ANNUAL ACTIVITY REPORT 2016

FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

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FCH JOINT UNDERTAKING

Publicly available

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TABLE OF CONTENTS

FACTSHEET

NAME	Fuel Cells and Hydrogen 2 Joint Undertaking
OBJECTIVES	a) To contribute to the implementation of Regulation (EU) N° 1291/2013, and in particular the Secure, Clean and Efficient Energy Challenge and the Smart, Green and Integrated Transport Challenge under part III of Annex I of Decision 2013/743/EU; (b) To contribute to the objectives of the Joint Technology Initiative on Fuel Cells and Hydrogen, through the development of a strong, sustainable and globally competitive fuel cells and hydrogen sector in the Union.
FOUNDING LEGAL ACT	Council Regulation (EU) N° 559/2014 of 6 May 2014 – OJ L169/108-129 of 7.6.2014
EXECUTIVE DIRECTOR	From 1 January 2016 to 15 May 2016: Philippe Vannson (Acting) Since 16 May 2016: Bart Biebuyck
GOVERNING BOARD	Chair: Raphaël Schoentgen Governing Board Composition: http://www.fch.europa.eu/page/governing-board
OTHER BODIES	States Representatives Group, Scientific Committee, Stakeholders Forum
STAFF	24 temporary agents and 2 contract agents
2016 BUDGET	EUR 127.3 million of which EUR 122 million allocated to operational activities and EUR 5.3 million to administrative costs
BUDGET IMPLEMENTATION	77.7 % in terms of commitment appropriations 83.9 % in terms of payment appropriations
GRANTS	By 31/12/2016, 46 signed for a total value of EUR 245 million
STRATEGIC RESEARCH AGENDA	The Multi-Annual Work Plan 2014-2020 is expected to be updated in 2017
CALL IMPLEMENTATION	1 call launched in 2016 Number of proposals submitted: 81 Number of eligible proposals: 76 Number of proposals funded: 19 Global project portfolio (since the setting up): 155 projects under FP7 and 46 projects under H2020 (calls 2014-2016) 3 studies from the AWP 2015 were contracted in 2016 Tenders paid in 2016: EUR 526 557.5 from H2020
PARTICIPATION, INCLUDING SMES	Total number of participants in funded projects (calls 2014-2016): 355 of which: % of SMEs: 22.5 % of private for profit/large companies: 64.8

FOREWORD

2016 was definitely a year of change for the FCH-JU with an almost completely new Governing Board (GB), including the chairman, and a new management team in the Programme Office. I want to use this opportunity to pay special thanks to Mr Philippe Vannson, acting executive director until May 2016, for running the FCH-JU during the transition phase and the preparations to ensure a smooth handover.

Nineteen projects were selected for grants in transport, energy and cross-cutting issues, two of which – one on energy and one on transport – will be flagship projects expected to attract international attention. In the 'JIVE' project, which includes co-funding from national and regional level and joined procurements, around 140 buses will be operational on European roads in five different Member States (MS). This project will demonstrate potential cost reductions and the possibility to use a zero-emission bus in everyday use. In the H2future project, a 6MW PEM electrolyser will be constructed near a steel plant to 'green' the hydrogen which is currently used by the steel industry. It will demonstrate one of the world's biggest PEM electrolyser and provide greater insight into its economic viability.

A new initiative was launched with cities and regions. We reached out to all those EU regions/cities with an interest in the potential use of fuel cell and hydrogen (FCH)-based products to help them achieve their decarbonisation goals and tackle air-pollution issues. To date, 43 cities and regions have signed a Memorandum of Understanding (MoU) with the FCH JU and there are more to come. In a first step, a symbolic signature session was organised during our stakeholder forum in November.

When preparing the Annual Work Plan 2017, we worked closely with all our stakeholders and agreed to put a special focus on basic research, the EU supply chain, international cooperation and the EU-13. A study was launched to map the EU supply chain and the final report is due at the beginning of 2017, but the intermediate results show that this technology has clear potential to create jobs and growth in Europe.

Communication about our projects and success stories has been another major focus point as we need to reach out to beyond the Fuel Cells and Hydrogen community. This was also one of the objectives during the stakeholder forum in 2016 where we reached out to other industries to discuss how we can cooperate more closely. For the first time, during the Programme Review Days (PRD), we showed project results from 2015 projects compared to the KPIs for 2017 set out in our Multi-Annual Work Plan. The outcome is that we are on the way to achieving our results.

Enjoy the reading

Bart BIEBUYCK
Executive Director FCH 2 JU

EXECUTIVE SUMMARY

2016 was a very dynamic year for the FCH 2 JU with a strong focus on the communication and dissemination of project results under the impetus of the new executive director (ED) and supported by a renewed governance team.

Significant achievements include:

1. The **state of the programme**, which was presented at the PRD on 21-22 November, showed the **progress towards achieving the scientific and technological targets** set in the MAIP/MAWP.

In the transport sector, 2017 targets in terms of efficiency (42 %° and availability (98 %) of cars have already been met, as have 2017 targets for availability (96 %) and the cost of hydrogen refuelling stations (HRS) (EUR 1-2.5 million depending on the capacity) and cost of hydrogen at the pump (EUR 5-11/kg depending on the origin).

Building on the results of bus demonstration projects, which confirm that the technology is now close to commercial reality, and on the outcome of the bus study[1] conducted in 2015, a new procurement study was contracted out. It aimed to pursue efforts to: (1) develop joint procurement for fuel cell buses, in particular in France and the Benelux countries; (2) support ongoing procurement activity and cluster coordination in the UK, Germany and Eastern Europe; and (3) define co-financing strategies.

In the energy sector, 2017 targets for electrical efficiency in power production (stationary fuel cells (FC)) were met and progress is ongoing in terms of cost reduction and greater durability.

A study was launched in May with the aim of: (1) analysing and evaluating potential business models and associated financing arrangements for the commercialisation of stationary FC, and including (2) recommendations for industry-wide business model innovation and for fostering collaboration among market actors. The report is expected by spring 2017.

Significant progress was also achieved in power to hydrogen (hydrogen production and storage) with 2017 targets being met for response time (< 10 s) and durability (< 2 % efficiency degradation per year) for both proton exchange membrane electrolysers (PEME) and solid oxide electrolysis (SOE) alkaline electrolyser types. It is worth reiterating that many projects are building on previous results and thereby increasing the effectiveness of the JU support.

A study was contracted out in June with the aim of identifying viable opportunities for power-to-hydrogen applications; the report will be available in spring 2017.

In cross-cutting activities, PNR projects are providing concrete information to improve and develop standards at international level, thereby contributing to developing an appropriate regulatory framework for FCH technologies. The Regulations, Codes and Standards Strategy Coordination Group (RCS SCG) established in 2015 has defined a set of priority areas for the FCH industry that will guide the selection of topics proposed for annual calls for proposals. In 2016, it issued recommendations for pre-normative research (PNR) priorities for the 2017 call.

2. **Success stories** were published highlighting key achievements of a number of projects, such as: 1) hydrogen from renewable energy[2] (Hydrosol); 2) hydrogen FC for zero-emission transport[3] (involving projects H2moves Scandinavia, HyTec, HyFive, H2ME, SWARM, CHIC, High V.LO City, HyTransit and 3Emotion); 3) clean urban transport with hydrogen buses[4] (involving projects CHIC, High V.LO City, HyTransit and 3Emotion); 4) fuel cell manufacturing industry[5] (involving projects Auto-Stack,

1 http://www.fch.europa.eu/sites/default/files/Strategies%20for%20joint%20procurement%20of%20FC%20buses_0.pdf

2 http://ec.europa.eu/research/infocentre/article_en.cfm?artid=40396

3 http://ec.europa.eu/research/infocentre/article_en.cfm?&artid=41376&caller=other

4 http://ec.europa.eu/research/infocentre/article_en.cfm?&artid=41156&caller=other

5 http://ec.europa.eu/research/infocentre/article_en.cfm?&artid=41356&caller=other

StackTest and Auto-Stack Core); and 5) 'Domestic Fuel Cells: the power within' (involving projects ene.field and PACE)[6]. A brochure was issued in November giving a general overview of the latest FCH JU achievements and funded projects' success stories (http://www.fch.europa.eu/publications/fch-ju-brochure).

3. **Key outreach activities** were carried out promoting real-life experiences and increasing the visibility of the FCH JU, such as: 1) the opening of the first public hydrogen station in Belgium (Zaventem) on 22 April in the presence of personalities from the European Commission and from Belgian local authorities; and 2) presence at the International Transport Forum (ITF) in Leipzig on 18-20 May with an exhibition, test-drive activities and the participation of the FCH 2 JU GB Chair, Raphaël Schoentgen, at a ministers' round-table session.

4. The ninth edition of the **Stakeholders Forum (SF)** held in Brussels on 23 November was a **big success** with over 300 participants, including new audiences. The programme focused on **partnerships** and involved external sectors, including gas, wind and solar. The event was marked by a **signing ceremony in the presence of the president of the European Committee of the Regions, Markku Markkula**, and with the participation of more than 20 representatives from cities and regions. The signature of the MoU between the FCH 2 JU and 43 cities and regions (at the date of this report) is the result of the FCH 2 JU's efforts to reach out to cities and regions in Europe with the aim of establishing a collaborative platform to facilitate the market introduction of FCH technologies.

5. Online communication activities were developed in 2016, in particular through two channels: 1) the Twitter account launched at the end of 2015 had reached 470 followers a year by the end of 2016 (more than double compared to June); and 2) the website visits increased by 77 % compared to 2015, reaching 96 382 following an increase in the news flow and implementation of the e-mail news module.

6. Call 2016 was published in January and following the evaluation of the proposals the FCH 2 JU GB approved a list of **19 actions selected for funding for a budget of EUR 94 million**. For 16 of the 19, the grant preparation was concluded with the signature of the Grant Agreement (GA) complying with the eight months' time to grant (TTG) target; the deadline was extended at the request of the consortium for the remaining three due to the complexity and/or size of the project; the related GAs will be signed in the first quarter 2017. It is the first time that GAs have been signed within the year of publication of the call.

7. Following a recommendation of the Internal Audit Service (IAS), a procedure on the selection and drafting of call topics which form part of the AWP was prepared and submitted to the FCH 2 JU GB who endorsed it on 29 June. It was effectively applied for call 2017.

8. FCH 2 JU methodologies for In-Kind Contributions in Projects (IKOP) and In-Kind contributions in Additional Activities (IKAA) were agreed by the FCH 2 JU GB and adopted by the ED. These provide for clear definitions and principles and for a robust process of controls to ensure the reliability of the reported data. The first reporting exercise for IKAA took place in 2016 with certified IKAA for 2014-2015 amounting to EUR 186.4 million. The updated 2016 additional activities plan adopted by the FCH 2 JU GB amounted to EUR 207.2 million, resulting in **cumulative IKAA for 2014-2016 of EUR 393.6 million, well above the minimum EUR 285 million set in the FCH 2 JU founding regulation for the entire duration of H2020.** Furthermore, when adding IKOP (for the calls 2014-2016) **the leverage effect of EU contributions to members only reaches 3.58**; in other words, for every euro of the EU contribution for all signed H2020 grant agreements for FCH 2 JU until 31 December 2016 committed to Hydrogen Europe and N.ERGHY members, their committed in-kind contributions are EUR 3.58.

9. Significant progress was made in the time taken to process periodic and final reports: 76 reports (similar to the number of reports validated in 2015) were validated with an average time to process of 216 days (compared to 300), while the time to pay was reduced to 71 days (compared to 85). The quality of *ex-ante* controls and other actions such as the financial workshops contributed to achieving a low error rate.

10. The *ex-post* audit effort was pursued with the launch of 18 new audits, for the first time using the RTD Framework Contract for FP7 audits and signing specific contracts with four external audit firms. Satisfactory results in terms of low error rates were confirmed with a cumulative residual error rate for finalised audits below 2 %.

11. Regarding the organisation and human resources, a new organisation structure was put in place reflecting the greater focus on communication and outreach activities and aiming at clear accountabilities and staff assignments. Special emphasis was put on learning and development and the introduction of individual training maps, which resulted in a positive trend in training statistics.

12. The FCH 2 JU GB, which counts eight new members (out of 10) appointed in 2016 – and corresponding to changes to the Hydrogen Europe and N.ERGHY boards and at the Commission – held the first **high-level strategic discussion** in November to reflect on the challenges facing the FCH sector and on possible actions to meet these challenges.

With the boost in communication and outreach activities, the results achieved by the projects, the launch of studies to define business models and financing arrangements in a number of applications, the significant leverage achieved to date, and the strong internal control system in place, in 2016 the FCH 2 JU confirmed its key role **as an effective and efficient platform** for the FCH sector in Europe.

6 Available in the brochure http://www.fch.europa.eu/publications/fch-ju-brochure and to be published on the EC repository in 2017.

INTRODUCTION

The Fuel Cells and Hydrogen Joint Undertaking (FCH 2 JU) was set up within the Horizon 2020 Framework Programme by Council Regulation N° 559/2014, as a unique Public-Private Partnership (PPP) supporting research, technological development and demonstration (RTD) activities in these technologies in Europe. This marks Europe's continued confidence and support for FC and hydrogen as key technologies for decarbonising our energy system, and creating a secure sustainable energy supply capable of generating new jobs.

In July 2014, President Jean-Claude Juncker highlighted in his Political Guidelines[7] the need "to pool our resources, combine our infrastructures (...) and to diversify our energy sources and reduce the high energy dependency of several of our Member States".

Indeed, 94 % of EU transport relies today on oil products of which 90 % is imported, and 75 % of the EU's housing stock is largely energy inefficient.

On 25 February 2015, Commissioner Miguel Arias Cañete insisted on the fact that: "Our path to real energy security and climate protection begins here at home. That is why I will focus on building our common energy market, saving more energy, expanding renewables and diversifying our energy supply." He launched the Energy Union Framework Strategy[8], one of the 10 Commission priorities, with the following statement: "We have to move away from an economy driven by fossil fuels, an economy where energy is based on a centralised, supply-side approach and which relies on old technologies and outdated business models. We have to empower consumers providing them with information, choice and creating flexibility to manage demand as well as supply."

He was supported in his approach by Commissioner Maroš Šefčovič who, on 21 June 2015, said: "We would like to provide Europeans with energy which is secure, competitive and sustainable".

The Communication from the European Commission[9] on 'A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy' includes all lines of action:

- Energy security, solidarity and trust
- Energy efficiency
- Decarbonising the economy
- Research, innovation and competitiveness.

In particular, the importance of supporting European research and innovation, for which Horizon 2020 represents its largest implementation tool to date, has been highlighted by Commissioner Carlos Moedas.[10]

Building a resilient Energy Union in Europe with a forward-looking climate-change policy will not be possible without promising technologies. FC and hydrogen could constitute a triple 'win' for Europe because they have the potential to enhance energy security (through superior efficiency and diversification of energy sources), environmental sustainability (through reduction of greenhouse gas emissions from both the energy and transport sectors) while simultaneously bringing economic benefits. They contribute to the following key priorities identified by President Juncker:

- A New Boost for Jobs, Growth and Investment
- A Resilient Energy Union with a Forward-Looking Climate Change Policy
- A Deeper and Fairer Internal Market with a Strengthened Industrial Base.

7 http://www.eesc.europa.eu/resources/docs/jean-claude-juncker---political-guidelines.pdf

8 http://ec.europa.eu/priorities/energy-union/index_en.htm

9 COM(2015)80, Energy Union Package

10 See, for example: https://ec.europa.eu/commission/2014-2019/moedas/announcements/european-research-and-innovation-global-challenges_en

In November 2016, the Commission presented the 'Clean Energy for All Europeans' package which aims to put energy efficiency first, achieve global leadership in renewable energies, and to give consumers a fair deal.

The Vice-President for Energy Union Maroš Šefčovič said:

"Today's package will boost the clean energy transition by modernising our economy. Having led global climate action in recent years, Europe is now showing example by creating the conditions for sustainable jobs, growth and investment. Today's proposals touch upon all clean energy related sectors: research and innovation, skills, buildings, industry, transport, digital, finance to name but a few. These measures will equip all European citizens and businesses with the means to make the most of the clean energy transition."

Commissioner for Climate Action and Energy Miguel Arias Cañete said:

"Our proposals provide a strong market pull for new technologies, set the right conditions for investors, empower consumers, make energy markets work better and help us meet our climate targets. I'm particularly proud of the binding 30 % energy efficiency target, as it will reduce our dependency on energy imports, create jobs and cut more emissions. Europe is on the brink of a clean energy revolution. And just as we did in Paris, we can only get this right if we work together. With these proposals, the Commission has cleared the way to a more competitive, modern and cleaner energy system. Now we count on the European Parliament and our Member States to make it a reality."

This should provide opportunities for FCH technologies.

The development of national plans to comply with the Directive for alternative fuels, which was scheduled for November 2016, was pursued, with most of the MS represented in the States Representatives Group (SRG) confirming the inclusion of hydrogen. The FCH JU continued dialogues with those MS which appeared to be excluding hydrogen, so as to make them aware of the latest developments in the technology and the efforts being made at European level.

The following section of the Annual Activity Report (AAR) highlights the main activities and the achievements of the FCH JU in 2016. They reflect the AWP 2016 adopted by the GB on 21 December 2015.

01
IMPLEMENTATION OF THE ANNUAL WORK PLAN 2015

1.1. KEY OBJECTIVES FOR 2016 AND ASSOCIATED RISKS

The overall objective of FCH JU is to implement an optimal research and innovation programme at EU level to develop a portfolio of clean and efficient solutions that exploit the properties of hydrogen as an energy carrier and FC as energy converters to the point of market readiness. This will lend support to EU policies on sustainable energy and transport, climate change, the environment and industrial competitiveness, as embodied in the Europe 2020 strategy, job creation, and will also help achieve the EU's overarching objective of smart, sustainable and inclusive growth.

The overall direction of the programme is guided by the multi-annual plans: MAIP for 2008-2014 under FP7 and MAWP for 2014-2020 under Horizon 2020. These plans specify targets for the state of FCH technologies in Europe (covering cost, durability and performance) and specific key performance indicators (KPIs). The progress of the programme and therefore scientific/technological achievements are judged by progress towards achieving these targets and KPIs. For the current review, the relevant ones are those for 2023 and interim ones for 2017 and 2020 during the **annual PRD**.

The main objectives and achievements are presented in section 1.2.

In 2016, the Programme Office (PO) prepared and published the 'FCH 2 JU first H2020 results' (http://fch.europa.eu/publications/fch-2-ju-first-h2020-results). The report summarises "*the first results on the popularity of H2020, the success of SMEs, the degree to which the programme has attracted newcomers and the FCH 2 JU Programme Office performance against some Key Performance Indicators*".

Leverage effect

'Leverage effect' is defined as the ratio between the total contributions provided by the JU members other than the EU and the EU contribution. The Council Regulation establishing FCH 2 JU sets the minimum leverage effect throughout its lifespan to 0.57 (i.e. for each EUR 1 of public money the EU contributes, the other members have to contribute at least EUR 0.57).

This leverage is achieved through participation in projects (IKOP), as well as through investments in Additional Activities (IKAA) that contribute to the FCH 2 JU goals but take place outside of its work plan. It should be noted that only contributions by the members of Hydrogen Europe and N.ERGHY (and their constituent entities) can be counted as leverage.

With regard to the definition of the 'leverage effect', the FCH 2 JU has adopted the following approach for the calculation:

(IKOP + IKAA) / EU contribution

As of 31 December 2016, the following data was taken into account for the individual components of the formula:

IKOP - > all committed amounts from Hydrogen Europe and N.ERGHY members from all signed grants (as of 31 December 2016) from calls 2014, 2015 and 2016.

EU contribution -> corresponding amounts from all signed grants (as of 31 December 2016) of FCH contributions from calls 2014, 2015 and 2016.

Please see a detail breakdown of the amounts per respective call in the table below:

TABLE 1.1.1: IN-KIND CONTRIBUTIONS AND EU CONTRIBUTIONS FOR GRANTS UNDER CALL 2014-2016

CALL	NUMBER OF PROJECTS	TOTAL EU CONTRIBUTION IN EUR	EU CONTRIBUTION TO HYDROGEN EUROPE/ N.ERGHY MEMBERS ONLY IN EUR	COMMITTED IN-KIND CONTRIBUTIONS (IKOP)[11] FROM HYDROGEN EUROPE/ N.ERGHY MEMBERS IN EUR
Call 2014	15	82 110 633.62	49 403 220.17	38 658 733.01
Call 2015	15	109 904 750.75	71 276 147.67	99 807 244.89
Call 2016	16[12]	52 975 062.88	29 147 615.17	3 824 336.45
TOTAL	**46**	**244 990 447.25**	**149 826 983.01**	**142 290 314.35**

These amounts are significantly higher than was initially foreseen, because many of the largest demo projects have rather low effective funding rates, being very close to the market.

IKAA - > all certified amounts of additional activities from the first reporting period of 2014-2015 of EUR 186.4 million and all planned 2016 additional activities to the value of EUR 207.2 million (based on the revised 2016 IKAA Plan adopted by the FCH 2 JU GB on 28 October 2016). This totals EUR 393.7 million of IKAA for the period 2014-2016.

For more details on IKAA, see section 1.7. of the AAR.

1. **Leverage effect on total EU contribution = (142.29 + 393.66) / 244.99 = 2.19**

In other words, for every single euro of the EU contribution for all signed H2020 grant agreements of FCH 2 JU until 31 December 2016, the industry and research members committed to spend EUR 2.19.

2. **Leverage effect on EU contribution to members only = (142.29 + 393.66) / 149.83 = 3.58**

In other words, for every single euro of the EU contribution for all signed H2020 grant agreements of FCH 2 JU until 31 December 2016 committed to Hydrogen Europe and N.ERGHY members, their committed in-kind contribution is EUR 3.58.

Thus, FCH 2 JU is able to demonstrate the leverage effect of commitments of the industry and research members far beyond the minimum threshold set in the FCH 2 JU founding regulation.

Risk assessment – 2016

In the annual risk assessment exercise, conducted in October 2015, the FCH 2 JU team identified significant risks and responses to those risks in terms of action plans in the AWP 2016.

As part of its annual risk assessment workshop for 2017, which took place on 17 October 2016, the FCH 2 JU team carried out a follow-up exercise on those risks identified in AWP 2016.

11 Data are based on total budget per grant agreement; the certification process for IKOP will start later in the H2020 programme.

12 Excluding three projects (Fit-4-AMandA, JIVE and ELECTROU) under preparation as of 31 December 2016.

The table below gives the status regarding fulfilment of the action plans (as reported in AWP 2016) as of 31 December 2016:

TABLE 1.1.2: FULFILMENT IF THE ACTION PLANS

RISK IDENTIFIED	ACTION PLAN	STATUS AS OF 31 DECEMBER 2016
FCH2 JU would fail to deliver on additional activities	Work closely with the stakeholders, attend meetings, and actively participate in preparation of the reporting and the plan for 2016. For the first certification year 2015, terms of reference and eligibility criteria for additional activities were defined in close cooperation with the FCH2 JU and its members.	The PO took an active role in the working group that was overseeing the first IKAA 2014-2015 certification exercise, and revision of the IKAA Plan 2016, as well as preparation of the IKAA Plan 2017. IKAA methodology, as a joint output from the working group, was presented to the FCH 2 JU GB and agreed on 9 December 2016. IKAA 2014-2015 certified figures and IKAA 2016 & 2017 Plan figures demonstrate significant commitment from the industry and research partners. (For more details, see section 1.7 In-kind Contributions.)
Unclear translation of the strategic objectives defined in the MAWP into the AWP (i.e. selection of grant topics)	In line with the findings and recommendations from the IAS report on evaluation and selection process of H2020 grant proposals, the internal procedure will be developed seeking an endorsement from the GB.	In 2016, the FCH 2 JU underwent the IAS audit on Performance Management, where one of the findings was similar to the risk identified by the PO, which confirms the effectiveness and efficiency of the risk-assessment process. On 29 June 2016, the FCH 2 JU GB endorsed the procedure on Selection and Drafting of Topics, in line with the action plan. In addition, all topics in call 2017 included targets with explicit links to those set in the MAWP. In the FCH 2 JU GB meeting held on 9 December 2016, the PO presented the plan for a revision of the MAWP which is scheduled to take place in 2017.
Stakeholders losing confidence in the industry	Work closely with the industry, steering their actions to align with the strategic objectives of the FCH2 JU, active participations on meetings/regular consultations. Ensure access to relevant information for stakeholders.	In 2016, FCH 2 JU introduced a new function in its organigram – Strategy and Market Development Officer, which aims to further improve the relationship with various stakeholders at the strategic level. At the Stakeholders' Forum held in November 2016, the participation of industry and other stakeholders was strengthened and there was positive feedback. In line with the Communication Strategy, adopted in December 2015, an annual communication plan was formalised and put in place to enable all relevant stakeholders to be fully informed.
Loss of control of important administrative processes in H2020 (e.g. *ex-post* audits) due to centralisation (important processes taken over by the Common Support Centre (CSC))	Liaise with the CSC at working and executive levels and active participation in meetings.	In 2016, most of the efforts related to discussions with the CSC focused on the area of H2020 *ex-post* audits. In September 2016, a strategic meeting at the JUs' ED level with the Director of the CSC Executive Committee was held to agree on the priority for the JUs to establish their own representative error rate for H2020, based on JUs' specific representative error rate. In light of the agreement reached at ED level, JUs have coordinated their efforts and jointly prepared a common H2020 JUs' sampling methodology. (For more details, see section 4.3.)

RISK IDENTIFIED	ACTION PLAN	STATUS AS OF 31 DECEMBER 2016
High dependency on the common H2020 IT tools – security and data quality issues	Close contact with the EC, regular reporting, implementation of the complete information security system.	In 2016, as part of the action plan, the PO undertook a review of the definition of the users' rights to H2020 tools and access rights for all users outside the FCH 2 JU PO. The list of the users and overview of their roles was obtained from the CSC central services. FCH 2 JU raised further questions on the nature and necessity of the rights given to those users for which CSC provided explanations and justifications.
Risk of not getting a clean audit opinion from the European Court of Auditors (ECA) and the subsequent discharge from the European Parliament (EP)	Close cooperation with the ECA, the EC, and other stakeholders (EP).	In 2016, the PO continued with a close and transparent communication with the ECA, EC and other stakeholders in the key areas, focusing on the transition between FP7 and H2020 in the light of the most significant changes, e.g. compliance with new legal requirements (i.e. IKAA reporting), error rates (i.e. changes in ex-ante and ex-post controls processes), etc. –to ensure the best circumstances for continuing positive discharge for the coming years.
High dependency on the key personnel, business continuity, back-up planning	Knowledge share and back-up planning, implementation of the talent management. Update of the business continuity plan based on the business impact assessment.	In 2016, sharing knowledge within the PO was further reinforced by introduction of the joint-inter-unit meetings whereby actions agreed at the management level are communicated to the staff on weekly basis to ensure common understanding and goals convergence. As regards business continuity, the back-up for each staff member was updated and measures were reviewed and updated (VPN access for all staff, communication means, car-pooling, etc.).

The outcome of the 2016 risk assessment workshop on the new or continuing risks for the year 2017 is included in the AWP 2017.

1.2. RESEARCH AND INNOVATION ACTIVITIES

1.2.1 KNOWLEDGE MANAGEMENT

From the knowledge management point of view, in May, a comprehensive request for data was addressed to all projects which had been active in 2015 via the online platform, the aim being to create a picture of the status in 2015 of the various FCH technologies. A set of parameters was requested from the projects via tailored template questionnaires developed in collaboration with the various stakeholders, including the FCH JU Scientific Committee (SC), the Industry Grouping (IG) and the Research Grouping (RG).

Compared to the 2015 pilot exercise, the interface was modernised to improve the user experience. Although this was welcomed by the data providers, it was offset by the fact that several users encountered access problems (corporate firewall preventing access to the website) and technical failures (failure to save, lost data, numbers not accepted, etc.). In the light of this, it was decided to develop a new data collection programme which would eliminate the complexities of the existing tool; this is due to be finalised by March 2017. Procurement was arranged with the company Intrasoft International through the European Commission Framework Contract for IT developments.

Overall, the 2016 data collection exercise was not entirely successful in that ultimately many projects failed to provide the information requested or only partially provided it. In addition, a lot of the data provided were marked 'confidential', allowing for their disclosure only upon prior anonymisation which was seldom possible considering the scarcity of available values.

Nevertheless, the information gathered was exploited to delineate a picture of the overall technology status compared to the MAWP targets, albeit in a broadly qualitative way bearing in mind the existing limitations to using the confidential data). This was disseminated during the PRD in November 2016.

In parallel to data collection from projects, the FCH JU coordinated the collection of the international state of the art on several FC and hydrogen technologies. The information was gathered by the Petten JRC team for the following technologies: vehicle on-board hydrogen storage tanks (type III and type IV), hydrogen refuelling station, PEMFC μ-CHP, SOFC μ-CHP, PEM electrolysers and alkaline electrolysers.

1.2.2 SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS

On the transport side, demonstration activities involving cars concern over 1500 vehicles (of which 250 are already in operation, the others being planned within the running projects) which have now accumulated a total of over 1 million km driven and consumed over 13 300 kg of hydrogen (average fuel consumption 1.3 kg hydrogen per 100 km) at an average availability of 99.2 % since the FCH JU started. During 2015-2016, there were over 4400 refuelling operations and the driving range was increased to 594 km. The 2017 targets for tank-to-wheel efficiency (42 %) and availability (98 %) have already been met, while those for fuel cell system cost (150 EUR/kW), mid-executive class vehicle cost (EUR 70 000) and fuel cell system lifetime (5000 h) are still ongoing.

To meet the refuelling requirements for further uptake, a network of HRS is being created across Europe. To date, this covers eight countries and during 2015-2016 delivered 130 000 kg of hydrogen in 17 500 refuelling operations at 96 % availability. These installations meet the 2017 targets for station CAPEX of EUR 1-2.5 million (200-1000 kg/day) and the cost of hydrogen at the pump EUR 5/kg (from hydrocarbons) to EUR 11/kg (from renewables). These values are slightly lower (better) than the international state of the art.

Demonstrations with buses concern 67 vehicles in 12 cities (41 vehicles in 7 cities already in operation) and the technology is now close to commercial reality at TRL 8. These demonstrations have now accumulated a total driven distance of over 446 000 km and consumed over 42 900 kg of hydrogen (average fuel consumption 9.8 kg hydrogen per 100 km) at an average availability of 86 % since the FCH JU began. In 2015, there were over 2500 refuelling operations, and the buses have proved able to meet the daily duty cycle. One vehicle has accumulated 22 000 h run time. The 2017 target for fuel consumption has been met (fuel economy doubled compared to the previous generation of vehicles), while those for vehicle costs (EUR 700 000), availability (90 %) and fuel cell system lifetime (8000 h) are still ongoing.

Demonstrations of material-handling vehicles have involved 48 vehicles covering 6 models from 3 manufacturers on 10 sites. These vehicles are now ready for commercialisation. They have accumulated approximately 45 000 h of operation, consuming over 4000 kg hydrogen in 11 300 refuellings. The 2017 targets for lifetime (10 000 h), efficiency (50 %), availability (95 %) and cost of on-board hydrogen storage (EUR 1000/kg hydrogen) have all been achieved. Only the target for the cost of the fuel cell system (EUR 1500/kW at 10 kW scale) remains to be met.

From the above achievements, it can be seen that fuel cell system cost and operational lifetime are the main outstanding issues in the transport pillar. The challenge for the coming years is to meet these requirements together (not individually) without compromising the targets already achieved.

As for the **research-oriented activities**, most of the activities and projects in this part of the programme are concerned with improvements in proton exchange membrane fuel cells (PEMFC) cells and stack components. The 2017 KPIs have been met for electrical efficiency (55 %), power density (1 W/cm^2 at 1.5 A/cm^2), durability (6000 h) and operating temperature (-25 to +95 °C). However, no project has yet been able to meet all the KPIs simultaneously. The KPI for platinum loading (0.1 g/kW) also remains elusive.

Novel hydrogen compression and storage systems have been developed to increase HRS availability and performance. New materials and improved components have enabled integrated on-board hydrogen storage tank systems to meet the 2017 KPIs for volumetric capacity (0.022 kg/l) and gravimetric capacity (4 %). However, despite the introduction of low-cost robotic manufacturing methods, the storage system cost is still greater than the 2017 target (EUR 800/kg hydrogen). Further cost reduction is anticipated through optimisation of the storage system design for the mass production processes.

Research and innovation in the transport pillar has resulted in a large number of dissemination activities, including over 200 conference presentations and more than 100 journal publications. The exploitation activities have generated 12 patents and, following the completion of the COPERNIC project, the creation of a new start-up company specialising in filament-wound tank modelling.

In conclusion, **current projects in the transport sector** give every confidence that Europe is catching up in the area of large demonstration projects for passenger vehicles, and the flagship project H2ME has started well. Road transport HRS projects are a huge success; they have excellent visibility, strong management and are on track to reach their objectives. Building on the current network of HRS will enable widespread adoption of the technology, and many projects already share hydrogen infrastructure which will increase station utilisation.

Europe has gained a lead position internationally for the technology validation of fuel cell buses with, encouragingly, more countries and regions becoming involved. 3EMOTION, CHIC, and HIGH V.LO-CITY all report significant progress. The bus projects in the portfolio are extremely comprehensive, following past demonstrations and building a consortium of industry partners able to contribute significant results to move to full commercial products with wide acceptance. The projects are showing impressive improvements with respect to fuel efficiency and availability. More publically available results would be very useful so that the larger industry (outside the group of EU-funded projects) can learn about the achievements and benefit from them.

In terms of portfolio, there does not appear to be any overlap between individual projects, and the majority of projects interact with similar projects. Some information sharing does take place in all the projects. The level of integration with other national initiatives is good, with H2ME, CHIC, HIGH V.LO-CITY, HY-FIVE and HYTRANSIT standing out as having excellent relationships/interactions with national and regional programmes.

On the energy side – power production (stationary FC) close to 700 m-CHP systems have been installed so far in 11 countries across the field trials by 10 active manufacturers. These have shown that generating their own electricity allows home owners to cut energy costs by EUR 800-1300 each year, reducing their exposure to rising electricity prices. The aim is to have 3000 units installed by 2020, providing a pathway to competitive market opportunities. The field trials have revealed that the European Commission (EC) labelling system for these devices is more stringent than for incumbent domestic heating systems, which acts as a barrier to the take-up of fuel cell systems. The 2017 KPIs have already been met for both electrical efficiency (reaching as much as 60 % for some systems) and total efficiency. However, 2017 KPIs for capital cost (EUR 14 000/kW at present manufacturing volumes) and durability (12 years lifetime) is still being explored. The main routes being pursued for cost reduction are to decrease system complexity, increase use of standardised components, further automate manufacturing, and raise production volumes.

In the case of larger systems, the DEMOSOFC project is achieving particular success in integrating a 170-kW FC system with a biogas supply from a waste-water treatment plant. This will be the largest solid oxide fuel cell (SOFC) in Europe. The DEMCOPEM project is constructing a 2-MW combined heat and power (CHP) installation in China utilising excess hydrogen from a chlor-alkali plant. On a smaller scale, tens of off-grid and back-up power supplies have been installed in remote areas and emerging economies.

As for the **research-oriented activities**, the projects on FC stacks have accumulated over 76 000 h of FC operation and the stacks have an average availability of 92 %. Average stack costs are EUR 4200/kW for SOFC and EUR 5300/kW for PEMFC. Average stack lifetimes now exceed the 2017 KPI of 30 000 h with total system efficiencies exceeding the 2017 KPI of 82 %. However, the average system electrical efficiency remains below the 2017 target of 57 %, even though efficiency as high as 60 % has been reported for some systems.

As expected for activities dominated by research, professional dissemination has been substantial with over 380 conference presentations and more than 220 journal publications. 'On the job' training for young engineers has been provided for approximately 17 postdoctoral researchers, 15 PhD students and 5 MSc students.

The strong emphasis on the issue of the degradation of research projects early on in the programme has achieved an increase in lifetime by two orders of magnitude. This has been key in enabling the success of demonstration projects such as ENE.FIELD. The ENDURANCE project is continuing to tackle this major issue and has already provided an enhanced understanding of degradation mechanisms for SOFCs. On the other hand, the HT-PEMFC project CISTEM has developed an innovative solution for membrane electrode assembly (MEAs) that has demonstrated a degradation rate of 4μV/h over more than 12 000 h, which goes beyond the state of the art.

Moreover, on the next-generation stack and cell design, the T-CELL project has demonstrated very positive results with its new concept of triode operation for SOFC, with its results showing a 40-50 % reduction in carbon deposition on commercial anodes.

In the area of diagnostics, monitoring and control, the highlights definitely come from the SAPPHIRE project which demonstrated two systems for 6000 h with minimal or no degradation and, in fact, managed to demonstrate a rejuvenation rate of 4μV/h.

Finally, the increasing interest in research on manufacturing has produced good results through the automation and streamlining of processes with the aim of reducing costs at large volumes. As an example, the NELLHI project has designed an all-European stack which is suitable for mass manufacturing and can lead to a stack cost of EUR 1000/kW.

In conclusion, **many projects build on previous results** which are increasing the effectiveness of FCH-JU support. Many are also performed jointly with nationally funded initiatives which are advantageous for increasing the scale of demonstration activities and wider promotion of the technologies. Projects are establishing links with others undertaking related work. The training aspects are good, particularly in those demonstration projects where technical staff are trained to install and monitor the field units. Dissemination in terms of publications and conference participation is very strong and workshop activity is growing.

On the **energy side – power to hydrogen (hydrogen production and storage)**, progress in proton exchange membranes (PEM) and alkaline electrolyser technology has been particularly strong and has served to maintain Europe's leading position in this area. Eight demonstration units have been installed and have produced 100 tonnes of hydrogen with 93 % availability. The 2017 KPIs for response time (< 10 s) and durability (< 2 % efficiency degradation per year) have already been met for both PEME and SOE alkaline electrolyser types. Energy consumption at 57 kWh/kg is very close to the target of 55 kWh/kg H_2. However, the capital cost of PEM electrolysers is still above the target (EUR 3.7 million/t/day) as it is for PEMFC in transport applications.

The NOVEL project has successfully incorporated new materials into PEM electrolyser stacks which can produce hydrogen at 5 €/kg, meeting the 2017 KPI. The developments are now being fed into MEGASTACK for a prototype demonstration at the megawatt (MW) scale and to reduce capital cost by improved cell design, manufacturability and supply chains. However, the projected cost using the current technology is below (75 %) the 2017 KPI.

Larger-scale demonstrations are now in prospect for concentrated and direct solar hydrogen production as a result of successful developments on smaller scales. Low concentration (1 μg/cm^2) gold catalysts have been developed for high-temperature water splitting using concentrated solar heat input, and promising new configurations and catalysts for photoelectrolysis are being scaled up.

Solid-state storage of hydrogen in metal hydrides was demonstrated in integrated systems, although issues of complexity and hydrogen density remain.

Future activities should look at the transient operation of electrolysers, particularly for renewable energy storage, and their reliability at proof of concept stage. Consideration should be given to the need for standardised methodologies for reporting on related key parameters to enable a common understanding on progress, targets and needs.

Most projects provide on-the-job training for research and technical staff and PhD students; further consideration should be given to appropriate regulation code and standards (RCS) developments where relevant.

All projects engage in public-awareness activities at some level. There is a strong output of conference presentations and journal papers as might be expected from the high volume of research activities.

On the **cross-cutting side**, the pre-normative research (PNR) projects are providing solid information to improve and develop standards at the international level, thereby contributing to developing an appropriate regulatory framework for FCH technologies. A Regulations, Codes and Standards Strategy Coordination Group (RCS SCG) has been created to establish a set of priority areas for the FCH industry that will guide the selection of topics proposed for annual calls for proposals.

HYRESPONSE has developed an operational training platform and a virtual reality platform to train first responders called to deal with incidents involving hydrogen. It has trained 71 firefighters from 15 countries. This platform is being exported to train first responders outside of Europe by providing both the training materials, in the form of a web-based course, and training sessions.

In the HYACINTH project, the largest exercise ever has been carried out to gain a deeper understanding of the social acceptance of hydrogen technologies across Europe. This has covered both the transport and energy sectors, conducting around 7000 surveys and 200 interviews with interested stakeholders and the general public. These showed that awareness of μm-CHP technologies is generally low and the technology is mainly perceived as costly and immature. Awareness of hydrogen FC vehicles in the transport sector is much higher, with cost and lack of refuelling infrastructure seen as the main barriers to potential take-up. This is being followed up by the HY4ALL project which aims to raise public awareness and increase social acceptance of FCH technologies.

Another internationally pioneering scheme has been developed by the CERTIFHY project for specifying and guaranteeing the quality of 'green' hydrogen in order to inform end-users about the hydrogen's 'renewable content'. Horizontal and dissemination activities are at the forefront of the projects in the cross-cutting area.

1.3. CALLS FOR PROPOSALS AND GRANT INFORMATION

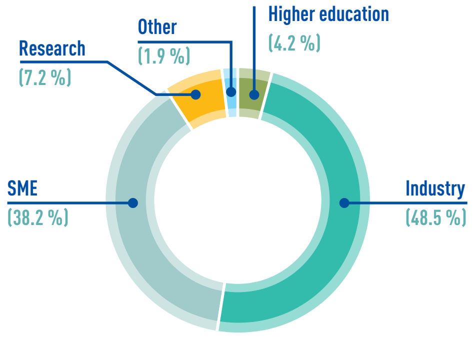
2015 CALL

The 2015 call for proposals, published on 5 May 2015 was closed on 27 August 2015. Sixty-two eligible proposals were received and submitted for the evaluation exercise that took place from 2 September to 10 October 2015, with the help of 34 independent experts. Fifteen proposals were selected for funding: the list of these and the reserve lists were adopted by the GB by written procedure on 26 February 2016. All consortia were informed of the evaluation results at the same time, 90 days (Time To Inform, TTI) after the closure of the call. This information was done well in advance of the TTI target fixed by the Commission (153 days). Immediately after the information had been sent, preparation of the GAs began. All the GAs were signed in 2016 and before the TTG target fixed by the Commission, i.e. 243 days after the closure of the call, except for two projects (H2ME2 and PACE) where the signature took longer due to the complexity of these two major demonstration projects.

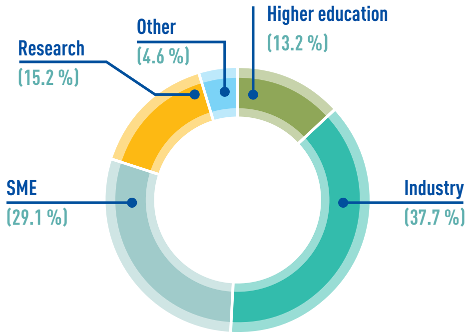
PROJECT CALL ID	PROJECT NUMBER	PROJECT ACRONYM	TTI	TTS	TTG
H2020-JTI-FCH-2015-1	700092	BIG HIT	90	147	237
H2020-JTI-FCH-2015-1	700266	Cell3Ditor	90	127	217
H2020-JTI-FCH-2015-1	700200	COMPASS	90	139	229
H2020-JTI-FCH-2015-1	699892	ECo	90	152	242
H2020-JTI-FCH-2015-1	700359	ELY4OFF	90	127	217
H2020-JTI-FCH-2015-1	700101	Giantleap	90	106	196
H2020-JTI-FCH-2015-1	700300	GrInHy	90	114	204
H2020-JTI-FCH-2015-1	700350	H2ME 2	90	194	284
H2020-JTI-FCH-2015-1	700564	HEATSTACK	90	127	217
H2020-JTI-FCH-2015-1	700008	HPEM2GAS	90	106	196
H2020-JTI-FCH-2015-1	700355	HyGrid	90	111	201
H2020-JTI-FCH-2015-1	700190	HYTECHCYCLING	90	127	217
H2020-JTI-FCH-2015-1	700127	INSPIRE	90	132	222
H2020-JTI-FCH-2015-1	700339	PACE	90	177	267
H2020-JTI-FCH-2015-1	700667	SOSLeM	90	149	239

The 15 projects listed above include 151 participations (127 participants) for the total FCH 2 JU contribution of EUR 109.9 million. The figures below provide statistics on the distribution of the number of participants and the FCH 2 JU contribution by participant category[13].

Call 2015: Breakdown of FCH contribution by participant category



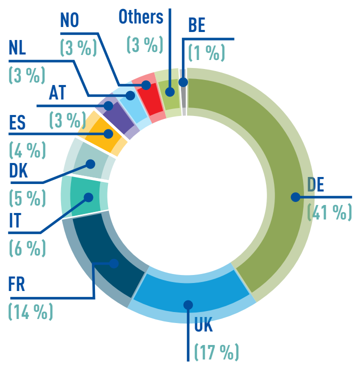
Call 2015: Number of projects by participant category



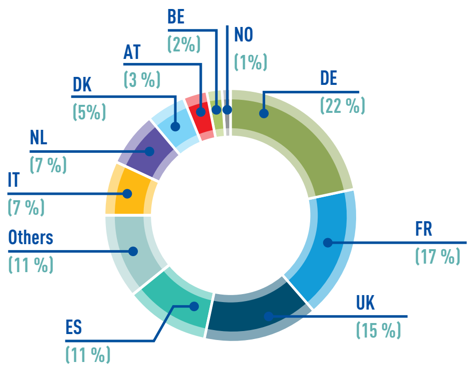
13 The data originate from the 'Participant LE Type Abbr' field whereby the PMC field is corrected with SMEs for all entries in which the field 'Participant SME?' is positive and 'Industry' where that field is negative.

Beneficiaries from 17 EU MS or Associated Countries are participating in the 15 projects and have received funding. Beneficiaries from another country (Switzerland, CH) are also participating in the projects but are not receiving FCH 2 JU funding. The figures below indicate the distribution of the participants and the FCH 2 JU contribution by country.

Call 2015: Breakdown of FCH contribution by country



Call 2015: Number of participants by country



2016 CALL

The 2016 call for proposals was published on 19 January 2016, including, in accordance with the AWP 2016, 24 topics: 10 in the transport pillar, 11 in the energy pillar, 1 overarching and 2 cross-cutting, with an indicative budget of EUR 117.5 million. The call closed on 3 May 2016.

On 3 February, a public information day was organised in Brussels.

The 2016 call received 81 proposals: the results of the evaluation of these proposals are presented in paragraph 1.3.2.

All consortia were informed of the evaluation results at the same time, 126 days (TTI) after the closure of the call, well in advance of the TTI target fixed by the Commission (153 days). Immediately after the information had been sent, preparation of the GAs began: 16 out of 19 GAs were signed in 2016 and before the TTG target fixed by the Commission, i.e. 243 days after the closure of the call.

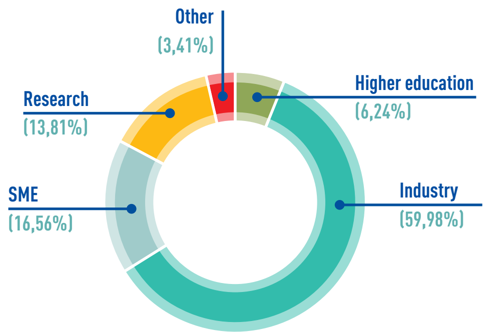
PROJECT CALL ID	PROJECT NUMBER	PROJECT ACRONYM	TTI	TTS	TTG
H2020-JTI-FCH-2016-1	735160	qSOFC	126	94	220
H2020-JTI-FCH-2016-1	735218	PECSYS	126	92	218
H2020-JTI-FCH-2016-1	735367	INLINE	126	92	218
H2020-JTI-FCH-2016-1	735485	QualyGridS	126	92	218
H2020-JTI-FCH-2016-1	735503	H2Future	126	98	224
H2020-JTI-FCH-2016-1	735533	MEMPHYS	126	92	218
H2020-JTI-FCH-2016-1	735582	JIVE[14]	126	135	
H2020-JTI-FCH-2016-1	735692	CH2P	126	100	226
H2020-JTI-FCH-2016-1	735717	MARANDA	126	101	227
H2020-JTI-FCH-2016-1	735918	INSIGHT	126	92	218

14 Signed on 19 January 2017.

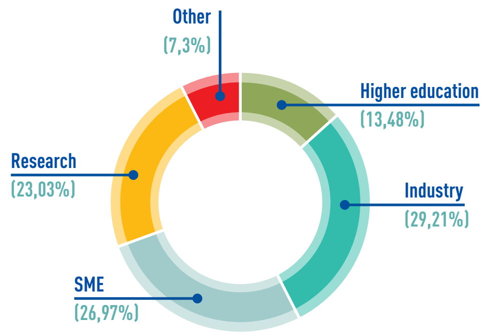
H2020-JTI-FCH-2016-1	735969	INN-BALANCE	126	100	226
H2020-JTI-FCH-2016-1	735977	HyLAW	126	99	225
H2020-JTI-FCH-2016-1	736122	COSMHYC	126	98	224
H2020-JTI-FCH-2016-1	736272	BIOROBURplus	126	100	226
H2020-JTI-FCH-2016-1	736290	DIGIMAN	126	94	220
H2020-JTI-FCH-2016-1	736351	Demo4Grid	126	94	220
H2020-JTI-FCH-2016-1	736648	NET-Tools	126	100	226

The 17 projects listed above (+ 2 expected to be signed in Q1 2017) include 178 participations for the total FCH 2 JU contribution of EUR 94 million. The figures below indicate the distribution of the number of participants and the FCH 2 JU contribution by participant category.

Breakdown of contribution by participant category (in %)

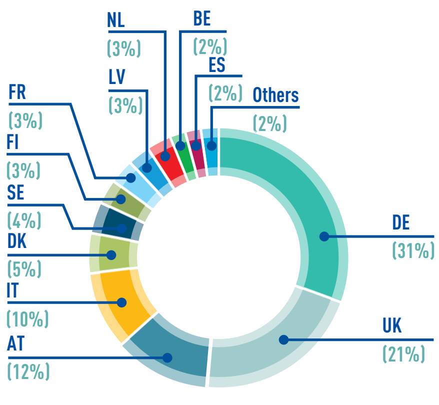


Number of participants by category

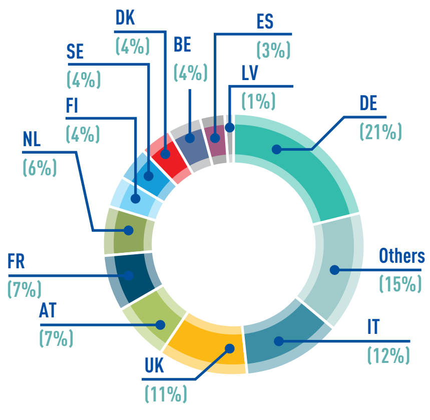


Beneficiaries from 22 EU MS or Associated Countries are participating in the 19 projects and have received funding. Beneficiaries from another country (Switzerland, CH) are also participating in the projects but are not receiving FCH 2 JU funding. The figures below indicate the distribution of the participants and the FCH 2 JU contribution by country.

FCH contribution by country (in %)



Number of participants by country



2017 CALL

With the help of the IG, RG and EC representatives, the programme unit prepared the AWP 2017 during 2016, following a newly developed procedure (see section 2.2).

The AWP 2017 was adopted by the GB on 20 December 2016. The call – with 24 topics distributed between the transport pillar (7), the energy pillar (12) and cross-cutting actions (5) – was launched on 17 January 2017 with an indicative budget of EUR 116 million. Closure of the call is fixed for April 20 2017.

1.3.1. PROGRESS VERSUS KPIs/STATISTICS (ANNEXES 5, 6 AND 7)

Annex 5 lists the Horizon 2020 KPI indicators relevant to the FCH 2 JU and Annex 6 the indicators for monitoring Horizon 2020 cross-cutting issues. The KPIs provided in these Annexes are calculated on the basis of the projects issued from the three Horizon 2020 calls for proposals to date (2014-2016) and indicate progress to date against the Framework Programme objectives[15].

Cumulatively, the 2014, 2015 and 2016 calls for proposals attracted applicants from 27 of the 28 MS: only beneficiaries from Luxembourg have never applied to any of the FCH JU Horizon 2020 calls. This demonstrates a very good visibility of the programme across the EU.

The distribution of FCH2 JU contributions according to the type of activities and the pillars is compared with the MAWP targets in the table below[16]:

TABLE 1.3.1.1: BUDGET DISTRIBUTION (IN %)

ACTIVITY AND PILLAR	2014	2014-2015	2014-2016[15]	MAWP TARGET
Innovation actions in transport	39.0	32.0	32.7	33
Research and innovation actions in transport	16.3	14.3	17.0	14.5
Innovation actions in energy	18.8	31.2	28.3	33
Research and innovation actions in energy	21.7	20.4	19.7	14.5
Cross-cutting activities	4.3	2.1	2.4	5

The table shows that, to date, transport innovation actions have been funded according to the intended MAWP percentage distribution, while innovation actions in the energy pillar are currently underfunded and deserve to be the subject of upcoming topics. The same is true for cross-cutting actions while, on the other hand, research activities in both transport and energy have received more percentage funding to date than the MAWP indications.

15 Calls 2014 and 2015 have finished at the time of writing. Call 2016 is close to completion, with two projects not yet signed but in an advanced stage of preparation. The values indicated were calculated including these three projects and according to figures known in mid-January 2017.

16 Overarching projects which draw budget from both the transport and energy pillars have been allocated as such: BIG HIT (EUR 5 million), innovation action: EUR 2.5 million each to transport and energy pillars; H2ME2 (EUR 35 million), innovation action: EUR 27 million to transport and EUR 8 million to energy; MEMPHIS, research and innovation action (EUR 2 million): EUR 1 million each to transport and energy. [we don't usually break a footnote over two pages].

1.3.2. EVALUATION: PROCEDURES AND GLOBAL EVALUATION OUTCOME, REDRESS, STATISTICS (NO. OF EVALUATORS, GENDER, AREA, ETC.) – CALL 2016

Under the AWP 2016, approved by the GB on 21 December 2015, the FCH2 JU published the H2020-JTI-FCH-2016 call for proposals in January 2016 (Official Journal C17). In accordance with the FCH2 JU rules (vade mecum) on proposal submission and evaluation, adopted on 30 June 2014 by the GB, an evaluation report, including all annexes (main list, reserve list, ineligible list, evaluation summary reports (ESRs), statistical information on proposals received, and experts' report, panel report and observer report) was submitted to the Board for approval. Of the 81 proposals received, four were withdrawn by the FCH 2 JU due to abusive submissions. The distribution of the remaining 77 proposals, according to pillar and call topic, is provided below:

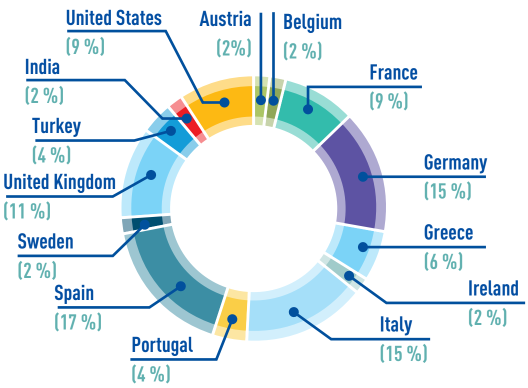
TABLE 1.3.2.1: NUMBER OF PROPOSALS EVALUATED

ACTIVITY: NUMBER OF PROPOSALS EVALUATED	TRANSPORT PILLAR: 26	ENERGY PILLAR: 38	OVERARCHING: 7	CROSS-CUTTING: 6
Topic: number of proposals evaluated	01-1: **5**	02-1: **2**	03-1: **7**	04-1: **4**
	01-2: **0**	02-2: **8**		04-2: **2**
	01-3: **2**	02-3: **7**		
	01-4: **3**	02-4: **3**		
	01-5: **6**	02-5: **2**		
	01-6: **2**	02-6: **4**		
	01-7: **2**	02-7: **4**		
	01-8: **4**	02-8: **1**		
	01-9: **1**	02-9: **1**		
	01-10: **1**	02-10: **2**		
		02-11: **4**		

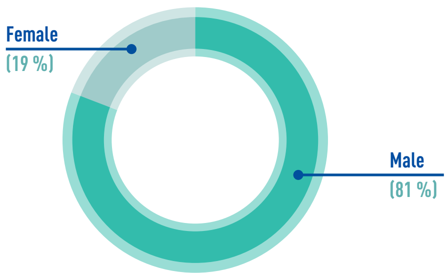
One of the admissible proposals (transport) was not carried to evaluation as it was deemed ineligible on the grounds of scope.

The 76 proposals included 593 participations. The proposals were evaluated by 47 independent experts (43 evaluators, 3 chairs and 1 observer), and 32 proposals (42 %) passed all the call thresholds. The figures below provide statistics on the experts' evaluations:

Breakdown of experts by country



Breakdown of experts by gender



The final ranking list for the call provided by the FCH2 JU PO did not deviate from the experts' recommendations.

Due to restrictions in the number of proposals that could be funded per topic according to AWP2016, an additional project that had passed the threshold could not be funded despite funds being available.

This ultimately resulted in EUR 23.5 million of unspent budget in 2016 following the evaluations phase.

The distribution of retained proposals and budget per pillar and activity is provided in the table below:

TABLE 1.3.2.2: BREAKDOWN OF PROPOSALS PER PILLAR AND ACTIVITY

AREA/PANEL	AVAILABLE BUDGET (EUR MILLION)	TOTAL NO OF PROPOSALS EVALUATED	NO OF PROPOSALS HAVING FAILED THE THRESHOLD	NO OF PROPOSALS ≥ THRESHOLD	NO OF PROPOSALS RETAINED (MAIN LIST)	BUDGET (EUR)
TRANSPORT PILLAR Research and innovation activities	20	23	12	11	6	20 208 045
TRANSPORT PILLAR Innovation activities	37	2	1	1	1	32 000 000
ENERGY PILLAR Research and innovation activities	16	26	16	10	6	16 101 896
ENERGY PILLAR Innovation activities	40	12	8	4	3	20 930 374
OVERARCHING	2	7	5	2	1	1 999 925
CROSS-CUTTING	2.5	6	2	4	2	2 739 008
TOTAL	**117.5**	**76**	**44**	**32**	**19**	**93 979 248**
		100 %	57.9 %	42.1 %	25.0 %	

1.4. CALL FOR TENDERS

The FCH 2 JU has funded three studies through calls for tender.

On the basis of the AWP 2015, the FCH 2 JU has launched three operational procurements (open procedure) on the following topics:

1. Joint procurement strategy for fuel cell buses

The strategy for the joint procurement and co-financing of hydrogen buses is a direct continuation of the bus study conducted in 2015. The final report of the previous study is available at: http://www.fch.europa.eu/publications/strategies-joint-procurement-fuel-cell-buses.

The ongoing study is looking to initiate new procurement activity for FC buses, particularly in France and the Benelux region, and to support the ongoing procurement activity and cluster coordination in the UK, Germany and Eastern Europe. The study will also define co-financing strategies for the identified bus operator or region/town beyond the support of the FCH 2 JU. In addition, the study aims to reach out to new cities (with a target to identify over 1000 buses in near-term demand), as well as ensuring a more widespread understanding of the status of the technology amongst bus operators across Europe, by means of a dissemination campaign at major bus events.

The study was contracted on 24 October 2016 for a period of 14 months and EUR 300 000. It includes provisions for interim reports in February and June 2017 and a final report in December 2017.

2. Early business cases for energy storage through hydrogen

The study aims to identify financially viable opportunities for power-to-hydrogen applications in the short term. The study has reached its mid-point and has produced results covering:

a) Identification of five locations in Europe offering the highest potential for business opportunities for hydrogen from an electricity system perspective;

b) In-depth analysis of the cost and performance of H2 technologies;

c) Estimation of the value that can be captured by power-to-hydrogen technologies for various industrial sectors, transport and electricity sectors.

In the second and final stage of the study, the business cases will be identified and recommendations will be made as to the regulatory and financing frameworks.

The study was contracted on 21 June 1016 for a period of 12 months and an amount of EUR 242 890. The final report will available in April 2017.

3. Business models and financing arrangements for the commercialisation of stationary FC

The study aims to analyse and evaluate existing and future potential business models and associated contractual and financing arrangements concentrating on European focus markets for FC commercialisation. It should also derive recommendations for industry-wide business model innovation and foster collaboration among market actors to turn new business models into practice.

The study was contracted on 12 May 2016 for a period of 12 months and an amount of EUR 390 225. The final report should be available in April 2017.

1.5. DISSEMINATION AND INFORMATION ABOUT PROJECTS RESULTS

1.5.1. PROJECT INFORMATION ON THE FCH 2 JU WEBSITE

The FCH JU website is up to date with a page for each funded project (185 projects until call 2015 + 16 projects from call 2016 – three more are due to be published as soon as they are signed) including information on dates, duration, funding, beneficiaries, call, topic and abstract. This information is continually updated with changes from amendments.

Public project deliverables and publishable summaries are uploaded/updated at each reporting period. The information is searchable in dedicated query pages.

When relevant, additional communication (new projects signed) and dissemination (project achievements) activities are carried out in the form of news on the FCH 2 JU website, with links to the project pages.

1.5.2. PROGRAMME REVIEW DAYS 2015 AND 2016

The fifth edition of the PRD took place on 17-18 November 2015. With the help of an external expert, the knowledge management officer prepared the final report which was published on the FCH 2 JU website on 4 April 2016. The analysis of the project results was carried out in the light of the assessment of the FCH 2 JU programme's progress and achievements, with the help of the nine SC members and 10 external experts.

The sixth edition of the PRD was organised on 21 and 22 November 2016 at the EC's Charlemagne Building in Brussels. The objective was to assess progress and achievements of the FCH JU and FCH 2 JU programmes, notably in relation to the targets in the MAWP and AWP, as well as in relation to international developments. As in previous editions, the review of FCH 2 JU projects was conducted in two phases:

1. Remote assessment during the preparation of the PRD based on the evaluation by 20 experts (including eight from the SC) of progress against the multi-annual and annual targets and the international state of the art; and

2. The public event at which the projects presented posters in dedicated sessions, while selected projects also made oral presentations. The posters were produced by the FCH 2 JU PO using information retrieved from the coordinators according to a pre-designed template. A total of 100 posters were produced and displayed. Oral presentations were made by 39 projects, in six sessions according to subject. Each session was opened by an FCH JU project officer who presented the portfolio covered by the session according to a standard format across the various sessions.

A total of 316 registered participants attended the 2016 PRD event (as against 317 in 2015) (see also paragraph 2.1 for joint accounting for the overall three-day event, including both PRD and the Stakeholder Forum).

1.6. OPERATIONAL BUDGET EXECUTION

FP7 budget

At the end of 2016, 69 operational payments for interim and final periodic reports were made for a total of EUR 44.9 million. The budget execution (in terms of payment appropriations) was 73.7 % (75.7 % in 2015).

H2020 budget

In terms of payment appropriations, 15 pre-financing payments were made for the call 2015 projects. In addition, there were four payments for operational studies. The budget execution (in terms of payments) reached 98 % (99 % in 2015).

In terms of commitment appropriations, one global commitment for the call 2016 (followed by 16 individual commitments for the 16 call 2016 grants signed in 2016) and one individual for the 2016 JRC rolling plan were made with the budget execution reaching 78.6 %. The execution rate is lower than 2015 (88.7 %) due to the outcome of the call. The unused commitment appropriations amounted to EUR 25.9 million and were introduced in the 2017 budget to be used for the 2017 call for proposals.

1.7. IN-KIND CONTRIBUTIONS

FP7 programme

The FCH JU founding regulation (Council Regulation 521/2008 as amended by Regulation 1183/2011) states that the operational costs of the FCH JU shall be covered through the financial contribution of the European Union and through in-kind contributions from the legal entities participating in the activities.

Calculation of the level of in-kind contributions is carried out following a methodology approved by the GB on 10 February 2012. Verification of these costs includes: 1) *ex-ante* controls before validation of the cost claims submitted by the beneficiaries (either based on desk-review assessment by the PO and/or certificates on financial statements provided by independent auditors); and 2) *ex-post* audits after validation of the cost claims, carried out by independent auditors appointed by FCH JU, in line with the FCH JU ex-post audit strategy.

In addition, in accordance with the methodology, the aggregated level of in-kind contributions is assessed every year by an independent external auditor.

In 2016, KPMG carried out the assessment and confirmed the amount of the aggregated level of in-kind contributions certified by the FCH 2 JU ED (cut-off date 31 December 2015) at EUR 488.9 million.

The full publishable report can be found under:

http://www.fch.europa.eu/page/annual-activity-reports

As of 31 December 2016, details of the aggregated level of in-kind contributions are as follows (in EUR):

FP7 YEAR 2016	ACCUMULATED VALIDATED IKC CONTRIBUTIONS AT 01/01/2016	VALIDATED IKC CONTRIBUTIONS IN YEAR 2016	IKC CONTRIBUTIONS RECEIVED BUT NOT VALIDATED AT 31/12/2016	IKC CONTRIBUTION ESTIMATE (PRO-RATA) AT 31/12/2016	IKC CONTRIBUTION ESTIMATE TO BE VALIDATED AS FROM 01/01/2017	FORECAST OF AGGREGATED LEVEL OF IN-KIND CONTRIBUTIONS
Industry Grouping	118 470 244	65 114 018	32 161 651	58 842 492	52 794 449	327 382 854
Research Grouping	67 112 314	32 719 159	8 421 341	21 878 029	27 789 317	157 920 159
TOTAL	**185 582 558**	**97 833 177**	**40 582 992**	**80 720 520**	**80 583 766**	**485 303 013**

H2020 programme

The FCH 2 JU legal framework for in-kind contributions, as defined in Council Regulation 559/2014 of 6 May 2014 establishing the FCH 2 JU, is described in section 2.2.2.

"The Members of the FCH 2 Joint Undertaking other than the Union shall make or arrange for their constituent entities or their affiliated entities to make a total contribution of at least EUR 380 million over the period defined in Article 1." (Article 4 of the Regulation)

When assessing the level of contributions according to above-mentioned article, the FCH 2 JU distinguishes between different types of contributions:

- Cash contributions
- In-kind contributions in operational activities (IKOP)
- In-kind contributions in additional activities (IKAA)

The overall minimum threshold of EUR 380 million for H2020 programme therefore refers to the sum of all three types of contributions.

In-kind contributions in operational activities (IKOP)

IKOP are costs incurred in implementing indirect actions less the contribution of the FCH 2 JU and any other EU contribution to those costs. (Statutes, Art 13.3.b).

To be considered as IKOP, these costs must be incurred by members of the Hydrogen Europe and N.ERGHY or their affiliates participating in the FCH 2 JU indirect actions.

The Regulation provides that IKOP should be valued according to members' usual accounting practices and applicable national and international accounting standards (Regulation, Art 4.4).

The Council Regulation allows the members to base their declaration of IKOP on the basis of their "total costs" (according to their usual accounting practices) which may be slightly higher than their "eligible costs" (according to H2020 rules). However, the members can agree to self-limit their declaration on the basis of "eligible costs" for simplification reasons.

On a proposal from the Industry and Research Groupings, the GB decided to limit IKOP to eligible costs for cost-efficiency reasons.

Calculation of the level of in-kind contributions is based on the methodology endorsed by the GB on 18 November 2015. The same *ex-ante* controls and *ex-post* audits apply to the valuation of the IKOP under H2020 as under FP7.

The amount of IKOP reflected in the FCH 2 JU accounts is based on all signed running projects as of 31 December 2016, considering mainly the estimated costs (pro-rata), as well as two cost claims received but whose costs had not been validated at the cut-off date.

As of 31 December 2016, the estimated in-kind contributions for the 30 projects signed in relation to the H2020 programme (2014 and 2015 calls) was as follows (in EUR):

H2020 IN 2016	ACCUMULATED VALIDATED IKOP AT 01/01/2016	VALIDATED IKOP IN 2016	IKOP RECEIVED BUT NOT VALIDATED AT 31/12/2016	IKOP ESTIMATE (PRO-RATA) AT 31/12/2016	IKOP ESTIMATE TO BE VALIDATED AS FROM 1/1/2017	FORECAST OF AGGREGATED LEVEL OF IKOP
Industry grouping			4 838 616	16 737 620	116 313 739	137 889 975
Research grouping			43 372	64 570	468 060	576 003
TOTAL			**4 881 988**	**16 802 191**	**116 781 799**	**138 465 978**

As of 31 December 2016, no IKOPs were certified, as this will happen later in the course of the H2020 programme, in line with both the guidance received from the EC and the internal methodology on IKOP (see section 2.2.2 for further details).

In-kind contributions in additional activities (IKAA)

According to the FCH 2 JU regulation, additional activities (AA) are defined as activities carried out by members of Hydrogen Europe and N.ERGHY and their affiliates contributing to the FCH 2 JU programme's objectives but undertaken outside its work plan, which are not funded by the European Union or by the Joint Undertaking.

The regulation provides that determination of the costs taken into account for the valuation of the in-kind contributions shall be in accordance with the usual cost accounting practices of the entities concerned, the applicable accounting standards of the country where the entity is established, and the applicable international accounting standards and international financial reporting standards (Article 4.4).

The FCH 2 JU regulation establishes a minimum level of IKAA at EUR 285 million over the period defined in Article 1 of the regulation.

In 2016, the following important activities took place:

1 . Introduction of the EUR 325 000 threshold for certification

With the aim of simplifying the certification process and relieving members of additional administrative burdens, particularly the smaller ones, only contributions from those members whose cumulative IKAA for the given reporting period are above EUR 325 000 will be subject to certification. The introduction of thresholds for certification is common practice as it encourages smaller members to report IKAA whilst relieving them from the certification burden, while not putting the sector's cumulative commitment at risk and maintaining a high level of accountability.

(For example, the 2016 IKAA Plan's final figure of EUR 207.2 million does not include contributions of EUR 2.8 million coming from 17 small members who did not reach a cumulative certification threshold of EUR 325 000.)

2. First round of IKAA certifications for the period 2014–2015

The following tables provide a breakdown of the certified IKAA numbers for the first reporting period in 2014-2015.

A full public version of the 2014-2015 IKAA report can be found on the FCH 2 JU website at:

http://www.fch.europa.eu/page/in-kind-additional-activities

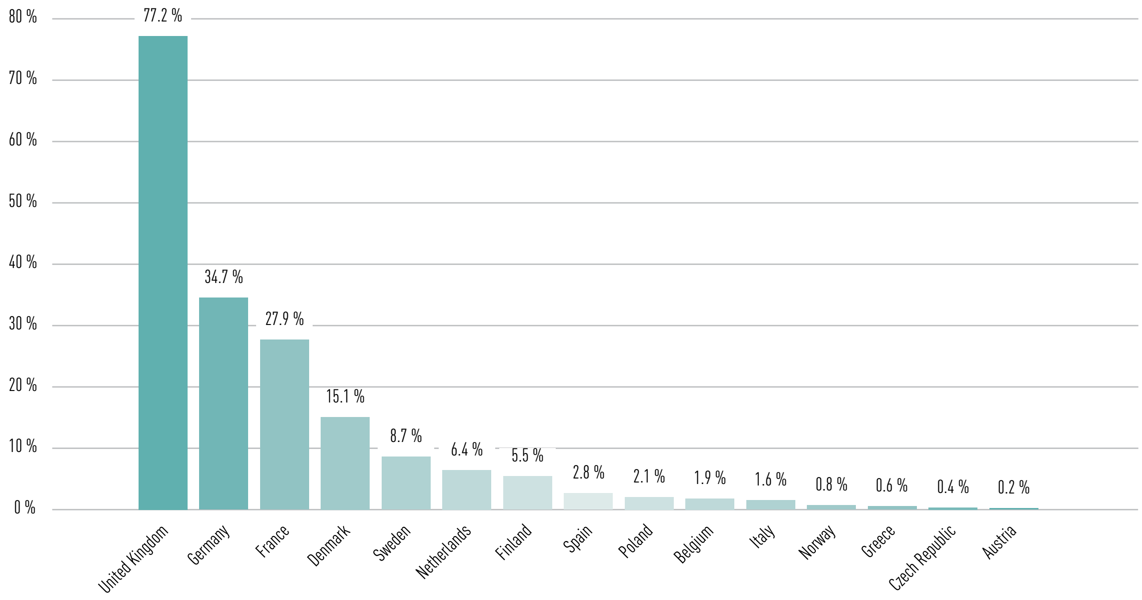
CERTIFIED 2014/2015 IKAA PER SECTOR

SECTOR	TOTAL EXPENDITURE OF THE PERIOD AS RECOGNISED IN THE ACCOUNTS OF THE MEMBER (IN EUR MILLION)
Energy	100.90
Transport	85.52
TOTAL	**186.42**

CERTIFIED 2014/2015 IKAA PER INDUSTRY/ RESEARCH GROUPING

GROUPING	TOTAL EXPENDITURE OF THE PERIOD AS RECOGNISED IN THE ACCOUNTS OF THE MEMBER (IN EUR MILLION)
Hydrogen Europe	166.99
N.ERGHY	19.43
TOTAL	**186.42**

Certified 2014/2015 IKAA per country



3. Revision of the IKAA 2016 Plan and its adoption by the FCH 2 JU GB on 28 October 2016

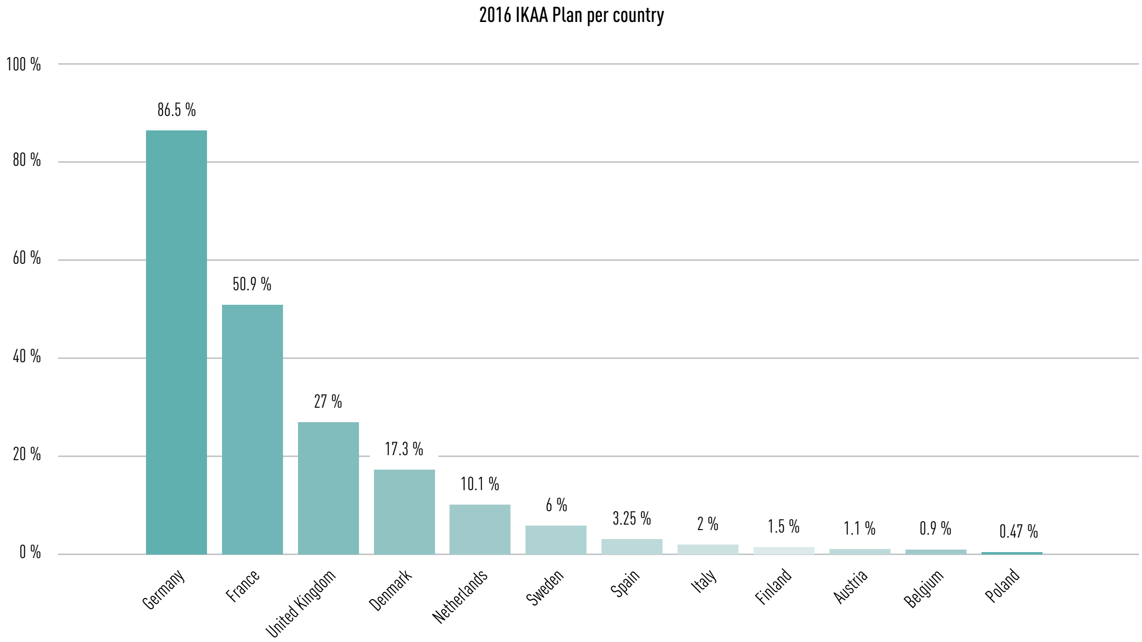
The following tables provide a breakdown of the planned IKAA numbers for the second reporting period in 2016. The IKAA Plan figures should be certified by determining the FCH 2 JU 2016 final accounts, by 30 June 2017.

A full public version of the 2016 IKAA Plan can be found on the FCH 2 JU website at:

http://www.fch.europa.eu/page/in-kind-additional-activities

2016 IKAA PLAN PER INDUSTRY/RESEARCH GROUPING

GROUPING	TOTAL EXPENDITURE FOR THE PERIOD PLANNED (EUR MILLION)
Hydrogen Europe	152.55
N.ERGHY	54.69
TOTAL	**207.244**[17]



4. Establishment of the IKAA 2017 Plan and its adoption by the FCH 2 JU GB on 21 December 2016

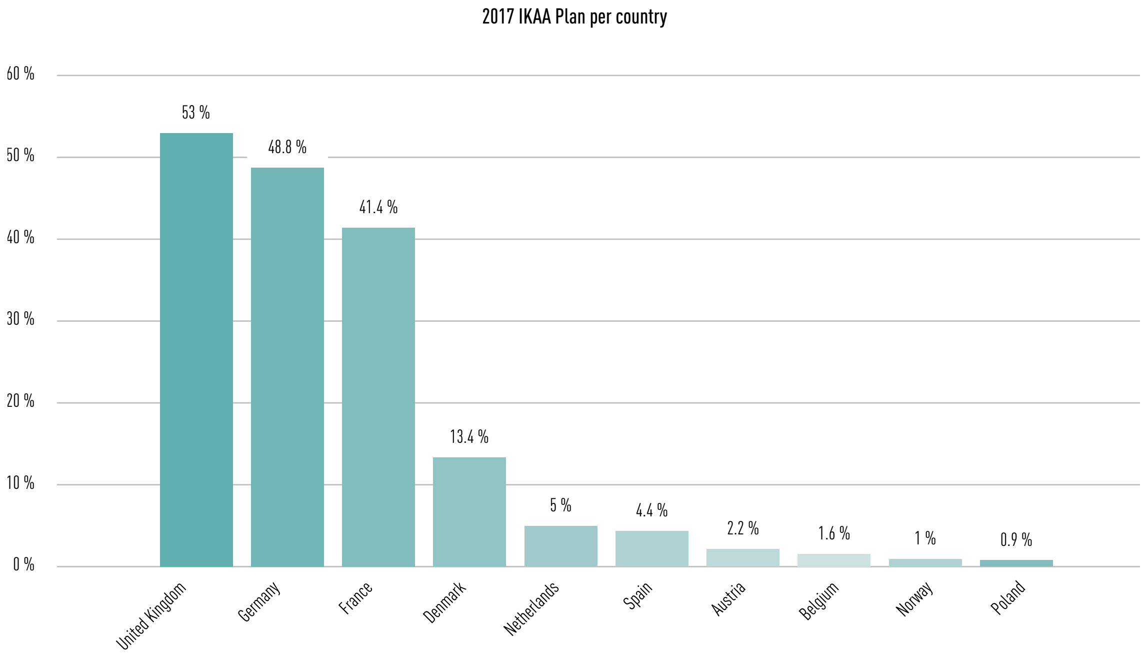
The following tables provide a breakdown of the planned IKAA numbers for the third reporting period in 2017. The IKAA Plan figures should be certified by establishing the FCH 2 JU 2017 final accounts, by 30 June 2018.

A full public version of the 2017 IKAA Plan can be found on the FCH 2 JU website, under:
http://www.fch.europa.eu/page/in-kind-additional-activities

2017 IKAA PLAN PER INDUSTRY/RESEARCH GROUPING

GROUPING	TOTAL EXPENDITURE FOR THE PERIOD PLANNED (EUR MILLION)
Hydrogen Europe	116.36
N.ERGHY	55.24
TOTAL	**171.60**

17 In the 2016 IKAA Preliminary Report, presented to the FCH 2 JU GB as of 31/1/2017, a few major corrections were made compared to the IKAA 2016 Plan, correcting an original estimate of EUR 207.2 million to EUR 180.1 million.



5. Finalisation of the formal FCH 2 JU IKAA methodology, describing a robust control process to ensure the planned, reported and certified IKAA figures are reasonable, as agreed by the FCH 2 JU GB on 9 December 2016

The methodology is largely built on the legal basis defined in Council Regulation (EU) No 559/2014 of 6 May 2014 establishing the Fuel Cells and Hydrogen 2 Joint Undertaking.

The current practice, as described in the methodology, is also aligned with the revised Commission position concerning in-kind contributions to the Joint Undertakings under H2020 (Ref. Ares(2016)3369605), dated 13 July 2016, clarifying the position of the Commission on a number of issues.

Furthermore, the methodology, fully applicable for the reporting period of 2017 and onwards, provides a formalised documented approach on planning, reporting and certifying the IKAA, stemming from experience and process improvements during the first two reporting periods of 2014-2015 and 2016.

The table below summarises the total estimated value of IKAA for the period covering 2014-2017:

ESTIMATED IKAA FOR 2014-2017

2014-2015 CERTIFIED AMOUNTS (CERTIFIED REPORT) (EUR MILLION)	2016 ESTIMATED VALUES (AA PLAN) (EUR MILLION)	2017 ESTIMATED VALUES (AA PLAN) (EUR MILLION)	TOTAL ESTIMATED VALUES FOR THE PERIOD 2014-2017 (EUR MILLION)
186.4	207.2	171.6	**565.2**

With these completed actions and the high IKAA figures expected from the first three reporting periods (EUR 565.2 million), FCH 2 JU is confident that the involvement of the private partners is high and the control environment mature enough to assure the credibility of the reported IKAA figures.

02
SUPPORT TO OPERATIONS

2.1. COMMUNICATION ACTIVITIES

2.1.1 COMMUNICATION STRATEGY: OBJECTIVES AND 2016 FOCUS

In line with the FCH JU Communication Strategy adopted in 2015, the FCH JU continued to carry out communication activities with the purpose of addressing the two central objectives identified in the strategy: raising awareness around the FCH JU programme itself and around the technology benefits, too. During 2016, specific efforts were made mainly to engage more new public and regional partners, to raise political awareness, and to improve the FCH JU online visibility through social media. More active and dynamic communication took place in 2016 with the aim of highlighting the benefits that the FCH JU brings to EU citizens as well as its contribution to the Energy Union priorities.

2.1.2. PUBLIC OUTREACH ACTIVITIES

Key actions have been undertaken to promote the programme's progress and demonstrate the technology, with a focus on real-life experiences. Activities have been driven mainly by the aim of stressing the FCH JU's contribution to environmental objectives and raising political awareness around this aspect. In parallel, significant efforts were made to coordinate major actions with project partners and FCH JU members' representatives for a 'one voice' effect and greater impact.

Policy-makers and new audiences

Opening of the first public hydrogen station in Belgium (Zaventem) – 22 April

Launched as part of an FCH JU project, the opening of the station was the occasion to highlight the fact that transportation which relies on hydrogen is already a reality, and emphasising the concrete contribution from the FCH JU. Key personalities from the European Commission joined the event along with Belgian local authorities, resulting in very good press and media coverage.


Inauguration de la première station à hydrogène publique en Belgique

La première station à hydrogène publique pour voitures et bus a été construite par Air Liquide sur le terrain de Toyota à Zaventem. Elle a été inaugurée officiellement vendredi 22 avril.

Participation in the International Transport Forum (ITF) (Leipzig) – 18–20 May

Organised annually, the ITF is the world-leading transport event which acts as a think-thank for ministers and policy-makers in the transport sector. With the purpose of putting hydrogen on the agenda for decisive discussions, the FCH JU organised its participation to cover multiple aspects. Besides holding an exhibition and test-drive activities, the chair of the FCH 2 JU GB participated in a ministers' round-table session.

ITF SECRETARY GENERAL JOSÉ VIEGAS VISITING THE FCH JU STAND

The FCH JU also joined the launch session for the 'ITF Global Decarbonising Transport Project'. More than 40 partners and supporting organisations attended this kick-off at the transport ministers' global summit. This is a major global initiative towards carbon-free transport, and was a great occasion to include hydrogen in a high-level debate, highlighting its benefits as well as the readiness of the technology. Since then, high-quality material has been produced and optimised through FCH JU channels to build on this key happening.

European Sustainable Week (EUSEW) (Brussels) – 15 June

Keeping up with the goal of reaching new public audiences not particularly familiar with the technology, the FCH JU invested further efforts to integrate general sessions and reinforce collaboration with different sectors. The Undertaking joined a session with several associations from the gas and electricity sectors to underline the potential of renewable gases in decarbonising the energy system.

In parallel, the FCH JU collaborated with the EC's DG RTD and contributed to an online contest organised within the framework of the EUSEW, engaging with participants on their views for a sustainable future.

EU Agencies Forum – European Parliament (Brussels) – 6-7 December

The FCH JU is part of the European Agencies Network. On 6-7 December, a specific conference dedicated to the work and contribution of the 45 EU Agencies and Joint Undertakings took place at the EP. As part of the keynotes, ENGIE Executive Vice-President Sandra Lagumina made a clear reference to the FCH JU, underlining how its role is fully aligned with the European objective of accelerating the energy transition. ENGIE stressed that the FCH JU is acting as a key instrument for industry commitment as it helps to frame its activities, thanks to a long-term EC strategy, and ensures joint investments in EU projects in a consistent manner.

Two studies were published as part of the conference: 1) *'How do EU agencies and other bodies contribute to the Europe 2020 Strategy and to the Juncker Commission Agenda?'*; and 2) *'The Cost of Non-Agencies with Relevance to the Internal Market'*. The FCH JU contributed to the content of both publications, thereby allowing it to pinpoint the FCH JU's specific role as part of this European network.

Regions and cities

In 2016, the FCH JU made significant efforts to reach out to all those EU regions/cities with an interest in the potential use of fuel cell and hydrogen (FCH)-based products to help them achieve their decarbonisation goals. With the specific aim of establishing an ambitious collaboration platform to facilitate market introduction, the FCH JU took on a large-scale effort to reach out to as many regions/cities in Europe as possible, offering to work closely with them to develop market opportunities. In a first step, this took the form of signing an MoU, which to date has been signed by 43 regions and cities. A special signature ceremony took place on the occasion of the FCH JU Stakeholder Forum in November (see below), in which representatives from 20 regions and cities participated, along with the European Committee of the Regions.

The FCH JU intends to follow through on its commitment to work with regions and cities in 2017 by launching a study that will:

- Assess the business cases for FCH applications they are seeking;
- Put them directly in touch with industry players;
- Help them map their local capabilities so that they can be exploited in the future; and
- Identify existing funding sources to implement future projects.

Along with this initiative, the FCH JU also took part, together with the four other Joint Undertakings, in the 2016 European Week of Regions and Cities, in a session called 'Enhance Regional Innovation and Growth: possibilities for integrated funding through regional cooperation with Joint Undertakings', on 11 October 2016 at the Committee of Regions in Brussels.

Stakeholder Forum

The 2016 edition of the Stakeholder Forum completely revamped the usual conference structure with the aim of attracting new audiences, such as the gas, wind and utility sectors, and addressing different topics. This resulted in the presentation of a completely new programme focusing on the theme of partnership and involving external sectors. As one of various high-level speakers, the **President of the European Committee of the Regions, Markku Markkula participated in the event.** And at a signing ceremony which also took place on this occasion, more than 20 representatives of European cities and regions gathered to highlight their willingness to integrate FCH into their path towards decarbonisation. This gave important visibility to the efforts the FCH JU is making to reach out and strengthen collaboration with the regions.

2.1.3 FACILITATING SYNERGIES WITH EXTERNAL FUNDING SOURCES

The FCH 2 JU works with other EU funding instruments to further increase the opportunities for securing funds to higher-risk investments in the future. A key project took off during the 2016 activities with the purpose of helping industry to further exploit the opportunities for the blending of EU funds. With the JIVE project, the FCH 2 JU has worked to combine the funding provided via the EU's Horizon 2020 programme with the Connecting Europe Facility (CEF). The project aims to deploy 139 FC buses in nine EU cities, plus construction and upgrade of 18 hours: this has been made possible thanks to the alignment of EU programmes.

2.1.4 CHANNELS AND NEW MATERIAL

Online presence

The FCH JU reinforced its online presence by building a stronger and larger platform where more knowledge can be shared with more public audiences.

Website

New features have been developed to enable a wider reach and facilitate access to the programme results. A 'news sending' functionality has been set up to automatically distribute information from the FCH JU website directly to interested readers. Building on this tool, the FCH JU communication and knowledge management teams have put in place a new information structure boosting news streams and fostering effective communication on project results. In terms of news content, priority has been given to informing about the launch of new projects and key achievements, while adapting narratives to facilitate content understanding and enhance impact.

Social media

The FCH JU has also increased its social media activity to enable a wider and more efficient outreach. Relevant and more frequent messaging, as well as greater coordination with both the Commission and private partner teams, has led to increased awareness around FCH JU activities. Reinforcement of this aspect (mainly Twitter) has allowed for a planned propagation of information at key moments, building a bigger community and triggering significantly greater interest in both the FCH JU programme and the technologies.

Online communication impact – statistics

Online communication activities in 2016 mainly targeted the website and Twitter audience. The FCH JU's Twitter account was launched at the end of 2015, with significant efforts made at the beginning of 2016. At June 2016, the account had approximately 200 followers, which more than doubled towards the end of the year (reaching 470 in mid-December). The account was used either to relay content from the FCH JU website in order to attract more traffic to the website or to promote content referring to projects and events.

Website visits also saw significant growth in 2016. Total yearly visits to the website increased by 77 % compared to 2015, from 54 580 to 96 382 visits. Overall, the increase in website traffic can be attributed to the rise in news content published on the website and the newly implemented module of e-mail news. Increased synergies in communication efforts with the EC and the projects also played an important role.

The most sessions on a single day were registered during the second day of PRD on 22 Nov 2016 – 729 visits in one day. The increase in traffic on the website during the period around the annual FCH JU events – the PRD and SF – is a recurring trend. Generally speaking, during the month of each event, visitors search for information about the event, registration, programme and web-streaming. Following this logic, the whole month of November registered the most visits during 2016.

Efforts towards online communication also extend to the FCH JU's annual events. The biggest event – the PRD and SF 2016, was web-streamed and generated more participants via online views. The number of online views increased significantly between 2015 and 2016, doubling from 151 to over 300.

The FCH JU repeatedly makes efforts to enlarge its audiences by web-streaming other events and seminars, including the Info Day and Financial Workshop.

Success stories

The FCH JU identified a list of specific themes highlighting the programme's key achievements. It worked together with the EC's RTD communication services to develop success stories around these themes. Five stories[18] were written in 2016 and published in the EC repository of H2020 success stories, for which they were initially foreseen. The FCH JU adapted and recovered these stories for its own material and channels.

Other products

FCH JU general brochure[19]

A new brochure was produced in 2016 with the aim of presenting both the FCH JU programme and the technology while explaining how the FCH JU programme complies with the Energy Union priorities. Targeting mainly policy-makers but new public audiences, too, this new promotional material featured key information communicated via a creative and highly appealing design conveying straightforward messages.

18 http://ec.europa.eu/research/infocentre/article_en.cfm?artid=40396
http://ec.europa.eu/research/infocentre/article_en.cfm?&artid=41376&caller=other
http://ec.europa.eu/research/infocentre/article_en.cfm?&artid=41156&caller=other
http://ec.europa.eu/research/infocentre/article_en.cfm?&artid=41356&caller=other
Four stories were written and published in 2016 and the fifth will be published in 2017.

19 http://www.fch.europa.eu/publications/fch-ju-brochure

Car lease

As from October 2016, FCH 2 JU has been leasing two FC cars for an initial period of two years. The cars are used to showcase the potential of the technology and to increase the social outreach. To this extent, they can be used by major FCH JU stakeholders (Hydrogen Europe and N.ERGHY, Members of the European Parliament, etc.).

2.1.3. MEDIA

There was significant press coverage during 2016, but mainly in the second part of the year, marked by the arrival of the FCH 2 JU's new ED. The communication team has been more active in pitching to the press and media on key launches and events, and additional interviews took place on several occasions. This led to increasing press appearances of the FCH JU, mainly within the general press (Le Vif; The Telegraph, Kanaal Z, etc.) as well as with the media related to the EU institutions (Horizon magazine, PEN, etc.).

2.2. LEGAL AND FINANCIAL FRAMEWORK

1. Procedure for selecting and drafting topics

In collaboration with the European Commission, the FCH 2 JU prepared Hydrogen Europe and N.ERGHY, a procedure which defines how call topics are proposed, drafted, selected and ultimately form part of the FCH 2 JU's AWP. The procedure was endorsed by the FCH 2 JU GB on 29 June 2016 and adopted by the ED on 13 July 2016.

2. FCH 2 JU methodologies for 'In-kind contributions in operational activities' (IKOP) and 'In-kind contributions in additional activities' (IKAA)

The FCH 2 JU founding regulation provides that its two private members, Hydrogen Europe and N.ERGHY have to contribute to FCH 2 JU activities by providing cash contributions to the administrative costs, in kind contributions incurred in operational activities (referred to as IKOP), and additional activities (referred to as IKAA).

- IKOP: The FCH 2 JU finalised its methodology for planning, reporting, certifying and verifying IKOP in 2015. The methodology was endorsed by the GB on 18 November 2015 and the first annual reporting took place in 2016;

- Additional activities (IKAA): The FCH 2 JU and its three members developed a methodology for planning, reporting, certifying and verifying IKAA. The methodology was agreed by the GB on 9 December 2016.

Both methodologies were adopted by the FCH 2 JU's ED on 19 December 2016.

3. Revision of the FCH 2 JU Financial Rules

The FCH 2 JU Financial Rules were revised to align them with the amended provisions of Articles 60 and 209 of the Regulation (EU, Euratom) No 966/2012 (the Model Financial Regulation for Public Private Partnerships). In practice, compared to the previous FCH 2 JU Financial Rules, the change comprises the introduction of an independent external auditor who shall verify the annual accounts of the PPP body and whose audit work shall be considered by the Court of Auditors in the preparation of the Court's specific annual report on the FCH 2 JU (Article 46 (1)). The revised FCH 2 JU Financial Rules were adopted by the FCH 2 JU GB on 20 May 2016.

4. Revision of the FCH 2 JU model grant agreement (MGA)

In accordance with Article 6 of the Delegation Agreement No FCH JU 2014 D2793, signed by the FCH 2 JU with the EU represented by the EC, the FCH 2 JU must use the H2020 MGA adopted by the EC.

On 20 July 2016, the EC adopted Decision C(2016)4568 amending Horizon 2020 MGAs. The revised MGA (version 3) provides – among others – clarifications, corrections and new rules in favour of beneficiaries.

The FCH 2 JU reviewed the proposed changes and modified its MGA accordingly. The revised version is expected to be implemented in the H2020 IT Tools in the first semester of 2017 and will have a retroactive effect. Consequently, the changes and new rules in favour of beneficiaries are applicable to the Gas already signed.

5. Guidance on H2020 ex-ante controls for interim and final payments

The FCH 2 JU provided input and participated in dedicated technical workshops organised by the CSC to develop guidelines on *ex-ante* controls for interim and final payments. The purpose of the document, which was adopted by the CSC Steering Board on 15 December 2016, is to describe a common *ex-ante* control approach and to support and guide all implementing H2020 services.

6. Rules on the prevention and management of conflict of interests

On the basis of a recommendation from the discharge authorities and a recommendation from an audit performed by the Undertaking's internal auditor, the FCH 2 JU prepared internal rules which specify more comprehensively the obligations in terms of conflict of interests.

Following a recommendation by the EC's DG for Human Resources and Security, the FCH 2 JU redrafted its rules and prepared two separate sets: one applicable to its staff members and one applicable to FCH 2 JU bodies.

Both documents are under review by the EC.

2.3. BUDGETARY AND FINANCIAL MANAGEMENT

2.3.1. BUDGET

The FCH 2 JU budget concerns the revenue and expenditure sides. On the expenditure side, the budget is divided into three titles:

- Title 1 covers staff expenditure, such as salaries, training, costs associated with the recruitment procedure, missions, medical expenses and representational costs;
- Title 2 covers the cost associated with the functioning of the FCH 2 JU, such as renting premises, IT needs, expenses related to external communication, expert fees, and the cost of *ex-post* audits;
- Title 3 covers the FCH 2 JU's operational activities for both the FP7 and H2020 programmes.

An overview of the initial budget and amendments is presented below:

TABLE 2.3.1.1: BUDGET 2016

BUDGET 2016 (EUR)						
	VOTED BUDGET		1ST AMENDING BUDGET		FINAL BUDGET	
	CA	PA	CA	PA	CA	PA
Revenue						
EU operational	104 955 460	104 093 400		-9 528 930	104 955 460	94 564 469
EU administrative	739 988	739 988			739 988	739 988
Industry Grouping	2 602 321	2 602 321			2 602 321	2 602 321
Research Grouping	432 163	432 163			432 163	432 163
Reactivations from previous years	15 176 005	1 491 547	3 376 974	15 225 551	18 552 979	16 717 098
Total revenue	**123 905 936**	**109 359 418**	**3 376 974**	**5 696 620**	**127 282 910**	**115 056 038**
Expenditure						
Title 1	3 248 949	3 248 949		92 968	3 248 949	3 341 917
Title 2	2 017 069	2 017 069		501 461	2 017 069	2 518 530
Title 3 - FP7	-	55 455 900	1 742 791	5 102 191	1 742 791	60 558 091
Title 3 - H2020	118 639 918	48 637 500	1 634 183		120 274 101	48 637 500
Total expenditure	**123 905 936**	**109 359 418**	**3 376 974**	**5 696 620**	**127 282 910**	**115 056 038**

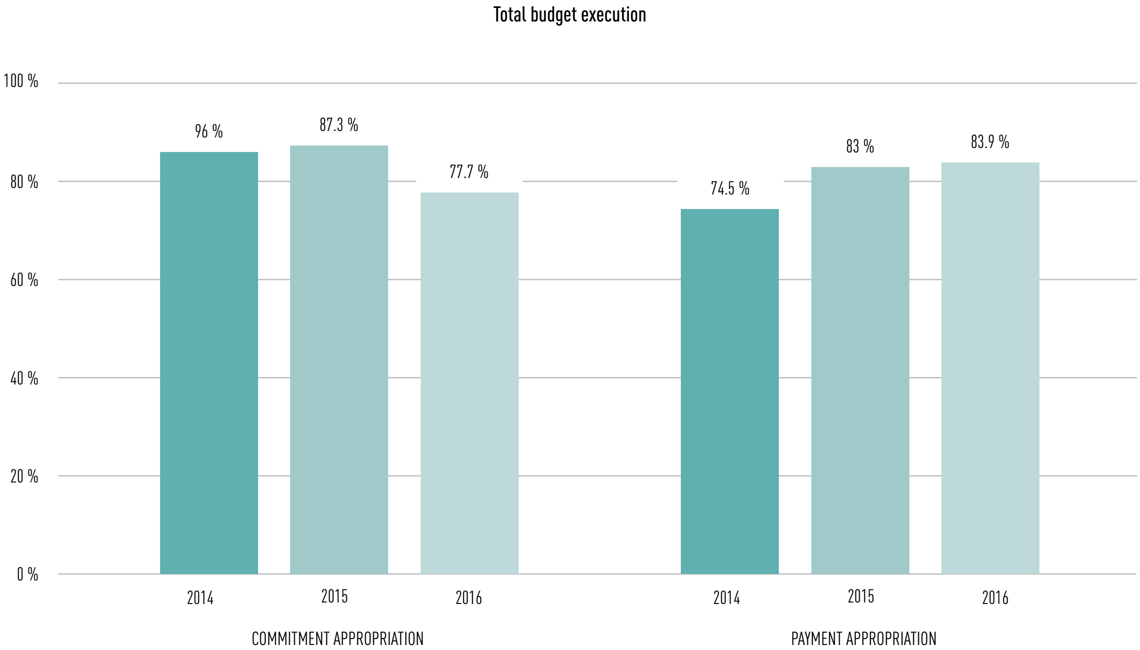
The 2016 budget was approved by the GB on 21 December 2015. Commitment appropriations increased by 5 % compared to 2015 due to the addition to the initial budget of unused appropriations from previous years, mainly used for the 2016 call for proposals. The available payment appropriations increased by 17 % reflecting the higher pre-financing needs for the 2016 call.

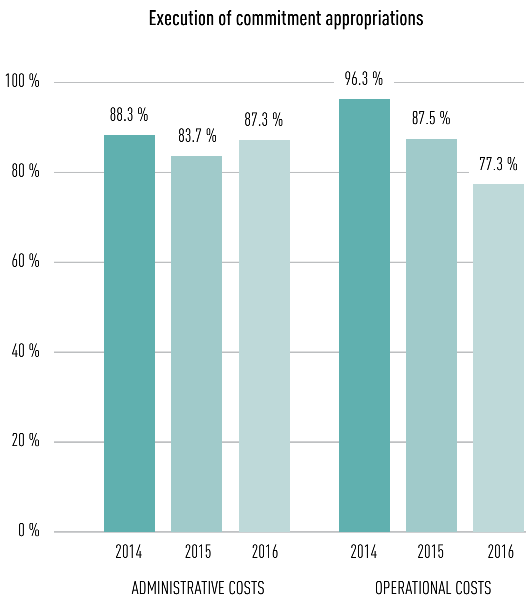
The first amendment was made based on the Decision of the GB of 18 April 2016 to introduce administrative payments carried over from 2015 and unused commitment and payment appropriations for operational costs.

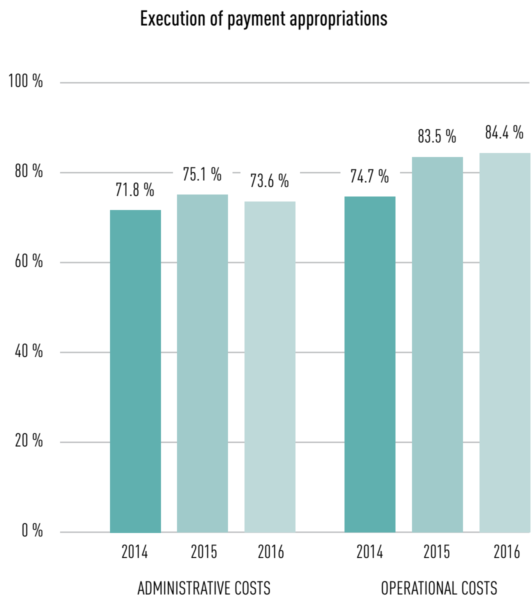
In addition, four budget transfers took place between different budget lines without any impact on either the voted or the amended budgets.

2.3.2 BUDGET EXECUTION

Overall in 2016, budget execution of commitment and payment appropriations reached 77.7 % and 83.9 %, respectively. The lower commitment execution rate was due to the outcome of the evaluations for the 2016 call. As regards payments, this represents the best execution rate of payments for the FCH JU to date.







Details regarding budget execution are as follows:

Revenues

TABLE 2.3.2.1: FCH 2 JU REVENUE FOR 2016

REVENUES (IN EUR)		
Heading	**Budget**	**Cashed**
EU contribution for operational expenditure	94 564 469	94 564 469
EU contribution for administrative expenditure	739 988	739 988
Industry Grouping	2 602 321	2 602 321
Research Grouping	432 163	432 163
Other revenues[20]	-	524 139
Reactivation of appropriations	16 717 098	
TOTAL	**115 056 038**	**98 863 080**

Expenditure

Administrative expenditure

FCH 2 JU's administrative costs recorded a higher rate of use (87.3 %) compared to 2015 and comparable to 2014. Unused appropriations came mainly from staff costs and communication. Savings were also made in costs for experts.

99.5% of these unused appropriations (as seen from the following table) are coming from H2020 budget and will be reactivated in 2017 and 2018 in accordance with FCH 2 JU Financial Rules.

Payment execution rate (73.6%) was slightly lower than in 2015.

The following table summarises the breakdown between the 2 programmes (FP7/H2020) for the implementation of administrative budget. Commitments refer to 2016 appropriations excluding any carry forwards from previous years, whereas payments refer to all payments made during the year

TABLE 2.3.2.2: ADMINISTRATIVE EXPENDITURE 2016

ADMINISTRATIVE EXPENDITURE (IN EUR)						
	Commitment appropriations (CA)	**Committed**	**% execution**	**Payment appropriations (PA)**	**Paid**	**% execution**
FP7	4 331 282	4 327 765	99.9 %	4 331 282	3 841 648	88.7 %
H2020	991 209[21]	319 151	32.2 %	991 209	-	0.0 %
Carry-overs				594 429	511 788	86.1 %
TOTAL	**5 322 491**	**4 646 916**	**87.3 %**	**5 916 920**	**4 353 435**	**73.6 %**

Operational expenditure

As regards **H2020 operational costs** (call, studies, JRC), the commitment execution rate reached 78.6 %. The total unused appropriations, amounting to EUR 25.9 million, are mainly due to the outcome of the evaluations of the 2016 call and have already been re-entered in the initial budget for 2017.

The payment appropriations were mainly used to pay the pre-financings for the 15 projects in the 2015 call. The execution rate of payments is

20 This includes recoveries from audit implementation, recoveries from pre-financing, bank interest, liquidated damages and recoveries from administrative expenditure.

21 Includes an amount of EUR 56 472.82 cashed from administrative expenditure but not shown in either the voted or amended budgets.

similar to the 2015 level (98 %). The unused payment appropriations (EUR 979 800) will be re-entered in the 2017 budget through an amendment.

As regards **FP7 operational costs**, the execution rate on the payment appropriations reached 73.6 %. The unused commitment (EUR 2.1 million) and payment appropriations (EUR 16.1 million) will be also re-entered in the 2017 budget through an amendment.

An overview of the operational costs of budget execution is given below:

TABLE 2.3.2.3: OPERATIONAL EXPENDITURE 2016

OPERATIONAL EXPENDITURE (IN EUR)						
Heading	Commitment			Payment		
	Commitment appropriations (CA)	Committed	% execution	Payment appropriations (PA)	Paid	% execution
FP7	2 165 705	56 949	2.6 %	60 981 006	44 910 439	73.6 %
H2020	120 274 101	94 591 748	78.6 %	48 637 500	47 657 699	98.0 %
TOTAL	**122 439 806**	**94 648 697**	**77.3 %**	**109 618 505**	**92 568 138**	**84.4 %**

Overview of programme implementation

The following tables provide an overview of FP7 and H2020 implementation.

As regards **operational costs**:

For **FP7**, the execution rate has reached 79.6 %. The commitments under operational costs refer to individual commitments. The amounts shown after 2017 represent the remaining obligations under the open GAs. From a total of 155 GAs signed, one project was cancelled, final payments were executed for 81 projects while 73 projects remain open. In addition, 12 operational studies were conducted.

For **H2020**, the amount committed until the end of 2016 refers to the 30 individual commitments under calls 2014 and 2015 and the global and individual commitments for the 2016 call. In addition, it includes one individual commitment for the studies in AWP 2014, the global commitment for the studies in AWP 2015, and the commitment for the 2016 contribution to JRC.

As regards **administrative costs**, EUR 805 269 was committed in 2016 but not paid (as services are ongoing and still have to be finalised and invoiced); therefore, it will be carried forward to meet remaining obligations.

The following tables present an overview of the implementation of FP7 and H2020 programmes.

TABLE 2.3.2.4: OVERVIEW PROGRAMME IMPLEMENTATION

FP7 (IN EUR)				
Type	Execution until 31/12/2016	2017	Subsequent years	Total
Commitments (operational costs)	453 185 163	-	-	453 185 163
Payments (operational costs)	360 950 056	32 178 026	43 106 543	436 234 625
Cumulative execution (operational costs)	**79.6 %**	**86.7 %**	**96.3 %**	**96.3 %**
Commitments (administrative costs)	26 882 353	4 089 129	-	30 971 482
Payments (administrative costs)	26 313 594	4 657 888	-	30 971 482
Cumulative execution (administrative costs)	**97.9 %**	**100.0 %**	**100.0 %**	**100.0 %**
Overall FP7 execution	**80.7 %**	**86.7 %**	**96.3 %**	**96.5 %**

H2020 (IN EUR)				
Type	**Execution until 31/12/2016**	**2017**	**Subsequent years**	**Total**
Commitments (operational costs)	287 805 632	104 598 498	253 595 870	646 000 000
Payments (operational costs)	77 293 833	144 317 998	424 388 169	646 000 000
Cumulative execution (operational costs)	**26.9 %**	**56.5 %**	**100.0 %**	**100.0 %**
Commitments (administrative costs)	337 255	113 516	37 549 229	38 000 000
Payments (administrative costs)	100 746	350 025	37 549 229	38 000 000
Cumulative execution (administrative costs)	**29.9 %**	**100.0 %**	**100.0 %**	**100.0 %**
Overall H2020 execution	**26.9 %**	**56.5 %**	**100.0 %**	**100.0 %**

2.3.3 TIME TO PAY

Operational payments

FP7

The analysis of the reports comprises a review and validation of the technical report and all financial claims and certificates of financial statements submitted by beneficiaries in each project, including any adjustments for previous reporting periods and for audit findings.

The average time to pay for cost claims in 2016 was 71 days, which is an improvement on 2015 (85 days). The gross time to pay (including any suspensions due to a request for clarifications, amendments and mid-term reviews) improved by 28 % compared to 2015. This was mainly achieved through the introduction of the single submission module for most FP7 projects.

76 reports were treated in 2016, which was similar to 2015.

H2020

The average time to pay for pre-financing reached 15 days for the pre-financings of the 2015 call. The first two submissions of periodic reports under H2020 were made in the last quarter of 2016 and the first interim payments under H2020 are expected to be executed in 2017.

Administrative payments

In 2016, the average time to pay for administrative payments (invoices and claims from experts/staff) reached 17 days (the same as 2015). The number of late payments (8 % of the total number of invoices/claims) showed an improvement from 2015 (12.5 %), reflecting the various rigorous controls put in place. Late payments concern mainly mission claims, expert claims and payment of communication invoices.

2.4. PROCUREMENT AND CONTRACTS

The tender and contract management has been simplified as far as possible by following the interinstitutional procurement procedures launched by the EC, and by using the resulting multi-annual Framework Contracts. The FCH 2 JU also cooperates with other Joint Undertakings in tendering needs in order to minimise the administrative effort. These Framework Contracts have been concluded mainly in the field of IT services and interim staff provision.

Most of the FCH 2 JU's contracting in 2016 was done under existing multi-annual Framework Contracts. Procedures were mainly launched by the FCH 2 JU for the purpose of conducting studies. In terms of volume, the procurement of studies were the most significant procedures launched, followed by various audit engagements and IT and communication services.

The table below gives an overview of the contracts awarded in 2016, including the procedure used in each case and the name of the contractor(s). Only contracts with a value exceeding EUR 15 000 are listed below:

TABLE 2.4.1: CONTRACTS AWARDED IN 2016

TYPE OF CONTRACT	AREA OR TITLE OF STUDY	SELECTION PROCEDURE (IF APPLICABLE FOR CONTRACT AWARDS)	NAME OF CONTRACTOR	AMOUNT (EUR)
Specific Contract	Operational		JRC	612 500
Service contract	Bus joint procurement strategy II	Open procedure	Element Energy	300 000
Service contract	Business models and financing arrangements for the commercialisation of stationary fuel cells	Open procedure	Delta Energy and Environment Ltd.	390 225
Service contract	Energy transition for H_2 in Energy storage and more broadly power to H_2 applications	Open procedure	Tractabel Engineering S.A.	242 890
Specific Contract	Audit – 9th batch – 9 audits	RTD FP7 Framework Contract	Lubbock Fine Chartered Accountants	103 338
Service contract	Study on the supply chain	Negotiated procedure	E4tech Sarl	79 950
Service contract	Study on trends in investment and jobs	Negotiated procedure	Consortium of LBST, Hinicio and Technopolis	72 275
Specific Contract	IT (development of NEWTON)	DIGIT Framework Contract	Intrasoft International SA Sword Technologies SA ARHS Developments SA	64 743
Framework contract	Catering	Negotiated procedure	Gusto Communications SPRL Hasyl SPRL	60 000
Specific Contract	Audit of annual accounts - 2016	Reopening of the tendering procedure (DG BUDG Framework Contract)	PKF Littlejohn LLP	59 525
Specific Contract	Audit – 9th batch – 5 audits	Negotiated procedure	PKF Littlejohn LLP	54 193
Contract for supplies	Car lease	Negotiated procedure	LeasePlan Fleet management nv	38 954
Contract for supplies	Car lease	Negotiated procedure	Korean Motor Company NV	37 401
Specific Contract	Communication (editorial and publications 2016-2017)	RTD Framework Contract	RETELL	35 479
Specific Contract	Audit – 9th batch – 2 audits	RTD FP7 Framework Contract	KPMG AG Wirtschaftspruefungsgesellschaft	29 330
Specific Contract	Communication (AAR and PRD reports 2016)	RTD Framework Contract	RETELL	23 520
Specific Contract	Audit – 9th batch – 2 audits	RTD FP7 Framework Contract	Ernst & Young sccrl/bcvba	19 900
Specific Contract	Communication	RTD Framework Contract	RETELL	17 146

2.5. IT AND LOGISTICS

The year 2016 was driven by the replacement of ageing end-user equipment and a plan for the renewal of shared assets between the JUs. Replacement of laptops was performed and migration to Windows 10 and Office 2016 was initiated in December. In parallel, the project was launched to move the common IT infrastructure to a cloud platform. The same year was also marked by the continuous deployment of the grant management tool COMPASS/SYGMA with new functionalities made available to the FCH 2 JU.

Support to FCH core business

As in previous years, FCH staff were ensured adequate access to the complete set of EC applications for grant management, with an improved monitoring system of access rights, in line with prior audit recommendations. The role of the Single Point of Contact (SPOC) was extended to manage the user rights locally. Close contacts were maintained with the CSC to ensure the successful implementation of the H2020 calls. New functionalities were introduced, including:

- Reporting and payment workflow became available in the second semester and the first reports under H2020 projects were submitted in the last quarter of the year;
- The amendment workflow became functional and the first amendments were completed;
- The expert contract and payment modules were integrated in the COMPASS workflow together with the existing expert management tool (EMI) and became functional in December 2016.

Business support tools

The IT platform made operational for the coordinators in 2016 to enter their project results and for the knowledge management officer endured several weaknesses and failures. An assessment of the tool led to the conclusion that it did not meet the necessary requirements to achieve the knowledge management objectives efficiently. It was therefore decided to develop a successor tool (TRUST) which is lighter, more efficient and focused on data entry with the goal of generating useful data quickly and easily to produce the effective dissemination of information and results of FCH technologies.

In 2016, the hosting of the FCH 2 JU website was renewed with the same supplier to ensure the stability and continuity of this essential tool for external communication and visibility of the FCH programme.

FCH internal support

An assessment of the possibility to join the group of early adopters for the SYSPER application provided by the EC led to the conclusion that it was not cost efficient at this stage. Consequently, the FCH 2 JU decided to continue to use the shared Innovative Medicines Initiative Joint Undertaking JU (IMI JU) cloud application platform (for time management and selection procedures) the availability of which was confirmed by the IMI JU. The mission platform was made available and tested during the last quarter of the year, although its adoption will be subject to the implementation of certain specific needs, requirements or corrections regarding its existing functionalities.

The FCH 2 JU also decided to adopt the EC tool ABAC Assets, the preparatory work was carried out and a service level agreement signed.

Discussions on the possibility of adopting ARES, the registration and document management system used by the EC, were held with the EC and the other JUs, and an assessment is ongoing in view of a replacement or complement to the current document management system used by the FCH 2 JU.

The new telecommunication line (testa-NG) was finally made available and became fully operational in March 2016.

A business case was developed comparing various options to replace the common IT infrastructure and led to the decision in June 2016 to adopt the cloud technology Internet as a Service (IaaS). Close monitoring of the preparatory activities was performed and several monthly infrastructure workshops were organised. Some renewals of infrastructure components still had to be done, notably on network security, as the migration to IaaS is a long-term project and foreseen only in mid-2017.

2.6. HUMAN RESOURCES

By the end of 2016, the FCH 2 JU PO numbered 24 team members (23 temporary agents and one contract agent) representing 10 different EU MS.

Three staff members left the PO during 2016: two resigned and one retired at the end of contract. Filling the Staff Establishment Plan 2016 was ensured by completing three external selection procedures which resulted in the recruitment of new staff members in the following areas of competence:

- Head of Unit Operations and Communication (took up duties on 1 July 2016)
- Two project officers (took up duties on 16 October 2016 and 1 January 2017)
- Financial engineering officer (took up duties on 1 November 2016).

A fourth recruitment procedure launched at the end of 2016 for the post of project officer (CA FG IV) will be finalised and the post filled in 2017. Details of the Staff Establishment Plan are given in Annex 2.

To provide support for the PO in communication and knowledge management, two short-term contracts for interim services were used in 2016.

With the arrival of the new executive director who took up duties on 16 May 2016, a new organisational structure (Annex 1) was proposed to face the challenges and implement the priorities of the FCH 2 JU programme, in particular in the area of communication and outreach activities. It was approved by the GB on 29 June and took effect from 1 July 2016. A team-building event was organised in September 2016 where all staff members were able to benefit from hands-on training to refill a FCH car at the hydrogen refuelling station in Zaventem; this resulted in very positive feedback.

The PO depends on its staff's expertise and motivation to achieve its goals. In 2016, special emphasis was put on learning and development by identifying training needs and promoting professional development through training opportunities, in particular for H2020 applications and tools, as well as the development of staff skills and competences required for implementing the team's objectives. Individual training maps were introduced for Appraisal Exercise 2016 to better address and plan for individual training needs, manage talents and ensure consistency in professional and personal development of all staff in line with the PO mission and tasks. As a result, a positive trend in training statistics was observed with almost double the number of training days in 2016 compared to the previous accounting period (Chart 2).

Training statistics

Chart 1: Trainings attended by domain in 2016

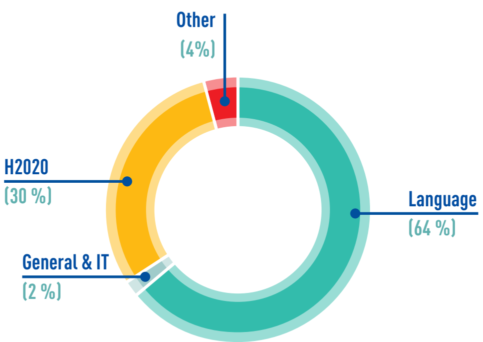
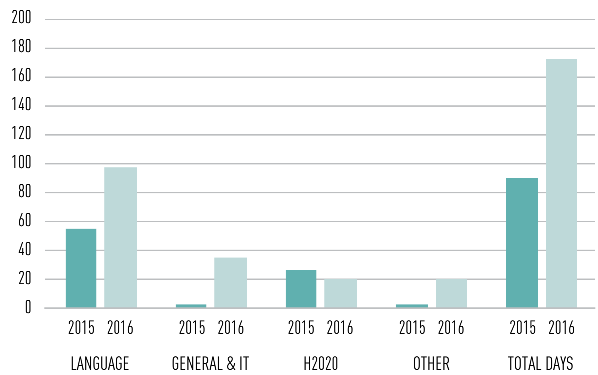


Chart 2: Number of training days



The Reclassification Exercise 2016 was carried out and the decision on staff reclassified (five temporary agents) was adopted with reclassifications taking effect retroactively on 1 January 2016.

Following up on implementing the rules of the revised staff regulations, the following decisions were adopted by means of a written procedure by the FCH JU GB during 2016:

- On reclassification of TA 2(f) (21/03/2016)
- On reclassification of CA 3(a) (21/03/2016)
- On working time (21/03/2016)
- On teleworking (21/03/2016)
- On part-time work (21/03/2016)
- On secondment of national experts (25/10/2016)

03
GOVERNANCE

3.1. GOVERNING BOARD

Composition, major decisions taken

The FCH 2 JU GB comprises three representatives from the EC representing the EU, six representatives of Hydrogen Europe and one representative of N.ERGHY. In 2016, eight out of the 10 members changed, including the chair and the vice chair. Raphaël Schoentgen, chair of Hydrogen Europe was elected as the new chair of the FCH 2 JU GB on 29 June 2016, and Ruxandra Draghia-Akli, deputy director-general of DG RTD was elected as the new vice chair on 9 December 2016.

The FCH 2 JU GB held three meetings in 2016 and adopted major decisions either at those meetings or through a written procedure, including the following: appointment of the new ED, adoption of the revised FCH 2 JU Financial Rules, adoption of implementing rules concerning staff regulations (see section 2.6), assessment and approval of the 2015 Annual Activity Report, opinion on the 2015 annual accounts, approval of the list of proposals for call 2016 selected for funding, adoption of the 2017 AWP, budget and staff establishment plan, approval of the revised 2016 Additional Activities Plan and of the 2017 Additional Activities Plan, and the appointment of a new member of the FCH 2 JU Scientific Committee following the resignation of Laurent Antoni who became the new chair of N.ERGHY and N.ERGHY representative on the FCH 2 JU GB.

Furthermore, the FCH 2 JU GB held a high-level strategic discussion in November 2016 to reflect on the challenges faced by the FCH sector and on possible actions to meet these challenges.

More information on the role and composition of the GB can be found at:
http://www.fch.europa.eu/page/governing-board

3.2. EXECUTIVE DIRECTOR

Following the end of the contract of the previous ED, Philippe Vannson was seconded from the EC and appointed acting ED by the FCH 2 GB in November 2015 with effect on 1 January 2016. The selection procedure for the Joint Undertaking's new ED was finalised in May 2016 with the appointment by the FCH 2 JU GB of Bart Biebuyck. The new ED took up his duties on 16 May 2016 for a period of three years which may be extended.

3.3. STATES REPRESENTATIVES GROUP

During 2016, the SRG met twice: on 19 May and 24 November. Amongst other activities focused on monitoring the achievements and results of the FCH 2 JU, particular attention was paid to the following:

1. The development of national plans to comply with the Alternative Fuels Directive. After the May meeting, the PO contacted all SRG members to complete a short survey on the inclusion of hydrogen in these plans. Subsequently, at the November meeting, the PO reported on the survey results which were complemented with information gathered from other sources. Most of the MS represented in the SRG confirmed the inclusion of hydrogen, although at the time of the meeting, confirmation had not been received from most countries as the plans were mostly in preparation and had yet to be submitted to the EC. The FCH JU continued dialogues with those MS which appeared to be excluding hydrogen, so as to inform them of the latest developments in the technology and the efforts being made at the European level.

2. National activities were presented, in particular in Italy (in May) and France (in November). These updates served to inform all MS of the actors, initiatives, funding schemes and projects currently in place in these countries.

3. A framework for the exchange of information at the national level was agreed with the FCH JU. The type of information being sought includes levels of deployment for various FCH applications, both for transport and energy. It was agreed to employ an existing template used within the IPHE for this data-collection exercise and that SRG members would start providing it in early 2017.

4. Further collaboration was agreed within the context of the actions taking place in the SET Plan, to enable the inclusion of hydrogen in the relevant working groups where SRG members already have a presence. This will serve to raise the awareness about FCH technologies and their potential benefits within these working groups so that they are included in working documents as far as possible.

5. In late 2016, the FCH JU launched an initiative to work more closely with regional and local authorities on the development of business cases and implementation plans for various hydrogen and fuel cell-based products. The SRG members were approached to help reach out to potentially interested authorities in their respective countries. This was instrumental in raising awareness and a number of regions and cities joined this initiative as a result of this action.

During 2016, the SRG was consulted on developing call topics and documents and on the AWP 2017. On 9 November, the GB validated a set of answers provided by the Coordinators' Group to the questions/comments raised by the SRG.

In 2016, a new SRG member (the Netherlands) was appointed by the relevant national authorities.

3.4. SCIENTIFIC COMMITTEE

The composition of the Scientific Committee slightly changed in 2016. One of its 9 members, Laurent Antoni, stepped down in June 2016 upon being nominated as Chair of the Research grouping and becoming a member of the FCH 2 JU Governing Board. Jean-Pierre Birat was nominated as his successor in December 2016.

The Scientific Committee met four times in 2016: on 12 February, 25 October, 22 November and 21 December.

As in previous years, the SC actively participated in the annual Programme Review, where its members acted as evaluators, rapporteurs and co-chaired panel sessions at the PRD events.

In addition, the SC also prepared a detailed report of its recommendations based on the Programme Review 2015 which its chairman, Eden Mamut, presented to the GB at the 26 June meeting.

3.5. STAKEHOLDERS FORUM

The Stakeholders Forum is a key FCH JU governance body which ensures the transparency and openness of the FCH 2 JU programme. The SF is also the occasion to enhance FCH JU communication activities as it gathers together a large number of policy-makers and EU stakeholders. It was recently the occasion to tap into key communication objectives and to enlarge its target audiences to newcomers, while also addressing new topics.

For more information on the SF in 2016, see section 2.1.2.

04 INTERNAL CONTROL FRAMEWORK

The foundation of the FCH 2 JU's Internal Control Framework (ICF) is provided for by a set of 16 Internal Control Standards (ICS) which were adopted by the GB on 15 June 2010. Following a revision of the control framework by the EC in 2014, an update of these standards and associated requirements was prepared in 2015 and was expected to be adopted in 2016.

During 2016, the EC, in its draft Communication, indicated that there would be a new and more profound reform of the ICS also applicable to the executive agencies and JUs (as well as other decentralised bodies). The core of the revision, highly inspired by the internationally recognised COSO framework 2013 reform, should transfer the concept from the current "rules-based" ICS into a "principle-based" ICF.

For the purpose of reporting in AAR 2016, the requirement remains to report on the implementation of 16 ICSs, which will only be replaced by the new framework during 2017.

In the annual internal control awareness session, held on 29 November 2016, the new concepts of five internal control components and their main characteristics were introduced to all staff, together with the information on the upcoming reform.

The awareness session held in 2016 further developed the existing ICS 4 (Staff Appraisal and Development), ICS 5 (Objectives and Performance Indicators), ICS 6 (Risk Management Process) and ICS 8 (Processes and Procedures). The session was highly interactive with the main focus on improving the performance of the FCH 2 JU and practical examples of the KPIs.

In addition, the FCH JU ICF provides for mid-year management reports from the heads of unit to the ED. Following the changes in the organisation with the arrival of the new ED in May and of the new head of operations and communications in July, the mid-year report was replaced by handover reports, briefings, monthly reporting on specific topics (such as budget execution and monitoring of KPIs) and reporting at weekly management meetings. The review of the year and declaration of assurance by the heads of unit is encompassed in their input into the AAR and on a review by the internal control coordinator of the state of the internal control system (see sections 4.6 and 5.2).

4.1. FINANCIAL PROCEDURES

Financial procedures guide FCH 2 JU operations and set out how the JU uses and manages its funds and resources.

Activities in 2016 included:

- Effective implementation of the newly developed procedure on the technical reviews for FP7. For H2020, technical audits have been provided for in the common H2020 *ex-post* audit strategy (adopted by CSC Steering Board on 22 February 2016);
- Active communication and cooperation with the CSC focused on the common understanding and interpretation of the requirements of newly developed workflows for H2020 in the context of the FCH 2 JU environment (see section 2.2.2. for further details);
- FCH 2 JU ensured the implementation of the research community's common anti-fraud strategy, adopted on 18 March 2015 by the CSC, by attending regular meetings of the Fraud and Anti Irregularity Committee (FAIR) coordinated by DG RTD, and by following up on the action plan derived from the strategy. FCH 2 JU has an anti-fraud correspondent and encourages its employees to take part in the anti-fraud trainings organised by DG RTD.

4.2. *EX-ANTE* CONTROLS ON OPERATIONAL EXPENDITURE

Ex-ante controls are essential to prevent errors and avoid the need for *ex-post* corrective actions. In 2016, FCH 2 JU continued to apply the provision of the Article 66 of the Financial Regulation and Article 18 of FCH 2 JU Financial Rules: "*each operation shall be subject at least to an* ex ante *control based on a desk review of documents and on the available results of controls already carried out relating to the operational and financial aspects of the operation*".

Therefore, the main objective of *ex-ante* controls was to ascertain that the principle of sound financial management has been applied.

The FCH 2 JU has developed and continued to apply the procedures developed to define the controls to be performed by project and finance officers for every cost claim, invoice, commitment and payment, taking into account risk-based and cost-effectiveness considerations.

In 2016, specific attention was paid to:

- The participation of project and finance officers at H2020 project kick-off meetings in order to clearly communicate the financial reporting requirements;
- Increased financial checks during the Grant Agreement Preparation (GAP) phase;
- Strengthening cooperation with the CSC regarding information campaigns on the H2020 rules for FCH2 JU beneficiaries – in this respect, the FCH 2 JU's internal control and audit manager participated in a pilot case and on 20 September 2016 attended a communication campaign organised by the CSC in Prague, with the cooperation of the Czech national contact point (NCP). During the seminar, the FCH 2 JU presented slides from the shared CSC presentation to the audience, focusing on the practical aspects of the preparation of the beneficiaries in case of an *ex-post* audit. The presentation was also shared with the FCH 2 JU PO and used for the preparation of internal communication events; e.g. Coordinators' Day. Based on the successful pilot project, other CSC stakeholders expressed their interest in joining the CSC in future campaigns, since the cooperation proved to be mutually beneficial. The FCH 2 JU will continue the cooperation in 2017.
- On 24 May 2016, the Undertaking organised a financial workshop on H2020 financial rules and the prevention of errors, focusing on the specificities and business models that are pertinent for FCH 2 JU projects. All successful participants from the 2014 and 2015 calls were invited to the session. The workshop was recorded and web-streamed at the same time. The workshop, which was organised at the FCH 2 JU premises in Brussels, was attended by 96 people (including online participants). The presentations were made available on the FCH 2 JU website: http://www.fch.europa.eu/page/h2020-financial-workshops.

4.3. *EX-POST* CONTROL OF OPERATIONAL EXPENDITURE AND ERROR RATES IDENTIFIED

Ex-post controls are defined as the controls executed to verify the financial and operational aspects of finalised budgetary transactions in accordance with Article 19 of the FCH 2 JU Financial Rules.

The controls are the last stage of the JU's control strategy in the project life cycle. This stage includes the *ex-post* audits as well as the recovery/correction of any amounts found to have been paid in excess of the sum due.

The main objectives of the *ex-post* controls are to ensure that legality, regularity and sound financial management (economy, efficiency and effectiveness) have been respected and to provide the basis for corrective and recovery activities, if necessary.

In 2016, the FCH 2 JU continued with execution of FP7 *ex-post* audits, as the basis for the authorising officer's declaration of assurance for that year. Since there were no payments for H2020 projects in 2016, the FCH 2 JU efforts in *ex-post* controls for H2020 focused on developing working practices in active dialogue with the CSC's Common Audit Support (CAS) to enable the smooth transition between FP7 and H2020, with same level of representative results for FCH 2 JU under H2020.

FP7 programme

FCH 2 JU *ex-post* controls of FCH FP7 grants included financial audits which were carried out by external audit firms.

The main activities of *ex-post* controls include management of FP7 *ex-post* audits of beneficiaries through a contract with external audit firms, and implementation of the FP7 ex-post audit strategy to ensure appropriate audit coverage of the cost claims validated.

At the same time, a primary goal of FP7 *ex-post* controls was to achieve performance efficiency – i.e. trying to minimise the costs of audits while maintaining targeted and appropriate audit coverage.

In 2016, in line with the multi-annual FP7 *ex-post* audit strategy of the FCH JU, the following new audits were launched:

- 16 representative audits, covering FCH JU's top beneficiaries not previously audited under the FP7 programme;
- 2 follow-up audits of the beneficiaries previously audited at the very beginning of the FP7 audit campaign, where the selection criterion was the amount of FCH JU budget spent and/or previously identified significant errors (including errors of a systematic nature). The aim of the audits was to verify whether corrective actions had been adequately implemented by the beneficiaries.

Following the expiry of the JUs' Framework Contract in 2015, for the execution of the FP7 audits in 2016, the FCH 2 JU used an RTD FP7 Framework Contract for the first time (cascade system), signing specific contracts for batch audits with the following external audit firms (EAFs):

- Lubbock Fine
- Ernst & Young
- KPMG

After conflict of interest and capacity checks, there were five audit engagements for which none of the three Framework Contractors were available. Therefore, FCH 2 JU entered into a negotiated procurement procedure for a low-value contract with the fourth EAF, PKF LJ, with whom it had previous experience with FP7 *ex-post* audits.

The contractual conditions were identical to those of the RTD Framework Contract, with prices remaining the same as in previous years. This resulted in the complete coverage and execution of all planned audits in 2016 while maintaining reasonable costs and effort to manage the audits.

Because of its multi-annual nature, the effectiveness of the FCH JU's control strategy can only be fully measured and assessed during the final stages of the JU's programme, once the *ex-post* control strategy has been fully implemented, and systematic errors have been detected and corrected.

The main legality and regularity indicator during this stage is the 'error rate' detected by *ex-post* audits. The following two aspects must be considered when providing information on error rates and inferring conclusions from such errors:

- Due to the multi-annual perspective of *ex-post* audits, their effectiveness must be measured by presenting '**cumulative**' information on the errors detected;
- **Two types of *ex-post* audits** must be distinguished with **two different objectives**: 'representative' audits with a goal of producing a representative estimate of the error rate present in the population, and 'corrective' audits (e.g. risk-based audits) with the objective of detecting and correcting as many errors as possible.

Bearing in mind these two aspects, three types of cumulative error rates are calculated to provide a comprehensive overall view of the results of *ex-post* audits (see table 4.3.3.). For each type of error, the rate is calculated at both the 'total cost' and at the 'FCH JU contribution' level. This distinction is necessary as not all errors detected at total cost have a financial impact on the FCH JU contribution[22].

22 For example, an error detected on indirect costs (at total cost level) for a beneficiary using the 'actual' indirect cost method but with a maximum reimbursement rate of 20 % could have no impact in the FCH JU contribution if 'declared' and 'eligible' indirect costs are above the 20 % reimbursed by the JU.

Overall error rate

This is the error rate derived from all audits, comprising both 'representative' and 'risk-based' audits. It is calculated as a percentage of the value[23] of the errors detected divided by the value of total costs accepted by the JU.

It provides information on the importance of the errors detected, but it cannot be used as a reference for inferring conclusions on the expected error in the non-audited population, for the following reasons: 1) it is the result of 'representative' and 'risk-based' audits with two different objectives; and 2) as it is based on values, it is easily influenced by the error rates resulting from the individual audits of the cost claims of the highest values, which may not necessarily be those most representative for inferring conclusions.

Residual error rate

This is the level of error remaining in the population after corrections and recoveries made by the FCH JU. This includes extrapolation of audit results to non-audited contracts and the correction of errors. The formula for the calculation of the residual error rate, in line with the *ex-post* strategy and shown in Annex 9, is based on the following assumptions: 1) all the errors detected will be corrected; and 2) the residual error rate for participations subject to extrapolation is estimated to be equal to the non-systematic error rate.

Ex-post audit resources

The lean structure of the FCH JU does not allow for the setting up of an internal *ex-post* audit section, therefore all *ex-post* audits are outsourced to external audit firms.

Whereas the execution of the audit work is externalised, some of the JU's staff ('*ex-post* audit team') are responsible for the management of *ex-post* audits, in particular the following three processes:

1. Planning (i.e. selection of 'representative' and 'risk-based' audits, coordination with EC audits and preparation of audit input files);

2. Monitoring (i.e. regular follow-up of audit status, interaction with audit firms on technical questions, and more importantly, quality checks of audit reports);

3. Evaluation/implementation of audit results (i.e. inferring conclusions on the basis of identified error rates, extrapolation procedures and initiation of recovery orders/offsetting with future payments to correct errors detected).

The following table gives an overview of the resources devoted to *ex-post* audits.

TABLE 4.3.1: RESOURCES DEVOTED TO *EX-POST* AUDITS

	2011	2012	2013	2014	2015	2016
Internal resources ex-post audits[24]	1 FTE	1.5 FTE	2 FTE	2 FTE	1.5 FTE	2 FTE
Cost of externalised audits (commitments, in EUR)	77 820	208 665	161 082	245 081	315 716	206 762

Ex-post audits – coverage

The FCH JU FP7 *ex-post* audit strategy was adopted by the GB on 6 January 2011, and its implementation began in September 2011.

The following table gives an overview of the number of *ex-post* audits and their audit coverage.

23 When considering the value of errors detected, three calculations are provided: 1) with only the errors in favour of the JU (i.e. ineligible costs detected by the auditors; the JU has to recover the unduly paid funds, and these errors are expressed in negative values); 2) with only the errors in favour of the beneficiary (i.e. additional eligible costs identified by the auditors and not declared by the beneficiary, who can submit an additional cost claim, and additional payment by the JU is subject to certain conditions; these errors are expressed in positive values); and 3) with the total net value of errors (in favour of both the JU and the beneficiary).

24 Due to the lean structure of the FCH JU and for cost-efficiency reasons, there is no single function in the JU fully dedicated to the management of ex-post audits. The reported figure in 'FTE: full-time equivalent' is therefore an estimation of the time devoted by various members of JU staff to ex-post audits in order to manage the three processes under the JU's responsibility (i.e. planning, monitoring/quality checks, and evaluation/implementation of audit results).

TABLE 4.3.2: NUMBER OF AUDITS AND AUDIT COVERAGE CUMULATIVE

BATCH	YEAR	TO BE LAUNCHED	ON-GOING	FINALISED[25]	TOTAL	OF WHICH	
						REPRESENTATIVE	RISK-BASED
1st batch	2011	0	0	5	5	5	0
2nd batch	2011	0	0	7	7	6	1
3rd batch	2012	0	0	9	9	7	2
4th batch	2012	0	0	12	12	12	0
5th batch	2013	0	0	15	15	11	4
6th batch	2014	0	0	20	20	15	5
7th batch	2014	0	0	2	2	0	2
8th batch	2015	0	3[26]	26	29	27	2
9th batch	2016	0	5	13	18	16	2
Total (audits)		**0**	**8**	**109**	**117**	**99**	**18**

Total (cost claims)	433
Total costs accepted by FCH JU (*cumulative*) (in EUR) **(A)**	544 096 374
Total costs of audits launched (*cumulative*) (in EUR) **(B)**	132 694 441
Total costs of audits finalised (*cumulative*) (in EUR) **(C)**	114 870 875
Direct audit coverage of total audits (in %) **(B/A)**	24 %
Direct audit coverage of finalised audits (in %) **(C/A)**	21 %
Total FCH JU beneficiaries **(D)**	571
FCH JU beneficiaries audited **(E)**	115[27]
Audit coverage (number of benef.) of total audits (in %) **(E/D)**	20 %

The first cost claims were received by the FCH JU in the spring of 2011 and the first *ex-post* audits were launched immediately after the JU's validation of the first claims. In the calendar year 2011, two batches were launched: the first (five audits) in September 2011 and the second (seven audits) in December 2011. During 2012, two additional batches were launched: the third (nine audits) in February 2012 and the fourth (12 audits) in December 2012. In 2013, one batch was launched: the fifth (15 audits) in May 2013. In the calendar year 2014, two additional batches were launched: the sixth (20 audits) in May 2014 and the seventh (two audits) in October 2014. In 2015, the eighth batch (29 audits) was launched, of which 27 were considered as representative audits and two audits were launched by request as part of the risk-based strategy.

In 2016, batch 9 was launched with 16 representative and two corrective audits, with the aim of optimising the total costs of audits while maintaining the appropriate audit coverage (resulting in overall direct audit coverage of 24 % in 2016 as compared to 22 % in 2015). For corrective audits, FCH 2 JU selected two beneficiaries who were audited at the very beginning of the FP7 audit campaign for a follow-up audit to ensure proper implementation of the previous audit findings and recommendations.

By 31 December 2016, all previous batches had been finalised, with the exception of batch 8 with three outstanding audits that are planned to be finalised in the course of 2017[26].

In conclusion, since launching the FP7 ex-post audits, 117 audits have been launched of which 99 were 'representative' and 18 'risk-based', covering in total EUR 132.7 million of accepted costs declared by the beneficiaries, with an average sum of EUR 1.1 million of accepted costs per individual audit.

25 **Finalised audits:** An audit is considered 'finalised' when the audit adjustment and the related 'error rate' is final. This comprises either audits with 'Final Audit Reports' received or, if not received, with a 'Pre-final audit report' (after a contradictory procedure with the beneficiary) approved by the JU and therefore with a definitive audit adjustment and error rate. For AAR assurance purposes, we have considered all audits as 'finalised' by 31 December 2016.

26 By 31 December 2016, there were three open audits from Batch 8, launched in 2015. The FCH 2 JU did not finalise these audits due to ongoing discussions with the beneficiaries that also required coordination with other DG RTD services (under FP7) in order to ensure coherent audit results across different stakeholders vis-à-vis the same beneficiary.

27 In 2016, FCH 2 JU launched for the first time an audit on two previously audited beneficiaries (from Batch 1), therefore the total number of beneficiaries audited (115) is lower than the total number of audits (117) launched under the FP7 audit campaign.

This resulted in direct audit coverage of 24 %, from all validated costs claims by the FCH for all 155 projects totalling EUR 544 million since the beginning of the FP7 Programme (until 31 December 2016).

Of these 117 audits (comprising 399 cost claims), 109 have been finalised and eight are ongoing. The cumulative audit coverage represents 21 % (on finalised audits) and 24 % (on total audits) of the value of validated cost claims at the cut-off[28] reporting date (i.e. 31 December 2016).

The total number of FCH JU beneficiaries is 571, of which 115 have been selected for audit, representing an audit coverage representing 20 %.

In 2016, the audited costs for batch 9 alone amounted to EUR 53.8 million with an average cost of EUR 3 million per audit (for 18 audits in total).

Ex-post audits – error rates

The error rates resulting from the 109 finalised audits (of which 93 are representative and 16 are risk-based) are as follows:

TABLE 4.3.3: INDICATORS OF ERROR

	ACHIEVED CUMULATIVE PERIOD (AS OF 31/12/2016)	
	TOTAL COST	FCH JU CONTRIBUTION
Costs accepted by FCH JU financial officers (FO) (in EUR) **(A)**	93 260 449	41 103 181
Overall errors (in EUR) in favour of the FCH JU **(B)**	-4 200 257	-1 492 583
'Overall error rate' (only in favour of the FCH JU) **(B/A)**	**-4.50 %**	**-3.63 %**
Overall errors (in EUR) in favour of the beneficiary **(C)**	3 221 849	943 159
'Overall error rate' (only in favour of the beneficiary) **(C/A)**	**3.45 %**	**2.29 %**
Total overall errors (in EUR) (in favour of both the FCH JU and the beneficiary **(D)**	-978 408	-549 425
'Overall error rate' (netting off errors in favour of both the JU and the beneficiary **(D/A)**	**-1.05 %**	**-1.34 %**
'Representative error rate' (formula in Annex 9) (%)	**-2.89 %**	**-2.19 %**
'Residual error rate' (formula in Annex 9) (%)	**-1.24 %**	**-1.19 %**

The difference between the 'representative error rate' and the 'residual error rate' is the result of the following: 1) the correction of errors in an important part of the population due to the high audit coverage; and 2) the effect of extrapolation of audit results to non-audited cost claims of audited beneficiaries.

In 2016, an overall 'net error rate[29]' on costs fell to -1.05 % (compared to -1.38 % in 2015) and, more significantly, *an overall 'net error rate' on FCH contribution (directly affecting the EC budget) fell from -2.88 % in 2015 to -1.34 % in 2016.*

Based on the calculation formula (derived from the FP7 *ex-post* audit strategy, and coherent with the overall RTD FP7 *ex-post* audit strategy – see Annex 9), on the representative error rates, where all positive audit adjustments (i.e. adjustments in favour of the beneficiaries) appear as zero adjustments, whereas all negative audit adjustments appear as their exact value, the representative error rate on total costs audited increased from -2.09 % (in 2015) to -2.89 % in 2016. The representative error rate on the FCH contribution (following the same calculation formula) increased from -2.02 % (in 2015) to -2.19 % in 2016.

In 2016, due to sufficient audit coverage and a 'cleaning' effect, the FCH was able to achieve a most decisive '**residual error rate**' (following the materiality criteria of 2 % threshold for AAR reservation) **of –1.24 % on the total costs audited** (compared to -0.8 % in 2015) **and of –1.19 % on the FCH contribution** (compared to -1.01 % in 2015).

Further analysis of the error rates and whether or not a reservation is necessary in the declaration of assurance concerning the accuracy of the cost claims is addressed in section 5.3.

28 The cut-off reporting date has been fixed at 31 December 2016 as this date coincides with the cut-off date for the preparation of the annual accounts.

29 **Net error rate**: an error rate taking into account the net amount of positive and negative adjustments on the total audited costs/total audited FCH contribution.

Most common audit findings

For the direct costs, most of the findings in the audits related to an incorrect calculation of the hourly rates applied by the beneficiaries to calculate personnel costs.

The FCH 2 JU has learnt lessons from the most common audit errors and, as part of the preventive measures, during the *ex-ante* process the FCH team is focusing on proper explanations of correct interpretations of the applicable financial rules towards the beneficiaries.

For the indirect costs, the findings related mainly to incorrect calculations (inclusion of ineligible costs) or to the use of budgeted rather than actual indirect cost figures. These errors should be completely avoided in the H2020 programme, which introduces a 25 % flat rate on indirect costs.

Implementation of audit results

As a result of errors identified during the FCH 2 JU *ex-post* audits, JU funds paid unduly must be recovered. The FCH 2 JU has implemented the necessary controls and monitoring mechanisms to ensure that all errors detected in favour of the JU are corrected in due course (either through a recovery order or by offsetting a future payment).

The detailed situation on the implementation (at project level) of *ex-post* audit results is shown below.

TABLE 4.3.4: IMPLEMENTATION OF *EX-POST* AUDIT RESULTS IN FAVOUR OF THE FCH JU EUR)

AUDIT LAUNCHING YEAR	AUDIT ADJUSTMENT (IN FAVOUR OF FCH JU)		ADJUSTMENTS PENDING IMPLEMENTATION		ADJUSTMENTS IMPLEMENTED	
	ON TOTAL COSTS	ON FCH JU CONTRIBUTION	ON TOTAL COSTS	ON FCH JU CONTRIBUTION	ON TOTAL COSTS	ON FCH JU CONTRIBUTION
2011	824 960	214 492			824 960	214 492
2012	629 111	346 512			629 111	346 512
2013	138 734	66 592			138 734	66 592
2014	1 096 153	486 361			1 096 153	486 361
2015	1 171 154	254 274	120 966	36 093	1 050 188	218 182
2016	250 567	95 425	23 093	89 723	15 474	5702
	4 110 680	**1 463 656**	**356 060**	**125 816**	**3 754 621**	**1 337 841**
NOTE:	The total amount of negative adjustments (4 110 680) does not match the same total in table 4.3.3 (4 200 257) because the information in this table is at the project level (in order to indicate afterwards the amount implemented, which is always by project), whereas in table 4.3.3 the information is given at the beneficiary level.					

At the cut-off reporting date (i.e. 31 December 2016), the percentages of total adjustments effectively implemented are over 90 % at both total cost and FCH 2 JU contribution level. These percentages prove the continuous timely implementation of audit results, and consequently the effective correction of detected errors by the FCH 2 JU. Indeed, the vast majority of the adjustments with pending implementations are not due to JU delays, but can be simply explained by the fact that the audits have been finalised recently and implementation will follow shortly. This is the case for most of the audits launched in 2016 for which the letters of conclusion have been sent very recently.

As can be seen in the table above, the FCH 2 JU has implemented results from all audits that were launched before 2015.

To date, the FCH 2 JU has focused its *ex-post* audit effort on finalising a representative number of audits in order to have sufficient information for the calculation of a 'representative error rate' in preparation for the 2016 AAR.

Implementation of extrapolation/"extension of audit findings"

Extension of the audit findings (formerly known as "extrapolation") is the process by which 'systematic' errors detected in audited cost claims are 'extrapolated' to all other non-audited FCH 2 JU claims of the same audited beneficiary. The timely implementation of 'extension of audit findings' relies on beneficiaries preparing and submitting revised cost claims from which the effect of any systematic error(s) detected in audits has been eradicated.

The overall situation on the implementation of extension of audit findings is shown in the table below.

TABLE 4.3.5: IMPLEMENTATION OF "EXTENSION OF AUDIT FINDINGS" OF *EX-POST* AUDIT RESULTS

	BENEFICIARIES	COST CLAIMS
Audits finalised	109[30]	
Letters of conclusion sent as of reporting date	98	
Of which potentially concerned by extrapolation	37	
Extrapolation feedback not received from beneficiary	0	
Extrapolation feedback received from beneficiary	37	141
Of which projects not affected		69
Of which projects affected		72
Of which non-implemented		11
Of which implemented		61

At the cut-off reporting date (31 December 2016), 37 of the 109 finalised audits were potentially affected by extrapolation. Feedback was received from all the beneficiaries where beneficiaries provided the necessary information which covers 141 cost claims. Of these 141 cost claims, 69 are affected by extension of audit findings, and the FCH 2 JU has implemented the extrapolation in 61 of these (85 %). This represents a significant increase compared to last year when the FCH 2 JU reported a 70 % implementation rate.

Liquidated damages[31]

Liquidated damages are applied systematically by the FCH 2 JU. In some cases, they do not result in a recovery order due to application of the *de minimis* rule.

At the cut-off reporting date (31 December 2016), 30 of the 109 finalised audits were assessed as requiring liquidated damages for a total amount of EUR 126 241. Pre-information letters (i.e. letters of conclusion) were sent to beneficiaries in all 30 cases, and recovery orders have already been issued and cashed for 28 cases, for a total value of EUR 96 127.

H2020 programme

As mentioned in the introduction of this section, 2016 was marked by close cooperation with the CAS to establish working arrangements "FCH 2 JU-CAS" for the effective management of H2020 *ex-post* audits, including the sampling methodology for joint undertakings. No H2020 audit was launched for the FCH 2 JU as no financial statements had been assessed and paid. The first H2020 audits are expected in 2017.

4.4. EUROPEAN COURT OF AUDITORS' AUDIT

In 2016, the FCH 2 JU:

- Contracted, following a procurement procedure, an independent auditor to audit FCH 2 JU accounts, as required by the revised General Financial Regulation (following adoption of FCH 2 JU revised Financial Rules);
- Liaised with ECA on the smooth transition from the annual audits performed by the ECA to audits performed by an external firm, as per requirements of the new procedure;
- Followed up and implemented the recommendations made in the ECA reports on the FCH 2 JU annual accounts.

30 One beneficiary, for which a follow up audit was launched and finalised in 2016, is counted twice, as the overall number shows number of audits.

31 Liquidated damages will only be applied where the unjustified contribution exceeds 2 % of the total contribution claimed for the given period.

4.5. INTERNAL AUDIT

Based on Council Regulation (EU) No 559/2014 of 6 May 2014 establishing the FCH 2 JU, the internal audit operation is under the authority and responsibility of the EC's Internal Audit Service (IAS), succeeding the previous role taken by the FCH JU's Internal Audit Capability (IAC).

Within the FCH 2 JU, a new role as internal control and audit manager was established in 2015 to act as a main contact point for IAS and coordinate the execution and follow-up on the annual internal audits carried out by IAS.

In 2016, the FCH 2 JU finalised implementation of all action plans addressing recommendations on IAS audits on the evaluation and selection process of H2020 grant proposals in FCH 2 JU carried out by IAS in 2015.

In 2016, the IAS undertook a new audit on the performance management of the FCH 2 JU.

On 29 November 2016, the FCH 2 JU received a final audit report from the IAS on this audit, which resulted in four recommendations.

The FCH 2 JU agreed with all the recommendations and sent an action plan to IAS on 22 December 2016, which was subsequently agreed by the IAS in January 2017.

4.6. RISK MANAGEMENT AND CONFLICT OF INTEREST

Risk management

During the annual risk assessment workshop, held on 17 October 2016, the FCH 2 JU team reflected on the status of the significant risks and action plans that were identified in the previous year and assessed their adequacy and relevance for the year 2017.

In addition, consolidated input from all the PO staff was gathered in order to establish a list of new significant risks for 2017, and the respective action plans were established.

The full list of important risks and related action plans identified can be found in the AWP 2017.

The FCH 2 JU will report on the fulfilment of the action plans and relevance of these risks in the following AAR 2017.

4.7. COMPLIANCE AND EFFECTIVENESS OF INTERNAL CONTROL

Priority is given to implementing and maintaining an effective internal control system so that reasonable assurance can be given that: (1) resources assigned to the activities are used according to the principles of sound financial management; and (2) the control procedures in place give the necessary guarantees concerning the legality and regularity of transactions.

In line with the objectives and priorities described in the AWP 2016, the robustness of the internal control system was monitored throughout the year. Internal control topics were also regularly discussed during weekly management and unit meetings or ad-hoc meetings (when preparing new processes or revising existing operating procedures).

The H2020 IT tools were further deployed during 2016 (amendment workflow, reporting and payment workflow, expert payments workflow) requiring adaptations to the PO staff working practices and definition of the relevant access rights. These new automated tools, which embed the controls and checklists, contribute to the strengthening and greater efficiency of the internal control system.

Furthermore, in 2016, FCH 2 JU's internal control system was also strengthened by implementing all the recommendations from the previous IAS audits.

Risks identified through the annual risk assessment exercise (see sections 1.1 and 4.6), which might pose a threat to achievement of FCH 2 JU's mission and objectives, were also systematically assessed and managed through appropriate controlling and mitigating actions.

In conclusion, based on the above information it can be confirmed that the FCH 2 JU is in compliance with all the ICS, the controls in place are working as intended, and the internal control system is providing an effective framework for managing any risks to the JU's ability to achieve its objectives.

05
MANAGEMENT ASSURANCE

5.1. ASSESSMENT OF THE ANNUAL ACTIVITY REPORT BY THE GOVERNING BOARD

This section is provided separately.

5.2. ELEMENTS SUPPORTING ASSURANCE

Reasonable assurance relies on the personal judgement of the JU's ED – as the JU's authorising officer at the date of signature of this AAR – based on all the information at his disposal.

The main elements supporting this assurance are based on the JU's management assessment of the robustness of its Internal Control Framework, the results of audits from the ECA and the IAS, the reporting from the internal control and audit manager, and the reporting from the heads of unit.

No significant weaknesses were identified or reported under section 2 (Support to operations) and section 4 (Internal Control Framework). Furthermore, based on their review, the heads of unit consider that given the scope of the assurance statement and taking into account the controls and monitoring system in place, the weaknesses they identified do not call into question reasonable assurance as to the use of resources for their intended purpose, in accordance with the principles of sound financial management, plus the fact that the implemented control procedures give the necessary guarantees on the legality and regularity of the underlying transactions.

5.3. RESERVATIONS

The **representative error rate** resulting from the 99 representative audits finalised is **-2.89 %** at total cost level and **-2.19 %** at FCH JU contribution level.

The residual error rate (i.e. error remaining in the population after corrections and recoveries) calculated at this point is **-1.24 %** at total cost level and **-1.19 %** at FCH JU contribution level. This rate should develop as more audits are closed, and more corrections and recoveries undertaken.

Taking into consideration:

- the residual error rates below 2 % at this point in time;
- the adequate audit coverage, comprising a representative number of finalised audits;
- the experience gained by the JU's staff in the ex-ante validation of costs claims;
- the JU's strong *ex-ante* controls;
- the improved quality of beneficiaries' cost claims as a result of the communication campaigns carried out by the FCH JU in 2012-2015;

no reservation is necessary. In the opinion of the ED, considering the aspects above and with the information available at this stage, it is possible to state with reasonable assurance that by the end of the programme, the residual error rate will be below the materiality threshold (i.e. 2 %) established in Annex 9 ('Materiality Criteria').

FCH JU actions towards an acceptable level of 'residual error rate'

The declaration of assurance in 2015 did not include a reservation, as is the case this year (2016). This is the result of the FCH 2 JU's firm commitment to maintain a robust internal control system where *ex-post* audits play a significant role. The 'residual error rate' is a key indicator of the legality and regularity of the JU's transactions. In this context, in 2012, the FCH JU set out an action plan with the aim of achieving an acceptable level of residual error rate, which should provide sufficient assurances to the ED, while at the same time respecting cost-benefit principles (i.e. the cost of controls have to be measured against the benefits that those additional controls can bring to the organisation – auditing 100 % of the cost claims is not cost-efficient).

The FCH JU action plan includes a combination of **preventive, detective and corrective measures** and is closely monitored. The measures/actions can be grouped around three main axes and are ongoing:

- Organisation of **communication campaigns** to prevent financial errors in cost reporting by improving awareness among the beneficiaries of the regulatory framework. In total, seven campaigns were organised by the FCH JU (three in 2012; two in 2013, one in 2014 and one in 2015). The set-up of the campaigns was reviewed in 2013 to maximise its impact, with the possibility to participate 'on-site' and 'online', a targeted audience (including auditors responsible for the preparation of the CFS and *ex-post* auditors) and a focus on the most recurrent issues. The 2015 campaign continued with onsite and online participation, with particular emphasis on the eligibility aspects in 'Demonstration' projects. In total, 146 beneficiaries involved in 129 projects attended the communication campaigns. This represents approximately 27 % and 83 % of FCH JU beneficiaries and projects, respectively. The communication campaigns were highly appreciated by the participants and their positive impact has been visible since 2013, through an improvement in the quality of beneficiaries' cost reporting.

- Maintaining strong FCH JU ***ex-ante* controls** to enable greater detection and correction of errors before validating cost claims (e.g. JU's scrutiny of the CFS, and its thorough *ex-ante* checklists).

- Continuation of FCH JU *ex-post* audit efforts. As of 31 December 2016, 117 audits were launched for FCH-FP7 grants, of which 109 were finalised and the remaining are expected to be finalised in the first quarter of 2017, representing a cumulative audit coverage of 24 % of the value of validated cost claims and 20 % in terms of the number of beneficiaries. The combination of appropriate audit coverage and relatively low detected error rate has resulted in a residual error rate below 2 %.

Likewise, the positive feedback loop generated by the combination of the three actions above is of particular importance. For example, the (preventive) communication campaigns are also a very useful platform on which to share experiences between beneficiaries and JU actors. Also, *ex-post* audits have a multiplying effect: lessons learned from the results of *ex-post* audits provide very valuable information not only for the audited beneficiary, but also for the JU's *ex-ante* controllers for future cost claims and to other beneficiaries of the same project.

The FCH JU has a clear control strategy which is multi-annual in nature and combines *ex-ante* and *ex-post* controls, and takes cost-efficiency into consideration. Since this strategy has proved its effectiveness from an assurance point of view, the FCH JU is fully committed to continuing its work along the same control principles.

5.4. OVERALL CONCLUSIONS

The purpose of this section is to provide an overall conclusion on the declaration of assurance as a whole (section 6).

It is important to note that only material weaknesses/risks lead to a reservation concerning the assurance in section 6. The concept of 'materiality' provides the ED with a basis for assessing the importance of the weaknesses/risks identified. Deciding whether something is material involves making a judgement in both qualitative and quantitative terms (see details on the 'Materiality criteria' in Annex 9).

Based on the information provided in the sections above, the following conclusions can be drawn:

- As regards the FCH 2 JU's policy activities, no qualification is to be made. There is also no reservation in the procedures relating to the selection of contractors and beneficiaries for FCH 2 JU projects and its underlying financial operations (legal and financial commitments). This is also the case for the JU's payments relating to administrative expenditure and procurement, as well as for pre-financing payments in the case of grants.

- The amounts that carry a higher risk of being affected by errors are the expenditures incurred against cost statements. Based on the analysis of error rates and the effectiveness of the preventive, detective and corrective actions presented in section 5.3, no reservation is necessary in this area either.

In conclusion, the management of the JU has reasonable assurance that, overall, suitable controls are in place and are working as intended, risks are being properly monitored and mitigated, and the necessary improvements noted by the auditors (i.e. the EC's IAS and the ECA) are being implemented. Therefore, the ED, in his capacity as authorising officer, has signed the declaration of assurance presented in section 6.

06
DECLARATION OF ASSURANCE

I, the undersigned, Bart Biebuyck, Executive Director of the FCH 2 JU, in my capacity as authorising officer

Declare that the information contained in this report gives a true and fair view[32].

State that I have reasonable assurance that the resources assigned to the activities described in this report have been used for their intended purpose and in accordance with the principles of sound financial management, and that the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions.

This reasonable assurance is based on my own judgement and on the information at my disposal, such as the results of the self-assessment, *ex-post* controls, the work of the internal audit capability, the observations of the Internal Audit Service and the lessons learnt from the reports of the Court of Auditors for years prior to the year of this declaration.

Confirm that I am not aware of anything not reported here which could harm the interests of the Joint Undertaking.

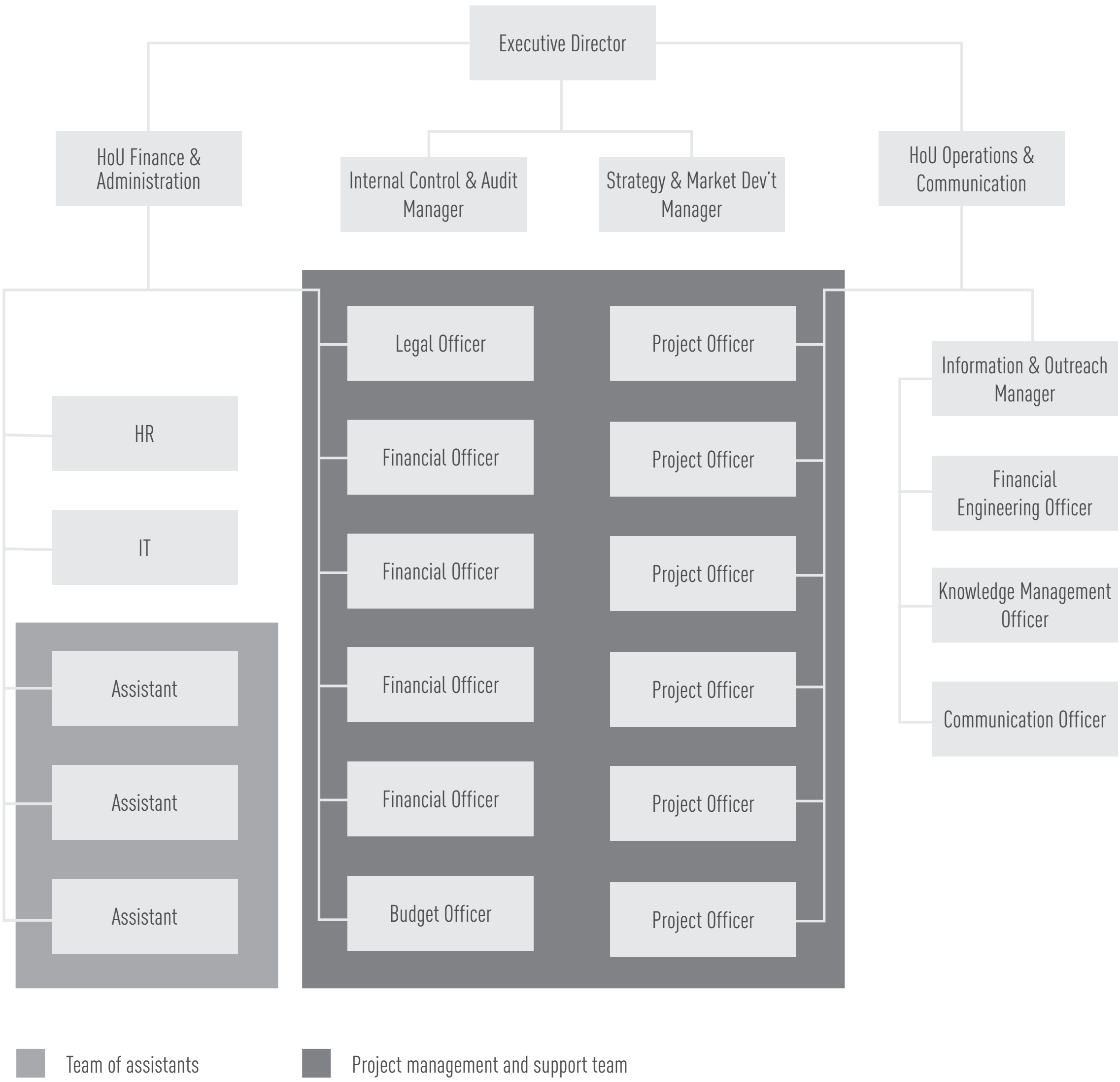
Brussels, 28 February 2017

Bart Biebuyck
Executive Director FCH 2 JU

32 True and fair in this context means a reliable, complete and correct view on the state of affairs in the Joint Undertaking.

07 ANNEXES

ANNEX 1
Organisational chart



ANNEX 2
Staff establishment plan

The team consists of 24 temporary agents (TA) and 2 contract agents (CA)

CATEGORY AND GRADE	ESTABLISHMENT PLAN 2016	POSTS FILLED AT 31/12/ 2015	POSTS FILLED BY EXTERNAL PUBLICATION IN 2016	RECLASSIFICATION IN 2016	DEPARTURES 2016	POSTS ACTUALLY FILLED AT 31/12/2016
AD 16						
AD 15						
AD 14	1	1	1		1	1
AD 13						
AD 12						
AD 11	2	2	1		1	2
AD 10						
AD 9	3	1		2	1	2
AD 8	5	5	3	2	2	6
AD 7		2				
AD 6						
AD 5	4	4				4
Total AD*	**15**	**15**	**5**	**4**	**5**	**15**
AST 11						
AST 10						
AST 9						
AST 8	2	1				1
AST 7		1				1
AST 6	2	2				2
AST 5						
AST 4	3	1		2		3
AST 3	2	4				2
AST 2						
AST 1						
Total AST**	**9**	**9**		**2**		**9**
TOTAL TA	**24**	**24**	**5**	**6**	**5**	**24**
CA FG III	1	1			1	1
CA FG IV	1	1			0	0
TOTAL CA	**2**	**2**			**1**	**1**

* AD stands for Administrator
** AST stands for Assistant

ANNEX 3
Publications from projects

The list of publications related to both FCH JU and FCH 2 JU projects is provided here[33].

Project ID	Project acronym	Publication title
244821	ASSENT	Effect of anode off-gas recycling on reforming of natural gas for solid oxide fuel cell systems
244821	ASSENT	Analysis of solid oxide fuel cell system concepts with anode recycling
245128	GENIUS	Implementation of a model-based methodology aimed at detecting degradation and faulty operation in SOFC systems
245128	GENIUS	Application of fault tree analysis to fuel cell diagnosis
245128	GENIUS	A neural network estimator of SOFC performance for on-field diagnostics and prognostics applications
245128	GENIUS	A review on solid oxide fuel cell models
245156	DEMMEA	Covalent cross-linking in phosphoric acid of pyridine-based aromatic polyethers bearing side double bonds for use in high-temperature polymer electrolyte membrane fuel cells
245156	DEMMEA	Cross-linked high-temperature polymer electrolytes through oxadiazole bond formation and their applications in HT PEM fuel cells
245156	DEMMEA	Design of a reference electrode for high-temperature PEM fuel cells
245156	DEMMEA	Cooperative behaviour of Pt microelectrodes during CO bulk electro-oxidation
245156	DEMMEA	Thermal cross-linking of aromatic polyethers bearing pyridine groups for use as high-temperature polymer electrolytes
245156	DEMMEA	Polymer blends based on copolymers bearing both side and main chain pyridine units as proton exchange membranes for high-temperature fuel cells
245156	DEMMEA	Analysing the influence of H3PO4 as catalyst poison in high-temperature PEM fuel cells using in-operando X-ray absorption spectroscopy
245156	DEMMEA	3D ordered layers of vertically aligned carbon nanofilaments as a model approach to study electrocatalysis on nanomaterials
245156	DEMMEA	Using ordered carbon nanomaterials for shedding light on the mechanism of the cathodic oxygen reduction reaction
245156	DEMMEA	Sulfonated aromatic polyethers containing pyridine units as electrolytes for high-temperature fuel cells
245156	DEMMEA	Preparation and characterisation of Pt on modified multi-wall carbon nanotubes to be used as electrocatalysts for high-temperature fuel cell applications
245156	DEMMEA	The effect ofstructural variations on aromatic polyethers for high-temperature PEM fuel cells
245156	DEMMEA	Mass transport effects in CO bulk electrooxidation on Pt nanoparticles supported on vertically aligned carbon nanofilaments
245156	DEMMEA	Preparation, testing and modeling of three-dimensionally ordered catalytic layers for electrocatalysis of fuel cell reactions

33 The table has been built from the publications query in the CORDA database for FP7 projects to which five publications were added manually for the DEMOSOFC project (the only project having reported publications out of the two H2020 projects having submitted an interim report by 31 December 2016). At the time of preparing this AAR, the relevant query for publications in H2020 had yet to become operational.

Main author	Title of the periodical	Publication date	Relevant pages
Halinen, Matias	Fuel Cells	8/Aug/2012	754-760
Roland Peters, FZJ	International Journal of Hydrogen Energy	19/Apr/2013	in press
Marra D.,	Proceedings of the ASME Design Engineering Technical Conference	7/Aug/2011	449-455
Yousfi Steiner N	Fuel Cells	27/Mar/2012	302-309
Marra D.	Journal of Power Sources	30/Apr/2013	in press
Wang, K	International Journal of Hydrogen Energy	1/Jun/2011	7212-7228
Konstantinia D. Papadimitrioua, Maria Geormezi, Stylianos G. Neophytides, Joannis K. Kallitsis	Journal of Membranes Science	25/Jan/2013	1-9
Christina I. Morfopoulou, Aikaterini K. Andreopoulou, Maria K. Daletou, Stylianos G. Neophytides and Joannis K. Kallitsis	Journal of Materials Chemistry	7/Dec/2012	1613-1622
Sebastian Kaserer, Christoph Rakousky, Julia Melke, Christina Roth	Journal of Applied Electrochemistry	28/Apr/2013	-
Alfonso Crespo-Yapur, Antoine Bonnefont, Rolf Schuster, Katharina Krischer, Elena R. Savinova	ChemPhysChem	1/Mar/2013	1117–1121
Ioannis Kalamaras, Maria K. Daletou, Stylianos G. Neophytides, Joannis K. Kallitsis	Journal of Membranes Science	22/May/2012	42-50
M. Geormezi, V. Deimede, J.K. Kallitsis, S. Neophytides	Journal of Membranes Science	2/Jan/2012	57-66
Sebastian Kaserer, Keegan M. Caldwell, David E. Ramaker and Christina Roth	Journal of Physical Chemistry C	1/Mar/2013	6210–6217
P.S. Ruvinskiy, A. Bonnefont, E.R. Savinova	Electrochimica Acta	3/Apr/2012	174–186
Pavel S. Ruvinskiy, Antoine Bonnefont, Cuong Pham-Huu and Elena R. Savinova	Langmuir	14/Jun/2011	9018–9027
I. Kalamaras, M. K. Daletou, V.G. Gregoriou, J.K. Kallitsis	Fuel Cells	17/Nov/2011	921-931
A. Orfanidi, M.K. Daletou, S.G. Neophytides	Applied Catalysis B: Environmental	22/Jun/2011	379-389
Christina Morfopoulou, Aikaterini K. Andreopoulou, Joannis K. Kallitsis	Polymer Chemistry	9/Aug/2011	4325–4334
Pavel S. Ruvinskiy, Antoine Bonnefont, Maryam Bayati and Elena R. Savinova	Physical Chemistry Chemical Physics	8/Sep/2010	15207-15216
P.S. Ruvinskiy, A. Bonnefont, M. Houllé, C. Pham-Huu, E.R. Savinova	Electrochimica Acta	18/Jan/2010	3245–3256

Project ID	Project acronym	Publication title	
245156	DEMMEA	Further insight into the oxygen reduction reaction on Pt nanoparticles supported on spatially structured catalytic layers	
245156	DEMMEA	Cross-linking of side chain unsaturated aromatic polyethers for high temperature polymer electrolyte membrane fuel cell applications	
245171	MCFC-CONTEX	Experimental analysis of SO2 effects on molten carbonate fuel cells	
245171	MCFC-CONTEX	Effects of sulfur contaminants on MCFC performance	
245171	MCFC-CONTEX	Membranes and molten carbonate fuel cells to capture CO2 and increment energy production in natural gas power plants	
245171	MCFC-CONTEX	Electrochemical impedance study of the poisoning behaviour of Ni-based anodes at low concentrations of H2S in a MCFC	
245171	MCFC-CONTEX	Experimental and theoretical analysis of H2S effects on MCFCs	
245171	MCFC-CONTEX	MCFC fed with biogas: Experimental investigation of sulphur poisoning using impedance spectroscopy	
245171	MCFC-CONTEX	Strategies and new developments in the field of molten carbonates and high-temperature fuel cells in the carbon cycle	
245202	IRAFC	Cross-linking of side chain unsaturated aromatic polyethers for high-temperature polymer plectrolyte membrane fuel cell applications	
245202	IRAFC	Non-trivial Redox behaviour of nanosized cobalt: new insights from ambient pressure X-ray photoelectron and absorption spectroscopies	
245202	IRAFC	When a metastable oxide stabilises at the nanoscale: Wurtzite CoO formation upon dealloying of PtCo nanoparticles	
245202	IRAFC	Development of an internal reforming methanol fuel cell: concept, challenges and opportunities	
245202	IRAFC	The effect of structural variations on aromatic polyethers for high-temperature PEM fuel cells	
245202	IRAFC	CuMnOx catalysts for internal reforming methanol fuel cells: application aspects	
245202	IRAFC	Performance of internal reforming methanol fuel cell under various methanol/water concentrations	
245202	IRAFC	Thermal cross-linking of aromatic polyethers bearing pyridine groups for use as high-temperature polymer electrolytes	
245202	IRAFC	Alloys in catalysis: phase separation and surface segregation phenomena in response to the reactive environment	
245202	IRAFC	Bimetallic nickel-cobalt nanosized layers supported on polar ZnO surfaces: metal-support interaction and alloy effects studied by synchrotron radiation X-ray photoelectron spectroscopy	
245202	IRAFC	Probing metal-support interaction in reactive environments:an in-situ study of PtCo bimetallic nanoparticles supported on TiO2	
245202	IRAFC	Side chain crosslinking of aromatic polyethers for high-temperature polymer electrolyte membrane fuel cell applications	
245202	IRAFC	Methanol steam reforming over indium-promoted Pt/Al2O3 catalyst: nature of the active surface	

Main author	Title of the periodical	Publication date	Relevant pages
Pavel S. Ruvinskiy, Antoine Bonnefont, Elena R. Savinova	Electrocatalysis	13/Apr/2011	123-133
Konstantinia D. Papadimitriou, Fotis Paloukis, Stylianos G. Neophytides and Joannis K. Kallitsis	Macromolecules	18/May/2011	4942–4951
N. Di Giulio, B. Bosio, J. Han, S.J. McPhail	International Journal of Hydrogen Energy	1/Aug/2014	12300-12308
I. Rexed, C. Lagergren, G. Lindbergh	International Journal of Hydrogen Energy	4/Aug/2014	12242-12250
Paolo Greppi, Barbara Bosio, and Elisabetta Arato	Journal of the American Chemical Society	20/Mar/2013	8755-8764
H. Devianto, E. Simonetti, S.J. McPhail, F. Zaza, V. Cigolotti, C. Paoletti, A. Moreno, A. La Barbera, I. Luisetto	International Journal of Hydrogen Energy	1/Dec/2012	19312-19318
N. Di Giulio, B. Bosio, V. Cigolotti, S.W. Nam	International Journal of Hydrogen Energy	1/Dec/2012	19329-19336
Viviana Cigolotti, Stephen McPhail, Angelo Moreno, Sung Pil Yoon, Jong Hee Han, Suk Woo Nam, Tae-Hoon Lim	International Journal of Hydrogen Energy	1/Aug/2011	10311-10318
M. Cassir, S.J. McPhail, A. Moreno	International Journal of Hydrogen Energy	2/Dec/2012	pp. 19345-19350
Konstantinia D. Papadimitriou, Fotis Paloukis, Stylianos G. Neophytides, and Joannis K. Kallitsis	Macromolecules	18/May/2011	4942-4951
Vasiliki Papaefthimiou, Thierry Dintzer, Véronique Dupuis, Alexandre Tamion, Florent Tournus, Arnaud Hillion, Detre Teschner, Michael Hävecker, Axel Knop-Gericke	ACS Nano	10/Feb/2011	2182-2190
Vasiliki Papaefthimiou, Thierry Dintzer, Véronique Dupuis, Alexandre Tamion, Florent Tournus, Detre Teschner, Michael Hävecker, Axel Knop-Gericke, R	Journal of Physical Chemistry Letters	4/Apr/2011	900-904
G. Avgouropoulos. T. Ioannides, J.K. Kallitsis, S. Neophytides	Chemical Engineering Journal	23/May/2011	95-101
Christina Morfopoulou, Aikaterini K. Andreopoulou, Joannis K. Kallitsis	Journal of Polymer Science, Part A: Polymer Chemistry	15/Oct/2011	4325-4334
Joan Papavasiliou, George Avgouropoulos, Theophilos Ioannides	International Journal of Hydrogen Energy	1/Nov/2012	16739-16747
G. Avgouropoulos, S.G. Neophytides	Journal of Applied Electrochemistry	1/Sep/2012	719-726
Ioannis Kalamaras, Maria K. Daletou, Stylianos G. Neophytides, Joannis K. Kallitsis	Journal of Membranes Science	1/Oct/2012	42-50
Spiros Zafeiratos, Simone Piccinin and Detre Teschner	Catalysis Science and Technology	26/Jan/2012	1787-1801
Y. T. Law, T. Skála, I. Píš, V. Nehasil, M. Vondráček, and S. Zafeiratos	Journal of Physical Chemistry C	12/Apr/2012	10048-10056
V. Papaefthimiou, T. Dintzer, M. Lebedeva, D. Teschner, M. Hävecker, A. Knop-Gericke, R. Schlögl, V. Pierron-Bohnes, E. Savinova, and S. Zafeiratos	Journal of Physical Chemistry C	11/Jun/2012	14342-14349
Andrea Vöge, Valadoula A. Deimede, Joannis K. Kallitsis	Journal of Polymer Science, Part A: Polymer Chemistry	4/Oct/2011	207-216
Roland L. Barbosa, Vasiliki Papaefthimiou, Yeuk T. Law, Detre Teschner, Michael Hävecker, Axel Knop-Gericke, Ralf Zapf, Gunther Kolb, Robert Schlögl	Journal of Physical Chemistry C	7/Mar/2013	6143-6150

Project ID	Project acronym	Publication title	
245202	IRAFC	Cross-linked high-temperature polymer electrolytes through oxadiazole bond formation and their applications in HT PEM fuel cells	
245202	IRAFC	Covalent cross-linking in phosphoric acid of pyridine based aromatic polyethers bearing side double bonds for use in high-temperature polymer electrolyte membrane fuel cells	
245202	IRAFC	Microchannel fuel processors as hydrogen source for fuel cells in distributed energy supply systems	
245224	HYDROSOL-3D	Hydrogen production via solar-aided water splitting thermochemical cycles with nickel ferrite: experiments and modelling	
245224	HYDROSOL-3D	Hydrogen production via solar-aided water splitting thermochemical cycles: combustion synthesis and preliminary evaluation of spinel redox-pair materials	
245224	HYDROSOL-3D	Development of a system model for a hydrogen production process on a solar tower	
245262	NEXPEL	A microblock ionomer in proton exchange membrane electrolysis for the production of high-purity hydrogen	
245339	LOLIPEM	Durability of sulfonated aromatic polymers for proton-exchange-membrane fuel cells	
245339	LOLIPEM	Thermogravimetric analysis of SPEEK membranes: thermal stability, degree of sulfonation and cross-linking reaction	
245339	LOLIPEM	Water activity coefficient and proton mobility in hydrate acidic polymers	
245339	LOLIPEM	Building bridges: cross-linking of sulfonated aromatic polymers – a review	
245339	LOLIPEM	Sulfonated aromatic ionomers: analysis of proton conductivity and proton mobility	
245339	LOLIPEM	High-performance sulfonated aromatic ionomers by solvothermal macromolecular synthesis	
245339	LOLIPEM	New results on the visco-elastic behaviour of ionomer membranes and relations between T-RH Plots and proton conductivity decay of Nafion 117 in the range 50-140 °C	
245339	LOLIPEM	Influence of the preparation conditions on the properties of polymeric and hybrid cation exchange membranes	
245339	LOLIPEM	New approach for the evaluation of membranes transport properties for polymer electrolyte membrane fuel cells	
245339	LOLIPEM	Conductivity and hydration of sulfonated polyethersulfone in the range 70-120°C: effect of temperature and relative humidity cycling	
245339	LOLIPEM	Permeability and diffusivity measurements on polymerelectrolyte membranes	
245339	LOLIPEM	Electrodeposition of PEM fuel cell catalysts by the use of a hydrogen depolarized anode	
245339	LOLIPEM	Stabilization of Sulfonated Aromatic Polymer (SAP) membranes based on SPEEK-WC for PEMFCs	
245339	LOLIPEM	Annealing of Nafion 1100 in the presence of an annealing agent: a powerful method for increasing ionomer working temperature in PEMFCs	
245339	LOLIPEM	Proton mobility in Sulfonated PolyEtherEtherKetone (SPEEK): influence of thermal cross-linking and annealing	
245339	LOLIPEM	Cross-linked SPEEK membranes: mechanical, thermal and hydrothermal properties	
245339	LOLIPEM	Proton-conducting cross-linked sulfonated aromatic polymers for fuel cells application	

Main author	Title of the periodical	Publication date	Relevant pages
Christina I. Morfopoulou, Aikaterini K. Andreopoulou, Maria K. Daletou, Stylianos G. Neophytides and Joannis K. Kallitsis	Journal of Materials Chemistry	7/Dec/2012	1613-1622
Konstantinia D. Papadimitriou, Maria Geormezi, Stylianos G. Neophytides, Joannis K. Kallitsis	Journal of Membranes Science	15/Apr/2013	1-9
G. Kolb, S. Keller, M. O'Connell, S. Pecov, J. Schuerer, B. Spasova, D. Tiemann, and A. Ziogas	Energy and Fuels	13/Feb/2013	4395–4402
Agrafiotis, C., Zygogianni, A., Pagkoura, C., Kostoglou, M. and Konstandopoulos, A. G.	AICHE Journal	28/Aug/2012	1213-1225
Christos C. Agrafiotis, Chrysoula Pagkoura, Alexandra Zygogianni, George Karagiannakis, Margaritis Kostoglou, Athanasios G. Konstandopoulos	International Journal of Hydrogen Energy	6/Apr/2012	8964-8980
J.-P. Säck, M. Roeb, C. Sattler, R. Pitz-Paal, A. Heinzel	Solar Energy	12/Oct/2011	99-111
Daniel W. Smith	Macromolecules	26/Feb/2013	1504 - 1511
H. Hou, M. L. Di Vona, P. Knauth	ChemSusChem	18/Nov/2011	1-12
P. Knauth, H. Hou, E. Bloch, E. Sgreccia, M.L. Di Vona	Journal of Analytical and Applied Pyrolysis	29/Jul/2011	361-365
P. Knauth, E. Sgreccia, A. Donnadio, M. Casciola, M.L. Di Vona	Journal of the Electrochemical Society	7/Dec/2010	159-165
H. Hou, M.L. Di Vona, P. Knauth	Journal of Membranes Science	17/Aug/2012	113-127
P Knauth, M.L. Di Vona	Solid State Ionics	25/Feb/2012	255-259
M.L. Di Vona, G. Alberti, E. Sgreccia, M. Casciola, P. Knauthc	International Journal of Hydrogen Energy	24/Mar/2012	8672-8680
Alberti, M.L. Di Vona, R. Narducci	International Journal of Hydrogen Energy	15/Sep/2011	6302-6307
Fontananova E., Cucunato V., Curcio E., Trotta F., Biasizzo M., Drioli E., Barbieri G.	Electrochimica Acta	30/Jan/2012	164-172
Brunetti A., Fontananova E., Donnadio A., Casciola M., Di Vona M.L., Sgreccia E., Drioli E., Barbieri G.	Journal of Power Sources	24/Jan/2012	222-230
A. Donnadio, M. Casciola, M.L. Di Vona, M. Tamilvanan	Journal of Power Sources	11/Jan/2012	145-150
F. Arena, J. Mitzel, R. Hempelmann	Fuel Cells	19/Dec/2012	56-64
J. Mitzel, F. Arena, H. Natter, T. Walter, M. Batzer, M. Stefener, R. Hempelmann	International Journal of Hydrogen Energy	11/Oct/2011	6261-6267
E. Fontananova, A. Brunetti, F. Trotta, M. Biasizzo, E. Drioli, G. Barbieri	Fuel Cells	8/Nov/2012	86-97
Alberti, G., Narducci, R., Di Vona, M. L., Giancola, S.	Fuel Cells	8/Nov/2012	42-47
Knauth, P., Pasquini, L., Maranesi, B., Pelzer, K., Polini, R., Di Vona, M. L.	Fuel Cells	16/Mar/2013	79-95
H. Hou, B. Maranesi, JF Chailan, M. Khadhraoui, R. Polini, M.L. Di Vona, P. Knauth	Journal of Materials Research	14/Aug/2012	1950-1957
B. Maranesi, L. Pasquini, M. Khadhraoui, P. Knauth, M. L. Di Vona	Materials Research Society Symposium - Proceedings	1/Mar/2012	60-65

Project ID	Project acronym	Publication title	
245339	LOLIPEM	Cross-linking of sulfonated poly ether ether ketone by thermal treatment: how does the reaction occur?	
245339	LOLIPEM	More on NAFION conductivity decay at temperatures higher than 80°C: preparation and first characterisation of in-plane oriented layered morphologies	
245339	LOLIPEM	Electrocatalyst–membrane interface and fuel cell performance with sulfonated poly ether ether ketone as ionomer	
245355	ROBANODE	Mathematical modelling of Ni/GDC and Au–Ni/GDC SOFC anodes performance under internal methane steam reforming conditions	
245355	ROBANODE	Study of the synergistic interaction between nickel, gold and molybdenum in novel modified NiO/GDC cermets, possible anode materials for CH4 fuelled SOFCs	
245355	ROBANODE	On the active surface state of nickel-ceria solid oxide fuel cell anodes during methane electro-oxidation	
245355	ROBANODE	Fundamental studies of sonoelectrochemical nanomaterials preparation	
245355	ROBANODE	Design of experiment approach applied to reducing and oxidising tolerance of anode supported solid oxide fuel cell. Part II: Electrical, electrochemical and microstructural characterisation of tape-cast cells	
245355	ROBANODE	Redox stable Ni-YSZ anode support in solid oxide fuel cell stack configuration	
256627	CATION	LCA-LCC analysis of a 230 kW SOFC system for distributed generation applications	
256647	MAESTRO	Effect of side-chain length on the electrospinning of perfluorosulfonic acid ionomers	
256647	MAESTRO	Physical and chemical modification routes leading to improved mechanical properties of perfluorosulfonic acid membranes for PEM fuel cells	
256647	MAESTRO	Short-side chain perfluorosulfonic acid membranes and their composites with nanosized zirconium phosphate: hydration, mechanical properties and proton conductivity	
256647	MAESTRO	Layered zirconium alkylphosphates: suitable materials for novel PFSA composite membranes with improved proton conductivity and mechanical stability	
256653	SSH2S	Experimental results of an air-cooled lab-scale H2 storage tank based on sodium alanate	
256653	SSH2S	Catalytic Influence of various cerium precursors on the hydrogen sorption properties of NaAlH4	
256653	SSH2S	Experimental study of powder bed behaviour of sodium alanate in a lab-scale H2 storage tank with flow-through mode	
256653	SSH2S	Additive effects of LiBH 4 and ZrCoH 3 on the hydrogen sorption of the Li-Mg-N-H hydrogen storage system	
256653	SSH2S	Effect of a Ti-based additive on the desorption in isotope-labelled LiB(H,D) 4 –Mg(H,D) 2 nanocomposites	
256653	SSH2S	Tailored heat transfer characteristics of pelletized LiNH2–MgH2 and NaAlH4 hydrogen storage materials	
256653	SSH2S	Preparation, scale-up and testing of nanoscale, doped amide systems for hydrogen storage	
256653	SSH2S	Theoretical and experimental study on Mg(BH4)2–Zn(BH4)2 mixed borohydrides	

Main author	Title of the periodical	Publication date	Relevant pages
B. Maranesi, H. Hou, R. Polini, E. Sgreccia, G. Alberti, R. Narducci, P. Knauth, L. Di Vona	Fuel Cells	18/Feb/2013	107–117
Alberti, G., Narducci, R., Di Vona, M. L., Giancola, S.	Industrial and Engineering Chemistry Research	14/Mar/2013	0-0
F. Arena,J. Mitzel, R. Hempelmann	Zeitschrift fur Physikalische Chemie	11/Feb/2013	0-0
S. Souentie a, M. Athanasiou a,b, D.K. Niakolas b, A. Katsaounis a, S.G. Neophytides b, S.G. Vayenas a,c	Journal of Catalysis	1/Oct/2013	116-128
D.K. Niakolasa,⁎, M. Athanasioua,b, V. Dracopoulosa, I. Tsiaoussisc, S. Bebelisa,b,S.G. Neophytidesa	Applied Catalysis A: General	5/Mar/2013	223-232
Vasiliki Papaefthimiou, Maxim Shishkin, Dimitris K. Niakolas, Michalis Athanasiou, Yeuk Ting Law, Rosa Arrigo, Detre Teschner, Michael Hävecker	Advanced Materials	31/Jan/2013	762-769
P. Sakkas, O. Schneider, S. Martens, P. Thanou, G. Sourkouni, and Chr. Argirusis	Journal of Applied Electrochemistry	1/Sep/2012	763-777
Faes, A*., Wuillemin, Z., Tanasini, P., Accardo, N., Modena, S., Schindler, H.J., Cantoni, M., Lübbe, H., Diethelm, S., Hessler-Wyser, A., Van herle, J.	Journal of Power Sources	1/Nov/2011	8909-8917
Faes, A.*, Wuillemin, Z., Tanasini, P., Accardo, N., Van Herle, J.	Journal of Power Sources	1/Apr/2011	3553-3558
C. Strazza	Applied Energy	31/Dec/2014	N/A
Surya Subianto, Sara Cavaliere, Deborah J. Jones, Jacques Rozière	Journal of Polymer Science, Part A: Polymer Chemistry	1/Jan/2013	118-128
Surya Subianto, Monica Pica, Mario Casciola, Paula Cojocaru, Luca Merlo, Graham Hards, Deborah J. Jones	Journal of Power Sources	1/Jul/2013	216-230
Monica Pica, Anna Donnadio, Mario Casciola, Paula Cojocaru, Luca Merlo	Journal of Materials Chemistry	1/Jan/2012	24902
Anna Donnadio, Monica Pica, Donatella Capitani, Valentina Bianchi, Mario Casciola	Journal of Membranes Science	1/Mar/2014	in press
I. Utz, N. Schmidt, A. Wörner, J.J. Hu, O. Zabara, M. Fichtner	International Journal of Hydrogen Energy	1/Mar/2011	3556-3565
Jianjiang Hu, Shuhua Ren, Raiker Witter, Maximilian Fichtner	Advanced Energy Materials	1/May/2012	560-568
I. Utz, M. Linder, N. Schmidt, J.J. Hu, M. Fichtner, A. Wörner	International Journal of Hydrogen Energy	1/May/2012	7645-7653
Jianjiang Hu, Alexander Pohl, Shumao Wang, Jörg Rothe, Maximilian Fichtner	Journal of Physical Chemistry C	27/Sep/2012	20246-20253
N. Boucharat, D. Wang, E. G. Bardají, M. Fichtner, W. Lohstroh	Journal of Physical Chemistry C	7/Jun/2012	11877-11885
Carsten Pohlmann, Lars Röntzsch, Jianjiang Hu, Thomas Weißgärber, Bernd Kieback, Maximilian Fichtner	Journal of Power Sources	1/May/2012	173-179
Ulrich Ulmer, Jianjiang Hu, Matthias Franzreb, Maximilian Fichtner	International Journal of Hydrogen Energy	1/Feb/2013	1439-1449
E. Albanese, G.N. Kalantzopoulos, J.G. Vitillo, E. Pinatel, B. Civalleri, S. Deledda, S. Bordiga, B.C. Hauback, M. Baricco	Journal of Alloys and Compounds	1/Dec/2013	S282-S286

Project ID	Project acronym	Publication title
256653	SSH2S	Advanced reactor concept for complex hydrides: hydrogen desorption at fuel cell relevant boundary conditions
256653	SSH2S	Advanced reactor concept for complex hydrides: hydrogen absorption from room temperature
256653	SSH2S	Material properties and empirical rate equations for hydrogen sorption reactions in 2 $LiNH_2$–1.1 MgH_2–0.1 $LiBH_4$–3 wt.% $ZrCoH_3$
256653	SSH2S	Optimisation of hydrogen charging process parameters for an advanced complex hydride reactor concept
256653	SSH2S	Experimental investigation of a liquid-cooled high-temperature proton exchange membrane (HT-PEM) fuel cell coupled to a sodium alanate tank
256653	SSH2S	Beneficial effects of stoichiometry and nanostructure for a $LiBH_4$ –MgH_2 hydrogen storage system
256653	SSH2S	Hydrogen storage of Mg–Zn mixed metal borohydrides
256653	SSH2S	Investigation on the decomposition enthalpy of novel mixed $Mg_{(1-x)}Zn_x(BH_4)_2$ borohydrides by means of periodic DFT calculations
256653	SSH2S	Destabilization effect of transition metal fluorides on sodium borohydride
256653	SSH2S	Considerations on the H_2 desorption process for a combination reactor based on metal and complex hydrides
256653	SSH2S	Numerical investigation of hydrogen charging performance for a combination reactor with embedded metal hydride and coolant tubes
256653	SSH2S	Thermodynamic modelling of $Mg(BH_4)_2$
256673	D-CODE	A review on non-model based diagnosis methodologies for PEM fuel cell stacks and systems
256673	D-CODE	A review on model-based diagnosis methodologies for PEMFCs
256673	D-CODE	A double-fuzzy diagnostic methodology dedicated to on-line fault diagnosis of PEMFC stack
256693	DESIGN	A random-effects model for long-term degradation analysis of solid oxide fuel cells
256693	DESIGN	Solid oxide fuel cells: the way for high-efficiency energy conversion
256694	LOTUS	System design and process layout for a SOFC micro-CHP unit with reduced operating temperatures
256730	SCOTAS-SOFC	Full ceramic fuel cells based on strontium sitanate anodes, an approach towards more robust SOFCs
256730	SCOTAS-SOFC	Thermomechanical properties of Y-substituted $SrTiO_3$ used as re-oxidation stable anode substrate material
256730	SCOTAS-SOFC	Influence of phase transformations on mechanical properties of novel ceramics for solid oxide fuel cell anode applications
256730	SCOTAS-SOFC	Impedance and stability of M/CGO (M: Ni, Pd, Ru) co-infiltrated Nb-doped $SrTiO_3$ SOFC anodes
256730	SCOTAS-SOFC	Effect of Ru/CGO versus Ni/CGO Co-infiltration on the performance and stability of STN-based SOFCs

Main author	Title of the periodical	Publication date	Relevant pages
I. Bürger, C. Luetto, M. Linder	International Journal of Hydrogen Energy	1/May/2014	7346-7355
I. Bürger, L. Komogowski, M. Linder	International Journal of Hydrogen Energy	1/Apr/2014	7030-7041
I. Bürger, J.J. Hu, J.G. Vitillo, G.N. Kalantzopoulos, S. Deledda, M. Fichtner, M. Baricco, M. Linder	International Journal of Hydrogen Energy	1/May/2014	8283-8292
Maha Bhouri, Inga Bürger, Marc Linder	International Journal of Hydrogen Energy	1/Oct/2014	17726-17739
Jörg Weiss-Ungethüm, Inga Bürger, Niko Schmidt, Marc Linder, Josef Kallo	International Journal of Hydrogen Energy	1/Apr/2014	5931-5941
Jianjiang Hu, Raiker Witter, Huaiyu Shao, Michael Felderhoff, Maximilian Fichtner	Journal of Materials Chemistry A	1/Jan/2014	66-72
G.N. Kalantzopoulos, J.G. Vitillo, E. Albanese, E. Pinatel, B. Civalleri, S. Deledda, S. Bordiga, M. Baricco, B.C. Hauback	Journal of Alloys and Compounds	1/Dec/2014	S702-S705
Elisa Albanese, Bartolomeo Civalleri, Silvia Casassa, Marcello Baricco	Journal of Physical Chemistry C	16/Oct/2014	23468-23475
Georgios N. Kalantzopoulos, Matylda N. Guzik, Stefano Deledda, Richard H. Heyn, Jiri Muller, Bjørn C. Hauback	Physical Chemistry Chemical Physics	1/Jan/2014	20483-20491
I. Bürger, M. Bhouri, M. Linder	International Journal of Hydrogen Energy	1/Jun/2015	7072-7082
Maha Bhouri, Inga Bürger, Marc Linder	International Journal of Hydrogen Energy	1/Jun/2015	6626-6638
E.R. Pinatel, E. Albanese, B. Civalleri, M. Baricco	Journal of Alloys and Compounds	1/Jan/2015	.
Z. Zheng, R. Petrone, M.C. Péra, D. Hissel, M. Becherif, C. Pianese, N. Yousfi Steiner, M. Sorrentino	International Journal of Hydrogen Energy	1/Jul/2013	8914-8926
R. Petrone, Z. Zheng, D. Hissel, M.C. Péra, C. Pianese, M. Sorrentino, M. Becherif, N. Yousfi-Steiner	International Journal of Hydrogen Energy	1/Jun/2013	7077-7091
Zhixue Zheng, Marie-Cécile Péra, Daniel Hissel, Mohamed Becherif, Kréhi-Serge Agbli, Yongdong LI	Journal of Power Sources	31/Dec/2014	1-10
Maurizio Guida, Fabio Postiglione, Gianpaolo Pulcini	Reliability Engineering and System Safety	1/Aug/2015	88-98
Florence Lefebvre-Joud, Jari Kiviaho, Olivier Bucheli	Fuel Cells	1/Aug/2013	447-448
T. Pfeifer	International Journal of Hydrogen Energy	11/Jan/2013	431-439
P. Holtappels, J. T. S. Irvine, B. Iwanschitz, L. T. Kuhn, L. Lu, Q. Ma, J. Malzbender, A. Mai, T. Ramos, J. Rass-Hansen, B. R. Sudireddy,	ECS Transactions	6/Oct/2013	1175-1184
Viacheslav Vasechko, Bingxin Huang, Qianli Ma, Frank Tietz, Jürgen Malzbender	Journal of the European Ceramic Society	28/May/2014	online corrected proof
Viacheslav Vasechko, Mirko Ziegner, Jürgen Malzbender	Ceramics International	30/Sep/2014	137179 - 13189
T. Ramos, S. Veltze, B. R. Sudireddy, P. Holtappels	Electrochemical and Solid-State Letters	1/Jan/2014	F5-F6
T. Ramos, S. Veltzé, B. R. Sudireddy, P. S. Jørgensen, L. T. Kuhn, P. Holtappels, 2014	Fuel Cells	31/Dec/2014	n.a.

Project ID	Project acronym	Publication title
256730	SCOTAS-SOFC	Electrochemical performance and stability of electrolyte-supported solid oxide fuel cells based on Y-substituted SrTiO3 ceramic anodes
256730	SCOTAS-SOFC	Instability and growth of nanoscale Ce0.8Gd0.2O1.9/NiO infiltrate in Sr0.94Ti0.9Nb0.1O3–Zr0.84Y0.16O1.92 anodes for solid oxide fuel cells
256730	SCOTAS-SOFC	Performance of electrolyte-supported solid oxide fuel cells with STN anodes
256730	SCOTAS-SOFC	Transmission electron microscopy specimen preparation method for multiphase porous functional ceramics
256730	SCOTAS-SOFC	A solid oxide fuel cell with lanthanum and calcium co-doped strontium titanate as support
256730	SCOTAS-SOFC	Thermo-mechanical properties of (Sr,Y)TiO3 as anode material for solid oxide fuel cells
256730	SCOTAS-SOFC	Evaluation of Ca-doped La0.2Sr0.7TiO3 as an alternative material for use in SOFC anodes
256730	SCOTAS-SOFC	Performance-microstructure relations in Ni/CGO infiltrated Nb-doped SrTiO3 SOFC anodes
256730	SCOTAS-SOFC	Comparison of Y and La-substituted SrTiO3 as the anode materials for SOFCs
256755	ADEL	Model-based behaviour of a high temperature electrolyser system operated at various loads
256755	ADEL	Transient operation of a solid oxide electrolysis cell
256755	ADEL	Coupling heat and electricity sources to intermediate temperature steam electrolysis
256755	ADEL	Development and manufacturing of SOFC-based products at SOFCpower SpA
256755	ADEL	High-temperature steam electrolysis stack with enhanced performance and durability
256755	ADEL	Electrolysis and co-electrolysis performance of SOE short stacks
256755	ADEL	Comparative system performance analysis of direct steam generation central receiver solar thermal power plants in megawatt range
256764	Asterix3	Antonucci "Definition and simulation of building heating systems exploiting the heat rejected by a small-scale SOFC"
256776	PREMIUM ACT	Experimental investigation of methanol crossover evolution during direct methanol fuel cell degradation tests
256776	PREMIUM ACT	A physical model of direct methanol fuel cell anode impedance
256776	PREMIUM ACT	A comparison of operating strategies to reduce DMFC degradation
256776	PREMIUM ACT	A parametric analysis on DMFC anode degradation
256776	PREMIUM ACT	Water transport into PEFC gas diffusion layer: experimental characterisation of diffusion and permeation
256776	PREMIUM ACT	Water transport and flooding in DMFC: experimental and modelling analyses

	Main author	Title of the periodical	Publication date	Relevant pages
	Q. Ma, B. Iwanschitz, E. Dashjav, A. Mai, F. Tietz, H.-P. Buchkremer	Solid State Ionics	31/Dec/2014	n.a.
	Wei Zhang, Luise Theil Kuhn, Peter Stanley Jørgensen, Bhaskar Reddy Sudireddy, Janet Jonna Bentzen, Carlos Bernuy-Lopez, Sune Veltzé, Tânia	Journal of Power Sources	1/Jul/2014	297-304
	S. Veltze, B. R. Sudireddy, P. S. Jorgensen, W. Zhang, L. T. Kuhn, P. Holtappels, T. Ramos	ECS Transactions	6/Oct/2013	743-752
	W. Zhang, L. Theil Kuhn, P.S. Jørgensen, K. Thydén, J.J. Bentzen, E. Abdellahi, B.R. Sudireddy, M. Chen, J.R. Bowen	Microscopy and Microanalysis	1/Apr/2013	501-505
	Lanying Lu, Maarten C. Verbraeken, Mark Cassidy and John T. S. Irvine	ECS Transactions	6/Oct/2013	1415 - 1422
	B.X. Huang, V. Vasechko, Q.L. Ma, J. Malzbender	Journal of Power Sources	1/Aug/2012	204 - 209
	M. C. Verbraeken, B. Iwanschitz, A. Mai, J. T. S. Irvine	Journal of the Electrochemical Society	1/Jan/2012	F757-F762
	T. Ramos, C. Bernuy-Lopez, B.R. Sudireddy, J.J. Bentzen, W. Zhang, P.S. Jørgensen, L. Theil Kuhn	ECS Transactions	31/Dec/2012	389 - 402
	Qianli Ma, Frank Tietz	Solid State Ionics	31/Dec/2012	108 - 112
	Floriane Petipas, Annabelle Brisse, Chakib Bouallou	Journal of Power Sources	1/Oct/2013	584-595
	Floriane Petipas, Qingxi Fu, Annabelle Brisse, Chakib Bouallou	International Journal of Hydrogen Energy	1/Mar/2013	2957-2964
	Martin Roeb, Nathalie Monnerie, Anis Houaijia, Christian Sattler, Javier Sanz-Bermejo, Manuel Romero, Ignacio Canadas, Anabella Drisaldi Castro, Crist	Journal of Energy and Power Engineering	30/Nov/2013	2068-2077
	O. Bucheli, M. Bertoldi, S. Modena, A. Ravagni	ECS Transactions	6/Oct/2013	81-88
	Julie Mougin, A. Chatroux, K. Couturier, M. Petitjean, M. Reytier, G. Gousseau, F. Lefebvre-Joud	Energy Procedia	1/Jan/2012	445-454
	S. Diethelm, J. Van herle, D. Montinaro, O. Bucheli	Fuel Cells	1/Aug/2013	631-637
	Javier Sanz-Bermejo, Víctor Gallardo-Natividad, José Gonzalez-Aguilar, Manuel Romero	Journal of Solar Energy Engineering, Transactions of the ASME	1/Feb/2014	011028
	A. Frazzica, N. Briguglio, A. Sapienza, A. Freni, M. Ferraro, V. Antonucci	International Journal of Hydrogen Energy	12/Jul/2015	?
	A. Casalegno, F. Bresciani, M. Zago, R. Marchesi	Journal of Power Sources	1/Mar/2014	103-109
	M. Zago, A. Casalegno	Journal of Power Sources	1/Feb/2014	1181-1190
	F. Bresciani, A. Casalegno, J. L. Bonde, M. Odgaard, R. Marchesi	International Journal of Energy Research	1/Jan/2014	117-124
	F. Bresciani, A. Casalegno, M. Zago, R. Marchesi	Fuel Cells	5/Nov/2013	00
	F. Bresciani, A. Casalegno, G. Varisco, R. Marchesi	International Journal of Energy Research	1/Apr/2014	602-613
	M. Zago, A. Casalegno, C. Santoro, R. Marchesi	Journal of Power Sources	1/Nov/2012	381-391

Project ID	Project acronym	Publication title	
256776	PREMIUM ACT	Effect of anode MPL on water and methanol transport in DMFC: experimental and modelling analyses	
256776	PREMIUM ACT	Surface analytical methods for the development of electrochemical components of polymer electrolyte fuel cells	
256776	PREMIUM ACT	Surface analytical methods for the development of electrochemical components of polymer electrolyte fuel cells	
256776	PREMIUM ACT	A flexible framework for modleling multiple solid, liquid and gaseous phases in batteries and fuel cells	
256834	MobyPost	"Investigation of the interactions between protonexchange membrane fuel cell and interleaved DC/DC boost converter in caseof power switch faults."	
256834	MobyPost	FPGA-based fault-tolerant control on an interleaved DC/DC boost converter for fuel cell electric vehicle applications	
256834	MobyPost	Advanced diagnosis based on temperature and current density distributions in a single PEMFC	
256834	MobyPost	Fuel cell systems reliability and availability enhancement by developing a fast and efficient power switch open-circuit fault detection algorithm in interleaved DC/DC boost converter topologies	
256850	H2FC-LCA	How can life cycle assessment foster environmentally sound fuel cell production and use?	
277844	FCGEN	A model-based approach to battery selection for truck onboard fuel cell-based APU in an anti-idling application	
277844	FCGEN	Fuel cell systems with reforming of petroleum-based and synthetic-based diesel and kerosene fuels for APU applications	
277844	FCGEN	Catalytic burner with internal steam generation for a fuel-cell-based auxiliary power unit for middle distillates	
277844	FCGEN	Start-up and load-change behaviour of a catalytic burner for a fuel-cell-based APU for diesel fuel	
277844	FCGEN	Fuel processing of diesel and kerosene for auxiliary power unit applications	
277916	METPROCELL	Electrical and electrochemical properties of architectured electrodes based on perovskite and A2MO4-type oxides for Protonic Ceramic Fuel Cell	
277916	METPROCELL	H/D isotope effects in high-temperature proton conductors	
278054	DURAMET	Performance analysis of polymer electrolyte membranes for direct methanol fuel cells	
278054	DURAMET	Synthesis of Pd	
278054	DURAMET	Activity of Co?N multi walled carbon nanotubes electrocatalysts for oxygen reduction reaction in acid conditions	
278054	DURAMET	Hybrid ordered mesoporous carbons doped with tungsten trioxide as supports for Pt electrocatalysts for methanol oxidation reaction	
278054	DURAMET	Improved Pd electro-catalysis for oxygen reduction reaction in direct methanol fuel cell by reduced graphene oxide	
278054	DURAMET	Composite anode electrode based on iridium oxide promoter for direct methanol fuel cells	
278054	DURAMET	IrO2 as a promoter of Pt–Ru for methanol electro-oxidation	
278054	DURAMET	PtCo catalyst with modulated surface characteristics for the cathode of direct methanol fuel cells	
278054	DURAMET	Metal oxide promoters for methanol electro-oxidation	

	Main author	Title of the periodical	Publication date	Relevant pages
	M. Zago, A. Casalegno, F. Bresciani, R. Marchesi	International Journal of Hydrogen Energy	25/Mar/2014	00
	Pawel Gazdzicki	Surface and Interface Analysis	24/Apr/2014	-
	Indro Biswas	ECS Transactions	1/Dec/2013	-
	J. P. Neidhardt	Journal of the Electrochemical Society	14/Aug/2012	-
	Damien GUILBERT, Arnaud GAILLARD, Ali MOHAMMADI, Abdoul N'DIAYE, Abdesslem DJERDIR	International Journal of Hydrogen Energy	5/Jan/2015	519-537
	Damien Guilbert, Michael Guarisco, Arnaud Gaillard, Abdoul N'Diaye, Abdesslem Djerdir	International Journal of Hydrogen Energy	1/Dec/2015	15815-15822
	A. Mohammadi, A. Djerdir, N. Yousfi Steiner, D. Khaburi	International Journal of Hydrogen Energy	7/Dec/2015	Pages 15845-15855.
	Damien Guilbert, Abdoul N'Diaye, Arnaud Gaillard, Abdesslem Djerdir	International Journal of Hydrogen Energy	28/Jan/2016	13
	Amalia Zucaro	International Journal of Hydrogen Energy	19/Oct/2012	58-69
	Boštjan Pregelj, Darko Vrečko, Janko Petrovčič, Vladimir Jovan, Gregor Dolanc	Applied Energy	1/Jan/2015	64-76
	Remzi Can Samsun, Joachim Pasel, Ralf Peters, Detlef Stolten	International Journal of Hydrogen Energy	1/May/2015	6405-6421
	J. Meißner, J. Pasel, R.C. Samsun, F. Scharf, C. Wiethege, R. Peters	International Journal of Hydrogen Energy	1/Mar/2014	4131-4142
	J. Meißner, J. Pasel, R. C. Samsun, R. Peters, D. Stolten	Fuel Cells	1/Feb/2015	15-26
	Joachim Pasel, Remzi Can Samsun, Ralf Peters, Detlef Stolten	Energy and Fuels	15/Aug/2013	4386-4394
	P. Batocchi, F. Mauvy, S. Fourcade and M. Parco	Electrochimica Acta	2/Sep/2014	1-10
	N. Bonanos, A. Huijser and F.W. Poulsen	Solid State Ionics	6/Apr/2015	9-13
	F. Lufrano, V. Baglio, P. Staiti, V. Antonucci, A.S. Arico'	Journal of Power Sources	1/Dec/2013	519-534
	Antonino S. Aricò, Alessandro Stassi, Claudia D'Urso, David Sebastian, Vincenzo Baglio	Chemistry - A European Journal	18/Aug/2014	10679-10684
	Luigi Osmieri, Alessandro H.A. Monteverde Videla, Stefania Specchia	Journal of Power Sources	15/Mar/2015	296-307
	J. Zeng, C. Francia, C. Gerbaldi, V. Baglio, S. Specchia, A.S. Arico, P. Spinelli	Electrochimica Acta	1/Apr/2013	80-91
	R. Carrera-Cerritos, V. Baglio, A.S. Aricò, J. Ledesma-Garcia, M.F. Sgroi, D. Pullini, A.J. Pruna, D.B. Mataix, R. Fuentes-Ramirez, L.G. Arr	Applied Catalysis B: Environmental	1/Jan/2014	554-560
	V. Baglio, D. Sebastián, C. D'Urso, A. Stassi, R.S. Amin, K.M. El-Khatib, A.S. Aricò	Electrochimica Acta	10/May/2014	304–310
	V. Baglio, R.S. Amin, K.M. El-Khatib, S. Siracusano, C. D'Urso and A.S. Aricò	Physical Chemistry Chemical Physics	30/Jan/2014	10414-10418
	V. Baglio, C. D'Urso, D. Sebastián, A. Stassi, A.S. Aricò	International Journal of Hydrogen Energy	1/Mar/2014	5399-5405
	R.S. Amin, K.M. El-Khatib, S. Siracusano, V. Baglio, A. Stassi, A.S. Arico	International Journal of Hydrogen Energy	1/Jun/2014	9782-9790

Project ID	Project acronym	Publication title	
278054	DURAMET	AC impedance spectroscopy investigation of carbon supported Pt3Co and Pt cathode catalysts in direct methanol fuel cell	
278054	DURAMET	Preparation and characterisation of Ti oxide based catalyst supports for low-temperature fuel cells	
278054	DURAMET	Composite anode electrocatalyst for direct methanol fuel cells	
278054	DURAMET	Facile synthesis of Zr- and Ta-based catalysts for the oxygen reduction reaction	
278054	DURAMET	Graphene-supported substoichiometric sodium tantalate as methanol tolerant non-noble metal catalyst for the electro-reduction of oxygen	
278138	NEMESIS2+	An experimental investigation of biodiesel steam reforming	
278138	NEMESIS2+	Direct steam reforming of diesel and diesel-biodiesel blends for distributed hydrogen generation	
278138	NEMESIS2+	Combustion of biodiesel in a large-scale laboratory furnace	
278138	NEMESIS2+	Longevity test for a water-gas shift catalyst	
278257	METSAPP	Manufacturing and characterisation of metal-supported solid oxide fuel cells	
278257	METSAPP	Long-term study of Cr evaporation and high-temperature corrosion behaviour of Co-coated ferritic steel for solid oxide fuel cell interconnects	
278257	METSAPP	Oxidation of Co- and Ce-nanocoated FeCr steels: a microstructural investigation	
278257	METSAPP	Development and performance of MgFeCrO4-based electrodes for solid oxide fuel cells	
278257	METSAPP	Advances in metal-supported cells in the METSOFC EU consortium	
278257	METSAPP	Infiltrated SrTiO 3 :FeCr-based anodes for metal-supported SOFC	
278257	METSAPP	Break-down of losses in high-performing metal-supported solid oxide fuel cells	
278257	METSAPP	In-situ growth of nanoparticles through control of non-stoichiometry	
278257	METSAPP	Development and performance of MnFeCrO 4-based electrodes for solid oxide fuel cells	
278257	METSAPP	Evaluation of the oxidation and Cr evaporation properties of selected FeCr alloys used as SOFC interconnects	
278257	METSAPP	Structure and properties of MgM x Cr 2-x O 4 (M = Li, Mg, Ti, Fe, Cu, Ga) spinels for electrode supports in solid oxide fuel cells	
278257	METSAPP	Effect of low temperature in-situ sintering on the impedance and the performance of intermediate temperature solid oxide fuel cell cathodes	
278257	METSAPP	Stationary FEM model for performance evaluation of planar solid oxide fuel cells connected by metal interconnectors: I. model framework and validation	
278257	METSAPP	Coated stainless steel 441 as interconnect material for solid oxide fuel cells: oxidation performance and chromium evaporation	
278257	METSAPP	Creep behaviour of porous metal supports for solid oxide fuel cells	
278257	METSAPP	Numerical evaluation of micro-structural parameters of porous supports in metal-supported solid oxide fuel cells	

Main author	Title of the periodical	Publication date	Relevant pages
F. Capitanio, S. Siracusano, A. Stassi, V. Baglio, A.S. Aricò, A.C. Tavares	International Journal of Hydrogen Energy	1/May/2014	8026-8033
S. Siracusano, A. Stassi, E. Modica, V. Baglio, A.S. Aricò	International Journal of Hydrogen Energy	1/Aug/2013	11600-11608
V. Baglio, S.C. Zignani, S. Siracusano, A. Stassi, C. D'Urso, A.S. Aricò	Electrocatalysis	29/May/2013	235-240
David Sebastián, Vincenzo Baglio, Shuhui Sun, Ana C. Tavares, Antonino S. Aricò	Chinese Journal of Catalysis	15/Mar/2015	0-0
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Project ID	Project acronym	Publication title	
278257	METSAPP	Coated stainless steel 441 as interconnect material for solid oxide fuel cells: Evolution of electrical properties	
278257	METSAPP	The effect of temperature on chromium vaporization and oxide scale growth on interconnect steels for solid oxide fuel cells	
278257	METSAPP	Nano-socketed nickel particles with enhanced coking resistance grown in situ by redox exsolution	
278257	METSAPP	The influence of Cr evaporation on long-term Cr depletion rates in ferritic stainless steels	
278257	METSAPP	Numerical evaluation of oxide growth in metallic support microstructures of solid oxide fuel cells and its influence on mass transport	
278257	METSAPP	Chromium vaporization from mechanically deformed pre-coated interconnects in solid oxide fuel cells	
278257	METSAPP	Copper iron conversion coating for solid oxide fuel cell interconnects	
278257	METSAPP	Effect of cerium on the electrical properties of a cobalt conversion coating for solid oxide fuel cell interconnects – a study using impedance spectroscopy	
278257	METSAPP	The oxidation of coated SOFC interconnects in fuel side environments	
278525	MMLRC=SOFC	Status of light-weight cassette design of SOFC	
278525	MMLRC=SOFC	Laser cladding of glass-ceramic sealants for SOFC	
278525	MMLRC=SOFC	Glass-ceramic seals in the system MgO-BaO-B2O3-SiO2 operating under simulated SOFC conditions	
278538	Hy2Seps-2	H2 purification by pressure swing adsorption using CuBTC	
278629	SUAV	Quantification of the radiative and convective heat transfer processes and their effect on mSOFC by CFD modelling	
278629	SUAV	Cfd analysis of heat transfer in a microtubular solid oxide fuel cell stack	
278629	SUAV	Modeling of thermal stresses in a microtubular solid oxide fuel cell stack	
278629	SUAV	Numerical analysis of thermal stresses in a new design of microtubular stack	
278629	SUAV	Simulation of thermal stresses for new designs of microtubular solid oxide fuel cell stack	
278674	LASER-CELL	Rapid laser sintering of alkaline fuel cell substrates using integrating mirror	
278796	DeliverHy	Safety approach for composite pressure vessels for road transport of hydrogen. Part 1: acceptable probability of failure and hydrogen mass	
278796	DeliverHy	Safety approach for composite pressure vessels for road transport of hydrogen. Part 2: safety factors and test requirements	
278798	SOFCOM	Thermoeconomic analysis of large solid oxide fuel cell plants: atmospheric vs. pressurised performance	
278798	SOFCOM	Small-scale biogas-SOFC plant: technical analysis and assessment of different fuel reforming options	

Main author	Title of the periodical	Publication date	Relevant pages
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Project ID	Project acronym	Publication title	
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278798	SOFCOM	Performance of a solid oxide fuel cell short-stack with biogas feeding	
278798	SOFCOM	Biogas from the organic fraction of municipal solid waste: dealing with contaminants for a solid oxide fuel cell energy generator	
278798	SOFCOM	Solid oxide fuel cell anode degradation by the effect of siloxanes	
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278798	SOFCOM	Parametric evaluation of a micro-CHP unit with solid oxide fuel cells integrated with oxygen transport membranes	
278798	SOFCOM	Large size biogas-fed SOFC power plants with CO2 management: technical and economic optimisation	
278824	ELYGRID	Life cycle assessment of hydrogen production via electrolysis - a review	
278855	HyTime	HyTIME - combined biohydrogen and biogas production from 2nd-generation biomass	
278855	HyTime	Biomass-to-electricity: analysis and optimisation of the complete pathway steam explosion – enzymatic hydrolysis – anaerobic digestion with ICE vs SOFC as biogas users	
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278997	ReforCELL	Hydrogen safety risk assessment methodology applied to a fluidized bed membrane reactor for autothermal reforming of natural gas	
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	Main author	Title of the periodical	Publication date	Relevant pages
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Project ID	Project acronym	Publication title	
279075	CoMETHy	Multi-fuelled solar steam reforming for pure hydrogen production using solar salts as heat transfer fluid	
279075	CoMETHy	Enhancement of pure hydrogen production through the use of a membrane reactor	
279075	CoMETHy	On-site pure hydrogen production by methane steam reforming in high flux membrane reactor: experimental validation, model predictions and membrane inhibition	
279075	CoMETHy	Catalyst development for steam reforming of methane and model biogas at low temperature	
279075	CoMETHy	Ethanol steam reforming over bimetallic coated ceramic foams: effect of reactor configuration and catalytic support	
279075	CoMETHy	Directing selectivity of ethanol steam reforming in membrane reactors	
279075	CoMETHy	Pure hydrogen production in a membrane reformer: demonstration, macro-scale and atomic scale modeling	
279075	CoMETHy	CeO2-supported Pt/Ni catalyst for the renewable and clean H2 production via ethanol steam reforming	
279075	CoMETHy	On the activity of bimetallic catalysts for ethanol steam reforming	
279075	CoMETHy	Hydrogen production through catalytic low-temperature bio-ethanol steam reforming	
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279075	CoMETHy	Modeling H2 transport through a Pd or Pd/Ag membrane, and its inhibition by co-adsorbates, from first principles	
279075	CoMETHy	Design concepts of a scaled-down autothermal membrane reformer for on board hydrogen production	
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279075	CoMETHy	H tunnelling effects on sequential dissociation of methane over Ni(111) and the overall rate of methane reforming	
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298300	T-CELL	Enhanced carbon deposition tolerance of SOFC anodes under triode operation	
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Main author	Title of the periodical	Publication date	Relevant pages
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Project ID	Project acronym	Publication title	
298300	T-CELL	Triode operation for enhancing the performance of H2S-poisoned SOFCs operated under CH4–H2O mixtures	
298300	T-CELL	Porous, robust highly conducting Ni-YSZ thin film anodes prepared by magnetron sputtering at oblique angles for application as anodes and buffer layers in solid oxide fuel cells	
298300	T-CELL	Carbon tolerant electrodes for SOFC and reversible SOFC (RSOFC) cells operating on carbon containing fuels	
298300	T-CELL	Sulfur tolerance of Au–Mo–Ni/GDC SOFC anodes under various CH4 internal steam reforming conditions	
299732	UNIfHY	New concepts in biomass gasification	
299732	UNIfHY	High-quality syngas production via steam-oxygen blown bubbling fluidised bed gasifier	
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299732	UNIfHY	Biomass to fuel cells state of the art: a review of the most innovative technology solutions	
299732	UNIfHY	Development of a CFD model for the simulation of tar and methane steam reforming through a ceramic catalytic filter	
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299732	UNIfHY	Improvement of steam reforming of toluene by CO2 capture using Fe/CaO–Ca12Al14O33 bi-functional materials	
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299732	UNIfHY	State of the art of small-scale bomass gasification power systems: a review of the different typologies	
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299732	UNIfHY	High-temperature water–gas shift catalysts for hydrogen enrichment of a gas produced by biomass steam gasification	
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Main author	Title of the periodical	Publication date	Relevant pages
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S. Rapagnà, A. D'Orazio, K. Gallucci, P.U. Foscolo, M. Nacken, S. Heidenreich	Chemical Engineering Transactions	7/Jul/2014	157-162
D. Barisano, G. Canneto, F. Nanna, A. Villone, E. Alvino, M. Carnevale, G. Pinto	Energy Procedia	1/Jan/2014	2-11
I. Zamboni, M. Debal, M. Matt, P. Girods, A. Kiennemann, Y. Rogaume, C. Courson	Environmental Science and Pollution Research	21/Mar/2016	1-14

Project ID	Project acronym	Publication title	
299732	UNIfHY	New DeTar catalytic filter with integrated catalytic ceramic foam: catalytic activity under model and real bio syngas conditions	
299732	UNIfHY	Goal and scope in life cycle sustainability analysis: the case of hydrogen production from biomass	
299732	UNIfHY	Influence of temperature on oxygen permeation through ion transport membrane to feed a biomass gasifier	
299732	UNIfHY	Oxygen transport by ionic membranes: correlation of permeation data and prediction of char burning in a membrane-assisted biomass gasification process	
299732	UNIfHY	The case study of an innovative small-scale biomass waste gasification heat and power plant contextualised in a farm	
299732	UNIfHY	Simulations of a plant with a fluidized bed gasifier WGS and PSA	
299732	UNIfHY	Parametric experimental tests of steam gasification of pine wood in a fluidized bed reactor	
300081	ELECTROHYPEM	Electrochemical characterisation of a PEM water electrolyser based on a sulfonated polysulfone membrane	
300081	ELECTROHYPEM	Design and testing of a compact PEM electrolyser system	
300081	ELECTROHYPEM	Polymer electrolyte membrane water electrolysis: status of technologies and potential applications in combination with renewable power sources	
300081	ELECTROHYPEM	Proton exchange membrane water electrolysis with short-side-chain Aquivion membrane and IrO2 anode catalyst	
300081	ELECTROHYPEM	Performance analysis of short-side-chain Aquivion® perfluorosulfonic acid polymer for proton exchange membrane water electrolysis	
300081	ELECTROHYPEM	Nanosized IrOx and IrRuOx electrocatalysts for the O2 evolution reaction in PEM water electrolysers	
300081	ELECTROHYPEM	Performance of a PEM water electrolyser combining an IrRu-oxide anode electrocatalyst and a short-side chain Aquivion membrane	
301782	FluMaBack	Fast measurement of proton exchange membrane fuel cell impedance based on pseudo-random binary sequence perturbation signals and continuous wavelet transform	
303024	EURECA	Investigation of tungsten carbide supported Pd or Pt as anode catalysts for PEM fuel cells	
303024	EURECA	Is platinum necessary for efficient hydrogen evolution? – DFT study of metal monolayers on tungsten carbide	
303024	EURECA	Efficient use of resources in energy-converting applications	
303417	HyUnder	Hydrogen underground storage in Romania, potential directions of development, stakeholders and general aspects	
303418	PHAEDRUS	Evaluation of Pt/carbon aerogels as electrode material in an electrochemical hydrogen compressor	
303418	PHAEDRUS	(Invited) Electrochemical hydrogen compression	
303418	PHAEDRUS	Correlations between the catalytic layer composition, the relative humidity and the performance for PEMFC carbon aerogel based membrane electrode assemblies	

Main author	Title of the periodical	Publication date	Relevant pages
Manfred Nacken, Gino V. Baron, Steffen Heidenreich, Sergio Rapagnà, Annalisa D'Orazio, Katia Gallucci, Joeri F.M. Denayer, Pier Ugo Foscolo	Fuel Processing Technology	1/Jun/2015	98-106
Milena Stefanova, Concetta Tripepi, Alessandra Zamagni, Paolo Masoni	Sustainability	1/Aug/2014	5463-5475
T Antonini, P U Foscolo, K Gallucci, S Stendardo	Journal of Physics: Conference Series	16/Nov/2015	012034
Tania Antonini, Katia Gallucci, Valentina Anzoletti, Stefano Stendardo, Pier Ugo Foscolo	Chemical Engineering and Processing	1/Aug/2015	39-52
Mauro Villarini, Enrico Bocci, Andrea Di Carlo, Elisa Savuto, Vanessa Pallozzi	Energy Procedia	1/Dec/2015	335-342
L. Vecchione, M. Moneti, S. Cocchi, M. Villarini, M. Sisinni, A. Micangeli	Journal of Agricultural Engineering	24/May/2015	587-590
L. Vecchione, M. Moneti, S. Cocchi, M. Villarini, M. Sisinni, A. Micangeli	Journal of Agricultural Engineering	9/Jun/2013	587-590
S. Siracusano,V. Baglio, F. Lufrano, P. Staiti, A.S. Aricò	Journal of Membranes Science	15/Dec/2013	209-214
N. Briguglio, G. Brunaccini, S. Siracusano, N. Randazzo, G. Dispenza, M. Ferraro, R. Ornelas, A.S. Aricò, V. Antonucci,	International Journal of Hydrogen Energy	30/Aug/2013	11519-11529
A.S. Aricò, S. Siracusano, N. Briguglio, V. Baglio, A. Di Blasi, V. Antonucci	Journal of Applied Electrochemistry	1/Sep/2013	107-118
A. Skulimowska, M. Zaton, M. Dupont, S. Sunde, L. Merlo, D.J. Jones, J. Rozière	International Journal of Hydrogen Energy	15/Apr/2014	6307–6316
S. Siracusano, V. Baglio, A. Stassi, L. Merlo, E. Moukheiber, A.S. Arico	Journal of Membranes Science	1/Sep/2014	1-7
S. Siracusano, N. Van Dijk, E. Payne-Johnson, V. Baglio, A.S. Aricò	Applied Catalysis B: Environmental	1/Mar/2015	488-495
S. Siracusano, V. Baglio, E. Moukheiber, L. Merlo, A.S. Aricò	International Journal of Hydrogen Energy	1/May/2015	x
Andrej Debenjak, Pavle Boškoski, Bojan Musizza, Janko Petrovćić, Đani Jurićić	Journal of Power Sources	1/May/2014	112-118
Vladimir M. Nikolic, Dragana L. Zugic, Ivana M. Perovic, Aleksandra B. Saponjic, Biljana M. Babic, Igor A. Pasti, Milica P. Marceta Kaninski	International Journal of Hydrogen Energy	1/Aug/2013	11340-11345
Dragana D. Vasić Aničijević, Vladimir M. Nikolić, Milica P. Marčeta-Kaninski, Igor A. Pašti	International Journal of Hydrogen Energy	13/Dec/2013	16071-16079
N. Jacobs, J. Busselmann, S. Theuring, M. Zobel, A. Dyck	ECS Transactions	31/Aug/2013	197-208
Ioan Iordache, Dorin Schitea, Adrian V. Gheorghe, Mihaela Iordache	International Journal of Hydrogen Energy	1/Jul/2014	11071-11081
Sandrine Berthon-Fabry, Remy Vie, Menno Koeman, Peter Bouwman, Rudolf Metkemeijer	Journal of Power Sources	30/Nov/2015	n/a
P.J. Bouwman, J. Konink, D. Semerel, L. Raymakers, M. Koeman, W. Kout, W. Dalhuijsen, E. Milacic, M.J.J. Mulder	ECS Transactions	18/Aug/2014	1009-1018
Mathilde Ouattara-Brigaudet, Sandrine Berthon-Fabry, Christian Beauger, Patrick Achard	International Journal of Hydrogen Energy	1/Jan/2014	1420-1429

Project ID	Project acronym	Publication title	
303418	PHAEDRUS	Evaluation of Pt/carbon aerogels as electrode material in an electrochemical hydrogen compressor	
303419	PUMA MIND	Finding optimal surface sites on heterogeneous catalysts by counting nearest neighbours	
303419	PUMA MIND	Introducing structural sensitivity into adsorption-energy scaling relations by means of coordination numbers	
303419	PUMA MIND	Fast prediction of adsorption properties for platinum nanocatalysts with generalised coordination numbers	
303419	PUMA MIND	Electrode structure effects on the performance of open-cathode Proton Exchange Membrane Fuel Cells: a multiscale modelling approach	
303419	PUMA MIND	Distributed parameter model simulation tool for PEM fuel cells	
303419	PUMA MIND	Experimental study of hydrogen purge effects on performance and efficiency of an open-cathode Proton Exchange Membrane fuel cell system	
303419	PUMA MIND	Experimental analysis of a degraded open-cathode PEM fuel cell stack	
303419	PUMA MIND	Performance improvement by temperature control of an open-cathode PEM fuel cell system	
303419	PUMA MIND	A unified theory of electrochemical double layers in energy conversion and storage	
303419	PUMA MIND	A multiscale model of electrochemical double layers in energy conversion and storage	
303419	PUMA MIND	Interplay between reaction mechanism and hydroxyl species for water formation on Pt(111)	
303419	PUMA MIND	Coverage-dependent thermodynamic analysis of the formation of water and hydrogen peroxide on a platinum model catalyst	
303419	PUMA MIND	A gain-scheduled LPV control for oxygen stoichiometry regulation in PEM fuel cell systems	
303419	PUMA MIND	Understanding adsorption-induced effects on platinum nanoparticles: an energy-decomposition analysis	
303419	PUMA MIND	Capturing solvation effects at a liquid/nanoparticle interface: AIMD investigation of Pt201 immersed in water	
303419	PUMA MIND	Concave sites enhance the catalytic activity of platinum for the oxygen reduction reaction	
303419	PUMA MIND	A multi-paradigm modelling investigation of membrane chemical degradation in PEM fuel cells	
303419	PUMA MIND	Evaluation of fuel cell vehicle regarding hybridization degree and its impact on range, weight and energy consumption	
303419	PUMA MIND	Observer design for fuel cell systems	
303419	PUMA MIND	Development and implementation of a supervisor strategy and sliding mode control set-up for fuel cell-based hybrid generation	
303419	PUMA MIND	A multi-methodology modelling approach of PEMFC performance and durability in a virtual fuel cell car	
303419	PUMA MIND	A multi-paradigm computational model of materials electrochemical reactivity for energy conversion and storage	
303419	PUMA MIND	Fault-tolerant unfalsified control for PEM fuel cell systems	
303419	PUMA MIND	Development and implementation of a supervisor strategy and sliding mode control set-up for fuel-cell-based hybrid generation systems	
303419	PUMA MIND	Evaluation of fuel cell vehicle regarding hybridization degree and its impact on range, weight and energy consumption	
303419	PUMA MIND	Dither-less extremum seeking for hydrogen minimisation in PEM fuel cells	
303419	PUMA MIND	Fuel cell modelling strategic roadmap: a systematic Approach	

Main author	Title of the periodical	Publication date	Relevant pages
Sandrine Berthon-Fabry, Remy Vie, Menno Koeman, Peter Bouwman, Rudolf Metkemeijer	Journal of Power Sources	30/Jul/2016	001 - 012
F. Calle-Vallejo, J. Tymoczko, V. Colic, Q. H. Vu, M. D. Pohl, K. Morgenstern, D. Loffreda, P. Sautet, W. Schuhmann, A. S. Bandarenka	Science	31/Dec/2015	185-189
F. Calle-Vallejo, D. Loffreda, M. T. M. Koper, P. Sautet	Nature Chemistry	31/Dec/2015	403-410
F. Calle-Vallejo, J. I. Martínez, J. M. García-Lastra, P. Sautet, D. Loffreda	Angewandte Chemie - International Edition	31/Dec/2014	8316-8319
S. Strahl, A. Husar, A.A. Franco	International Journal of Hydrogen Energy	31/Dec/2014	9752-9767
M. Sarmiento-Carnevali, M. Serra, C. Batlle	International Journal of Hydrogen Energy	31/Dec/2013	?
S. Strahl, A. Husar, J. Riera	Journal of Power Sources	31/Dec/2014	474-482
S. Strahl, N. Gasamans, J. Llorca, A. Husar	International Journal of Hydrogen Energy	31/Dec/2014	?
S. Strahl, A. Husar, P. Puleston, J. Riera	Fuel Cells	31/Dec/2014	?
M. Quiroga, K.H. Xue, T.K. Nguyen, H. Huang, M. Tułodziecki, A.A. Franco	Physical Review Letters	31/Dec/2014	?
M. Quiroga, K.H. Xue, T.K. Nguyen, H. Huang, M. Tulodziecki, A.A. Franco,	Journal of the Electrochemical Society	31/Dec/2014	3302-3310
Rodrigo Ferreira de Morais, Alejandro A. Franco, Philippe Sautet, and David Loffreda	ACS Catalysis	31/Dec/2014	1068-1077
R. Ferreira de Morais, A. Franco, P. Sautet, D. Loffreda	Physical Chemistry Chemical Physics	31/Dec/2015	11392-11400
F. Bianchi, C. Kunusch, C. Ocampo-Martínez and R. Sánchez-Peña	IEEE Transactions on Control Systems Technology	31/Dec/2014	1837-1844
F. Calle Vallejo, P. Sautet, D. Loffreda	Journal of Physical Chemistry Letters	31/Dec/2014	3120-3124
R. Ferreira de Morais, T. Kerber, F. Calle-Vallejo, P. Sautet, D. Loffreda	Small [??]	18/Mar/2016	?
F. Calle-Vallejo, M. Pohl, D. Reinisch, D. Loffreda, P. Sautet, A. S. Bandarenka	Energy and Environmental Science	18/Mar/2016	?
M.A. Quiroga, K. Malek, A.A. Franco	Journal of the Electrochemical Society	18/Mar/2016	F59
Marina Roche and Natalia Artal	Journal of Electrical Engineering	31/Jan/2015	2328-2223
J.A. Luna, A.P. Husar and M. Serra	International Journal of Hydrogen Energy	31/Dec/2015	?
J.J. More, P.F. Puleston, C. Kunusch and M. Allue	IEEE Transactions on Energy Conversion	31/Dec/2015	?
M. Mayur, S. Strahl, A. Husar, W. Bessler	International Journal of Hydrogen Energy	31/Dec/2015	?
Alejandro A. Franco, Matias A. Quiroga	Journal of the Electrochemical Society	30/Apr/2015	E73
F. Bianchi, C. Ocampo-Martínez, C. Kunusch and R. Sánchez-Peña	IEEE Transactions on Energy Conversion	31/Dec/2015	307-315
J. Moré, P.F. Puleston, C. Kunusch and M. Allué	IEEE Transactions on Energy Conversion	31/Dec/2015	218-225
Marina Roche and Natalia Artal	Journal of Electrical Engineering	31/Dec/2015	36-51
F. Castaños and C. Kunusch	IEEE Transactions on Industrial Electronics	31/Dec/2015	5218-5226
Costis Kompis and Kourosh Malek	Fuel Cells	18/Mar/2016	?

Project ID	Project acronym	Publication title	
303419	PUMA MIND	Performance and degradation of Proton Exchange Membrane Fuel Cells: state of the art in modelling from atomic to system scale	
303422	MATHRYCE	Fatigue crack initiation and growth in a CrMo steel under hydrogen pressure	
303428	BOR4STORE	Synchrotron diffraction studies of hydrogen absorption/desorption on CaH 2 + MgB 2 reactive hydride composite mixed with fluorinated compounds	
303428	BOR4STORE	First direct study of the ammonolysis reaction in the most common alkaline and alkaline earth metal hydrides by in situ SR-PXD	
303428	BOR4STORE	Influence of milling parameters on the sorption properties of the LiH–MgB2 system doped with TiCl3	
303428	BOR4STORE	Effect of NaH/MgB2 ratio on the hydrogen absorption kinetics of the system NaH + MgB2	
303428	BOR4STORE	Structural analysis of calcium reactive hydride composite for solid state hydrogen storage	
303428	BOR4STORE	NaAlH4 production from waste aluminum by reactive ball milling	
303428	BOR4STORE	Hydrogen storage systems from waste Mg alloys	
303428	BOR4STORE	Transport phenomena versus intrinsic kinetics: hydrogen sorption limiting sub-process in metal hydride beds	
303428	BOR4STORE	Effect of the partial replacement of CaH 2 with CaF 2 in the mixed system CaH 2 + MgB 2	
303428	BOR4STORE	Destabilization of LiBH4 by nanoconfinement in PMMA–co–BM polymer matrix for reversible hydrogen storage	
303428	BOR4STORE	2LiBH4–MgH2–0.13TiCl4 confined in nanoporous structure of carbon aerogel scaffold for reversible hydrogen storage	
303428	BOR4STORE	Effective nanoconfinement of 2LiBH4–MgH2 via simply MgH2 premilling for reversible hydrogen storages	

Main author	Title of the periodical	Publication date	Relevant pages
Thomas Jahnke, Georg Futter, Arnulf Latz, Thomas Malkow, Georgios Papakonstantinou, Georgios Tsotridis, Pascal Schott, Mathias Gérard, Manuelle Quina	Journal of Power Sources	18/Mar/2016	207–233
L. Briottet, I. Moro, M. Escot, J. Furtado, P. Bortot, G.M. Tamponi, J. Solin, G. Odemer, C. Blanc, E. Andrieu	International Journal of Hydrogen Energy	1/Dec/2015	17021-17030
K. Suarez-Alcantara, M. H. Sørby, C. Pistidda, F. Karimi, I. Saldan, B. C. Hauback, T. Klassen, M. Dornheim	Journal of Physical Chemistry C	28/May/2015	11430-11437
C. Pistidda, A. Santoru, S. Garroni, N. Bergemann, A. Rzeszutek, C. Horstmann, D. Thomas, T. Klassen, M. Dornheim	Journal of Physical Chemistry C	15/Jan/2015	934-943
Nina Busch, Julian Jepsen, Claudio Pistidda, Julián A. Puszkiel, Fahim Karimi, Chiara Milanese, Martin Tolkiehn, Anna-Lisa Chaudhary, Thomas Klassen, Martin Dornheim	Journal of Alloys and Compounds	1/Oct/2015	S299-S303
Claudio Pistidda, Daphiny Pottmaier, Fahim Karimi, Sebastiano Garroni, Agnieszka Rzeszutek, Martin Tolkiehn, Maximilian Fichtner, Wiebke Lohstroh, Marcello Baricco, Thomas Klassen	International Journal of Hydrogen Energy	1/Mar/2014	5030-5036
Fahim Karimi, P. Klaus Pranzas, Armin Hoell, Ulla Vainio, Edmund Welter, Vikram S. Raghuwanshi, Claudio Pistidda, Martin Dornheim, Thomas Klas and A. Schreyer	Journal of Applied Crystallography	1/Feb/2014	67-75
Nils Bergemann, Claudio Pistidda, Chiara Milanese, Alessandro Girella, Bjarne R.S. Hansen, Johannes Wurr, José M. Bellosta von Colbe, Julian Jepsen, Torben R. Jensen, Amedeo Marini, Thomas Klassen, Martin Dornheim	International Journal of Hydrogen Energy	1/Jun/2014	9877-9882
C. Pistidda, N. Bergemann, J. Wurr, A. Rzeszutek, K.T. Møller, B.R.S. Hansen, S. Garroni, C. Horstmann, C. Milanese, A. Girella, O. Metz,	Journal of Power Sources	1/Dec/2014	554-563
Gustavo A. Lozano, Jose M. Bellosta von Colbe, Thomas Klassen, Martin Dornheim	International Journal of Hydrogen Energy	1/Nov/2014	18952-18957
C. Pistidda, F. Karimi, S. Garroni, A. Rzeszutek, C. Bonatto Minella, C. Milanese, T. T. Le, L. H. Rude, J. Skibsted, T. R. Jensen, C. Horst	Journal of Physical Chemistry C	11/Dec/2014	28409-28417
Rapee Gosalawit-Utke, Sukanya Meethom, Claudio Pistidda, Chiara Milanese, Daniel Laipple, Thanit Saisopa, Amedeo Marini, Thomas Klassen, Martin	International Journal of Hydrogen Energy	1/Mar/2014	5019-5029
Rapee Gosalawit-Utke, Chiara Milanese, Payam Javadian, Alessandro Girella, Daniel Laipple, Julián Puszkiel, Alice S. Cattaneo, Chiara Ferrara	Journal of Alloys and Compounds	1/Jun/2014	78-86
Rapee Gosalawit–Utke, Sophida Thiangviriya, Payam Javadian, Daniel Laipple, Claudio Pistidda, Nils Bergemann, Christian Horstmann, Torben R. Jensen, Thomas Klassen, Martin Dornheim	International Journal of Hydrogen Energy	1/Sep/2014	15614-15626

Project ID	Project acronym	Publication title	
303428	BOR4STORE	Nanoconfined 2LiBH4–MgH2–TiCl3 in carbon aerogel scaffold for reversible hydrogen storage	
303428	BOR4STORE	Structural study of a new B-rich phase obtained by partial hydrogenation of 2NaH + MgB2	
303428	BOR4STORE	Compaction pressure influence on material properties and sorption behaviour of LiBH4–MgH2 composite	
303428	BOR4STORE	Structural study of a new B-rich phase obtained by partial hydrogenation of 2NaH + MgB2	
303428	BOR4STORE	A round robin test exercise on hydrogen absorption/desorption properties of a magnesium hydride based material	
303428	BOR4STORE	Manganese borohydride; synthesis and characterisation	
303428	BOR4STORE	Hydrogen storage properties of nanoconfined LiBH4–NaBH4	
303428	BOR4STORE	Hydrogen storage properties of nanoconfined LiBH4–Ca(BH4)2	
303428	BOR4STORE	Hydrogen reversibility of LiBH4–MgH2–Al composites	
303428	BOR4STORE	Boron-nitrogen based hydrides and reactive composites for hydrogen storage	
303428	BOR4STORE	Complex hydrides for hydrogen storage – new perspectives	
303428	BOR4STORE	Enhanced hydrogen reversibility of nanoconfined LiBH4–Mg(BH4)2	
303428	BOR4STORE	Hydrogen storage capacity loss in a LiBH 4 –Al composite	
303428	BOR4STORE	Eutectic melting in metal borohydrides	
303428	BOR4STORE	Trimetallic borohydride Li 3 MZn 5 (BH 4) 15 (M = Mg, Mn) containing two weakly interconnected frameworks	
303428	BOR4STORE	Novel alkali earth borohydride Sr(BH 4) 2 and borohydride-chloride Sr(BH 4)Cl	
303428	BOR4STORE	Hydrogen storage of Mg–Zn mixed metal borohydrides	

Main author	Title of the periodical	Publication date	Relevant pages
Rapee Gosalawit-Utke, Chiara Milanese, Payam Javadian, Julian Jepsen, Daniel Laipple, Fahim Karmi, Julián Puszkiel, Torben R. Jensen, Amedeo	International Journal of Hydrogen Energy	1/Mar/2013	3275-3282
Claudio Pistidda, Emilio Napolitano, Daphiny Pottmaier, Martin Dornheim, Thomas Klassen, Marcello Baricco, Stefano Enzo	International Journal of Hydrogen Energy	1/Aug/2013	10479-10484
Julian Jepsen, Chiara Milanese, Alessandro Girella, Gustavo A. Lozano, Claudio Pistidda, José M. Bellosta von Colbe, Amedeo Marini, Thomas Klassen, Martin Dornheim	International Journal of Hydrogen Energy	1/Jul/2013	8357-8366
Claudio Pistidda, Emilio Napolitano, Daphiny Pottmaier, Martin Dornheim, Thomas Klassen, Marcello Baricco, Stefano Enzo	International Journal of Hydrogen Energy	1/Aug/2013	10479-10484
P. Moretto, C. Zlotea, F. Dolci, A. Amieiro, J.-L. Bobet, A. Borgschulte, D. Chandra, H. Enoki, P. De Rango, D. Fruchart, J. Jepsen, M. Latroche, I. Llamas Jansa, D. Moser, S. Sartori, S.M. Wang, J.A. Zan	International Journal of Hydrogen Energy	1/May/2013	6704-6717
Bo Richter, Dorthe B. Ravnsbæk, Nikolay Tumanov, Yaroslav Filinchuk, Torben R. Jensen	Dalton Transactions	1/Jan/2015	3988-3996
Payam Javadian, Drew A. Sheppard, Craig E. Buckley, Torben R. Jensen	International Journal of Hydrogen Energy	1/Nov/2015	14916-14924
Payam Javadian, Drew A. Sheppard, Craig E. Buckley, Torben R. Jensen	Nano Energy	1/Jan/2015	96-103
Bjarne R. S. Hansen, Dorthe B. Ravnsbæk, Jørgen Skibsted, Torben R. Jensen	Physical Chemistry Chemical Physics	1/Jan/2014	8970
Lars H. Jepsen, Morten B. Ley, Young-Su Lee, Young Whan Cho, Martin Dornheim, Jens Oluf Jensen, Yaroslav Filinchuk, Jens Erik Jørgensen, Flemming Besenbacher, Torben R. Jensen	Materials Today	1/Apr/2014	129-135
Morten B. Ley, Lars H. Jepsen, Young-Su Lee, Young Whan Cho, José M. Bellosta von Colbe, Martin Dornheim, Masoud Rokni, Jens Oluf Jensen, Mik	Materials Today	1/Apr/2014	122-128
Payam Javadian, Torben R. Jensen	International Journal of Hydrogen Energy	1/Jun/2014	9871-9876
Bjarne R. S. Hansen, Dorthe B. Ravnsbæk, Daniel Reed, David Book, Carsten Gundlach, Jørgen Skibsted, Torben R. Jensen	Journal of Physical Chemistry C	18/Apr/2013	7423-7432
Mark Paskevicius, Morten B. Ley, Drew A. Sheppard, Torben R. Jensen, Craig E. Buckley	Physical Chemistry Chemical Physics	1/Jan/2013	19774
Radovan Černý, Pascal Schouwink, Yolanda Sadikin, Katarina Stare, L'ubomír Smrčok, Bo Richter, Torben R. Jensen	Inorganic Chemistry	3/Sep/2013	9941-9947
D. B. Ravnsbæk, E. A. Nickels, R. Černý, C. H. Olesen, W. I. F. David, P. P. Edwards, Y. Filinchuk, T. R. Jensen	Inorganic Chemistry	7/Oct/2013	10877-10885
G.N. Kalantzopoulos, J.G. Vitillo, E. Albanese, E. Pinatel, B. Civalleri, S. Deledda, S. Bordiga, M. Baricco, B.C. Hauback	Journal of Alloys and Compounds	1/Dec/2014	S702-S705

Project ID	Project acronym	Publication title
303428	BOR4STORE	Combined X-ray and Raman studies on the effect of cobalt additives on the decomposition of magnesium borohydride
303428	BOR4STORE	Isotopic exchange in porous and dense magnesium borohydride
303428	BOR4STORE	Hydrogen cycling in γ-$Mg(BH_4)_2$ with cobalt-based additives
303428	BOR4STORE	Structural changes observed during the reversible hydrogenation of $Mg(BH_4)_2$ with Ni-based additives
303428	BOR4STORE	Thermodynamic modelling of $Mg(BH4)2$
303428	BOR4STORE	Investigation on the decomposition enthalpy of novel mixed $Mg_{(1-x)}Zn_x(BH_4)_2$ borohydrides by means of periodic DFT calculations
303428	BOR4STORE	Theoretical and experimental study on $Mg(BH4)2$–$Zn(BH4)2$ mixed borohydrides
303428	BOR4STORE	Coupling solid-state NMR with GIPAW ab initio calculations in metal hydrides and borohydrides
303428	BOR4STORE	Supercritical nitrogen processing for the purification of reactive porous materials
303428	BOR4STORE	Dehydrogenation studies of the bimetallic borohydrides
303428	BOR4STORE	The role of Ti in alanates and borohydrides: catalysis and metathesis
303428	BOR4STORE	Supercritical N_2 processing as a route to the clean dehydrogenation of porous $Mg(BH_4)_2$
303428	BOR4STORE	Hydrogen desorption and cycling properties of composites based on mesoporous carbons and a $LiBH4$–$Ca(BH4)2$ eutectic mixture
303428	BOR4STORE	Thermal coupling potential of solid oxide fuel cells with metal hydride tanks: thermodynamic and design considerations towards integrated systems
303435	ArtipHyction	Evaluation of the charge transfer kinetics of spin-coated $BiVO4$ thin films for sun-driven water photoelectrolysis
303435	ArtipHyction	Molecular cathode and photocathode materials for hydrogen evolution in photoelectrochemical devices
303435	ArtipHyction	A comprehensive comparison of dye-sensitized NiO photocathodes for solar energy conversion
303435	ArtipHyction	Oxygen tolerance of a molecular engineered cathode for hydrogen evolution based on a cobalt diimine-dioxime catalyst
303435	ArtipHyction	10.1016/j.electacta.2015.07.043

Main author	Title of the periodical	Publication date	Relevant pages
Olena Zavorotynska, Stefano Deledda, Jenny Vitillo, Ivan Saldan, Matylda Guzik, Marcello Baricco, John Walmsley, Jiri Muller, Bjørn Hauback	Energies	1/Sep/2015	9173-9190
Olena Zavorotynska, Stefano Deledda, Guanqiao Li, Motoaki Matsuo, Shin-ichi Orimo, Bjørn C. Hauback	Angewandte Chemie - International Edition	1/Sep/2015	10592-10595
O. Zavorotynska, I. Saldan, S. Hino, T. D. Humphries, S. Deledda, B. C. Hauback	Journal of Materials Chemistry A	1/Jan/2015	6592-6602
I. Saldan, S. Hino, T. D. Humphries, O. Zavorotynska, M. Chong, C. M. Jensen, S. Deledda, B. C. Hauback	Journal of Physical Chemistry C	9/Oct/2014	23376-23384
E.R. Pinatel, E. Albanese, B. Civalleri, M. Baricco	Journal of Alloys and Compounds	1/Oct/2015	S64-S68
Elisa Albanese, Bartolomeo Civalleri, Silvia Casassa, Marcello Baricco	Journal of Physical Chemistry C	16/Oct/2014	23468-23475
E. Albanese, G.N. Kalantzopoulos, J.G. Vitillo, E. Pinatel, B. Civalleri, S. Deledda, S. Bordiga, B.C. Hauback, M. Baricco	Journal of Alloys and Compounds	1/Dec/2013	S282-S286
Federico Franco, Marcello Baricco, Michele R. Chierotti, Roberto Gobetto, Carlo Nervi	Journal of Physical Chemistry C	16/May/2013	9991-9998
Nicholas P. Stadie, Elsa Callini, Philippe Mauron, Andreas Borgschulte, Andreas Züttel	Journal of Visualized Experiments	1/Jan/2015	1 - 10
M. Chong, E. Callini, A. Borgschulte, A. Züttel, C. M. Jensen	RSC Advances	1/Jan/2014	63933-63940
Elsa Callini, Andreas Borgschulte, Cedric L. Hugelshofer, Anibal J. Ramirez-Cuesta, Andreas Züttel	Journal of Physical Chemistry C	9/Jan/2014	77-84
Nicholas P. Stadie, Elsa Callini, Bo Richter, Torben R. Jensen, Andreas Borgschulte, Andreas Züttel	Journal of the American Chemical Society	11/Jun/2014	8181-8184
A. Ampoumogli, G. Charalambopoulou, P. Javadian, B. Richter, T.R. Jensen, Th. Steriotis	Journal of Alloys and Compounds	1/Oct/2015	S480-S484
Andreas G. Yiotis, Michael E. Kainourgiakis, Lefteris I. Kosmidis, Georgia C. Charalambopoulou, Athanassios K. Stubos	Journal of Power Sources	1/Dec/2014	440-450
Simelys Hernández, Gianluca Gerardi, Katarzyna Bejtka, Alberto Fina and Nunzio Russo	Applied Catalysis B: Environmental	28/Feb/2016	66-74
Nicolas Queyriaux, Nicolas Kaeffer, Adina Morozan, Murielle Chavarot-Kerlidou, Vincent Artero	Journal of Photochemistry and Photobiology C: Photochemistry Reviews	7/Aug/2015	90-105
C. J. Wood, G. H. Summers, C. Clark, N.Kaeffer, M.Brautigam, L. Roberta Carbone, L. D'Amario,K. Fan, Y. Farré, S. Narbey, F. Oswald, L.A. Stevens, C.D.J. Parmenter, M.W. Fay, A. La Torre, C.E. Snape, B. Dietzek, D. Dini, L. Hammarström, Y. Pellegrin, F. Odobel, L. Sun, V. Artero, E.A. Gibson	Physical Chemistry Chemical Physics	22/Dec/2015	-
N. Kaeffer, A. Morozan, V. Artero	Journal of Physical Chemistry B	20/May/2015	13707–13713
A.S. Gliozzi, S. Hernández, A.L. Alexe-Ionescu, G. Saracco, G. Barbero	Electrochimica Acta	29/Jul/2015	280-286

Project ID	Project acronym	Publication title	
303435	ArtipHyction	Effect of surface area on the rate of photocatalytic water oxidation as promoted by different manganese oxides	
303435	ArtipHyction	Green and low-cost synthesis of PANI-TiO2 nanocomposite mesoporous films for photoelectrochemical water splitting	
303435	ArtipHyction	Comparison of photocatalytic and transport properties of TiO 2 and ZnO nanostructures for solar-driven water splitting	
303435	ArtipHyction	Considerations on oxygen bubble formation and evolution on BiVO4 porous anodes used in water splitting photoelectrochemical cells	
303435	ArtipHyction	Thick mesoporous TiO2 films through a sol-gel method involving a non-ionic surfactant: characterisation and enhanced performance for water photoelectrolysis	
303435	ArtipHyction	New transparent laser-drilled fluorine-doped tin oxide covered quartz electrodes for photoelectrochemical water splitting	
303435	ArtipHyction	Photo-catalytic activity of BiVO4 thin-film electrodes for solar-driven water splitting	
303435	ArtipHyction	Toward the rational benchmarking of homogeneous H2-evolving catalysts	
303435	ArtipHyction	A computational study of the mechanism of hydrogen evolution by cobalt(diimine-dioxime) catalysts	
303445	StackTest	Parametric sensitivity tests—European polymer electrolyte membrane fuel cell stack test procedures	
303445	StackTest	Validation of the Influence of test parameters in performance measurements of a PEMFC stack	
303445	StackTest	Polymer electrolyte membrane fuel cell efficiency at the stack level	
303446	IMPALA	Water transport in gas diffusion layer of a polymer electrolyte fuel cell in the presence of a temperature gradient: phase change effect	
303446	IMPALA	Characterisation of liquid water saturation in gas diffusion layers by X-ray tomographic microscopy	
303446	IMPALA	New method for the super hydrophobic treatment of gas diffusion layers for Proton Exchange Membrane Fuel Cells using electrochemical reduction of diazonium salts	
303446	IMPALA	Benefits of membrane electrode assemblies with Asymmetrical GDL configurations for PEM fuel cells	
303446	IMPALA	Surface analytical methods for the development of electrochemical components of polymer electrolyte fuel cells microporous and catalyst layers	
303447	HYPER	Rapid surfactant-free synthesis of Mg(OH) 2 nanoplates and pseudomorphic dehydration to MgO	
303447	HYPER	Revisiting the hydrogen storage behaviour of the Na-O-H system	
303447	HYPER	Recent advances in the use of sodium borohydride as a solid state hydrogen store	
303449	STAMPEM	Carbon-polymer composite coatings for PEM fuel cell bipolar plates	
303449	STAMPEM	An investigation of the typical corrosion parameters used to test polymer electrolyte fuel cell bipolar plate coatings, with titanium nitride coated stainless steel as a case study	
303454	TriSOFC	Emission and economic performance assessment of a solid oxide fuel cell micro-combined heat and power system in a domestic building	
303454	TriSOFC	Fuel cell technology for domestic built environment applications: state of-the-art review	
303454	TriSOFC	Schottky Junction effect on High Performance Fuel Cells based on nanocomposite materials	

Main author	Title of the periodical	Publication date	Relevant pages
C. Ottone, M. Armandi, S. Hernández, S. Bensaid, M. Fontana, C. F. Pirri, G. Saracco, E. Garrone and B. Bonelli	Chemical Engineering Journal	17/Jan/2015	36–45
Diana Hidalgo, Sergio Bocchini, Marco Fontana, Guido Saracco, Simelys Hernandez	RSC Advances	1/Jan/2015	49429-49438
Simelys Hernández, Diana Hidalgo, Adriano Sacco, Angelica Chiodoni, Andrea Lamberti, Valentina Cauda, Elena Tresso, Guido Saracco	Physical Chemistry Chemical Physics	17/Feb/2015	7775-7786
S. Hernández, G. Barbero, G. Saracco and A.L. Alexe-Ionescu	Journal of Physical Chemistry C	13/Apr/2015	9916-9925
D. Hidalgo, R. Messina, A. Sacco, D. Manfredi, S. Vankova, E. Garrone, G. Saracco and S. Hernández	International Journal of Hydrogen Energy	29/Mar/2014	21512–21522
S. Hernández, M. Tortello, A. Sacco, M. Quaglio, T. Meyer, S. Bianco, G. Saracco, C. F. Pirri and E. Tresso	Electrochimica Acta	21/Jan/2014	184-194
S. Hernández, S.M.Thalluri, A. Sacco, S. Bensaid, G. Saracco, N. Russo	Applied Catalysis A: General	19/Jan/2015	266-271
Vincent Artero, Jean-Michel Savéant	Energy and Environmental Science	7/Aug/2014	3808-3814
A. Bhattacharjee, E. S. Andréiadis, M. Chavarot-Kerlidou, M. Fontecave, M. J. Field, V. Artero	Chemistry - A European Journal	17/Sep/2013	15166 – 15174
Samuel Simon Araya, Søren Juhl Andreasen, Søren Knudsen Kær	Journal of Fuel Cell Science and Technology	1/Dec/2014	061007
Corinna Harms, Frank Köhrmann, Alexander Dyck	Solid State Ionics	1/Jul/2015	75-79
Piotr Piela, Jens Mitzel	Journal of Power Sources	1/Oct/2015	95-103
Benjamin Straubhaar, Joël Pauchet, Marc Prat	International Journal of Hydrogen Energy	1/Sep/2015	11668-11675
Adrien Lamibrac, Felix Buchi	Journal of the Electrochemical Society	1/Jan/2016	F202-F209
Yohann Thomas, Joël Pauchet	Journal of the American Chemical Society	1/Jul/2015	15068-15077
Ruediger Schweiss	Fuel Cells	1/Jan/2016	1
Indro Biswas, Mathias Schulze	ECS Transactions	1/Jan/2016	1429-1435
James M. Hanlon, Laura Bravo Diaz, Giulia Balducci, Blane A. Stobbs, Marek Bielewski, Peter Chung, Ian MacLaren, Duncan H. Gregory	CrystEngComm	1/Jan/2015	5672-5679
Jianfeng Mao, Qinfen Gu, Duncan Gregory	Materials	1/May/2015	2191-2203
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H. Husby, O. E. Kongstein, A. Oedegaard, F. Seland	International Journal of Hydrogen Energy	13/Jan/2014	951–957
A. Orsi, O.E. Kongstein, P.J. Hamilton, A. Oedegaard, I.H. Svenum, K. Cooke	Journal of Power Sources	1/Jul/2015	530-537
Theo Elmer, Mark Worall, Shenyi Wu, Saffa B. Riffat	Applied Thermal Engineering	1/Nov/2015	1082-1089
Theo Elmer, Mark Worall, Shenyi Wu, Saffa B. Riffat	Renewable and Sustainable Energy Reviews	1/Feb/2015	913-931
Bin Zhu, Peter D. Lund, Rizwan Raza, Ying Ma, Liangdong Fan, Muhammad Afzal, Janne Patakangas, Yunjun He, Yufeng Zhao, Wenyi Tan, Qiu-An Hua	Advanced Energy Materials	1/Apr/2015	n/a-n/a

Project ID	Project acronym	Publication title
303454	TriSOFC	Electrochemical study of lithiated transition metal oxide composite for single layer fuel cell
303454	TriSOFC	Flower-like CeO2 microspheres coated with Sr2Fe1.5Mo0.5Ox nanoparticles for an advanced fuel cell
303454	TriSOFC	Synthesis of Ba0.3Ca0.7Co0.8Fe0.2O3-δ composite material as novel catalytic cathode for ceria-carbonate electrolyte fuel cells
303454	TriSOFC	Fabrication of electrolyte-free fuel cell with Mg0.4Zn0.6O/Ce0.8Sm0.2O2-δ–Li0.3Ni0.6Cu0.07Sr0.03O2-δ layer
303454	TriSOFC	Time-dependent performance change of single layer fuel cell with Li0.4Mg0.3Zn0.3O/Ce0.8Sm0.2O2-δ composite
303454	TriSOFC	Functional semiconductor-ionic composite GDC–KZnAl/LiNiCuZnOx for single-component fuel cell
303454	TriSOFC	Understanding the electrochemical mechanism of the core-shell ceria-LiZnO nanocomposite in a low-temperature solid oxide fuel cell
303454	TriSOFC	Study on GDC-KZnAl composite electrolytes for low-temperature solid oxide fuel cells
303454	TriSOFC	Synthesis of hierarchically porous LiNiCuZn-oxide and its electrochemical performance for low-temperature fuel cells
303454	TriSOFC	Microstructure and catalytic activity of Li0.15Ni0.25Cu0.3Zn0.3O2-δ-Ce0.8Sm0.2O1.9-carbonate nanocomposite materials functioning as single component fuel cell
303454	TriSOFC	A commercial lithium battery LiMn-oxide for fuel cell applications
303454	TriSOFC	Ceria-carbonate composite for low-temperature solid oxide fuel cell: Sintering aid and composite effect
303454	TriSOFC	Recent development of ceria-based (nano)composite materials for low-temperature ceramic fuel cells and electrolyte-free fuel cells
303454	TriSOFC	A new energy conversion technology based on nano-redox and nano-device processes
303454	TriSOFC	Electrochemical study of lithiated transition metal oxide composite as symmetrical electrode for low temperature ceramic fuel cells
303454	TriSOFC	Development of high-performance anode supported solid oxide fuel cell
303454	TriSOFC	Novel electrolytes for solid oxide fuel cells with improved mechanical properties
303454	TriSOFC	Novel electrolytes for solid oxide fuel cells with improved mechanical properties
303454	TriSOFC	Effects of electrolyte pattern on mechanical and electrochemical properties of solid oxide fuel cells
303454	TriSOFC	Measurement of the temperature distribution in a large solid oxide fuel cell short stack
303454	TriSOFC	Design and fabrication of stair-step-type electrolyte structure for solid oxide fuel cells
303454	TriSOFC	Electrochemical behaviour and sulfur tolerance of VxMo(1-x)Oy as solid oxide fuel cell anode
303454	TriSOFC	Effects of ceramic based pastes on electrochemical performance of solid oxide fuel cells
303454	TriSOFC	Effects of anode fabrication parameters on the performance and redox behavior of solid oxide fuel cells

	Main author	Title of the periodical	Publication date	Relevant pages
	Huiqing Hu, Qizhao Lin, Afzal Muhammad, Bin Zhu	Journal of Power Sources	1/Jul/2015	388-393
	Yanyan Liu, Yongfu Tang, Zhaohui Ma, Manish Singh, Yunjuan He, Wenjing Dong, Chunwen Sun, Bin Zhu	Scientific Reports	8/Jul/2015	11946
	Muhammad Afzal, Rizwan Raza, Shangfeng Du, Raquel Bohn Lima, Bin Zhu	Electrochimica Acta	1/Oct/2015	385-391
	Huiqing Hu, Qizhao Lin, Zhigang Zhu, Bin Zhu, Xianrong Liu	Journal of Power Sources	1/Feb/2014	577-581
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	Bin Zhu, Liangdong Fan, Yufeng Zhao, Wenyi Tan, Dingbang Xiong, Hao Wang	RSC Advances	1/Jan/2014	9920
	Liangdong Fan, Ying Ma, Xiaodi Wang, Manish Singh, Bin Zhu	Journal of Materials Chemistry A	1/Jan/2014	5399
	Ying Ma, Manish Singh, Xiaodi Wang, Fan Yang, Qiuan Huang, Bin Zhu	International Journal of Hydrogen Energy	1/Oct/2014	17460-17465
	Yufeng Zhao, Yunjuan He, Liangdong Fan, Jing He, Ding-Bang Xiong, Faming Gao, Bin Zhu	International Journal of Hydrogen Energy	1/Aug/2014	12317-12322
	Cai Pan, Wenyi Tan, Jiangang Lu, Bin Zhu	International Journal of Hydrogen Energy	1/Nov/2014	19140-19147
	Bin Zhu, Liangdong Fan, Yunjun He, Yufeng Zhao, Hao Wang	Materials Letters	1/Jul/2014	85-88
	Mingming Chen, Hongjuan Zhang, Liangdong Fan, Chengyang Wang, Bin Zhu	International Journal of Hydrogen Energy	1/Aug/2014	12309-12316
	Liangdong Fan, Chengyang Wang, Mingming Chen, Bin Zhu	Journal of Power Sources	1/Jul/2013	154-174
	Bin Zhu, Peter Lund, Rizwan Raza, Janne Patakangas, Qiu-An Huang, Liangdong Fan, Manish Singh	Nano Energy	1/Nov/2013	1179-1185
	Liangdong Fan, Hongjuan Zhang, Mingming Chen, Chengyang Wang, Hao Wang, Manish Singh, Bin Zhu	International Journal of Hydrogen Energy	1/Aug/2013	11398-11405
	Bora Timurkutluk, Cigdem Timurkutluk, Mahmut D. Mat, Yuksel Kaplan	International Journal of Energy Research	1/Dec/2012	1383-1387
	Bora Timurkutluk, Selahattin Celik, Cigdem Timurkutluk, Mahmut D. Mat, Yuksel Kaplan	International Journal of Hydrogen Energy	1/Sep/2012	13499-13509
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	Bora Timurkutluk, Selahattin Celik, Serkan Toros, Cigdem Timurkutluk, Mahmut D. Mat, Yuksel Kaplan	Ceramics International	1/Sep/2012	5651-5659
	Selahattin Celik, Bora Timurkutluk, Mahmut D. Mat	International Journal of Hydrogen Energy	1/Aug/2013	10534-10541
	Yuksel Palaci, Bora Timurkutluk	International Journal of Energy Research	1/May/2013	631-637
	Berceste Beyribey, Bora Timurkutluk, Tuğrul Y. Ertuğrul, Çiğdem Timurkutluk, Mahmut D. Mat	Ceramics International	1/Aug/2013	7053-7061
	Abdullah Mat, Bora Timurkutluk, Cigdem Timurkutluk, Yuksel Kaplan	Ceramics International	1/Jul/2014	8575-8583
	Bora Timurkutluk, Mahmut D. Mat	Journal of Power Sources	1/Jul/2014	108-116

Project ID	Project acronym	Publication title	
303454	TriSOFC	Mechanical and electrochemical behavior of novel electrolytes based on partially stabilized zirconia for solid oxide fuel cells	
303454	TriSOFC	Strength evaluation of glass–ceramic composites containing yttria stabilized zirconia after thermal cycling	
303454	TriSOFC	The role of lamination conditions on electrochemical and mechanical performance of ceramic electrolytes for solid oxide fuel cells	
303454	TriSOFC	A performance prediction tool for solid oxide fuel cells after single redox cycle	
303454	TriSOFC	Synthesis of Ba0.3Ca0.7Co0.8Fe0.2O3-δ composite material as novel catalytic cathode for ceria-carbonate electrolyte fuel cells	
303461	LiquidPower	Fuel cell systems and hydrogen supply for early markets	
303466	IMMEDIATE	Mitigation of PEM fuel cell electrolyte degradation with metal oxide/nafion nanofiber interlayers	
303466	IMMEDIATE	Highly loaded carbon black supported Pt catalysts for fuel cells	
303466	IMMEDIATE	Fuel cell platinum catalysts supported onmediate surface area carbon black supports	
303466	IMMEDIATE	Development of tailored high-performance and durable electrocatalysts for advanced PEM fuel cells	
303466	IMMEDIATE	Synthesis of Pt/C fuel cell electrocatalysts: residual content of chlorine and activity in oxygen reduction	
303476	BeingEnergy	Ultra-selective low-temperature steam reforming of methanol over PdZn/ZnO catalysts – Influence of support defects on catalytic performance	
303476	BeingEnergy	Methanol steam reforming for hydrogen generation via membrane reactores: a review	
303476	BeingEnergy	H2 production by low-pressure methanol steam reforming in a dense Pd-Ag membrane reactor in co-current flow configuration: experimental and modelling analysis	
303476	BeingEnergy	Evaluation of silica membrane reactor performance for hydrogen production via methanol steam reforming: modelling study	
303476	BeingEnergy	H2 production in silica membrane reactor via methanol steam reforming: modelling and HAZOP analysis	
303476	BeingEnergy	Performance and long-term stability of Pd/PSS and Pd/Al2O3 membranes for hydrogen separation	
303476	BeingEnergy	Low-temperature methanol steam reforming kinetics over a novel CuZrDyAl catalyst	
303476	BeingEnergy	Study of different designs of methanol steam reformers: experiment and modelling	
303482	ARTEMIS	Pore-scale modelling of fluid flow through gas diffusion and catalyst layers for high-temperature proton exchange membrane (HT-PEM) fuel cells	
303482	ARTEMIS	Gas-dynamic and electro-chemical optimisation of catalyst layers in high temperature polymeric electrolyte membrane fuel cells	
303492	CathCat	Tuning the activity of Pt alloy electrocatalysts by means of the lanthanide contraction	

Main author	Title of the periodical	Publication date	Relevant pages
Selahattin Celik, Bora Timurkutluk, Serkan Toros, Cigdem Timurkutluk	Ceramics International	1/Aug/2015	8785-8790
Bora Timurkutluk, Yelda Ciflik, Hatice Korkmaz	Ceramics International	1/Jun/2015	6985-6990
Bora Timurkutluk	Ceramics International	1/Mar/2015	2057-2068
B. Timurkutluk, M. D. Mat	Fuel Cells	1/Feb/2015	71-89
Muhammad Afzal, Rizwan Raza, Shangfeng Du, Raquel Bohn Lima, Bin Zhu	Electrochimica Acta	1/Oct/2015	385-391
Kristina F Juelsgaard	Prologue	1/Jan/2016	51
1.M. Zaton, D. Jones, J. Rozière	ECS Transactions	11/May/2015	15–23
2.L. Kaluža, M. J. Larsen, M. Zdražil, D. Gulková, Z. Vít, O. Šolcová, K. Soukup, M. Koštejn, J. L. Bonde, L. Maixnerová, M. Odgaard	Catalysis Today	1/Nov/2015	375–383
3.L. Kaluža, M. J. Larsen, M. Zdražil, D. Gulková, M. Odgaard	Chemical Engineering Transactions	1/May/2015	913–918
4.M. J. Larsen, I. Jiménez Morales, S. Cavaliere, J. Zajac, D. J. Jones, J. Rozière, L. Kaluža, D. Gulková, M. Odgaard	International Journal of Hydrogen Energy	28/Jan/2016	submitted
5.L. Kaluža, M. J. Larsen, I. Jiménez Morales, S. Cavaliere, D. J. Jones, J. Rozière, A. Kallistová, P. Dytrych, D. Gulková, M. Odgaard	Electrocatalysis	1/Feb/2016	submitted
Katarzyna Morawa Eblagon, Patricia Heydorn Concepción, Hugo Silva, Adélio Mendes	Applied Catalysis B: Environmental	1/Aug/2014	316-328
A. Iulianelli, P. Ribeirinha, A. Mendes, A. Basile	Renewable and Sustainable Energy Reviews	1/Jan/2014	355-368
K. Ghasemzadeh, S. Liguori, P. Morrone, A. Iulianelli, V. Piemonte, A.A. Babaluo, A. Basile	International Journal of Hydrogen Energy	1/Jan/2013	16685–16697
K. Ghasemzadeh, P. Morrone, S. Liguori, A.A. Babaluo, A. Basile	International Journal of Hydrogen Energy	1/Jan/2013	16698–16709
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Liguori S., Iulianelli A., Dalena F., Pinacci P., Drago F., Broglia M., Huang Y., Basile A.	Membranes	1/Mar/2014	143–162
Hugo Silva, Cecilia Mateos-Pedrero, Paulo Ribeirinha, Marta Boaventura, Adelio Mendes	Reaction Kinetics, Mechanisms and Catalysis	1/Jun/2015	321-339
P. Ribeirinha, M. Boaventura, José Carlos B. Lopes, José M. Sousa, A. Mendes	International Journal of Hydrogen Energy	3/Dec/2014	19970–19981
Uktam R. Salomov, Eliodoro Chiavazzo, Pietro Asinari	Computers and Mathematics with Applications	1/Feb/2014	393-411
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M. Escudero-Escribano, P. Malacrida, M. H. Hansen, U. G. Vej-Hansen, A. Velazquez-Palenzuela, V. Tripkovic, J. Schiotz, J. Rossmeisl, I.E.L. Stephens, I.	Science	1/Apr/2016	73-76

Project ID	Project acronym	Publication title	
303492	CathCat	The enhanced activity of mass-selected PtxGd nanoparticles for oxygen electroreduction	
303492	CathCat	The effect of substrates at cathodes in low-temperature fuel cells	
303492	CathCat	Mixed-oxide Ti1-xWxO2 as support for (photo)-electrochemical processes	
303492	CathCat	Enabling direct H2O2 production through rational electrocatalyst design	
303492	CathCat	Electrocatalysis at palladium nanoparticles: effect of the support nitrogen doping on the catalytic activation of carbonhalogen bond	
303492	CathCat	Enhanced activity and stability of Pt–La and Pt–Ce alloys for oxygen electroreduction: the elucidation of the active surface phase	
303492	CathCat	Yttrium oxide/gadolinium oxide-modified platinum nanoparticles as cathodes for the oxygen reduction reaction	
303492	CathCat	Pd nanoparticles deposited on nitrogen-doped HOPG: new insights into the Pd-catalysed oxygen reduction reaction	
303492	CathCat	Towards the elucidation of the high oxygen electroreduction activity of Pt x Y: surface science and electrochemical studies of Y/Pt(111)	
303492	CathCat	Single and multiple doping in graphene quantum dots: unravelling the origin of selectivity in the oxygen reduction reaction	
303492	CathCat	Palladium nanoparticles supported on highly oriented pyrolytic graphite: preparation, reactivity and stability	
303492	CathCat	Metal-support interaction in platinum and palladium nanoparticles loaded on nitrogen-doped mesoporous carbon for oxygen reduction reaction	
303492	CathCat	Benchmarking Pt-based electrocatalysts for low-temperature fuel cell reactions with the rotating disk electrode: oxygen reduction and hydrogen oxidation in the presence of CO (review article)	
303492	CathCat	Electronic interaction between platinum nanoparticles and nitrogen-doped reduced graphene oxide: effect on the oxygen reduction reaction	
303492	CathCat	Thermally induced strains on the catalytic activity and stability of Pt-M 2 O 3 /C (M=Y or Gd) catalysts towards oxygen reduction reaction	
303492	CathCat	The effect of support on advanced Pt-based cathodes towards the oxygen reduction reaction: state of the art	
303492	CathCat	Multiple doping of graphene oxide foams and quantum dots: new switchable systems for oxygen reduction and water remediation	

Main author	Title of the periodical	Publication date	Relevant pages
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Jiwei Ma, Aurélien Habrioux, Nicolas Alonso-Vante	ChemElectroChem	3/Jan/2014	37-46
S. Mokrane-Soualah, A.S. Gago, A. Habrioux, N. Alonso-Vante	Applied Catalysis B: Environmental	1/Apr/2014	756-763
Samira Siahrostami, Arnau Verdaguer-Casadevall, Mohammadreza Karamad, Davide Deiana, Paolo Malacrida, Björn Wickman, María Escudero-Escribano	Nature Materials	17/Nov/2013	1137-1143
Lorenzo Perini, Christian Durante, Marco Favaro, Stefano Agnoli, Gaetano Granozzi, Armando Gennaro	Applied Catalysis B: Environmental	1/Jan/2014	300-307
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Yun Luo, Aurélien Habrioux, Laura Calvillo, Gaetano Granozzi, Nicolas Alonso-Vante	ChemPhysChem	21/Jul/2014	2136-2144
Wenbo Ju, Marco Favaro, Christian Durante, Lorenzo Perini, Stefano Agnoli, Oliver Schneider, Ulrich Stimming, Gaetano Granozzi	Electrochimica Acta	1/Sep/2014	89-101
T. P. Johansson, E. T. Ulrikkeholm, P. Hernandez-Fernandez, M. Escudero-Escribano, P. Malacrida, I. E. L. Stephens, I. Chorkendorff	Physical Chemistry Chemical Physics	1/Jan/2014	13718-13725
Marco Favaro, Lara Ferrighi, Gianluca Fazio, Luciano Colazzo, Cristiana Di Valentin, Christian Durante, Francesco Sedona, Armando Gennaro, Stefano Agnoli, Gaetano Granozzi	ACS Catalysis	2/Jan/2015	129-144
Wenbo Ju, Tine Brülle, Marco Favaro, Lorenzo Perini, Christian Durante, Oliver Schneider, Ulrich Stimming	ChemElectroChem	15/Apr/2015	547-558
Lorenzo Perini, Christian Durante, Marco Favaro, Valentina Perazzolo, Stefano Agnoli, Oliver Schneider, Gaetano Granozzi, Armando Gennaro	ACS Applied Materials and Interfaces	21/Jan/2015	1170-1179
Christoffer M. Pedersen, María Escudero-Escribano, Amado Velázquez-Palenzuela, Leif H. Christensen, Ib Chorkendorff, Ifan E.L. Stephens	Electrochimica Acta	1/Oct/2015	647-657
Jiwei Ma, Aurélien Habrioux, Yun Luo, Guadalupe Ramos-Sanchez, Laura Calvillo, Gaetano Granozzi, Perla B. Balbuena, Nicolas Alonso-Vante	Journal of Materials Chemistry A	1/Jan/2015	11891-11904
Yun Luo, Aurélien Habrioux, Laura Calvillo, Gaetano Granozzi, Nicolas Alonso-Vante	ChemCatChem	18/May/2015	1573-1582
Yun Luo, Nicolas Alonso-Vante	Electrochimica Acta	1/Oct/2015	108-118
M. Favaro, F. Carraro, M. Cattelan, L. Colazzo, C. Durante, M. Sambi, A. Gennaro, S. Agnoli, G. Granozzi	Journal of Materials Chemistry A	1/Jan/2015	14334-14347

Project ID	Project acronym	Publication title	
303492	CathCat	Nanostructured palladium tailored via carbonyl chemical route towards oxygen reduction reaction	
303492	CathCat	A synchrotron-based spectroscopic study of the electronic structure of N-doped HOPG and PdY/N-doped HOPG	
303492	CathCat	Comparison between the oxygen reduction reaction activity of Pd 5 Ce and Pt 5 Ce: the importance of crystal structure	
303492	CathCat	The electro-oxidation of formic acid on Pd nanoparticles: an investigation of size-dependent performance	
303492	CathCat	(Invited) Applications of ionic liquids in electrochemical energy conversion and storage	
303492	CathCat	Substrate effects on the catalytic centre of CoSe2 for oxygen reduction Reaction	
303492	CathCat	Chemical and electrochemical stability of nitrogen and sulphur-doped mesoporous carbons	
303492	CathCat	Enhanced oxygen reduction reaction stability on platinum nanoparticles photo-deposited on to oxide-carbon composites	
303492	CathCat	A highly efficient and stable oxygen reduction reaction on Pt/CeOx/C electrocatalyst obtained via a sacrificial precursor based on a metal-organic framework	
303492	CathCat	Depth probing of the hydride formation process in thin Pd films by combined electrochemistry and fibre-optics-based in-situ UV/vis spectroscopy	
303492	CathCat	An easy and cheap chemical route using a MOF precursor to prepare Pd–Cu electrocatalyst for efficient energy conversion cathodes	
303492	CathCat	Nitrogen and sulfur-doped mesoporous carbon as metal-free electrocatalysts for the in-situ production of hydrogen peroxide	
325268	CATAPULT	New eectrocatalysts with pyrolyzed siloxane matrix	
325268	CATAPULT	Microkinetic modelling of the oxygen reduction reaction at the Pt(111)/gas interface	
325275	Sapphire	Characteristion of PEM fuel cell degradation by polarization change curves	
325275	Sapphire	Proton exchange membrane fuel cell behavioral model suitable for prognostics	
325275	Sapphire	Reducing fuel cell degradation in micro combined heat and power systems	
325326	H2Sense	Developments in gas sensor technology for hydrogen safety	
325326	H2Sense	An assessment on the quantification of hydrogen releases through oxygen displacement using oxygen sensors	
325326	H2Sense	Evaluation of selectivity of commercial hydrogen sensors	

Main author	Title of the periodical	Publication date	Relevant pages
Y. Luo, J.M. Mora-Hernández, L.A. Estudillo-Wong, E.M. Arce-Estrada, N. Alonso-Vante	Electrochimica Acta	1/Aug/2015	771-778
M. Favaro, G.A. Rizzi, S. Nappini, E. Magnano, F. Bondino, S. Agnoli, G. Granozzi	Surface Science	21/Aug/2015	132-139
Vladimir Tripkovic, Jian Zheng, Gian Andrea Rizzi, Carla Marega, Christian Durante, Jan Rossmeisl, Gaetano Granozzi	ACS Catalysis	2/Oct/2015	6032-6040
Wenbo Ju, Roudabeh Valiollahi, Reza Ojani, Oliver Schneider, Ulrich Stimming	Electrocatalysis	10/Dec/2015	149-158
J. Ma, L. Seidl, W. Ju, E. Mostafa, L. Asen, S. Martens, U. Stimming, O. Schneider	ECS Transactions	15/Aug/2014	407-423
M. U. Sreekuttan, J. M. Mora-Hernandez, Y. Luo, N. Alonso-Vante	ECS Transactions	11/Feb/2015	1-9
Valentina Perazzolo, Emilia Grądzka, Christian Durante, Roberto Pilot, Nicola Vicentini, Gian Andrea Rizzi, Gaetano Granozzi, Armando Gennaro	Electrochimica Acta	1/Feb/2016	???
Luis Alberto Estudillo-Wong, Yun Luo, Jesús Adrián Díaz-Real, Nicolas Alonso-Vante	Applied Catalysis B: Environmental	1/Jun/2016	291-300
Yun Luo, Laura Calvillo, Carole Daiguebonne, Maria K. Daletou, Gaetano Granozzi, Nicolas Alonso-Vante	Applied Catalysis B: Environmental	1/Jul/2016	39-50
Björn Wickman, Mattias Fredriksson, Ligang Feng, Niklas Lindahl, Johan Hagberg, Christoph Langhammer	Physical Chemistry Chemical Physics	1/Jan/2015	18953-18960
Yun Luo, Luis Alberto Estudillo-Wong, Laura Cavillo, Gaetano Granozzi, Nicolas Alonso-Vante	Journal of Catalysis	1/Jun/2016	135-142
Valentina Perazzolo, Christian Durante, Roberto Pilot, Andrea Paduano, Jian Zheng, Gian Andrea Rizzi, Alessandro Martucci, Gaetano Granozzi, Armando Gennaro	Carbon	1/Dec/2015	949-963
C. Harms, M. Adam, K. A. Soliman, M. Wilhelm, L. A. Kibler, T. Jacob, G. Grathwohl	Electrocatalysis	1/Jul/2014	301-309
Donato Fantauzzi, Tianwei Zhu, Jonathan E. Mueller, Ivo A. W. Filot, Emiel J. M. Hensen, Timo Jacob	Catalysis Letters	1/Jan/2015	451-457
Dario Bezmalinovic, Boris Simic, Frano Barbir	Journal of Power Sources	1/Oct/2015	82-87
Elodie Lechartier, Elie Laffly, Marie-Cécile Péra, Rafael Gouriveau, Daniel Hissel, Noureddine Zerhouni	International Journal of Hydrogen Energy	1/Jul/2015	8384-8397
Federico Zenith	IFAC Proceedings Volumes (IFAC-PapersOnline)	1/Jan/2015	445-450
T. Hübert, L. Boon-Brett, V. Palmisano, M.A. Bader	International Journal of Hydrogen Energy	1/Dec/2014	20474-20483
W.J. Buttner, R. Burgess, C. Rivkin, M.B. Post, L. Boon-Brett, V. Palmisano, P. Moretto	International Journal of Hydrogen Energy	1/Dec/2014	20484-20490
V. Palmisano, L. Boon-Brett, C. Bonato, F. Harskamp, W.J. Buttner, M.B. Post, R. Burgess, C. Rivkin	International Journal of Hydrogen Energy	1/Dec/2014	20491-20496

Project ID	Project acronym	Publication title	
325326	H2Sense	Assessment of commercial micro-machined hydrogen sensors performance metrics for safety sensing applications	
325326	H2Sense	Selectivity and resistance to poisons of commercial hydrogen sensors	
325329	FireComp	Determination of the tensile residual properties of a wound carbon/epoxy composite first exposed to fire	
325329	FireComp	On the Influence of the sample absorptivity when studying the thermal degradation of materials	
325357	H2TRUST	Hydrogen safety risk assessment methodology applied to a fluidized bed membrane reactor for autothermal reforming of natural gas	
325383	BioRobur	High-throughput assessment of catalyst stability during autothermal reforming of model biogas	
325383	BioRobur	Deactivation mechanism of Ni supported on Mg-Al spinel during autothermal reforming of model biogas	
325383	BioRobur	LCA evaluation for the hydrogen production through the innovative BioRobur project concept	
325383	BioRobur	Early-stage oxidation behaviour at high temperatures of SiSiC cellular architectures in a porous burner	
325383	BioRobur	Biogas robust processing with combined catalytic reformer and trap. Part 1: catalysts and support design	
325383	BioRobur	Biogas robust processing with combined catalytic reformer and trap. Part 2: tests on demonstration plant	
325383	BioRobur	Techno-economic analysis of green hydrogen production from biogas autothermal reforming	
671470	DEMOSOFC	Sulfur poisoning in Ni-anode solid oxide fuel cells (SOFCs): deactivation in single cells and a stack	
671470	DEMOSOFC	Biogas trace compound removal with ashes using proton transfer reaction time-of-flight mass spectrometry as innovative detection tool	
671470	DEMOSOFC	Limiting factors for planar solid oxide fuel cells under different trace compound concentrations	
671470	DEMOSOFC	Evaluation of the Wheeler-Jonas parameters for biogas trace compounds removal with activated carbons	
671470	DEMOSOFC	A comparative study of two SOFC-based cogeneration systems fed by municipal solid waste by means of either the gasifier or digester	

Main author	Title of the periodical	Publication date	Relevant pages
H. El Matbouly, F. Domingue, V. Palmisano, L. Boon-Brett, M.B. Post, C. Rivkin, R. Burgess, W.J. Buttner	International Journal of Hydrogen Energy	1/Mar/2014	4664-4673
V. Palmisano, E. Weidner, L. Boon-Brett, C. Bonato, F. Harskamp, P. Moretto, M.B. Post, R. Burgess, C. Rivkin, W.J. Buttner	International Journal of Hydrogen Energy	1/Mar/2015	online
T. H. Y. Quach, A. Benelfellah, B. Batiot, D. Halm, T. Rogaume, J. Luche, D. Bertheau	Journal of Composite Materials	21/Mar/2016	na
Pascal Boulet, Damien Brissinger, Anthony Collin, Zoubir Acem, Gilles Parent	Materials	1/Aug/2015	5398-5413
N. Psara, M. Van Sint Annaland, F. Gallucci	International Journal of Hydrogen Energy	1/Jun/2015	under review
M. Luneau, Y. Schuurman, F. C. Meunier, C. Mirodatos, N. Guilhaume	Catalysis Science and Technology	1/Jan/2015	4390-4397
Mathilde Luneau, Elia Gianotti, Frédéric C. Meunier, Claude Mirodatos, Eric Puzenat, Yves Schuurman, Nolven Guilhaume	Applied Catalysis B: Environmental	1/Apr/2017	289-299
S. Pris Hernandez Ribullon, F.Battista, S.Bensaid, B. Ruggeri, D. Fino	International Journal of Hydrogen Energy	1/Apr/2017	Manuscript No. HE-D-16-01536
A. Ortona	Ceramics International	1/Apr/2017	CERI-D-16-03767R2
All BioRobur Partners	International Journal of Hydrogen Energy	1/Apr/2017	*
All BioRobur Partners	International Journal of Hydrogen Energy	1/Apr/2017	*
All BioRobur Partners	Clean Technologies and Environmental Policy	1/Apr/2017	CTEP-S-16-00757-2
Papurello D., Lanzini A., Fiorilli S., Smeacetto F., Singh R., Santarelli M.	Chemical Engineering Journal	1/Jan/2016	pp. 1224-1233
Papurello D., Tomasi L., Silvestri S., Belcari I., Santarelli M., Smeacetto F., Biasioli F.	Fuel Processing Technology	1/May/2016	62-75
Papurello D., Lanzini A., Drago D., Leone P., Santarelli M.	Energy	15/Jan/2016	67-78
Papurello D., Tomasi L., Silvestri S., Santarelli M.	Fuel Processing Technology	1/Nov/2016	93-101
Yari M., Mehr A.S., Mahmoudi S.M.S., Santarelli M.	Energy	1/Nov/2016	586-602

ANNEX 4
Patents from projects

The list of PATENTS related to both FCH JU and FCH 2 JU projects is provided here[34].

Project call identifier	Project ID	Project acronym	Application reference	Applicants	Subject title
FCH-JU-2008-1	244821	ASSENT	EP11006485.4-2119	R. Deja, R. Peters, L. Blum, Forschungszentrum Jülich GmbH	Festoxid-Brennstoffzellen-System sowie Verfahren zum Betreiben eines solchen – Solid Oxide Fuel Cell System and Method for Operating the Same
FCH-JU-2008-1	244821	ASSENT	FI 20105697	Wärtsilä Finland Oy, ownership transferred to Convion Oy 14.1.2013	Control arrangement and method in fuel cell system
FCH-JU-2008-1	244821	ASSENT	FI 20106241	Wärtsilä Finland Oy, ownership transferred to Convion Oy 14.1.2013	Method and control arrangement for a fuel cell device
FCH-JU-2008-1	244821	ASSENT	FI 20116281	Wärtsilä Finland Oy, ownership transferred to Convion Oy 14.1.2	Method and arrangement for controlling water content of cell anode gas
FCH-JU-2008-1	244821	ASSENT	FI 20125147	Wärtsilä Finland Oy, ownership transferred to Convion Oy 14.1.2013	Method and arrangement for utilising recirculation for high temperature fuel cell system
FCH-JU-2008-1	244821	ASSENT	PCT/FI2012/050405	Wärtsilä Finland Oy, ownership transferred to Convion Oy 14.1.2013	Method and arrangement for determining enthalpy balance of a fuel cell system
FCH-JU-2008-1	244821	ASSENT	PCT/FI2012/050407	Wärtsilä Finland Oy, ownership transferred to Convion Oy 14.1.2013	Method and arrangement for determining enthalpy change of a fuel cell system
FCH-JU-2009-1	256764	Asterix3	EP12171563	HTceramix S.A.	Gas distribution element for a fuel cell
FCH-JU-2009-1	256764	Asterix3	EP12171565	HTceramix S.A.	Gas distribution element with a supporting layer
FCH-JU-2009-1	256764	Asterix3	EP12171566	HTceramix S.A.	A gas flow dividing element
FCH-JU-2012-1	325268	CATAPULT	GB15158694	Johnson Matthey Fuel Cells, Centre National de la Recherche Scientifique Université Montpellier	Oxygen reduction reaction catalyst
FCH-JU-2011-1	303492	CathCat	WO2015144894	Centre National de la Recherche Scientifique (C.N.R.S.)	Nanaoparticles based on platinum and a rare earth oxide, and the methods for the production thereof
FCH-JU-2009-1	256627	CATION	EP2719447A1	Yves De Vos; Freddy Wollants; Jean-Paul Hubert Janssens	Combined heat exchanging and fluid mixing apparatus
FCH-JU-2009-1	256627	CATION	FI20115307	Wärtsilä Finland Oy	A heating method and arrangement for enhanced heating of a high temperature fuel cell device

34 The table has been built from the patents query in the CORDA database for FP7 projects, neither of the two H2020 projects (H2ME and DEMOSOFC) having submitted an interim report by 31 December 2016 having reported any patents.

FCH-JU-2010-1	279075	CoMETHy	EP121599989	STAMICARBON	Method and system for the production of hydrogen
FCH-JU-2008-1	245156	DEMMEA	GR 20110100058 A	ADVENT S.A., University of Patras, FORTH/ICE-HT	Cross-linked or non-cross-linked aromatic copolymeric proton-conducting electrolytes for polymeric membrane fuel cells
FCH-JU-2008-1	245156	DEMMEA	US2012202129	Advent Technologies (GR)	Crosslinked or non-cross-linked aromatic (co)polymers as proton conductors for use in high temperature PEM fuel cells
FCH-JU-2011-1	303472	EDEN	WO2013186417	CIDETE	Electrical generator for exploiting heat reservoirs using a ring-based thermoelectric system
FCH-JU-2011-1	300081	ELECTROHY-PEM	PCTGB2014051370	ITM Power Ltd	Additive to prevent degradation of polymer membranes - free radical resistant materials
FCH-JU-2008-1	245224	HYDRO-SOL-3D	US 2011/0135566 A1	Martin Roeb, Christian Sattler, Peter-Michael Rietbrock, Ruth Küster, Athanasios G. Konstandopoulos, Christos Agrafiotis, Lamark De Oliveira, Mark Schmitz	Gas/solid phase reaction
FCH-JU-2011-1	303446	IMPALA	1550497	Yohann Thomas, Anass Benayad, Arnaud Morin, Joël Pauchet, Maxime Schroder	Procédé de greffage d'un substrat en carbone, et utilisation de ce substrat dans une pile à combustible
FCH-JU-2011-1	303446	IMPALA	DE1020142135559	Rüdiger Schweiss	Membranelektrodeneinheit
FCH-JU-2011-1	303446	IMPALA	reference	Yohann Thomas, Marie Heitzmann, Joël Pauchet	procédé de traitement hydrophobe d'un substrat en carbone
FCH-JU-2011-1	303446	IMPALA	reference	Indro Biswas, Mathias Schulmze	Verfahren zur Strukturierung von Gasdiffusionsschichten in Brennstoffzellen
FCH-JU-2008-1	245202	IRAFC	GR20110100058 A	ADVENT S.A., University of Patras, FORTH/ICE-HT	Cross-linked or non-cross-linked aromatic copolymeric proton-conducting electrolytes for polymeric membrane fuel cells
FCH-JU-2008-1	245202	IRAFC	US2012/0202,129	ADVENT S.A., University of Patras, FORTH/ICE-HT	Crosslinked or non-cross-linked aromatic (co)polymers as proton conductors for use in high temperature PEM fuel cells
FCH-JU-2010-1	278674	LASER-CELL	GB12084828	AFC Energy PLC	Fuel cells (laser-sintered GDL)
FCH-JU-2010-1	278674	LASER-CELL	WO2014174303	AFC Energy PLC	(EN) Fuel cell (FR) Pile à combustible
FCH-JU-2010-1	278674	LASER-CELL	WO2015033123	AFC Energy PLC	(EN) Fuel cells, electrodes, and method of manufacture (FR) Piles à combustible, électrodes et procédé de fabrication

FCH-JU-2010-1	278257	METSAPP	EP2808932	Haldor Topso8e A/S	Metal-supported solid oxide cell
FCH-JU-2010-1	278257	METSAPP	EP2830127	Haldor Topso8e A/S	Air electrode sintering of temporarily sealed metal-supported solid oxide cells
FCH-JU-2009-1	256768	RAMSES	ITVR20130200	SOFCPower SPA	Method for depositing a layer of material on a metallic support for fuel cells or electrolysis cells
FCH-JU-2009-1	256768	RAMSES	ITBO2014A000267	AEA - Loccioni	Method for size control and surface inspection of a fuel cell, and corresponding control apparatus
FCH-JU-2010-1	278732	RESelyser	PCTEP2012053376	Doyen, Willy; Alvarez Gallego, Yolanda; B-2160 Wommelgem (BE)Alvarez Gallego, Yolanda; B-2000 Antwerpen (BE)	Novel separator, an electrochemical cell therewith and use thereof therein
FCH-JU-2012-1	325275	Sapphire	WO2016059203	Stiftelsen Sintef	Control of an electrochemical device with integrated diagnostics, prognostics and lifetime management
FCH-JU-2009-1	256653	SSH2S	DE102012100875A1	I.Utz, M. Linder	Verfahren zur Speicherung von Wasserstoff und Wasserstoffspeichervorrichtung
FCH-JU-2011-1	303445	StackTest	PL414321	Wojciech Tokarz, Piotr Piela	Method for stopping work of a fuel cell fuelled with a gaseous fuel
FCH-JU-2011-1	299732	UNIfHY	102016000033240	Bocci Enrico, Di Carlo Andrea, Foscolo Pier Ugo, Università degli Studi Guglielmo Marconi	Internal circulating dual bubbling fluidised bed gasifier
FCH-JU-2011-1	299732	UNIfHY	BRPI0810731	PALL Corp.	Gasification apparatus and method for generating syngas from gasifiable feedstock material
FCH-JU-2011-1	299732	UNIfHY	US8562701	Pall Corporation	Gasification apparatus and method for generating syngas from gasifiable feedstock material

ANNEX 5
Scoreboard of Horizon 2020 common KPIs[35]

H2020 priority	H2020 KPI number	Key Performance Indicator	Type of data required	Results, Horizon 2020 to date (calls 2014-2016/31 December 2016)
INDUSTRIAL LEADERSHIP	12	SME - Share of participating SMEs introducing innovations new to the company or the market (covering the period of the project plus three years)	Number of SMEs that have introduced innovations	3[36]
	13	SME - Growth and job creation in participating SMEs	Turnover of company, number of employees	Some data was reported by the 2 projects having submitted an interim report by 31 December 2016, however data needs to be verified and completed
SOCIETAL CHALLENGES	14	Publications in peer-reviewed high-impact journals	Publications from relevant funded projects (DOI: Digital Object Identifiers); Journal impact benchmark (ranking) data to be collected by commercially available bibliometric databases	5[36]
	15	Patent applications and patents awarded in the area of the JTI	Patent application number	0[36]
	16	Number of prototypes testing activities and clinical trials[1]	Reports on prototypes, and testing activities, clinical trials	0[36]
	17	Number of joint public-private publications in projects	Properly flagged publications data (DOI) from relevant funded projects	n/a (flagging does not appear to be implemented)
	18*	New products, processes, and methods launched on the market	Project count and drop-down list enabling the type processes, products and methods to be selected	0[36]

35 KPIs and Indicators that correspond to those approved by DG RTD are presented with a white background in the tables. They are aligned to what has been discussed between the Common Support Centre and the JUs. KPIs and monitoring indicators in tables which do not correspond to those approved by DG RTD are presented with a green background in the tables.

36 Obtained by manually looking in the two interim reports already submitted for H2020 (H2ME and DEMOSOFC).

H2020 priority	H2020 KPI number	Key Performance Indicator	Type of data required	Results, Horizon 2020 to date (calls 2014-2016/31 December 2016)
EVALUATIONS	NA	TTI all applicants of the outcome of the evaluation of their application from the final date for submission of completed proposals	Number and % of information letters sent to applicants within target Average TTI (calendar days) Maximum TTI (calendar days)	114
	NA	Redress after evaluations	Number of redresses requested	11
GRANTS	NA	TTG (average) from call deadline to signature of grants	Number and % of grants signed within target Average TTG in calendar days Maximum TTG in calendar days	84 % within TTG, avg TTG = 25[37]
	NA	Time to sign GAs from the date of informing successful applicants (information letters)	Number and % of grants signed within target Average TTG in calendar days Maximum TTG in calendar days	TTS min. 92 days TTS max. 281 days[37]
PAYMENTS	NA	TTP (% made on time) - pre-financing - interim payment - final payment	To optimise the payments circuits, both operational and administrative, including payments to experts	Pre-financing: 100 % on time No interim/final payments for operational expenses
HR	NA	Vacancy rate (%)	% of posts filled, composition of the JU staff	3.8 %[38]
JU EFFICIENCY	NA	Budget implementation/ execution: 1. % CA to total budget 2. % PA to total budget	Realistic yearly budget proposal, possibility to monitor and report on its execution, both in commitment (CA) and payments (PA), in line with sound financial management principle	CA: 92 % of the available appropriations until 2016 included PA: 96 % of the available payment appropriations until 2016 included
	NA	Administrative budget: Number and % of total of late payments	Realistic yearly budget proposal, possibility to monitor and report on its execution in line with sound financial management principle	2016: 63 late payments (8 % of the total invoices paid for administrative costs)

37 The figures report on calls 2014-2016, bearing in mind that by 31 December 2016 three projects from the 2016 call had not yet been signed, the figure is not definitive.

38 At 31 December 2016, one CA post at grade FG IV remained vacant, from a total of 26 TAs and CAs.

ANNEX 6

Indicators for monitoring cross-cutting issues[35]

NUMBER	DEFINITION/RESPONDING TO QUESTION	TYPE OF DATA REQUIRED	AAR 2016 (CALLS 2014-2016)[39]
2.1	Total number of participations by EU-28 Member States	Nationality of Horizon 2020 applicants and beneficiaries (number of)	1392 participations, 778 participants from EU-28 at submission; 453 participations, 288[39] participants from EU-28 at grant
2.2	Total amount of EU financial contribution by EU-28 Member States (EUR millions)	Nationality of Horizon 2020 beneficiaries and corresponding EU financial contribution	In EUR per country[39]: AT 16 917 643.82 - BE 5 320 851.75 - BG 190 500 - CZ 905 456.25 - DE 95 507 429.1 - DK 13 332 479.5 - EE 200 750 - EL 2 803 900 - ES 8 814 749.5 - FI 9 056 300 - FR 37 237 594.68 - HR 380 000 - HU 21 000 - IT 21 270 733.14 - LT 130 530.28 - LV 2 725 978.75 - MT 32 999 - NL 6 944 781.35 - PL 21 000 - PT 416 085 - RO 21 000 - SE 510 3028.68 - SI 572 856.25 - UK 50 990 519.45 - Grand Total 278 918 166.5
NA	Total number of participations by Associated Countries	Nationality of Horizon 2020 applicants and beneficiaries (number of)	78 participations, 52 participants from Associated Countries at submission; 16[39] participations, 11[39] participants from Associated Countries at grant
NA	Total amount of EU financial contribution by Associated Country (EUR millions)	Nationality of Horizon 2020 beneficiaries and corresponding EU financial contribution	In EUR per country: IS (390470) NO (6680995.75) Total (7071465.75)
3.1	Share of EU financial contribution going to SMEs (Enabling & industrial tech and Part III of Horizon 2020)	Number of Horizon 2020 beneficiaries flagged as SMEs	SME participations[39]: 130/493 (26.3 %) SME participants[39]: 79/312 (25.3%) SME funding[39]: EUR 77 640 274.89/EUR 285 989 632.25[39] (27.1 %)
6.1	Percentage of women participants in Horizon 2020 projects	Gender of participants in Horizon 2020 projects	Women participations[39]: 73/458 (16 %)
6.2	Percentage of women project coordinators in Horizon 2020	Gender of MSC fellows, ERC principle investigators and scientific coordinators in other Horizon 2020 activities	Women coordinators[39]: 12/49 (24 %)
6.3	Percentage of women in EC advisory groups, expert groups, evaluation panels, individual experts, etc.	Gender of memberships in advisory groups, panels, etc.	Scientific Com. 2/9 (22 %) on 31/12/2016 SRG: 8/27 (30 %) on 31/12/2016 Evaluators: 23/116 (20 %)
7.1	Share of third-country participants in Horizon 2020	Nationality of Horizon 2020 beneficiaries	22 participations, 13 participants from third countries at grant
7.2	Percentage of EU financial contribution attributed to third country participants	Nationality of Horizon 2020 beneficiaries and corresponding EU financial contribution	0
	Share of projects and EU financial contribution allocated to Innovation Actions (IAs)	Number of IA proposals and projects properly flagged in the WP; follow up at grant level.	No: 11[39] /49[39] (22 %) Funding: EUR 174 308 398.19[39]/EUR 285 989 632.25[39] (61 %)

39 The values include 49 projects including 3 projects from call 2016 that are not yet signed at 31.12.2016 but that are at an advanced stage of preparation.

NUMBER	DEFINITION/RESPONDING TO QUESTION	TYPE OF DATA REQUIRED	AAR 2016 (CALLS 2014-2016)[39]
	Within the innovation actions, share of EU financial contribution focused on demonstration and first-of-a-kind activities	Topics properly flagged in the WP; follow-up at grant level	Na – none of the FCH JU projects had such a flag
NA	Scale of impact of projects (High Technology Readiness Level	Number of projects addressing TRL[2] between ...(4-6, 5-7	Based on TRL specified in the topic (project start)[39] TRL <3: 1 topic - 1 grants; TRL 3: 12 topics - 10 grants; TRL 3-4: 3 topics - 2 grants; TRL 4: 17 topics - 12 grants; TRL 4-5: 1 topic - 3 grants; TRL 5: 4 topics - 4 grants; TRL 4-6: 1 topics - 0 grants; TRL 5-6: 1 topic - 1 grants; TRL 6: 5 topics - 1 grant; TRL >6: 1 topic - 0 grants; TRL 7: 6 topics - 4 grants; TRL 6-7: 5 topics - 5 grants; TRL >7: 1 topics - 1 grant; n/a: 8 topics - 5 grants (cross-cutting projects);
11.1	Percentage of Horizon 2020 beneficiaries from the private-for-profit sector	Number of and % of the total Horizon 2020 beneficiaries classified by type of activity and legal status	Participations: 306/493 (62 %) Participants[39]: 205/312 (66%)
11.2	Share of EU financial contribution going to private-for-profit entities (Enabling & industrial tech and Part III of Horizon 2020)	Horizon 2020 beneficiaries classified by type of activity; corresponding EU contribution	EUR 230 570 751.9/EUR 285 989 632.25 (81 %)[39]
12.1	EU financial contribution for PPP (Art 187)	EU contribution to PPP (Art 187)	For the period 2014-2016: CA: EUR 314 681 576 PA: EUR 79 523 006
12.2	PPPs leverage: total amount of funds leveraged through Art. 187 initiatives, including additional activities, divided by the EU contribution	Total funding made by private actors involved in PPPs - in-kind contribution already committed by private members in project selected for funding - additional activities (i.e. research expenditures/investment of industry in the sector, compared to previous year)	Committed contribution from N.ERGHY and Hydrogen Europe members (IKOP): EUR 142 290 314 35[40] IKAA: EUR 393 600 000 (including certified amount for the period July 2014-December 2015 and estimated value for 2016) IKOP and IKAA divided by the EC contribution (EUR 244 990 447.25) give a leverage effect of 2.19
13.3	Dissemination and outreach activities other than peer-reviewed publications – conferences, workshops, press releases, publications, flyers, exhibitions, trainings, social media, websites, communication campaigns (e.g. radio, TV)]	A drop-down list enables selection of the type of dissemination activity. Number of events, funding amount and number of people reached thanks to the dissemination activities	Based on manual extraction for 2 projects having already reported: 1 website, 1 Twitter account, 1 Facebook account, 1 LinkedIn group, 1 video, 1 slideshare, 4 press releases, 3 newsletters, 1 brochure, 4 posters, 1 newspaper interview, 20 presentations at conferences or seminars, 2 exhibitions, 1 trade fair, 1 vehicle handover ceremony, 1 HRS opening ceremony
14.2	Proposal evaluators by country	Nationality of proposal evaluators	Austria (2), Belgium (2), Finland (2), France (11), Germany (18), Greece (8), Hungary (2), Ireland (1), Italy (12), Lithuania (1), Netherlands (1), Portugal (5), Spain (19), Sweden (2), United Kingdom (10), Turkey (2), India (5), Switzerland (2), United States (11)
14.3	Proposal evaluators by organisations' type of activity	Type of activity of evaluators' organisations	Type of activity: No of expert participations (%), calls 2014-2016: • Higher education: 34 (29 %) • Public research: 9 (8 %) • Public, non-research: 4 (3 %) • Private research: 18 (15 %) • Private companies: 10 (9 %) • Consultancies: 21 (18 %) • Other or not categorised: 21 (18 %)

NUMBER	DEFINITION/RESPONDING TO QUESTION	TYPE OF DATA REQUIRED	AAR 2016 (CALLS 2014-2016)[39]
NA	Participation of RTO[3]s and universities in PPPs (Art 187 initiatives)	Number of RTO participations in funded projects and % of the total	89/493 (18 %)
		Number of participations from universities in funded projects and % of the total	62/493 (16 %)
		% of budget allocated to RTOs and to Universities	RTO - 31 650 820.06 (11 %) HES - 14 718 524.55 (5 %)
NA	The objective is to ensure that the research projects funded are compliant with provisions on ethics efficiently	% of proposals not granted because of non-compliance with ethical rules/ proposals invited to grant (target 0 %); time to ethics clearance (target 45 days)[4]	n/a
NA	Error rate	% of common representative error; % residual error	n/a: first audits on H2020 projects in 2017
NA	Implementation of ex-post audit results	Number of cases implemented; in total €million; ´of cases implemented/total cases	n/a

40 Refers to calls 2014-2015 and the 16 projects signed until 31 December 2016 from the 2016 call.

ANNEX 7
Scoreboard of KPIs specific to FCH 2 JU

#	Key Performance Indicator	Results
1	Share of the funds allocated to the following research activities: - renewable energy - end-user energy efficiency - smart grids - storage	Renewable energy: EUR 24 260 537.49 (9 %) End-user energy efficiency: EUR 84 325 098.05 (29 %) Smart grids: EUR 31 039 760 (11 %) Storage: EUR 1 494 780 (0.5 %)
2	Demonstrator projects hosted in MSs and regions benefiting from EU Structural Funds	The FCH 2 JU is making good progress towards the KPI of having demonstrator projects hosted in MS and regions benefiting from EU Structural Funds: projects HyBalance and JIVE use additional funding schemes in parallel with that of the FCH 2 JU

ANNEX 8
Draft annual accounts

BALANCE SHEET

		EUR '000
	31.12.2015	31.12.2014
NON-CURRENT ASSETS		
Intangible assets	2	1
Property, plant and equipment	52	44
Pre-financing	58 313	64 790
	58 367	**64 834**
CURRENT ASSETS		
Pre-financing	52 330	55 011
Exchange receivables and non-exchange recoverables	21 945	19 225
	74 275	**74 236**
TOTAL ASSETS	**132 642**	**139 071**
CURRENT LIABILITIES		
Payables and other liabilities	(176 809)	(190 667)
Accrued charges and deferred income	(59 029)	(82 131)
	(235 838)	**(272 799)**
TOTAL LIABILITIES	**(235 838)**	**(272 799)**
NET ASSETS		
Contribution from members	763 386	567 213
Accumulated deficit	(700 941)	(535 600)
Economic result of the year	(165 640)	(165 341)
NET ASSETS	**(103 196)**	**(133 728)**

STATEMENT OF FINANCIAL PERFORMANCE

		EUR '000
	2016	2015
REVENUE		
Revenue from non-exchange transactions		
Recovery of expenses	2808	3107
Other	37	41
Total	**2846**	**3148**
Revenue from exchange transactions		
Financial income	2	2
Other exchange revenue	17	0
Total	**19**	**2**
	2864	**3150**
EXPENSES		
Operating costs	(164 066)	(164 168)
Staff costs	(2552)	(2485)
Finance costs	(103)	(0)
Other expenses	(1783)	(1837)
	(168 505)	**(168 491)**
ECONOMIC RESULT FOR 2016	**(165 640)**	**(165 341)**

ANNEX 9
Materiality criteria

The **'materiality'** concept provides the ED with a basis for assessing the importance of the weaknesses/risks identified and thus whether those weaknesses should be subject to a formal reservation to his declaration.

When deciding whether something is material, **qualitative and quantitative** terms have been considered.

In **qualitative** terms, when assessing the significance of any weakness, the following factors have been taken into account:

- The nature and scope of the weakness;
- The duration of the weakness;
- The existence of compensatory measures (mitigating controls which reduce the impact of the weakness);
- The existence of effective corrective actions to correct the weaknesses (action plans and financial corrections) which have had a measurable impact.

In **quantitative** terms, in order to make a judgement on the significance of a weakness, the potential maximum (financial) impact is quantified.

Whereas the FCH JU control strategy is of a multi-annual nature (i.e. the effectiveness of the JU's control strategy can only be assessed at the end of the programme, when the strategy has been fully implemented and errors detected have been corrected), the ED is required to sign a declaration of assurance for each financial year. In order to determine whether to qualify his declaration of assurance with a reservation, the effectiveness of the JU's control system has to be assessed, not only for the year of reference, but more importantly, with a multi-annual outlook.

The **control objective** for FCH JU is to ensure that the '**residual error rate**', i.e. the level of errors which remain undetected and uncorrected, does not exceed 2 % by the end of the JU's programme. Progress towards this objective is to be (re)assessed annually, in view of the results of the implementation of the *ex-post* audit strategy. As long as the residual error rate is not (yet) below 2 % at the end of a reporting year within the programme life cycle, a reservation would (still) be made. Nevertheless, apart from the residual error rate, the ED may also take into account other management information at his disposal to identify the overall impact of a weakness and determine whether or not it leads to a reservation.

If an adequate calculation of the residual error rate is not possible, for reasons not involving control deficiencies, the consequences are to be assessed quantitatively by estimating the likely exposure for the reporting year. The relative impact on the declaration of assurance would then be considered by analysing the available information on qualitative grounds and considering evidence from other sources and areas (e.g. information available on error rates in more experienced organisations with similar risk profiles).

Considering the crucial role of *ex-post* audits within the JU's control system, its effectiveness needs to check whether the scope and results of the *ex-post* audits carried out are sufficient and adequate to meet the control objectives.

EFFECTIVENESS OF CONTROLS

The **starting point** to determine the effectiveness of the controls in place is the 'representative error rate' expressed as a percentage of errors in favour of the FCH JU detected by *ex-post* audits measured with respect to the amounts accepted after *ex-ante* controls.

According to the FCH JU *ex-post* audit strategy approved by the GB, the representative error rate will be based on the simple average error rate (AER) for a stratified population, from which a judgemental sample has been drawn according to the following formula:

$$AER\% = \frac{\Sigma\,(err)}{n} = RepER\%$$

Where:

Σ (err) = sum of all individual error rates of the sample (in %). Only the errors in favour of the JU will be taken into consideration.

n = sample size

Second step: calculation of **residual error rate**:

To take into account the impact of the *ex-post* controls, this error level is to be adjusted by subtracting:

- errors detected and corrected as a result of the implementation of audit conclusions;
- errors corrected as a result of the extrapolation of audit results to non-audited contracts with the same beneficiary.

This results in a residual error rate, which is calculated by using the following formula:

$$RepER\% = \frac{(RepER\% * (P-A) - (RepERsys\% * E)}{P}$$

Where:

ResER% = residual error rate, expressed as a percentage.

RepER% = representative error rate, or error rate detected in the representative sample, in the form of the AER, expressed as a percentage and calculated as described above (AER%).

RepERsys% = systematic portion of the RepER% (the RepER% is composed of complementary portions reflecting the proportion of 'systematic' and 'non-systematic' errors detected) expressed as a percentage.

P = total amount in EUR of the auditable population.

A = total of all audited amounts, expressed in EUR.

E = total non-audited amounts of all audited beneficiaries. This will comprise the total amount, expressed in EUR, of all non-audited validated cost statements for all audited beneficiaries, excluding those beneficiaries for which an extrapolation is ongoing.

This calculation will be performed on a point-in-time basis, i.e. all the figures will be provided as of a certain date.

ADEQUACY OF THE AUDIT SCOPE

The quantity and adequacy of the audit effort carried out is to be measured by comparing the actual audits to the target audit coverage.

ANNEX 10
List of acronyms

AAR	Annual activity report
ABAC	Accrual-based accounting
AER	Average error rate
ARES	Advanced REcord System
AWP	Annual Work Plan
CA	Commitment appropriations
CAPEX	Capital expenditure
CAS	Common Audit Service
CEF	Connecting Europe Facility
CFS	Certificate of Financial Statements
CHP	Combined heat and power
CORDA	Common Research Data Warehouse
COSO	Committee of Sponsoring Organizations of the Treadway Commission
CSC	Common Support Centre
DG	Directorate-General
DG BUDG	Directorate-General for the Budget
DG ENV	Directorate-General for the Environment
DG RTD	Directorate-General for Research and Innovation
EC	European Commission
ECA	European Court of Auditors
ED	Executive Director
EMI	Experts management tool
EP	European Parliament

ESR	Evaluation summary report
ESS	Electronic submission system
EU	European Union
EUSEW	European Sustainable Week
FCH 2 JU	Fuel Cells and Hydrogen 2 Joint Undertaking
FO	Financial officer
FP7	Seventh Framework Programme
FTE	Full-time equivalent
GA	Grant Agreement
GB	Governing Board
H2020	Horizon 2020
HR	Human resources
HRS	Hydrogen refuelling station
IAS	Internal Audit Service
ICS	Internal control standard
IG	Industry Grouping
IKAA	In-kind Contributions in Additional Activities
IKOP	In-kind Contributions in Operational Activities
IPHE	International Partnership for the Hydrogen Economy
IT	Information technology
ITF	International Transport Forum
JRC	Joint Research Centre
JTI	Joint Technology Initiative
JU	Joint undertaking
KPI	Key Performance Indicator
MAIP	Multi-Annual Implementation Plan
MAWP	Multi-Annual Work Programme

MEA	Membrane electrode assembly
MGA	Model Grant Agreement
MoU	Memorandum of Understanding
MS	Member State
MW	Megawatt
N.ERGHY	New European Research Grouping on Fuel Cells and Hydrogen
PA	Payment appropriation
PEM	Proton exchange membrane
PEME	Proton exchange membrane electrolyser
PNR	Pre-normative research
PO	Programme office
PPP	Public-Private Partnership
PRD	Programme Review Days
RCS	Regulation Code and Standards
RE	Renewable energy
RG	Research Grouping
RTD	Research and technological development
SC	Scientific Committee
SCG	Strategy Coordination Group
SET Plan	Strategic Energy Technology Plan
SF	Stakeholder Forum
SME	Small and medium-sized enterprise
SOE	Solid oxide electrolysis
SOFC	Solid oxide fuel cell
SPOC	Single point of contact
SRG	States Representatives Group
SYSPER	SYStème de gestion du PERsonnel

TRL	Technology readiness level
TTG	Time to grant
TTI	Time to inform
TTP	Time to pay
TTS	Time to sign
UK	United Kingdom
US	United States
VPN	Virtual private network

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