Fuel Cells and Hydrogen Joint Undertaking (FCH JU)

Amendment N°2 to ANNUAL IMPLEMENTATION PLAN (AIP) 2013

Adopted by the FCH JU Governing Board on 25th of November 2013

An additional chapter 3.8 is introduced as follows:

Chapter 3.8 of the AIP2013: Calls for Proposals

Call title: FCH JU Call for Proposals 2013 Part II

Call identifier: FCH-JU-2013-2

Indicative publication date: 28 November 2013

Indicative deadline: 27 February 2014 at 17.00.00 (Brussels local time)

Indicative budget: EUR 23 million[1] from the FCH JU 2013 budget[2].

Topics called:

Area/ Topics called	Funding Schemes
Area SP1-JTI-FCH.1: Transportation & Refuelling Infrastructure	
SP1-JTI-FCH.2013.1.1 Large-scale demonstration of buses and refuelling infrastructure VI	Collaborative Project
Area SP1-JTI-FCH.2: Hydrogen Production & Distribution	
SP1-JTI-FCH.2013.2.1: Demonstration of hydrogen production from biogas for supply to vehicle refuelling applications	Collaborative Project
Area SP1-JTI-FCH.4: Early Markets	
SP1-JTI-FCH.2013.4.2 Demonstration of portable generators, back-up power and uninterruptible power systems	Collaborative Project
Area SP1-JTI-FCH.5: Cross-cutting Issues	
SP1-JTI-FCH.2013.5.5 Development of a European framework for the generation of guarantees of origin for green H2	Coordination and Support Actions (Supporting Action)

The call for proposals will be selective. There will be competition between proposals, based on quality and excellence, which may result in some topics not being supported in this call.

[1] The final budget awarded as a result of this call and of the evaluation of proposals may vary by up to 10% of the total value of the call
[2] The funding includes the FCH JU's own budget only.

Duration of projects

Council Regulation 521/2008 set up the FCH JU as a body responsible for implementing the 7th Framework Programme for Research and Development for a period up to 31 December 2017. Accordingly the projects funded as a result of this call for proposals should end by 30 June 2017. For topics 1.1 and 2.1, it may, in exceptional cases, be accepted that a project lasts beyond that date. Applicants who are convinced that the success of a project in this topic will depend on a longer duration shall clearly explain the reasons in their proposal. In this case, in accordance with the statutes of the FCH JU an ad hoc procedure will be set up to ensure appropriate management of the concerned Grant Agreement(s) after the termination of the FCH JU. The Programme Office will work with the Commission services and the concerned project coordinator(s) to ensure a sound and smooth transfer of the grant agreement(s), the associated commitments and payments, the project file(s), the IT tools access and the audits rights.

Ranking of proposals and reserve list

Prioritisation between proposals will be made as follows

- In order to ensure the widest possible topic coverage, only one proposal by topic can be placed in the main ranking list. Other proposal(s) for the same topic will be placed in the reserve list.
- If proposals for the same topic obtain equal overall scores, they will be prioritised according to their scores for the S/T Quality criterion. If they are still tied, they will be prioritised according to their scores for the Impact criterion, and then by their scores for the Implementation criterion. If they continue to be tied, other characteristics agreed by the Panel member should be taken into account.
- If proposals for different topics obtain equal overall scores, they will be prioritised according to their scores for the S/T Quality criterion, then by their scores for the Impact criterion, and then by their scores for the Implementation criterion. If they continue to be tied, preference will be given to the proposal submitted under topic 1.1. Otherwise, other characteristics agreed by the Panel members should be taken into account.
- Proposal(s) in the reserve list will be funded if budget becomes available.

Indicative evaluation and contractual timetable

Evaluation of proposals is expected to be carried out in March 2014.

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

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

- **<u>Indicative</u> timetable for this call**

Publication of call	*28 November 2013*
Deadline for submission of proposals	*27 February 2014 at 17.00.00 (Brussels local time)*
Evaluation of proposals	*March 2014*
Evaluation Summary Reports sent to proposal coordinators ("initial information letter")	*April 2014*
Invitation letter to successful coordinators to launch grant agreement negotiations with the FCH JU	*May 2014*
Signature of first FCH JU grant agreements	*From September 2014*
Letter to unsuccessful applicants	*From September2014*

- **Further information and help**

The FCH JU website (call 2013 page) and Participant Portal call page contain links to other sources that you may find useful in preparing and submitting your proposal. Direct links are also given where applicable.

- **Call information**

Participant Portal call page and FCH JU web-page:
http://ec.europa.eu/research/participants/portal/page/fp7_calls

http://www.fch-ju.eu/

- **Specialised and technical assistance:**

Participant Portal help desk (eFP7 service desk)
http://ec.europa.eu/research/participants/portal/page/contactus

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

FCH JU reference documents are available at the website:
http://www.fch-ju.eu/content/how-participate-fch-ju-projects

Call for Proposals 2013-2: Topic Descriptions

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

Topic SP1-JTI-FCH.2013.1.1: Large-scale demonstration of buses and refuelling infrastructure VI

Rationale

In order to start the mass production of competitive hydrogen vehicles and provision of appropriate hydrogen refuelling infrastructure in the 2015 – 2020 timeframe, continuation and extension of the large-scale demonstration projects comprising vehicles and hydrogen refuelling stations is essential. Further, a broader picture including the connection of transport applications of FCH technology and issues with storage of fluctuating renewable electricity is essential.

Overall project objectives/Scope of work

The objective is to continue extending the earlier hydrogen demonstration sites and to continue setting up and pursuing initial steps for the demonstration of hydrogen fuelled buses and the related infrastructure in European regions/municipalities, increasing public awareness and attracting additional candidates for further demonstration activities. Candidate regions/municipalities should be well populated urban areas to either increase activity where hydrogen infrastructures already exist or create new markets close to existing ones. The purpose of the project is to add one or more new regions with the minimum of one new hydrogen station and additional buses, in hubs with one or more existing refuelling stations and to address the demonstration of FCEVs within metropolitan areas. Additionally the project should show benefits and synergies with production of renewable hydrogen for storing renewable electricity.

The demo project shall focus on public transport buses, which are in a development status of principle series production ability, and also provide high visibility. The consortium needs to deliver and operate vehicles and infrastructure, including their comprehensive performance monitoring, and propose recommendations for commercialisation. Furthermore, a close and binding link with the production of renewable hydrogen should be shown. The energy production does not necessarily be part of the project itself, but a strong and reliable interface between a sustainable transport technology such as hydrogen and a sustainable energy system should be demonstrated. For example, the storage of fluctuating renewable energy as hydrogen and the eventual use as a transport fuel could be such an issue.

The demonstration program needs to address:

- deployment of an additional number of hydrogen buses and infrastructure to contribute to the volume targets set in the multi annual implementation plan of the FCH JU (MAIP)
- measurement, evaluation and monitoring of specific vehicle and fuelling station parameters, such as delivered from the HyLights monitoring assessment framework in order to show the potential of the technology for the industries including suppliers. Specific values are to be defined by the project group at the beginning of the project.

- public awareness campaign and networking with potential candidate regions/ sites in order to accelerate the commercialization steps
- documentation on approval and certification process of vehicles and infrastructure aiming at simplification and harmonisation of approval procedures Europe wide to facilitate establishing the RCS framework required to enable the large scale deployment of vehicle and fuelling infrastructure throughout Europe
- dissemination of lessons learned and best practices for next demo sites
- perform safety due diligence for all aspects of the demonstration, including documentation of accidents and incidents and monitoring of safety issues in the context of prevailing regulations on site to provide guidelines for proper handling.
- results from the demonstration project to be exchanged with other projects working on fuel cell materials, components and degradation aspects to facilitate new innovations
- the consortium needs to show the path to series production of the vehicles and filling stations applied in the project and prove economic feasibility
- the consortium should establish a link to renewable hydrogen production projects. Topics of these projects could be the production of green hydrogen or the storage of fluctuating renewable energy as hydrogen and its eventual use as automotive fuel.

Expected outcome

The project shall provide a minimum of 5 urban buses, accompanied by at least one additional fully integrated filling station per site capable of meeting specified performance targets. In total a minimum of at least 15 buses in 2 different sites have to be realized. The vehicles or the hydrogen station could also be part of another funding programme, be it European, National or Regional, but with the minimum of one new hydrogen station.

The consortium needs to develop, deliver and operate vehicles and infrastructure, including their comprehensive performance monitoring. The vehicle types should be such which are usually mass produced with the potential of high market penetration in the future. The consortium has to show that the vehicles and their components used in the project are designed in a way that allows mass production. All participating vehicle providers must already sell buses (independent from the drive train technology) in large volumes on the European market. The minimum operation of the vehicles is 50,000 km per vehicle.

Both enlargement of existing sites and new sites are considered relevant.

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

- 35 MPa and if suitable 70 MPa refuelling capacity of a minimum of 100 kg H2/day at the beginning to be extended to a minimum of 200 kg H2/day ensuring that 5 buses can be re-fuelled per day and 1-2 buses can be re-fuelled within one hour. Concept for modular upgrade of the filling station for 10 buses/day refuelling capacity must be provided
- Availability of the station 98% (measured in usable operation time of the whole filling station)

- Alternative filling station specifications which will ensure that 5 buses can be re-fuelled per day and 1-2 buses can be re-fuelled within one hour will be acceptable, or another alternative several filling stations in the region with the total filling capacity equivalent to 5 buses refuelled per day
- Hydrogen cost (based on an operation capital expended consideration) at station <€10/kg (excluding tax) at start of project. Cost improvements due to higher hydrogen production for higher vehicle numbers is anticipated in the course of the project. Conditions under which hydrogen cost can be reduced to < 5€ /kg should be identified. (e.g. use of by-product hydrogen)
- Hydrogen purity and vehicle refuelling process according to SAE J2601 and 2719 and ISO specifications. IR Communication according to SAE TIR J 2799.
- Station hydrogen production efficiency target 50 – 70%, depending on the method of production (conversion efficiency of the whole production chain from primary energy to filling nozzle)
- A significant amount of the hydrogen (more than 50% per site) supplied should be produced by using renewable energies

Cost targets:

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

Targets:

- >4,000h lifetime initially, min. 6,000h lifetime as program target
- Major power source of the vehicles must be a fuel cell system
- Availability >85% with maintenance as for conventional buses
- Fuel Consumption < 11 - 13 kg H_2 / 100 km depending on drive cycle
- Pressure at filling station suitable to fill vehicles up to 350 bar CGH2 and if suitable 700 bar CGH2

Dissemination of the activities of the project to the broad public is seen as one key part of the demonstration project. It should especially be foreseen to communicate the benefits of hydrogen and fuel cells with reference to the demonstration project. Regional authorities should support the project with communication.

Environmental sustainability: assessment by using Well-to-wheel studies should be carried out. State of the art WTW data have to be used (e.g. JEC WTW study).

Any event (accidents, incidents, near misses) that may occur during the project execution shall be reported into the European reference database HIAD (Hydrogen Incident and Accident Database) at https://odin.jrc.ec.europa.eu/engineering-databases.html.

Other information

It is recommended that the project be co-funded by national, regional or private sources in order to demonstrate a strong commitment towards clean propulsion and emission free public transport.

The maximum FCH-JU contribution that may be requested is 15 M€ per project. This is an eligibility criterion – proposals requesting FCH-JU contributions above this amount will not be evaluated.

The project consortium should develop concepts to link their projects with other demonstration projects for FCEVs.

The consortium should include bus OEMs, integrated infrastructure equipment providers, fuel suppliers, bus fleet operators, industrial players, local and regional bodies, as appropriate. The involvement of SMEs is especially encouraged. The project should make proposals how the project can be coordinated with projects funded under the call FCH JU 2008 (topic SP1-JTI-FCH.1.1 and SP1-JTI-FCH.1.2) as well as the call FCH JU 2009 topic SP1-JTI-FCH.2009.1.1, the call FCH JU 2010 topic SP1-JTI-FCH 2010.1.1, the call FCH JU 2011 topic SP1-JTI-FCH 2011.1.1 and the call FCH JU 2012 topic 2012.1.1.

Expected duration: up to maximum 5 years (see chapter on duration of projects)

Funding scheme: Collaborative Project

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

Topic SP1-JTI-FCH.2013.2.1: Demonstration of hydrogen production from biogas for supply to vehicle refuelling applications

Rationale

Conversion of biogas to hydrogen for use in fuel cell vehicles is not only a way forward towards a decarbonised transport, but also an energy efficient pathway for implementing this renewable primary energy in the transport sector.

Mature and cost effective technologies for biogas conversion to fuel cell grade hydrogen are available. There is a need to demonstrate system level technology readiness at the MW level through implementation of all the functions required to bring bio-resource energy to vehicles with hydrogen as the energy carrier.

Overall project objectives / Scope of Work

The objective is to demonstrate the technological readiness, performance, reliability and total cost of ownership of installations for production and short-term storage of hydrogen from biogas with subsequent supply as a high value fuel to e.g. a nearby vehicle fuelling stations (retail, public transport, or fleets), by road transport or pipeline.

The aim is to show that providing hydrogen to transport applications from biogas can be an economically viable solution for reducing greenhouse gas emissions of transport.

Means for the production of biogas, logistics of the hydrogen produced and equipment for the use of the hydrogen are out of scope.

Optimal logistics from the production site to the point of use (by road transport or pipeline) should be considered to select proper locations for the demo site.

Expected Outcome

- Installation and continuous operation of a hydrogen production unit from biogas (between 100 and 500 kg/day), associated to a hydrogen storage system, with means of supply to a fuelling station.
- Study of relevant regulatory aspects associated with use of renewable certificates, access to spot purchase prices, as well as RCS relative to hydrogen production and stationary storage. Identification of barriers to deployment and recommendations to address these.
- Evaluation of costs, efficiency, and availability based on actual operation. Targets for operation are:
    - Efficiency > 64% (from biogas, LHV based)
    - Cost of hydrogen delivered short term < 10 €/kg, long-term < 5 €/kg
    - Hydrogen production facility turn-key CAPEX: 4.2 M€/(t/d)

- Availability > 95%
- > 25,000 h operation within the project, expected durability >10 years
- Hydrogen quality ISO/DIS 14786-2 compliant

- Assessment of CAPEX and cost of hydrogen delivered evolving with volume (both size of installation and number of installations deployed).
- LCA/LCI analysis (using FC-HyGuide guidance document available at: http://www.fc-hyguide.eu/) to be conducted

Other Information

The maximum FCH-JU contribution that may be requested is 10 M€ per project. This is an eligibility criterion – proposals requesting FCH-JU contributions above this amount will not be evaluated.

The consortium should include a BtH conversion/gas purification equipment supplier, as well as the required actors for system integration (including storage), operation and hydrogen fuel delivery, and involve RCS experts.

The vehicle fleet and fuelling stations that will be supplied shall be identified (these are not in the scope of this proposal). Projects should be coordinated with existing hydrogen vehicle and refuelling station deployment projects, and evidence of cooperation has to be stated in the proposal.

Expected duration: up to maximum 5 years (see chapter on duration of projects)

Funding Scheme: Collaborative project

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

Topic SP1-JTI-FCH.2013.4.2: Demonstration of portable generators, back-up power and uninterruptible power systems

Rationale

Back-Up Power (BUP) and Uninterruptible Power Systems (UPS), together with base load power supply, are promising early market applications for fuel cells and hydrogen and these technologies are being taken up by end-users in the telecoms, utilities, IT and other industry sectors. The potential to move into formal system implementation in the field is driven by the Total Cost of Ownership (TCO) gains resulting from the substitution of diesel gensets and batteries by hydrogen fuel cells. These gains can be very significant in areas where grids are unstable (Asia, Africa, etc.) but are still significant in Europe where grid networks are quite stable.

To promote European based technology commercialisation of hydrogen and fuel cell solutions for BUP and UPS applications (and in remote and/or grid weak areas for base load power systems) needs to be demonstrated at representative end-user sites and against specific end-user requirements to show that acceptable performance, reliability and lifetime targets can be met and that a lower total cost of ownership can be achieved. In the telecom sector the trend is for a reduced power requirement per site and 1-5 kW scale BUP and UPS systems are becoming more prevalent. However, site consolidation is also occurring with multiple operators co-locating their equipment and using the same BUP or UPS system, and providing base power for all system requirements. The major part of the market can be reached with solutions up to 10 kW but TCO gains for fuel cells might be found for systems of up to 50kW in off-grid applications.

Overall project objectives / Scope of Work

The overall objective is to deploy BUP or/and UPS units that can show a cost competitive total cost of ownership (TCO) when compared to legacy solutions (battery and diesel generators). The demonstration focus will be in the power requirement range of 1-10 kW or up to 50 kW on an exceptional basis. Fuel cell BUP and UPS demonstration sites could include more than one power range and type of fuelling solution (hydrogen logistics or on-site reforming of multiple fuels as well as integration with renewable sources where available).

Projects need to:

- Utilise latest development pathways (at the component and full system level) to establish technology platforms with improved reliability, life-time and cost prediction that already show credibility for future volume manufacture and roll-out, and providing a demonstrable advantage to the end-user over incumbent technology
- Measure and evaluate achieved benefits (e.g. in terms of savings, maintenance, emission reduction, operating hours)
- Contribute towards the determination of clear technical targets on costs, durability and reliability in order to establish a path forward for commercial deployment
- Provide for training of personnel for installation, fuelling, maintenance and service

- Coordinate with existing projects to provide clear recommendations for the establishment of the Regulations, Codes and Standards (RCS) framework needed to permit and to facilitate the commercialization of HFC technology for the application(s) addressed
- Be based on business plans and committed partners to continue the transition to volume deployment and future market introduction
- Disseminate results to wider audiences, preferably to potential customers and to the application stakeholders in international seminars/workshops

The fuel cell systems to be demonstrated will need to meet key challenges resulting from increased operation such as LHV average electrical efficiency of 50% (35% for reformate based fuel cell systems) and 2,000 cycles capability. Ideally one scalable system technology can be used to address a broad range of power requirements so as to simplify service and maintenance and to minimise spare parts inventory.

Expected Outcome

- Demonstration shall comprise a sufficient number of sites and a sufficient number of systems to aggregate to the demonstration of up to 250kW of units (for example up to 50 in the 1-5 kW range, up to 25 in the 6-10 kW range or up to 5 systems in the 11-50 kW range) in order to prove a technology readiness and commercial customer value proposition thereby leading to potential commercial supply
- Technical requirements that the proposed systems should include:
    - Reliability >95%
    - Response time of less than 5 ms
    - Projected lifetimes of 3 to 5+ years
    - Target system cost: 3,500 €/kW (if fuel cell system alone is considered); 6,000 €/kW (if fuel cell system + hydrogen generator is considered)
- Projected number of start-stop cycles 2,000
- Demonstrate a viable hydrogen supply solution for this application
- Demonstration activities should focus on deployment pathways most likely to lead to market introduction
- Environmental sustainability: assessment by means of Life Cycle Assessments studies should be carried out according to the requirements in the FC-HyGuide guidance document (available at :http://www.fc-hyguide.eu/)
- Systematic identification of technology benefits at system level compared to conventional technologies and TCO evaluations for each application shall be delivered together with cost targets for formulating future deployment schemes and mechanisms for the targeted sectors and markets including wide dissemination to the potential end-user industries and institution

Any event (accidents, incidents, near misses) that may occur during the project execution shall be reported into the European reference database HIAD (Hydrogen Incident and Accident Database) at https://odin.jrc.ec.europa.eu/engineering-databases.html.

Other Information

The project consortium should include a mix of sector relevant end-users (telecoms, utilities, IT, hospitals and other applicable industry sectors), equipment OEMs or/and service providers, fuel cell system developers and fuelling infrastructure or fuelling replenishment providers, alongside research and test organizations.

The delivery of BUP or/and UPS units for field demonstration should be achieved within one year of project commencement. Proposals should indicate a clear commitment of end users and/or service providers to continue with fuel cell system commercialization and technology deployment in Europe and/or external market regions during and post project completion. The project can be coordinated with similar demonstration projects funded under previous calls.

Expected duration: Up to 3 years with at least 1 year of field operation (see chapter on duration of projects)

Funding Scheme: Collaborative project

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

SP1-JTI-FCH.2013.5.5: Development of a European framework for the generation of guarantees of origin for green H2

Rationale

Guarantees of origin have been defined in the European regulation[3]: "*Guarantees of origin (…) have the sole function of proving to a final customer that a given share or quantity of energy was produced from renewable sources. A guarantee of origin can be transferred, independently of the energy to which it relates, from one holder to another. However, with a view to ensuring that a unit of electricity from renewable energy sources is disclosed to a customer only once, double counting and double disclosure of guarantees of origin should be avoided. Energy from renewable sources in relation to which the accompanying guarantee of origin has been sold separately by the producer should not be disclosed or sold to the final customer as energy from renewable sources. It is important to distinguish between green certificates used for support schemes and guarantees of origin.*"

The development of hydrogen as an energy carrier will partly depend on the capacity of market stakeholders to propose low-carbon or carbon-free hydrogen to final customers. However, the production of green H2 and its effective consumption will likely to be unbundled for optimizing transport and distribution, and thereby reducing the cost of hydrogen. This implies that a system of guarantees of origin for green hydrogen is created so that final customers can buy low-carbon hydrogen which is not the molecules they will effectively use in their fuel cell. In addition, these guarantees of origin could also be an appropriate instrument to create financial incentives to use green hydrogen.

Rather than several national guaranty systems are created in parallel, such a guaranty organization should be contemplated at the European level immediately.

Overall project objectives / Scope of work

The overall project objective for this project is to investigate and initiate a unique European framework for green hydrogen certificates, involving all producers and industrial customers of hydrogen energy which want to have their green H2 certified.

Expected Outcome

- Assess the needs and the benefits of H2 guarantees of origin in Europe, based on market projections from the industry and taking into account the recent European public policy documents (e.g. Fuel Quality Directive, Renewable Energy Directive, etc.)
- Identify the relevant stakeholders of a European framework for H2 guarantees of origin
- Investigate the synergies with existing platforms delivering guarantees of origin for other energy carriers and explore the interest in joining such platforms
- Propose a complete procedure for the emission of H2 guarantees of origin, with a strong emphasis on practical implementation
- Elaborate and provide a full description of an implementation strategy

[3] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources

Other information

The consortium should include highly experienced and qualified industry experts, representative of the production or distribution of renewable energy or hydrogen, to ensure sufficient coverage of the whole value chain. The participation in the consortium of an expert having significant previous experience in guarantees of origin will be actively sought.

Experience and outcomes from similar international activities should also be taken into consideration.

Expected duration: up to 2 years

Funding Scheme: Coordination and Support Action (Supporting Action)