To the Media

Stuttgart, April 14, 2020

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

Location: Meitnerstr. 1, 70563 Stuttgart

Megawatt-Scale Industrial Power-to-Gas Plant on the High Rhine Running Reliably

More cost-effective means of producing green hydrogen to power vehicles

Renewable hydrogen can be the ticket to greener transportation, but the costs will have to come down first. The power industry and researchers are conducting trials in an industrial power-to-gas plant in the southern German town of Grenzach-Wyhlen to investigate ways of cutting costs. As of April 2020, the megawatt plant had been on line for four months and running reliably. An on-site research electrolyzer is also operating very successfully. The Centre for Solar Energy and Hydrogen Research Baden-Württemberg (ZSW) is coordinating this project. Energiedienst AG, a power company, operates the commercial plant.

This power-to-gas plant has a connected electrical load of one megawatt. It produces renewable hydrogen using electricity sourced from a hydroelectric power plant at Wyhlen on the Rhine. The P2G facility does not draw on the public power grid, so it is not subject to grid fees or the EEG levy. Hydropower is available practically around the clock, so this facility can run at full load for many hours more than power-to-gas plants driven by wind or solar power. This enables the plant to run even more cost-efficiently and plant personnel to gain a great deal of operating experience in a very short time.

Over 1,800 operating hours in four months; more than 60 trailers filled

With routine operations underway since early December 2019, the plant has already clocked 1,850 operating hours. The monitoring system set up by the ZSW to keep track of all key components and subsystems is working flawlessly. The plant operates fully automatically around the clock, either at a full load or at varying partial loads. The ZSW monitors operations via a remote data link to Stuttgart and an automated data assessment routine. Its researchers keep an eye on several parameters, one being the efficiency of the plant with all its subsystems. As it stands, the facility converts electricity to ultrapure hydrogen compressed to 300 bar at an overall efficiency of 66 percent in relation to the higher heating value of the gas. The researchers are also monitoring degradation effects and examining this data to spot potential for improvements.
To date, the plant has filled 62 trailers with hydrogen suitable for fuel cell applications. Each of these transportable containers holds around

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300 kilograms. The facility can produce up to 500 kilograms of hydrogen a day – enough gas to cover the average daily distance traveled by more than 1,000 fuel-cell passenger cars.

Driving down the costs of industrial electrolyzers

The research project underway on the grounds of this commercial plant is also making advances. Scientists are testing improved electrolysis blocks with a maximum output of 300 kilowatts in a research plant operating alongside the commercial plant. The researchers expect these blocks to bring down the price of hydrogen another notch. The project is also facilitating the transfer of technology to the industry by enabling companies to test and optimize components in this plant. These enterprises can then apply the results to their products. The ZSW and its research partners got off to a great start, making a major stride last year while they were still testing this plant. Newly developed electrode coatings enabled the researchers to increase the power density by 20 percent over that of the industrial plant's electrolysis blocks. In other words, their electrolyzers require less volume capacity and material to achieve the same performance.

Advances like this automatically affect the price of hydrogen because cubic capacity is a major line item when investing in a plant and the electrolysis blocks account for the largest share of the cost – around 40 percent – of converting renewable electricity. This development will help the companies that make electrolysis systems cut costs. ZSW researchers and Energiedienst engineers' long-term goal is to roughly halve today's cost of electricity-based hydrogen production.

The state of Baden-Württemberg is funding this lighthouse project with 4.5 million euros. In 2019, the German Federal Ministry for Economic Affairs and Energy selected a venture based on this project as one of the winners in the first round of a contest of ideas called "Real-world Laboratories of the Energy Transition."

Learn more at www.ptg-bw.de.

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Major power-to-gas project with 12 partners

Twelve partners have joined forces in this project. Four are research institutions: the ZSW, the German Aerospace Center (DLR), the Fraunhofer Institute for Solar Energy Systems ISE, and the DVGW research unit of the Engler-Bunte Institute at the Karlsruhe Institute of Technology (KIT). Eight industrial partners are on board: Energiedienst AG, the Daimler subsidiary NuCellSys, Zweckverband RBB Böblingen (a special-purpose association), Sindelfingen's public utilities, the long-

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distance pipeline and telecommunications network operator terranets bw, the electrolyzer manufacturer McPhy Deutschland, Fumatech BWT, a company that makes membranes and constructs plants, and e-mobil BW GmbH, the agency of the state of Baden-Württemberg for new mobility and automotive solutions.

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The Zentrum für Sonnenenergie- und Wasserstoff-Forschung Baden-Württemberg (Centre for Solar Energy and Hydrogen Research Baden-Württemberg, ZSW) is one of the leading institutes for applied research in the areas of photovoltaics, renewable fuels, battery technology, fuel cells and energy system analysis. There are currently around 280 scientists, engineers and technicians employed at ZSW's three locations in Stuttgart, Ulm and Widderstall. In addition, there are 100 research and student assistants. The ZSW is a member of the Innovation Alliance Baden-Württemberg (innBW), an association of 13 non-university, business-oriented research institutes.

Media contacts

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The industrial power-to-gas plant at the Grenzach-Wyhlen hydroelectric power station

Photo: Energiedienst

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The ZSW's research electrolyser

Photo: Energiedienst

A look inside the plant

Photo: Energiedienst

Images are available from Solar Consulting or at https://energie.themendesk.net/zsw/.