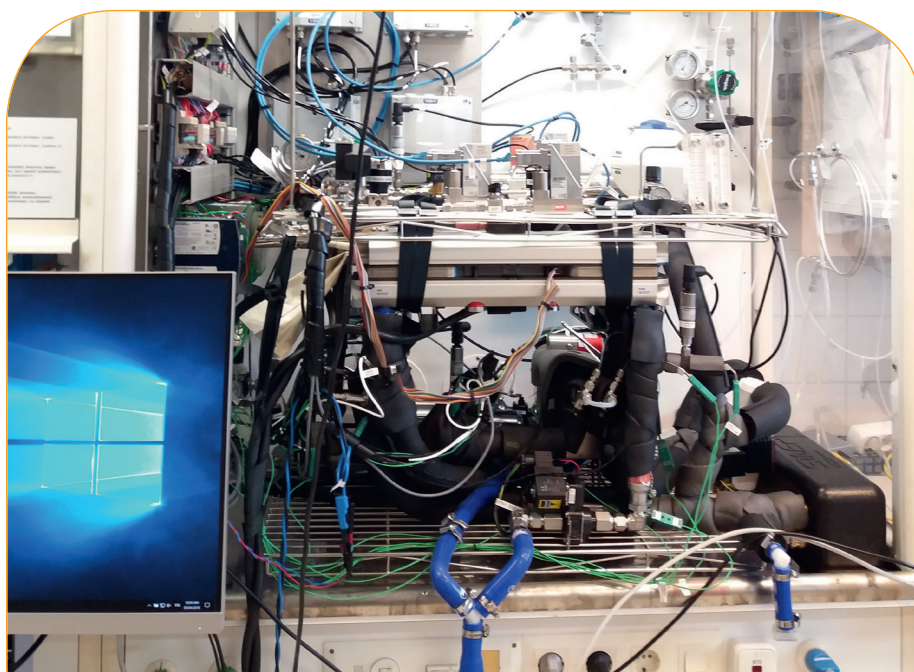




HYDRAITE

HYDROGEN DELIVERY RISK ASSESSMENT AND IMPURITY TOLERANCE EVALUATION

Project ID:	779475
Call topic:	FCH-04-1-2017 - Limiting the impact of contaminants originating from the hydrogen supply chain
Project total costs:	€ 3,499,867.50
FCH JU max. Contribution:	€ 3,499,867.50
Project start - end:	01/01/2018 - 31/12/2020
Coordinator:	Teknologian tutkimuskeskus VTT Oy, FI
Website:	hydraite.eu



BENEFICIARIES: COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES, STIFTELSEN SINTEF, NPL MANAGEMENT LIMITED, ZENTRUM FÜR SONNENENERGIE- UND WASSERSTOFF-FORSCHUNG BADEN-WÜRTTEMBERG, POWERCELL SWEDEN AB, ZENTRUM FÜR BRENNSTOFFZELLEN-TECHNIK GMBH, SINTEF AS

PROJECT AND OBJECTIVES

HYDRAITE project aims to solve the issue of hydrogen quality for transportation applications. Effects of contaminants, originating from the hydrogen supply chain, on the fuel cell systems in automotive applications are studied. An HRS sampling campaign has been conducted. In-line monitoring of hydrogen quality at the HRS as well as sampling strategy and methodology for new impurities, gas, particles and liquids, are evolved. Two European H2 laboratories have been established. Three laboratories will be established, capable of measuring all of the contaminants according to ISO 14687 standards.

NON QUANTITATIVE OBJECTIVES

- Recommendations for revision of ISO standard 14687
- Recommendations for FC stack contaminant measurements in automotive-type operation will derive from the successful measurement campaigns
- 1st HRS measurement campaign completed, external analysis completed, internal analysis and inter-laboratory comparison on going
- Evaluation of existing methods has started and concept for PEM-based sensor established
- Two laboratories with the analytical methods compliant ISO 14687 achieved.

PROGRESS & MAIN ACHIEVEMENTS

- Set up of 6 measurement systems of 6 different partners according to the stack testing methodology
- 1st HRS sampling campaign, 10 gas and particle samples was collected from 8 different stations in Germany, Sweden and Norway
- Set up of two European hydrogen laboratories.

FUTURE STEPS & PLANS

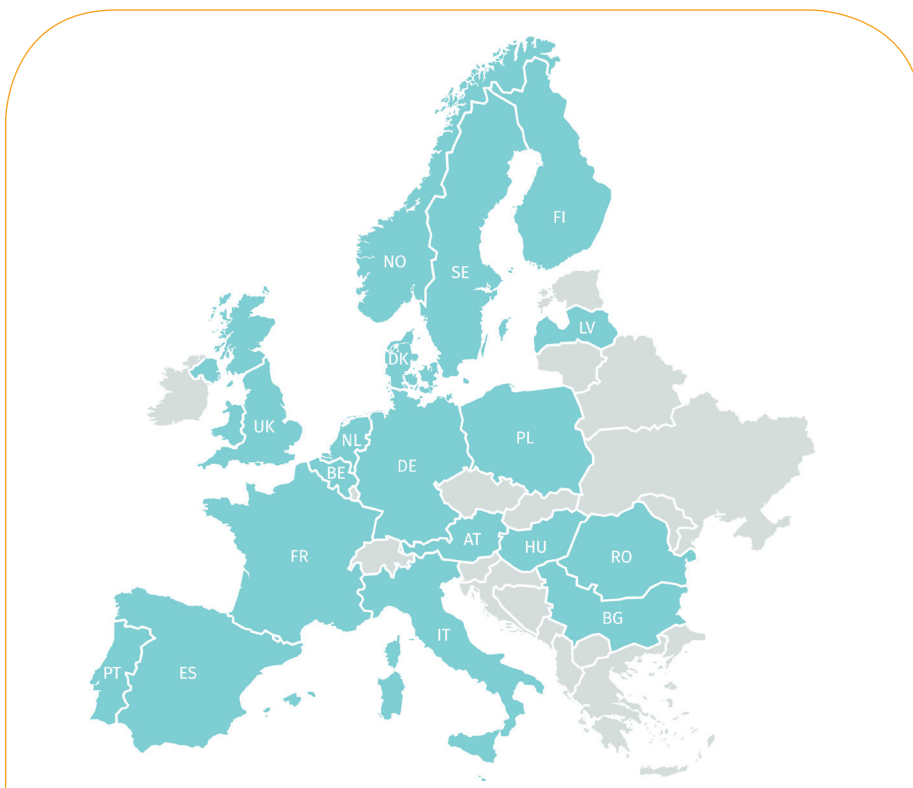
- FC measurements will run as planned in the DoA by 6 project partners and results reported
- Recommendations are formulated based on the experience and results from FC measurement campaigns
- 2nd HRS measurement campaign will be conducted
- Evaluation of the analytical solutions for in-line hydrogen fuel monitoring and development of new sensor for in-line hydrogen fuel monitoring
- Establishing three European H2 laboratories and set the first quality assurance network in Europe for hydrogen purity.





HyLAW

IDENTIFICATION OF LEGAL RULES AND ADMINISTRATIVE PROCESSES APPLICABLE TO FUEL CELL AND HYDROGEN TECHNOLOGIES' DEPLOYMENT, IDENTIFICATION OF LEGAL BARRIERS AND ADVOCACY TOWARDS THEIR REMOVAL



Project ID: 735977

Call topic:

FCH-04-2-2016 - Identification and reduction of legal-administrative barriers for the installation and operation of key FCH technologies

Project total costs: € 1,143,000

FCH JU max. Contribution: € 1,143,000

Project start - end: 01/01/2017 - 31/03/2019

Coordinator: HYDROGEN EUROPE, BE

Website: www.hylaw.eu

BENEFICIARIES: COMMISSARIAT A L ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES, AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, STIFTELSEN SINTEF, MAGYAR TUDOMANYOS AKADEMIA TERMESZETTUDOMANYI KUTATOKOZPONT, STICHTING NEDERLANDS NORMALISATIE - INSTITUUT, NATIONAL RESEARCH AND DEVELOPMENT INSTITUTE FOR CRYOGENICS AND ISOTOPIC TECHNOLOGIES ICSI RM VALCEA, INSTYTUT ENERGETYKI, FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON, VATGAS SVERIGE IDEELL FORENING, BULGARIAN ACADEMY OF SCIENCES, WATERSTOFNET VZW, GREATER LONDON AUTHORITY, OSTERREICHISCHE ENERGIEAGENTUR AUSTRIAN ENERGY AGENCY, BRINTBRANCHEN, TEKNOLOGIAN TUTKIMUSKESKUS VTT OY, STI - SISTEMAS E TECNICAS INDUSTRIAIS LDA, THE SCOTTISH HYDROGEN AND FUEL CELL ASSOCIATION LTD, DEUTSCHER WASSERSTOFF- UND BRENNSTOFFZELLENVERBAND EV, LATVIJAS UDENRAZA ASOCIACIJA, ASSOCIATION FRANCAISE POUR L'HYDROGENE ET LES PILES A COMBUSTIBLE, UK HYDROGEN AND FUEL CELL ASSOCIATION, DANSK GASTEKNISK CENTER AS, SINTEF AS

PROJECT AND OBJECTIVES

The project aimed to bring existing data into one place and combine it with rigorously acquired survey data. It aimed to undertake a consistent quantitative and qualitative assessment of the impacts of each process studied in order to provide the facts and underlying evidence essential for discussions with regulatory agencies, policymakers and other stakeholders on how best to manage, simplify or/and modify or/and bring commonality to the LAP process across the sector. In this context, The HyLAW project set out to provide a comprehensive review of the typical barriers of FCH technologies.

NON QUANTITATIVE OBJECTIVES

- Creating a comprehensive database with more than more 50,000 entries
- Identifying the most pressing legal and administrative barriers
- 18 well attended and well received workshops took place. They raised the profile of FCH technologies and helped create momentum in the HyLaw countries
- A strong network of partners across Europe has been formed that will continue to work together to promote FCH technologies.

PROGRESS & MAIN ACHIEVEMENTS

- The development of the most comprehensive database of legal and administrative processes associated with FCH technologies
- The identification of the most pressing legal and administrative barriers faced by the sector, alongside well developed arguments and analysis
- High profile dissemination events, raising awareness of FCH technologies and the barriers they face.

FUTURE STEPS & PLANS

- Project finished
- The database will continue to be kept up to date.

QUANTITATIVE TARGETS AND STATUS

TARGET SOURCE	PARAMETER	UNIT	TARGET	ACHIEVED TO DATE BY THE PROJECT	TARGET ACHIEVED?
AWP 2016	Countries	N/A	12	18	✓
Project's own objective	Legal and Administrative Processes	N/A	55	55	
	Workshops	N/A	18	18	



HySEA

IMPROVING HYDROGEN SAFETY FOR ENERGY APPLICATIONS (HYSEA)
THROUGH PRE-NORMATIVE RESEARCH ON VENTED DEFLAGRATIONS

Project ID: 671461

Call topic:

FCH-04.3-2014 - Pre-normative research on vented deflagrations in containers and enclosures for hydrogen energy applications

Project total costs: € 1,511,780

FCH JU

max. Contribution: € 1,494,780

Project start - end: 01/09/2015 - 30/11/2018

Coordinator: GEXCON AS, NO

Website: www.hysea.eu



BENEFICIARIES: FIKE EUROPE BVBA, HEFEI UNIVERSITY OF TECHNOLOGY, IMPETUS ADVANCED FINITE ELEMENT ANALYSES AS, THE UNIVERSITY OF WARWICK, UNIVERSITA DI PISA, UNIVERSITY OF SCIENCE AND TECHNOLOGY OF CHINA

PROJECT AND OBJECTIVES

The main objective of the project Improving Hydrogen Safety for Energy Applications through pre-normative research on vented deflagrations (HySEA) is to conduct pre-normative research on vented hydrogen deflagrations with an aim to provide recommendations for European and international standards on hydrogen explosion venting mitigation systems.

NON QUANTITATIVE OBJECTIVES

- Meetings in 2017, 2018 and 2019
- 29 presentations at conferences
- 19 journal publications.

PROGRESS & MAIN ACHIEVEMENTS

- Completed experimental campaigns in 20-foot containers and smaller enclosures (GEXCON and UNIPI)

- Developed model based on semi-empirical correlations for vented hydrogen deflagrations (UWAR)
- Communicated project results to relevant RCS (CEN TC 305 WG 3 ad-hoc group on gas explosions).

FUTURE STEPS & PLANS

Project finished.



Project ID:	700190
Call topic:	FCH-04.1-2015 - Recycling and Dismantling Strategies for FCH Technologies
Project total costs:	€ 497,666.25
FCH JU max. Contribution:	€ 497,666.25
Project start - end:	01/05/2016 - 30/04/2019
Coordinator:	FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON, ES
Website:	hytechcycling.eu

BENEFICIARIES: FUNDACION IMDEA ENERGIA, INDUSTRIAS LOPEZ SORIANO SA, PARCO SCIENTIFICO TECNOLOGICO PER L'AMBIENTE ENVIRONMENT PARK TORINO SPA, UNIVERZA V LJUBLJANI



PROJECT AND OBJECTIVES

HyTechCycling aims 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 legislation and business models.

A study on novel recycling technologies and strategies, a "cradle to grave" LCA, a document of recommendations and guidelines for stakeholders in FCH life and a business model with its implementation roadmap are results of the HyTechCycling project.

The project was completed in April 2019.

NON QUANTITATIVE OBJECTIVES

- Deliver a reference document for the re-adaptation of the recycling centres considering the FCH technologies needs
- Document with recommendations and guidelines for the introduction of the circular economy in the FCH technologies, per actor involved
- Development of a business model that aims to consider all the previous work performed in the project, and an implementation roadmap
- Performing of a LCA of the whole life of the technologies.

PROGRESS & MAIN ACHIEVEMENTS

- Developing reference documentation for dismantling and recycling of the FCH, considering new technologies and the readapting of recycling processes
- A "cradle-to-grave" LCA has been done per technology, considering the recycling strategies of the project
- A business model and its implementation roadmap have been developed, considering future market trends and how the FCH technologies will evolve.

FUTURE STEPS & PLANS

Project finished.





ID-FAST

INVESTIGATIONS ON DEGRADATION MECHANISMS AND DEFINITION OF PROTOCOLS FOR PEM FUEL CELLS ACCELERATED STRESS TESTING

Project ID: 779565

Call topic:

SFCH-04-5-2017 - Definition of Accelerated Stress Testing (AST) protocols deduced from understanding of degradation mechanisms of aged stack components in Fuel Cell systems

Project total costs: € 2,748,195

FCH JU max. Contribution: € 2,748,195

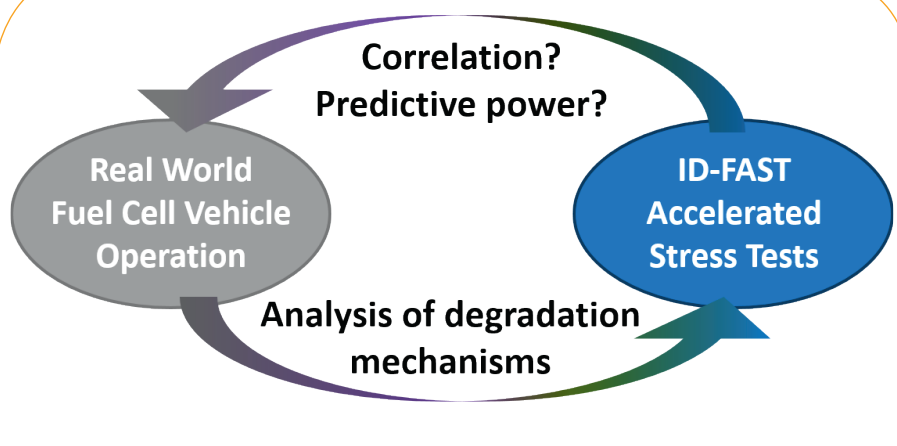
Project start - end: 01/01/2018 - 31/12/2020

Coordinator:

COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES, FR

Website:

id-fast.eu



BENEFICIARIES: FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V., DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV, POLITECNICO DI MILANO, ZENTRUM FUR SONNENENERGIE- UND WASSERSTOFF-FORSCHUNG BADEN-WURTEMBERG, BAYERISCHE MOTOREN WERKE AKTIENGESELLSCHAFT, FREUDENBERG TECHNOLOGY INNOVATION SE & CO. KG, FREUDENBERG PERFORMANCE MATERIALS SE & CO KG, SYMBIOFCCELL SA

PROJECT AND OBJECTIVES

ID-FAST aims at promoting the deployment of PEMFC technologies for automotive application thanks to specific combined Accelerated Stress Tests (AST) and a methodology allowing durability prediction. Core focus is on degradation mechanisms understanding and validation of representative ASTs relating in-situ, ex-situ and modelling investigations. Degradation analyses started on components aged in real conditions. Models of single degradation mechanisms are developed or improved, along with experiments and simulations on the impact of stressors. Next period will allow the coupling of mechanisms.

NON QUANTITATIVE OBJECTIVES

- Identification of real ageing mechanisms and quantification of their impact
- Development of performance degradation models integrating several mechanisms

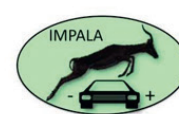
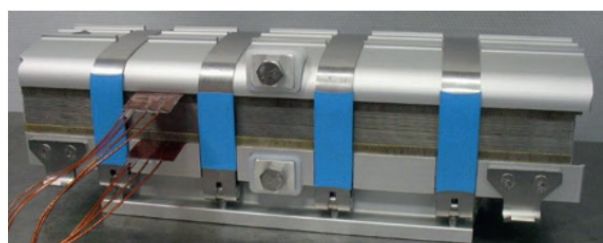
- Application of degradation models for the simulation of accelerated ageing tests
- Development and validation of specific and combined AST protocols
- Proposal of transfer functions relating accelerated to real degradation.

PROGRESS & MAIN ACHIEVEMENTS

- Real ageing data base: new protocol based on fleet data adopted and several aged samples analysed post-mortem by physical and electrochemical methods
- Improved models for catalyst and membrane degradation and for carbon corrosion - Simulations showing the influence of ageing modes on Pt dissolution
- Approach for development of new ASTs launched successfully for Gas Diffusion Layer case or for start-up shut-down related ageing mechanisms.

FUTURE STEPS & PLANS

- Analysing real ageing data and post-mortem analyses results to define the major relevant stressors and their impact
- Validation of single mechanisms models and coupling of these models - Simulation and comparison of real / AST impact for single mechanisms
- Proposal of combined accelerated tests with several mechanisms and application in single cells to check their impact on performance losses
- Validation of the ASTs developed by comparing post-mortem data with real ageing case on MEA components
- Launching the ID-FAST approach on the bipolar plates with degradation analyses and relevance analysis.





NET-Tools

NOVEL EDUCATION AND TRAINING TOOLS BASED ON DIGITAL APPLICATIONS RELATED TO HYDROGEN AND FUEL CELL

Project ID: 736648

Call topic: FCH-04-1-2016 - Novel Education and Training Tools

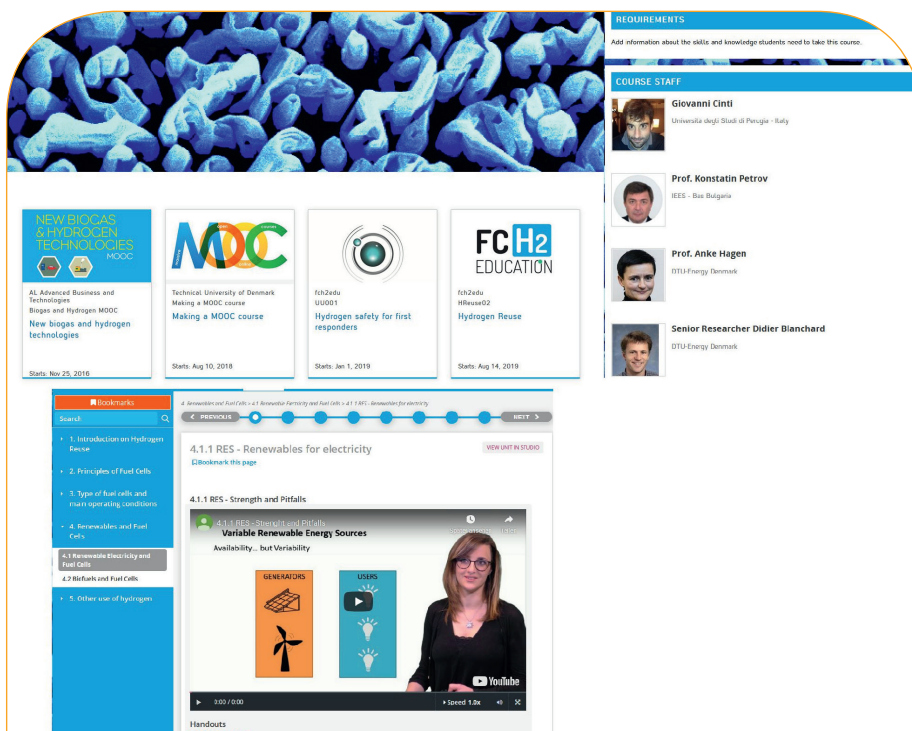
Project total costs: € 1,596,007.5

FCH JU max. Contribution: € 1,596,007.5

Project start - end: 01/03/2017 - 29/02/2020

Coordinator: KARLSRUHER INSTITUT FUER TECHNOLOGIE, DE

Website: www.h2fc-net.eu



BENEFICIARIES: DANMARKS TEKNISKE UNIVERSITET, NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS", UNIVERSITY OF ULSTER, UNIVERSITA DEGLI STUDI DI PERUGIA, INSTITUTE OF ELECTROCHEMISTRY AND ENERGY SYSTEMS, ELEMENT ENERGY LIMITED, PERSEE

PROJECT AND OBJECTIVES

NET-Tools aim to develop a functional e-platform which shall operate as a gateway for the FCH community. The e-platform shall provide FCH relevant information and content compiled under different categories. These categories are e-laboratory, e-learning and e-repository. While e-laboratory and e-learning are dedicated to FCH related education, the e-repository will offer additional opportunities to publish the outcome of FCH-projects or research results. The technical realisation is completed also most of the e-tools included in e-laboratory while examples to the e-learning under development.

NON QUANTITATIVE OBJECTIVES

- Course executed based on NET-Tools e-learning. 1st course BAS Sofia 12 candidates, 10 certificates 2nd course Buenos Aires
- Compilation of calculation e-tools based on peer reviewed publications

- Specific project events to introduce into NET-Tools e-platform (2nd Educational School under preparation 2020)
- First MOOCs of externals under preparation and development.

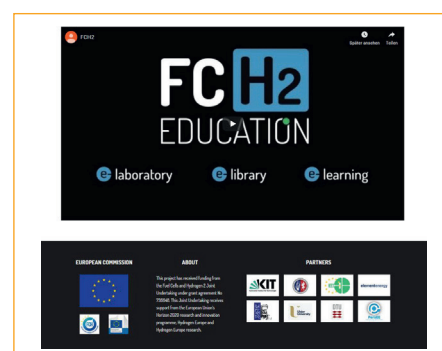
PROGRESS & MAIN ACHIEVEMENTS

- Technical realisation and structuring of the e-platform and its categories e-laboratory, e-learning and e-repository
- The programming of a set of e-tools and inclusion into the e-laboratory
- The development of e-learning materials as a specific example on FCH related e-learning materials.

FUTURE STEPS & PLANS

- Development of content to be added to the e-learning category in the e-platform
- Development of further e-tools for calculation and educational use
- Announcement and execution of 2nd educational school and Flying Teachers

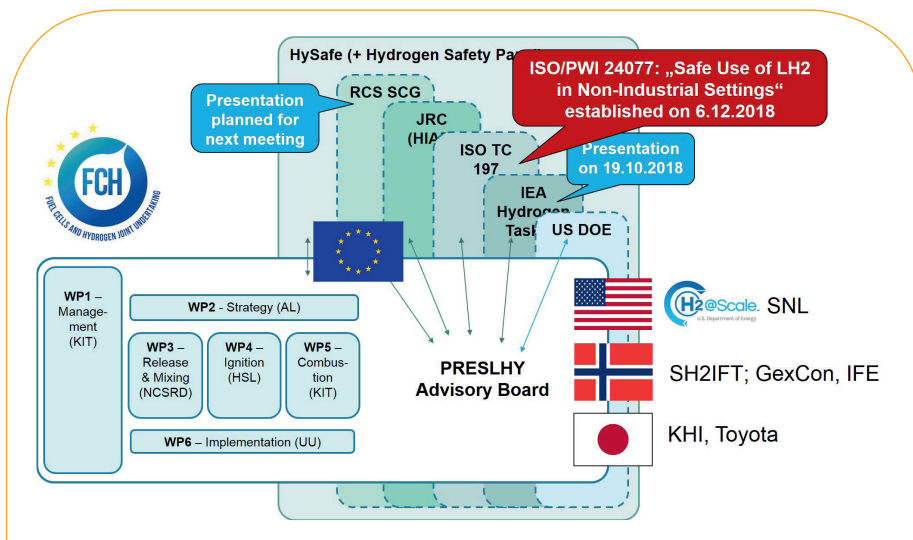
- Dissemination of NET-Tools results and especially opportunities to motivate externals for direct collaboration on the development of content
- Structuring the whole content to each category included in the e-platform.



QUANTITATIVE TARGETS AND STATUS

TARGET SOURCE	PARAMETER	TARGET	ACHIEVED TO DATE BY THE PROJECT	TARGET ACHIEVED?
Project's own objective	E-tools to be developed	35	24	✗
	Test courses	3	1,5	
	Public project events	5	3	
	E-newsletter	6	4	
	Persons in collaboration	100	20	

Project ID:	779613
Call topic:	FCH-04-4-2017 - PNR for a safe use of liquid hydrogen
Project total costs:	€ 1,905,862.50
FCH JU max. Contribution:	€ 1,724,277
Project start - end:	01/01/2018 - 31/12/2020
Coordinator:	KARLSRUHER INSTITUT FUER TECHNOLOGIE, DE
Website:	preslhy.eu



BENEFICIARIES: NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS", THE UNIVERSITY OF WARWICK, L'AIR LIQUIDE SA, INSTITUT NATIONAL DE L'ENVIRONNEMENT ET DES RISQUES INERIS, UNIVERSITY OF ULSTER, HEALTH AND SAFETY EXECUTIVE, PRO-SCIENCE - GESELLSCHAFT FÜR WISSENSCHAFTLICHE UND TECHNISCHE DIENSTLEISTUNGEN MBH, INTERNATIONAL ASSOCIATION FOR HYDROGEN SAFETY

PROJECT AND OBJECTIVES

PRESLHY conducts pre-normative research for the safe use of cryogenic liquid hydrogen (LH2) in non-industrial settings. In the first phase the state of the art was summarized and the experimental program was adjusted to the outcome of a research priorities workshop. The central part of the project consists of 3 phenomena oriented work packages addressing release, ignition and combustion with analytical approaches, experiments and simulations. The results shall improve the general understanding of the behaviour of LH2 in accidents and suggest development or revision of standards.

NON QUANTITATIVE OBJECTIVES

- Critical analysis of RCS in the field of LH2 safety
- Successfully initiated a preliminary working item on LH2 safety at ISO TC 197 initiation of standardisation process.

PROGRESS & MAIN ACHIEVEMENTS

- Research Priorities Workshop on LH2 conducted. The workshop was accompanied with an RCS analysis and an advanced PIRT analysis.
- First cold release experiments DISCHA combined with electrostatic measurements conducted. Hot surface ignition tests successfully accomplished

- Preliminary Working Item Nr 24077 at ISO TC 197 established.

FUTURE STEPS & PLANS

Delay of KIT/PS experiments will be solved by combination of other related experiments in a more general set-up (e.g. DISCHA with electrostatics).



QUANTITATIVE TARGETS AND STATUS

PARAMETER	TARGET	ACHIEVED TO DATE BY THE PROJECT	TARGET ACHIEVED?
Number of meetings with standards developing organisations	3	1	✗
Number of workshops with standards developing organisations	2	1	
Number of reports sent to standards developing organisations	2	0	



Project ID: 779730

Call topic: FCH-04-3-2017 - European Higher Training Network in Fuel Cells and Hydrogen

Project total costs: € 1,248,528.75

FCH JU max. Contribution: € 1,248,528.75

Project start - end: 01/11/2017 - 31/10/2020

Coordinator: THE UNIVERSITY OF BIRMINGHAM, UK

Website: www.teachy.eu

BENEFICIARIES: DANMARKS TEKNISKE UNIVERSITET, UNIVERSITE LIBRE DE BRUXELLES, POLITECNICO DI TORINO, TECHNISCHE UNIVERSITEIT DELFT, ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE, UNIVERSITY OF ULSTER, INSTITUT POLYTECHNIQUE DE GRENOBLE, VYSOKA SKOLA CHEMICKO-TECHNOLOGICKA V PRAZE, UNIVERSITATEA POLITEHNICA DIN BUCURESTI, NATIONAL TECHNICAL UNIVERSITY OF UKRAINE IGOR SIKORSKY KYIV POLYTECHNIC INSTITUTE, KARLSRUHER INSTITUT FUER TECHNOLOGIE

PROJECT AND OBJECTIVES

As the FCH industry gradually emerges into the markets, the need for trained staff becomes more pressing. TeachHy2020 specifically addresses the supply of undergraduate and graduate education (BEng/BSc, MEng/MSc, PhD etc.) in fuel cell and hydrogen technologies (FCHT) across Europe.

TeachHy 2020 will take a lead in building a repository of university grade educational material, and design and run an MSc course in FCHT, accessible to students from all parts of Europe.

TeachHy2020 will be offering solutions to accreditation and quality control of courses, and support student and industry

staff mobility by giving access to placements. Schemes of Continuous Professional Development (CPD) will be integrated into the project activities. TeachHy will offer educational material for the general public, build a business model to continue operations post-project, and as such act as a single-stop shop and representative for all matters of European university and vocational training in FCHT.

NON QUANTITATIVE OBJECTIVES

- First draft of full course on e-learning platform implemented in full structure
- First test course accomplished in 2018-2019.

PROGRESS & MAIN ACHIEVEMENTS

- Lecture material from partners collected
- Format and content of module delivery agreed
- First full course structured on e-learning platform.

FUTURE STEPS & PLANS

- First full run of course in academic year 2019/20
- Run of several courses in parallel
- Translation of course content
- Implementation on the NET-Tools platform
- CPD courses added and performed

