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analyst view

Electrolysers and Fuel Cell Commercialisation

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As growing numbers of fuel cell products progress towards commercialisation, it is worth noting the relatively quiet revolution in electrolyser technology that has taken place alongside this and which is proving helpful in supporting this progress. In many instances, by addressing the questions around hydrogen supply, electrolysers are smoothing the way for fuel cell deployment.

Water electrolysis has the longer commercial history: where the development of fuel cell technology for industrial purposes dates from the efforts of General Electric and NASA in the 1950s and 60s, electrolysers have been used to produce industrial hydrogen since about 1890. But the use of electrolysers in the hydrogen economy, i.e. with fuel cells and renewable energy to replace fossil fuels, has posed new challenges for the technology.

Electrolysers find three main areas of application within the hydrogen economy: the production of hydrogen as fuel for fuel cell vehicles; the means for grid energy storage and grid integration of variable renewable energy sources; and in autonomous energy systems that allow for independence from the grid and from fossil fuels. Often these overlap or are synergistic, as when excess grid energy is used to produce hydrogen for FCEVs, and the requirements in each are broadly similar. However, each application could be said to have key requirements that illustrate the combined challenge facing electrolyser developers. The production of hydrogen fuel for transportation must be cheap and energy-efficient. Electrolysers used for balancing the grid must have ultra-fast response time and operate effectively under variable load. And electrolysers in off-grid systems must be robust, low-maintenance, and often – in conventional terms – very small and compact.

Significant technological development along these lines has resulted in market-ready electrolyser systems which are being used in each of the three application areas mentioned above. The following examples are from news reported so far this year.

Hydrogenics' HySTAT® electrolysers have been used in at least 35 hydrogen vehicle fuelling installations worldwide and the orders continue to come in: a WaterstofNet hydrogen station using a HySTAT 30 opened in Brussels in February and another HySTAT 30 is to be delivered to a new refuelling station in the Netherlands around the middle of this year. Europe's largest hydrogen refuelling station to date opened in Hamburg in February; half the hydrogen for the station is produced on site by electrolysis of water using renewable energy. Also in Germany, the Fraunhofer Institute for Solar Energy Systems has opened a hydrogen refuelling station in which electrolysis is driven by solar power.

ITM Power is launching a 1 MW electrolyser hydrogen production system, based on its new electrolyser stack designs, that it is targeting specifically at power companies for megawatt-scale energy storage to help balance the grid. It is cooperating with Logan Energy for the joint tendering of hydrogen energy storage and hydrogen fuel projects in Scotland. The intention is to facilitate balancing of a grid which is likely to see increasing integration of intermittent renewables: Scotland has one of the highest wind energy potentials in the EU.

Electro Power Systems has deployed its ElectroSelf 'self-recharging' power unit within a fully grid-independent energy system using solar and wind power to provide back-up power for a new WiMAX antenna in Italy. The ElectroSelf system requires minimal maintenance, storing the excess energy from the renewables by electrolysing water and then feeding hydrogen to the fuel cell during a power dip or outage, which produces water again. Back-up power for off-grid installations such as telecom base stations is proving to be a particularly promising application for fuel cells.

Recent partnerships are capitalising on the commercial advantage of offering a 'one-stop energy solution' – i.e. a fuel cell product combined with a dedicated electrolyser system to provide fuel. Acta has entered into a ten-year licensing agreement with Heliocentris to be its exclusive supplier of alkaline solid membrane electrolyser products. Heliocentris will then have a license to use Acta's technology in its products, particularly for stationary clean power applications such as telecom base stations or residential power. Acta has also signed a letter of intent with Horizon Fuel Cell Technologies. Subject to evaluation, Horizon will incorporate Acta's stacks into its own electrolyser equipment, likely to be used for refuelling of Horizon's smaller, portable fuel cell products such as the MiniPak. Horizon will however also be marketing ITM Power's range of small-scale electrolysers to complement its expansion into larger fuel cell systems.

There are of course a number of other companies that supply electrolyser systems: RE Hydrogen, NEL Hydrogen, h-tec Systems and Proton Onsite, to name a few. Research and development is on-going, promising further advances in electrolyser technology. If your company is involved in RD&D or supplies commercial electrolyser systems, please get in touch and let us know your news.

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