adel Advanced Electrolysers

Project Factsheet

ADEL - ADvanced ELectrolyser for Hydrogen Production with Renewable Energy Sources

Background

European energy dependency is steadily rising with perspectives of reaching around 70% of the Union's energy requirements in the next 20 to 30 years, compared to 50% today. Moreover, imported products frequently come from politically unstable regions with prices subject to large and frequent variations. Furthermore, our environment is challenged by a variety of threats. Europe, with other industrialised continents or countries in the world has already set the example by adopting an ambitious policy for a lean and ideally a CO_2 free energy production and use. Therefore, a series of strategic goals has been defined to reduce greenhouse gas emissions:

- 20% reduction in greenhouse gas emissions compared with 1990 levels
- 20% share of renewable energy sources in the energy mix
- 20% reduction in primary energy use

The European Strategic Energy Technology (SET) Plan has identified fuel cells and hydrogen (H_2) among the technologies needed to achieve these 2020 targets and to meet the long-term vision for 2050 towards decarbonisation.

Objectives

The ADEL project (ADvanced ELectrolyser for Hydrogen Production with Renewable Energy Sources) focuses on the development of cost-competitive, high energy efficient and sustainable H_2 production based on renewable energy sources. To achieve this goal, a new steam electrolyser concept will be developed, the Intermediate Temperature Steam Electrolysis (ITSE). The technology aims at optimizing the electrolyser lifetime by decreasing its operating temperature while maintaining a satisfactory performance level. In addition a high energy efficiency at the system level should be reached by optimally combining the heat and power source and the electrolyser unit.

This project is built on a two scales parallel approach:

- At the stack level, the adaptation and improvement of current most innovative cells, interconnect/coating and sealing components for ITSE operation conditions (temperature down to 600°C) aims at increasing the electrolyser lifetime by decreasing its degradation rate to less than 1%/1000hrs (0.5%/1000hrs at the cell level). Special attention will be given to sealing methods in order to increase the mechanical durability of the cell, especially upon transient operation conditions, and to the association interconnect/coating in order to limit the cell internal resistance and allow current densities across the cell as high as $2A/cm^2$.
- At the system level, to facilitate an exhaustive and quantified analysis of the integration of this "new generation ITSE" with different heat and power sources like wind, solar, geothermal and nuclear, flow sheets will be produced with adjustable parameters. For selected cases, an in depth energy efficiency evaluation will be done based on obtained stack data at intermediate temperature, and on comprehensive description of energy sources.

Funding programme:
7th Framework Programme of the European Union (FP7) / Fuel Cells and Hydrogen Joint Undertaking (FCH-JU)

SEVENTH FRAMEWORK PROGRAMME

New Energy World JU
fuel cells & hydrogen for sustainability

Project start:
1 January 2011

Project duration:
36 months

Project budget:
4.1 million euro

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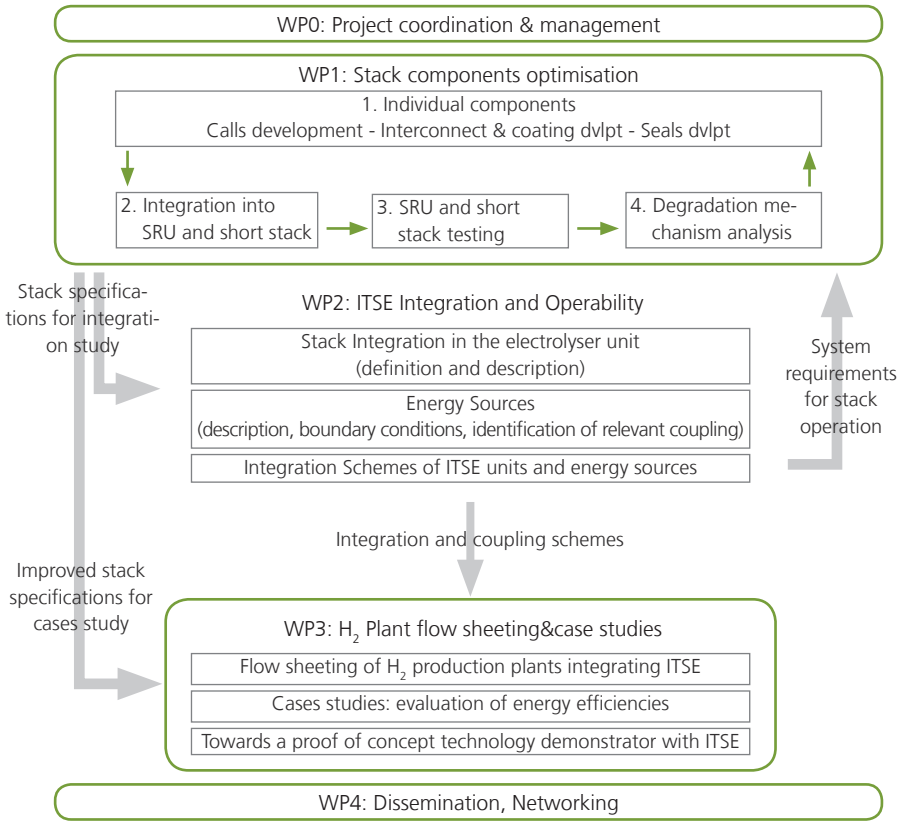
Activities

To achieve these scientific and technological objectives and lead the two scales parallel approach, the ADEL project is organised in three technical work packages (WP) and two support work packages.



The work plan takes full advantage of the highly specialised industrial and academic partners` knowledge and skills.

Impact

The ADEL project will provide a preliminary specification of a proof of concept demonstrator that will pave the way to further demonstration and pre-commercialisation activities. It will also gather a pool of complementary industries to develop and bring to the market a sustainable H_2 production technology based on Intermediate ITSE coupled to renewable energy sources. This will enable the ADEL partners to jointly make a significant contribution to developing a portfolio of sustainable H_2 production liable to meet 10% - 20% of the H_2 demand for energy applications from carbon-free or lean energy sources by 2015.

Project coordinator:

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Project participants:

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- Abengoa Hidrógeno, S. A., ES
- Commissariat à l'Energie Atomique, FR
- Deutsches Zentrum für Luft und Raumfahrt e.V., DE
- Eidgenössische Materialprüfungs- und Forschungsanstalt, CH
- Empresarios Agrupados, ES
- European Institute for Energy Research, DE
- Fundacion IMDEA Energia, ES
- HyGear B.V., NL
- Joint Research Center, BE
- SOFCpower S.r.l., IT
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