

ISO New England's Approach to Future Grid Studies

Supporting New England's transition to a clean energy future



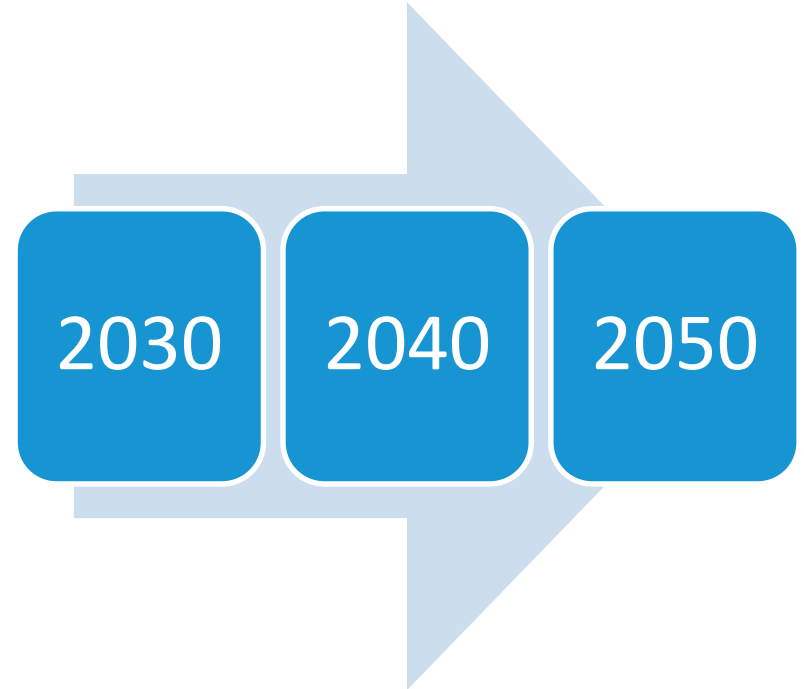
Vamsi Chadalavada

EXECUTIVE VICE PRESIDENT AND COO



Study Time Horizons and Timeframe

- Time horizons for future-grid-related studies already underway at the Planning Advisory Committee (PAC), plus new studies for the States and NEPOOL stakeholders, span from the end-of-decade to mid-century
- Conducting these studies would occupy much of the next year



2021 Future Grid Studies

The studies in bold are discussed in this presentation

Study (Sponsor)	Start	Est. Finish	Forum	Horizon Year	Study By
Transmission Planning for the Clean Energy Transition (<i>ISO-NE</i>)	Sept. 2020	2021	PAC	2030	ISO
2020 Economic Study (<i>National Grid</i>)	4/1/20	Est. 6/1/21	PAC	2035	ISO
Future Grid Reliability Study (FGRS) Phase I (<i>NEPOOL</i>)	4/1/21	Q1 2022	MC/RC (PAC)	2040	ISO
2050 Transmission Study (<i>NE States</i>)	Q1 2021	TBD	NESCOE/PAC	2050	ISO
Pathways: Analysis of FCEM/ICCM (<i>States/Stakeholders</i>)	Feb. 2021	Q1 2022	PC	TBD	ISO
Pathways: Analysis of Net Carbon Pricing (<i>ISO-NE</i>)	Feb. 2021	Q1 2022	PC	TBD	ISO
FGRS Phase II (<i>NEPOOL</i>)	Fall 2021	TBD	MC/RC	2040	TBD



Future Grid Reliability Study (FGRS) Phase I

Use stakeholder-defined scenarios to examine how New England's power system could operate in 2040 in light of current state energy and environmental policies

- Primary objective of Phase 1
 - Build assumptions under the defined scenarios and identify operational and reliability challenges that could occur in 2040, using the following:
 - Production Cost Simulation
 - Ancillary Services Simulation
 - Resource Adequacy Screen
 - Probabilistic Resource Availability Analysis
- The ISO has agreed to conduct Phase I of the study
 - Anticipate completion by **Q1 2022** if incorporated as 2021 Economic Study



2050 Transmission Study

New England States' vision statement seeks a transmission study that can help states determine how to expand the system to incorporate wind, hydro, and distributed energy resources

- Primary objectives
 - Develop high-level transmission scenarios to evaluate large-scale renewable energy integration and cost estimates
 - Look well beyond the ISO's typical 10-year horizon for transmission needs
 - Is not a plan to build specific projects unless States choose to move forward
- States have requested the ISO to conduct the study, which we will do
 - Building on discussions at the New England Energy Vision [February 2 transmission planning technical forum](#), States are engaging with the ISO to further develop their study request
 - The ISO anticipates discussing the **scope, assumptions, and inputs** at the PAC before finalizing



Pathways Evaluations: Forward Clean Energy and Carbon Pricing Studies

Stakeholder effort to review market frameworks that may help evolve the power grid to a future state reflecting states' policies

- Frank Felder's January 2021 report assessed pathways (1) in helping to advance state clean energy policy objectives and (2) on market efficiency
 - Frameworks assessed included: Forward Clean Energy Market (FCEM), Integrated Clean Carbon Market, Carbon Pricing, Energy-Only Market, and Alternative Reliability Assurance Frameworks
- The ISO has committed to evaluate **FCEM** and **net carbon pricing** proposals
 - **Kickoff today** to discuss scope, deliverables, and timeline
 - The ISO expects to complete these studies in **Q1 2022**



FGRS Phase II

Contemplates whether revenues from the existing markets could be sufficient to attract and retain the new and existing resources necessary to continue operating the system reliably under stakeholder-defined scenarios

- Two components still require additional scoping
 - Transmission System Security: Thermal, Voltage, and Stability Analysis
 - Revenue Sufficiency Analysis
- The ISO suggests stakeholders pause on these components to allow the ISO and the region to focus on the four other requested 2021 studies the ISO will be conducting
 - FGRS Phase I
 - Pathways Evaluation: forward clean energy market
 - Pathways Evaluation: net carbon pricing
 - Transmission 2050 Study



ISO View—FGRS Phase II Reliability Study should follow 2050 Transmission Study because of linkages

- The 2050 Transmission Study scope will help inform the System Security study in FGRS Phase II
- The ISO believes that key modeling assumptions will substantially improve the quality of a future System Security review, including:
 - Detailed transmission network (bus-branch model) should be represented in a grid security assessment (likely consideration for the 2050 study)
 - Neighboring systems will have significant impacts on the security of New England and need to be represented in certain detail, especially for transient stability and inter-area oscillations (likely consideration for the 2050 study)
 - Such assumptions will improve as interconnection-wide models are created through industry working groups



ISO View—Key modeling improvements are needed before undertaking FGRS Phase II Reliability Study

- Inverter technology is rapidly evolving from ‘Grid Following’ to ‘Grid Forming’
 - The need for newer advanced-inverter technologies has been recognized by the industry and models are under development
 - It is important to include such models in studies much beyond the ten-year horizon as for example, Grid Forming Inverters provide direct voltage and frequency control and also help with inertial-response
- The ability to simulate the fast switching and non-linear dynamics of inverters is critical to understanding the stability and security of the system
 - This will require newer techniques that are currently being tested
- The ISO has been working with NERC, EPRI, and industry vendors to develop and test the necessary models and tools and has several internal efforts underway in 2021 and 2022
- The ISO believes that it is prudent to let some of these efforts mature before engaging in a longer-term system security study as contemplated in FGRS Phase II

ISO View—Outcomes from Pathways studies can help inform FGRS Phase II Revenue Sufficiency analysis

- The 2021 Pathway studies will require building at least two models, one for Net Carbon Pricing and the other for FCEM, which will inform the region’s next steps
- The Pathways process should determine how the Minimum Offer Price Rule (MOPR) will be treated in the modeling assumptions to assess how it affects the outcomes of the proposed frameworks
 - The FERC has recently made clear that addressing the MOPR is one of its top priorities
 - If this process doesn’t resolve the central question “What is a solution that addresses MOPR?,” additional analysis may be necessary to answer the question by Q1 2022
- Linking this back to the FGRS Phase II study request, the ISO believes that understanding these outcomes will better inform studies related to revenue sufficiency
 - Holding the existing markets static may not represent a realistic scenario because the existing markets will evolve before the time horizon that the study seeks to examine



ISO Resources and Budget

- The ISO has dedicated resources and budget to work with stakeholders in finalizing scope and assumptions, developing models, running simulations, presenting, and discussing results of the four 2021 study commitments
- A fifth study on Resource Capacity Contributions to Resource Adequacy, while not directly related to the future grid studies, will be informative because it seeks to identify a methodology that appropriately accredits capacity value to resources as the resource mix evolves over time
 - The study will look at using Effective Load Carrying Capability (ELCC) techniques to determine capacity ratings
 - The scope of this study will be discussed with stakeholders in Q2 2021
- The ISO is able to perform the committed 2021 studies, meet its planning and operational commitments, and respond to current FERC orders such as 2222
 - These efforts have placed a significant strain on the ISO operating budget
 - If new priorities emerge, the ISO will seek to rebalance its work and discuss with stakeholders



Summary and Next Steps

- The future grid studies will reveal useful information about
 - The future of resource adequacy
 - High-level transmission scenarios and costs estimates
 - Analyses related to various assumptions associated with possible resource mixes
- There are some dependencies and efficiencies that can be better captured through appropriate sequencing
- Additional efforts are underway to develop models and tools that are adaptive to new technologies and changes as they materialize, which will better position the region to replicate studies under evolving conditions
 - The ISO is hoping to address this objective by 2023 by improving network models, assessing resource capacity contributions, and developing an integrated market simulator, as well as other efforts
- The ISO will always be looking ahead for needed adjustments to market structures; planning and operational models, tools, and procedures; and software and IT infrastructure
- Further information on our other projects will be in the Annual Work Plan update

