



Transport Pillar Topics in the 2016 call



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Topic	Type of Action	Ind. Budget M EUR
FCH-01-1-2016: Manufacturing technologies for PEMFC stack components and stacks	Research & Innovation (RIA)	20
FCH-01-2-2016: Standardisation of components for cost-efficient fuel cell systems for automotive applications		
FCH-01-3-2016: PEMFC system manufacturing technologies and quality assurance		
FCH-01-4-2016: Development of industrialization-ready PEMFC systems and system components		
FCH-01-5-2016: Develop new complementary technologies for achieving competitive solutions for marine applications		
FCH-01-6-2016: Develop new complementary technologies for achieving competitive solutions for rail applications		
FCH-01-7-2016: Improvement of compressed storage systems and related manufacturing processes in the perspective of automotive mass production		
FCH-01-8-2016: Development of innovative hydrogen compressor technology for small scale decentralized applications for hydrogen refuelling or storage		
FCH-01-9-2016: Large scale validation of fuel cell bus fleets		
FCH-01-10-2016: Validation of fuel cell urban trucks and related infrastructure		

Challenge

- Enable a cost efficient production and thereby marketable products in the transport sector.

Scope

- Develop manufacturing technologies
- Transpose established automotive industry best practices on production and quality
- Identification of bottleneck processes, improvement, modification, adaptation or even new development of at least two critical stack or stack component production steps
- Integration of inline non-destructive quality control tools and strategies compatible with ISO/TS16949
- Avoid duplication with VOLUMETRIQ
- Indicative Funding 3 MEuro; No. of projects: 2; Duration: 3-4 years
- MRL5 @ start, MRL6 @ end

Impact

- Demonstrate capability to increase from 100 stacks/year to 50,000 stack/year in 2020 for a total power of 5MW/year with a single line
- Produce engineering samples of the improved design for manufacturability of at least two relevant stack components, including their product validation
- Validate in hardware
- Achieve components yields > 95% for the improved stack component production steps

Topic 1.2: Standardisation of components for cost-efficient fuel cell systems for automotive applications

Challenge

- **Standardization of interfaces and system components to reduce cost of automotive fuel cell technology.**
- **Development and qualification of a capable European supplier base**

Scope

- Components suitable: air supply, fuel supply, valves, sensors, cooling, water management, DC/DC converters, current connectors...
- Minimum three components or subsystems;
- Standardized verification, validation and qualification test protocols
- Develop and build the components and test them against the specifications
- Assess the cost impact upon standardization
- Indicative Funding 3 MEuro; No. of projects:1; Duration: 3years
- TRL4 @ start, TRL7 @ end

Impact

- Recommendations for aligned interfaces and specifications for key PEMFC system components
- At least three PEMFC system components or subsystems modified, adapted and built
- Standardize verification, validation and qualification test protocols (&White paper)

Topic 1.3: PEMFC system manufacturing technologies and quality assurance

Challenge

- **Cost reduction of fuel cell systems and their components through manufacturing and quality assurance technologies.**

Scope

- Development of manufacturing technologies
- Transpose established automotive industry best practices on production and quality
- Identification of bottleneck processes in production lines, improvement, modification, adaptation or even new development of at least two critical system or system component production steps
- Integration of inline non-destructive quality control tools compatible with ISO/TS 16949
- Indicative Funding 3 MEuro; No. of projects: 2; Duration: 3-4 years
- MRL5 @ start, MRL7 @ end

Impact

- Increase production from 100 stacks/year to 50,000 stack/year in 2020 for a total power of 5MW/year with a single line
- Produce and validate engineering samples of the improved design for manufacturability of at least one relevant component, including its product validation
- Validate in hardware
- Validate the performance of the full system production in an existing production line
- Achieve components yields > 95% for the improved system component production steps

Topic 1.4: Development of industrialization-ready PEMFC systems and system components

Challenge

- **Improvement of system components and configurations to prepare for mass production**

Scope

- Development of a new generation of systems using cost engineering
 - Novel system prototypes that eliminate or reduce voltage cycling, CU/SD corrosion
 - Freeze start design and system component layout to enable faster start up at sub-zero temperature
 - Air compressor prototypes with higher efficiency at max load meet automotive dynamic requirements (0-90% power in 0.5s) and improve flow vs. pressure operating window at low current densities
 - **Optional:** Turbine/expanders prototypes; humidification prototypes; intercoolers
- Indicative Funding 5 MEuro; No. of projects: 1; Duration: 3-4 years
- TRL4 @ start, TRL7 @ end

Impact

- **FC system production cost: 100 €/kW at 50 000 units/year production rate**
- **Maximum power degradation of 10% after 6000 h for passenger cars**
- **Cold Start: Improved freeze start up performance and reliability closer to standard automotive conditions**

To be eligible for participation a consortium must contain at least one constituent entity of the Industry or Research Grouping.

Topic 1.5: Develop new complementary technologies for achieving competitive solutions for marine applications

Challenge

- Adoption of fuel cell technologies as power trains for large ships

Scope

- Identify components with specific marine application requirements
- Select highest impact for the marine application in cost and performance
- Develop improved, industrialisation-ready system components
- Validate the system performance on a powertrain test bench and in a target marine vessel for a period of minimum 6 months
- Indicative Funding 3 MEuro; No. of projects: 1; Duration: 3-4 years
- TRL4 @ start, TRL7 @ end

Impact

- Fuel to electric efficiency > 42 %; Freeze start capabilities from -35°C; Top -30°C to +45°C
- Powertrain system cost below 6000€/kW; stack life of >15,000 hours
- Fuel cell system of at least 75kW
- Formulation of initial go-to market strategy with support from stakeholders from the marine industry
- Potential for future demonstration 'innovation' actions once the project is completed

Topic 1.6: Develop new complementary technologies for achieving competitive solutions for rail applications

Challenge

- Adoption of fuel cell technologies as power trains for electrification of railway

Scope

- Identify components with specific rail application requirements
- Select highest impact for the rail application in cost and performance
- Develop improved, industrialisation-ready system components
- Validate the system performance on a powertrain test bench and a target rail vehicle for a period of minimum 6 months
- Indicative Funding 4 MEuro; No. of projects: 1; Duration: 3-4 years
- TRL4 @ start, TRL7 @ end

Impact

- Fuel to electric efficiency > 42 %; Freeze start capabilities from -35°C; Top -30°C to +45°C
- Powertrain system cost below 6000€/kW; stack life of >15,000 hours
- Fuel cell system of at least 200kW
- Formulation of initial go-to market strategy with support from stakeholders from the rail industry
- Potential for future demonstration 'innovation' actions once the project is completed

Topic 1.7: Improvement of compressed storage systems and related manufacturing processes in the perspective of automotive mass production

Challenge

- Achievement of the automotive cost targets changing manufacturing processes
- Vessel and ancillary component (tank valve, pressure regulator) integration in the vehicle
- Extended temperature range of the COPV
- Increase the acceptance of COPVs in automobile applications by means of a higher safety level

Scope

- New and/or optimized tank geometries, standardized interfaces, manufacturing processes
- Improve filling and venting tolerance of COPV; Design a leak-before-burst vessel
- Provide input to revised regulation codes and standards for storage tanks for compressed hydrogen.
- Indicative Funding 3 MEuro; No. of projects: 1; Duration: 3-4 years
- TRL4 @ start, TRL6 @ end

Impact

- Best trade-off weight/cost savings with conventional COPV and/or novel geometries/architecture strategies
- New automated and flexible manufacturing processes, equipment and tools: COPV manufacturing yield increase by a factor of 3 & Standard deviation of burst pressure reduced by 30%
- Improved filling/venting tolerance of storage systems (temperature range: -60°C to $+100^{\circ}\text{C}$) to sustain fast-filling and unrestricted extraction.
- Produce whitepapers for RCS and/or maintenance guidance
- Volumetric capacity: 0.023Kg/l (2020)
- Gravimetric capacity: 5%

Topic 1.8: Development of innovative hydrogen compressor technology for small scale decentralized applications for hydrogen refuelling or storage

Challenge

- Reduce the cost and noise generation and make compression systems sufficiently dynamic to follow the hydrogen production rates maintaining efficiency to pressurize hydrogen from 1 to 1000 bar

Scope

- Development of a modularly scalable, low noise hydrogen compression technology capable of
 - < 6 kWh / kg H₂ from 1 to 1000 bars (or equivalent)
 - installed system cost of < €2,000/ (kg H₂/day) on the long term
- Long duration testing of a typical start-stop operational profile during 9 months with <10% performance decay
- Validation of the hydrogen compression technology in a relevant simulated environment
- Indicative Funding 2.5 MEuro; No. of projects: 1; Duration: 3years
- TRL3 @ start, TRL5 @ end

Impact

- Modular scalability and operation; Low noise level(<60 dB at 5 m); Low energy demand
- 6 kWh/kg H₂ for 1 to 1000 bar compression
- Low cost:
 - CAPEX: < €4,000/ (kg H₂/day) on a short term basis with a target of <€2,000/(kgH₂/day) on a longer term.
 - OPEX: lower maintenance cost and lower down time compared to conventional technology

Challenge

- **Establish a committed coalition that can achieve the aggregate volume for a full commercialisation of fuel cell bus technology by 2020**

Scope

- Roll-out of a set of fleets amounting to at least 100 FC buses
 - at least 3 locations with minimum 20 buses per depot
 - minimum 10 buses per location/depot for additional locations
- Hydrogen refuelling station for large bus fleets based on previous engineering research projects (min. > 20 buses and 400 kg refuelling capacity per day)
- MAXIMUM Funding 32 MEuro; No. of projects: 1; Duration: 4-6 years
- TRL7 @ start buses, TRL7 @ start HRS

Impact

- Further cost reduction of FC-buses; uptake of FC-buses by European cities
- Higher public awareness
- Increase the confidence of bus operators
- Deliver lessons learnt from implementing and operating large hydrogen bus fleets

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Topic 1.10: Validation of fuel cell urban trucks and related infrastructure

Challenge

- Increase air quality in cities by reducing emissions of urban logistic vehicles

Scope

- Deployment and demonstration of Fuel Cell urban truck fleets (3.5 - 20 tons)
 - Lifetime 25,000h; MTBF >2,500h; Efficiency >42%; Availability >90%
 - Funding lesser of 1,500€/kW or 3000,000€; minimum demo 24 months
- At least 10 urban trucks and the related infrastructure
- At least two major European cities with minimum 5 trucks each
- HRS: minimum 5 vehicles; availability 98%; potential to scale up; at the pump < 9 €/kg excl. taxes
- MAXIMUM Funding 5 MEuro; No. of projects: 1; Duration: 4-5 years
- TRL6 @ start for trucks; TRL7 @ start for HRS

Impact

- Significant step towards successful market introduction of FC trucks
- Increase the confidence of fleet operators in reliable fuel supply and demonstrate the viability of fuel cells for trucks
- Identify and disseminate lessons learnt from implementing and urban trucks for early adopters

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Overarching projects in the 2016 call



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Topic	Type of Action	Ind. Budget M EUR
FCH-03.1-2016: Development of innovative hydrogen purification technology based on membrane systems	Research & Innovation (RIA)	2

Topic 3.1: Development of innovative hydrogen purification technology based on membrane systems

Challenge

- Develop innovative membrane based hydrogen purification methods fit for dynamic hydrogen demand at lower scale and high hydrogen purity requirements

Scope

- Proof-of-concept and optimization of stand alone hydrogen purification technologies for small-scale clean-up steps of H₂ produced from new production methods with:
 - low overall energy consumption
 - low investment cost
- Design and validation in relevant simulated environment of stand-alone hydrogen purification system
- Cost assessment and benchmarking with the conventional PSA
- Indicative Funding 2 MEuro; No. of projects: 1; Duration: 3 years
- TRL3 @ start; TRL5 @ end

Impact

- A step change in membrane based, small scale stand-alone hydrogen purification system
- Hydrogen recovery >90%; Hydrogen purity min 5N (SAE2719 or ISO 14687-2/3)
- Output capacity 2-5 kgH₂/day; Energy consumption 5 kWh/kg H₂
- Reduction of CAPEX compared to state of art (e.g. PSA purification) to 1,500€/kg H₂/day