



FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

HyTechCycling

New technologies and strategies for fuel cells and hydrogen technologies in the phase of recycling and dismantling



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Programme Review Days 2019

Brussels, 19-20 November 2019

PROJECT OVERVIEW



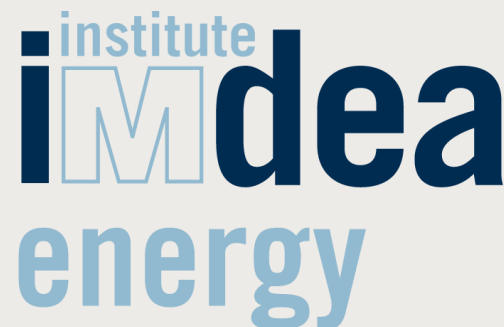
- **Call year:** 2015
- **Call topic:** FCH-04.1-2015 Recycling and Dismantling Strategies for FCH Technologies
- **Project dates:** 01/05/2016-30/04/2016
- **% stage of implementation 01/11/2019:** 100%
- **Total project budget:** 497 666.25 €
- **FCH JU max. contribution:** 497 666.25 €



PARTNERS



FOUNDATION FOR THE
DEVELOPMENT OF NEW
HYDROGEN TECHNOLOGIES
IN ARAGON



University of Ljubljana



ENVIRONMENT
PARK Parco Scientifico
Tecnologico per l'Ambiente

PROJECT SUMMARY



- **HyTechCycling**, New technologies and strategies for fuel cells and hydrogen technologies in the phase of recycling and dismantling
- **Objective**
 - To deliver reference documentation and studies about existing and new recycling and dismantling technologies and strategies applied to FCH technologies, paving the way for future demonstration actions and advances in roadmaps and regulations.
- **Global positioning vs international state-of the art**
 - First European project related with FCH recycling technologies.
- **Application and market area**

Current and novel devices introduced to the market that will be recycled in the near future



PROJECT ACTIONS- CURRENT AND NOVEL TECHNOLOGIES IDENTIFICATION

IDENTIFICATION OF CURRENT AND NOVEL TECHNOLOGIES

Not an specific research available

25%

50%

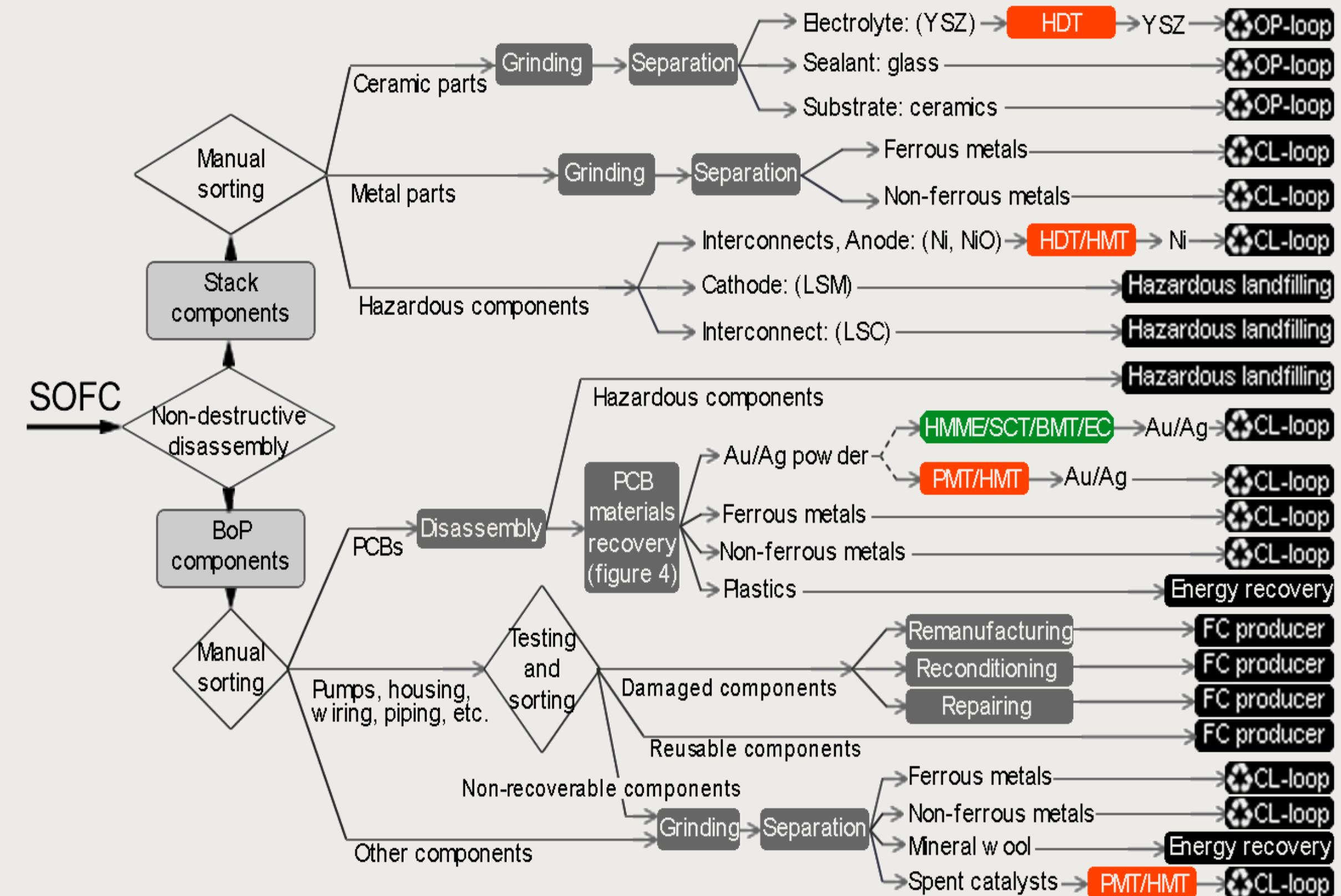
75%

Work performed

- Bibliographic research taking into account current technologies
- Bibliographic research on new technologies
- Classification and SWOT analysis of technologies

Future work

- R&D of novel technologies for FCH components (SOFC stack)
- Adaptation of the current recycling technologies in the industrial scheme to the FCH technologies



PROJECT ACTIONS- LCA FROM CRADLE TO GRAVE

Development of LCA considering EoL strategies

LCA until End of Utilisation

LCA from cradle to grave

Work performed

- **Complete LCA** for 4 different devices (1 AWE, 1 PEMWE, 1 PEMFC and 1 SOFC).
- EoL modelled **step by step**. From disassembly to the use of secondary raw materials.
- Continuous work with manufacturers to use **realistic data**

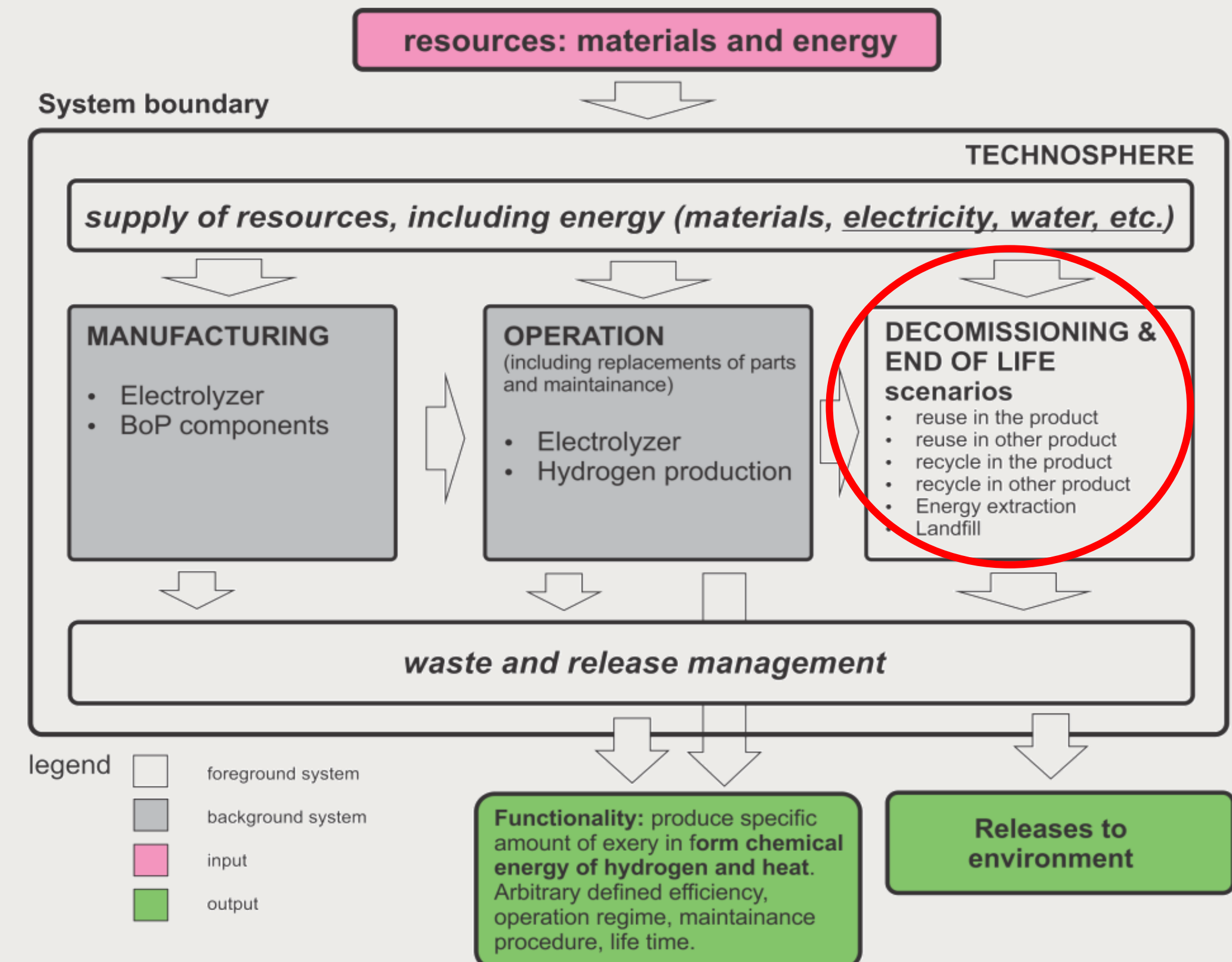
Future work

- There is a lack of materials in LCA databases for SOFC to overcome
- Need for more detailed input into EoL modeling

25%

50%

75%



PROJECT ACTIONS GUIDELINES AND RECOMMENDATIONS



Recommendations for recycling and dismantling of FCH product in EU

FCH to be introduced in Recycling Centres

25%

50%

75%

Work performed

- Born from all the results of the project
- Work done by RC with recommendations for manufacturers, distributors, logistic companies, end-users and RC
- An important summary of **needs and challenges in the phase of dismantling and recycling** resulting from the project

Future work

- Real implementation of the recommendations by the actors involved thanks to dissemination



New technologies and strategies for fuel cells and Hydrogen Technologies in the phase of recycling and dismantling

Grant No. 700190

WP5. Harmonization of procedures considering all actors involved in lifetime of FCH products.

D 5.4 Recommendations and guidelines on the introduction of new technologies and strategies for recycling and dismantling of FCH products in the EU



Risks and Challenges

<i>RISKS AND CHALLENGES</i>	<i>MITIGATION ACTIONS</i>
Classification of the materials	<i>As function of cost, hazardousness and EU CRM methodology</i>
Lack of reliable LCA data	<i>Strong and close work with representative manufacturers from the technologies looking for work synergies</i>
Identification of the SoA and possible scenarios	<i>Work with representative manufacturers Study of different EPR schemes from different technologies (WEEEs, batteries, planes...)</i>
Involvement of all different actors	<i>Multiple communication actions</i> <ul style="list-style-type: none"> • <i>Workshops with industrial representation</i> • <i>Participation in congresses</i> • <i>Industrial representation in the consortium</i>
Creation of representative and reference documentation	<i>Recommendations created for RC from RC Business model considering different scenarios</i>
Low dissemination of demo events	<i>Development of an interactive tool with a virtual visit to a recycling centre and the explanation of the dismantling of the FCH equipments</i>

Communications and Disseminations Activities



Demo event
and
Workshops

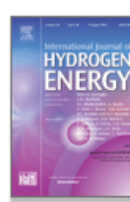
3
Scientific
papers

Project
Visual
content

+10
conferences



International Journal of Hydrogen Energy
Volume 44, Issue 38, 9 August 2019, Pages 20965-20977



End of life of fuel cells and hydrogen products:
From technologies to strategies



Webpage



Newsletters



HyTechCycling - Recycling
a Hydrogen Fuel Cell



HYPOTHESIS XIII Singapore 2018

Hydrogen Power Theoretical & Engineering Solutions International Symposium



EXPLOITATION PLAN/EXPECTED IMPACT



Exploitation

- An **interactive tool** (ILSSA)
- A **project video** (All)
- An already dismantled fuel cell to disseminate the project outcomes (FHa)
- Recommendations** prepared for different actors of the FCH life cycle. (**Public information**)
- Reference documentation for all actors involved in EoL FCH technologies. (**Public information**)



Impact

- Participation on the Workshop on Life Cycle Assessment (LCA) in fuel cells and hydrogen technologies organised by JRC and FCH JU
- Workshop and demo-event performed at ILSSA facilities
- Reference documentation for recycling FCH technologies

FHa team in PRD2019



FUNDACIÓN PARA EL
DESARROLLO DE LAS NUEVAS
TECNOLOGÍAS DEL HIDRÓGENO
EN ARAGÓN



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