Improving Electrical Grid Reliability & Resilience to Withstand Extreme Weather Events

Aging electrical systems cannot withstand catastrophic weather events

- Heat and ice
- Tornados
- Hurricanes

Negative impacts on the electrical grid

- Damage and collapse of overhead power lines
- BLACKOUT — Nationwide blackouts causing damages in billions of dollars every year
- Supply unable to keep up with the demand for electricity

Climate change and the consequent rise in harsh weather in the United States has highlighted the need for reliable and resilient electrical grids

ASCE collection on the impact of extreme weather on the electrical grid

Simulation models

- Fragility and reliability assessment
- Power grid vulnerability and robustness assessment
- Icing hazard reliability assessment

Case studies

- Probabilistic risk analysis for transmission towers in Mexico
- Analysis of blackout hazards following Hurricane Irma
- Cost estimation for storm-induced power outages in Texas
- Energy management analysis of Alexandria, Egypt's distribution network
- Grid performance analysis for posthurricane investigation in Puerto Rico

Development of power grid resilience strategies

- Machine learning-based framework for predicting rapidity of a power structure following outages to improve resilience
- Assessing grid vulnerability and robustness through simulating cascading failure propagations using a dynamic cascading failure physics-based model

Upgrading old technologies and implementing new technologies

- Upgrading to modern aluminum conductor composite core conductors in old transmission lines in Brookfield Smoky Mountain
- Employing smart meters, automated switches, and microgrids
- Switching to smart grids

These studies help civil and structural engineers build more resilient and reliable electrical grids, which help with:

- Supply of continuous energy to Americans
- Healthy integration of renewable energy to achieve climate goals
- Reduction of energy costs to have a positive impact on the economy
- Technically sound structural design of distribution infrastructure

Funding now available through the Bipartisan Infrastructure Law will help with improving this critical energy infrastructure and create new jobs in the process

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