

Hydrogen Electrolysis in Refineries

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Abstract

Shell and ITM Power will build the world's largest hydrogen electrolysis plant at the Rhineland refinery in Germany. With a peak capacity of 10 megawatts the hydrogen will be used for the processing and upgrading of products at the refinery's Wesseling site as well as testing the technology and exploring applications in other sectors. The European partner consortium of Shell, ITM Power, SINTEF, thinkstep and Element Energy is supported by the European Fuel Cell Hydrogen Joint Undertaking (FCH JU).

The project, named "Refhyne", started in January 2018 and is scheduled to be in operation by 2020 after two years of design, permitting, construction and commissioning. It will be the first industrial scale test of the polymer electrolyte membrane technology process.

This new unit at the Rhineland refinery enables hydrogen to be made from electricity rather than from natural gas. A unit of this kind brings flexibility that can help the stability of the refinery power grid, thereby facilitating more use of renewable electricity. In addition, if powered by renewable electricity, the green hydrogen will help reduce the carbon intensity of the site and of the transport fuels produced in the refinery.

Currently the Rhineland refinery, which is Germany's largest refinery, requires approximately 180,000 tons of hydrogen annually, which is produced by steam reforming from natural gas. The new facility will be able to produce an additional 1,300 tons of hydrogen per year, which can be fully integrated into the refinery processes, such as for the desulphurization of conventional fuels.

Hydrogen has the potential to play an important role in the energy transition. Today, hydrogen is already being used in transport by fuel cell vehicles, as well as in industrial applications. When used in transport, hydrogen can help improve local air quality, as the only emissions of fuel cell vehicles is water vapor. When the hydrogen is produced from renewable sources, it can help to reduce CO₂ emissions in the transport sector. Shell is also part of H2 Mobility which is currently building up in Germany a hydrogen refueling network for the transport sector.