Sustainable SoluTions FOR recycling of end-of-life Hydrogen technologies

Deliverable D7.3

Communication, Dissemination and Exploitation Action plan

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Prepared by	Monica Risso, Sabina Fiorot, Ilaria Schiavi
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FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

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Executive Summary

This document aims at defining a common strategy for the communication, dissemination and exploitation of BEST4Hy project in order to reach effectively project stakeholders and significant target groups. The plan identifies the project visual identity use, the online and offline communication channels and adequate KPI to monitor performance. In the development of the document, the consortium has followed a bottom-up approach to harmonize all partners' needs in a joint communication, dissemination and exploitation guidelines document.

1 Introduction to the project

BEST4Hy focuses on the development and validation of existing and novel recycling processes for two key fuel cell and hydrogen products: proton exchange membrane fuel cells (PEM FC) and solid oxide fuel cells (SOFC). The project aims to adapt two existing recycling processes already applied to other technologies and to validate a novel dismantling process for PEMFC. Furthermore, a novel SOFC recycling technology will be proved. At the end of the processes, the materials will be validated in terms of quality and performance when re-used in new components and in new stacks, demonstrating the overall efficiency of recycling. Ambitious targets for recycled content in new stacks/cells have been set and will be validated by fuel cell producers, to prove the viability of higher value, closed loop recycling. Environmental impact and cost-benefits evaluations on the proposed technologies will be performed. This will support a more efficient use of raw materials, including critical resources, and it will contribute to improve the end-of-life treatment of the hydrogen technologies and to foster a circular economy approach within the sector.

BEST4Hy international consortium is composed of industrial partners and research institutes: Environment Park SpA (Italy), CEA Liten (France), Turin Politecnico (Italy), Hensel Recycling Gmbh (Germany), EKPO (Germany), Aktsiaselts Elcogen (Estonia), RINA Consulting SpA (Italy), University of Ljubljana (Slovenia).

1.1 Objectives

The main objective of the communication, dissemination and exploitation activities is to maximize the impact of BEST4Hy project, reaching project stakeholders and identified target groups.

These activities pursue different objectives along the project and can be divided in three main phases:

- **Phase I (M1-M24),** when the project **focuses on the technology selection and implementation of the four technologies**: the dissemination will be more

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oriented to maximize the scientific impact of the project, promoting the results amongst peers.

- **Phase II (M24-M36)**, when the project **focuses on the validation of results**, quality acceptance analysis and evaluation of the outputs for applicability, closed loop vs. open loop recycling. This phase will have a strong focus on disseminating the project's results once they are mature enough to clearly show the benefits of the technologies.
- **Phase III (M21-M36) focuses on** how to promote the results after the project for **the exploitation** through strategic assessment, analysis of the business case and replicability.

2 Communication and dissemination plan

A first analysis regarding the project target groups, useful for communication, dissemination and exploitation activities, is presented in *Paragraph 2.3*. More in detail, communication channels are described in *Chapter 3* where all means used to promote project progress from the beginning are described, targeting different audiences (not only the scientific community but the general public included). On the other hand, dissemination activities are focused on the public disclosure of the results and target actors who can learn from their disclosure (e.g., scientific community, European industry and technology provider), as shown in *Chapter 4*. Table 1 summarizes the difference between communication, dissemination and exploitation (*see chapter 8*), as it is interpreted in the document and suggested by European Commission Guidelines [1].

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1 https://ec.europa.eu/research/participants/docs/h2020-funding-guide/imgs/quick-guide_diss-expl_en.pdf

Table 1 Communication, Dissemination and Exploitation

	What	When	To whom	How
Communication actions	Project progress	From the start of the project until the end	Stakeholders, citizens	Online and offline channels
Dissemination actions	Project results	As soon as the project produces results	Actors that can learn from the results (especially, but not exclusively scientific community and technology provider)	Online and offline channels. Especially but not exclusively: scientific magazines, scientific/thematic conferences, scientific open science repository.
Exploitation actions	Project results and outputs	Towards the end and beyond, as soon as the action has exploitable results	E.g. Industry including SMEs, industrial authorities, policymakers, sectors of interest, civil society	Creating roadmaps, prototypes, software. Sharing knowledge, skills, data

The BEST4Hy project Dissemination and Communication plan will be a living document throughout the whole project. Its main outcomes will be detailed in the following deliverables as shown in *Figure 1*:

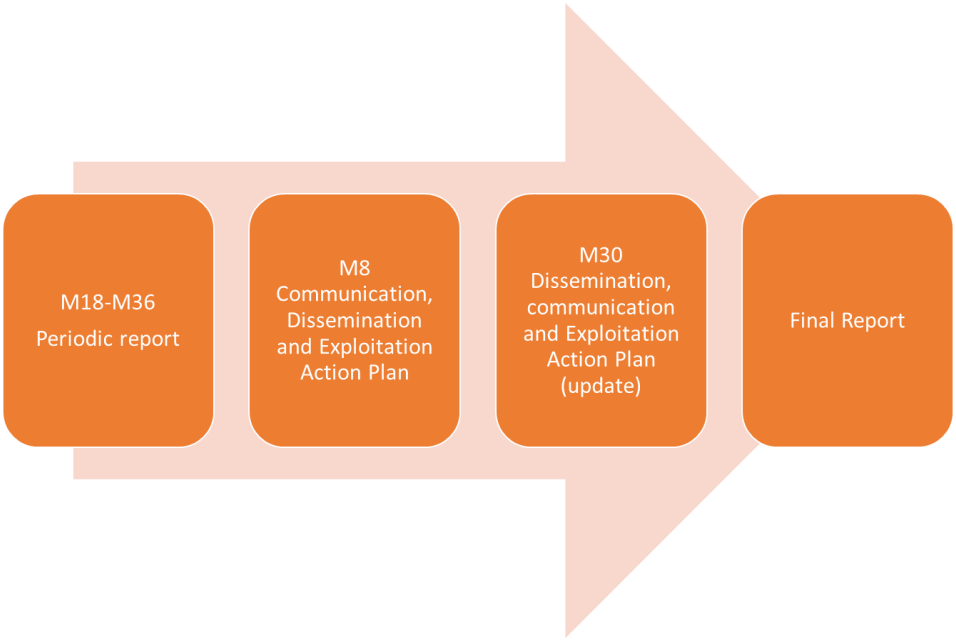

Figure 1 BEST4Hy Dissemination and communication results delivery

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Periodic reports

According to the Grant Agreement the periodic reports must detail the dissemination, communication and exploitation of the results and — if required in Annex 1 (GA) — an updated 'plan for the exploitation and dissemination of the results. BEST4Hy is required to produce at least one Periodic report at the end of the M18 Review Period.

Final report

According to the Grant Agreement the final report must include an overview of the results and their exploitation and dissemination and the socio-economic impact of the action. BEST4Hy Final Report is due after M36.

D7.3 Dissemination, communication and exploitation Action Plan (first)

It is this document and it includes:

- A first overview of potential channels and dissemination, communication and exploitation actions to be undertaken
- A first draft of the communication and dissemination strategy

D7.5 Dissemination, communication and Exploitation Action Plan (update)

In this second report, additional information will be included, as well as measures to overcome exploitation related issues.:

2.1 Visual identity

Figure 2 below illustrates the logo developed for the proposal. It was further developed as shown in the following figures (*Fig. 3, 4*). The concept is intended to inspire the idea of circularity underlying the whole project.

Figure 2 First version of the BEST4Hy project logo

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Figure 3 Definitive version of BEST 4Hy logo

Figure 4 Black and white version of BEST4Hy logo

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2.2 EU acknowledgement

All communication related to the project (including electronic communication, social media, etc...) and all infrastructures, equipment or major results funded under the grant must:

- display the EU emblem (see *Fig. 5*)
- include the following text: *This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 101007216. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme, Hydrogen Europe and Hydrogen Europe research*.

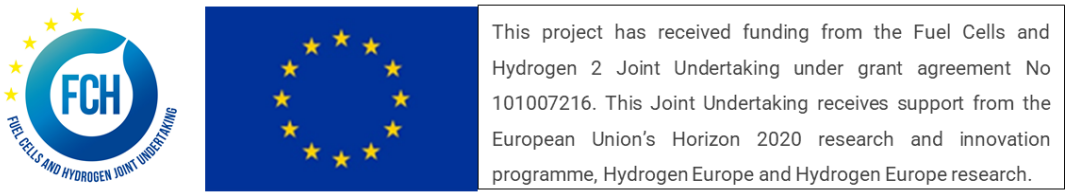

Figure 5 FCHJU and EU acknowledgement

2.3 Target groups

The following target groups are identified as primary BEST4Hy stakeholders:

1. **Research Community**: Hydrogen and Fuel Cells; Life Cycle Cost and Life Cycle Assessment; Recycling; Raw Materials
2. **Industry**:
   - involved in FCHs
   - Recycling Centres
3. **General public**
4. **Customers**: industrial producers both of FCH vehicles as well as stationary FCH producers
5. **Policy makers:** local Authorities; European, National & Regional Public Body/Policy Makers
6. **Education:** universities, vocational courses providers, continuous professional development course providers.

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2.3.1 Reaching the target groups

The strategy followed to reach all target groups and increase the impact of BEST4Hy project is based on the exploitation of partners' existing networks and channels. Indeed, a large number of researchers involved in BEST4Hy project are members of EU projects and/or EU networks. This is a multiplicative factor: partners will activate their networks to seek synergies, to convey interests and to increase the impact and the exploitability of the results. *Table 2* shows how the consortium plans to reach the target groups identified. Of course, BEST4Hy website and social media are channels useful for all target groups and are additional to the channels listed below.

Table 2 How to reach the target groups

Target group	Means& Targets	Outputs expected
Research Community	Publications in international journals and participation to thematic events (Conferences, Fairs)	Dissemination of the main results. Involvement of researchers for future collaborations opportunities.
Industry involved in FCHs & Recycling Centres	Participation at Conferences (*See TABLE 8*) Workshops with stakeholders and Advisory Board	Sharing of results and exchange of ideas and inputs on LCC / LCA, regulations, eco-labelling issues. Involvement of industrial sectors and possibility of future collaborations.
Industry: recycling centres	A specific training plan dedicated to recycling centres will be finalized at M20. Online training and face-to face sessions: 1 at HRD at M36, 1 at ENVI at M33.	Technical recycling and dismantling of FCH
General public	BEST4Hy Website, social media and partners own channels	Engage citizens on the main project challenges and achievements
Customers	Partnerships and/or licence agreements in order to promote the Interest of	Discussions in industrial and commercial fairs (e.g., Hannover Fair)

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	industrial customers on Technology Exploitation	
Policy makers	Directly involved in 2 workshops: M33 Standardisation and regulatory stakeholders' workshop (WP6) M36 Final workshop at HRD headquarter, involving Local Authorities, HRD clients, AB members with visit at pilots (exploitation workshop).	Direct involvement in working groups/innovation deal on EoL FCHs. Main outputs: creation of a new law or changing/integrating the scope of existing directives; standardization guidelines.
Education	Use of BEST4Hy research in teaching. POLITO will activate PhD positions in the frame of Materials Science and Technology Doctorate focusing on recycling study from SOFCs. 4-5 thesis for master students of Energy Engineering and Materials Engineering 3 Internship activities, also in collaboration with Environmental Park	Education of future technology users and experts

2.3.2 Advisory Board

A number of organizations have expressed the interest to be part of BEST4Hy Advisory Board already during the project submission. Further stakeholders have been contacted also through the partners network of contacts. The Advisory Board has been completed at Month 8 and includes: companies (stack and materials developers), the coordinator of the two sisters project (eGHOST and SH2E), research centres involved in hydrogen technologies and the JRC (Joint Research Centre of the European Commission). The Advisory Board has been formed to complement the project consortium: their experiences and know will be strategic for the project progress and results exploitation.

2.4 Challenges

BEST4Hy communication, dissemination and exploitation activities also have to face some peculiar challenges that have to be adequately tackled and anticipated. Here below, some of the possible threats.

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- The organisation and participation of networking events and conferences is threatened by COVID 19 outbreak and by the strict prevention measures (travel restrictions and social distancing).
- BEST4Hy addresses multidisciplinary scientific domain, therefore it is not easy to identify the correct audience that fully understands the innovative potential of the project.
- BEST4Hy addresses a complex topic (recyclability of FCH technologies) which is so far not yet widespread. The audience of interested stakeholders could be limited due to the limited number of FCH Technologies manufacturers, recycling centres and researchers investigating on the topic.
- Because of the specificity of the sector (a niche within the hydrogen sector, and addressing issues of current relevance mainly to the industry rather than the consumer), it is challenging to divulgate targeting the general public.

3 Communication channels

3.1 Digital media

3.1.1 Website

A public website and social media are useful channels to disseminate and communicate about the results of a research project. These channels are fundamental to build a community interested in the project and are important requirements for a public co-financed research project. For BEST4Hy Project, a website with the following URL (https://best4hy-project.eu/) has been created (*see Fig 6,7,8*). The website contains 6 sections (Home, Project and publications, Partners, News, Contact, Login) and it is regularly updated with news available for partners to translate in their native language to increase accessibility. In addition to the institutional website, also partners websites are used to amplify the impact of the dissemination activities, as shown in TABLE 4.

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Figure 6 Project homepage

The website includes the most important project information: the objectives of the project, the main concept *(see Fig. 7),* the consortium *(see Fig. 8)*, and all publications from the project as they become available. Furthermore, it shows all news and events concerning the project, which will be regularly updated.

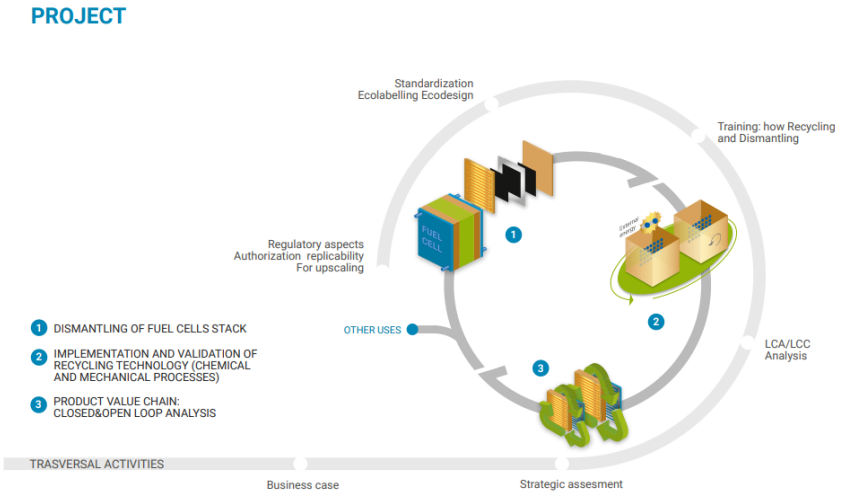

Figure 7 Project scheme within the website

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Figure 8 BEST4Hy partners within the website

In addition to the institutional website, partners websites are used. Below in Table 3, there are the partners' website and the estimated monthly visitors.

Table 3 BEST4Hy partners websites

Partner name	Partner website	Website visitors/month
ENVIPARK	*www.envipark.com*	*1500*
CEA	*www.cea.fr*	*2300 for CEA Liten website*
POLITO	*https://www.polito.it/* *www.irisgroup.polito.it* *http://www.composites.polito.it/* *http://www.steps.polito.it/* *https://www.diati.polito.it/en/research/areas/environmental_sanitary_engineering*	*N/A*
HRD	*www.hensel-recycling.com*	*4.000*
EKPO	*https://www.ekpo-fuelcell.com/*	*N/A*

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ELCOGEN	*https://elcogen.com/*	*7250*
RINA-C	*www.rina.org*	*>1000*
UL	*https://www.uni-lj.si/university*	*N/A*

3.1.2 Social media

Social media are considered one of the most useful measures to disseminate projects updates and results, therefore a dedicated BEST4HyTwitter and LinkedIn profile (See *Fig. 9 and 10*) have been created. In addition to the institutional project profiles, partner social media are used as a multiplier of BEST4Hy dissemination activities, as shown in Table 4.

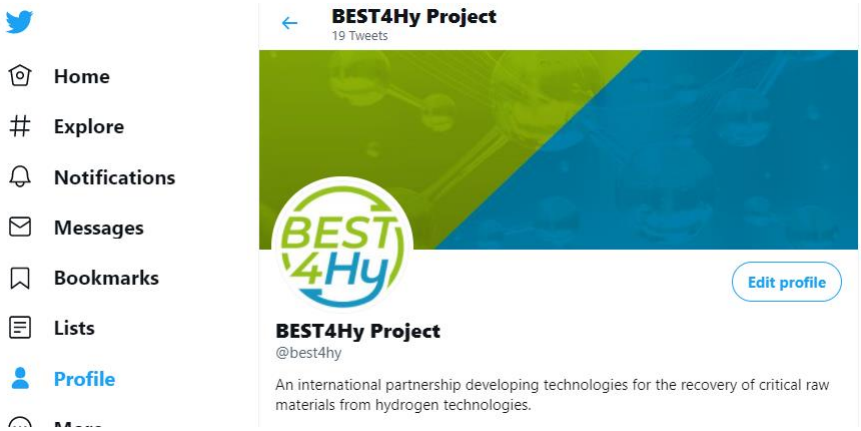

Figure 9 BEST4Hy twitter profile: https://twitter.com/best4hy

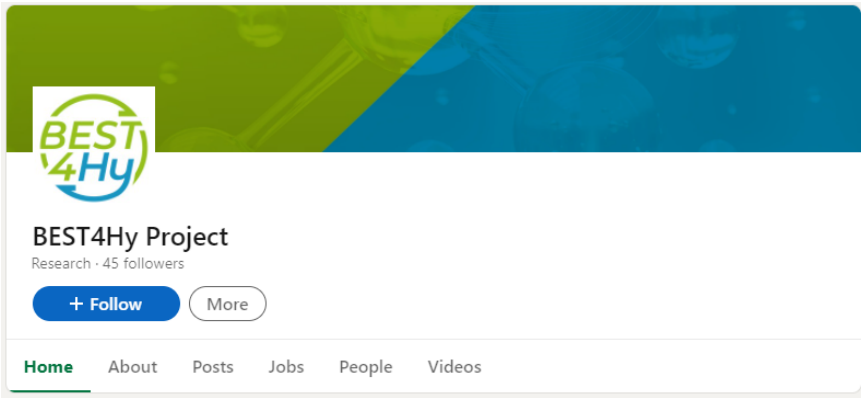

Figure 10 BEST4Hy LinkedIn profile: https://www.linkedin.com/company/best4hy-project

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Table 4 Social media accounts

Partner name	Social media profile	Social media profile followers
TWITTER		
PROJECT ACCOUNT	**@best4hy**	14
ENVIPARK	**@EnvironmentPark**	528
CEA	**@CEA_Officiel**	27 200
POLITO	**@PoliTOnews**	17 700
HRD	**N/A**	
EKPO	**N/A**	
ELCOGEN	**@Elcogen_EU**	800
RINA-C	**@RINA1861**	2 189
UL	**N/A**	
LINKEDIN		
PROJECT ACCOUNT	**@ BEST4Hy Project**	45
ENVIPARK	**@Environment Park**	2 800
CEA	**@CEA**	146 887
	@CEA-Liten	6 062
POLITO	**@Politecnico di Torino**	154 673
HRD	**@Hensel Recycling**	1 169
EKPO	**@EKPO Fuel Cell Technologies GmbH**	928
ELCOGEN	**@Elcogen**	1 024
RINA	**@RINA**	18 5477
UL	**University of Ljubljana**	42 278

The WP8 leader manages BEST4Hy social media profiles and regularly involve partners in re-posting. The contents shared in the project social media are in English.

To differentiate the type of contents shared and to benefit fully from the social media potential, some of the rules followed for the content strategy and social media management are listed below:

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- Use meaningful # in order to be in the flow of the BEST4Hy topic related conversations. Some ideas (#CriticalRawMaterials, #rawmaterials #recycling, #hydrogen, #energy transition, , #research, #energy).
- Tag and connect with EU institutions[2], other EU-funded projects and notify the Project Officer of upcoming publications to maximise their visibility.
- Try to engage the audience asking questions or using replies, retweets or tags.
- Dynamize the social media channels using different types of contents and diverse sources (text, pictures, videos, polls, links, etc.), for example:

    1. Posts related to BEST4Hy's updates and news (presentation of partners, news about the publication of papers concerning project results, release of relevant project output, project progresses)

    2. Sharing of interesting insights related to project topics (research results and new technologies, relevant infographics)

    3. Live posting during project events or when participating in thematic Conferences/Fairs.

Twitter and LinkedIn profiles are updated regularly with about two posts every week.

3.2 Newsletters and Traditional media

After each project meeting (every six months) the WP8 leader releases a synthetic text concerning the project most relevant progress and accomplishments, which is first reviewed by the partners and, within 15 days, published on BEST4Hy website with any amendments suggested by the consortium. Partners are invited to translate the text and use their own channels (websites, newsletter and press office) to disseminate the news, giving 1 week to the consortium if they want to make significant modifications in order to

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[2] https://europa.eu/european-union/contact/social-networks_en#

reach their target more effectively. *Table 5* shows partners who regularly send newsletters, with number of subscribers, and the ones who have a press office.

Table 5 BEST4Hy partner institutional newsletter

Partner name	URL for subscription	Subscribers	Target group	Press office
ENVIPARK	https://www.envipark.com/chi-siamo/newsletter/	1500	General public	No
	CLEVER members only	800	SMEs belonging to CLEVER, cleantech, regional cluster	
HRD				Yes

3.3 Communications products

The communication products that have been created within the project are listed below:

- Project website: https://best4hy-project.eu/
- Project logo: colored and black and white (*See Chapter 2*)
- Project activities representation: to be used both for the website and in communication materials (see *Fig.11*)
- Project flyer (See *Fig. 12*)
- Project Roll-up banner (See *Fig. 13*)
- Word template for reports (See *Fig. 14*)
- PowerPoint template for presentations (See *Fig. 15*)

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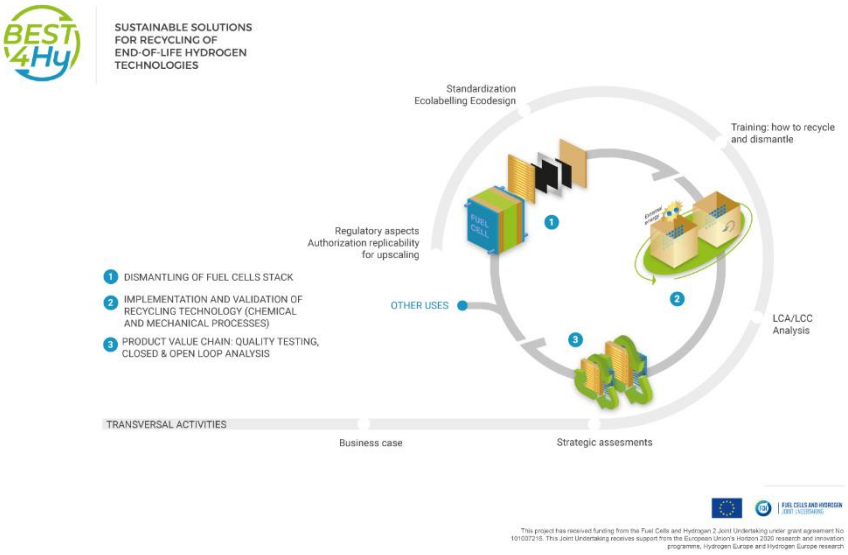

Figure 11 BEST4Hy activities technical scheme

The figure above was created to represent the project activities. It features on the website, where it can be used interactively to learn about each step represented.

Figure 12 Project flyer

A flyer has been created to present the project. It contains the main details of the project, e.g., consortium, objectives, activities etc.

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Figure 13 Project roll-up

A first version of the project roll-up has been created, as illustrated above. It is in a format ready to print should any partner require it when representing the project at an event.

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Figure 14 Project Word template

The template represented above is to be used for the project deliverables.

Figure 15 Project Power point template

The template represented above is to be used for the internal and external presentations.

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4 Dissemination activities

This section is aligned with BEST4Hy Grant Agreement Article 29 — Dissemination Of Results — Open Access — Visibility of FCH JU funding and support from FCH JU members, where it is stated that:

> *Unless it goes against their legitimate interests, each beneficiary must — as soon as possible — 'disseminate' its results by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in scientific publications (in any medium). A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate. Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.*

As mentioned above, dissemination activities are focused on results and target actors that can learn from their disclosure.

4.1 Dissemination channels

4.1.1 Academic publications

Partners belonging to research and public institution will publish papers based on project results, which might be published in international journals with high impact factor. A minimum target of 10 scientific publication has been set, while some of the papers will be published after the project conclusion.

The academic dissemination will be coordinated by ENVIPARK. The content will be reviewed by the consortium's Scientific Committee (SC). The specified conditions for publication must be applied to the following formats: journal papers, book chapter, conference proceedings and peer-review publications. The scientific journals listed below have been identified as potential targets for academic dissemination:

- International Journal of Hydrogen Energy
- The International Journal of Life Cycle Assessment
- Energy Research
- Resources, Conservation & Recycling
- Journal of the Electrochemical Society

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4.1.1.1 Open Access

As stated in the Grant Agreement, article 29.2 Open access to scientific publications, "*Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results*".

The Grant Agreement article 29.3 on *Open access to research data* and the Data management Plan *(Deliverable 8.1)*, specifies the regulation for the publishing of data collected during the project. To accomplish these obligations, both "green" and "gold" open access routes will be adopted. "Green" open access (also referred to as self-archiving), is the upload of a final peer reviewed manuscript through an online repository. This may be possible after an embargo period set by the publisher. On the other hand, "gold" open access enables the article to be freely and permanently accessible for everyone, immediately after publication.

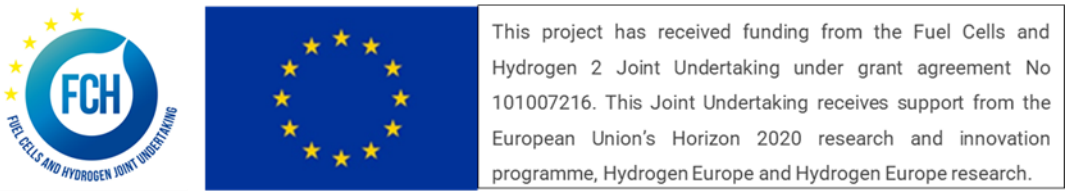
ENVIPARK, as the project coordinator, is committed to guaranteeing that the project results will be readily accessible. For that reason, ENVIPARK suggests to host all the scientific publications related to BEST4Hy project in online research dissemination platforms such as OpenAIRE's Zenodo repository (https://zenodo.org/). The relevant links to the repository platforms will be also exposed at the BEST4Hy website.

Moreover, the consortium will consider the use of Open Research Europe platform, an open access publishing platform for the publication of research stemming from Horizon 2020 funding across all subject areas. The platform makes it easy for Horizon 2020 beneficiaries to comply with the open access terms of their funding and offers researchers a publishing venue to share their results and insights rapidly and facilitate open, constructive research discussion.

4.1.1.2 Funding statement in scientific publication

The first author must ensure in every publication that the following guidance is applied:

- displaying of the EU emblem
- inclusion of the following text:



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4.1.2 Events

As already mentioned, physical or virtual events (depending on COVID 19 restrictions), are useful means to disseminate and widen the project network. Below are examples of relevant international events which take place on a regular/annual basis and could be used for disseminating BEST4Hy progress and results. ENVIPARK updates the academic and non-academic events list in the shared drive and ensures that both Scientific Publication and dissemination record is updated. For this kind of events, partners agree to share fifteen days in advance the materials presented during non-scientific conference.

Table 6 List of potential events to attend

Name of the event	Planned date and location	Type of event
FCH2-JU Review days	Changes year by year	Eu event
Pollutec Fair	Every two years, Lyon, (FR)	Fair
Eco Mondo fair	Every Autumn, Rimini, (IT)	Fair
CARS recycling show	Changes year by year	Fair
International Automobile Recycling Congress	TBD	Congress
WHEC	Changes year by year	Congress
EHEC	Madrid	Conference
SDEWES	Changes year by year	Conference
Sustainable Places	Changes year by year	Conference
EUSEW	Changes year by year	Conference
F-Cell Stuttgart (f-cell.de)	Stuttgart	Conference
European SOFC & SOE Forum	Changes year by year	Exhibition
GDR Promethee, Pollutec	Lyon	Fair
FC Expo	Tokyo	Exhibition
World Hydrogen Technology Conference (WHTC)	Changes year by year	Conference
Fuel Cell Seminar	Changes year by year	Seminar

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Sustainable Places Conference	Changes year by year	Conference
ECS meeting (the Electrochemical Society)	Changes year by year	Digital meeting
Carbon Capture Technology EXPO	Bremen	Exhibition

4.1.3 Use of BEST4Hy research in teaching

Partners are encouraged to use BEST4Hy project to support academic teaching. Examples of use include:

- Using the BEST4Hy project as examples within lectures
- Using BEST4Hy as a focus of Masters and PhD theses

4.1.4 Exchanges with other projects

Specific link will be made with the two sisters projects SH2E and eGHOST to ensure the results of the three projects provide a common view on the minimisation of the environmental impacts of disposal of FCHs. The coordinator of these two projects is involved in the BEST4Hy advisory board.

BEST4Hy will promote a common workshop from which a policy paper (Common Position Paper or White Paper) will be issued. This workshop will be organised in consultation with FCH JTU and selected EU DGs and Agencies. Other projects to be contacted include BReCycle, but also global initiatives such as the EERA (European Energy Research Alliance) on H2 and Fuel Cell, with the members from BEST4Hy (CEA, POLITO).

Another project to be linked with is EVERYWH2ERE, a FCHJU funded project coordinated by RINA-C. The two projects can create some synergies for common events and exchange data from the LCA activities.

Moreover, each partner will use its own network in order to maximise the impact of the communication, dissemination and exploitation activities:

- Envipark is the managing authority of the regional Clean Tech and Energy **Innovation cluster (CLEVER)** in synergy with a network of actors including chambers of commerce and SMEs associations. CLEVER cluster supports more than 120 regional companies and SMEs on innovation topics for business development and the main focus on circular economy. Furthermore, at National level, from May 2019 Envipark participates in the "National Technology Cluster of Energy", which brings together 72 members amongst Italian research bodies,

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companies and clusters active in energy innovation, at national level. Envipark is also in close contact with other energy-related clusters in Europe through the International Cleantech Network and through project SMARTENERGY.

Other networks and initiatives with which we are linked:

- IPMI (International Precious Metals Institute)
- Platinum Week
- PlatinumStandard
- The Hydrogen Standard

4.1.5 Workshops

Technical workshops will be organized in order to involve different stakeholders in the main project results and challenges. The main workshops are already listed below:

- At month 12, a workshop will be organized at the premises of Envipark with interested SMEs – potential for online workshop will be explored.
- At month 18, a workshop on LCA/LCC-Brussels will be organized at FCH JU the collaboration and synergy with other projects based on LCA)
- At month 33, a workshop on Standardisation and regulatory stakeholders in the framework of WP6. The main output will be a policy paper.
- At month 36, a final workshop at HRD headquarter, involving Local Authorities, HRD clients, AB members with visit at pilots (exploitation workshop).

5 Gender equity

Within the consortium, women and man are well involved in different activities of the BEST4Hy project. A significant number of women are involved in the project (38%): women are directly contributing to the project scientific work and its management and, especially, are Work Package leaders in core R&D activities or actively participating to WP completion. BEST4Hy partners are committed to foster gender equality in accordance to Articles 2&3 of the Treaty of Amsterdam (1997) and other EU policy directives. Also, the BEST4Hy consortium will fully support the EU ambitions and policy on the issue of gender equality stated in the EC papers "Women and Science, Mobilising women to enrich European Research" and "Women and Science: the gender dimension as leverage for reforming science". This commitment is taken into high consideration also in communication and dissemination activities. In fact, partners:

• Make sure that the images chosen for communication and dissemination materials do not reinforce gender stereotypes and are representative of a wide mix of people belonging to different contexts and background.

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- Ensure that the language used actively promotes gender equality.

6 Evaluation and monitoring of communications and dissemination activities

WP 8 leader monitors and reports continuously communication and dissemination activities, while all partners identify specific initiatives undertaken to track them. To benchmark impacts and results, here below are listed some hypothetic targets that may be adjusted and readapted during the project.

Workshops

- 4 workshops targeting the industry sector two of them involving policy makers >30 attendees

Training plan:

- 1 at HRD at M36, 1 at ENVI at M33. >20 attendees

Traditional media

- 8 articles in traditional media (one each partner)
- Publications in international journals: 10

Social media statistics:

- 300 Twitter and LinkedIn followers
- 250 Tweets
- 120 LinkedIn posts

Website statistics

- 400 visits per month (average)

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7 Preliminary Exploitation plan

7.1 BEST4Hy exploitable results

7.1.1 Exploitation definition methodology

The dissemination and exploitation strategy consists in three main phases, as reported in section 1.1: Phase I (M1-M24), Phase II (M24-M36), Phase III (M21-M36).

So, there will be two different exploitation levels:

- One connected to the Phase I and II that will follow mainly the exploitation of the results at project level, mainly linked to the results produced during the 3-years of BEST4Hy project.
- One linked to Phase III that will produce Plans for exploitation after the project. In particular based on ARTICLE 28 of the Grant Agreement, each beneficiary must — up to four years after the period set out in Article 3 — take measures aiming to ensure 'exploitation' of its results.

The BEST4Hy project exploitation plan will be a living activity throughout the whole project whose main outcomes will be detailed in the following deliverables as shown in *Figure 16:*

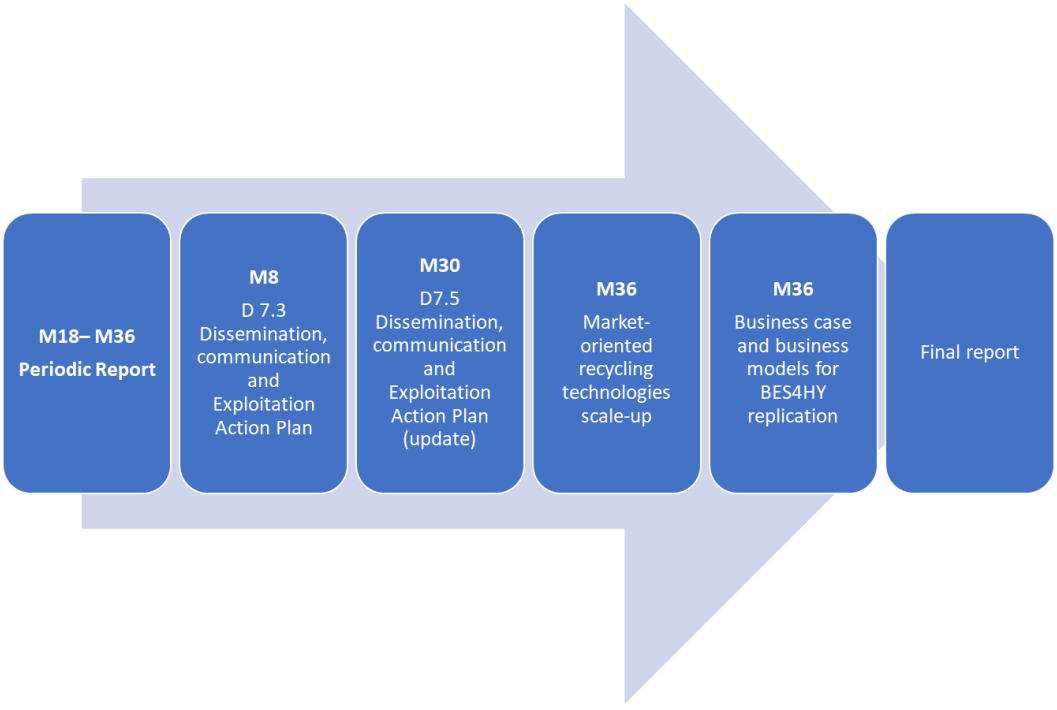

Figure 16 BEST4Hy exploitable result information delivery

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Periodic reports

See above

Final report.

See above

D7.3 Dissemination, communication and Exploitation Action Plan (first)

It is this document and it includes:

- Identification & Management of project exploitable results: the main project results should be identified as well as the partners responsible of them. A first proposal for their exploitation should be included;
- An exploitation strategy at partner level.

D7.5 Dissemination, communication and Exploitation Action Plan (update)

In this second report additional information will be included, as well as measures to overcome exploitation related issues will be provided:

- Identification & Management of project exploitable results: it is possible that new results will be developed as the project progresses. In any case, all the exploitable results should be properly identified and assigned. The exploitation intention should be clearly defined.
- IPR management and results protection strategies: all the IPR generated should have a clear method of protection. In agreement between partners should be proposed/signed if there any conjoint IPR, or if a partner is willing to exploit the result generated by another partner.

D7.6 Market-oriented recycling technologies scale-up

The report includes a potential market analysis mainly for HRD (entry in new activities and new market) and a final roadmap of the BEST4Hy project results, potential for the recovery market and potential view for closed-loop and open loop scenarios.

D6.6 Business case and business models for BEST4Hy replication

The report will include:

- A business case to evaluate the potential upscale of BEST4Hy solutions and its viability: a preliminary Cost-Benefit analysis will be performed also to understand the minimum rate of yearly “FCH Technologies Special wastes” to be conveyed to the recycling center to ensure an adequate PBP and return of the investment.
- Proposition of EoL facilitating measures (like promotion of certain materials usage via “end-of-life” vouchers) will be studied with the support of FCH Technology manufacturers. The cost-benefit analysis will take care also of the cost reduction estimation.

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Alongside the long-term opportunities, the partners will consider also the immediate next steps after the project end, focusing on ways to progress the most promising innovations to higher TRLs, through exploitation of patents developed within the project or search for innovation funding from regional, interregional, national and EU funding or investors.

7.1.2 Exploitation of key results

According to the Horizon 2020 Rules for Participation, 'results' are any tangible or intangible output of the action, such as data, knowledge or information, that is generated in the action, whatever its form or nature, whether or not it can be protected, as well as any rights attached to it, including intellectual property rights. More specifically key exploitable results (KERs) are the ones which have been selected and prioritized due to their high exploitability potential after the project, both from a commercial (product, process solution), academic and political perspective (further research, support policy). The main criteria to consider in order to define KERs according to EC indications are:

1. degree of innovation,
2. exploitability,
3. impact.

Table 7 gives a first overview of BEST4Hy Key Exploitable Results and the related responsible partner.

As the document will be revised during the project, the KERs could implement during the project duration.

Table 7 BEST4Hy exploitation strategy

KEY EXPLOITABLE RESULTS (KERs)				
Result coding	Exploitable result	LP	WP	Status at the beginning of BEST4Hy
KER1	Pt recovery via Hydrometallurgical process	HRD	1	Currently, HRD recovers Pt from spent car-catalyst by pyro-metallurgical process. HRD has high-experience in wet chemistry in the determination of precious metals in converters, oxygen sensors or e-scrap with different methods in wet-chemistry or fire assay. *Preliminary proof of concept at lab-scale: using MEA from an EoL PEMFC; mechanical separation of CCM and GDL in ultrasounds and after Pt recovered as PtCl6-2. Leaching process performed in a 100ml beaker, adding aqua regia solution (65%HNO3/37%HCl) and working at 100°C. CCM material was added in the solution and stirred for 2 h. Final filtration and analysis with ICP OES by adding Internal Standard and buffer, dilution 1:10. Analysis at different leaching temperature/concentrations. TRL 3 at HRD
KER2	Automatization of the MEA separation	HRD	1	no before BEST4Hy

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KER3	Novel MEA gaseous phase dismantling process	CEA	1	No literature report on this kind of process. TRL 3 at CEA planned for end of 2020 *Proof of concept will be done at lab scale in 2020
KER4	Novel Pt and ionomer recovery by alcohol dissolution	HRD	1	Expertise in CEA available TRL 3 at HRD planned for end of 2020 *Proof of concept will be done at lab scale in 2020
KER5	Pt recovery by Electro leaching/electro deposition in IL media	CEA	1	TRL 3 at CEA *Proof of concept done at lab scale -> the feasibility of anodic dissolution of platinum followed by its recovery by electrodeposition has been demonstrated previously at a carbon cathode, using IL electrolytes at temperatures near 100°C. The electrolyte was a mixture of two ILs having a common cation, BMIM+, associated with two different anions: Cl- and TFSI-. BMIM Cl was chosen due to the complexing property of chloride anions for platinum. However, whereas a high chloride concentration favors the leaching of platinum, it inhibits the metal electrodeposition, which means that BMIM Cl cannot be used alone here. In order to reduce the complexing ability of the electrolyte and allow occurrence of Pt electrodeposition, BMIM Cl was used as a solute with another IL—BMIM TFSI—acting as the solvent, since TFSI- anion is known to be a low coordinating species. The optimum electrolyte composition was determined for both electrochemical leaching and the electrodeposition of platinum using a single cell process operated in potentiostatic mode.
KER6	Synthesis of Pt/C catalyst using (NH4)2PtCl6 precursor from recycling	CEA	2	Pt/C synthesis using classical Pt salt precursor in laboratory scale from commercial supply (i.e., H2PtCl6); onto nanostructured carbon supports (CNT carbon nanotube and FGL Few Graphene Layer) and carbon Vulcan support ; deposition on carbon support followed by several possible reduction processes: polyol, boron hydride (up-scaled already done) in liquid media or impregnation followed by thermal reduction under reductive atmosphere; TRL 3
KER7	Ni-YSZ anode components recovery by HTH and HTM	POLITO	3	POLITO proved at lab scale the feasibility of the process based on mechanical pre-treatment and HTH to disaggregate sintered ceramics (i.e., zirconia), while preserving microstructural features. Selective and efficient extraction of Ni by means of hydrometallurgical approaches from several sources (i.e., industrial wastes, catalysts) has also been proved at TRL3.
KER8	Ni-YSZ anode recovery from scrap cells	POLITO	3	Currently no available recovery technology for scrap cells before operation
KER9	Selective and efficient recovery of La and Co from degraded cathode components	POLITO	4	Recovery of lanthanum and cobalt from several sources (i.e., batteries, electronic wastes) is reported in the literature however no literature report on recovery/recycling is available for LSC materials and in particular on cathode components with contaminations due to operation conditions.
KER10	Synthesis of LSC perovskite starting from recovered La and Co precursors	POLITO	4	Several synthesis methods have been developed to produce perovskite-oxides starting from virgin precursor materials, including dry or water-based methods. More recently, a few examples of perovskite solar cells from precursors sourced from recycled materials (i.e., batteries) have proved to lead to material with similar features (crystallinity, morphology) and performances. No literature report is available for perovskite SOFC cathode.

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KER11	LCA/LCC implementation database	UL	5	The generic data in LCA methodology is missing for SOFC. No LCA in EoL phase of SOFC was done in previous projects. There is no LCA for EoL of recycled critical materials in FCH technologies based on real recycling industry data. LCA in the previous project dealing with EoL of FCH technologies (www.hytechcycling.eu – HyTechCycling) are modelled mainly according to literature input or in best cases on the scale of laboratory test inventories. For FCH technologies a chain of manufacturer – user – recycling industry is not yet established. LCC approach is currently not used in FCH technologies since there is a lack of data in all product chain system.
KER12	Regulations on FCH technologies	RINA_C, ENVI	6	Hytechcycling detected some barriers on regulation, including lack of a specific FCH Directive. Some current Directives include FCH products or have to be taken in account with a FCH system, but the creation of a more detailed FCH relevant regulatory is needed.
KER13	Guidelines for Eco-design and ecolabelling of FCH technologies	RINA_C,	6	There is currently a push towards technologies that reduce the carbon footprint in the whole value chain. In this sense to make FCH technologies more market and socially acceptable is necessary to develop a FCH ECO DESIGN framework. There are also robust technologies/approaches to recycle-treat precious/rare/hazardous materials coming from other "special Waste/WEEN" Only FCs that are intended for space heating and/or hot water are currently included/ECO LABELED (e.g., SOLIDPower BlueGen) as they are considered "cogeneration units".

7.1.3 Exploitation strategy at project level

Along with project evolution, exploitation routes for exploiting BEST4Hy results will be analyzed, to achieve by the closure of the project, the definition of the most appropriate market-oriented strategies.

For these purposes, BEST4Hy project defined two strategic figures among the partners:

- **The Exploitation Manager (EM) – Environment Park**. Its role is to ensure a systematic and sufficient exploitation of the project results during the lifetime of the project. The EM will report existing IPR and developed in the project. HRD is one of the main exploitation partners;
- The **Innovation Manager (IM)** - Anna Marchisio from HRD. She will take care of creating an appropriate strategy for the innovations of the project. Her work will be carried out in close collaboration with the PC and the other partners (in particular EKPO and Elcogen). She will choose a strategic direction, evaluating possible strategies of cooperation/partnerships. Moreover, she will conduct an internal analysis in order to assess the strengths and weaknesses of innovations generated and identify sources of competitive advantage by developing a positioning strategy. Her work contributes to the outcomes of WP6, mainly on strategic assessment and business modelling, and WP7 in terms of exploitation of results.

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7.1.4 Exploitation strategy at partner level

The activities envisaged in BEST4Hy project will produce exploitable data/results and the consortium will provide a clear and detailed exploitation plan, the types of exploitation and the channels to perform it. The dissemination activities reported in the section above will promote the exploitation of the results during the Phase I and II.

Partner	Key Exploitable result	Individual exploitation plan
ENVI	Improvement of knowledge on technical and regulatory aspects of EoL of FCH devices; training and dissemination expertise already in place reinforced and extended	Publications, attendance to national and international events on FCH and Circular Economy, support to local policy makers in developing Hydrogen strategies including EoL considerations, delivery of training services to local cluster and clusters within the cluster's network
HRD	Opportunity to improve the current know-how about EoL stacks and MEA recycling techniques (PEM). For the HRNA (HRD subsidiary USA) project is an opportunity to investigate the US and Canadian PEM markets and steering the legislation process in the US	Exchange and dissemination of the results at international and national congresses and fairs such as IPMI, BIR, ARA, ISRI etc. Entering in new markets.
POLITO	BEST4Hy project will offer the opportunity to enhance knowledge on recycling technologies, up-scaled processing and to consolidate the expertise related to modelling tools applied to case studies that exploit SOFC systems in relevant environment.	New publications on scientific journals, new co-patent filing, attendance to European SOFC & SOE Forum; SOC conferences; FC Expo
EKPO	Recyclability of stack design, improved environmental impact of fuel cell technology through recycling, reducing stack cost due to increased recycling rate	Adoption of recycled materials in the supply chain
Elcogen	Possibility to recycle EoL cells. Decreasing the amount of scrap cells by reusing them.	European SOFC & SOE Forum; SOC conferences; FC Expo; Press release on website.
RINA_C	Guidelines for the realization of an ECOLABELING certificate and auditing procedure for FCH technologies. Guidelines for the realization of certified and standardized procedures for recycling FCH technologies	Offering of consulting and auditing services. Possibility to develop specific certification guidelines for recycling processes
UL	Innovative new inventories for PEMFC and SOFC in manufacturing phase. Inventories of current and novel EoL strategies for PEMFC and SOFC in the form of deliverables available to scientific community. General instructions how to approach LCA of EoL phase of FCH technologies. LCA results that could be used as inputs in all EU funded projects addressing eco-design and circular economy	New publications in scientific journals Attendance of FHC and EoL related Conferences: EHEC, WHEC, SDEWES, etc. Implementation of knowledge in education process in University Press releases on web site and in social media of university

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CEA	Development of more efficient recycling technologies. Development and integration into MEA of Pt electrocatalyst from recycled Pt precursor. Propose several routes for recycled PGM: close and open loop	Patent, new publications

Table 8: Preliminary exploitation Plan for each partner

7.2 IPR (Intellectual Property Rules) preliminary approach

7.2.1 IPR principles

Chapter 7 intends to summarize the framework of the IPR management which is fully set out within the Consortium Agreement (Section 8, 9 and 10), that stipulates the rules related to the following IP dimensions.

- Ownership of the results
- Identification of the pre-existing knowledge (background) and the specific limitations and conditions for its implementation;
- Access rights to the background and the results;
- Transfer of the results;
- Non-disclosure of the information.

7.2.1.1 Ownership of results

According to the Horizon 2020 Rules for Participation and BEST4Hy Consortium Agreement/Grant Agreement, the partner who generates the results, owns them.

Where several partners have jointly carried out work generating results (**Joint ownership of the results**) and if, it is not possible to separate such joint invention, partners shall have joint ownership of such results.

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership ('joint ownership agreement'), to ensure compliance with their obligations under this Agreement.

Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licenses to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given:

(a) at least 45 days advance notice and

(b) fair and reasonable compensation.

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Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30 of the Grant Agreement) with access rights for the others).

However, the JU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to disseminate its results without protecting them, except in some defined cases (Article 26.4, GA).

7.2.1.2 Identification of the background and foreground

According to the Grant Agreement (Article 24) **Background is defined as "data, know-how or information (…) that is needed to implement the action or exploit the results".** Background is defined as any data, know-how or information whatever its form or nature, tangible or intangible, including any rights such as intellectual property rights, which is identified and held by participants prior to their accession to the action and it is needed for carrying out the action or for exploiting the results of the action. More synthetically, background refers to pre-existing IP and knowledge held by partners prior to their participation to the project.

Because of this need, Access Rights have to be granted in principle, but Parties must identify and agree amongst them on the Background for the project.

In Attachment 1 of the BEST4Hy Consortium Agreement, the members of the consortium have identified and agreed on the background for the project and have also, where relevant, informed each other that access to specific background is subject to legal restrictions or limits. Anything not identified in the Cooperation Agreement shall not be the object of access right obligations regarding background. However, any party may add further own background during the project by written notice to the other parties after the approval of the General Assembly.

"Foreground" means the results, including information, materials and knowledge, generated in a given project, whether or not they can be protected. It includes intellectual property rights (IPRs such as rights resulting from copyright protection, related rights, design rights, patent rights, plant variety rights, rights of creators of topographies of semiconductor products), similar forms of protections (e.g., sui generis right for databases) and unprotected know-how (e.g., confidential material). Foreground intellectual property is intellectual property that comes from a research project.

Table 9 reports background information (B) associated to the partners involved in each related exploitable result and a first tentative of Foreground contribute of the partners (F).

Exploitation results, code	Leading partner	HRD	CEA	POLITO	EKPO	ELCOGEN	UL	RINA_C	ENVI
KER1	HRD	**B, F**	**F**		**F**				**F**

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KER2	HRD	**F**			**F**				
KER3	CEA	**F**	**B, F**						**F**
KER4	HRD	**B, F**	**B, F**		**F**				**F**
KER5	CEA	**F**	**B, F**						
KER6	CEA		**B, F**		**F**				
KER7	POLITO			**B, F**		**F**			
KER8	POLITO			**B, F**		**F**			
KER9	POLITO			**B, F**		**F**			
KER10	POLITO			**B, F**		**F**			
KER11	UL	**F**	**F**	**F**	**F**	**F**	**B, F**	**F**	**F**
KER12	RINA_C, ENVI							**F**	**B, F**
KER13	RINA_C				**F**	**F**	**F**	**B, F**	

Table 9: Preliminary background and foreground

7.2.1.3 Access rights to the Background and the Results

Access rights for implementation and exploitation

Access rights to results and background needed for the implementation and exploitation of the own work of a partner under the project shall be granted on a royalty-free basis, unless otherwise agreed for background in the Cooperation agreement.

Access rights to background if needed for exploitation of a partner's own results, including for research on behalf of a third party, shall be granted on fair and reasonable conditions and can be made up to twelve months after the end of the Project.

Transfer of results

Transferring the ownership of results to other parties is a possibility for partners participating in a Horizon 2020 action. Whenever transferring the ownership of their results, participants have to follow the requirements established in the Consortium Agreement (8.3).

Protection of results

Along with Exploitation, Dissemination and Open Access obligation, projects funded under Horizon 2020 research program, beneficiaries must examine the possibility, considering its own legitimate interests and the legitimate interests (especially commercial), of the other beneficiaries, of protecting their results (see article 42 Horizon 2020 Rules for Participation) for an appropriate period and with appropriate territorial coverage if:

- the results can reasonably be expected to be commercially or industrially exploited and
- protecting them is possible, reasonable and justified (given the circumstances).

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The ratio of protecting results is to provide incentives to devote resources to research and development by providing a reward system that makes more profitable the investment and exclude imitators for a finite period.

7.2.2 IPR protection form and strategy

As reported in article 42 of the Horizon 2020 Rules, results produced within a funded project can be protected, in order to ensure their effective commercial exploitation. Therefore, Intellectual Propriety Rights (IPR) are private legal rights that protect, in a reasonable and justified way for an appropriate period of time and, in a suitable territory, the creation of the human mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce.

They are commonly divided into two categories:

- Industrial Property Rights (e.g., patents, trademarks, industrial designs, geographical indications)
- Copyright and Related rights (e.g., rights of the authors/creators and those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programmes).

The definition of the most adequate type of IP protection (its duration and geographical coverage) depends on the result itself (exploitation plan, consortium partners' interests).

7.2.2.1 Patent

A patent is an industrial propriety right that can be granted for any invention having a technical character for a limited period of time (generally 20 years). An invention, to be patentable must: being new, involve an inventive step and, have an industrial application. A patent gives the owner the right to prevent others from making, using or selling the invention without permission. In Europe, technical inventions can be protected either by national patents granted by the competent national authorities, or by European patents granted centrally by the European Patent Office (EPO).

Patents are the most likely IP protection type to be used for BEST4Hy project. CEA has already a background patent.

Describe Background	Specific limitations and/or conditions for implementation (Article 25.2 Grant Agreement)	Specific limitations and/or conditions for Exploitation (Article 25.3 Grant Agreement)
Patent n°1656293 "Procédé de récupération de platine, par voie électrochimique, à partir d'un matériau dans lequel il est contenu"	NA	NA

Table 10: CEA background patent

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7.2.2.2 Utility model

The Utility model is one of the intellectual property rights that protects technical solutions such as an invention, with a lower level of inventiveness required than for a patent and they are granted without substantive examination. The utility model allows holder to prevent others from commercially using the protected invention with a protection period shorter than for patents (often 6 to 10 years without the possibility of extension or renewal). Utility model is generally intended for the protection of minor or incremental innovations, frequently for mechanical or electrical devices, reason why they are more accessible to individual innovators or small and medium-sized enterprises (SMEs).

7.2.2.3 Industrial design

An industrial design is an intellectual property right aimed at protecting the appearance of products (particular resulting from its lines, contours, colors, shape and materials), reason why it is a type of protection dedicated to the intellectual creation used by designers. It consists of the right to prevent any third party from making, offering, selling, importing, exporting or using a product in which the design is incorporated or to which it is applied, or stocking such a product, without the design owner's consent, when such acts are undertaken for commercial purposes.

7.2.2.4 Copyright

Copyright is the right to protect non-technical intellectual creations and refers mainly to composer, playwright, publisher or distributor to the exclusive publication, production, sale, or distribution of a literary, musical, dramatic, or artistic work.

7.2.2.5 Trademarks

A trademark may consist of any distinctive signs, or designs (letter, numerals, colors, the shape of goods, their packaging) identifying brands of products or services. Trademarks may be registered for a period of 10 years, with the option of indefinite renewal.

7.2.2.6 Confidentiality

Confidentiality can be intended as an informal method to protect intellectual propriety and consist in keeping a piece of information confidential, meaning that is not available to the public, but it is restricted only to the members of the consortium.

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Conclusions

To conclude, this document represents the first draft of the Communication, Dissemination and Exploitation Plan which is a living document that will be updated during the project following the progresses of the activities as represented in *Fig. 1 and 16.*

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