Fuel Cells and Hydrogen Joint Undertaking (FCH JU)

ANNUAL IMPLEMENTATION PLAN 2010

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1. Introduction, background and mission

This document establishes the third 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 third Call for proposals in 2010, 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, climate change, 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 2050[1] 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.

To implement these priorities and bring clean energy technologies to the market, a key element of the SET Plan's implementation strategy is to combine resources with the private sector, allowing industry to take the lead in identifying technology gaps that need to be addressed. The cooperation is structured through public-private partnerships, the European Industrial Initiatives. Among the first such initiatives, the Fuel Cells and Hydrogen Joint Undertaking (FCH JU) was established by a Council Regulation of 30 May 2008[3] as a long-term public–private-partnership under the Seventh Framework Programme (FP7) of the European Community.

The FCH JU pools public and private resources, with activities co-financed by the Commission and the industry and research community partners. The founding members: the Union, represented by the European Commission, and the *European Fuel Cell and Hydrogen Joint Technology Initiative Industry Grouping* (hereinafter referred to as "the IG"), share the running costs 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"). The planning of the agenda for research, technological development and demonstration (RTD) is led by the industry to ensure that it is focused at the objective of commercialisation.

The FCH JU's first call for proposals, with indicative Community funding of €28.1M[4], was finalised in December 2009 with the conclusion of contracts with 16 project consortia[5]. The second call, with an indicative Community funding of €71.3M[6], entered into the negotiation stage in April 2010.

[1] COM(2007) 723 final
[2] COM(2007) 1 final
[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 including European Free Trade Area (EFTA) contributions 2.4% from countries associated to the 7th Framework Programme.
[5] For details of the projects funded in the first call, please see http://ec.europa.eu/research/fch/index_en.cfm?pg=projects
[6] €72,970,240 including European Free Trade Area (EFTA) contributions 2.4% from countries associated to the 7th Framework Programme.

The current AIP outlines the FCH JU's work plan for 2010, in line with the programme priorities set out in the Multi-Annual Implementation Plan (MAIP) adopted by the Governing Board on 15 May 2009[7]. In particular, the AIP establishes the list of topics and detailed topic descriptions for the Call for Proposals to be published in 2010.

2. RTD priorities and key objectives for 2010

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;
- Undertake supporting actions where appropriate through calls to tender;
- 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. Management 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 (AAs)

The Annual Implementation Plan (AIP) is the result of a joint effort by the major stakeholders - namely the 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.

Within the framework of the available annual budget, the actions have been chosen based on their potential contribution to achieving Europe's policy objectives, i.e. the Commission's targets for green house gas reductions, energy security and competitiveness. They include in a balanced way research, technological development, demonstration and cross-cutting activities, including Regulations, Codes & Standards (RCS).

[7] The Multi-Annual Implementation Plan can be consulted at http://ec.europa.eu/research/fch/index_en.cfm?pg=documents

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 emphasis given to different action categories in different application areas reflects the industry and research partners' assessment of the state of technological maturity of the applications.

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 as well as ICE vehicles, including cars and buses, 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. Focused 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, important for achieving commercial success stories. 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 cost of a single product unit for early market products is quite low, this 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. The programme will thus help pave the way for a widespread acceptance of the technology, with fuel cells becoming general consumer items.

In many cases, early markets represent niche markets that are the business domain 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.

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. The cross-segment approach 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 2010 Call for proposals

In line with the political and technical objectives outlined above, the following topics have been prioritised for the AIP 2010 and the third call for proposals of the FCH JU:

- In the application area **Transportation and Refuelling Infrastructure** a topic will be published for 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 to expand on the number of existing demo sites in Europe. Research and development of membrane electrode assemblies (MEAs) of polymer electrolyte membrane fuel cells will aim to further reduce the amount of platinum loading, increase catalyst performance and stability, and improve the manufacturability of MEAs. Other R&D activities proposed include investigating degradation phenomena specific to transport applications and improving bipolar plates. Finally, proof-of-concept demonstration activity in Auxiliary Power Units (APUs) for transport applications is called for.

- 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 low temperature alkaline electrolysis technology to further advance the large-scale use of renewable and other energy sources, and to achieve substantial improvement of energy efficiency. Demonstration activities in hydrogen production are prepared with a call for an efficient design for a large-scale hydrogen liquefaction plant. A

collaborative project is also launched to prepare for the introduction of higher truck delivery pressure for distribution and retail, including recommendations on safety aspects and legislation.

- The application area **Stationary Power Generation** has emphasis on material development to improve performance of fuel cell stacks and Balance of Plants components, and on long-term research for novel architectures for cells and stack design. Component improvement of fuel cell systems is also addressed. Activities further along the technological maturity curve will also be introduced in this application area with a topic on construction and validation of proof-of-concept fuel cell systems and another one on field demonstration of stationary fuel cell systems. Finally, pre-normative research on power grid integration and management of stationary fuel cell systems for development of RCS is proposed.

- 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 these applications. Another topic relates to the demonstration of application readiness of fuel cell generators for power supply to off-grid stations, another promising early market. Research and technological development topics focus on micro fuel cells and portable applications of up to 5kW, demonstrating proof-of concept for a fully integrated system; developing improved, cost-efficient components for Direct Methanol Fuel Cells; and new portable and micro FC solutions. PNR is proposed to be done on cost-effective safety solutions for the indoor use of fuel cell systems.

- **Cross-Cutting Issues** focus on two topics: First, the 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. Second, development of financing models for reusable or recyclable components of hydrogen and fuel cell technologies.

The table below describes specific topics selected for the third call, together with their rationales. For a detailed description of the topics, see Annex 9.1 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[8] Million €
Transportation & Refuelling Infrastructure			**31.6**
1	Large-scale demonstration of road vehicles and refuelling infrastructure III	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	Next generation European MEAs for transportation applications	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).	
3	Investigation of degradation phenomena	Research and development on critical stack and system operating parameters and conditions. The aim is to establish a solid methodology and develop tools for safe life-time assessments and help improve system and vehicle operating strategies.	
4	Bipolar Plates	Research and development of cost effective bipolar plate manufacturing technologies including corrosion resistant coatings for stainless steel, demonstration of processability of steel/coating combination in complex configurations, as well as adequate stacking capabilities and long-term stability under fuel cell conditions (anode and cathode side conditions).	
5	Auxiliary Power Units for Transportation Applications	Research, development and proof-of-concept demonstration of APU systems for on-board power generation. The project should demonstrate feasibility of using logistic fuels, demonstrate fuel processing technology for logistic fuels and define requirements for fully integrated systems in the specific application.	
Hydrogen Production & Distribution			**11.0**
6	Efficient alkaline electrolysers	Development activities on low cost, low temperature, high efficiency electrolysers based on alkaline technology, including prototyping and testing; demonstration of the application and production readiness.	
7	Development of fuel processing catalyst, modules and 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] The funding includes the FCH JU's own budget only. The amount corresponding to EFTA contributions (2.3 M€) may be used to reinforce the different sub-budgets.

No.	Topic	Scope	Indicative FCH JU Funding[8] Million €
8	Development of gas purification technologies	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.	
9	Low temperature H_2 production processes	Development of efficient chemical or biological systems converting renewable energy sources (solar energy and biomass) into hydrogen (via chemical energy for water splitting and anaerobic fermentation). Efficient, easy to handle chemical or biological systems shall be developed and the low temperature hydrogen production shall be demonstrated in small scale reactors.	
10	Preparation of demonstration of efficient large-scale hydrogen liquefaction	Development of a process for hydrogen liquefaction with significantly reduced energy consumption and a commercial design for a large-scale liquefaction plant as preparation for future implementation.	
11	Feasibility of >400bar CGH2 distribution	Assessment of the benefits of higher truck delivery pressure for distribution and retail as well as preparing the case for permitting higher hydrogen truck delivery pressure, including a report on safety aspects, and recommendations on maximum pressure and change in legislation.	
Stationary Power Generation & CHP			**33.0**
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 needs to be considered as well. Open to all fuel cell technologies.	
13	Next generation cell and stack designs	Long-term and break-through oriented research on novel architectures for cell and stack design to provide step change improvements over existing technology in terms of performance, endurance, robustness and cost for relevant applications. Efficiency, cost, reliability (and power density) are main drivers. The call is open to all solutions or operating ranges, geometries or materials. The project proposals should lead to a proof of concept.	
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.	

No.	Topic	Scope	Indicative FCH JU Funding[8] Million €
15	Proof-of-concept and validation of integrated fuel cell systems	This topic will support the development, construction and validation of fully integrated proof of concept fuel cell systems for any stationary application. These integrated systems must be proven to be technologically and economically viable, prior to any large scale demonstration. Proof of concept systems will be constructed that show interaction with other devices as required for the target application, including fuel supplies utilising any necessary processing technology, if necessary. For fully integrated systems manufacturing routes need to be also identified to establish a sustainable approach towards commercialisation.	
16	Field demonstration of stationary fuel cell systems	Demonstration of FC-based integrated generator systems in real application environment which includes interfaces with the infrastructure for power, heat, CCS, renewable sources and fuel/oxidant processing as necessary.	
17	Pre-normative research on power grid integration and management of fuel cells for residential CHP, commercial and industrial applications	Pre-normative research on power grid integration and management of fuel cells for residential CHP, commercial and industrial applications. Based on a thorough review of previous RCS activities, the projects shall produce proposals and recommendations on background procedures and methodologies for RCS as well as for further development of RCS. Dissemination to research and industry shall be included.	
Early Markets			**11.5**
18	Demonstration of fuel cell-powered materials handling vehicles including infrastructure II	Demonstration of early market solutions for fuel cell powered industrial and specialty vehicles, in particular material handling vehicles (Fork lift trucks, stackers, moving cranes, etc.).	
19	Demonstration of industrial application readiness of fuel cell generators for power supply to off-grid stations, including the hydrogen supply solution	Demonstration of fuel cell and hydrogen systems for stand-alone off-grid stations including hydrogen supply solution. Minimum 20 sites.	
20	Fuel supply concepts for portable and micro fuel cells	Research and development in the field of hydrogen supply concepts for micro fuel cells and portable applications of up to 5 kW. A fully integrated system demonstrating the proof-of-concept including logistic distribution aspects is required.	
21	Components with advanced durability for Direct Methanol Fuel Cells	Research and development to develop improved components demonstrating superior durability vis-à-vis state-of-the-art while at the same time lowering the cost/kW for Direct Methanol Fuel Cells.	
22	Research and development on new portable and micro Fuel Cell solutions	Research and development to develop novel portable and micro Fuel Cell Solutions (low and high temperature) targeted to meet specific application requirements.	

No.	Topic	Scope	Indicative FCH JU Funding[8] Million €
23	Pre-normative research on the indoor use of hydrogen and fuel cells	Development of the scientific base for defining and justifying cost effective safety strategies specific to the use of hydrogen and fuel cells indoors or in confined spaces, with power ratings between 200W and 50kW.	
Cross-cutting Issues			**2.0**
24	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.	
25	Study of advanced hydrogen economy financing options	Development of financing models for reusable or recyclable components of hydrogen and fuel cell technologies.	
Total indicative FCH JU Funding[9]			**89.1**

[9] The amount corresponding to EFTA contributions (2.3 M€) may be used to reinforce the different sub-budgets.

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 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 2010. The key activities are listed below:

Key activities in 2010 - timetable	
Appoint the Accounting Officer	Q1
Adopt Terms and Conditions for Internal Investigations in Relation to the Prevention of Fraud	Q1
Adopt/approve the list of projects for negotiations for the 2009 Call.	Q2
Adopt/approve the key documents for operations in 2010: Call documents for 2010, Annual Implementation Plan 2010, the Staff Policy Plan and the Annual budget.	Q2
Approve a request for the Commission to initiate a change in the Regulation to improve FCH JU funding rules	Q2
Adopt the Internal Control Standards and Internal Control Framework	Q2
Appoint the Executive Director of the FCH JU	Q2
Adopt the External Communication Strategy of the FCH JU	Q4

3.2 Executive Director and the Programme Office

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.

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 and is foreseen to continue in this function for the first and second quarters of 2010. He is assisted by the Programme Office that by the second quarter of 2010 is expected to have 12 of its own staff recruited, in addition to two Commission officials who support the establishment of the FCH JU in the interim period.

The appointment process of the Executive Director is scheduled to be finalised during the third quarter of 2010.

The activities of the Programme Office include the preparation of all the decisions and activities of the Governing Board and the advisory bodies described in this chapter and the day-to-day execution of the FCH JU programme as described in Chapters 4 and 5 below.

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.

Nine members were appointed to the Scientific Committee in the first half of 2009[10]. There have been no changes to the membership since.

The Scientific Committee will hold two to three meetings in 2010. Its main activities will be:

Key activities in 2010 - timetable	
Provide input on the scientific priorities of the AIP 2010	Q2
Provide input on the scientific priorities of the AIP 2011	Q3-4
Provide input to the revision of the MAIP	Q4

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.

[10] For the list of members, see http://ec.europa.eu/research/fch/pdf/fch_ju_scientific_committee.pdf#view=fit&pagemode=none

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 will hold two to three meetings in 2010. Its main activities will be:

Key activities in 2010 - timetable	
Consultation of the SRG on the topics for Call for Proposals 2010	Q1-2
Consultation of the SRG on the possible change of Regulation to improve the FCH JU funding limits	Q2-3
Consultation of the SRG on the revision of the MAIP	Q3-Q4
Consultation of the SRG on the topics for the Call for Proposals 2011	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 third Stakeholders' General Assembly is scheduled to take place in Brussels on 9-10 November 2010. The emphasis of the agenda is foreseen to be on FCH JU progress and projects as well as wider policy and market strategies for the commercialisation of fuel cell and hydrogen technologies.

Key activities in 2010 - timetable	
The 3rd SGA meeting 9-10 November 2010.	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 9.1.1.

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. If they are still tied, they will be prioritised according to their scores for the S/T Quality criterion, then by 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 members should be taken into account.

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 2010.
Evaluation results are estimated to be available within 2 months after the closure date.

See Annex 9.1.2 and Annex 9.1.3 for details.

4.3 Consortium

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 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 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 Programme[11];

(c) At least 1 legal entity must be a member of the 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.

[11] 1. Two legal entities shall be regarded as independent of each other where neither is under the direct or indirect control of the other or under the same direct or indirect control as the other.

2. For the purposes of paragraph 1, control may, in particular, take either of the following forms:
(a) the direct or indirect holding of more than 50 % of the nominal value of the issued share capital in the legal entity concerned, or of a majority of the voting rights of the shareholders or associates of that entity;
(b) the direct or indirect holding, in fact or in law, of decision making powers in the legal entity concerned.

3. However, the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:
(a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50 % of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;
(b) the legal entities concerned are owned or supervised by the same public body.

[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)]

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 in-kind contribution of industry participants shall at least match the EU contribution, i.e. the financial (cash) contribution coming from the FCH JU.[12]

Reimbursement of direct costs

To ensure that industry in-kind contribution matches the FCH JU contribution, the FCH JU proceeds in two stages for the reimbursement of direct costs:

1. The FCH JU starts with maximum reimbursement rates that are 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:

Type of organisation	**Type of Activity**		
	RTD	Demonstration	Other (including management)[13]
Industry (other than SME)	CP: max. 50%	CP: max. 50%	CP: max. 100% CSA: max. 100%
SME	CP: max. 75%	CP: max. 50%	CP: max. 100% CSA: max. 100%
Non-profit public-bodies, universities & higher education establishments, non-profit Research organisations	CP: max. 75%	CP: max. 50%	CP: max. 100% CSA: max. 100%

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

[12] Article 12(3) of the statutes of the FCH JU provides: *The operational costs of the FCH Joint Undertaking shall be covered through the financial contribution of the Community, and through in-kind contributions from the legal entities participating in the activities. The industry contribution shall at least match the Community's contribution. Other contributions to co-funding of activities will be considered as receipts in accordance with the Rules of Participation of the Seventh Framework Programme.*

[13] "Other" activities refer to management activities, training, coordination, networking and dissemination (including publications). It also includes coordination and support activities in case of CSA. Please note that scientific coordination is not considered to be a management activity.

2. The FCH JU will apply a correction factor (reduction) to ensure the matching obligation[14]. Experience from the previous FCH JU Calls for proposals showed that these decreases might be substantial, depending on the type of activity (Research, Demonstration, Other) and type of participants (SME, university, etc) in 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.

Identification and Reimbursement of indirect costs

Indirect costs shall represent a fair apportionment of the overall overheads of the organisation. They shall be identified according to one of the following methods:

1. Participants who have an analytical accounting system enabling to identify them may declare their actual indirect costs. This option is mandatory for industrial legal entities, except for those whose accounting system does not allow distinguishing direct from indirect costs.

   a. In Collaborative Projects, their indirect costs will be reimbursed with a maximum amount equal to 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.

   b. In Cooperation and Support actions, their indirect costs will be reimbursed with a maximum amount equal to 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 beneficiaries

2. Alternatively indirect cost may be identified by means of 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.

   a. In collaborative projects, indirect costs will be reimbursed with an amount equal to the 20% flat rate.

   b. In Cooperation and Support actions, their indirect costs will be reimbursed with an amount equal to 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 beneficiaries.

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

[14] Article 15(3) of the statutes of the FCH JU provides: *"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."*

5. Other Actions

The activities described in this section fall outside of the mainstream 'calls for proposals' means of implementation of the Annual Implementation Plan. Funds will be made available to support the following activities:

- **Three public procurements** - planned for 2010 as shown in the table below:

Subject (Indicative title)	Indicative FCH JU Funding €	Indicative timetable for publication
Development of a European Fuel Cell and Hydrogen Vehicles Roll Out Plan	One contract 0.6 million	Last quarter 2010
Development of a European Urban Fuel Cell Bus Commercialisation Strategy	One contract 1.7 million	Last quarter 2010
Commercialisation roadmap for hydrogen powered fuel cell material handling vehicles	One contract 0.5 million	Last quarter 2010
Total indicative FCH JU Funding[15]	**2.8 million**	

Their main objectives will be:

- The European fuel cell and Hydrogen vehicles roll out plan will provide a study which will formulate a European commercialisation strategy as a common framework of reference for national and EU policymakers.
- The European urban fuel cell buses commercialisation strategy will provide a study which will establish an independent fact base for fuel cell technology in buses, as well as a European based roll out plans.
- The EU Commercialisation roadmap for hydrogen powered fuel cell material handling vehicles will identify market segments within materials handling vehicles for which value propositions show promise for commercialisation in the near term. It will also identify and propose solutions that address the present gaps in reaching sufficient levels of commercialisation.

Each tender shall be carried out under a direct service contract as defined in the Directive 2004/18/EC[16]. For the award of the contract an open procedure shall be used. A contract notice with reference to detailed tender specifications shall be published in the S series of the Official Journal in line with preliminary timetable indicated above.

[15] The amount corresponding to EFTA contributions (2.3 M€) may be used to reinforce the different sub-budgets.
[16] DIRECTIVE 2004/18/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:134:0114:0240:EN:PDF)

6. Support Activities

6.1 Preparatory actions

In addition to preparing the publication of the third call for proposals and related tenders, the FCH JU's operations in the first quarter of 2010 will cover the preparatory actions remaining to reach the capacity to implement the FCH JU programme autonomously.

These include

- Completion of recruitment of key staff;
- Preparation of Internal Control Standards and an Internal Control Framework;
- Preparation of Manual of Procedures and Financial Circuits;
- Finalising the adaptation of IT tools for the FCH JU;
- Finalising the adaptation of the accounting system;
- Preparation of training policy and training plans;
- Preparation of the AIP 2010 including the budget;

The conditions for autonomy of the FCH JU are scheduled to be fulfilled by the third quarter of 2010.

6.2 IT support

For the 2010 call for proposals, the Commission's FP7 IT systems have been adapted for the use of FCH JU and will be used for the publication of the call, as well as for the submission, evaluation and negotiation of proposals.

6.3 Accounting system

The European Commission’s Accrual Based Accounting system (ABAC) is already adapted, tested and ready for use of the FCH JU. The Governing Board appointed the Accounting Officer in January 2010, who took up duties in March 2010. The Accounting Officer received the necessary training for the use of ABAC in order for it to be fully operational by the date of autonomy of the FCH JU.

7. Indicators

7.1 Result Indicators

Fuel Cells and Hydrogen Joint Undertaking – RTD activities				
SPECIFIC OBJECTIVES		**Result indicators**		
		Indicator	**Target**	**Latest known results**
1	**To address technological and non-technological barriers to commercialisation of FCH technologies as defined in the MAIP**	Coverage of topics called for	100% by 2013	66%[17]
		Percentage of proposals which successfully address the criteria of scientific and/or technological excellence[18]	70% by 2013	64%[19]
		Percentage of projects which have fully achieved their objectives and technical goals and have even exceeded expectations	60%[20] by 2013	Data not yet available [21]
2	**To promote the use and dissemination of research results with a view specifically to commercialising FCH technologies**	Percentage of proposals which successfully addressed the criterion of dissemination and use of project results[22]	70% by 2013	70%[23]
		Percentage of projects showing evidence that they will produce significant scientific, technical, commercial, social or environmental impacts	60%[24] by 2013	Data not yet available
		Percentage of industrial participation in the projects of which SMEs	50% of industrial participation by 2013	48,8%[25]
			15% of SMEs participation by 2013[26]	23,6%[27]
		Percentage of projects which generate one or more patent applications	30% by 2013	Data not yet available
		Percentage of projects with publications in peer reviewed journals	55% by 2013	Data not yet available

[17] Based on the evaluation results of the Call for Proposals 2009.
[18] Based on the Consensus report for research projects established by the evaluators to rank the proposals. The scoring used for this indicator is very good to excellent
[19] Based on the evaluation results of the Call for Proposals 2009.
[20] On finished projects. (not all projects will be finished by 2013)
[21] No FCH JU projects have been finished at the time of the publication of the AIP 2010.
[22] Based on the Consensus report for research projects established by the evaluators to rank the proposals. The scoring used for this indicator is very good to excellent
[23] Based on the evaluation results of the Call for Proposals 2009.
[24] On finished projects. (not all projects will be finished by 2013)
[25] Based on the projects funded under the 2008 Call for Proposals.
[26] Based on budget allocated to SMEs in projects
[27] Based on the projects funded under the 2008 Call for Proposals.

8. Communication activities for 2010

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.

As a key communication tool, the FCH JU has developed a website[28] including the key information about the programme, the latest developments and events. 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.

Communication activities of the FCH JU will be reinforced in 2010 with the recruitment of the Policy and Communications Officer in Q2 and the Stakeholder Relationships Manager in Q3. Activities in 2010 will focus, on the one hand, on communicating about the first projects of the FCH JU and, on the other hand, improving the public visibility of the technologies and increasing their weight in policy decisions. Following the recruitment of the key communications personnel, a communication strategy, including a long-term communication plan for the FCH JU, is scheduled to be adopted in the fourth quarter of 2010 to ensure proper messaging and outreach to both stakeholders and the public.

Communication activities will:

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

Meeting/Activity	Timing
Information Day on the Call for Proposals 2010	Q3
WHEC Conference 17-21 May 2010	Q2
SGA - Stakeholder event 9-10 November 2010	Q4
SET Plan conference of the Council Presidency, 15-16 November 2010	Q4
Adoption of the Communication Strategy	Q4

[28] http://ec.europa.eu/research/fch/index_en.cfm

9. Annexes

9.1 Calls for proposals

9.1.1 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 rules[29].

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.

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 fulfils the **minimum conditions of participation** defined in 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

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

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

- 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 outlined in the tables below.

Evaluation criteria applicable to **Collaborative project proposals - CP**		
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"**
• 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	• 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)	• 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.

Evaluation criteria applicable to **Coordination and support actions (Supporting) – CSA-SA**		
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"**
• Soundness of concept, and quality of objectives • Quality and effectiveness of the support action mechanisms, and associated work plan	• 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)	• 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 experts should consider in the assessment of the respective 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* covering 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 -	*The proposal fails to address the criterion under examination or cannot be judged due to missing or incomplete information*
1 -	***Poor.*** *The criterion is addressed in an inadequate manner, or there are serious inherent weaknesses.*
2 -	***Fair.*** *While the proposal broadly addresses the criterion, there are significant weaknesses*
3 -	***Good.*** *The proposal addresses the criterion well, although improvements would be necessary*
4 -	***Very Good.*** *The proposal addresses the criterion very well, although certain improvements are still possible*
5 -	***Excellent.*** *The proposal successfully addresses all relevant aspects of the criterion in question. Any shortcomings are minor*

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.

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.

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.

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

Since the same panel has considered proposals submitted to various parts of a call (for example different funding schemes, or different application areas 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.

9.1.2 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	*18 June 2010*
Deadline for submission of proposals	*13 October 2010 at 17.00 (Brussels local time)*
Evaluation of proposals	*November 2010*
Evaluation Summary Reports sent to proposal coordinators ("initial information letter")	*December 2010*
Invitation letter to successful coordinators to launch grant agreement negotiations with the FCH JU	*February 2011*
Signature of first FCH JU grant agreements	*From June 2011*
Letter to unsuccessful applicants	*From June 2011*

- **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 FCH JU calls web-page:
http://cordis.europa.eu/fp7/dc/index.cfm
http://ec.europa.eu/research/fch/index_en.cfm?pg=calls

- **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

FCH JU reference documents are available at the website:
http://ec.europa.eu/research/fch/index_en.cfm

9.1.3 Call fiche

Call title: FCH JU Call for Proposals 2010 Part 1

Call identifier: FCH-JU-2010-1

Publication date: 18 June 2010

Indicative deadline: 13 October 2010 at 17.00 (Brussels local time)

Indicative budget [30]: EUR 89.1 million from the FCH JU 2010 budget[31]

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		**31.6**
SP1-JTI-FCH.2010.1.1 Large-scale demonstration of road vehicles and refuelling infrastructure III	Collaborative Project	
SP1-JTI-FCH.2010.1.2 Next generation European MEAs for transportation applications	Collaborative Project	
SP1-JTI-FCH.2010.1.3 Investigation of degradation phenomena	Collaborative Project	
SP1-JTI-FCH.2010.1.4 Bipolar Plates	Collaborative Project	
SP1-JTI-FCH.2010.1.5 Auxiliary Power Units for Transportation Applications	Collaborative Project	
Area SP1-JTI-FCH.2: Hydrogen Production & Distribution		**11.0**
SP1-JTI-FCH.2010.2.1 Efficient alkaline electrolysers	Collaborative Project	
SP1-JTI-FCH.2010.2.2 Development of fuel processing catalyst, modules and systems	Collaborative Project	
SP1-JTI-FCH.2010.2.3 Development of gas purification technologies	Collaborative Project	

[30] A reserve list will be constituted if there is a sufficient number of a good quality proposal.
[31] The funding includes the FCH JU's own budget only. The final total funding for projects is expected to be increased by EFTA contributions (up to 2.3 M€).

Area/ Topics called	Funding Schemes	Indicative FCH JU Funding Million €
SP1-JTI-FCH.2010.2.4 Low temperature H2 production processes	Collaborative Project	
SP1-JTI-FCH.2010.2.5 Preparation of demonstration of efficient large-scale hydrogen liquefaction	Collaborative Project	
SP1-JTI-FCH.2010.2.6 Feasibility of 400b+ CGH2 distribution	Collaborative Project	
Area SP1-JTI-FCH.3: Stationary Power Generation & CHP		**33.0**
SP1-JTI-FCH.2010.3.1 Materials development for cells, stacks and balance of plant (BoP)	Collaborative Project	
SP1-JTI-FCH.2010.3.2 Next generation cell and stack designs	Collaborative Project	
SP1-JTI-FCH.2010.3.3 Component improvement for stationary power applications	Collaborative Project	
SP1-JTI-FCH.2010.3.4 Proof-of-concept and validation of integrated fuel cell systems	Collaborative Project	
SP1-JTI-FCH.2010.3.5 Field demonstration of stationary fuel cell systems	Collaborative Project	
SP1-JTI-FCH.2010.3.6 Pre-normative research on power grid integration and management of fuel cells for residential CHP, commercial and industrial applications	Collaborative Project	
Area SP1-JTI-FCH.4: Early Markets		**11.5**
SP1-JTI-FCH.2010.4.1 Demonstration of fuel cell-powered materials handling vehicles including infrastructure II	Collaborative Project	
SP1-JTI-FCH.2010.4.2 Demonstration of industrial application readiness of fuel cell generators for power supply to off-grid stations, including the hydrogen supply solution	Collaborative Project	
SP1-JTI-FCH.2010.4.3 Fuel supply concepts for portable and micro fuel cells	Collaborative Project	
SP1-JTI-FCH.2010.4.4 Components with advanced durability for Direct Methanol Fuel Cells	Collaborative Project	
SP1-JTI-FCH.2010.4.5 Research and development on new portable and micro Fuel Cell solutions	Collaborative Project	
SP1-JTI-FCH.2010.4.6 Prenormative research on the indoor use of hydrogen and fuel cells	Collaborative Project	

Area/ Topics called	Funding Schemes	Indicative FCH JU Funding Million €
Area SP1-JTI-FCH.5: Cross-cutting Issues		**2.0**
SP1-JTI-FCH.2010.5.1 Development of a Framework for Technology Monitoring and Assessments (TMA)	Coordination and Support Actions (Supporting Action)	
SP1-JTI-FCH.2010.5.2 Study of Advanced Hydrogen Economy Financing Options	Coordination and Support Actions (Supporting Action)	
Total indicative FCH JU Funding		**89.1**

Calls for Proposals will be selective. There will be competition, based on quality and excellence, between proposals primarily, but nor 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. If they are still tied, they will be prioritised according to their scores for the S/T Quality criterion, then by 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 members should be taken into account.

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 2010.

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 2011.

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 89.1 million.
- In-kind contributions from the legal entities participating in the activities. The industry contribution shall at least match the financial contribution of the EU.

Forms of grant and reimbursement conditions for projects funded through the FCH JU are indicated in the point 4.5 of the 2010 AIP, and explained in the Guide for Applicants.

9.1.4 Call for proposals 2010 - topic descriptions

APPLICATION AREA SP1-JTI-FCH.1: TRANSPORTATION & REFUELLING INFRASTRUCTURE

Topic SP1-JTI-FCH.2010.1.1: Large-scale demonstration of road vehicles and refuelling infrastructure III

Rationale
In order to start the mass production of competitive hydrogen vehicles and provision of appropriate hydrogen refuelling infrastructure in the 2015 – 2020 timeframe, continuation and extension of the large-scale demonstration projects comprising vehicles and hydrogen refuelling stations is essential.

Overall project objectives/Scope of work
The objective is to start extending and/or interlinking the earlier hydrogen demonstration sites and to continue setting up and pursue initial steps for the demonstration of hydrogen fuelled vehicles and the related infrastructure in European regions/municipalities, increase public awareness and attract additional candidates for further demonstration activities. Candidate regions/municipalities should be well populated urban areas to bridge the regions where hydrogen infrastructures already exist.

The demo project shall focus on public transport buses and/or a number of passenger vehicles, as well as provide high visibility. The consortium needs to develop, deliver and operate vehicles and infrastructure, including their comprehensive performance monitoring, and propose recommendations for commercialisation.

The demonstration program needs to address:

- deployment of an additional number of hydrogen vehicles and infrastructure measurement, evaluation and monitoring of specific vehicle and fuelling station parameters, according to an assessment framework such as delivered by the HyLights projects in order to show the potential of the technology for the industries including suppliers. Specific values are to be defined by the project group at the beginning of the project
- public awareness campaign and networking with potential candidate regions/ sites in order to accelerate the commercialization steps
- documentation on approval and certification process of vehicles and infrastructure aiming at simplification and harmonisation of Europe-wide approval procedures. This will facilitate establishing the RCS framework required to enable the large scale deployment of vehicle and fuelling infrastructure throughout Europe.
- dissemination of lessons learned and best practices for next demo sites
- 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
- results from the demonstration project to be exchanged with other projects working on fuel cell materials, components and degradation aspects to facilitate new innovations

Expected outcome
A minimum of 5 buses and/or minimum of 10 passenger cars shall be provided per site and be operational for onsite demonstration no later than one year after the project start accompanied by at least one additional fully integrated filling station capable of meeting performance targets and be accessible for private customers/users. The hydrogen station could also be part of another funding programme, be it European, National or Regional.

The project shall demonstrate advancement compared to similar existing projects with respect to key challenge such as cost, durability, reliability and/or efficiency.

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

Both enlargement of existing sites and interlinking of new sites are considered relevant. It is seen as advantageous if new classes of vehicles (e.g., delivery vans) are included in addition to passenger cars and/or buses.

The new refilling stations shall qualify for the following performance targets, which need to be demonstrated in the project:

- Both 35 and 70 MPa, refuelling capacity of 50 kg at the beginning of the project, to be extended to 200 kg H2/day ensuring that 50 cars or 5 buses can be re-fuelled per day and 5 cars or 1-2 buses can be re-fuelled within one hour, or another alternative several filling stations in the region with the total filling capacity equivalent to 50 vehicles refuelled per day
- 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. (e.g. use of by-product hydrogen)
- Hydrogen purity and vehicle refuelling time according to SAE specifications
- Station hydrogen production efficiency target 50 – 70%, depending from method of production

Cost targets:

- The consortium has to show the potential to reduce cost of the vehicle by 25% for the next generation.

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 H_2 / 100 km depending on drive cycle

Dissemination of the activities of the project to the broad public is seen as one key part of the demonstration project. It should especially be foreseen to communicate the benefits of hydrogen

and fuel cells with reference to the demonstration project. Regional authorities should support the project with communication.

Other information
The project needs to be co-funded by national, regional or private sources in order to demonstrate a strong commitment towards clean propulsion and emission free public transport.

The consortium should include automotive OEMs, integrated infrastructure equipment providers, fuel suppliers, bus fleet operators, local and regional bodies, as appropriate. The project may be coordinated with projects funded under the call FCH JU 2008 (topic SP1-JTI-FCH.1.1 and SP1-JTI-FCH.1.2) as well as the call FCH JU 2009 topic SP1-JTI-FCH.2009.1.1.

Expected duration: At least 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.1.2: Next generation European MEAs for transportation applications

Rationale
The Membrane and Electrode Assembly (MEA) constitutes the core energy converting part of the PEMFC. Improvement of PEMFC – membranes, electrodes, and gas diffusion layers (GDLs) as well as MEA processing - is required for further cost reduction and to increase durability of next generation PEMFC stacks. Maximum fuel cell performance of state of the art membrane materials is observed at 80-90 °C. This falls significantly short of the automotive industry targets, which is for a cell temperature from sub-zero up to 120 °C, with no or little humidification of reactant hydrogen and air, since humidification increases systems complexity and costs. Higher temperature of operation is required to enable the heat generated by the fuel cell stack to be exchanged efficiently and to simplify the system management and reduce its cost. 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 (GDLs), in combination with high quality manufacturing methods of complete MEAs, are required to maintain high power density and efficiency. Materials compatibility and chemical stability under automotive fuel cell environment and conditions are pre-requisites for reaching the targeted lifetime of 5000 h.

Overall topic objectives / Scope of Work
The objective of this topic is to significantly reduce the cost and improve durability of PEMFCs, increase the ability to operate above 100 °C and low relative humidity (RH), while maintaining high power density. Approaches can be based on improvement of existing materials, and/or by development of innovative concepts for which the proof of principle has been given already. Development should be aimed at the particular and demanding set of properties required for transportation fuel cell application. New and alternative concepts for membranes, electrode structures and catalyst supports providing increased Pt activity and utilisation may be included. Proposals may also include the development of novel catalyst structures, platinum thrifting approaches or non-precious metal catalysts. MEA integration should be considered, and new GDL materials development may be included. Studies on structural mechanics and on electrical conductivity 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, especially for high temperature operation (120 °C) consistent with very low temperature (-20°C), shall be verified by assembling high performance MEAs for benchmarking purposes. 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.

The project activities should include one or more of the following:

- Development of membrane materials and ionomer solution/dispersion having properties appropriate for transportation fuel cell application including hybrid and/or textured membranes
- Validation of the membranes and ionomers based on existing electrode concepts suited for operation temperatures above 100°C, up to 120 °C where adequate.
- Development of catalysts and electrode layers allowing for significant reduction in precious metal catalyst loadings.
- Optimization of GDLs and Micro Porous Layers for handling low RH levels.
- Demonstration of sub-zero start-up capabilities including conductivity and mechanical robustness
- Demonstration of high temperature properties under low relative humidity, including conductivity and mechanical robustness
- Demonstration of long-term stability under automotive fuel cell conditions
- Optimisation and demonstration of MEA processing at pilot scale based on these innovative membranes, electrodes and GDL concepts.
- Development and improvement of multi-scale (from catalyst to MEA) and multi-phenomena (electrochemistry, fluidics, mechanics, degradation…) modelling tools for increased understanding of performance and degradation phenomena.

Expected outcome

MEAs appropriate for high temperature and low RH operation, with a significant reduction in cost and durability of at least 5000 h under automotive conditions as well as considerations regarding pilot scale processability of MEAs and components are expected.

Technical targets are:

- Pt-loadings < 0.15 g/kW at > 55% efficiency (LHV=lower heating value).
- Specific targets for membranes:
  - proton conductivity ≥100 $mS \cdot cm^{-1}$ at ≤25% RH, 120 °C
  - proton conductivity >10 $mS \cdot cm^{-1}$ at -20 °C
  - thermal stability up to 160 °C
  - area dimensional change in wet/dry conditions < 10 %
- > 5000h lifetime at dynamic operation (car)*.
- Operation temperature: sub-zero up to 120 °C

** demonstrated for complete MEAs/single cells or small stacks, following adequate accelerated test protocols at automotive conditions (including start-stop and freeze-thaw cycles) operating at temperatures up to 120°C. Lifetime is defined as the time until a maximum of 10% reduction in power output at peak power is reached.*

Other Information

The consortium should include academia/research institutes, materials developers, SMEs, OEMs and application related end-users. The project should be coordinated with and build on experience from recent EC funded FP6 project(s) (e.g. AUTOBRANE, IPHE-GENIE, NEXTGENCELL, APOLLON-B). The action shall be coordinated with topic SP1-JTI-FCH.1.3 – "European Stack Cluster" of the FCH JU 2008 call, to ensure synergies to European stack integration activities, as well as the topic 1.3: *Investigation of degradation phenomena* of the current call. Links to US activities should be explored.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.1.3: Investigation of degradation phenomena

Rationale

The life-time of a fuel cell stack and system is dependent upon its design, materials selection, assembling quality and its controlled performance within live operating conditions. Wide variations in performance degradation of stacks and systems currently occur between different (and similar) stack and system designs. Factors influencing lifetime include electrical load variations (drive cycle), water management, thermal cycling, corrosion, start-up and shut-down procedures, contaminants from fuel, air and construction materials etc. A more comprehensive and quantitative knowledge of degradation and failure mechanisms is essential to ensure improved reliability and prolonged durability under automotive conditions. A full range of standardized diagnostic techniques and test methods need to be developed as tools for systematic identification of irreversible and reversible degradation mechanisms together with improved control algorithms for increased life times.

Overall project objectives / Scope of Work

The project should focus on critical system operating parameters and conditions for automotive applications aiming at establishing a robust methodology and develop tools for life-time assessments, reveal degradation and failure mechanisms and facilitate improvements in materials, system architectures and vehicle operating strategies. The work should include one or more of the following aspects:

- Irreversible and reversible degradation mechanism categorization assessment: stack components, (MEAs, GDLs, BPPs, seals, etc), full stacks, system components and full systems with focus on automotive operation conditions
- Stack and system operation:
    - identify load dynamics to which stacks are exposed in systems, taking into account the load levelling effects of system auxiliaries as well as peak power devices in the system, and the impact of such load dynamics on life-time
    - identify irreversible and reversible degradation impacts of Noise, Vibration & Harshness, EMC, thermal cycling and air quality
    - reveal impact of water management on failure modes
- Establishment and further development of diagnostic tools and life time determination methods revealing key stress factors and aging modes by
    - electrochemical characterization, effluent analysis etc to reveal material changes occurring in cells and linking these to performance decrease and degradation and failure mechanisms
    - development of standardized test protocols for systematic mapping of degradation and failure mechanisms, including accelerated testing;
    - Simulation/emulation of concepts and novel system architectures to minimize
        - load dynamics using peak shaving components
        - negative impact of start, stop and idling situations on lifetime
        - impact of sub-zero conditions on life time
        - the effect of contaminants in fuel, air and corrosion products from construction materials
- Development of models for reliable life-time prediction

Expected Outcome

- Increased knowledge with respect to the most pronounced degradation and failure mechanisms for automotive applications including:
    - Catalyst support corrosion linked to shut-down and start-up or fuel starvation

    - Catalyst dissolution, migration and re-precipitation linked to voltage excursions typically experienced in case of automotive load profiles
    - Catalyst particle growth causing loss in active catalyst area at high cell potentials (low load or idling conditions)
    - MEA layer de-lamination linked to freeze-thaw cycles
    - Pin-hole formation linked to high local temperatures during full load conditions or mechanical stress on membrane related to operation with low humidity reactant gases
- Improved degradation mitigation strategies by optimal selection of materials, clever system design as well as control algorithms for stack operation.
- Inventory of degradation and failure mechanisms occurring in MEA, GDL, BPP, stack and system components and mitigation methods
- Established relationship between key factors affecting lifetime and performance degradation rate of MEA, GDL, BPP, stack and system components
- Improved understanding of the effect of various approaches to counteract degradation, such as:
    - better BOP components for peak shaving
    - improved start-stop and idling protocols
    - robust protocols for freeze proof shut-down and start-up of fuel cell system
- Established (accelerated) test protocols and lifetime determination method
- Enhanced knowledge and advice of how to prolong PEM fuel cell lifetime including properties of next generation materials with improved stability

Other information
The consortium should include academia/research institutes, stack producers and system integrators [and may optionally included fuel cell vehicle designers and operators]. Access to international experience on degradation phenomena in transport (and stationary applications, where applicable) in North America and Japan would be beneficial. Links to ongoing R&D-projects (funded by the FCH JU and under Framework Programmes) on PEM fuel cell degradation for stationary and automotive applications are recommended. Projects will be coordinated with topic 1.2*: Next generation European MEAs for transportation applications.* Links to US activities should be explored.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.1.4: Bipolar Plates

Rationale
The bipolar plate is presently by weight, volume and cost one of the most significant components of a fuel cell stack. Bipolar plates can be made from various materials with the most common being graphite, metal, carbon/carbon and carbon/polymer composites.

The metal plate has excellent electrical bulk conductivity and can be processed with inexpensive manufacturing methods but its major drawback is the need for a corrosion resistant conductive coating. The higher strength of metallic bipolar plates allow for a higher power density stack, which is desirably especially for transportation applications. Furthermore, metallic plates have a low thermal mass and high thermal conductivity, which is particularly beneficial for efficient cooling and rapid start-up.

Overall project objectives / Scope of Work
The project activities will include:

- Development of (i) corrosion resistant conductive coating(s) for low cost metals or (ii) bipolar plates made from alternative non-metallic materials, including verification of long-term stability under fuel cell operating conditions, especially for high temperatures (up to 120-130 °C), for either technological solution
- Identification and quantification of levels of corrosion products, including assessments of their potential contamination on other cell components.
- Development of cost effective bipolar plate manufacturing technologies
- Demonstration of formability of metal/coating combination in complex configuration assuring efficient cooling and excellent stacking capabilities
- cost reduction potentials of bipolar plates for different production volumes

Expected Outcome

- Proof of feasibility of bipolar plate production at automotive relevant sizes of >300 cm^2
- Reaching 7-10 € /kW at mass production volumes
- Corrosion stability for 5000 h with verified figures for emissions of detrimental contaminating species (e.g., metallic ions Fe, Cr, Al etc.)
- Formability into complex geometries allowing for high power densities
- Specific targets for bipolar plates:
    - Contact resistance: < 25 $m\Omega.cm^2$
    - H_2 permeability (< $2*10^{-6}$ cm^3 cm^{-2} s^{-1})
    - corrosion resistance (< 10 μA cm^{-2})
    - flexural strength (>50 MPa)
    - tensile strength (>40 MPa)
    - thermal stability up to 120 °C
    - low thermal expansion coefficient compatible with operation at temp of 130°C
    - thermal conductivity (>10 W $(m.K)^{-1}$)

Other Information
The consortium should include bipolar plate suppliers, research organisations and possibly fuel cell stack developers and application related end users and SMEs in specialised areas according to need. Topic should be linked to *Topic SP1-JTI-FCH.2010.1.3: Investigation of degradation phenomena* on the potential degradation effects of contaminants from bipolar plates. Potential links with JRC may be explored.

Expected duration: 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.1.5: Auxiliary Power Units for Transportation Applications

Rationale

Deployment of fuel cell technology in Auxiliary Power Units (APU) is attractive for a series of applications due to the potential for increased efficiency and reduction in emissions. Upcoming introduction of strict emission regulations e.g. by IMO (International Maritime Organization) especially during harbour-time is creating a significant market for fuel cell based APUs. Similarly, significant reduction of emissions and fuel consumption is possible by installation of fuel cell based APUs in trucks where idling is increasingly recognized as a health and environmental problem as well as being energy inefficient. Airborne and rail applications also constitute potential future markets for fuel cell based APUs. Most of these application areas require utilization of commercially available conventional fuels to be cost-competitive from application point of view and enable rapid market penetration.

Overall project objectives / Scope of Work

This topic is focusing on APU systems for on-board power generation within transportation applications. Two specific application areas are foreseen: 1) automotive applications; 2) maritime applications. A path forward to commercialisation of the technology in the relevant application sector must be shown. The project should provide state-of-the-art figures (e.g., efficiency, cost, durability) for similar previous projects and show progress compared to current achievements within the specific application area. The project activities may include:

- Development of cost effective fuel processing technology for logistic fuels such as diesel and marine gas oil and experimental verification in regard to lifetime targets
- Proof-of-concept demonstration of such fuel processing technology
- Fuel cell system development focusing on factors especially challenging for maritime and automotive APU applications including heat integration, shock and vibrations, tolerance/susceptibility to poisonous species (e.g. chlorine in air etc.), reliability and durability in accordance with lifetime requirements
- Concept development, including efficient reformate gas cleanup
- Full APU system evaluation with respect to application specific requirements and multi-functional usage of fuel cells (heat and water), including cost analysis
- Components, system integration and packaging improvements and modifications to meet the corresponding needs of marine and automotive applications
- Planning of future full-scale field demonstration of the systems for the specified application
- Assessment of legislation and need for application related rules and regulations

The activity is open to all fuel cell technologies, logistic fuels and power output levels. Utilisation of high-sulphur containing fuels is considered not adequate in this context. Proposals need to identify and will be measured against technology and application specific targets.

Expected Outcome

- Proof of feasibility of using logistic fuels
- Demonstration of fuel processing technology for logistic fuels
- Definition of requirements for fully integrated systems in the specific application
- Specific targets:
    - Cost below 1000 €/kW for automobile application, 2000-3000€ for maritime application
    - Electric system efficiency (LHV) in the range of ~35% for automotive and ~40% for maritime applications with logistic fuels

- Anticipated lifetime according to application requirements (≥ 40 000 h for maritime, ≥ 20 000 h for automotive)
- Anticipated reliability figures (MTBF, availability) according to application requirements
- Emission reduction to less than current rules and regulations under development (e.g. IMO targets up to 2020)

Other Information
The consortium should include system integrators (OEMs) and fuel processing technology suppliers, research organisations, application related end-users and possibly regulatory officials, including opportunities for SMEs in specialised areas according to need. Work should build on results from FP-projects such as HYTRAN, FELICITAS, MCWAP, METHAPU as well as relevant nationally and regionally supported activities. Proposals are expected to cover only 1 of the two transportation applications.

Expected duration: 3 years

Funding Scheme: Collaborative Project

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

Topic SP1-JTI-FCH.2010.2.1: Efficient alkaline electrolysers

Rationale

Centralized and decentralized sustainable H_2 production, using low temperature electrolyser technology, requires further improvement of performance and reduction of both capital and operating costs. In this context, alkaline technology, particularly adapted for applications in power levels exceeding 5kW in a single stack configuration, will be considered, with a strong focus on improvements to make the technology fit for integration with renewable energy generators, where it can be used for electricity system (smart grid) management and H_2 fuel generation for low-carbon transport.

Overall project objectives/Scope of work

Research to increase electrode stability and efficiency under intermittent and variable operation and development of new catalyst and materials for lowering costs and improved performance. Two distinct areas of activities have been identified for this topic:

1. Research & development issues:
   - Research and development on advanced power electronics and controls to improve full and part load efficiencies and minimize standby losses
   - Research to improve efficiency by increasing operation temperature and electrolyte concentration.
   - Research to improve materials, components and systems durability and reliability in order to reduce lifetime costs while optimizing production processes through design optimization
   - Development of low cost (low capex), highly efficient (low opex) electrolyser system operating at high pressure (15MPa = 150 bar with internal compression or 3MPa = 30 bar without additional compressing means)

2. Demonstration & Life Cycle Analysis issues:
   - Implementation of field trial(s) and demonstration project(s) for electrolyser(s) integrated with RES @>25kW capacity. This includes the evaluation of system integration with RES through improvements in modelling and design tools and in optimization of BoP components and control methodologies
   - Aspects of RCS (Regulations, Codes and Standards) harmonisation of electrolyser technology
   - Comparative Life Cycle Assessment studies carried out according to the practice guidance developed by the FCH JU

Expected outcomes

- New design of a prototype, efficient, high pressure electrolyser (more than 150bar). Utilization of innovative materials and components to enhance the efficiency, reliability, durability and cost of the electrolyser when operated variably and intermittently, as is demanded by integration into low-carbon energy networks.
- Demonstration of the efficient integration of low carbon, intermittent energy sources through more efficient alkaline electrolysers.

Key performance indicators

- Current density @ 0.75 A/cm² with η>80% on HHV basis

- Retention of >90% of initial efficiency over at least 1000 on/off switching cycles
- 10 year lifespan
- Modular system cost @ €1,000 per Nm³/h plant capacity for the stack, and 3.000 €/Nm3 for a complete system
- Operating pressure >150 bar

Other information
The consortium should include industry and research organisations and give opportunities for SMEs with expertise in the field of materials, membranes, modelling and design optimization.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.2.2: 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. Targeted applications include but are not limited to on-site production for hydrogen Refuelling stations not being cost effectively supplied by central production plant. Flexibility in the selection of feedstocks for the small scale systems is equally important for making cost competitive and sustainable hydrogen available especially during the early transition phase of hydrogen technologies deployment. In this regard, provisions should be made to allow for biofuels (e.g. methanol, ethanol, dimethylether) to be used along with more conventional feedstocks. This would also help initiating the distribution and use of "green" hydrogen.

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(s) shall either focus on: (i) the development of optimized catalysts or (ii) on 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 Outcomes
1. Research & development activities:
   - Optimized catalyst materials & supports
   - Innovative materials and processes for liquid desulphurization

2. Demonstration / Integration activities:

- 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 H_2S to the feed results in a < 20% decrease in hydrogen production by the reforming catalyst.
- System cost: After 6 years, materials cost should be reduced to €5,000 / Nm^3 H_2 (5.0 quality) plant capacity for a plant with a capacity of 50 Nm^3/hr. Therefore, the materials cost of a 50 Nm^3/hr capacity plant should not exceed €250,000.
- 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 / (Nm^3 H_2 @ 10 bar) including compression; Conversion efficiency > 80 % (HHV H_2 (5.0) / HHV fuel)
- Scalability: Scalable from 2 to 750 Nm^3/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 other projects funded by the FCH JU. 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.2010.2.3: Development of gas purification technologies

Rationale

The separation of H2 from CO_2/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 H_2 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 H_2 purity requirements for several fuel cells applications. A special focus should be made on the improvements of membrane technologies.

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 H_2 separation of 20 % with respect to current standards)
- Optimization of the simultaneous production of pure H_2 & CO_2 with quality suitable for carbon capture in Steam Methane Reforming (SMR)/Partial Oxidation (goal: CO_2 recovery from reformate >75% @ >10 bar prior to hydrogen purification; absorbent recyclable)

Project activities need to include as well research on H_2 purity and on repeatability/robustness of H_2 quality monitoring/sampling techniques.

Expected Outcome

- H_2 recovery & purity improvements- Hydrogen recovery >70% @ 5.0 quality (H_2 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/ Nm^3 Pure H_2 (5.0)
    - CO_2 vs. H_2 membrane/adsorbent selectivity
    - Energy intensity of the Gas separation process (H_2 separation power consumption < 0.004 kWh/Nm^3 of pure H_2 (5.0)

Proposals need to provide technical targets such as gas purity based on relevant bench marks. Potential recyclability of system components should be addressed.

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 other projects funded by the FCH JU. Work should not duplicate/overlap efforts in previous and/or ongoing FP6/FP7 projects.

Expected duration: Up to 2 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.2.4: Low temperature H2 production processes

Rationale
Low temperature hydrogen production technologies are very promising for decentralized applications: water splitting using solar energy in chemical or biological systems or fermentation technologies is likely to play an important role in hydrogen production from renewable resources.

To achieve this, basic research is necessary to develop efficient chemical or biological systems converting solar energy into chemical energy for water splitting or to convert directly biomass to hydrogen by digestion. In addition applied research and development is necessary to design and construct devices that efficiently produce and collect the hydrogen.

Overall Project Objectives / Scope of Work
Efficient, easy to handle chemical or biological systems shall be developed and the low temperature hydrogen production process shall be demonstrated in small scale reactors. The reactors should be compact and allow an easy integration in small to medium scale applications ranging from 100 watts for domestic use up to 100 kW for commercial use.

Expected outcomes
1. Chemical/biological systems technologies:
    - Chemical systems for highly efficient low temperature water splitting using solar radiation
    - Demonstration of solar to hydrogen efficiency > 5%
    - Demonstration of a systems with a perspective of 100h lifetime (for solar water splitting processes)
    - Design and construction of a reactor for providing hydrogen for consumers

2. Biological fermentation technologies:
    - Biological hydrogen producing digestion systems based on 2nd generation biomass feedstock
    - Production of hydrogen utilizing different waste biomass focussing on those that allow a sufficient productivity (1-10 kg/d H2)
    - Develop bio-hydrogen production systems as a stepping stone for pre-commercial applications (expected to reach production rates of 10-100 kg/d H2)
    - Setting up and testing of a continuous process prototype (1-10 kg/d H2)

Other Information
The consortium should include broad research and industry participation especially for material development and production with opportunities for SMEs in the field of reactor design.

Expected duration: Up to 4 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.2.5: Preparation for a demonstration of efficient large-scale hydrogen liquefaction

Rationale

In the absence of a pipeline network, liquid hydrogen is besides compressed storage the only way to effectively supply large fuelling stations without having more than one delivery per day. However, existing facilities for hydrogen liquefaction are expensive and use significant amounts of energy to liquefy hydrogen. Literature studies indicate that the energy use can be reduced to about 50% compared to existing plants when a scale-up is done and the focus is LH_2 production for energy use rather than for specific industrial purposes only. These new process schemes need to be set in a commercial context and the technology needs to be demonstrated on commercial scale.

Overall project objectives / Scope of Work

Projects should develop a process for hydrogen liquefaction with significantly reduced energy consumption and translate this into a commercial design as preparation of future implementation. The scope of the work includes:

- Development or identification of an efficient liquefaction process scheme
- Liquefaction plant design whereby cost and efficiency are co-optimised by combining expertise from institutes and businesses
- Well-to-wheel analysis that illustrates the role of LH_2 in an energy chain with flexibility of end-users' choice of storage form
- Preparation of a demonstration phase for a hydrogen plant near one of the markets for transportation hydrogen, taking into account hydrogen source, hydrogen customers and a liquid hydrogen distribution system, including addressing safety issues

Expected outcome

- Feasibility assessment of novel hydrogen liquefaction concepts with focus on cost and efficiency
- Identification of possible technology elements requiring more in-depth studies
- Assessment of potential benefits of distribution of liquid hydrogen
- Recommendation for the location of a hydrogen liquefaction plant
- Preparation for a large-scale, efficient hydrogen liquefaction plant
- Safety assessment of liquid hydrogen production and distribution infrastructure

Other Information:

The consortium should include major stakeholders for hydrogen distribution, industry and research institutions with opportunities for SMEs in the field of component development. A maximum of 1 project is expected to be funded for this topic.

Expected duration: Up to 2 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.2.6: Feasibility of 400b+ CGH2 distribution

Rationale

Distribution of centrally produced hydrogen can be done via pipelines and via road - trailers in either liquid or compressed form. The construction of hydrogen pipelines is only feasible in a more mature market and liquefaction of hydrogen is presently energy intensive and requires a large capex budget. Therefore compressed hydrogen trailers are a cost efficient option for near term distribution. However, with the currently used 200 bar hydrogen trailers the supply of larger stations would result in multiple truck deliveries per day, which is in many cases not acceptable. In order to increase the transported quantity (and hence reduce the delivery frequency) for supplying larger stations, lighter materials and higher pressure need to be adopted. Furthermore, increased capacity results in distribution cost savings.

Overall project objectives / Scope of Work

Projects should focus assessment of the benefits of higher truck delivery pressure for distribution and retail as well as on the work necessary to prepare a case for permitting higher hydrogen truck delivery pressure. The scope of the topic includes:

- Assessment of safety implications of using composite material and higher storage pressures.
- Comparison of state of the art stationary and mobile 200 bar infrastructure with 400+ bar hardware (compressors, tanks, valves) to determine the strengths and weaknesses of a 400+ bar truck delivery infrastructure system. The comparison should focus on: materials and components behaviour, lifetime assessment, cost comparison and energy consumption taking into account the combination with on-site infrastructure for 700 bar refuelling systems.
- Assessment of technical issues and cost-benefit analysis of using higher capacity trailers, including impact on energy efficiency and GHG emissions
- Identification of issues to be addressed and way-forward for facilitating the use of high pressure trucks with regards to Regulations, Codes and Standards

Expected outcome

- Report on the impact of truck distribution pressure on hydrogen distribution and retail cost, energy use, and emissions
- Report on the safety implications of increasing the maximum truck pressure and recommendation on the optimal pressure to be adopted
- RCS roadmap for facilitating the use of high capacity trailers

Other Information

The consortium should include major stakeholders for hydrogen distribution as well as research teams with opportunities for SME in component development and testing. Links to US activities should be explored.

A maximum of 1 project is expected to be funded for this topic.

Expected duration: Up to 2 years

Funding scheme: Collaborative Project

APPLICATION AREA SP1-JTI-FCH.3: STATIONARY POWER GENERATION & CHP

Topic SP1-JTI-FCH.2010.3.1: 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
- Proof 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, set the targets for critical parameters including costs, define applications and conditions and develop a structured concept for the research activities. They need to show how they build on experience from other EU and national projects.

Projects must address potential recyclability and concerns regarding availability of materials that meet performance targets.

Other information
The consortium should include academia, research institutes, material producers and cell/stack manufacturers. Potential links with JRC may be explored. Coordination with ongoing projects funded by the FCH JU is required.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.3.2: Next generation cell and stack designs

Rationale
Long-term and break-through oriented research on novel architectures for cell and/or stack design is needed to provide step change improvements over existing technology in terms of performance, endurance, robustness and cost targets for relevant applications.

Overall project objectives/Scope of work
Novel and break-through design solutions for cells and stacks are required to show significant improvement over incumbent designs, mainly regarding efficiency, cost, reliability (and power density). The call is open to all solutions or operating ranges, geometries or materials. The project proposals should state improvements over the state-of-the-art and lead to a proof of concept.

Projects are expected to cover:

- Simplification of design and manufacturing of cells, stacks and/or stack modules (power generation units)
- New architectures, adaptation of cell and/or stack designs to specific applications and system designs
- Design to cost
- Significant increases in performance, power density, efficiency and/or reliability applying harmonized test protocols
- Robustness to cycling and transient operating conditions

The activities are open to all fuel cell technologies. Proposals need to identify the technology specific gaps, set the targets for critical parameters including costs, technical parameters (e.g efficiency and their improvement over the state of the art), define applications and conditions and develop a structured concept for the research activities.

Expected Outcome
Outcome will include at least one or ideally several of the following items

- Improved electrical efficiency over the state of the art. Considerable cost reductions: (e.g. system cost per kW of € 2500 for industrial and € 5000 for domestic micro CHP by 2015)
- Compact and robust designs
- Decreased materials consumption

Other information
The consortium should include academia, research institutes, material producers and cell/stack manufacturers. A maximum of 2 projects are expected to be funded. Coordination with ongoing projects funded by the FCH JU is required.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.3.3: 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
- CO2 separation systems/units

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
- Environmental sustainability assessment by means of Life Cycle Assessments studies carried out according to the International Life Cycle Data System (ILCD) Handbook requirements.

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 projected lifetime >10 years
- achieving cost targets (e.g. system cost per kW of € 2000 for industrial and € 5000 for domestic micro CHP by 2020)

Projects should identify potential for recyclability of solutions meeting performance targets.

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 other projects dealing with materials development (as topic 3.1 of this call and before). At the end of the project, all the environmental LCA data resulting from this action shall be made available to the ILCD Data Network. Coordination with ongoing projects funded by the FCH JU is required.

Expected duration: Up to 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.3.4: Proof-of-concept and validation of integrated fuel cell systems

Rationale

This topic will support the development and construction of proof of concept fuel cell systems for stationary applications (residential CHP, FC systems coupled with renewables, distributed generation with natural gas, renewable fuels, by-products and large industrial application including CCS), as well technology validation of fully integrated systems that must be proven to be technologically and economically viable prior to any large scale demonstration.

Proof of concept systems will be constructed that show interaction with other devices as required for the target application, including fuel supplies utilising any necessary processing technology, if necessary.

The projects will assess system performance against required functional properties, identify existing gaps and allow further development steps. Fully integrated systems must also identify manufacturing routes at a defined quality and acceptable maintenance costs and patterns to establish a sustainable approach towards commercialisation.

Overall project objectives / Scope of Work

Projects need to provide technical solutions in the stationary application categories (residential CHP, FC systems coupled with renewables, distributed generation with natural gas, renewable fuels, by-products and large industrial application including CCS), identifying relevant technology approaches to specific applications and markets. The overall objectives are:

- Development of proof of concept prototypes that combine fuel cell units into complete systems, performing integration and testing with fuel delivery and processing sub-systems; interface with devices featuring delivery of customer requirements (e.g. power, heat, cooling and CO2 capture), also integrating renewable sources and other services wherever appropriate;
- Maintenance and repair issues to reduce downtimes from known failure mechanisms
- Identification of technical and economic requirements in order to be competitive in the marketplace
- Validation activities, performed in a real system environment or with real equipment in a simulated system environment, must show appropriate achieved system maturity levels and a proven market potential.
- Fulfilment of the diverse application needs
- Validation of the whole system build, supply chain, costs targets, including life-cycle considerations and integration into power plants and networks
- Establishment of quality control procedures and techniques to ensure quality of systems
- Addressing relevant manufacturing solutions linked to the validation of fuel cell systems

Expected Outcome

- Feasibility of integrated fuel cell units including proof of potential to achieve targets of the specific application(s), (e.g. 5000 €/kW for residential CHP, 2500 €/kW for distributed generation by 2015)
- Increase in power density and/or efficiency over state-of-the-art generation (e.g. electrical efficiency >45%, overall efficiency >80% for CHP residential and distributed 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, repair and recycling strategies necessary for introduction of robust and reliable systems
- Pre-normative results that can lead to recommended practice for the concept

- 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 (e.g. lifetime of 40000 hours for cells and stacks for distributed generation)
- Feedback to other RD&D activities to remove technical barriers to successful larger scale demonstration
- Environmental sustainability assessment by means of Life Cycle Assessments studies carried out according to the International Life Cycle Data System (ILCD) Handbook requirements

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. At the end of the project, all the environmental LCA data resulting from this action shall be made available to the ILCD Data Network. Coordination with ongoing projects funded by the FCH JU is required.

Expected duration: Up to 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.3.5: Field demonstration of stationary fuel cell systems

Rationale
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, CCS, renewable sources 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 completely integrated generator systems
- Supply chain and support activities for complete systems including renewables
- Capability of systems to integrate into existing power, heat infrastructure
- Advantages over incumbent technologies, take advantage of other developing generation technologies such as renewable sources (Solar, Wind, Biomass).
- Compliance with or identify further need for RCS

Projects need to demonstrate sufficient levels of 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
- Environmental sustainability assessment by means of Life Cycle Assessments studies carried out according to the International Life Cycle Data System (ILCD) Handbook requirements.
- Strong dissemination efforts to a wider audience, preferably to potential customers and to industrial stakeholders, must be included.

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. The project will be coordinated with ongoing and upcoming projects in verification and validation (as for instance in topic 3.4 of the current call). At the end of the project, all the environmental LCA data resulting from this action shall be made available to the ILCD Data Network.

Expected duration: Up to 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.3.6: Pre-normative research on power grid integration and management of fuel cells for residential CHP, commercial and industrial applications

Rationale

Pre-normative research shall be conducted to define a whole set of requirements with the necessary specificity for different application categories. This will ensure that power grid integration and management of the main stationary fuel cells application categories (residential CHP, commercial and any industrial application) are performed according to the developing Rules, Codes and Standards to be applied for the use of such devices.

Overall project objectives / Scope of Work

Pre-normative research should focus on:

- Research into the interaction of fuel cell system, power conditioning and grid connection, including grid failure conditions, harmonics, etc.
- Review of previous and on-going RCS activities and studies (e.g. US, Japan) from which a proposal for best practices can be extracted.
- Dissemination of results to industry and research

Expected Outcome

Projects shall provide:

- Improved technical understanding of grid interaction problems
- Proposals for validation measurements and testing protocols
- Background procedures and methodologies for RCS
- Proposal and recommendations for further development of RCS

Other Information

The consortium should include any of research and/or industry test facilities, certification agencies, OEMs, end-users and utilities with relevant expertise, including opportunities for specialised SMEs and possibly academia and research organisations. Potential cooperation with JRC-IE already active in the field of RCS for fuel cell may be explored. Links to US activities should be explored. A maximum of 1 project is expected to be funded under this topic.

Expected duration: Up to 2 years

Funding Scheme: Collaborative Project

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

Topic SP1-JTI-FCH.2010.4.1: Demonstration of fuel cell-powered materials handling vehicles including infrastructure II

Rationale
In order to continue European efforts of commercialising use of hydrogen and fuel cells for materials handling vehicles, demonstration projects comprising hydrogen powered fuel cell vehicles and supporting hydrogen refuelling infrastructure are essential for demonstrating customer value propositions.

Overall project objectives / Scope of Work
The objective of this action is to demonstrate the technical and economical viability of fuel cell powered materials handling vehicles using available technology. It will extend previous regional, national and European initiated material R&D and demonstration efforts by providing continued support for demonstrations that can help increase awareness of the fuel cell technology value proposition on customer sites throughout Europe.

- Projects should demonstrate the economical advantages of using fuel cells with the supporting hydrogen refuelling infrastructure, compared to current technologies (diesel or equivalent, LPG and batteries).
- Projects shall cover demonstrations of a sufficient number of vehicles and shall be based on sufficient maturity levels of fuel cell systems & hydrogen refuelling infrastructure. In particular materials handling vehicles (fork lift trucks, stackers, moving cranes, etc.) are considered attractive early market sectors
- Projects should show a commercial customer value proposition and shall be conceived envisaging a continuation of efforts in high volume deployment projects leading to market introduction on full commercial basis. Thus projects should contribute to determine clear technical targets on costs, durability and efficiency in order to establish a path forward for commercial deployment.
- Projects should show a solid approach for handling necessary Regulation, Codes and Standardisation activities for the fuel cell systems and hydrogen refuelling infrastructure to be demonstrated in this application.
- Efforts on dissemination of results to wider audience, preferably to potential customers and the general material handling industry, must also be included.

Expected Outcome

- Demonstration shall comprise at least one single end-user site with sufficient vehicles for proving a commercial customer value proposition leading to a potential for future commercial conditions without support
- Ensure continuation of efforts in large scale deployment projects and/or market introduction

Other Information
The end-user should be a project partner. All key technology providers should be identified - where this is not the case, the proposal shall provide visibility as to the supply of the corresponding technology. The proposal shall demonstrate the commitment of all the partners with regards to the projected deployment.

Expected duration: Up to 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.4.2: Demonstration of industrial application readiness of fuel cell generators for power supply to off-grid stations, including the hydrogen supply solution

Rationale

Powering of stand alone off-grid stations in absence of grid power supply is a promising early market for fuel cell technologies. In order to bring this application closer to commercial maturity, supported deployment of such power systems in actual conditions of use, along with the associated hydrogen supply solution, is required.

Overall project objectives / Scope of Work

The objective of this action is to demonstrate the industrial application readiness and market appeal of hydrogen and fuel cells for powering stand alone off-grid stations.

- Projects should demonstrate the advantages of hydrogen and fuel cells with the supporting hydrogen refuelling infrastructure for delivering the expected power supply service, compared to the solutions used today.
- Projects shall demonstrate a significant number of sites and shall be based on sufficient maturity levels of fuel cell systems & hydrogen supply solutions.
- Projects should show a commercial customer value proposition and shall be conceived envisaging a continuation of efforts in high volume deployment projects leading to market introduction on full commercial basis. Thus projects should contribute to determine clear technical targets on costs, durability and efficiency in order to establish a path forward for commercial deployment.
- Projects should show a solid approach for moving forward the standards developments that will support the commercial development of this application.
- Efforts on dissemination of results to wider audience, preferably to potential customers and to the application stakeholders, must also be included.

Expected Outcome

- Demonstration shall comprise a sufficient number of sites (20 minimum) for proving a commercial customer value proposition leading to a potential for future commercial conditions without support
- Demonstrate a viable hydrogen supply solution for this application
- Ensure continuation of efforts in large scale deployment projects and/or market introduction

Other Information

The key actors for achieving the project objectives such as system integrators, fuel cell and hydrogen supply system providers, RCS and certification experts, should be identified.

Expected duration: Up to 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.4.3: Fuel supply concepts for portable and micro fuel cells

Rationale
Portable Fuel Cells (10W - 5 kW) for many applications require appropriate fuel supply systems. A comprehensive approach is needed which addresses application-specific fuelling requirements for micro fuel cell and portable applications.

Overall project objectives / Scope of Work
Projects should focus on the development of innovative fuel supply concepts for micro fuel cell and portable applications. Fully integrated systems should be developed that demonstrate how the proposed fuelling system concept fits into an overall scheme and efficiently meets application requirements. Fuelling concepts may include hydrides, micro-reforming or even direct fuelling options by cartridges for PEM-FCs and micro-SOFCs, including LPG, methanol, sodium borohydride and ammonia. Proposals should justify the choice of fuel and fuelling system concept based on application specifics, including the associated logistical and distribution requirements.

Projects must also include dissemination of results to industry and research organisations.

Expected Outcome
- New fuelling system concepts meeting application targets including the required logistics and distribution
- Proof of concept fully integrated system
- Identification of technical gaps and the requirement for potential novel approaches
- Dissemination of results to industry and research

Proposals shall address potential scarcity of resources and perform a Life Cycle Assessment to ensure sustainability of solutions that meet performance targets.

Other Information
The consortium should include research and/or industry development facilities, integrated fuelling system suppliers and users, including OEMs. Projects must be coordinated with other projects funded by the FCH JU.

Expected duration: Up to 3 years

Funding Scheme: Collaborative Project

Topic SP3-JTI-FCH 2010 SP.4.4.Components with advanced durability for Direct Methanol Fuel Cells

Rationale
Direct Methanol Fuel Cells (DMFC) do not suffer from many of the issues related to fuel storage, as methanol has a high energy density. DMFCs have therefore been successfully developed for compact portable fuel cell solutions. However, one of the barriers of wider commercialisation of DMFCs is their not yet satisfactory durability owing to a variety of issues such as cathode activity loss, catalyst crossover via the proton conducting membrane, agglomeration and growth of catalyst particles and thus reduction of the specific surface area, membrane –electrode interface degradation, gas diffusion hydrophilicity loss and corrosion.

Overall project objectives / Scope of Work
Projects should focus on developing advanced components addressing one or more of the degradation mechanisms and develop innovative and cost effective solutions that can be transferred into industrially usable products. Both the superior durability and the cost effectiveness will need to be demonstrated within the scope of the project. Developments may focus on e.g. novel catalysts less prone to crossover, improved complete MEAs or new bipolar plates with non deteriorating electric contact surfaces.

No basic research into further understanding of degradation mechanisms will be funded.

Expected outcomes
- New components for DMFCs with improved durability and superior cost efficiency
- Proof-of-concept on the component level
- Integration in at least one DMFC stack solution and proof of durability under simulated real operating conditions

Other information
The consortium should include research facilities, component and stack manufacturers.

Expected duration: 3 years

Funding Scheme: Collaborative Project

Topic SP3-JTI-FCH 2010 SP.4.5. Research and development on new portable and micro Fuel Cell solutions

Rationale
Large scale manufacturing is limited to a single supplier of only one fuel cell technology in Europe. This limits the chances for success of earlier calls for large scale demonstration and reflects a lack of well-developed portable fuel cell technologies. With relatively low power needs and superior value, technical and commercial success in this sector will be critical. Widespread dissemination across sectors and development a sustainable supply chain in Europe could strengthen the European micro fuel cell industry through technical expertise, manufacturing and consumer satisfaction.

Overall Project Objectives / Scope of Work
Projects are open to all types of fuel cell technology (low and high temperature) provided they can sufficiently demonstrate their ability to meet the application specification. Maximum power should be limited to 200We net.

The objective is to develop application tailored solutions, ready to be used by the end user or being integrated by a systems integrator. Thus the system development must address:

- on-board fuel storage
- if technically required, fuel processing
- Stack
- Balance of Plant
- if required for the application, power electronics and controls integration

Expected Outcome

- Proof of concept complete units meeting application specifications
- System validation through thorough testing activities
- Life Cycle Assessment and sustainability issues for the proposed solution shall be addressed.

Other information
The consortium should include research and development partners for the development areas of the system, sufficient industrial capacity for commercialisation, and at least one end-user / system integrator as consortium partner. High involvement of innovative SMEs is beneficial.

Expected duration: 3 years

Funding Scheme: Collaborative Project

Topic SP1-JTI-FCH.2010.4.6: Pre-normative research on the in-door use of hydrogen and fuel cells

Rationale
Early market applications, such as materials handling or backup power supply, typically involve the use of hydrogen and fuel cells indoors and in enclosures, in locations where access is not fully controlled.

In such cases, safety issues such as the possible accumulation of hydrogen due to foreseeable accidental circumstances need to be addressed. A well established set of safety requirements for this purpose is lacking as existing reference applies to hydrogen equipment located outdoors in industrial settings.

In order to support the development of the Regulations, Codes and Standards (RCS) covering early market applications, technical means and approaches that are both effective and efficient to control the hazards associated to hydrogen releases in indoor or confined locations may be specified.

Overall project objectives / Scope of Work
Definition and scientific justification of cost effective safety strategies to control the hazards that are specific to the use of hydrogen in-doors or in confined locations, in low and mid-power (200 W to 50 kW) fuel cell early market applications. The applications to be covered are: backup-power supply, portable power generation, forklift refueling and operation.

Pre-normative research activities shall be performed to further define the conditions under which the means commonly applied (possibly in combination) to mitigate the effects of foreseeable and potential releases – such as ventilation, detection and isolation, or venting – are effective for preventing:

- flammable hydrogen air mixture
- hazardous overpressures in the event of ignition
- hazardous phenomena associated with under-ventilated jet fire combustion, such as extinction followed by re-ignition.

Expected Outcome

- Characterization of typical hydrogen release conditions to be addressed for early market applications, in terms relevant to the project objectives
- Design criteria for preventing or limiting the consequences of the phenomena associated with reasonably foreseeable hydrogen releases, with regards to ventilation, hydrogen leak detection and isolation, and overpressure venting
- Safety guidelines
- Dissemination of results to industry and the RCS community

Other Information
The consortium should include product developers/integrators, research and/or industry test facilities, and RCS experts. Links to US activities should be explored. Work should not duplicate pre-normative research activities on H2 safety already undertaken in previous and current EU-funded and/or national projects.

Expected duration: Up to 3 years

Funding scheme: Collaborative Project

APPLICATION AREA SP1-JTI-FCH.5: CROSS-CUTTING ISSUES

Topic SP1-JTI-FCH.2010.5.1: Technology monitoring and assessment (TMA)

Rationale

The development of an advanced TMA tool will enable the FCH JU to obtain an accurate assessment of progress both towards its objectives and its position within the global field of energy technologies. This implies both a monitoring of results of the work funded by the FCH JU Programme and projects funded by other parties such as national programs as far as data is made available by the owners. These results can then be compared to each other as well as against the program targets to assess progress of the programme and the technology. However, from a more strategic point of view, monitoring competing and emerging technologies and their progress is necessary for timely responses by the FCH JU.

Overall project objectives/ Scope of Work

General

The goal of this action is to develop an advanced TMA tool based on sound scientific methodology and tailored for hydrogen and fuel cell technologies.

Data Input/Management

This section will include a methodology for transferring existing databases as far as available, dealing with the respective compatibility issues, establishing a common data format and database in line with the EC IT standards. Input data for FCH JU funded projects, as well as other external inputs, should be available via a simple mechanism. A framework for data (e.g. cost, performance) collection and analysis from the RTD and demonstration projects - allowing assessment and forward projections shall be proposed; a methodology for the validation of external inputs shall be developed.

TMA Report outputs

The tool shall support or have an automated report generator that can be adapted to different reporting purposes.

Technology Assessment

For the technology assessment section used for managing the program vis-a-vis its own objectives as well as for supporting funding allocation, the tool needs to be able to define and select benchmarks towards both best-in-class (BiC) and best available technology (BAT) as well as resources allocated to enable outputs in econometric form.

As each technological option carries a large set of qualifying attributes (e.g. cost, power density, durability, space needs, LCA parameters), a methodology for flexible multi-parameter comparisons shall be proposed.

Technology Monitoring

A computer supported general technology monitoring ("Radar function") identifying critical competing technology shall be supplied. A ranking system that ascribes levels of commercialisation to competing technologies must be part of the monitoring function. Such rating of inputs shall be supported by the system e.g. via structured input trees, Q&As, etc.

A merging of the results of the Technology monitoring and assessment into a joint assessment (e.g. final portfolio graph of FCH JU projects plus most critical technologies in single graphs) will be an important element of the tool.

Expected outcome
A comprehensive and adaptable TMA Tool to be used and implemented by the FCH JU, including a detailed process handbook/manual, development, definition and justification of benchmarking (BiC, BAT), database structure and implementation, data input interfaces and incoming/outgoing reports.

The successful project will only develop and validate the TMA tool; the actual execution and maintenance of the tool will be subject to separate actions.

Other information
The TMA tool will be used by the FCH JU and will be provided by a consortium of knowledgeable legal entities able to deliver a complete tool. 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; compatibility with LCA framework (project under topic SP1-JTI-FCH 5.3 of AIP 2009) and latest development of well-to-wheel (WtW) methodologies shall be ensured. Developing links and coordination with other TMA frameworks for stationary, transport and early market applications at European and international level is encouraged. Potential links with JRC may be explored.

A maximum of 1 project will be funded under this topic.

Expected duration: Up to 1.5 years

Funding Scheme: Coordination and Support Actions (Supporting Action)

Topic SP3-JTI-FCH.2010.5.2: Study of Advanced Hydrogen Economy Financing Options

Rationale

A number of components from fuel cells can be recycled or recovered for later use in new products. The ability to do so should impact the upfront cost of the fuel cell stack, because cost can be spread out over several generations of fuel cells. The most obvious example is Pt, a component that by some estimates accounts for up to 50% of the cost of the fuel cell stack. As a commodity on the open market it is also subject to significant oscillations in price. These initial costs of the components could be diminished if they were spread out over several uses, thus reducing the stack cost significantly. This model may be applied to other components of PEM fuel cells and even other types of fuel cells. However, proper financing mechanisms to achieve such a scenario have not been explored and are thus necessary.

Overall project objectives/ Scope of Work

The study should take into account suitable recyclable or reusable fuel cell components for which proposed mechanisms would apply. To this extent, the scope of work may also include an analysis of further research needs for fuel cell material recycling. It should identify cost thresholds at which recycling options for specific components provide an economic competitive advantage, and analyse in detail the impact of proposed solutions on the upfront cost of fuel cell stacks and systems and how these would advance commercialisation. It should develop financing mechanisms that take into consideration these recoverable costs and are able to reduce them significantly. The study should also consider the feasibility of implementing such measures including, but not limited to, from a legal and financial point of view, including specific proposals for policy intervention measures wherever applicable.

Expected outcome

- Analysis of the potential recyclable components of fuel cells
- Development of models for financing costs of components over several years
- Analysis of effects on factory cost and end user prices
- Study on possible structures required to make proposed mechanisms feasible (legal, regulatory, financial)

Other information

The consortium should contain at least one major supplier for the fuel cells market, financing and/or commodity market specialists, experts on automotive cost calculations and pricing as well as organisations with legal expertise. A maximum of 1 project will be funded under this topic.

Expected duration: Up to 1 year

Funding Scheme: Coordination and Support Actions (Supporting Action)

9.2 Staff establishment plan 2010

Temporary Agents

Grade	2010 Establishment Plan Draft Budget / Authorised	
	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 *AD*[32]	**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 *AST*[33]	**0**	**7**
TOTAL	**0**	**18**

[32] AD stands for Administrator
[33] AST stands for Assistant

Contract agents

	2010 estimate
Function Group IV	1
Function Group III	1
Function Group II	0
Function Group I	0
Total	**2**

9.3 FCH JU Budget 2010

9.3.1 Estimated revenues[34]

REVENUES Million €*	Running costs		Operational costs		TOTAL	
	Commitment appropriations	Payment appropriations	Commitment appropriations	Payment appropriations	Commitment appropriations	Payment appropriations
European Commission	2.904	2.904	91.932	42.180	94.836	45.084
EFTA Contribution	0.073	0.073	2.317	1.063	2.390	1.136
Industry Grouping	0.195	0.195	0.000	0.000	0.195	0.195
Research Grouping	0.033	0.033	0.000	0.000	0.033	0.033
TOTAL REVENUES	**3.205**	**3.205**	**94.249**	**43.243**	**97.454**	**46.448**

* Figures rounded

[34] The Industry Grouping and the Research Grouping will contribute to the running costs once the FCH JU has become autonomous and can invoice the other members of the FCH JU.

9.3.2 Estimated expenditure

Commitment and payment appropriations

EXPENDITURE Million €*	Budget 2010	
Title 1 - Staff expenditure	**Commitment appropriations**	**Payment appropriations**
Salaries & allowances	1.811	1.811
Expenditure relating to Staff recruitment	0.294	0.294
Mission Expenses	0.040	0.040
Socio-medical infrastructure	0.030	0.030
Professional development	0.030	0.030
Receptions and Events	0.020	0.020
Title 1 - Total	**2.225**	**2.225**
Title 2 - Infrastructure and operating expenditure		
Rental of buildings and associated costs	0.175	0.175
IT Infrastructure	0.100	0.100
Movable property and associated costs	0.025	0.025
Current Administrative expenditure	0.015	0.015
Postage / Telecommunications	0.020	0.020
General Meeting Expenses	0.040	0.040
Expert contracts and meetings	0.325	0.325
Communication	0.280	0.280
Title 2 - Total	**0.980**	**0.980**
Title 3 - Operating expenditure		
Operating Costs	94.249	43.243
Title 3 - Total	**94.249**	**43.243**
TOTAL EXPENDITURE	**97.454**	**46.448**

* Figures rounded

9.4 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
IG	New Energy World Industry Grouping - European Industry Grouping for a Fuel Cell and Hydrogen JTI also referred to as "Industry Grouping" or "NEW 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