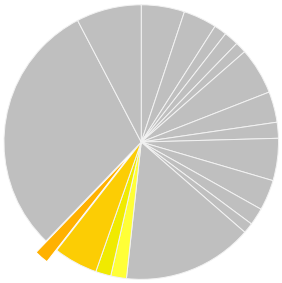
# Federal Energy R&D: Oil & Gas

BY COLIN CUNLIFF AND BATT ODGEREL | MARCH 2020

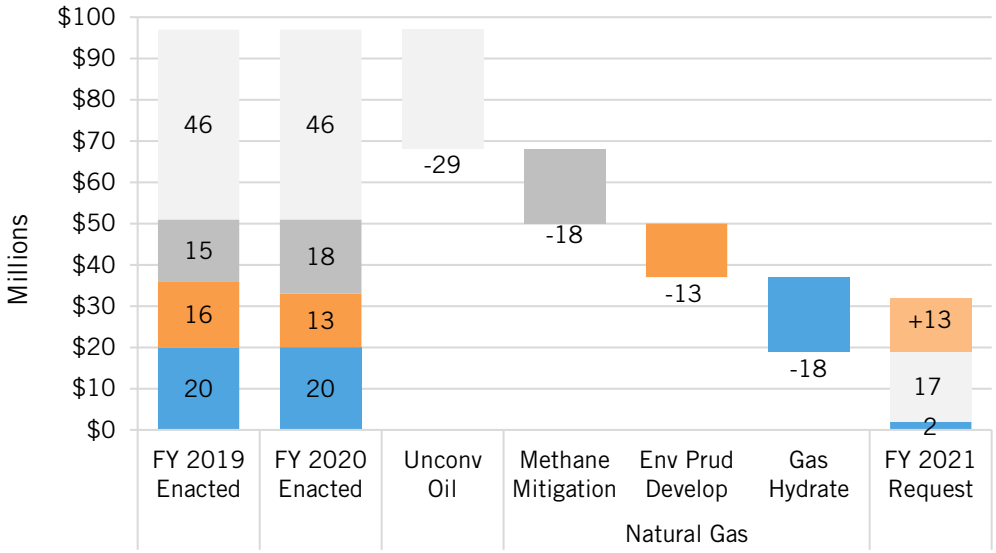
*This briefing is part of a series on the U.S. energy budget. See: itif.org/energy-budget.*



Oil & Gas (orange)
Other Fossil (yellow)
Energy R&D (gray)

The Department of Energy's (DOE) oil and natural gas program supports research and development (R&D) to ensure domestic production, transmission, storage, and distribution of oil and natural gas remain safe, secure, and environmentally prudent. A key focus of this program has been to improve the safety and mitigate the environmental impacts of oil and natural-gas energy systems. The program has explored the connection between hydraulic fracturing and induced seismicity, while also seeking to reduce fugitive methane emissions. In addition, it has funded R&D to reduce the amount of water used in oil and gas production, and to develop technologies to treat brackish water that is coproduced with oil and gas. The program also focuses on the development of new oil and gas resources, including methane hydrates and unconventional oil.[1]

**Figure 1: The FY 2021 budget request would reduce oil and gas R&D by 67 percent[2]**




## What's at Risk

Domestic production from unconventional reservoirs has enabled the United States to become the world's largest producer of oil and gas over the last few years, keeping energy prices low, and decreasing reliance on imported crude oil. DOE's R&D activities focus on improving the efficiency of natural gas infrastructures—including pipelines and storage facilities—to reduce fugitive methane emissions and better conserve domestic energy resources, as well as address high-priority challenges to the safe and prudent development of unconventional oil and gas resources. Methane, the main component of natural gas, is a

powerful greenhouse gas that, on a pound-for-pound basis, is about 30 times more effective at trapping heat than carbon dioxide ($CO_2$), although its atmospheric residence time is much shorter.[3] Reducing methane emissions would have the dual effect of improving the environmental performance of natural gas systems and enhancing stewardship of domestic gas resources. Additional R&D activities include treating and managing coproduced water, characterizing and minimizing induced seismic risk, and reducing surface footprints on well-pad sites and surrounding areas.[4] Reduced funding could inhibit progress toward key public health, safety, and environmental goals.

Other programs seek to expand access to domestic oil and gas resources. Current technology allows for recovery of only 7 to 10 percent of the oil found in such unconventional reservoirs, but R&D on subsurface flow mechanics seeks to improve recoverability factors. R&D to characterize and evaluate domestic sources of methane hydrate deposits could also lead to large new sources of domestic natural gas in such places as Alaska and the Gulf of Mexico.[5]

## Oil & Gas R&D Activities

R&D in oil and natural gas is spread among four activities:[6]

- **Unconventional Fossil Energy from Petroleum R&D** supports the development of domestic production from unconventional reservoirs, which requires complicated engineering measures, such as hydraulic fracturing and directional drilling, to improve access and enable commercial production.
- **Methane Emissions Quantification and Mitigation** focus on technologies that quantify and reduce methane leaks and vented emissions from natural gas systems. Methane is the second-largest driver of climate change (behind only $CO_2$), accounting for more than 10 percent of annual U.S. greenhouse gas emissions.[7] Oil and gas systems together account for the largest share of domestic methane emissions, with the lost methane valued at an estimated $2 billion.[8] These R&D activities serve multiple purposes: They conserve domestic energy resources; reduce waste and inefficiencies in oil and gas systems, which keeps costs low for consumers; provide value to oil and gas producers by ensuring more gas makes its way to the consumer; and reduce the greenhouse gas emissions that cause climate change.
- **Environmentally Prudent Development** conducts research on induced seismicity and wellbore integrity, as well as into water quality, water availability, air quality, and environmental impacts of oil and gas resource development.
- **Gas Hydrates R&D** aims to advance technologies that will enable natural gas production from domestic and arctic offshore methane hydrate deposits. Gas hydrates are methane molecules trapped in ice that turn into natural gas and water when heated or depressurized.

## Key Elements of the FY 2021 Budget Proposal[9]

- **Elimination of the Methane Emissions Quantification and Mitigation programs,** which would stall domestic efforts to reduce methane leaks and fugitive emissions from oil and natural gas systems.

- **Elimination of the Environmentally Prudent Development program,** which would hinder efforts to mitigate the environmental impacts of natural gas production.

- **Creation of a new $13 million Natural Gas Infrastructure Research program** (light orange in the FY 2021 Request bar in figure 1), with research to focus on advanced materials and sensors for midstream gas infrastructure and conversion technologies for stranded and vented gas. The proposed funding level and research activities do not provide an adequate substitute for the methane emissions quantification and mitigation programs or the environmentally prudent development program.

- **A 90 percent reduction in Gas Hydrates research.**

- **A 63 percent reduction in Unconventional Oil R&D,** due to a focus on current field laboratory projects, with no additional field test sites, produced water treatment technology development, or offshore research budgeted in FY 2021.

## ENDNOTES


1. DOE, "FY 2016 Congressional Budget Justification," Volume 3, 603–610 (DOE Chief Financial Officer, DOE/CF-0109, February 2015), https://www.energy.gov/sites/prod/files/2015/02/f19/FY2016BudgetVolume3_7.pdf; Proposed changes to DOE Oil and Gas programs in the FY 2017 through FY 2020 budget cycles have been rejected by congressional appropriators, so an earlier description of the program is used here.
2. The Emissions Mitigation from Midstream Infrastructure ($10 million in FY 2019) and Emissions Quantification from Natural Gas Infrastructure ($5 million in FY 2019) programs are grouped in the figure under the category "Methane Mitigation." The proposed budget would terminate the methane quantification and mitigation programs and the Environmentally Prudent Development program and create a new Natural Gas Infrastructure Research program ($13 million in FY 2021), shown in green on the FY 2021 Request column. DOE, "FY 2021 Congressional Budget Justification," Volume 3 Part 2, 198–199 and 245–257 (DOE Chief Financial Officers, DOE/CF-0164, February 2020), https://www.energy.gov/sites/prod/files/2020/02/f72/doe-fy2021-budget-volume-3-part-2_2.pdf.
3. EPA, "Understanding Global Warming Potentials," accessed April 15, 2018, https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.
4. DOE, "Shale Research & Development," accessed March 29, 20190, https://www.energy.gov/fe/science-innovation/oil-gas-research/shale-gas-rd.
5. DOE, "FY 2018 Congressional Budget Justification," Volume 3, 397 (DOE Chief Financial Officer, DOE/CF-0130, May 2017), https://www.energy.gov/sites/prod/files/2017/05/f34/FY2018BudgetVolume3_0.pdf.

6. DOE, "FY 2016 Congressional Budget Justification," 607–610.
7. EPA, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2017," Table ES-2 (EPA, 2019), accessed April 2, 2019, https://www.epa.gov/sites/production/files/2019-02/documents/us-ghg-inventory-2019-main-text.pdf.
8. Environmental Defense Fund (EDF), "Major Studies Reveal 60 Percent More Methane Emissions," accessed April 2, 2019, https://www.edf.org/climate/methane-studies.
9. DOE, "FY 2021 Congressional Budget Justification," Volume 3 Part 2, 245–257.

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