

The Electric Grid: An Overview

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THE WORLD'S LARGEST MACHINE

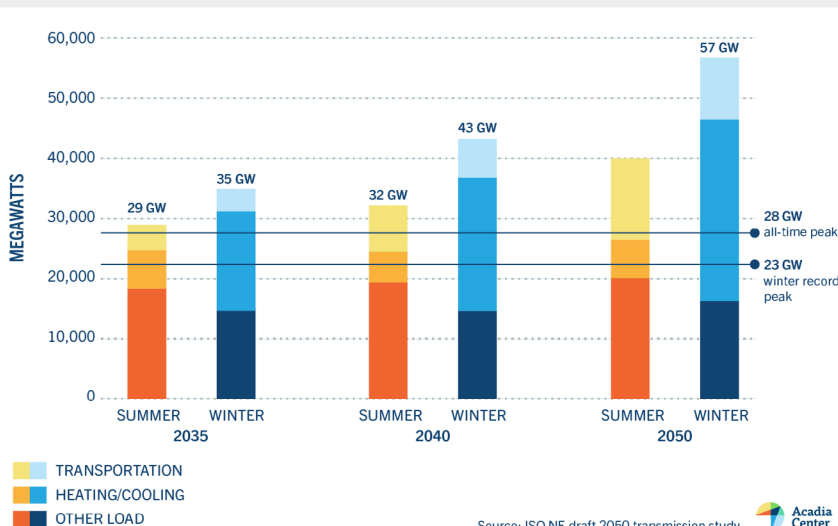
You walk into a room, and with the flick of a switch, you turn on the light. Nothing could be simpler. In fact, few things could be more fiendishly complicated. Behind the switch plate, on the other side of your electricity meter, the wire that extends from your home to the nearest utility pole connects you to what has been called the world's largest machine—the electric grid. The United States is organized into different power grids. The one for New England covers the six New England states and comprises approximately 350 power plants¹, 9,000 miles of high voltage transmission lines² that carry electricity from those plants to the region's 71 electric utilities, and substations, transformers, poles, and tens of thousands of miles of distribution lines, that are owned and operated by those utilities. And that is just the equipment that comprises the grid. Regulating it is a byzantine host of federal, regional, and state entities. The Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corporation (NERC) are at the federal level. At the regional level, there is the New England Power Pool ("NEPOOL") and the Independent System Operator of New England (ISO-New England). At the state level, utility commissions regulate the delivery of power within their borders, and various state agencies develop policies and programs that shape the contours of the grid.

THE ONCE AND FUTURE ELECTRIC GRID

Because it has had to meet the demands of a growing national economy, change has been the sole constant of the electric grid since its inception. In 1950, for example, the U.S. power sector delivered 329 terawatt hours (TWh) of electricity to customers; by 2022, the amount of power delivered had increased by 1,278% to 4,090 TWh³. Today, however, federal, state, and local policies to mitigate the worst effects of climate change are eclipsing the grid's historic pattern of growth matched to economic expansion. The federal government has pledged to achieve a net-zero greenhouse gas emissions (GHG) goal by 2050. Five of the six New England states have pledged to reduce their GHG emissions by 80% by 2050. Many New England cities and towns have also announced their own GHG reduction goals. The principal strategy to meet these goals is electrification: substituting fossil fuels with electricity produced from low- and zero-carbon resources like wind and solar.



ISO Draft Transmission Study - 2050 Grid Load Levels Analyzed



The primary focus of electrification is the heating and transportation sectors. This requires the replacement of propane, oil, and fossil gas furnaces and boilers with electric-powered air and ground source heat pumps and replacing internal combustion vehicles with electric vehicles. It is estimated that electrifying heating and transportation could more than double the region's demand for electricity. Moving that amount of electricity around the region will require many new miles of transmission lines and the reconstruction of existing lines. Finally, electrification would also require decarbonizing the generation of the region's electricity with the addition of renewable resources and the retirement of fossil fuel power plants.



CLARITY REGARDING THE GOAL, CHOICES REGARDING PATHWAYS

The assessment of a region's future power demands and preparations to meet it are done at the regional level by the grid operator: in the New England region both ISO New England, an independent, federally charged nonprofit that plans and controls the electric grid, and NEPOOL, a FERC-approved stakeholder group that advises ISO New England on matters relating to competitive wholesale energy markets and transmission. In the New England area, both ISO New England, an independent, federally chartered nonprofit that plans and controls the regional electric grid, and NEPOOL, a FERC-approved stakeholder group that advises ISO New England on matters relating to competitive wholesale energy markets and transmission. While there is no dispute at either ISO New England or NEPOOL regarding the urgency of the region's decarbonization goal, their planning points to alternative pathways to achieve it. For example, ISO New England's draft 2050 Transmission Study predicts that electrification may increase future winter peak demand from the grid's 28 GW record peak to 51-57 GW—a 122% to 148% increase. The cost differential of meeting a 51 GW versus a 57 GW peak is substantial: \$16 billion versus \$26 billion. Here is where the choices regarding the future present themselves. ISO New England asserts that the less expensive 51 GW peak could be achieved if some fossil fuels are retained for use in winter. A 51 GW peak could be reached if heating was 80% electrified and transportation 100% electrified. This strategy would reduce the amount of electricity that would have to be produced to meet the wintertime peak, and any reduction in the amount of electricity needed to meet the peak would also reduce the amount of new transmission needed to deliver it. According to ISO New England's draft 2050 Transmission Study, other strategies, such as programs to have electric customers reduce their electricity consumption during peak periods, might reduce the amount of transmission that would otherwise have to be built but would not reduce the amount of electricity needed to meet wintertime peaks in the electrified future.



THE FUTURE IS HERE

The region's GHG reduction goals represent a choice regarding the future, one in which the worst effects of climate change are avoided, and the health, safety, and prosperity of New Englanders are safeguarded. The achievement of the region's GHG reduction goals depends, however, on choices regarding the future of the electric grid, and those choices have yet to be made. How should they be made, and by whom? In Acadia Center's view, these decisions should not be made by ISO New England and NEPOOL alone but by a collaboration between them and stakeholders—everyone who will be affected by the choices that are made and the decarbonization strategies that are adopted, both in terms of their effectiveness and their cost. However, there are genuine obstacles to stakeholder engagement at both ISO New England and NEPOOL. NEPOOL meetings are closed: public members are only allowed to attend meetings if they are invited and pre-approved, and discussions are considered confidential and non-public. The New England States Committee on Electricity, which represents the interests of the six New England before NEPOOL and ISO New England, has characterized the ISO's stakeholder processes as “inadequate.”⁴ With the future at stake, the need for expanded stakeholder engagement and greater transparency is essential. Acadia Center is a NEPOOL member and actively monitors the development of the recommendations NEPOOL conveys to ISO New England.

Similarly, Acadia Center remains engaged in all of ISO New England's activities relating to its day-to-day operation of the electric grid, how it designs, administers, and oversees the region's wholesale electricity markets, and its management of the regional power system planning process. Acadia Center is also committed to creating opportunities for broader stakeholder engagement. Currently, for example, Acadia Center is implementing a Communities and Clean Grid project to facilitate the participation of local governments in ISO New England planning and decision-making to ensure that adopted solutions and strategies align with their climate and climate, energy, and environmental justice policies.

To learn more about the electric grid, decarbonization, and electrification, visit our webpage below:

<https://acadiacenter.org/work/respect/>

Primary Expert and Author: Joseph LaRusso | jl Russo@acadiacenter.org | 617.742.0054 x103

¹ <https://www.iso-ne.com/about/key-stats/resource-mix>

² https://www.iso-ne.com/static-assets/documents/2021/03/new_england_power_grid_regional_profile.pdf

³ www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf

⁴ <https://nescoe.com/resource-center/vision-stmt-oct2020/>

acadiacenter.org • info@acadiacenter.org

Acadia Center, PO Box 583, Rockport, ME 04856-0583

Boston, MA 617-742-0054 • Hartford, CT 860-246-7121 • New York, NY 212-256-1535 • Providence, RI 401-276-0600 • Rockport, ME 207-236-6470

