



The Grid is Essential for Progress, Yet Vastly Underfunded

The electric grid is the backbone of modern society and the lifeblood of our economy. Regarded as the greatest engineering achievement of the 20th century, our ubiquitous electric grid drives all of our major industries and provides services and safety to nearly every household. Yet we now often take it for granted. As our 21st century society has digitized, and commerce, government services, education and even entertainment have moved online, we have not invested in the power that makes this all work. As we saw in Texas in February, when the power grid goes down, our people, businesses and way of life are all at risk.

The U.S. is facing a \$208 billion (in 2019 dollars) grid investment shortfall by 2029 and a \$338 billion shortfall by 2039.¹ To ensure reliable power, and avoid future catastrophic disruption and suffering, we need to start a \$340 billion investment right now.

- **Outdated critical equipment:** Most electricity transmission and distribution lines were built in the 1950s and 1960s² with a 50-year planned useful life that has now come due for replacement. Investing in modern technologies will minimize today's risk and improve service for all.
- **Societal costs:** NOAA reports that there were 22 billion-dollar weather and climate disasters in 2020, costing the nation a combined \$95 billion in damages. The climate threat will only get worse. Investing \$340 billion starting now could save us trillions in the coming two decades.
- **Accelerating change:** Rapidly evolving technologies such as renewable energy and demand response are upending market dynamics, promising to lower costs and carbon footprint. We must deploy new techniques and tools to create a robust grid infrastructure and ensure all segments of society benefit.

Decarbonization Happens on the Grid

The electric grid is the platform for decarbonization of energy, the only means to connect both central and distributed clean energy resources with demand across the country. The need is immediate! Renewable generation provided a new record of 742 million MWh, or 17.6%, of electricity in 2018, nearly double the 382 million MWh produced in 2008.³ S&P Global estimates that 55 GW of wind and 45 GW of solar will be installed between 2020-2030 just to maintain pace with state-level Renewable Power Standard requirements.

1. https://www.asce.org/uploadedFiles/Issues_and_Advocacy/Infrastructure/Content_Pieces/failure-to-act-electricity-report.pdf

2. <https://www.infrastructurereportcard.org/wp-content/uploads/2019/02/Full-2017-Report-Card-FINAL.pdf>

3. <https://www.eia.gov/todayinenergy/detail.php?id=38752>

This build-out can benefit all segments of society, because the costs of renewable power are plummeting even faster than optimistic projections. Clean energy is now cheaper than fossil fueled electricity generation, and actual costs in 2018-2019 were lower than previously projected costs for 2030-2035. Over the last decade, wind energy prices have fallen 70% and solar photovoltaics have fallen 89% on average.⁴ Investing in the grid unlocks cost savings for every segment of society.

U.S. utility executives are embracing this vision, because climate change is forcing changes in how they do business. In a 2020 Guidehouse/Public Utilities Fortnightly survey, 71% of utility executives and other industry players believe that climate change already poses a tangible threat to utilities.⁵

- **Huge supply:** Wood Mackenzie estimates that cumulative distributed energy resource (DER) capacity in the United States will reach 387 gigawatts by 2025.⁶
- **Utility buy-in:** Xcel Energy recently filed an application for \$1.7 billion in new transmission “to bring more renewable energy onto the grid and improve system reliability”⁷ as it pursues a path toward a 100% carbon-free energy supply.⁸

Flexibility for Continuous Innovation Across Sectors

Our system was built in many locations over a century ago to deliver energy in one direction: from central generating stations out to lights in homes and motors in factories. More diverse energy sources are needed not just to maintain our traditional way of life, but also to power electrification across vehicles, buildings and industry. By 2030, electrification could increase nationwide annual energy demand by 5% to 15%, and in 2050 by 25% to 85%.⁹ The Brattle Group estimates that between \$30 billion and \$90 billion of incremental transmission investments will be necessary to meet additional load due to electrification.¹⁰

Meeting demand instantaneously will require significant expansion of resources that bring flexibility in our grid. This flexibility can come from diversified generation resources as well as proactive load management capabilities and a variety of forms of energy storage. Expanding the use of demand side resources as grid assets significantly increases the flexibility that our electric grid will require. Furthermore, the dramatic increase in DERs shows the promise of new energy asset classes and the value they can bring for customers as well as adaptability of our systems.

- **Business innovation:** The U.S. market for C&I Building Energy Storage is expected to grow from 200 MW annually in 2020 to 1,100 MW annually by 2029.¹¹
- **Utility assets:** The U.S. market for Utility-Scale Energy Storage is expected to grow from 800 MW annually in 2020 to 4,500 MW annually by 2029.¹²

4. <https://www.fortnightly.com/fortnightly/2020/06-0/puf-annual-pulse-power-survey>

5. <https://www.lazard.com/perspective/lcoe2019>

6. <https://www.woodmac.com/news/editorial/der-growth-united-states/>

7. <https://www.morningstar.com/news/dow-jones/202103029307/xcel-energy-colorado-proposes-transmission-line-that-would-expand-access-to-renewables>

8. https://www.xcelenergy.com/Environment/Carbon_Reduction_Plan

9. <https://guidehouseinsights.com/reports/global-der-deployment-database-1q21>

10. <https://www.transmissionhub.com/articles/2019/03/report-30bn-to-90bn-of-incremental-transmission-investments-will-be-needed-by-2030-due-to-electrification.html>

11. <https://guidehouseinsights.com/reports/leading-us-states-for-distributed-energy-storage>

12. <https://guidehouseinsights.com/reports/leading-us-states-for-utility-scale-energy-storage>

- **Electrifying transportation:** Reasonable estimates show 7-12% electric vehicle (EV) adoption by 2030 and 11-48% adoption by 2050. Electricity demand for EVs is estimated at 33 TWh per year by 2025 and 551 TWh by 2040.¹³

Resiliency to Dire Weather Events and Losses

There have always been threats to continuity of electric supply. However, the frequency and magnitude of disturbances seems to be expanding. NOAA reports that there were 22 billion-dollar weather and climate disasters in 2020, shattering previous records of 16 events, which occurred in 2011 and 2017. The 22 events cost the nation a combined \$95 billion in damages.¹⁴ In the face of storms, fires, floods, earthquakes and other natural disasters (let alone human-created threats) we have to ensure investments in grid hardening keep pace with demands we have for continuous supply of energy. Moreover, access to energy is the first order of business in responding to a crisis, ensuring safety, and beginning to rebuild.

- **Lost power:** From January 2020-November 2020, the U.S. experienced over 212 outage events representing at least 91.6 GW lost.¹⁵
- **Trillion-dollar issue:** Since 1980, the U.S. has sustained 285 weather and climate disasters where the overall costs reached at least \$1 billion. The cumulative cost for these events exceeds \$1.875 trillion.¹⁶

Equitable Access to Affordable Energy

Electrification during the middle part of the 20th century provided access to rural Americans that had become commonplace in urban areas. Utilities of all ownership models provided affordable electricity to customers across their service territory. In the last couple of decades, improvements in energy efficiency and distributed energy have provided clear benefits to consumers, but up-front costs have skewed the improvements to those with upper incomes. At the same time, all of us have become more dependent on digital access to information and services. Many are disproportionately disadvantaged by the costs and availability of reliable energy. As the grid evolves, the benefits of the system must be accessible to the most vulnerable communities.

- **Millions disadvantaged:** Nationally, 67% (25.8 million) of low-income households face a high energy burden and 60% (15.4 million) of low-income households with a high energy burden face a severe energy burden.¹⁷ Energy burden is the percentage of gross household income spent on energy costs:¹⁸ 6% is the threshold for high energy burden.¹⁹
- **Paying more:** In the five states with the highest low-income energy burden, low-income households use 36% more electricity than the low-income national average.²⁰

13. <https://www.osti.gov/pages/servlets/purl/1576484>

14. <https://www.climate.gov/news-features/blogs/beyond-data/2020-us-billion-dollar-weather-and-climate-disasters-historical>

15. https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_b_1

16. <https://www.ncdc.noaa.gov/billions/>

17. <https://www.aceee.org/sites/default/files/pdfs/u2006.pdf>

18. <https://www.energy.gov/eere/slsc/low-income-community-energy-solutions>

19. <https://www.aceee.org/sites/default/files/energy-affordability.pdf>

20. https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf



Reducing Danger of Cyber Threats

Safety and security of the energy system has always been at the front of grid operators' minds. As the surface area of resources on the system expands so does the vulnerability. As the threats to critical infrastructure increase, utilities are being required to strengthen their cyber protection.²¹ It is critical that the US maintain world-class security and cyber security capabilities to continuously monitor and proactively mitigate any potential security threats to the system.

- **Attacking now:** Energy utility operators report that the frequency of attacks has been increasing, with 56 percent having experienced a data breach or outage in the past year, and 54 percent expected an attack on critical infrastructure in the coming 12 months.²²

Today's Investment Builds the Foundation for Future Prosperity

Our society relies on our electric system more than ever before. We need a power grid that is decarbonized, resilient, flexible, equitable and secure – not just to maintain our way of life, but to continue to progress all of our national priorities. Many of the technologies we need to tackle the challenges are ready to deploy now, with sufficient priority and funding. The benefits of proactive investments today will be realized by every segment of citizens and businesses and help to propel the U.S. to a more competitive, sustainable and prosperous 21st century.

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- Utilidata
- UtilityAPI
- Washington State University

²¹ <https://www.osti.gov/servlets/purl/1337873/>

²² <https://www.siemens-energy.com/global/en/news/magazine/2019/cyber-security-ponemon-study.html>

Grid Forward is an industry association promoting and accelerating grid modernization across the U.S. west via advanced technology, policy progress and business innovation.

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