

Grid Reliability 101

Clean energy will keep America's aging electric grid—the system of wires, electricity generators, and operators that delivers electricity—reliable through rising power demand and extreme weather events.

What Is 'Grid Reliability'?

Grid reliability is the electric grid's ability to continue operating, even in unexpected conditions. Key components of grid reliability include:

Operational Reliability



Ability to Respond to Real-Time Demand

How easily can grid operators balance supply and demand in real time?

Resilience



Ability to Withstand and Bounce Back from Extreme Events

Can the grid withstand disruptive events and quickly restore power after a blackout?

Resource Adequacy



Enough Spare Capacity

Does the grid have enough supply to meet demand everywhere under reasonably foreseeable circumstances?

System Stability



Adequate Flow of Electricity

Can all parts of the grid maintain enough voltage through system disturbances?

Why Do We Need Grid Reliability?

Maintaining a functioning power system is crucial to saving lives and powering the economy – both under normal circumstances and in the event of extreme weather, natural disasters, or other unforeseen events. A reliable electric grid is essential for America's economy and energy security.

What Challenges Is Our Grid Facing?

Our electric grid is more than a century old and badly in need of modernization. Many of the cables, towers, substations, and other components are 50-70 years old and past their useful lives.

These outdated and stressed systems have left our grid vulnerable to blackouts during extreme weather events such as drought, extended heatwaves, wildfires, and extreme cold conditions. Research suggests that these weather events are expected to become more common and more intense due to climate change¹, and our current grid will struggle to withstand these new extremes.

Can Clean Energy Affect Grid Reliability?

Clean energy sources improve grid reliability. During times of both average and peak electricity demand, clean energy plays an increasingly important role in stabilizing the grid.

Widescale incorporation of utility-scale wind, solar, offshore wind and energy storage into the grid improves its resilience against extreme weather and heat waves². In many parts of the country, clean energy resources regularly serve most of customer demand for electricity without any reliability issues.

- For example, the Southwest Power Pool (SPP), operating the power grid for most of the Great Plains, has at times obtained more than 90% of its electricity from renewable sources and on average generates more than a third of its electricity from wind sources.³

Across the nation, wind, solar and storage already provide over 15% of our electricity needs⁴.

Forecasting the availability of wind and solar has become increasingly accurate, so changes in the output of wind and solar have become highly predictable in a way that other resources are not; this provides grid operators with enough time to bring other units online during an emergency.

¹ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter11.pdf

² <https://www.sciencedaily.com/releases/2021/05/210511123634.htm>

³ <https://www.spp.org/news-list/spp-sets-regional-records-for-renewable-energy-production/>

⁴ <https://cleanpower.org/market-report-2022/>

Grid-scale battery storage strengthens grid reliability by storing energy and instantly dispatching the exact amount of electricity needed when demand rises – a level of precision that existing electricity generators cannot match. Additionally, storage can be charged during periods of high renewable energy and discharged when the wind isn't blowing and the sun isn't shining, allowing for the seamless integration of clean power resources.

Energy storage also serves as back-up power for individual homes, businesses, communities, and the broader grid system to minimize and prevent power outages and service interruptions from extreme weather.

What is Needed to Improve Grid Reliability?

Transmission and energy storage are especially important for grid reliability.

New electricity transmission lines help us access a diverse set of renewable sources of electricity often located long distances away from load centers, while energy storage helps to smooth out fluctuations in output. During peak hours, there is typically substantial wind and solar availability somewhere in the country – but without transmission, customers may not be able to access it. The ability to transfer more electricity (transfer capacity) bolsters energy supply for the grid, ensuring that consumers have access to reliable power when and where they need it.

Energy storage solutions can capture and store energy generated from clean sources and deploy it during times of peak demand, maximizing the benefits of clean energy and minimizing outages.

Should We Add More Clean Energy to the Grid?

A grid powered by clean energy ensures a diverse, reliable electricity supply in a cost-effective manner for millions of Americans. It reduces the uncertainty posed by new extreme weather events and other challenges.

- **Clean energy directly benefits consumers by keeping electricity rates low⁵ and offering protection from market volatility**, as those resources do not expose customers to high fluctuating fuel prices.
- **Clean energy also provides an alternative to electricity generators that produce particulate and carbon pollution**, improving human health outcomes and reducing climate change-related extreme weather incidents that strain the grid.
- **Adding more clean energy to the grid diversifies our generation sources**, mitigating future weather-related power losses and keeping the lights on for American families and businesses.
 - And when extreme weather events *do* occur, like the recent heat waves in Texas⁶ and California⁷, or winter storm Elliott⁸, we've witnessed wind, solar, battery storage, and transmission provide critical energy to the grid.

The continued deployment of clean energy is not just beneficial but *necessary* for a sustainable, reliable and efficient power grid.



5 https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Aug/IRENA_Renewable_power_generation_costs_in_2022.pdf

6 <https://cleanpower.org/resources/clean-energy-keeps-texas-grid-resilient-during-heatwave/>

7 <https://www.energy.ca.gov/news/2023-08/data-show-clean-power-increasing-fossil-fuel-decreasing-california>

8 <https://www.pjm.com/-/media/markets-ops/winter-storm-elliott/faq-winter-storm-elliott.ashx>