RESelyser (278732)

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General Overview

- “Hydrogen from RES: pressurised alkaline electrolyser with high efficiency and wide operating range”
- Duration Nov. 2011 – Oct. 2014
- Total budget: 2.89 Mio. €, FCH-JU contribution: 1.48 Mio. €; Regional support: 594,000 DKK from ForskEl program of Energinet.dk
- Consortium:

  DLR Dt. Zentrum f. Luft- und Raumfahrt - Germany (coordinator)

  VITO Vlaamse Instelling voor Technilogisch Onderzoek N.V. – Belgium

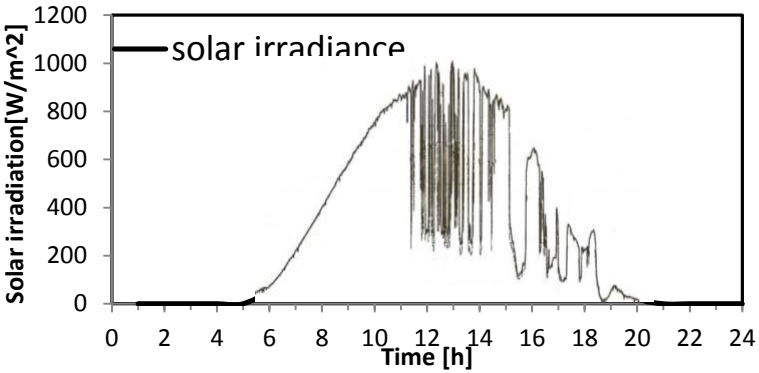
  Hydrogenics Europe NV – Belgium

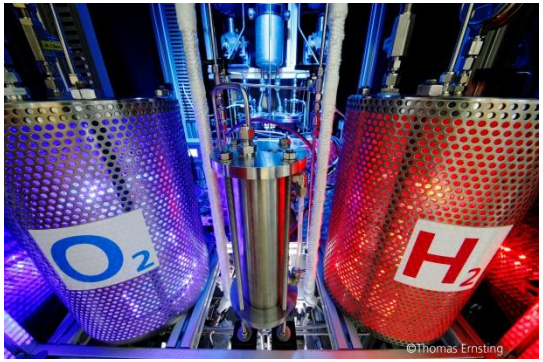
  DTU Danmark Techniske Universitet, Risoe Lab - Denmark

➢ Project objectives and targets in relation to the AIP/MAIP

The project develops **high pressure**, **low cost** alkaline water electrolysers that can be integrated with **renewable power sources** using

- an advanced membrane concept,
- highly efficient electrodes
- and a new cell concept





RES elyser

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AIP 2010 efficient alkaline electrolyser	RESelyser Objectives

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- Electrolyser system operating at 15 MPa with internal compression or 3MPa bar without additional compressing means

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- Retention of >90% of initial efficiency over at least 1000 on/off switching cycles demonstrated with 10 kW electrolyser
- Modular system cost 1,000 € per Nm^3/h plant capacity for the stack and 3,000 € /Nm^3 for a complete system

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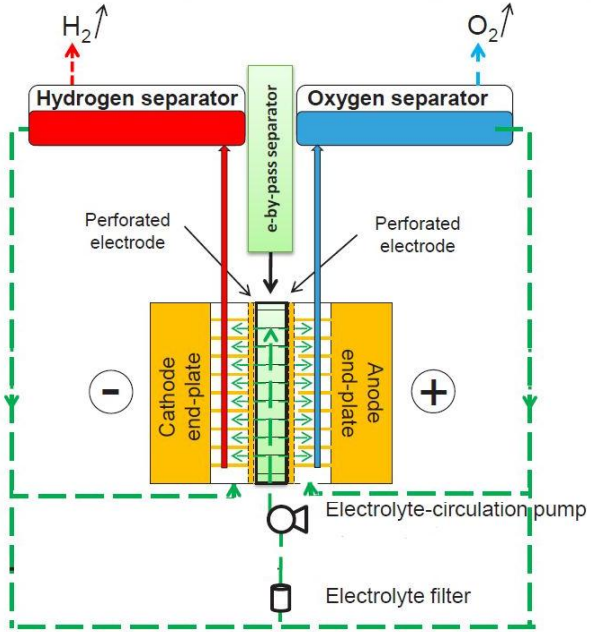
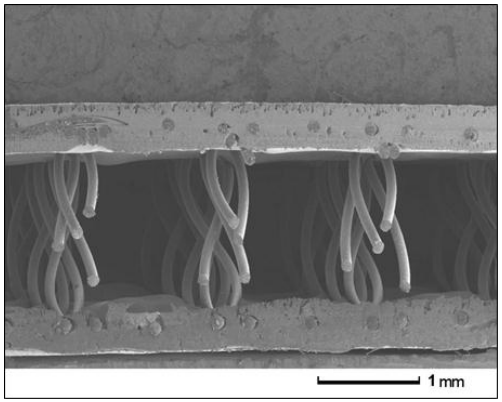
- Electrolyser system operating at 10-15MPa concept, 2.5MPa realisation
- Retention of >90% of initial efficiency over at least 1000 on/off switching cycles demonstrated with 10 kW electrolyser
- Modular system cost 3,000 € per Nm^3/h plant capacity for the complete system

➢ Project Achievements in respect to the stated objectives and targets

- RES-operation-> Improvements in low current density and high pressure as well as high current density region by « e-bypass membrane »





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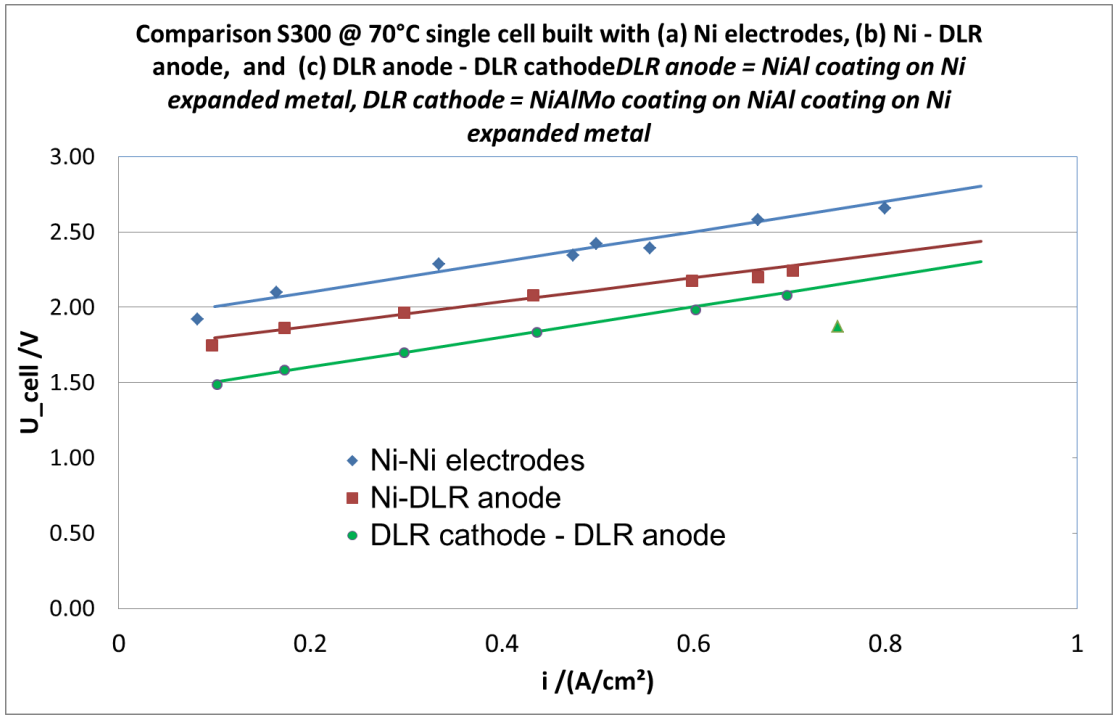

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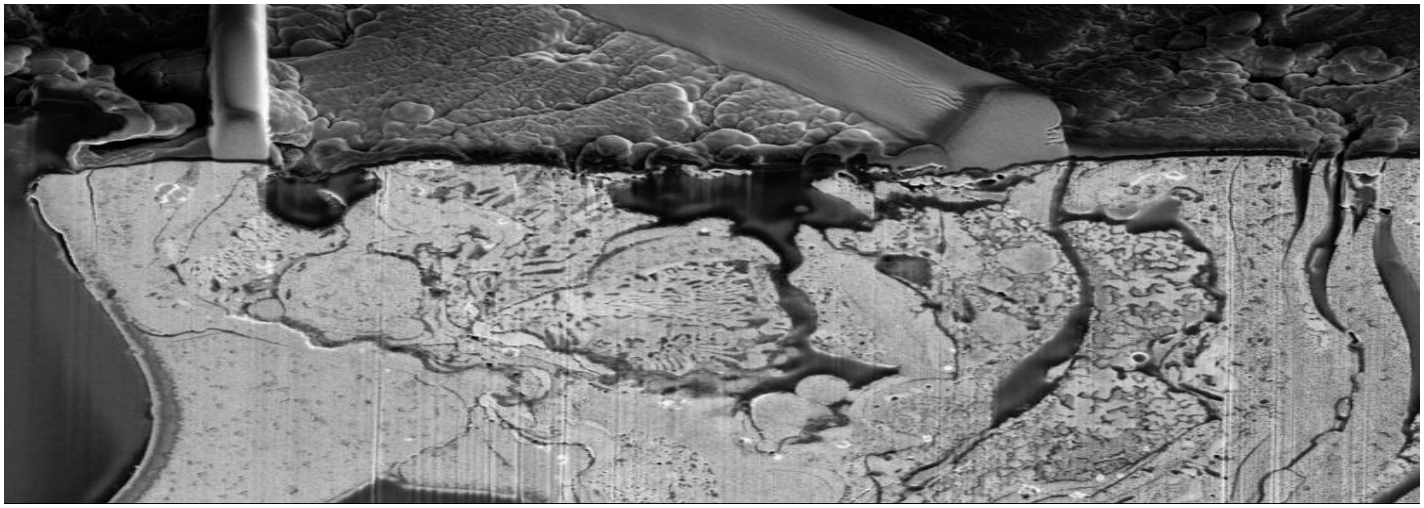
- Porosity investigation of electrode coating by 3D SEM reconstruction



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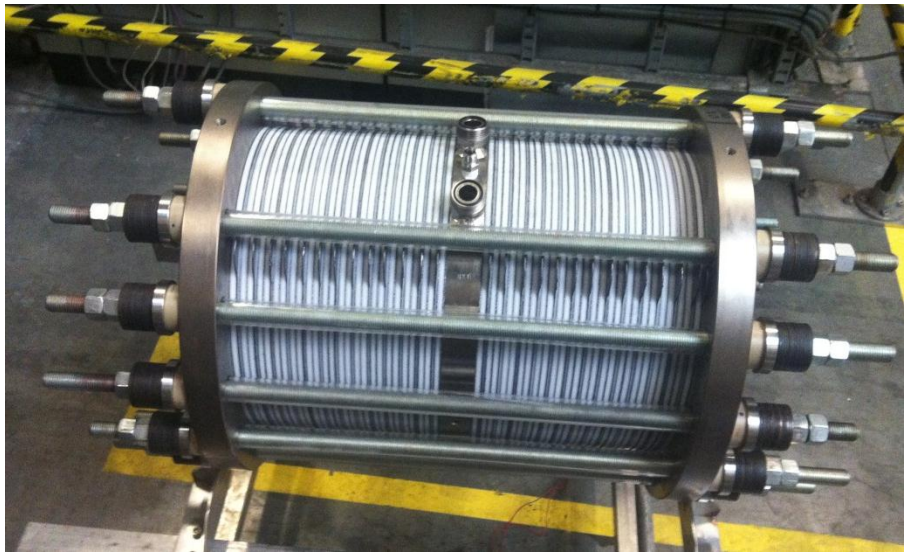
- 10 kW stack with e-bypass membrane and Plasma-spray coated electrodes



- **Evaluation of the progress towards the overall project objectives**

Power level single stack 30 kW	10 kW stack ready
Efficiency @0.75 A/cm^2: η>80% on HHV basis demonstrated with 300 cm^2 electrodes, low cost materials	η=70%
Retention of >90% of initial efficiency over at least 1000 on/off switching cycles demonstrated with 10 kW electrolyser	Tests in preparation
Modular system cost 3,000 € per Nm^3/h plant capacity for the complete system	System not yet defined and quantified

➢ Bottlenecks and Risks

- Some delays
  - delayed materials delivery from suppliers
- Delay because of sealing / mechanical construction
- Extra effort for adequate degassing efficiency

- **Complementarity with Projects from Other Programs**
- DTU Energinet.dk
- DLR German national projects
- Hydrogenics Ingrid FP7 nr. 296012 (DG-Energy) / Don Quichote (FCH-JTI nr. 303411)
- VITO ElyGRID
- **Dissemination Activities**
- Workshop planned with ElyGRID
- Papers
- Conference and exposition presentations

- **Exploitation and Post-Project Activities**
- Added value in Hydrogenics'commercial electrolysers

  electrode materials, sealing, elevated pressure concept, control electronics,…
- Licensing of materials and concepts to other interested companies
- **Recommendations towards the Programme**
- Next step: to realise the technique in a full scale technical electrolyser and demonstrate the connection to renewable energy sources
- Further improvements of the electrolyser by establishing and using techniques for measurement in the electrolyser (e.g. current density distribution) and by theoretical simulations (eg. bubble formation and transport)