

Powering the Future: American Innovation for a Secure, Efficient, and Digitally Enabled Power System

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America's electric grid is the backbone of the economy, and it is showing its age.

Electricity demand, flat for two decades, is now surging due to data centers, artificial intelligence (AI), manufacturing, and the electrification of transportation and industry. Costs are escalating as utilities race to meet new load, harden the system against extreme weather and wildfires, and absorb rising component prices.

The grid is also the platform on which every other technology pillar in Clean Tomorrow's Re-Energizing America roadmap depends, and it is central to each of that roadmap's imperatives.¹ It underpins national security, powering defense manufacturing and military bases in an increasingly digital warfighting age, as it faces growing cyber and physical threats and relies heavily on imported components. Rapidly expanding grid capacity is vital to seizing the economic opportunity of AI and advanced manufacturing, and building grid technologies at home promises new jobs. A modern grid speeds decarbonization by connecting the thousands of clean energy projects stuck waiting in line and reducing curtailment of wind and solar generation. And it protects affordability as electricity prices climb: congestion alone cost the U.S. more than \$12 billion in 2024, and connecting just 10% of the capacity waiting in the mid-Atlantic could save \$3.5 billion.²

Innovative grid technologies and operations offer a faster, cheaper path. Advanced conductors can increase the capacity of existing lines by 1.5 to 3 times at less than half the cost of a new line, and dynamic line ratings can squeeze 10–30% more out of existing infrastructure.³ Alongside advanced distribution management systems, virtual power plants, high-voltage direct current (HVDC), and storage, these solutions can unlock many gigawatts of capacity and strengthen reliability and security at a fraction of the cost and time of building new lines.

Yet these solutions have languished. Some still need further testing and validation, but even mature options go largely unused in the U.S. while Europe and China race ahead. The core problem is a lack of demand from utilities, the grid's key customers: regulated utilities earn returns on capital spending, so technologies that avoid new investment offer utilities little financial upside under traditional cost-of-service regulation. Weak regulatory signals, fragmented federal programs, and a thin deployment ecosystem compound the problem. Utilities devote just 0.1% of revenue to research and development (R&D), versus 5.1% across all industries.



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¹ Clean Tomorrow, "Re-Energizing America: Reclaiming American Leadership in Energy Innovation," November 2025. <https://cleantomorrow.org/wp-content/uploads/2025/11/Re-Energizing-America-Report-Clean-Tomorrow.pdf>

² Grid Strategies, "Transmission Congestion in the U.S.," September 2026. <https://gridstrategiesllc.com/project/transmission-congestion-in-the-u-s/>

³ U.S. Department of Energy, "Pathways to Commercial Liftoff: Innovative Grid Deployment," April 2024. <https://yardsale.energy/wp-content/uploads/2025/05/DOE-Liftoff-Innovative-Grid-Deployment-2024.pdf>

Targeted federal action can help overcome barriers to grid innovation. Through research, development, and demonstration (RD&D) support, financing, regulatory incentives, and tax policy, the Department of Energy (DOE), the Federal Energy Regulatory Commission (FERC), and Congress can help the economy capture the benefits of grid innovation to meet the moment of rising electricity demand. **We recommend five broad strategies, each with specific spotlight actions:**



1 Offset the costs of technology development and testing to demonstrate value across jurisdictions

by scaling up DOE's Speed to Power through Accelerated Reconductoring and other Key Advanced Transmission Technology Upgrades (SPARK) program, growing DOE's Office of Electricity (OE) and Office of Cybersecurity, Energy Security, and Emergency Response (CESER) budgets to \$800M and \$300M a year, and creating an investment tax credit for advanced grid investments.



2 Encourage dissemination through knowledge-sharing and early deployments

by directing the Tennessee Valley Authority (TVA) and the Power Marketing Administrations (PMAs) to act as first deployers of new grid technologies and providing technical assistance for adopters of advanced grid technologies.



3 Double down on domestic grid technology manufacturing by funding Defense Production Act support for domestic transformer and grid component manufacturing and expanding the 45X production credit to cover advanced grid technologies.



4 Harness AI, neural networks, and quantum computing breakthroughs for grid planning, operations, and security by authorizing and regularly funding the Genesis Mission's grid work and supporting open-source grid modeling and quantum computing.



5 Overcome misaligned utility incentives that discourage adoption by expanding utility reporting on congestion and use of advanced grid technologies, providing grants to state public utility commissions to strengthen utility oversight, establishing independent transmission monitors, and creating shared savings incentives for deployment of cost-saving grid technologies.

Taken together, these strategies will accelerate the deployment of innovative grid solutions for a cheaper, more reliable, and more secure power grid to meet our rapidly changing modern electricity needs.