HyBalance pioneering facility proves Power-to-Hydrogen to be a viable way to balance the grid and transfer renewables into industry and mobility

(30.11.2020) One of Europe's first facilities for the production of hydrogen by PEM water electrolysis on an industrial scale has achieved a number of important results. Led by Air Liquide, Cummins (through its Hydrogenics Europe business), Centrica Energy Trading, LBST and Hydrogen Valley, the facility in Denmark has delivered 120 tons of hydrogen since 2018 and demonstrated its ability to balance the electricity grid.

The 1.2 MW HyBalance electrolyser has demonstrated that producing hydrogen to store energy at a large scale – including electricity from renewable sources – is technically and economically viable. In 2019, 47 percent of the electricity consumed in Denmark derived from wind power.

High availability supplying industry and clean transportation
The HyBalance plant has produced 120 tons of hydrogen since its inauguration in 2018. It has demonstrated a high availability, enabling 24/7 delivery of 60 tons of hydrogen to an industrial customer connected through a pipeline. The remaining 60 tons have been delivered for other customers as well as for clean transportation, such as a network of hydrogen stations fuelling a fleet of fuel cell taxis in Copenhagen.

High flexibility and short reaction-time help balance the grid
The facility has validated the PEM (Proton Exchange Membrane) electrolysis technology as highly dynamic, able to cope with fast power ramps up and downs. HyBalance is thus certified by the Danish energy authorities as a bidder in all electricity markets. This is a great success as specifically in the primary reserve containment, only a few power installations are able to reach a reaction time below 10 seconds. The plant is now also used to help balance the Danish grid.

Diederick Luijten, VP Hydrogen Energy Nec Cluster, Air Liquide said: *"We are happy to have contributed to the success of the HyBalance plant by passing on more than 50 years of Air Liquide's experience in hydrogen. This success story will lead the plant to keep delivering low-carbon hydrogen to customers over the long term. The facility is already a model for larger scale PEM electrolysers around the world including another Air Liquide plant, under construction, in Bécancour, Québec (Canada) with a 20 MW PEM electrolyser. The success of HyBalance will contribute to making low-carbon hydrogen a key element of the energy transition."*

The potential of using hydrogen in future energy systems
While Air Liquide will continue to operate the site and produce hydrogen to supply its customers, the HyBalance project that kickstarted the facility in 2016, has been concluded by October 2020 as planned. The budget for the project has totalled €15 million, including €8 million in funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (FCH JU), and €2.6 million in funding from the Danish EUDP program.

The EU has made a commitment to a forward-looking climate policy with energy security and independence and decarbonizing the economy as some of the prioritized dimensions. With the share of

The HyBalance project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 671384. The Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation program. www.fch.europa.eu. The HyBalance project has furthermore received funding from the Danish EUDP program, administered by the EUDP Board.

renewable energy growing in the energy mix, the need for storage and downstream use in fossil dependent sectors such as transportation has become a critical issue. Hydrogen is seen as one of the key enablers to solve these challenges.

Bart Biebuyck, Executive director, FCH JU said: *"The FCH JU would like to acknowledge the good quality work and the timely execution of the HyBalance project. HyBalance was the first MW-scale PEM electrolyser demonstration project that the FCH JU funded back in 2014. It is a true lighthouse project to the current multi-MW projects, where a number of technical and electricity market issues were faced and successfully addressed in terms of the dynamic operation of electrolysers for the provision of hydrogen and electricity grid balancing services."*

More information
More information on HyBalance can be found at hybalance.eu

Partners in the HyBalance project

Air Liquide: A world leader in gases, technologies and services for Industry and Health, Air Liquide is present in 80 countries with approximately 67,000 employees and serves more than 3.7 million customers and patients. Oxygen, nitrogen and hydrogen are essential small molecules for life, matter and energy. They embody Air Liquide's scientific territory and have been at the core of the company's activities since its creation in 1902.

In the past 50 years, Air Liquide has developed unique expertise enabling it to master the entire hydrogen supply chain, from production and storage to distribution and the development of applications for end users, thus contributing to the widespread use of hydrogen as a clean energy source, for mobility in particular. Air Liquide has designed and installed more than 120 stations around the world to date. *www.airliquide.com*

Copenhagen Hydrogen Network (CHN): Refuelling station network operator and institution rolling out national hydrogen infrastructure in Denmark. CHN is a wholly owned subsidiary of Air Liquide.

Cummins Inc. (through its Hydrogenics Business) Cummins Inc., a global power leader, is a corporation of complementary business segments that design, manufacture, distribute and service a broad portfolio of power solutions. In September 2019, Cummins acquired a majority share in the Hydrogenics Corporation. Hydrogenics is an electrolyzer technology developer and global leader in advanced largescale electrolysis, having profound expertise in the design, provision and operation of

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hydrogen generation, fuel cell power modules and electrolyzers. Founded in 1919 and headquartered in Columbus, Indiana (U.S.), Cummins employs approximately 61,600 employees around the globe. *www.cummins.com.*

centrica

Centrica Energy Trading, owned by Centrica PLC, is an international energy asset management company and operates in power, gas and energy certificate markets across Europe. As a Balance Responsible Party Centrica Energy Trading handles a client portfolio of 14,000 MW CHPs, power plants, renewables and flexible consumption in all available electricity markets. *www.neasenergy.com.*

HYDROGEN VALLEY®

Hydrogen Valley/CEMTEC: Danish business incubator acting as a driver in the hydrogen and Power-to-X industry in Denmark. Hydrogen Valley develops Power-to-X concepts and facilitates and brings them to life in solid business cases. *www.hydrogenvalley.dk*

ludwig bölkow systemtechnik

Ludwig-Bölkow-Systemtechnik GmbH (LBST): Technology and strategy expert consultancy on energy, mobility and the environment with more than thirty years of hydrogen and fuel cell expertise, contributing with its deep knowledge on life-cycle analysis, techno-economic and environmental performance assessments of power-to-x value chains. www. *lbst.de*

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EUDP Energiteknologisk udvikling og demonstration

FCH FUEL CELLS AND HYDROGEN JOINT UNDERTAKING