



Fuel Cells and Hydrogen Joint Undertaking (FCH JU)

ANNUAL IMPLEMENTATION PLAN 2009

Adopted by the FCH JU Governing Board on 15 June 2009

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1. Introduction, background and mission

This document establishes the second Annual Implementation Plan (AIP) of the Fuel Cell and Hydrogen Joint Undertaking (FCH JU), outlining the scope and details of research activities prioritised for the second Call for proposals in 2009, together with supportive actions required. It also describes the objectives of the FCH JU, the policy and global context, assessment criteria, technical targets and rationale for individual activities.

The challenge facing fuel cells and hydrogen technologies is of great complexity, requiring substantial investments and a high level of scientific, technological and industrial expertise. At the same time, their potential contribution to Community policies - in particular energy, environment, transport and industrial competitiveness – is very important.

The European Strategic Energy Technology (SET) Plan has identified fuel cells and hydrogen among the technologies needed for Europe to achieve the targets for 2020 - 20% reduction in greenhouse gas emissions; 20% share of renewable energy sources in the energy mix; and 20% reduction in primary energy use – as well as to achieve the long-term vision for 2050¹ towards decarbonisation. This is in line with the Commission's Communication, "Energy for a Changing World – An Energy Policy for Europe"², the goals of the Lisbon Strategy and the European Council's Conclusion on a European Energy Strategy for Transport, 29 May 2007.

In May 2003, the Hydrogen and Fuel Cell High Level Group presented its vision report, "Hydrogen Energy and Fuel Cells – A Vision of our Future". In this document, the formation of a fuel cell and hydrogen technology partnership was recommended in order to accelerate substantially the development and market introduction of fuel cell and hydrogen technologies.

In December 2003, the European Commission facilitated the creation of a European Hydrogen and Fuel Cell Technology Platform (HFP), bringing together all interested stakeholders. In March 2005, HFP published a Strategic Research Agenda and Deployment Strategy, followed by an Implementation Plan in January 2007 which combined them into one consistent, long-term road map for Europe.

This process confirmed that a coherent, long-term approach at EU level was essential for achieving critical mass in terms of scale, excellence and potential for innovation. Hence the Commission's proposal for a long-term public-private-partnership in the Seventh Framework Programme (FP7) of the European Community, 2007-2013 in the form of a Joint Technology Initiative (JTI) on "Fuel Cells and Hydrogen" was a consequential step to address the challenge. In practical terms, this JTI was set up as a 'Joint Undertaking' on the basis of Article 171 of the EC Treaty.

The FCH JU pools public and private resources, with activities mainly co-financed by the Commission and the industry partners. The founding members, the European Commission and *European Fuel Cell and Hydrogen Joint Technology Initiative Industry Grouping* (hereinafter referred to as the NEW IG), shares the running cost of the JU, with an additional contribution from the third member, *the New European Research Grouping on Fuel Cells and Hydrogen*, N.ERGHY, hereinafter referred to as the RG.

¹ COM(2007) 723 final

² COM(2007) 1 final

The FCH JU was established by a Council Regulation of 30 May 2008³. Preparations for its autonomy as well as RTD activities were subsequently initiated under the responsibility of the European Commission. By the end of January 2009, all bodies of the FCH JU prescribed by the Regulation were in place and other preparations for autonomy of the FCH JU under way.

The first call for proposals, with indicative Community funding of 28.1 m€⁴, was closed on the 15 January 2009 and the proposals submitted were evaluated in February 2009.

2. RTD priorities and key objectives for 2009

In carrying out a programme of RTD activities in the field of hydrogen and fuel cells, the FCH JU will

- Aim at placing Europe at the forefront of fuel cell and hydrogen technologies worldwide and enabling the market breakthrough of fuel cell and hydrogen technologies, thereby allowing commercial market forces to drive the substantial potential public benefits
- Support RTD in the Member States and countries associated with the Seventh Framework Programme in a coordinated manner in order to avoid market failure, focus on developing market applications and facilitate additional industrial efforts towards a rapid development of fuel cell and hydrogen technologies
- Support the implementation of the RTD priorities of the Multi-Annual Implementation Plan of the FCH JU, notably by awarding grants following competitive calls for proposals
- Aim to encourage increased public and private RTD investment in fuel cells and hydrogen technologies in the Member States and Associated countries.
- Ensure the coordination and efficient management of funds. It will be guided by the principles of transparency and openness, competitiveness and excellence, inclusiveness and close cooperation among stakeholders in order to achieve the best possible benefit for Europe. RTD activities will respect the fundamental and ethical principles applicable to the Seventh Framework Programme.

2.1 FCH JU Programme Overview: the Application Areas

The Annual Implementation Plan (AIP) is the result of a joint effort by the major stakeholders - namely the NEW IG, the RG and the European Commission. It represents a set of prioritised actions, consistent with the long-term objectives of the FCH JU, which are implemented on an annual basis in order to facilitate the rapid deployment of fuel cell and hydrogen technologies, and to achieve the overall objectives of the FCH JU.

The actions have been chosen based on their potential contribution to achieving Europe's policy objectives, i.e. the Commission's '20-20-20' targets; energy security and competitiveness, and also the available annual budget. In this, they include in a balanced way research, technological development, demonstration and cross-cutting activities, including Regulations, Codes & Standards

³ Council Regulation (EC) No 521/2008 of 30 May 2008 setting up the Fuel Cells and Hydrogen Joint Undertaking for the implementation of the Joint Technology Initiative on Fuel Cells and Hydrogen, OJ L 153/1, 12.6.2008, p.1.

⁴ €28,771,590.00 including European Free Trade Area (EFTA) contributions 2.4% from countries associated to the 7th Framework Programme.

(RCS). Emphasis has been placed on actions for which results are required to achieve later steps in the programme, such as long-term research, assessments, studies and interdependent actions.

The overall programme of the FCH JU is divided into four major horizontal application areas (AA): Transportation & Refuelling Infrastructure; Hydrogen Production, Storage & Distribution; Stationary Power Generation & CHP; and Early Markets. Cross-cutting activities have also been established as a fifth area in order to make their relevance more visible. The programme structure reflects the RTD cycle from long-term and breakthrough-oriented basic research to demonstration and support activities. Pre-normative research is also included at project level.

The main objectives and activities of the different AAs are the following:

2.1.1 Transportation & Refueling Infrastructure

This application area plans real-use, Europe-wide large-scale fleet demonstration of the next-generation fuel cell hybrid vehicles, including cars and buses, hydrogen ICE vehicles and an infrastructure with an appropriate number of refuelling stations. The activities in this AA will also provide the experimental data for the verification of the well-to-wheel technology chain needed to meet the programme target of 3,000 vehicles in the field by 2015 and prepare volume production and infrastructure from 2020.

The synergies between the base technology for onboard auxiliary power generation and stationary power generation will be explored and used for potential technology development of SOFC, MCFC and PEMFC.

This AA also includes RTD activities for off-road (e.g. rail, marine and air) transport applications in order to demonstrate the feasibility of the technology as “proof-of-concept” and to raise its maturity level to application readiness.

2.1.2 Hydrogen Production & Distribution

This application area aims to develop a portfolio of sustainable hydrogen production, storage and distribution processes which can meet 10% - 20% of the hydrogen demand for energy applications from carbon-free or lean energy sources by 2015. To achieve this, the various sustainable hydrogen production and supply chains must be demonstrated and ready for commercialisation by 2013. Synergies with the AA on "Transportation & Refuelling Infrastructure" will be exploited.

Innovative hydrogen production and supply chains (e.g. low and high temperature electrolysis and direct production of hydrogen from biomass, including technologies such as enzymes for fermentation, or solar energy) will receive around 50% of the budget for this application area. By helping renewable hydrogen production to become cost competitive, the actions will prepare the ground for future large investments.

Solid state, underground and liquid storage technologies will be developed in order to complement renewable production pathways and help establish the supply chain for hydrogen. The efficiency of existing hydrogen production processes will also be improved, contributing directly to further energy savings in Europe.

2.1.3 Stationary Power Generation & Combined Heat and Power (CHP)

The research objectives of this application area are designed to reflect the main needs of the three principal fuel cell technologies, i.e. MCFC, PEMFC and SOFC. MCFC and PEMFC technologies

are generally speaking further advanced than SOFC. Thus a diverse set of actions is required to cover the different RTD needs.

The programme aims to achieve the principal technical and economic requirements needed to compete with existing energy conversion technologies, such as high electrical efficiencies of 45%+ for power units and of 80%+ for CHP units, combined with lower emissions and use of non-hydrocarbon fuels. Focussed efforts are required to address lifetime requirements of 40,000 hours for cell and stack, as well as commercial target costs, depending on the type of application.

Basic research activities will be directed to degradation and lifetime fundamentals, and new materials for the different technologies - particularly focusing on SOFC and, to lesser extent, on PEMFC and MCFC. Applied research activities are directed towards developing components and sub-systems with improved performance, durability and cost for all three technologies in order to achieve system application readiness.

Demonstration activities target technology validation or market capacity build up, depending upon technological maturity. Generally, they will focus initially upon MCFC and PEMFC near-ready units, whilst SOFC technologies are more likely to be ready for validation and demonstration at later dates.

2.1.4 Early Markets

This application area aims to develop a range of fuel cell-based products capable of entering the market in the near term. The sectors addressed are:

- *Stationary*, with emphasis on back-up power
- *Transport*, emphasizing industrial and material handling vehicles, as well as small individual mobility markets (off-road applications)
- *Portable*, with a wide range of possible products, e.g. recreational, educational, medical emergency equipment, industrial power tools, etc.

Strong emphasis is placed on the demonstration and deployment of ready-to-market products for these applications. Existing synergies with other AAs will also be explored.

As the unit cost is quite low, the programme can support a broad variety of actions. The portable sector, in particular, offers opportunities for much greater public awareness due to the broader outreach, compared to stationary installations.

In many cases, early markets represent niche markets that are the business domains of SMEs. Support measures will therefore specifically address existing commercialisation risks and regulatory hurdles that specifically impact these companies. This will include the better integration of SMEs in industrial supply chains.

The programme will thus help pave the way for a widespread acceptance of the technology, with fuel cells becoming general consumer items.

2.1.5 Cross-cutting Activities

These activities will serve the objectives of the FCH JU in a variety of ways, in particular to ensure that non-technical barriers to the deployment of these technologies are properly addressed. They will include:

1. Technical activities, such as pre-normative research (PNR) on topics which transcend the boundaries of the various applications, e.g. design and test criteria for composite hydrogen storage containers or fuel quality. This will ensure that the viewpoints and requirements of all potential users are integrated into PNR work.
2. Programme level activities, such as Socio-Economic Modelling and Planning, Technology Monitoring and Assessment, and Lifecycle Analysis (LCA) will assess the progress of the FCH JU in achieving its objectives. The strategic coordination of Regulations, Codes & Standards (RCS) Activities and Joint Public Awareness Activities will also help develop the market; while Educational Projects will enable wider access to training and educational information.
3. Assistance to SMEs “inter alia” for their integration into the supply chains of OEMs and also in the certification processes.

These activities will be complemented by specific tasks related to PNR, LCA and public awareness to be carried out as part of individual collaborative projects.

2.2 Specific topics for the 2009 Call for proposals

In line with the political and technical objectives outlined above, the following topics have been prioritised for the AIP 2009 and the second call for proposals of the FCH JU:

- In the application area **Transportation and Refuelling Infrastructure** activities for the large-scale demonstration of second-generation fuel cell vehicles (car and bus fleets with improved durability, robustness, reliability and efficiency) and of a refuelling infrastructure will start by establishing a number of demo sites in several European cities. Another topic relates to the development of peripheral air supply systems, as critical sub-system to further improve system performance, efficiency and robustness; this will include the assessment of improved system architectures and alternative concepts. Research and development of catalysts for membrane electrode assemblies (MEAs) of polymer electrolyte membrane fuel cells will aim to further reduce the amount of platinum loading and increase catalyst performance and stability, and improve the manufacturability of MEAs. It is also proposed to perform research on cryogenic storage as a potential alternative to the 700bar onboard storage technology.
- The application area **Hydrogen Production and Distribution** will focus on research and development to improve reforming technologies for hydrogen production, with the goal of addressing mid-term fuelling requirements based on conventional and alternative fuels. This shall enable initial introduction of hydrogen-fuelled vehicles in the market. Research and development on gas purification technologies is a prioritized topic to tackle short-term fuelling requirements i.e. a suitable hydrogen quality. One call topic is dedicated to research and development on high temperature electrolysis technology (Solid oxide electrolysis cells, SOEC) to further advance the large-scale use of renewable and other energy sources, and to achieve substantial improvement of energy-efficiency. Finally, long-term and break-through research on solid state hydrogen storage for increased efficiency and storage capability is kicked-off.

- The application area **Stationary Power Generation** has emphasis on long-term basic research to better understand degradation/failure mechanisms and the lifetime requirements of all fuel cell stack types (SOFC, MCFC, PEMFC), for different fuels and levels of power. For lifetime predictions, research is necessary to establish methodologies as well as tools for modelling, operational controls and diagnostics. Other activities aim at novel diagnostic and control tools, as well as improvements of components and systems in terms of functionality, performance, lifetime and cost reduction. Another research topic refers to validation of fuel cell systems in simulated application environment, including also the 'fine tuning' of operation parameters and set-up of maintenance and repair strategies. Another topic tackles the demonstration of the fuel cell system readiness, including accelerated testing of integrated prototypes, and their interaction with the grid and fuel infrastructure.
- Emphasis of the application area **Early Markets** is put on demonstration of readiness of fuel cell systems applied to materials handling vehicles, with the final aim to stimulate market pull for non-highway vehicle applications. Another topic relates to the demonstration of application readiness of portable and micro fuel cells in industrial tools, sub-micro CHP (< 1 kW), to explore additional niche applications. Research and technological development is dedicated to miniaturized balance of plant to achieve the required power density, fuel variability and target cost. Pre-normative research and RCS activities will be performed to ensure safe in-door use of fuel cells. The call also covers further SME promotion activities towards early demand stimulation schemes, with focus on strategic procurement by public institutions, cities or regions.
- **Cross-Cutting Issues** focus on pre-normative research on composite storage to address design criteria like ageing, pressure levels, shock resistance, failure modes. The goal is to establish production and performance standards and define safety factors. In relation with the topics of the transportation and hydrogen production area, a topic of pre-normative research is opened on hydrogen fuel quality, with the aim to determine reasonable quality requirements and standards based on safe fuel cell operation requirements. Development of training initiatives will be started aiming to secure the required mid- and long-term availability of human resources capable to properly operate the technologies safely. This will be done for various educational levels, and cooperation with other educational programs like Leonardo will be sought. Technology-related training initiatives for regulators and code officials will be also initiated. In the context of developing a market and finance outreach program for SMEs; the call includes the development of supporting tools for SMEs towards investors and major OEMs. Other **cross-cutting activities** will focus on the development of appropriate frameworks for Technology monitoring and assessments (TMA) and Life Cycle Assessments (LCA). The results of these activities will play an important role in harmonising the different datasets, accelerating the innovation cycle and establishing a structured approach to measuring impact and progress. These activities are needed to create the required framework for the overall JTI programme.

The table below describes specific topics selected for the second call, together with their rationales. For a detailed description of the topics, see Annex 8.1 of this document. Please, note that when submitting a proposal the topic reference to be used in the submittal forms is the one identified in this Annex.

Calls for Proposals will be selective. There will be competition, based on quality and excellence, between proposals primarily, but not exclusively, within activity areas, which may result in exceptional cases in some topics not being supported in a given call.

No.	Topic	Scope	Indicative FCH JU Funding Million €
Transportation & Refuelling Infrastructure			26.4
1	Large-scale demonstration of road vehicles and refuelling infrastructure II	Demonstration of second generation fuel cell hybrid buses for public transportation, passenger cars and appropriate refuelling infrastructure with improved durability, robustness, reliability and efficiency. The aim is to provide extended operating experience, and prove technological readiness. Demonstration trials are supported by activities on public awareness, on technological and environmental assessment, on safety and certification requirements.	
2	Development of electric driven turbocharger for fuel cell	Development on air supply systems to further improve system performance, efficiency and robustness, assess improved architectures and alternative concepts.	
3	Development and optimisation of PEM FC electrodes and GDLs	Development of catalysts for PEM fuel cells- to further reduce the use of platinum in membrane electrode assemblies (MEAs), increase catalyst performance and electro-chemical stability; development of novel materials for gas diffusion layers (GDLs). Testing of the MEAs. The overall aim is to produce MEAs with significant specific cost reduction (i.e. cost/power).	
4	Cryogenic hydrogen storage	Development activities on cryogenic hydrogen storage. The activities need to include an assessment of the potential to reach the technological targets with regard to benchmarks of alternative storage technologies, such as compressed on board hydrogen storage.	
5	PNR on composite storage	Pre-normative research for high pressure composite storage on design criteria, such as ageing, pressure levels, shock resistance, failure modes. The overall objective is to establish production and performance standards and define safety factors.	
6	PNR on fuel quality	Pre-normative research on hydrogen fuel quality with the aim to determine fuel quality specifications and standards based on safe fuel cell operation requirements	
Hydrogen Production & Distribution			5.7
7	Development of fuel processing catalyst, modules & systems	Development of reforming technologies for hydrogen production based on conventional and alternative fuels (such as bio-fuels, methanol and ethanol); focus is on materials and processes for chemical conversion and desulphurisation. The objective is to further develop refuelling technologies for the introduction of hydrogen-fuelled vehicles in the market.	
8	Development of gas purification technologies for hydrogen production	Development of gas purification technologies and quality monitoring for hydrogen production processes based on conventional and alternative fuels, such as bio-fuels. Scope of work is on optimisation of materials, including membranes and sorbents, - and processes for pressure swing adsorption (PSA) and temperature swing adsorption (TSA). The objective is to further develop refuelling technologies for the introduction of hydrogen-fuelled vehicles in the market.	

No.	Topic	Scope	Indicative FCH JU Funding Million €
9	New generation of high temperature electrolyser	Development activities of high-temperature electrolysis, with focus on cells and stacks. The objective is to couple high-temperature electrolysers with renewable solar and nuclear energy systems, with substantial improvement of energy-efficiency.	
10	Improved solid state H2 storage systems	Long-term and break-through oriented research on improved solid state hydrogen storage options for increased efficiency and storage capability.	
Stationary Power Generation & CHP			25.9
11	Fundamentals of fuel cell degradation for stationary power application	Research on critical parameters and operating conditions that impact degradation and life time of cells and stacks, for all power ranges and fuel cell technologies	
12	Materials development for cells, stacks and balance of plant (BoP)	Development of materials to improve performance of single cells stacks and BoP components, in terms of longer lifetime and lower degradation as well as improved mechanical, thermal and electro-chemical stability. Investigation on material production techniques need to be considered as well. Open to all fuel cell technologies	
13	Operation diagnostics and control for stationary applications	Development activities on control and diagnostic tools for a) reliable degradation and lifetime prediction of cells and stacks; b) robust control and operation of complete fuel cell systems. Open to all fuel cell technologies.	
14	Component improvement for stationary power applications	Development activities to improve a) The performance of individual components of fuel cell systems (e.g. fuel cell units, reformer, heat exchangers, fuel management and power electronics); b) The understanding and optimization of interaction between BoP components and mature stacks. The objective is to meet relevant performance targets, including durability and cost. Open to all fuel cell technologies.	
15	Proof-of- concept fuel cell systems	Development of proof-of- concept prototype fuel cell systems for any stationary application, potential feature and technology. The aim is to demonstrate feasibility of proposed systems. The aim is to show interaction between the PoC FC systems with other devices required for delivering power, heat and cooling to end users.	
16	Validation of integrated fuel cell systems readiness	Development to show system readiness of integrated fuel cell systems in simulated application environments for typical lead applications. Economic manufacturing solutions need also to be addressed, ensuring that quality and cost targets are met.	
17	Market capacity Build and Field demonstration of stationary fuel cell systems	Demonstration of proven fuel cell systems on a relevant scale and in real end-user environment. Systems shall be suited for up scale-manufacturing including supply chain. The aim is to demonstrate fit-for -purpose technical system performance and extended operation experience to pave the ground for large-scale deployment.	
18	Application specific targets for stationary power generation and related technology benchmark.	Assessment and benchmarking of specific technological and economic targets for small, micro, commercial and industrial stationary applications. The analysis shall review the potential of the different technologies to fulfil the identified targets and identify actions for the consolidation and acceleration of research activities.	

No.	Topic	Scope	Indicative FCH JU Funding Million €
Early Markets			10.3
19	Demonstration of fuel cell-powered materials handling vehicles and infrastructure	Demonstration of industrial application readiness of fuel cell-powered material handling vehicles, (e.g. forklifts, pallet trucks) including the related hydrogen refuelling infrastructure. The aim is to address critical application requirements with regard to sustainability, efficiency and logistic effort. Demonstration trials are supported by activities on dissemination and certification requirements.	
20	Demonstration of portable generators, backup and UPS power systems	Demonstration of application readiness with respect to cost-competitiveness, lifetime, logistics, environmental performance of portable generators, back-up and UPS-systems.	
21	Demonstration of portable and micro Fuel cells for various applications	Demonstration of application readiness of portable and micro fuel cells for different applications (e.g. industrial tools, recreational, sub-micro CHP) in order to provide awareness and attract additional niche applications.	
22	Miniaturised balance of plant components	Development of miniaturized balance of plant components for micro fuel cells (10- 500 W) in order to achieve the required power density, prove the capability to operate with different fuels and meet target cost.	
23	PNR & RCS on the indoor use of fuel cells	Pre-normative research aimed at the development of methodologies and procedures for safe indoor use of fuel cells, including definition of specific codes for noise, emissions, and safety.	
24	SME promotion: Early demand stimulation schemes	Support action aiming at developing concepts for SMEs early demand stimulation schemes and frameworks with focus on strategic procurement by public institutions, cities or regions. The final aim is to support the market entry for SMEs.	
Cross-cutting Issues			3.0
25	Development of educational programmes	Development of technology-specific training initiatives for technical professionals, in cooperation with other programs such as Leonardo. The overall objective is to secure the required mid- and long-term human resource base.	
26	Training initiatives for regulators	Development of technology-specific training initiatives for local, regional or national regulators and technical project managers to broaden knowledge base on hydrogen and fuel cells.	
27	SME promotion: Outreach program	Development of supporting tools for SMEs to approach investors and OEMs.	
28	Development of a framework for Technology Monitoring and Assessments (TMA)	Development of a comprehensive technology monitoring and assessment (TMA) framework to be used by the FCH JU for assessing progress towards achieving both FCH JU objectives and vis-à-vis major external developments.	
29	Development of a framework for Life Cycle Assessment (LCA)	Development of dedicated practice guidance for hydrogen and fuel cell technologies to be integrated with the International Reference Life Cycle Data System (ILCD) Handbook on LCA	
Total indicative FCH JU Funding			71.3

3. FCH JU Governance

The FCH JU is composed of two executive bodies: the Governing Board and the Executive Director. In addition there are three advisory bodies, the Scientific Committee, the FCH States Representatives Group and the Stakeholders' General Assembly.

3.1 Governing Board

The Governing Board shall have the overall responsibility for the operations of the FCH JU and shall oversee the implementation of its activities in accordance with Article 5 of the Statutes. The NEW IG has 6 seats, the EC 5 seats and the RG 1 seat respectively.

The Governing Board is planning to hold three Board meetings during 2009. The key activities are listed below:

Key activities in 2009 - timetable	
Complete selection procedure for the Scientific Committee	Q1
Adopt Framework Agreement with the JRC	Q1
Adopt/approve the key documents for continued implementation of the 2008 budget: The list of projects for negotiations for the 2008 Call and the Grant Agreement.	Q2
Adopt/approve the key documents for operations in 2009: Call documents for 2009, Annual Implementation Plan 2009, the Staff Policy Plan and the Annual budget.	Q2
Adopt/approve the key documents for operations in the long term: Multi-Annual Implementation Plan and Staff Policy Plan 2010-2012.	Q2
Adopt the practical arrangements for implementing Regulation (EC) No 1049/2001 regarding transparency and access to EU documents. ⁵	Q4
Adopt the practical arrangements for implementing Regulation (EC) No 1073/1999 in relation to the prevention of fraud, corruption and any illegal activity detrimental to the communities' interest.	Q4
Make appropriate provisions for the internal auditing function ⁶	Q4
Appoint the FCH JU Executive Director	Q4
Adopt the FCH JU Communication Strategy	Q4

3.2 Executive Director

The Executive Director is the legal representative of the FCH JU, and shall be the chief executive for the day-to-day management in accordance with the decisions of the Governing Board in line with Article 6 of the Statutes. The Executive Director will be supported by the staff of the Programme Office.

⁵ FCH JU Council Regulation No 521/2008, Article 14

⁶ FCH JU Statutes Article 11

The Interim Executive Director has been appointed by the Commission to fulfil the functions of the Executive Director until such time he/she takes up his/her duties. Mr Philippe Vannson was appointed as the Interim Executive Director on 18 November 2008. He is assisted by a number of Commission officials to ensure that the JU is carrying out its activities efficiently during this period.

The process for the selection and appointment of the Executive Director was initiated in 2008. The vacancy was published on 21 April 2009 with a closing date of 29 May 2009. The appointment process is scheduled to be finalised by the end of the year.

3.3 Scientific Committee

The Scientific Committee is an advisory body to the Governing Board. It shall conduct its activities in close liaison and with the support of the Programme Office.

The members shall reflect a balanced representation of world class expertise from academia, industry and regulatory bodies. Collectively, the Scientific Committee members collectively shall have the scientific competencies and expertise covering the complete technical domain needed to make strategic science-based recommendations regarding the FCH JU. It shall have a maximum of 9 members.

According to Article 8 in the FCH JU Statutes the role of the Scientific Committee is to:

- (a) advise on the scientific priorities for the Annual and Multiannual Implementation Plans proposal;
- (b) advise on the scientific achievements described in the Annual activity report;
- (c) advise on the composition of the peer review committees.

The Governing Board adopted the Specific Criteria and Selection Process for the Composition of the Scientific Committee on 22 December 2008. Eight members were appointed by the Board on 30 January 2009. In making their selection, the Governing Board took into account the potential candidates proposed by the FCH States Representatives Group. Another call for candidacies was opened for the ninth member on 5 February 2009. The Governing Board is scheduled to make the appointment in May 2009.

The first meeting of the Scientific Committee was held on 9 March 2009 with the principal objective of consulting the Committee on the scientific priorities of the Multi-Annual Implementation Plan and the Annual Implementation Plan 2009. The second meeting is foreseen during the second quarter of 2009 and the third one during the fourth quarter.

3.4 FCH States Representatives Group

The FCH States Representatives Group (SRG) shall consist of one representative of each Member State and of each country associated to the 7th Framework programme.

According to Article 9 in the Statutes the SRG shall have an advisory role to the JU and shall act as an interface between the JU and the relevant stakeholders within the respective countries. It shall in particular review information and provide opinions on the following issues:

- (a) programme progress in the FCH JU;
- (b) compliance and respect of targets;
- (c) updating of strategic orientation;
- (d) links to Framework Programme Collaborative Research;

- (e) planning and outcome of calls for proposals and tenders;
- (f) involvement of SMEs.

It shall also provide input to the JU on the following:

- (a) status of and interface to JU activities of relevant national research programmes and identification of potential areas of cooperation;
- (b) specific measures taken at national level with regard to dissemination events, dedicated technical workshops and communication activities.

The FCH States Representatives Group may issue, on its own initiative, recommendations to the FCH JU on technical, managerial and financial matters, in particular when these affect national interests. The FCH JU shall inform the FCH States Representatives Group of the follow up it has given to such recommendations.

The States Representatives Group held its first meeting on 16 December 2008. The process for the election of Chair and Vice-Chair and the adoption of the Rules of Procedure of the States Representatives Group was initiated at this meeting and both procedures were concluded at the second meeting, held on 12 March 2009. Mr Bernard Frois (France) was elected Chair while Mr Georg Menzen (Germany) and Axel Mortensgaard (Denmark) were elected Vice-Chairs. The second main objective for the meeting was to seek the States Representatives Group's opinion on the Multi-Annual Implementation Plan and the Annual Implementation Plan 2009.

The third meeting of the States Representatives Group is scheduled preliminarily for December 2009.

Key activities in 2009 - timetable	
Election of Chair and Vice-Chairs, adoption of the Rules of Procedure	Q1
Consultation of the SRG on MAIP and AIP 2009	Q1
Consultation on national programmes	Q3-Q4
Preparation of AIP 2010	Q4
Feedback on Stakeholders General Assembly	Q4

3.5 Stakeholders' General Assembly

The Stakeholders' General Assembly (SGA) shall have an advisory role to the FCH JU. It shall be open to all public and private stakeholders, international interest groups from Member States, Associated countries as well as from third countries.

The Stakeholders' General Assembly shall be informed of the activities of the FCH JU and shall be invited to provide comments.

The Stakeholders' General Assembly is an important communication channel to ensure transparency and openness of the RTD activities with its stakeholders. It shall be convened once a year.

The second Stakeholders' General Assembly is scheduled to take place in Brussels 26-27 October 2009. The emphasis of the agenda is foreseen to be on FCH JU progress and technical issues.

Key activities in 2009 - timetable	
The 2 nd SGA meeting 26-27 October 2009.	Q4

4. Calls for Proposals

4.1 Submission and evaluation procedure

Applications to the FCH JU for financial support to the RTD activities are made following competitive calls for proposals. The evaluation, selection and award procedures of the FCH JU are described in the document "FCH JU - Rules for submission of proposals, and the related evaluation, selection and award procedures".

The evaluation shall follow a single stage procedure.

The evaluation criteria (including weights and thresholds) and sub-criteria, together with the eligibility, selection and award criteria, for the different funding schemes are set out in "Evaluation criteria and procedures" in Annex 8.1.1.

Proposals will not be evaluated anonymously.

Ranked lists of proposals will be established for each area. At the Panel stage, proposals from different topics with equal overall scores will be prioritised according to the overall FCH JU Annual Implementation Plan coverage. Proposals from the same topic with equal overall scores will be prioritised according to their scores for the S/T Quality criterion. If they are still tied, they will be prioritised according to their scores for the Impact criterion, and then by their scores for the Implementation criterion. If they continue to be tied, other characteristics agreed by the Panel member should be taken into account. A reserve list will be constituted if there are a sufficient number of good quality proposals. It will be used if extra budget becomes available.

4.2 Indicative evaluation and contractual timetable

Evaluation of proposals is expected to be carried out in November 2009.

Evaluation results are estimated to be available within 2 months after the closure date.

See Annex 8.1.2 and Annex 8.1.3 for details.

4.3 Consortium agreement

The legal entities wishing to participate in a project shall form a consortium and appoint one of its members to act as its coordinator. In general, the coordinator should come from the NEW IG or from the RG.

4.4 Particular requirements for participation, evaluation and implementation

Participation in projects shall be open to legal entities and international organisations once the minimum conditions have been satisfied.

The minimum conditions to be fulfilled for Collaborative Projects and Coordinating Actions funded by the FCH JU shall be the following:

- (a) At least 3 legal entities must participate, each of which must be established in a Member State or an Associated Country, and no two of which are established in the same Member State or an Associated Country.
- (b) All 3 legal entities must be independent of each other as defined in Article 6 of the Rules for Participation of the Seventh Framework Programme⁷;
- (c) At least 1 legal entity must be a member of the NEW IG or the RG.

The minimum condition for service and supply contracts, Support Actions, studies and training activities funded by the FCH JU shall be the participation of one legal entity.

Forms of grants and maximum reimbursement rates for projects funded through the FCH JU will be specified in the FCH JU Grant Agreement.

4.5 Forms of grants

A grant will be awarded by means of a Grant Agreement between the FCH JU and the project participants.

The Grant Agreement will:

- provide appropriate provisions for the implementation of the RTD activities,
- ensure that appropriate financial arrangements and rules are in place relating to the intellectual property rights policy and,
- govern the relationship between the consortium and the FCH JU.

The project activities shall be financed through a financial contribution from the FCH JU and through in-kind contributions from the legal entities participating in the activities. The industry contribution shall at least match the Community contribution, i.e. the financial (cash) contribution coming from the FCH JU.

Reimbursement of direct costs

FCH JU maximum reimbursement rates of direct costs will be aligned with FP7 upper funding limits.

The reimbursement of direct costs will therefore be based on a maximum percentage of actual eligible direct costs, depending on the type of participant, funding scheme and type of activity, as follows:

⁷ Regulation (EC) No 1906/2006 of the European Parliament and of the Council of 18 December 2006 laying down the rules for the participation of undertakings, research centres and universities in actions under the Seventh Framework Programme and for the dissemination of research results (2007-2013)

Type of organisation	Type of Activity		
	RTD	Demonstration	Other ⁸
Industry (other than SME)	CP: max. 50% CSA: max. 100%	CP: max. 50% CSA: max. 100%	CP: max. 100% CSA: max. 100%
SME	CP: max. 75% CSA: max. 100%	CP: max. 50% CSA: max. 100%	CP: max. 100% CSA: max. 100%
Non-profit public-bodies, universities & higher education establishments, non-profit Research organisations	CP: max. 75% CSA: max. 100%	CP: max. 50% CSA: max. 100%	CP: max. 100% CSA: max. 100%

Funding schemes: CP: Collaborative project
CSA: Coordination and Support Action

Reimbursement of indirect costs

The reimbursement of indirect costs for every beneficiary will be:

1. Either a maximum of 20% of the direct eligible costs, excluding its direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiaries.
2. Or a flat rate of 20% of the direct eligible costs, excluding its direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiaries.

Option 1 is mandatory for industrial legal entities, except for those whose accounting system does not allow to distinguishing direct from indirect costs. Under this option, beneficiaries shall declare their actual indirect costs under eligible costs.

In the case of coordination and support actions, the reimbursement of indirect eligible costs for every beneficiary may reach a maximum of 7% of the direct eligible costs, excluding its direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

FCH JU Financial contribution

The FCH JU contribution shall be determined by applying the upper funding limits for the reimbursement of direct eligible costs and the maximum reimbursement rate or flat rate for indirect costs.

However, as indicated in Article 15(3) of the statutes of the FCH JU,

⁸ "Other" activities refer to management activities, training, coordination, networking and dissemination (including publications). Please note that scientific coordination is not considered to be a management activity.

"in case lower levels of funding will be necessary to comply with the matching principles referred to in Article 12(3) (the industry contribution shall at least match the Community's contribution), the decreases shall be fair and balanced proportionally with the above mentioned upper funding limits of the Rules of Participation of the Seventh Framework Programme for all categories of participants in each individual project."

Experience from the FCH JU 2008 Call for proposals showed that these decreases might be substantial, depending on the type of activity (Research, Demonstration, Other) and type of participant (SME, university, etc) of the proposals retained for negotiation, as well as on the related matching funds provided by industrial participants in these proposals.

The decreases will be estimated per call for proposals, after evaluation and before signing the Grant Agreement.

These provisions are further developed in the FCH JU Grant Agreement.

5. Support activities

5.1 Preparatory actions

The Commission will be responsible for the establishment and initial operation of the FCH JU until it has the operational capacity to implement its own budget. The Commission will carry out, in accordance with Community law, all necessary actions in collaboration with the other members of the JU and with the involvement of the competent bodies.

For that purpose, until such time as the Executive Director takes up his/her duties the Commission has appointed Mr Philippe Vannson as the Interim Executive Director as of 18 November 2008. To support the Interim Executive Director in setting up the FCH JU, a dedicated Task force of four staff of EC officials has also been established in December 2008.

The Interim Executive Director may authorise all payments covered by the credits provided in the budget of the FCH JU, once approved by the Governing Board, and may conclude contracts, including staff contracts, following the adoption of the FCH JU staff establishment plan. The Commission authorising officer may authorise all payments covered by the credits provided in the general budget of the FCH JU.

FCH JU's operations in 2009 will be focused on finalising the procedure for recruiting the staff, publishing the second call for proposals, drafting the reference documents for the said call, preparing the accounting system as well as the necessary IT tools.

In addition, the FCH JU's operations will also cover the preparation of the necessary steps remaining to become a fully operational Joint Undertaking. This implies that the Executive Director, Accounting Officer and core staff is recruited, that core Service Level Agreements are signed, the accounting system is in place and that the FCH JU's bank account is opened. The conditions for autonomy of the FCH JU are scheduled to be fulfilled by the first quarter of 2010.

5.2 IT support

For the 2009 call for proposals, the Commission FP7 IT systems will be used for the publication of the call, as well as for the submission, evaluation and negotiation of proposals.

5.3 Accounting system

The choice of an IT-assisted accounting system has been discussed during 2008 and a recommendation for European Commission's Accrual Based Accounting system (ABAC) has been given the support of the Governing Board on 30 January 2009. Consultations for the specific needs of the FCH JU will follow before the implementation of the system. The accounting system is scheduled to be in place by Q1 2010.

6. Indicators

6.1 Annual activity report

The Annual activity report will present the progress made by the FCH JU in each calendar year, in particular in relation to the Annual Implementation Plan for that year.

It will include information on the performed RTD activities; the costs and the contribution of the FCH JU for any individual project; the participation of SMEs; and any other activities during the previous year, with the corresponding expenditure.

The first Annual Activity Report for 2008, together with the annual accounts and balance sheets, will be presented to the Governing Board by the Interim Executive Director during Q2 of 2009. Once approved by the Governing Board, it will be made public.

6.2 Management control and internal control procedures

The FCH JU and its bodies shall avoid any conflict of interest in the implementation of the activities.

The FCH JU has adopted specific financial rules which may depart from the Community Financial Regulation, in cases where the specific operating needs of the FCH JU so require.

The FCH JU shall establish its own internal audit capability, which shall make appropriate provisions, taking into account the size and the scope of the FCH JU.

The FCH JU shall protect the financial interests of the members and implement anti-fraud measures. In particular, the FCH JU shall ensure that the financial interests of its members are adequately protected by carrying out or commissioning appropriate internal and external controls.

In case of irregularities committed by the FCH JU or its staff, the members of the FCH JU shall reserve the right to recover any amount unduly spent, including by a reduction or suspension of subsequent contributions to the FCH JU.

For the purposes of combating fraud, corruption and other illegal acts, Regulation (EC) No 1073/1999 shall apply.

The FCH JU shall also carry out on-the-spot checks and financial audits among the recipients of the FCH JU's funding.

The Commission and/or the Court of Auditors may, as necessary, also carry out on-the-spot checks among the recipients of the FCH JU's funding and the agents responsible for its allocation. To that end, the FCH JU shall ensure that grant agreements and contracts provide for the right of the Commission and/or the Court of Auditors to carry out, on behalf of the FCH JU, the appropriate controls and, in the event of the detection of irregularities, to impose dissuasive and proportionate penalties.

7. Communication activities for 2009

Fuel cell and hydrogen technologies are as yet relatively unknown to the public. Their benefits and the RTD results obtained within the programme must therefore be carefully explained and widely disseminated. For this reason, efficient and pro-active communication and dissemination activities are of great importance for the success of the FCH JU. Their objective is to:

- i. Ensure that the FCH JU is perceived as a key European strategic initiative for focused, coordinated and competitive RTD activities in the field of fuel cells and hydrogen
- ii. Raise public awareness of the role of fuel cells and hydrogen for creating a sustainable, secure and affordable energy system as well as employment
- iii. Ensure internal communication and coordination with members and stakeholders managing their expectations and promoting continued interest in the FCH JU activities
- iv. Engage external stakeholders encouraging increased RTD investment in fuel cell and hydrogen technologies.

Communication materials and tools will be chosen according to the target group (e.g., students, educators, policy makers, general public, etc.). As a key communication tool serving all these groups, the FCH JU will develop a website including an information portal, press material, brochures, videos and standard presentations. Furthermore, the website will be instrumental in disseminating project results. As explained in section 3.5, the Stakeholders General Assembly will also be an important channel for communication and information exchange of FCH JU activities.

Activities in 2009 will therefore focus on communicating the objectives of the FCH JU and establishing some of the communication tools required. To this end, a communication strategy, including a long-term communication plan for the FCH JU, is being finalised in 2009 to ensure proper messaging and outreach to both stakeholders and the public.

A communication group will be established to manage the FCH JU communication activities.

Communication activities will:

- provide timely, reliable, coherent and consistent messaging;
- ensure all stakeholders have equal access to information;
- be guided by transparency and openness.

Proposed communication materials and tools include a website, press material, brochures, videos and standard presentation materials. As a key communication tool, the official website should be established as soon as possible. In the meanwhile, a temporary website will be set up by the end of May 2009.

Meeting/Activity	Timing
Develop the FCH JU interim website	Q2
SGA - Stakeholder event Oct 26-27, 2009	Q4
Launch the development of branding of the FCH JU	Q4

8. Annexes

8.1 Calls for proposals

8.1.1 Evaluation criteria and procedures

1. General

The evaluation of proposals is carried out by the FCH JU with the assistance of independent experts.

FCH JU staff ensures that the process is fair, and in line with the principles contained in the FCH JU rules⁹.

Experts perform evaluations on a personal basis, not as representatives of their employer, their country or any other entity. They are expected to be independent, impartial and objective, and to behave throughout in a professional manner. They sign an appointment letter, including a declaration of confidentiality and absence of conflict of interest before beginning their work. Confidentiality rules must be adhered to at all times, before, during and after the evaluation.

In addition, an independent expert might be appointed by the FCH JU to observe the evaluation process from the point of view of its working and execution. The role of the observer is to give independent advice to the FCH JU on the conduct and fairness of the evaluation sessions, on the way in which the experts apply the evaluation criteria, and on ways in which the procedures could be improved. The observer will not express views on the proposals under examination or the experts' opinions on the proposals.

2. Before the evaluation

On receipt by the FCH JU, proposals are registered and acknowledged and their contents entered into a database to support the evaluation process. **Eligibility criteria** for each proposal are also checked by FCH JU staff before the evaluation begins. Proposals which do not fulfil these criteria will not be included in the evaluation.

For this call a proposal will only be considered eligible if it meets all of the following conditions:

- It is received by the FCH JU **before the deadline**
- It involves at least the **minimum number of participants** (see also chapter 4.4)
- It is **complete** (i.e. both the requested administrative forms and the proposal description are present)
- The **content of the proposal relates to the topic(s) and funding scheme(s)**, including any special conditions set out in the relevant parts of the Annual Implementation Plan

The FCH JU establishes a **list of experts capable of evaluating the proposals** that have been received. The list is drawn up to ensure:

⁹ FCH JU Rules for submission of proposals, and the related evaluation, selection and award procedures (posted on CORDIS)

- A high level of expertise;
- An appropriate range of competencies.

Provided that the above conditions can be satisfied, other factors are also taken into consideration:

- An appropriate balance between academic and industrial expertise and users;
- A reasonable gender balance;
- A reasonable distribution of geographical origins;
- Regular rotation of experts.

In constituting the lists of experts, the FCH JU also takes account of their abilities to appreciate the industrial and/or societal dimension of the proposed work. Experts must also have the appropriate language skills required for the proposals to be evaluated.

FCH JU staff allocates proposals to individual experts, taking account of the fields of expertise of the experts, and avoiding conflicts of interest.

3. Evaluation of proposals

At the beginning of the evaluation, experts will be briefed by FCH JU staff, covering the evaluation procedure, the experts' responsibilities, the issues involved in the particular area/objective, and other relevant material (including the integration of the international cooperation dimension).

Each proposal will first be assessed independently by at least 3 experts.

The proposal will be evaluated against pre-determined evaluation criteria and sub criteria.

<i>Evaluation criteria applicable to Collaborative project proposals</i>		
S/T QUALITY “Scientific and/or technological excellence (relevant to the topics addressed by the call)”	IMPLEMENTATION “Quality and efficiency of the implementation and the management”	IMPACT “Potential impact through the development, dissemination and use of project results”
<ul style="list-style-type: none"> • Soundness of concept, and quality of objectives • Progress beyond the state-of-the-art • Quality and effectiveness of the S/T methodology and associated work plan 	<ul style="list-style-type: none"> • Appropriateness of the management structure and procedures • Quality and relevant experience of the individual participants • Quality of the consortium as a whole (including complementarity, balance) • Appropriateness of the allocation and justification of the resources to be committed (budget, staff, equipment) 	<ul style="list-style-type: none"> • Contribution, at the European [and/or international] level, to the expected impacts listed in the work programme under the relevant topic/activity • Appropriateness of measures for the dissemination and/or exploitation of project results, and management of intellectual property.

<i>Evaluation criteria applicable to Coordination and support actions (Supporting)</i>		
S/T QUALITY “Scientific and/or technological excellence (relevant to the topics addressed by the call)”	IMPLEMENTATION “Quality and efficiency of the implementation and the management”	IMPACT “Potential impact through the development, dissemination and use of project results”
<ul style="list-style-type: none"> • Soundness of concept, and quality of objectives • Quality and effectiveness of the support action mechanisms, and associated work plan 	<ul style="list-style-type: none"> • Appropriateness of the management structure and procedures • Quality and relevant experience of the individual participants • Quality of the consortium as a whole (including complementarity, balance) [only if relevant] • Appropriateness of the allocation and justification of the resources to be committed (budget, staff, equipment) 	<ul style="list-style-type: none"> • Contribution, at the European [and/or international] level, to the expected impacts listed in the work programme under the relevant topic/activity • Appropriateness of measures for spreading excellence, exploiting results, and disseminating knowledge, through engagement with stakeholders, and the public at large.

<i>Evaluation criteria applicable to Coordination and support actions (Coordinating)</i>		
S/T QUALITY “Scientific and/or technological excellence (relevant to the topics addressed by the call)”	IMPLEMENTATION “Quality and efficiency of the implementation and the management”	IMPACT “Potential impact through the development, dissemination and use of project results”
<ul style="list-style-type: none"> • Soundness of concept, and quality of objectives • Contribution to the co-ordination of high quality research • Quality and effectiveness of the co-ordination mechanisms, and associated work plan 	<ul style="list-style-type: none"> • Appropriateness of the management structure and procedures • Quality and relevant experience of the individual participants • Quality of the consortium as a whole (including complementarity, balance) • Appropriateness of the allocation and justification of the resources to be committed (budget, staff, equipment) 	<ul style="list-style-type: none"> • Contribution, at the European [and/or international] level, to the expected impacts listed in the work programme under the relevant topic/activity • Appropriateness of measures for spreading excellence, exploiting results, and disseminating knowledge, through engagement with stakeholders, and the public at large.

Evaluation scores will be awarded for each of the three criteria, and not for the sub-criteria. The sub-criteria are issues, which the expert should consider in the assessment of that criterion. They also act as reminders of issues to rise later during the discussions of the proposal.

The relevance of a proposal will be considered in relation to the topic(s) of the *Annual Implementation Plan* open in the call, and to the objectives of the call. These aspects will be integrated in the application of the criterion "S/T Quality", and the first sub-criterion under "Impact" respectively. When a proposal is partially relevant because it only marginally addresses the topic(s) of the call, or if only part of the proposal addresses the topic(s), this condition will be reflected in the scoring of the first criterion. Proposals that are clearly not relevant to a call ("out of scope") will be rejected on eligibility grounds.

Each criterion will be scored out of 5. Half marks can be given.

The **scores** indicate the following with respect to the criterion under examination:

0 -	<i>The proposal fails to address the criterion under examination or cannot be judged due to missing or incomplete information</i>
1 -	Poor. <i>The criterion is addressed in an inadequate manner, or there are serious inherent weaknesses.</i>
2 -	Fair. <i>While the proposal broadly addresses the criterion, there are significant weaknesses</i>
3 -	Good. <i>The proposal addresses the criterion well, although improvements would be necessary</i>
4 -	Very Good. <i>The proposal addresses the criterion very well, although certain improvements are still possible</i>
5 -	Excellent. <i>The proposal successfully addresses all relevant aspects of the criterion in question. Any shortcomings are minor</i>

No weightings will be applied to the scores for the different criteria.

Thresholds will be applied to the scores. The threshold for individual criteria will be 3. The overall threshold, applying to the sum of the three individual scores, will be 10.

Conflicts of interest: Under the terms of the appointment letter, experts must declare beforehand any known conflicts of interest, and must immediately inform a staff member from the FCH JU if one becomes apparent during the course of the evaluation. The FCH JU will take whatever action is necessary to remove any conflict.

Confidentiality: The appointment letter also requires experts to maintain strict confidentiality with respect to the whole evaluation process. They must follow any instruction given by the FCH JU to ensure this. Under no circumstance may an expert attempt to contact an applicant on his own account, either during the evaluation or afterwards.

4. Individual evaluation

This part of the evaluation will be carried out on the premises of the experts concerned ("remotely").

At this first step the experts are acting individually; they do not discuss the proposal with each other, nor with any third party. The experts record their individual opinions in an Individual Evaluation Report (IER), giving scores and also comments against the evaluation criteria.

When scoring proposals, experts must *only* apply the above evaluation criteria.

Experts will assess and mark the proposal exactly as it is described and presented. They do not make any assumptions or interpretations about the project in addition to what is in the proposal.

Concise but explicit justifications will be given for each score. Recommendations for improvements to be discussed as part of a possible negotiation phase will be given, if needed.

The experts will also indicate whether, in their view, the proposal deals with sensitive ethical issues, or if it requires further scrutiny with regard to security considerations.

Signature of the IER also entails a declaration that the expert has no conflict of interest in evaluating the particular proposal.

Scope of the call: It is possible that a proposal is found to be completely out of scope of the call during the course of the individual evaluation, and therefore not relevant. If an expert suspects that this may be the case, a staff member from the FCH JU will be informed immediately, and the views of the other experts will be sought.

If the consensus view is that the main part of the proposal is not relevant to the topics of the call, the proposal will be withdrawn from the evaluation, and the proposal will be deemed ineligible.

5. Consensus meeting

Once all the experts to whom a proposal has been assigned have completed their IER, the evaluation progresses to a consensus assessment, representing their common views.

This entails a consensus meeting (might be in the form of an electronic forum) to discuss the scores awarded and to prepare comments.

The consensus discussion is moderated by a representative of the FCH JU. The role of the moderator is to seek to arrive at a consensus between the individual views of experts without any prejudice for or against particular proposals or the organisations involved, and to ensure a confidential, fair and equitable evaluation of each proposal according to the required evaluation criteria.

The moderator for the group may designate an expert to be responsible for drafting the consensus report ("rapporteur"). The experts attempt to agree on a consensus score for each of the criteria that have been evaluated and suitable comments to justify the scores. Comments should be suitable for feedback to the proposal coordinator. Scores and comments are set out in a consensus report. They also come to a common view on the questions of scope, ethics and/or security, if applicable.

In case hearings will be conducted, the consensus group will also suggest questions to be asked during the hearing. (See below)

If during the consensus discussion it is found to be impossible to bring all the experts to a common point of view on any particular aspect of the proposal, the FCH JU may ask up to three additional experts to examine the proposal.

Ethical issues: If one or more experts have noted that there are ethical issues touched on by the proposal, the relevant box on the consensus report (CR) will be ticked and an Ethical Issues Report (EIR) completed, stating the nature of the ethical issues. Exceptionally for this issue, no consensus is required.

Outcome of consensus

The outcome of the consensus step is the consensus report. This will be signed/approved (either on paper, or electronically) by all experts, or as a minimum, by the "*rapporteur*" and the moderator. The moderator is responsible for ensuring that the consensus report reflects the consensus reached, expressed in scores and comments. In the case that it is impossible to reach a consensus, the report sets out the majority view of the experts but also records any dissenting views.

The FCH JU will take the necessary steps to assure the quality of the consensus reports, with particular attention given to clarity, consistency, and appropriate level of detail. If important changes are necessary, the reports will be referred back to the experts concerned.

The signing of the consensus report completes the consensus step.

Evaluation of a resubmitted proposal

In the case of proposals that have been submitted previously to the Commission or the FCH JU, the moderator will inform the experts and, if possible, give them the previous evaluation summary report (see below) at the consensus stage, if the previous evaluation took place under comparable conditions (e.g. broadly similar work programme topics and criteria). If necessary, the experts will be required to provide a clear justification for their scores and comments should these differ markedly from those awarded to the earlier proposal.

6. Panel review

This is the final step involving the independent experts. It allows them to formulate their recommendations to the FCH JU having had an overview of the results of the consensus step.

The main task of the panel is to examine and compare the consensus reports in a given area, to check on the consistency of the marks applied during the consensus discussions and, where necessary, propose a new set of scores.

The panel comprises experts involved at the consensus step. One panel will cover the whole call.

The tasks of the panel will also include:

- hearings with the applicants of those proposals that have passed thresholds (see below)
- reviewing cases where a minority view was recorded in the consensus report
- recommending a priority order for proposals with the same consensus score
- making recommendations on possible clustering or combination of proposals.

The panel is chaired by the FCH JU or by an expert appointed by the FCH JU. The FCH JU will ensure fair and equal treatment of the proposals in the panel discussions. A panel rapporteur will be appointed to draft the panel's advice.

Option for hearings

Hearings with applicants may be organised as part of the panel deliberations.

Invitations will be sent to the co-ordinators of all those proposals having consensus scores above the individual and overall thresholds.

Hearings provide input to clarify further the proposals and to help the panel to establish their final rating and scores for the proposals. To this end, applicants will be invited to provide explanations and clarifications to questions submitted to them in advance. They will not be required to present their proposal.

Any particular issues raised by individual proposals requiring specific expertise may be dealt with by inviting appropriate extra experts to the hearings for those proposals. In this case, the extra experts are only invited to comment on the particular issue on which they have expertise and not on the proposal as a whole.

If a consortium submitting a proposal does not attend the hearing, but replies in written form to the questions, which were sent, their written responses will be taken into account. If a consortium both fails to reply to the questions and also to attend the hearing, the panel will

arrive at a final score and comments for the proposal on the basis of the originally submitted material only.

The detailed arrangements for the hearings will be given in a letter to the coordinators concerned.

The outcome of the panel meeting is a report recording, principally:

- An evaluation summary report (ESR) for each proposal, including, where relevant, a report of any ethical issues raised and any security considerations
- A list of proposals passing all thresholds, along with a final score for each proposal passing the thresholds and the panel recommendations for priority order
- A list of evaluated proposals having failed one or more thresholds
- A list of any proposals having been found ineligible during the evaluation by experts
- A summary of any deliberations of the panel
- A record of the hearings, if any hearing was organised.

Since the same panel has considered proposals submitted to various parts of a call (for example different funding schemes, or different topics that have been allocated distinct indicative budgets in the Annual Implementation Plan), the report may contain multiple lists accordingly.

The panel report is signed by at least three panel experts, including the panel *rapporteur* and the chairperson. If necessary, a further special ethical review of above-threshold proposals might be organised by the FCH JU.

8.1.2 Timetable and specific information for the call

This Annual Implementation Plan provides the essential information for submitting a proposal to this call. It describes the content of the topics to be addressed, and details on how it will be implemented. The part giving the basic data on implementation (deadline, budget, additional conditions etc) is presented in the Call fiche as an annex to the Annual Implementation Plan.

- **Indicative timetable for this call**

Publication of call	<i>2 July 2009</i>
Deadline for submission of proposals	<i>15 October 2009 at 17.00 (Brussels local time)</i>
Evaluation of proposals	<i>November 2009</i>
Evaluation Summary Reports sent to proposal coordinators ("initial information letter")	<i>December 2009</i>
Invitation letter to successful coordinators to launch grant agreement negotiations with the FCH JU	<i>February/March 2010</i>
Letter to unsuccessful applicants	<i>February/March 2010</i>
Signature of first FCH JU grant agreements	<i>From June 2010</i>

- **Further information and help**

The CORDIS call page contains links to other sources that you may find useful in preparing and submitting your proposal. Direct links are also given where applicable.

- **Call information**

CORDIS call page and Annual Implementation Plan:

<http://cordis.europa.eu/fp7/dc/index.cfm>

- **Specialised and technical assistance:**

CORDIS help desk http://cordis.europa.eu/guidance/helpdesk/home_en.html

EPSS Help desk support@epss-fp7.org

IPR help desk <http://www.ipr-helpdesk.org>

FP7 reference documents are available at the CORDIS website:

http://cordis.europa.eu/fp7/find-doc_en.html

8.1.3 Call fiche

Call title: FCH JU Call for Proposals 2009 Part 1

Call identifier: FCH-JU-2009-1

Publication date: 2 July 2009

Indicative deadline: 15 October 2009 at 17.00 (Brussels local time)

Indicative budget¹⁰: EUR 71.3 million from the FCH JU 2009 budget

The final budget awarded to this call, following the evaluation of projects, may vary by up to 10% of the total value of the call.

All budgetary figures given in this call are indicative. The repartition of the sub-budgets awarded within this call, following the evaluation of proposals, may vary by up to 10% of the total value of the call.

Topics called:

Area/ Topics called	Funding Schemes	Indicative FCH JU Funding Million €
Area SP1-JTI-FCH.1: Transportation & Refuelling Infrastructure		26.4
SP1-JTI-FCH.2009.1.1 Large-scale demonstration of road vehicles and refuelling infrastructure II	Collaborative Project	
SP1-JTI-FCH.2009.1.2 Development of electric driven turbocharger for fuel cell	Collaborative Project	
SP1-JTI-FCH.2009.1.3 Development and optimisation of PEM FC electrodes and GDLs	Collaborative Project	
SP1-JTI-FCH.2009.1.4 Cryogenic hydrogen storage	Collaborative Project	
SP1-JTI-FCH.2009.1.5 Pre-normative Research (PNR) on composite storage	Collaborative Project	
SP1-JTI-FCH.2009.1.6 Pre-normative Research (PNR) on fuel quality	Collaborative Project	
Area SP1-JTI-FCH.2: Hydrogen Production & Distribution		5.7
SP1-JTI-FCH.2009.2.1 Development of fuel processing catalyst, modules & systems	Collaborative Project	
SP1-JTI-FCH.2009.2.2 Development of gas purification technologies for hydrogen production	Collaborative Project	

¹⁰ A reserve list will be constituted if there is a sufficient number of a good quality proposal.

Area/ Topics called	Funding Schemes	Indicative FCH JU Funding Million €
SP1-JTI-FCH.2009.2.3 New generation of high temperature electrolyser	Collaborative Project	
SP1-JTI-FCH.2009.2.4 Improved solid state hydrogen storage systems	Collaborative Project	
Area SP1-JTI-FCH.3: Stationary Power Generation & CHP		25.9
SP1-JTI-FCH.2009.3.1 Fundamentals of fuel cell degradation for stationary power application	Collaborative Project	
SP1-JTI-FCH.2009.3.2 Materials development for cells, stacks and balance of plant (BoP)	Collaborative Project	
SP1-JTI-FCH.2009.3.3 Operation diagnostics and control for stationary applications	Collaborative Project	
SP1-JTI-FCH.2009.3.4 Component improvement for stationary power applications	Collaborative Project	
SP1-JTI-FCH.2009.3.5 Proof-of- concept fuel cell systems	Collaborative Project	
SP1-JTI-FCH.2009.3.6 Validation of integrated fuel cell systems readiness	Collaborative Project	
SP1-JTI-FCH.2009.3.7 Market capacity Build and Field demonstration of stationary fuel cell systems	Collaborative Project	
SP1-JTI-FCH.2009.3.8 Application specific targets for stationary power generation and related technology benchmark	Coordination and Support Actions (Supporting Action)	
Area SP1-JTI-FCH.4: Early Markets		10.3
SP1-JTI-FCH.2009.4.1 Demonstration of fuel cell-powered materials handling vehicles and infrastructure	Collaborative Project	
SP1-JTI-FCH.2009.4.2 Portable generators, backup and UPS power systems	Collaborative Project	
SP1-JTI-FCH.2009.4.3 Demonstration of portable and micro fuel cells for various applications	Collaborative Project	
SP1-JTI-FCH.2009.4.4 Miniaturised balance of plant components	Collaborative Project	
SP1-JTI-FCH.2009.4.5 PNR & RCS on the indoor use of fuel cells	Collaborative Project	

Area/ Topics called	Funding Schemes	Indicative FCH JU Funding Million €
SP1-JTI-FCH.2009.4.6 SME promotion: Early demand stimulation schemes	Coordination and Support Actions (Supporting Action)	
Area SP1-JTI-FCH.5: Cross-cutting Issues		3.0
SP1-JTI-FCH.2009.5.1 Development of educational programmes	Coordination and Support Actions (Supporting Action)	
SP1-JTI-FCH.2009.5.2 Training initiatives for regulators	Coordination and Support Actions (Supporting Action)	
SP1-JTI-FCH.2009.5.3 SME promotion: Outreach program	Coordination and Support Actions (Supporting Action)	
SP1-JTI-FCH.2009.5.4 Development of a framework for Technology Monitoring and Assessments (TMA)	Coordination and Support Actions (Supporting Action)	
SP1-JTI-FCH.2009.5.5 Development of a framework for Life Cycle Assessment (LCA)	Coordination and Support Actions (Supporting Action)	
Total indicative FCH JU Funding		71.3

Calls for Proposals will be selective. There will be competition, based on quality and excellence, between proposals primarily, but not exclusively, within activity areas, which may result in some topics not being supported in a given call.

Submission and Evaluation procedure:

Applications to the FCH JU for financial support to participate in research activities are made following competitive calls for proposals. The evaluation, selection and award procedures of the FCH JU are described in the document "FCH JU - Rules for submission of proposals, and the related evaluation, selection and award procedures".

- The evaluation shall follow a single stage procedure.
- The evaluation criteria (including weights and thresholds) and sub-criteria, together with the eligibility, selection and award criteria, for the different funding schemes are set out in Annex 8.1.1 to this work programme.
- Proposals will not be evaluated anonymously.
- Ranked lists of proposals will be established for each area. At the Panel stage, proposals from different topics with equal overall scores will be prioritised according to the overall FCH JU Annual Implementation Plan coverage. Proposals from the same topic with equal overall scores will be prioritised according to their scores for the S/T Quality criterion. If they are still tied, they will be prioritised according to their scores for the Impact criterion, and then by their scores for the Implementation criterion. If they continue to be tied, other characteristics agreed by the Panel member should be taken into account. A reserve list will be constituted if there are a sufficient number of good quality proposals. It will be used if extra budget becomes available.

Indicative evaluation and contractual timetable:

Evaluation of proposals is expected to be carried out in November 2009.

Evaluation results are estimated to be available within 2 months after the closure date. A reserve list of projects might be established.

It is expected that the Grant Agreement negotiations for the short-listed proposals to be open by February/March 2010.

Consortium agreements:

Participants in the projects are required to conclude a consortium agreement.

Particular requirements for participation, evaluation and implementation:

Participation in projects shall be open to legal entities and international organisations once the minimum conditions have been satisfied.

The **minimum conditions** to be fulfilled for projects funded by the FCH Joint Undertaking shall be the following:

- (a) at least three legal entities must participate, each of which must be established in a Member State or Associated country, and no two of which may be established in the same Member State or Associated country;
- (b) all three legal entities must be independent of each other as defined in Article 6 of the Rules of Participation of the Seventh Framework Programme;
- (c) at least one legal entity must be a member of the Industry Grouping or the Research Grouping.

The legal entities wishing to participate in a project shall form a consortium and appoint one of their members to act as its coordinator.

In general, the coordinator should come from the Industry Grouping or from the Research Grouping if such Research Grouping becomes a member of the FCH JU.

The **minimum condition** for service and supply contracts, **Support Actions**, studies and training activities funded by the FCH Joint Undertaking shall be the participation of one legal entity.

The proposals will be evaluated on the basis of the following three criteria: **1. S/T Quality; 2. Implementation; 3. Impact**. For each criterion marks from 0 to 5 will be given, with the possibility of half-point scores. Successful proposals must pass the minimum thresholds as follows:

	Minimum threshold
S/T Quality	3/5
Implementation	3/5
Impact	3/5
Overall threshold required	10/15

FCH-JU Grant Agreements will be jointly funded through:

- A financial contribution from the EC up to a maximum of EUR 71.3 million.
- In-kind contributions from the legal entities participating in the activities. The industry contribution shall at least match the financial contribution of the Community.

Forms of grant and reimbursement conditions for projects funded through the FCH JU are indicated in the point 4.5 of the 2009 AIP, and explained in the Guide for Applicants.

8.1.4 Call for proposals 2009 - topic descriptions

APPLICATION AREA SPI-JTI-FCH.1: TRANSPORTATION & REFUELLING INFRASTRUCTURE

Topic SPI-JTI-FCH.2009.1.1: Large-scale demonstration of road vehicles and refuelling infrastructure II

Rationale

In order to kick-start the mass production of competitive hydrogen vehicles in the 2015 – 2020 timeframe, it is essential to prepare and facilitate the deployment through large-scale demonstration projects comprising vehicles and appropriate hydrogen refuelling infrastructure.

Overall project objectives/Scope of work

The objective of this action is to set up and implement initial steps for the demonstration of hydrogen fuelled vehicles and the related infrastructure in several European regions / municipalities to increase public awareness and attract additional candidates for further demonstration activities.

The demo project shall focus on public transport buses and/or potentially a number of early cars, as well as provide high visibility. The candidate regions/municipalities shall make available an operating hydrogen refuelling infrastructure with a capacity for at least 10 buses and/or 30 passenger vehicles at the beginning of the project that needs to be funded by national, regional or private sources in order to demonstrate a strong commitment towards clean propulsion and emission free public transport.

About 5-10 buses and/or (additional) 10- 20 passenger cars shall be provided per municipality and be operational for onsite demonstration by 2011 accompanied by at least one additional fully integrated filling station capable of serving 100 vehicles (together with the existing station) and be accessible for private customers/users.

The demonstration program needs to address:

- documentation on approval and certification process of vehicles and infrastructure
- dissemination of lessons learned and best practices for next demo sites
- public awareness campaign and networking with potential candidate regions/ sites
- measurement, evaluation and monitoring of specific vehicle and fuelling station parameters, such as fuel consumption, efficiency (according to New European Driving Cycle, NEDC), power, torque and degradation effects, hydrogen purity and refuelling time.
- perform safety due diligence for all aspects of the demonstration, including documentation of accidents and incidents, monitoring of safety issues in the context of prevailing regulations on site to provide guidelines for proper handling
- an assessment and validation framework, based on well validated procedures

Preference will be given to consortia which provide a well-developed and detailed road map as to how they plan for commercialisation of vehicles and infrastructure beyond the initial demonstration project.

Expected outcome

The consortium needs to develop, deliver and operate vehicles and infrastructure, including their comprehensive performance monitoring, and propose recommendations for next demo sites.

The two new refilling stations shall qualify for the following performance targets:

- Refuelling capacity of 200 kg H₂/day ensuring 50 vehicles can be re-fuelled per day and 5 vehicles can be re-fuelled within one hour
- Concept for modular upgrade of the filling station for 100 vehicles/day refuelling capacity must be demonstrated.
- Availability of the station 98%
- Hydrogen cost (based on an OPEX consideration) at station <€10/kg (excluding tax) at start of project. Cost improvements due to higher hydrogen production for higher vehicle numbers is anticipated in the course of the project. Conditions under which hydrogen cost can be reduced to < 5€/kg should be identified.
- Hydrogen purity and vehicle refuelling time (according to SAE or analogous specifications)
- Station hydrogen production efficiency target 50 – 70%, depending from method of production

Technical targets for the passenger cars are:

- >2000h lifetime initially, min 3000h lifetime as program target
- MTBF >1000 km
- Availability >95%
- Efficiency >40% (NEDC)

Technical targets for the buses are:

- >4000h lifetime initially, min 6000h lifetime as program target
- Availability >85% with maintenance as for conventional buses
- Fuel Consumption < 11 - 13 kg H₂/ 100 km depending on drive cycle

Other information

The consortium should include automotive OEMs, integrated infrastructure equipment providers, fuel suppliers, bus fleet operators, local and regional bodies, as appropriate. The project will be coordinated with projects funded under the call FC JU 2008 (topic SP1-JTI-FCH.1.1 and SP1-JTI-FCH.1.2)

Expected duration: At least 5 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2009.1.2: Development of electric driven turbocharger for fuel cell systems

Rationale

In order to enable high volume production of fuel cell systems for market entry in 2015-2020, cost optimized, compact and efficient air compressors are very critical system components.

Technology assessments suggest that electrically-driven turbochargers are most favourable in terms of functionality and efficiency for this application. Some basic technologies are available but need to be further developed and tested in automotive fuel cell systems to prove the suitability for this application and to fulfil automotive requirements.

Overall project objectives/Scope of work

The objective of this action is to develop a low-cost, electrically-driven turbocharger module for a fuel cell system. The scope of the work is the development of the compressor and turbine wheels as well as the development of a high speed electric motor and inverter. The components shall be designed in a way that two different turbine versions can be assembled, one designed for cold air flow from the fuel cell, the other one for high temperature air, similar to a typical internal combustion engine application.

One main objective is to compare technologies, e.g. cold and hot turbine with other available compressor technologies, and demonstrate the main benefits in typical automotive environments (e.g. wide load range, high dynamics, shock and vibrations, subzero and hot environment, frequent start / stop cycles,) to achieve high reliability and long life; energy density and efficiency criteria should also be addressed.

The component development activities shall take into consideration the possibility of extending the project to higher automotive volumes.

Components shall be tested and evaluated by dedicated testing for automotive usage. After key component and system testing of some first samples, the component shall be further developed towards the target for the automotive fuel cell system application. Further samples need to be built and tested on component and system level. Test and comparison have to refer to a mid-class European car under typical certification and typical OEM test development cycles.

The project shall also provide advanced analysis and concepts for further system simplification, manufacturing aspects and cost projections reflecting typical automotive volumes. Design to cost methodologies shall be applied to analyse cost and to identify cost reduction opportunities to further advance electrical turbo charger modules.

Expected outcome

Deliverables consist of electric driven turbocharger hardware for system integration with inlet air temperature according to system requirements.

The developed hardware shall demonstrate the achieved performance by component testing against the specified target performance and prove the requested operational behaviour in fully integrated automotive system environment.

Deliverables include furthermore milestone reports and test results.

Methodologies to be applied are: automotive development methods, design to cost, reliability and robustness methods.

Main technical targets (approximate targets)

- Voltage 270 - 430 VDC
- Lifetime 4,000 h
- Air flow 300 kg/h
- Turbine inlet wet air (100% rh)
- Turbine inlet temperature ca. 80°C or according to system requirements

- Pressure ratio < 3.5
- Dynamics idle to max power < 800 ms
- Operation @ ambient temperature -40 ... +50°C
- Freeze start @ -25°C
- Efficiency > 85%
- Power density > 0,5 kW/kg
- Unit cost < 2,000 €(high volume)
-

Other information

The consortium should include automotive OEMs, relevant suppliers and system integrators.

Expected duration: 2-3 years

Funding scheme: Collaborative Project

Topic SPI-JTI-FCH.2009.1.3: Development and optimisation of PEMFC electrodes and GDLs

Rationale

Improvement of PEMFC - electrodes and gas diffusion layers is required for cost reduction and to increase durability of new generation of automotive fuel cell stacks. The reduction of precious metal catalyst loading of the electrodes is a key for cost abatement of stacks to competitive levels. Optimised composition and morphology of the catalyst layers as well as of the gas diffusion layers (GDL), in combination with high quality manufacturing methods, are required to maintain high power density and efficiency.

Overall project objectives/Scope of work

The objective of this project is to significantly reduce the cost and improve durability of PEMFCs, while maintaining high power density. Work shall include improvement of existing materials (approximately 75% of the total activities), but also allow for development of breakthrough novel concepts for electrodes (approximately 25%), i.e. new and alternative concepts for electrode structures and catalyst supports providing increased Pt activity and utilisation e.g., by utilising core-shell structures or other partial replacement of precious metals. Projects may also cover the development of non-precious metal catalysts.

New GDL materials development for improved water management and micro-porous layers (MPL) to improve gas and fluid management may be included. Studies on structural mechanics of the GDL and on proton conduction in the active layer are considered relevant, as well as supporting modelling efforts.

The compatibility of materials and their durability shall be verified by assembling high performance MEAs for benchmarking purposes. Single cells with the new MEAs shall be tested in automotive test cycles to prove their potential to significantly increase existing automotive performance and durability benchmarks at stack level with reduced cost.

Expected outcome

MEAs with a significant reduction in cost are expected.

Technical targets are:

- Pt-loadings < 0.15 g/kW at > 55% efficiency (LHV=lower heating value).
- > 5000h lifetime at dynamic operation (car)*.

* demonstrated for electrodes and GDLs as part of complete MEAs/single cells, following adequate accelerated test protocols at automotive conditions (including start-stop and freeze-thaw cycles).

Other information

The consortium should include research institutes, universities, automotive OEMs, and supply industry (in particular catalyst manufacturers). Opportunities for innovative SMEs with expertise in specialised areas. The action shall be coordinated with topic SP1-JTI-FCH.1.3 – “European Stack Cluster” of the FCH JU 2008 call, to ensure full integration of stack activities.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2009.1.4: Cryogenic hydrogen storage

Rationale

Liquefaction of hydrogen provides advantages for the infrastructure, particularly for large transport vessels due to its high storage density, but is energy-consuming. Novel operating concepts for cryogenic tank systems have to be developed and tested, to increase efficiency. Compatibility to existing LH2&CGH2 filling stations should also be ensured.

Overall project objectives/Scope of work

- a. Material & component development for novel operating regimes including high-pressure, (up to 300 bar) and hydrogen solid state absorbers, improvement of thermal insulation concepts, component development for cryogenic-valves and heat exchangers under observation of effective manufacturing techniques, and crashworthiness testing.
- b. Tank system development, which shall target at reduction of filling losses and boil-off management including overall efficiency for the novel concept.
- c. The project aims at a final proof of concept at system level.
- d. The project activities need to include an assessment of the potential to reach the technological targets with regard to benchmarks of alternative storage technologies, such as compressed on board hydrogen storage.
- e. The adaptability of the results and the improvement potential for off-board applications have to be assessed at the end of the project

Investigations on cylindrical or spherical vessels shall be privileged as they show inherently the best thermal performance.

Expected outcome

The project needs to deliver improved performance of basic materials, thermal insulation, and components and proof of concept test validation at system level.

Technical Targets:

- Operating temperature range from operation under all ambient conditions including freeze start from -25 °C / +45 °C (preferably from -40 °C to +60 °C)
- Round trip efficiency targets?
- Minimum and maximum hydrogen delivery temperature from -40 °C and +85 °C

- More than 1,500 cycles
- Kinetics and transient response, maximum extraction rate > 2 g/s
- Usable Volumetric energy density > 0.023 kg/litre
- Usable Gravimetric energy density > 0.048 kg/kg
- Autonomy time without hydrogen losses > 5 days
- Boil-off losses after autonomy time <1.5%

Other information

The consortium should include research institutes, automotive OEMs and supply industry offer Opportunities for innovative SMEs with the required expertise in specialised areas.

Expected duration: 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2009.1.5: Pre-normative research on composite storage

Rationale

It is expected that many fuel cell systems will include composite storage tanks to store hydrogen efficiently at high pressure. In order to develop and update relevant Regulations, Codes and Standards (RCS), a pre-normative phase must be conducted that addresses certain design criteria, potential failure modes and safety issues of composite storage tanks.

Overall project objectives / Scope of Work

Projects should develop standardised design criteria reflecting critical issues such as fatigue, impact, inspection, pressure levels, shock resistance, and failure modes for composite storage to establish production standards, performance based RCS and define safety factors. Scope of work includes:

- Review of previous and ongoing related projects and their associated RCS activities,
- Dissemination of results to industry and research
- Enhanced understanding of the balance between material consumption (cost) and safety
- Dissemination of results to industry and research

Expected outcome

- Identification of potential failure modes and ways to address them
- Specific proposals for design criteria of composite storage tanks
- Background procedures and methodologies for RCS
- Proposals for testing protocols

Other Information:

The consortium should include research and/or industry test facilities, certification agencies, OEMs (manufacturers and users). This action shall be co-ordinated with topic SP1-JTI-FCH.1.4: Compressed hydrogen onboard storage of the call FCH JU 2008. Opportunities for international cooperation.

Expected duration: Up to 3 years

Funding scheme: Collaborative project

Topic SPI-JTI-FCH.2009.1.6: Pre-normative research on fuel quality

Rationale

Fuel quality specifications are critical to ensure that energy conversion devices using hydrogen as a fuel, including fuel cells, perform appropriately. In order to develop Regulations, Codes and Standards (RCS) that can be applied to the use of hydrogen as fuel, a pre-normative research phase must be conducted aimed at determining fuel quality requirements appropriate for different applications (such as fuel cells and ICE) and standard methods for fuel quality testing and checking compliance.

Overall project objectives / Scope of Work

Projects should focus on pre-normative research that supports the upcoming need for RCS to address fuel quality issues, determine reasonable quality requirements and standards based on forward-looking requirements specifications for use of hydrogen in fuel cells and internal combustion engines (ICEs). Scope of work includes:

- Mapping of previous and ongoing related projects and their associated RCS activities, from which a proposal for best practices can be extracted
- Develop background testing procedures and methodologies
- Dissemination of results to industry and research

Expected Outcome:

- Specific proposals for fuel quality requirements across a variety of fuel cell applications and ICE

Other Information:

The consortium should include research and/or industry test facilities, certification agencies, hydrogen fuel suppliers, OEM (user), stack developers and manufacturers. The work should not duplicate/ overlap activities funded in FP6. The project should be linked to other relevant international initiatives in this research field.

Expected duration: Up to 3 years

Funding scheme: Collaborative project

APPLICATION AREA SP1-JTI-FCH.2: HYDROGEN PRODUCTION & DISTRIBUTION

Topic SP1-JTI-FCH.2009.2.1: Development of fuel processing catalyst, modules and systems

Rationale

Catalytic and chemical conversion technologies for hydrogen production need to be optimized in terms of cost and efficiency. Currently, large steam methane reforming is the main H₂ production method. There is a need to adapt and further develop these systems to provide small-scale, decentralized, fuel flexible systems, as well as multifunctional systems (e.g. High Temperature FC systems having the flexibility to operate either for CHP or hydrogen production as a by product) with improved durability & efficiency.

Overall Project Objectives / Scope of Work:

Scope of work comprises research and technological development activities on materials and processes for chemical conversion and desulphurization, multi-metal catalysts, catalyst supports, as well as their integration and demonstration in an efficient, thermally optimized system. The project shall develop optimized catalysts and new reactor/ systems designs to improve reforming, partial oxidation and thermal gasification technologies in terms of increased efficiency and higher load flexibility.

Special attention should be turned to small scale systems <100Nm³/h (excluding micro-reformation systems i.e. <500W). Concepts should include operation with different fuels including methanol, ethanol and bio fuels, as well as innovative concepts for desulphurization of liquid feed stocks. A proof of concept of the system should be included.

The improvements shall result in a reduction of the hydrogen production cost.

Expected Outcome:

- Optimized catalyst materials & supports
- Innovative materials and processes for liquid desulphurization
- New integrated reactor designs (i.e. micro-channel or tubular) for higher surface to volume ratio and a high degree of thermal integration
- Test of load flexibility / fuel flexibility by modular approach of small scale systems with focus on liquid feed stocks
- Key Performance Indicators:
 - Catalyst efficiency: reforming catalyst system should exhibit enough shift activity to reduce CO concentration below 10vol% (dry basis) to reduce shift catalyst quantity
 - Catalyst durability: indication for sulphur resistant steam reforming: after initial normal deactivation (10 days of operation), adding 5 ppm of H₂S to the feed results in a < 20% decrease in hydrogen production by the reforming catalyst.
 - System cost: After 6 years cost reduction to 5000 Euro/Nm³ H₂ (5.0) materials for 50 Nm³
 - availability/recyclability: Catalyst replaceable within 4 hours; Active metal recovery > 85% possible
 - High degree of reactor compactness & design simplification
 - System efficiency: electricity consumption < 0.1 kWh / (Nm³ H₂ @ 10 bar) including compression; Conversion efficiency > 80 % (HHV H₂ (5.0) / HHV fuel)
 - Scalability: Scalable from 2 to 750 Nm³/h

Other Information:

The consortium should include broad industry & research participation with opportunities for SMEs in the field of: catalysts materials & supports, micro reactor technologies. Activities shall be coordinated with topic SP1-JTI-FCH.2.2 of the FCH JU 2009 call. This project should aim to foster emergence of a dynamic original equipment industry and stimulate the development of packaged, modular systems. Work should not duplicate/overlap efforts in previous and/or ongoing FP6/FP7 projects.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2009.2.2: Development of gas purification technologies**Rationale:**

The separation of H₂ from CO₂/CO in reforming, partial oxidation and gasification processes requires the use of specific separation technologies such as pressure swing adsorption (PSA) and temperature swing adsorption (TSA). Improved gas separation technologies should facilitate carbon capture and the production of H₂ at low cost, with increased purity towards meeting the requirements of FC applications.

Overall Project Objectives / Scope of Work:

Project activities should aim at further improving the efficiency of materials, technologies and processes for gas purification for PSA and/or TSA in hydrogen production based on conventional and alternative fuels to safely meet H₂ purity requirements for several fuel cells applications.

Scope of work includes the development of improved membrane & sorbent materials through:

- Exploitation of advances in high temperature membrane technology for gas separation at the water gas shift level
- Exploitation of new reversible adsorption materials (e.g. nano-structured ceramics) in PSA / TSA (goal: Reversibility >95% per cycle)
- Testing of hybrid separation schemes combining membrane & PSA technology (Goal: improvement of H₂ separation of 20 % with respect to current standards)
- Optimization of the simultaneous production of pure H₂ & CO₂ with quality suitable for carbon capture in Steam Methane Reforming (SMR)/Partial Oxidation (goal: CO₂ recovery from reformat >75% @ >10 bar prior to hydrogen purification; adsorbent recyclable)

Project activities need to include as well research on H₂ purity and on repeatability/robustness of H₂ quality monitoring/sampling techniques.

Expected Outcome:

- H₂ recovery & purity improvements- Hydrogen recovery >70% @ 5.0 quality (H₂ outlet pressure recovery > 10 bar)
- Simplification of PSA/TSA operation (reduction of steps) without loss of recovery & product purity (indicatively maximum 3 absorption vessels for PSA/TSA), or : energy consumption of hydrogen clean up < 0.004 kWh/ Nm³ Pure H₂ (5.0)
 - CO₂ vs. H₂ membrane/adsorbent selectivity

- Energy intensity of the Gas separation process (H₂ separation power consumption < 0.004 kWh/Nm³ of pure H₂ (5.0)

Proposals need to provide technical targets such as gas purity based on relevant bench marks.

Other Information:

The consortium should include broad Industry & Research participation with opportunities for SMEs in the field of sorbent materials, membrane tech., engineering of separation systems & modelling. Activity should be coordinated with topic SP1-JTI-FCH.2.1 and SP1-JTI-FCH 1.6 of the FCH JU 2009 call.

Expected duration: Up to 2 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2009.2.3: New generation of high temperature electrolyser

Rationale:

High temperature electrolysis (HTE) has excellent perspectives for an efficient use of renewable solar, wind or geothermal as well as nuclear energy, especially for large-scale centralised hydrogen production, and with substantial improvement of energy-efficiency. Long-term research is required to overcome technical constraints and allow proof of concept technology demonstration.

Overall Project Objectives / Scope of Work:

The three main areas to be addressed are:

- Understanding of degradation phenomena and improvement of materials and components for HTE: The focus shall be solid oxide electrolysis cells (SOEC) and stacks, sealing, coatings, and interconnects, aiming at high durability under relevant operating conditions (high humidity, high current load, and high temperature). Work should include testing of mechanical durability, investigation of role of impurities (both from materials and from team) and diffusion phenomena in glass.
- Development of flow sheets for the integration of HTE with different heat and power sources like wind, solar, geothermal and nuclear.
- Evaluation of HTE systems behaviour under unstable conditions as typically associated with renewable energy sources.

Expected Outcome:

- Improved cells and small stacks with better performance and improved durability: Cell degradation < 0.5% /1000 hours under relevant operating conditions
- Improved interconnects and coatings
- Current density of 2 A/cm².
- Improved sealants and sealing methods for better stack durability:
- Stack degradation with a degradation < 1% /1000 hours under relevant operating conditions
- Flow sheet with adjustable parameters to assist the development of systems

Other Information:

The consortium should include research and industry participation with opportunities for SMEs in the field of: sealing, simulation software. Projects here should complement the work done relevant FP6/FP7 projects (e.g. Hi2H2/RELHY).

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SPI-JTI-FCH.2009.2.4: Improved solid state H2 storage systems**Rationale:**

Current materials and concepts do not meet the required goals for efficient and safe H₂ storage. Long-term research is needed to bench mark existing technologies as well as select and further develop most promising options to meet application requirements.

Overall Project Objectives / Scope of Work:

The investigation of new materials for solid state hydrogen storage (SSHS) systems must be performed within the following 3 areas:

- New SSHS using metallic and complex hydrides: optimization of systems (kinetics, cycling, thermal management, modelling, tank design)
- SSHS using porous materials: development of new materials based on carbon and metal organic frameworks (MOF) (kinetics, cycling, thermal management, modelling)
- SSHS using porous materials: development of hybrid organic-inorganic materials (including liquid-state organic and solid-state inorganic) combining physic- and chemisorptions (kinetics, cycling, thermal management, modelling)

Activities include long-term and break-through oriented research on new materials as well as development of second generation prototypes of SSHS systems. Study of complete applications of SSHS systems should be included in the work plan.

Expected Outcome:

- Development of new Materials for SSHS systems with improved efficiency and capacity.
- Key Performance Indicators in terms of H₂ tank system density:
 - Gravimetric energy density: 1.7 kWh/kg (5 wt%),
 - Volumetric energy density : 1.5 kWh/l (4.5 kg H₂/100l)
 - Materials heat of reaction < 40 kJ/mol H₂
 - Temperature of operation < 200°C, compatible with advanced fuel cells
 - Mobile applications:
 - Loading time < 10 min
 - Loading pressure < 300 bar
 - Reliable supply of a hydrogen flow of 2 g/sec at 2 – 6 bar (tank for 4 kg of H₂, ≡ 0.5 g/(sec * kg H₂)), also at low loading levels
 - Stationary applications
 - Loading pressure ca. 10 – 50 bar
 - Potential for system cost of 500 €/ kg of stored H₂ in serious production to be demonstrated

Other Information:

The consortium should include broad Industry & Research participation. Work should not duplicate projects already funded under FP6/FP7. Opportunities for SMEs in the field of materials and systems modelling/optimisation.

Expected duration: Up to 4 years

Funding scheme: Collaborative Project

APPLICATION AREA SPI-JTI-FCH.3: STATIONARY POWER GENERATION & CHP

Topic SPI-JTI-FCH.2009.3.1: Fundamentals of fuel cell degradation for stationary power applications

Rationale

Fuel cell stacks for stationary applications require an operational lifetime up to 40,000 hours. Improved understanding of failure mechanisms is required to ensure reliable prediction of cell and stack failure

Overall project objectives/Scope of work

The activities related to cell and stacks should focus on:

- Developing full understanding of failure mechanisms, degradation and deterioration phenomena and how these relate to stationary operating conditions, materials and processing
- Steady state operation, abnormal operational states, thermal and/or current cycling, vibration and shock proofing, sensitivity to typical gas impurities, loss of water supply, power cycles, etc.
- Material research to relate basic materials/performance understanding relevant to current industrial cell/stack component, proof of concept
- Accelerated testing techniques, statistical analysis and building up a sensitivity matrix to allow predictive lifetime estimates
- Durability/failure mechanisms common to other applications and interface with other relevant actions in the field

These activities are open to all technologically mature stationary fuel cell stack types (PEMFC, SOFC, MCFC) and applications. Proposals need to identify the technology specific gaps, critical parameters and conditions and develop a structured concept including targets how to address them.

Expected Outcome

- Improved understanding of technology specific short and long term failure mechanisms,
- Establishment of accelerated test techniques
- Establishment of technology specific sensitivity matrix
- Use of data in lifetime prediction methods

Other information

The consortium should include academia, research institutes, material producers and cell/stack manufacturers. Activities related to the establishment of accelerated testing techniques should duly consider ongoing PNR in this area. Coordination with stationary FC programme under the JTI will be ensured to improve the quality of the knowledge base.

Expected duration: Up to 3 years

Funding scheme: Collaborative project

Topic SP1-JTI-FCH.2009.3.2: Materials development for cells, stacks and balance of plant (BoP)

Rationale

The selection and properties of materials used in fuel cell systems influence the cell and stack performance, lifetime and cost. Novel, and improved materials can hence increase performance, reduce statistically based failures, increase lifetime and reduce cost.

Overall project objectives/Scope of work

Projects are expected to cover:

- Development and design of materials to improve performance of both cells and stack and BoP components. Mechanical, thermal and electro-chemical stability should be considered and lifetime and degradation issues relevant to production cost for single cells and stacks.
- Investigation on failure mechanisms (such as Chromium poisoning, redox resistance in SOFCs, fuel tolerance, robust low resistance membranes in PEMFCs, and durable metals for interconnects of MCFCs).
- New and improved material production techniques to reduce cost, emissions and improve yields, quality and performance in industry relevant cells, or BoP materials in FC-units
- Development of inspection techniques that can be used in manufacturing of materials and cells to identify known defects or anomalies related to materials

The activities are open to all fuel cell technologies.

Expected Outcome

- Solutions to specific identified failure mechanisms
- Proved of improved performance for existing design of cells, stacks and BoP
- New material production techniques and new inspection techniques
- Recommendations for use of materials in specific stack or BoP components

Proposals need to identify the technology specific gaps, critical parameters and conditions and develop a structured concept for the research activities.

Other information

The consortium should include academia, research institutes, material producers and cell/stack manufacturers. Projects will be coordinated with topic FCH 3. 1.

Expected duration: Up to 3 years

Funding scheme: Collaborative project

Topic SP1-JTI-FCH.2009.3.3: Operation diagnostics and control for stationary power applications

Rationale

Effective control of stationary fuel cell stacks is vital for optimum operation, as it influences their performance, life and reliability, as well as ultimate efficiency, fuel utilisation, response

times, emissions and waste. For this purpose, it is necessary to develop a better understanding of critical operating conditions and operating strategies and establish a reliable management of interfaces with the application environment.

Overall project objectives/Scope of Work

Activities should include:

- Development and utilisation of diagnostic techniques to reveal potential failures and optimise run parameters and recovery methods in stacks and FC-units
- Development of control hardware and operation strategies that provide predictable, safe and reliable generators capable of <20% end of life degradation in simulated application environment
- Standard communication protocols both with control interfaces of the grid or other industrial environments

Activities need to consider relevant codes and standardisation issues (RCS).

Proposals need to identify the technology-specific gaps, critical parameters and conditions and develop a structured concept for research activities.

These activities are open to all technologically mature stationary fuel cell stack types and applications

Expected Outcome

- Novel diagnostics to identify potential failures, including in-operation diagnostic tools for cell/stack
- FC-unit level failure sensitivity matrix
- Improved prediction and avoidance of failure mechanisms
- Development of strategies for recovery of cell and stack performance
- Tools for improved field diagnostics and services
- Control of stationary fuel cells systems in integrated generation environment to deliver low emissions and high network efficiencies

Other Information

The consortium should include academia, research organisations, component and stack suppliers, software developers, utilities and grid providers. The project will be coordinated with topic SP1-FCH-JTI-3.1 of this call.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SP1-JTI-FCH.2009.3.4: Component improvement for stationary power applications

Rationale

It is necessary to improve availability and cost-competitiveness of balance of plant (BoP) components, systems and sub-systems as well as their suitability for mass production to meet performance and lifetime targets.

Overall project objectives / Scope of Work

Sub-system components based on developed stack designs including:

- Power generation unit (integrated stack/ BoP)
- Power electronics
- Reforming and fuel/oxidant processing
- Heat exchangers/Thermal management
- Humidification
- Air and fluid flow equipments, including subcomponents
- Fluid supply and management including pumps, turbines, compressors, valves, flow meters, desulphurisation, gas separation membranes

The project activities shall focus on:

- Novel designs and optimisation of non-stack components
- Manufacturing process and control techniques for mature components
- Validation of lifetime, durability/robustness in application environment
- Demonstration of end-of-life specifications
- Cost assessment vs. target cost
- Concepts for rework, recycling, disposal including cost
- Life Cycle Assessment according to developed guidelines

Proposals need to identify and will be measured against technology and application specific targets. The activities are open to all fuel cell technologies, pertinent fuels and levels of power.

Expected Outcome

Development of improved components which are

- viable for mass production
- meeting performance and lifetime >10 years by 2015
- achieving cost targets (e.g. cost per kW of € 2000 for industrial and € 5000 for domestic micro CHP)

Other Information

The consortium should include system integrators (OEMs) and component and stack suppliers, including opportunities for academia, research organisations and SMEs in specialised areas. The project will be coordinated with topic SP1-FCH-JTI-3.1 of this call.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SP1-JTI-FCH.2009.3.5: Proof-of-concept fuel cell systems

Rationale

This topic will support the development and construction of proof of concept fuel cell systems for any stationary application, potential feature and technology. Proof of concept systems will be constructed that show interaction with other devices required for delivering power, heat and cooling and other possible services to end users and which will draw upon appropriate fuel supplies utilising any necessary processing technology.

This work is necessary to address the feasibility of proposed systems, prior to any further validation or demonstration activity. It will assess system performance against required functional properties, identify existing gaps and allow further development steps.

Overall project objectives / Scope of Work

The project activities will include:

- Development of proof-of-concept prototype systems that combine FC-units into complete systems;
- Integration and testing of the proof of concept prototype with fuel delivery and processing sub-systems; interface with devices necessary to deliver power, and/or heat and/or cooling and/or other possible services to the end user;
- Maintenance and repair issues to reduce downtimes from known failure mechanisms

The activity is open to all fuel cell technologies, pertinent fuels and level of powers. Proposals need to identify and will be measured against technology and application specific targets.

Expected Outcome

- Proof of feasibility of integrated fuel cell units including proof of potential to achieve targets of the specific application(s)
- Increase in power density and/or efficiency over state-of-the-art generation
- Increased understanding of system level failure modes leading to more robust system designs
- Definition of requirements for fully integrated systems in the specific application(s)
- Maintenance and repair strategies necessary for introduction of robust and reliable systems

Other Information

The consortium should include system integrators (OEMs) and component and stack suppliers and end-users, including opportunities for academia, research organisations and SMEs in specialised areas.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SPI-JTI-FCH.2009.3.6: Validation of integrated fuel cell system readiness

Rationale

Prior to large scale demonstration, fully integrated systems must be proven to be technologically and economically viable; manufacturing routes need to be also identified to establish a sustainable approach towards commercialisation.

Overall project objectives / Scope of Work

The scope of proposals need to reflect and must have appropriate achieved system maturity levels and a proven market potential.

Projects need to provide technical solutions for one among the main stationary application categories (domestic, commercial and industrial). They shall identify relevant technology approaches to specific applications and markets. In addition, they should focus on:

- Fulfilment of the diverse application needs in simulated or real environment

- Validation of the whole system build, supply chain; costs validation including end-of-life considerations
- Establishment of quality control procedures and techniques to ensure quality of systems
- Integration into power networks, simulated or real

The project should also seek to address relevant manufacturing solutions linked to the validation of fuel cell systems.

Proposals need to identify and will be measured against technology and application specific targets.

Expected Outcome

- Validation of technically mature fully integrated systems that fulfil specifications defined by the end users, including identification of mass-production route at a defined quality
- Extrapolation of test data to longer run times pertinent to the end use and identification of failure mitigation strategies by design and/or maintenance
- Feedback to other RD&D activities to remove technical barriers to successful larger scale demonstration

Other Information

The consortium should include system integrators (OEMs) and component and stack suppliers and end-users, including opportunities for academia, research organisations and SMEs in specialised areas.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SPI-JTI-FCH.2009.3.7: Field demonstration of stationary fuel cell systems

Rationale

Sufficient numbers of complete systems need to be demonstrated and proven to pave the ground for large scale deployment. These demonstrations must be performed in real application environment which includes interfaces with the infrastructure for power, heat and fuel/oxidant processing as necessary.

Overall project objectives / Scope of Work

Projects need to provide and demonstrate:

- Systems with sufficient power generation capacity from pertinent numbers of completely integrated generator systems
- Supply chain and support activities for complete systems
- Capability of systems to integrate into existing power, heat infrastructure
- Advantages over incumbent technologies, take advantage of other developing generation technologies
- Compliance with or further need for RCS need

It is paramount for the FC industry to avoid negative feedback from field demonstration. Accordingly, projects need to demonstrate sufficient preparation (technology readiness) and capacity to meet unexpected challenges. Projects with redundancy in technology in terms of

several technologies or solution providers are preferred in order to minimize the chance of failure.

Proposals need to identify and will be measured against technology and application specific targets.

Expected Outcome

Successful demonstration of FC-based integrated generator systems that provide:

- Required efficiencies, cost and lifetimes vs. application targets
- Identification of barriers or risks to full implementation
- Proof of suitable supply chain and field support concept
- Feedback to RD&D activities on required mitigations

Other Information

The consortium should include system integrators (OEMs) and component and stack suppliers and end-users, including opportunities for academia, research organisations and SMEs in specialised areas.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SPI-JTI-FCH,2009.3.8: Application specific targets for stationary power generation and related technology bench mark

Rationale

Markets for stationary power generation are very geographically fragmented. Different applications and technologies as well as national and regional requirements or preferences represent a challenge for determining relevant application targets. The project shall identify the technical and economic targets for the key applications, establish pertinent application categories and review the potential of the different technologies to fulfil them.

Overall project objectives / Scope of Work

The project aims to:

- Analyse and collect relevant technical and economic targets for stationary applications across the European Economic Area to compile a data base
- Assess existing studies to extract available data and identify scope of further analysis
- Assess opinions and goals of relevant certification agencies as well as potential impact of market support programs
- Establish application categories to be referenced, addressing domestic or commercial and industrial use
- Review the potential of different technologies to fulfil the identified targets

Targets will include, but not be limited to: durability, reliability, cost per kW installed, cost per kW operation and maintenance; start-up and run conditions; peak power and base load requirements; fuel quality; power and heat grid interconnection requirements as well as balance between power and heat requirements.

Expected Outcome

Projects shall provide:

- Categorized technical and economic targets for stationary fuel cells across the European Economic Area
- Status report of fuel cell development vs. targets
- Technology specific bench mark results on the potential and risks to achieve targets
- Recommendations for further development

Other Information

The consortium should include OEMs and end-users with relevant expertise, including opportunities for specialised SMEs and possibly academia and research organisations.

Expected duration: Up to 2 years

Funding Scheme: Coordination and Support Action (Supporting Action)

APPLICATION AREA SP1-JTI-FCH.4: EARLY MARKETS

Topic SP1-JTI-FCH.2009.4.1: Demonstration of fuel cell-powered materials handling vehicles including infrastructure

Rationale

Among the most promising early market applications for fuel cells, materials handling vehicles such as electric forklifts have received significant attention. A strong effort to demonstrate and gain field experience is needed to accelerate commercialisation, ensure that the proper certification procedures are in place, address public acceptance and safety regulations and prove economic viability.

Overall project objectives / Scope of Work

- Projects should demonstrate the advantages of using fuel cells compared to current technologies (diesel, LPG and batteries) in materials handling vehicles (e.g. electric forklifts, pallet trucks) of up to 50 kW, including the coupling with hydrogen refuelling infrastructure. Projects shall cover demonstrations of a larger numbers of vehicles and shall be based on sufficient maturity levels of fuel cell systems.
- The projects also need to cover the development of certification procedures in conjunction with relevant agencies; Identification of potential RCS needs. Dissemination of results to wider audience, preferably to potential customers (trade associations, etc.) must be also included.
- The projects should be conceived envisaging a continuation of efforts in high volume deployment projects and following market introduction

As an example of technical requirements, the following illustrates the goals for forklifts:

- Total cost of fuel cell system < 4.000 €/kW
- System lifetime (with service/stack refurbishment) > 5000 hrs
- System efficiency (tank to wheel) >40%
- Refuelling time < 5min
- Hydrogen price at pump (end-user price) < 13 €/kg

Expected Outcome

- Demonstration shall comprise at least 10 vehicles at a single end-user site
- Prove durability of fuel cell system, functionality of hydrogen refuelling infrastructure and end-user acceptance of concept
- Certification procedures

Other Information:

The consortium should include industry test sites, fuel cell system developers, certification agencies, vehicle OEMs and end-users.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SP1-JTI-FCH.2009.4.2: Portable fuel cell generators, back-up and UPS power systems

Rationale

Among the most promising early market applications for fuel cells, back-up power devices for a variety of applications have received significant attention. However, their deployment has been limited in Europe.

A strong effort is needed to gain field experience with these fuel cell systems and demonstrate the economic and environmental viability of this technology including accelerating deployment and commercialisation. Proper certification procedures must be ensured and issues of public acceptance, safety regulations including transport in public areas and transportation means need to be addressed.

Overall Project Objectives/Scope of Work

The project should focus on the development and deployment of portable generators, back-up and UPS power systems.

Scope of work may include: Demonstration of commercially ready fuel cell products meeting minimum customer requirements, assessment of fuelling infrastructure requirements, validation and product testing, dissemination of results to a wider audience, preferably to potential customers (trade associations, etc.). Regulation, codes and standards issues also need to be properly addressed, in particular certification procedures of the new products.

While alpha-testing may be included in proposals, deployment of a statistically relevant number of units, i.e. 5 to 10 units per project, is necessary.

A proper benchmark of fuel cell products with current technologies need to be performed. The projects need to include comparative life cycle assessment studies carried out according to the practice guidance developed by the FCH JTI, as soon as this guidance becomes available (ref. topic 14 of this Call).

Expected outcome

Early deployment of (portable) fuel cell based generators, back-up and UPS power systems. Technical requirements that the proposed systems must meet include:

<u>Requirement</u>	<u>Target</u>
• Reliability	100%
• Response time of less than	5 ms
• Projected lifetimes greater than	5 years
• Target system cost	5'000€kW
• Number of start-stop cycles	1'000

Other information

The consortium should include industry, research organisation in the fields of industry test sites, fuel cell system developers, certification agencies, OEMs (users).

Expected Duration: Up to 3 years

Funding scheme: Collaborative project

Topic SPI-JTI-FCH.2009.4.3: Demonstration of portable and micro FCs for various applications

Rationale

A strong effort to demonstrate application readiness and gain field experience for various portable and micro fuel cells is needed to accelerate commercialisation. Requirements include *inter alia* that proper certification procedures are in place, that public acceptance and safety regulations are addressed and economic viability is proven.

Overall project objectives / Scope of Work

Projects should demonstrate the benefits of using fuel cells systems, compared to conventional products, including refuelling infrastructure. Applications include, but not limited to, industrial tools, educational, recreational tools, sub-micro CHP (<1 KW). Projects shall typically include alpha-testing while demonstration of larger numbers of units shall be based on sufficient maturity levels of fully integrated systems.

Expected Outcome

- Demonstration of commercially ready fuel cell products that meet minimum customer requirements
- Bench marking with competitive technologies and validation testing under real world conditions
- Certification procedures developed in conjunction with relevant agencies, including relevant RCS issues
- Dissemination of results to wider audience, preferably to potential customers (trade associations, etc.)
- Assessment of environmental performance

Other Information:

The consortium should include industry test facilities, system integrators and users, including OEMs and optional stack developers and research institutes, as appropriate.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SPI-JTI-FCH.2009.4.4: Miniaturised balance of plant components

Rationale

Micro Fuel Cells (10-500W) used in many applications, such as analytical or medical devices, require miniaturised balance of plant (BoP) components which are currently commercially unavailable. Development of such components is needed to demonstrate feasibility and proof of concept.

Overall project objectives / Scope of Work

Projects should focus on development of:

- Mechatronic components with a wide fuel capability, with a target cost of <10% of comparable sized parts for analytical or medical devices, assuming annual production volumes of >500000 units

- Highly integrated DC/DC converters in Voltage range 3-10V with efficiencies >90% and max. power of 50W
- Such components must meet the specifications required for specific micro fuel cell applications. These technical specifications include, among others, start up time, freeze-thaw cycles, layman abuse, fuel impurities, and constant operation after long idle times. These technical requirements will vary depending on the specific application. Proposals need to show improvements over state of the art components, with the support of validation of accelerated and coordinated testing procedures. Projects should identify how they will address the shortcomings (in which respect) of the specific micro fuel cell application they are targeting.
- Dissemination of results to industry and research

Expected Outcome

- Improved components and component performance with respect to degradation factors
- Description of most critical factors and impacts of operating conditions
- Integration of BoP components and proof of concept functional testing
- Development of testing procedures, including accelerated testing, and testing protocols based on application specifications

Other Information:

The consortium should include fuel cell system integrators, research institutes, component suppliers and users, including OEMs as well as research and/or industrial test facilities.

Expected duration: Up to 3 years

Funding Scheme: Collaborative project

Topic SPI-JTI-FCH.2009.4.5: Pre-normative research and Regulations, Codes and Standards on the in-door use of fuel cells

Rationale

There is a need for Regulations, Codes and Standards (RCS) to support safe indoor use of fuel cells in low and mid-power (up to 1 KW) fuel cell early market applications. Implementation of appropriate certification procedures is also needed.

Overall project objectives / Scope of Work

Pre-normative research actions shall develop procedures and methodologies to support the establishment of RCS for indoor use of fuel cells. Aspects that may be of interest include, but are not limited to: emissions, noise, safety, hydrogen sensors and electrical codes.

Expected Outcome

- Mapping of previous and ongoing related projects and their associated RCS activities, from which a proposal for best practices can be extracted
- Development of background procedures and methodologies for RCS, including specific proposals for testing protocols
- Dissemination of results to industry and research

Other Information:

The consortium should include industrial fuel providers, research and/or industry test facilities, certification agencies and users, including OEMs.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SPI-JTI-FCH.2009.4.6: SME Promotion: Early demand stimulation schemes**Rationale**

For SMEs, one of the critical issues in the path to commercialization of hydrogen and fuel cells is the stimulation of early demand to create market pull, and particularly to encourage public institutions to procure hydrogen and fuel cell products.

Overall project objectives / Scope of Work

- Projects shall develop procurement schemes and frameworks that are appropriate for public institutions to foster the commercialization of hydrogen and fuel cell products. The proposed initiatives should be tested to assess the effectiveness of suggested approach for the development of procurement schemes

Expected Outcome

- Mapping of existing procurement tools in the EU
- Specific proposals for stimulation of early demand, including procurement of fuel cell-powered products by public institutions, large private customers and/or buyer's pools
- Dissemination of results to industry, in particular SMEs, and to public institution across the EU

Other Information:

The consortium should include financial institutions, socio-economic researchers, OEMs, SMEs and final users from the public and private sector.

Expected duration: Up to 3 years

Funding scheme: Coordination and Support Action

APPLICATION AREA SPI-JTI-FCH.5: CROSS - CUTTING ISSUES

Topic SPI-JTI-FCH.2009.5.1: Development of educational programmes

Rationale

While several training programs exist in the EU, specific hydrogen and fuel cell-related technology training is needed to secure the required mid- and long-term human resource base of technical professionals needed within research, industry and users. This topic specifically addresses the need to provide technical training to future industry professionals at all levels, from technical schools all the way to graduate studies.

Overall project objectives / Scope of Work

Projects should focus on the development of specific technology related training initiatives through various educational levels, in cooperation with other programs such as Leonardo. Suitable existing programs should be identified and concrete proposals shall be made to use them in an efficient and effective manner to develop the necessary human resource base.

These proposals shall address the technical needs required to train educational groups at various levels, starting at technical school level and covering undergraduate and graduate studies. Project should focus on a specific educational level. The proposed initiatives shall be tested and implemented during the project, including specific measures for tracking of progress, by way of hiring rates of trainees within the program by industry, for example, even after the project is finished.

Expected Outcome

- Mapping of existing training programs in the EU that may provide a good base for this educational action
- Develop proposals for specific initiatives on educational programs addressing the need to develop a well-trained work force
- Dissemination of results to industry and research

Other Information:

The consortium should include SMEs, users, including OEMs, training and education institutions/professionals and universities/R&D centres.

Expected duration: Up to 2 years

Funding scheme: Coordination and Support Action (Supporting Action)

Topic SPI-JTI-FCH.2009.5.2: Training initiatives for regulators

Rationale

Certain groups, such as local and regional regulators and technical project managers from the public and private sector constitute an important part of the early efforts to demonstrate and commercialise hydrogen and fuel cell technologies. For this reason, specific hydrogen and fuel cell-related technology outreach and training activities are needed to establish the required knowledge base.

Overall project objectives / Scope of Work

Suitable programs emphasising key aspects of hydrogen and fuel cell technologies shall be developed or identified to provide efficient and effective educational concepts that can be used and/or coordinated across Member States. The proposed initiatives shall be tested and implemented during the project, including tracking of progress. Results should be disseminated to industry, public agencies, and research organisations.

Expected Outcome

- Mapping of existing training programs in the EU that may provide a good base for this educational action
- Proposals for specific initiatives on educational and outreach programs addressing the need to educate the specified target groups
- Implementation of broad, efficient outreach education programs
- Dissemination of results to industry, public agencies and research

Other Information:

The consortium should include training and education institutions/professionals, universities/R&D centres, manufacturers (OEMs) and target group representatives.

Expected duration: Up to 5 years

Funding scheme: Coordination and Support Action (Supporting Action)

Topic SPI-JTI-FCH.2009.5.3: SME Promotion: Outreach program

Rationale

In the early stage, SMEs need support to develop the necessary tools that enable access to risk capital financing their growth and operations. While there are certain forums available within the EU, a specific support action for SMEs in the field of fuel cells and hydrogen is needed to develop a comprehensive program for market and finance outreach.

Overall project objectives / Scope of Work

Projects shall develop a host of tools available to SMEs at EU level, including but not limited to: a presentation platform specifically geared towards investors, a database of potential investment and funding opportunities at EU level for SMEs with large growth potential, business plan templates for companies involved in the development of hydrogen and fuel cell technologies.

Expected Outcome

- Mapping of financial resources available to SMEs
- Presentation platform for market growth (OEMs) and financial needs (investment)
- Template for business plans specifically geared to hydrogen and fuel cell start-up companies
- Development of a EU-wide database of potential investment and funding opportunities
- Effective dissemination of results to industry, in particular SMEs, through leverage of existing communication networks within EU Member States. If such networks are deemed inadequate, development of effective ones.

Other Information:

The consortium should include financial / venture capital, socio-economic research and OEMs.

Expected duration: Up to 2 years

Funding scheme: Coordination and Support Action (Supporting Action)

Topic SP1-JTI-FCH.2009.5.4: Technology monitoring and assessment (TMA)**Rationale**

The FCH JU needs to assess progress both towards FCH JU objectives and vis-à-vis major external technological developments. Regular technology monitoring and assessment including major stakeholders is essential for this purpose and it is necessary to develop a specific programme assessment tool and methodology, to collect and link data developed in the FCH JU projects and benchmarked also with external inputs.

Overall project objectives/ Scope of Work

The goal of this action is to develop an appropriate TMA Framework tailored for hydrogen and fuel cell technologies; this will include establishing the data format and database for projects and external inputs; defining the incoming report frequency and the TMA reporting system. An opportune rating framework, including weighting of criteria, must also be established. This should include a definition and selection of benchmarks towards both best-in-class (BiC) and best available technology (BAT).

Website design and on line implementation of TMA reports/databases should be also envisaged.

TMA reports will be developed in the form of a semi-annual briefing for the FCH JU. It is expected that a full assessment will also be performed twice throughout the lifetime of the FCH JU and then discussed with a wider community of stakeholders.

The successful project will only develop the TMA Framework; the actual execution of the TMA's will be subject to separate calls. To ensure consistency and compatibility with related tools in policy and industry context, this work will be properly interfaced with the project on LCA (topic SP1-JTI-FCH.5.3 of this call).

Expected outcome

Definition and development of a complete TMA Framework to be used by the FCH JU, including a detailed process handbook/manual, development, definition and justification of benchmarking (BiC, BAT), interfaces and incoming/outgoing reports; database structure and implementation, including respective interfaces and report generators.

Other information

The TMA function will be provided by a consortium of knowledgeable legal entities able to deliver impartial advice. The consortium should include organisations with broad expertise in technology monitoring and assessment frameworks. Links to the EU SET-Plan shall be established and monitored. The successful consortium should liaise with the Institute for Energy of the EU Joint Research Centre (JRC-IE) for the implementation of this action.

Expected duration: Up to 1.5 years

Funding Scheme: Coordination and Support Actions (Supporting Action)

Topic SP1-JTI-FCH.2009.5.5: Life Cycle Assessment (LCA)

Rationale

Sustainability is a key driver of the FCH JU activities and it is necessary to assess the new developments towards these goals. Life Cycle Assessment will therefore be applied throughout the FCH JU on a programme level. To meet this goal the FCH JU will require dedicated practice guidance for hydrogen and fuel cell technologies. To ensure consistency and compatibility with related tools in policy and industry context, this will be done in line and building upon the International Reference Life Cycle Data System (ILCD) Handbook on LCA, developed/coordinated by the European Commission's European Platform on LCA (EPLCA)¹¹

What is needed in context of the FCH JU is a specific guidance that links the general ILCD Handbook for application to Hydrogen and Fuel Cell Technology, and related training material and courses for practitioners in industry.

It is envisaged that an LCA will be performed on both FCH JU projects and the total programme, as soon as the guidance becomes available. The resulting Life Cycle Inventory (LCI) data sets will form a database, published and maintained by the industry partners of the FCH JU, being one component of the upcoming ILCD Data Network.

Previous assessments including WtW - analysis provided by EUCAR and CONCAVE are to be considered and included. The project shall also establish an international dimension thus providing for a globally consistent framework.

Overall project objectives/Scope of work

The goal is to develop dedicated practice guidance on the technology system for hydrogen and fuel cells, drawing on the related approach of developing Product Category Rules (PCR) used in Environmental Product Declarations (EPD)¹². Close cooperation with the European Commission's *European Platform on LCA* is necessary to ensure the requirements of the ILCD Handbook are met by the practice guidelines. Training courses on their application should also be developed by this project. The guidance shall cover the whole range of steps covered in the ILCD Handbook, starting from Goal and Scope Definition, collecting and calculating data, to LCIA results calculation and Interpretation, including internal quality control. The review part and documentation will directly apply the ILCD guidance.

The successful consortium will need to supply sufficient information for public presentation and debate on its results, and conduct training courses for potential users.

The project will only develop the specific guidance - the actual data collection and execution of the LCA(s) will be subject to a separate call. The LCA framework actions will be properly interfaced with the TMA framework support action (topics SP1-JTI-FCH.5.2 of the present call).

Expected Outcome

- Guidance document (PCR-type) including a detailed manual for performing ILCD-conform LCAs on Hydrogen and Fuel Cell Technologies.

¹¹ <http://lca.jrc.ec.europa.eu/>

¹² ISO 14025: Environmental labels and declarations – Type III environmental declarations – Principles and procedures

- LCA study reporting templates based on the ones provided in the ILCD handbook, tailor-made for Hydrogen/Fuel Cell studies; data sets directly are to meet the ILCD documentation requirements.
- Website design with both public and restricted access areas to up-/download data for assessment, tools, etc.
- Workshops and training courses on the developed guidance document

Other information

The consortium should include organisations with expertise in life cycle assessments and methodologies as well as experience in developing PCRs.

The successful consortium should liaise with the EU Joint Research Centre (JRC) for the implementation of this action.

Expected duration: 1 year

Funding scheme: Coordination and Support Actions (Supporting Action)

8.2 Staff establishment plan 2009

Temporary Agents

Grade	Staff		2009 Establishment Plan	
	Employed on 31/12/2008		Draft Budget / Authorised	
	Permanent posts	Temporary posts	Permanent posts	Temporary posts
AD 16				
AD 15				
AD 14				1
AD 13				
AD 12				
AD 11				3
AD 10				
AD 9				1
AD 8				4
AD 7				2
AD 6				
AD 5				
Total AD¹³	0	0	0	11
AST 11				
AST 10				
AST 9				
AST 8				1
AST 7				3
AST 6				
AST 5				
AST 4				1
AST 3				2
AST 2				
AST 1				
Total AST¹⁴	0	0	0	7
TOTAL	0	0	0	18

¹³ AD stands for Administrator

¹⁴ AST stands for Assistant

Contract agents

	2008 Number as of 31/12/2008	2009 estimate
Function Group IV		1
Function Group III		1
Function Group II		
Function Group I		
Total	0	2

8.3 FCH JU Budget 2009

8.3.1 Estimated revenues¹⁵

<u>REVENUES</u> (Million €)	Running costs	Operational costs	TOTAL
European Commission	2.7	71.26	73.96
Industry Grouping	0,000	0,000	0,000
Research Grouping	0,000	0,000	0,000
TOTAL REVENUES	2.7	71.26	73.96

¹⁵ The Industry Grouping and the Research Grouping will contribute to the running costs for 2009 once the FCH JU has become autonomous and can invoice the other members of the FCH JU.

8.3.2 Estimated commitment appropriations

<u>EXPENDITURE</u>	Budget 2008	Budget 2009
<u>Million €</u>	(*) (**)	
Title 1		
Staff Expenditure		
Salaries & allowances		1.015
Expenditure relating to Staff recruitment		0.145
Mission Expenses		0.030
Socio-medical infrastructure		0.012
Professional development		0.017
Receptions and Events	0.002	0.010
Title 1 - Total	0.002	1.229
Title 2		
Infrastructure and operating expenditure		
Rental of buildings and associated costs		0.146
Communication		0.917
Movable property and associated costs		0.050
Current Administrative expenditure		0.050
Postage / Telecommunications		0.003
Meeting Expenses		0.205
Running costs in connection with operational activities		0.100
Title 2 - Total	0.00	1.471
Title 3 - Operating Expenditure		
Operating Costs	28.771	71.260
Title 3 - Total	28.771	71.260
TOTAL EXPENDITURE	28.773	73.960

(*) The amounts include European Free Trade Area (EFTA) contributions 2.4% from countries associated to the 7th Framework Programme.

(**) As allowed by Article 12 of the Annex to the Council Regulation (EC) N° 521/2008, an amount of 1 832 000 € has been transferred from the non-used running costs to the operational budget 2010. The running budget for 2008 was thus 113 410 € including contributions from EFTA of 45 410 €

8.3.3 Estimated payment appropriations

<u>EXPENDITURE</u> <u>Million €</u>	Executed Budget 2008	Budget 2009
Title 1		
Staff Expenditure		
Salaries & allowances		1.015
.Expenditure relating to Staff recruitment		0.145
Mission Expenses		0.030
Socio-medical infrastructure		0.012
Professional development		0.017
Receptions and Events		0.010
Title 1 - Total		1.229
Title 2 Infrastructure and operating expenditure		
Rental of buildings and associated costs		0.146
Information and communication technology		0.917
Movable property and associated costs		0.050
Current Administrative expenditure		0.050
Postage / Telecommunications		0.003
Meeting Expenses	0	0.205
Running costs in connection with operational activities		0.100
Title 2 - Total	0.00	1.471
Title 3 - Operating Expenditure		
Operating Costs (*)		16.860
Title 3 - Total	0.00	16.860
TOTAL EXPENDITURE	0.00	19.560

8.4 Abbreviations & Definitions

Term	Definition
AA	Application areas such as Transportation & Infrastructure, Hydrogen Production & Distribution etc.
AA-EM	Application Area Early Markets, short-term markets encompassing a group of applications for which products can be commercially deployed within the 2007-2013 timeframe
AA-H	Application Area Hydrogen Production, Storage & Distribution
AA-S	Application Area Stationary Power Generation & CHP
AA-T	Application Area Transportation & Refuelling Infrastructure
AC	Associated Country means a third country which is party to an international agreement with the Community, under the terms or on the basis of which it makes a financial contribution to all or part of the Seventh Framework Programme
AIP	Annual Implementation Plan
BOP	Balance of Plant
CCI	Cross Cutting Issues
CSA	Coordination and Support Action
EC	European Commission
Deployment	Development phase for a given technology and/or infrastructure from its market introduction to its widespread use
ED	Executive Director
FCH	Fuel Cells & Hydrogen
FCH JU	The Fuel Cells and Hydrogen Joint Undertaking: the name refers to the legal entity established as the public & private partnership to implement the Joint Technology Initiative
SRG	FCH States Representatives Group: Advisory body of the FCH JU gathering Member States and Associated Countries' representatives
FP7	Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013)
GB	Governing Board of the FCH JU
HFP	The European Hydrogen and Fuel Cell Technology Platform
IDA	Innovation and Development Actions: A programmatic cluster of the HFP Implementation Plan targeting a specific objective of the programme and encompassing a set of relevant technologies and market enablers along with the actions to achieve it
IP	Implementation Plan
JTI	Joint Technology Initiative - a policy initiative introduced in the FP7. The Term JTI may also be used to refer to the legally established structure implementing the initiative (cf. above FCH JU)
MAIP	Multi-Annual Implementation Plan

MCFC	Molten Carbonate Fuel Cells
Members	The term "members" refers to the founding members of the FCH JU (EC & NEW IG) and the RG
MS	The "Member States" shall be understood as the EU-27 Members States
NEW IG	New Energy World Industry Grouping - European Industry Grouping for a Fuel Cell and Hydrogen JTI also referred to as "Industry Grouping" or "IG"
OEM	Original Equipment Manufacturer
PEMFC	Proton Exchange Membrane Fuel Cell
PNR	Pre-normative research
PO	Programme Office (also referred to as JTI PO)
RCS	Regulations & Codes and Standards
RG	New European Research Grouping on Fuel Cells and Hydrogen AISBL, also referred to as " Research Grouping" or "N.ERGHY"
RTD	Research, Technological Development & Demonstration
SOFC	Solid Oxide Fuel Cell
Stakeholders	The term "Stakeholders" embodies all public or private actors with interests in FCH activities both from the MS or third countries. It shall not be understood as "partners" or "members" of the FCH JU.
UPS	Uninterruptible Power Supply
WtW	Well to Wheel