FUEL CELLS and HYDROGEN 2 - JOINT UNDERTAKING

FCH 2 JU is a public-private partnership focusing on the objective of **accelerating the commercialization of fuel cell and hydrogen technologies**. Its aim is to contribute to the Union's wider competitiveness goals, leverage private investment, industry-led implementation structure. The three members of the FCH JU are the European Commission, fuel cell and hydrogen industries represented by Hydrogen Europe and the research community represented by Hydrogen Europe Research.

A call for proposals with an indicative budget of **EUR 73.2 M** has been launched on January 16th 2018, addressing key challenges as identified by the stakeholders in the Joint Undertaking. These challenges encompass different areas of research and innovation: a total of 20 topics are part of the call for proposals, including 7 for **Transport**, 8 for **Energy**, 1 for **Overarching** and 4 for **Cross-Cutting** issues. They will be grouped into 5 Innovation Actions (IA), 14 Research and Innovation Actions (RIA) and 1 Coordination and Support Action (CSA).

The deadline for applications is April 24th 2018.

Research and innovation on **Fuel Cells and Hydrogen technologies** is not funded under the Societal Challenge 3, with one exception: topic on Smart Cities and Communities.

Transport

Polymer Electrolyte Membrane (PEM) technology *is the main enabling technology for all transport applications. Specifically the cost reduction, increased power density and durability are challenges that have to be tackled continuously and over several product generations, fostering the EU supply chain. In this call, two topics address these challenges, albeit at different technical readiness levels (TRL): one focusing on the* ***evolution of Microelectrode Array (MEA) technology*** *and the other asking for a* ***more radical approach to automotive stack technology****.*

Another key transport enabling technology is ***compressed hydrogen storage****. The challenge asked in this call lies specifically in the strengthening of the European supply chain by driving competition among various players, which should lead to cost reduction and improved technical performance.*

Heavy-duty trucks *are an application of strategic value since it is foreseen to take the best value of the advantages of fuel cell systems for transport compared with other zero-emission technologies: long range and reduced refuel time. These aspects should translate in monetary value for its operators as well. A demonstration of this application aims to pinpoint the ideal conditions for its operation, including all relevant stakeholders such as customers, Original Equipment Manufacturers (OEMs), suppliers, operators, and experimenting various business models.*

Similarly, ***long distance maritime applications*** *such as mid-size passenger ships or inland freight will be demonstrated in order to better understand the market potential (and business cases/feasibility) and regulatory issues.*

The quest for the commercial offer of ***fuel cell aeronautic applications*** *continues with concrete steps in modularization and certification process. Both Unmanned Aerial Vehicle (UAV) and small maned planes alike could benefit from the result of successful projects focusing on the Fuel Cell system components.*

Further research to ***reduce cost and increase Hydrogen Refueling Station (HRS) performance****, specifically on the compression process will also be addressed in this call. The cost and reliability of the HRS infrastructure remain the key challenges for OEMs, operators and customers alike.*

Action	Topic
IA	Large Scale Demonstration of H2 fueled HD Trucks with High Capacity Hydrogen Refueling Stations (HRS)
IA	Demonstration of Fuel Cell applications for mid-size passenger ships or inland freight
RIA	Strengthening of the European supply chain for compressed storage systems for transport applications
RIA	Fuel cell systems for the propulsion of aerial passenger vehicle
RIA	Next generation automotive MEA development
RIA	Game changer fuel cell stack for automotive applications
RIA	Improvement of innovative compression concepts for large scale transport applications

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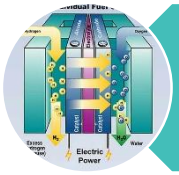
RIA: Research and Innovation Action
IA: Innovation Action
CSA: Coordination and Support Action



Energy

Electrolysis as key enabling technology for increased renewables sources remains in the focus of the FCH 2 JU. As regards ***more mature water electrolyser technologies****, a further increase in hydrogen production respectively power transformation capacity is aimed at, with a 20 MW water electrolyser integrated, connected to renewable energy sources and for greening the industry (e.g. fertilizers, food industry etc). Less mature steam electrolysers should also progress in scale; the related topic will aim to demonstrate a 15 kg/hr hydrogen electrolyser, using renewable electricity only and making use of heat resources directly available within an industrial context for the steam generation. While the demonstration should allow for* ***cost reduction by increasing the volume****, a separate research topic aims to* ***reduce the cost by establishing a supply chain for the major stack cost item, the metallic interconnects****. By integrating results from several projects into an industrially manufactured component,* ***new, more competitive value chains for solid-oxide stack manufacturing should be enabled****. Solid oxide fuel cell manufacturers should also benefit from this topic, as they use very similar or identical components in their fuel cells stacks.*

Besides electrolysis, the more ***long-term option of direct hydrogen production from concentrated solar sources will be explored****. Transformation efficiency to hydrogen is here in focus.*

The storage and distribution of hydrogen for stationary applications faces some challenges. ***Low pressure solution with hydrogen carriers*** *have been shown feasible and the aim now is to transform this in engineered solutions, showing the expected lower cost and higher energy efficiency of such solutions.*

As regards the stationary fuel cells (for CHP solutions), the exploitation of the strengths of solid oxide fuel cells in different context will be demonstrated. One topic aims at ***simplifying the purification of biogas****, while exploiting the biogas contained CO2 in fuel cells to achieve high electrical efficiencies. Another topic will demonstrate the* ***robustness of the fuel cell systems with respect to hostile environmental conditions*** *(temperature, humidity) that are encountered in remote areas, such as for the protection of gas pipelines. Today, low efficient or maintenance intensive products are used, which offers the technology a market niche of significant size on the global level. Finally,* ***solid oxide membrane reactors*** *present the ability to operate reversibly in electrolysis and fuel cell mode. Their high operating temperature and the use of an oxygen membrane present many technical options for an optimised exploitation of various carbon-containing waste streams that likely will be transformed by gasification processes in a first step. Those new technical options for thermal and energetical integration for such power balancing plants will be first engineered, before proceeding further in this direction.*

Action	Topic
IA	Demonstration of a large-scale (min. 20MW) electrolyser for converting renewable energy to hydrogen
IA	Demonstration of large-scale steam electrolyser system in industrial market
IA	Robust, efficient long term remote power supply
RIA	Thermochemical Hydrogen Production from Concentrated Sunlight
RIA	Hydrogen carriers for stationary storage of excess renewable energy
RIA	Cost-effective novel architectures of interconnects
RIA	Efficient and cost-optimised biogas-based co-generation by high-temperature fuel cells
RIA	Waste-stream based power balancing plants with high efficiency, high flexibility and power-to-X capability

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Overarching

*These activities look at **synergies between transport and energy applications**. For this call, the topic will investigate **fuel cell applications (stationary and mobile) in port environments**, as these have been identified as areas where high reductions of emissions can be achieved.*

Action	Topic
RIA	Developing Fuel Cell applications for port/harbour ecosystems

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Cross-Cutting

Crosscutting activities are included in order to both support and enable activities undertaken within the Energy and Transport Pillars, and also to facilitate the transition to market for fuel cell and hydrogen technologies.

***Pre-normative research** (PNR) is more and more necessary for safety of road applications in confined structures, including tunnels; the results should contribute to related standards.*

*It is considered strategic to start looking at the **hydrogen admixture in the natural gas grid and the impact on Europe energy transition**; injecting hydrogen admixtures into the natural gas network can contribute significantly to solving the problem of transporting and storing surplus electricity generated from renewable resources, therefore in order to establish a European understanding of an acceptable hydrogen concentration in the natural gas system, one topic will identify and start looking at different knowledge gaps.*

***Identifying degradation mechanisms in stack components for SOFC technology** continues.*

***Public awareness and acceptance regarding fuel cells and hydrogen technologies** have essential impacts on the market implementation and stabilization of FCH applications. To address this most efficiently, a bottom up approach focusing on pupils (primary and secondary education) appears as most promising to transfer essential knowledge to the public.*

Action	Topic
RIA	PNR for safety of hydrogen driven vehicles and transport through tunnels and similar confined spaces
RIA	Hydrogen admixtures in the natural gas grid
RIA	Accelerated Stress Testing (AST) protocols for Solid Oxide Cells (SOC)
CSA	Strengthening public acceptance and awareness of FCH-technologies by educating pupils at schools

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