

GigaWatt Scale part 1

Publieke samenvatting / Public summary

Aanleiding

In the energy system of the near future a key role will be played by renewable electricity. This will feed the platform for green value chains with H₂ as intermediate for products (e.g. via the syngas platform or the ammonia platform), for mobility and for heating. The key technology in this value chain is H₂ production via electrolysis. Hydrogen production via electrolysis is currently done only at 1-MW scale¹. However, to match the demand for hydrogen of the Dutch industry and to play a significant role in buffering the future intermittent power supply, a significant scale up is required of the electrolyser capacity at least to the 1-GW scale. Yet, this scale-up is unprecedented and hence not been considered to be viable on the short-term.

Doelstelling

Main research challenge: develop a conceptual design and a transparent cost estimation methodology for a 1-GW electrolyser plant that is ready for start-up in 2025 and that delivers H₂ at a TAC level that is below the cost level of current H₂ manufacturing technologies. This translates in the following sub-questions: 1. How can investment costs per cell be reduced? 2. What are the key barriers to overcome towards larger cells: current density, pressure, temperature, membrane sizes, base material (PEM, alkaline, AEM), spacing, heat removal? 3. What is the optimal configuration of cells into stacks, considering the amount of heat to be removed, but also in view of accessibility for maintenance purposes? 4. Which turn-down levels and rates of the 1-GW electrolyser should be assumed? How can this be accomplished given

Projectinformatie / Project information

Projectnummer / Project number

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Algemene informatie / General information

Penvoerder / Secretariat

ISPT

Publicaties en materialen / Publications and attachments

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assumed wind-power intermittency profiles? 5. What is (are) the most suitable location(s) for these 1-GW electrolyser plants? 6. What are the projected costs over time, most-likely business models and financial risks related to building and operating such facilities?

Korte omschrijving

For practical purpose the 1-GW project has been split in two parts. The current proposal addresses Part 1, aimed to start early Q3 2018. This first part focuses on research questions 1 through 3 and provides the foundations and tools that enable addressing the research questions 3 through 6. In part 1, founding work is done to obtain a fundamental understanding of how economies-of-scale of a large electrolysis facility can be combined optimally with the learning curves of electrolysis components, cells, stacks and system integration and manufacturing, relating to the economies-of-numbers of the OEM manufacturing industry. Part 2 is projected to start early 2019 and shifts focus from ISBL, the plant internal design, to OSBL, the interaction with the plant environment. In this second part regional case studies will be carried out to identify how local conditions related to the industry served determine and influence the design parameters, cost structure and many other aspects necessary to address when installing a GW-scale electrolysis plant.

Resultaat

Key Deliverables:

- Summary of intermediate outcomes of the program to be published every six months
- Revised scope and reformulation of the project objectives every year based on the progress made
- A series of white papers that can be used to consult and/or challenge innovation by electrolyser system suppliers.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar www.rvo.nl/tse.