ISSUE
09
December
2011

Technology Spotlight: Hydrogen Refuelling

About Us

London Research International (LRI) is a global research and consulting firm, combining broad research capabilities with specialist expertise in the energy, environment, and chemical sectors.

Our Newsletter

At LRI, our monthly interview-based newsletter features innovative energy technologies and businesses. To receive past editions, please contact us directly.

Announcements

December 2011

LRI will shortly launch a new web portal for showcasing green technologies in Europe. The unique interface will enable companies to effectively market and promote their innovations at no cost. More details to follow in February 2012.

Featuring:

At LRI, our monthly interview-based newsletter features innovative energy technologies and businesses. In the latest edition of the newsletter, LRI staff interviewed Dr. Graham Cooley, CEO of ITM Power. Among other products, the company is the developer of the HFuel, a hydrogen refuelling station that provides on-site hydrogen fuel production through combined electrolysis, storage, and fueling innovations.

HFuel: The Portable Hydrogen Refuelling Station

The HFuel is a "Plug and Play" hydrogen refuelling system that can be turned on-and-off in a single second. This enables the HFuel to balance incoming intermittent power, such as from renewable sources like wind or solar. In many cases, any surplus of energy delivered to the electricity network tends to be constrained. By using electrolysis to convert this excess power into hydrogen fuel, available energy that might have gone to waste can be used at a later date.

The HFuel hydrogen production units are housed in ISO containers (standard shipping size), with single units producing up to 100kg of hydrogen a day—accounting for between one-quarter and one-third MW of load. Straightforward and familiar for transport purposes, HFuel containers can be placed in a car park or field. Once the HFuel is plugged into a supply of power and water, then the HFuel is ready to start making hydrogen. Capital costs depend on the location and capacity of the system. Given the ease of transport and set-up, construction and engineering expenses are nearly non-existent, making the equipment and electricity supply the main system costs. For a detailed quote, contact ITM.

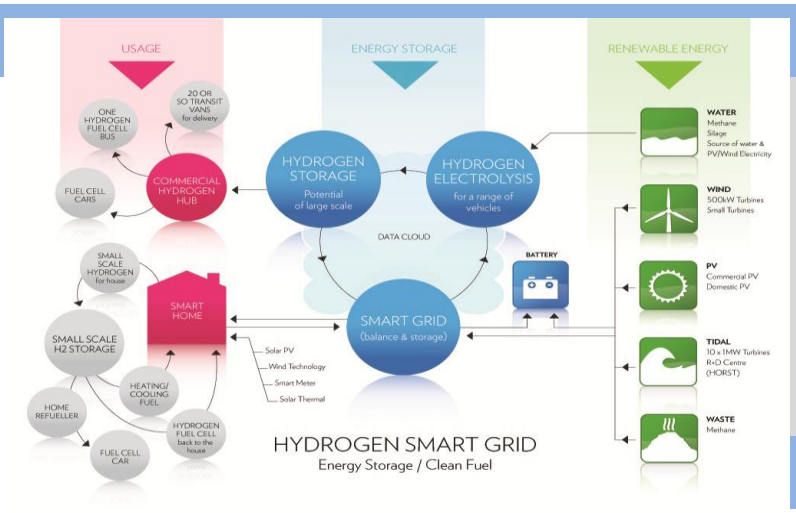
New systems usually begin with two on-site containers. The first container contains the electrolysis equipment that develops the hydrogen from an incoming power and water source, while the second container stores the hydrogen at pressures of between 350 and 700 bar. Attached to the second container is a cascade refuelling pump that can refuel a vehicle in 3-4 minutes. Van drivers comment how easy it is to refuel the van, noting the safety and quality of the operation. Within the HFuel, the electricity can be stored as hydrogen in tanks for a length of 2.5 days. If a longer storage period is desired, more tanks can be added to the system.

Energy Management & Emissions Reduction

Dr. Graham Cooley, CEO
ITM Power

"In the old days, if demand increased, grid operators would simply turn on more power stations; and vice versa for when demand dropped significantly. This can't be done anymore because a large percentage of power stations now depend on sun and wind—supply has taken over. Hydrogen production is a solution to demand-side management. By using hydrogen as a transport fuel, HFuel helps to decarbonise the grid by assimilating a growing mix of renewables, while simultaneously working to decarbonise transport by providing a zero-carbon fuel with no pipelines or tankers—this is 'joined-up' thinking in the energy sector. A large percentage of the funding for our operations has been provided by the Technology Strategy Board, which we feel has been a major boost to our credibility."

(Photo Credit: visualpanic/CC)



HFuel in action

- HOST Trials
- EcoIsland

EcoIsland Partnership

The EcoIsland project is being conducted on the Isle of Wight, with a goal of making this small island off the southern coast of England self-sufficient in energy and an energy exporter to the mainland. The project has started already, with renewable systems being put in place and with significant amounts of other activity. Partners for the project include: IBM, Toshiba, Southern Scottish Energy and Southern Water. Dr. Cooley identified the Energy Storage initiative (seen in the middle column of the graphic above) as the most significant advance—the development of a hydrogen smart grid.

Hydrogen On-Site Testing (HOST)

In an effort to demonstrate their success, ITM is involved in various demonstration projects across the UK. The HOST project has been the largest cross-sector hydrogen trial in the country. HOST was launched at Stansted Airport in early 2011, with 11 trials completed to date across seven different industrial sectors, including trials with DHL, Scottish Water, and Amey. Each participating partner receives a delivery of the HFuel hydrogen production equipment, placement of the system on their property (i.e. in a car park), and clean hydrogen fuel generated on-site to refuel their vans. The HOST project was part-sponsored by the Technology Strategy Board.

QUICK FACTS

Key Features
-On-site fuel production
-Zero-carbon solution if renewably powered
-Staged and scalable rollout
-Rapid refuelling capability
-Minimal site preparation required

Operation and Performance
- Industry standard connection nozzle
- Operating range -10ºC to 40ºC
- Scalable production up to 50kg/day H_2
- 350 bar (35MPa) discharge pressure
-Purity configurable up to fuel cell grade

Site Requirements
- Potable tap water supply, 20 psi minimum pressure
- 3-phase 440V AC 50/60Hz power supply
-Flat site area capable of supporting freight containers
- H&S appraisal of intended site

Optional Features
-Upgradable up to 700 bar (70 MPa) refuelling
-Gas purity reduced and cost benefits for HICE vehicles

ITM POWER
Energy Storage | Clean Fuel

ITM POWER
Energy Storage | Clean Fuel

HFuel Here
Hydrogen Vehicles Welcome

Advantages and Competitors

Financial Foundation

In 2004, ITM became the first hydrogen energy company to be listed on the stock exchange. ITM is a fully compliant company with ISO 9001, ISO 14001, and ISO 18001 certifications. HFuel has been awarded the ISO14687 standard. ITM held a secondary capital raising in 2006, which assures them financial stability for several more years, even with the exclusion of product revenues and further grant money.

Reducing Fuel Costs

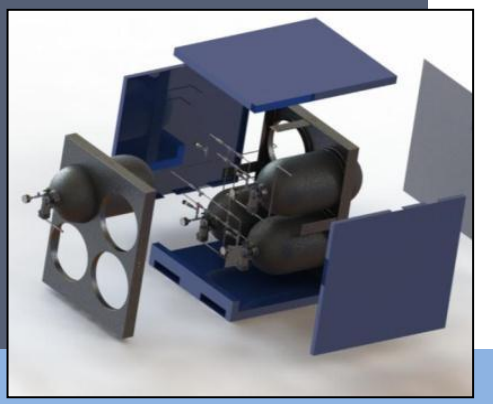
The HFuel comes in various sizes, with a 15 kg/day model that will refuel 3 vans, and a 100 kg/day model that will refuel 20 vans or 100 cars. Once a purchaser requires more hydrogen fuel capacity, increases are made in modules of 100 kg/day thereafter. This scaling-up comes simply in the form of adding more containers, requiring few engineering arrangements or complicated infrastructure. HFuel containers are robust, and ITM has recently received compliance permission from the UK Department of Transportation (DOT) to transport full HFuel containers on UK roads.

Foes or Allies?

"Our main competition is from other energy storage devices, such as: batteries, flow cells, and mechanical energy storage," said Dr. Cooley. "Except that in many ways you can also combine hydrogen with these applications. This is an early stage market that is going to become huge. So in a sense, we don't have any other competitors, only future partners. And that's what we encounter now as we travel around—a series of enthusiastic potential partners."

Future Markets and Products: Germany and the *HFill*

Based on Germany's favourable policy incentives and *H2 Mobility* project, ITM is preparing for a major rollout in Europe. Germany is a perfect example of an early adoption market, and ITM GmbH is in discussions with various partners to be a major refuelling provider within this expanding market.
Additionally, ITM is developing, and set to debut, a new home refuelling device called the *HFill*.
The device utilizes a 200-bar electrolyser for hydrogen production. The HFill is supported by funding from the UK Department of Transportation, with work moving forward jointly with a consortium of 8 major OEM's, including GM, Toyota, Nissan, and Mercedes-Benz.



Work with ITM Power

ITM Power has been garnering increasing media attention over the past few months and welcomes contact from potential partners and investors.

Contact Points

Mr. Charles Purkess
Marketing & PR Officer
+44 (0) 166 682 2133
chp@itm-power.com

ITM Power
22 Atlas Way
Sheffield
S4 7QQ

+44 (0) 114 244 5111

Follow on Twitter: **@ITMPowerPlc**

Explore features on ITM Power's YouTube channel.

Visit ITM Power's website at: http://www.itm-power.com

All photo credits are via ITM Power, unless otherwise indicated.

Stay in touch with LRI

Follow on Twitter

Join on Facebook

Related Upcoming Events – Hydrogen and Alternative Fuels

• Stationary Hydrogen and Fuel Cell Showcase

7 March 2012 | London, UK

The London Hydrogen Partnership, in collaboration with the Energy Generation and Supply Knowledge Transfer Network, would like to invite you to this unique gathering. The event is aimed at: Professionals involved in the built environment with interests in sustainable energy solutions; Facilities managers for businesses in London; Property portfolio managers; and those with an interest in CHP.

• World Biofuels Market Congress & Exhibition

13 – 15 March 2012 | Rotterdam, Netherlands

The event will include sessions on aviation, algae, advanced biofuels, finance and investment, energy crops, transport, biogas and more. The event is co-located once again with Biopower Generation and Bio-based Chemicals.

• European EV Battery Forum

20 March 2012 | Barcelona, Spain

The event will start with a training course on Monday 19th and then a full day on E-Bikes, a full day on EV Charging Infrastructure, and a 2-day conference on EV business models and latest energy density advances.

NEXT ISSUES

Smart Grids w/ ECI Telecom
Algae Biofuels w/ OriginOil LLC

London Research International

Elizabeth House, First Floor, Block 2
39 York Road
London, SE1 7NQ
Tel: +44(0)20 7378 7300 Fax: +44(0)20 7183 1899
http://www.londonresearchinternational.com/