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Green hydrogen: the missing link between the power, gas and mobility systems

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Abstract

European energy policy has resulted in the increased integration of renewable energy sources (RES), especially in the power sector with wind and solar energy. This increasing share of these fluctuating RES brings the new challenge of balancing the power grid. Demand response management, grid extension, controllable generation and energy storage solutions seems today to be the main answer to this challenge in the power sector.

However, the decarbonisation of the transportation sector and the gas sector has been particularly difficult to achieve and relies today mainly on biomass (biofuels and biogas).

Green hydrogen represents today a very interesting solution to decarbonize the mobility and gas sectors and the industry, but can also be very helpful to balance the power grid thanks to its ability to operate very dynamically.

Electricity produced from RES can be converted into hydrogen via the electrolysis process, which splits water (H₂O) into its 2 main components: hydrogen (H₂) and oxygen (O₂). Hydrogen can then be stored and transported until it is finally consumed.

Many applications using hydrogen have been demonstrated today and rely on existing mature technologies. Green hydrogen can:

- be reconverted into electricity via a fuel cell and injected into the power grid (Power-to-Power);
- be combined with CO₂ to produce methane (Power-to-Gas) which is injected into the natural gas grid, or directly injected (pure hydrogen) under specific limitations;
- be used as a fuel in Fuel Cell Electric Vehicle (FCEV) or combined with CO₂ to produce methanol (Power-to-Mobility);
- be used by the industry or in refineries instead of hydrogen produced from steam methane reforming (Power-to-Industry).

The objective of our presentation will be to present the latest status about the electrolysis technology, to explain the challenges of the different valorization routes and to show how green hydrogen can compete with other cleantech technologies towards a decarbonised energy system.

