

Development of a Highly Efficient and Robust Solid Oxide Electrolyzer system for hydrogen production

Publieke samenvatting / Public summary

Aanleiding

Solid Oxide Electrolysis (SOE) offers the most efficient way (20-30% more efficient compared to Alkaline and PEM electrolysis) to produce green hydrogen, due to its operation at high temperature allowing favorable thermodynamics and kinetics for conversion of steam into hydrogen and direct industrial process integration. Especially in countries like the Netherlands, with a large exothermic energy and petrochemical sector (Rotterdam, Geleen, Zeeland and Delfzijl), which all produce excess of steam, SOE becomes highly interesting, due to its capability of direct reuse of steam as feedstock. First fieldready systems, manufactured by Haldor Topsoe, Sunfire, Genvia and Solid Power, are already available on the sub-MW scale while 100MW scale systems are expected to be in operation in 2024. To enhance the competitiveness of SOE even more, we would like to contribute to the CAPEX reduction target (80-90%) which is prognosticated by Hydrogen Europe (EU Joint Undertaking European Industrial & Research parties dealing with electrolyzer systems) in 2030 and to improve system lifetime of SOE electrolyzer systems.

Doelstelling

HERSO aims at the (CAPEX and maintenance) cost reduction of the SOE electrolyzer system, accelerating economic viable integration of the SOE electrolyzer system in the industrial environment.

Korte omschrijving

The HERSO project goals will be achieved by

Projectinformatie / Project information

Projectnummer / Project number
TKITOETKI2021-H2-21

Subsidiebedrag / Grant amount
€ 249.924,00

Algemene informatie / General information

Penvoerder / Secretariat
TNO

Publicaties en materialen / Publications and attachments

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Eindrapport HERSO (TKI2021-H2-21)

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focusing on increasing efficiency and lifetime of the SOE stack technology and simplification of the SOE system by increasing stack and system operating pressure. The following activities contribute to this focus: - System design study on the SOE electrolyzer system addressing an improved operational match between stack and balance-of-plant design resulting in lower CAPEX and OPEX (lower maintenance) for the overall SOE electrolyzer system. - Development of robust performing solid oxide cells and a short 1-3 cell stack with improved current density, robustness and lifetime for pressurized H₂-SOE operations (3-10 bar); - Assessment of the robust SOE electrolyzer system and integration potential in the industrial environment.

Resultaat

The HERSO project will generate the following results: - SOE system design with improved match of stack properties with the balance-of-plant components resulting in simplified less expensive and robust performing (integrated) SOE electrolyzer systems; - Solid oxide cells and short 1-3 cell stack with increased hydrogen productivity (> 7 ml/min H₂/cm² cell area), increased hydrogen pressure (3-10 bar) and increased stack lifetime (degradation rate < 10 mV/1000 hours); - Roadmap of the HERSO technology towards implementation and demonstration in the industrial environment; With these results the HERSO project contributes to the realization of economic and technical viable green hydrogen generation value chain within the next 5 years.

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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