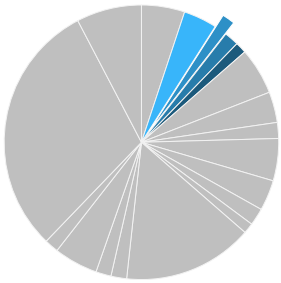
# Federal Energy R&D: Wind Energy

BY COLIN CUNLIFF | APRIL 2019

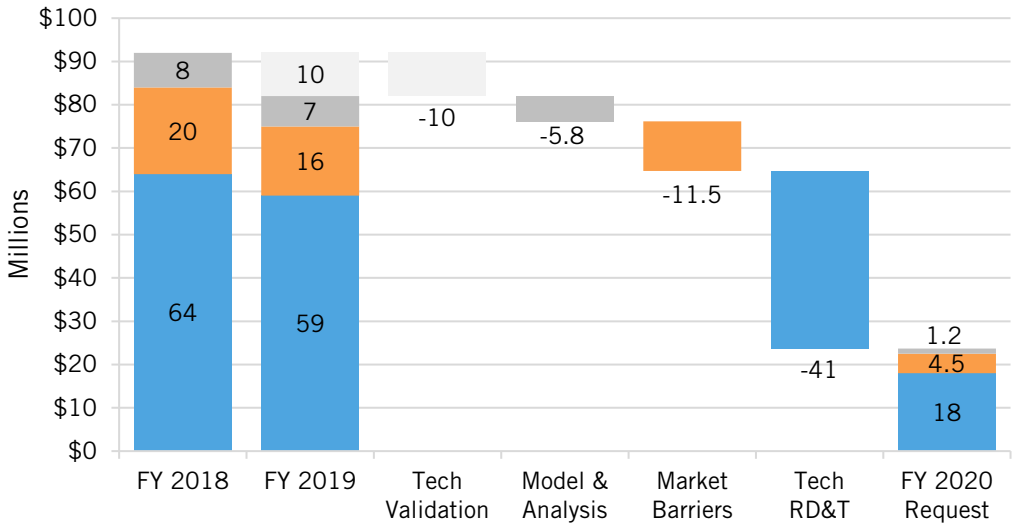
*This briefing is part of a series on the U.S. energy budget. See: itif.org/energy-budget.*



Wind (blue)
Other Renewables (blue)
Energy R&D (light grey)

The Department of Energy's (DOE) Wind Energy program targets innovations in onshore, offshore, and distributed wind power to capture the kinetic energy in wind and turn it into electricity via spinning generators. The program also works to integrate wind generation more effectively into the bulk power system to enable wind farms to provide more reliable power output and essential reliability services to the grid.[1]

**Figure 1: The FY 2020 Budget Request Would Cut Wind Energy R&D by 74 Percent.[2]**




## What's At Risk

DOE's Wind Energy program has already achieved substantial cost reductions and technology improvements that have enabled the rapid expansion of land-based wind power. The cost of energy from land-based wind power has decreased from more than 55 cents per kilowatt-hour ($0.55/kWh) in 1980 to a national average of $0.046/kWh in 2015, thus enabling the expansion of wind power to 41 states.[3] DOE should build on this success to improve performance and reduce costs much further until unsubsidized wind power becomes competitive across more parts of the country. DOE's "Wind Vision" report provides a path to reducing the cost of energy from unsubsidized land-based wind to $0.023/kWh and achieving a 50 percent reduction in the cost of energy from offshore and distributed wind by 2030. Achieving these goals could enable up to 200 gigawatts (GW) of total wind capacity by 2030, thereby contributing to energy affordability and security while also reducing carbon emissions.[4]

The nascent offshore wind industry is beginning to take off, with 25,500 megawatts (MW) of new offshore wind capacity in development, of which 2,000 MW are expected to be operational by 2023.[5] Offshore wind could present a low-carbon energy alternative for the 28 coastal and Great Lake states, although additional cost reductions will be needed to make it cost competitive with other sources of electricity—as it already is in parts of Europe. Validation and demonstration of new offshore wind technologies will also provide investors with greater confidence in the growing array of energy projects in U.S. waters.[6]

## Wind Energy R&D Subprograms

R&D in the Wind Energy program is divided into four subprograms:[7]

- **Technology Research, Development, & Testing (RD&T) and Resource Characterization** focuses on turbine technology innovations; systems-level optimization of multi-turbine wind power plants; soft costs for distributed wind; and other innovations to reduce the cost and enhance the value of wind energy. The subprogram also manages wind-specific test facilities that enable validation and testing of public- and private- R&D.
- **Technology Validation and Market Transformation** conducts high-risk testing and validation of new technologies, including innovative offshore wind pilot projects, and collect and produces public performance and environmental data sets.
- **Mitigate Market Barriers R&D** identifies research needs evaluates technology solutions to address wind-turbine radar interference, wildlife impacts, and community impacts; supports STEM and workforce programs; and funds R&D to develop and refine the ability of wind turbines to provide frequency, voltage, and ramping support to the grid.
- **Modeling and Analysis** identifies and evaluates opportunities to reduce the cost and improve the value of land and offshore wind technologies in order to inform and prioritize R&D activities.

## Key Elements of the FY 2020 Budget Proposal[8]

- **Elimination of the Technology Validation and Market Transformation subprogram**, which has supported demonstration of first-of-a-kind offshore wind technologies at two sites: the first freshwater offshore wind project in North America, the Lake Erie Icebreaker Project off the coast of Cleveland, Ohio; and a floating offshore wind farm in the deep waters off the coast of Main, where fixed-bottom installations are not feasible.
- **A 69-percent reduction in the Technology RD&T and Resource Characterization subprogram**, which houses the Atmosphere to Electrons (A2e) initiative and the Big Adaptive Rotor (BAR) initiative, and provides support to Sandia's Scaled Wind Farm Technology (SWiFT) / National Rotor Testbed (NRT) facility in Texas and National Renewable Energy Laboratory's National

Wind Technology Center (NWTC) in Colorado, which hosts testing facilities for industry and academia to test and validate their innovations. The proposal would reduce funding in atmospheric wind science, wind plant reliability and optimization, tall wind, advanced manufacturing, and materials for wind energy, and includes no new competitive funding opportunities.

- **An 83-percent reduction to the Modeling and Analysis subprogram**, with no new funding for a project to identify the turbine, substructure, and balance-of-plant R&D pathways to achieve deep cost reductions for floating offshore wind systems; reduced funding for systems engineering and other analysis to identify opportunities to reduce the cost of wind and enhance wind's value to the electricity system, e.g., through the provision of essential reliability services; and no new competitive funding opportunities.

- **A 72-percent reduction in the Mitigate Market Barriers subprogram,** including reduced funding for workforce development programs; research to address regulatory restrictions associated with radar interference and environmental impacts of offshore wind; research to enhance the ability of wind to provide essential reliability services, including inertia, frequency response, and voltage control; and research into dynamic line rating forecasting for transmission lines.

## ENDNOTES

1. DOE, "FY 2020 Congressional Budget Justification," Volume 3 Part 2, 115-132, (DOE/CF-0153, April 2019), https://www.energy.gov/sites/prod/files/2019/04/f61/doe-fy2020-budget-volume-3-part-2_0.pdf.
2. The FY2020 budget for EERE would use $353 million in prior year (FY 2018 and FY 2019) balances to fund FY2020 programs. Thus the numbers shown in the figure underestimate the magnitude of cuts included in the proposed budget. Department of Energy, "FY 2020 Congressional Budget Request: Budget in Brief," (DOE CFO, March 2019), p 3, https://www.energy.gov/sites/prod/files/2019/03/f60/doe-fy2020-budget-in-brief.pdf; DOE, "FY 2020 Congressional Budget Justification" Volume 3 Part 2, 117.
3. DOE, "Wind Energy Technologies Office Accomplishments" (Washington, D.C.: DOE, 2017), https://www.energy.gov/sites/prod/files/2017/05/f34/108630-Wind%20Accomplishments-FactSheet-web150.pdf. For comparison, the levelized cost of electricity from a natural gas combined-cycle power plant was $0.042–0.078/kWh in 2017. Lazard, "Lazard's Levelized Cost of Energy Analysis—Version 11.0," (Lazard, November 2017), https://www.lazard.com/perspective/levelized-cost-of-energy-2017/.
4. Katherine Dykes, et al., "Enabling the SMART Wind Power Plant of the Future Through Science-Based Innovation" (Washington, D.C.: DOE NREL, August 2017) https://www.nrel.gov/docs/fy17osti/68123.pdf; DOE, "Congressional Budget Justification," Volume 3 Part 2, 115.
5. Potential capacity includes installed projects, projects under construction, projects moving through permitting and offtake processes, projects with site control, the Bureau of Ocean Energy Management's unleased wind energy areas, and unsolicited lease applications submitted by developers. DOE, "2017 Offshore Wind Technologies Market Update Executive Summary" 5 (Washington, D.C.: DOE NREL, September 2018), https://www.energy.gov/sites/prod/files/2018/10/f56/exec-summary-71709_V4.-jf3.pdf.

6. Matthew Stepp, "What Interior's Lease Auction Says about Offshore Wind Innovation," Innovation files (June 12, 2013), https://www.innovationfiles.org/what-interiors-lease-auction-says-about-offshore-wind-innovation/.
7. DOE, "FY 2020 Congressional Budget Justification," Volume 3 Part 2, 115-132.
8. Ibid.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## ABOUT THE AUTHOR


Colin Cunliff is a senior policy analyst for clean energy innovation with the Information Technology and Innovation Foundation. He previously worked at the U.S. Department of Energy (DOE) Office of Energy Policy and Systems Analysis (EPSA), with a portfolio focused on energy sector resilience and emissions mitigation. He holds a Ph.D. in physics from the University of California, Davis.


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