

Funded Projects under Horizon 2020

Secure, clean and efficient energy

Fuel Cells and Hydrogen Calls 2016

FCH 2 JU, institutional PPP

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This document gives information on calls and funded projects of the EU Framework Programme for Research and Innovation Horizon 2020 for the Societal Challenge – Secure, clean and efficient energy for the year 2016.

The data used in this document was extracted from the tables available at the website of the Cordis Information Service. More data is available in those tables.

Table of contents

Topic FCH-01-1-Projects	3
Topic FCH-01-3-Projects	5
Topic FCH-01-4-Projects	6
Topic FCH-01-5-Projects	7
Topic FCH-01-8-Projects	8
Topic FCH-01-9-Projects	9
Topic FCH-02-1-Projects	10
Topic FCH-02-2-Projects	11
Topic FCH-02-3-Projects	12
Topic FCH-02-4-Projects	13
Topic FCH-02-5-Projects	14
Topic FCH-02-6-Projects	15
Topic FCH-02-7-Projects	16
Topic FCH-02-11-Projects	18
Topic FCH-03-1-Projects	19
Topic FCH-04-1-Projects	20
Topic FCH-04-2-Projects	21
List of Calls Fuel Cells and Hydrogen	24
List of Abbreviations	26

Topic FCH-01-1-Projects

Topic: FCH-01-1-2016 (Transport)	Acronym: DIGIMAN
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: DIGItal MAterials CharacterisatioN proof-of-process auto assembly	
Starting date: 01.01.2017	End date: 31.12.2019
Total Cost: 3,486,965.00 €	EU max. contribution: 3,486,965.00 €
Coordinator: COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	
Participants: <ul style="list-style-type: none"> ▪ TOYOTA MOTOR EUROPE ▪ THE UNIVERSITY OF WARWICK ▪ PRETEXO ▪ FREUDENBERG VLIESTOFFE KG ▪ INTELLIGENT ENERGY LIMITED 	
Countries: FR;BE;DE;UK	
Objectives: <p>The project's proposition and charter is to advance (MRL4 > MRL6) the critical steps of the PEM fuel cell assembly processes and associated in-line QC & end-of-line test / handover strategies and to demonstrate a route to automated volume process production capability within an automotive best practice context e.g. cycle time optimization and line-balancing, cost reduction and embedded / digitized quality control. The project will include characterization and digital codification of physical attributes of key materials (e.g. GDLs) to establish yield impacting digital cause and effects relationships within the value chain, from raw material supply / conversion / assembly through to in-service data analytics, aligning with evolving Industry 4.0 standards for data gathering / security, and line up-time, productivity monitoring. The expected outcome will be a blueprint for beyond current state automotive PEM fuel cell manufacturing capability in Europe.</p> <p>The project will exploit existing EU fuel cell and manufacturing competences and skill sets to enhance EU employment opportunities and competitiveness while supporting CO2 reduction and emissions reduction targets across the transport low emission vehicle sector with increased security of fuel supply (by utilizing locally produced Hydrogen).</p>	

Topic: FCH-01-1-2016 (Transport)	Acronym: Fit-4-AmandA
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Future European Fuel Cell Technology: Fit for Automatic Manufacturing and Assembly	
Starting date: 01.03.2017	End date: 29.02.2020
Total Cost: 2,999,185.00 €	EU max. contribution: 2,999,185.00 €
Coordinator: UNIRESEARCH BV	
Participants: <ul style="list-style-type: none"> ▪ Proton Motor Fuel Cell GmbH ▪ USK KARL UTZ SONDERMASCHINEN GMBH ▪ TECHNISCHE UNIVERSITAET CHEMNITZ ▪ UPS EUROPE SA ▪ EWII FUEL CELLS A/S ▪ FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V. 	
Countries: NL;DE;DK;BE	
Objectives: <p>The main target of our work is to industrialise the stack production, to deliver affordable fuel cell systems in larger quantities to saturate the emerging market/demand. Heart of our call is to build a worldwide new and unique machine which allows serially* produce the centrepiece of fuel cell system: the stack. This will revolutionize the way how stacks are produced in future.</p> <p>The members of the consortium are: a developer and producer of fuel cell systems (Proton Motor Fuel Cell GmbH), a supplier of MEAs and BiPolar Plates (BPP) (EWII), a supplier of industrial machinery for assembly, handling and testing equipment (USK Karl UTZ Sondermaschinen GmbH), two renowned research institutions (Technische Universitat Chemnitz / ALF, Fraunhofer IWU) and a EU project management expert (Uniresearch B.V.) and last but not least, UPS an international transport OEM with its own vehicle production of Light Commercial Vehicles.</p> <p>The result of our project work can be used for several purposes: Branding, Prototyping and Business development. The stacks can be used outside of automotive industry, because they can be adapted to other applications (such as uninterruptible power sources) by the design of a fuel cell system.</p>	

Topic FCH-01-3-Projects

Topic: FCH-01-3-2016 (Transport)	Acronym: INLINE
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Design of a flexible, scalable, high quality production line for PEMFC manufacturing	
Starting date: 01.02.2017	End date: 31.01.2020
Total Cost: 3,286,068.75 €	EU max. contribution: 3,286,068.75 €
Coordinator: PROFACTOR GMBH	
Participants:	
<ul style="list-style-type: none"> ▪ FRONIUS INTERNATIONAL GMBH ▪ KARLSRUHER INSTITUT FUER TECHNOLOGIE 	<ul style="list-style-type: none"> ▪ ELRINGKLINGER AG ▪ OMB SALERI SPA
Countries: AU;DE;IT	
Objectives:	
<p>The INLINE project aims at the solution of key challenges to enable the implementation of a scalable manufacturing process for fuel cell systems. Current manufacturing processes rely on manual work that has substantial limits in terms of cycle times, costs and scalability. Developments will start with the re-design and optimization of two key components: the media supply unit and the tank valve regulator. Both are components that are currently difficult to manufacture and are perceived as bottlenecks in the production process. Based on these new designs, an integrated production line will be planned using simulation tools. These tools will enable the evaluation of different layouts, part flow strategies and for different production scenarios. In terms of manufacturing tools, the end of line test will be improved to reduce cycle times by a factor of 3 and assistance systems for assembly stations will be developed that will enable scalability by reducing the need for training of workers. The overall target is to reduce the cycle time for production of a whole fuel cell system from 15 hours to less than 2.5 hours. Data gathering and analysis methods will be developed to enable the tracking of parts through the production line and - through a correlation of process and quality data - the continuous improvement of the production process.</p> <p>Demonstration of the end of line test and the assistance system will be done in hardware. The whole production line will be evaluated using a simulation tool that has been verified on the current production process. A set of engineering samples of the re-designed tank valve regulator and the media supply unit will be produced and used for tests of the integrated fuel cells and for assessment of the whole production process. A potential of 250 new jobs in manufacturing of fuel cells and for production of the key components will be generated by the project.</p>	

Topic FCH-01-4-Projects

Topic: FCH-01-4-2016 (Transport)	Acronym: INN-BALANCE
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: INNovative Cost Improvements for BALANCE of Plant Components of Automotive PEMFC Systems	
Starting date: 01.01.2017	End date: 31.12.2019
Total Cost: 6,156,288.75 €	EU max. contribution: 4,994,538.75 €
Coordinator: FUNDACION AYESA	
Participants: <ul style="list-style-type: none"> <li style="width: 50%;">▪ Brose Fahrzeugteile GmbH & Co. Kommanditgesellschaft, Würzburg <li style="width: 50%;">▪ AVL LIST GMBH <li style="width: 50%;">▪ UNIVERSITAT POLITECNICA DE CATALUNYA <li style="width: 50%;">▪ VOLVO PERSONVAGNAR AB <li style="width: 50%;">▪ STEINBEIS INNOVATION GGMBH (Participation ended) <li style="width: 50%;">▪ Powercell Sweden AB <li style="width: 50%;">▪ CELEROTON AG <li style="width: 50%;">▪ DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV <li style="width: 50%;">▪ STEINBEIS 2I GMBH 	
Countries: ES;DE;AU;SE	
Objectives: <p>The aim of INN-BALANCE is to develop a novel and integrated development platform for developing advanced Balance of Plant components in current fuel cell based vehicles, in order to improve their efficiency and reliability, reducing costs and presenting a stable supply chain to the European car manufacturers and system integrators. Accordingly, INN-BALANCE technical objectives are (i) to develop highly efficient and reliable fuel cell BoP components; (ii) to reduce costs of current market products in fuel cell systems; (iii) to achieve high technology readiness levels (TRL7 or higher) in all the tackled developments; and (iv) to improve and tailor development tools for design, modelling and testing innovative components in fuel cell based vehicles. To this end, a European Consortium composed by major automotive companies, consulting groups, research institutes and universities was established. INN-BALANCE will be focused on four main general topics; first of all on new components developments, addressing the latest changes and trends in fuel cells vehicles technology, from new air turbo-compressor, anode recirculation/injection module and advanced control/diagnosis devices to new concepts of thermal management and anti-freeze units based on standard automotive components; secondly, on the vehicle integration and validation of the components in a TRL7 platform placed at a well-known car manufacturing platform; thirdly, providing innovative and cost optimized manufacturing processes especially developed for automotive BoP components; finally, on the results dissemination and exploitation, new technology broadcasting and public awareness of new, low-cost and reliable clean energy solutions in Europe bringing at the same time highly qualified new job opportunities.</p>	

Topic FCH-01-5-Projects

Topic: FCH-01-5-2016 (Transport)	Acronym: MARANDA
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Marine application of a new fuel cell powertrain validated in demanding arctic conditions	
Starting date: 01.03.2017	End date: 28.02.2021
Total Cost: 3,704,757.50 €	EU max. contribution: 2,939,457.50 €
Coordinator: Teknologian tutkimuskeskus VTT Oy	
Participants:	
<ul style="list-style-type: none"> ▪ Powercell Sweden AB ▪ OMB SALERI SPA ▪ SUOMEN YMPARISTOKESKUS 	<ul style="list-style-type: none"> ▪ ABB OY ▪ PERSEE ▪ SWISS HYDROGEN SA
Countries: FI;SE;FI;IT;FR;CH	
Objectives:	
<p>In MARANDA project an emission-free hydrogen fuelled PEMFC based hybrid powertrain system is developed for marine applications and validated both in test benches and on board the research vessel Aranda, which is one of about 300 research vessels in Europe. Special emphasis is placed on air filtration and development of hydrogen ejector solutions, for both efficiency and durability reasons. In addition, full scale freeze start testing of the system will be conducted.</p> <p>When research vessels are performing measurements, the main engines are turned off to minimize noise, vibration and air pollution causing disturbance in the measurements. The 165 kW (2 x 82.5 kW AC) fuel cell powertrain (hybridized with a battery) will provide power to the vessel's electrical equipment as well as the dynamic positioning during measurements, free from vibration, noise and air pollution.</p> <p>One of the major obstacles for wider implementation of fuel cells in the marine sector is the hydrogen infrastructure. To alleviate this problem, a mobile hydrogen storage container, refillable in any 350 bar hydrogen refuelling station will be developed in this project. This novel solution will increase hydrogen availability to marine sector as well as many other sectors.</p> <p>The consortium of this project contains companies from the whole fuel cell value chain, from balance-of-plant components to system integrator and end user. The fuel cell system will be tested in conditions similar to arctic marine conditions before implementation to the target vessel. In addition, long-term durability testing (6 months, 4380 operating hours) of the system will be conducted at an industrial site.</p> <p>The project will increase the market potential of hydrogen fuel cells in marine sector, which have for long lagged behind road transportation. General business cases for different actors in the marine and harbor or fuel cell business will be created and therefore the impacts in the whole industry will be notable.</p>	

Topic FCH-01-8-Projects

Topic: FCH-01-8-2016 (Transport)	Acronym: COSMHYC
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: COmbined hybrid Solution of Multiple HYdrogen Compressors for decentralised energy storage and refuelling stations	
Starting date: 01.01.2017	End date: 31.12.2019
Total Cost: 2,496,830.00 €	EU max. contribution: 2,496,830.00 €
Coordinator: EIFER EUROPAISCHES INSTITUT FUR ENERGIEFORSCHUNG EDF KIT EWIV	
Participants: <ul style="list-style-type: none"> ▪ MAHYTEC SARL ▪ STEINBEIS INNOVATION GMBH (Participation ended) ▪ STEINBEIS 2I GMBH ▪ H2 Logic A/S ▪ Ludwig-Boelkow-Systemtechnik GmbH 	
Countries: DE;FR;DK	
Objectives: <p>The COSMHYC project aims at answering the needs identified by the MAWP of the FCH2 JU of increasing energy efficiency of hydrogen production while reducing operating and capital costs, in order to make hydrogen a competitive fuel for transport applications. COSMHYC will develop and test an innovative compression solution from 1 to 1000 based on a hybrid concept, combining a conventional compressor with an innovative compression technology. The aim is to reduce the overall compression costs, by reducing investments costs down to less than 2000 €/(kg*day), reducing energy consumption by optimizing the interactions between both compression technologies. Maintenance will be reduced to <50% compared to mechanical compressors and life time will be improved, by decreasing the degradation down to 1% per year, thanks to mechanical adjustments and the implementation of appropriate remote control devices and corrective algorithms. In addition, the system will be significantly less noisy than a mechanical compressor (less than 60 dB at 5 meters). LBST will perform an analysis of the market requirements and define the main critical parameters, which will be used as an input for the research and development activities. MAHYTEC, NEL and EIFER will develop and test both compressors, with a focus on thermal integration. The partners will jointly install, connect and test the new compressor solution in a test facility during 9 months. At each stage of the developments and tests, the results will be used to perform a technical economic assessment of the solution compared to competitors with LBST. In parallel, Steinbeis 2i will accompany the partners in organizing and managing the communication around the project, disseminating the results and preparing their exploitation.</p>	

Topic FCH-01-9-Projects

Topic: FCH-01-9-2016 (Transport)	Acronym: JIVE
Call: H2020-JTI-FCH-2016-1	Type of Action: IA
Title: Joint Initiative for hydrogen Vehicles across Europe	
Starting date: 01.01.2017	End date: 31.12.2022
Total Cost: 106,009,175.36 €	EU max. contribution: 32,000,000.00€
Coordinator: ELEMENT ENERGY LIMITED	
Participants: <ul style="list-style-type: none"> ▪ ABERDEEN CITY COUNCIL ▪ DUNDEE CITY COUNCIL ▪ EUE APS ▪ HyCologne - Wasserstoff Region Rheinland e.V. ▪ hySOLUTIONS GmbH ▪ PLANET PLANUNGSGRUPPE ENERGIE UND TECHNIK GBR ▪ RIGAS SATIKSME SIA ▪ SUEDTIROLER TRANSPORTSTRUKTUREN AG ▪ UNION INTERNATIONALE DES TRANSPORTS PUBLICS ▪ VERKEHRS-VERBUND MAINZ-WIESBADEN GMBH ▪ BIRMINGHAM CITY COUNCIL ▪ EE ENERGY ENGINEERS GMBH ▪ FONDAZIONE BRUNO KESSLER ▪ HYDROGEN EUROPE ▪ LONDON BUS SERVICES LIMITED ▪ WEST MIDLANDS TRAVEL LIMITED ▪ REBELGROUP ADVISORY BV ▪ REGIONALVERKEHR KOLN GMBH ▪ THINKSTEP AG ▪ TRENTO TRASPORTI SPA ▪ WSW MOBIL GMBH 	
Countries: UK;DE;DK;IT;BE;NL;LV	
Objectives: <p>The hydrogen fuel cell (FC) bus is one of very few options for the elimination of harmful local emissions and the decarbonisation of public transport. Its performance has been validated in Europe in recent years through various demonstration projects, however, a number of actions are required to allow the commercialisation of FC buses. These include addressing the high ownership costs relative to conventional buses, ensuring the FC buses can meet the high availability levels demanded by public transport, developing the refuelling infrastructure to provide reliable, low-cost hydrogen and improving the understanding of the potential of FC buses for zero emission public transport.</p> <p>JIVE will pave the way to commercialisation by addressing these issues through the deployment of 142 fuel cell buses across 9 locations, more than doubling the number of FC buses operating in Europe. JIVE will use coordinated procurement activities to unlock the economies of scale which are required to reduce the cost of the buses. They will operate in large fleets of 10-30 buses, reducing the overhead costs per bus, as well as allowing more efficient supply chains and maintenance operations compared to previous deployments. By working at this scale and with bus OEMs with proven vehicles, JIVE will ensure reliability at the level required for commercialisation.</p> <p>JIVE will also test new hydrogen refuelling stations with the required capacity to serve fleets in excess of 20 buses. This will not only reduce the costs of hydrogen and increase the availability of equipment but will also test the ability to offer >99% reliability, which is required for the commercialisation of FC buses.</p> <p>A dissemination campaign will use the project results to demonstrate the technical readiness of FC buses to bus operators and the economic viability of hydrogen as a zero emission bus fuel to policy makers will help to catalyse the future development and expansion of the hydrogen bus sector.</p>	

Topic FCH-02-1-Projects

Topic: FCH-02-1-2016 (Energy)	Acronym: QualyGridS
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Standardized Qualifying tests of electrolyzers for grid services	
Starting date: 01.01.2017	End date: 31.12.2019
Total Cost: 2,811,262.50 €	EU max. contribution: 1,996,795.00 €
Coordinator: DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV	
Participants: <ul style="list-style-type: none"> ▪ NEW NEL HYDROGEN AS ▪ ITM POWER (TRADING) LIMITED ▪ FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON ▪ COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES ▪ STICHTING NEDERLANDS NORMALISATIE – INSTITUUT ▪ DANMARKS TEKNISKE UNIVERSITET ▪ FACHHOCHSCHULE ZENTRALSCHWEIZ - HOCHSCHULE LUZERN ▪ IHT INDUSTRIE HAUTE TECHNOLOGIE SA ▪ EUROPEAN FUEL CELL FORUM AG 	
Countries: DE;NO;UK;ES;FR;DK;NL;CH	
Objectives: <p>The overall objective of the QualyGridS project is the establishing of standardized tests for electrolyzers performing electrical grid services. Alkaline electrolyzers as well as PEM electrolyzers will be considered individually in performance analysis and in an assessment of business cases for these electrolyzers' use. A variety of different grid services will be addressed as well as multiple hydrogen end users. The protocols developed will be applied to alkaline and PEM electrolyzers systems, respectively, using electrolyser sizes from 50 kW up to 300 kW. Additionally, a techno-economic analysis of business cases will be performed covering the grid and market situations in the most relevant regions of Europe. The consortium adressing these tasks includes three electrolyser manufacturers and well as research institutions with plenty of experience. Inclusion of a European standardisation institution will allow for maximum impact of the protocols. An advisory committee including TSOs from several countries and a key player in US electrolysis research will support the project with valuable advice. Experience from previous FCH-JU electrolyser projects and national projects is available to the project.</p>	

Topic FCH-02-2-Projects

Topic: FCH-02-2-2016 (Energy)	Acronym: BIOROBURplus
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Advanced direct biogas fuel processor for robust and cost-effective decentralised hydrogenproduction	
Starting date: 01.01.2017	End date: 30.06.2020
Total Cost: 3,813,536.24 €	EU max. contribution: 2,996,248.74 €
Coordinator: POLITECNICO DI TORINO	
Participants:	
<ul style="list-style-type: none"> ▪ KARLSRUHER INSTITUT FUER TECHNOLOGIE ▪ CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS ▪ DBI - GASTECHNOLOGISCHES INSTITUT GGMBH FREIBERG ▪ ACEA PINEROLESE INDUSTRIALE SPA ▪ JOHNSON MATTHEY PLC 	<ul style="list-style-type: none"> ▪ SCUOLA UNIVERSITARIA PROFESSIONALE DELLA SVIZZERA ITALIANA (SUPSI) ▪ ETHNIKO KENTRO EREVNAS KAI TECHNOLOGIKIS ANAPTYXIS ▪ ENGICER SA ▪ HYSYTECH SRL ▪ UAB MODERNIOS E-TECNOLOGIJOS
Countries: IT;DE;CH;FR;EL;UK;LT	
Objectives:	
<p>BioROBURplus builds upon the closing FCH JU BioROBUR project (direct biogas oxidative steam reformer) to develop an entire pre-commercial fuel processor delivering 50 Nm³/h (i.e. 107 kg/d) of 99.9% hydrogen from different biogas types (landfill gas, anaerobic digestion of organic wastes, anaerobic digestion of wastewater-treatment sludges) in a cost-effective manner.</p> <p>The energy efficiency of biogas conversion into H₂ will exceed 80% on a HHV basis, due to the following main innovations: 1) increased internal heat recovery enabling minimisation of air feed to the reformer based on structured cellular ceramics coated with stable and easily recyclable noble metal catalysts with enhanced coking resistance; 2) a tailored pressure-temperature-swing adsorption (PTSA) capable of exploiting both pressure and low T heat recovery from the processor to drive H₂ separation from CO₂ and N₂; 3) a recuperative burner based on cellular ceramics capable of exploiting the low enthalpy PTSA-off-gas to provide the heat needed at points 1 and 2 above.</p> <p>The complementary innovations already developed in BioROBUR (advanced modulating air-steam feed control system for coke growth control; catalytic trap hosting WGS functionality and allowing decomposition of incomplete reforming products; etc.) will allow to fully achieve the project objectives within the stringent budget and time constraints set by the call.</p> <p>Prof. Debora Fino, the coordinator of the former BioROBUR project, will manage, in an industrially-oriented perspective, the work of 11 partners with complementary expertise: 3 universities (POLITO, KIT, SUPSI), 3 research centres (IRCE, CPERI, DBI), 3 SMEs (ENGICER, HST, MET) and 2 large companies (ACEA, JM) from 7 different European Countries.</p> <p>A final test campaign is foreseen at TRL 6 to prove targets achievement, catching the unique opportunity offered by ACEA to exploit three different biogas types and heat integration with an anaerobic digester generating the biogas itself.</p>	

Topic FCH-02-3-Projects

Topic: FCH-02-3-2016 (Energy)	Acronym: PECSYS
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Technology demonstration of large-scale photo-electrochemical system for solar hydrogen production	
Starting date: 01.01.2017	End date: 31.12.2020
Total Cost: 2,499,992.50 €	EU max. contribution: 2,499,992.50 €
Coordinator: HELMHOLTZ-ZENTRUM BERLIN FÜR MATERIALIEN UND ENERGIE GMBH	
Participants: <ul style="list-style-type: none"> ▪ FORSCHUNGSZENTRUM JÜLICH GMBH ▪ SOLIBRO RESEARCH AB ▪ 3SUN SRL ▪ UPPSALA UNIVERSITET ▪ CONSIGLIO NAZIONALE DELLE RICERCHE 	
Countries: DE;IT;SE	
Objectives: <p>The objective of the project PECSYS is the demonstration of a system for the solar driven electrochemical hydrogen generation with an area >10 m². The efficiency of the system will be >6% and it will operate for six months showing a degradation below <10%. Therefore, the consortium will test various established PV materials (thin-film Silicon, crystalline Silicon and CIGS) as well as high potential material combinations (Perovskite/Silicon). It will study and develop innovative device concepts for integrated photoelectrochemical devices that will go far beyond the current state of the art and will allow to reduce Ohmic transport losses in the electrolyte and membranes. The best concepts will be scaled up to prototype size (>100 cm²) and will be subject to extensive stability optimization. Especially, the use of innovative ALD based metal oxide sealing layers will be studied. The devices will have the great advantage compared to decoupled systems that they will have reduced Ohmic transport losses. Another advantage for application in sunny, hot regions will be that these devices have a positive temperature coefficient, because the improvements of the electrochemical processes overcompensate the reduced PV conversion efficiency. With these results, an in-depth socio-techno-economic model will be developed to predict the levelized cost of hydrogen production, which will be below 5€/Kg Hydrogen in locations with high solar irradiation, as preliminary back of the envelope calculations have revealed. Based on these findings, the most promising technologies will be scaled to module size. The final system will consist of several planar modules and will be placed in Jülich. No concentration or solar tracking will be necessary and therefore the investment costs will be low. It will have an active area >10 m² and will produce more than 10 Kg of hydrogen over six months period.</p>	

Topic FCH-02-4-Projects

Topic: FCH-02-4-2016 (Energy)	Acronym: CH2P
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Cogeneration of Hydrogen and Power using solid oxide based system fed by methane rich gas	
Starting date: 01.02.2017	End date: 31.07.2020
Total Cost: 6,868,158.75 €	EU max. contribution: 3,999,896.00 €
Coordinator: FONDAZIONE BRUNO KESSLER	
Participants: <ul style="list-style-type: none"> ▪ SOLIDPOWER SPA ▪ ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE ▪ HYGEAR TECHNOLOGY AND SERVICES BV ▪ VERTECH GROUP ▪ HTceramix SA ▪ DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV ▪ SHELL GLOBAL SOLUTIONS INTERNATIONAL BV 	
Countries: FR;NL;DE;CH;IT	
Objectives: <p>To achieve European ambitions to reduce global emissions of greenhouse gases by 80% before 2050, emissions of the transport and the energy sectors will need to decrease drastically. The Hydrogen Economy offers ready solutions to decarbonize the transport sector. Fuel cell electric vehicles (FCEVs) close to be deployed in the market in increasing numbers. For FCEVs to be introduced to the market in volumes, a network of hydrogen refuelling stations (HRS) first has to exist. Green hydrogen is figured, in the medium – long term, as the target technology to decarbonize the transport sector. Indeed, this will not be commercially attractive in the first years. Similarly, new-built hydrogen supply capacity will not be viable in the first years with low demand.</p> <p>CH2P aims at building a transition technology for early infrastructure deployment. It uses widely available carbon-lean natural gas (NG) or bio-methane to produce hydrogen and power with Solid Oxide Fuel Cell (SOFC) technology. Similar to a combined heat and power system, the high quality heat from the fuel cell is used to generate hydrogen.</p> <p>CH2P therefore generates hydrogen and electricity with high efficiencies (up to 90%) and a reduced environmental impact compared to conventional technologies. The system will have high dynamic (more than 50% of energy will be in form of hydrogen), purity level of hydrogen at 99.999%, a CO-level lower than 200 ppb. The target cost for the hydrogen generated will be below 4,5 €/kg. The overall technology concept will be based on modularity to enable a staged deployment of such infrastructure.</p> <p>CH2P will realize two systems, one with hydrogen generation capacity of 20 kg/day, for components validation, and another at 100 kg/day for infield testing.</p> <p>A dissemination campaign will use the project results to demonstrate the technical readiness of CH2P technology, while industrial partners are committed to enter the market after the project end.</p>	

Topic FCH-02-5-Projects

Topic: FCH-02-5-2016 (Energy)	Acronym: INSIGHT
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: ImplementatioN in real SOFC Systems of monItoring and diaGnostic tools using signal analysis to increase tHeir lifeTime	
Starting date: 01.01.2017	End date: 31.12.2019
Total Cost: 3,146,056.25 €	EU max. contribution: 2,498,948.75 €
Coordinator: COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES	
Participants:	
<ul style="list-style-type: none"> ▪ DANMARKS TEKNISKE UNIVERSITET ▪ ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE ▪ AVL LIST GMBH ▪ SOLIDPOWER SPA ▪ ABSISKEY CP 	<ul style="list-style-type: none"> ▪ UNIVERSITA DEGLI STUDI DI SALERNO ▪ INSTITUT JOZEF STEFAN ▪ Teknologian tutkimuskeskus VTT Oy ▪ HTceramix SA ▪ BITRON SPA
Countries: FR;DK;IT;CH;SI;FI;AU	
Objectives:	
<p>The INSIGHT project aims at developing a Monitoring, Diagnostic and Lifetime Tool (MDLT) for Solid Oxide Fuel Cell (SOFC) stacks and the hardware necessary for its implementation into a real SOFC system. The effectiveness of the MDLT will be demonstrated through on-field tests on a real micro-Combined Heat and Power system (2.5 kW), thus moving these tools from Technology Readiness Level (TRL) 3 to beyond 5.</p> <p>INSIGHT leverages the experience of previous projects and consolidates their outcomes both at methodological and application levels. The consortium will specifically exploit monitoring approaches based on two advanced complementary techniques: Electrochemical Impedance Spectroscopy (EIS) and Total Harmonic Distortion (THD) in addition to conventional dynamic stack signals. Durability tests with faults added on purpose and accelerated tests will generate the data required to develop and validate the MDL algorithms. Based on the outcome of experimental analysis and mathematical approaches, fault mitigation logics will be developed to avoid stack failures and slow down their degradation.</p> <p>A specific low-cost hardware, consisting in a single board able to embed the MDLT will be developed and integrated into a commercial SOFC system, the EnGen™ 2500, which will be tested on-field.</p> <p>INSIGHT will then open the perspective to decrease the costs of service and SOFC stack replacement by 50%, which would correspond to a reduction of the Total Cost of Ownership by 10% / kWh.</p> <p>To reach these objectives, INSIGHT is a cross multidisciplinary consortium gathering 11 organisations from 6 member states (France, Italy, Denmark, Slovenia, Austria, Finland) and one associated country (Switzerland). The partnership covers all competences necessary: experimental testing (CEA, DTU, EPFL), algorithms developments (UNISA, IJS, AVL), hardware development (BIT), system integration and validation (VTT, SP, HTC), supported by AK for the project management and dissemination.</p>	

Topic FCH-02-6-Projects

Topic: FCH-02-6-2016 (Energy)	Acronym: qSOFC
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: Automated mass-manufacturing and quality assurance of Solid Oxide Fuel Cell stacks	
Starting date: 01.02.2017	End date: 31.01.2020
Total Cost: 2,110,015.00 €	EU max. contribution: 2,110,015.00 €
Coordinator: Teknologian tutkimuskeskus VTT Oy	
Participants:	
<ul style="list-style-type: none"> ▪ ELRINGKLINGER AG ▪ ELCOGEN OY ▪ SANDVIK MATERIALS TECHNOLOGY AB ▪ HAIKU TECH EUROPE BV ▪ MUKO MASCHINENBAU GMBH 	<ul style="list-style-type: none"> ▪ AKTSIASELTS ELCOGEN ▪ AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE
Countries: FI;DE;EE;IT;SE;NL	
Objectives:	
<p>qSOFC project combines leading European companies and research centres in stack manufacturing value-chain with two companies specialized in production automation and quality assurance to optimize the current stack manufacturing processes for mass production. Currently the state-of-the-art SOFC system capital expenditure (capex) is 7000...8000 €/kW of which stack is the single most expensive component. This proposal focuses on SOFC stack cost reduction and quality improvement by replacing manual labour in all key parts of the stack manufacturing process with automated manufacturing and quality control. This will lead to stack cost of 1000 €/kW and create a further cost reduction potential down to 500 €/kW at mass production (2000 MW/year).</p> <p>During the qSOFC project, key steps in cell and interconnect manufacturing and quality assurance will be optimized to enable mass-manufacturing. This will include development and validation of high-speed cell-manufacturing process, automated 3D machine vision inspection method to detect defects in cell manufacturing and automated leak-tightness detection of laser-welded/brazed interconnect-assemblies.</p> <p>The project is based on the products of its' industrial partners in stack-manufacturing value-chain (ElringKlinger, Elcogen AS, Elcogen Oy, Sandvik) and motivated by their interest to further ready their products into mass-manufacturing market. Two companies specialized in production automation and quality control (Müko, HaikuTech) provide their expertise to the project. The two research centres (VTT, ENEA) support these companies with their scientific background and validate the produced cells, interconnects and stacks.</p> <p>Effective exploitation and dissemination of resulting improved products, services, and know-how is a natural purpose of each partner and these actions are boosted by this project. This makes project results available also for other parties and increases competitiveness of the European fuel cell industry.</p>	

Topic FCH-02-7-Projects

Topic: FCH-02-7-2016 (Energy)	Acronym: H2Future
Call: H2020-JTI-FCH-2016-1	Type of Action: IA
Title: HYDROGEN MEETING FUTURE NEEDS OF LOW CARBON MANUFACTURING VALUE CHAINS	
Starting date: 01.01.2017	End date: 30.06.2021
Total Cost: 17,823,264.13 €	EU max. contribution: 11,997,820.01 €
Coordinator: VERBUND Solutions GmbH	
Participants: <ul style="list-style-type: none"> ▪ VOESTALPINE STAHL GMBH ▪ STICHTING ENERGIEONDERZOEK CENTRUM NEDERLAND ▪ K1-MET GMBH ▪ AUSTRIAN POWER GRID AG ▪ SIEMENS AKTIENGESELLSCHAFT 	
Countries: AU;DE;NL	
Objectives: <p>Under the coordination of VERBUND, VOESTALPINE, a steel manufacturer, and SIEMENS, a PEM electrolyser manufacturer, propose a 26 month demonstration of the 6MW electrolysis power plant installed at the VOESTALPINE LINZ plant (Austria). After pilot plant commissioning, the electrolyser is prequalified with the support of APG, the transmission operator of Austria, in order to provide grid-balancing services such as primary, secondary or tertiary reserves while utilising the commercial pools of VERBUND. The demonstration is split into five pilot tests and the quasi-commercial operation to show that the PEM electrolyser is able both to use timely power price opportunities (in order to provide affordable hydrogen for current uses of the steel making processes), and to attract extra revenues from grid services which improves the hydrogen price attractiveness from a two-carrier utility like VERBUND. Replicability of the experimental results at larger scales in EU28 for the steel industry (with inputs from TSOs in Italy, Spain and the Netherlands) is studied under the coordination of ECN. It involves a technical, economic and environmental assessment of the experimental results using the CertifHY tools. The roll out of each result is provided by ECN, together with policy and regulatory recommendations to accelerate the deployment in the steel and fertilizer industry, with low CO₂ hydrogen streams provided also by electrolysing units using renewable electricity. The plausibility of this roadmap is reinforced at the on-start of the demonstration by the creation of an exploitation company involving the core industrial partners, which starts commercial operations of the Linz pilot plant right after the end of the demonstration. Dissemination targeting the European stakeholders of the electricity, steel and fertilizer value chain nourishes the preparation of the practical implementation of the results in the 10 years following the demonstration's end.</p>	

Topic: FCH-02-7-2016 (Energy)	Acronym: Demo4Grid
Call: H2020-JTI-FCH-2016-1	Type of Action: IA
Title: Demonstration of 4MW Pressurized Alkaline Electrolyser for Grid Balancing Services	
Starting date: 01.03.2017	End date: 28.02.2022
Total Cost: 7,736,682.50 €	EU max. contribution: 2,932,554.38 €
Coordinator: DIADIKASIA SYMVOULOI EPICHEIRISEONAE	
Participants: <ul style="list-style-type: none"> ▪ IHT INDUSTRIE HAUTE TECHNOLOGIE SA ▪ MPREIS WARENVERTRIEBS GMBH ▪ FEN SUSTAIN SYSTEMS GMBH ▪ FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON ▪ INSTRUMENTACION Y COMPONENTES SA 	
Countries: EL;CH;ES;AU	
Objectives: <p>The main aim of project Demo4Grid is the commercial setup and demonstration of a technical solution utilizing “above state of the art” Pressurized Alkaline Electrolyser (PAE) technology for providing grid balancing services in real operational and market conditions. In order to validate existing significant differences in local market and grid requirements Demo4Grid has chosen to setup a demonstration site in Austria to demonstrate a viable business case for the operation of a large scale electrolyser adapted to specific local conditions that will be found throughout Europe.</p> <p>To achieve that, Demo4Grid will demonstrate at this demo site with particular needs for hydrogen as a means of harvesting RE production:</p> <ol style="list-style-type: none"> I. a technical solution to meet all core requirements for providing grid balancing services with a large scale PAE in direct cooperation with grid operators, II. a market based solution to provide value added services and revenues for the operation strategy to achieve commercial success providing grid services and those profits obtained also from the hydrogen application. III. Aiming at the exploitation of the results after the project ends, Demo4Grid will assess the replicability and viability of various business cases <p>Demo4Grid will be the decisive demonstration stage of previous FCH-JU projects related to the PAE addressed in this proposal. The first project ELYGRID (finished) and the following one ELYntegration (still ongoing) have provided promising results on the development of PAE to provide grid services operating under dynamic profiles (significant results will be shown in this proposal).</p>	

Topic FCH-02-11-Projects

Topic: FCH-02-11-2016 (Energy)	Acronym: ELECTROU
Call: H2020-JTI-FCH-2016-1	Type of Action: IA
Title: MW Fuel Cell micro grid and district heating at King's Cross	
Starting date: 01.01.2018	End date: 30.06.2023
Total Cost: 10,329,628.28 €	EU max. contribution: 6,000,000.00 €
Coordinator: METROPOLITAN KING'S CROSS LIMITED	
Participants: <ul style="list-style-type: none"> ▪ BUUK INFRASTRUCTURE NO 2 LIMITED ▪ FUEL CELL SYSTEMS LTD ▪ UNIVERSITA DEGLI STUDI DI PERUGIA ▪ FUELCELL ENERGY SOLUTIONS GMBH ▪ POLITECNICO DI MILANO 	
Countries: UK;DE;IT	
Objectives: <p>ELECTROU will install the first MW fuel cell in Europe fully integrated into a building at the high profile redevelopment at Kings Cross, London. This includes the full use of power & heat generated by the fuel cell within the local building, the site wide heat, power and cooling networks, and extends to water re-use and support of the micro grid.</p> <p>ELECTROU will prove that the multi-MW installation due to operational efficiency and negligible emissions will massively improve local and EU wide carbon emission targets. Designed to be an outdoor installation the plant will be adapted to indoor requirements e.g. space, ventilation, and safe access and egress. Up-scaling more than 3 times the installed capacity compared to current indoor installations is a critical step for large scale deployment within building applications.</p> <p>The use of fuel cells in this critical sector is currently prevented due to the high spatial requirements of multiple smaller modules, high capital cost compared to other technologies, and complexity of integration. ELECTROU will break all of these barriers. The project will demonstrate to key decision makers, investors and financiers that there is a near term route to produce electricity and heat in a highly efficient way by a technology which is commercially viable today.</p> <p>ELECTROU will prove through funding support that multi-MW installations within buildings can make an investment grade return without the need for any form of local or EU subsidy, this is a critical step in making the sector viable. A targeted dissemination campaign will be performed to share all of the results with stakeholders and the general public that promotes the technical, commercial and environmental benefits of this mature but high tech technology. We will develop one valid process for all fuel cell installations in Europe by supporting the set-up of simplified regulations, codes and standards that as a result will positively influence market entry throughout the EU.</p>	

Topic FCH-03-1-Projects

Topic: FCH-03-1-2016 (Overarching)	Acronym: MEMPHYS
Call: H2020-JTI-FCH-2016-1	Type of Action: RIA
Title: MEMbrane based Purification of HYdrogen System	
Starting date: 01.01.2017	End date: 31.12.2019
Total Cost: 2,008,195.00 €	EU max. contribution: 1,999,925.00 €
Coordinator: DUALE HOCHSCHULE BADEN-WURTTENBERG	
Participants:	
<ul style="list-style-type: none"> ▪ HYDROGEN EFFICIENCY TECHNOLOGIES (HYET) BV ▪ IMPERIAL COLLEGE OF SCIENCE TECHNOLOGY AND MEDICINE 	<ul style="list-style-type: none"> ▪ INSTITUT JOZEF STEFAN ▪ FORSCHUNGSZENTRUM JULICH GMBH ▪ BORIT NV
Countries: DE;NL;SI;BE;UK	
Objectives:	
<p>Project MEMPHYS, MEMbrane based Purification of HYdrogen System, targets the development of a stand-alone hydrogen purification system based on a scalable membrane hydrogen purification module. Applications are for instance hydrogen recovery from biomass fermentation, industrial pipelines, storage in underground caverns, and industrial waste gas streams.</p> <p>The consortium consists of six partners including two universities, two research institutes, and two companies from five different countries. The overall budget totals 2 M€, with individual budgets between 220 and 500 T€.</p> <p>This project will utilize an electrochemical hydrogen purification (EHP) system. EHP has proven to produce high purity hydrogen (5N) while maintaining low energy consumption because the purification and optional compression are electrochemical and isothermal processes. A low CAPEX for the EHP system is feasible due to the significant reductions of system costs that result from recent design improvements and market introductions of various electrochemical conversion systems such as hydrogen fuel cells.</p> <p>In detail, the purification process will be a two-step process. A catalyst-coated proton exchange membrane will be assisted by one selectively permeable polymer membrane. Standard catalysts are sensitive to impurities in the gas. Therefore, alternative anode catalysts for the EHP cell, an anti-poisoning strategy and an on board diagnostic system will be developed. The resulting MEMPHYS system will be multi-deployable for purification of a large variety of hydrogen sources.</p> <p>A valuable feature of the MEMPHYS system is the simultaneous compression of the purified hydrogen up to 200 bar, facilitating the transport and storage of the purified hydrogen.</p> <p>The MEMPHYS project offers the European Union an excellent chance to advance the expertise in electrochemical conversion systems on a continental level, while at the same time promoting the use and establishment of hydrogen based renewable energy systems.</p>	

Topic FCH-04-1-Projects

Topic: FCH-04-1-2016 (Cross-cutting)	Acronym: NET-Tools
Call: H2020-JTI-FCH-2016-1	Type of Action: CSA
Title: Novel Education and Training Tools based on digital applications related to Hydrogen and Fuel Cell Technology	
Starting date: 01.03.2017	End date: 29.02.2020
Total Cost: 1,596,007.50 €	EU max. contribution: 1,596,007.50€
Coordinator: KARLSRUHER INSTITUT FUER TECHNOLOGIE	
Participants: <ul style="list-style-type: none"> ▪ PERSEE ▪ UNIVERSITY OF ULSTER ▪ DANMARKS TEKNISKE UNIVERSITET ▪ UNIVERSITA DEGLI STUDI DI PERUGIA ▪ ELEMENT ENERGY LIMITED ▪ "NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS" ▪ INSTITUTE OF ELECTROCHEMISTRY AND ENERGY SYSTEMS 	
Countries: DE;FR;EL;UK;DK;IT;BG	
Objectives: <p>Education and training for the fuel cell and hydrogen (FCH) technology sector is critical for the current and future workforce as well as for the further implementation of a promising technology within Europa. The project NET-Tools will develop an e-infrastructure and provide digital tools and information service for educational issues and training within FCH technologies based on most recent IT tools. NET-Tools will constitute a technology platform, leveraging robust and effective open source/free learning management systems while offering a unique blend of novel digital tools encompassing the spheres of information, education and research. With its two main pillars e-Education, e-Laboratory, the project addresses various target groups and levels of education - from higher schools and universities (undergraduate and graduate students) to professionals and engineers from industry, offering both e-learning modules and on-line experimental techniques. The main goal is to develop new e-education methods and concepts, ICT-based services and tools for data- and computer-intensive research to enhance the knowledge, productivity and competitiveness of those interested or already directly involved in the massive implementation of H2 and FCH technologies in Europe. NET-Tools will be delivered combining the expertise of major experts and practitioners on FCH sector under the guidance of leading companies gathered in a board, while interacting with similar activities in US, Asia and South Africa. It has the capacity to pave the road to more efficient digital science combining latest technical achievements and an internet culture of openness and creativity, while pursuing the ambition to become the hydrogen counterpart of Coursera. The development of business concepts will guide NET-Tools as an e-infrastructure useable for FCH-Community into the future.</p>	

Topic FCH-04-2-Projects

Topic: FCH-04-2-2016 (Cross-cutting)	Acronym: HyLAW
Call: H2020-JTI-FCH-2016-1	Type of Action: CSA
Title: Identification of legal rules and administrative processes applicable to Fuel Cell and Hydrogen technologies' deployment, identification of legal barriers and advocacy towards their removal.	
Starting date: 01.01.2017	End date: 31.12.2018
Total Cost: 1,143,000.00 €	EU max. contribution: 1,143,000.00 €
Coordinator: HYDROGEN EUROPE	
Participants:	
<ul style="list-style-type: none"> ▪ OSTERREICHISCHE ENERGIEAGENTUR AUSTRIAN ENERGY AGENCY ▪ BRINTBRANCHEN ▪ MAGYAR TUDOMANYOS AKADEMIA TERMESZETTUDOMANYI KUTATOKOZPONT ▪ NATIONAL RESEARCH AND DEVELOPMENT INSTITUTE FOR CRYOGENICS AND ISOTOPIC TECHNOLOGIES ICSI RM VALCEA ▪ FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON ▪ COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES ▪ INSTYTUT ENERGETYKI ▪ LATVIJAS UDENRAZA ASOCIACIJA ▪ ASSOCIATION FRANCAISE POUR L'HYDROGENE ET LES PILES A COMBUSTIBLE 	<ul style="list-style-type: none"> ▪ WaterstofNet vzw ▪ BULGARIAN ACADEMY OF SCIENCES ▪ DEUTSCHER WASSERSTOFF-UND BRENNSTOFFZELLENVERBAND EV ▪ AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE ▪ THE SCOTTISH HYDROGEN AND FUEL CELL ASSOCIATION LTD ▪ VATGAS SVERIGE IDEELL FORENING ▪ GREATER LONDON AUTHORITY ▪ Teknologian tutkimuskeskus VTT Oy ▪ STICHTING NEDERLANDS NORMALISATIE – INSTITUUT ▪ STI - SISTEMAS E TECNICAS INDUSTRIAIS LDA ▪ STIFTELSEN SINTEF ▪ UK HYDROGEN AND FUEL CELL ASSOCIATION ▪ DANSK GASTEKNISK CENTER AS
Countries: BE;AU;BG;DK;DE;HU;IT;RO;UK;ES;SE;FI;FR;NL;PL;PT;NO;LV	

Objectives:

The fuel cells and hydrogen (FCH) industry has made considerable progress toward market deployment. However existing legal framework and administrative processes (LAPs) – covering areas such as planning, safety, installation and operation – only reflect use of incumbent technologies. The limited awareness of FCH technologies in LAPs, the lack of informed national and local administrations and the uncertainty on the legislation applicable to FCH technologies elicit delays and extra-costs, when they do not deter investors or clients.

This project aims at tackling this major barrier to deployment as follows:

- Systematically identifying and describing the LAPs applicable to FCH technologies in 18 national legal systems as well as in the EU proper legal system.
- Assessing and quantifying LAP impacts in time and/or resource terms and identify those LAP constituting a legal barrier to deployment.
- Comparing the 18 countries to identify best and bad practices
- Raising awareness in the countries where a LAP creates a barrier to deployment.
- Advocating targeted improvements in each of 18 countries + EU level
- It will make all this work widely available through: (1) A unique online database allowing easy identification, description and assessment of LAPs by country and FCH application. (2) Policy papers by applications and by country with identification of best practice and recommendations for adapting LAP. (3) A series of national (18) and European (1) workshops with public authorities and investors.

HyLAW sets up a National Association Alliance not just for the duration of the project, but for the long term consolidation of the sector under a single unified umbrella. By bringing together these national associations and all of Hydrogen Europe's members, it's the first time ever that the entire European FCH sector is brought together with a clear and common ambition.

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List of Calls Fuel Cells and Hydrogen

CALL: H2020-JTI-FCH-2016-1			
Deadline: 03.05.2016			
Topic	Title	Number of funded projects	Total EU-contribution [€]
FCH-01-1	Manufacturing technologies for PEMFC stack components and stacks	2	6,486,150.00 €
FCH-01-3	PEMFC system manufacturing technologies and quality assurance	1	3,286,068.75 €
FCH-01-4	Development of industrialization-ready PEMFC systems and system components	1	4,994,538.75 €
FCH-01-5	Develop new complementary technologies for achieving competitive solutions for marine applications	1	2,939,457.50 €
FCH-01-8	Development of innovative hydrogen compressor technology for small scale decentralized applications for hydrogen refuelling or storage	1	2,496,830.00 €
FCH-01-9	Large scale validation of fuel cell bus fleets	1	32,000,000.00 €
FCH-02-1	Establish testing protocols for electrolysers performing electricity grid services	1	1,996,795.00 €
FCH-02-2	Development of compact reformers for distributed bio-hydrogen production	1	2,996,248.74 €
FCH-02-3	Development of processes for direct production of hydrogen from sunlight	1	2,499,992.50 €
FCH-02-4	Co-generation of hydrogen and electricity with high-temperature fuel cells	1	3,999,896.00 €
FCH-02-5	Advanced monitoring, diagnostics and lifetime estimation for stationary SOFC stacks and modules	1	2,498,948.75 €
FCH-02-6	Development of cost effective manufacturing technologies for key components or fuel cell systems for industrial applications	1	2,110,015.00 €
FCH-02-7	Demonstration of large-scale rapid response electrolysis to provide grid balancing services and to supply hydrogen markets	2	14,930,374.39 €
FCH-02-11	MW or multi-MW demonstration of stationary fuel cells	1	6,000,000.00 €
FCH-03-1	Development of innovative hydrogen purification technology based on membrane systems	1	1,999,925.00 €



FCH-04-1	Novel education and training tools	1	1,596,007.50 €
FCH-04-2	Identification of legal-administrative barriers for the installation and operation of key FCH technologies	1	1,143,000.00 €
Total		19	93,974,247.88 €

List of Abbreviations

Type of Action

CSA: Coordination and Support Action

IA: Innovation Action

RIA: Research and Innovation Action

Others

FCH: Fuel Cells and Hydrogen

H2020: Horizon 2020

JTI: Joint Technology Initiative

JU: Joint Undertaking

NCP National Contact Point