U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

VEHICLE TECHNOLOGIES OFFICE
FY 2016 BUDGET AT-A-GLANCE

Transportation accounts for two-thirds of U.S. petroleum use, and on-road vehicles are responsible for 80% of this amount. Our dependence on petroleum creates significant national security and environmental challenges, limits our potential for economic growth, and hits our individual wallets—making it a high-value opportunity for change. The Vehicle Technologies Office (VTO) develops and deploys advanced highway transportation technologies that reduce petroleum consumption and greenhouse gas emissions, while meeting or exceeding vehicle performance expectations.

What We Do

VTO uses an integrated portfolio approach and relies on strategic partnerships to accelerate the movement of technologies from the laboratory onto the road.

- ✓ **Research and Development (R&D)** seeks to reduce the cost and improve the performance of a mix of near-term and long-term technologies, including advanced batteries, electric drive technologies, lightweight and propulsion materials, advanced combustion engines, advanced fuels and lubricants, and other enabling technologies.
- ✓ **Modeling, Evaluation, and Demonstration** provides objective, publicly available data to identify pathways for technology improvements and lessons learned for cost-effective future deployment.
- ✓ **Outreach and Deployment** provides technical assistance, tools, and resources to help consumers and fleets understand their options for saving money on fuel.
- ✓ **Partnerships** leverage technical expertise, accelerate progress, and catalyze action to enable the widespread use of advanced technology vehicles—at no additional cost to the government.

Program Goals/Metrics

- Cut battery costs to $125/kWh by 2022 from $300/kWh in 2014.
- Eliminate almost 30% of vehicle weight through lightweighting by 2022 compared to a 2002 baseline.
- Reduce the cost of electric drive systems to $8/kW by 2022 from $16/kW in 2013.
- Improve engine efficiency to demonstrate 35% fuel economy improvement for passenger vehicles by 2020.

FY 2016 Priorities

- **EV Everywhere Grand Challenge:** An Energy Department Grand Challenge to enable the United States to be the first to produce a wide array of plug-in electric vehicle (PEV) models that are as affordable and convenient as gasoline vehicles by 2022. R&D targets focus efforts on reducing PEV battery and electric drive system costs by up to 50%. The Challenge cuts across VTO subprograms (Batteries and Electric Drive, Vehicle Systems, Materials Technologies).
- **SuperTruck II:** Through competitively awarded, cost-shared projects with industry, develop and demonstrate technologies to increase the freight efficiency of Class 8 long-haul trucks by 100% in 2020 (compared to a 2009 baseline vehicle). Projects will include efforts to demonstrate applicability of SuperTruck technologies to regional-haul vehicles as well. The SuperTruck Initiative cuts across VTO subprograms (Advanced Combustion Engines, Vehicle Systems, and Materials Technologies).

(Dollars in Thousands)	FY 2014 Enacted	FY 2015 Enacted	FY 2016 Request
Batteries and Electric Drive Technologies	108,935	103,701	144,400
Vehicle Systems	43,474	40,393	68,100
Advanced Combustion Engine R&D	49,970	49,000	64,500
Materials Technology	38,137	35,602	70,500
Fuel and Lubricant Technologies	15,990	20,000	37,000
Outreach, Deployment, and Analysis	31,231	28,304	56,500
NREL Site-Wide Facility Support	2,000	3,000	3,000
Total, Vehicle Technologies	**289,737**	**280,000**	**444,000**

- **Manufacturing/Materials Genome (Magnesium Sheet):** Use high-performance computing and high-throughput experimentation to accelerate the development of high-strength, high-formability, corrosion-resistant, and low-cost magnesium sheet alloys for vehicle lightweighting from discovery through qualification, capturing the effects of processing and end-use performance. Supports the Materials Genome Initiative and will be coordinated with related manufacturing activities across the Energy Department.
- **New Fuels and Vehicle Systems Optima:** Establish a link across fuels and engines early in the R&D cycle to enable a new, synergistic, and complete systems-based approach to creating optimized powertrains. Work will involve studying the "optima" for fuel properties/formulation and engine efficiency, as well as techno-economic analysis. Involves collaboration with Bioenergy Technologies and cuts across VTO subprograms (Advanced Combustion Engines and Fuel and Lubricant Technologies).
- **Alternative Fuel Community Partner Projects:** Competitively awarded, cost-shared projects that highly leverage private-sector investments to accelerate the widespread introduction and adoption of commercially available advanced vehicle technologies to reduce petroleum consumption.

Key Accomplishments

- **Battery Costs Continue to Fall.** In 2014, VTO R&D reduced the modeled, high-volume production cost of electric drive vehicle batteries to less than $300/kwh, a 40% reduction from the EV Everywhere baseline cost established in 2012.
- **Reduced Cost of Electric Drive Systems.** VTO R&D has reduced the cost of an electric drive system from $30/kW to $16/kW in 2013. Through a VTO project, General Motors is the first U.S.-based original equipment manufacturer that is manufacturing electric motors in the United States, and the Chevy Spark EV is already using those electric motors.
- **Technical Boundaries of Vehicle Lightweighting Pushed.** VTO, Ford, and Magna partnered to demonstrate weight reduction of a 2013 Ford Fusion by nearly 25%—improving fuel economy while maintaining safety and performance. The team integrated multiple lightweight materials into a variety of vehicle components, including carbon fiber in the seats, lightweight glazings in the rear window, aluminum in the 3-cylinder engine, and advanced high-strength steel in the body.
- **Improved Fuel Economy.** With VTO support, Nissan and Cummins demonstrated that a four-cylinder clean diesel engine could improve full-sized pickup truck fuel economy by 40% compared to a 2009 baseline truck powered by a gasoline V8 engine. The engine achieves an additional 7–10 miles per gallon (average) and complies with new emissions standards.
- **SuperTruck Success.** Daimler Trucks North America, one of four manufacturers in VTO's SuperTruck I program, hit its targets a year ahead of schedule. SuperTruck I seeks to increase the efficiency of Class 8 long-haul trucks by 50% (compared to a 2009 baseline). Daimler achieved a more than 50% improvement in overall freight efficiency through measures that include hybridization, engine downsizing, electrification of auxiliary systems, waste heat recovery, improved aerodynamics, and weight reduction.
- **Clean Cities.** In 2013, through Clean Cities' advanced technology and alternative fuel deployment activities, VTO reduced petroleum use by 1 billion gallons, prevented 7.5 million tons of greenhouse gases, and deployed 475,000 alternative fuel vehicles on the road. This puts Clean Cities ahead of schedule for meeting its petroleum reduction goal of 2.5 billion gallons per year by 2020.

SuperTruck at the Forrestal Building in Washington, DC. The FY 2016 Budget builds upon the SuperTruck success by supporting SuperTruck II.