

The Hydrogen and Fuel Cell Technologies Office (FCTO) focuses on early-stage research and development (R&D) to advance hydrogen and fuel cells for transportation and diverse applications that contribute to a strong domestic economy and U.S. energy independence, security, and resilience.

Economic Highlights

FCTO strengthens U.S. energy independence and security through cutting-edge technology R&D.

- Hydrogen can be produced from diverse domestic resources, such as natural gas, oil, coal, and biomass, as well as from water-splitting using any form of electricity including nuclear and renewables.
- Fuel cell electric vehicles (FCEVs) using hydrogen can achieve significantly higher efficiencies than combustion engines, and domestically produced hydrogen enables energy independence.
- Stationary hydrogen and fuel cell technologies can also improve energy security and reliability, by providing responsive back-up power and other electric and fuel distribution services.
- The Hydrogen-at-Scale (H2@Scale) concept lays a framework for the potential wide-scale production and utilization of hydrogen to address key issues such as grid resiliency and energy security by producing hydrogen when power generation exceeds load for multiple applications across sectors.

FCTO R&D stimulates the U.S. economy, job growth, and global competitiveness.

- Today’s fuel cell vehicle sector contributes over 16,000 U.S. jobs. Market success in hydrogen and fuel cells can increase current employment several-fold and impact over 40 industries across the hydrogen and fuel cell value chain.
- FCTO R&D investments have enabled 650 hydrogen and fuel cell-related patents and ultimately led to industry commercializing over 30 technologies.

FY 2018 Priorities

FY 2018 Program Strategy

FCTO will focus on early-stage R&D on:

- Hydrogen fuel and fuel cells to reduce costs and improve performance.
- Leveraging laboratory resources through lab calls and cooperative R&D agreements (CRADAs) with universities and industry partnerships.

Activity Highlights

- Hydrogen Fuel R&D – Hydrogen production, delivery, and storage R&D to achieve \$4/gasoline gallon

equivalent (gge), including advanced materials for water-splitting, storage, and delivery.

- Fuel Cell R&D – Platinum-free catalysts, innovative membranes, and electrodes for breakthroughs in fuel cell cost to achieve \$40/kilowatt (kW) and 5,000 hour targets.
- H2@Scale – Focus on materials R&D for components to enable H2@Scale (polymers, infrastructure components, etc.) and advanced liquefaction.
- Systems Analysis – Technical analysis to inform FCTO R&D strategies and prioritization.

FY 2018 Budget Request

Budget Authority (Dollars in Thousands)	FY 2018 Request
Fuel Cell R&D	15,000
Hydrogen Fuel R&D	29,000
Systems Analysis	1,000
Total, Hydrogen and Fuel Cell Technologies	45,000

FCTO R&D stimulates the U.S. economy and global competitiveness by reducing dependence on foreign oil imports and establishing a domestic power and fuel industry using efficient, reliable clean energy technologies.

Major Accomplishments and Goals

FCTO R&D makes cutting-edge technology advances.

- FCTO funding enabled a five-fold reduction in platinum based catalyst and a 50% reduction in automotive fuel cell cost since 2006, to roughly \$60/kW when projected to 100,000 units per year manufacturing volumes.
- Since 2006, fuel cell durability has quadrupled to 120,000 miles.
- FCTO cost-shared efforts enabled the world's first tri-generation station using natural gas or sewage waste to co-produce power, heat, and hydrogen fuel.
- FCTO reduced hydrogen production costs and cut electrolyzer stack costs by 80% in the last decade.

- FCTO continues to achieve world-record breaking energy material performance through its laboratory-led consortia for materials discovery and developed the H2@Scale initiative.

FCTO's key targets include –

- Achieve \$40/kW fuel cell cost with 5,000 hours (150,000 miles) of durability.
- Achieve \$4/gge cost of hydrogen (produced, delivered and dispensed).
- Lower hydrogen delivery costs to less than \$2/gge.
- Develop hydrogen storage systems to achieve a fuel cell driving range of over 300 miles, while meeting performance requirements and an ultimate cost of \$8/kW.

Success Stories

FCTO R&D advances hydrogen and fuel cell technologies making progress in overcoming challenges to commercialization

H-Prize Winner: SimpleFuel™

Location: Massachusetts and Pennsylvania

FCTO awarded Team SimpleFuel™ the \$1 million H2 Refuel H-Prize, a competition designed to challenge American innovators to deploy onsite hydrogen generation systems using electricity or natural gas to fuel hydrogen vehicles. SimpleFuel is comprised of three companies, Ivys Energy Solutions Inc. and McPhy Energy North America located in Massachusetts, and PDC Machines in Pennsylvania.

Team SimpleFuel™ successfully demonstrated a hydrogen refueling appliance for FCEVs able to meet the challenging Prize criteria, and providing an option to help bridge the gap as hydrogen infrastructure is being established. Their home-scale refueling appliance (rated for 5 kg H₂/day) can provide a one-kilogram fill – enough fuel to travel approximately 60 to 70 miles – in 15 minutes or less at required pressure (700 bar) to fully fill onboard hydrogen storage tanks using hydrogen produced via electrolysis, a method of producing hydrogen from water using electricity.



The eye-catching, seven-foot long SimpleFuel™ enclosure houses all the equipment necessary to convert water into hydrogen fuel. It can be used in a variety of settings: homes, municipalities, or small businesses, and is gaining widespread industry attention. Modular fueling projects like this are integral to the deployment of hydrogen infrastructure across the country, supporting more transportation options for American consumers.

