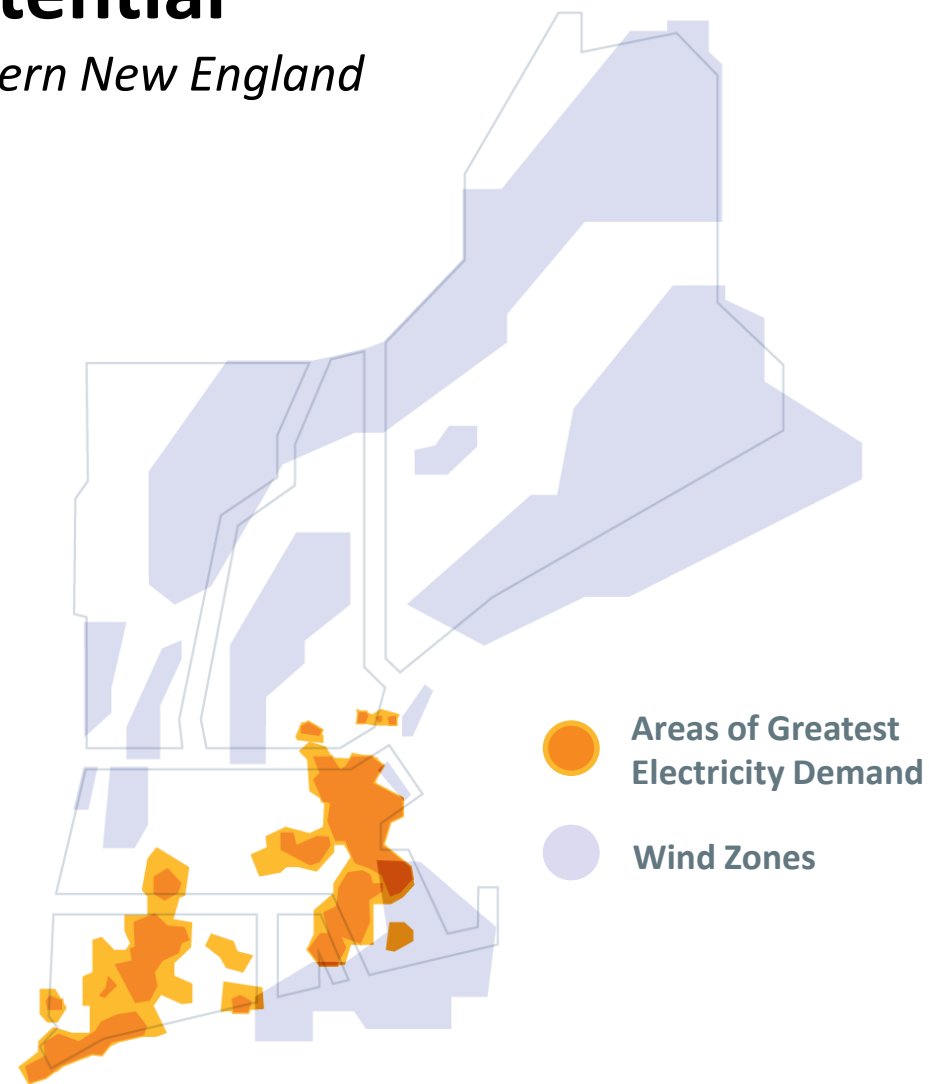
Source: ISO New England [Net Energy and Peak Load by Source](#)

Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels.
This data represents electric generation within New England; it does not include imports or behind-the-meter (BTM) resources, such as BTM solar.

New England Has Significant Wind Potential

Primarily in Northern New England and off the Coast in Southern New England

- **12,000 MW** of onshore and offshore wind potential in New England*
 - Preliminary screening eliminated wind sites near urban areas and sensitive geographic locations (e.g., Appalachian Trail)
- Roughly **1,400 MW** of wind installed in New England today, including the nation's **first** offshore wind farm
- Population and electric demand are concentrated along the coast in central and southern New England



* Source: New England 2030 Power System Study, Report to the New England Governors, 2009 Economic Study: Scenario Analysis of Renewable Resource Development (February 2010)

Generator Proposals Are Subject to a Reliability Review Involving Extensive Engineering Studies

1 Interconnection Request → 2 Scoping Meeting

3 Feasibility Study

4 System Impact Study

5 Facilities Study

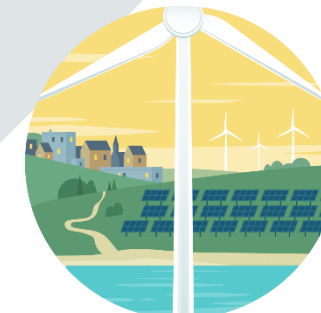
6 Interconnection Agreement

7 Commercial Operation



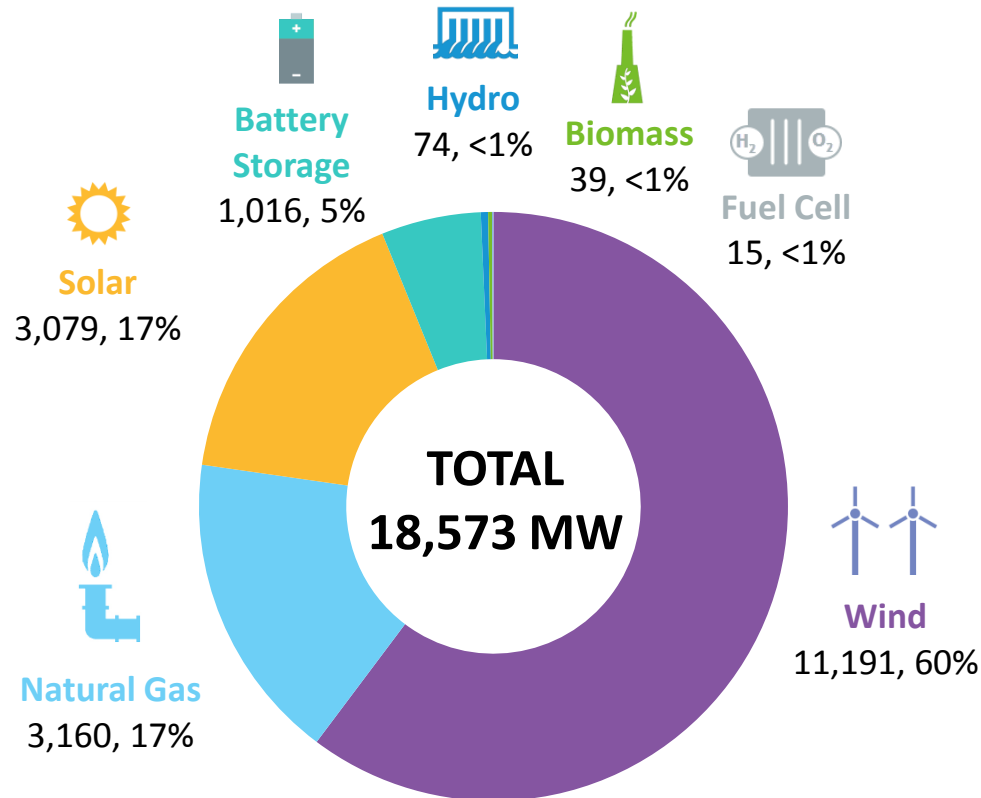
Upon completion of these studies, an Interconnection Agreement between the ISO, the generator, and the interconnecting transmission owner is executed

Elective Transmission Upgrades are subject to a similar reliability review

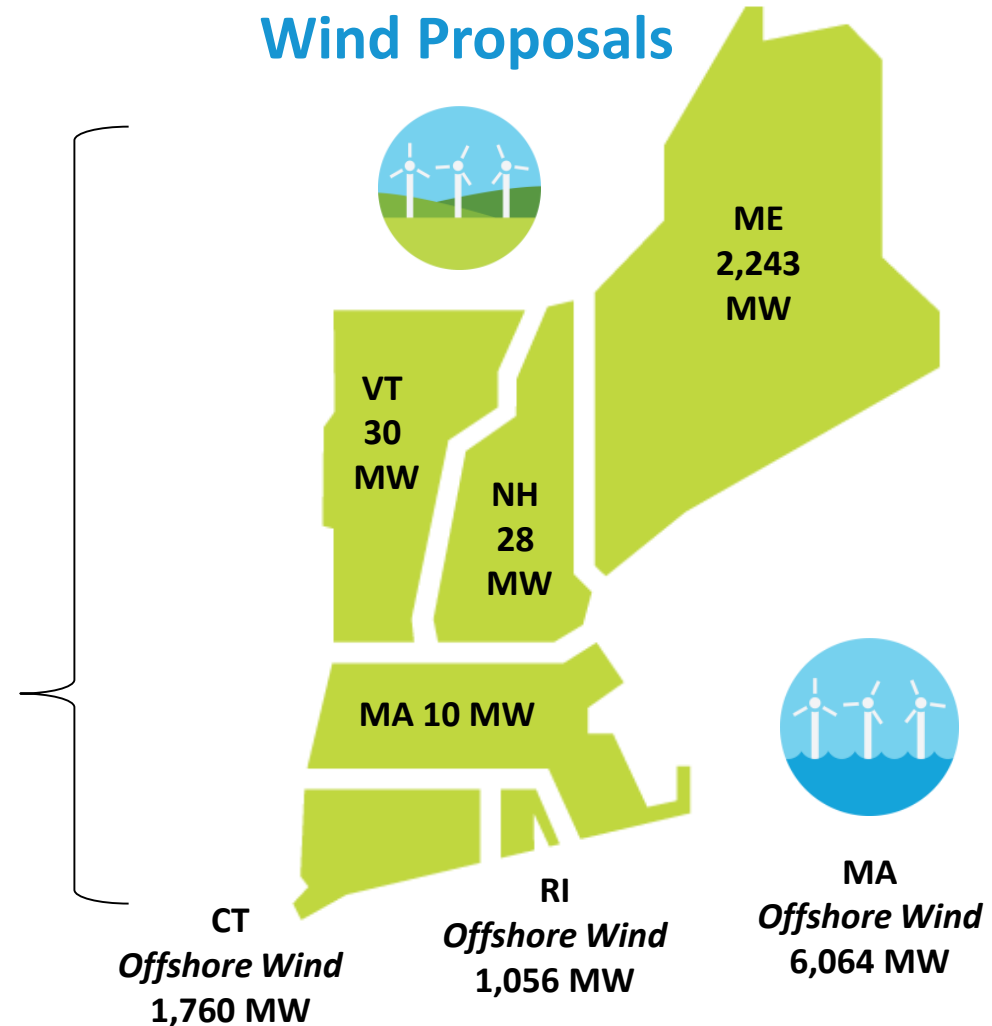


Wind Power Comprises Nearly Two Thirds of New Resource Proposals in the ISO Interconnection Queue

All Proposed Resources



Wind Proposals

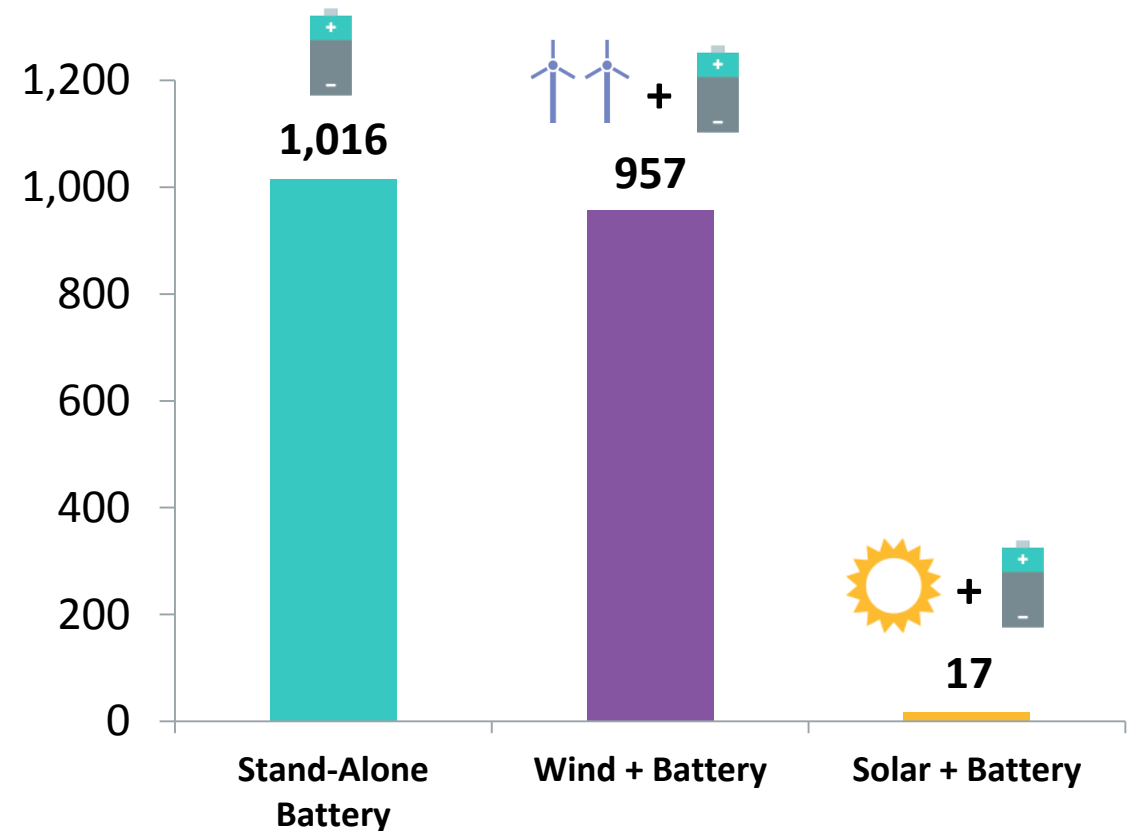


Source: ISO Generator Interconnection Queue (March 2019)
 FERC and Non-FERC Jurisdictional Proposals; Nameplate Capacity Ratings
 Note: Some natural gas proposals include dual-fuel units (with oil backup).
 Some natural gas, wind, and solar proposals include battery storage.

New England Has Successfully Utilized Energy Storage for Over 40 Years, and New Forms of Storage Are Emerging in the Queue

- Since the 1970s, the predominant grid-scale energy storage has come in the form of **pumped-storage hydro**
 - Two large facilities can provide **1,800 MW** of capacity within 10 minutes
 - At maximum, they can generate up to **12,000 MWh** of energy
- From 2008 through 2015, a **flywheel system** provided regulation service in a pilot program
- Since 2017, two grid-scale battery storage resources have been installed in the region
 - Can supply nearly **20 MW for 30 minutes**
 - Can provide or consume electricity on a **near-instantaneous basis**

Battery Storage Proposals in the Queue (Stand-Alone and Paired with Renewables)



Source: ISO Generator Interconnection Queue (March 2019)

Several Enhancements Made to ISO New England's Interconnection Study Queue Process

Facilitate projects proposed in response to state procurement efforts for clean energy

1. New Elective Transmission Upgrade (ETU) Rules

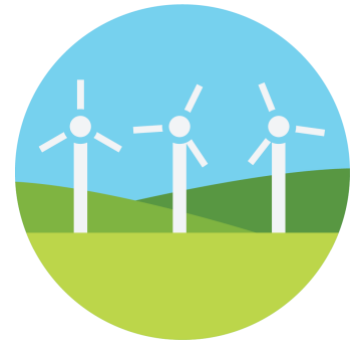
- Enable ETUs to establish and hold a firm queue position and ensure these resources are able to deliver capacity and energy into the wholesale electricity markets

2. New Technical Data Requirements for Wind and Other Inverter-Based Generators

- Make wind and other inverter-based generator projects more “study-ready,” similar to conventional generators

3. New Clustering Methodology

- Alleviate queue backlog in Maine and, in the future, elsewhere on the New England transmission system should similar conditions arise



Questions

