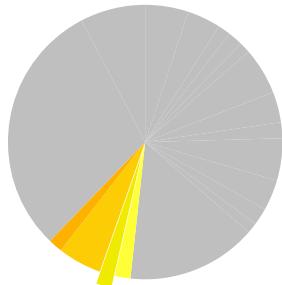


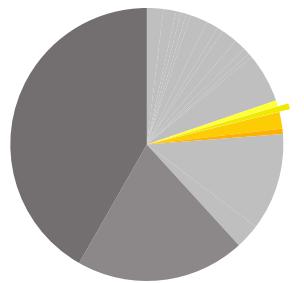
# Federal Energy R&D: Carbon Storage and Utilization

BY DAVID M. HART AND COLIN CUNLIFF | APRIL 2018

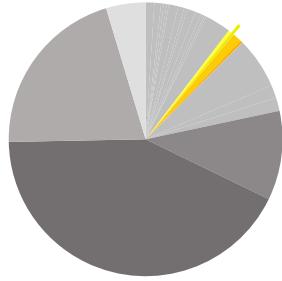
*This briefing is part of a series on the U.S. energy budget. See: [itif.org/energy-budget](http://itif.org/energy-budget).*



Carbon Storage (yellow)  
Other Fossil (yellow)  
Energy R&D (light gray)



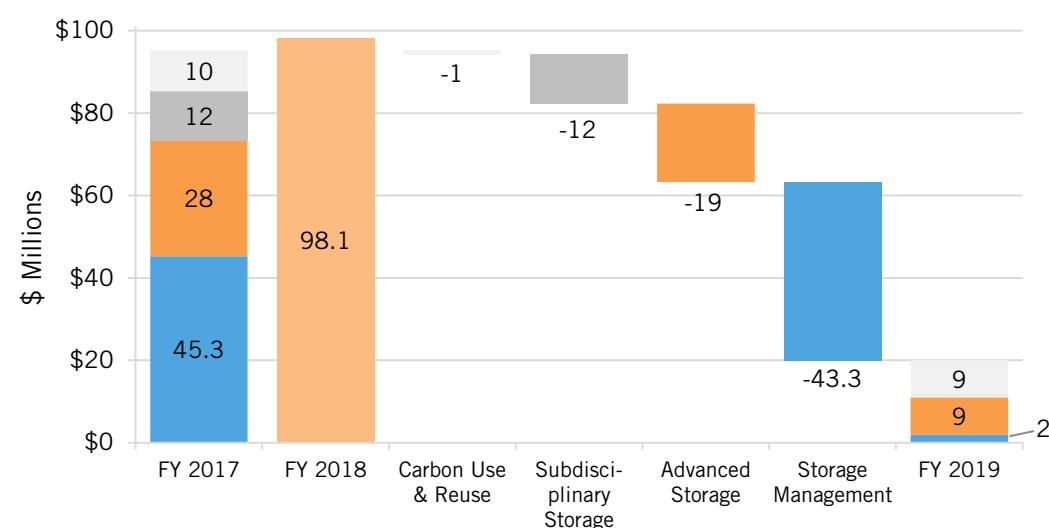
Carbon Storage & Energy R&D  
Basic Science R&D  
Defense R&D



Carbon Storage & Energy  
Basic Science  
Defense  
Environ Mngmt  
Other DOE

The Carbon Storage and Utilization subprogram is focused on development of technologies for the safe and permanent utilization and storage of captured carbon dioxide (CO<sub>2</sub>). It conducts research and development on 5 primary geologic storage media—saline formations, oil and natural gas reservoirs, unmineable coal seams, basalts, and organic shales—and in reservoirs across 11 geologic depositional classes.

**Figure 1: The FY 2019 Budget Request Would Cut Carbon Storage and Utilization R&D by 80 Percent**



## What's At Risk

Preliminary research suggests the United States has enough subsurface capacity to permanently sequester 1.71 trillion metric tons of CO<sub>2</sub>, which is the equivalent of 950 years of carbon emissions from power plants at 2016 levels.<sup>1</sup> However, additional cost reductions, validation, safety testing, and mitigation research are necessary to realize this capacity. While the size of many subsurface storage reservoirs has been initially characterized, detailed site-specific work is required to confirm their potential. R&D is also needed to develop tools to map and simulate below-ground fractures and faults with a high degree of resolution and fidelity, devise wellbore materials that can better resist corrosion by CO<sub>2</sub>-saturated brine, and improve the ability to monitor and mitigate the risk of induced seismicity from the injection of CO<sub>2</sub> underground.

The launch of the Illinois Industrial Carbon Capture and Storage project in April 2017 provides one of the largest-ever demonstrations of geologic sequestration. The project, which is funded jointly by DOE and private-sector partners, captures CO<sub>2</sub> from an ethanol-production facility—at a rate of up to one million metric tons of CO<sub>2</sub> per year—and stores it underground in a saline reservoir. This large, first-of-a-kind demonstration project is testing and validating technologies, while concurrently endeavoring to reduce future costs. The proposed budget would cut funding substantially for this promising effort.

### **Carbon Storage and Utilization R&D Activities**

Funding for carbon storage and utilization R&D is spread across four activities:

- **Storage Infrastructure R&D** focuses on geologic resource characterization and small- and large-scale field projects to demonstrate permanent geologic storage; validation of injection, simulation/risk assessment, and monitoring strategies; and assessment of the probability, and subsequent mitigation, of potential seismic events.
- **Advanced Storage R&D** is focused on developing and validating storage monitoring, simulation, risk-assessment, and advanced wellbore technologies to detect and mitigate wellbore issues. R&D activities include developing CO<sub>2</sub>-resistant construction materials and well-integrity technologies, plus technologies to detect and mitigate potential CO<sub>2</sub> leakage pathways.
- **Carbon Use & Reuse R&D** explores the beneficial reuse of CO<sub>2</sub>, including conversion into higher-value products such as chemicals, plastics, and building materials, and accelerated curing for cement. The primary objective is to lower the near-term cost of CCUS through the creation of value-added products via the conversion of CO<sub>2</sub>.
- **Sub-Disciplinary Storage R&D** focuses on assessment and validation of subsurface models; participation in the National Risk Assessment Partnership (NRAP), with a focus on storage risk tools; and development of assessment and monitoring capabilities.

### **Key Elements of the FY 2019 Budget Proposal**

- **A 96-percent reduction in Storage Infrastructure R&D**, and discontinuation of all field projects, including the Brine Extraction Storage Tests (BEST), which advances strategies for managing subsurface pressure and fluid flow; all seven Regional Carbon Sequestration Partnerships, which are currently testing large-scale CO<sub>2</sub> injection and storage technologies; and the Carbon Storage Assurance and Facility Enterprise (CarbonSAFE), which funds industry cost-shared R&D projects to characterize and develop commercial-scale (50+ million metric tons of CO<sub>2</sub>) storage complexes by 2025.

- A 78-percent reduction in Advanced Storage R&D (which would be merged with Sub-Disciplinary Storage R&D). Current activities in this area focus on development of monitoring, verification, accounting, and assessment (MVAA) tools for CO<sub>2</sub> storage; simulation and risk-assessment technologies; and advanced wellbore technologies to detect and mitigate wellbore issues from both short- and long-term exposure to CO<sub>2</sub>. It is unclear which activities would be scaled down or discontinued under the proposed budget.
- A 10-percent reduction in Carbon Use & Reuse R&D, with remaining funding focused on catalytic conversion of carbon wastes to chemicals and polymers, mineralization to building products, and biological conversion of CO<sub>2</sub> to nutraceuticals, bio plastics, and animal feed.

## ENDNOTES

1. DOE, “Siting and Regulating Carbon Capture, Utilization, and Storage Infrastructure” (Washington, D.C.: DOE Office of Energy Policy and Systems Analysis and Office of Fossil Energy, January 2017) 14, <https://www.energy.gov/sites/prod/files/2017/01/f34/Workshop%20Report--Siting%20and%20Regulating%20Carbon%20Capture%2C%20Utilization%20and%20Storage%20Infrastructure.pdf>; EPA Draft, “Inventory of U.S. Greenhouse Gas Emissions and Sinks,” Table ES-2, (Washington, D.C.: Environmental Protection Agency, February 2018), <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>.

## ABOUT THE AUTHORS

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