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Delivering cost-effective **Transmission Solutions** that provide reliable power and support a **Clean Energy Future**

New Hampshire Commission to Study Offshore Wind and Port Development
June 29, 2021 | Great Bay Community College, Portsmouth, NH

The Role of **Transmission**

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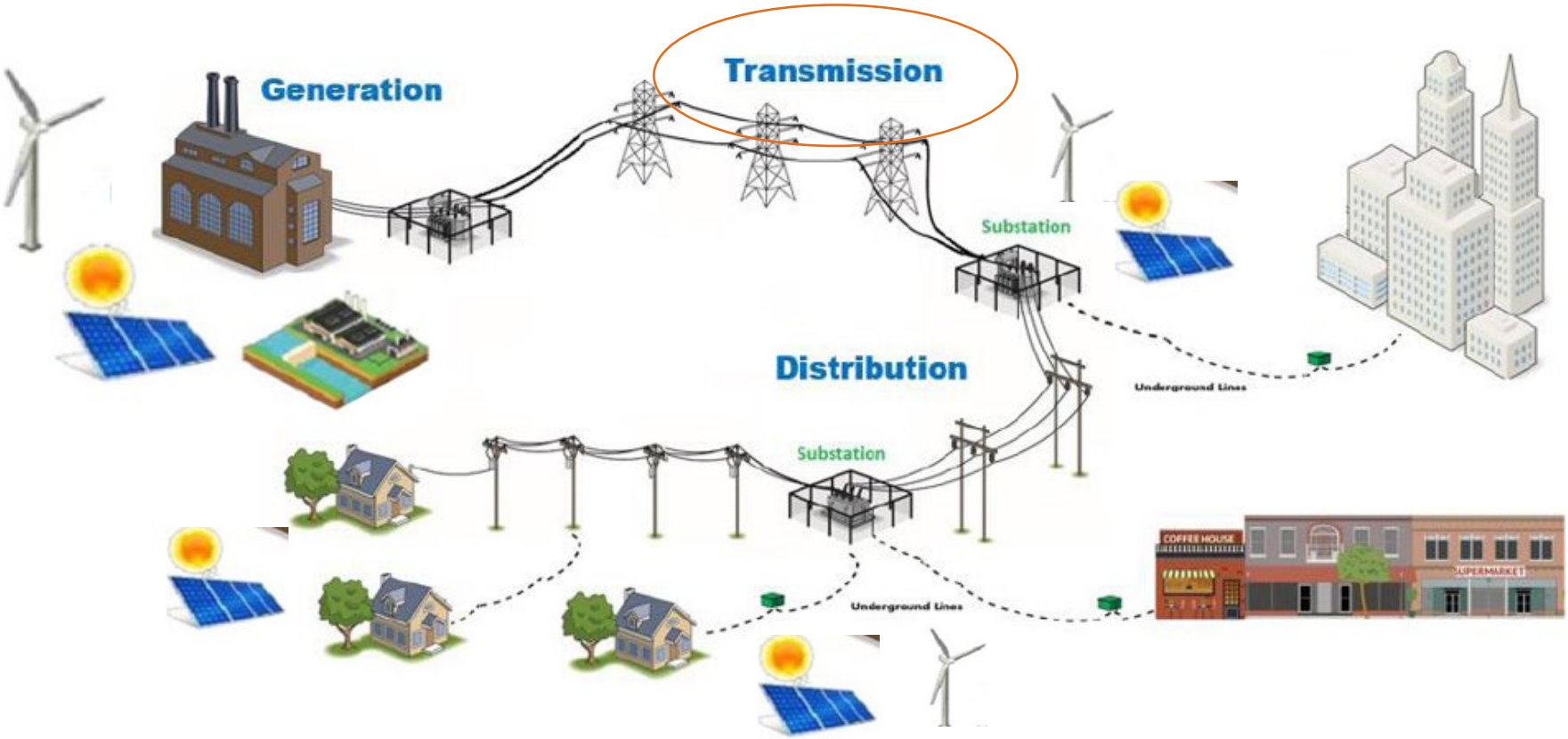
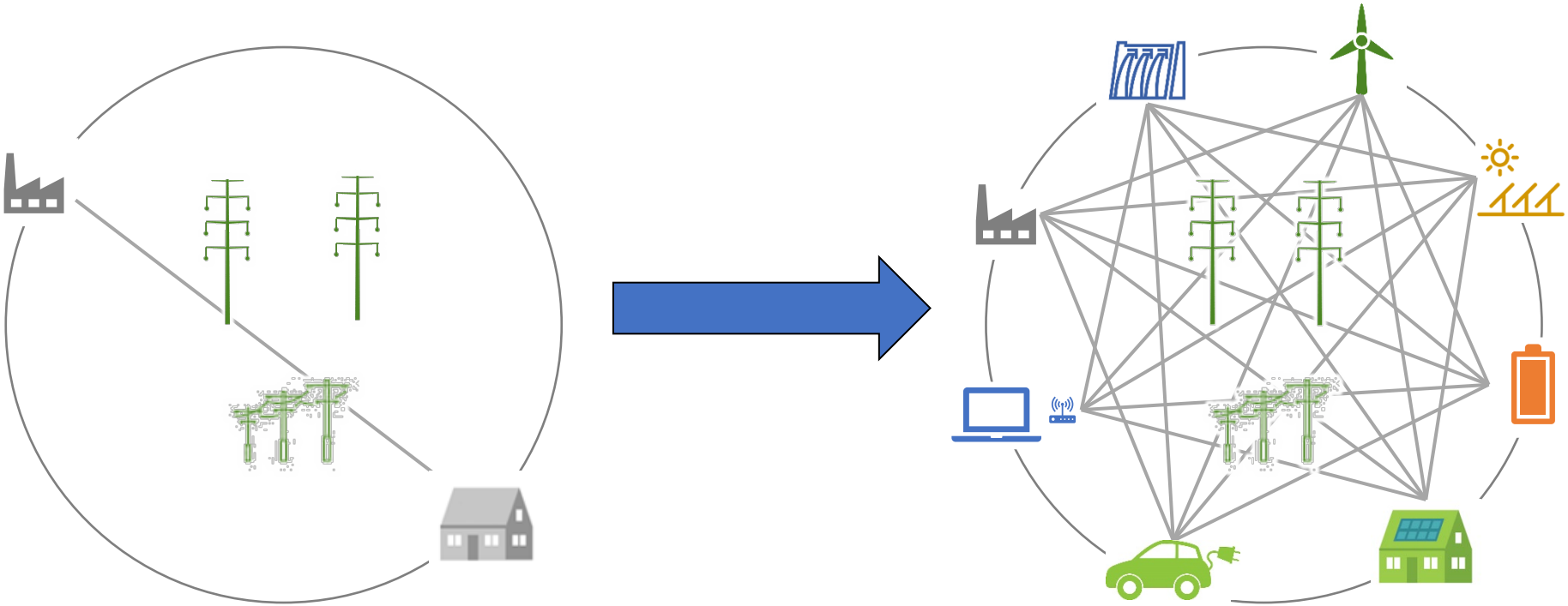
- ✓ Investments are addressing pockets of **load growth** and improving **reliability**
- ✓ Aging infrastructure replacements are improving **storm resiliency, security** and **operations**
- ✓ Significant progress towards greater **integration of clean energy**

The **Electricity Network**

- **Transmission** moves large quantities of energy at high voltages from generation resources to customers' homes and businesses
- Regulated by Federal Energy Regulatory Commission and North American Electric Regulatory Corporation



Building a **Modern Grid**



- One-way power flow
- Generating resources located far from demand
- Fossil fuel heavy
- Aging grid with limited automation

- Power flows in different directions from multiple locations
- Both small and large clean energy resources
- Requires an efficient, flexible and increasingly automated grid

Making the Grid More **Resilient** & **Flexible**

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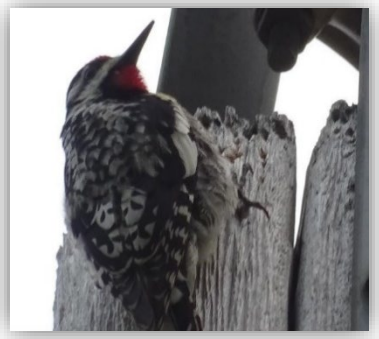
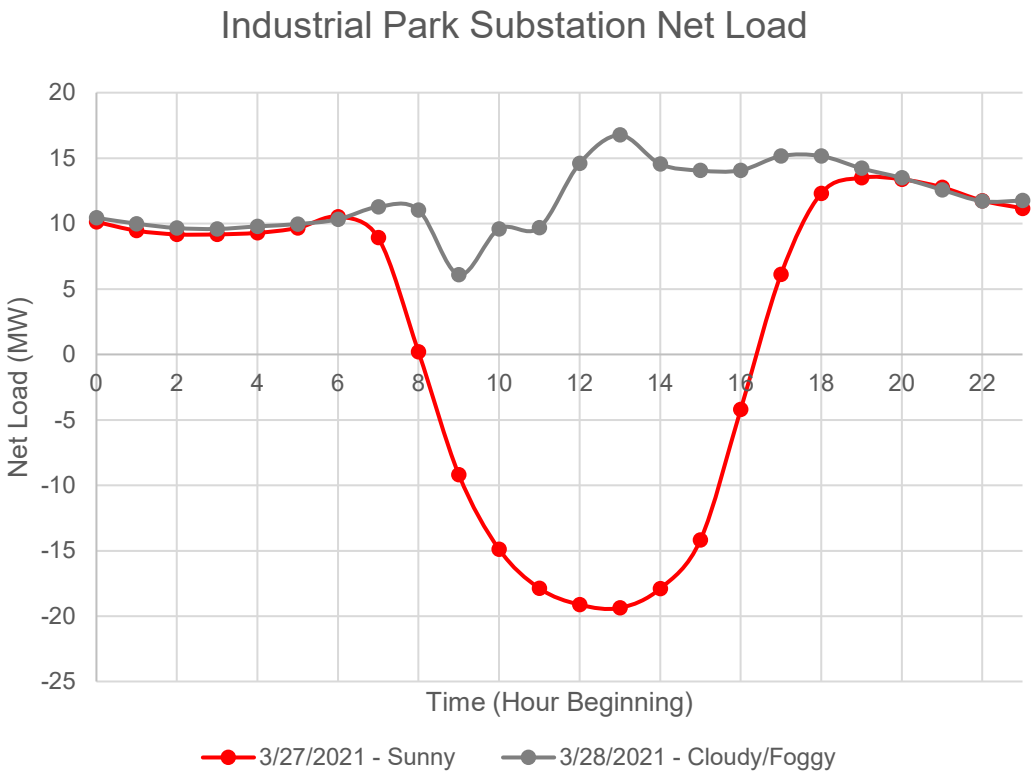


- Nearly **700** structures in total being replaced this year due to deterioration or other deficiencies
- Average age of structures being replaced: **55** years

- Lightning arresters to be installed on more than **700** structures across **56** power lines to protect the lines from lightning strikes
- Upgrading substation equipment for **operational flexibility, reliability** and to better manage **voltage variations** on the system

- **Rebuilding three power lines** and installing optical ground wire for increased automation
  - Whitefield to Northumberland (18 miles)
  - Franklin to New Hampton (11 miles)
  - Keene (1 mile)

Transmission is Needed to Balance Load with Distributed Solar



Example of how power flows at a Massachusetts substation with a large amount of distributed solar

- On sunny days, **solar can produce more power than is needed** for a region served by a substation, so the excess power is delivered by the transmission system to other parts of the grid
- On cloudy days, **solar doesn't produce enough power**, so the transmission system delivers power to the station from other parts of the grid

Enabling Explosive **Growth in Clean Energy** and Supporting **Higher Demand**

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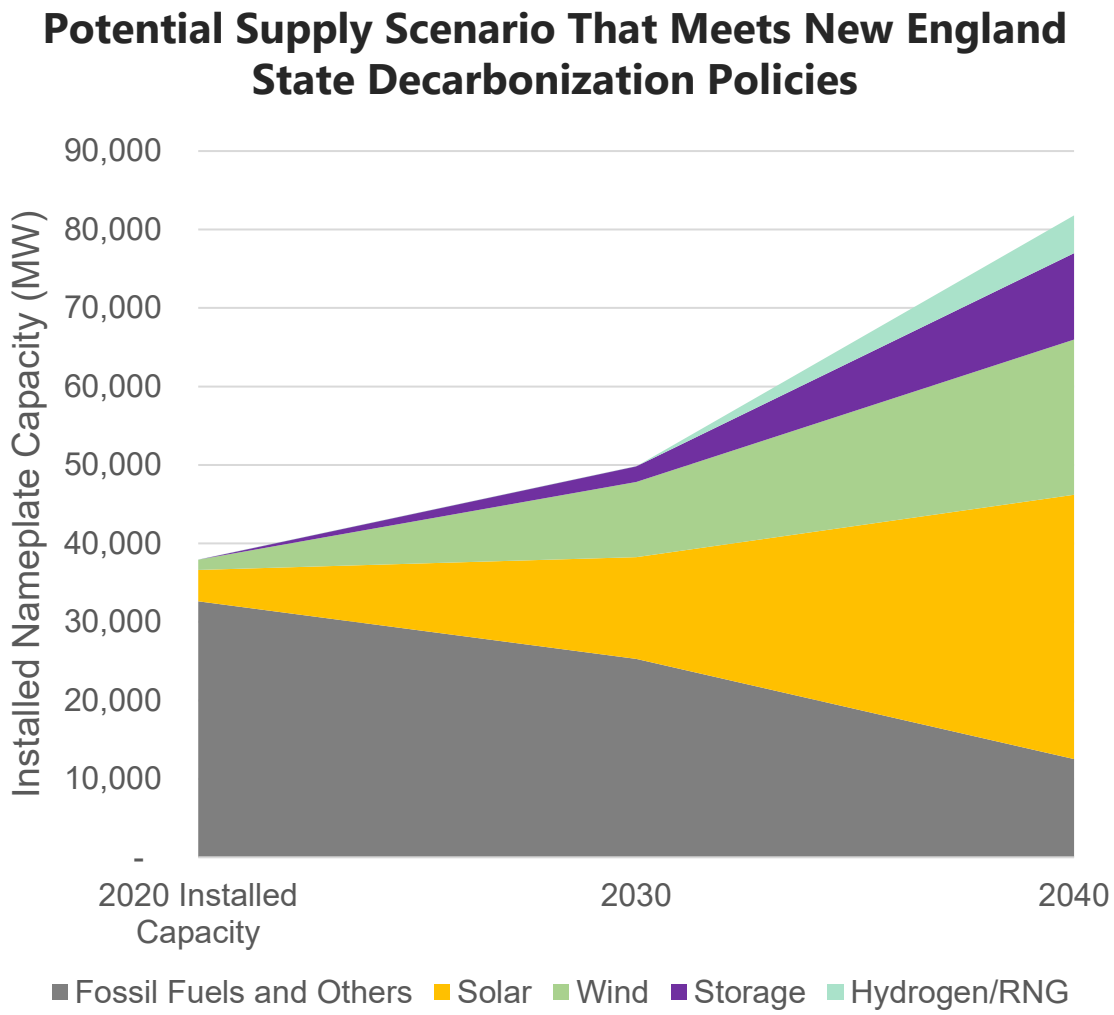
electrification increases demand by at least
65% by 2050

Demand response, energy efficiency and distributed resources will help to moderate the electric demand



Source: London Economics International, LLC capacity expansion and hourly economic simulations of multiple decarbonization scenarios

Infrastructure to Enable a Cleaner Resource Mix

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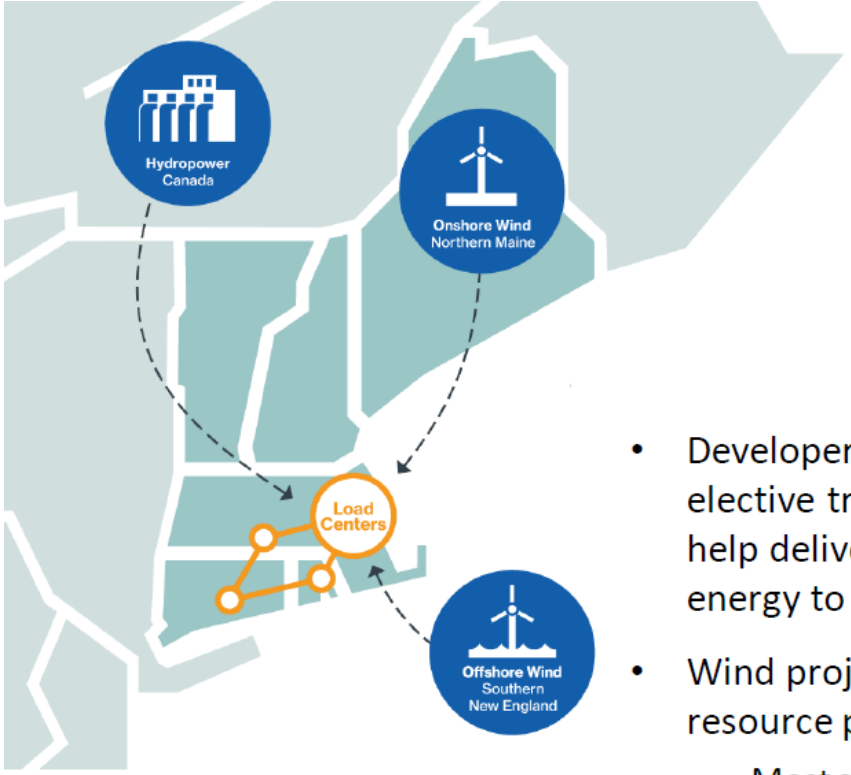

Lines represent types of ETUs private developers have proposed in recent years

Source: ISO Interconnection Queue (February 2021)

Developers Are Proposing Large-Scale Transmission Projects to Deliver Clean Energy to Load Centers

- Developers are proposing 10 elective transmission upgrades (ETUs) to help deliver about **3,400 MW** of clean energy to New England load centers
- Wind projects make up roughly **62%** of new resource proposals in the ISO Queue
  - Most are offshore wind proposals in southern New England, but some are onshore wind proposals in northern New England and **would require transmission** to deliver the energy to load centers

Infrastructure to Enable a Cleaner Resource Mix

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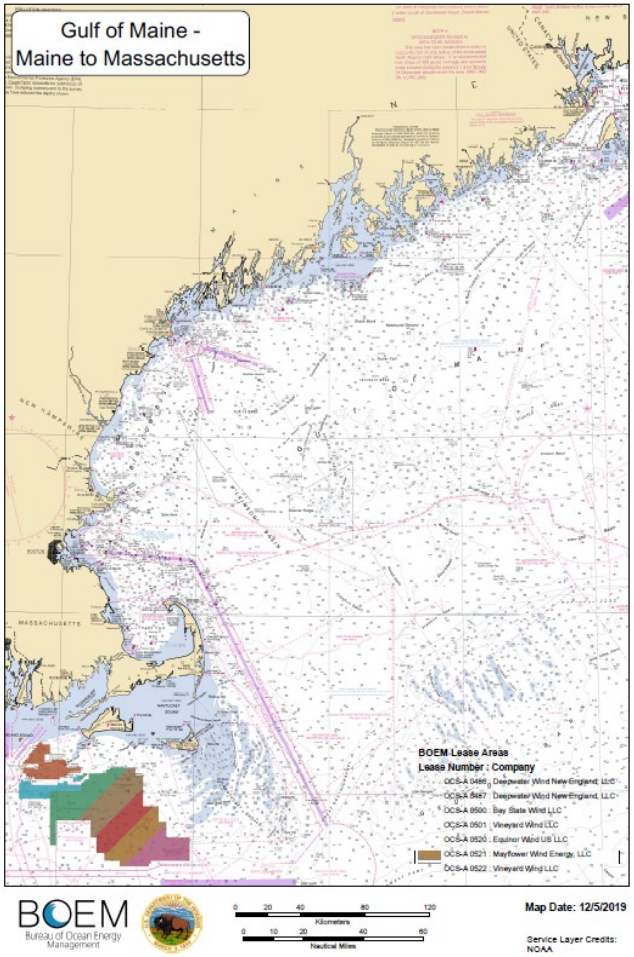

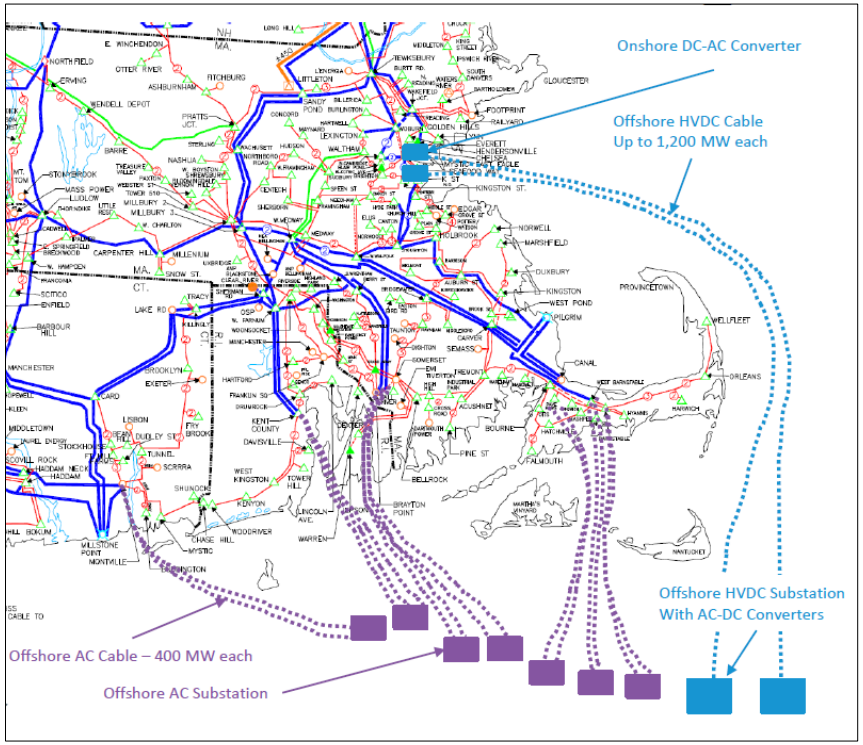

ISO-NE Offshore Wind Study (2019)

- Some amount of offshore wind from the BOEM lease area (shown at left) can interconnect at coastal locations without major upgrades
- At higher levels of offshore wind penetration, major upgrades become necessary and alternative locations and High Voltage Direct Current (HVDC) technology become economic

How We **Achieve the Grid of the Future** in New England

- **Collaborating** with states, FERC, ISO-NE, communities and clean energy developers

- **Planning ahead to look for ways to cost effectively prepare the grid now** for future clean energy and electrification demands

- **Modernizing the grid** to support both large-scale and distributed clean energy resources while maintaining reliability

Path to the **Grid of the Future**

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With the right transmission and distribution investments, the grid of the future will be…

The network for a clean, sustainable, and increasingly-interconnected energy future

The backbone for even higher reliability and resilience for our customers

Brook St Substation, Manchester, NH 1918

Early Days
Up to 1940s

- Initial electrification
- Small, independent systems
- Limited sharing of resources
- Primarily mechanical and manual operation

PSNH Control Room, 1958

Rapid Growth
1950s – 1970s

- Rapid load growth
- Grid expansion
- Power pools for sharing resources
- One-way power flow
- Early automation and control of transmission system

PSNH Computer Tape Drive, 1983

Initial Deregulation
1980s – 1990s

- Limited transmission investments
- Rise of non-utility power producers & competition
- Expanding automation to distribution system

Merrimack Valley Reliability Project, 2018

Improved Reliability & Markets
2000 - 2018

- Transmission investments eliminate congestion
- Blackout of 2003 & reliability standards
- Expanded redundancy to improve reliability
- Incorporation of distributed generation

Well-Planned Grid
2021 and Beyond

- Optimized delivery of distributed generation & clean energy
- Widespread customer engagement
- Improved reliability
- Support for electric vehicles and other electrification

Avoids higher costs, unmanaged growth, clean energy curtailments, and reliability risks

Questions?