



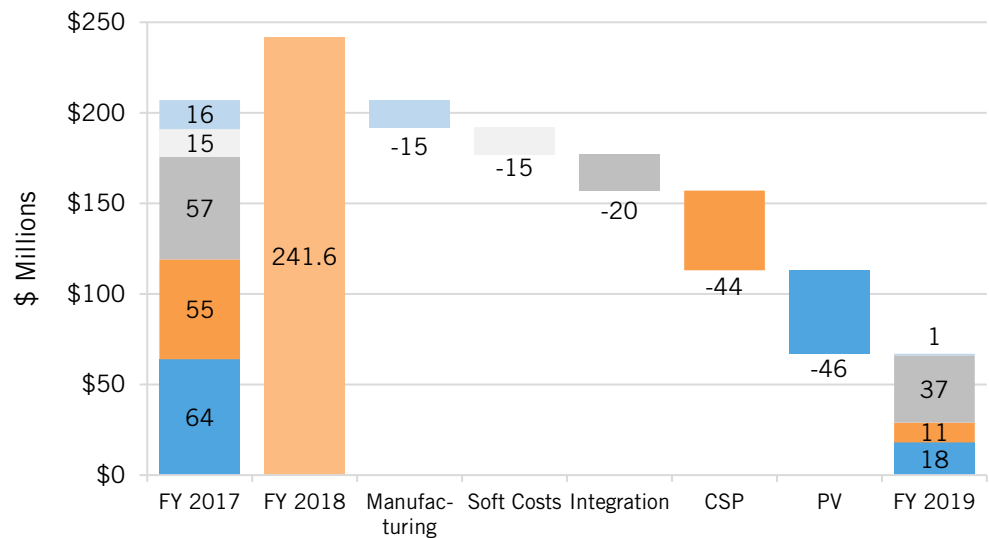
# Federal Energy R&D: Solar Energy

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](http://itif.org/energy-budget).*

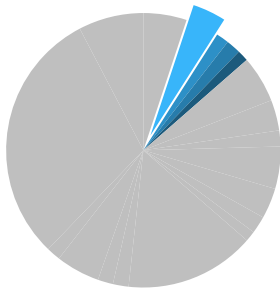
The Department of Energy’s (DOE) Solar Energy Program embraces two complementary technologies: photovoltaics (PV), which convert light to electricity via semiconductors, and concentrating solar power (CSP), which converts light to heat that can then be stored and used to generate electricity. The program also works to integrate these electricity-generation technologies more effectively into the transmission and distribution grid, and transfer DOE solar innovations into domestic manufacturing capabilities.<sup>1</sup>

**Figure 1: The FY 2019 Budget Request Would Cut Solar Energy R&D by 72 Percent**

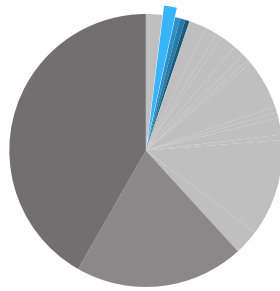


## What's At Risk

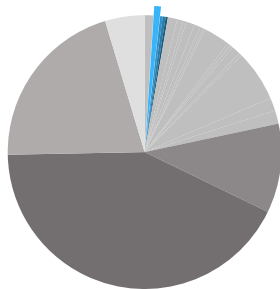
DOE’s SunShot Initiative program has already achieved its 2020 goal of utility-scale solar PV power at six cents per kilowatt-hour (\$0.06/kWh), making it a competitive source for electricity generation in areas with good solar resources and low PV penetration.<sup>2</sup> DOE should build on this success to reduce costs to the point solar PV becomes more competitive for utility, residential, and commercial systems as well—especially when factoring in the costs of integration. SunShot’s 2030 goal for utility-scale solar PV is \$0.03/kWh, which is 50 percent below today’s utility-scale cost. Goals for commercial solar (\$0.04/kWh) and residential solar (\$0.05/kWh) are even more ambitious, requiring cost reductions of up to 68 percent of today’s costs.<sup>3</sup> Achieving these goals would make solar one of the least-expensive sources of electricity generation, costing less than most fossil-fuel-powered sources, thereby contributing to energy affordability while reducing carbon emissions.



Solar (light blue)  
Other Renewables  
Energy R&D (light gray)



Solar & Energy R&D  
Basic Science R&D  
Defense R&D



Solar & Energy  
Basic Science  
Defense  
Environ Mngmt  
Other DOE

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The ten CSP systems operating in the United States today have demonstrated solar power's ability to provide 24-hour energy to the grid—although not yet at a competitive cost.<sup>4</sup> DOE's 2030 goal for CSP power is \$0.06/kWh, or 71 percent below the 2010 benchmark. These targets are highly competitive with other dispatchable power generators and would enable greater overall penetration of solar electricity into the grid, while also enabling more reliable solar generation and increasing its value to the grid.

### Solar Energy R&D Subprograms

R&D in the Solar Energy program is spread across five subprograms:

- **Photovoltaics (PV)** funds research and development to enable higher PV performance, including advanced silicon processes, multijunction solar-cell efficiency, advanced materials science for cadmium-telluride solar cells, and impacts of outdoor soiling, temperature cycling, ultraviolet light, and humidity on PV performance.
- **Concentrating Solar Power (CSP)** focuses on component-level research and development in solar collection, receivers and heat-transfer fluids, power conversion, and thermal-energy storage, as well as integration of subcomponent technologies.
- **Systems Integration** addresses key technical challenges related to the grid integration of solar power, including power variability, voltage regulation, frequency control, unintentional islanding, protection coordination, and two-way power flow.
- **Balance of Systems Soft-Cost Reduction** focuses on reducing non-hardware costs—including financing, customer acquisition, permitting, installation, labor, and inspection—which constitute over half the cost of total system prices for residential, commercial, and community PV systems.
- **Innovations in Manufacturing Competitiveness** funds the development and demonstration of innovative solar manufacturing technologies, as well as technology-to-market programs that support businesses seeking to develop innovations in hardware installation and grid-integration technologies.

### Key Elements of the FY 2019 Budget Proposal

- **Elimination of the Soft Costs subprogram**, which threatens to derail progress toward the 2020 and 2030 cost goals for residential and commercial solar, given that soft costs constitute more than half of total system prices for residential, commercial, and community PV systems
- **A 94-percent reduction in the Manufacturing subprogram**, including a discontinuation of funding for the SunShot Incubator program, which provides early-stage assistance to small businesses commercializing innovative solar

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technologies. The SolarMAT program—which funds innovative manufacturing technologies and aims to increase the United States’ share of the global solar market through the creation of competitive advantages for domestic manufactures—would also be eliminated.

- **Elimination of several R&D activities in the Systems Integration subprogram,** including the Solar Forecasting program, which advances predictive modeling capabilities, and R&D aimed at using solar to improve the resilience of the nations’ electrical grid.

## ENDNOTES

1. DOE, “FY 2018 Congressional Budget Justification” (Washington, D.C.: DOE/CFO, May 2017) Volume 3, 97.
2. DOE, “2020 Utility-Scale Solar Goal Achieved” (Washington, D.C.: DOE/SETO, September 2017), <https://www.energy.gov/eere/solar/articles/2020-utility-scale-solar-goal-achieved>.
3. R. Fu et al., “U.S. Solar Photovoltaic System Cost Benchmark: Q1 2016,” (NREL Technical Report, September 2016).
4. National Renewable Energy Laboratory, “Concentrating Solar Power Projects in the United States,” [https://www.nrel.gov/csp/solarpaces/by\\_country\\_detail.cfm/country=US](https://www.nrel.gov/csp/solarpaces/by_country_detail.cfm/country=US).

### ABOUT THE AUTHORS

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