The Fuel Cells and Hydrogen Joint Undertaking (FCH JU)

The Fuel Cells and Hydrogen Joint Undertaking (FCH JU) is a public private partnership supporting research, technological development and demonstration (RTD) activities in fuel cell and hydrogen energy technologies in Europe. Its aim is to accelerate the market introduction of these technologies, realizing their potential as an instrument in achieving a carbon-lean energy system. The three members of the FCH JU are the European Commission, fuel cell and hydrogen industries represented by the NEW Industry Grouping and the research community represented by Research Grouping N.ERGHY.

http://www.fch-ju.eu

SOL2HY2

Solar To Hydrogen Hybrid Cycles

SOL2HY2, is a multi-disciplinary project with a strong participation of research-intensive university (Aalto University Foundation, Finland) and R&D centres (DLR - German Aerospace Authority, ENEA - Agenzia per le Nuove Tecnologie, l'Energia e lo Sviluppo Economico Sostenibile, Italy), industry (Outotec Corp., Finland) and SMEs (EnginSoft S.p.A., Italy; Erbicol S.A., Switzerland, Oy Woikoski AB, Finland).

SOL2HY2 is a Research Project co-financed by the Fuel Cells and Hydrogen Joint Undertaking

Starting date: 1st June 2013

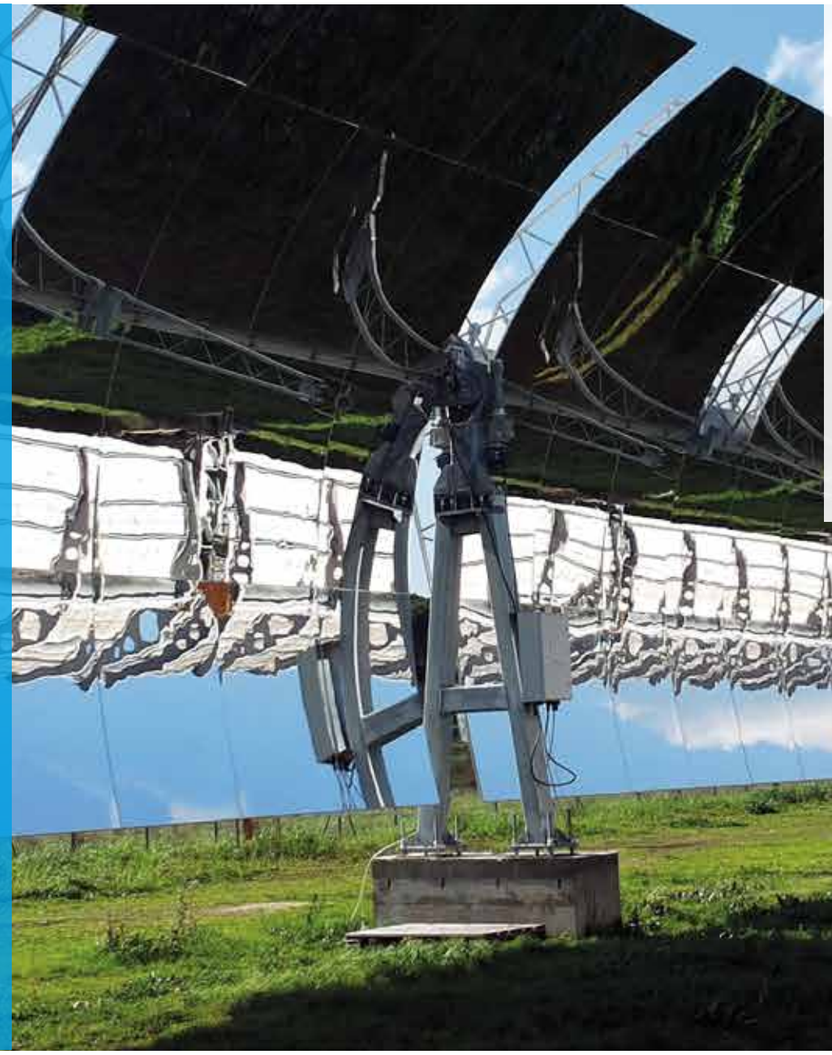
Duration: 36 months

Budget: Total Budget: 3.701.300 Euro
FCH contribution: 1.991.115 Euro

Topic: FCH-JU-2012-1 SP1-JTI-FCH.2012.2.5 :
Thermo-electrical-chemical processes with solar heat sources

Project Coordinator: EnginSoft S.p.A., Italy
Contact person: Prof. Stefano Odorizzi

Scientific Coordinator: Aalto University Foundation, Finland
Contact person: Prof. Michael Gasik



Hydrogen "green" production will finally be possible through the exploitation of solar power.

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THE PROJECT CONCEPT OUTLINE

The FCH JU strategy has identified hydrogen production powered by renewables such as solar energy to be a major component for sustainable supply.

Different solar-powered cycles are capable to convert sunlight into chemical energy by a series of chemical and electrochemical reactions.

Only few such thermochemical cycles have been proven to be feasible for practical realization. The hybrid-sulphur (HyS) has been ranked by IEA HIA Task25 and other studies to be the most promising one. However, the original HyS cycle has been always associated with nuclear heat and electricity sources as the H_2 production was evaluated to be more economic since high-temperature input is needed to decompose the intermediate product - sulphuric acid. The recent technology concepts are unlikely to achieve hydrogen costs below 3.0-3.5 €/kg.

The aim of the SOL2HY2 project is to demonstrate that the HyS cycle can be economically realized using mainly concentrated solar power.

The challenges in HyS realization remain mostly in materials and with the whole process optimisation, needed to be tailored to specific solar input and plant site location. The consortium starts with the integration of solar-power sources into the new Outotec® Open Cycle .

The whole production chain and flowsheet will be connected to multi-objective design, optimisation and meta-modeling.

Courtesy of DLR

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PROGRESS BEYOND THE STATE OF THE ART

Optimized key components:

- **Solar thermal storage**
  aimed to provide 500-550°C continuous output within 24 h with >95% efficiency and integrated design
- **Sulphur dioxide depolarized electrolyser catalysts**
  without Pt or Pd, stable against sulphuric acid and sulphur compounds
- **High-performance SiC- based ceramics**
  for acid cracker with novel proven catalysts
- **Gases separation and purification**
- **Solar sulphuric acid cracking:**
  development of pilot plant on solar tower

Modelling and simulation of the whole plant:

- **Virtual plants model**
  Combination of cycles/stages and sub-components integration with thermodynamic software and databases, flowsheet simulators
- **Pareto-optimal concepts combinations**
  Simulation of the developed virtual plants constrained by technical, manufacturing, economical and environmental reasons.