

Fuel Cell Vehicles Enhance NREL Hydrogen Research Capabilities

*Highlights in
Research & Development*

Expanded research, development, and testing activities will help advance fuel cell electric vehicle technology.

The National Renewable Energy Laboratory (NREL) has acquired four Fuel Cell Hybrid Vehicle—Advanced (FCHV-adv) sport utility vehicles on loan from Toyota. Over the next two years the lab will use the FCHVs, also known as fuel cell electric vehicles or FCEVs, to research overall vehicle and fuel cell system performance, renewable hydrogen production capabilities, fueling infrastructure, and hydrogen energy system integration in real-world conditions. Previous demonstration projects have already shown that FCEVs have double the efficiency of internal combustion engine vehicles and that some have up to a 430-mile driving range.



The Toyota FCHV-adv design is representative of the fuel cell vehicles that many automakers are expecting to release commercially in the 2015–2017 timeframe. Photo by Dennis Schroeder, NREL 25255

Researchers are testing and analyzing the FCHVs under everyday driving conditions such as daily business trips and NREL security routes. Using four vehicles of the same make and model allows NREL to make a fair comparison of how driving habits, routes, passenger and cargo load, and environmental conditions—including high-altitude driving—affect vehicle fuel economy, range, and other performance metrics.

The FCHVs give NREL a hands-on opportunity to study the integration of renewable hydrogen production with vehicle fueling and energy storage, and to assess the technology for deployment on a commercial scale. The vehicles are fueled with hydrogen produced by renewable electrolysis at NREL's Distributed Energy Resources Test Facility—wind turbines and solar panels power electrolyzers that produce hydrogen from water, and the hydrogen is dispensed into the vehicles at NREL's existing hydrogen fueling station. One research area is to determine whether hydrogen production can keep up with demand or if supplemental hydrogen is needed from another source. Another important activity is determining how the vehicles and onboard storage systems interact with the hydrogen fueling infrastructure.

Through real-world data collection and analysis on the complete hydrogen energy system—from producing renewable hydrogen to driving and fueling the vehicles—this R&D project supports next-generation technology development for fuel cell systems, FCEVs, and hydrogen production and dispensing technologies. NREL is showcasing the vehicles at public events to raise awareness of the technology and will gather feedback from potential consumers as well as from the drivers of the vehicles.

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Key Research Results

Achievement

NREL received four FCHVs on a two-year loan from Toyota. These vehicles are allowing NREL to enhance its research, development, and testing capabilities related to renewable hydrogen production, fueling infrastructure, and vehicle performance and durability.

Key Result

NREL is investigating the entire hydrogen energy system under real-world conditions to determine how FCHVs can integrate with renewable hydrogen production and how drivers interact with the vehicles and fueling infrastructure.

Potential Impact

Automobile manufacturers, fuel cell developers, hydrogen producers, and station operators can use the information gained from real-world operation to drive technical advancements, improve infrastructure reliability, and advance FCEV commercialization and deployment.

NREL is a national laboratory of the U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC.

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303-275-3000 • www.nrel.gov

NREL/FS-5400-58149 • October 2013

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