Austrians to power steel industry entirely on clean hydrogen

July 26 2018

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Scientists are investigating alternative methods to produce the energy that is required for us to carry on living our lives, but in a way that doesn't burden the environment. Now, one group of scientists is getting ready to deliver on such efforts with the world's biggest pilot plant for the production of green hydrogen.

Hydrogen fuel can be used for various functions such as powering liquid rocket engines and most modes of transport. It is generally accepted that along with electricity, hydrogen will constitute a primary energy carrier upon which vehicles, buildings, aircraft and even national economies will depend. The Hydrogen Council has estimated that by 2050 hydrogen will constitute almost 20 percent of energy consumed by end users.

Tackling fossil fuels

The ongoing Horizon 2020 project H2Future – a Fuel Cells and Hydrogen Joint Undertaking (FCH JU) flagship project – has set the ambitious target of generating 'green' hydrogen that is specifically intended for the steel and iron manufacturing industry. The International Energy Agency estimates that current operations in this area are responsible for around 7 percent of total global CO2 emissions.Austria's largest electricity company VERBUND has teamed up with five other partners – voestalpine, APG, K1-MET, ECN (along with TNO) and Siemens – to construct a polymer electrolyte membrane (PEM) electrolysis system at voestalpine's steel mill in Linz, Austria. A joint press release notes that the PEM system is capable of generating up to 6 MW of power and is planned to be fully operational in the second quarter of 2019.

Since hydrogen does not occur naturally in sufficient quantities, electricity is directly applied to water (H2O) to separate the hydrogen and oxygen atoms. The system is comprised of a positively charged anode and a negatively charged cathode which are separated by a membrane. Given that the membrane is a proton exchange one, hydrogen protons (H+) can permeate through the membrane, without mixing with other gaseous products. The protons combine with free electrons in the cathode and form hydrogen, which can then be stored and used later. Using its reported 6 MW capacity, the PEM electrolysis system will ideally generate 1 200 cubic metres of hydrogen per hour,

with the ultimate target being an electricity-to-hydrogen efficiency of 80 percent.

As indicated on the project website, the benefits of using such a system include low maintenance costs and needs, high-quality hydrogen produced with zero emissions and no additional chemicals that could endanger the system operators.

Bart Biebuyck, FCH JU executive director, commented on the H2Future project in a voestalpine press release: "It demonstrates that greening large industry, such as steelmaking, is feasible and is a viable option in the near future. Moreover, this project successfully shows sector coupling. Both these aspects are vital in proving that hydrogen is an important piece of the puzzle in achieving European climate goals."

Once the plant is up and running in 2019, Dutch researchers at ECN will coordinate, study and attempt to replicate all results at an industrial scale. ECN will also provide administrative and policy suggestions to expedite the practical implementation of H2Future's results within the steel industry, which is expected to take place within a decade of the project's successful completion.

More information: H2Future project website: www.h2future-project.eu/

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