Effects of Future Peak Loads: Ten-Year Forecast and Longer-Term Outlook

NECPUC Retail Demand Response & Load Flexibility Working Group

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Ten-Year Forecast: Electrification Impacts

- ISO-NE forecasts increases in load over the next 10 years due to electrification of transportation and heating
- By 2032, transportation and heating are forecasted to be…
  - 14.2% of year-round net energy consumption
  - 8.9% of summer peak demand
  - 24.3% of winter peak demand
- Forecasts are based on current federal, state, and local policies and economic trends

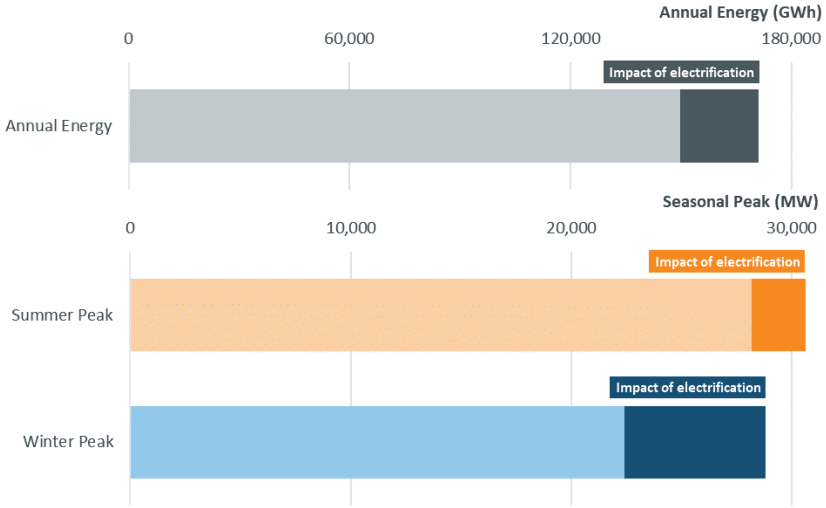


Figure source: 2023 Regional System Plan, Figure 1-2
Data Source: 2023 CELT Report

Timing of Shift to Winter Peaking

- As the growth of transportation and heating electrification continues, New England is likely to return to a winter-peaking system
- Other factors being equal, shift from summer-peaking to winter-peaking is likely in the mid-2030s
- Relative severity of winter and summer weather may result in an earlier/later shift to winter peaks

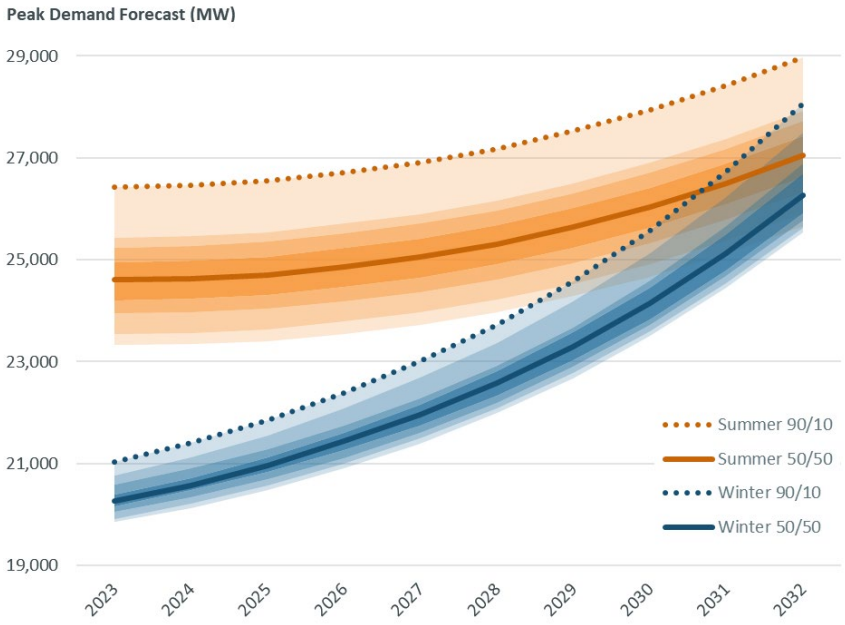


Figure source: 2023 Regional System Plan, Figure 4-9
Data Source: 2023 CELT Report

Beyond Ten Years: Peak Load Out to 2050

- Load data beyond 2032 is based on a Massachusetts-commissioned “Energy Pathways to Deep Decarbonization” study
  - ISO-NE translated data from this study to a 2019 weather year
- Winter peak demand projected to reach 57 GW – over double New England’s previous all-time peak

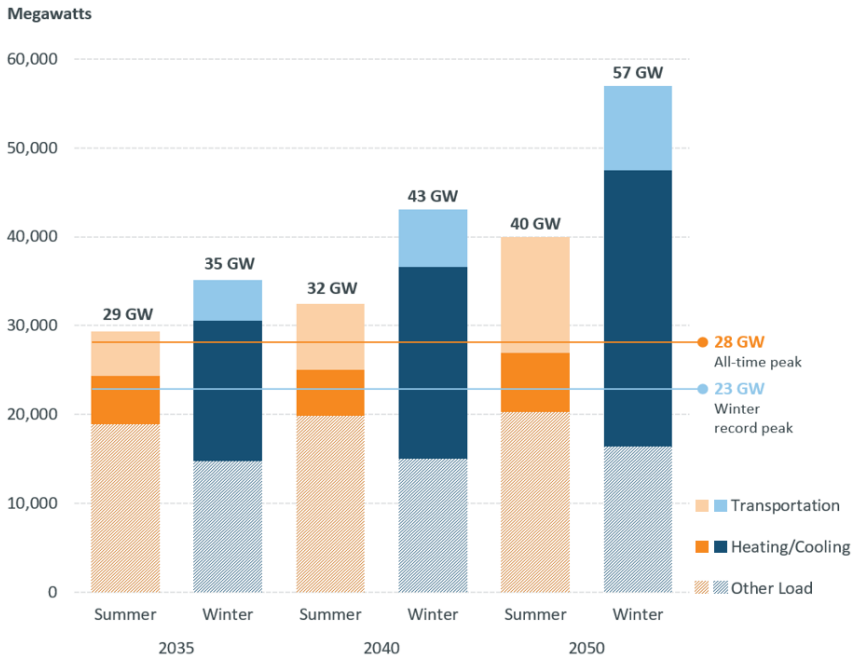


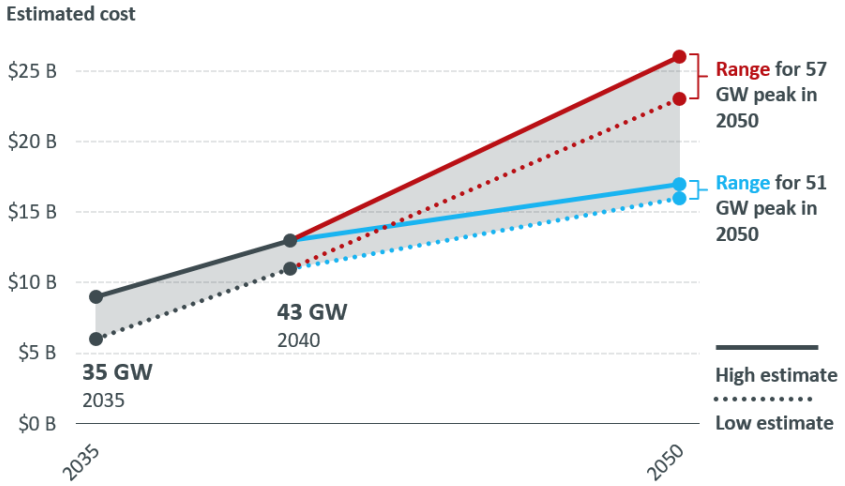
Figure source: 2050 Transmission Study, Figure 1-1
Data Source: Energy Pathways to Deep Decarbonization

Load Flexibility in Longer-Term Assumptions

- The “Energy Pathways to Deep Decarbonization” study assumed:
  - 50% of all light-duty EV charging could be delayed by up to eight hours
  - 15% of space heating/cooling could be shifted by up to one hour
  - 25% of water heating load could be shifted by up to two hours
- Without this load management, 57 GW winter peak demand would likely be even higher
- Any further load reduction through load flexibility/demand response would have to be in addition to these assumptions

Transmission Cost for Serving Winter Peak Load

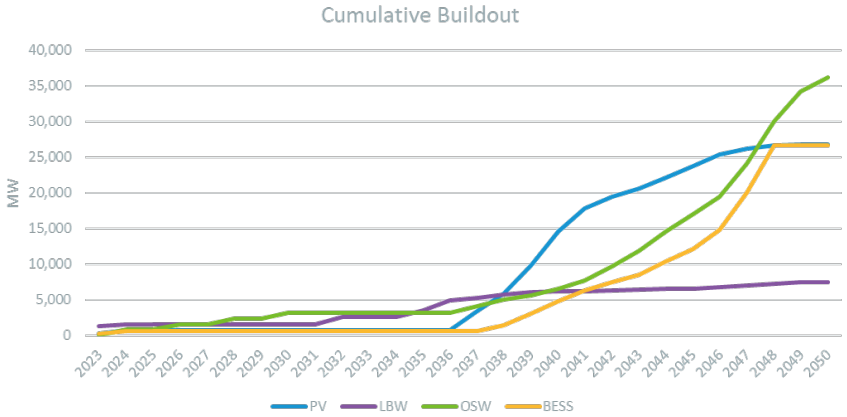
- The 2050 Transmission Study found that a 6 GW (~10%) reduction in winter peak could save $8 billion (~35-45%) in costs of addressing overloads
- The costs for addressing voltage/stability concerns and distribution system expansion were not included in the 2050 Transmission Study, and will also be driven by load growth



Source: 2050 Transmission Study, Figure 2-1

Shifting Load vs. Reducing Energy Consumption

- As load electrifies and grows, carbon constraints require increasing amounts of wind/solar/battery storage
  - In a pure wind/solar/battery scenario, 97 GW (nameplate) are added by 2050
- Challenge is not just in serving the peak load hour, but supplying energy over multi-day/week periods of peak load and/or low renewable generation
- Addressing this challenge requires reducing total energy consumption, seasonal storage, or clean dispatchable resources
  - Shifting load by a few hours may address transmission needs, but *not* energy sufficiency needs



Source: Economic Planning for the Clean Energy Transition

Questions

Overview of Establishment of the Regional Energy Shortfall Threshold (REST)

NECPUC Retail Demand Response & Load Flexibility Working Group

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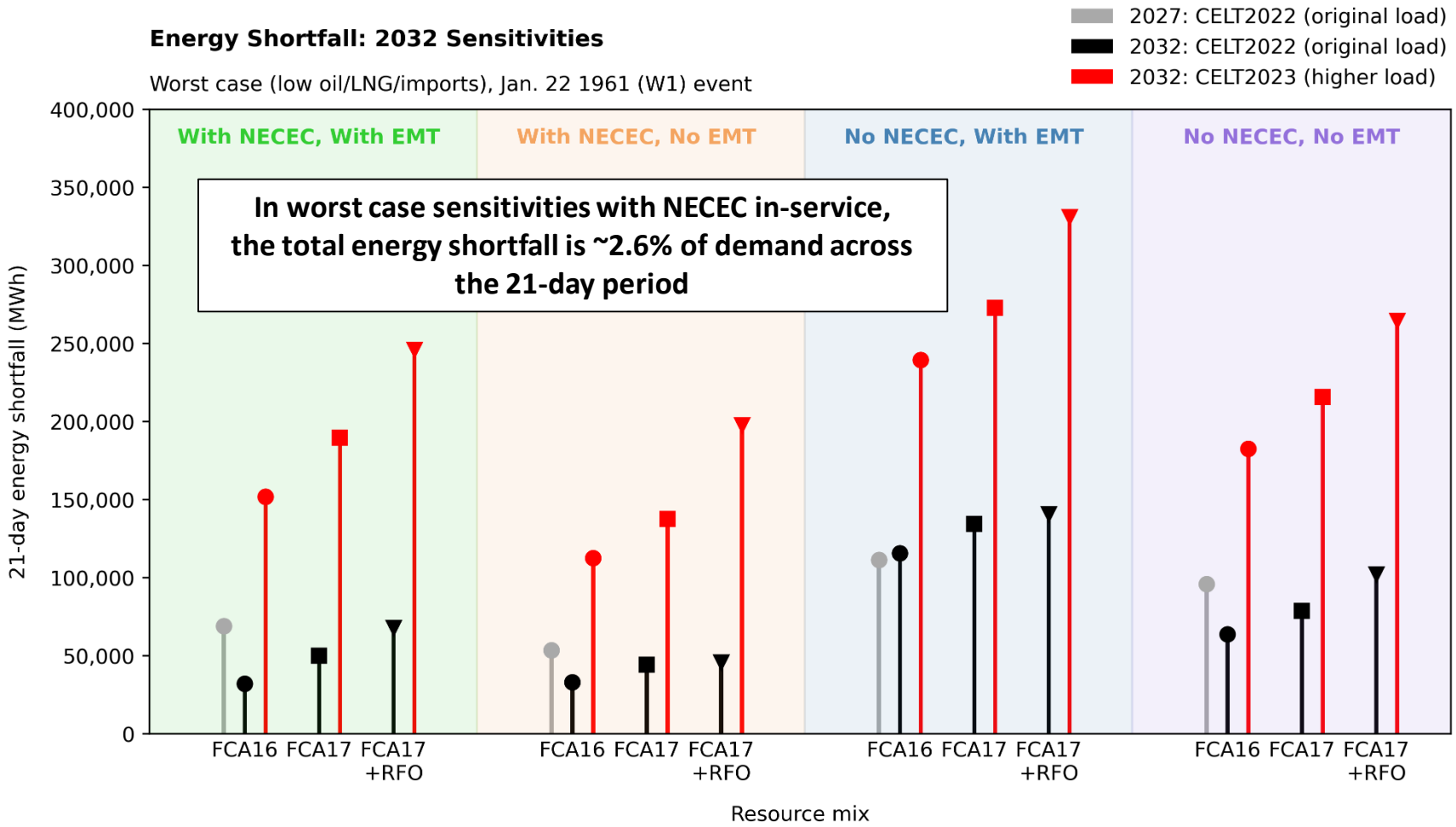
Energy Adequacy Study Key Takeaways

- Final Report released in December 2023 includes results of energy assessments completed for winter and summer 2027 and 2032 events, and reviews 2032 sensitivity analysis
- In the near-term, the winter energy shortfall risk appears manageable over a 21-day period; sensitivity analysis of 2032 worst-case scenarios indicate an increasing energy shortfall risk profile between 2027 and 2032
- Timely additions of BTM and utility-scale PV, offshore wind, and incremental imports from NECEC are critical to mitigate energy shortfall risks that result from significant peak winter load growth and retirements
- The Probabilistic Energy Adequacy Tool (PEAT) developed in partnership with EPRI provides a much needed foundation for the ISO to monitor risks and study the system as it continues to evolve

Results Highlight the Impact of Retirements and Electrification on Energy Shortfall Amounts



*2027 and 2032 studies based on an FCA 16 resource mix ("FCA16") assume the retirement of ~2,100 MW of capacity that retired in FCA 16 (including Mystic 8&9); 2032 sensitivities that incorporate FCA 17 results ("FCA17") assume the retirement of ~1,600 MW of capacity that delisted in FCA 17 and did not obtain a CSO; 2032 sensitivities that incorporate additional RFO retirement ("FCA17+RFO") assume the retirement of an additional 1,600 MW of RFO capacity above the retirements assumed in FCA 17 sensitivities

Introduction to the Regional Energy Shortfall Threshold

- ISO's 2027 and 2032 energy adequacy study results are expected to help inform the development of a Regional Energy Shortfall Threshold (REST)
  - ISO expects that the REST will be a reliability-based threshold that reflects the region's level of risk tolerance with respect to energy shortfalls during extreme weather
- The REST scope of work was introduced at the December NEPOOL Reliability Committee meeting; work is expected to continue through 2024
- The magnitude of energy shortfall risk that is expected to be manageable is a key consideration in the development of the REST

More information on the Operational Impacts of Extreme Weather Events Key Project, including ongoing efforts related to development of a Regional Energy Shortfall Threshold, is available on the ISO website: Operational Impacts of Extreme Weather Events Key Project (iso-ne.com)

Management of Energy Shortfall Risk Assumes Awareness and Action

- The region's ability to effectively manage energy shortfall risk in advance of low probability 21-day winter events requires situational awareness of the risks and actions by ISO and regional stakeholders
  - ISO's 21-Day Energy Assessment forecast provides situational awareness of regional energy supplies, quantifies potential energy shortfall, and communicates advance warning that action may be necessary
  - With advance warning that action may be necessary, ISO anticipates that market participants will make reasonable efforts to replenish stored fuel supplies, as applicable
  - ISO's well-established emergency operating procedures, including public appeals for conservation, facilitate additional relief in advance of any forecasted energy shortfalls
- At some level of energy shortfall risk, based on magnitude and/or probability, existing risk mitigation actions may be inadequate
- Establishment of the REST is intended to define the level of energy shortfall risk beyond which a set of additional, future solutions may be required

REST Scope of Work

- Establishment of the REST is expected to be a collaborative process with regional stakeholders including the six New England states
- ISO anticipates that the REST scope of work will include, at a minimum, the following components:
  - **What**: Identify the key risk metrics and establish the "threshold(s)", or criteria, that define the region's level of risk tolerance with respect to energy shortfall in extreme weather
  - **When**: Determine the periodicity (e.g., annual, seasonal, etc.) and, as applicable, specify the time horizon over which the region's energy shortfall risk is assessed against the REST
  - **How**: Specify the event selection criteria to be used in determining the set of 21-day events to be considered when using the PEAT framework to assess the region's energy shortfall risk against the REST
  - An additional item to determine as part of the 2024 work is the effective date for the threshold (i.e., the date when the REST first becomes effective); the effective date is expected to represent the first season where the PEAT framework is used to measure energy shortfall risk against the REST

Expectations for the REST Stakeholder Process

- ISO expects to share its initial REST proposal in May 2024; as part of developing its initial REST proposal ISO plans to solicit stakeholder feedback (details to be announced)
- ISO envisions a multi-month process spanning several RC meetings to allow for proposals, feedback, counter-proposals, and finalization of the REST toward the end of 2024
- ISO also anticipates that periodic discussions with representatives from the New England states will be critical to development of the REST