



## Hydrogen fuel cell vehicles and stations: The future of transport?

**As the motoring industry prepares itself for a future without petroleum products, slowly adapting to alternative energy sources, a number of experts and car manufacturers are betting on hydrogen as the fuel of the future.**

Many experts suggest that hydrogen is the closest alternative to gasoline or diesel. It only takes a few minutes to fill up the tank of a hydrogen fuel cell vehicle (FCV), providing a driving range that can go from 300 to 400 miles depending on the car.

When in contact with oxygen, hydrogen can be transformed into electrical energy that powers the vehicle's fuel cells. The process to power FCVs with this technology produces zero emissions. In comparison to battery-powered vehicles, FCVs have a far greater range, can be filled up in minutes, and even be used for larger and heavier vehicles.

Major car manufacturing companies across the world are now developing fuel cell vehicles and in some cases participating in government projects to promote the installation of hydrogen fuelling stations. "Asian manufacturers are currently at the lead. German manufacturers are a few years behind," said Dr Emma Guthrie, of Hydrogen Energy, at an APEA conference in Coventry, UK.

Guthrie pointed at the initial investment to construct a hydrogen fuelling station – extremely high due to the economy of scale – as one of the major challenges when developing a large network. An analysis by Japan's National Renewable Energy Laboratory put the costs of upgrading a service station to dispense hydrogen at \$2.5 million.

### **Developing hydrogen stations across the globe**

California, Scandinavia, Germany and Japan have taken the lead in hydrogen fuelling, with support from governments, car manufacturers and fuel retailers.

In Germany, [H2 Mobility has laid out plans to install up to 400 stations by 2023](#). The joint-venture was formed in 2014 by Air Liquide, Daimler, Linde, OMV, Shell and TOTAL to develop and promote the use of hydrogen-powered cars. The stations are funded as research and development projects by the German federal government through the National Innovation Programme for Hydrogen and Fuel Cell Technology (NIP). To date, 21 hydrogen filling stations have been completed in Germany.

"It is a significant opportunity for hydrogen in the German market because of the framework that

exists. We are willing to give it a good shot,” says Patrick Carré, General Manager Retail D-A-CH for Shell. “Government support is one key aspect when getting a technology off to a good start. But it also has to do with availability of the network (our part) and availability of cars.”

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Japan, a realm of technological innovation for the car industry, has also presented an ambitious project to construct a nationwide fuelling network for FCVs. The Ministry of Economy, Trade and Industry presented a plan that would bring Japan’s hydrogen fuel stations to 160 by 2020 and 320 by 2025, according to Nikkei.

The Japanese publication set the costs of building a hydrogen fuelling station between \$3.54 million and \$4.43 million. The government will hand out significant subsidies and relax regulations which affect traditional gas stations such as the self-service restriction.

Eastern Asian car manufacturers are spearheading the efforts to make FCVs a success. The Toyota Mirai, Hyundai Tucson Fuel Cell and Honda Clarity are either available or about to go on the market. Last summer, the three Japanese automaker giants, Toyota, Nissan, and Honda agreed a joint strategy of support for hydrogen station development in Japan with an investment ranging from \$40 million to \$49 million for a five-year plan. Meanwhile, Toyota and Hyundai have joined forces to pursue a similar goal in Australia.

“From a car manufacturer point of view we see hydrogen fuel cell as the ultimate goal – the range, the practicality, the refuelling time – we’re all used to going to a petrol station, filling up in three minutes then driving away and doing 600kms. Fuel cell gives you the best comparison to petrol,” said Scott Nargar, leader of the Fuel cell Program for Hyundai Australia, as reported by Wheels Mag.

The driving range, speed and convenience of filling up a hydrogen fuel cell car make it an attractive choice for drivers seeking to avoid gasoline-powered vehicles. The main challenges facing the success of FCVs continue to be the current, limited availability of fuelling infrastructure; the costs of constructing hydrogen stations; the production and transportation of hydrogen itself, as in many cases it requires a fossil fuel; and the effect of low oil prices on the growth of the fuel. If these obstacles can be overcome, the ‘fuel of the future’ could become the ‘fuel of the present’.

*Written by Oscar Smith Diamante*