Microgrids and solar reduce risk of power outages

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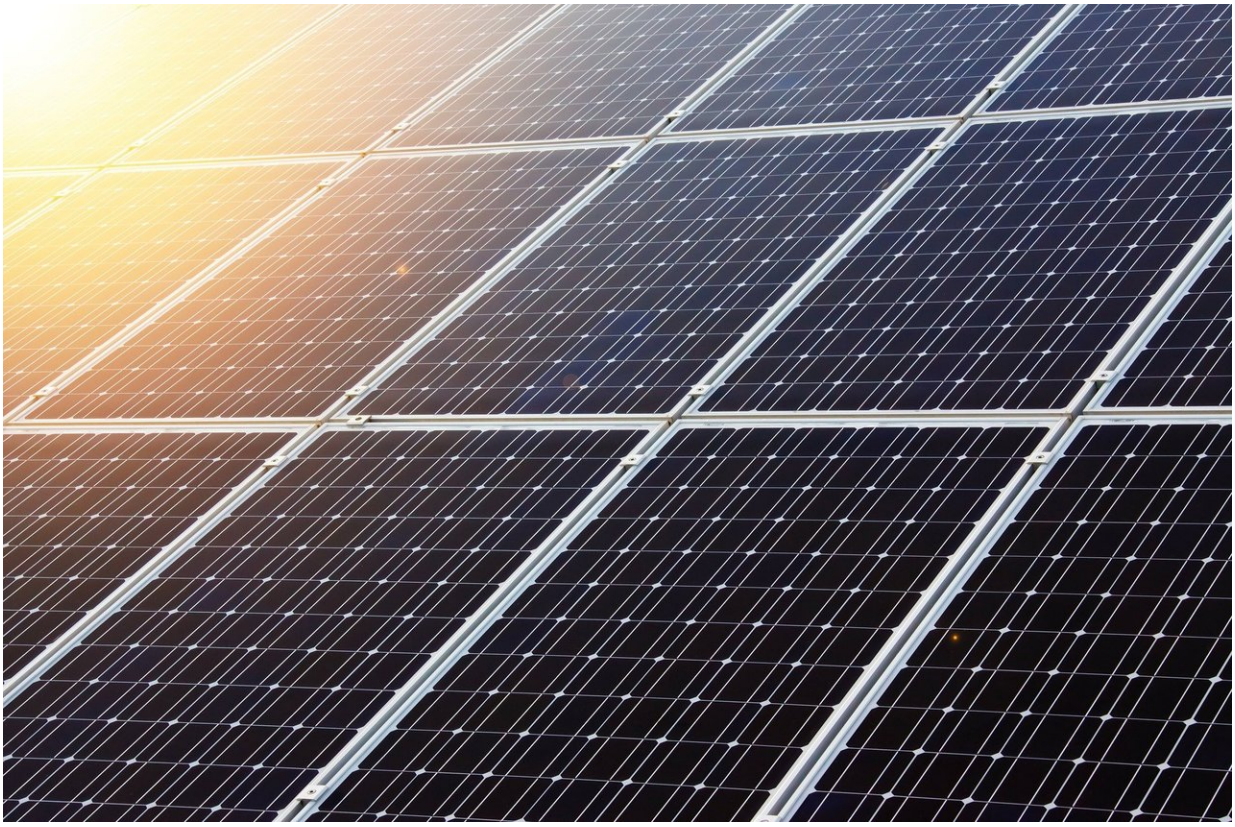

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Climate change is fueling more floods, droughts, wildfires, and extreme storms across the United States. As a result, aging power grids are being pushed beyond their limits, sometimes with deadly impacts. (In 2020, a

series of unusual winter storms knocked the power out in Texas for days—leading to shortages of water and heat and more than 100 deaths.)

New research on ways to make electrical systems more resilient and restore power to people and critical facilities faster will be highlighted during the 2021 Society for Risk Analysis Virtual Annual Meeting, Dec. 5-9.

Microgrids to the rescue

Microgrids offer a promising way for communities and organizations like hospitals and universities to keep their essential services online by generating their own electricity during an outage. A microgrid can provide electricity to a subset of an urban area, such as a neighborhood. These localized energy grids can be powered by traditional or alternative energy sources—such as solar energy stored in batteries—and operate independently from the bulk power grid.

Energy analyst Amanda Wachtel of Sandia National Laboratories will describe a tool called ReNCAT that helps planners choose the ideal locations for microgrids to ensure that critical services stay online. This optimization tool uses a genetic algorithm to determine which sections of distribution lines to power via microgrids during a grid outage. A key feature involves mapping critical lifeline services to critical infrastructure by specifying which sectors provide which services and at what level.

Backup solar power

Many organizations and communities are investing in solar backup power to keep critical systems online during grid outages. A solar+battery system can provide green energy during normal times and

deliver needed backup power during an outage. But in order to make the switch, planners need a faster, simpler way to estimate the cost of such a system (other than complicated computer programs). This is the focus of a study conducted by the group Physicians, Scientists, and Engineers (PSE) for Healthy Energy.

The biggest driver for the cost of resilient energy is battery size, according to PSE Healthy Energy Senior Scientist Patrick Murphy. More batteries are needed when solar capacity is low, load is high, and outages last a long time. Larger solar installations can help reduce the battery costs. "While more solar is more expensive, it also produces more energy during normal times and is typically a good investment," says Murphy.

As a test of their new model, the researchers developed a method for estimating the size and cost of a solar+battery system for community facilities in California. "Our method allows stakeholders to quickly compare the levels of service possible and the cost to provide them," says Murphy. "The results will provide community leaders with ways to make their electrical system more resilient and keep critical functions online."

Mapping wildfire outage risk

Wildfires are a major cause of power outages in California and other western states where summers are becoming hotter and drier due to climate change. A large wildfire can disrupt a community's electricity system via direct physical damage or indirect public safety power cutoffs. To minimize the risk to people and help officials prepare for outages, researchers at the University of Buffalo have developed a vulnerability map that quantifies and visualizes the wildfire-induced risk (low, medium and high) for specific communities in a geographic region. The mapmaking method uses machine learning algorithms to analyze combines publicly available geo-data with machine learning

algorithms.

In the presentation, "A Geo-AI based framework for modeling wildfire-induced failure risk of electric power grid," Prasangsha Ganguly will present a vulnerability map for the electric infrastructure of California. A second pixel-based map assigns different zones (low, moderate, and high) to risk clusters, representing the level of risk arising due to loss of the critical power infrastructure. "These maps can help federal and state governments make risk-informed decisions related to resource allocations and planning for wildfire risk mitigation," says Ganguly.

More information: Meeting Details: www.sra.org/event/2021-sra-annual-meeting/

Provided by Society for Risk Analysis