

Electrical Grid Resilience and West Virginia

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The electrical grid is the combination of electricity generation, transmission and [control](#) and distribution systems (see figure). Electrical power outages can cause significant disruptions to economic activity, state functions, and public health.

Electrical grid reliability and resilience are related concepts. Reliability refers to the frequency and duration of everyday disruptions and has [standardized metrics for measurement](#). [Resilience](#) deals with the grid's ability to anticipate, withstand, and flexibly respond to adverse events. This Science and Technology Note considers grid challenges and opportunities to improve the resilience and reliability of West Virginia's electrical grid.

Electric Grid Challenges in West Virginia

The reliability of electric power impacts [industry](#), government, and the well-being of residents in a state. Grid infrastructure is aging: [around 70%](#) of US transmission and distribution lines are nearing their expected fifty-year lifetime, while nationwide electricity demand is [expected to grow nearly 5%](#) in the next five years. Billion-dollar weather disasters are [increasing nationally](#); West Virginia alone has experienced [45 confirmed billion-dollar weather disasters](#) in the last 44 years. Improving West Virginia's grid reliability and resilience could help the state forestall [costly power outages](#). West Virginia is in the [top ten states](#) for cheapest average electricity prices, but consistently [ranks worst](#) or among the worst in grid reliability based on both frequency and duration of outages (see figure). These grid failures result in economic and health harms to West Virginia ratepayers. Research has found that across the country, power outages [last longer in counties with lower median](#)

Research Highlights

- A reliable and resilient electric grid is crucial for a state's economy, critical infrastructure and services, and public health. West Virginia's electrical grid is among the least reliable in the country, often having both the most frequent and longest duration power outages (excluding major events).
- Investments in a more reliable and resilient power grid could improve residents' quality of life and the state's economy. Numerous opportunities, from more aggressive vine maintenance and tree trimming to advanced grid technologies and distributed energy resources, have the potential to improve West Virginia's grid resilience.
- Other states have sought to encourage grid reliability by allowing utilities to recoup grid transformation costs and by offering high-cost infrastructure tax credits.

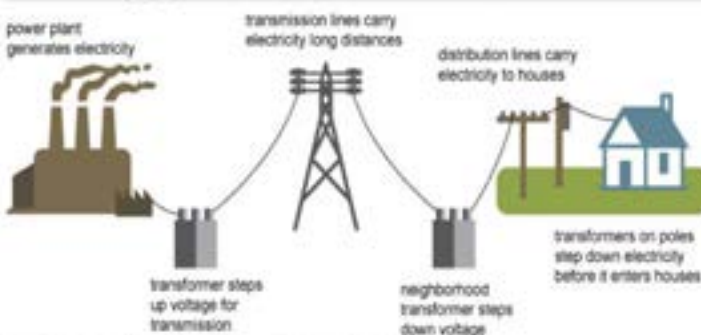
[household income](#).

One contributing factor to West Virginia's lower electric grid reliability is that electricity consumers are spread out across mountainous terrain. The small number of customers in a given area, combined with the difficult terrain, makes it expensive for utility companies to invest in infrastructure improvements and maintenance. Mountain thunderstorms, flooding, and downed branches increase the likelihood of power outages.

The [Public Service Commission \(PSC\)](#) regulates public utilities in the state to ensure "adequate, economical and reliable" service in West Virginia. A [2019 legislative audit](#) of the PSC found high workforce turnover and vacancies had a "demonstrable impact" on the ability of the utilities division to achieve its missions.

Efforts to enhance the resilience of the West Virginia electric grid are ongoing. The Department of Energy (DOE) [announced](#) \$10.5 billion in investments over four years for a Grid Reliability and Innovation Partnership (GRIP) program, providing grants to utilities to improve the ability of the electric grid to respond to challenges. In April 2024, Senator Manchin [announced](#) a \$5 million DOE grant to help Monongahela Power Company rebuild power lines and improve grid reliability in Pocahontas, Clay, and Braxton

Electricity generation, transmission, and distribution



Electrical Grid explainer cartoon (Source: [EIA](#))

counties.

Many approaches could improve grid reliability and resilience in West Virginia. Studies have found [90% of power interruptions](#) stem from failures in distribution systems. [Improved data collection](#) can lead to targeted investments, for example by identifying particular high risk distribution lines. Lower cost options include improved vegetation management and replacing wooden utility poles with [stronger composite materials](#). More costly options include [burying power lines](#) (undergrounding) and elevating electrical substations to avoid flood damage. [Distributed energy resources](#) (DERs) like rooftop solar, energy storage units, and even electric car chargers can, if managed well, provide local backups for West Virginians. West Virginia is receiving [\\$106 million in federal grants](#) to support rooftop solar installations. Form Energy's [battery manufacturing facility](#) under construction in Weirton will soon produce iron-air batteries that can [help support grid reliability](#). [Advanced grid technologies](#) coupled with advanced modeling and analysis can help with challenges integrating DERs and enhance grid resilience. The state's [former mine lands](#) could serve as sites for renewable energy generation or battery storage which could contribute to increased grid reliability.

West Virginia and Other State Grid Resilience Legislation

Existing West Virginia law ([§24-2-1q](#)) requires any coal-fired power plant owned by an electric utility maintain a 30 day coal supply in order to support grid reliability. In 2023, the legislature passed the Grid Stabilization and Security Act ([SB 188](#)) which encouraged and supported development of electricity generation from natural gas in the state, in part by identifying suitable sites for natural gas development. Natural gas can contribute to grid reliability but [can fail](#) to meet demand during severe winter storms (as in [Texas in 2021](#)). [HB 3437](#) (2023) would have required utilities to reinvest some profits into infrastructure or reliability, but stalled in committee. [HB 4632](#) (2024) would have declared that energy storage systems can enhance grid stability, and required processes for government purchasing of these technologies. [HB 4634](#) (2024) would have created a legislative commission on energy storage resources. Both bills stalled in committee.

Virginia's 2018 [Grid Transformation and Security Act](#) allowed [utilities to recover the cost](#) of distribution grid transformation projects. This law also required state utilities undertake grid modernization and reliability efforts and deliver [annual reports on those efforts](#) to the legislature. In 2024 [Virginia](#) and [Minnesota](#) required utilities to consider "grid-enhancing technologies" which maximize transmission in a way that ensures reliability, physical and cyber security in their planning. In 2023, New York [required](#) vine trimming as a



WVU Bridge Initiative, Data: [EIA](#). SAIDI = System Average Interruption Duration Index (average customer minutes of non-momentary interruptions)

part of routine maintenance and [prioritization of repairing downed wires](#). Utah offers [high-cost infrastructure tax credits](#).

Benefits of Improving Grid Resilience and Policy Options for West Virginia

Improving grid reliability and resilience could create new opportunities for West Virginia residents and businesses. A [Department of Energy analysis](#) estimates the annual cost of power outages in the United States to be around \$80 billion (some estimate costs up to \$130 billion). The study found that [98% of the financial cost](#) from outages is borne by commercial and industrial customers, suggesting enhanced reliability could spur economic activity. Power outages [negatively impact West Virginia's public health](#) through carbon monoxide poisoning (improper generator use) and gastrointestinal illnesses (spoiled food). People who rely on electronic medical devices are [especially at risk](#). Improved grid reliability could help improve public health outcomes for West Virginians.

Policy options for the West Virginia Legislature include allowing utilities to recover the costs of distribution grid transformation projects, and requiring annual reports from electric utilities on grid reliability efforts.

This Legislative Science & Technology Note was written by Ryan Nesselrodt, PhD, West Virginia Science and Technology Policy Fellow, on behalf of the Bridge Initiative for Science and Technology Policy, Leadership, and Communications. Please see <https://scitechpolicy.wvu.edu/> or contact scitechpolicy@mail.wvu.edu for more information.