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The Clean Energy Transition Is Driving Change to New England's Wholesale Electricity Markets

The New England Council

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New England's Wholesale Electricity Markets

The Clean Energy Transition and Potential Future Pathways

ISO New England is supporting a Clean Energy Transition through an evolving competitive market for power system reliability

What are the implications of other pathways for the region's wholesale electricity markets?

Things to consider:

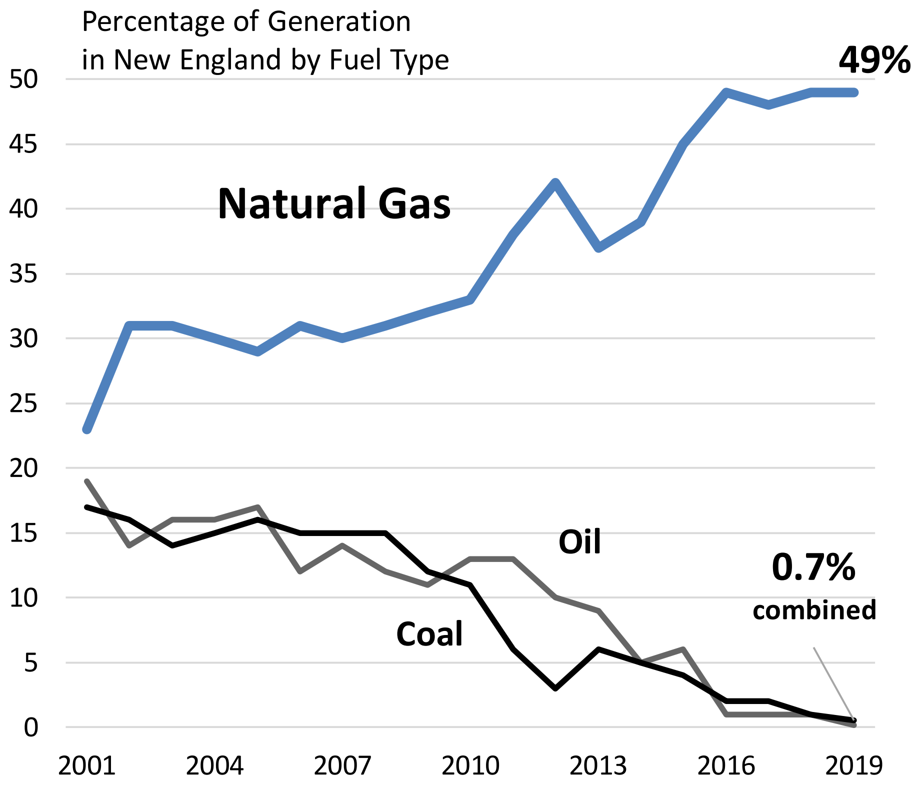
- **Balancing Policy and Regulatory Structure**
- **Enabling a Reliable Clean Energy Transition**
- **Navigating the Transition**

Setting the Stage

A look at some key trends, policy drivers, and development activity in the region

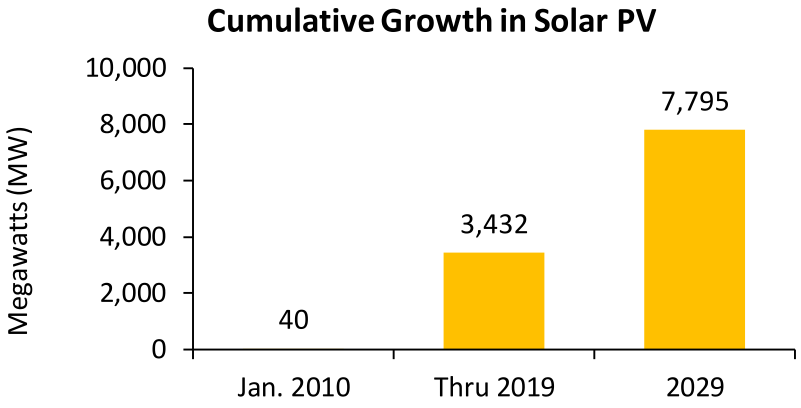
New England's Energy Mix Is Changing Dramatically

Gas has displaced oil and coal for electric generation …



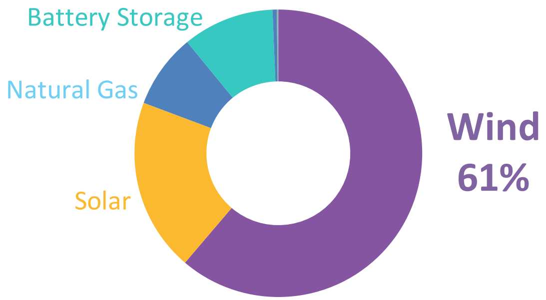
***Source**: ISO-NE Net Energy and Peak Load by Source Electric generation within New England; excludes imports and behind-the-meter (BTM) resources, such as BTM solar.*

… as solar grows rapidly …



***Source**: Final 2020 PV Forecast; MW values are AC nameplate*

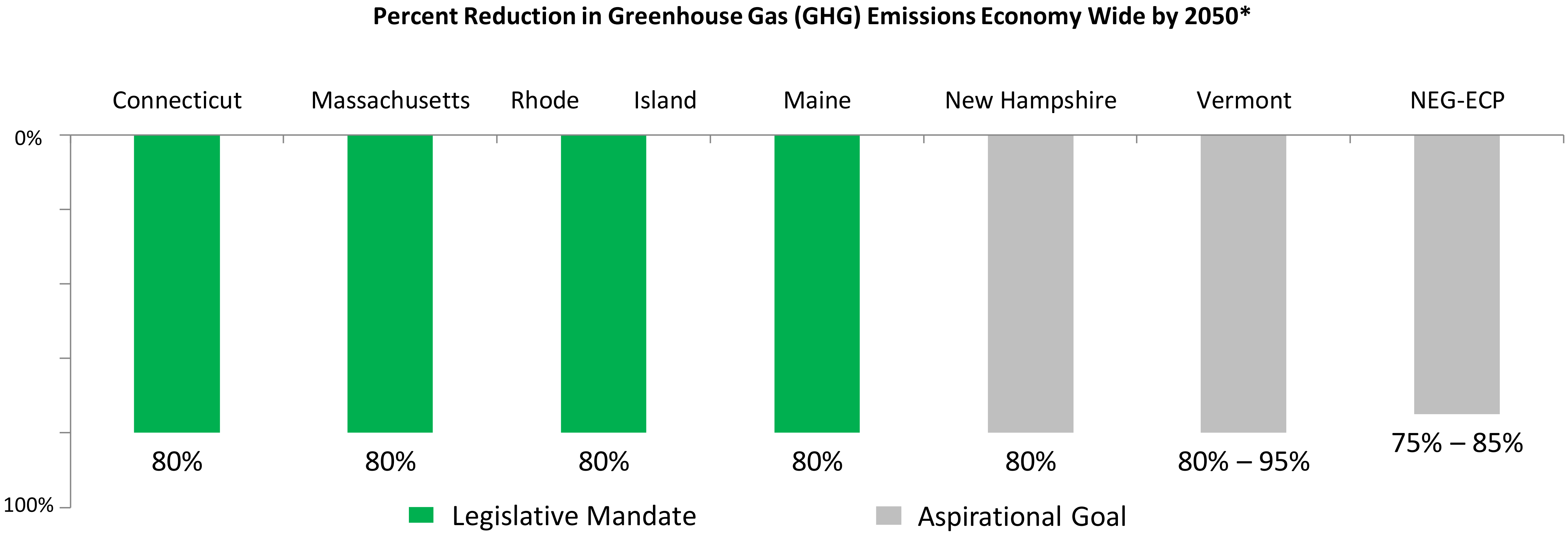
… and wind dominates the queue



***Source**: ISO-NE Generator Interconnection Queue (July 2020)*

States Have Set Goals for Reductions in Greenhouse Gas Emissions

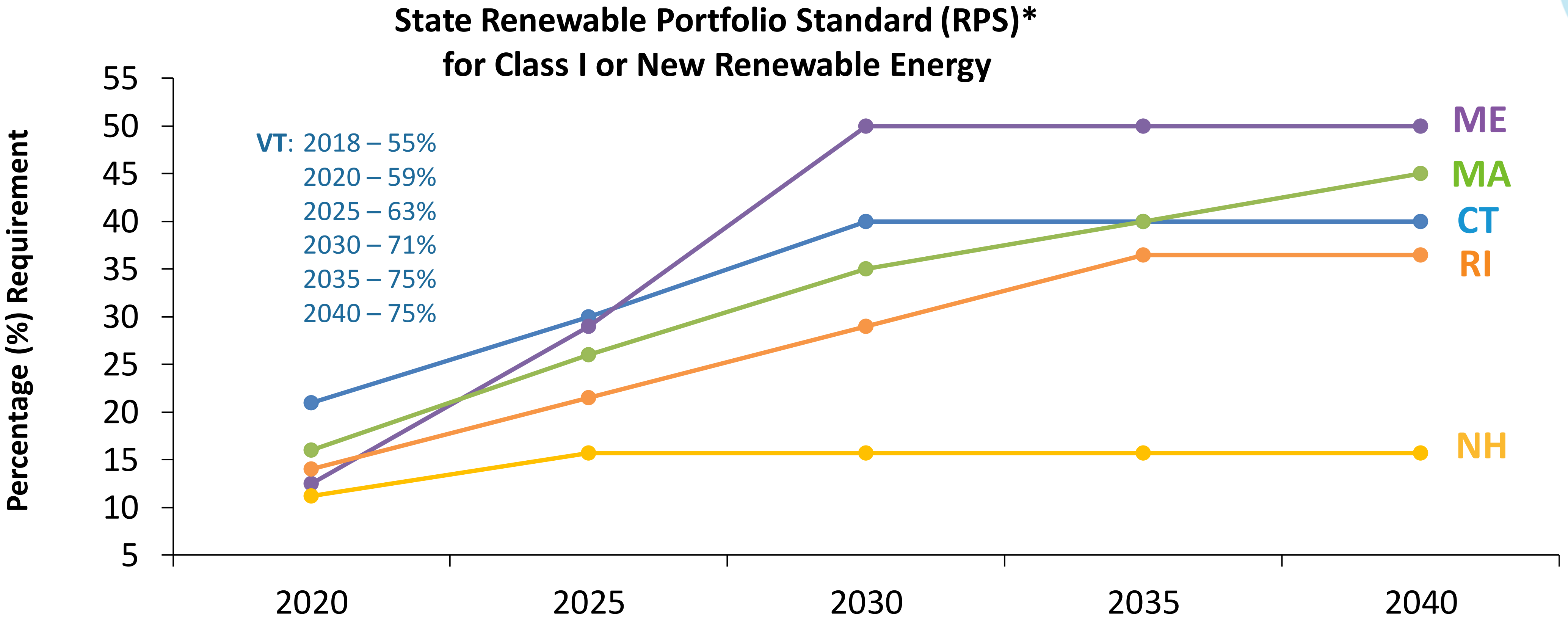
Some Mandated, Some Aspirational



The New England states are promoting GHG reductions on a state-by-state basis, and at the regional level, through a combination of legislative mandates (e.g., CT, MA, RI, and ME) and aspirational, non-binding goals (e.g., NH, VT and the New England Governors and Eastern Canadian Premiers).

MA, RI, NH, ME, and VT use a 1990 baseline year for emissions reductions. CT and the NEG-ECP use a 2001 baseline. For more information, see the following ISO Newswire article: http://isonewswire.com/updates/2019/10/2/the-new-england-states-frameworks-for-reducing-greenhouse-ga.html

States Are Driving Up Demand for Renewable Energy



Notes: State RPS requirements promote the development of renewable energy resources by requiring electricity providers (electric distribution companies and competitive suppliers) to serve a minimum percentage of their retail load using renewable energy. Connecticut's Class I RPS requirement plateaus at 40% in 2030. Maine's Class I/IA RPS requirement increases to 50% in 2030 and remains at that level each year thereafter. Massachusetts' Class I RPS requirement increases by 2% each year between 2020 and 2030, reverting back to 1% each year thereafter, with no stated expiration date. New Hampshire's percentages include the requirements for both Class I and Class II resources (Class II resources are new solar technologies beginning operation after January 1, 2006). New Hampshire's Class I and Class II RPS requirements plateau at 15.7% in 2025. Rhode Island's requirement for 'new' renewable energy plateaus at 36.5% in 2035. Vermont's 'total renewable energy' requirement plateaus at 75% in 2032; it recognizes all forms of new and existing renewable energy and is unique in classifying large-scale hydropower as renewable.

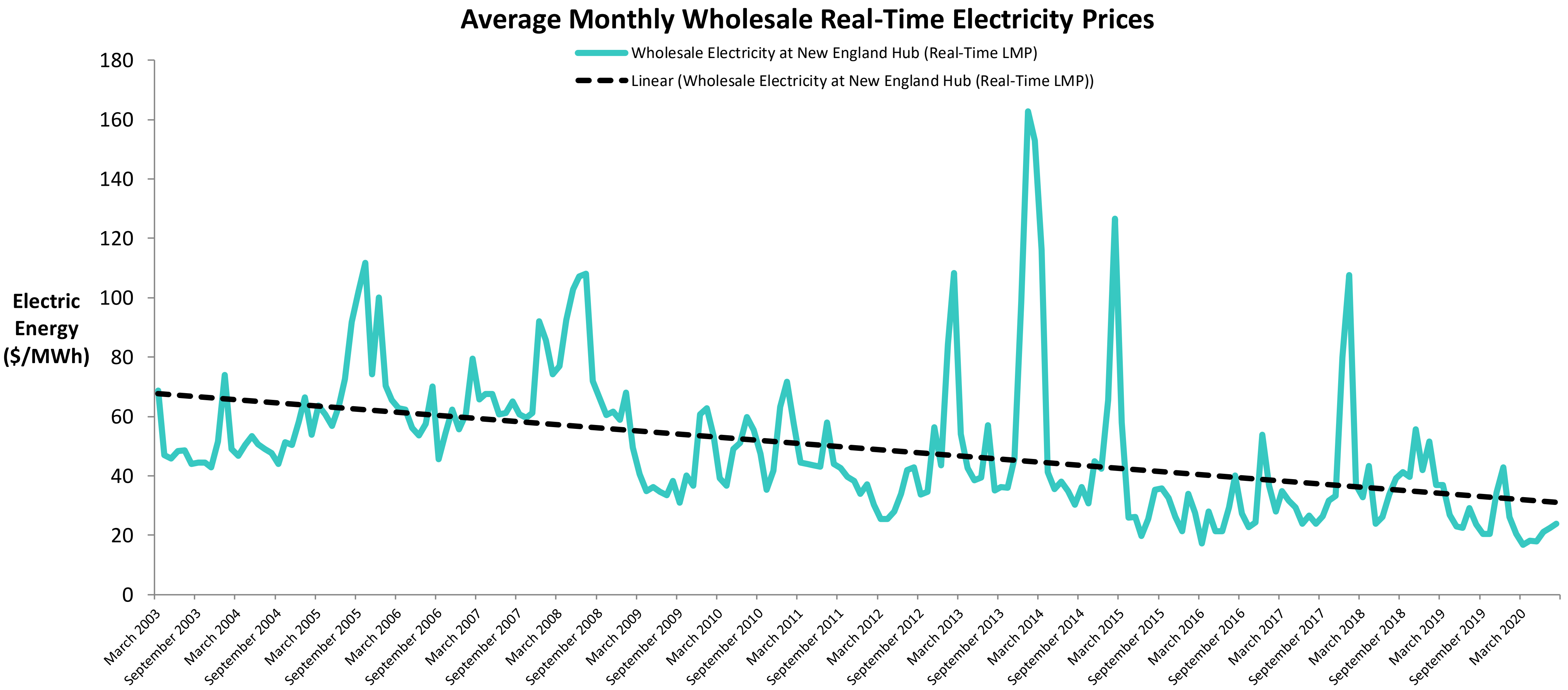
Developers Are Proposing Large-Scale Transmission Projects to Deliver Clean Energy to New England Load Centers

- Developers are proposing ~**15** elective transmission upgrades (ETUs) to help deliver about **7,200 MW** of clean energy to New England load centers
- Wind projects make up roughly **61%** 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

Source: ISO Interconnection Queue (July 2020)

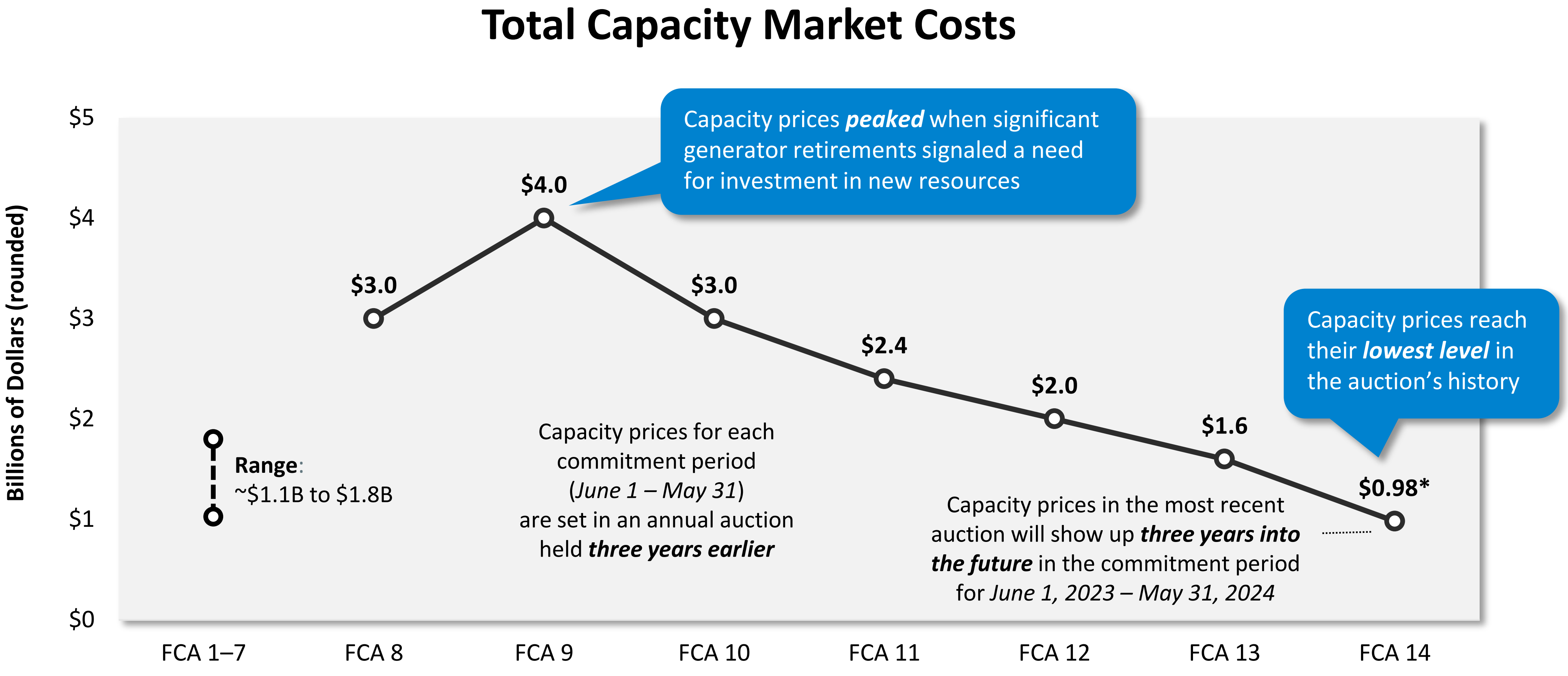
Wholesale Electricity Prices Have Been Declining

Volatility persists in extreme cold winter periods



Capacity Market Prices Have Been Declining

Costs reflect changing supply outlook



*Preliminary estimate

Balancing Policy and Regulatory Structure

The role of policy in market design

A Longstanding Construct of Federal, Regional, and State Requirements Guides the Electric Industry's Evolving Mix of Technologies, Market Incentives and Policy Goals

- Central planning and regulatory failures of the past led policymakers to restructure and use competition to drive efficiencies and to ensure reliability
- More than twenty years ago, the New England states played a crucial role in designing the region's competitive markets to achieve the efficient, reliable production of electricity with the policy goal of doing so at the lowest cost

New England's regional wholesale markets have achieved the original objectives of competition, resulting in efficiencies and significant environmental benefits

Consumers Have Benefited from New England's Regional System Planning and Competitive Wholesale Electricity Markets

- **Wholesale markets continue to deliver efficiency**
  Average annual wholesale energy prices fell more than 60 percent from 2008 to 2019. Last year, the total value of the wholesale electricity market was the lowest since the start of competitive markets, and the 2020 capacity price (for 2023–2024) hit a record low. *Would a cost-of-service structure respond as quickly, or as efficiently?*

- **Emissions have declined with changes in the fuel mix**
  Generator air emissions have fallen sharply over the last two decades

- **Investment risk has shifted away from consumers**
  The competitive market structure has shifted the risk of bad investment decisions from consumers to private developers

Federal and State Policies, However, Are Not Aligned, Leading to Jurisdictional Tension and Debate Over Electricity Market Design

- **FERC seeks market efficiency** and appropriate price formation for reliability services and requires *resource neutrality* in the market design
- **But states have the authority** to select their own generation mix under the Federal Power Act. For many states, the policy imperative of the 2020 era is to ensure a *rapid transition* to clean energy resources, at affordable costs
- The New England States are *generally aligned*, but their policies on this transition are not uniform

States Want to Decarbonize the Economy and Use a Clean Power System to Decarbonize Other Sectors (e.g., Transportation and Buildings)

- **State clean energy initiatives include** RGGI; Renewable Portfolio Standards (RPS) and Renewable Energy Credits (RECs); Emission Reductions; Solar RECs; incentives for storage; and PPAs for hydro, wind and nuclear energy
  - The more specific the incentive and the more it makes the resource indifferent to wholesale prices, the higher the tension with a wholesale market design that seeks the *price for providing reliability,* in a resource-agnostic manner
  - The disparate nature of the current incentive structure makes it difficult to create alignment with reliability objectives
- **State economic-development objectives** (e.g., specific resources in specific locations) are unlikely to be achieved in a resource-neutral market design

Enabling a Reliable Clean Energy Transition

Wholesale market will evolve; incentives matter

The Clean Energy Transition Is Changing the Way We Operate the Region's Electricity Grid

- **Renewable energy resources (other than large hydro) are weather dependent** and energy from these resources is variable. To ensure grid reliability, other resources must provide "balancing" electrical energy at the right time, and in the right place. Studies show the region will need more such resources as electricity demand increases due to de-carbonization and electrification

- **Grid reliability will remain imperative** as the clean energy economy evolves to become ever more dependent on clean electricity. The evolution of the resource mix will require an evolution in the wholesale market design

The Clean Energy Transition Will Depend on Two Types of Resources

- **Variable, renewable energy resources** will eventually become the new "baseload" resources and produce most of the electrical energy. Today, these resources are evolving, but in this region still require "above market" financial support via state incentives and contracts, making them largely indifferent to wholesale prices

- **Balancing resources** will be necessary to "fill in" the energy gaps, which may last from milliseconds to multiple weeks. Currently, balancing resources are primarily made up of Merchant Resources (non-utility owned or non-state-sponsored), and are wholly dependent on wholesale market prices

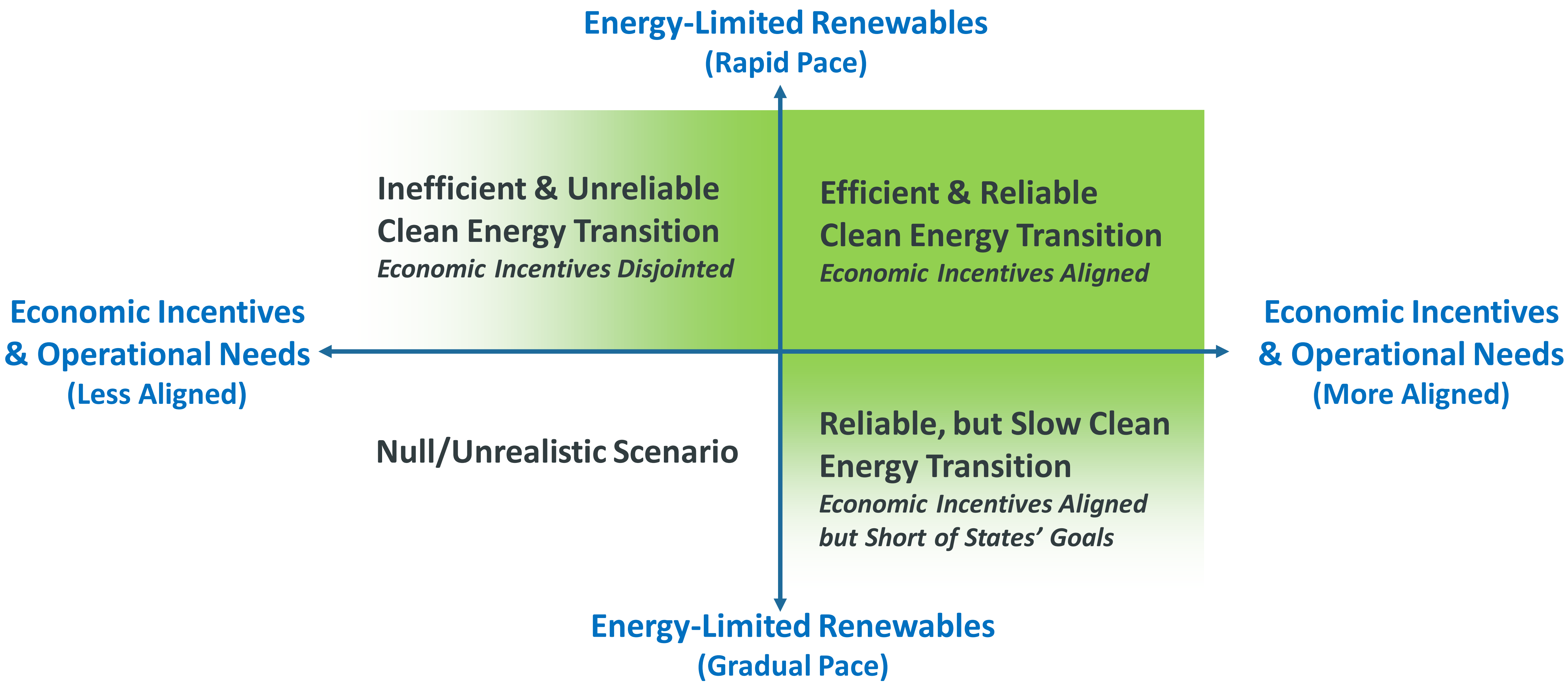
This transitional, "hybrid," compensation structure introduces significant market design tensions and inefficiencies, and has stimulated a discussion on the future of the wholesale markets

An Efficient and Sustainable Clean Energy Transition Requires a Continued Focus on Reliability

This involves:

- **Optimization and dispatch of resources** in accordance with the physical realities and constraints of the power system
- **Adequate resources and infrastructure** to ensure “on call” production of energy when required, given the energy-limited nature of renewables and the constraints imposed on carbon emissions and fuel infrastructure
- **A robust transmission system** to transport clean electrical energy
- **A market structure that pays for required reliability attributes and drives performance across the entire resource mix**

Renewables Are Expected to Grow, but The Success of The Transition Will Depend on How the Region Manages Two Critical Uncertainties



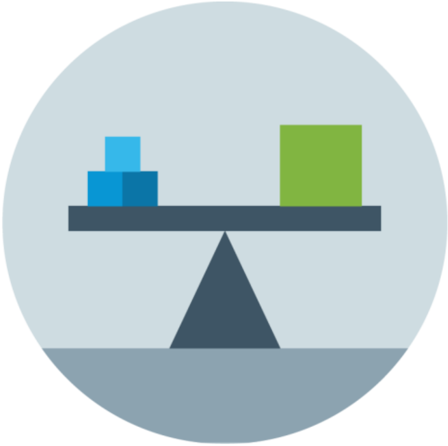
Balancing Resources Are Needed for Reliability and Rely on Wholesale Market Revenues to Recover their Costs

- **Energy market revenues are based on the marginal cost of production**
  Over time, low-marginal-cost renewables and distributed resources will reduce energy market prices and cause balancing resources to run less often

- **The capacity market provides vital supplementary revenues to the unsponsored balancing resources and ensures Resource Adequacy**
  Ancillary services will expand but are unlikely to ensure full cost recovery for unsponsored resources

- **The MOPR (Minimum Offer Price Rule) and CASPR (Competitive Auctions with Sponsored Policy Resources) protect price formation in the capacity market while providing a path for state sponsored resources to enter the market over time**
  However, if insufficient trading occurs in CASPR, the region may experience some overbuilding. Removing the MOPR requires a solution to price suppression in the capacity market, or moving to a different resource adequacy construct

- ***Key Question:* How should the region solve for Resource Adequacy?**
  Or stated another way; how can the market design solve for both reliability and the states' de-carbonization objective?



The ISO's Energy Security Improvements (ESI) Initiative Would Expand Ancillary Services to Support the Clean Energy Transition

Challenges: Fuel infrastructure limits, emission restrictions and rapid growth in energy-limited resources create New England's energy security risks

Principles: The ISO is committed to market-based solutions, guided by its core, market design principles

Priorities: ESI filing to comply with the FERC's fuel security order aligns with several strategic priorities:

- ✓ Energy security for the power system, in accordance with varying risk
- ✓ Sound price formation in the markets
- ✓ Ensure resource flexibility and support renewables integration

Resource Adequacy Is the Thorniest Market-Design Issue Facing New England

- Carbon pricing is the simplest, most direct market incentive to drive a transition
  - Compensates both carbon-free resources and efficient, low-emission resources through the energy market (reducing dependency on the capacity market), and if done correctly, will eliminate the need for the MOPR and CASPR
  - The RGGI model could work, but caps need to be significantly lower
  - An alternative is 'net carbon pricing' within the wholesale electricity markets
- Absent carbon pricing, the region will not be able to easily address both the *reliability* and *decarbonization* objectives within the wholesale market structure
  - If the MOPR is eliminated, price suppression will occur in the FCM and unsponsored resources may retire prematurely, leading to uncertain reliability outcomes
- What is the universe of available solutions for ensuring resource adequacy?

Navigating the Clean Energy Transition

What is the evolutionary path for New England's wholesale market design?

What Is the Evolutionary Path for New England's Market Design?

- The current FERC-approved Energy and Ancillary Services markets are "state-of-the-art" and will continue to evolve and improve
  - The ISO's Energy Security Improvements (ESI) filing, a market-based proposal to address regional energy security concerns, is pending at FERC
  - Future Ancillary Services enhancements may be needed (e.g., ramping and inertia)
  - The region will have to decide whether to maintain the current resource adequacy construct (i.e., FCM), or transition to another model

Existing Resource Adequacy Models Fall into One of Three Categories

1 Traditional, Regulated Utility Model

Regulated utility develops Integrated Resource Plan and state regulators authorize cost recovery; consumers bear risks of cost overruns and poor resource selection decisions (Central planning approach and precursor to electric industry restructuring in the late 1990s)

2 Combined Model

A different form of IRP, combined with regional energy markets. States oversee and approve cost recovery for electric distribution company (EDC) and/or load serving entity (LSE) resource portfolios. Some merchant resources participate under a combination of market revenues and out-of-market contracts. Resource adequacy is essentially under state control. Environmental policy objectives are achieved state by state

3 Market-Based Mechanism

An explicit regional (or statewide) mechanism for valuing resource adequacy. Use either forward auctions to establish a clearing price for capacity or establish a high scarcity price in the energy market. Capacity auctions seek a target reserve margin and the 'Energy-Only' market accepts a variable reserve margin. Carbon reduction objective is achieved by including a price on carbon in fuel costs/production cost

What Are the Cost Recovery and Risk Implications of Existing Models?

	1 Trad., Reg. Utility Model (Customers Bear Most Risk)	2 Combined Model (Customers Bear Most Risk)	3 Market-Based Mechanism (Suppliers Bear Most Risk)	
	Regulated Utilities ensure RA and optimize energy production via economic dispatch	**Utilities/LSEs ensure RA and fuel infr.; Energy Market optimizes energy production**	**Energy, Capacity, Ancillary Mkts ensure reliability**	**Energy and Ancillary Mkts, RA through very high spot price**
ISO/RTO, or Region	WECC (except CA) and SERC regions	California, MISO, SPP	ISO-NE, PJM, NYISO	ERCOT
Reserve Margin Requirement?	Yes (Utility IRP, State regulated)	Yes (Utility/LSE IRP enabled, State regulated; CAISO utilizes cost of service reliability contracts to cover gaps)	Yes (FERC regulated)	No, variable (State sets the scarcity price)
Capital Cost Recovery?	Traditional Cost-of-Service Rate Recovery	State approved cost recovery, net of Energy Market	Energy and Capacity Markets	Energy Market
			3a	3b

Which Model Would Best Drive/Support the Clean Energy Transition?

States Take Responsibility for Resource Adequacy and Accept Investment Risk:

1 Implement centralized, regional, integrated resource planning (IRP) through some form of multi-state compact and a regional planning/procurement agency to select/finance the resource mix

2 States direct Electric Distribution Companies to assure Resource Adequacy through contracts with all required resources (i.e., a version of the California model)

Achieve Resource Adequacy through a Market Construct:

3a Maintain the capacity market and implement substantive carbon pricing

- Substantive carbon pricing could eliminate the need for the MOPR and CASPR
- Absent carbon pricing, a mechanism is needed to ensure appropriate price formation in the FCM

3b Eliminate the capacity market and rely on Energy and Ancillary Services (EAS) only

- Responsibility for resource adequacy shifts to load-serving entities (LSEs)
- Who decides the appropriate scarcity price (FERC or States)?
- Reserve Margin is highly variable and derived from the scarcity price and market expectations

If Desired, What's the Timeframe for Market Changes?

- Through the Forward Capacity Market, the ISO has commitments from resources to meet the region's resource adequacy needs for about the next 4 to 5 years
  - The region has secured capacity resources through May 2024, and the process is underway to secure resources for the following year
- If changes are required, those changes would require development time, and time to process, file and approve those changes
  - Major changes have typically taken 2 to 3 years
- The next stage of the evolution of the market structure will likely be in place for multiple decades, so we need to proceed deliberately

If a transition to a new pathway is required, the timeframe would be towards the latter part of this decade

Future Grid Reliability Study

Develop a Future Grid Reliability Study and Discuss Potential Market Improvements to Address Identified Gaps

- This is one track in the New England Future Grid Initiative
- The States and NEPOOL, with support from the ISO, are working toward a **reliability study** to evaluate the future resource mix as the region moves toward achieving state renewable energy mandates
- If gaps in reliability and/or revenue adequacy are identified in the study, this initiative may also analyze potential changes to the **wholesale market design** to support the reliable operation of the grid as those mandates are achieved

What Timeframe Is Envisioned for a Future Grid Reliability Study?

- Ultimately, policymakers in New England are seeking to **decarbonize the entire economy** (not just the energy sector)
- The primary target is an **80% reduction by 2050** in greenhouse gas emissions below 1990 levels, economy-wide (and interim goals for 2030, 2040)
- Existing studies evaluated so far look at a range of **horizon study years**, e.g., 2025, 2030, 2040, 2050

States target
80%
by 2050

Insightful Analysis from a New England-Focused Decarbonization Study

E3 and EFI looked at deep decarbonization scenarios and reliability challenges in the 2050 timeframe

Among their preliminary results and findings (emphasis added):

- In most weeks, significant **wind** and **solar** generation minimize the need for traditional generation, but significant amounts are *still needed for reliability* in **low-renewable conditions**
- Relying on **renewables** and **storage** (without gas) in a high-electrification scenario would require *significant overbuild* and *significant curtailment* during typical weeks
- **Electricity demand** will increase significantly (66 - 97%) in New England over the next three decades under all plausible low-carbon scenarios
- New England requires significant **thermal capacity** (30 - 37 GW) in all cases
  - Expect declining capacity factors, but also some form of low-carbon fuel to become available

ENERGY FUTURES INITIATIVE

Source: *Electric Reliability under Deep Decarbonization in New England*, Draft/Preliminary Results, Energy+Environmental Economics and Energy Futures Initiative, Presentation to NEPOOL, Aug. 4, 2020.

Pathways to the Future Grid

- This is the second track in the New England Future Grid Initiative
- NEPOOL has engaged Dr. Frank Felder to perform a **qualitative assessment** of future market pathways, estimated to be completed in December 2020
- ISO Board has directed Management to evaluate two of the concepts in more detail: ***net* carbon pricing** and a **forward clean energy market (FCEM)**, and has requested feedback on market pathways at the November meeting with stakeholders. This evaluation will essentially be a more detailed extension of Dr. Felder’s work and we will review scope, assumptions and results of our assessment in the stakeholder process
- The ISO is prepared to evaluate other pathways that may emerge in discussions with stakeholders

What Pathway will the region choose?

*We look forward to working with the New England States and stakeholders to choose a preferred **Pathway** to the region's Clean Energy Future*

Photo provided by Trace Meek