EPRI ELECTRIC POWER RESEARCH INSTITUTE

P201 Back Pocket Insights

KEY INSIGHTS

- **Wind and solar costs from different organizations span a wide range** both for current estimates and future projections.
- **Wind and solar are the largest generation resources for many scenarios and regions**, but their shares depend on assumptions about costs, policy targets, and policy timeframes.
- Cost reductions for wind and solar technologies lower decarbonization costs, but **policy design and timing have larger effects on decisions**.
- Low wind/solar costs have **more limited impacts on carbon removal and firm capacity**.

This brief is based on the paper "Implications of Variations in Renewable Cost Projections for Electric Sector Decarbonization in the United States" published in *iScience* (2022)

Impacts of Wind and Solar Costs on Electric Sector Decarbonization

by John Bistline, Robin Bedilion, Naga Srujana Goteti, Neil Kern

New research surveys U.S. wind and solar cost projections and models their potential impacts on electric sector decarbonization planning and costs.

Wind and solar power are expected to play central roles in decarbonizing the electric sector, which in turn is anticipated to be a key pillar in lowering economy-wide emissions through electrification and electricity-derived fuels. However, uncertainties about future costs and emissions policies create uncertainty about future deployment.

We find that **wind and solar costs from different organizations span a wide range** both for current estimates (driven by differences in technology, location, plant size, and financing) and for future projections (which vary in scenario assumptions and approach). Figure 1 illustrates this cost range for solar PV, which captures alternate assumptions about future technology and cost improvements.

Model results indicate that **assumptions about technological costs, policy targets, and policy timeframes jointly alter decisions in the power sector**—including renewables deployment—and system costs. Target definitions (i.e., policy design decisions about which technologies are available and eligible) have the largest impacts nationally, but effects vary by region.

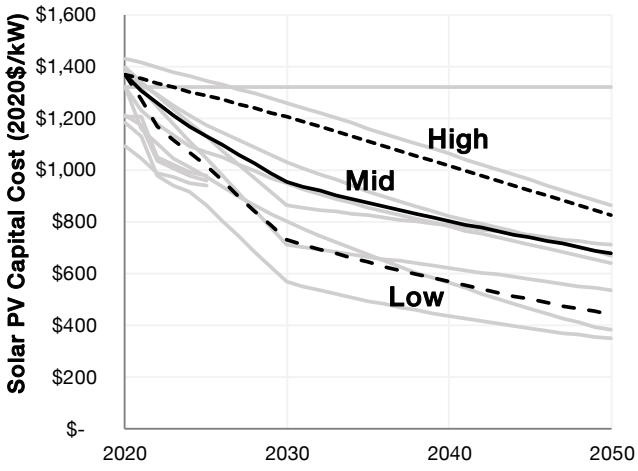

Figure 1. Solar PV cost projections ($/kW$_{AC}$) over time across different scenarios and organizations. Light gray lines show individual projections.

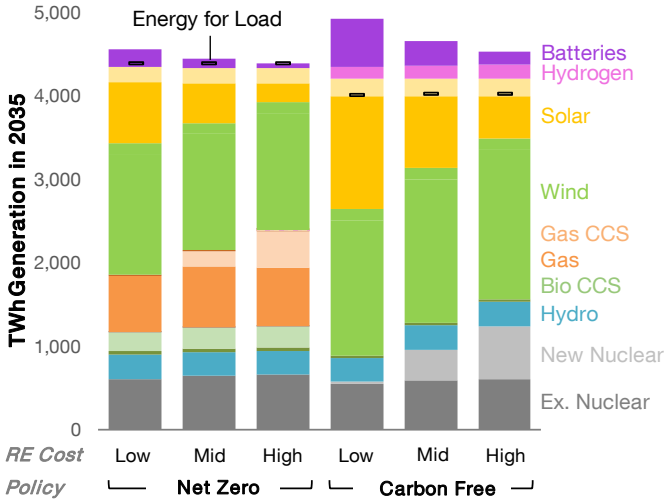

Figure 2. National generation by technology and scenario. Detailed scenario assumptions are discussed in Bistline, et al. (2022).

Wind and solar are the largest generation resource for many scenarios and regions, which is robust to a range of potential future costs (Figure 2). The extent of variable renewable and energy storage deployment varies by region and depends on policy-related choices—spanning 14% to 67% of national generation by 2035. The economic potential of wind and solar depends jointly on declining marginal value and cost.

Renewable cost reductions lower decarbonization costs, but **policy decisions have a larger influence on future trajectories**. Lower wind and solar costs reduce nuclear and carbon-capture-equipped generation but do not obviate their need, especially for providing dispatchable capacity during high residual load periods. Lower costs have more limited impacts on carbon removal ("negative emissions") technologies, which are valuable for cost management and flexibility in the "Net-Zero" scenario. Without carbon removal, challenges increase in terms of the scale of capital investment, extent of nascent technology deployment such as advanced nuclear and long-duration storage, and system operations. **Broader technological portfolios (i.e., moving from Carbon-Free to Net-Zero policy) and advanced technologies (i.e., lower wind/solar costs) lower decarbonization costs.**

Targeting a zero-emissions electric sector by 2050 instead of 2035 entails higher deployment of solar PV and battery storage due to their larger relative cost declines, which are amplified with lower renewables and storage costs.

For more information about deep decarbonization scenarios in EPRI's Regional Economy, Greenhouse Gas, and Energy (REGEN) model, see https://esca.epri.com/usregen

FOR MORE INFO

Explore the EPRI Energy Systems and Climate Analysis website at esca.epri.com

Authors:
John Bistline, Robin Bedilion, Naga Srujana Goteti, Neil Kern