

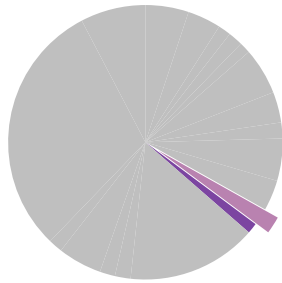


Federal Energy R&D: Grid Modernization

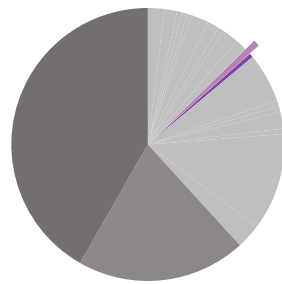
BY DAVID M. HART AND COLIN CUNLIFF | APRIL 2018

This briefing is part of a series on the U.S. energy budget. See: itif.org/energy-budget.

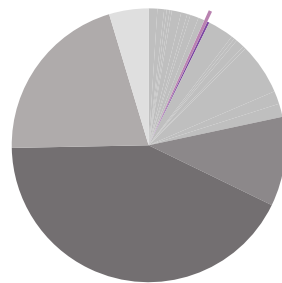
The Grid Modernization program conducts R&D into technologies and tools to improve the reliability and resilience of the electric power grid and its components. It focuses on transmission and distribution systems, large power transformers, and energy-storage technologies—and seeks to provide solutions to market, institutional, and operational failures that go beyond any one utility’s ability to solve.¹ The program’s work on resilience, threat assessment, risk management, and grid hardening is motivated by natural disasters, such as hurricanes Harvey and Maria and Superstorm Sandy, as well as the 2013–2015 drought and accompanying wildfires in the western United States. The Department of Energy (DOE)-funded R&D into energy-storage technologies aims to enable greater stability, resiliency, and reliability in the electric grid, while also supporting increasing levels of variable renewable energy sources such as wind and solar.



Grid Mod (lavender)
Office of Electricity
Energy R&D (light gray)

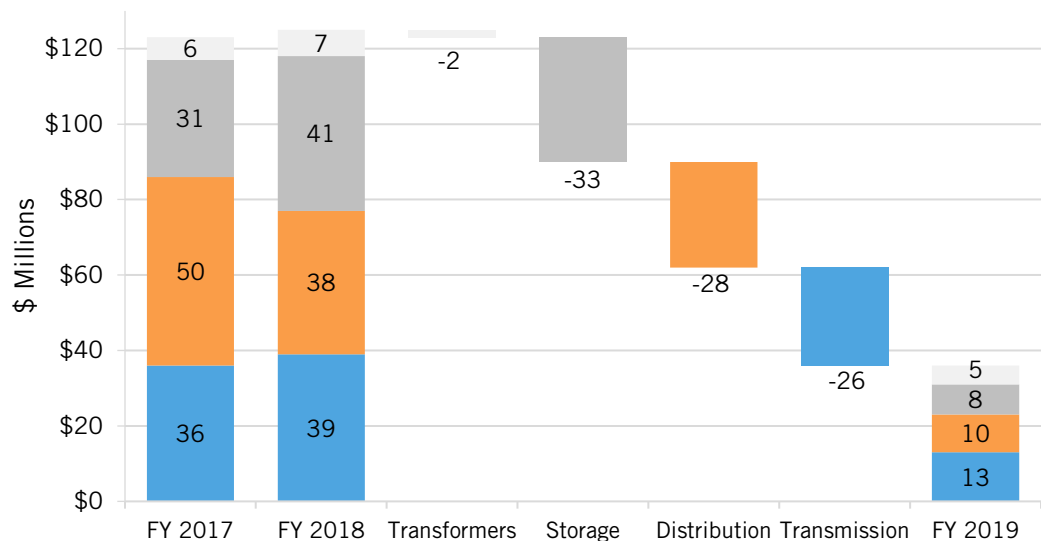


Grid Mod & Energy R&D
Basic Science R&D
Defense R&D



Grid Mod & Energy
Basic Science
Defense
Environ Mngmt
Other DOE

Figure 1: The FY 2019 Budget Request Would Cut Grid Modernization R&D by 71 Percent



What’s At Risk

Grid modernization is critical to ensuring reliable and affordable energy delivery, sustaining economic growth, and mitigating risks to the security of the grid and other vital sectors that depend on the grid’s services. In collaboration with the utility industry, DOE established the Grid Modernization Initiative to coordinate R&D activities. Through the initiative, a multiyear R&D roadmap outlining six technical areas (devices and integrated systems testing; sensing and measurements; system operations, power flow, and control;

design and planning tools; security and resilience; and institutional support) that industry and government should jointly pursue to establish a resilient, secure, sustainable, and reliable grid was created.² For its part, DOE has set aggressive targets and performance measures in reliability and resilience, as well as cost and performance targets for new grid-storage technologies.³ Reductions in R&D funding threaten to delay or even derail progress toward these goals.

Grid Modernization R&D Subprograms

Grid modernization R&D is made up of four main subprograms:

- **Transmission Reliability and Resilience (TRR)** focuses on ensuring the reliability and resilience of the U.S. electric grid through R&D on measurement and control of the electrical system, and risk assessments to address challenges across integrated energy systems.
- **Resilient Distribution Systems (RDS)** pursues strategic R&D to improve reliability, resiliency, outage recovery, and operational efficiency of the distribution portion of the electricity-delivery system, with a focus on improved resilience against extreme weather and other natural and man-made hazards.
- **Energy Storage** focuses on the development of new materials and device technologies that both improve the cost and performance of utility-scale energy-storage systems and better integrate storage into the grid infrastructure.
- **Transformer Resilience and Advanced Components (TRAC)** supports modernization, hardening, and resilience of grid components, including transformers, power lines, and substation equipment.

Key Elements of the FY 2019 Budget Proposal

- **A 64-percent reduction in Transmission Reliability and Resilience**, including reductions in advanced modeling grid research, which helps system operators and utilities prevent blackouts by expanding wide-area real-time visibility into grid conditions. R&D to develop analytical tools to assess near- and long-term extreme weather risks to energy systems would also be eliminated.
- **An 80-percent reduction in Resilient Distribution Systems**, including termination of R&D activities related to microgrid controller demonstrations; development of Advanced Distribution Management System (ADMS) applications; demonstrations of on-site generation and microgrids; and development of low-cost sensors that measure, analyze, predict, and control the grid.

- **A 74-percent reduction in Energy Storage**, including elimination of grid-scale field-validation efforts with states and utilities, discontinuation of the biannual Safety Forum, and elimination of DOE participation in industry-led safety codes and standards development.
- **A 17-percent reduction in Transformer Resilience and Advanced Components**, which currently conducts research on grid-component vulnerabilities to geomagnetic disturbances (GMD) and electromagnetic pulses (EMP), as well as R&D on improving the resilience of large power transformers—which are one of the most vulnerable components of the grid and would pose a significant risk to the nation in the event of multiple failures.⁴

ENDNOTES

1. For example, individual utilities and grid operators lack the wide-area visibility that could have minimized the 2003 Northeast blackout, or the modeling and analytical tools identified as necessary for containing the 2011 Southwest blackout.
2. DOE, “Grid Modernization Multi-Year Program Plan” (Washington, D.C.: November 2015), <https://www.energy.gov/sites/prod/files/2016/01/f28/Grid%20Modernization%20Multi-Year%20Program%20Plan.pdf>.
3. DOE, “FY 2019 Congressional Budget Justification,” Volume 3 Part 1 (Washington, D.C.: March 2018) 20, 26, 32, 36, https://www.energy.gov/sites/prod/files/2018/03/f49/DOE-FY2019-Budget-Volume-3-Part-1_0.pdf.
4. DOE, “Strategic Transformer Reserve Report to Congress” (Washington, D.C.: March 2017), <https://www.energy.gov/oe/downloads/strategic-transformer-reserve-report-congress-march-2017>.

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