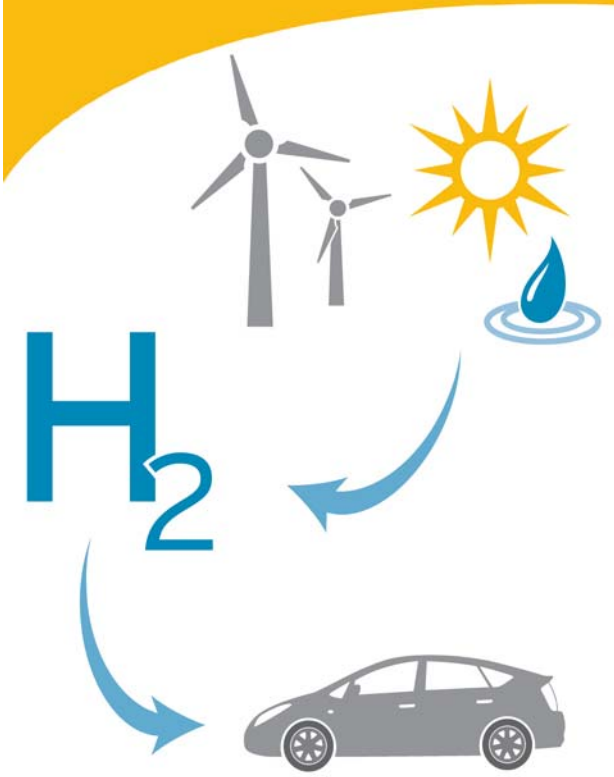
HSU HYDROGEN FUELING STATION AND HYDROGEN VEHICLES



Frequently Asked Questions

How does the hydrogen fueling station work?

The station uses electric power to split water into hydrogen and oxygen gases. The hydrogen is compressed to 6,000 pounds per square inch (psi), then it is stored for dispensing to hydrogen-powered vehicles.

How many vehicles can it serve?

The station is designed to produce sufficient fuel for a fleet of three to four hydrogen vehicles. It can produce up to 2.5 kilograms (kg) of hydrogen per day and store up to 12 kg of hydrogen in the stationary storage tanks. One kg of hydrogen has approximately the same energy content as one gallon of gasoline.

How much does the fuel cost?

The station requires approximately 80 kWh of electricity to generate, compress and dispense one kg of hydrogen fuel. Based on the average cost of industrial electricity in the U.S. of 6.2 cents/kWh, the energy cost of each kg of hydrogen would be approximately $5.00. Since HSU pays more for electricity, the cost at this station is higher.

Does the station use renewable energy to make hydrogen?

The station uses electricity supplied by the utility company. As utility companies increase their use of renewable resources, hydrogen made from grid power will get cleaner and greener.

Who designed and built the fueling station?

The fueling station began with an award-winning conceptual design by a team of HSU engineering students. The detailed design and construction were carried out by Schatz Energy Research Center (SERC), with support and

assistance from HSU Plant Operations staff and a number of project partners.

How much did it cost to build the station?

The cost to design and build this station was $676,690. The land is provided by HSU.

How do the hydrogen powered cars work?

Currently the station serves two vehicles, a Toyota Highlander Fuel Cell Hybrid Vehicle (FCHV-adv) and a Toyota Prius. Built on Toyota's Highlander mid-sized sport utility vehicle platform, the FCHV-adv is a zero-emission vehicle equipped with a 100 kilowatt PEM fuel cell, four high-pressure hydrogen fuel tanks, an electric motor that directly drives the front wheels, a nickel-metal hydride battery, and a power control unit. The sophisticated power control unit determines the division of energy between the fuel cell stack and the battery to power the vehicle and is similar to the mechanism that manages the engine and battery in the Toyota Prius.

The Prius uses a modified internal combustion engine (ICE). This is a different approach than a fuel cell car. The Prius was modified to run on hydrogen by adding a special fuel injection system and engine controller. A turbocharger and inter-cooler improve performance and fuel efficiency.

How far can you go on a tank full of gas?

The FCHV-adv has a driving range of about 400 miles on a full tank. Four high-pressure hydrogen tanks store up to 6 kg of hydrogen on board at pressures of 70 MPa (10,000 psi).

The Prius has a driving range of 80-100 miles on a full tank. Three composite tanks store up to 2.5 kg of hydrogen on board at pressures of 5,000 psi.

How much did the vehicles cost?

The FCHV-adv is currently on loan from UC Berkeley's Transportation Sustainability Research Center (TSRC). SERC is helping the TSRC road test and acquire operational data for the vehicle. A limited number of other FCHV-adv are in operation right now at other California Universities, private companies, and Japanese government agencies. According to Toyota, the 30-month lease price is approximately $11,600/month. For more information about the FCHV-adv, visit www.toyota.com/about/environment/innovation/advanced_vehicle_technology/FCHV.html.

The Prius was one of a fleet of Priuses converted by Quantum Technologies to run on hydrogen. The total cost of each vehicle is approximately $102,000 including original vehicle purchase and conversion. These conversions were performed on a very limited scale. A mass-produced hydrogen ICE vehicle would cost about the same as a gasoline vehicle. For more information about Quantum's hydrogen-powered ICE vehicles, visit www.qtww.com.

How long does it take to fuel the vehicle?

Vehicle fueling is extremely fast, taking less than one minute. This is one of the chief advantages of hydrogen fueled cars over battery electric vehicles.

Is hydrogen safe? What if the car is involved in an accident?

Hydrogen is as safe or safer than ordinary vehicle fuels. Like all fuels it must be handled properly. The vehicles have undergone rigorous crash testing, with both demonstrating that the hydrogen storage tanks and fuel system perform safely in a collision.

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Does the vehicle emit any pollution? Is it cleaner than a gasoline car?

The FCHV-adv is smog-free, and the only by-product is water vapor. It has been certified a zero emissions vehicle by the California Air Resources Board.

The hydrogen Prius is much cleaner than a gasoline-powered car. It does produce minor NOx emissions, but no carbon dioxide, carbon monoxide, or particulate matter. ICE technology is not quite as clean or efficient as a fuel cell vehicle but, given current technolgy, it is more affordable and reliable, while still offering significant improvement over the environmetnal performance of gasoline fueled vehicles.

Can hydrogen cars solve our oil addiction problem?

Dependence on petroleum for fuel has many downsides. It is a non-renewable resource that causes air pollution and climate change. Hydrogen cars can contribute to solving this problem by allowing us to make vehicle fuel locally using clean energy. Hydrogen is not a magic solution to our energy problems, but as part of a palette of strategies including renewable energy and energy efficiency, it is a promising alternative.

Are there other hydrogen fueling stations and vehicles in the area? How about in other locations?

This is the first and so far the only fueling station on the North Coast. As of March 2010, the California Fuel Cell Partnership lists 21 hydrogen stations operating in California, with 10 more in the planning or construction phases. At this time there are no other hydrogen powered cars in our area, but we are working to create a local fleet.

Why was this station built?
HSU and SERC are committed to bringing clean and sustainable energy technologies to Humboldt County and the world. Building this station and acquiring hydrogen vehicles are early steps toward a secure, environmentally responsible transportation system for the 21st century.

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