Federal Energy R&D: Vehicle Technologies

BY DAVID M. HART AND COLIN CUNLIFF | APRIL 2018

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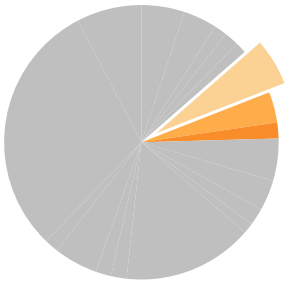
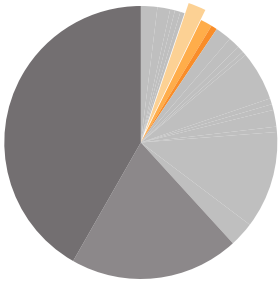
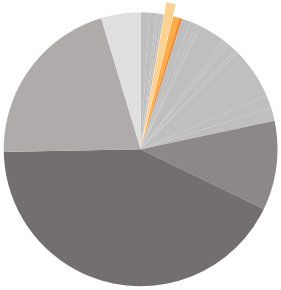


Vehicles (light orange)
Other Transportation (orange)
Energy R&D (light gray)



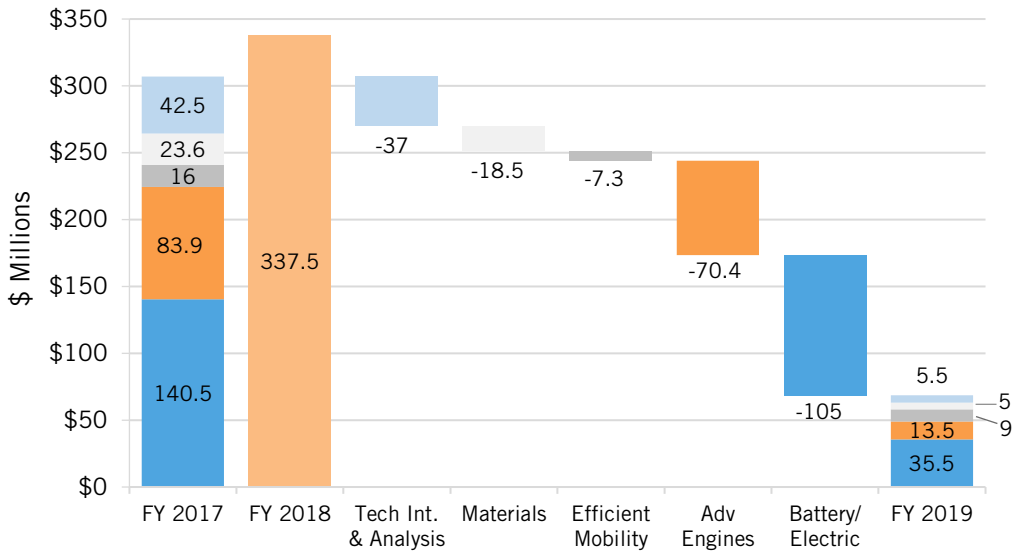
Vehicles & Energy R&D
Basic Science R&D
Defense R&D



Vehicles & Energy
Basic Science
Defense
Environ Mngmt
Other DOE

The transportation sector accounts for 70 percent of petroleum use and 34 percent of all carbon pollution.[1] The average U.S. household spends nearly one-fifth of its total expenditures on transportation, making it the most expensive spending category after housing.[2] With 25 percent of U.S. petroleum consumption coming from imports, U.S. consumers send more than $10 billion per month overseas for crude oil.[3] By investing in R&D to use conventional fuels more efficiently and develop domestically produced alternative-vehicle technologies, the Vehicle Technologies Office (VTO) works to keep prices low for consumers, improve national energy security, and enhance environmental performance.[4]

Figure 1: The FY 2019 Budget Request Would Cut Vehicle Technologies R&D by 80 Percent



What's At Risk

The Vehicle Technologies office has established technology cost and performance targets to help meet national imperatives in energy security, environmental stewardship, and economic growth. Reaching these goals will require new technologies and cost reductions in batteries, efficient engines, lightweight materials, and other enabling technologies. For electric vehicles (EVs), the office has established ambitious targets of reducing the cost of EV batteries by more than half, to $100/kWh, increasing the range to 300 miles, and decreasing charge time to 15 minutes or less by 2028. For conventional light-duty vehicles, the office is working to develop the next generation of engines and fuels capable of

improving passenger-vehicle fuel economy by 35 percent by 2030. The SuperTruck II research activity has set an ambitious target of doubling the freight-hauling efficiency of heavy-duty Class 8 long-haul trucks by 2020. In order to meet consumer expectations regarding cost and performance, each of these goals was chosen to make new technology options more efficient and at least as affordable as conventional technology. However, reductions in R&D funding threaten to delay or even derail current DOE progress toward these targets.

Vehicle Technologies R&D Subprograms

R&D in the Vehicle Technologies program is distributed across six subprograms:

- **Battery and Electrification Technologies** explores new battery chemistry and cell technology to reduce the cost of EV batteries.
- **Energy Efficient Mobility Systems (EEMS)** applies complex modeling and simulation to explore the energy impact of emerging disruptive technologies such as connected and autonomous vehicles, information-based mobility-as-a-service platforms, and advanced powertrain technologies in order to identify opportunities to improve efficiency.
- **Advanced Engine & Fuel Technologies R&D** works to develop advanced combustion engines and co-optimize fuels to improve fuel economy.
- **Materials Technology** supports vehicle lightweighting and improved propulsion (powertrain) efficiency through materials R&D.
- **Technology Integration** maintains the Alternative Fuels Data Center (AFDC) and Fuel Economy Guide, and manages the State & Alternative Fuel Provider Fleet Program.
- **Analysis** provides technology, economic, and interdisciplinary analyses to inform and prioritize the Vehicle Technologies research portfolio.

Key Elements of the FY 2019 Budget Proposal

- **A 75-percent reduction of the Battery and Electrification Technologies subprogram,** including the elimination of battery-safety and thermal-performance research, as well as computer-aided design research to couple crash response with electrochemical response.
- **Elimination of cross-cutting SuperTruck II activities,** which aim to improve freight-hauling efficiency of heavy-duty Class 8 long-haul trucks by 100 percent by 2020. SuperTruck II is a cross-cutting activity funded by multiple R&D subprograms, and whose elimination would result in funding reductions across subprograms.

- **An 84-percent reduction of Advanced Engine & Fuel Technologies R&D,** including the elimination of research on multi-fueled and spark-ignited engines, diesel-engine emissions reduction, and modeling of fluid dynamics in multicylinder engines.

- **A 45-percent reduction in Energy Efficient Mobility Systems,** including the elimination of research on multimodal transportation systems and advanced fueling infrastructure within the SMART Mobility National Laboratory Consortium, as well as work to enhance and update transportation energy models.

- **A 79-percent reduction in Materials Technology R&D**, including the elimination of research on materials for emissions control and reductions, and cuts to research on lightweight and high-temperature materials that could enable greater energy efficiency and engine performance.

ENDNOTES

1. EPA, DRAFT "Inventory of U.S. Greenhouse Gas Emissions and Sinks," Table ES-2.
2. Bureau of Labor Statistics, "Consumer Expenditure Survey, 2015. Average Annual Expenditures and Characteristics of All Consumer Units, 2013-2015," https://www.bls.gov/cex/2015/standard/multiyr.pdf.
3. Transportation Energy Data Book 34th Edition, Table 1.7 "Imported Crude Oil by Country of Origin 1973-2015"; Table 10.3, "Prices for a Barrel of Crude Oil and a Gallon of Gasoline, 1978-2015" (Oak Ridge National Laboratory, 2015).
4. DOE, "FY 2019 Congressional Budget Justification" (Washington, D.C.: DOE/CFO 2018) 31.

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