



# Hydrogen Europe: European Hydrogen & Fuel cell Project Database

## Project SOPHIA

Solar integrated pressurized high temperature electrolysis

Hydrogen and other fuels are expected to play a key role as energy carrier for the transport sector and as energy buffer for the integration of large amounts of renewable energy into the grid. Therefore the development of carbon lean technologies producing hydrogen at reasonable price from renewable or low CO<sub>2</sub> emitting sources like nuclear is of utmost importance. It is the case of water electrolysis, and among the various technologies, high temperature steam electrolysis (so-called HTE or SOE for Solid Oxide Electrolysis) presents a major interest, since less electricity is required to dissociate water at high temperature, the remaining part of the required dissociation energy being added as heat, available at a lower price level. In addition, technologies that offer the possibility not only to transform energy without CO<sub>2</sub> emissions, but even to recycle CO<sub>2</sub> produced elsewhere are rare. High temperature co-electrolysis offers such a possibility, by a joint electrolysis of CO<sub>2</sub> and H<sub>2</sub>O, to produce syngas (H<sub>2</sub>+CO), which is the standard intermediate for the subsequent production of methane or other gaseous or liquid fuels after an additional processing step. These aspects are covered by the SOPHIA project. A 3 kWe-size pressurized HTE system, coupled to a concentrated solar energy source will be designed, fabricated and operated on-sun for proof of principle. Second, it will prove the concept of co-electrolysis at the stack level while operated also pressurized. The achievement of such targets needs key developments that are addressed into SOPHIA. Further, SOPHIA identifies different “power to gas” scenarios of complete process chain (including power, heat and CO<sub>2</sub> sources) for the technological concept development and its end-products valorisation. A techno-economic analysis will be carried out for different case studies identified for concepts industrialization and a Life Cycle Analysis with respect to environmental aspects according to Eco-indicator 99 will be performed.

## Project Information

**Type of project :** Research

**Timing :** 01/04/2014 > 30/09/2017

**Project website:** <http://www.sophia-project.eu/>

**Project Budget :** 6.080.105 €

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## Funding

European Union through FCH JU: Grant agreement 621173 - [CORDIS link](#)

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## Project partners

**Coordinator :**

HyGear B.V.

**Partners :**

CEA - Commissariat à l'énergie atomique et aux énergies alternatives

DLR - German Aerospace Center

Teknologian tutkimuskeskus VTT Oy

ENGIE

HTceramix SA

ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE

SOLIDPOWER SPA

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**Sub project(s)**

**Sub project 1**

**Country:** Netherlands

**Address:**

Westervoortsedijk 73 6827 AV Arnhem

**Sub project categories**

Research

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Project Id: 1093

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