Federal Energy R&D: Bioenergy Technologies

BY DAVID M. HART AND COLIN CUNLIFF | APRIL 2018

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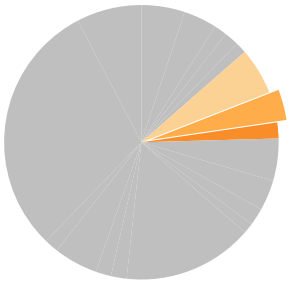
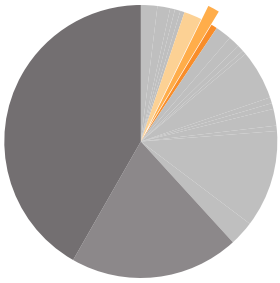
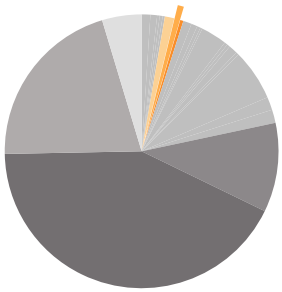


Bioenergy (orange)
Other Transportation (orange)
Energy R&D (light gray)



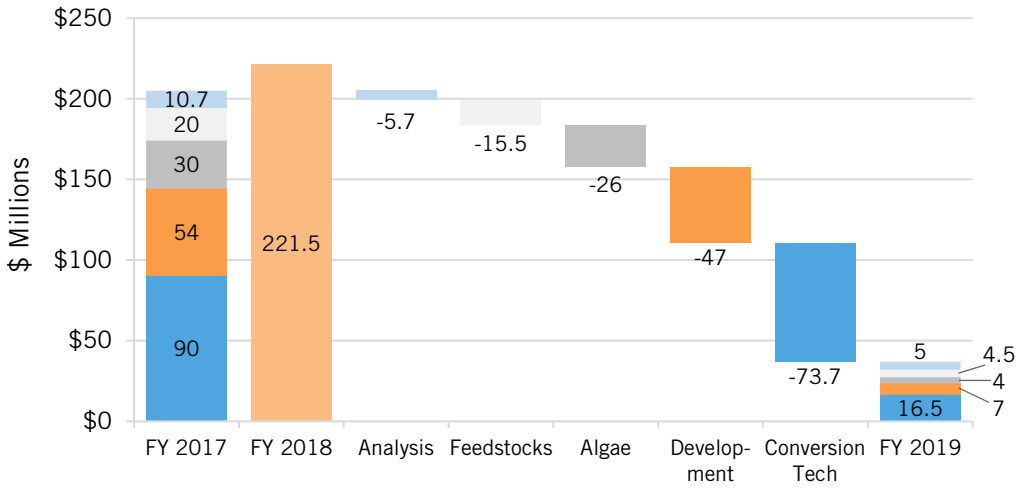
Bioenergy & Energy R&D
Basic Science R&D
Defense R&D



Bioenergy & Energy
Basic Science
Defense
Environ Mngmt
Other DOE

The Department of Energy's (DOE) Bioenergy Technologies Program (BETO) focuses on R&D to develop sustainable bioenergy technologies capable of producing price-competitive biofuels from nonfood sources of biomass such as wastes and agricultural residues, and energy crops like switchgrass and algae. The program's primary focus is on R&D to produce "drop-in" biofuels that are compatible with existing fueling infrastructure and vehicles across a range of transportation modes, including renewable-gasoline, -diesel, and -jet fuels.[1]

Figure 1: The FY 2019 Budget Request Would Cut Bioenergy technologies R&D by 83 Percent



What's At Risk

By 2030, the United States will have the resource potential to sustainably produce 1 billion dry tons of nonfood biomass resources without disrupting agricultural markets for food and animal feed.[2] These resources could produce approximately 50 billion gallons of biofuels (25 percent of U.S. transportation fuels), 50 billion pounds of high-value chemicals and products, and 75 billion kWh of electricity (enough to power 7 million homes).[3] Algal biomass is an important kind of biomass due to its ability to grow quickly, use waste resources, and produce fuel precursors. Algal biofuels could potentially contribute up to 5 billion gallons per year—about 25 percent of the current jet-fuel market—by 2030.[4] Bioenergy with carbon capture, utilization, and storage (CCUS) offers the increasingly essential possibility of net-negative carbon emissions.

Each of the bioenergy production and conversion targets within BETO was chosen to create new technology options that are more efficient than, and at least as affordable as, conventional technology. Achieving these targets will both improve transportation-energy affordability and take the United States one step closer to reaching its national goals in energy security, economic growth, and environmental stewardship. However, reductions in DOE R&D funding threaten to delay or even derail this progress.

Bioenergy Technologies R&D Subprograms

R&D in the Bioenergy program is distributed across these five subprograms:

- **Feedstock Supply and Logistics** develops and improves strategies, technologies, and systems to provide consistent quality feedstock to biorefineries, while focusing on supply and logistics challenges to support further development of advanced biofuels.
- **Advanced Algal Systems** supports R&D of algal-biomass production and logistics systems, with a focus on improving capabilities to predict, breed, and select the best-performing algal strains, harvest algae at high-throughputs, and extract and convert algal biomass components into fuels.
- **Conversion Technologies** R&D focuses on converting biomass feedstocks into transportation fuels and related bioproducts and explores both biological and thermochemical routes to convert biomass into "drop-in" hydrocarbon fuels.
- **Advanced Development and Optimization (ADO)** collaborates with the Vehicle Technologies program on the Co-Optimization of Fuels & Engines (Co-Optima) initiative to develop fuels and engines that are co-optimized to enable higher efficiency and performance.
- **Strategic Analysis and Cross-cutting Sustainability** provides quantitative analysis to inform BETO decisions regarding the future direction and scope of its R&D portfolio.

Key Elements of the FY 2019 Budget Proposal

- **An 87-percent reduction in the Advanced Development and Optimization R&D**, including elimination of biopower R&D, as well as discontinuation of all biorefinery pilot- and demonstration- scale projects.
- **An 87-percent reduction in Advanced Algal Systems**, including discontinuation of R&D on algae harvesting, conversion, and integration studies, such as those previously conducted at the Algae Testbeds.
- **An 82-percent reduction in Conversion Technologies R&D,** including the elimination of public-private cost-shared R&D partnerships between the Agile BioFoundry, industry, and academic partners. R&D on gaseous or wet-feedstock conversion (of biosolids) and advanced anaerobic digestion would also be eliminated.

- **A 78-percent reduction in Feedstock Supply and Logistics R&D,** including for the Fuel Conversion Interface Consortium (FCIC), an organization comprising eight national laboratories whose directive is to solve obstacles encountered by integrated biorefinery projects. R&D on cross-cutting feedstock logistics related to high-moisture feedstocks would be eliminated, and the annual State of Technology on feedstock handling and preprocessing systems would be discontinued.

ENDNOTES

1. Department of Energy, "FY 2018 Congressional Budget Justification," volume 3, DOE/CF-0130 (Washington, D.C.: DOE Chief Financial Officer, May 2017) 49, https://www.energy.gov/sites/prod/files/2017/05/f34/FY2018BudgetVolume3_0.pdf
2. DOE, "U.S. Billion Ton Report," (Washington, D.C.: DOE, 2016), https://energy.gov/sites/prod/files/2016/12/f34/2016_billion_ton_report_12.2.16_0.pdf.
3. Department of Energy, "FY 2019 Congressional Budget Justification," volume 3 part 2, DOE/CF-0141 (Washington, D.C.: DOE Chief Financial Officer, March 2018) 61, https://www.energy.gov/sites/prod/files/2018/03/f49/FY-2019-Volume-3-Part-2.pdf.
4. Ryan Davis, et al., "Renewable Diesel from Algal Lipids: An Integrated Baseline for Cost, Emissions, and Resource Potential from a Harmonized Model," Argonne National Laboratory, ANL/ESDA/12-4 (2012), http://greet.es.anl.gov/publication-algae-harmonization-2012.

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