To the Media

Stuttgart, May 9, 2019

Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (ZSW)

Location: Meitnerstr. 1, 70563 Stuttgart

Green Electricity for More Affordable Hydrogen

Research platform with optimized electrolyzer up and running at commercial power-to-gas plant

Hydrogen sourced from green electricity can increase the share of renewables in the transportation sector and reduce particulate matter and nitrogen oxide emissions. There is a catch, though – green gas production is still too expensive. The Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) and its partners recently tested an option on a research platform that could help cut costs. In early 2019, this consortium deployed a research electrolyzer for a trial at a commercial power-to-gas plant in the southern German town of Grenzach-Wyhlen. It performed well. With the benefit of new electrode coatings, scientists managed to increase power density, outperforming the plant's industrial equipment by 20 percent. What is more, the research electrolyzer consists of just a few parts and is better suited for mass manufacturing. This advance could drive down the cost of electrolyzers. The researchers are now investigating the improved electrode coating's durability.

Gradually replacing fossil fuels with renewables in electrical power stations is a start, but the same will have to happen in transportation and buildings. Hydrogen is the perfect enabler for this transition. This gaseous energy carrier can buffer surplus green electricity for other sectors to use. Germany's exit from fossil fuels in transportation and heating has slowed to a crawl; hydrogen could get things rolling again.

Same footprint, but more powerful – the new electrolyzer

Electrolysis plants use electricity to break water down into hydrogen and oxygen. As it stands, the process is too expensive for green hydrogen gas to be competitively priced. Seeking to drive down these costs, ZSW researchers and their partners in science and industry recently set up a research platform at an industrial one-megawatt plant on the Upper Rhine River. The larger goal is climate-friendly mobility.

"Participating companies and institutes can test and optimize components in a real environment in this research facility. For example, we have been testing an optimized alkaline pressure electrolysis plant with up to 300 kilowatts output under real-world conditions since January. It features newly developed, cheaper electrodes and a simpler design," says Dr. Michael Specht, head of the ZSW Renewable Energy Sources and Processes department. This project's stakeholder are also seeking to analyze compressors, rectifiers and pressure reser-

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voirs with an eye to their cost and efficiency potential. They hope to turn promising ideas into products.

Initial trials with this research electrolyzer went well. The project partners ZSW and the German Aerospace Center (DLR) achieved a 20 percent increase in power density using new electrode coatings. This means the plant is able to generate a fifth more hydrogen than an industrial plant of the same size and with the same energy consumption. To put it another way, the new electrolyzer can achieve the same performance using less space and material. However, the researchers still have to substantiate the advanced electrode coating's durability.

Faster time to market for hydrogen plants

Electrolyzers' price tag also depends on their size. They account for the lion's share of the costs of converting renewable electricity – around 40 percent – so the hydrogen price automatically reflects any upstream savings. Research and development is a major cost point for manufacturers of electrolysis plants, so lower R&D costs could also drive the adoption of this technology.

This research initiative is part of a lighthouse project called Power-to-Gas Baden-Württemberg launched in November 2018. The power company Energiedienst AG aims to operate an electrolysis plant to produce hydrogen on an industrial scale at Wyhlen in the south of the German Baden region. The commercial plant, up and running on a trial basis since November 2018, can now produce around half a metric ton of hydrogen per day - enough fuel for more than 1,000 fuel-cell cars' average daily trips. The ZSW scientists' research facility is connected to this plant and also operates under real-world conditions. A neighboring hydropower plant on the Rhine River furnishes the electricity for both facilities. Once the two electrolysis units convert water into hydrogen, their yield is merged and trucked to the point of use.

Monitoring underway

This project coordinated by ZSW also calls for scientists to monitor both plants, a brief that includes live data surveillance. Monitoring commenced in January. By the end of this year, the researchers will have examined data generated in the course of some 4,000 operating hours. Industrial companies and research institutions are also taking part in this project focused on the future of mobility. Eleven partners are on board, with three hailing from the scientific community. The state of Baden-Württemberg is funding the project with €4.5 million.

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fuels, battery technology, fuel cells and energy system analysis. There are currently around 260 scientists, engineers and technicians employed at ZSW's three locations in Stuttgart, Ulm and Widderstall. In addition, there are 90 research and student assistants. The ZSW is a member of the Innovationsallianz Baden-Württemberg (innBW), a group of 13 non-university, applied research institutes.

Media contacts

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ZSW research electrolyser.

Photo: Energiedienst / Juri Junkov

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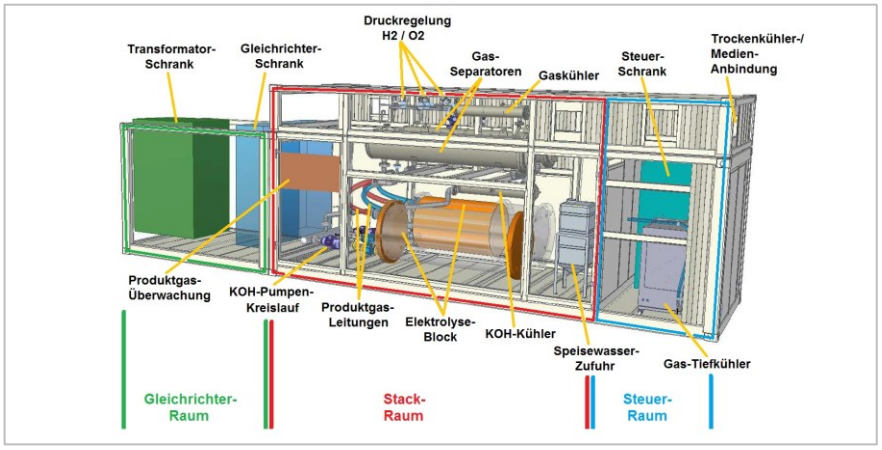

3D model of the research electrolyser.

Diagram: ZSW