Transmission Planning for the Future Grid

Northeast Public Power Association

Al McBride

VICE PRESIDENT, SYSTEM PLANNING, ISO NEW ENGLAND

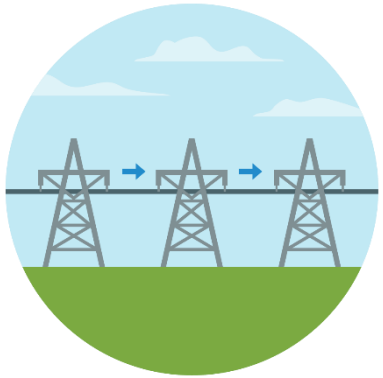
ISO New England (ISO) Has More Than Two Decades of Experience Overseeing the Region's Restructured Electric Power System

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

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

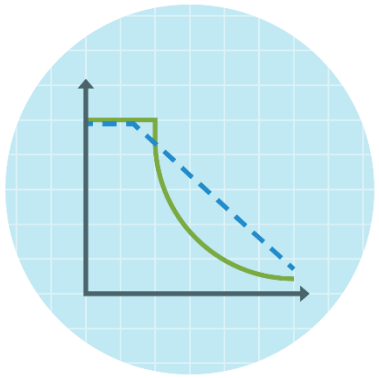
Grid Operation

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



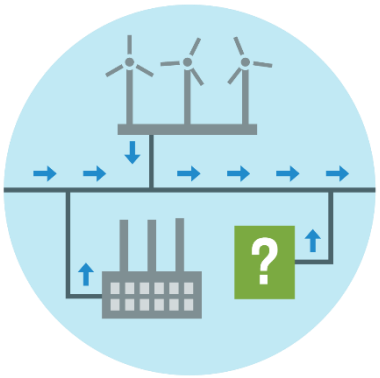
Market Administration

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



Things We Don’t Do

Handle retail electricity

Own power grid infrastructure

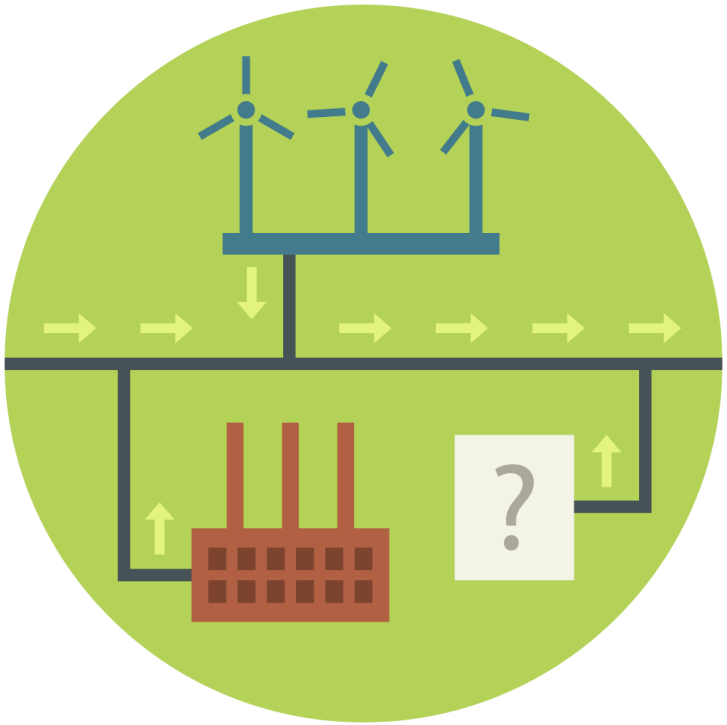
Have a stake in companies that own grid infrastructure

Have jurisdiction over fuel infrastructure

Have control over siting decisions

ISO New England Manages Regional Power System Planning to Meet Future Electricity Needs

- Manage regional power system planning in accordance with mandatory reliability standards
- Administer requests for interconnection of generation and regional transmission system access
- Conduct transmission system needs assessments
- Plan regional transmission system to provide regional network service
- Develop Regional System Plan (RSP) with a ten-year planning horizon



THE POWER SYSTEM IN TRANSITION

There Are Four Pillars Necessary to Support a Successful Clean Energy Transition

PILLAR ONE

Clean Energy

Significant amounts of clean energy to power the economy with a greener grid

PILLAR TWO

Balancing Resources

Resources that can supply electricity, reduce demand, or provide other services to maintain power system equilibrium

PILLAR THREE

Energy Adequacy

A dependable energy supply chain and/or a robust energy reserve to manage through extended periods of severe weather or energy supply constraints

PILLAR FOUR

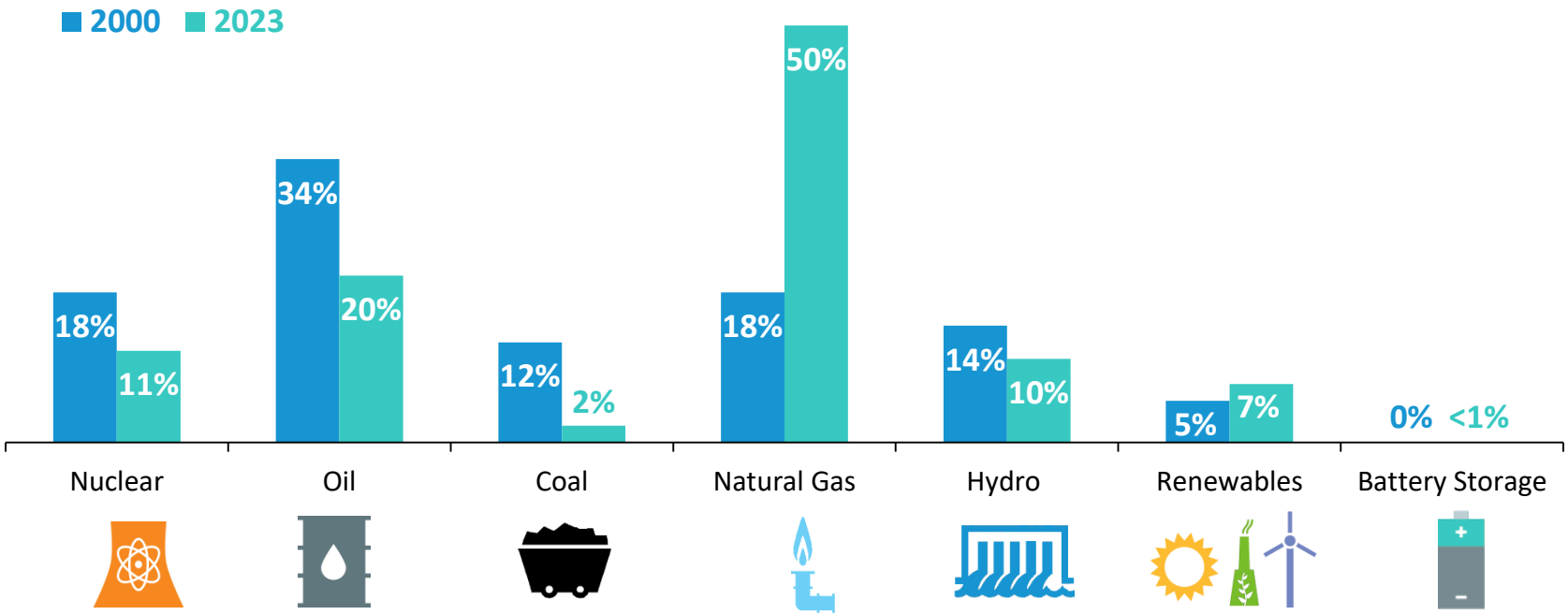
Robust Transmission

To integrate renewable resources and move clean energy to consumers across New England

Dramatic Changes in Power System Resources

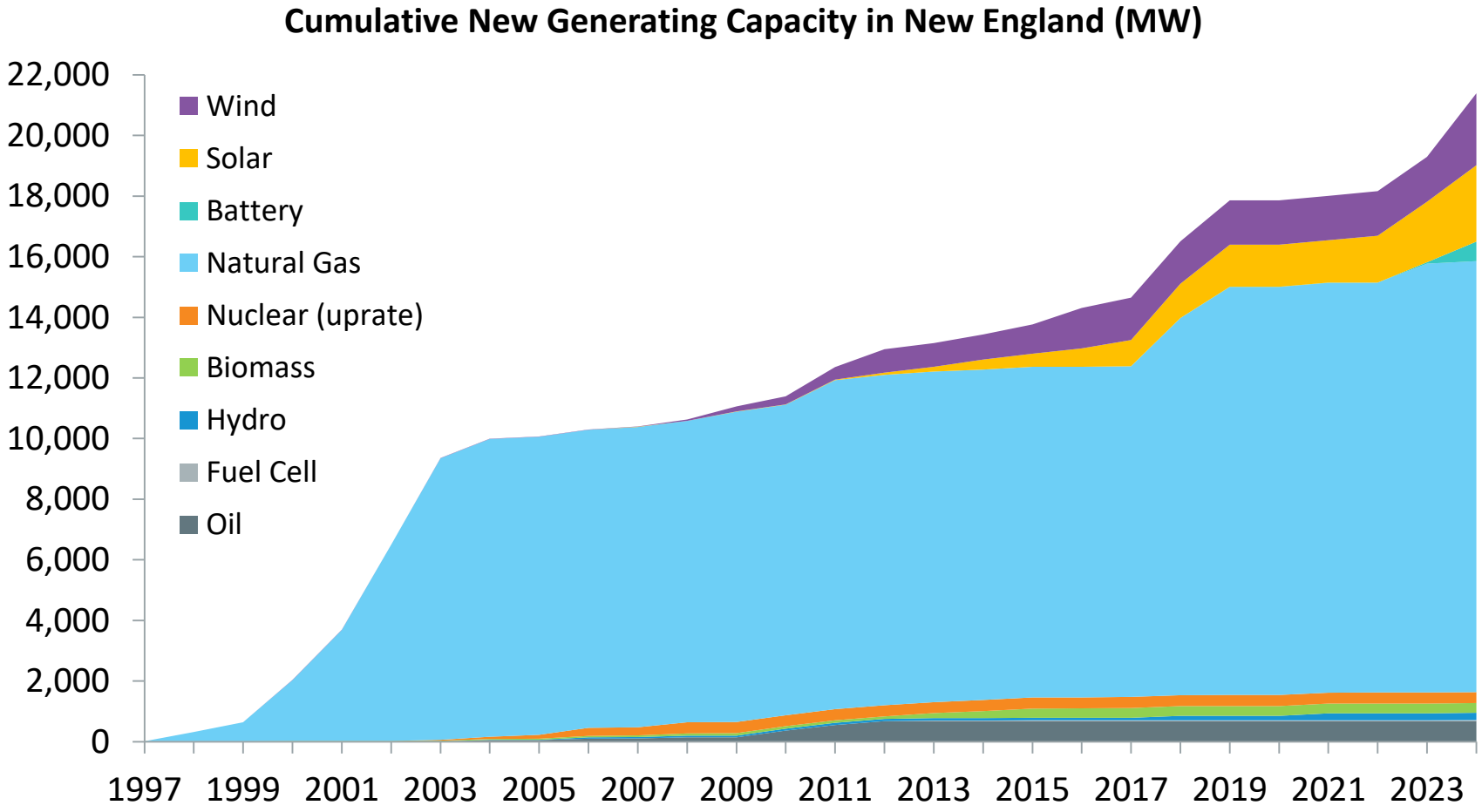
The resources making up the region's installed generating capacity have shifted from nuclear, oil, and coal to natural gas

Percent of Total System **Capacity** by Fuel Type
(2000 vs. 2023)



Source: ISO New England 2023-2032 Forecast Report of Capacity, Energy, Loads, and Transmission (2023 CELT Report), Summer Seasonal Claimed Capability (SCC) Capacity. Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels.

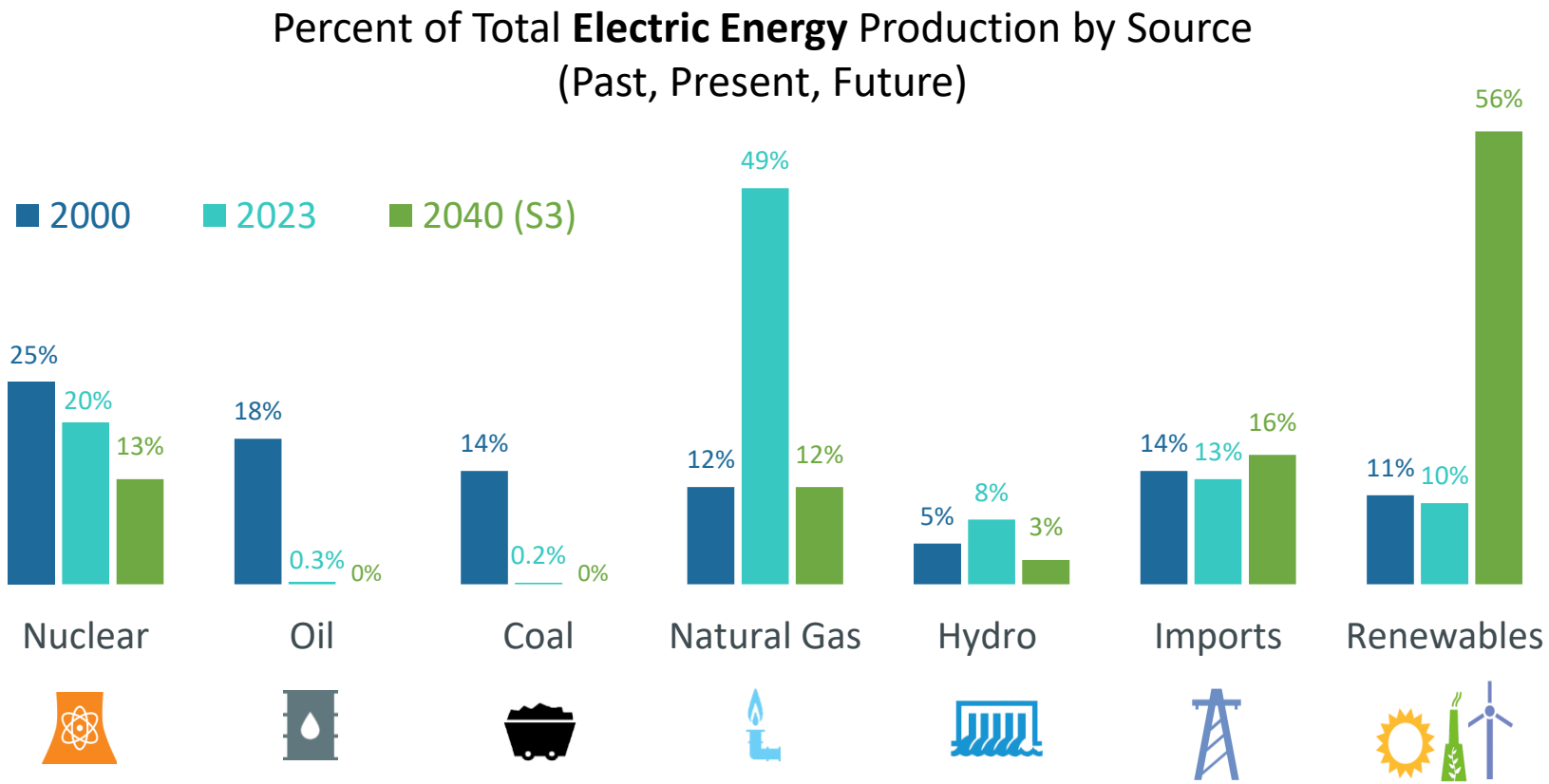
Wind and Solar Have Emerged as the Most Recent Capacity Additions to the System



Note: New generating capacity for years 2021 – 2024 includes resources clearing in recent Forward Capacity Auctions.

Dramatic Changes in the Energy Mix

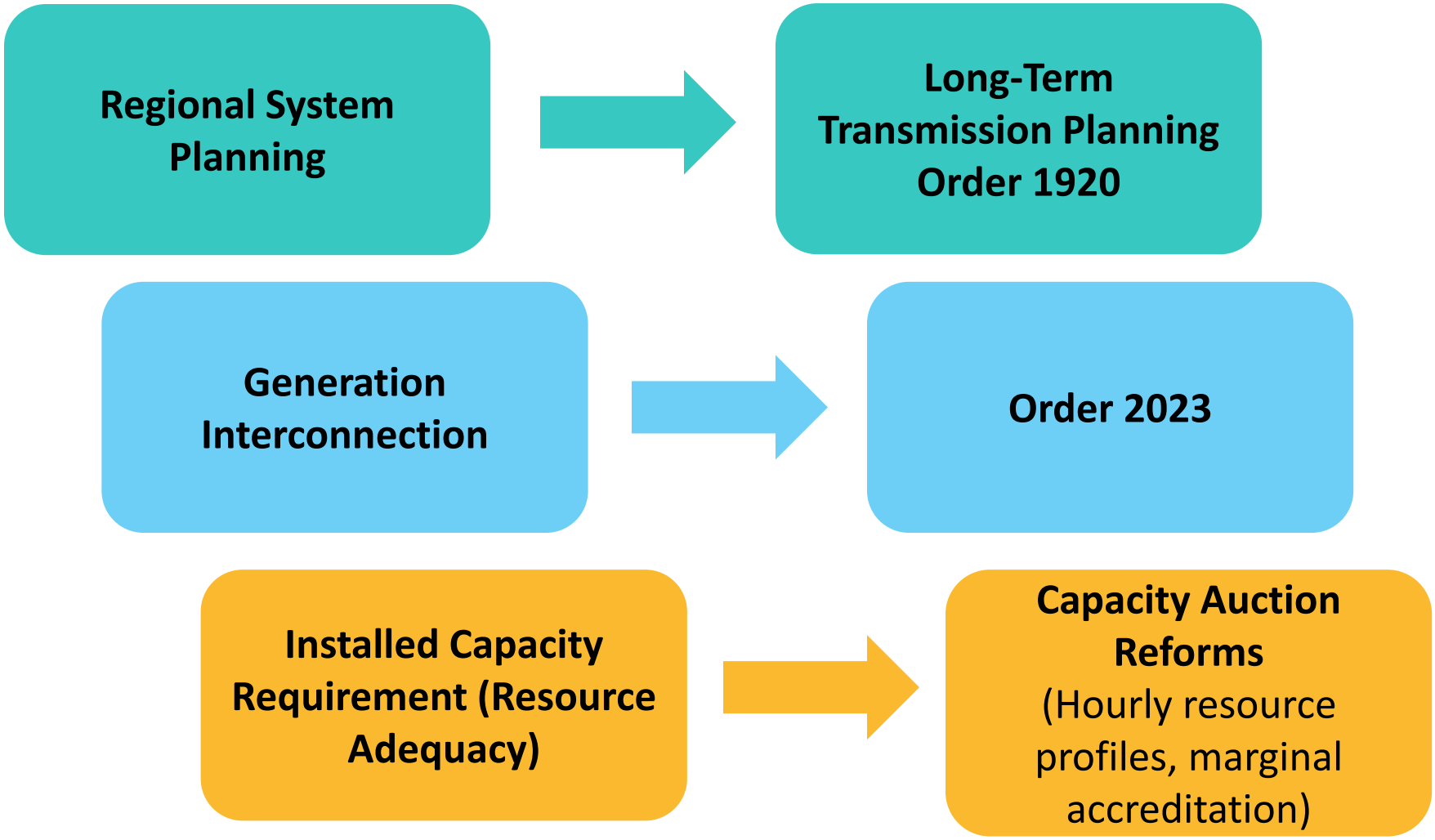
New England made a major shift from coal and oil to natural gas over the past two decades, and is shifting to renewable energy in the coming decades



Source: ISO New England Net Energy and Peak Load by Source; data for 2023 is preliminary and subject to resettlement; data for 2040 is based on Scenario 3 of the ISO New England 2021 Economic Study: Future Grid Reliability Study Phase 1.

Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, behind-the-meter solar, municipal solid waste, and miscellaneous fuels.

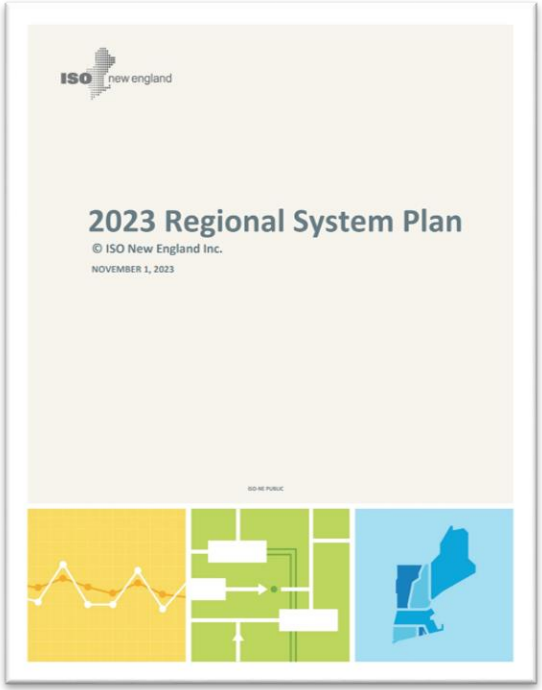
System Planning in Transition



LONGER-TERM TRANSMISSION PLANNING

Overview of Transmission Planning

- As the **Regional Transmission Organization**, the ISO is required to identify transmission infrastructure solutions that are essential for maintaining power system reliability in New England
- Through an **open stakeholder process**, the ISO is responsible for the development of long-range plans to address future system needs over the ten-year planning horizon
  - Summarized in a **Regional System Plan (RSP)**
- The transmission planning process is governed by a **FERC-approved tariff**
- ISO-NE continuously revises the transmission planning process to comply with applicable FERC orders (e.g., Orders 1000 and 1920)



ISO New England 2023 Regional System Plan

Longer-Term Transmission Planning Background

- Initiated in response to the 2020 New England States Committee on Electricity (NESCOE) "*New England States' Vision for a Clean, Affordable, and Reliable 21st Century Regional Electric Grid*"
- Among other considerations, this vision statement recommended that the ISO work with stakeholders to conduct a **comprehensive long-term regional transmission study**
- In first phase of changes, the ISO began the study and sought **FERC approval** to revise the ISO Tariff to establish a repeatable longer-term study process
- Approved by FERC in early 2022, these changes allow the ISO to conduct planning studies **beyond** the traditional **10-year** planning horizon
- The resulting **2050 Transmission Study** is the first example of its kind within New England, offering an unprecedented look at the future of the region's transmission system

2050 Transmission Study Overview

- The study informs stakeholders of the **amount and type** of **transmission infrastructure** necessary to provide reliable, cost-effective energy to the region through the **clean energy transition**, driven by state policy
- The **region's aging transmission system** has the potential to become **a significant bottleneck** to progress if it does not keep pace with changes to other elements of the power system
  - Assuming increased build-outs of renewables continue, and electrification of heating and transportation proceeds as expected

Big-picture observations from the study can help inform future decision making

2050 Transmission Study Lessons Learned

- Reducing peak loads significantly **reduces transmission cost**
- Targeting and prioritizing high-likelihood concerns is **highly effective**
- **Incremental upgrades** can be made as opportunities arise
- Generation **location matters**
- **Transformer capacity** is crucial

Looking to the Future: LTTP Phase II

- Accepted by FERC in July 2024, Phase II creates a **new process to implement transmission system upgrades** based on LTTP studies
  - Provides an avenue for the **states** to evaluate and finance transmission upgrades needed to ensure a reliable grid throughout the clean energy transition
  - ISO will issue and evaluate requests for proposals (RFPs) to **address needs identified by the states** and provide technical assistance to the states in support of their procurements and efforts to secure federal funding for transmission investments

LTTP: Core and Supplemental Processes

- Two processes were developed, the **"core" process** and the **"supplemental" process**
- Both processes begin with the completion of an LTTS, which is performed under existing Section 16 of Attachment K
  - An LTTS is a study conducted by the ISO in response to a request from NESCOE
  - The 2050 Transmission Study is the first LTTS
- **Core process** allows the states to advance the development of transmission when at least one proposal meets the identified needs and has a benefit-to-cost ratio (BCR) greater than 1.0
- **Supplemental process** is an add-on to the core process to address instances where none of the proposals that meet the identified needs satisfy the BCR requirement

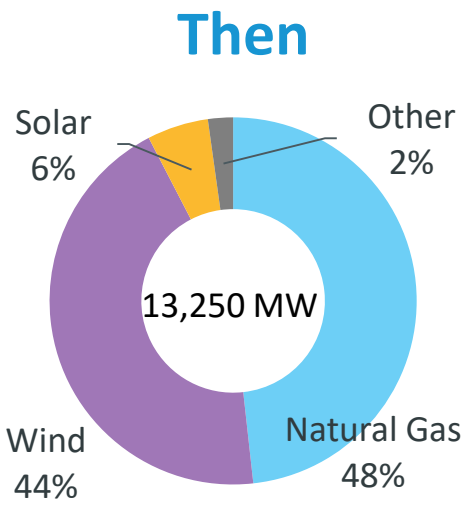
LTTP Phase II & FERC Order No. 1920

- Many elements of LTTP Phase II are aligned with FERC's recent Order 1920, which also addresses future regional transmission planning.
  - FERC Order 1920 continues work to ensure a reliable grid looking towards longer term planning, outlining cost allocation provisions and focusing on "right sizing" or modifying existing facilities when needed.
  - The ISO expects to begin discussions on this order later in 2024

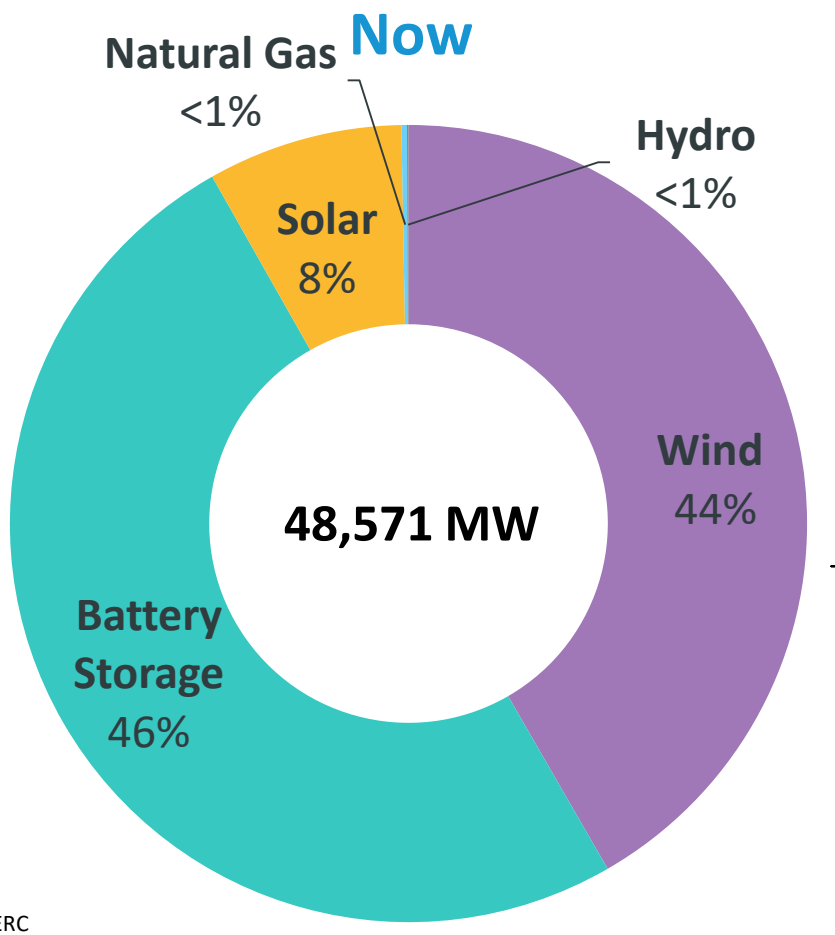
NEW RESOURCE INTERCONNECTION

The ISO Generator Interconnection Queue Provides a Snapshot of Resource Proposals

Dramatic shift in proposed resources from natural gas to battery storage and renewables



June 2017



July 2024

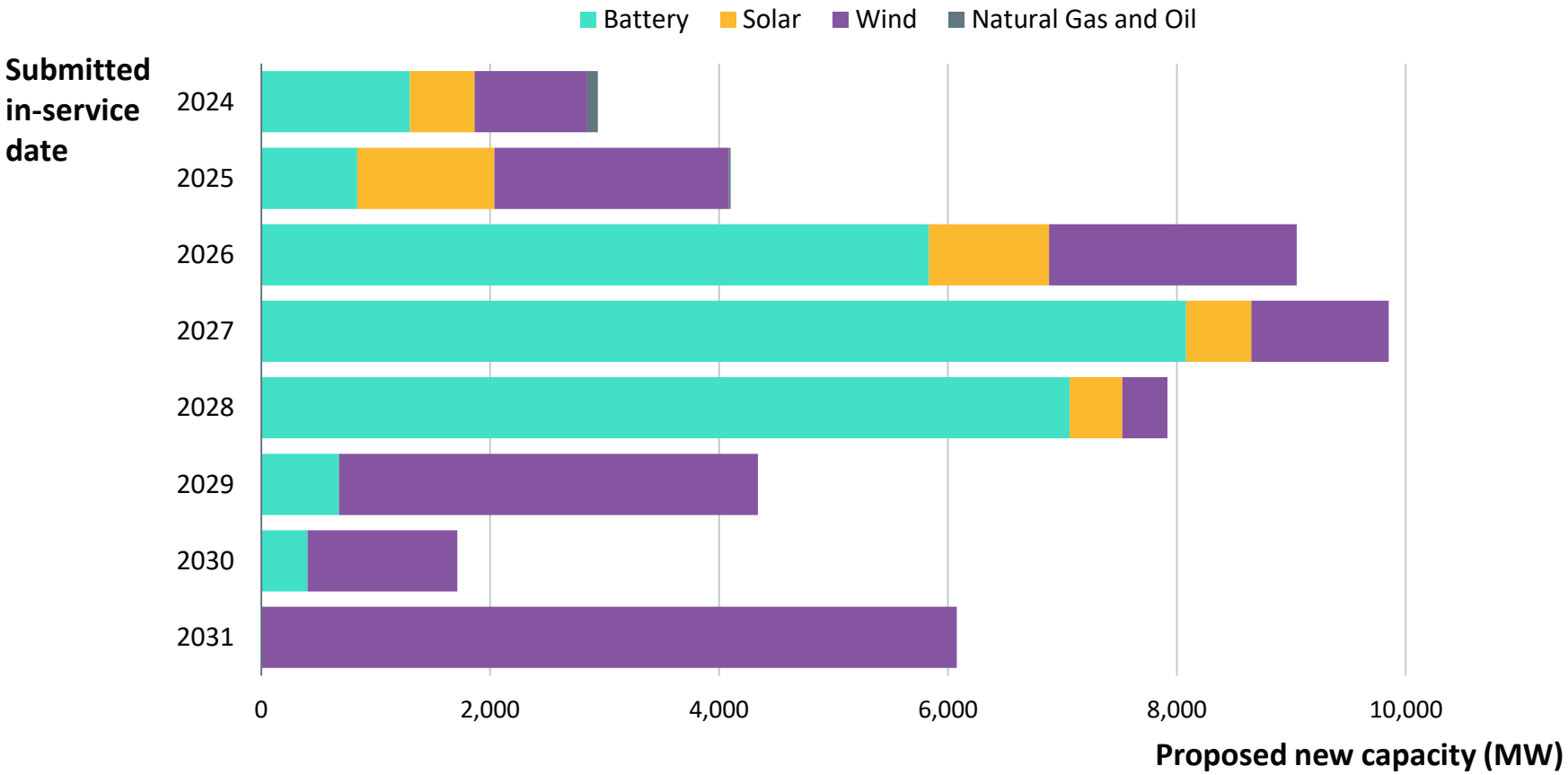
Offshore Wind	
CT	4,875 MW
MA	10,741 MW
RI	1,904 MW

Onshore Wind	
ME	2,720 MW

Source: ISO Generator Interconnection Queue, FERC Jurisdictional Proposals; Nameplate Capacity Ratings.

Resources Active in the Interconnection Request Queue

The ISO's Queue reflects more than 200 proposed projects of which over 6,000 MWs have signed interconnection agreements but are not yet commercially operational



Source: ISO Generator Interconnection Queue, FERC Jurisdictional Proposals (updated July 2024)

Background on FERC Order No. 2023 (July 28, 2023)

- Ruling adopts significant reforms to:
  - Large Generator Interconnection Procedures ("LGIP")
  - Small Generator Interconnection Procedures ("SGIP")

- Reforms build on the standardized procedures that FERC Order Nos. 2003, 2006 and 845 to:
  - address interconnection queue backlogs
  - improve certainty
  - prevent undue discrimination for new technologies

Federal Energy Regulatory Commission

Improvements to Generator Interconnection Procedures and Agreements

Docket No. RM22-14-000

Order 2023

Final Rule

(Issued July 28, 2023)

Primary Elements of the Order

Transition to First-Ready First-Served Cluster Process

- For **ISO Interconnection Requests (IRS):** Requires transmission providers make several changes to transition to a **first-ready, first-served cluster study process** (vs. current serial first-come, first-served study process):
  - Cluster study process
  - Increased financial commitments for interconnection customers to enter and remain in the process
  - New mechanisms for interconnection customers to share interconnection study and upgrade costs
  - Enhanced site control requirements
  - Requirements for interconnection customers to select a definitive point of interconnection
  - Commercial readiness deposit requirements
  - Withdrawal penalties

Primary Elements of the Order, cont.

Increase the Speed of Interconnection Processing – ISO IRs

- Eliminates the "reasonable efforts" standard for completing interconnection studies, and **establishes firm study deadlines** along with **financial penalties** on transmission providers that fail to meet them
- Adopts a uniform approach to Affected System coordination

Primary Elements of the Order, cont.

Incorporate Technological Advancements – ISO IRs

- Allow **co-location** of multiple generating facilities behind a single point of interconnection
- Allow interconnection customers to **access surplus interconnection capability** once the original interconnection customer has an executed LGIA (or an unexecuted filed LGIA)
- Update approach to the study of proposed **charging behavior** of an electric storage resource
- Incorporate specific **alternative transmission technologies** for evaluation during the interconnection study process
- Incorporate modeling and ride-through requirements for **non-synchronous generating facilities**

Order No. 2023 Transition Process

- The Order prescribed a specific transition process
- ISO IRs that do not have completed System Impact Studies (SIS) **must withdraw** from the ISO queue or **proceed to a Transitional Cluster Study**
- ISO issued draft Transitional Cluster Study agreements to all eligible resources on August 12 and the agreements and associated materials are due by October 11

ASO Study Coordination: Roles & Responsibilities

- The **ISO serves as an affected party** to Distributed Energy Resource (DER) Affected System Operator (ASO) studies, and helps to coordinate project approvals through Section I.3.9 of the Tariff
- The **Interconnecting TO** is responsible for conducting the Transmission System Impact Study on the developer's behalf for state jurisdictional projects

The ISO's role is to provide hands-on guidance on study practices and modeling methods to ensure the study is in compliance with the applicable Tariff and Planning Procedure requirements in support of I.3.9 approval

Coordination of ASO Studies with FERC Jurisdictional Studies: Post-Order No. 2023

- Mandates **cluster studies** be used to study FERC jurisdictional interconnection requests
  - Process requires fixed, targeted timeframes for the initiation and completion of cluster studies
  - These fixed timeframes necessitate coordination of ASO study initiation and completion
- To better coordinate between ASO studies and FERC Order No. 2023 Clusters, ISO-NE is seeking to **update** how ISO-NE reviews and approves state jurisdictional projects through the I.3.9 process
- ISO-NE is seeking to create **windows** for these **I.3.9 reviews** to ensure efficient alignment of the processes

Coordination of ASO Studies with FERC Jurisdictional Studies, *cont.*

- ASO studies taking place in an electrical part of the system that are **not relevant** will be able to complete their studies without respecting an ongoing FERC study
- ASO studies taking place in an **electrically relevant** part of the system will need to respect and coordinate with an ongoing FERC study
- These ASO studies will need to model all relevant FERC jurisdictional projects and associated upgrades in the ASO base cases

**The determination of relevance is based upon a review of electrical proximity, the likelihood of causing common violations, and whether identified upgrades of FERC Interconnection Requests may impact the performance of the proposed projects*

CAPACITY AUCTION REFORMS (CAR)

CAR is Effectively a Complete Redesign of the Capacity Market and Related Functions

Four major design changes being considered with wide ranging impacts to outcomes:

1. Modeling

Improve hourly modeling used in the resource adequacy assessment (RAA)

2. Accreditation

Use a marginal accreditation framework

3. Prompt

Shift qualification and auction timing to be immediately ahead of the commitment period

4.Seasonal

Develop a seasonal product

The RAA Will Be Used…

- …as the basis for determining the **system and local capacity requirements** and **demand curves**
  - Determines the system's ability to meet the one-in-ten ("1-in-10") loss-of-load expectation (LOLE) reliability criterion
- ...as the basis for the development of **resource-specific accreditation under CAR**
  - More focus on individual resource's seasonal performance than the aggregate impacts to reliability of load and resource performance

Improvements to RAA Modeling Will Enable More Accurate Accreditation

- Resource accreditation value is conceptually a **measure of the expected performance** of resources during hours of **reliability risk** (e.g., system is experiencing loss of load)
- Improvements to the RAA will better **identify timing and duration** of **loss-of-load (LOL)** and will improve how individual resource performance is reflected during events
- Four broad **drivers of changes** under consideration:
  - Model system conditions with greater accuracy and granularity
  - Better capture resources' performance and interactions among different resources
  - Better reflect the correlation between resources' performance, system loading conditions and weather
  - Improve modeling consistency among different types of resources

Conclusion: System Planning in Transition

In response to new regulatory requirements, policy and stakeholder requests, and changing industry dynamics, System Planning in the New England region is evolving significantly

ISO New England's *Mission and Vision*

Mission: *What we do*

Through collaboration and innovation,
ISO New England plans the transmission system, administers the region's wholesale markets, and operates the power system to ensure reliable and competitively priced wholesale electricity

Vision: *Where we're going*

To harness the power of competition and advanced technologies to reliably plan and operate the grid as the region transitions to clean energy

*The ISO's **Vision** for the future represents our long-term intent and guides the formulation of our Strategic Goals*

Questions