MegaWatt Test Centre

Publieke samenvatting / Public summary

Aanleiding

More and more sustainable electricity production capacity is being developed e.g. via off-shore wind farms. The Dutch ambition regarding off-shore wind is to operate in total 4,450 MW in 2023. After 2023 the plan is to continue to construct at least 1 GW per year until 2030. The conversion of water (H2O) using sustainably produced electricity into hydrogen (H2), could create great CO2 reduction impact, since hydrogen can replace fossil fuels in a number of applications: transportation fuel, urban heating and industrial applications like green processes for the production of chemicals. Moreover, hydrogen can be stored and potentially its chemical energy can be converted back into electricity in a fuel cell. Demand for hydrogen is expected to increase to some 66 billion m3 in the year 2050.2 In this context, GW-scale electrolysis is required. Yet, current electrolysis technologies (alkaline and PEM) typically operate at MW scale (up to 10). An upscaling with a factor of more than 100 is required. Furthermore, the efficiency of the electrolysis needs to be increased up to 80%.

Doelstelling

Although the impact of producing green hydrogen at GW-scale would be immense, the chemical sector is not yet ready to make investments. There are too many technical and business risks (efficiency, stability, operation pressure, price level per kW) considering the current scale in relation to the required GW-scale. Research and more industrial scale testing and stressing at MW setups are required to discover the possibilities of upscaling to GW-scale. Given the strategic character of this

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Algemene informatie / General information

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matter, the expected impact on both environmental and economic level, the Dutch process industry has agreed to join forces and take the initiative for a collaborative research initiative. The project goal is to design, build and operate an open-innovation MW test centre for electrolysis at the Zernike campus in Groningen at the so-called EnTranCe facility (www.entrance.org), in order to run a series of research, testing and stressing projects to generate the answers that are needed from an end-user perspective.

Korte omschrijving

At the heart of the MW test centre are the most advanced water electrolysis technologies, namely alkaline and proton exchange membrane (PEM). For both technologies, stacks will be installed that have cell sizes that are close to commercial units (order of 0.5 m2). Possibly also some smaller stacks will be installed for alkaline, since these are currently also still lacking in the Netherlands. Two types of tests will be carried out in the centre: - New component testing: this consists of the testing of new components such as membranes, electrodes and cell designs in the centre. These new components will come from knowledge institutes or suppliers. Their performance will be compared to the benchmark. - Pushing the limits: this consists of tests in which the electrolyser is pushed beyond its typical limits. Pushing can be done with regard to current density, temperature, pressure, etc. Again, the performance of the electrolyser will be compared to the benchmark Initial tests will probably be short-term tests. If promising new components and conditions have been identified, it is planned to carry out longer term tests, in this way bringing innovations to a TRL of 7.

Resultaat

The expected results of the project are the physical establishment of a test facility at one location in The Netherlands. This test facility will be able to bring inventions made at knowledge institutes from a TRL of 4 to a TRL of 7, in this way providing a critical intermediate step in the valorisation of inventions. The test facility runs different experiments, tests

and research projects. The test facility will be an innovative environment open for other organizations, ideas and research to attract and push them forward. The facility can be a ground for creating an innovative ecosystem around the subject of hydrogen and electrolysis, which can place The Netherlands on number one in knowledge about 'green' hydrogen to turn our environment in 'green' economies. All outcomes from these experiments will be used to answer the main question: how to best design a gigawatt electrolyzer with the boundaries of efficiency (80%), stability, density, operation pressure (30 bara), price level per kW.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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