


## Integrated Hydrogen Production, Storage & Use

Levenmouth Community Energy Project	
In partnership with Bright Green Hydrogen, Toshiba, Fife Council and Hydrogenics, the facility at the Levenmouth Community Energy Project was constructed in order to demonstrate green hydrogen as a viable medium for energy storage, grid balancing, electricity generation and transport fuel.	

Logan Energy was instructed to design, build, install and commission the hydrogen technology at Levenmouth Community Energy Project in Methil, Fife.

The facility produces compressed hydrogen through electrolysis from surplus electricity generated by a 750kW wind turbine and 160kW solar photovoltaics. The hydrogen is stored on-site and is used to generate electricity for the micro-grid at times when demand is higher than the renewable energy supply. Two further electrolyzers each generate hydrogen for the refuelling system. This hydrogen is stored at 450 bar and then used to fuel a local fleet of hydrogen-powered vehicles.

Collaboration with the project partners, including Fife Council and Bright Green Hydrogen was essential to define the required building modifications and civil works prior to the installation of the system. The whole system design demanded the specification, selection and procurement of the following equipment:

- A 270 kW PEM electrolyser to convert excess renewable energy in to hydrogen up to 100kg per day
- A 60 kW PEM electrolyser integrated in to a containerized refueler, 25kg/day
- A 60 kW Alkaline electrolyser integrated in to a containerized refueler, 25kg/day
- Hydrogen storage tanks at 450bar holding 30kg of hydrogen in each refueler
- Two high pressure hydrogen compressors (450bar), one in each refueler
- A 100kW PEM fuel cell to power the micro-grid

Deliverables:	Achievements:	Benefits:
<ul style="list-style-type: none"> <li>• H<sub>2</sub> energy storage</li> <li>• H<sub>2</sub> compression</li> <li>• Fuel Cells for energy balancing</li> <li>• Hydrogen Refuelling Stations</li> </ul>	<ul style="list-style-type: none"> <li>• PEM electrolyser operation at cold temperatures</li> </ul>	<ul style="list-style-type: none"> <li>• Micro-grid demand completely covered by renewable sources and H<sub>2</sub></li> <li>• H<sub>2</sub> used as a fuel for a local fleet</li> </ul>

A hydrogen-based renewable energy balancing system and two mobile Hydrogen Refuelling Stations (HRS) provide hydrogen for the project's fleet of 17 hydrogen vehicles and balance the private wire grid for the Methil Docks Business Park.

The lessons learned from this successful real-life application over the past six months for both energy storage and transport provide Logan Energy with an insight into designing, supplying and installing hydrogen energy systems.

Bill Ireland, CEO, said: "It was fantastic to ... showcase how the real-life application of hydrogen has been so well-established, received and successful at the Levenmouth Community Energy Project.

"Collaboration is key as we increase the role of hydrogen in the clean energy revolution. What we have achieved during the first six months at Levenmouth further demonstrates the huge potential of hydrogen as a standalone multisector energy resource that also supports existing energy networks.

"Going forward, we shall work with our international partners to develop opportunities to replicate these successes which will make a real difference to distributed renewable energy storage and clean transport worldwide."

The systems generate and store hydrogen when there is excess renewable energy available. The hydrogen is then used to power a fuel cell to provide power to the private wire network at times when there is insufficient renewable energy being generated. The two HRSs are used to power Europe's largest fleet of hydrogen hybrid vehicles which includes vans and refuse collection lorries.

The energy balancing system designed, built, and commissioned by Logan Energy comprises a 250kWe Proton Exchange Membrane (PEM) Electrolyser, a gas storage arrangement, 100kWe PEM fuel cell and smart control system. The relocatable HRSs are self-contained modules, based upon ISO shipping container dimensions, so they can be readily transported and easily relocated from site to site.

Up to 60kg of hydrogen is stored at the site and reconverted to electricity at times when on-site wind and solar generation is low helping to offset the intermittency of renewable energy, as well as being compressed and dispensed at 350bar for ultra-low and zero-emission hydrogen vehicles.

Logan Energy will maintain the systems for five years and will continue to gather and assess information on their performance.

(From bqlive.co.uk)

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