ANNEX to GB decision no FCH-GB-2020-11

FUEL CELLS and HYDROGEN 2 JOINT UNDERTAKING

(FCH 2 JU)

2021

ANNUAL WORK PLAN and BUDGET

NOTICE

For UK [*for grants*: applicants] [*for procurement*: candidates or tenderers]: Please be aware that following the entry into force of the EU-UK Withdrawal Agreement* on 1 February 2020 and in particular Articles 127(6), 137 and 138, the references to natural or legal persons residing or established in a Member State of the European Union are to be understood as including natural or legal persons residing or established in the United Kingdom. UK residents and entities are therefore eligible to participate under this call.

* Agreement on the withdrawal of the United Kingdom of Great Britain and Northern Ireland from the European Union and the European Atomic Energy Community

In accordance with the Statutes of the FCH 2 JU annexed to Council Regulation (EU) No 559/2014 and with Article 33 of the Financial Rules of the FCH 2 JU.

The annual work plan will be made publicly available after its adoption by the Governing Board.

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2. INTRODUCTION

This document establishes the eight Annual Work Plan (AWP) of the Fuel Cell and Hydrogen 2 Joint Undertaking (FCH 2 JU), outlining the scope and details of its operational and horizontal activities for the year 2021.

FCH 2 JU is a public-private partnership focusing on the objective of accelerating the commercialization of fuel cell and hydrogen technologies. FCH 2 JU was setup, within the Horizon 2020 Framework programme, as a Joint Undertaking by Council Regulation N° 559/2014[1]. Its aim is to contribute to the Union's wider competitiveness goals and leverage private investment by means of an industry-led implementation structure. The European Commission (EC) has identified renewable and low carbon hydrogen[2] as an energy carrier that can both diversify supply sources, decarbonise the energy system and integrate high shares of renewables sources.

Hydrogen storage solutions were first acknowledged[3] as an important energy storage option for developing an affordable and efficient energy market, facilitating the integration of variable renewable energy sources. The role of hydrogen as a solution that can decarbonise the EU gas network and increase security of supply was highlighted in the proposed update of the EU Gas Directive[4]. The important role of hydrogen for the integration of renewable energy sources is emphasized in the revised Renewables Energy Directive (RED II)[5], establishing a binding EU target of at least 32% for 2030. RED II calls Member States to establish a methodology for guarantees of origin of renewable gases (including hydrogen) and consequently certification system.

In December 2018, Member States have also submitted their draft integrated National Climate and Energy Plans (NECPs)[6] for the period 2021-2030. Several of them were already mentioning hydrogen as a crucial energy carrier to decarbonise their entire economy. This was confirmed both with the final NECPs submitted in 2020, but also with a number of national hydrogen strategies that were published, and keep being published, by the Member States. A study[7] performed for FCH 2 JU analyses all NECPs and concludes that major opportunities for hydrogen appear already before 2030, with the large-scale deployment of renewable and low-carbon hydrogen expected to take off as of 2030.

Similarly for the transport sector, the “Clean Mobility Package” proposed more stringent CO2 emission standards for new passenger cars and vans, accelerating the transition to low- and zero-emission vehicles. In particular, the first-ever EU-wide CO2 emission standards for heavy-duty vehicles, adopted in 2019[8], set targets for reducing the average emissions from new lorries for 2025 and 2030. At the same time, it identified hydrogen infrastructure as one of the main solutions and part of the trans-European deployment of Alternative Fuels Infrastructure. In 2018 there was a global agreement for the first time within International Maritime Organisation on targets to reduce the greenhouse gas emissions of the maritime transport by a minimum of 50% by 2050 and phase-out completely before the end of the century. This represents a substantial challenge and the possibility of using fuel cells, together with hydrogen or other zero carbon fuels, as a very promising energy source for large-scale shipping.

At international level, during Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal. The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by limiting global warming to

[1] OJ L 169/108 of 7.6.2014

[2] COM(2020) 301 final “A hydrogen strategy for a climate-neutral Europe”- https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0301

[3] https://ec.europa.eu/energy/sites/ener/files/documents/swd2017_61_document_travail_service_part1_v6.pdf

[4] https://ec.europa.eu/info/news/commission-proposes-update-gas-directive-2017-nov-08_en

[5] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.328.01.0082.01.ENG&toc=OJ:L:2018:328:TOC

[6] https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/governance-energy-union/national-energy-climate-plans

[7] https://www.fch.europa.eu/publications/opportunities-hydrogen-energy-technologies-considering-national-energy-climate-plans

[8] https://ec.europa.eu/clima/policies/transport/vehicles/heavy_en

2°C *"…and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius".* European Commission published in November 2018 its 2050 Long-term Strategy[9] calling for a climate-neutral Europe by 2050 (COM (2018) 773). The strategy analysed different pathways for achieving this goal, concluding that all carbon-free or low carbon energy carriers, including low carbon hydrogen, will be necessary to achieve the ambitious climate neutrality goal of Europe by 2050.

In December 2019 the President of the European Commission presented the European Green Deal[10], a new growth strategy for Europe aiming to transform the Union into a modern, resource-efficient and competitive economy. In the core of the European Green Deal lies the need to fight climate change. On March 2020, a European Climate Law was proposed by the Commission, capturing the climate-neutrality objective in EU law. At the same time, it underlined the need to review the Union's targets for 2030 and define a trajectory compatible with the climate neutrality objective by 2050. To this end, the Commission adopted on September 2020 the 2030 Climate Target Plan[11], proposing the increase of the greenhouse gas emissions reduction ambition for 2030, from 40% to by at least 55%, setting Europe on a cost-effective path for climate neutrality by 2050.

In July 2020 the Commission adopted the Energy System Integration Strategy[12] and Hydrogen Strategy[13]. Together they aim to address a vision on how to accelerate the transition towards a more integrated and clean energy system, in support of a climate neutral economy. The Energy System Integration Strategy addresses the planning and operation of the energy system "as a whole", across multiple energy carriers, infrastructures, and consumption sectors. The Strategy sets out 40 actions to implement the necessary reforms, including the promotion of renewable and low-carbon fuels, including hydrogen, for sectors that are hard to decarbonise.

The Hydrogen Strategy aims to create an enabling environment to scale up renewable and low carbon hydrogen supply and demand for a climate-neutral economy. It also tries to address the issue that the majority of hydrogen production is today fossil-based, as low-carbon hydrogen is not yet cost-competitive. To achieve this, the strategy outlines a number of key actions and presents three strategic phases in the timeline up to 2050.

Building on the Commission's New Industrial Strategy for Europe[14] and the Recovery Plan for Europe[15], the Strategy sets out a vision of how the EU can turn hydrogen into a viable solution to decarbonise different sectors over time. Most notably, it sets the ambitious goal of installing at least 6 GW of renewable hydrogen electrolysers in the EU by 2024 and 40 GW of renewable hydrogen electrolysers by 2030.

In line with all the policy developments described above, it is crucial that the FCH 2 JU continues to support its existing projects and develop technology solutions that will help materialise the benefits of hydrogen (in particular, R&I for renewable hydrogen while low-carbon hydrogen solutions being supported by other EU programmes) and fuel cell technologies in support of the high level EU policy agenda. The present Annual Work Plan 2021 of the Fuel Cells and Hydrogen 2 Joint Undertaking will continue to support such solutions, in line with all the FCH 2 JU objectives as listed in Council Regulation 559/2014 of 6 May 2014:

1. Reduce the production cost of fuel cell systems to be used in transport applications, while increasing their lifetime to levels which can compete with conventional technologies;
2. Increase the electrical efficiency and the durability of the different fuel cells used for power production to levels which can compete with conventional technologies, while reducing costs;

[9] https://ec.europa.eu/clima/policies/strategies/2050
[10] European Green Deal Communication. COM(2019) 640 final.
[11] 2030 Climate Target Plan Communication. COM(2020) 562 final.
[12] Strategy for Energy System Integration. COM(2020) 299 final.
[13] A Hydrogen Strategy for a climate neutral Europe. COM(2020) 301 final.
[14] New Industrial Strategy for Europe. COM(2020) 102 final.
[15] Europe's moment: Repair and Prepare for the Next Generation. COM(2020) 456 final.

3. Increase the energy efficiency of production of hydrogen mainly from water electrolysis and renewable sources while reducing operating and capital costs, so that the combined system of the hydrogen production and the conversion using fuel cell system can compete with the alternatives for electricity production available on the market;
4. Demonstrate on a large scale the feasibility of using hydrogen to support integration of renewable energy sources into the energy systems, including through its use as a competitive energy storage medium for electricity produced from renewable energy sources;
5. Reduce the use of the EU defined 'Critical raw materials", for instance through low-platinum or platinum-free resources and through recycling or reducing or avoiding the use of rare earth elements.

2. ANNUAL WORK PLAN YEAR 2021

3.1 Executive Summary

The Annual Work Plan 2021 for the FCH 2 JU continues the work initiated in previous years concerning the development of a research and innovation programme aligned with the objectives set in Council Regulation 559/2014 of 6 May 2014.

As the FCH 2 JU has already committed most of its budget through its annual calls for proposals (2014-2020), in 2021 there is no substantial budget to further commit and therefore no call for proposals. However, a very limited budget, left either from previous calls or from recoveries during the entire programme implementation, may be available for prospective studies which will complement the current activities but also further prepare the ground for the future Clean Hydrogen partnership, and which will be implemented through procurements (see section 3.2.H. Operational Procurements).

In addition, work will continue on the different operational activities along the follow-up and implementation of the budget committed in previous years, and to ensure that the support activities to operations provided by the Programme Office facilitates the proper management of H2020 and FP7 funds, according to the principles laid out in the financial guidelines.

Communication and outreach activities will ensure that stakeholders are duly informed about the activities and results of the FCH 2 JU, raising the FCH 2 JU Programme's profile and highlighting technology potential and market readiness.

In anticipation of the proposed Clean Hydrogen partnership under Horizon Europe[16], which will replace and build on the existing FCH 2 JU, discussions have started and will continue in 2021 to support the European Commission in this preparatory work, such as on the Multi-Annual Work-Plan, MAWP 2021-2017 (based on the Strategic Research and innovation Agenda, SRIA proposed by the industry partners[17]).

[16] https://ec.europa.eu/info/horizon-europe/european-partnerships-horizon-europe/candidates-climate-energy-and-mobility_en#:~:text=European%20Partnership%20on%20Clean%20Hydrogen,and%20fully%20integrated%20energy%20system.

[17] https://hydrogeneurope.eu/clean-hydrogen-europe

3.2 Operations

Objectives & indicators - Risks & mitigations

Techno-economic objectives

The techno-economic objectives laid out in the Multi-Annual Work Plan (MAWP) 2014-2020[18] are addressed in this AWP through the follow-up of the signed grant agreements from previous AWPs.

Key Performance Indicators (KPIs):

FCH 2 JU follows the objectives and technical targets defined in the MAWP. These are integrated in the ongoing projects/grant agreements.

A list of indicators (see Annex) was developed by the European Commission services; the indicators are grouped into 3 categories as follows:

- Horizon 2020 Key Performance Indicators[19] common to all JUs;
- Indicators for monitoring H2020 Cross-Cutting Issues [20] common to all JUs;
- Key Performance Indicators specific to FCH 2 JU;

Risk Assessment

In the annual risk assessment exercise, conducted in October 2020, the following significant risks (medium level of residual risk) & responses to those risks in terms of action plans were identified:

	Risk Identified	Action Plan
MEDIUM	Due to limitation of H2020 ex-ante controls (trust-based approach with minimum amount of default checks), representative error rate for FCH 2 JU may increase. Consequently, there is a risk of obtaining a qualified opinion and of not getting the discharge from the European Parliament due to fact that the Court of Auditors' threshold for a residual representative error rate stays at the level of 2%. (NB: H2020 ex-ante control strategy envisaged level of the residual error rate in the range between 2-5%)	Annual analytical risk – assessment at the beneficiary level and subsequent introduction of the targeted ex-ante controls for the projects / beneficiaries with higher identified inherent risk. Application of the feedback from ex-post audits and lessons learnt on ex-ante controls, e.g. from accompanying auditors in the missions for FCH audits. Continuation of interactive financial webinars for complex projects or where there are numerous newcomers in the consortia in the first 12 months of the project duration. Additional review of potential financial risks within FCH 2 JU top beneficiaries, followed up by bilateral telco's.

[18] http://www.fch.europa.eu/page/multi-annual-work-plan
[19] Based on Annex II - Council Decision 2013/743/EU
[20] Based on Annex III - Council Decision 2013/743/EU

MEDIUM	Due to COVID-19, to ensure business continuity, FCH 2 JU is highly dependent on safe and proper functioning of the IT tools and network connection, which become increasingly vulnerable to potential cyberattacks, performance inefficiencies and connection failures due to increased traffic, different level of security connection and increased levels of pirate attacks and phishing. Unknown weaknesses in the systems may pose higher risks of failures of the operations, and also they may create opportunities for fraudulent behaviour.	Mitigating actions include raising awareness of staff and mechanisms to prevent attacks including the following: - Improved ex-ante and ex-post security systems controls for automated attacks; - Increased the level of controls were implemented with CERT-EU; Increased level of security and advanced protection were adopted; Training and awareness sessions for increased security measures should be put in place further.
MEDIUM	Risk that program objectives will not be achieved fully and timely due to delays in project execution attributed to COVID-19.	Mitigating actions are in place for monitoring of any delays in the project, restructuring of the projects, if necessary, granting project extension in average of 6 months due to COVID-19 via amendment process.
MEDIUM	Risk of disruption of the operations in case substantial amount of people would be infected by COVID-19 virus, combined with a risk of staff disengaging from the culture of the organization.	Adequate back-up systems are in place, coaching sessions and regular virtual team meetings are in place.

The FCH 2 JU monitors closely the fulfilment of the action plan and reports on it in its Annual Activity Report.

Scientific priorities & challenges

In order to achieve its objectives, the FCH 2 JU will continue to follow-up the signed grants from calls 2014-2020, including work to reinforce the European supply chain of critical key components by e.g. a higher range of common/standardised parts to be produced in EU and H2020 Associated Countries, and to enable start investments in production facilities for further ramp-up in these markets.

International collaboration with countries under the International Partnership of Hydrogen into the Economy (IPHE)[21] is continuously encouraged in the supported grants. Collaboration with developing world countries supported by the Climate Technology Centre & Network (CTCN) under the UN Environment Programme[22] is also encouraged. In particular, cooperation within RENEWABLE AND CLEAN HYDROGEN INNOVATION CHALLENGE[23] under Mission Innovation (Accelerating the Clean Energy Revolution) is foreseen (see section 3.2.G below).

In addition, further openness towards markets in the EU13 countries should be continued and dedicated activities with participants from those countries or regions are continued through the FCH 2 JU work with regions such as Project Development Assistance.

For proper technology monitoring and progress against state-of-art, but also to identify how each of the projects contribute to reaching the targets and indicators set by the MAWP 2014-2020, supported projects will report on an annual basis in the FCH 2 JU secure online data collection platform (TRUST), according to template questionnaire(s) relevant to the project content (and the technology development and TRL). This should be integrated as specific annual deliverable in the grant agreement. The template questionnaires can be consulted online (http://www.fch.europa.eu/projects/knowledge-management), subject to modifications due to technology development and/or change in projects portfolio.

[21] https://www.iphe.net/
[22] https://www.ctc-n.org/
[23] http://mission-innovation.net/our-work/innovation-challenges/hydrogen-challenge/

List of actions

For the implementation of the Work Plan, the following actions will be taken in 2021:

A. Call for proposals 2021

There is no call for proposals to be launched in 2021.

B. Collaboration with JRC – Rolling Plan 2021

The Commission's Joint Research Centre (JRC) undertakes high quality research in the field of fuel cells and hydrogen that is of considerable relevance to the implementation of the FCH 2 JU activities. During the FP7 period, cooperation between the JRC and FCH JU was structured under a Framework Agreement that covered support activities which JRC provided in-kind to FCH JU, as well as possible funded JRC participation to FCH JU projects.

For the Horizon 2020 period, a Framework Contract between FCH 2 JU and JRC was approved by the Governing Board on 23/12/2015, including Rolling Plan 2016 as its annex, and was signed by both parties on 18/02/2016. Contrary to the situation under FP7, involvement of JRC in FCH 2 JU funded projects outside Horizon 2020 Rules for Participation is not possible. The scope of the Framework Contract therefore covers the activities that JRC will provide at the level of the FCH 2 JU programme free of charge and against payment from the FCH 2 JU operational budget. In line with the JRC mission, these support activities will primarily contribute to formulation and implementation of the FCH 2 JU strategy and activities in the areas of support to standardisation and technology monitoring and assessment. In addition, the Programme Office may call upon JRC to perform testing as a service to FCH 2 JU, providing added value to programme objectives by complementing activities of FCH 2 JU funded projects.

For the year 2021, a maximum budget of 1 million euros from the FCH 2 JU operational budget is foreseen.

The JRC support activities to the FCH 2 JU programme covered by the Framework Contract are discussed and agreed on an annual basis between the JRC and the Programme Office, with involvement of representatives of Hydrogen Europe and Hydrogen Europe Research.

The annual Rolling Plan 2021 (based on the similar plans approved and executed from 2016 onwards), constitutes part of this work-plan and describes the annual activities and their related deliverables provided by JRC to FCH 2 JU (heading B of Article 2 in the Framework Contract) against payment. Additional activities which JRC performs without payment (heading A in Article 2) are not listed in this document. They consist of activities within international collaborations as well as in support of programme definition and implementation.

B.1 JRC support to formulation and implementation of RCS strategy

Section 4.1 of the MAWP 2014-2020 requires the set-up and operation of a Regulations, Codes and Standards (RCS) Strategy Coordination (RCS SC) group led by industry, and specifies that "… JRC will assist the RCS Group and the PO in their RCS task". In general, RCS activities should consist of identifying and prioritising RCS needs of strategic importance for the EU. In addition, the necessary PNR activities to support the RCS priorities should be identified. Another important issue is the transfer and ensured application of the projects' PNR results into RCS development. A strategy to pursue the priority RCS issues should be developed.

In supporting the European Commission with related preparatory work for the Clean Hydrogen partnership, the approach to RCS strategy and organisation of the RCS group will be revised. In 2021 JRC will assist in preparing for this transition, taking into consideration the results of the legislative process. JRC will contribute to a definition and implementation of a new approach, building on the impact of the group already achieved under the H2020. A key result of the efforts during H2020 is the now stronger link between FCH 2 JU PNR projects and the standardisation development occurring outside the frame of the FCH 2 JU. It is now important to further strengthen this link, in order to increase impact. This can be done through annual strategic prioritisation of the PNR/RCS needs, which should be performed jointly by all stakeholders. JRC will contribute to this activity.

B.2. JRC direct contribution to implementing RCS strategy

To provide inter-project comparable results and to facilitate assessment of technology progress without compromising on IPR issues, FCH 2 JU formed working groups lead by JRC, aiming at harmonisation of the various testing protocols and procedures. The harmonised tests should be consented to by industry and enable a consistent performance assessment.

In the period 2017-2018, JRC has designed and manufactured a reference test cell hardware for PEM fuel cells the ZERO∇CELL, a single cell test hardware aiming at minimising the effect of the testing device on the overall test results. Since 2019, JRC has extensively tested the hardware, and has made the design of the ZERO∇CELL hardware available to relevant European projects and stakeholders. JRC will continue to provide technical support and assistance to individual users on request. In addition, upon request and within the limits of its own resources, JRC foresees validation testing for performance assessment and harmonised testing protocols and procedures as part of the testing harmonisation multi-annual plan.

The FCH 2 JU working group on test harmonisation for high temperature water electrolysis (HTE) applications, supported by the JRC, has finalised the terminology report. The final multiannual results of this harmonisation activity, in particular the HTE terminology document and the LTWE testing protocols, will be utilised for standardisation and their implementation to further standardise hydrogen technologies at ISO TC 197 and IEC TC105, as appropriate. All work will take recent and ongoing standardisation efforts, such as those regarding reversible fuel cells, into account. According to the decision of the working group regarding the scope of work, efforts on the development of testing protocols for HTE will be started in 2021.

B.2.1 Support provided to the FCH community for the use of JRC ZERO∇CELL single cell test hardware for PEM fuel cells (including feedback from users). Annual activity report (December 2021)

B.2.2 Report on standardisation activities for electrolysers and reversible fuel cells (December 2021)

B.3 JRC contribution to programme monitoring and assessment

Technology benchmarking: In 2019, the JRC has begun a historical analysis of the performance of selected FCH JU projects against the overall Programme Targets, using, wherever possible, quantitative values and Key Performance Indicators (KPI) for assessment. The purpose of this exercise is to see how the programme has enhanced the state of the art for selected technologies and to identify potential gaps for their future development. This work is to continue also in 2021 for other technologies, following the 2019/2020 reports on electrolysis and stationary fuel cells. In addition, the JRC will track the evolution of selected key performance technological indicators throughout the running time of the FCH (2) JU programmes.

To allow for an assessment of European achievements against the international state-of-the-art, so-called 'reference data' also needs to be collected. In the past few years, JRC has delivered the reference data related to some priority technologies. In 2021, JRC will support the update of information on the international state-of-the-art for selected technologies, as well as gather new information, as requested, taking into account other ongoing efforts.

JRC will also provide input to the FCH JU towards the setting of appropriate KPIs for applications and technologies that do not have targets yet, and contribute to the development of a dedicated methodology.

B.3.1 Support to knowledge management through technology monitoring and assessment of the FCH JU project portfolio. Historical analysis reports on project portfolio of FCH JU and FCH 2 JU and on on-board hydrogen storage (December 2021)

B.3.2 Reporting on international technology status upon request, according to the agreed priority ranking. (December 2021)

Support to Programme Monitoring and Assessment by means of JRC tools: JRC.I.3 will develop and adapt to the needs of the FCH 2 JU two JRC general monitoring and analysis tools.

- The Europe Media Monitor (EMM) is a system for monitoring open source news information. The main purpose of EMM is to provide monitoring of a large set of electronic media, reducing the information flow to manageable proportions by clustering related news and categorising articles to derive further metadata. In 2018, JRC has tailored its generic EMM tool to the FCH 2 JU needs, by defining categories and developing ad-hoc filters. This customised EMM system is hosted and maintained at JRC Data Centre in Ispra and enables a custom newsletter template and an interface to provide data to the FCH 2 JU Web Portal that sends content to the list of FCH subscribers. In 2019, system validation has been completed and used. FCH 2 JU accessed the EMM platform to create and improve categories to improve the quality of the media coverage. During 2019, the new interface between the EMM system and the new FCH 2 JU web portal has been handed over to a new IT team coordinated by FCH 2 JU and was finalized in 2020. During 2021, the existing installation of the EMM platform customized for FCH-JU will be maintained, regularly updated and improved. Categories and filters defined in the system will be monitored and EMM will continue to provide assistance and training sessions to FCH 2 JU to further customize the system, to tailor it to the needs of the FCH-JU. EMM will deliver ad hoc periodic media monitoring selections and, on demand, ad-hoc statistics based on EMM media coverage.

- The JRC Tools for Innovation Monitoring (TIM) is a tool gathering scientific literature, patent data, news articles and data from R&D projects funded by the EU, aiming at monitoring and analyzing thematic or technological areas, tracking currently used or emerging technologies. The JRC is developing a FCH 2 JU-specific version of TIM to provide the FCH 2 JU with a system customised with features related specifically to its programme, such as tagging functions of FCH 2 JU beneficiaries. JRC will assess with FCH 2 JU whether this version can be further extended or adapted to be used for mining data from the TRUST database of FCH 2 JU. The mapping of technology fields (alkaline electrolysers/FC, H2 production methods, polymer electrolyte membrane FC/electrolysers and solid oxide FC/electrolysers, transport applications) will be further enhanced, with the additional provision of some data cleaning, in order to maximize accuracy of publishable results. Additional technology fields could be considered, such as hydrogen safety. Content delivery will proceed based on requests of the FCH 2 JU. New metrics based on publications and patents will also be suggested by FCH 2 JU and possibly developed in TIM.

B.3.3 Customized FCH media monitoring system European Media Monitor FCH EMM (December 2021)

B.3.4 Maintenance, operation and extension of FCH Technology Innovation Monitoring System FCH TIM (December 2021)

Programme Annual Review: As in previous years, JRC will perform a full programme review cycle for the year 2021, in the form of a report.

B.3.5 Update of methodology for the Programme Review, if needed, submitted for approval by PO (April 2021). This will consider the lessons learned from the 2020 PRD.

B.3.6 Draft report delivered before the Programme Review Days (PRD) 2021 (October 2021)

B.3.7 Final JRC report delivered for finalization & publication by PO (February 2022)

B.4 JRC contribution to assessment of sustainability of hydrogen and fuel cells

Sustainability aspects: One of the overarching objectives of the FCH 2 JU, as laid down in the MAWP 2014-2020, is to reduce the use of EU-defined 'critical raw materials'. More generally, this objective relates to the development of a circular economy. As a tool to support progress in this area, the FCH 2 JU has defined a Life-Cycle Assessment (LCA) methodology which is to be applied to its projects and products[24]. LCA is part of the FCH 2 JU strategy: "*it is expected that LCAs will be performed at both project and programme levels. The resulting Life Cycle Inventory (LCI) data sets will form a database, published as part of the ILCD Data Network, and maintained by the industry partners of the FCH 2 JU. The FCH 2 JU shall also establish an international exchange, thus providing for a globally consistent framework*."

In 2018, JRC has provided an inventory and gap analysis of the work performed in the various projects to the FCH 2 JU, focussing on LCA methodology. Based on the outcome of this analysis, a need for a harmonisation effort in the approach to LCA was identified, and a dedicated call topic was included in the AWP 2020. In 2021, JRC will support efforts for this harmonisation as undertaken by the project on this topic (contingent on funding of an LCA project from 2020 call).

In addition, JRC will assess the sustainability of various modes of hydrogen delivery, including the analysis of transport means and conversion of hydrogen to different carriers.

In 2021, the JRC will continue to assess the LCA deliverables of all ongoing projects and report to the FCH JU. JRC will also support the FCH JU in developing a strategy for data collection from projects and population of a LCI database with FCH technology data.

B.4.1 Report on JRC contributions to LCA methodology (contingent on there being a dedicated project) (December 2021)

B.4.2. Report on sustainability of hydrogen transport options (December 2021)

B.4.3. Report on LCA activities of the JRC (December 2021)

B.5 JRC contribution to safety, and safety awareness

Since the launching of the European Hydrogen Safety Panel (EHSP) (see the dedicated section in the MAWP 2014-2020), JRC activities related to hydrogen safety have been integrated in those of ESHP. These activities consisted in first instance in the maintenance and continuous population of the hydrogen accidents database HIAD2.0. In 2018-20 the EHSP has collected new events and delivered them to HIAD2.0, while JRC has performed their validation, by performing quality check, harmonising event descriptions and finally approving (or rejecting) the public sharing of the event. Since 2019, the EHSP has assessed the new data by statistical analyses and extracted lessons learnt. The operation and utilisation of the HIAD2.0 has naturally identified improvements needs, which will have to be implemented into the tool software structure. JRC contributes also to other EHSP activities.

The only activity which JRC performs outside the frame of the EHSP is the management, population and annual summary of the restricted-access database HELLEN (Hydrogen Events and Lesson LEarNed): HELLEN has the same structure as HIAD2.0, but contains the events (incidents or accidents) occurring during the execution of any FCH 2 JU project. There is a commitment to provide event description to HELLEN for all the FCH 2 JU projects. Access to HELLEN is limited only to selected staff of the FCH 2 JU and to the JRC-HIAD team, not the EHSP at large.

[24] See project FC-HyGuide (https://www.fch.europa.eu/page/cross-cutting-issues-0#H2FC-LCA)

Since 2020, JRC had to reduce and eventually phase-out its safety-related activities in the field of hydrogen technologies. In 2021, the operation of the databases and will be maintained, but in addition a solution for the re-location of the databases will be found and implemented.

B.5.1 HELLEN operation: HELLEN population with the events delivered by projects and annual report (December 2021)

B.5.2 Contribution to the EHSP activities, in particular for WP3, in the field of hydrogen safety, including co-writing of relevant reports (continuous).

B.5.3 Report on the population and validation work performed in HIAD2.0 in 2020-21, including a list of improvements needs (July 2021).

B.5.4 Due to the possible phasing out of JRC from this activity by the end of 2021, the two databases (structure and content) will be prepared for delivery to another operator (to be documented and agreed with Commission/FCH 2 JU in a report, December 2021).

***B.6 JRC testing activities in support to specific part of the programme**.*

This deliverable consists of providing testing services by means of JRC reference facilities and reference hardware, mainly to implement the harmonisation efforts mentioned in subsection B.2 above and to guarantee programme-level harmonisation of performance assessment. The type and the quantity of the testing service will depend on the execution of AWP's and PO requests. These testing activities are particularly relevant for low temperature and high temperature electrolysis harmonisation and standardisation. Testing for the validation of reported electrolyser efficiency values at cell level is possible at JRC labs, based on resource availability.

ESTIMATED RESOURCES:

(these are values reflecting approximately the true figures from the Cost Evaluation Form of the Framework Contract)

Deliverable number	Deliverable title	Effort [PM]	Costs [k€]
B.1	**Support to formulation and implementation of RCS strategy (RCS SC group)**	2	-
B.2	**Direct contribution to implementing RCS strategy (Harmonisation)**	6	-
B.3	**Contribution to programme monitoring and assessment**	23	-
B.4	**Assessment of sustainability**	12	-
B.5	**Support to safety aspects**	2	
B.6	*Testing in support to specific activities of the FCH 2 JU programme*	*Max 6*	-
	Manpower Totals [PM]	**51**	

	Overview indicative costs (with overhead) [k€]
Manpower	**600.0**

Missions	**40.0**
Consumables	**50.0**
Hardware (EMM/TIM, B.3.3 and B3.4)	**20.0**
Subcontract (for LCA expertise, B.4)	**60.0**
Subcontract (for maintenance of databases B.5)	**15.0**
Intra-muros consultants (for TIM and EMM, deliverables B.3.3 and B3.4)	**205.0**
Total indicative cost for 2021	**990.0**
Max amount per year	*1000*

Costs includes overhead costs = 25%

JRC will report on a regular basis (every month) on deliverables progress and meet the Programme Office every three months.

C. Regulations, Codes and Standards Strategy Coordination (RCS SC) Group

The establishment and implementation of a multi-annual Regulations, Codes and Standards strategy is crucial for the market deployment of FCH systems. The development of common regulations and codes, the harmonisation of standards, also carrying out PNR to address RCS knowledge gaps at EU (and world) level is recognised as something that would greatly facilitate the commercialization of hydrogen-based technologies. Inconsistent and conflicting regulations and standards will hinder the development of FCH technologies through lack of confidence from stakeholders (customers, authorities) and impair the reduction of costs linked to experience gained and economies of scale.

The overall goal of the RCS Strategy is to enable the development and application of any necessary safety and harmonized performance-based standards for FCH appliances and systems for energy and transport applications so that these standards can be referred to in legislation.

The RCS Strategy therefore aims to facilitate activities which will enable EU industry interests to be met, e.g. establishing compliance/certification criteria within the EC and United Nations (UN) regulatory framework; developing international and European standards that provide the technical requirements to achieve safety and build confidence; as well as to guide authorities and other stakeholders in their application.

The FCH 2 JU tackles RCS-related issues mainly through the Cross-cutting activities and for the RCS Strategy, an industry-led RCS SC Group was created in 2015 with the aim of addressing the needs of the EU FCH sector.

The RCS SC Group[25], consisting of representatives of organisations in the Hydrogen Europe and Hydrogen Europe Research groupings, supported by the European Commission's Joint Research Centre (JRC) and the FCH 2 JU Programme Office (PO), coordinates the strategy on RCS. The four main tasks of the RCS SC Group are to:

1. Identify and prioritise RCS needs of strategic importance for the EU, through following RCS developments, and updating and prioritizing RCS needs of the sector through a continuous global watch function;

2. Identify PNR activities to support the RCS priorities, tailor PNR and other RCS-related activities in the FCH 2 JU programme to ensure that safety issues and needs for standardization and regulation are appropriately addressed and validated;

3. Transfer and ensure application of the projects' PNR results into RCS development;

4. Define a strategy to pursue the priority RCS issues (including through use of projects results, as above).

The activities include interfacing with regulatory bodies (e.g. EC, UN), and international organizations for standardization (e.g. ISO, IEC, CEN, CENELEC) for development/amendment of international standards and regulations. To progress these tasks, through its members, the RCS SC group interacts with standardisation and regulatory bodies particularly by introducing EU interests into these bodies, and coordinating the attendance of EU representatives.

Since 2016, the RCS SC Group has identified and prioritised the main RCS needs of strategic importance for the EU and based on them, has provided recommendations of priority areas and specific topics within for incorporation into the FCH 2 JU Annual Work Plans. Furthermore, a strategy implementation plan has been developed and adopted to further define the tasks of the RCS SC Group.

In 2021, the RCS SC Group will continue with these activities, as laid out in its annual work plan, while redefining its structure/scope in view of forthcoming Clean Hydrogen Partnership related activities.

[25] https://www.fch.europa.eu/page/rcs-strategy-coordination-group

D. European Hydrogen Safety Panel (EHSP)

Hydrogen technologies are undergoing rapid expansion across multiple applications. Hydrogen technologies are now at a critical stage with massive growth predicted, but there are some aspects that need further improvements and safety along the whole hydrogen chain is paramount.

The FCH 2 JU launched the EHSP[26] initiative in 2017. The mission of the EHSP is to assist the FCH 2 JU both at programme and at project level in assuring that hydrogen safety is adequately managed, and to promote and disseminate H2 safety culture within and outside of the FCH 2 JU programme.

The EHSP is composed of a multidisciplinary pool of experts (e.g. 14 experts in 2020) grouped in ad-hoc working groups (task forces) according to the tasks to be performed and to their individual expertise. Collectively, the members of the EHSP have the necessary scientific competencies and expertise covering the technical domain needed to make science-based recommendations to the FCH 2 JU.

In terms of the future role of the EHSP, the EHSP will concentrate the effort in the following sections over 2021, per task force.

D.1 Support at project level

EHSP activities under this category (Task force) aim at coordinating a package of measures to avoid any accident by integrating safety learnings, expertise and planning into FCH 2 JU funded projects by ensuring that all projects address and incorporate the state-of-the-art in hydrogen safety appropriately. In 2021, the already published "Safety Planning Guidance"[27] document will be updated and its scope will be widened to a "Safety Management Guidance" document, covering not only planning but the overall management, reporting etc. Furthermore, the EHSP will perform Safety Plan Reviews – assessing the Safety Management of 3 to 5 critical running projects, and Safety Specific Sessions will be organized with sets of projects with similar applications coverage.

D.2 Support at programme level

EHSP works under this category (Task force) include a set of activities intrinsically linked with the activities of the previous task force but with a broader and cross-cutting dimension, focused on the FCH 2 JU programme itself and how safety-related aspects can be enhanced within the overall programme and activities. The main activity within this task force in 2021 will be the maintenance and updating of the strategic document for the Multi-Annual Work Plan for the EHSP. The document describes the activities of the EHSP within the hydrogen safety community as a framework until 2024. The document will provide a clear framework for the EHSP activities in the years to come. It is also foreseen to include actively support in developing areas like Aviation and Maritime. In addition, the international dissemination plan will be updated including links with homologue US Hydrogen Safety Panel, International Association HySafe (and related international activities such as Research Priorities Workshop, International Conference on Hydrogen Safety). More systematic cooperation with these two organisations is foreseen starting in 2021. Last, further development of emergency crisis management document (and links to 'crisis communication') will be also performed.

D.3 Data collection and assessment

As learning from others is an essential element of a high-level safety culture, activities in this category are centred on the collection and analysis of hydrogen safety-related data to derive lessons learned and provide further general recommendations to all stakeholders.

EHSP activities over 2021 will continue on the assessment of safety data end events in HIAD2.0 with the addition of new events, including events from countries like Japan, China and H2Tool (subject to agreement with related international organisations). A particular effort will be devoted to the

[26] https://www.fch.europa.eu/page/european-hydrogen-safety-panel

[27] https://www.fch.europa.eu/sites/default/files/Safety_Planning_for_Hydrogen_and_Fuel_Cell_Projects_Release1p31_20190705.pdf

improvement of the existing 40 cases in HIAD2.0 with relatively poor quality, increasing their quality by adding details identified by the experts.

In close collaboration with the JRC, the EHSP members will complete and update the review and assessment of the events and the lessons learned and statistics obtained from this information

Last, and related to the activities of the previous task force, a set of activities on reviewing the contribution and research progress in the field of hydrogen safety by FCH 2 JU projects will be produced. Activities are envisaged to encompass:

- Link to HIAD 2.0 and the report on the statistics, lessons learnt, recommendations;
- Engineering models developed from FCH 2 JU projects and the international hydrogen safety community, links to relevant published documents will be provided;
- Computer Fluid Dynamic, CFD models developed from FCH 2 JU projects and the international hydrogen safety community (links to relevant published documents and contacts for accessing the models will be provided);
- HyRISK – EHSP's own protocol for risk assessment of hydrogen facilities.

D.4 Public outreach

In 2021, the main activity in this Task Force will be to implement a Safety Communication Strategy, this important strategy will be concluded and started to be implemented.

Besides this, activities to be carried out within in 2021 will be mainly concentrated in:

- The updating of the EHSP web page;
- Establishing templates, procedures and channels for publishing material;
- Publish 'significant' NEW articles (FAQ, events etc) on the EHSP web page;
- Present oral/poster presentations at relevant safety, fuel cell and/or hydrogen technology conferences;
- Develop a research thematic for hydrogen safety in TIM tool;
- Organise workshops with relevant stakeholders and in collaboration with Task-Force1;
- Revise and update the competence matrix for the EHSP;
- Update the generic presentations for accumulating EHSP information, including template and procedures for approving content in collaboration with Task-Forces 1 and 2.

E. Knowledge management. Dissemination and communication on projects results

Knowledge Management:

Technology and programme monitoring will continue with the annual data collection exercise from projects, in the internally developed data collection platform TRUST (Technology Reporting Using Structured Templates)[28]. Following its successful development and use, projects will be invited similarly to provide their data in 2021 concerning results generated in 2020. Data collected, will allow to benchmark project progress against State of the Art (SoA) and FCH 2 JU targets as defined in the MAWP 2014-2020 (and its Addendum)[29] and related AWPs. In addition, the annual iterations of the data collection exercise have enabled the development of a time-dependent database of FCH 2 JU project results.

In that respect, each project active in the year 2020 (previous year to the exercise) will be asked to complete one or several questionnaires concerning the data obtained within the activities foreseen in the description of action/work. The questionnaires are assigned to the projects according to the type of technologies concerned and the activities carried out. In 2020, 23 different questionnaires were used (so called "templates")[30]. Within each questionnaire, several parameters either descriptive or operational should be filled and each of them can individually be tagged as public or confidential. The FCH 2 JU is committed to respect data confidentiality (according to the conditions setup by the Grant Agreement) and will only use them in the respect of this attribute: confidential data will not be disclosed as such, but only in aggregated form (following a clean-room approach), and in a manner that ensures anonymity of their origin.

Progress and findings that can be shown will be made public (normally associated to the Programme Review exercise – see below). In 2021 further developments will take place on the TRUST tool to offer efficient use of the tool and the database. Developments will improve the interface of the tool as well as functions related to input and export of data/databases. Recommendations for further improvements derive from the feedback collected from the FCH 2 JU project beneficiaries who experienced the tool and the FCH 2 JU programme office. Furthermore, additional templates will be developed to cover new applications related to maritime applications and H2 carriers.

At the same time, FCH 2 JU will review in detail the capabilities offered by TRUST and its predecessor TEMONAS31 (TEchnology MONitoring and ASsessment tool), to examine whether these tools cover sufficiently the needs of FCH 2 JU. The sufficiency and analytical capabilities of the technology monitoring tools in the possession of FCH 2 JU will be critical in the future, especially in anticipation of the new Clean Hydrogen Partnership. To this end, it may prove necessary to proceed to yet another upgrade of the existing tools or even the procurement of a new tool, depending on the evolution of the legislative process, and based on the work already done in the context of the two aforementioned tools.

In parallel to this, JRC (see section B above) will support the FCH 2 JU by updating international state-of-the art, SoA figures with the so called 'reference data' for the various technologies, in order to allow a benchmarking of the FCH 2 JU activities and results of its projects within the global setting. This work is to continue in 2021 for other technologies, following the 2019/2020 reports on electrolysis and stationary fuel cells. In addition, the JRC will track the evolution of selected key performance technological indicators throughout the running time of the FCH (2) JU programmes.

JRC will also provide input to the FCH 2 JU towards the setting of appropriate KPIs for applications and technologies that do not have targets yet, and contribute to the development of a dedicated methodology. In 2020, as a part of the knowledge management activities of the FCH 2 JU, the JRC is finalising the publication of a historical study on FCH 2 JU electrolysers projects to assess their impact

[28] https://www.fch.europa.eu/sites/default/files/documents/TRUST_ExplanationFile_Draft_2019%20%28ID%205709356%29%20%28ID%205833842%29.pdf

[29] https://www.fch.europa.eu/page/multi-annual-work-plan

[30] https://www.fch.europa.eu/projects/knowledge-management

[31] https://www.fch.europa.eu/project/technology-monitoring-and-assessment

and the progression of the FCH 2 JU MAWP 2014-2020 towards its objectives. In 2021, JRC will perform a similar study related to on-board storage projects funded by FCH 2 JU.

Continuing the developments on TIM (Tools for Innovation Monitoring) tool, a tool gathering scientific literature, patent data, news articles and data from R&D projects funded by the EU, aiming at monitoring and analyzing thematic or technological areas, tracking currently used or emerging technologies. The JRC is developing a FCH 2 JU-specific version of TIM to provide the FCH 2 JU with a system customised with features related specifically to its programme, such as tagging functions of FCH beneficiaries. The mapping of technology fields (alkaline electrolysers/FC, H2 production methods, polymer electrolyte membrane FC/electrolysers and solid oxide FC/electrolysers, transport applications) will be further enhanced, with the additional provision of some data cleaning, in order to maximize accuracy of publishable results. Additional technology fields could be considered. Content delivery will proceed based on requests of the FCH 2 JU. FCH 2 JU will continue cooperation with JRC for further adaptation, maintenance and operation of the tool.

The internal database containing overall plans and deployments in EU will continue to be maintained and updated by the FCH 2 JU. This database is fed with information from projects and from general/specific press concerning plans and deployments of FCH technologies, such as electrolysers, vehicles, hydrogen refuelling stations and stationary units, including detailed information on country, size, technology etc. Information for other parts of the world may also be included for benchmarking. In particular, for cars, this should be complemented with reference to fuel cell car deployment figures (passenger car data only) from the European Automobile Manufacturers Association (ACEA) recorded on a quarterly basis, as obtained from ACEA directly. Vehicle sales figures are also captured every 6 months from the vehicle manufacturers themselves.

Finally, FCH 2 JU is currently procuring the Fuel Cells & Hydrogen Observatory, which is intended to become one of the main public reference points for data related to the FCH sector. The Fuel Cells and Hydrogen Observatory was launched in September 2020, its data being became publically available through a dedicated website. The Fuel Cell Hydrogen Observatory (FCHO) provides data (statistics, facts and analysis) and up to date information about the entire hydrogen sector. The FCHO focuses on technology and market statistics, socio-economic indicators, policy and regulation, and financial support.

Dissemination and communication on projects results:
The FCH 2 JU is part of the Horizon 2020 Dissemination and Exploitation Network (D&E-Net) which is established under the H2020 Strategy for common dissemination and exploitation of research and innovation data and results for the period of 2018-2020. In 2020 the D&E-Net activities mainly involved the participation of FCH 2 JU in the main working group and in six subgroups established by the European Commission DG RTD:

(1) D&E practices across the R&I family & capacity building,

(2) Data sharing and visualisation,

(3) Activating multipliers & synergies,

(4) Horizon Results Platform & Go-to-Market guidance for POs,

(5) Strengthening policy feedback,

(6) Exploitation and impact in FPs.

FCH 2 JU is planning to continue its active contribution to these working groups or their successors as well as to new ones. Additionally, FCH 2 JU will contribute to the IRIS initiative concerning text mining for EU policy purposes of project documents (proposals, grant agreements, amendments, reports, deliverables, etc).

In close relationship with daily knowledge management activities, relevant actions will continue as part of the European Commission initiatives in the field, such as invitation and encouragement of

projects to participate in the new Horizon Results Booster (Dissemination and Exploitation Booster)[32] and the Intellectual Property Booster (IP Booster)[33]. The former SSERR (Support Services for Exploitation of Research Results), which benefited more than 20 FCH 2 JU beneficiaries and projects through training and coaching on exploitation aspects has been succeeded by the aforementioned D&E Booster. Furthermore, FCH 2 JU projects will be continuously encouraged to upload their results in the Horizon Results Platform[34] for valorising and promoting their project results to targeted audiences and eventually establish fruitful partnerships.

In 2018, the FCH 2 JU began its participation in the Innovation radar and by the end of 2020 the exercise will have been conducted for 46 projects. The Innovation Radar exercise has so far been conducted in project mid-term and final reviews where a dedicated expert is mandated to identify potential innovations and is required to fill out a questionnaire with the aim of providing information in a structured and quantified way. Furthermore, the identified innovations/innovators will be supported for further exploitation and dissemination of their results. One concrete example of this is Deaflow.eu[35], a new action supported by the European Union's Horizon 2020 Research and Innovation Program to help projects commercialize their innovations ("go to Market"), by facilitating access to clients and investors and providing high-end coaching services. The service gives priority to the projects that are already analysed by the Innovation Radar. Also, during the Innovation Awards organized by the FCH 2 JU during the Programme Review Days, the top-ranking innovations that have been filtered from the Innovation Radar are presented to the public allowing them to vote for the best one.

Continuing the good experience and practice so far, the 11th annual Programme Review Days will be organised in autumn 2021 (Q4 of 2021). The review will be carried out with the support of JRC and will be reflected in the Annual Programme Review Report (see section B above). Initiated in 2011, this annual exercise, managed by the FCH 2 JU initially with the input of independent experts and lately JRC, provides feedback on the progress of the portfolio of FCH 2 JU funded projects identifying key achievements but also potential areas to be addressed or reinforced in subsequent years. The exercise also provides an excellent visibility platform for projects and technological developments achieved in the sector, as well as networking and pitching opportunities for project participants (see section F below). Furthermore, the Best Success Stories Awards highlight the results of collaboration between research, industry and policy makers.

[32] https://www.horizonresultsbooster.eu/
[33] https://ipbooster.meta-group.com/
[34] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/horizon-results-platform
[35] https://dealflow.eu/

F. Support to policies and funding/financial engineering

Support and input to EU policies:

The FCH 2 JU is contributing more and more to the activities of a number of services in the European Commission (EC). Contributions vary in content and format, but they all share the common goal of providing fact-based information on the state-of-the-art of fuel cells and hydrogen technologies and their contribution to the EU initiatives and policies especially in the energy, transport and industry sectors as well as to competitiveness and growth.

In practical terms, this means taking part in a number of technical groups organised by the EC and other international bodies, active participation in the meetings, providing written technical input and ensuring that fuel cells and hydrogen technologies are properly represented. It includes also feedback from projects and studies to the EC in contribution to relevant energy, transport and clean air policy files.

In 2021 the FCH 2 JU Programme Office will continue to reinforce the collaboration with policy makers in the European Commission, specifically (but not exclusively) within the new framework for feedback to policy in Horizon Europe[36], prepared and piloted by the Common Implementation Centre to support evidence-informed policy design and evaluation.

The FCH 2 JU is actively following and contributing as necessary to the European Strategic Energy Technology Plan (SET-Plan)[37] activities, in particular Action 6 "Energy Efficiency for Industry" and Action 8 on "Renewable Fuels and Bioenergy". The FCH 2 JU has facilitated the direct participation of Hydrogen Europe/industry representatives in Action Groups 6 and 8. The FCH 2 JU is also taking part as an observer in several of the sub-groups of the ART Fuels Forum[38] established under the project "Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)".

The FCH 2 JU followed the update of the STRIA roadmap on alternative fuels and will continue upcoming activities in this domain. In 2020 the FCH2 JU attended the meetings of the EU funded project ART fuels[39] meetings. The ART fuels group gathers representatives from the alternative and renewable transport and transport consumption industry to discuss existing barriers to the penetration of these fuels in transport.

Still in the transport domain, the FCH 2 JU is supervising the preparation of the "Study on European business cases for fuel cells and hydrogen trucks and technology development roadmap". Aim of the study is to assess business cases and market potential for the use of fuel cell and hydrogen technologies as part of the energy solutions for the heavy-duty road transport sector. An advisory board composed by over 50 industry representatives is involved in the preparation of the study. This work, presented during the first European Hydrogen Week (23-27 November 2020)[40], will provide useful insights both to industry and policy makers on early business cases for fuel cells and hydrogen solutions in the road heavy-duty transport segment, shedding light on the technologic challenges ahead and barriers to be addressed in view of timely mass scale deployment. Consequently, will follow-up in 2021 with dedicated activities to implement the study R&I recommendations.

[36] https://ec.europa.eu/info/sites/info/files/research_and_innovation/strategy_on_research_and_innovation/documents/ec_rtd_implementation-strategy_he.pdf
[37] https://ec.europa.eu/energy/en/topics/technology-and-innovation/strategic-energy-technology-plan
[38] http://artfuelsforum.eu/
[39] https://artfuelsforum.eu/
[40] https://www.fch.europa.eu/european-hydrogen-week

In 2020 the FCH 2 JU launched also the first public release of the 'Fuel Cells and Hydrogen Observatory, FCHO'[41] dedicated to fuel cells and hydrogen technologies. The aim of the Observatory is to become the reference point for all parties interested in knowing more about these technologies. The Observatory includes information on technology deployment, policies, standards, publications and patents as well as financing. By the end of 2020 the Observatory is expected to also include a module on Education and Training. Throughout 2021 the FCHO will be updated and its scope will continue to grow. The overall goal is that the FCHO portal acts as a one-stop-shop for all policy makers and other stakeholders interested in the use of fuel cells and hydrogen technologies as a decarbonisation solution primarily in the energy and transport sectors.

The FCH 2 JU also continued to work on developing a Guarantee of Origin (GO) Scheme for Renewable and Low-Carbon Hydrogen, an effort that started back in 2014 with the first "CertifHy" project[42]. In its continuation, in CertifHy2, the work involved gaining practical experience with an operational pilot to identify and address practical issues raised by the implementation of the GO scheme that was designed as part of CertifHy1 and to ensure compatibility with evolving EU legislation. A highly inclusive Stakeholder Platform was set-up and governed the project. About 70,000 GOs were issued from the four pilot production plants and several thousand of them were bought and used by entities such as Transport for London and H2 MOBILITY Deutschland to prove the renewable nature of their hydrogen products to their customers.

The work above is planned to continue in 2021 with the recent signed Framework Contract (October 2020) in an effort to accelerate the establishment of harmonised and mutually recognised Guarantees of Origin Schemes for renewable and non-renewable hydrogen across Member States, and by sharing the lessons learned from the CertifHy GO pilot scheme operation while ensuring compliance to article 19 of the RED II.

The current contract is having the following key objectives:

- Support further the establishment of an independent and self-sustainable community that will deal with all hydrogen certification issues (Guarantees of Origin and Target Compliance);
- Support and accelerate the establishment of harmonised and mutually recognised Guarantees of Origin Schemes for renewable and non-renewable hydrogen across Member States while ensuring compliance to article 19 of the REDII;
- Design of a hydrogen certification system that is able to demonstrate compliance with targets of REDII on the share of renewables following the specific requirements that are applicable in each case;
- Engage in communication and outreach activities with hydrogen consumers, traders and policy makers with the aim of increasing the usage of GOs, thereby adding to their market value.

The FCH 2 JU will remain proactive in taking up opportunities for collaboration with other JUs, EU agencies, initiatives and actions with the potential for synergy with its research agenda. Examples of past collaborations are the common study with S2R[43] to identify where fuel cell technologies best fit in the rail sector[44], the linked project JIVE-MERLHIN on the deployment of fuel cell buses with CEF, the link between projects Life'N Grab Hy (Life), HECTOR (Interreg), and REVIVE (FCH 2 JU) on the

[41] https://www.fchobservatory.eu
[42] https://www.certifhy.eu/
[43] Shift2Rail (https://shift2rail.org/)
[44] https://www.fch.europa.eu/publications/use-fuel-cells-and-hydrogen-railway-environment

deployment of fuel cells garbage trucks, the link between projects FLAGSHIPS with HySeas III (H2020) on hydrogen fuel cells ships, or the complementary programs and recently published common study with CleanSky2 for the use of fuel cells in the aeronautic sector[45].

Exchanges of the FCH 2 JU extend also to the Commission Executive Agencies in charge of managing other parts of Horizon 2020 in areas relevant to fuel cells and hydrogen technologies. On the energy sector the FCH 2 JU and INEA[46] have continued exploring potential synergies and areas of collaboration, especially on fuel cells for stationary applications and hydrogen production and storage. On the transport sector, the FCH 2 JU continues collaborating with INEA (under both H2020 and CEF[47] programmes) on activities related to fuel cell buses and Hydrogen Refuelling Stations (HRS). The FCH 2 JU has also liaised closely with the EASME[48]. The FCH 2 JU has also liaised with the EASME and INEA to better understand the opportunities that the City[49] and Island[50] facilities these two Executive Agencies are managing could bring to the FHC community. This work will continue throughout 2021[51].

The FCH 2 JU continued exchanging with the European Defence Agency (EDA[52]) on transport and energy. The FCH 2 JU is actively collaborating with the EDA as part of the next Phase of the Consultation Forum[53] for Sustainable Energy in the Defence and Security Sectors, which continues supporting European Ministries of Defence to adopt sustainable solutions in their assets and activities. This collaboration will continue throughout 2021.

The FCH 2 JU will continue to collaborate with executive agencies and other JUs (under the leadership of the policy DGs in the EC) in view of improving the exchange of information and generating synergies between different initiatives, thus reducing the risk of duplication within areas that are of common interest.

The above are just examples of some of the activities the FCH 2 JU is involved.

Funding and Financial Engineering:

Funding/financial engineering activities have been integrated into the FCH 2 JU in order to work closely with the Industry, Academia and Research, the European Commission, Member States, Regions and Cities, other EU bodies and Financial Institutions to create synergies between different funding and financing sources. By combining or opening access to new funding streams for the projects, it is expected that both the time to market of R&D supported under FCH 2 JU operations and its cost premium compared with incumbent technologies will be reduced. The aim is to accelerate the market introduction and deployment of the technologies stemming from the projects that FCH 2 JU supports.

To better exploit synergies among funding programmes the FCH 2 JU is providing advice and support to prospective or past beneficiaries of FCH 2 JU projects in order to combine funding from various programmes and optimise structured finance operations.

[45] https://www.fch.europa.eu/publications/hydrogen-powered-aviation
[46] Innovation & Networks Energy Agency (https://ec.europa.eu/inea/en/welcome-to-innovation-networks-executiveagency)
[47] Connecting Europe Facility (CEF)
[48] Executive Agency for SMEs (EASME)
[49] https://eucityfacility.eu/home.html
[50] https://www.nesoi.eu/
[51] For more information on the FHC JU activities for and with regions please see the dedicated section on regions
[52] European Defence Agency (https://www.eda.europa.eu/)
[53] https://eda.europa.eu/european-defence-energy-network/consultation-forum

As the momentum around Hydrogen is growing, it is essential that the investors and finance community become fully aware of the state-of-the-art in terms of FCH technology solutions (through the results of FCH 2 JU projects and studies), their market readiness, the benefits they bring and the impacts they may achieve through the provision of private sector funding and financing support (across the spectrum of new entrants, start-ups, SMEs and established firms in the FCH marketplace). The FCH 2 JU will continue to raise awareness of projects' results within the finance community. It will therefore address the private sector funding and financing challenge that acts as a market barrier for deployment of FCH technologies and wider FCH integrated solutions. While in 2019 the FCH 2 JU involvement in the Venture Capital event '2019 Tech Tour Energy Transition' (TTET)[54] and the Venture Capital (and Finance) Club – theme 'Super scaling-up of hydrogen companies' – that followed, it placed the hydrogen sector under the spotlight of the investors with five companies from the FCH 2 JU hydrogen and fuel cells ecosystem getting the chance to pitch in front of prestigious Venture Capital investors, in 2020 the FCH 2 JU opted to go for a 'reverse investment pitching' instead, during the Hydrogen Week (23-27 November 2020). In view of speeding the fund to market route for FCH SMEs, FCH 2 JU will continue to organise in 2021 such targeted 'investor pitching event(s)' during 2021.

Working with Member States and Regions

Back in 2017 the FCH 2 JU launched an initiative to support regions and cities across Europe in the adoption of fuel cells and hydrogen technologies as a means to reduce their emissions and realise their green energy transition. The FCH 2 JU Regions Initiative managed to attract extensive support from local and regional governments across Europe. Close to 100 separate regional and municipal public authorities from 22 countries representing about one quarter of Europe's population, surface area and GDP, committed to the goals of this Initiative. The surveys undertaken assessed project implementation intentions in excess of EUR 1.8 billion over a 5 year period. Out of the 36 responses, 24 participating regions and cities expressed an ambition to become an "H2 Valley" in the future, with ten regions pursuing concrete plans for implementation in the years ahead. Regions with ambitions to become H2 Valleys were mainly in countries that already have substantial experience in FCH deployments, in particular the UK, Belgium, the Netherlands, Germany and France.

The conclusion of the Regions initiative were included in the report "Fuel Cells and Hydrogen for Green Energy in European Cities and Regions"[55], that was published in October 2018. To address the gaps identified and to capitalise on the opportunities that the Regions initiative brought up the FCH JU has, since 2018, implemented a number of actions including (and in addition to the H2 Valley and H2 Island projects/grants supported from calls 2019-2020):

- Smart Specialisation Platform/H2 Valley Partnership: Leveraging on the existing network and capacity building generated under the FCH Regions initiative, the FCH 2 JU has facilitated and supported a group of four co-leading Regions from the Netherlands, France (2) and Spain, to set up a new thematic interregional partnership on Fuel Cells and Hydrogen within the Industrial Modernisation Smart Specialisation Strategies (S3) Platform approved by DG GROW back in 2019. The so-called European Hydrogen Valleys Partnership (EHV-S3P)[56] involves 35 European regions as of July 2020 which work together in 8 distinct working groups across the hydrogen value-chain, aiming at enhancing the role of green hydrogen in the European energy transition process. The partnership supports regions in their efforts to raise the technological

[54] https://www.techtour.com/events/2019/11/event-tech-tour-energy-transition-2019.html
[55] https://www.fch.europa.eu/publications/fuel-cells-and-hydrogen-green-energy-european-cities-and-regions
[56] https://s3platform.jrc.ec.europa.eu/hydrogen-valleys

and commercial readiness of FCH applications, facilitate match-making and co-investment between European regions also leveraging on EU Funds' blending opportunities, strengthen the value chain for FCH technologies via interregional cooperation. The partnership became an active stakeholder on EU policy making on hydrogen, towards the decarbonisation of the EU's economy with a bottom-up approach (from local regions to the EU), publishing several position papers; In 2021 the FCH 2 JU will continue brining the results and outcomes of our activities to this Partnership.

- Project Development Assistance (PDA): Launch of a pilot PDA facility to help develop detailed project planning in regions and cities with a lower maturity level and a special attention to Central and Eastern Europe. Since it started, in June 2020, this PDA for Regions is supporting 11 public regional and local authorities from across the EU to develop their concepts for regional FCH projects into detailed work plans. It is noteworthy that more than half of the projects selected are from regions that had no specific track record in deploying hydrogen related projects. These projects should contribute to accelerate the progress of hydrogen deployment in Europe by providing a blueprint to other regional hydrogen projects, namely to those other 24 regions participating in its Observer Network, as part of a drive towards carbon neutrality. This activity will continue in 2021 and may be extended further to Central-European countries and Outermost regions/Islands (see section 3.2.H on Operational procurements).

In addition, and following the high interest that the H2 Island topic generated it was decided to strengthen the activities in this area. For the last years, the FHC 2 JU has been facilitating participation of FCH 2 JU funded projects with activities in islands in the Forums organised by the Clean Energy for EU Islands Secretariat. In addition, together with the EC, the FCH 2 JU organised a "H2 Island" session as part of the EU Sustainable Week (EUSEW) 2020[57]. As a result, in 2020 the FCH 2 JU further hold a webinar for the members of the Island Commission to illustrate the opportunities that FCH could bring to their territories in the context of a green economic recovery. This webinar was very successful and a number of concrete follow-ups have already been identified. Collaboration with the CPRM Island Commission will continue in 2021 and it is the intention to extend this to other associations representing islands.

Looking ahead to 2021 the FCH 2 JU has already started to discuss with the different actors above mentioned on how better coordinate efforts and ongoing activities in support of the further deployment of hydrogen ecosystems across Europe at national, regional and local levels. Many of the ongoing activities will continue and new ones could be supported in the AWP 2021 to support on this endeavour.

[57] https://eusew.eu/hydrogen-green-recovery-european-islands

G. International Cooperation

The importance of international cooperation in science and technology is explicitly recognized in the European Union's Innovation Union flagship initiative and the Horizon 2020 programme. This is described in the communication entitled "Enhancing and focusing EU international cooperation in research and innovation: a strategic approach"[58]. Following this principle, in order to align with, facilitate and accelerate worldwide market introduction of fuel cell and hydrogen technologies the FCH 2 JU continuously tries to identify priority areas, at policy and technology level, where coordinated and collaborative international activities are of interest.

As the deployment of fuel cells and hydrogen technology is carried out globally and key stakeholders of the FCH 2 JU are involved in these developments, establishment of links with other major FCH related programmes globally is deemed important. This is particularly valid during 2021 in areas of cross cutting nature such as regulatory and policy frameworks (for example issues with harmonisation of regulations for maritime applications), codes, standards (for example pre-normative research on refueling protocols or impact of hydrogen admixtures in the natural gas networks), safety or education (for example training of responders). These areas play a very important role in early market activation and where intellectual property rights are less of an issue.

On a more general level, the relevant international activities of interest include in particular those carried out by the IEA under the Hydrogen Technology Collaboration Program (TCP) (IEA Hydrogen)[59], Technology Collaboration Programme on Advanced Fuel Cells (IEA AFC) and IPHE[60]. The FCH 2 JU will hence continue in 2021 to collaborate closely with the EC representatives in the steering committees of these international agreements/associations, in particular within the working-groups on power-to-X, maritime applications and recently launched working group on modelling of the IEA Hydrogen.

Synergies will continue to be explored with the CTCN[61], which is the implementing body to the COP[62], making sure developing countries adopt the right climate technologies to reach the 2°C target.

Following the launch in May 2018 (Malmö, Sweden) of a new Hydrogen Innovation Challenge[63] to accelerate the development of technologies needed for a global hydrogen market, FCH 2 JU will foster the collaboration and support to the Mission Innovation[64] activities, especially through projects collaboration with similar worldwide activities. Within this context, European Commission (as co-leader of this Hydrogen Innovation Challenge) pushes the acceleration of hydrogen innovation and this work-plan includes a number of specific actions, which directly target an increased international cooperation of EU Member States and Associated Countries in the context of Mission Innovation. In particular, the FCH 2 JU will continue in 2021 with the 'Information-Sharing Platform for H2 Valleys' project/contract[65] and support the Commission with the setup of the Mission Innovation 2.0 (and its leading role on hydrogen activities).

Following increasing importance of hydrogen on the International Agendas (e.g. G20, Clean Energy Ministerial, H2 Ministerial etc.) and related initiatives, the role of the FCH 2 JU has become increasingly important internationally and therefore will be further reinforced during 2021.

[58] COM(2012)497
[59] http://ieahydrogen.org/
[60] http://www.iphe.net/
[61] https://www.ctc-n.org/
[62] http://unfccc.int/bodies/body/6383.php
[63] http://mission-innovation.net/our-work/innovation-challenges/hydrogen-challenge/
[64] http://mission-innovation.net/about/
[65] https://www.fch.europa.eu/news/launch-hydrogen-valley-platform

H. Public Procurements

In 2021, the FCH 2 Joint Undertaking will carry out a number of activities via calls for tenders (i.e. public procurement) for an indicative amount of **EUR 1.75 million**. Recourse to existing Framework Contracts will be envisaged where possible. The procurement activities are covering subjects of a strategic nature for the FCH 2 JU, providing input to R&I priority setting and supporting further financing, deployment and commercialisation of green hydrogen and fuel cells.

For each of the procurements, detailed Terms of Reference will be drafted with European Commission participation. The following indicative list of procurements is currently foreseen:

Subject (Indicative title)	Indicative budget (EUR)	Expected type of procedure	Schedule Indicative
Hydrogen in ports *Map the future hydrogen needs in ports/coastal-industrial areas by 2030-2050 and derive economic attractiveness and investment/funding needs for decarbonisation of these areas with hydrogen solutions (beyond hydrogen for maritime/shipping applications), including roadmaps/pathways for H2 production (such as electrolysers in ports linked to offshore wind farms), delivery at port and basic H2 bunkering network & potential R&D and innovation needs.* *The work will build on existing activities of Hydrogen Europe with coalition of stakeholders for maritime applications AND extend it across the EU to the port authorities and related coastal-industrial areas actors.* *The activity may also support the Clean Energy Ministerial Hydrogen Initiative.*	600,000	Open procedure	Q2
Project Development Assistance for Cohesion Countries, Outermost Regions and Islands *Provide PDA support to bring projects to a high level of preparedness for approx. 25 regions ' projects & create Observers' Network(s) of inter-island, inter-regional and cross city networks to generate specific blue prints. Raise awareness of relevant Regional and National ESIF Managing Authorities.* *The work will build on current PDA initiative/contract and will extend to these specific regions.*	1,000,000	Open procedure	Q3
Technical Assistance support to generate synergies with Member States/Regions *Work will start with at least 10 MS/Regions to identify relevant ESIF, Recovery funds etc and structure cooperation with Managing Authorities (MA) in order to assess possibilities for exploitation of results from*	150,000	Open procedure	Q1

FCH 2 JU projects into national/regional projects and synergies. *By generating synergies with other EU/recovery, National and Regional Funds, we will boost the realization of various H2 roadmaps and support indirectly the objectives in the NECPs.*			

The final budgets awarded to actions implemented through procurement procedures may vary by up to 20% of the total value of the indicative budget.

Conditions for the Call

N/A

3.3 Call management rules

N/A

3.4 Support to Operations

COMMUNICATION AND OUTREACH ACTIVITIES

Overview

The European Commission has identified fuel cells and hydrogen technologies as one of its key political priorities in its new mandate which started in December 2019.

In order to implement the ambitious emission reduction targets of the European Green Deal, the EU Hydrogen Strategy[66] adopted on 8 July 2020, sets out a vision of how the EU can turn clean hydrogen into a viable solution to decarbonise different sectors over time, enabling the production, distribution and storage of renewable and low carbon hydrogen at scale.

2021 will be a crucial year for the FCH2 JU in making use of the growing political momentum, increase public trust in the use of fuel cells and create compelling narratives that will further shape hydrogen policies in the upcoming years.

Strategic communication to all stakeholders and an increased outreach effort to the general public with intensified awareness campaigns will be key.

We need to communicate the FCH 2 JU's main messages in an accurate, clear and accessible way to all stakeholders. In order to do so, we will provide state of the art communication products and services to accompany the crucial period to the run up to the new mandate and beyond.

During the past years, FCH 2 JU has built up its communication around programme success stories to demonstrate the benefit of the instrument and the impact of its results. This approach will continue as it proved to be extremely valuable. The stories about the technology, the journey and the successes are a powerful narrative. However, considering that hydrogen technologies are a highly technical and scientific topic, their outreach can be improved by engaging with new target groups, such as SMEs, regional authorities and municipalities, and by enhanced cross-promotion across sector, such as the transport sector, the agricultural sector, academia.

Communication activities will continue to support the priorities identified in the current AWP and will ensure that all stakeholders will be duly informed about the activities and results of the FCH 2 JU.

Our projects have accelerated Europe's technological lead, notably on electrolysers, hydrogen refuelling stations and megawatt-scale fuel cells. Proactive and evidence-based communication is critical to increase our visibility and positive narrative in these areas and raise awareness about the market readiness of the technology. In addition, we will continue to create synergies with the projects communication to strengthen the impact and increase outreach.

Communication objectives

The main objective in the area of communication will be to demonstrate the added value of FCH 2 JU to the European Hydrogen Strategy, the European Clean Hydrogen Alliance and European policies on

[66] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A hydrogen strategy for a climate-neutral Europe, COM/2020/301 final
https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1596807561238&uri=CELEX:52020DC0301

more general terms. Our communication activities will therefore focus on how the programme delivers results that have a strong impact and translate into concrete benefits for European industries, authorities on all levels and European citizens. In order to do so, we will:

- Highlight the programme's relevance, impact and contribution to related EU policies areas (DG GROW, DG RTD, DG ENER, DG CLIMA, DG MOVE, DG EMPL and other implementing bodies such as INEA, EASME);
- Showcase the programme achievements progress and benefits;
- Mobilise strongly committed applicants to continue to ensure excellence in our call for proposals/grants;
- Increase communication synergies with other programmes and instruments;
- Highlight technology potential and market readiness;
- Leverage project communication and promote successful projects' outcomes;
- Communicate the benefits of the technology with real-life examples and projects' results;
- Increase public awareness of the FCH 2 JU and of fuel cells and hydrogen technologies beyond the programme stakeholders, reaching out to new audiences.

Target audiences

- Policy-makers: EU Institutions (European Commission, European Parliament, Committee of the Regions, Council of the EU), individual Member States (relevant representatives of governments and permanent representations), municipalities and regional authorities;
- FCH stakeholders and their governance structure: European Clean Hydrogen Alliance, European Commission, Hydrogen Europe, Hydrogen Research, National Contact Points, technical experts, associations;
- FCH JU current and potential new beneficiaries;
- Financial actors (e.g. EIB, commercial banks, investors);
- Decision supporters and multipliers: Civil society, Associations, NGOs;
- General public (see below).

Outreach to the general public

Hydrogen technologies are a highly technical subject, whose scientific insights are constantly evolving and whose technology is still relatively unknown to the wider public. Our communication efforts should strive to address interested EU citizens and analyse how these audiences could be reached on a larger scale. As generally acknowledged, communication is more effective when it provides an "emotional appeal" and when it provides a story that citizens can identify with and relate to.

We should build compelling narratives that reflect how citizens can benefit from hydrogen or how these technologies can actively contribute to curb global climate change, an attractive topic among the younger generation. To better reach younger generations and boost the visibility of the FCH 2 JU's mission, we could explore new trends and different channels (e.g. Instagram and Facebook), depending on the content. Given the limited resources available, we could reach out to younger audiences also through designated collaborations, e.g. Climate Ch2ampions campaign on Instagram.

Main communication themes

Throughout all communications, we need to deliver clear, accurate, up-to-date and consistent messages that resonate with a variety of audiences, from policymakers to researchers and industry.

Our priorities and communication activities around them need to be tailored to target audiences and be flexible enough to adapt to our rapidly changing working environments. The unprecedented health-related measure imposed by the spread of Covid-19 have moved many physical events, meetings and

seminars online. This required a fast adaptation to new working arrangements and new technical skills in using numerous online platforms. As done successfully in the past months, we need to show readiness to adapt to the 'new normal' and its implications for the working circumstances also in the upcoming year 2021.

Future communication themes will include, amongst others:

-
- Projects' results and success stories: concrete benefits for the European citizens, socio-economic benefits, benefits and involvement of SMEs;
- Boosting the visibility of innovative concepts: EU Hydrogen valleys, Fuel Cells and Hydrogen Observatory (FCHO), Project Development Assistance (PDA), flagship projects in key areas relating to heavy-duty transport, shipping industry, maritime transport, aviation;
- Successful collaboration within the EU to deliver green transport and green energy, nurture our long-standing cooperation with EU institutions and explore collaborations further;
- Growing momentum for the FCH technology: scaling up to GW electrolysers, EU leadership on electrolyser manufacturing;
- Market readiness of the technology and the need to support the development of the market conditions;
- H2 jobs and education;
- Specific, target messages for both transport and energy sectors.

Communication and outreach activities

Success stories

Continue to develop FCH 2 JU success stories and adapt them to different audiences and channels, and back up FCH 2 JU's key messages. We will continue to maintain close contacts with ongoing projects to gather and promote their latest news and results. In addition, we will continue to work in close collaboration with the communication unit of the European Commission's Directorate-General for Research and Innovation, responsible for services such as the Horizon Magazine, Futuris and the webpage for EU research success stories.

Based on the content promoted through the Success Stories, we have all the interest to preserve the close collaboration with H2View, where we have a regular column, called 'Pillars of Progress'. The articles are based on the content of the FCH 2 JU Success Stories and they have the goal of setting a spotlight on our activity and our flagship projects.

Media relations

The following activities will continue throughout 2021 in order to develop media outreach (such as public awareness of FCH 2 JU achievements/results and related technology performance):

- Publication of news articles and op-eds in both specialised and general publications (online and print);
- Development of a press and social media strategy around relevant initiatives and events;
- Further developing the media contacts database, with a stronger focus on MS in Eastern and Central Europe;
- Paid advertising will be used only in combination with earned media and as part of wider campaigns;
- Development and implementation of press & media relations, to include the public procurement of media and press agency services and of media monitoring services;

- Development of a crisis communication plan to maintain public trust and ensure access to reliable, up-to date information in the different stages of a crises situation (e.g. incidents at HRS);
- The development of short promotional videos to tell the success stories about the programme through its projects.

Media database

A comprehensive media database - containing both European and national media has been developed and nurtured. The partnerships with selected media are based on a number of criteria, ranging from impact, influence and outreach:

Potential media partners in 2021

	Pros	**Proposal**	**Audience**	**Estimated cost**
Euractiv	Well-established, independent media, pro-European, increasing interest in hydrogen	• Policy page with articles written by the Euractiv journalists • Euractiv is proposing also a regional/local coverage: articles translated in different European languages.	European, Brussels – based , EU institutions, governments, makers, associations, NGOs Media	20,000 for 12 months or 12,000 for 6 months
Politico	Influential media outlet in European policy-making	• Homepage takeover during the Hydrogen Week • Oped (sponsored content / article)	Government officials EU Institutions Policy-makers Decision-makers Experts Journalists	15,000 (package tbc)
H2View	Specialised media Distributed to all the H2 community No costs (they might expect some sponsorship – i.e. for their main event)	Dedicated column signed by Bart (every second month). Topics to be determined by FCH JU according to priorities. Promote FCH JU studies (high interest from the publication) Promote projects (success stories as articles) Publish "Fact of the month" – presented by the FCH JU	FCH community, industry, research community	No cost
Science and Business	Specialised media – Horizon 2020	Take advantage of Science|Business' online newsletters and website to take your message into Europe's innovation community.	Audience includes key decision makers in research policy, industry and academia	Biweekly newsletter (Tues and Thur): top or middle banner One issue: € 350 Two issues: € 650 Four issues: € 990 Social media posts (Twitter & Facebook)

				3 original Tweets or Facebook posts/week: € 500 W
Euronews	Mainstream European news channel – but targeting different shows within (i.e. Futuris, Business channel)	Pitch new projects to be presented (i.e., Heavenn etc.) and also new energy section – in cooperation with FCH	Wide audience across Europe	tbc

Awareness-raising campaign around the European Hydrogen Week

To raise awareness around the European Hydrogen Week and its embedded European Hydrogen Forum, which is foreseen to take place twice a year in 2021 (May and November), we need to communicate related events and activities around a common framework and timeline.

We will continue to raise the profile of the FCH 2 JU's mission to a wider audience, and insert dedicated awareness campaigns (e.g. videos, teasers, banners) on selected publication websites, e.g. Politico, Euractiv, Financial Times, Euronews.

Website

As the main communication tool of the programme the website https://www.fch.europa.eu/ requires continuous updating and editing. New developments are needed to improve user friendliness and allow for a better presentation of the information, in line with recent trends. These will be addressed throughout the year, according to resources.

FCH JU Flash news

These are distributed around important announcements, articles, events to the FCH 2 JU Community registered on the website.

e-Newsletter

Programme highlights a distributed to a subscriber database through a monthly external e-newsletter, which will complement the existing news-alert system. New subscribers will be targeted actively, via social media and during events, to ensure compliance with GDPR rules.

Currently the monthly newsletter is generated through the European Media Monitoring tool (developed by JRC). An additional potential collaboration is envisaged to better centralise media monitoring and social media analytics.

The development of EMM[67] for FCH technologies with support of JRC (mainly for communication purposes), is providing a more comprehensive press screening mechanism and will allow an even more thorough capture of the relevant information in the future. During 2021, the existing installation of the EMM platform customized for FCH 2 JU will be maintained, regularly updated and improved. Categories and filters defined in the system will be monitored and EMM will continue to provide assistance and training sessions to FCH 2 JU to further customize the system, to tailor it to the needs of the FCH 2 JU. EMM will deliver ad hoc periodic media monitoring selections and, on demand, ad-hoc statistics based on EMM media coverage.

Social media

[67] https://ec.europa.eu/jrc/en/scientific-tool/europe-media-monitor-newsbrief

The FCH 2 JU Twitter account is one of the main tools for distributing content to a wider audience. Communication activities will continue leveraging this channel to relay news information, drive traffic to the FCH 2 JU website and reach out to new audiences. Additionally, the Twitter feed has been recently integrated on the FCH 2 JU home page, which allows us to benefit both from a dynamic content, as well as from a more appealing visual content.

In addition, LinkedIn will continue to support communication targeting the professional community interested in both technical and general information, while the YouTube channel will support the distribution of the programme and project videos. Acknowledging a growing video consumption among digital users, the FCH 2 JU will be trying to dedicate more resources to video content to support the awareness campaign: sponsored YouTube ads targeting different types of audience, professional video footages, videos recorded internally, such as the Executive Director's video challenge and launched on special occasions.

In 2021 FCH 2 JU will continue to develop its brand on social media, especially Twitter and LinkedIn with specific campaigns around key events such as the Hydrogen Week and its related Hydrogen Forum. This will include developing engaging content with strong visuals and use promoted/ sponsored tweets at key moments of the year. Through the creation of an editorial calendar around the main events and initiatives, social media will be better coordinated.

Events

The organisation and sponsorship of targeted events will continue to build FCH 2 JU's corporate reputation in line with its mission and objectives. A detailed events calendar will be developed and updated throughout the year. Below are the events identified so far:

- HyVolution – February 2021, Paris
- European Zero Emission Bus Conference – March 2021, Paris
- Hydrogen Days Croatia – March 2021, Zagreb (exhibition and workshop)
- EU Sustainable Energy Week – May 2021, Brussels (online)
- SET Plan Conference – June 2021, Portugal (tbc)
- EU Research & Innovation Days – September 2021, Brussels (Exhibitor/session organiser)
- European Week of Regions and Cities – October 2021, Brussels (Exhibitor/session organiser)
- Second edition of the European Hydrogen Week (including Programme Review Days and FCH JU Awards & European Hydrogen Forum) – Fall 2021, Brussels
- SET Plan Conference – November 2021, Slovenia (tbc)

Visual Identity

The FCH 2 JU visual identity has been reinforced throughout all communication channels, both print and online. We will continue to incorporate the EU funding reference and logo throughout all the programme communications as well as in the communication of the project beneficiaries. The dedicated webpage on communication and dissemination activities contains important information on this topic.

Collaboration with the European Commission and EU agencies

Collaboration with EC communication services and other relevant DGs entails:

- Organisation of and participation in joint events – such as Open Doors Day, Research and Innovation Days, EUSEW, TRA2020, SET PLAN, Transport and Energy Horizon Info Days;
- Meetings of the Joint Communication Taskforce;

- Participation in the Communication Research and Innovation Group (Communication Correspondents) group;
- Contributions to the EC websites and publications (including Horizon Europe, CORDIS, etc.);
- Cross-communication and contribution to campaigns in line with the FCH 2 JU's objectives.

External communication support

The FCH 2 JU will contract external services providing web design and development support, event organisation, proofreading and editorial tasks, media relations and the design and production of promotional material, as appropriate. Participation in communication framework contracts will be assessed according to the needs and context. Past examples include editorial services from external contractors, web development cooperation with DIGIT, media monitoring services from JRC, layout and printing services from the Office of Publications.

Monitoring and measuring impact of communication activities

We want our communication activities to have impact and reach the relevant target audiences. In order to assess our reach, we require systematic Performance Indicators.

Dedicated services can provide us with tools for monitoring and measuring communication impact across communications channels, such as press/media, social media and audio-visual and online. We aim at evaluating our results and invest in such processes and tools that allow us to improve our communication effort in the upcoming years.

Simultaneously, we measure the impact of our communication efforts using the Europa Analytics reports for our website performance, and default social media Analytics reports available on each of our currently used platforms, namely Twitter, LinkedIn and YouTube.

Furthermore, in order to better coordinate our communicate efforts, we asked our project for feedback collected through EU survey. It gave us valuable insights into their communication efforts, allowed us to follow their social media accounts and provided us with information on their upcoming events and press releases.

Procurement and contracts

Besides procurement funded by the operational budget as described in section 3.2.H above, FCH 2 JU allocates part of the administrative budget to procure the necessary services and supplies needed to support its operations and infrastructures.

With a view to make tendering and contract management as effective and cost-efficient as possible, FCH 2 JU has a policy to join inter-institutional tenders either launched by the European Commission (EC) or in agreement with other Joint Undertakings.

In order to maximize effectiveness and cost-efficiency in procurement, FCH 2 JU already started using eProcurement solutions in 2019: it is currently using eTendering (for preparing and managing a call for tenders); eSubmission (for receiving and opening tenders), and eInvoices (for the electronic reception of commercial invoices).

Moreover, the FCH 2 JU deployed and uses EU Sign, the e-solution providing a qualified electronic signature, equivalent of blue ink signatures, in an effort to align with the Commission's Digital Strategy driven by the 2019-2024 priorities of President von der Leyen, which set out a vision for the European Commission to lead by example in digital transformation. In addition, contract management reporting has become more efficient with the use of ABAC[68] LCK.

The focus in 2021 will be to continue to follow up on developments in eProcurement with a view to further simplify the management of procurement requests.

FCH 2 JU expects to be invited in the following procedures in 2021:

- Microsoft licenses
- Graphic design services
- Insurance cover against risk of accidents or death for persons visiting or working in the premises
- Acquisition of general and special purpose computer solutions

In addition, FCH 2 JU may launch the following procedures:

Subject	Indicative budget (€)	Expected type of procedure	Indicative launch date
Review of the FCH 2 JU website in view of its flexibility vs content	139,000	negotiated	Q3
Leasing of 1 hydrogen powered car	50,000	negotiated	Q3
Trailer for cars (for transporting to events, to maintenance/service centers)	30,000	Negotiated	Q2
Acquisition of tool for monitoring of social media	20,000	Negotiated	Q4
Organisation of investment pitching sessions	60,000	Negotiated	Q2

[68] Accrual Based Accounting system provided by the European Commission

IT and logistics

The FCH 2 JU strategic objective in the field of IT is to deliver applications and infrastructure to support the implementation of the business objectives. The priority objectives are to ensure a stable and secure IT system, provide IT support to staff in the use of IT applications and equipment and to cooperate with the other JUs to ensure synergy and efficient use of resources.

In 2021 special focus will be put on the following:

1) Infrastructure and office automation:

FCH shares IT infrastructure, related IT operations and office automation support with other JUs that are also located in the same premises. In the context of the common infrastructure, the following activities are foreseen:

- Follow-up of the infrastructure-as-a-service (IaaS) solution transferred to the inter-agency framework contracts available to the JU, together with the lead on the Framework Contract for common IT services, to ensure a continuous maintenance of the common infrastructure and networks as well as end-user office-automation support covering incidents, service requests and improvements;
- FCH 2 will proceed to the deployment of Software-as-a-service solution (SaaS), starting with the implementation of the mitigation measures identified in the Office365 DPIA. The four assets of Microsoft Office 365 (O365) defined as priority in 2021 (Sharepoint, Teams, Onedrive, Exchange on line) will provide new functional applications to end users allowing better collaboration and flexibility in the daily work;
- In the context of the Future Office Automation Environment (FOAE), FCH 2 JU agreed to build on the strategic choice of Teams for more secure and less expensive Unified Communication and Collaboration (UCC) service, and will explore the possibility to replace the classic phones and PABX;
- As FCH will organise more hybrid or full virtual events it will complete the installation of new equipment for video conference and live streaming system and the transformation of a meeting room into a flexible audio-visual studio.

2) Information systems for operational and administrative activities:

- Ensure a continuous maintenance of the FCH 2 JU website aiming to facilitate the dissemination of results related to studies and project related information;
- Support to the development of the new H2Forum website aiming to facilitate political and networking forum organised in cooperation with European Commission;
- In 2021, FCH2 JU will start the effective use of the of the EC application SYSPER (for personnel management) and will consider the adoption of new modules (such as performance appraisal and reclassification) where available to the JU. It will prepare for the adoption of MiPS (Mission Processing System) as IT application for the management of mission approval workflows and the reimbursement of costs incurred by mission performers;
- FCH 2 JU agreed in September 2020 with the other JUs on the acquisition of the SYSTAL tool for recruitments adopted by a number of EU agencies and will therefore start the effective progressive use of the application along roadmap for production;
- Regarding software applications, the FCH2 JU will continue to adopt more common EU systems. Amongst them new modules made available for the e-procurement platform

provided by DIGIT for a paperless procurement cycle that simplifies manual interactions, saves time and reduces payment delays;

- Supporting the business continuity plan and disaster recovery plan established in 2018, the secured telecommunication link to access the EC application services was transferred for Brussels White Atrium building to the community cloud hosted in Hamburg with CANCOM. This link is also shared since November 2020 with the European Railways Agency (ERA) and the European Labour Authority (ELA) for cost efficiency and is opened to more Agencies expected to join in 2021;

- Given the reinforced used of teleworking, the FCH 2 JU will explore the possibility of a failover solution when a corporate device is damaged or missing. The MDM (temporary environment using Office 365 tools) and VDI (private environment using virtual desktop) solutions are envisaged.

In terms of internal efficiency and effectiveness, the FCH JU`s Document Management function will continue the review and simplification of its internal processes. With the implementation and adoption of ARES in 2018, the FCH JU will continue to:

- improve handling of all the information
- continue the development of the document management archiving policy and streamline the use of electronic workflows
- move towards a more paperless office environment and seek more efficiencies in this area, namely the integration into Ares of the "Qualified Electronic Signature (QES)" equivalent to the handwritten blue ink signature adopted end 2020 (see above procurement and contracts section)
- review of all existing policies as well as the Document and Records Management policy ensuring compliance with all the recent regulatory requirements.

In addition, **logistical support** is provided in the context of General Administration. It encompasses the management of supply and maintenance of equipment namely stationery, goods and services for administration and includes monitoring of services provided in particular through the OIB, the translation centre and the publication office.

In the context of the reflection on the new ways of working that was accelerated by the COVID-19 situation changes in the organization of the workplace will be considered taking into account less presence in the office, increased hybrid modes of working as well as health and safety requirements.

JU Executive Team – HR matters

JU Executive Team

The Executive Director is the legal representative of the FCH 2 JU and the chief executive responsible for the day-to-day management. He is supported by the Programme Office (PO), composed of temporary and contract agents.

The PO implements all the decisions adopted by the GB; provides support in managing an appropriate accounting system; manages the calls for proposals; provides to the Members and the other bodies of the FCH 2 JU all relevant information and support necessary for them to perform their duties as well as responding to their specific requests; acts as the secretariat of the bodies of the FCH 2 JU and provides support to any advisory group set up by the GB.

In 2021, in the context of the negotiations by the budgetary authority of the Commission proposal for a Clean Hydrogen Partnership preparatory work will be carried out in terms of organisation and resources necessary to implement the new mandate and achieve the objectives.

HR matters

The priority objectives in the field of Human Resources are to ensure that the Staff Establishment Plan is filled, to ensure an efficient management of staff resources and to ensure an optimal working environment.

This is achieved mainly through efficient selection procedures, staff performance appraisals and reclassifications, learning and development opportunities, promotion of open communication and inter-JU cooperation.

In 2021 special focus will be put on the following:

- Continue to implement the learning and development plan to ensure adaptation of staff skills and competences to efficiently implement the Programme office mission and tasks; in particular training and workshops on Horizon Europe rules and tools will be arranged as well as on new tasks foreseen in the mandate of the future Clean Hydrogen Partnership;
- Organise in-house workshops to further foster common working methods, and knowledge-sharing, enhanced use of tools and improved communication;
- Update procedures and submit for adoption by the FCH 2 JU Governing Board new or revised implementing rules as necessary to ensure alignment to the legal framework;
- Organise a teambuilding activity to promote team spirit and increased team collaboration;
- Carry out the appraisal and reclassification exercises;
- Pursue the traineeship programme by giving opportunities to new trainees to acquire experience at the FCH 2 JU;
- Following the preliminary phase in 2019 and the project phase in 2020 FCH 2 JU will use SYSPER for personnel management. Further modules such as performance appraisal and reclassification will be considered as soon as made available by the Commission.
- Consider the acquisition of a proctoring tool for online tests in selection procedures.

Administrative budget and finance

The main objective for Finance and Budget is to ensure a sound financial management of the Programme Office resources.

This is mainly achieved though the alignment of planned activities with budgeted resources, the establishment of commitments for respecting legal obligations, the payment execution for goods and services delivered, the management of subsidies and revenues and the monitoring of the budget execution.

In 2021 activities will focus on the following:

- Ensure efficient budget forecast and maintaining a high level of accuracy in budgetary forecasting; to this perspective, the spending pace of the grants with the highest budget will continue to be closely monitored and checked against the forecast that their consortia has been provided;
- Subject to the adoption of the future partnership, FCH 2 JU will prepare the multiannual budget under Horizon Europe as well as the contribution agreement (with the European Commission) and the Financing Agreements with the members other than the Union.
- Prepare 2022 and any modifications to 2021 budget following the approval of mandate in liaison with DG R&I and DG BUDG;
- Report on 2020 budget execution and financial management;
- Prepare monthly reports containing key elements to budget execution and sound financial management (payment delays, budget execution, state of play for procurement procedures);
- Ensure transactions are financially and procedurally correct, that is, in conformity with the contracts and respecting the Financial Regulations and other relevant rules in operations; timely treatment of all types of transactions.

These activities will be monitored through targeted KPIs, such as budget execution and Time-To-Pay.

Data protection

The FCH 2 JU applies Regulation (EU) 2018/1725 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies[69] .

The role of the Data Protection Officer (DPO) is exercised by the Legal Officer. The DPO together with all staff members involved in data processing activities, will continue to ensure an effective application the data protection legal framework.

In 2021, the following actions will be taken:

- Monitor and update as needed the electronic central register of records of processing activities, published on the FCH 2 JU website;
- Implement and follow up the implementation of the mitigation measures decided in Data Protection Impact Assessments.
- Continued awareness raising for staff with regard to the data protection related tools, keeping an update records, as well as on the different aspects in implementing the data protection legislation through bi-annual sessions to be organised by the DPO;
- General and ad-hoc advice to the controller in fulfilling its obligations;
- The DPO will continue to provide support for the preparation of any new records and corresponding privacy statements;
- Continue to participate in the data protection working groups of the EU institutions and bodies for maintaining up-to-date the necessary documentation relating to data protection in the framework of Horizon 2020 / Horizon Europe;

[69] OJ L 295, 21.11.2018, p. 39–98. Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC

- Ensure follow-up with guidelines provided by the EDPS, the European Data Protection Board, CJEU decisions affecting the field of data protection in the context of FCH 2 JU's activities.

3.5 Governance

The **Governing Board (GB)** is the main decision-making body of the FCH 2 JU. It shall have overall responsibility for the strategic orientation and the operations of the FCH 2 JU and shall supervise the implementation of its activities in accordance with Article 7 of the Statutes. The GB is composed of 3 representatives of the European Commission on behalf of the EU, 6 representatives of the Industry Grouping (Hydrogen Europe) and 1 representative of the Research Grouping (Hydrogen Europe Research). The GB is planning to hold three meetings during 2021.

The indicative key decisions of the GB in the year 2021 are listed below:

Key decisions in 2021 – timetable	
Approve the Annual Activity Report (AAR) 2020 and adopt its assessment	Q2
Deliver an opinion on the Final Accounts 2020	Q2
Approve the independent assessment of the level of in-kind contributions (related to FP7) as at 31 December 2020	Q2
Elect the Chair of the Governing Board	Q2
Adopt the Annual Work Plan and Budget for 2022 including the staff establishment plan	Q4
Approve the Additional Activities plan for 2022	Q4

In addition depending on the timing of EC decisions implementing rules on staff regulations may be submitted to the GB for adoption (e.g on administrative enquiries and disciplinary procedures).

The States Representatives Group (SRG) is an advisory body to the GB. It consists of one representative of each Member State and of each country associated to the Horizon 2020 Framework Programme. The SRG shall be consulted and, in particular review information and provide opinions on the following matters: (a) programme progress in the FCH 2 JU and achievement of its targets; (b) updating of strategic orientation; (c) links to the Horizon 2020; (d) annual work plans; (e) involvement of SMEs. The GB shall inform without undue delay the SRG of the follow up it has given to recommendations or proposals provided by the SRG, including the reasoning if they are not followed up. The Chairperson of the SRG shall have the right to attend the meetings of the GB and take part of its deliberations but without voting rights.

The SRG will hold at least two meetings in 2021. Issues that are likely to be covered include:

- Input to MAWP 2021-2027 for Clean Hydrogen Partnership
- Input to AWP2021 for Clean Hydrogen Partnership
- Preparatory work related to the future mandate of the SRG under the proposed Clean Hydrogen Partnership

The **Scientific Committee (SC)** is an advisory body to the GB and shall consist of no more than 9 members. The members shall reflect a balanced representation of worldwide-recognized expertise from academia, industry and regulatory bodies. The SC role is to provide (a) advice on scientific priorities to be addressed in the annual work plans; (b) advice on scientific achievements described in the Annual Activity Report. The Chairperson of the SC shall have the right to attend the meetings of the GB and take part of its deliberations, but without voting rights. During 2021, the SC activities may continue as regards point (b) of its mandate (as no further call for proposals are planned under the FCH 2 JU).

The **Stakeholder Forum (SF)** is an advisory body to the GB. It is an important communication channel to ensure transparency and openness of the FCH 2 JU programme. It provides an overview of the major developments in the past year and seeks to outline a vision for the way the sector will unfold in the coming years. It shall be convened once a year and shall be open to all public and private stakeholders, international interest groups from Member States, Associated Countries as well as from other countries. The SF shall be informed of the activities of the FCH 2 JU and shall be invited to provide comments. As of 2020, the Stakeholder Forum is enlarged to a European Hydrogen Forum (part of a Hydrogen Week[70]), to further include all EU activities on hydrogen and therefore, collaborate with Hydrogen Alliance activities. Due to the current big attention and multiple activities on hydrogen at EU level, it may be organised twice in 2021.

[70] https://www.fch.europa.eu/european-hydrogen-week

3.6 Internal Control framework

FCH 2 JU revised Internal Control Framework was adopted by the GB in August 2018[71], whereas an assessment of the level of implementation of Internal Control Framework was completed in December 2018[72].

The priority objective remains to implement and maintain 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.

For this purpose, particular emphasis will be given to the assessment of efficiency of internal control measures.

Following the assessment of the internal control systems carried out in 2020, the following actions were identified for 2021:

- ✓ Regarding the component **of the risk assessment:**
  1) Update KPIs according to the new objectives of the future Clean Hydrogen Partnership under Horizon Europe
  2) Carry out a full scope risk assessment exercise in the context of the adoption of the new Council Regulation establishing the Clean Hydrogen Partnership
  3) An antifraud awareness session will take place in 2021
- ✓ Regarding the component **Control Activities**:
  1) Implement the data protection and IT measures identified in the Data Protection Impact Assessment (DPIA) in view of using Office 365
- ✓ Regarding the component **Information and Communication component:**
  1) Qualified Electronic Signature in Ares to be implemented in 2021
  2) Develop actions related to adaptation of internal communication in the frame of the new ways of working
  3) Draft communication strategy for the future Clean Hydrogen Partnership
- ✓ Regarding the component **Monitoring Activities**
  1) Follow up on findings and recommendation raised in the IAS audit on Horizon 2020 grant implementation in FCH 2 JU

Financial procedures

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

In 2021, FCH 2 JU will continue to ensure proper implementation of the FCH 2 JU financial rules and procedures and will maintain financial circuits up-to-date.

Ex-ante and ex-post controls

Ex-ante controls are essential to prevent errors and avoid the need for ex-post corrective actions. In accordance with Article 74 of the Financial Regulation 2018/1046[73], "each operation shall be subject at least to an ex ante control relating to the operational and financial aspects of the operation, on the basis of a multiannual control strategy which takes risk into account.". Therefore, the main objective of ex ante controls is to ascertain that the principle of sound financial management has been applied.

[71] Ares(2018)4420458
[72] Ares(2018)6591876
[73] OJ L193, 30.7.2018 p.66

An ex-ante control can take the form of checking grant agreements, initiating, checking and verifying invoices and cost claims, carrying out desk reviews (performed by FCH 2 JU project, finance and legal officers); mid-term reviews carried out by external experts and ad-hoc technical reviews (when deemed necessary).

FCH 2 JU has developed elaborated procedures defining 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 2021, specific attention will be put to the following elements of ex-ante control:

- Participation of project and finance officers at H2020 project kick-off meetings in order to clearly communicate the financial reporting requirements;
- Setting-up webinars with consortia to clarify financial issues before claiming costs;
- Targeted workshops and reviews for beneficiaries and projects with higher identified inherent risk, especially for smaller SMEs;
- Participation of the finance officers to audits launched by Common Audit Service (CAS) with the aim to identify potential risks as well as for training purposes;
- Application of the feedback from ex-post audits and lessons learnt on ex-ante controls, e.g. identification and red-flags for most frequent H2020 errors identified by ex-post audits.

Ex-post controls are defined as the controls executed to verify financial and operational aspects of finalised budgetary transactions in accordance with Article 19 of FCH 2 JU Financial Rules. 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. FCH 2 JU ex post controls of FCH grants include financial audits. The complete lifecycle of FCH-FP7 audits is managed and monitored by FCH 2 JU and audits are carried out by external audit firms. For FCH- H2020 grants, the ex-post audits are monitored by CAS (Unit B2) of the Common Implementation Centre (CIC), in close cooperation with the FCH 2 JU, except for implementation which remains fully with the FCH 2 JU. CAS may also outsource the audit work to external audit firms for the FCH-H2020 grants.

In 2021, focus will be put on the following:

- In cooperation with CAS, launching of new H2020 audits in two rounds: early in 2021 based on analytical risk-profile review of the main beneficiaries and later in 2021 based on the JUs' random sampling methodology to cover annual targets as per Annex 1 of the H2020 ex-post audit strategy;
- In cooperation with CAS, and in line with H2020 Working Arrangements, ensure monitoring of timely completion of the H2020 audits;
- Contribute, in cooperation with the CAS, to developments of the Horizon Europe programme, based on experience and lessons learnt from H2020;

FCH 2 JU implements the common Research **Anti-Fraud Strategy. In March 2019, CIC adopted** the revised Research Family Anti-Fraud Strategy (RAFS 2019) and the associated action plan (replacing RAFS 2015 and its action plan). The implementation of the action plan is monitored through regular meetings of the Fraud and irregularity Committee (FAIR) to which the FCH 2 JU takes part. Furthermore for areas of expenditure other than grants, the FCH 2 JU applies 'mutatis mutandis' by analogy the anti-fraud strategy of DG R&I. This is relevant in particular for expert management, procurement and internal fraud and the risk analysis lead to the conclusion that the residual risks (after mitigating actions) are low.

In 2021, FCH 2 JU will:

- continue to apply harmonized preventive measures for fraud detection, e.g. via enhanced-monitoring tool available as a new feature in Sygma-Compass workflow;
- implement the anti-plagiarism check of project deliverables;
- participate to FAIR meetings organized by DG R&I;
- arrange an awareness raising session on fraud prevention and detection;
- follow up on a specific guidance of OLAF for COVID-19 related fraud schemes in the frame of ex-ante and ex-post controls within FCH 2 JU.

Audits

Internal audits are carried out by the **Internal Audit Service of the European Commission** (IAS) in liaison with Internal Control and Audit Manager.

In 2021, focus will be put on the following:

- Coordination of the new annual IAS audit under a new strategic internal audit plan (ref. SIAP 2019 – 2021[74]);
- Input for a revision of SIAP 2019 -2021;
- Follow up on findings and recommendation raised in the IAS audit on Horizon 2020 grant implementation in the Fuel Cells and Hydrogen 2 Joint Undertaking (FCH2 JU).

As regards **European Court of Auditors (ECA) audits**, the FCH 2 JU will:

- Liaise with the independent auditor (contracted in 2020 based on the results of the reopening of competition under EC (DG BUDG) FWC) to audit FCH 2 JU accounts as required by the FCH 2 JU Financial Rules);
- Follow up and implement any recommendation made in ECA reports on the FCH 2 JU annual accounts;
- Provide the necessary information and support for ECA audit on 2020 and 2021 accounts;
- Participate or support the ECA team in their field or remote missions for FCH 2 JU projects selected (on a sample basis) for an ex-post financial reviews, including follow up with FCH 2 JU beneficiaries and with CAS.

[74] Ref. Ares(2019)5836085

4. BUDGET YEAR 2021

4.1 Budget information

The draft budget 2021 is in line with the preliminary budget presented in the Fiche Financière and with the draft budget sent to GB members on 31 January 2020[75]. The following changes are noted:

1) Reactivation of EUR 43 500 of unused commitment appropriations from administrative costs, coming from year 2020, stemming from appropriations that is known that will not be committed
2) Reactivation of EUR 1 200 000 of unused commitment appropriations from 2020 operational budget
3) Reactivation in EUR 2 484 487 of unused payment appropriations under operational budget lines, coming from year 2020 as follows:

- ✓ EUR 217 362 from FP7 unused appropriations in 2020, stemming from moving 1 payment foreseen in 2019 to 2020.
- ✓ EUR 2 267 125 from H2020 unused appropriations

It is noted that the budget of the FCH 2 JU shall be adapted to take into account the amount of the Union contribution as laid down in the budget of the Union.

[75] Ares(2020)623311

The estimated revenue of FCH 2 JU for the year 2021 include contributions to the administrative costs from Hydrogen Europe and Hydrogen Europe Research as well as the contribution of the Union for administrative costs and operational activities (the latter only for payment appropriations). Amounts are expressed in euros.

Title Chapter Article Item	Heading	Budget 2019 CA (executed)	Budget 2019 PA (executed)	Budget 2020 (as at 02/10/2020) CA	Budget 2020 (as at 02/10/2020) PA	Budget 2021 CA	Budget 2021 PA	Remarks
20	SUBSIDIES AND REVENUES							
2001	*European Commission subsidy for operational expenditure (7th Framework Programme)*	0	250,000	0	4,521,322		1,150,639	Council Regulation 559/2014 of 6 May 2014 on the establishment of the Fuel Cells and Hydrogen 2 Joint Undertaking
2002	*European Commission subsidy for administrative expenditure*	2,684,775	2,684,775	2,381,733	2,381,733	2,649,250	2,649,250	Council Regulation 559/2014 of 6 May 2014 on the establishment of the Fuel Cells and Hydrogen 2 Joint Undertaking includes EFTA (2.38% in 2019, 2.41% in 2020 and 2021)
2003	*Hydrogen Europe contribution for administrative expenditure*	2,308,907	2,308,907	2,048,290	2,048,290	2,278,355	2,278,355	Council Regulation 559/2014 of 6 May 2014 on the establishment of the Fuel Cells and Hydrogen 2 Joint Undertaking
2004	*Hydrogen Europe Research contribution for administrative expenditure*	375,869	375,869	333,443	333,443	370,895	370,895	Council Regulation 559/2014 of 6 May 2014 on the establishment of the Fuel Cells and Hydrogen 2 Joint Undertaking
2005	*European Commission subsidy for operational expenditure (Horizon 2020)*	81,723,069	98,618,082	81,510,246	76,127,865		60,815,319	Council Regulation 559/2014 of 6 May 2014 on the establishment of the Fuel Cells and Hydrogen 2 Joint Undertaking includes EFTA (2.38% in 2019, 2.41% in 2020 and 2021)
2006	*JTI revenues*	838,790	838,790					Interest, income from liquidated damages & others
Total title subsidies and revenues		**87,931,410**	**105,076,423**	**86,273,712**	**85,412,653**	**5,298,500**	**67,264,458**	
30	REACTIVATIONS							
3012	*C2 reactivation of appropriations for administrative expenditure (2017)*	269,954	269,954					FCH 2 JU Financial rules article 6 - unused PA for administrative costs re-entered to be used for administrative costs
3013	*C2 reactivation of appropriations for operational expenditure (2017)*							FCH 2 JU Financial rules article 6 - de-committed CA for operational activities re-entered to be used for operational activities
3014	*C2 reactivation of appropriations for administrative expenditure (2018)*		814,345	662,380	662,380			FCH 2 JU Financial rules article 6 - unused PA for administrative costs re-entered to be used for administrative costs
3015	*C2 reactivation of appropriations for operational expenditure (2018)*	3,529,221	7,695,259	263,606	12,286,651			FCH 2 JU Financial rules article 6 - de-committed CA for operational activities re-entered to be used for operational activities
3016	*C2 reactivation of appropriations for administrative expenditure (2019)*			424,410	424,410	250,000	250,000	FCH 2 JU Financial rules article 6 - unused PA for administrative costs re-entered to be used for administrative costs
3017	*C2 reactivation of appropriations for operational expenditure (2019)*			12,784,309	300,000			FCH 2 JU Financial rules article 6 - de-committed CA for operational activities re-entered to be used for operational activities
3018	*C2 reactivation of appropriations for administrative expenditure (2020)*					43,500	43,500	FCH 2 JU Financial rules article 6 - unused PA for administrative costs re-entered to be used for administrative costs
3019	*C2 reactivation of appropriations for operational expenditure (2020)*					1,200,000	2,484,487	FCH 2 JU Financial rules article 6 - de-committed CA for operational activities re-entered to be used for operational activities
Total title reactivations		**3,799,175**	**8,779,558**	**14,134,705**	**13,673,441**	**1,493,500**	**2,777,987**	
TOTAL REVENUES		**91,730,585**	**113,855,981**	**100,408,417**	**99,086,094**	**6,792,000**	**70,042,445**	

The FCH 2 JU 2021 budget amounts to a total of EUR 6 792 000 in CA and EUR 70 042 445 in PA. To facilitate comparison between 2020 and 2021, the amount reactivated in 2020 as unused administrative payment appropriations stemming from open commitments of 2019 is excluded from the presentation below (EUR 869 686):

Title Chapter Article Item	Heading	Executed 2019		Financial year 2020 (as at 02/10/2020)		Financial year 2020		*Ratio 2019/2021*	*Ratio 2019/2021*	Comments
		Committed appropriations	Paid appropriations	Commitment appropriations (CA)	Payment appropriations (PA)	Commitment appropriations (CA)	Payment appropriations (PA)	Commitment appropriations (CA)	Payment appropriations (PA)	
1	**STAFF EXPENDITURE**									
1 1	STAFF IN ACTIVE EMPLOYMENT	3,137,163	3,131,151	3,556,000	3,556,000	3,631,800	3,631,800	86%	86%	Salaries for temporary staff and contract agents, family allowances, expatriation and foreign residence allowances, unemployment insurance, insurance against accidents and occupational disease, annual travel costs; Interim staff and trainees; SNE allowances Installation allowance and daily subsistence, resettlement allowance and removal costs for staff arriving/departing Cost of PMO provisions
1 2	EXPENDITURE RELATED TO RECRUITMENT	13,843	13,843	5,000	5,000	5,000	5,000	277%	277%	Miscellaneous expenditure on staff recruitment: installation and travel expenses
1 3	MISSIONS AND TRAVEL	180,000	157,550	175,000	175,000	130,000	130,000	138%	121%	Mission expenses
1 4	SOCIOMEDICAL INFRASTRUCTURE AND TRAINING	39,533	35,865	44,500	44,500	43,000	43,000	92%	83%	Training, medical service and mobility costs
1 5	ENTERTAINMENT AND REPRESENTATION EXPENSES	3,338	3,338	5,600	5,600	5,000	5,000	67%	67%	Representation and receptions
	TOTAL TITLE 1	**3,373,877**	**3,341,747**	**3,786,100**	**3,786,100**	**3,814,800**	**3,814,800**	**88%**	**88%**	
2	**BUILDING, EQUIPMENT AND MISCELLANEOUS EXPENDITURE**									
2 0	INVESTMENTS IN IMMOVABLE PROPERTY RENTAL OF BUILDINGS AND ASSOCIATED COSTS	353,563	347,109	370,000	370,000	356,000	356,000	99%	98%	Rent, works, insurance, common charges (water/gas/electricity), maintenance, security and surveillance
2 1	INFORMATION TECHNOLOGY	354,473	291,122	481,517	481,517	388,000	388,000	91%	75%	IT purchases, software licences, software development
2 2	MOVABLE PROPERTY AND ASSOCIATED COSTS	0	0	5,000	5,000	10,000	10,000	0%	0%	Purchases and rental of office equipment, maintenance and repair
2 3	CURRENT ADMINISTRATIVE EXPENDITURE	3,322	3,388	11,000	11,000	9,300	9,300	36%	36%	Office supplies, library, translation service, bank charges and miscellaneous office expenditure
2 4	CORRESPONDENCE, POSTAGE AND TELECOMMUNICATIONS	10,660	7,297	13,000	13,000	13,000	13,000	82%	56%	Telephones, video conferences and postal services
2 5	EXPENDITURE ON FORMAL AND OTHER MEETINGS	48,184	46,431	90,000	90,000	50,000	50,000	96%	93%	Official meetings such as SRG, Scientific Committee, Governing Board
2 6	COMMUNICATION COSTS	569,720	508,306	600,000	600,000	660,000	660,000	86%	77%	External communication and events
2 7	SERVICE CONTRACTS	119,250	81,126	132,239	132,239	167,000	167,000	71%	49%	Studies and audits
2 8	EXPERT CONTRACTS AND MEETINGS	321,259	316,475	361,400	361,400	123,900	123,900	259%	255%	Costs related to expert contracts (evaluations, mid-term, ad-hoc and final reviews)
	TOTAL TITLE 2	**1,780,432**	**1,601,255**	**2,064,156**	**2,064,156**	**1,777,200**	**1,777,200**	**100%**	**90%**	
	TOTAL TITLE 1+2 (ADMINISTRATIVE EXPENDITURE)	**5,154,309**	**4,943,002**	**5,850,256**	**5,850,256**	**5,592,000**	**5,592,000**	**92%**	**88%**	
3	**OPERATIONAL EXPENDITURE**									
3 0 0 1	Implementing the research agenda of FCH Joint Undertaking: 7th Framework Programme (FP7)	0	5,805,092		5,223,805	0	1,368,001	0%	165%	This appropriation shall cover the operational costs of the JU regarding FP7 grants (pre-financings, interim and final payments) and studies.
3 0 0 2	Implementing the research agenda of FCH Joint Undertaking: Horizon 2020	73,642,035	101,263,790	94,558,162	88,012,032	1,200,000	63,082,444	0%	161%	This appropriation shall cover the operational costs of the JU regarding H2020 grants (pre-financings, interim and final payments), studies and JRC contribution.
	TOTAL TITLE 3 (OPERATIONAL EXPENDITURE)	**73,642,035**	**107,068,882**	**94,558,162**	**93,235,838**	**1,200,000**	**64,450,445**	**6137%**	**166%**	
	TOTAL EXPENDITURE	**78,796,344**	**112,011,884**	**100,408,418**	**99,086,094**	**6,792,000**	**70,042,445**	**1160%**	**160%**	

Revenues

As per article 13.2 of the Statutes annexed to the Council Regulation No 559/2014 of 06/05/2014, the Union shall contribute 50%, the Industry Grouping 43% and the Research Grouping 7% to the administrative budget.

The 2021 administrative appropriations are complemented by additional EUR 267 500 from 2019 and 2020 unused administrative appropriations.

Operational expenses are entirely covered by the EC subsidy.

Expenditure

Overall the administrative budget (Titles 1 and 2) will show a decrease by 4.4% (EUR 258 256) compared to 2020.

In more details:

Title 1 – Staff

Title 1 (staff costs) represents 68% of the administrative costs in the 2021 budget. It mainly covers salaries (94% of the Title 1 amount) whereas other budget lines cover missions, training & socio-medical costs, recruitment costs and representation expenses.

Title 1 will show an increase by 0.8% (EUR 59 400) compared to 2020 costs. This is due to:

- An increase by 2.1% in budget line for staff in active employment. This is justified due to an assumption for a 2% indexation (applicable as of the second half of the year) whereas the net impact of reclassifications and step advancements and the decrease in number of pupils in the European School and crèches is 1%.

On the other side, the following budget lines will show decrease compared to 2020:

- Mission expenses will be decreased by 26% as it is expected that many travel restrictions will still be in place until at least Q1 2021, thus preventing missions.
- Sociomedical infrastructure and training budget line will be decreased by 3% due to a decrease in the provision for mobility since fewer FCH staff are expected to use means of public transport in 2021.

Title 2 – Infrastructure

Title 2 represents 32 % of the administrative costs in 2020. Title 2 will show a 14% decrease (EUR 286 956) compared to the 2020 budget. This is due to:

- A significant decrease by nearly 2/3 in the expert contracts and meetings budget line as there will be no cost for evaluators in 2020 whereas the costs for mid-term reviews will be decreased at least for the 1st quarter of 2021 where due to expected travel restrictions, reviews will take place remotely.
- Decrease by 44% in meetings budget line since it is expected that no or limited physical meetings will take place in Q1 2021.
- Decrease by 16% in current administrative expenses to adjust the budget to actual consumption of the past 3 years.
- Decrease by 19% in IT budget line as the provision for the E-HRS procurement will be reserved in BL 2700.
- Decrease by 4% in building rentals and charges since the repartition key (calculated as share of the building surface) for FCH slightly decreased resulting in a decrease in both rent and charges.

On the other side:

- Communication costs will increase by 10% (EUR 60 000) since 2021 will see the organisation of the European Hydrogen week and possibly a second Hydrogen Forum. In addition and to

implement the communication plan as described in section 3.4 above, more focus will be placed in online awareness campaigns and public awareness/acceptance measures.

- Service contracts will show an increase by 26% (EUR 34 761). Compared to 2020 provisions, there will be no contract for the audits on accounts (the contract was signed in 2020 for a 2-year certification period) whereas this BL will include the provision for E-HRS study.

Title 3 – Operational

The last call for proposals under H2020 occurred in 2020. Therefore, the current budget, covering FP7 and H2020 programmes, does not foresee any commitment appropriations in 2021. There will be only an amount of EUR 1 200 000 reactivated to cover for the annual rolling plan with JRC as well as the work of the European Hydrogen Safety Panel in 2021.

Concerning payment appropriations:

- FP7 budget will be decreased by nearly 80% as only 3 reports are expected to be paid.
- H2020 budget will also be decreased by 28% as no pre-financing will be given in 2021. However, 67 reports are expected to be paid, a figure slightly higher compared to 2020 provision (61). In addition, payment appropriations will cover for the payments in line with the JRC agreed rolling plan and payments of studies procured under the operational budget as described in section 3.2 (H).

Summary Statement of Schedule of Payments

The FCH 2 JU Schedule of payments represents a summary statement of the schedule of payments due in subsequent financial years (2020-2023 and following years) to meet budget commitments entered into earlier financial years (before 2020) as well as in 2020.

SUMMARY SCHEDULE OF PAYMENTS (Operational)

2019 Outturn		2020 Budget		2021 Budget		Difference (2021/2020)	
Committed	Paid	CA	PA	CA	PA	CA	PA
73,642,035	107,068,882	94,558,162	93,235,838	1,200,000	64,450,445	-99%	-31%

DETAILS OF PAYMENT SCHEDULE (Operational)

FP7

		Payments					
Commitments		2020	2021	2022	2023	Outstanding amount	**Total**
Commitments still outstanding (RAL)	**9,405,539**	2,630,904	1,368,001	0	2,999,997	2,406,638	**9,405,539**
TOTAL	**9,405,539**	2,630,904	1,368,001	0	2,999,997	2,406,638	**9,405,539**

H2020

		Payments					
Commitments		2020	2021	2022	2023	Outstanding amount	**Total**
Pre-2020 commitments still outstanding (RAL)	**129,915,581**	11,349,835	59,036,070	15,498,138	26,197,377	17,834,161	**129,915,581**
2020 commitment appropriations still outstanding (RAL)	**93,037,510**	53,245,264	4,046,374	9,911,691	8,356,277	17,477,904	**93,037,510**
TOTAL	**222,953,091**	64,595,099	63,082,444	25,409,829	34,553,654	35,312,065	**222,953,091**

State of play on 02/10/2019: RAL refers to open commitments on 02/10 - payments for 2020 refer to foreseen payments from 02/10/2020 until the end of the year

FP7: RAL refers to FCH open commitments from 11 grants for which a final payment is not done or there is an ongoing audit that may lead to adjustments

H2020:
1) Pre-2020 RAL refers to 85 grants for which final payment is not yet done (hence not de-committed yet) and 6 studies
2) 2020 RAL includes the global amount committeed for the call 2020, the JRC commitment for 2020 and the commitment for the work on the European Hydrogen Safety Panel in 2020. 2020 payments under the 2020 RAL refer to the pre-financing, whereas the 2021 payments under 2020 RAL refer to JRC and EHSP only

4.2 Staff Establishment Plan and Organisation Chart

The JU team of statutory staff consists of 27 positions (24 TA and 3 CA).

In addition, staff resources include 2 Seconded National Experts (SNE).

The 2021 Staff Establishment Plan is shown below:

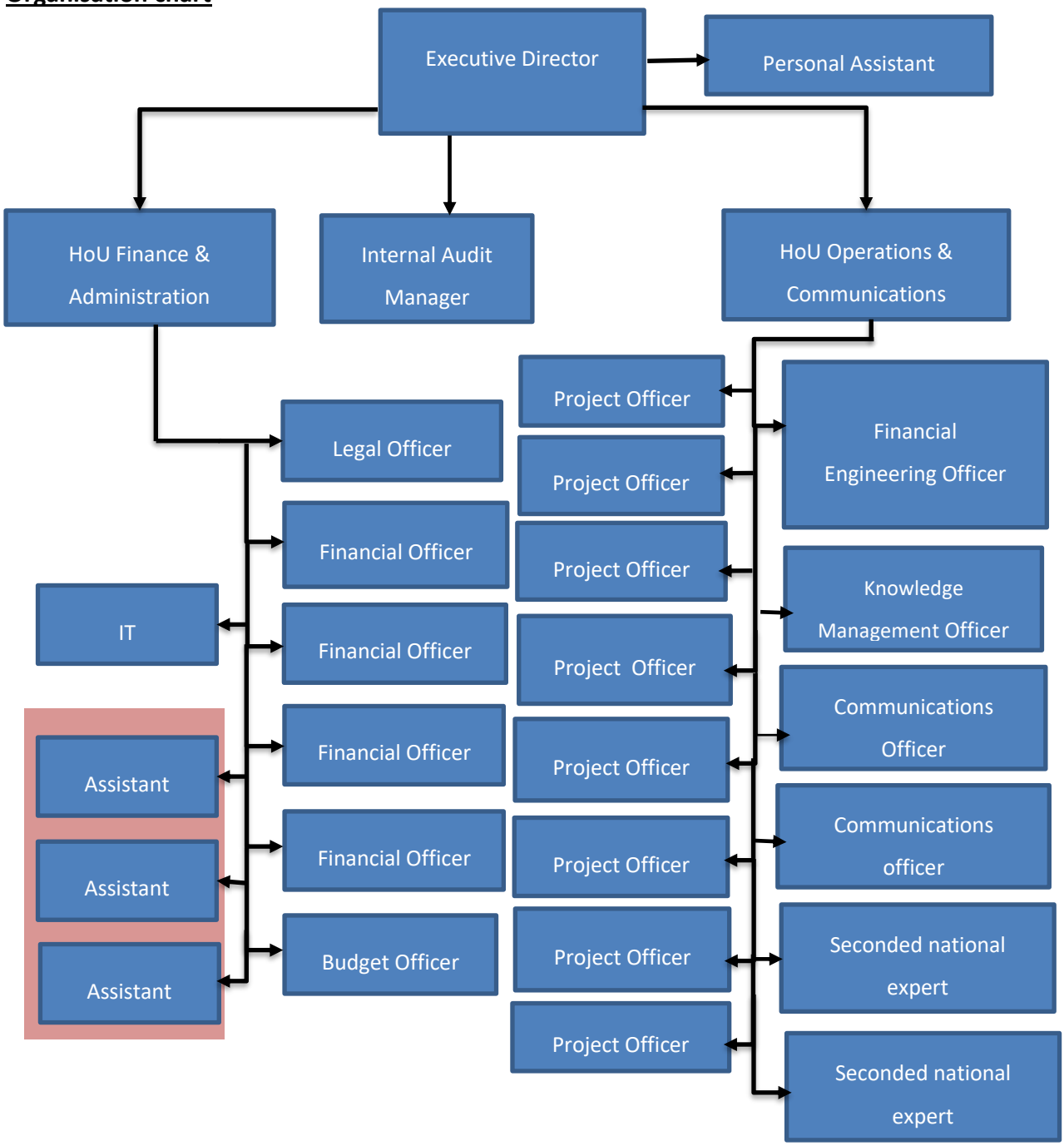
Grade	**2019 budget**	**2019 filled**	**2020 budget**	**2021 budget**
AD 14	1	1	1	1
AD 13	-	-	-	-
AD 12	-	-	-	2
AD 11	2	2	2	-
AD 10	-	-	-	-
AD 9	2	2	4	5
AD 8	6	6	4	3
AD 7	-		1	2
AD 6	4	4	3	2
AD 5	-	-	-	-
Total AD[76]	**15**	**15**	**15**	**15**
AST 9	-		1	1
AST 8	2	2	1	1
AST 7	1	1	1	1
AST 6	1	1	1	1
AST 5	1	1	1	2
AST 4	4	4	4	3
Total *AST*[77]	**9**	**9**	**9**	**9**
Function Group IV	1	1	1	1
Function Group III	1	1	1	1

[76] AD stands for Administrator

[77] AST stands for Assistant

Grade	2019 budget	2019 filled	2020 budget	2021 budget
Function Group II	1	1	1	1
Total Contract Agents	**3**	**3**	**3**	**3**
Total Seconded National Experts	**2**	**1**	**2**	**2**

Organisation chart



5. LIST OF ACRONYMS

Term	Definition
AAR	Annual Activity Report
AWP	Annual Work Plan
CA	Contract Agent (HR); Commitment Appropriations (Budget)
CAS	Common Audit Service
CEF	Connecting Europe Facility funding instrument
CIC	Common Implementation Centre (former CSC)
COP	Conference of the Parties (yearly conferences in the framework of the United Nations Framework Convention on Climate Change)
CORDIS	Community Research and Development Information Service
CRIG	Communication Research and Innovation Group
CTCN	Climate Technology Centre & Network
DG BUDG	Directorate-General for Budget
DG GROW	Directorate-General for Internal Market
DG HR	Directorate-General for Human Resources and Security
DG MOVE	Directorate-General for Mobility and Transport
DG RTD; DG R&I	Directorate-General for Research and Innovation
DIGIT	Directorate-General for Informatics
DPO	Data Protection Officer
ED	Executive Director
EC	European Commission
ECA	European Court of Auditors
EHSP	European Hydrogen Safety Panel
EMM	European Media Monitoring
EFTA	European Free Trade Area
EU	European Union
EUSEW	EU Sustainable Energy Week
FAIR	Fraud And Irregularity Committee of DG RTD
FCH 2 JU	The Fuel Cells and Hydrogen 2 Joint Undertaking: name used to refer to the legal entity established as the public & private partnership.
FP7	EU's Seventh Framework Programme for Research and Technological Development (2007 - 2013)
GB	Governing Board
H2020	Horizon 2020 – EU's Framework Programme for Research and Innovation programme (2014 - 2020)
HE	Hydrogen Europe
HELLEN	Hydrogen Events and Lessons LEarNed database
HER	Hydrogen Europe Research
HIAD	Hydrogen Incident and Accident Database
HRS	Hydrogen Refuelling Station
HTE	High Temperature Electrolysis
IAS	Internal Audit Service

IEA	International Energy Agency
IEC	International Electrotechnical Commission
IPHE	International Partnership for Hydrogen into the Economy
ISO	International Standards Organization
JRC	Joint Research Centre of the European Commission
KPI	Key Performance Indicator
LCA	Life-Cycle Assessment
LTWE	Low Temperature Water Electrolysis
MAWP	Multi-Annual Work Plan
MW	Megawatt
NECPs	National Energy and Climate Plans
NG	Natural Gas
NGO	Non-governmental organisation
PEM	Proton Exchange Membrane Fuel Cell
PA	Payment Appropriations
PO	FCH 2 JU Programme Office
PPP	Public Private Partnership
PRD	Programme Review Days
PNR	Pre-normative Research
RCS	Regulations, Codes and Standards
R&D; R&I	Research and Development; Research and Innovation
SET-plan	Strategic Energy Technology plan
SME	Small and Medium Enterprises
SoA	State of the Art
SOC	Solid Oxide (Fuel) Cell
SRG	States Representative Group, advisory body of the FCH 2 JU gathering representatives from Member States and Associated Countries
TA	Temporary Agent
TRL	Technology Readiness Level
TRUST	Technology Reporting Using Structured Templates (Data collection platform)
UN	United Nations

6. Annex: Horizon 2020 INDICATORS FOR JOINT UNDERTAKINGS

- Table I shows the Horizon 2020 KPIs which apply to JUs, both under Industrial Leadership and Societal Challenges (Horizon 2020 Key Performance Indicators (Annex II - Council Decision 2013/743/EU)).

- Table II presents all indicators for monitoring of cross-cutting issues which apply to JUs (Annex III - Council Decision 2013/743/EU).

- In tables I and II, the numbers attributed to the indicators correspond with those in the Horizon 2020 indicators approved by the RTD Director-General and agreed by all the Research family DGs (according to Annexes II and III - Council Decision 2013/743/EU). The missing numbers correspond to KPIs not applicable to the JUs.

- KPIs and Indicators that correspond to those approved by the RTD Director-General 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 I and II, which do not correspond to those approved by the RTD Director-General, are presented with a green background in the tables.

- Table III presents the KPI specific for FCH 2 JU.

TABLE I: Horizon 2020 Key Performance Indicators[78] common to all JUs

		Key Performance Indicator	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Baseline at the Start of Horizon 2020 (latest available)	Target at the End of Horizon 2020	Automated
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);	Based on Community Innovation Survey (?). Number and % of participating SMEs that have introduced innovations to the company or to the market;	Number of SMEs that have introduced innovations;	HORIZON 2020 beneficiaries through project reporting	n.a. [new approach under Horizon 2020]	50%	Yes
	13	SME - Growth and job creation in participating SMEs	Turnover of company, number of employees	Turnover of company, number of employees;	Horizon 2020 beneficiaries through project reporting	n.a. [new approach under Horizon 2020]	To be developed based on FP7 ex-post evaluation and /or first Horizon 2020 project results	Yes
SOCIETAL CHALLENGES	14	Publications in peer-reviewed high impact journals	The percentage of papers published in the top 10% impact ranked journals by subject category.	Publications from relevant funded projects (DOI: Digital Object Identifiers); Journal impact benchmark (ranking) data to be collected by commercially available bibliometric databases.	Horizon 2020 beneficiaries through project reporting; Responsible Directorate/Service (via access to appropriate bibliometric databases)	n.a. [new approach under Horizon 2020]	[On average, 20 publications per €10 million funding (for all societal challenges)]	Yes

[78] (based on Annex II to Council Decision 2013/743/EU)

		Key Performance Indicator	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Baseline at the Start of Horizon 2020 (latest available)	Target at the End of Horizon 2020	Automated
	15	Patent applications and patents awarded in the area of the JTI	Number of patent applications by theme; Number of awarded patents by theme	Patent application number	Horizon 2020 beneficiaries through project reporting; Responsible Directorate/Service (via worldwide search engines such as ESPACENET, WOPI)	n.a. [new approach under Horizon 2020]	On average, 2 per €10 million funding (2014 - 2020) RTD A6	Yes
	16	Number of prototypes testing activities and clinical trials[79]	Number of prototypes, testing (feasibility/demo) activities, clinical trials	Reports on prototypes, and testing activities, clinical trials	Horizon 2020 beneficiaries through project reporting	n.a. [new approach under Horizon 2020]	[To be developed on the basis of first Horizon 2020 results]	Yes
	17	Number of joint public-private publications in projects	Number and share of joint public-private publications out of all relevant publications.	Properly flagged publications data (DOI) from relevant funded projects	Horizon 2020 beneficiaries through project reporting; Responsible Directorate/Service (via DOI and manual data input-flags)	n.a. [new approach under H202]	[To be developed on the basis of first Horizon 2020 results]	Yes
	18*	New products, processes, and methods launched into the market	Number of projects with new innovative products, processes, and methods,	Project count and drop down list allowing to choose the type processes, products, methods,	Horizon 2020 beneficiaries through project reporting	n.a. [new approach under Horizon 2020]	[To be developed on the basis of first Horizon 2020 results]	Yes

[79] Clinical trials are IMI specific

		Key Performance Indicator	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Baseline at the Start of Horizon 2020 (latest available)	Target at the End of Horizon 2020	Automated
EVALUATION	NA	Time to inform (TTI) all applicants of the outcome of the evaluation of their application from the final date for submission of completed proposals	To provide applicants with high quality and timely evaluation results and feedback after each evaluation step by implementing and monitoring a high scientific level peer reviewed process	Number and % of information letters sent to applicants within target Average TTI (calendar days) Maximum TTI (calendar days)	Joint Undertaking	FP7 latest know results?	153 calendar days	Yes
	NA	Redress after evaluations	To provide applicants with high quality and timely evaluation results and feedback after each evaluation step by implementing and monitoring a high scientific level peer reviewed process	Number of redresses requested	Joint Undertaking	FP7 latest know results?		
GRANTS	NA	Time to grant (TTG) measured (average) from call deadline to signature of grants	To minimise the duration of the granting process aiming at ensuring a prompt implementation of the Grant Agreements through a simple and transparent grant preparation process	Number and % of grants signed within target Average TTG in calendar days Maximum TTG in calendar days	Joint Undertaking	n.a. [new approach under Horizon 2020]	TTG < 243 days (as %of GAs signed)	Yes
	NA	Time to sign (TTS) grant agreements 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	Joint Undertaking	n.a. [new approach under Horizon 2020]	TTS 92 calendar days	Yes

		Key Performance Indicator	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Baseline at the Start of Horizon 2020 (latest available)	Target at the End of Horizon 2020	Automated
PAYMENTS	NA	Time to pay (TTP) (% made on time) -pre-financing - interim payment -final payment	To optimize the payments circuits, both operational and administrative, including payments to experts	Average number of days for Grants pre-financing, interim payments and final payments; Average number of days for administrative payments; Number of experts appointed	Joint Undertaking	FP7 latest know results?	-pre-financing (30 days) - interim payment (90 days) -final payment ((90days)	Yes
HR	NA	Vacancy rate (%)		% of post filled in, composition of the JU staff [80]	Joint Undertaking	n.a. [new approach under Horizon 2020]		
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	% of CA and PA	Joint Undertaking		100% in CA and PA	Yes
	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	Number of delayed payments % of delayed payments (of the total)	Joint Undertaking			Yes

NOTES:

18* This indicator is not a legally compulsory one, but it covers several additional specific indicators requested for more societal challenges by the services in charge.

[80] Additional indicators can be proposed/discussed with R.1 and/or DG HR

TABLE II: Indicators for monitoring Horizon 2020 Cross-Cutting Issues[81] common to all JUs

	Cross-cutting issue	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Data to be Provided in/to	Direct Contribution to ERA	Automated
2	Widening the participation	2.1 Total number of participations by EU-28 Member State	Nationality of Horizon 2020 applicants & beneficiaries (number of)	Horizon 2020 applicants & beneficiaries at the submission and grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
		2.2 Total amount of EU financial contribution by EU-28 Member State (EUR millions)	Nationality of Horizon 2020 beneficiaries and corresponding EU financial contribution	Horizon 2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
NA		Total number of participations by Associated Countries	Nationality of Horizon 2020 applicants & beneficiaries (number of)	Horizon 2020 applicants & beneficiaries at the submission and grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
NA		Total amount of EU financial contribution by Associated Country (EUR millions)	Nationality of Horizon 2020 beneficiaries and corresponding EU financial contribution	Horizon 2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
3	SMEs participation	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 SME; % of EU contribution going to beneficiaries flagged as SME	Horizon 2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report		Yes
6	Gender	6.1 Percentage of women participants in Horizon 2020 projects	Gender of participants in Horizon 2020 projects	Horizon 2020 Beneficiaries through project reporting	JU AAR	YES	Yes

[81] (based on Annex III to Council Decision 2013/743/EU)

	Cross-cutting issue	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Data to be Provided in/to	Direct Contribution to ERA	Automated
		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	Horizon 2020 beneficiaries at the grant agreement signature stage	JU AAR	YES	Yes
		6.3 Percentage of women in EC advisory groups, expert groups, evaluation panels, individual experts, etc.	Gender of memberships in advisory groups, panels, etc.	Compiled by Responsible Directorate/ Service/Joint Undertaking based on existing administrative data made available by the CSC	JU AAR	YES	
7	International cooperation	7.1 Share of third-country participants in Horizon 2020	Nationality of Horizon 2020 beneficiaries	Horizon 2020 beneficiaries at the grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
		7.2 Percentage of EU financial contribution attributed to third country participants	Nationality of Horizon 2020 beneficiaries and corresponding EU financial contribution	Horizon 2020 beneficiaries at the grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
9	Bridging from discovery to market [82]	9.1 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.	Project Office – at GA signature stage he/she will be required to flag on SYGMA. Responsible Directorate/Service (WP coordinator)/Joint Undertaking - via tool CCM2	JU AAR RTD Monitoring Report		Yes
		9.2 Within the innovation actions, share of EU financial contribution focussed on demonstration and first-of-a-kind activities	Topics properly flagged in the WP; follow-up at grant level	Responsible Directorate/Service (WP coordinator)/Joint Undertaking - via tool CCM2	JU AAR RTD Monitoring Report		Yes

[82] This indicator (9.2) is initially intended to monitor the Digital Agenda (its applicability could be only partial)

	Cross-cutting issue	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Data to be Provided in/to	Direct Contribution to ERA	Automated
NA		Scale of impact of projects (High Technology Readiness Level)	Number of projects addressing TRL[83] between …(4-6, 5-7)?	Joint Undertaking	JU AAR RTD Monitoring Report		
11	Private sector participation	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	Horizon 2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report		Yes
		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	Horizon 2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report		Yes
12	Funding for PPPs	12.1 EU financial contribution for PPP (Art 187)	EU contribution to PPP (Art 187)	Responsible Directorate/Service/	JU AAR		Yes
		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)	Joint Undertaking Services	JU AAR RTD Monitoring Report JU annual accounts (part of)		

[83] TRL: Technology Readiness Level

	Cross-cutting issue	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Data to be Provided in/to	Direct Contribution to ERA	Automated
13	Communication and dissemination	13.3 Dissemination and outreach activities other than peer-reviewed publications - [Conferences, workshops, press releases, publications, flyers, exhibitions, trainings, social media, web-sites, communication campaigns (e.g. radio, TV)]	A drop down list allows to choose the type of dissemination activity. Number of events, funding amount and number of persons reached thanks to the dissemination activities	Horizon 2020 Beneficiaries through project reporting	JU AAR RTD Monitoring Report	YES	Yes
14	Participation patterns of independent experts	14.2 Proposal evaluators by country	Nationality of proposal evaluators	Responsible Directorate/Service/Joint Undertaking in charge with the management of proposal evaluation	JU AAR		
		14.3 Proposal evaluators by organisations' type of activity	Type of activity of evaluators' organisations	Responsible Directorate/Service/Joint Undertaking in charge with the management of proposal evaluation	JU AAR	YES	
NA	Participation of RTOs and Universities	Participation of RTO[84]s and Universities in PPPs (Art 187 initiatives)	Number of participations of RTOs to funded projects and % of the total Number of participations of Universities to funded projects and % of the total % of budget allocated to RTOs and to Universities	Horizon 2020 beneficiaries at the grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes
NA	Ethics	The objective is ensuring that research projects funded are compliant with provisions on ethics efficiently	% of proposals not granted because non-compliance with ethical rules/proposals invited to grant (target 0%); time to ethics clearance (target 45 days)[85]	Responsible Directorate/Service/Joint Undertaking	JU AAR RTD Monitoring Report		

[84] RTO: Research and Technology Organisation

[85] Data relates to pre-granting ethics review. This time span runs in parallel to granting process.

	Cross-cutting issue	Definition/Responding to Question	Type of Data Required	Data to be Provided by	Data to be Provided in/to	Direct Contribution to ERA	Automated
NA	Audit	Error rate	% of common representative error; % residual error	CAS	JU AAR RTD Monitoring Report		Yes
NA		Implementation of ex-post audit results	Number of cases implemented; in total €million; ´of cases implemented/total cases	CAS	JU AAR RTD Monitoring Report		Yes

Notes:

* Horizon 2020 applicants - all those who submitted Horizon 2020 proposals

* Horizon 2020 beneficiaries - all those who have signed a Horizon 2020 Grant Agreement

*Responsible Directorate - DG RTD Directorates and R&I DGs family in charge with management of Horizon 2020 activities

*Services -Executive Agencies and other external bodies in charge with Horizon 2020 activities

*Project officer - is in charge of managing Horizon 2020 projects in Responsible Directorate/Service including Executive Agencies

TABLE III: Key Performance Indicators specific to FCH 2 JU

Key Performance Indicator	Objective	Data to be Provided by	Baseline at the Start of Horizon 2020	Target at the End of Horizon 2020	Automated
Share of the fund allocated to the following research activities: - renewable energy - end user energy-efficiency - smart grids - storage		JU	Result of FP7		
Demonstrator projects hosted in MSs and regions benefiting from EU structural funds		JU	Result of FP7		