

Next Level Solid Oxide Electrolysis Feasibility study

Publieke samenvatting / Public summary

Aanleiding

Solid oxide electrolysis cells technology (SOEC) has great potential as an innovative technology for hydrogen production and circular carbon. SOEC converts steam and carbon dioxide electrochemically directly into hydrogen gas, carbon monoxide and oxygen. SOEC's can be integrated with a range of down-stream processes, resulting in the generation of synthetic fuels, methanol, ammonia and recycling captured carbon dioxide. The favourable thermodynamics and kinetics at higher operating temperatures give a higher conversion efficiency than existing technologies like Alkaline water electrolysis and PEM. The energy efficiency can be increased by heat integration in existing chemical processes. Despite the promise of the emerging SOEC technology many uncertainties remain for the fuel and chemical industry about the practical merits of SOEC technology and the economic viability for integration in existing processes. In this project we investigate the preconditions for a feasible pilot project on SOEC technology and provide a preview with use cases of SOEC technology for the energy intensive industry.

Doelstelling

The project goal is to give the chemical and fuels industry a guideline in the applications and near-term perspective of integrated SOEC-technology. This feasibility study will, if applicable, be followed by a pilot project in which pilots at (an) industrial site(s) will be realized. Our main objectives are: 1.

Projectinformatie / Project information

Projectnummer / Project number
TESN221009

Subsidiebedrag / Grant amount
€ 160.262,00

Algemene informatie / General information

Penvoerder / Secretariat
Stichting Ispt

Publicaties en materialen / Publications and attachments

- 05.03.2024

Samenvatting TESH221009

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Exploring application areas and possibilities for process- and heat integration of SOEC-technology in the industrial clusters in the NL. 2. Developing scale-up scenarios towards large scale SOEC to shorten time to market and bring the technology to next level. 3. Optimizing integration in up and downstream processing and focusing on heat integration. 4. Generating OPEX and CAPEX cost estimates for the upscaled SOEC solutions, achieved energy efficiency and integration options. 5. Roadmap describing user case selection for piloting possibilities followed by an approach description towards on-site industrial scale pilots.

Korte omschrijving

The feasibility of integrating SOEC technology will be studied in three different case studies with large industries: - hydrogen production in ammonia plant at OCI; - syngas and green hydrogen integrated with blue hydrogen and downstream e-fuels at BP; - coal monoxide production at Air Liquide. For each use case the integration options of the SOEC technology in the industrial environment, including options for heat integration and retrofit integration, will be explored. We will research both the technical and economic aspects of SOEC integration, resulting in a roadmap for SOEC integration in a (use case) pilot plant.

Resultaat

- An overview of SOEC ins and outs in an integration model for each use case, covering heat integration, retrofit integration fulfilling the interest of the industrial stakeholders. - SOE technology scale-up options and feasibility towards multi-MW to GW-scale. This is of importance for further future roll-out of the technology on realistic industrial scale. - Industrial use cases including process flow diagrams, high level heat and material balances established in close cooperation with industry partners. - High level techno-economic evaluation resulting in energy efficiency numbers towards the product, OPEX and CAPEX. The CAPEX and OPEX numbers give the foundation for the economic viability of the different integration cases. - Roadmap describing and defining the piloting

possibilities for the selected use cases, including the required steps and value chain towards on-site pilots in a potential follow-up project.

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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