Source: NREL, Dennis Schroeder

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Powered by Hydrogen

Source: NREL, Dennis Schroeder

Hydrogen-Powered Buses

fuel efficient, near-zero greenhouse gas emissions, and no air pollution

Hydrogen-Powered Buses Showcase Advanced Vehicle Technologies

Visitors to federal facilities across the country may now have the opportunity to tour the sites in a hydrogen-powered shuttle bus.

The U.S. Department of Energy (DOE) is supporting the demonstration of hydrogen-powered vehicles and hydrogen infrastructure at federal facilities across the country. Nine facilities will receive fourteen hydrogen-powered buses to demonstrate this market-ready advanced technology. Produced by Ford Motor Company, the 12-passenger buses are being used for special events, campus tours, new employee orientation and often as part of their shuttle bus fleet.

How do Hydrogen-Powered Vehicles work?

Hydrogen-powered vehicles use the same basic technology as gasoline-powered engines but run on hydrogen fuel instead. The buses in this project have a 6.8-liter supercharged Triton V-10 engine. Only modest design adjustments are needed to switch a basic gasoline-powered engine design to a hydrogen-powered engine, such as using alternate materials for valve seats and other parts that may become brittle when exposed to hydrogen.

Hydrogen-powered vehicles offer many operating advantages. They are highly fuel efficient—up to 25% more efficient than gasoline-fueled ICEs and can run for about 175 miles per fill up.

Source: NREL, Dennis Schroeder

Source: NREL, Keith Wipke

Filling up at the Hydrogen Fueling Station

Each of the federal facilities have their own hydrogen fueling station with the hydrogen being produced using natural gas. This is only one of the multiple ways to produce hydrogen. The hydrogen is periodically replenished by refueling trucks. As another example, the National Renewable Energy Laboratory (NREL) is demonstrating the production of renewable hydrogen produced via water electrolysis as part of a wind-to-hydrogen demonstration project. This project integrates wind turbines and photovoltaic arrays to power electrolyzer stacks that split water into hydrogen and oxygen. The hydrogen is then compressed and stored for later use at their fueling station.

Slashing Carbon Emissions

Hydrogen-powered vehicles have the potential for near-zero emissions at the point source. Because the fuel contains no carbon, the engine doesn't produce carbon dioxide or other carbon compounds.

Fast Facts about Hydrogen

- Hydrogen is the simplest element on Earth
- Hydrogen is rarely found in its pure form; instead, it's found in compounds such as water, methane, and biomass
- Hydrogen is the lightest gas, it rises and disperses rapidly
- Hydrogen is odorless, colorless, and nontoxic
- When hydrogen burns in air, it doesn't produce smoke
- 1 kg of hydrogen has about the same energy content as 1 gallon (3.2 kg) of gasoline

Advantages of Hydrogen-Powered Vehicles

- Hydrogen can be made using a wide variety of domestic resources, including renewable resources such as solar, wind, and geothermal energy
- When fueled by renewable hydrogen, hydrogen-powered vehicles have near-zero lifecycle greenhouse gas emissions
- Compared to conventional gasoline vehicles, hydrogen-powered vehicles produce minimal tailpipe emissions
- Only modest design modifications to standard gasoline-powered engines are necessary, so the engine technology is familiar to mechanics and fleet personnel
- With very few cost and technical issues limiting commercialization and deployment, hydrogen-powered vehicles can help create the demand needed to support the development of a hydrogen refueling infrastructure