FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Energy Pillar

H2 Production
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Stationary FCs
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Energy Pillar Overview

Hydrogen Production

Main Focus

- Further increase in capacities of low & high temperature electrolysers to be demonstrated in new applications
- Concentrated solar energy for thermochemical hydrogen production
- Alternative H2 carriers for stationary storage

What is new

- MW-scale high-temperature electrolyser
- Robust materials for thermochemical H_2 production
- Hydrogen carriers for stationary H_2 storage

Energy Pillar

4 topics – 20 M€

Topic	Type of Action	Ind. FCH Cont. (M€)
FCH-02-1-2018: Demonstration of a large-scale (min. 20MW) electrolyser for converting renewable energy to hydrogen	IA	11
FCH-02-2-2018: Demonstration of large-scale steam electrolyser system in industrial market	IA	4
FCH-02-4-2018: Thermochemical Hydrogen Production from Concentrated Sunlight	RIA	3
FCH-02-5-2018: Hydrogen carriers for stationary storage of excess renewable energy	RIA	2

Energy Pillar Topics

Hydrogen Production – Innovation Action (IA)

FCH-02-1-2018: Demonstration of a large-scale (min. 20MW) electrolyser for converting renewable energy to hydrogen

Develop 20 MW rapid response electrolyser to convert RES e- to RES H_2 for use in end-market valorising renewable value of H_2

- Favourable economic conditions, e.g. upstream connection in wind park
- Minimise footprint, single BoP
- Steel, refining industrial sectors excluded

FCH-02-2-2018: Demonstration of large-scale steam electrolyser system in industrial market

Scale-up SOE to “megawatt class”, reducing CAPEX < 3M€/(t/d)

- 15kg/hr H_2 production using renewable electricity
- Two year operation without stack replacement, cumulated 50tons of renewable H_2
- <40kWhel/kg, <5min hot start, >90% availability

Energy Pillar Topics

Hydrogen Production – Research and Innovation Action (RIA)

FCH-02-4-2018: Thermochemical Hydrogen Production from Concentrated Sunlight

Improve performance of 500kW concentrated solar system for H_2 production

- Improve the stability, cyclability and performance of functional materials for high temperature water splitting aiming for 1,000 cycles or 5,000 hours of operation
- > 50% heat recovery rates, < 25% heat loses of flushing gas: design for 10% solar-to-fuel efficiency, 5% in the field

FCH-02-5-2018: Hydrogen carriers for stationary storage of excess renewable energy

Develop & demonstrate >50kg H_2 storage system

- 70% round trip efficiency
- Liquid organic carriers are not eligible for this call

Energy Pillar Topics

Stationary Fuel Cells for Heat and Power Generation

Main Focus

- Solid oxide fuel cells (component and system level)
- Waste/biomass-to-energy and (storage)
- Demonstrate and unlock new markets

What is new

- Dedicated topic on novel interconnects solutions
- Cost-optimisation of cogeneration with fuel cells using biogas
- Pathways for waste-to-energy concepts using solid oxide membrane reactors
- Demonstration of fuel cells for long term power supply in remote locations

Energy Pillar

4 Topics – 7 M€

Topic	Type of Action	Ind. FCH Contribution (M€)
FCH-02-3-2018: Robust, efficient long term remote power supply	IA	3
FCH-02-6-2018: Cost-effective novel architectures of interconnects	RIA	2
FCH-02-7-2018: Efficient and cost-optimised biogas-based co-generation by high-temperature fuel cells	RIA	1.5
FCH-02-8-2018: Waste-stream based power balancing plants with high efficiency, high flexibility and power-to-X capability	RIA	0.5

Energy Pillar Topics

Stationary Fuel Cells - Innovation Action (IA)

FCH-02-3-2018: Robust, efficient long term remote power supply

Develop and demonstrate **FCs for remote power supply** in gas and oil infrastructure and telecom towers to replace inefficient conventional solutions

- Create long-term **track record** in real **installations** (efficiency, harsh climate conditions, reliability, service lifetime, maintenance)
- No less than **15 units** in the power range of 0.5 to 5 kW_e with overall power capacity >**15kW_e**
- At least **3** stack **manufacturers** or fuel cell **integrators**
- Firm **commitment from end-users** should be demonstrated
- **Cost reduction** through value engineering and manufacturing readiness for serial production

Energy Pillar Topics

Stationary Fuel Cells - Research and Innovation Actions (RIA)

FCH-02-6-2018: Cost-effective novel architectures of interconnects

Development of **cost effective novel interconnects** for SOFCs and SOECs

- **demonstrate** solutions for >3000 hours and 50 cycles **in a 1 kW stack**
- demonstrate **low cost fabrication** solutions **adaptable** to any stack design and for mass-manufacturing processes
- **involve** (European) **actors across full value chain** (at least one component and stack manufacturer)
- expected **KPIs** for both fuel cell and electrolysis operation modes

FCH-02-7-2018: Efficient and cost-optimised biogas-based co-generation by high-temperature FCs

Design and engineer an **integrated biogas-fed fuel cell system architecture** with minimal gas pre-processing

- universal one-stop appliance to process **different types of biogas** for **HTFC systems**
- **efficient, low-cost** and **modular** solutions: η_e>53%, <3500 €/kW_e (FC and gas processing system)
- at least **2 HTFC manufacturers**
- address **design of a full-scale system**

Energy Pillar Topics

Stationary Fuel Cells - Research and Innovation Action (RIA)

FCH-02-8-2018: Waste-stream based power balancing plants with high efficiency, high flexibility and power-to-X capability

Using **Solid Oxide membrane reactors based plants** for **power generation and energy storage using** waste and biomass derived fuels

- **identify** long-term **low-grade waste streams** and **processes to transform** them
- develop concepts considering a **RES dominated power generation** landscape
- define requirements underpinning **viable business cases**
- develop a **pathway** for a gradual **integration** of Solid Oxide membrane reactors based plants
- focus on conceptual engineering work rather than experimental but **new technical concepts should be elaborated**