European Commission

Second Interim Evaluation of the **Fuel Cell & Hydrogen** Joint Undertaking

Expert group report

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Luxembourg: Publications Office of the European Union, 2013

ISBN 978-92-79-33018-6
doi:10.2777/41144

Contents

ACRONYMS AND ABBREVIATIONS

AIP	Annual Implementation Plan
BEV	Battery Electric Vehicles
CHP	Combined Heat and Power
CS	Clean Sky programme for Aeronautics and Air Transport
DoE	See US DoE
EEO	European Electro-mobility Observatory
EII	European Industrial Initiative
ELENA	European Local Energy Assistance - a project of the EIB
ERA	European Research Area
ERA-NET	A Networking initiative within the ERA
FCEV	FCH Electric Vehicles
FCH	Fuel Cells and Hydrogen
GB	Governing Board
H2020	Horizon 2020
HyER	Hydrogen Fuel Cells and Electromobility for European Regions
IEG	Independent Expert Group
IG	Industry Grouping
IMI	Innovative Medicines Initiative
IPR	Intellectual Property Rights
JRC	Joint Research Centre
JTI	Joint Technology Initiative
JU	Joint Undertaking
KPI	Key Performance Indicator
LCA	Life Cycle Assessment
MAIP	Multi-Annual Implementation Plan
MS	Member State
N.ERGHY	New European Research Grouping on Fuel Cells and Hydrogen
NEW-IG	European Industry Grouping for the FCH Joint Technology Initiative
NGO	Non-Governmental Organisation
NMP	Nanosciences, Nanotechnologies, Materials and New Production Technologies
PEFC	Polymer Electrolyte Fuel Cell
PO	Programme Office
PPP	Public-Private Partnership
RG	Research Grouping
RSFF	Risk-Sharing Financial Facility
RTD	Research, Technology and Demonstration
SC	Scientific Committee
SET	Strategic Energy Technology
SETIS	Strategic Energy Technologies Information System
SGA	Stakeholders' General Assembly
SME	Small and Medium Enterprise
SRG	State Representatives Group
SWOT	Strengths, Weaknesses, Opportunities and Threats
TEMONAS	TEchnology MONitoring and ASsessment - a project of the FCH-JU
TEN-T	Trans-European Transport Networks
TEN-T EA	Trans-European Transport Network Executive Agency
TFEU	Treaty on the Functioning of the European Union
ToR	Terms of Reference
TRIMIS	Transport Research and Innovation Monitoring System
US DoE	US Department of Energy

EXECUTIVE SUMMARY

The Fuel Cells and Hydrogen Joint Undertaking (FCH JU) was established to implement the Joint Technology Initiative (JTI) in Fuel Cells and Hydrogen under Article 187 of the Treaty on the Functioning of the European Union (TFEU). The founding regulation1 specifies that two interim evaluations of performance should be conducted with the assistance of independent experts. The first was completed in May 2011. The second is required to be completed by December 2013; this requirement has been accomplished by an independent expert group (IEG) and the present document contains the findings.

The IEG is of the view that the JU has successfully demonstrated the viability of the Public-Private Partnership (PPP) concept for research in FCH. It has realised an adequate governance structure, created an effective dialogue between industry and research around a common strategic agenda, and has successfully implemented that agenda. The expression of a long-term political commitment by EU institutions that is manifest in the FCH JU, coupled with stable funding, has given confidence to industry and helped the sector through difficult times.

The FCH JU has helped to stimulate new relations including trans-national linkages between the public sectors and private sectors of different Member States and strong communities within the Industry Grouping (IG) and Research Grouping (RG). In the latter case, formerly dispersed actors have been brought together to formulate a collective position on research priorities and to debate that position between the two communities.

The FCH JU continues to be relevant to the grand challenges facing Europe; in particular it supports the climate change objectives, helps improve energy security and contributes to the status of Europe as an international leader in technology upon which the future competitiveness and welfare of the Union will depend. The IEG recommends therefore that the FCH JU be continued under Horizon 2020.

There is nevertheless a list of points that can be improved and the IEG has made recommendations to this effect that it has compiled under four headings: programme governance, design and management; technology monitoring and policy support; engagement with Member States and regions, and communication and dissemination.

Programme governance, design and management

The governance of the programme is adequate, but decision-making is impeded by the obligation in many cases for the Executive Director to seek authorisation from the Governing Board. The division of responsibilities between the Governing Board and the Executive Director should be reconsidered and more executive authority attributed to the Executive Director. The resources available to the FCH JU are unevenly distributed between administrative and technical tasks to the detriment of the latter. Overheads need to be reduced by sharing administrative functions with other JUs and more people should be engaged in technical matters.

It is important in a private-public partnership that the contribution of industry matches public funds and be seen to do so. The present arrangements do not work well and are to be discontinued, but an alternative scheme is necessary. A legally binding

[1] Council Regulation 521/2008 of 30 May 2008, amended by Council Regulation n° 1183/2011

and audited commitment of industry to make parallel qualifying disbursements in related research and infrastructure may be the most effective option. There is some evidence that participation by Small and Medium Enterprises (SMEs) is restricted by the absence of a guarantee fund such as exists in FP7; this facility should be provided.

The content of the programme is in many ways good; objectives are appropriate and public and show in the main reasonable ambition, but there are aspects that need attention. The linkage to EU policies is not always clear; activity in stationary applications is dispersed; some areas of research have been relatively neglected - often those with a strong public-good character where participants cannot generate intellectual property rights (IPR); results are not fed back effectively into the programme design.

The research strategy for the continuation of the FCH JU should focus more sharply on three main principles: alignment on EU policies; areas where Europe has or can achieve leadership; adaptation to changing needs of the sector. Coping with the large inputs of intermittent electricity into the power grid is (at present) a uniquely European problem. FCH technologies can help balance the grid; storage and cost-efficient end-use of electricity together with the production of hydrogen from renewable sources should therefore be priorities of the energy pillar and it may be necessary to strengthen the participation of network operators in the programme.

Cross-cutting activities were delayed at inception and this is regrettable as this category includes socio-economic studies, regulations, codes and standards and life-cycle analysis – all are important for market roll-out at scale. The FCH JU should develop a strategy for these activities in cooperation with the JRC that has an obligation to perform work of public interest.

Basic research should not be neglected in the transition to market applications; lower costs will not only come from economies of scale, but depend also on better science; six to ten percent of the FCH JU budget should be preserved for breakthrough oriented research.

Programme results should be fed back more effectively into the Multi-Annual and successive Annual Implementation Plans (MAIP and AIPs) whilst preserving stakeholders' confidence in the stability of the long-term vision; a closer integration of industrial interests with those of other stakeholders should be sought through joint workshops with the research community, advisory bodies and representative regional organisations. Synergies and interaction with other programmes along the whole value chain should be maximised.

Technology Monitoring and Policy Support

The first evaluation recommended the adoption of a portfolio monitoring approach to the programme design and management and subsequently the FCH JU has commissioned the writing of software for the purpose. This now needs to be deployed effectively in a technology monitoring scheme that will support not only the programme, but will provide reliable scientific evidence for policy. More generally, the information flow between policy and science must be improved. The procedures for incorporating scientific evidence into transport and energy policy should be transparent and effective and be consistent across the sectors, and mutual awareness between the FCH JU and the Commission on FCH related activities needs to be reinforced.

Much greater disclosure and dissemination of results from the programme is essential. There has been in the past a strong tendency to invoke commercial confidentiality as a reason not to disclose results of work. There must obviously be some

protection for the generators of IPR, but it is also important that publically-funded research strengthen the capacity of the community wherever possible. Future proposals should be obliged to include a list of publishable key performance indicators (KPIs) and evaluation should penalise low levels of disclosure. Existing projects should be encouraged to disclose post hoc some of their results. The JU should introduce "clean rooms" for this purpose.

Engagement with Member States, Associated Countries and Regions

The programme of the FCH JU is estimated to represent about 20% of the research expenditure in the field in Europe. Effective cooperation with Member States, especially those with large research programmes, is vital. The main channel of cooperation is the State Representatives Group (SRG) and this does not seem to work effectively. The mandate of the SRG should to be upgraded to cover strategic functions including a proactive role in the choice and design of large-scale demonstration and deployment projects and participation in technology monitoring. The European Community Steering Group on Strategic Energy Technologies might be a useful reference. The flow of information between the SRG and the Programme Office needs to be improved in quality and timeliness. Members of the SRG should be more clearly associated with national research and / or industrial policies.

The next stage of the JU will require, in addition to conventional research projects, large deployment and capacity projects that coordinate many actors and multiple sources of funding along with skilful policy interventions. Large-scale demonstrations will require the support of Member States, regions and municipalities across an extensive, contiguous area. Member States should explore innovative solutions for co-funding, including for example conditionality in Calls, whereby countries offer complementary funding if a project is performed on their territory. The involvement of regional and local authorities is critical to deployment. The relationship with organisations such as HyER (association of European regions and municipalities for the promotion of hydrogen, fuel cells and electric mobility) is important for transport and should be better exploited. Similar relationships must be built for storage and other aspects of infrastructure.

The funding requirements will be large and varied and should probably be met by some or all of: industrial sources, the JU, loans from the European Investment Bank (EIB), the Risk-Sharing Financial Facility, Structural Funds, grants and loans from the Trans-European Transport Networks (TEN-T), grants from Member States, private and sovereign wealth funds. To overcome the extra financial cost compared to conventional options new policy instruments – essentially incentives – will also be needed. Such incentives may be partially justified by the need to overcome first-mover disadvantages. Hydrogen infrastructure should be made eligible within the new National Strategic Reference Frameworks for Structural Funds. The JU should prepare to facilitate developers by providing advice on available financial options from EU institutions, including the EIB, Structural Funds and TEN-T loans and grants; it should consider calls for preparation of fundable projects.

Communication and dissemination

The FCH JU should strive to be the most authoritative source of knowledge in Europe for FCH and the website needs to evolve to reflect this ambition. Better delivery of information to the Commission is needed for the purposes of monitoring progress

against goals. The rules governing the provision of information about the programme to various stakeholders (different members of the Governing Board, Scientific Committee, SRG, broader community) should be reviewed by the relevant bodies to determine whether the JU can disseminate more within a proper interpretation of those rules. If this is not possible then the rules should be modified appropriately for H2020. The JU should oblige presentations of funded projects at the Programme Review to meet certain standards of disclosure.

There is a diverse community of stakeholders that need information (municipal actors, universities, teachers, the public) with which the Programme Office cannot efficiently deal directly, but it should take actions to support others for this purpose.

Recommendations

A full set of recommendations is tabled below.

Recommendation	Responsibility
The JU has been largely successful in achieving the objectives assigned to it, is very relevant to the grand challenges of H2020, and should be continued.	European institutions
Programme governance, design and management	
Governance of the programme needs to ensure: that decision-making is more prompt; that more resources are assigned to programme and knowledge management and that the private sector's commitment continues to be comparable to the EU's effort. The Executive Director should have greater executive authority; administrative functions should be shared with other JUs and / or taken back into the Commission services; the Commission should agree a mechanism to demonstrate that the industry adopts "stretch" targets for its own research and early deployment expenditure. Contractual targets steadily to reduce time-to-grant should be introduced under Horizon 2020.	European institutions GB
The research strategy for the continuation of the FCH JU in Horizon 2020 should focus more sharply on three main principles: alignment on EU policies; areas where Europe has or can achieve leadership; adaptation to changing needs of the sector.	GB Advisory bodies
Storage and cost-efficient end-use of electricity together with the production of hydrogen from renewable sources should be priorities of the energy pillar; additional actors (e.g. network operators) will need to be recruited. Synergies and interaction with other programmes along the whole value chain should be maximised (e.g. "Advanced Materials" and with "Advanced Manufacturing and Processing"), Green Vehicle, SET-Plan EIIs (e.g. Smart Grids). Six to ten percent of the FCH JU budget should be preserved for breakthrough oriented research.	GB PO
The capacity to adapt to change should be strengthened. Programme results should be fed back more effectively into the AIP and MAIP whilst preserving stakeholders' confidence in the long-term vision; a closer integration of industrial interests with those of other stakeholders should be sought through joint workshops with the research community, advisory bodies and representative regional organisations.	PO IG
Certain research areas need greater prominence: the FCH JU should develop a strategy for Regulations, Codes and Standards including international dimension across the FCH businesses that is agreed by all (IG, RG, SRG, Commission) and that draws upon the resources of the JRC.	PO GB

SME participation should be further strengthened through a scheme of financial guarantees as in the Framework Programme and linkage between research projects and venture capital funding from the RSFF to generate new and innovative European companies and businesses.	European institutions
Technology Monitoring and Policy Support	
The JU should implement a robust technology monitoring procedure adapted to project, programme and policy levels. Results should be used to adapt the research programmes and made available to the SET Plan and for policy support.	PO
Much greater disclosure and dissemination of results is essential. Future proposals should be obliged to include a list of publishable KPIs and evaluation should penalise low levels of disclosure. Existing projects should be encouraged to post hoc disclose some of their results. The FCH JU should introduce “clean rooms” for this purpose.	PO
Policy DGs within the Commission need to provide greater clarity and visibility of public policy for FCH related activities (e.g. zero emission vehicles, energy storage). The procedures for incorporating scientific evidence into transport and energy policy should be transparent and effective and be consistent across the sectors.	European institutions + PO
Engagement with Member States and Regions	
Member States involvement with the programme must be strengthened. The mandate of the SRG should to be upgraded to cover strategic functions including a proactive role in the choice and design of large-scale demonstration and deployment projects and participation in technology monitoring; the flow of information between the SRG and the Programme Office needs to be improved; members should be more clearly associated with national research and / or industrial policies; innovative solutions for co-funding by Member States should be explored (e.g., ERA-NET activities or conditional co-funding within Calls).	European institutions GB SRG PO
Relationship with regional and local authorities is critical to deployment. The relationship with organisations such as HyER is important for transport and should be better exploited. Similar relationships must be built for storage and other aspects of infrastructure.	PO
Finance of future deployment and capacity build-up projects is vital and will require new financial arrangements. The Commission should investigate whether Hydrogen infrastructure can be made eligible for funding within the new National Strategic Reference Frameworks for Structural Funds. The FCH JU should prepare to facilitate developers by providing advice on available financial options from EU institutions, including the EIB, Structural Funds and TEN-T loans and grants; calls for preparation of fundable projects should be considered.	European institutions, Member States, PO GB
Communication and dissemination	
The FCH JU should strive to be the most authoritative source of knowledge in Europe for FCH. The visibility of the FCH JU should be greatly improved and the website needs to evolve to reflect this ambition. The rules governing the provision of information about the programme to various stakeholders (Scientific Committee, SRG, Commission services) should be reviewed to determine whether the JU can disseminate more within a proper interpretation of those rules. If this is not possible then the rules should be modified appropriately for H2020.	PO
The FCH JU should support the engagement, education and training of stakeholders beyond the immediate FCH Community and should engage the SRG in this process.	PO/GB

1. INTRODUCTION

1.1. Context and Objectives of the Second Interim Evaluation of the FCH JU

Article 11(2) of the Council Regulation that established the Fuel Cells and Hydrogen Joint Undertaking (see Section 2.1 below) requires that two interim evaluations should be conducted by the Commission with the assistance of independent experts on the basis of terms of reference drafted after consultation with the FCH JU. The first interim evaluation was completed in 2011; its work and conclusions are summarised in Section 2.6 below. A final evaluation is to be conducted after the winding up of the FCH JU.

The present report contains the findings of the Independent Expert Group (IEG) asked by the European Commission to conduct the second mid-term evaluation. The composition of the expert group is described in Annex 1. The purpose of these interim evaluations is to assess the quality and efficiency of the FCH JU and its progress towards the objectives set. The Commission shall communicate the conclusions of the evaluations to the European Parliament and to the Council, accompanied if appropriate by proposals to amend the Regulation and by its own observations on the findings of the experts.

This evaluation of the FCH JU was conducted in parallel with evaluations of two other JUs, namely the Innovative Medicines Initiative (IMI) and the Clean Sky programme for Aeronautics and Air Transport (CS); the methodology adopted is broadly specified within the Terms of Reference (ToR) with the intention to provide a coherent framework for all the interim evaluations. One expert was common to all panels in order to ensure coherence and coordination, to facilitate benchmarking and to identify best practices.

In accordance with the ToR the evaluation principally addressed:

- **Effectiveness:** The progress towards meeting the objectives set, including how all parties in the public-private partnerships live up to their financial and managerial responsibilities and keep an open non-discriminatory attitude towards a wide community of stakeholders.
- **Efficiency:** The extent to which the JUs are managed and operate efficiently.
- **Research Quality:** The extent to which the JUs enable world-class research that helps propel Europe to a leadership position globally, and how they engage with a wider constituency to open the research to the broader society.

In addition to the legal obligation to evaluate the performance of the JUs there are compelling practical reasons to do so. The imminent shift from FP7 to Horizon 2020 will represent in many ways a sharp break from the past[1],[2]. Priorities of Horizon 2020 include, inter alia: the integration of research and innovation by providing seamless and coherent funding from idea to market; more support for innovation and activities close to the market, leading to a direct economic stimulus; a strong focus on creating business opportunities out of the response to societal challenges. In many respects the Public-Private Partnerships (PPPs) manifest in the JTIs are an early effort

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Horizon 2020 - The Framework Programme for Research and Innovation, COM(2011) 808, Brussels, 30.11.2011

[2] EU. (2011). Proposal for a Council Decision establishing the Specific Programme Implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020), COM(2011) 811

to achieve similar goals and therefore lessons from their performance will be relevant to the implementation of H2020.

1.2. Methodology

At an inception meeting on the 5th March the group agreed on the methodology described here and on the broad questions that would guide the evaluation; the questions were slightly modified from those proposed within the Terms of Reference and are reproduced in Annex 2. The group prepared also a more detailed set of questions for use in the interviews, many of which addressed the specificities of the different actors within the FCH JU, and agreed on a list of people to be asked for interview. A web-based survey of coordinators was designed and performed with the support of the EC. The group undertook a detailed review of pertinent literature including the founding articles, programming documents, commissioned studies, details of Calls, mid-term and final evaluations of projects where they were available, surveys and documents concerning the proposed future of the FCH JU, and EU policy documents in particular for Energy, Research and Transport. The list of literature surveyed is included as Annex 3. Group interviews were held in Brussels from April 3rd to the 5th, 2013. Members of the IEG individually interviewed other stakeholders on various dates. The people interviewed are listed in Annex 4.

Following the literature survey and interviews a draft report was circulated to the group and discussed in detail at a third meeting on the 27th and 28th of May. The group conducted a study of the Strengths, Weaknesses, Opportunities and Threats (SWOT) facing the FCH JU, drawing upon the evidence of the evaluation for the strengths and weaknesses and complementing the material with their wider, shared professional expertise to identify the opportunities and threats. The recommendations of the evaluation were then reconsidered in the light of the SWOT analysis and modified to ensure they were robust and relevant to the future. The report was finalised by email exchange and the evaluation was completed on the 31 July 2013.

2. BACKGROUND TO THE FCH JU

2.1. Objectives and Legal Basis

The Joint Undertakings are legal entities that are mainly used to implement a class of instruments known as Joint Technology Initiatives (JTIs) that was proposed within the Decision establishing the 7th Research Framework Programme[1]. Joint Undertakings are Community bodies that must comply with much of the EU administrative regulations including the Financial Regulation and EC Staff Rules (with derogations applied where required).

Clear criteria for setting up of PPPs were specified in the Decision: the research field had to be deemed of strategic importance with perceptible impact on industrial competitiveness and sustainable growth; there should be significant risk of market failure; research at EU level should have clear added value; long-term industry commitment was forthcoming and existing Community instruments should be inadequate; fuel-cells and hydrogen was included among a tentative list of possible candidates annexed to the Decision. In 2007 the Commission sent to the Council a proposal to establish the FCH JU[2] along with an ex-ante impact assessment[3].

Following the Commission proposal, the Fuel Cells and Hydrogen Joint Undertaking was established by a Council Regulation for a period to 2017[4] with a budget of €470 million from the EU and a matching commitment from industry. The legal basis for the Joint Undertakings was Article 171 of the EC Treaty (now Article 187 of the TFEU). The EU contribution is sourced from the FP7 Cooperation Programme allocations of DGs RTD, ENER and MOVE.

The overall objective of the FCH JU as specified in the Regulation is to contribute to the implementation of the Seventh Framework Programme and in particular the Specific Programme Cooperation themes for 'Energy', 'Nanosciences, Nanotechnologies, Materials and New Production Technologies', 'Environment (including Climate Change)', and 'Transport (including Aeronautics)'.
The specific objectives are to:

- place Europe at the forefront of fuel cell and hydrogen technologies worldwide and to enable 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 Associated Countries in a coordinated manner to overcome market failures and to focus on developing market applications and facilitating additional industrial efforts towards a rapid deployment
- support the implementation of the RTD priorities of the JTI by awarding grants following competitive calls for proposals;
- encourage increased public and private research investment in the technologies in the Member States and Associated Countries.

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[1] Council Decision of 19 December 2006 concerning the Specific Programme "Cooperation" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013), O.J. 30.12.2006, L 400/86

[2] Proposal for a Council Regulation setting up the Fuel Cells and Hydrogen Joint Undertaking, Brussels, COM(2007) 571, 9.10.2007

[3] Commission Staff Working Document Accompanying document to the Proposal for a Council Regulation setting up the Fuel Cells and Hydrogen Joint Undertaking; Impact Assessment, Brussels, SEC(2007) 1272, 9.10.2007

[4] Council Regulation (EC) No 521/2008 of 30 May 2008 setting up the Fuel Cells and Hydrogen Joint Undertaking, O.J., L 153/1, 12.6.2008 and Council Regulation (EU) No 1183/2011 of 14 November 2011 amending Regulation (EC) No 521/2008 setting up the Fuel Cells and Hydrogen Joint Undertaking, O.J. L 302/3, 19.11.2011

2.2. Governance

The FCH Joint Undertaking is composed of the Governing Board (GB), the Executive Director and a Scientific Committee (SC). The States Representatives Group (SRG) and the Stakeholders General Assembly (SGA) are external advisory bodies. The Executive Director is assisted by a Programme Office. The FCH JU is a public-private partnership and this is reflected in the composition of the Governing Board; the Commission represents the European Union; the private interests of industry and the research community are represented respectively by the European Industry Grouping for the Fuel Cells and Hydrogen Joint Technology Initiative (NEW-IG) and the New European Research Grouping on Fuel Cells and Hydrogen (N.ERGHY). Between May 2008 and November 2010 the Joint Undertaking was managed by the European Commission; it became autonomous in November 2010.

NEW-IG is a legal entity established under Belgian Law; it represents a large part of Europe's hydrogen and fuel cell industry. Membership has fluctuated, but at present it represents around 60 companies from 18 European countries; half of them are Small and Medium Enterprises (SMEs). Much of the substantial work of the NEW-IG is done through committees that follow the research application areas adopted by the FCH JU, i.e. transport and refuelling infrastructure; hydrogen production and distribution; stationary power and early markets. A special coordination group was created in 2011 to liaise with the Governing Board[1]. The N.ERGHY association is also a legal entity established under Belgian Law formed in 2008 by the European research community; as of early 2013 it represents more than 60 universities and research institutes from 21 EU Countries[2].

The duties, powers and compositions of the bodies comprising the FCH JU are set out in the Statutes of the Fuel Cells and Hydrogen Joint Undertaking appended to the Regulation. The Governing Board has twelve members; the NEW-IG nominates six members (including at least one SME), the European Commission nominates five and N.ERGHY has one seat. The Board has overall responsibility for the operations of the Joint Undertaking: implementation of the activities, approval of the annual implementation plan, budget, accounts and the balance-sheet and approval of the list of projects proposed for funding. Decision making is by consensus, but if not possible then by three-quarters majority; EC votes are indivisible.

The Executive Director is the chief executive responsible for the day-to-day management of the FCH Joint Undertaking in accordance with the decisions of the Governing Board. His particular duties are specified in detail in the regulation; they include the supervision of the calls for project proposals, evaluation and selection of the projects and gathering the necessary assurance (e.g. through financial audits) on the proper use of FCH JU funds necessary for the annual discharge from the European Parliament.

The Scientific Committee is an advisory body to the Governing Board composed of members from academia, industry and regulatory bodies. Collectively, the Committee is intended to encompass the expertise needed to make strategic science-based recommendations across the work of the FCH JU. Specifically it gives advice on the scientific priorities for the Annual and Multiannual Implementation Plans (see Section 2.4) and the scientific achievements described in the annual activity report.

The States Representatives Group (SRG) is a purely advisory body comprising one representative of each Member State and of each Associated Country. Its functions

[1] New Energy World Industry Grouping Annual report 2011, http://www.new-ig.eu/uploads/Modules/Publications/new-ig-annual-report-2011.pdf

[2] N.ERGHY Position Statement On the Role of Research and Development in the European Programme on Hydrogen and Fuel Cells Technologies for the Period 2014-2020

are to review and to comment the progress of the FCH JU, but also to inform the JU about relevant national research programmes and to identify areas of cooperation. The Group meets at least bi-annually and is convened by the FCH JU.

The Stakeholders' General Assembly (SGA) is open to anyone with an interest in fuel cell and hydrogen technologies, including industry, academia, public sector and Non-Governmental Organisations (NGOs). It must be convened once a year and formally has an advisory role towards the FCH JU.

2.3. Management

2.3.1. Procedures

Management of the FCH JU differs from the FP7 in several respects. The Commission contribution to funding is foreseen for the duration of the programme; this is intended to allow a long-term research strategy to be formulated and implemented. There is no process of comitology, so executive decisions are not delayed by negotiation with Member States. Scientific priorities are decided in practice by the private members of the partnership, although the Commission can veto decisions related to spending of public funds. Participation rules slightly vary from those of FP7.

The seminal document determining the research agenda and specific targets of the FCH JU is the Multi - Annual Implementation Plan (MAIP) 2008 – 2013, adopted by the Governing Board on 15 May 2009[1]. The MAIP is divided into four main application areas: transport & refuelling infrastructure; hydrogen production and distribution; stationary power generation, combined heat and power and early markets. Cross-cutting activities were added to support programme coordination, including regulations, codes and standards, pre-normative research, socio-economic research, technology and life cycle assessments, market support, public awareness and education.

The MAIP proposes high level objectives and targets for all application areas together with a prioritised programme of activities based on the judgements of the Industry and Research Groupings. These targets represent qualitative and quantitative indicators to assess the performance of the FCH JU; it is intended that targets are reviewed periodically against progress of the technology. The Implementation Plan also contains a tentative budget breakdown for the period from 2008 to 2013, divided by application area, but also by the type of actions, i.e. break-through research, research & technological development and demonstrations and support actions. Based on this breakdown, indicative budgets for each annual call for proposals from 2008 to 2013 are assigned. In principle the MAIP also informs other national, regional and industrial research programmes and allows them to adjust accordingly, if they so wish.

In 2010, shortly after adoption of the first MAIP, it was judged necessary to review the contents taking into account the experience of the first calls for proposals, the first interim evaluation and changes in the technological, financial and policy environment. The revised MAIP has somewhat more aggressive targets, but mainly differs in a much closer specification and a stronger focus on cost and performance indicators[2]; it was adopted by the Governing Board on the 22nd November 2011.

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[1] Multi - Annual Implementation Plan 2008 – 2013, FCH JU
http://www.fch-ju.eu/sites/default/files/documents/fch_ju_multi_annual_implement_plan.pdf
[2] Multi - Annual Implementation Plan 2008 – 2013, FCH JU
http://www.fch-ju.eu/sites/default/files/MAIP%20FCH-JU%20revision%202011%20final.pdf

The MAIP is implemented by Annual Implementation Plans (AIPs) which list the topics and detailed topic descriptions to be included within the annual calls for proposals. AIPs are prepared by the Industrial and Research Groupings with inputs from the European Commission and with the support of the Programme Office. Once adopted by the Governing Board, they become formal documents of the FCH JU. The structure of the AIP by research areas is identical to that of the MAIP; the Call fiche for the call for proposals associated with the AIP is included within the AIP. Evaluation of Calls follows closely the procedures of FP7. Six AIPs have been produced to date and are available on the web-site of the FCH JU[1].

A comparison of the governance and procedures of the FCH JU with those for the Innovative Medicines Initiative and the Clean Sky programme for Aeronautics and Air Transport was produced by the expert common to all three evaluations and is attached as Annex 5.

2.3.2. Funding

The FCH JU is jointly funded by the Members through financial contributions paid in partial instalments, and in-kind contributions from the legal entities participating in the activities. Funding from the Commission comes from the FP7 that ends in 2013; the funding for the projects should be committed until end of 2013; these should not last beyond 30th June 2017 except if a derogation is awarded on exceptional grounds e.g. for long demonstration projects. Funding for projects that start after the end of FP7 is reserved until they are completed. The total indicative programme volume over the period 2008 to 2013 is €940 million. The total contribution of the EC is €470 million of which €20 million has been reserved for its share of running costs. The EC pays 5/12 of running costs, the Industry Grouping (IG) pays 6/12 and the Research Grouping (RG) pays 1/12. Members of the IG and RG contribute to the payments in proportion to their receipts from the programme. This has been a complex issue to negotiate and operate; despite considerable effort, no easier solution has been agreed.

Article 12(3) of the Regulation that established the FCH JU originally required that the industry contribution to the cost of the research programme should at least match the Community's budgetary support. The financial contributions from the FCH JU to the various consortium members were aligned on the permitted funding rates established for FP7. If the industry in-kind contribution (i.e. total eligible costs for industry minus FCH JU contribution paid to industry for projects) was less than the total Commission contribution then the Commission contribution had to be reduced.

The calculation of the reduction was required to be "fair and balanced proportionally for all categories of participants in each individual project". The reduction was implemented through a correction factor calculated by the FCH JU. During evaluation the projects were ranked within application areas; based on the available EC funding a cut-off was then established in each application area. EU funds for each project were reduced by a common factor to match the overall commitment of the beneficiaries. This released more EU funds so that more projects could then be financed and the process was repeated until funds were exhausted. In the 2010 call for proposals, FP7 funding rates were multiplied by a factor of 0.72 giving rates of around 36% for industrial participants and 54% for other participants; these are considerably less than the upper limits for FP7 of 50% and 75% respectively[2].

[1] Fuel Cells and Hydrogen Joint Undertaking; Documents, http://www.fch-ju.eu/page/documents
[2] Fuel Cells and Hydrogen Joint Undertaking, Annual Activity Report 2011, http://www.fch-ju.eu/sites/default/files/AAR%202011%20signed%20incl%20analysis%20%26%20assessment.pdf

A later amendment to the founding Regulation establishing the FCH JU was adopted to set contributions from all participating legal entities against the EU contribution[1] and this has been done for the 2011 and subsequent Calls. Even with the amended Regulation the contribution from the participating legal entities was insufficient to match the EU contribution and in 2011 and 2012 the funding rates were multiplied by a factor of 0.8 giving rates of around 40% for industrial participants and 60% for other participants. Moreover, in FP7 beneficiaries can claim real indirect costs and some entities such as SMEs or non-profit research centres could claim a flat reimbursement rate of 60%; indirect costs were capped at 20% for all beneficiaries of the FCH JU although their real indirect cost was taken into account for the assessment of the in-kind contribution. This can be a substantial loss to participants.

The matching rule has been a persistent cause of confusion; the main consequence has been that funding rates are lower than in FP7 and are unpredictable. The correction factor varies annually and cannot be announced when launching the calls; it is an unforeseeable factor for the beneficiaries. The matching rule will be abolished in any continuation of the FCH JU, but the problem of how to ensure a measurable industry commitment whilst maintain predictable and adequate funding rates remains unsolved.

2.4. Outputs

2.4.1. Funding of proposals

Five Calls for proposals have been completed and one more Call has been published in 2013. Some details are given in Table 1. The number of proposals has tended to increase over the period and the proportion funded has fallen from 50 – 60% in the early years to between 30-40%, which is comparable to the Energy FP7 Energy programme (usually around 30%), but many FP7-Energy Calls have two stages, so the figures are not exactly comparable.

Table 1 Overview of Calls from 2008 to 2013

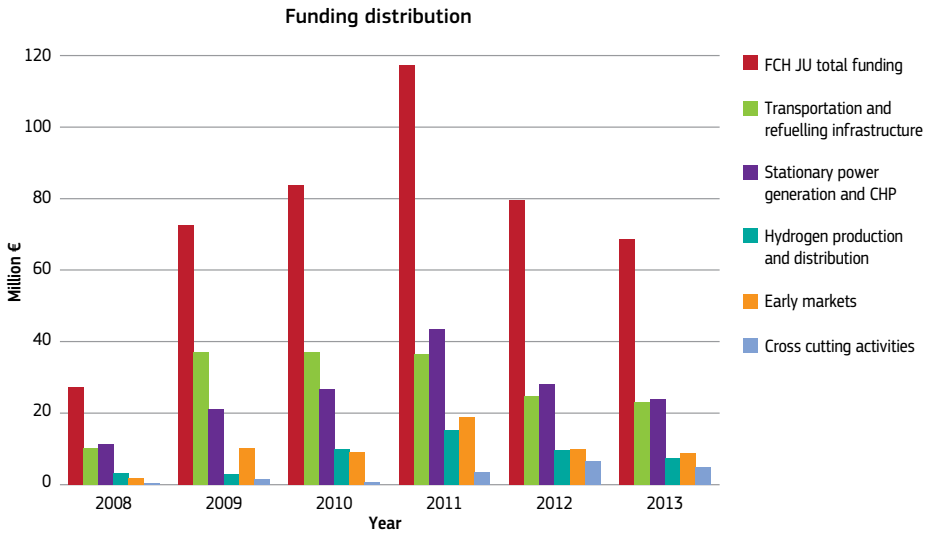
Year	Commission contribution (M€)	Number of proposals submitted	Number of proposals funded	Success rate (%)	Funding correction factor
2008	27,2	32	16	50%	0,67
2009	72,5	49	28	57%	0,67
2010	83,7	69	26	38%	0,72
2011	117,5	80	33	41%	0,80
2012*	79,8	78	28	36%	0,80
2013*	68,5	71	not avail.	not avail.	not avail.

* Indicative budget

[1] Council Regulation (EU) No 1183/2011 of 14 November 2011 amending Regulation (EC) No 521/2008 setting up the Fuel Cells and Hydrogen Joint Undertaking, O.J. L 302/3, 19.11.2011

An indication of the scope of the Calls is given in Figures 1 and 2, which shows the funding distribution by application area for successive AIPs and for the period 2008 - 2013. This is consistent with the allocation agreed in the MAIP. Transport has received the largest share, mainly because of some large demonstration projects.

Figure 1 Funding distribution by application area (M€)



* Indicative budgets for 2012 and 2013

Figure 2 Funding distribution for 2008 - 2013 (M€)

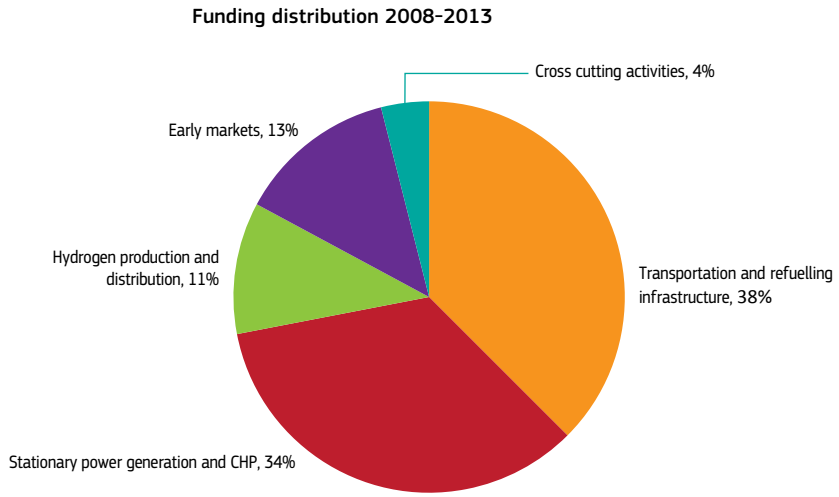


Table 2 shows how well the Calls have covered the topics published and how the quality of the proposals was judged. Coverage of topics has been good, always above 80%. After the first year, the share of proposals passing the threshold has been stable at about 65% and the quality of proposals has been consistent; about 40% receive in evaluation a mark of 4 or 5 (very good or excellent) for science and technology, and a somewhat higher share receive a mark of 4 or 5 for dissemination. This performance is similar to the evaluations performed for the energy programme of FP7, but there are some differences. For FP7 the average share of proposals achieving a 4 or a 5 for scientific quality was 44.3%, but it varied from 38.2% in 2012 to 54.9% in 2009.

Table 2 Coverage of Call, quality of proposals

Year	No. of topics	No. of topics covered by a submitted proposal	Coverage of topics called (%)	Share of proposals passing the threshold	Scientific quality of proposals (%)*	Quality of proposed dissemination (%)*
2008	15	13	86.7%	56.3%	28.1%	40.6%
2009	29	24	82.8%	62.0%	42.0%	56.0%
2010	25	23	92.0%	62.3%	37.7%	44.9%
2011	36	29	80.6%	66.3%	40.0%	45.0%
2012	31	28	90.3%	66.2%	44.1%	42.6%
2013	27	n/a	n/a	n/a	n/a	n/a

*Percentage of projects with a mark of 4 or 5 in the evaluation

Table 3 shows the average time to grant for the FCH JU compared to that of the FP7. The time to grant is longer for the FCH JU than for FP7-Energy. The reasons for this are not entirely clear. Part of the reason may be the matching rule; although the calculation is now automated it can affect negotiations. A part might be attributed to the complexity of demonstration projects in their IPR, ownership and financing, but FP7-Energy includes demonstration projects managed by DG ENER of similar complexity so this is not a convincing argument. The verification of the financial viability of the companies also takes time as the FCH JU is not eligible to use the EU guarantee fund. The internal decision-making process is cumbersome involving two authorisations by the Governing Board.

Table 3 Time to grant: comparison of the FCH JU and EC

	Programme	Calendar days
EC management	FP7-Energy-2007	303
	FP7-Energy-2007-FCH	255
	FP7-Energy-2009	290
	FP7-Energy-2011	204
FCH JU (transition)	FCH-JU-2008	341
	FCH-JU-2009	411
FCH JU (full autonomy)	FCH-JU-2010	406
	FCH-JU-2011	365

2.4.2. Benchmark studies

The AIPs makes provision for selected activities to be implemented by call for tenders. This instrument allows the FCH JU precisely to specify its requirements and is particularly suitable for general market intelligence, strategic and policy studies. Significant expenditures have been foreseen in successive AIPs: €2.8 million in 2008; €6.4 million in 2009; 4.5 million in 2012; 4.65 million in 2013. Much of this proposed expenditure in successive years is not for new studies, but for previously proposed studies that have been delayed.

A study of the jobs creation impact of different deployment scenarios for fuel cells and Hydrogen technologies was finished as foreseen[1]; a first phase of a European urban fuel cell bus commercialisation strategy was completed in 2012[2]; the first stage of European commercialisation strategy for fuel cell stationary applications was made by private companies outside of the FCH JU; a study of materials handling was abandoned. Where possible the tenders have been completed through framework contracts already signed in a previous open procedure. The 2013 AIP confirmed second stages for the bus and stationary power strategies and extended the scope of studies to include an economic and technical assessment of the role of Hydrogen in energy storage and a study of conditions for financing Hydrogen refuelling infrastructure. Historic and planned expenditure on the benchmark studies as provided by the FCH JU to the IEG is summarised in the Table 4; the outputs are less than the ambitions of the AIPs and delivered later than envisaged. The IEG has no firm evidence to indicate what might be the reasons for this, but it has been suggested that a part of the reason is that firms are unwilling to contribute data to such an exercise; it is plausible that this is a contributory factor.

[1] http://www.fch-ju.eu/page/publications, 2013
[2] Urban buses: alternative powertrains for Europe, FCH JU and McKinsey, 2012.

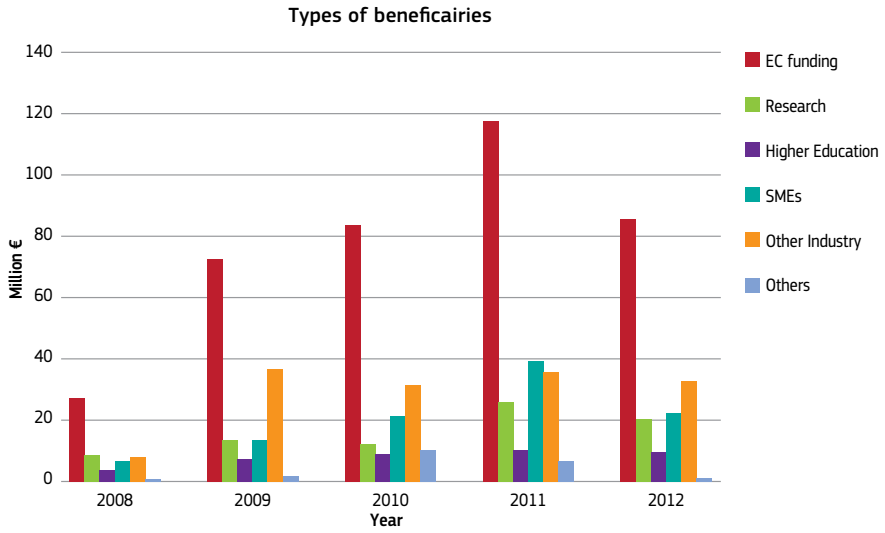
Table 4 Status of the benchmark studies

Sector	Studies	Amount (€)	Year
Funded by the FCH JU and finalized			
FC cars (transport)	Policy justifications to support FC cars and policy instruments to support them	122,000	2011
	Support to UK H2 Mobility initiative (mainly financed by private companies)	92,550	2012
FC Bus (transport)	Urban buses: alternative powertrains for Europe	1,056,000	2012
Economics/policy	Trends in Investments, turnover and jobs in the FCH sector	160,000	2012
Made with private funds			
FC Cars (transport)	A portfolio of power-trains for Europe: a fact-based analysis: The Role of Battery Electric Vehicles, Plug-in-Hybrids and Fuel Cell Electric Vehicles	Not known	2009-2011
Energy (stationary)	A fact based study of power/heat technologies for distributed power	Not known	2011-2012
On-going or in procurement			
Finance (transport)	Financing mechanism for HRS infrastructure	390,000	2013
Role of H2 in energy storage	A techno-economic assessment of electrolysis technologies (to be followed by a large study with industrial coalition on storage technology)	Up to 125,000	2013
To be procured in 2013			
Energy (stationary)	Phase 2, continuation and extension of the study done by industry	Up to 1,500,000	
Role of H2 in Energy Storage		Up to 1,125,000	
Economics/policy	Macro-economic impact of a massive deployment of FC & H techno		

2.4.3. Participation

Figure 3 shows the participation in funded projects by requested contribution broken down into classes of participant and the manner in which it has evolved throughout the period. The bulk of the funding has gone to industry; SMEs have received 27% of funding, more than 40% of the industrial funding. Research institutes are also prominent. Institutes of higher education are not well represented, perhaps because of the focus of the programme away from fundamental research.

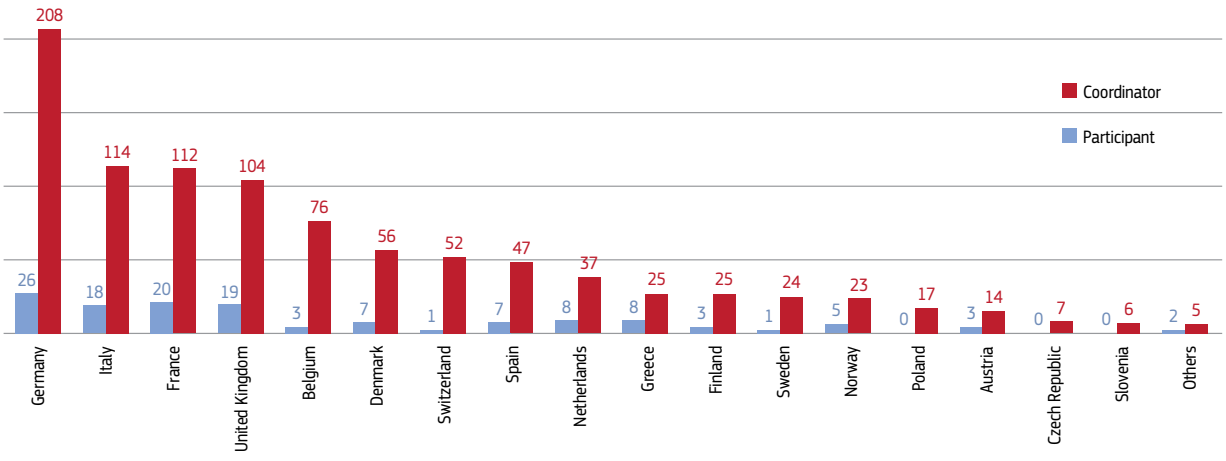
Figure 3 Participation in funded projects by types of beneficiaries (M€)



*Indicative budget for 2012

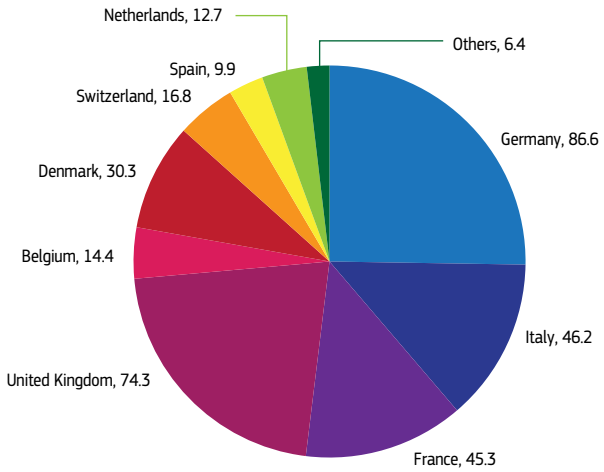
Figure 4 indicates the distribution of coordinators and participants by country over the period 2008 to 2012; there is evidence of significant concentration upon a few countries, but nevertheless there is also good evidence that the programme has a widespread reach. The EU12 does not show strongly, especially in terms of coordination, but it does a little better in terms of participants. The pie chart in Figure 5 shows the distribution by funding and here the concentration is more marked[1];

Figure 4 Participation by numbers of coordinators and participants (2008-2012)



[1] The data for Belgium includes the JRC which leads to a low funding compared to the number of participants

Figure 5 Distribution by funding in the period 2008-2012 (M€)



2.5. External Relations

2.5.1. Policy makers

Support to policy formulation from the activities of the FCH JU needs to be conceived within the context of the Strategic Energy Technology Plan (SET-Plan), which has its own governance structure and information process[1]. The Joint Research Centre (JRC) is responsible for the online Strategic Energy Technologies Information System (SETIS) where is compiled the latest research results and information on the status, forecasts and R&D investment figures for low-carbon technologies. SETIS is intended to sustain the effective strategic planning, conception and implementation of EU energy technology policy. The European Commission is now preparing a strategic framework for transport research, innovation and deployment, based on the Transport White Paper[2]. The first proposals for this framework include a Strategic Transport Technology Plan that will be supported by a European Transport Research and Innovation Monitoring System (TRIMIS) to be launched in 2013 and managed by the JRC. This is an on-line information platform on research and innovation; it will also publicise the roadmap and report on implementation. Clearly its contents need to be carefully aligned with the SET-Plan[3].

Despite the limitations of budget and resources, the FCH JU has taken some initiatives at the policy level including the commissioning of a brief on the role of fuel cells and hydrogen in decarbonising energy and transport that identifies the policy and commercial gaps[4]. The benchmark studies noted earlier are also relevant in this respect.

2.5.2. European programmes in the Member States and regions

The FCH JU comprises only a small part of the FCH research conducted in Europe. The position paper on the future of the FCH JU that was tabled by N.ERGHY estimates that about 80% of research in the field is performed under national programmes. In 2011 expenditures on national programmes were 94M€ in Germany, 41 M€ in the UK,

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[1] The European Strategic Energy Technology Plan Set-Plan: Towards a low-carbon future, European Commission 2010
[2] White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM(2011) 144, 8.3.2011
[3] Communication from the Commission to the Council and the European Parliament. Research and innovation for Europe's future mobility Developing a European transport-technology strategy, COM(2012) 501, 13.9.201
[4] The great transformation: decarbonising Europe's energy and transport systems, Bruegel Blueprint Series, Brussels, 2012. http://www.fch-ju.eu/sites/default/files/transformation%20BP%20160112.pdf

35M€ in France, and 25 M€ in Denmark[1]; Germany at the end of 2012 had a portfolio of projects worth 750 M€. The principal channel of communication with the Member States is through the States Representative Group. The first interim evaluation was critical of the SRG, many members of which it found to be insufficiently close to national policy and programme management to identify and to progress opportunities for alignment of the JTI and national programmes. Membership of the Group does not seem to have changed a great deal since then.

Local governments are influential in transport policy and often own or regulate public bus fleets as well as vehicles for their own administration and agencies, so they are important partners for the FCH JU. A useful interlocutor is HyER (Hydrogen Fuel Cells and Electromobility for European Regions); the association is intended to provide a means whereby European regions and municipalities can influence strategies and policies for hydrogen fuelled vehicles. The activities of HyER extend in many respects beyond the immediate scope of the FCH JU; it is a member of the European Electro-mobility Observatory (EEO) that is intended to support policy-making for battery and fuel cell electric vehicles and their infrastructure; it is a participant in many of the activities of the trans-European transport network (TEN-T) and cooperates closely with the Trans-European Transport Network Executive Agency (TEN-T EA)[2].

There are areas of potential synergy between the functions of HyER and those of the FCH JU. The association can contribute to the dissemination of research results (as it does for the Hytec and High V.LO-City projects), to the coordination of strategies across regions and can support to the creation of regional consortia for participation in projects, public visibility and data collection. HyER has been invited as an observer to meetings of the Governing Board and the States Representative Group, participates in a communication taskforce with the FCH JU and has cooperated in some studies.

2.5.3. The Joint Research Centre

The mission of the Joint Research Centre (JRC) is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle. This Directorate General of the Commission is also a research body in its own right. The Regulation establishing the FCH JU explicitly foresees that the JRC may participate in joint technology initiatives[3], however "Any possible financial or in-kind contribution from the Joint Research Centre to the FCH Joint Undertaking shall not be considered as part of the Community contribution referred to in paragraph 1 of Art. 5". The Framework Agreement between the FCH JU and JRC formalises the nature of the contribution and identifies three types of activity that the JRC can provide to the FCH JU without payment, either upon request of a project consortium, or by the FCH JU Programme Office[4]. These activities are known as "reference activities" and are:

- Experimental contributions to pre-normative research
- Support to individual FCH JU projects providing the services of a reference laboratory
- Support, upon request of the Governing Board, to the formulation and implementation of the FCH JU strategy

[1] N.ERGHY Position Statement On the Role of Research and Development in the European Programme on Hydrogen and Fuel Cells Technologies for the Period 2014-2020
[2] Commission Decision of 26 October 2006 establishing the Trans-European Transport Network Executive Agency pursuant to Council Regulation (EC) No 58/2003, O.J., L 32/88, 6.2.2007
[3] Art. 5(4) of the Regulation 521/2008 establishing the Fuel Cells and Hydrogen Joint Undertaking
[4] Framework Agreement between the European Community and the Fuel Cells and Hydrogen Joint Undertaking, Adopted by the FCH JU Governing Board on 30th January, 2009. http://www.fch-ju.eu/sites/default/files/FCH%20-%20JR%20FINAL%20VERSION%20Adopted%20by%20Board%20on%2030Jan09%20-%20Framework%20agr.pdf

The JRC can also be funded by the FCH JU as a consortium participant, but it cannot also contribute reference activities to a project in which it is funded. This restriction is intended to prevent a consortium gaining a competitive advantage by bundling both types of work in a single proposal. The JRC is the most active single participant in the research programme, involved in 44 projects. It participates without any contribution from FCH JU funds in 27 projects and it is funded in 17 projects with a total contribution of €2.2 million. It has contributed strategic advice and participated in the formulation of the MAIP and successive AIPs. The JRC brings significant benefits to the work programme: it has considerable research competence and assets in its various laboratories; it has a longer-term perspective than the industrial interests that are the main driver of the programme; it is impartial between different commercial interests; it can promote and contribute to work on public goods, such as regulations codes and standards; it has a wide view over the whole range of energy technologies and it has a pivotal role in the provision of scientific evidence to the policy DGs. The relationship is likely to become more important as the FCH JU begins to produce more policy relevant material and the implications of this are addressed later in the paper.

2.5.4. International programmes

The strategy of the FCH JU in this regard is to develop cooperation at operational levels through projects and information exchanges. Staff of the FCH JU participated in the US Department of Energy's (US DoE) Annual Merit Review and DoE experts were present at the 2012 Programme Review and in the successive evaluations of the calls for proposals. Work programmes were shared in order to identify areas of common interest at project level and as a consequence the 2012 Call for Proposals included work on Hydrogen safety sensors that required inclusion of a US partner approved by the DoE. One proposal for this topic was selected by the Governing Board for negotiation and is expected to lead to a Grant Agreement in mid-2013. No such cooperation was envisaged in the 2013 AIP, but a looser form of collaboration was introduced for research on peripheral components of refuelling stations whereby US participants in an FCH JU project are encouraged to seek support for similar work through the DoE. Discussions were established through contacts with KETEP (Korea Energy Technology Evaluation and Planning). The same approach as the one proposed to DoE was proposed to KETEP and will be discussed further during 2013. In addition, international experts from for example Japan were involved in the 2012 Program Review.

2.5.5. The Public

The Stakeholders' General Assembly is an innovative part of the governance structure that is open to all public and private stakeholders, international interest groups from Member States, Associated countries as well as from third countries. It offers the opportunity for the widest possible comment and criticism of the programme and its implementation. The statutes of the FCH JU require that the Assembly should be convened once a year. In 2011 and 2012 the first days of this Assembly have been devoted to a "Programme Review Day" in which the progress of the project portfolio is presented and senior experts contribute to a critical appreciation of the programme; the results are published and made available on the web-site[1].

[1] Programme Review 2011, FCH JU.
http://www.fch-ju.eu/sites/default/files/188213_2012_2640_FUEL_CELLS_AND_HYDROGEN1.pdf

2.6 First Interim Evaluation

The first mid-term evaluation of the FCH JU took place between December 2010 and April 2011, shortly after the beginning of the autonomous operation[1].

2.6.1. Findings and Recommendations of the Evaluation

The review concluded that the overall technical objectives of the FCH JU were ambitious and internationally competitive; it appreciated the concept of public-private partnership for technology development and demonstration. The expert group found the FCH JU to enjoy strong stakeholder representation and to provide stability in an uncertain funding climate. The group criticised the length of time taken to establish the JU; it noted the low and unpredictable funding rates and the modest technical resources of the Programme Office. External relations were, in its view, insufficient in particular the collaboration with Member States' related programmes and international engagement.

Recommendations were divided into five blocks; they were mainly addressed to the Executive Director, the Governing Board and the European Commission, but in a few cases to the Scientific Committee and the State Representatives Group. They are summarised below:

- To reinforce the portfolio management. The IEG took the view that the FCH JU should be more pro-active in delivering its technical objectives; to this end it should manage its project portfolio through targeted call processes and on-going project review.
- To ensure high agility of operations and adaptability to changing competitive forces. The FCH JU needs to maintain its focus on innovation and respond to emergent competing technologies and extend its efforts to engage stakeholders from the complete value chain.
- To improve visibility, communication and outreach. The IEG proposed a strengthening of the FCH JU visibility within and beyond Europe.
- To improve collaboration and alignment with Member States. The States Representatives Group is important in coordinating with the activities of Member States; not all the country representatives in the SRG had the necessary links to policy-making to achieve this aim.
- To ensure high efficiency of operations. The IEG detected several failings in efficiency, some of which it attributed to the status of the FCH JU as a Community body which it felt ill-adapted to a public-private partnerships.

More detail of the recommendations is given in Annex 6 and the response of the FCH JU is in Annex 7.

2.6.2. Status of the Recommendations of the First Evaluation

The IEG has reviewed the status of the recommendations from the first evaluation and determined that most of the recommendations targeting the Executive Director and Governing Board concerning implementation bottlenecks have been realised or are under implementation. Focal points of the annual calls and projects portfolio have been adjusted in the past two years to meet Recommendation 1 and cross-cutting issues including RCS are being led by an industry representative. However, not

[1] First Interim Evaluation of the Fuel Cell & Hydrogen Joint Undertaking, European Commission, Directorate-General for Research and Innovation, Directorate K - Energy, May 2011; http://www.fch-ju.eu/page/publications

all aspects of reinforcing portfolio management have been properly considered. The recommendation addressed to the EC (and Governing Board) concerning appropriate support for basic research within the Framework Programme has not been fulfilled. But the Commission has informed the IEG that, because the funds allocated to the FCH JU included support for basic research, it would not have been possible to have allocated funds specifically for FCH technology elsewhere within the Framework Programme.

Concerning the fulfilment of Recommendation 2 addressing agility of operations and adaptability to changing competitive forces, steps have been taken towards reinforcing efforts to engage stakeholders from the complete value chain and strategic discussions are on-going. A fact based study of power/heat technologies for distributed power is being undertaken with private funding and is due for release. However, the implementation of a number of recommendations is still pending or is on-going. Some opportunities for synergies/complementarities between FC electric cars and BEV in the market place have been examined, especially concerning the infrastructure solution, promoting tax incentives and credits and towards the electric powertrain supply chain.

The recommended establishment of an SME contact point at the Programme Office was not implemented. According to the Programme Office, all project officers have to promote SME participation and may be contacted by SMEs. The participation of SMEs in the FCH JU portfolio is higher than the average of the framework programme, which appears to validate the claim.

Regarding the recommendations in block 3 to improve visibility, communication and outreach, much has been done since the first evaluation. Progress has been made towards enhancing participation/organisation of FCH events and promotion of the calls. Also at international level there has been an increase in cooperation activities. Nonetheless this is an area where there is still an enormous room for improvement for both internal and external communication strategies, which appear to lack tailored messages and tools. For example, there is still a need for condensed and reliable basic facts & figures on the programme, projects and results. The website is unappealing and static and relevant information is difficult to find. These aspects will be further analysed in the frame of the assessment of the efficiency/effectiveness criteria.

None of the recommendations addressing the improvement of collaboration and alignment with Member States and the role and functions of the SRG has been met yet. Both the Governing Board and the SRG show interest in enhancing the role of the SRG, but without tangible results. Only a few representatives show engagement and the SRG has not been reorganised with participants connected to policy and programme management, able to identify and improve opportunities for alignment of national activities and those of the FCH JU.

The fifth block of recommendations, advocating a high efficiency of operations, could be only partly fulfilled and there is scope for a more dynamic and efficient implementation; administrative personnel still predominate.

3. ASSESSMENT

3.1. General

3.1.1. Contribution to improved competitiveness

The FCH JU has created an effective dialogue between industry and research around a common strategic agenda and has successfully implemented that agenda through carefully structured Calls and good programme management. Several stakeholders observed that the JTI has been an important support for research in FCH throughout the prolonged economic crisis; in such times there is a tendency for research institutes and industry to withdraw from radical innovation and to focus on core business and incremental technology progress. Given that there are few commercial products available using fuel cells and hydrogen the research area is vulnerable. The FCH JU has helped counter this tendency, both by virtue of its stable funding and through the expression of a long-term political commitment by the EU institutions that gives confidence to industry. There is good evidence that the FCH JU has stimulated creation of new networks of relationships including trans-national linkages between the public sectors and private sectors of different Member States that, whilst common in commercial activities, would have been difficult to achieve in any other research programme. This is an important contribution to the creation of a potential European market in FCH. The impact through the creation of strong communities within the IG and RG is also important. These formerly dispersed actors have been brought together to formulate collectively a joint position on future research and to debate that position between the two communities; this is a significant achievement and in the long-run will be positive for the competitive position of Europe.

It is difficult to separate the commercial and technical progress in the sector from influences other than the FCH JU, but there is evidence that the FCH JU has had significant real impact. A survey of companies involved in FCH showed strong positive trends in investment, jobs and turnover. Respondents estimated the number of jobs had been increasing by about 6% per year since 2007, to around 4,000 full-time equivalents today; the number of patents granted in the EU to European companies for FCH showed a 16% annual increase compared to the average annual growth for all EU industries of 1.5%; annual turnover increased by 10% per annum, R&D expenditures by 8% and market deployment expenditures by 6%[1].

These may seem modest increases, but hydrogen and fuel cells are a disruptive technology that works with novel devices requiring new manufacturing lines and infrastructure. Penetration is inevitably slow as is the build-up of jobs that can be clearly identified with the sector. It should also be recognised that jobs generated in the FCH sector will often displace jobs in conventional sectors. It is crucial that Europe creates and maintains the technological lead that will ensure that the jobs lost in old skills are replaced by new European jobs in advanced skills, not by jobs in foreign competitors, and that genuinely new jobs are created in Europe from selling advanced technology into foreign markets. For example, as noted by the European strategy on clean and energy efficient vehicles, the European automotive industry is a world leader in clean and energy efficient technologies based on combustion engines; it is a crucial European industry, competitive, innovative and supporting a wide range of related activities[2]. Preserving this depends upon maintaining a technological lead that may be measured

[1] Trends in investments, jobs and turnover in the Fuel cells and Hydrogen sector. Brussels: Fuel Cells and Hydrogen Joint Undertaking, FCH JU, 2013.
[2] A European strategy on clean and energy efficient vehicles, COM(2010)186

only in a few years, but which will permit the large scale capacity development necessary for future success. It is encouraging therefore to see that the views of the future conveyed to the survey were positive. Respondents expected that turnover would increase on average by 35% per year towards 2020 and research expenditures by 12% per annum; the fact that turnover is outpacing RD&D expenditures is an indication of impending commercialisation.

Concrete achievements have varied across application areas. The main achievement in transportation and refuelling is the coordinated deployment of vehicles and infrastructure generating a base for further development. In this manner, the FCH JU has helped Europe to a leading position in fuel-cell technology for the automotive industry. There is a need now to supplement research and development with new instruments to create a real market and supply chain. Other areas have proved more challenging and innovation has mainly been incremental and at the level of components. The N.ERGHY position statement cites examples of improved performance including: progress with alkaline electrolysis; the decreased platinum content for Proton Exchange Membrane Fuel Cells (PEMFC); low temperature operation of Polymer Electrolyte Fuel Cell (PEFC) systems; improved lifetime of stationary fuel cells and improved reliability of small reformers for biogas. The paper also documents several successful business ventures with SMEs and start-up companies that have developed from FCH JU projects[1]. Some demonstration of Combined Heat and Power (CHP) using fuel cells both for domestic applications and for decentralised generation has been made performed, but the effort has been fragmented and there are no significant applications on European markets. It was suggested to the IEG that it had been more difficult to achieve a consensus among industrial partners on the priorities within the stationary application.

The relatively recent perception of the need for large-scale energy storage to assist in the management of intermittent sources of renewable energy offers a strong and important unifying theme for the future. Europe has higher levels of penetration of intermittent energy than anywhere else in the world and the limits of managing intermittency through interconnection of grids are beginning to be visible[2]. Hydrogen storage has a strong competitive potential for grid-balancing[3],[4].

3.1.2 Evolution of competitive technologies

The wider conjuncture in the energy and transport sector has become more complex since the inception of the FCH JU. The overriding decarbonisation goals that have governed policy in both sectors must now be examined in the light of weak policies for climate change in the rest of the world and the need to preserve European competitiveness, maintain employment and reduce poverty. The financial constraints on investment and consumption brought about by the recession must also be recognised.

The original separation of activities within the JTI into five applications reflects a technical approach to the research programme. The need to relate research convincingly to the social challenges facing Europe is the main idea behind Horizon 2020 (H2020). In keeping with the new orientation of H2020, the work of the future FCH JU will be divided into two major themes – energy and transport. This change was welcomed by all parties from whom the IEG sought evidence. The IEG also supports this new

[1] N.ERGHY Position Statement On the Role of Research and Development in the European Programme on Hydrogen and Fuel Cells Technologies for the Period 2014-2020
[2] Wind Power Integration, Negative Prices and Power System Flexibility - An Empirical Analysis of Extreme Events in Germany, Marco Nicolosi, Institute of Energy Economics at the University of Cologne, March 2010
[3] Wind Power Integration, Negative Prices and Power System Flexibility - An Empirical Analysis of Extreme Events in Germany, Marco Nicolosi, Institute of Energy Economics at the University of Cologne, March 2010
[4] Economic Analysis of Large-Scale Hydrogen Storage for Renewable Utility Applications, Sandia National Laboratories, August 2011

arrangement, noting that policy for deployment will be important in the future and that the clear alignment of activities along two major policy axes of the Commission will be helpful in this respect. Linkages between the two main themes must however be sought and nurtured.

Despite the financial and economic constraints, it was argued to the IEG that the effort to reduce or eliminate emissions from large vehicles in cities will continue to be a driver of technology for mass-transit. FCH vehicles compete with battery electric vehicles (and tracked modes). Electric buses are promoted in China and have advantages for peak deployment, but there is a credible view that fuelled vehicles with greater range will be better for baseload operations. Much of the impetus for low emission vehicles arises within municipalities and regions rather than at national level; Cologne, London, Amsterdam, Brussels, Oslo, Hamburg and Stockholm all have aggressive policies to promote alternative fuels and power-trains[1]. Creating alliances with local government should be therefore a priority for the FCH JU in the transport field.

There is a competition, but also complementarity, between battery electric vehicles (BEVs) and FCH electric vehicles (FCEVs) for automobile use. Not long after the inception of the FCH JU, perceptions shifted towards BEVs as the more promising option. To support the automotive industry in the economic crisis of 2008, the EU launched the European Green Cars Initiative as one of three Public Private Partnerships of the European Economic Recovery Plan[2]; the main OEMs put considerable emphasis on marketing of electric vehicles and lobbied governments for financial and policy measures to stimulate electric charging infrastructure. Subsequently a degree of disappointment with the performance and cost of electric vehicles has helped strengthen the case for hydrogen. Indeed, as one of the benchmark studies of the JTI makes clear, there are definite market segments for short distance urban transport that respond to BEVs and long-distance mobility that is more suitable for FCEVs. There is a growing understanding of this market segmentation among municipal and regional policy-makers to which the FCH JU has contributed.

In the case of energy, the technical options are more numerous than they were ten years ago. Alternative technologies of supply and demand-management are now mature and some of the complementary requirements of those technologies will have strong and to some extent contradictory influences on the future activities of the FCH JU. There has been radical innovation in extractive technologies for hydrocarbons by horizontal drilling and fracking that has affected international markets for oil and gas. The increase in supply, combined with weak economic activity and adoption of energy efficiency options will affect energy wholesale prices with consequences that are hard to predict in detail, but the expectation that high prices for conventional energy will be sufficient to make low-carbon options cost-effective is receding. There are more proven energy reserves than can be consumed if the global average temperature is not to rise by more than to 2 °C[3]; carbon, capture and storage can in principle change the relationship between the two constraints, but it is unlikely to be deployed on a sufficient scale for that to happen before 2050. Therefore, if the international community is successful in containing climate change there may be a potential oversupply of conventional energy that is inconsistent with high prices. Transition to a low-carbon future will depend therefore on stronger public intervention to correct market failures and more intensive research to reduce costs and improve performance. In this second respect, strong and well-focused research is needed on hydrogen storage and subsequent relevant and cost-efficient end-use of the hydrogen produced and stored. There are potential synergies with parallel programmes on smart grids.

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[1] Urban buses: alternative powertrains for Europe, FCH JU and McKinsey, 2012.
[2] Communication from the Commission to the European Council of 26 November 2008 – 'A European Economic Recovery Plan' [COM(2008) 800 final
[3] IEA. (2012). World Energy Outlook. Paris: International Energy Agency

The research strategy for the continuation of the FCH JU should focus more sharply on three main principles: alignment on EU policies; areas where Europe has or can achieve leadership; adaptation to changing needs of the sector.

Storage and cost-efficient end-use of electricity together with the production of hydrogen from renewable sources should be priorities of the energy pillar; additional actors (e.g. network operators) will need to be recruited. Synergies with Smart Grid should be sought.

3.2. Effectiveness

3.2.1. Support to the themes of FP7

The principal objective set out in the Regulation was that the FCH JU should contribute to the implementation of the Seventh Framework Programme and in particular the Specific Programme 'Cooperation' themes for 'Energy', 'Nanosciences, Nanotechnologies, Materials and New Production Technologies', 'Environment ', and 'Transport ', which provide budgetary support for the programme. It is clear that the FCH JU has contributed to research in energy and transport and to some extent in environment. At inception, transport was the first priority[1] and the FCH JU has certainly helped demonstrate the technical feasibility of FCH for depot-based operations and somewhat less for other transport modes, as noted earlier in Section 3.1.1.

Even if transport underpinned the initial vision, energy applications were always prominent in the programme of the FCH JU, although perhaps some aspects were under represented. There is little evidence that the activities have made as yet a significant impression on energy policy. Developments within the wider energy sector, and in particular the increasing difficulty of coping with large volumes of intermittent generation from renewable sources, have led to renewed interest in hydrogen storage as a means to cope with the longer-term outages of renewable plant. Effective support means improving hydrogen production, stationary generation and to some extent distribution. Consequently, much of the wider agenda around hydrogen as an important energy vector is being revived. Even if FCH JU can show few concrete results, it has provided an effective forum wherein industry and research interests can debate the possibilities of responding to the challenge and can establish a practical research agenda.

The direct impacts of the programme on the environment theme are less obvious, although the environmental benefits through the transport and energy policies are potentially considerable. The IEG notes that there are few performance indicators (both at the level of projects and at the level of the programme) measuring the environmental impact. The FCH JU has financed a Life Cycle Assessment (LCA) methodology appropriate to hydrogen production, transport, conversion and use, and this is a commendable recognition of the importance of environmental impacts in commercial deployment, but it is essentially an adaption of a well-known approach to environmental management and does not represent a significant support to the environment research theme. In general there is little clarity on the interactions between the research programmes within FP7 and the FCH JU, how they are achieved and to what extent results from one programme are made available or disseminated to the other

[1] EU. (2007). Commission Staff Working Document Accompanying document to the Proposal for a Council Regulation setting up the Fuel Cells and Hydrogen Joint Undertaking; Impact Assessment, SEC(2007) 1272. Official Journal

programmes. This is a general consideration for FP7, but it is exacerbated by the slightly detached nature of the JTIs.

Linkages with the theme of 'Nanosciences, Nanotechnologies, Materials and New Production Technologies' (NMP) have to be considered in a different way from the linkages to the policy-oriented research themes where the FCH JU is delivering (or is likely to deliver) useful support. In the case of NMP, materials research is an input into the fuel cells and hydrogen business. The road map for materials for energy technology developed for the SET-plan identifies a range of basic research needs, but does not identify whether they should be performed in the JTI or within NMP[1]. Several stakeholders consulted by the IEG argued that basic research needs in the sector are not being sufficiently addressed because the JTI is focused on market application and the NMP programme assumes the work will be done in the JTI. In this respect the linkage with FP7 does not work well.

Members of the Scientific Committee were especially concerned that interactions with NMP and other relevant programmes of research should be improved. It is also desirable to build good relations with a range of relevant European activities in particular the SET-Plan, the JRC, the Future Emerging Technologies Programme, the KIC InnoEnergy within the European Institute of Innovation and Technology (EIT), and the Research Infrastructure Support Programme. The Research Grouping and in particular the Scientific Committee could be fruitful agents in creating these relationships and could together map the on-going efforts in fundamental research and the areas that might be deficient. Participation of Commission would be needed for activities within the Framework Programme.

The original aim of the FCH JU was that the proportion of basic research should diminish progressively as the activity shifted increasingly closer to market and there is a strong rationale for the promotion of pan-European demonstration, but this is no reason to exclude basic research. The position paper of N.ERGHY notes that basic research (and research institutes) "close the loop and integrate feedback from demonstration projects to develop new ideas and guarantee a connection between the achievements from national, European, and international programmes outside the EU". Other evidence to the group stressed that the reduced costs necessary to make a business case could not come from mass-production alone; it depends also upon better technology generated by basic research. The IEG concurs strongly with this view. The approach of the DoE in the USA is to maintain a certain proportion of the budget for basic research. That may be a sensible policy for the FCH JU also and it would have the advantage of avoiding the uncertainty that is created by funding large and small projects from within the same Call budget.

A better articulation of the activities of the FCH JU with "Advanced Materials" and with "Advanced Manufacturing and Processing" and with other relevant basic research should be sought.

A portion of the budget (perhaps six to ten percent) should be ring-fenced for basic research and coordination sought with relevant aspects of the Framework Programme.

[1] EU. (2011). Commission Staff Working Paper: Materials Roadmap Enabling Low Carbon Energy Technologies. SEC(2011) 1609. European Commission.

3.2.2. Enabling market breakthrough

A specific objective of the FCH JU was to place Europe at the forefront of fuel cell and hydrogen technologies worldwide and to enable the market breakthrough of fuel cell and hydrogen technologies, thereby allowing commercial market forces to drive the substantial potential public benefits. The FCH JU has succeeded generally in maintaining Europe in a satisfactory position compared to international competitors, but the positioning varies by application areas. There is a strong case that Europe should focus on applications where it has a lead over the international competition, which would probably mean mobility and, in the medium-term, hydrogen production and storage. Europe has gone further than others in accepting intermittent power onto the grid and therefore the need for large-scale storage is more evident than elsewhere; this should be a spur to achieve leadership.

Despite creditable improvements in performance and cost reduction, market breakthrough has not been achieved, except in a few niche markets. A few actors in the business are now profitable, but most manufacturing companies are not. It is uncertain whether this will change over the period of H2020. In mobility the technical performance is largely proven, but the commercial case is not yet strong. The main difficulty is the high cost of the fuel-cells and fuel and the risks of moving first. A mass roll-out may reduce unit costs, but this seems unlikely soon without robust and sustained intervention by public policy.

There are several examples documented by N.ERGHY of successful business initiatives fostered through the FP7. A common obstacle to innovation is the difficulty of finding venture capital for start-up companies. It would be inappropriate for the FCH JU to supply venture capital directly as it does not have the capacity to perform the proper due diligence, but joint activities along this line should be pursued in conjunction with the EIB Risk-Sharing Financial Facility (RSFF)[1]. One possibility is to request calls for proposals to define investment projects with innovative funding schemes in which the EIB can play a role. There is some precedent here in the Intelligent Energy Europe (IEE) Programme[2] that has linked activities with the European Local Energy Assistance (ELENA) project of the EIB, an initiative to help local and regional authorities to prepare energy efficiency or renewable energy projects[3]. The proposed regulations for Horizon 2020 would seem to permit it as they include that, "provisions from the debt facility may be combined, with the possible addition of grants (including lump sums), with provisions from the equity financial instrument in one or more integrated schemes[4].

A serious potential impediment to deployment that the FCH JU can affect directly is the absence of European or International Regulations, Codes and Standards. Progress with these has been slow and is clearly an area where there is European Value Added, where public and private interests should both be involved and where a single European voice on the international scene is necessary. Unfortunately there is little incentive for participants to contribute to such work as it is a public good and they will perceive greater advantage in work that build up their own IPR. The FCH JU should seek to develop alternative means to pursue this goal, in cooperation with the JRC for whom it is a part of their mandate. The IEG understands that the JRC did draft a RCS strategy for FCH JU, but this was never officially formalised because of opposition by parts of the Industrial Group. Subsequently the JRC has included some elements of the topic in its own institutional work programme.

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[1] Evaluation of Activities under the Risk Sharing Finance Facility (RSFF), EIB April 2010
[2] Intelligent Energy Europe, Call for Proposals 2013.
http://ec.europa.eu/energy/intelligent/files/call_for_proposals/call_2013_en.pdf
[3] The European Investment Bank: ELENA – European Local ENergy Assistance,
www.eib.org/attachments/thematic/elena_en.pdf
[4] EU. (2011). Proposal for a Council Decision establishing the Specific Programme Implementing Horizon 2020 - The Framework Programme for Research and Innovation (2014-2020), COM(2011) 811

3.2.3. Coordination with Member States and Associated countries

A second objective set out in the regulation is an obligation to support RTD in the Member States and Associated countries in a coordinated manner to overcome market failures and help develop market applications, thereby facilitating additional industrial efforts towards a rapid deployment of fuel cells and hydrogen technologies. Part of this objective is beyond the powers of the FCH JU. There is a large gap between the economic and financial analyses of the technology; the economic analysis includes the benefits of lower harmful emissions and improved local air quality, and the benefits of climate change mitigation. The cumulative effect of these external costs over several future decades is immense, but difficult to quantify and not adequately represented in the business case. This market failure cannot be influenced by the FCH JU directly; it can only be affected by public policy and it would not be therefore fair to criticise because the principal market failure persists. Policy DGs within the Commission need to provide greater clarity and visibility of public policy for FCH related activities. The NEW-IG has prepared a technology outlook for the FCH business in Europe over the period 2014 to 2020 in which many appropriate instruments are listed and examined[1]. The main ways in which the FCH JU can work upon market failure are to improve the technology, disseminate knowledge and reduce perceptions of risk through demonstrations at scale. This it has done, although there may be room for a better consolidated reflection on the results and a more effective dissemination.

The coordination with Member States and Associated countries was thought to need improvement by most of the interests consulted. Good coordination with national programmes is essential if overall resources are to be used effectively. To complement the interaction through the SRG, the FCH JU has instituted direct contacts with countries with national FCH-programmes. This appears to provide a better coordination for alignment and effectiveness than SRG, but has the disadvantage to further undermine the SRG. Some Member States have programmes to supplement grants for participants in JTI projects or to encourage national companies to cooperate with on-going JTI work and there is surely also some passive adaptation of national programmes to the expectation of work to be performed in the JTI, but there is no clear, transparent, overt alignment. If the lack of effective cooperation continues then the consequences will be increasingly serious as the emphasis shifts more to deployment where Member State involvement is essential.

The main concerns from outside the SRG are that it has not made much progress in aligning or coordinating national programmes with those of the JTI and that some members of the SRG do not appear to hold positions where they bring comprehensive knowledge of national research programmes or research policy and do not have access to higher levels of government decision-making. The criticism from within the SRG derives from its limited mandate that assigns the group no executive role and consequently does not appear to require the attendance of high-ranking officials. A sense of frustration was detected by the IEG; some members of the SRG feel that their advice is sought and given, but that there is no apparent effect or subsequent feedback. This is to some extent a natural consequence of their advisory role.

Regardless of the merits of the case on either side, it is clear that the arrangement does not work well and needs to be changed. The mandate of the SRG needs to be strengthened if it is to be seen to deserve more attention from Member states. The tasks of SRG could be aligned with those of MS representatives in the SET-Plan Steering Group; one of those tasks is to contribute to technology monitoring and assessment; it has also an important potential to advance deployment activities. Better

[1] Fuel Cell and Hydrogen technologies in Europe. Financial and technology outlook on the European sector ambition 2014-2020. New Energy World Industrial Grouping (New-IG)

ways to coordinate the funding of the EU with those of the MSs should be found, but the task is not easy. The most important area for co-funding is in demonstration. One possibility proposed to the IEG is to allow conditionality within Calls, whereby a Member State could offer to provide co-funding if the project were to be implemented on their territory. The IEG understands that within the SET-Plan there are also discussions on co-funding[1].

The ERA-NET+ instrument was established specifically to address the difficulties of co-funding within the European Research Area (ERA). The RG and the Programme Office are exploring the option of developing activities under the ERA-NET and ERA-NET+ rules that are designed to stimulate cooperation of EU and national research programmes. These instruments were introduced in FP6 and FP7 respectively and will be continued in H2020. Other parts of the organisation appear to be reticent about the idea (GB, IG, SRG) and have not apparently been proactive in these discussions. It would not be the first use of the ERA-NET instrument for FCH; the HY-CO ERA-NET was created in 2002, but closed in 2008 and from the web-site does not appear to have been very active[2]. Since 2009 FCH activities are no longer eligible for ERA-NET funding as the area is presently considered to be adequately covered within the FCH JU[3], but the IEG understands that this is under discussion. On balance the IEG believes that use of the ERA-NET + instrument could be beneficial, but care should be taken to ensure that the topics are clearly aligned on the MAIP.

For significant activities, in particular for demonstrations, the regions and municipalities are important MS interlocutors. Participation of regions in the present programme appears to be good; they are prominent in the demonstration projects, but past demonstrations have involved few vehicles and could be based on a coalition of individual, interested regions. If the emphasis of effort should now shift to large-scale roll-out of vehicles in several regions, or provision of infrastructure over contiguous regions, then strong advocacy within Member States may be needed. Similar coordination is also desirable in the scale-up of stationary applications. It would helpful if structural funds could be deployed in support of infrastructure investments and these are controlled by Member States and/or regions. The arrangements for the disbursement of structural funds from 2014 onwards are yet to be finalised. The IEG recommends that hydrogen infrastructure be made eligible within the new National Strategic Reference Frameworks. The TEN-T is another possible source of complementary funding; the revised TEN-T guidelines[4] and their financial instrument, the Connecting Europe Facility[5], permits grants or financial instruments to support *inter alia* the deployment of hydrogen infrastructure[6].

HyER has attempted to initiate collaboration with the SRG and with the FCH JU, and has occasionally been invited as an observer to meetings of the SRG and the GB, but there seems to have been no concrete consequence. Hydrogen-fuelled vehicles for public transport will only be deployed if they meet the plans and expectations of the regions and the FCH JU should make more effort to determine these expectations and to respond. In the future a strong cooperation with regions will also be necessary to obtain planning and other consents for the development of hydrogen storage and the integration of hydrogen more generally into national energy systems.

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[1] EU. (2013). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Energy Technologies and Innovation. COM(2013) 253.
[2] www.hy-co-era.net
[3] Annual Work Programme. 2013 Cooperation Theme 5: Energy. ec.europa.eu/research/participants/portal/download?docId=32765
[4] European Commission, COM(2011) 650 Proposal for a Regulation on Union guidelines for the development of the trans-European transport network
[5] European Commission, COM(2011) 665 Proposal for a Regulation establishing the Connecting Europe Facility
[6] A first project has been funded in 2011: Hydrogen Infrastructure for Transport, http://www.hit-tent.eu/

Member States involvement with the programme must be strengthened. The mandate of the SRG need to be upgraded to cover strategic functions including a proactive role in the choice and design of large-scale projects and a formal obligation to participate in technology monitoring. The flow of information to the Group needs to be improved.

Members of the SRG should be actively engaged in government research and/or industrial policy in their countries rather than representatives of research institutes, which are adequately represented through the RG and Scientific Committee.

Innovative solutions for co-funding through conditionality within Calls for demonstration projects should be explored. If feasible, the EU institutions should introduce within the legal basis for the continuation of the FCH JU the possibility of establishment of ERA-Net and Era-Net+ activities. Such activities should be clearly aligned on the MAIP.

The FCH JU should develop a constructive relationship with regional representation, particularly HyER to align closely FCH JU programmes with regional and municipal requirements for mobility.

The FCH JU should prepare to facilitate developers by providing advice on available financial options from EU institutions, including the EIB, Structural Funds and TEN-T loans and grants; calls for preparation of fundable projects should be considered.

Policy DGs within the Commission need to provide greater clarity and visibility of public policy for FCH related activities (e.g. zero emission vehicles, energy storage).

The Commission should investigate whether Hydrogen infrastructure can be made eligible for funding within the new National Strategic Reference Frameworks for Structural Funds.

3.24. Support for the RTD priorities of Fuel Cells and Hydrogen

The main operational objective of the FCH JU as specified in the regulation is to support the implementation of the RTD priorities of the JTI on Fuel Cells and Hydrogen, notably by awarding grants following competitive calls for proposals. In the mechanics of this process the FCH JU has been generally effective. The development of a strategic agenda and the translation into the MAIP and its subsequent revision has been proved to work. The arrangement to generate the AIPs through interaction between the IG and the RG has worked reasonably well, although there is scope for improvement that is discussed in the section on efficiency. There is a creditable involvement of SMEs. Calls have been successfully organised and implemented. Evaluation has been well-performed. Financial auditing of projects is apparently acceptable. Some weaknesses in the monitoring and assessment of projects and in the progress of the programme are discussed below under the heading of efficiency.

3.2.5. Stimulation of public and private investment in research

The last of the objectives specified in the regulation is to encourage increased public and private investment in research in fuel cells and hydrogen technologies in the Member States and Associated countries. The establishment of the FCH JU was expected to trigger from the industry an additional investment of 600M€ in RTD on top of their in-kind contribution to the FCH JU[1]. The benchmark study of present trends in investments in the sector found that a majority of the 153 companies surveyed had increased their investment in research and development as a consequence of the existence of the FCH JU[2]. Table 5, based on the results of that study, indicates that almost 60% out of 150 companies surveyed had increased their R&D budgets as a consequence of this "existentialist" effect; 36% reported an increase of more than 10% annually since 2007. This amounts to a volume of funds in excess of the original undertaking; stakeholders have reported € 1.5 billion of expenditures in R&D and in market introduction during 2011 and 2012 alone.

Table 5 Effect on R&D expenditure on industrial stakeholders of the existence of the JU

Effect on R&D expenditure	< -20%	-20% to 0%	No change	0% to 20%	>20%
Share of respondents	3%	5%	26%	27%	32%

The IEG notes also that the FCH JU has succeeded, albeit painfully, in achieving a matching expenditure in kind by beneficiaries. The matching rule has proved a problem, but one unintended consequence is that the matching of expenditure has been achieved within a greater volume of research work than was foreseen, because funding rates are lower than was expected. The vote of confidence from the European institutions implied in the establishment and funding of the JTI has encouraged industry and others to continue working in the field despite occasionally discouraging signals that market penetration was more distant than anticipated and through periods of economic turmoil.

3.3. Efficiency

3.3.1. Project coordinators' Survey

As part of the investigation of the efficiency of the FCH JU the IEG conducted a survey of project coordinators' to determine their views. The main results of the survey are in Annex 8; this section summarises the salient points.

Forty-six replies to the survey were received out of the eighty-three coordinators to whom questionnaires were sent. The responses were noticeably clustered by country (more than 50% came from just three countries - Germany, Italy and France) and by type of organisation (65% were research centres and less than 10% were from large business). The application areas were well covered, but mainly through research and technological development rather than breakthrough research or demonstration. Questions were put on the administration of the programme, project management and programme design and implementation.

[1] EU. (2007). Commission Staff Working Document Accompanying document to the Proposal for a Council Regulation setting up the Fuel Cells and Hydrogen Joint Undertaking; Impact Assessment, SEC(2007) 1272. Official Journal

[2] Expected http://www.fch-ju.eu/page/publications, 2013

The judgement of the coordinators on the administration of the programme was favourable. In all aspects addressed by the questionnaire the respondents found the FCH JU to be either "much better than average" or a "little better than average" compared to FP7. In some cases such as "clarity of the call", "advice at the preparatory stage" and "response to questions during implementation" the appreciation compared to FP7 was especially strong. The most surprising statistic was that seventy-eight percent found the "time to grant" to be better than with FP7 even though the facts suggest otherwise. This may reflect the low representation of large demonstration projects among respondents as it is particularly this kind of project where the time-to-grant is long. Many replies offered no opinion of the "fairness and appropriateness of financial auditing", probably because they had not been audited; of those that replied the large majority found it better than FP7.

The responses on project management showed a similar strong appreciation of the FCH JU. Ninety percent of respondents thought that the expectations of project management were clearer than under FP7 and the performance of the FCH JU was judged significantly superior in all but one of the other aspects addressed by the questionnaire. The exception was the clarity of funding where opinions were finely balanced; this presumably reflects the uncertainties caused by the matching rule. For the responses on programme design and implementation, ninety-five percent thought that programme objectives were clearer than with FP7 and ninety percent assessed the Call and the criteria for evaluation to be clearer. There were again some questions where a significant proportion of replies offered no opinion, in particular on the "fairness and helpfulness of mid-term evaluations" and the "help with dissemination". It is probable that many projects had not yet been evaluated or reached the stage of dissemination.

These results indicate that the performance of the FCH JU in administration of the programme, project management and programme design and implementation is much appreciated by users and in many respects is found to be better than under FP7. It is possible that as the respondents benefit from the FCH JU, they have concern for its future and exaggerate its merits, but in the view of the IEG, this is unlikely to be the full explanation and there are underlying structural factors that are more important. There can be many hypotheses about the causes of this out-performance, but the IEG does not have the means to distinguish them. It is clear though that out-sourcing of project management can be well received by users. If out-sourcing is to become more prevalent under H2020 then it might be useful to deepen the analysis better to understand the factors that make for success.

3.3.2. Overall Performance

Several interviewees indicated that the FCH JU is more bureaucratic and the administrative load is higher than was initially anticipated. The coordinator survey suggests that the negative aspects of the FCH JU as frequently perceived (poor and unpredictable funding rates and a long time-to-grant) are of less concern to coordinators than might be expected. The matching rule as currently enforced is responsible for the poor and unpredictable funding rates and this will disappear in any continuation of the FCH JU; it is also a contributory factor to the long time-to-grant, so this delay should be reduced. Without the matching rule it is unclear how industry will demonstrate its commitment to the scheme. Joint commitment is an important part of the philosophy of a PPP and its absence would be disquieting. The IEG understands that in the Clean Sky JU, verification of a comparable commitment is achieved by audits performed at three levels: inside the Members´ organisation, by the JU on the basis of documents provided and by an ex-post audit of members´ expenses against the specified model grant agreements for members. This would be difficult to implement for the future FCH JU because of the numerous stakeholders and would impose a disproportionate administrative burden.

The general principle of matching industrial expenditure should be preserved in any public private partnership, even though the explicit implementation of the matching rule is dropped. The Commission should propose a mechanism to demonstrate that the industry has adopted "stretch" targets for its own research expenditure in keeping with the matching principle without imposing a disproportionate administrative burden.

3.3.3. Better allocation of resources

There are twenty members of staff in the FCH JU, but the direct management of the research programme comprising 131 projects is carried out by five project officers plus the Programme Head of Unit. Given the complexity of the process, the high technical level of the work and the large number of projects this is very commendable. In terms of cost, 40 M€ out of 940 M€ of the budget is allocated to running costs, although current figures show that actual expenditures will most probably be around 8%-10% less, at about 32 M€. It is difficult to compare this figure with FP7, because the officers engaged in programme management within DG RTD are involved also in policy work. The IEG understands that a detailed investigation conducted during the Impact Assessment of the FCH JU concluded that the administrative cost to the EU was comparable to FP7, i.e. the cost to the Community is similar as long as the beneficiaries pay half.

Taken together these figures suggest that at individual level, as measured by projects managed per person, the FCH JU is efficient, but that at institutional level it is inefficient, because of high overheads. It is unclear why on average two to three people are needed to manage and support one project officer. Many interviewees remarked on the disproportionate allocation of staff between project management and general administration. The high overheads are partly explained by the small size of the organisation and an apparent need for autonomous services in administration, legal affairs, human resources, accountancy, information technology, auditing, procurement and communications. Given that there are other JUs co-located with the FCH JU it might be hard to justify this extent of autonomy; significant savings might be achievable by sharing services. Financial auditing could be brought back into the specialised Commission services, but it would have significant implications for the independence of the FCH JU as the Commission would have to be made legally responsible for the discharge rather than the Executive Director.

The proposal to share horizontal services has been examined by the JUs over the past few years. The IEG understands that they have concluded from their detailed investigations that sharing of facilities is more difficult than it might appear and that there are benefits from a small tightly knit organisation where functions are in close physical proximity. The FCH JU has suggested that efficiency could be improved more easily by authorising more flexibility in the organigramme and function descriptions. The IEG sympathises with this view, but believes that some synergies in administrative services (e.g. recruiting, procurement, etc.) are achievable and should continue to be scrutinised and exploited where feasible.

Resource savings should be sought from a sharing of functions with other JTIs and by seeking greater suppleness in the organigramme and function descriptions. Future structures for all JTIs should seek to maximise synergies in common services and focus activities on core functions, allowing a greater share and volume of resources to be directed to programme management and to technology assessment and monitoring.

3.3.4. Internal decision-making

The present relationship between the Governing Board and the Executive Director is cumbersome. The overall responsibility for the management of EU funds falls on the Executive Director, but many decisions require the authorisation of the Governing Board, even small decisions and decisions that the Governing Board does never reverse in practice (e.g. the selection of projects by the evaluation). The IEG suggests that the Executive Director should be assigned a greater executive authority to adjudicate conflicting interests and to rationalise and speed up decision-making. The IEG notes that in the Clean Sky JU, the director has delegated authority to sign contracts up to a predefined level for matters related to administrative expenditures, but not grant agreements. A further delay arises from the Commission procedure; Commission services have 5 seats out of 12 in the Governing Board, but its position on issues is indivisible and is by prior inter-service consultation that takes time. The arrangement is understandable, but is also not conducive to efficient decision-making. The status of the FCH JU as a Community body also restricts its possibilities in recruitment and procurement.

Internal decision-making was described by several interviewees as excessively influenced by vested interests and a desire to protect existing research areas, rather than a genuine search for a common programme that builds on Europe's greatest strengths. Specifically, some commentators allege that often the MAIP and AIP are the accumulation of individual company and institute interests and not a true reflection of needs. The RG has suggested joint workshops with the IG to allow for a greater exposure of conflicts and a better means of resolution.

In the case of the SRG and the SC, their complaint is that on occasions they see documents too late to make properly considered suggestions for amendments. There are also interested third parties, whom there is no obligation to consult, but that could benefit from a more timely flow of information, e.g. HyER that may need time to build a convincing coalition of regional interests.

The IEG considers that the time to grant is too long. A breakdown of the steps involved suggests that the main additional delays compared to FP7 are in the period from the end of evaluation to the start of negotiations and the negotiations themselves. The IEG understands that there is a proposal to introduce legally binding targets for time-to-grant in Horizon 2020, which would de facto be applied to the FCH JU. The IEG supports this proposal; targets could be tightened from year to year, from say 300 days in the first year of operations down to alignment with H2020 best performance.

3.3.5. Monitoring of projects

All parties, including the Programme Office, agree that the monitoring of progress within the programme needs to be improved. The consequences of inadequate monitoring are that: it is hard to know whether the results of research justify the effort put in; it is unclear whether results represent progress towards the objectives of the MAIP and they cannot be used effectively to construct new AIPs or to update the MAIP when necessary.

The first evaluation noted the absence of an adequate system for portfolio management and technology assessment. The Programme Office had requested proposals for such a tool in the 2009 call, but no satisfactory proposal was received. In a subsequent Call, a contract was signed for a technology assessment and monitoring software tool known as TEMONAS (TEchnology MONitoring and Assessment). The project was completed in February 2013; the next stage is to deploy this tool in a correct management framework for reporting and introducing data.

Whatever management solution is found, the perceived confidentiality of many of the results of research work will hinder effective monitoring. Most interviewees, including members of the IG, accepted that the high level of confidentiality of results hinders the progress of the programme and is to some extent unnecessary. The problem arises in part from a lack of clear requirements about the desirable dissemination level of project results in the call text, coupled with the absence of any visible penalty in evaluation if disclosure is insufficient. In such circumstances the low-risk option is to declare deliverables to be confidential. On the other hand, it is reasonable to expect in programmes partly funded by public money that there should be enough disclosure to enable monitoring of the programme and adjustment of the priorities. There are two issues: how to deal with data from past projects that have been produced under terms of confidentiality and how to deal with new projects to avoid the same thing happening again. Remedies can be applied at the level of the Call, by requiring a minimum level of disclosure, but also during evaluation and negotiations; it should be a responsibility of the evaluator to suggest greater disclosure and to the project officers to negotiate and implement if it appears justified. The FCH JU might also investigate the use of "clean rooms[1]" for the management of confidential data; this technique was used in the production of the benchmark reports and appears to have been successful. The JRC might provide added value in this context by virtue of its independence, impartiality, expertise and the fact that it is a Commission internal service

Although the restrictions of confidentiality were perceived to be a serious constraint by most of the people interviewed, there was a minority view that this was not the case; the important deliverables are defined as public during negotiation and the obligation incorporated into the consortium agreement. In this view the main difficulty is that project officers have no time to follow up or to analyse results and to disseminate them to other stakeholders.

The FCH JU should implement an effective technology monitoring procedure as soon as possible and ensure under H2020 that there are sufficient resources to use and maintain it effectively.

Future proposals should be obliged to include a list of publishable key performance indicators (KPIs) and to report on the extent to which those indicators have been achieved. The evaluation should take into account the extent of public disclosure; proposals with higher levels of disclosure will be preferred.

The rules governing the provision of information about the programme to various stakeholders (Scientific Committee, SRG, Commission services) should be reviewed to determine whether the JU can disseminate more within a proper interpretation of those rules. If this is not possible then the rules should be modified appropriately for H2020.

Existing projects should be encouraged to post hoc disclose some of their results. The FCH JU should introduce "clean rooms" for this purpose

[1] A clean room is a physical or virtual space wherein confidential data is processed to remove signs of origin; it serves to protect the IPR of participants whilst making consolidated information available to others

3.3.6. Communication

The IEG heard a range of criticism of the communication of the FCH JU with other parties. There is little guidance from the Regulation about the responsibilities of the FCH JU in this respect, except for the requirement to convene the Stakeholders General Assembly. The view of the FCH JU appears to be that it is primarily a programme office and there must be limits on what resources it can attribute to communication. Some specific criticisms are that the FCH JU does not effectively:

- Feed results from projects back into programme design
- Communicate usefully and in a timely fashion with the Scientific Committee, Members States and regions
- Provide the Commission with sufficient information properly to monitor progress against objective
- Provide sufficient support to community policies
- Stimulate knowledge and support for the FCH technologies among the public
- Advocate FCH technology at political level

The first three of these concerns relate to internal communication within the FCH JU family; the second group relate to external communication.

3.3.6.1. Internal communication

The SC, the SRG and HyER remarked independently to the IEG that they were not informed sufficiently early of the critical steps in programme management for them to contribute effectively, whether to the elaboration of the AIP, to the coordination with national programmes or to the creation of regional interest in forthcoming Calls. The IEG recognises that the FCH JU has a tight annual time-table that compromises its capacity to keep all interested parties fully informed, but it seems also that it has a restrictive approach to the release of information, seeking only to divulge what it absolutely must rather than what it can. This strategy should be reviewed.

The Programme Review provides an opportunity for review not only of individual projects, but also of the overall programme. This is a good process; the reports of the Programme Review are public and the use of members of the Scientific Committee to provide consolidated reviews of progress across the application areas is commendable. The effectiveness of the process as a mechanism of quality control is limited by the quality of the presentations which is variable. Some are excellent and go into good detail; some are more reticent and superficial. It would be helpful to design and impose upon contributors a template for presentations that obliged a higher level of disclosure. For future projects this can be linked to the earlier recommendation to oblige consortia to identify publishable KPIs in their proposals and to report on progress towards those KPIs on a regular basis.

The Governing Board has a responsibility to monitor the performance of the FCH JU and to ensure that the output genuinely contributes to social and economic welfare. For this it needs good, timely information on Calls, results of calls, project evaluations, results and their implications for the status of the FCH business and wider policy and social goals. There are some signs that this timely and adequate provision of information is not yet in place. The matter is closely linked to technology management and assessment; more project officers are needed for the sensible management of knowledge in the interests of better policy, better feedback to research, better market positioning and better monitoring of the public interest dimension of the work of the FCH JU.

3.3.6.2. External communication

The FCH JU should strive to be the most authoritative source of knowledge in Europe for FCH amongst policy-makers, developers, researchers and the general public. The visibility of the FCH JU should be greatly improved and the website needs to evolve to reflect this ambition.

In terms of policy support, the first stage processing of data by means of a tool for knowledge management and technology assessment should be done by the FCH JU. Subsequently, the use of the information to support policy design, implementation and monitoring should be the responsibility of the JRC and the Commission services (see subsequent section). Recognition of this principle does not stop the FCH JU preparing benchmark reports and similar materials and it does not stop the policy DGs having direct contact with the FCH JU. There is a need for an integrated research and innovation chain at EU level that spans from basic research to market roll-out; the systematic sharing of information between actors and along the chain is addressed in a recent Communication from the Commission[1]; the FCH JU needs to be well-linked into the process.

There was some indication that the link to policy support at DG MOVE needed to be strengthened. Project officers in DG MOVE typically spend most of their time on policy issues and about 10-20% of their time on the management of large projects with a direct link to policy. There is therefore a natural tendency for DG MOVE to source policy support from within their services. A more joined-up approach between DG MOVE and the FCH JU may be needed, enhancing incorporation of evidence into policy making from FCH projects as they start to deliver results.

The Stakeholders General Assembly serves to inform post hoc the wider community. It appears to be well-organised and successful; it is well-attended and attendance is growing year by year. The FCH JU has also engaged in a series of ad hoc activities including: briefings of Member State and Commission officials, and the European Parliament; contributions to relevant consultations and public relations events at conferences and exhibitions. It is doubtful that the FCH JU should do more to communicate directly with the wider audience than it does now. The scope of such dissemination is so wide and the needs of target groups are so distinct that a successful, comprehensive campaign is beyond its capacities. It could however do more to promote communication by others. The position paper of N.ERGHY proposes actions to: prepare teaching materials for students and awareness materials for the public; stimulate post-graduate training; improve innovation potential in business and exchange researchers. Two Support Actions with these objectives have already been launched and this practice should continue.

There is a distinction between contributing to an objective statement of possibilities and needs and participating in advocacy. For the FCH JU to engage in advocacy would entail compromise with its technical judgement and its position as a Community body. Advocacy should be undertaken by industry, or possibly a coalition of industrial, regional and research interests. It has been proposed to the IEG that the IG should engage in advocacy using funds from the levy that it imposes on members that have been successful under the Calls and that is used to pay the contribution of the IG to the administrative costs of the FCH JU. The proposition is that funds equal to the money presently spent by the FCH JU on communications should be retained and used to fund advocacy by the IG. Although disguised, such a transaction would amount to funds from the PPP being used for advocacy and this is not appropriate.

[1] EU. (2013). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Energy Technologies and Innovation. COM(2013) 253.

The FCH JU should strive to be the most authoritative source of knowledge in Europe for FCH. The visibility of the FCH JU should be greatly improved and the website needs to evolve to reflect this ambition.

3.3.6.3. The relationship to the JRC

Within FP7/H2020 direct actions the JRC implements activities linked to their overall mandate. These "reference activities" constitute nominally 80% of the JRC budget, and the additional 20% stems from competitive income from non-FP7/H2020 sources. The Framework Agreement between FCH-JU and JRC specifies particular activities that the JRC delivers at no charge from its institutional budget. There appears to be no firm definition of a "reference activity", but in general terms it is an activity that depends upon the impartiality and independence of the JRC in areas of its S&T competence. Technology monitoring fits the concept of a reference activity and JRC already makes such contributions to the technology maps for different low-C energy technologies within SETIS. Support to RCS is also a reference activity and is already provided by JRC to FCH-JU, whereas support to technology monitoring and evaluation is not. The JRC work for the FCH JU under the institutional budget has to compete with other demands. The IEG understands that at overall JRC level there is no prioritisation of technology evaluation and monitoring activities, although there is for European and international standardisation. The limitation in the support that JRC can provide derives therefore not from any legal principle, but from normal budgetary constraints. Further involvement by JRC in both technology monitoring and RCS could in principle also be financed by FCH-JU directly, but possibly it might be reluctant to do this.

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The JRC involvement in the evaluation of deliverables from the subcontracted benchmark studies, as for all other policy-relevant outputs, would be beneficial. As noted earlier, MS have to be involved in technology monitoring and assessment. The model of technology monitoring and assessment of the SET-Plan EIIs may be applicable to FCH-JU. The mandate of SRG should then be designed to reflect the arrangements for the Member States in the SET-Plan governance.

The JU should be responsible for the examination and treatment of project results to provide an accurate description of the achievements of the programme. This should be made available to the JRC to discharge its obligations under the SET Plan and more widely for policy support.

The procedures for incorporating scientific evidence into transport and energy policy should be transparent and effective and be consistent across the sectors.

The JU should support actions to engage, educate and train stakeholders beyond the immediate FCH Community and should engage the SRG in this process.

The FCH JU should oblige presentations at the Programme Review to meet certain standards of disclosure as set out in a mandatory template. For future projects this can be linked to the recommendation for a mandatory set of publishable KPIs in proposals

3.3.7. Reacting to change

The FCH JU has apparently had difficulty to adapt to changing circumstances. Several interviewees noted that it was difficult to modify the priorities of the original MAIP, established when circumstances were significantly different from the present. The distribution of initial funding was established in the MAIP of 2007 and undisturbed by the later revision. For example, despite a recognition some years ago on the need for more work on hydrogen production, this has not been reflected in the subsequent programme. It is not obvious where this rigidity originates; the procedures for change exist, although they may be onerous. The main difficulty may be in upsetting a balance between competing interests that has been achieved through a painful debate that participants are unwilling to reopen. External stakeholders as represented by the SC and the SRG are formally involved in reviewing the MAIP and AIP, but in practice they receive the documents too late to have a material impact and the effectiveness of their input is limited by the confidentiality of some critical results, that makes it hard to know for the Committee to determine what should be the main future emphasis. The SC does comment and members feel that they have some modest influence. The SRG appears not in practice to comment. A wide range of stakeholders is involved in the Stakeholders General Assembly and Review Day, although it is unclear that their comments have any influence.

The Scientific Committee has recently contributed to the Review Day by improving the templates of the presentations to be performed by the project coordinators, by acting as reviewers and by the provision of summary reports by application area and this also strengthens the ability of the Committee to comment on programming. It is a positive innovation, but it seems that the resources of the Scientific Committee could still be more effectively deployed. The equivalent body within the Clean Sky JU appears to be more fully involved: its members are well engaged in the monitoring of projects; they have a working group on socio-economic implications; they participate in the reviews (as is the case with the FCH JU); they review the deliverables and have devised a process to scrutinise impacts of projects in terms of innovation, environment and competitiveness. This is a full and appropriate use of high-level academic resources.

The FCH JU should develop mechanisms to adapt more rapidly to changing circumstances. A closer integration of research and industrial interests should be sought in the design of the MAIP and AIP, perhaps through joint workshops that the SC, SRG, representative regional organisations as well as JRC could also be invited to attend, but it is also necessary to review the procedures for modification of budget allocations and to be better prepared to adapt to changing events. More effective feedback of results into the AIP and MAIP should be arranged.

3.4. Quality

3.4.1. The quality of work

The quality of research proposals can be measured by the marks awarded in evaluations; these are a little lower on average than marks for successful projects under FP7, but the difference is not large. As the evaluation process is the same and many of the evaluators are also experienced in FP7 evaluations, it can be deduced with confidence that the quality of successful projects is broadly comparable to FP7.
The universal view of interviewees interviewed by the IEG was that the quality of output from the research programme is quite acceptable, but it was also widely recognised that it is difficult to demonstrate this quantitatively. Projects are evaluated by independent reviewers at mid-term and at the end of the project. The experts were given access to a sample of the review reports on projects to have reached mid-term. It is hard to make judgements from a small sample but, apart from one project that has since been terminated, it seems that the quality is from good to acceptable and does not significantly different from FP7. An overall consolidation of the mid-term reviews at an aggregated level into the annual programme review might be considered.

It was suggested to the IEG that the FCH JU should arrange to continue to monitor the economic performance of demonstration projects after completion of the project. The IEG was informed that in the Netherlands and in Belgium the technical and economic performance is monitored for 5 years after the end of the project. Circumstances may be different in the EU programmes, but the idea is sound and ways to implement it should be sought.

3.4.2. Quality of participants

There is a general acceptance that the research programme attracts the best participants in Europe, with the possible exception of some SMEs. It was suggested to the IEG that a very few SMEs might not participate for fear of having to disclose intellectual property, rather more interviewees thought that some SMEs would not have a financial history that would meet the balance sheet requirements for participation. This might be compensated by the introduction of a scheme of financial guarantees.

There is little participation of EU12 within the programme. From a political perspective this is unsatisfactory as part of the function of FP7 is to create a European Research Area, to bring EU12 countries into the mainstream of European research and to strengthen and to deploy fully their capacities. There was some support for affirmative action to encourage participants from this group. The contrary view was that any intervention of that nature would be a compromise with the quality of research that could not be afforded in a programme aimed at creating vigorous, commercially viable business; this view was the more apparent. There is a case to be made that as the programme moves towards larger scale roll-outs of equipment and infrastructure that countries from the EU12 would be as well-positioned as others, but the argument seems weak; such projects will require large funding inputs from the host country that are only likely to materialise if there is a pre-existing interest. The FCH JU has made efforts to bring EU12 countries into the programme through visits and presentations and this should continue. There is also a possibility that EU12 countries could participate as learning partner to enhance their competence as is done elsewhere in EU programmes. There might be some resistance for consortia concerned about the preservation of IPR and means would need to be found to overcome this obstacle.

SME participation should be further strengthened through a scheme of financial guarantees as in the Framework Programme

3.4.3. Quality of programme design

The constraints on the programme from vested interests and confidentiality have been touched upon above, both in effectiveness and efficiency; they are detrimental also to research quality. The MAIP is the controlling strategic document and the AIP is the main implementing tool. As noted, it appears that they are not necessarily based in the best possible strategic overview. The obstacles are: many stakeholders do not have access to the data needed to comment; much is dictated by specific industrial interest; no mechanism exists to introduce or subsequently implement research in public goods that may be vital to deployment. The remedies proposed earlier in the section on efficiency are relevant.

4. SWOT ANALYSIS

Following the first draft of the performance evaluation and in order to place the assessment in a broader strategic context, the IEG performed a SWOT analysis (strengths, weaknesses, opportunities and threats). Following this analysis the recommendations and analysis of Section 3 were slightly modified to ensure the robustness and relevance of the recommendations to the future of the FCH JU. The SWOT analysis is shown in Table 6.

Table 6 SWOT analysis

STRENGTHS

- The basic principle of PPP in FCH research has been successfully demonstrated
- The FCH JU is established as a central element of the European FCH landscape
- FCH JU has proved a valid instrument to achieve agreement on a strategic research agenda and potentially efficient use of research budget
- Strong communities within the IG and RG have been created
- Ensuring a steady industry-led development towards longer-term targets through varying economic cycles
- Impressive mobilisation and pooling of resources and expertise
- Critical mass reached for the automotive application area
- Stable budget for long term development attracting private sector
- Strong stakeholder participation, especially industry involvement and RG cooperation
- Governance is in place and working
- Project management is perceived positively by projects coordinators

WEAKNESSES

- Burdensome administrative rules, regulations and controls
- Sub- optimal use of resources and inappropriate balance of scientific and administrative staff
- Project funding rates inferior to FP rates and unpredictable
- Lack of a guarantee fund to cover for SMEs in a weak financial position
- No coherent approach to stationary applications and early markets
- Lack of coordination with national programmes; uneven MS involvement and commitment to the FCH JU
- Insufficient adaptability to realign obsolete targets
- Little exchange between the FCH JU and the FP basic research programme
- Insufficient targeted communication and dissemination strategies and efforts and low visibility
- Insufficient monitoring and knowledge management at project, programme and policy levels
- The work on cross-cutting activities has not progressed well

OPPORTUNITIES

- Contribute to EU societal challenges identified in the energy, transport and climate change policies
- Create European lead in emerging field of high potential
- Create real alignment between regional, national and European initiatives
- Increase visibility triggering new entries and political support
- Promote best practices and enhance awareness of the technology for the public and policy makers across Europe
- Common vision building and communication to participants and beneficiaries
- Stimulate coordinated large scale deployment and capacity building of FCH technology
- Limitations of BEV might shift industry and political interest to FCEV
- Integration of large amounts of renewable electricity by using hydrogen as an energy storage medium
- Interaction with other industries can generate new opening for businesses incl. SMEs
- Synergies and interaction with other programmes along the whole value chain

THREATS

- Low energy prices and inadequate policy measures
- Shifting emphasis on EU climate, energy and competitiveness policy objectives
- Failure to attract necessary investments for the supplier and infrastructure industry
- Unsolved technical obstacles, especially for performance and cost
- Lack of EU competitiveness or lagging behind compared to Asia and North America in the near future
- Lack of openness of export markets (e.g. Asia)
- Failure to put in place the relevant incentives for market uptake
- Lack of political/policy support for FCH
- Low public acceptance by end-users due to incapability to communicate benefits to society and/or accidents
- Prolonged economic/financial downturn may cause loss of interest of the public and/or private sectors
- Breakthrough of competing technologies
- Uncoordinated and isolated demonstrations at EU, MS and regional levels without consideration for product development, marketability and capacity build up in a commercial product.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The FCH JU has successfully demonstrated the viability of the PPP concept for research in FCH. It has realised an adequate governance structure, created an effective dialogue between industry and research around a common strategic agenda, and has successfully implemented that agenda. The expression of a long-term political commitment by EU institutions that is manifest in the FCH JU, coupled with stable funding has given confidence to industry and helped the sector through the difficult times caused by a shifting emphasis to BEVs and the economic crisis. The FCH JU has helped to stimulate new relations including trans-national linkages between the public sectors and private sectors of different Member States and strong communities within the IG and RG. In the latter case, formerly dispersed actors have been brought together to formulate a collective position on research priorities and to debate that position between the two communities. The FCH JU continues to be relevant to the grand challenges facing Europe in particular it support climate change objectives, helps improve energy security and contributes to status of Europe as an international leader in technology upon which the competitiveness and welfare of the Union will depend in the future. The IEG recommends therefore that the FCH JU be continued under Horizon 2020.

The FCH JU has been largely successful in achieving the objectives assigned to it, is very relevant to the grand challenges of H2020, and should be continued.

A strict assessment of effectiveness against the requirements of the Regulation establishing the FCH JU shows a few deficiencies, but in some cases the objectives go beyond what might reasonably be expected. The requirement to support the various themes of FP7 has been only partially successful. The FCH JU has demonstrated successful depot-based applications of vehicles and to some extent has contributed to automobile applications, but its impact is limited in the latter case by the need for specialised infrastructure if a mass market is to develop. Concrete results pertaining to the energy theme are relatively few at this stage in the programme, and there is little sign of an impact on policy. Output in a second stage of the programme is likely to be more effective and better organised around the notion of energy storage and cost-effective end uses of hydrogen, which are vital issues for grid-balancing as the contribution of intermittent energy to electricity production continues to grow. It is obvious that there has been no market breakthrough and market failures have not been overcome, but it would be unfair to attribute this disappointment to the FCH JU. Technological developments as a consequence of the work programme have ensured that the market position is stronger than it was at inception and demonstration projects, particularly in transport, have strengthened knowledge of the technology among potential developers and reduced perceptions of risk, but it needs policy interventions and strategic planning by the competent authorities to deliver a real impact on policy and on welfare. The results of the programme do not at present have much impact on policy. In part this is because the activities are still at an early stage, but there are also signs that the tools, procedures and institutional responsibilities to convey results into scientific evidence for policy are not yet in place; these need to be clarified,

particularly the relationship between the JRC and the FCH JU. Better articulation with the work of policy DGs, especially ENER and MOVE, is desirable.

Although the governance structure is adequate it can still be improved. The main failings are the cumbersome decision-making and the unsatisfactory relationship with member states. Decision-making at the Executive level urgently needs revision. The Executive Director is severely constrained in decisions he can make without referral to the Governing Board; this causes long delays and impedes the timely information to stakeholders outside of the Governing Board. To a large extent the difficulties arise from the status of the FCH JU as a Community Body, which seems unlikely to change, but within these limitations there is scope to assign greater executive powers to the Executive Director and the IEG recommends that this be done. The main channel of co-operation with the Member States is the State Representatives Group and this does not seem to work well. The mandate of the group should be upgraded and should specify a requirement to conceive joint actions, through coordinating policies and programmes and to contribute to the creation of a European knowledge base in FCH technologies. The European Community Steering Group on Strategic Energy Technologies might be a useful reference. The FCH JU is efficient in its basic role of project management and its work is appreciated by project coordinators. Resources are not well allocated; the overheads are too high and should be reduced by *inter alia* a sharing of horizontal services with other JUs. The clear commitment of industry is essential to the notion of a public-private partnership. The present arrangements are unsatisfactory and will end this year. It is important to find a new sustainable, equitable and efficient mechanism. A legally binding commitment to demonstrate complementary inputs to the programme in terms of infrastructure and related research is a possibility.

The FCH JU is sometimes criticised for its low visibility and not being proactive in its communication, but it does have a huge challenge simply in its programme management and there is a limit to the resources it can directly assign elsewhere. Its priority in communication should be to support and accompany other agents that are better placed to disseminate information. It needs, as noted above, to provide a service in technology assessment, but it should rely on the JRC to translate those results to policy support. It should not act as an industrial lobby; this is the responsibility of the IG and it should not in any way be funded by the PPP. There is a diverse community of stakeholders that need information (municipal actors, universities, teachers, the public) that the FCH JU cannot efficiently deal with directly, but the PO should take actions to support others for this purpose. Finally, there is a need for a better delivery of information for the purposes of monitoring progress against goals.

The next stage of the FCH JU will require, in addition to conventional research projects, large deployment and capacity projects that coordinate many actors and multiple sources of funding along with skilful policy interventions. It is not at all clear how this to be done and what is the appropriate role of the JU. Large-scale demonstrations will require the support of Member States, regions, municipalities across an extensive, contiguous area. The funding requirements will be large and varied and should probably be met by some or all of: industrial sources, the FCH JU, EIB loans, the Risk-Sharing Financial Facility, Structural Funds, TEN-T grants and loans, grants from Member States, private and sovereign wealth funds. Vehicles and infrastructure will need to be financed and deployed. To overcome the extra financial cost compared to conventional options new policy instruments – including public procurement, risk-sharing financial instruments and other incentives – will also be needed. Such incentives may be partially justified by the need to overcome first-mover disadvantages. The FCH JU should prepare to facilitate developers by providing advice on available financial options from EU institutions, including the EIB, Structural Funds and TEN-T loans and grants; it should consider calls for preparation of fundable projects.

There is a concern shared by the IEG that the role of breakthrough-oriented research risks to be under-represented in future activities. The future cost-reductions necessary for market penetration depend as much on improved technology as upon mass-production. A portion of the budget should be ring-fenced for basic research and coordination sought with relevant aspects of the Framework Programme.

The quality of work done by the FCH JU appears to be comparable to that of the Framework Programme. The evaluation processes are carefully managed and the quality of the proposals is quite acceptable. Mid-term reviews are properly conducted and judging by the sample seen by the IEG the quality of the work on average is good. One project will be terminated, which is unfortunate, but it is a testament to the willingness of the FCH JU to act when quality is poor.

5.2. Recommendations

The recommendations made throughout the text have been compiled in the Executive Summary and restructured to reflect better the hierarchy of actions and the issues addressed rather than the logic of the evaluation analysis.

ANNEX 1.

MEMBERS OF THE INDEPENDENT EVALUATION GROUP

Chair: Anneli Ojapalo (FI):

Anneli Ojapalo is an independent consultant and has long industrial experience in technology and business development, technology transfer and commercializing of emerging technologies. She has managed large innovation programmes in public-private interface including strategic planning, partnering, international network, and communication. She is specialised on fuel cells and hydrogen, new energies, green economy, functional materials, and in innovation ecosystems. Anneli Ojapalo is Programme Coordinator of Finnish Fuel Cell Programme 2007-2013, a seven year programme of Tekes, the Finnish Funding Agency for Technology and Innovation. Since January 2013, Anneli Ojapalo is CEO at A.Ojapalo Consulting Oy.

Rapporteur: Nigel Lucas (UK):

Nigel Lucas was involved in the 2007 and 2012 impact assessments of the FCH JU and has chaired several evaluation panels. He is an independent consultant with more than 30 years' experience in the energy sector. Between 1996 and 1998 he was an Executive Director of Environmental Resources Management, responsible for the energy business. Prior to this, he was professor of Energy Technology at Imperial College Centre for Environmental Technology between 1991 and 1996, senior adviser at ASEAN-EU between 1988 and 1990, professor of Energy Policy at the Asian Institute of Technology in Bangkok between 1983 and 1988 and lecturer in Energy Policy at Imperial College between 1975 and 1983. He is a Fellow of the Royal Academy of Engineering.

Helge Holm-Larsen (DK):

Helge Holm-Larsen has more than 20 years' experience in clean energy conversion technology and business development. He acted as assessor at the FCH JU Programme Review 2012, and has had the role of coordination chair of the FCH JU Industry Grouping as well as vice chair with special interest for stationary FC systems. He is former Director, Sales and Service at Topsoe Fuel Cell A/S (very active Danish SME); as well as chairman of the board of the Danish Hydrogen and Fuel Cell Partnership 2008-2011. Presently, he is CEO of the SME TEGnology.

Dirk De Keukeleere (BE):

Dirk De Keukeleere is a former researcher/manager in the Flemish Institute for Technological Research (VITO) from 1991 to 2008 in several functions, mainly in fuel cell, automotive, and energy. He has extensive experience in FCH for automotive applications, but also for stationary applications. As managing partner of Ennovation, he works today as an independent consultant for innovation management and business development in the field of Transport and Energy technology. He has been evaluator for many FP7 calls for proposals, including FCH JU, but also on energy, for Green Car, SME, REGIONS and IEE.

Common expert: Maria-Rosaria Di Nucci (IT):

Maria Rosaria Di Nucci was part of the group of experts of the 1st FCH-JU interim evaluation and is involved in the evaluation of the Clean Sky and IMI Joint Undertakings, acting as the common expert. She is Senior Researcher at the Environmental Policy Research Centre of the Freie Universität Berlin and is also an independent consultant. She has been working in technology and energy policy for over 30 years and participated in several EC initiatives. A further focus of her activities is impact assessment. Dr. Di Nucci is expert evaluator for European RTD funding organisations and the EC (since the 5th Framework Programme) and has been engaged until recently in the assessment of the national and international “Climate Protection Initiative” of the German Ministry for Environment.

ANNEX 2.

QUESTIONNAIRE SENT TO INTERVIEWEES

General	
Q1	To what extent has the FCH JU contributed to the competitive position of the FCH Technologies in the short, medium and long terms?
Q2	How has the availability and performance of complementary and competing technologies changed since the inception of the JU and what are the consequences? How has the global economic and financial context of the sector changed and what is the likely impact on the operations of the JU?
Q3	To what extent have the recommendations from the first interim evaluation been taken into account and/or implemented?

Effectiveness: Progress towards meeting the objectives set.	
Q4	What progress has been achieved towards the objectives set in the Article 2 of the Council Regulation setting up the JU? In particular:
Q4.1	Has the FCH JU so far adequately supported the objective of placing Europe at the forefront of fuel cell and hydrogen technologies worldwide and enabling the market breakthrough of fuel cell and hydrogen technologies?
Q4.2	Has the FCH JU so far effectively facilitated additional industrial efforts for a rapid deployment of fuel cells and hydrogen technologies, and contributed to the development of their market applications and to overcoming market failure?
Q4.3	Has the FCH JU so far effectively contributed to the implementation of FP7? In particular, has there been effective contribution to the objectives of the specific 'Cooperation' themes ('Energy', 'Nanosciences, Nanotechnologies, Materials and New Production Technologies', 'Environment (including Climate Change)', and 'Transport) which provide budgetary support to the FCH JU programme? Has the FCH JU ensured complementarity with other activities of the Seventh Framework Programme?
Q4.4	Has the FCH JU supported the coordination of Research, Technological development and Demonstration (RTD) in the Member States and Associated countries)? Has the FCH JU been effective at leveraging R&D investment at national/regional programme level? Has the FCH JU been successful in increasing the interaction between Industry and Research communities?
Q4.5	Has the FCH JU contributed to or promoted the participation and/or involvement of Small and Medium-sized Enterprises (SMEs) in its supported RTD activities?
Q4.6	Has the FCH JU contributed to the main related Community policies in the field of energy (e.g. SET Plan), environment, transport, sustainable development and economic growth?
Q4.7	Are the objectives of the FCH JU in line with the challenges of Horizon 2020?
Q4.8	What have been the major achievements in R&D and demonstration in the five applications areas?

Efficiency: The extent to which the JU has been operated efficiently, whether there has been good communication of objectives and progress, and the ability to address problems as they arose.	
Q5	Are the overall legal framework and the modalities for implementation of the JU clear, appropriate and efficient?
Q6	Are the activities of the JU carried out efficiently?
Q7	Are the available resources (incl. JU staff) sufficient to achieve its objectives?
Q8	Is the level of supervision/control within the JU sufficient to monitor progress in programme implementation?
Q9	In the framework of the FCH JU, has the cooperation between industry and public sector been efficient in enhancing trans-national public-private links, and in combining private-sector investment and European public funding?
Q10	Is the JU knowledge dissemination efficient? Are the JU´s goals and achievements in the five applications areas suitably communicated: a) to the participating companies; b) to external stakeholders including policy makers; c) the public? Has the JU been pro-active in launching international cooperation activities?
Q11	How adaptable is the JU to changing research needs and policy priorities and how are external stakeholders from science, industry and policy involved in identifying these needs and shaping the priorities?
Research quality: The extent to which the JU supports top-class RTD in the area.	
Q12	At this stage, what are the indications that the RTD activities supported by the JU are of high quality?
Q13	Does the FCH JU attract the best organisations active in the field? Are there weaknesses in the participation of stakeholders (academic, industrial, including SMEs, and research organisation sectors), or in the geographical and gender balance?
Q14	Are the measures described in the Multiannual Implementation Plan and in the Annual Implementation Plans appropriate to ensure innovation?
Q15	Is the JU perceived as flagship for Public-Private partnership-supported RTD in the world and what more could be done in this respect?

ANNEX 3.

DOCUMENTS RECEIVED AND STUDIED

Governance of the FCH JU

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Project management

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- FCH JU. (2009). Framework Agreement between the European Community and the Fuel Cells and Hydrogen Joint Undertaking, Adopted by the FCH JU Governing Board on 30th January, 2009. http://www.fch-ju.eu/sites/default/files/FCH%20-%20JR%20FINAL%20VERSION%20Adopted%20by%20Board%20on%2030Jan09%20-%20Framework%20agr.pdf
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ANNEX 4.

FCH JU STAKEHOLDERS INTERVIEWED

Interviewer (group, individual member)	Interviewee	Role in FCH JU	Position
Group	Pierre-Etienne Franc	Chairman of FCH JU Governing Board, chairman of the NEW-IG, Industry Grouping	Air Liquide
Group	Rudolf Strohmeier	Vice-chair of the FCH JU Governing Board, representative of the Commission.	European Commission, deputy Director General DG RTD
Group	Paul Lucchese	RG representative in FCH Governing Board, chairman of N.ERGHY, Research Grouping	CEA
Group	Henri Winand	IG representative in FCH JU Governing Board	Intelligent Energy
Group	Florence Lefebvre-Joud	Chairwoman of Scientific Committee (SC)	CEA
Group	Bernard Frois	Chairman of States Representatives Group (SRG)	CEA
Group	Bert de Colvenaer	FCH JU Executive Director	FCH JU Programme Office
Group	Luis Correas	RG Leader of Application Area “Hydrogen production and distribution“	Foundation “Hydrogen Aragon”, Spain
Group	Marieke Reijalt	Dissemination’ stakeholder, participant in many FCH JU projects as well as TEN-T project HIT-Hydrogen Infrastructure for Transport	HyER, Brussels Office coordinator
Group	Marc Steen	JRC	Head of unit ‘Cleaner energy’, IET Petten
Group	Tudor Constantinescu	Member of the Governing Board	European Commission, Adviser to the Director General, DG ENER
Group	Steffen Moller-Holst	Coordinator of 4 R&D projects: KEEPEMALIVE (stationary), NEXPEL (hydrogen production), STAMPEM (transport) and NOVEL (hydrogen production)	STIFTELSEN SINTEF (Norway)
RDN	Angelo Moreno	RG Leader of Application Area “Stationary power generation and CHP” , Italy representative to the SRG	ENEA
RDN	Georg Menzen	Germany representative in the SRG, vice-chair	Bundersministerium für Wirtschaft und Arbeit

Interviewer (group, individual member)	Interviewee	Role in FCH JU	Position
RDN	Klaus Bonhoff	Close relation with the FCH JU - Managing Director of NOW	The German National Organisation Hydrogen and Fuel Cell Technology (NOW GmbH)
HHL	Aksel Mortensgaard	Denmark representative in the SRG, vice-chair	Ministry for Climate and Energy, The Danish Energy Agency
HHL	Mickaël Sloth	Member of the Governing Board	H2Logics
HHL	Karel Kapoun	Member of the Governing Board	Shell
HHL	Sunita Satyapal	International cooperation	Program manager, Fuel Cells and Hydrogen, US DoE
AO	Ralf-Uwe Dietrich	AA leaders, RG for Early Markets	CUTEC Deutschland
AO	Heikki Kotila	Finland representative in the SRG	TEKES
AO	Jari Kiviaho	Coordinator of ASSENT and CATION (Stationary, R&D)	VTT, Finland
DDK	Daniela Rosca	Representing O. Onidi, member of the Governing Board	European Commission, head of Unit 'Clean Transport and Sustainable Urban Mobility' DG MOVE
DDK	Lut Bollen	Belgium alternate representative in the SRG (also in Energy Programme Committee)	Flemish Government
DDK	Jörg Wind	IG Leader of Application Area "Transport and Refuelling Infrastructure"	Daimler
DDK	Paul Jenné	Coordinator of "HIGH V.LO-CITY" (transport, demo)	VAN HOOL N.V. (Belgium)
DDK	Mirela Atanasiu	Project Manager of Programme Office	FCH JU Programme Office
NL	Alan Atkinson	Member of the SC	Imperial College
NL	Ray Eaton	UK representative in the SRG	Renewable Energy Innovation Unit (REIU)- Department for Business, Enterprise and Regulatory Reform
NL	Mike Weston	Participants in transport demonstration projects CHIC and HyTEC	Director of Operations, London Bus Services

ANNEX 5. COMPARISON OF PROCEDURES OF THE THREE JUS

	ACTIVITIES	FCH	IMI	CS
JU Organisation	**Legal Form**	Legally established in May 2008 as community body involving a PPP based on the principles of the EU Financial Regulations. Full autonomy in November 2010	Legally established in December 2007 as community body involving a PPP under the EU Financial Regulations. Full autonomy in November 2009	Legally established in December 2007 as a community body involving a PPP under the EU Financial Regulations. Full autonomy in November 2009
	Veto Right EC	YES (by failing consensus a majority of 9/12 is required and EC has an indivisible vote of 5/12)	de jure NO, de facto YES (decisions taken by a three-quarters majority and requiring the positive vote by the Founding Members)	YES
	Founding Members	EU and 'Industry Grouping'. The Research Grouping became a member late in 2008.	EU and the European Federation of Pharmaceutical Industries and Associations (EFPIA)	EU and Industry consisting of 12 ITD leaders, 72 Associates (and 450 Partners).
	Staffing	Authorised ceiling of 20 staff of which 18 posts assigned as of June 2013. 5 Project Managers responsible for approx. 150 projects and overloaded with a wide range of administrative functions and other functions dealing (directly or indirectly) with operational activities (financial, legal, audit and communication officers) Additional efficiencies resulting from internal reallocation of resources and sharing of horizontal services with other JUs are already exploited	Authorised maximum ceiling of 36 staff members reached in July 2012. 9 scientific managers for scientific activities +3 communications/external relations. In total 30 + 6 admin. assistants. 80% of staff resources are assigned to directly work or support operational activities.	Authorised ceiling of 24 8 Project officers; 75% of staff dealing with operational activity (technical and financial); 6 staff on horizontal support, e.g. Executive Director, Head of Admin, secretary, Internal Auditor; etc.
	Nr of Calls for Proposals	6 in total, one yearly	11 in total (9- 11 to be launched in second half of 2013)	14 in total (one planned in July 2013)
	Nr of Projects	estimated total of 150 for 2008-2013	40 signed (estimated 60 in total)	342 GAP (Grant Agreement for Partners) + 7 GAM (Grant Agreement for Members) = 349 projects signed (further 63 under negotiation and further 30 to be published) – Estimated final total -= 442 projects
	Nr of Projects per PO	Approx. 25-30 projects/PO The Head of Programme does also manage 13 projects.	Each on-going project managed by a scientific & a finance officer. Projects' portfolio distributed among 9 scientific and 4 finance officers (7 projects per scientific officer on average).	1 GAM and 60 GAPs per PO on average
Budget	**Funding for RTD**	2008-2013: 940 M€ (including max 40 M € for running costs) Contribution on a 50/50 basis by the EC in cash and IG/RG(in-kind for operations and cash for running costs)	2 billion € (1 billion from EC in cash/ EFPIA companies contribute €1 billion in kind), including maximum €40 million contribution per Founding Member. Funding is distributed through open and competitive CfP following a peer reviewed two-stage process.	2008-2013: 780.26 M €. Contribution on a 50/50 basis by the EC (in cash) and the aeronautical industry (in-kind). ITD Leaders commit up to 400m €, Associates members up to 200 m € and Partners receive (through Call for Proposals) a minimum of 200m €.

	ACTIVITIES	FCH	IMI	CS
Audit	**Internal Audit**	Commission's Internal Audit Service (IAS) Internal Audit Capability within the JU		
	External Audit	European Court of Auditors		
Coordination amongst JUs	**Shared Services & Facilities**	Logistics (building); Common IT infrastructure Shared approach on continuation of JU in H2020 legal basis and financial rules Regular coordination between Internal Audit Functions of the 3 JUs in place for issues of horizontal nature (e.g. audit methodology, approach towards the Court of Auditors). Audit services are also shared between JUs when it is the most cost-efficient solution (e.g. common framework contract on Ex-Post audits, joint engagements...)		
	Synergies/ Commonalities	Informal general coordination at executive directors' level (quarterly) and Heads of Administration and Finance IT Governance Committee (quarterly meetings) Common framework contracts (e.g. ex-post audits, interim staffing, IT support) Coordination on case-by-case basis for communication / HR / legal matters /IT/ audits...		
	Planned Common Activities	2nd October 2013: JTIs joint conference and exhibit at European Parliament		
Potential services to be shared	**IT**	No objection within JU. There is already a shared IT service (outsourced to an external firm). IT officer of the JU chairs the IT Governance Committee & ensures coordination between JUs on common IT issues.	No objection within JU. Joint management of common infrastructure and services already in place.	No objection within JU Joint management of common infrastructure and services already in place.
	Internal Audit	The JU has an Internal Audit Manager covering assurance (i.e. audits) and consulting services on risk manage-ment, governance aspects, reporting and ex-post audit .This internal solution with a multi-task approach is considered by FCH JU the most efficient solution to address the necessary 'assurance' and 'advisory' needs of the JU.	The JU has an Internal Audit Manager providing internal assurance and consulting services on governance, internal control, ex-post and risk management processes. This current arrangement, embedded within the JU's internal governance and internal control system is considered by the JU as essential and necessary as to ensure timely and efficient response to the 'assurance' and 'advisory' needs of the JU.	JU has Internal Audit Officer focusing on advisory services, risk assessment, ex-post audit process. "Internal" advisory function, partially management role. This internal solution is considered by CS as more effective. CS claims that the quality function within the JU is essential. Even if the internal audit could be shared, this internal knowledge and advisory role should be kept.
	Other Administrative Services	JU claims that a combination of "multi-task" of staff in a JU (HR & general affairs; legal & procurement; accounting & finance...) with coordination & cooperation on a case by case basis with other JUs is more efficient as it has the advantage of knowledge of the JU transactions, flexibility and business continuity	Enhanced cooperation and synergies in areas of support services (e.g. IT, HR, Finance) are desirable but remains to be further investigated based on impact analysis of centralisation of common support services by DG RTD for the Research family under Horizon 2020, workload and budget (including staffing level) for IMI2.	Some staff are performing 'multi-task' functions, e.g. the Assistant to the Director is the only person dealing with all HR matters for the JU; the Legal officer is combining the role of legal officer with procurement officer and Data Protection Officer and is also in charge with European Parliament relations; The internal audit function and quality management role are performed by the same person.

	ACTIVITIES	FCH	IMI	CS
Governance	**Governing Bodies**	Same structure based on Governing Board and advisory bodies (SC, SRG/STAB, Stakeholder Assembly/Stakeholder Forum/General Forum)		
	Governing Board	The GB consists of the EC (5 members), the Industry Grouping (6 Members) and 1 member of the Research Grouping.	The GB consists of the EC (5 members) and EFPIA (5 Members)	The GB consists of the EC, 12 ITD leaders and 6 Associates (rotating representatives for associates)
	Scope and Functions of the SRG	SRG acts as advisory group and should interface with the relevant stakeholders in their respective countries. Around 10 members attend regularly. The Group meets at least bi-annually The chair attends as observer the GB meetings. Up to now there have been limited joint activities. There appear to be a strong interest in reviewing AIP and MAIP and in advising on the strategic orientation of the programme.	SRG acts as advisory group and as an interface with the relevant stakeholders in their respective countries. It is supposed to have an important role in liaising with the national programmes and helping in dissemination and outreach activities. SRG members shall act as IMI ambassadors/ multipliers. The SRG has been invited to propose experts and to contribute to the workshops related to the calls consultations prior to launch. SRG consulted on annual scientific priorities set out in AIPs. SRG proposes candidatures for the SC to be approved by the GB.	SRG acts as advisory group and as an interface with the relevant stakeholders in their respective countries. 14 members attend regularly. Some members are at the same time NCPs or/and members of the programme committee. The CS ED and the GB Chair attend the NSRG meetings and the Chair of the NSRG attends as an observer at the CS GB. During 2012, the NSRG met four times and was represented at the GB meetings. Members take a supportive role particularly in relating with the European Council and take part in information dissemination and Info days. They analyse the results of the calls.
	Scope and Functions of the Scientific Committee SC/ STAB	The SC (9 members from academia, industry and regulatory bodies) provides scientific advice on the R&D agenda (MAIP & AIP) and participates in the monitoring of the FCH JU programme by acting as experts in the annual Programme Review Days	The SC (15 members, including the EU regulatory agency EMA as observer) provides scientific advice to the Governing Board	The STAB (established in 2010) is involved in monitoring the progress of the 7 ITDs that comprise the technical content of the programme, largely through participation as Reviewers at the Annual Reviews and in the mid-year progress reviews and other reviews throughout the year. Each Board member is associated with the reviews of at least 2 ITDs and also serves to check the quality of the reports delivered by these ITDs. The STAB oversees all the reviews and produces (since 2012, at the ED's request) a synthesis of the annual reviews outcomes.
	Role and Authority of Exec. Director	Chief executive responsible for the management and implementation of the JU programme in accordance with the decisions of the Governing Board. No system of delegation from the GB to the Exec. Director in place.	Chief executive responsible for the management and implementation of the JU programme in accordance with the decisions of the Governing Board. Few discretionary decisions. A system of delegation from the GB to the Exec. Director for routine operations is envisioned.	Chief executive responsible for the management and implementation of the JU in accordance with the decisions of the Governing Board. CS is a programme, with a common set of objectives, cross-links between platforms, interfaces, priorities and management. The exec Director is in charge with it. The director has delegation for contracts signatures up to a predefined level.

	ACTIVITIES	FCH	IMI	CS
SMEs	**Support/ Involvement Of SMEs/CfP Statistics**	No dedicated PO focusing on SMEs. All POs do their best to invr SMEs (in practice, there are 2 SMEs seating in the GB) SME participation > than in FP (in 2008-2012: 25% of the funding compared to 18% in FP7) >50% of the more than 60 members of the IG are SMEs	A Scientific officer has been tasked with focusing on SMEs and developed links with many SMEs associations. IMI Executive Office supports SMEs through info on IPR, a web based tool kit, advice on negotiating grants & project agreements, rules on financial reporting. SME are selected based on the needs of EFPIA consortium coordinators. In total, there are 141 SMEs participating in IMI projects (15.9% of total participants). 21.4% of IMI Calls funding is allocated to SMEs (Calls 1-8). Perceived benefits for SMEs: to work with large companies, who are potential clients. There has been a steady increase in SME participation in IMI consortia and in EoI.	No dedicated officer focusing on SMEs CfP participants: 38% SMEs winning in CfPs SMEs ' share of funding earmarked for CfP (25%of EC contribution)amounts to: 35%
	Financial Restrictions/ Red Tape	As the FCH is not part of the guarantee fund it carries out a Financial Viability Check (eligibility for grant pre-financing) which may lead to requiring a guarantee or limiting the amount of pre-financing and this may appear difficult for some SMEs. Possibility to organise a workshop on the topic between FCH JU PO/ EC and SMEs who have been facing these issues.	No need for financial guarantee for SMEs, but a financial viability check is performed. The current IP-policy of the IMI is alleged to discourage the participation of SMEs.	No need for financial guarantee for SMEs, but a financial viability check is performed. SMEs can be mono-beneficiaries which contributes to the high percentage participation in CfPs
Participation in JU **CfP Procedures and Regulations**	**Funding Rate**	The funding rules are very close to the FP7 ones. The upper funding rates for direct costs are basically the FP7 ones, with the additional requirement of matching between EU funds and in-kind contribution from participants. This might lead to decreased funding rates with a 'correction factor' to be applied across the whole call. Funding rates may differ for each Call depending on 'correction factor' applied. This assessment is done after evaluation of each call and before starting negotiations. Indirect costs (overhead) can be declared based either on 'actual' or on a 'flat rate' model (EC validation system), but are reimbursed at a maximum fixed rate of 20% of the direct costs.	Eligibility for funding limited to academia, research institutes, patient organisations, regulators, SMEs 75% RTD contribution to SMEs/academia and other IMI beneficiaries; 20% flat overhead rate or actual indirect costs For other activities , management and training, the IMI JU financial contribution may reach a maximum of 100% of the total eligible costs EFPIA companies contribute with in-kind or cash contribution and are not reimbursed.	The single entity applying is eligible for either 50% or 75% depending on the legal status (for example industry or SME); in case of a consortium, both funding criteria will apply and the resulting funding will be an average of the two percentages, weighted by the actual contributions of each partner. The existing members are only eligible for 50% funding if they are winners of CfPs Budget distribution: • Up to: 400 M €: leaders • Up to 200M €: associates • At least 200 M€ CfP Average funding rate in Calls: 65.6% Applicants success rate: 35%

ACTIVITIES	FCH	IMI	CS
Rules for Participation/ Requirements for Consortia	Similar as in FP7 (3 legal entities from at least 3 MS or associated countries etc.) with one addition: at least one member of the consortium must be member either of the IG or of the RG	Two-stage process. In Stage 1 applicants (at least 2 legal entities eligible for IMI funding) submit EoI for joining a consortium of EFPIA member companies. In Stage 2 the successful applicants and EFPIA consortium (at least 2 EFPIA companies) are invited to submit a full proposal. With the 4th revision of the IMI model Grant Agreement, IMI projects have been provided with additional flexibility: - to launch competitive calls for the addition of new beneficiaries to on-going projects - for setting up synergies with other on-going IMI collaborative research projects.	Most of RDD&TD are performed by the Members of CS whose activities are covered by Grant Agreements for Members (GAM). There is one amendment to the GAM per year and per ITD which specifies work plan, resources and budget. Subcontractors are selected by Members through Calls for Tender. Part of the CS programme using 25% of the EC contribution is performed by Partners selected through CfP. Successful CfPs lead to the signature of Grant Agreement for Partners (GAP). Average GAP duration is 20 months. There are also mono-beneficiaries. CS does not require a consortium as a constraint; even a single entity can apply.
Financial Regulations	**In-kind contributions** ('matching rule') Procedure in use (based on GB approved methodology) to verify that the in-kind contributions provided by the JU participants ' match the cash contribution from the EU. The 'correction factor' is the main tool 'to steer' the matching between EU funds and in-kind contribution from the participants, in order to comply with the requirement of the Regulation by the end of the Programme. The verification of the in-kind contributions reported by the participants in the cost claims (CCs) is done at three levels: (1) ex-ante review of 100% of CCs by the JU, (2) audit certificates carried out by beneficiaries' auditors for CCs above pre-defined thresholds and (3) Ex-Post audits by the JU on a sample basis. **Assessment and reporting.** In addition, FCH JU Council Regulation (art 12.7) requests an independent auditor to assess the level of in-kind contributions on an annual basis and report the results by April of N+1. Since the autonomy of the JU, two annual assessments have been carried out.	**In-kind contribution** Procedure in use to verify that Members' in-kind contributions to IMI match the cash contribution from the EC. EFPIA in kind contribution is monitored through different levels, Call, Grant agreements, ex-ante and ex-post audits. A limited amount of in kind contribution from outside the EU and associated countries can now account for industry matching contribution. This relates to up to 10% of the global contribution for standard projects within a global cap of 5% of the total industry contribution. For projects of special interest to the EU and society, such as antimicrobial resistance, there is no maximum limit by project but a maximum limit of 30% of the total in kind contribution.	**In-kind contribution** There is a procedure in use to verify that Members' in-kind contributions to CS match the cash contribution from the EC. The verification is carried out at 3 levels, by audits inside the Members' organizations when preparing their Form C (annual cost claim), by a CS ex-ante check before payment on the basis of the documents provided (which includes a document of audit procedures to be carried out above 200k threshold per claim) and by an ex-post audit of Members' expenses against the specified GAM activities. CS Financial Regulations only allow for either 20% flat rate without justification or real overheads, there is nothing in between.
Time to Grant **Time to Pay**	Target in H2020 < 180 days from evaluation < 90 days Present Between 341 and 411 days 365 days in 2011 < 90 days	Target in H2020 < 180 days from evaluation < 90 days Present Evaluation process was streamlined. Time to grant (reduction from 400 days in call 3 to 185 days in call 6).	Target in H2020 < 180 days from evaluation Present Latest calls: < 240 days from call publication to GAP 360 days on average for grant signed in 2012

	ACTIVITIES	FCH	IMI	CS
Budget	**Flexibility**	"N+3" rule gives the possibility to re-enter in the budget cancelled appropriations from previous years and this is effectively used	Certain flexibility available. Possibility to shift budget according to the " 3-years rule"	Certain flexibility available. Possibility to shift budget according to the"3-years rule". Transfer from SAGE ITD to GRA ITD. Internal changes in all ITDs as % share. A ITD (SGO) made available 2.5 M€ to JU which was redistributed to other ITDs; budget flexibility works for CS projects in a timely way;
Coordination with National Programmes & Collaborative Research		Cooperation with national programmes (NOW in Germany and Danish FCH programme); involvement in UK H2 Mobility, possibly in future French H2 Mobility	Enhanced cooperation with SRG, which is consulted on annual scientific priorities and proposal CfP text prior to launch Interactions with JPI through CfP pre-launch consultation.	Cooperation with NSRG, providing visibility on the CS programme and especially CFPs. Limited or partial interaction about synergies with national programmes.
KPIs/ Metrics		KPIs on: (1) operational aspects linked to Calls/ projects; (2) control aspects encompassing the grant management cycle (e.g. % of complaints on the evaluation process, financial impact of the negotiation process, % of payments made on time, Ex-Post audits: coverage and error rates). The JU reports annually the resulting KPIs in the Annual Activity Report) Concerning project and technology metrics, the on-going project TEMONAS should provide a TEchnology MONitoring and ASsessment tool combining S-O-A methodology and IT-implementation. The tool is tailored for the needs of programme progress evaluation and should enable a targeted comparison and evaluation of project results and achievements in an objective way. The tool has still to be provided to the JU (project finished in May 2013) and has to be filled in with project results data, plus literature data for benchmarking. It is expected to start providing reports in 2014.	KPIs were initially developed in 2011 and reported to the Governing Board from 2012. In 2013, a dedicated IT tool has been developed to facilitate tracking of project data and the generation of "classical" metrics. This tool is operational and allows reporting a series of metrics from June 2013. In the future, data generated by the IT-tool will be used to generate a Balanced Scorecard that should facilitate the governance of the partnership. Regular release of bibliometric data. Agreement with Thompson Reuters to devise metrics for the analysis of scientific publications. Metrics are derived from scientific reports and interim reviews.	Internal Quality management encompassing internal control standards, KPIs and a system of various TRL. For ITDs indicators include: - Budget vs. planned, - Deliverables/TRL gates/ other milestones/ on time vs. delayed - Risk status per technology/sub system - TRL passed during the quarter - % of review recommendation fulfilled at next Annual Review KPIs related to CfP process include: - topic failure rate, time to contract, SME rate KPIs related to GAPs include: - topic success, eligible proposals, contracts signed on time, delay of final reports - Actual resources consumption of ITDs - SME participation and funding Specific case of TE, providing monitoring and assessment of the improvement in environmental impact of aviation (CO_2; NOx; noise) due to the maturity of the technologies being developed and demonstrated in CS: this in terms of sectors (by conceptual aircraft types integrating the suitable technologies) at mission, airport and ATS levels.

	ACTIVITIES	FCH	IMI	CS
IPR		The IPR rules are identical to FP7 (foreground and background). The IPR details are agreed between beneficiaries in the mandatory Consortium Agreement. They have to accommodate the interests of a wide range of stakeholders from large companies to SMEs and researchers in different application areas.	Although based on FP7, IPR rules have been adapted to the objectives of IMI and provide flexibility to IMI consortia to reach the most appropriate agreements (e.g. definition of background; scope of research use of results, access rights to third parties after project's end, etc.). Agreement on IP management shall be reached upfront before the start date of each concerned IMI project. IPR rules are sometimes perceived to act as a barrier for SME participation	IPR rules – same as in FP7 are implemented in both GAMs and GAPs The Foreground, (results generated by the project), is the property of the beneficiary carrying out the work generating that Foreground. Indeed, beneficiaries are not subcontractors of the CS-JU, so IPRs are not the property of the Topic manager or of the CS-JU. Where several beneficiaries have jointly carried out work generating foreground and where their respective share of the work cannot be ascertained, they shall have joint ownership of such foreground. Transfer of ownership can be defined. A plan for the use and dissemination of foreground needs to be prepared, including patent applications and use of the results.
Quality control	**Technical/ Scientific Reviews**	Projects are monitored by the POs (after each reporting period) and (with assistance from external experts) during mid-term review meetings and final meetings when needed Feed-back is provided to beneficiaries for better steering the project in the next period. In parallel an assessment of the program is performed annually via the Programme Review Days.	Scientific officers and external experts, including members from the Scientific Committee.	Review performed by JU with external experts and STAB. Technology evaluator providing monitoring and assessment of the improvement in environmental impact (CO2; NOx; noise)
	Ex post audit Error rate threshold allowed by the European Court of Auditors: 2%	Ex-Post audits of beneficiaries are regularly launched in line with the Audit Strategy adopted by the Governing Board. To date, 48 audits have been launched of which 20 are concluded. 97.6% of the errors in favour of the FCH JU detected in the concluded audits have been corrected by the JU. This leads to a residual error rate (i.e. error rate after corrections) of 1.67%, below the Court's threshold (i.e. 2%). In addition to the corrective measures above, two main preventive measures have been established by the JU to reduce the probability of errors occurring and/or being undetected, i.e. (1) communication campaigns to provide guidance to beneficiaries and (2) reinforcement of JU's ex-ante controls.	Ex-post audits of beneficiaries are regularly launched in accordance with the Ex-Post Audit Strategy adopted by the Governing Board. To date, 90 audits of beneficiaries have been launched of which 56 have been concluded, indicating to date an error rate above threshold of 2%. Recovery and corrective actions are now being taken (where possible with offsetting against next payments). In addition, as preventive measures IMI has continue to reinforce its ex-ante controls and has provided training and guidance to beneficiaries, which has appeared very important to reduce errors especially with the many participants that are SMEs or unfamiliar with FP7 rules.	In 2011 and 2012 ex-post audits of financial statements of CSJU beneficiaries have been implemented in line with the Ex-post Audit Strategy adopted by the Governing Board. To date, 65 audits have been launched, out of which 52 have been finalised. Audit results have been implemented (i.e. overpayments were recovered) with more than 96%. The residual error rate, reflecting the remaining errors in favour of the JU - after corrective measures have been taken place- passed from 4.22% in 2011 to 1.29% in 2012, resulting in an accumulated rate of 2.77. In order to reduce the error rates, the JU has put efforts in improving its ex-ante validation process and has provided extensive guidance to its beneficiaries concerning the eligibility of costs for the CS projects.
Continuation in H 2020		Proposed by the Commission	Proposed by the Commission	Proposed by the Commission

ANNEX 6.

RECOMMENDATIONS OF THE FIRST INTERIM EVALUATION

Recommendation 1. Reinforce portfolio management

The FCH JU needs to assume more responsibility for delivering its overall technical objectives and have an active management of its project portfolio through targeted call processes and on-going project review. The balance between application areas of the MAIP needs to be reviewed and methods implemented to ensure projects interact where appropriate.

To achieve its objective of placing Europe at the forefront of fuel cell and hydrogen technologies worldwide and at enabling the market breakthrough of these technologies, FCH JU should emphasise industrial leadership for large-scale projects.

The Scientific Committee (SC) has the potential to provide support to, and verification of, the above portfolio management approach, and opportunities to widen its present role to do this should be actively explored.

Recommendation 2. Ensure high agility of operations and adaptability to changing competitive forces

Over the last few years, technology development has brought fuel cells and its applications from research on how to make it work, to development on how to make it cheaper. The latter is to a large extent about cost reductions in systems and Balance of Plant (BOP) and will eventually lead to commercialisation and new products. To achieve its objectives, the FCH JU needs to maintain its focus on innovation and respond to emergent competing technologies.

The FCH JU must reinforce efforts to engage stakeholders from the complete value chain in addition to the manufacturers and researchers who represent the great majority of participants in the FCH JU.

Recommendation 3. Improve visibility, communication and outreach

International outreach and engagement should be a key role and responsibility for the FCH JU. There is an urgent need to increase FCH JU visibility, with a clear identity and mission.

The awareness of FCH JU initiatives and achievements also outside Europe should be increased and the FCH JU needs to establish what international engagement or participation should be sought to support the faster or cheaper achievement of its programme objectives.

Recommendation 4. Improve collaboration and alignment with Member States

It is clear that there is scope for improvement in the performance of the States Representatives Group (SRG) for the coordination with Member States' parallel activities. The SRG needs members connected to policy and programme management, not scientific experts, able to identify and to progress opportunities for alignment of national activities and those of the FCH JU.

Recommendation 5. Ensure high efficiency of operations

The current legal framework as a "Community body" is not well-suited to industry led public-private partnerships like JTIs and should be streamlined. The IEG supports the related recommendations of the JTI's Sherpa Group.

The time scale involved from publication of calls to negotiated call is around one year and should be improved upon. Currently the management structure is unbalanced in terms of administrative resources compared to project management, leaving the project management capability (just 25 % of the staff) under- resourced and probably insufficient to ensure delivery of objectives. A sufficiently skilled resource is needed for project monitoring and programme management (including portfolio management) greater than that presently in place.

Given the innovative nature of JUs it is recommended that an exchange of experience and advice between senior staff of all PPPs be organised, and that a dialogue is set up between FCH JU and other SET Plan initiatives of a similar nature to ensure exchange of best practice related to operation and implementation of objectives. Also, project monitoring and benchmarking of best practise should be introduced.

Interim Evaluation Report		FCH JU comments / opinion / actions			
1. Reinforce portfolio management		**What**	**Who**	**When**	**Current Status**
1.1 The MAIP should be thoroughly reviewed and updated where necessary before the production of the AIP for 2012. This exercise should be repeated no less than every 2 years to ensure the technical priorities remain valid in relation to results achieved and developments elsewhere.	*FCH JU GB*	• The review process of the MAIP is currently defined as an update within the changed (external) environment; budget reallocation is not included in this process. • The revision of the MAIP 2008 is currently in progress; the review activity is under the responsibility of the FCH JU ED and the revised version will be finally approved by the FCH JU GB. • Within the FCH JU program lifetime (2008 – 2013) one revision in 2011 is adequate as for future program activities (in FP8) another MAIP is to be created, most likely in 2013. • Correspondence between MAIP priorities and project results achieved are essential and monitored during the annual FCH JU project review day(s).	FCH JU ED & FCH JU GB	2011 & 2013 (for FP8)	The MAIP has been revised and available on the FCH JU website: mainly targets are updated. For Horizon 2020, a new and updated MAIP will be produced; target finishing time end 2013.
1.2 The current project portfolio is evidently light on hydrogen production, storage and distribution and efforts should be made to increase activity.	*FCH JU GB, FCH JU SC*	• Within the relevant AA, this issue is recognised and already addressed in the AIP planning process by the related industry. • Additional, hydrogen production and storage related issues are addressed in other AAs like AA1: transport on refuelling infrastructure, and AA4: early markets. • In parallel, other opportunities as the technical road map exercise, will further develop this need in three directions: electrolysis, storage and CSS.	FCH JU PO & IG AA	Jan 2012	Following coverage have been reached to rectify the situation: Call 2010: 12 % Call 2011: 13 % Call 2012: 20 %
1.3 Priorities and work on RCS should be led by industry.	*FCH JU Executive Director*	• The industrial strategy on FCH RCS is currently under discussion together with a specific 5th AA on RCS, PNR & other crosscutting issues. • It is recognised that the current FCH JU project portfolio on RCS is rather weak and this is addressed in the 2011 review of the MAIP. • A more active role of the JRC together with a reinforced cooperation with international partners is currently in planning stage.	FCH JU ED & FCH JU GB	Jan 2012 as part of the AIP 2012	The AA5, cross cutting, includes RCS and is now lead by an industry representative.
1.4 The structure and composition of the annual calls should explicitly support the objectives of the FCH JU, the interests of Europe, and competition in the market place through projects that clearly have industrial leadership.	*FCH JU GB, FCH JU Executive Director*	• The structure and composition of the calls is the result of the AIP planning process executed by both the Industry Grouping and the Research Grouping and in line with the MAIP plan. With the complete overview of all running projects, the FCH JU PO will be earlier and actively involved. • Each call contribution towards the objectives, the interest and competition will be monitored by means of the annual FCH JU project review days. • The FCH JU will open the discussion on how to improve and formalise industry leadership of project consortia.	FCH JU PO & IG AA	Jan 2012 as part of the AIP 2012	Through both SETIS and TEMONAS and the annual program review days, the achievements of the program are closely followed.

Interim Evaluation Report		FCH JU comments / opinion / actions			
1.5 The EC must ensure appropriate support is provided for basic research in the FP.	*FCH JU GB, EC*	• Within the FCH JU MAIP, 15 % is allocated to basic and fundamental research. The recent adopted amendment of the founding FCH JU council regulation improves the overall project funding rates, but, due to the matching principle, not yet reaching the FP7 funding rates. • The FCH JU has no intention to substitute the fundamental research platforms of Individual Member States but wants to stay more focus on the transfer of those technologies into marketable technologies, through pilots, light house projects and demonstration projects. • The EU is also supporting the FET calls where also FCH technology, bottom up, is covered.			
2. Ensure high agility of operations and adaptability to changing competitive forces					
2.1 Actively involve all stakeholders of the value chain.	*FCH JU SRG, FCH JU Executive Director*	• The FCH JU has a good working relation with and an active participation from the current stakeholders: IG, RG, SRG, SC, GB, EU, ... • The FCH JU PO together with the GB will ongoinly further involve and actively cooperate with HyER and members of their network, the EHA (European Hydrogen Association), the financial community as EIB (European Investment Bank), banks and venture capitalists.			
2.2 Establish an SME contact point at the Programme Office	*FCH JU Executive Director*	• The FCH JU ED will implement this recommendation for the duration of 2 years and closely monitor the added value of this initiative. • Additionally, the FCH JU will make a specific information section (website) for SME's and see how the European Association of SME's (UEAPME) can be more involved.	FCH JU ED	July 2011	SME's are already very well presented in the FCH JU portfolio and get a higher funding rate; meetings with Enterprise Europe Network have been held and a specific person in the PO is dedicated to SME's.
2.3 Explore opportunities for complementarity between FC electric cars and BEV in the market place	*FCH JU Executive Director, EC*	• The FCH JU will use the appropriate opportunities and specific stakeholders to look at synergies between both technologies (FCH & BEV) for example towards the infrastructure solution, towards promoting tax incentives and credits and towards the electric powertrain supply chain. • For various aspects (market, RCS, PNR, infrastructure), the approach used by the BEV world is deeper investigated by the current policy study.	FCH JU ED	Ongoing	The ED presented the activities of the FCH JU at a EGCI board meeting in March 2012 and participated in the launch of the EE observatory; further strategic discussions are ongoing.
2.4 Commission a report on status, opportunities, and priorities for stationary fuel cells.	*FCH JU Executive Director*	• This is on-going: the industrial coalition is currently being set up and is defining the scope of this report. The work on this report (an independent fact base for fuel cell technology in stationary applications), with the help of an external tendered consulting partner, is planned to start by 2012 Q1.	FCH JU ED	2011-2012	A coalition study has been finalised but not yet made public by the consortium.

Interim Evaluation Report		FCH JU comments / opinion / actions			
3. Improve visibility, communication and outreach					
3.1 Develop an effective communication strategy and web site.	*FCH JU GB, FCH JU Executive Director*	• The FCH JU web site (www.) is operative since 15 March 2011 and as any other website continuously developed and enriched. • FCH JU communication strategy and the annual communication plans will be deeply discussion during the FCH JU GB meetings. As part of this strategy, the FCH JU will reinforce the link with national and regional associations towards stronger communication leverage.	FCH JU ED	Ongoing July 2011	A communication strategy has been made and presented to the GB. Website is online; social media are being worked on.
3.2 The communication plan should be aligned with the FCH-JU objectives and integrate both external and internal communication.	*FCH JU GB, FCH JU Executive Director*	• These elements are integrated in the Communication strategy.			
3.3 Use SRG and SC actively in supporting FCH JU awareness.	*FCH JU GB, FCH JU Executive Director*	• The benefit of deeper involvement of the SRG & SC is recognised. In consensus, the role of the members of the SRG and the SC should be further clarified towards deeper and more active involvement under the overall responsibility of the FCH JU GB and the chairs of the SRG and SC. • Increased outreach towards Member States can also be achieved by active involvement of organizations as HyER and EHA.	FCH JU ED, FCH JU GB, SC chair and SRG chair	By 2012	The activities with the SRG are strongly improved: stronger dialogue. The SC involvement needs further improvement: Program review days, involvement in AIP and MAIP.
3.4 Develop strategy and priorities for international outreach, engagement and cooperation.	*FCH JU GB, EC*	• The responsibility for the international policy in the field of FCH lies with the European Commission; the operational activities and budget are with the FCH JU. • Actual international cooperation activities (with US, Korea and Japan on a bilateral basis) are currently being pursued by the FCH JU PO inline with the EU policy and the FCH JU regulations; in particular, there is an active participation of the FCH JU in the Technology Group of the EU-US Energy Council. • The FCH JU PO follows closely international developments and activities by means of visits and meetings. • The added value of a potential more active involvement of the FCH JU in international fora as IEA or IPHE should be further discussed.	EC FCH JU ED& FCH JU GB	Ongoing	Actual cooperation with US; dialogue with Japan and Korea; assessing opportunities with India and China.

Interim Evaluation Report		FCH JU comments / opinion / actions			
3.5 Outputs from the FCH JU projects should be integrated into and used to support relevant EU policies.	*EC Policy Directorates*	• The FCH JU has indeed contributed to position papers and responses to consultations in the field of transport, energy, climate change objective, ... On going, more and more FCH JU projects will concluded with more material for this type of contributions. • The FCH Annual Report (produced as outcome of the Annual Review Days) will be publicly shared and can be used as supporting reference material. • In this respect, the FCH JU should become fully integrated in the EU SET plan family and will, by this integration, fully clarify its innovation capacity.	FCH JU ED	Ongoing	Hiring of Knowledge management and policy officer to replace communication officer.
4 Improve collaboration and alignment with member states					
4.1 Adjust SRG Rules of Procedure in order to better define the profile of the SRG representatives so that they are appropriately connected to political decision makers in their Member States.	*FCH JU GB*	• The EU Member States are nominating their representatives in the SRG based on the rules and procedures adopted by the SRG. • The SRG representatives have clearly a national multiplicator role and therefore representatives from the highest possible level can give the biggest impact whereby a political profile is currently more appropriate than a technical profile. • Currently, there is already a more active involvement (organization of high level meetings on the coalition report, governmental and preparatory ministerial meetings, ...) additional, FCH JU GB together with the chair of the SRG will see on how this can be further reinforced.	FCH JU GB & SRG chair	By 2012	On-going in light of H2020; involvement of national funding agencies and national representatives for policies.
4.2 To raise interest and attention from Member States involve representatives more proactively – candidate areas for this are developing project portfolio, communication and joint profiling events.	*FCH JU GB, FCH JU Executive Director*	• Together with the chair of the SRG, the FCH JU ED is currently enlarging the strategy in this direction; every opportunity will be considered: program (AIP) alignment, national event participation as meeting, exhibition, conference, roundtables, ... as it has been already the case for UK, France, Portugal, Netherlands, Italy, ... • Despite, the different ambitions in the field of Fuel Cell and Hydrogen, of the individual member states has to be recognised.	FCH JU ED & SRG chair	By 2012	Increasing of local brokerage events: UK, Portugal, Spain, Germany, Romania, Italy, Brussels, ...
4.3 Explore joint funding schemes between FCH JU and Member States.	*EC, FCH JU SRG*	• With input from all relevant stakeholders, this aspect will be pursued to the widest extend and is currently on going with a few member states and other European and International organisations. (EUREKA, EUROGIA, NOW, ...) A first phase should be on planning alignment before co funding schemes can become operational. • Additional, the FCH JU considers using some of the funding mechanisms currently being tested by the SET EII's. (for example Joint EU – MS actions)	FCH JU ED, EC,	Ongoing	On going with UK, Austria, Germany, Denmark and Norway; usually legal framework is hindering. Expanding to E12: Romania, Hungary, Bulgaria, ...

Interim Evaluation Report		FCH JU comments / opinion / actions			
5 Ensure high efficiency of operations					
5.1.1 The current legal framework should be streamlined to fit the purposes of setting up and implementing JTIs. **5.1.2** The staff rules must be tailored to the needs of a PPP of this scale and in particular the number of staff for project management must be raised. **5.1.3** Review the possibility of sharing resource for required administrative functions between JUs to reduce costs to each and so allowing extra skilled project management resource to be included with no marginal cost increase.	EC, FCH JU GB and FCH JU Executive director	• On 5.1.1: A revision of the financial regulation is underway with a proposal to have specific provisions in their basic acts of public-private partnerships allowing derogations from the framework financial regulation and from the staff regulations; the outcome of the revision is not yet known. • On 5.1.1: The possibility of a new or adopted legal framework, in view of Horizon 2020, is currently under discussion. • On 5.1.1: In order to provide a solid and transparent basis for supporting large scale demonstration and deployment activities, securing a linkage between RTDD and commercial activities, other (new and existing) financial tools and constructions are being looked at. • On 5.1.2: In 2013, the 5 Project officers may have each between 20 and 25 projects to manage: limited to just administrative tasks and FCH JU representation. To be able to use the full extent of the FCH JU program officers and the full project portfolio, a more balanced workload, specific priorities within the program office and enlargement of operational staff should be discussed and decided within the FCH JU GB in respect of the Horizon 2020 objectives. • On 5.1.3: The ED of the 5 JU's are currently pursuing various cooperation activities as far as this is possible between different legal entities with specific peculiarities in several areas. Amongst the joint activities are :building and housing, IT, various joint procurements and joint HR reserve lists, ...) The leeway for further sharing, under the current legal framework, is quite limited and cost reductions would therefore be marginal.	EU, FCH JU GB & FCH JU ED	Ongoing activity and FP8 is a clear time target.	On going in light of H2020 for staff regualtions. Between the JU's discussions are on going to share further resources: HR, IT, Accounting, ...; however, already quiet some activities are in common: vacancies, IT infrastructure, and management, procurements, ...
5.2 Plans should be developed and implemented for interaction and exchange between projects supported by the JU.	FCH JU Executive director	• The FCH JU ED recognises to gap on project integration and with the operational staff, he will work on an implementation strategy. The FCH JU Project Review Day 2011, will be a first opportunity to practically see to this. Over the coming years, this event is expected to grow to become the main project interaction platform and info sharing hub. • Specific thematic workshops (Degradation, Sept 2011, Materials, Jan 2012) will be another opportunity. • Inter JU activities (for example FCH JU and Cleansky) are currently also being pursued.	FCH JU ED	On-going	Some activities are done and on-going; limited resources available and reluctance of project consortia

Interim Evaluation Report		FCH JU comments / opinion / actions			
5.3 Establish as soon as possible a high quality, robust system for project monitoring and assessment.	*FCH JU Executive director*	• The FCH JU project TEMONAS, currently under negotiations, will provide this, and also address 5.4 as it will enable benchmarking. • The SETIS, managed by JRC will also prowvide a program assessment.	FCH JU ED	Ongoing	TEMONAS is almost ready; Knowledge and policy officer; reduction of administration to free time for technical management.
5.4 Undertake international benchmarking to establish best practice for project commissioning.	*FCH JU Executive director*	• By regular meetings and actual visits, the situation in US, Canada, Korea and Japan, and in a second stage also BRIC countries, is monitored and best practice examples are adopted as for example on review of project portfolios, funding mechanisms, deployment strategies and technology status.	FCH JU ED	Ongoing	Program review days implemented; funding mechanisms in light of H2020.

ANNEX 8.

SUMMARY OF PROJECT COORDINATORS' SURVEY

Start date: 2013-03-27 End date: 2013-04-26

Respondents		
Country of origin		
	Number	**% of total**
Belgium	1	2.2%
Denmark	1	2.2%
Finland	1	2.2%
France	6	13.0%
Germany	11	23.9%
Greece	4	8.7%
Italy	8	17.4%
Netherlands	3	6.5%
Portugal	1	2.2%
Spain	2	4.3%
United Kingdom	3	6.5%
Associated country	5	10.9%
Nature of organisation		
Large business	4	8.7%
SME (less than 250 employees)	11	23.9%
Research centre (private, public, universities)	30	65.2%
Other	1	2.2%
What is the Application Area of your project?		
Transport and refuelling infrastructure	9	19.6%
Hydrogen production and distribution	12	26.1%
Stationary power generation & CHP	15	32.6%
Early market	6	13.0%
Cross-cutting Issues	4	8.7%
What is the nature of your project?		
Breakthrough research	5	10.9%
Research & technological development	33	71.7%
Demonstration	7	15.2%
Support action	1	2.2%

How does the FCH JU compare to FP7		
Administration		
	Number	**% of total**
Clarity of calls for Proposals		
Much better than average	14	30.4%
A little better than average	29	63.0%
A little worse than average	1	2.2%
Much worse than average	0	0.0%
No opinion	2	4.3%
Advice at preparatory stage		
Much better than average	22	47.8%
A little better than average	18	39.1%
A little worse than average	1	2.2%
Much worse than average	0	0.0%
No opinion	5	10.9%
Clarity of funding procedures		
Much better than average	7	15.2%
A little better than average	17	37.0%
A little worse than average	15	32.6%
Much worse than average	4	8.7%
No opinion	3	6.5%
Time to grant		
Much better than average	6	13.0%
A little better than average	30	65.2%
A little worse than average	6	13.0%
Much worse than average	0	0.0%
No opinion	4	8.7%
Response to questions during project implementation		
Much better than average	21	45.7%
A little better than average	21	45.7%
A little worse than average	2	4.3%
Much worse than average	0	0.0%
No opinion	2	4.3%
Time to pay		
Much better than average	15	32.6%
A little better than average	23	50.0%
A little worse than average	1	2.2%
Much worse than average	0	0.0%
No opinion	7	15.2%

Fairness and appropriateness of financial auditing		
Much better than average	8	17.4%
A little better than average	14	30.4%
A little worse than average	2	4.3%
Much worse than average	2	4.3%
No opinion	20	43.5%

Project management

	Number	% of total
Clarity of expectations of project management		
Much better than average	10	21.7%
A little better than average	32	69.6%
A little worse than average	1	2.2%
Much worse than average	0	0.0%
No opinion	3	6.5%
Quality and fairness of feedback on project progress		
Much better than average	15	32.6%
A little better than average	21	45.7%
A little worse than average	1	2.2%
Much worse than average	0	0.0%
No opinion	9	19.6%
Fairness and helpfulness of mid-term evaluations		
Much better than average	13	28.3%
A little better than average	14	30.4%
A little worse than average	2	4.3%
Much worse than average	0	0.0%
No opinion	17	37.0%
Facilitation of communication among projects		
Much better than average	13	28.3%
A little better than average	20	43.5%
A little worse than average	6	13.0%
Much worse than average	0	0.0%
No opinion	7	15.2%
Help with dissemination		
Much better than average	9	19.6%
A little better than average	21	45.7%
A little worse than average	3	6.5%
Much worse than average	0	0.0%
No opinion	13	28.3%

Programme design and implementation		
	Number	% of total
Clarity of programme objectives and relevance to Calls		
Much better than average	21	45.7%
A little better than average	23	50.0%
A little worse than average	0	0.0%
Much worse than average	0	0.0%
No opinion	2	4.3%
Appropriateness of programme objectives		
Much better than average	18	39.1%
A little better than average	24	52.2%
A little worse than average	1	2.2%
Much worse than average	0	0.0%
No opinion	3	6.5%
Structuring of programme by research areas and topics		
Much better than average	19	41.3%
A little better than average	21	45.7%
A little worse than average	4	8.7%
Much worse than average	0	0.0%
No opinion	2	4.3%
Clarity of Call and criteria for evaluation of proposals		
Much better than average	13	28.3%
A little better than average	28	60.9%
A little worse than average	0	0.0%
Much worse than average	0	0.0%
No opinion	5	10.9%
Fairness and transparency of evaluation		
Much better than average	7	15.2%
A little better than average	26	56.5%
A little worse than average	3	6.5%
Much worse than average	0	0.0%
No opinion	10	21.7%
Feedback from evaluation		
Much better than average	8	17.4%
A little better than average	24	52.2%
A little worse than average	4	8.7%
Much worse than average	0	0.0%
No opinion	10	21.7%

KI-NA-26-145-EN-N

Publications Office

ISBN 978-92-79-33018-6
doi:10.2777/41144