Towards solid oxide electrolysis plants in 2020

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Publication date: 2017

Document Version
Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):

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SOEC is a unique energy conversion technology that can provide regulating services to the electrical power grid by efficient storage of electrical energy as fuels. The fuels can be converted back to electricity by running the SOEC in the reverse power generation mode.

Denmark’s ambitious plan to rapidly increase the fraction of renewable energy supply towards 100% over the coming 35 years will lead to huge changes in the electricity grid and a need for large-scale energy storage due to the intermittent nature of wind and solar power.

The project is structured into five technical work packages (WPs), WP 1-4 focus on the SOEC technology development, covering from SOEC single cell, stack components, to stacks and systems, while WP5 provides analysis on energy system level and gives inputs to WPs 1-4.

The SOEC technology is a key player in the transition to renewable energy available from around 2020. The current project is based on the previous line of SOEC-focused ForskEL projects (ForskEL 10609 “Development of SOEC cells and stacks” and ForskEL 12013 “Solid oxide electrolysis for grid balancing”), of which ForskEL 12013 was awarded with the ForskEL award as the best finalized ForskEL project in 2015.

A number of good results on the SOEC technology development have been achieved in the current project.

Some of them have already been implemented in the SOEC production at HTAS, such as the improved SOEC stack and SOEC-CORE designs.

The results obtained by DTU Energy, in particular improvements in performance and durability of cells and stack components, improved understanding of degradation mechanisms, and fruitful degradation mitigation strategies will be transferred to HTAS.

The power converters developed by DTU Elektro will be transferred to companies specialized in this area.

The results obtained in the series of ForskEL projects including the current project played a key role in achieving the development targets necessary for commercialization of the Danish SOEC technology.