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New England's Wholesale Electricity Markets

The Clean Energy Transition and Future Pathways

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P R E S I D E N T A N D C E O



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This presentation examines how ISO New England is currently enabling the Clean Energy Transition through a competitive market for power system reliability services and considers the implications of future evolutionary pathways for the region's wholesale electricity markets

The presentation consists of five sections:

- **Maintaining a Reliable Grid**
- **Balancing Policy and Regulatory Structure**
- **Enabling Clean Energy Transition**
- **Framing the Pathways Discussion**
- **Navigating the Transition**



Maintaining a Reliable Grid

Ensuring the basic requirements of reliability



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 characterized by high temporal and spatial variability. To ensure grid reliability, other resources must provide balancing electrical energy at the right time, in the right place
- **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 less dependent on wholesale market revenues
- **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 revenues

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



Balancing Resources Are Needed for Reliability, but They Only Receive Wholesale Market Revenues

- **Energy market revenues are based on the marginal cost of production.**
Over time, these revenues are likely to decline (on average) due to high volumes of very low marginal cost renewables and distributed resources
- **Balancing resources will run less often and are subject to caps on energy offers.**
Therefore, it is unlikely they will fully recover their capital and fixed costs through the energy market
- **Today, capacity and ancillary services markets provide supplementary revenues.**
This is essential for these “on-call” balancing resources. Also, the capacity market currently provides supplemental revenue for most existing renewable and distributed resources, and is factored into the prices for the long-term contracts
- **Traditionally, the capacity market has been useful to ensure resource adequacy.**
(However, this depends on the true cost of the “call option” on energy being revealed in the pricing)



How Does Nuclear Generation Fit into this Picture?

- **Nuclear generators are valuable sources of stable, carbon-free electricity**
 - Like renewables, they are high capital cost resources. Their primary revenue source is the energy market, and as energy market revenues decrease, recovery of these capital investments will be more difficult. Owners typically seek longer term, forward energy sales to hedge the risk of recovery of capital investments
 - Like renewables, they provide a valuable environmental attribute (carbon-free electricity) for which they do not receive material compensation
 - They significantly reduce the quantity of balancing energy required and currently **comprise 25% of regional energy supply in the winter**
 - However, they do take refueling outages and can experience unplanned outages. They will eventually retire
 - In the event of outages or retirement, the need for replacement energy, including balancing energy, will increase significantly



The Clean Energy Transition Has Raised Key Questions About How to Retain Resources Needed for Reliability

- 1. Is there a better solution than a capacity market for ensuring resource adequacy?**
(Or, how can the markets evolve to further accommodate the Clean Energy Transition?)
- 2. Do we need to expand ancillary services markets?**
- 3. How can we harness market forces to bring about a merchant transition toward clean resources (that doesn't depend on direct state sponsorship of specific resources)?**
(Or, does the region want to return to a planned, cost-of-service structure?)
- 4. Will the disparity between old and new Power Purchase Agreement (PPA) prices turn out to be reminiscent of the stranded asset phenomena from decades ago?**
(With falling PPA prices, shorter PPA contract lengths, and as older renewables fall off PPAs, will all wind/solar eventually become merchant resources?)
- 5. Is it time to consider realistic pricing for carbon emissions in New England?**
(Putting a realistic price on carbon will raise energy market revenues, favoring the operation of resources that reduce carbon [including nuclear], thus driving the Clean Energy Transition and improving the overall efficacy of the existing market structure)



Balancing Policy and Regulatory Structure

The role of policy in market design



It Is Important to Understand the Electric Industry's Evolving Mix of Technologies, Market Incentives and Policy Goals Amid the Longstanding Framework of Federal, Regional, and State Requirements

- 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 deliver regional efficiencies.** Average annual wholesale energy prices declined by 46 percent from 2008 to 2018 and preliminary data shows that wholesale prices fell further in 2019, approaching record-low prices. The February 2020 capacity clearing price (for the 2023–2024 period) is a record low. Would a cost-of-service structure respond as quickly, as efficiently?
- **Emissions have declined with changes in the fuel mix.** Air emissions from regional generators have fallen dramatically over the last two decades. The roughly 70 million short tons of CO₂ emissions avoided between 2001 and 2017 is equivalent to taking >13.5 million vehicles off the road for a year
- **Investment risk has shifted away from consumers.** The competitive market structure has shifted the risk of bad investment decisions from consumers to private developers. If the owner of a generator makes an uneconomic investment decision in the wholesale market, consumers are not exposed to that risk



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 2020s is to ensure a rapid transition to clean energy resources, at affordable costs
- The New England States, although generally aligned, do not have uniform policies on the Clean Energy Transition



States Generally Want to Decarbonize, with the Intent of Using a Clean Power System to Enable the Decarbonization of Other Sectors (e.g., Transportation and Heating)

- **State clean energy initiatives include** the 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, 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
- **States' economic development objectives** are also specific (e.g., specific resources in specific locations); this is unlikely to be achieved in a resource-neutral market design



Enabling the Clean Energy Transition

Wholesale market will evolve; incentives matter

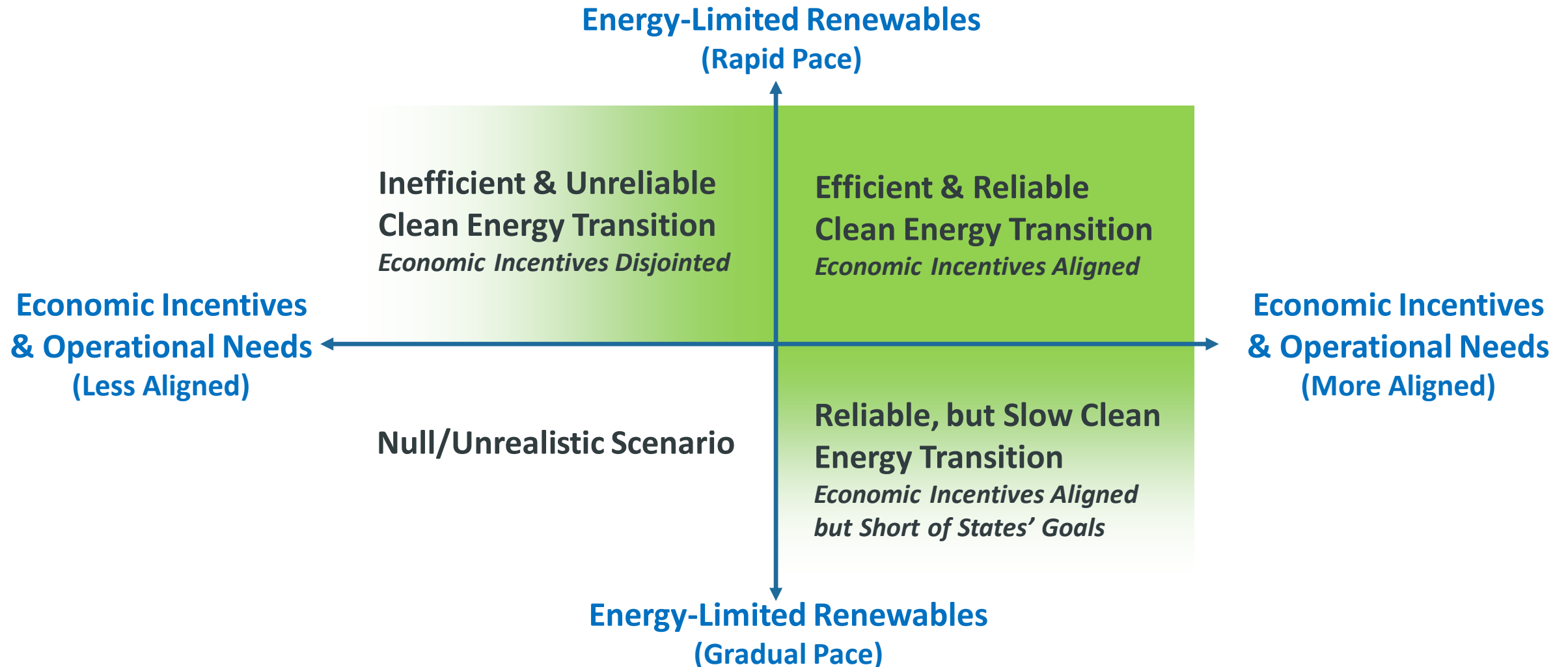


An Efficient and Sustainable Clean Energy Transition Requires a Continued Focus on Reliability. This Involves:

- **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 ensures reliability**
 - **Energy and ancillary markets** that are reflective of power system physics, including explicitly addressing energy limitations
 - **A Resource Adequacy construct that evolves** with regional preferences and policies
 - **Market incentives should drive performance**



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



The Energy Security Improvements (ESI) Initiative Addresses the Region's Energy Limitations with a Risk Responsive Design

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: Current ESI effort 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



ESI Solution: Energy Options in the Day-Ahead Market

Procure two product types in an expanded, co-optimized day-ahead market:

- A. *Forward energy*** for Real-Time (RT) delivery (same as today); and
- B. *Options on energy*** for RT delivery (new), acquired from *additional* (physical-only) resources

An energy-option award in the day-ahead market provides:

- An up-front, market-determined option price that reduces revenue uncertainty for sellers, and
- Strong incentives for resources to be able to “cover the call” (e.g., have stored energy or access to fuel during stressed or potentially stressed conditions)



Three New Co-optimized Day-Ahead Energy Option Products

1. ***Energy Imbalance Reserves*** to supply the difference when forecast next-day energy demand exceeds demand cleared in the Day-Ahead Market
2. ***Replacement-Energy Reserves*** to ensure “on call” energy within 1.5 to 4 hours, for load forecast uncertainties, generator non-performance, and to restore other reserves
3. ***Generation Contingency Reserves***, the (existing) fast-response reserve products that address sudden supply loss situations

These provide a greater “margin for uncertainty” in the region’s increasingly energy-limited grid



The Resource Adequacy Question Is the Thorniest

- A realistic, stable, economy-wide carbon pricing regime that can be trusted by investors, is the simplest and most direct market incentive for driving a transition to clean energy *within* the market
- Until such an incentive is in place, the region needs a solution that facilitates this transition while maintaining price formation in the capacity market
 - CASPR (*Competitive Auctions with Sponsored Policy Resources*) is an innovative, “next best” solution that facilitates the transition of resources into the capacity market over time
 - Resource substitution via CASPR will depend on the build-up of economic pressures over time
 - This has caused concern among some stakeholders that the transition may not occur swiftly enough, or that the lack of substitution may lead to a costly overbuild, leading to a discussion about alternative market designs or structures
- So, what are feasible pathways?



Framing the Pathways Discussion

Evaluating the options and tradeoffs



Some Questions Motivating the Resource Adequacy Debate

- Is the ISO New England resource adequacy mechanism (Forward Capacity Market) compatible with the New England states' clean energy policies and mandates?
- Is there a preferred mechanism for ensuring resource adequacy, given the clean energy policies? What are the cost recovery and risk transfer implications under the various potential resource adequacy mechanisms?
- As the economy becomes ever more dependent on electricity, does the interaction of policies and market structure mechanisms result in a reliable provision of electricity service, at the lowest costs for customers?

Are there other resource adequacy models being used today that may be instructive? Or should the ISO's rules continue to evolve to accommodate state public policies?



Existing Resource Adequacy Models Fall into One of Three Categories

- **A Traditional, Regulated Utility Model:** A form of central planning where the utility is responsible for resource adequacy and the State PUC approves an Integrated Resource Plan (IRP) and associated cost recovery. Objective is to achieve a target reserve margin in accordance with state policies. Dominant model before restructuring in the late 1990s
- **A Combined Model:** A different form of IRP, combined with regional energy markets, where states oversee and approve cost recovery for utility 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 target is essentially under state control. Environmental policy objectives are achieved in an uncoordinated fashion (state by state)
- **A Market-based Mechanism:** An explicit regional (or statewide) mechanism for valuing resource adequacy; using either forward auctions to establish a clearing price for capacity, or establishing 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 costs



Existing Resource Adequacy Models: What Are the Cost Recovery and Risk Implications of the Various Resource Adequacy Mechanisms?

	Central Planning (Customers Bear Most Risk)	Combined (Customers Bear Most Risk)	Market Mechanisms (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 (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

All models are under scrutiny by their respective jurisdictions



Which Evolutionary Path Is Feasible? Which Is Best for the Region?

- **Maintain the Capacity Market and Make Incremental Improvements:**
 - And eventually implement realistic carbon pricing, either through RGGI, or in energy market?
- **Eliminate the Capacity Market and Accept the Volatility/Risk of an Energy-Only Market:**
 - Texas has structural differences: Single state, policymakers accept volatility and risk, default for load is “unhedged,” load is highly price responsive, unlimited balancing energy (natural gas), warm winters
 - Would FERC or the New England States decide on the appropriate scarcity price?
- **States Take Responsibility for Resource Adequacy and Accept Investment Risk:**
 - Implement centralized, regional, integrated resource planning (IRP)? (This would require some form of multi-state compact and a regional planning/procurement agency to finance the resource mix)
 - Authorize Transmission Owners to do full IRP, and to own and/or contract for needed resources, utilizing the TO balance sheet for financing? (e.g., the “Combined Approach” of California or MISO)
- **A New Market-Based and Technology-Agnostic Resource Adequacy Construct?**
 - Aspirational? Ideally, assure resource adequacy by orchestrating forward obligations in a purely financial manner, eliminating administrative burdens and achieving appropriate price formation irrespective of state sponsorship of resources

Which structure will best harness competitive forces and innovation to drive the Clean Energy Transition?



Whatever Pathway is Chosen, the Market Structure Must Drive Operational Performance

- **Disaggregation of the resource mix will continue**
 - Consumers want the freedom to choose between self-supply and the market
 - Contracting for annual energy quantities does not ensure energy “on demand”
 - New England will become a winter-peaking system, amplifying reliability consequences
 - High penetration of distributed resources (including electric vehicles) means that thousands/millions of resources need to be aligned with grid reliability
- **The importance of system reliability will grow as electrification grows**
 - Economic incentives must be aligned with operational and grid reliability needs
 - Wholesale and retail incentives need to be aligned
 - Advanced coordination is required between Transmission and Distribution operations
- **Innovation will be critical; there are many challenges to be addressed**

Incentives matter. The combined market revenue opportunity (energy, ancillary services, resource adequacy construct) must be well aligned with reliability needs



Navigating the Clean Energy Transition

What is ISO New England's evolutionary path and timeframe?



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

- The timing of the transition is uncertain; large renewable energy projects are experiencing delays and the market needs to work during the transition and in the end-state
- The current FERC-approved Energy and Ancillary Services markets are “state-of-the-art” and will continue to evolve
 - ISO New England has to comply with a FERC Order to file a market based design to address regional energy security concerns by April 15, 2020 (i.e. the Energy Security Improvements initiative)
 - Future enhancements may be needed (e.g. ramping and inertia)
- The New England States (through NESCOE) and the New England Power Generators (through NEPGA), have requested a stakeholder discussion on the future of the wholesale market structure



Enhanced Modeling Will Inform Market Design Choices and the Transmission Planning Process for the Clean Energy Transition

- **The future path of the markets needs careful study**
 - The steep part of the Clean Energy Transition is 2030 and beyond. We expect a “hockey stick” in demand for clean electricity and for New England to become a winter-peaking system
 - Costs for renewable technologies and electric storage continue to drop
 - When will clean fuels (e.g., clean hydrogen) become economically viable?
 - Will it be possible to decarbonize an entire economy without a price on carbon?
 - How does the region avoid future stranded costs?
- **It is important to model the likely trajectory for the power system from 2030 to 2050**
 - What are the likely revenue requirements of the future resource mix?
 - What are the tradeoffs inherent in any design choice?
 - What transmission investments are likely needed?



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

- Through the Forward Capacity Market (FCM), ISO New England 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 31, 2024 (FCA #14, held on February 3, 2020)
 - The 2025 timeframe for the FCM begins March 2020 (FCA #15)
- 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



Next Steps?

- A stakeholder-led process is underway in the region to consider the future of the wholesale markets. As we understand it, the primary question is how best to harmonize the achievement of *three objectives*: carbon reduction, reliability, and using markets to select the lowest-priced resources
- The ISO has committed to provide resources to support the discussion. We recommend a study of the implications of economy-wide decarbonization on the future power system. The first step would be to define a scope of work
- The ISO believes that the existing market structure is viable and we are committed to make improvements as necessary (e.g., ESI). We are not currently planning further major market structure changes
- The New England region has a successful history of solving difficult problems, and the ISO stands ready to help the region meet its goals and objectives, and ensure a reliable electricity future



QUESTIONS?