

Sharing risk to avoid power outages in an era of extreme weather

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This summer's Western heat waves raise the specter of recent years' rotating power outages and record-breaking electricity demand in the region. If utilities across the area expanded current schemes to share

electricity, they could cut outage risks by as much as 40%, according to new [research](#) by the Climate and Energy Policy Program at the Stanford Woods Institute for the Environment.

The study highlights how such a change could also help ensure public opinion and policy remain favorable for renewable energy growth. It comes amid debate over initiatives like the [West-Wide Governance Pathways Initiative](#), an effort led by Western regulators to create a multi-state grid operations and planning organization.

"Extreme weather events disregard state and electric utilities' boundaries, and so will the solution needed to mitigate the impact," said study co-author Mareldi Ahumada-Paras, a postdoctoral scholar in energy science and engineering in the Stanford Doerr School of Sustainability. "Greater regional cooperation can benefit reliability under wide-spread stress conditions."

The new abnormal

Across the West, electricity providers are struggling with three new realities. Demand and resource availability are becoming harder to predict because of factors ranging from more frequent and widespread weather extremes to the proliferation of rooftop solar installations to more frequent and widespread weather extremes.

Rapid growth of renewable energy, such as wind and solar, along with energy storage options requires new operating and planning strategies for meeting demand. On top of these trends, a patchwork of state and federal clean energy goals creates different incentives that influence utilities' operation and planning differently.

"New grid management approaches can capitalize on the opportunities created by our rapidly changing electricity system and address increasing

stress from extreme heat, drought, and other climate-related events," said study co-author Michael Mastrandrea, research director of the Climate and Energy Policy Program.

The study focuses on the [power grid](#) that stretches from the West Coast to the Great Plains and from western Canada to Baja California. In recent years, [extreme heat](#) events and [severe droughts](#) have put major demand stresses on the grid and reduced hydropower availability.

The researchers used power system optimization models to simulate grid operations under stress conditions based on those experienced during a 2022 California heat wave that saw record-breaking energy demand.

Their simulations demonstrated that expanding the area of cooperation could reduce the risk of power outages by as much as 40%, reduce the amount of unserved energy—when electricity demand exceeds supply—by more than half, and increase reliability.

Policy and public opinion

The researchers refer to these estimates as "illustrative and directional" because incomplete information makes it hard to precisely simulate how those responsible for ensuring power system reliability within specific service territories will respond to stress conditions.

Still, the results highlight how expanded cooperation among utilities can improve responses to local shortages and excesses, offer greater flexibility in managing unexpected disruptions and balancing supply and demand, and ensure reliable electricity supply during [extreme weather events](#).

Expanded cooperation among utilities could also maximize the value of the region's growing renewable energy portfolio, according to the

researchers. Renewable power generation, such as wind and solar, can be variable since the wind doesn't always blow and the sun only shines so many hours per day.

Expanding cooperation across a larger geographic area can ensure that renewable power generation is used (or stored for later) when it is available. Critics of these sources are also likely to blame them for major [power outages](#), according to the researchers, feeding a narrative that could sour public opinion and lead to policies slowing the adoption or expansion of clean energy.

"Our work shows how greater cooperation isn't just about dollars and cents for utilities and their customers," said study co-author Michael Wara, director of the Climate and Energy Policy Program at the Stanford Woods Institute for the Environment.

"It's about keeping the lights on as we confront the challenge of the energy transition and the growing impacts of climate change."

More information: Paper: woods.institute.stanford.edu/sites/default/files/2024-08/2024-08-21_Paper_v05_WEB.pdf

Provided by Stanford University

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