CERTIFHY

Developing a European Framework for the generation of guarantees of origin for green hydrogen

PANEL 6
Cross-cutting

ACRONYM	CERTIFHY
CALL TOPIC	SP1-JTI-FCH.2013.5.5 (2): Development of a European framework for the generation of guarantees of origin for green H_2
START DATE	1/11/2014
END DATE	31/10/2016
PROJECT TOTAL COST	€0,5 million
FCH JU MAXIMUM CONTRIBUTION	€0,43 million
WEBSITE	http://www.certifhy.eu/

PARTNERSHIP/CONSORTIUM LIST

HINICIO SA, STICHTING ENERGIEONDERZOEK CENTRUM NEDERLAND, TUV SUD INDUSTRIE SERVICE GmbH, Ludwig-Boelkow-Systemtechnik GmbH

MAIN OBJECTIVES OF THE PROJECT

The CertifHy project, supported by a wide range of key European industry leaders (gas companies, energy utilities, green hydrogen technology developers, automobile manufacturers and other leading industrial players) therefore aims to:

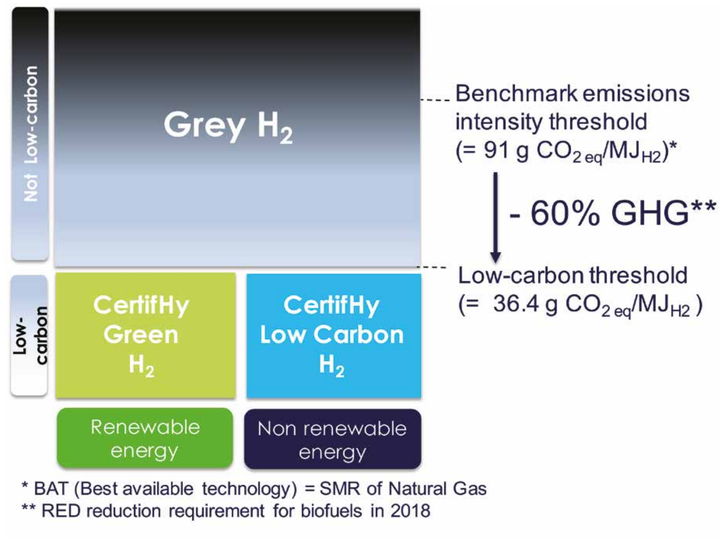
1. Define a widely acceptable definition of green hydrogen.
2. Determine how a robust Guarantee of Origin (GoO) scheme for green hydrogen should be designed and implemented throughout the EU.

PROGRESS/RESULTS TO-DATE

- Generic market outlook for hydrogen: overview of future trends, application areas and segmentation.
- Definition of "green" hydrogen: step-by-step consultation approach leading to a consensus common on the definition of green hydrogen in the EU (WP2).
- Review of existing platforms and interactions between existing GoO and green hydrogen; lessons learnt and mapping of interactions (WP3).

FUTURE STEPS

- Definition of a new framework of guarantees of origin for "green" hydrogen: technical specifications, rules and obligations for the GoO (WP4).
- Roadmap for the implementation of an EU-wide GoO scheme for green hydrogen: project implementation plan.



CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- Under a policy-driven scenario, green hydrogen could represent about 15 % of all hydrogen demand in Europe by 2030, amounting up to 1.4 Mtons of H_2.
- CertifHy Green H_2 is from Renewable feedstock & has low GHG intensity. CertifHy Low Carbon H_2 is from non-renewable feedstock & low GHG intensity.
- When discussing a GoO scheme, it is important to distinguish the guarantee of origin from the actual product label.

FIRECOMP

Modelling the thermo-mechanical behaviour of high pressure vessel in composite materials when exposed to fire conditions

PANEL 6
Cross-cutting

ACRONYM	FIRECOMP
CALL TOPIC	SP1-JTI-FCH.2012.5.4: Pre-normative research on fire safety of pressure vessels in composite materials
START DATE	1/06/2013
END DATE	31/05/2016
PROJECT TOTAL COST	€3,5 million
FCH JU MAXIMUM CONTRIBUTION	€1,8 million
WEBSITE	http://www.firecomp.info/

PARTNERSHIP/CONSORTIUM LIST

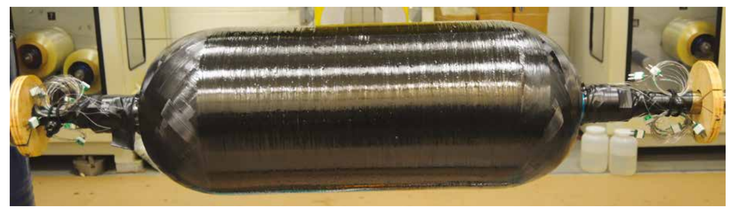
L'AIR LIQUIDE S.A, CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, THE UNIVERSITY OF EDINBURGH, RAUFOSS FUEL SYSTEMS AS, INSTITUT NATIONAL DE L'ENVIRONNEMENT ET DES RISQUES INERIS, HEALTH AND SAFETY EXECUTIVE, SAMTECH SA, ALMA CONSULTING GROUP SAS

MAIN OBJECTIVES OF THE PROJECT

Better characterize the conditions that need to be achieved to avoid burst of composite vessels for CGH_2 storage. To this aim, experimental work has been done in order to improve the understanding of heat transfer mechanisms and the loss of strength of composite high-pressure vessels in fire conditions. We modelled the thermo-mechanical behaviour of these vessels. Different applications have been considered: automotive application, stationary application, transportable cylinders, bundles and tube trailers.

PROGRESS/RESULTS TO-DATE

- Bonfire test campaign on 19 and 36L composite cylinders performed.
- Parametric study model performed and comparison with experimental results satisfying.
- Proposed approach for comparison with metallic cylinder of risk evaluation.
- Definition of RCS recommendations.
- Dissemination at WHEC Zaragoza, Spain June 16, ECCM Munich, Germany June 16.



FUTURE STEPS

- Finalizing last deliverables and public RCS recommendations.
- Prepare the publications for scientific results.
- Dissemination at ISO TC58SC3 WG24 and ISO TC197.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- If a reliable pressure relief system is used, composite cylinders are able to provide satisfying safety levels comparable to metallic ones.
- Fire scenarios include both engulfing and localised fires, which should be taken into account in the risk analysis.
- Whatever other protections are used, the pressure relief system shall activate for all types of fires which can lead to a burst.
- The performance of the cylinder alone (without any protection) should be assessed in order to provide information to the integrator.
- Then, the integrator should design and test his safety devices using his own risk analysis.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:				MAIP 2008-2013
Deliverables 2.1 and D6.6 Current fire approach for cylinders, RCS mapping and project expected outcomes	Compare policy and technology options	ACHIEVED	100 %	
WP2: Define & characterize fire scenario, perform risk assessment, compare with metallic cylinders	Specify technology assessment, collect and compare data for alternative technologies	ACHIEVED	100 %	Risk mythology presented at IchemE, proposition of approach for comparison with metallic cylinder
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:				AIP 2012
WP3- develop and validate a model representing the thermal degradation of a composite cylinder	Understand the evolution of the composite material when exposed to fire conditions	ACHIEVED	100 %	Succeeded in extracting "general" thermal properties
WP4- develop a thermo-mechanical damage model	Develop a model for predicting loss of strength & Identify conditions to avoid burst	ACHIEVED	100 %	Characterization of the mechanical behaviour and the different damage modes at different temperatures in the range [20 °C-150 °C]
WP5: Test composite reservoir behaviour in referenced fires and thermo-mechanical model validation	Validation of the model by an experimental programme. Propose safety pressure relief curve	ACHIEVED	95 %	Simulated times to burst and times to leak in accordance with the experiment, without parameter recalibration

HY4ALL

Hydrogen For All of Europe (HY4ALL)

PANEL 6
Cross-cutting

ACRONYM	HY4ALL
CALL TOPIC	FCH-04.2-2014: Develop strategies to raise public awareness of fuel cell and hydrogen technologies
START DATE	1/09/2015
END DATE	31/08/2018
PROJECT TOTAL COST	€1,9 million
FCH JU MAXIMUM CONTRIBUTION	€1,9 million
WEBSITE	

PARTNERSHIP/CONSORTIUM LIST

AIR LIQUIDE ADVANCED TECHNOLOGIES SA, DAIMLER AG, FUELCELL ENERGY SOLUTIONS GMBH, SIEMENS AKTIENGESELLSCHAFT, IMAGINATION FACTORY, CAMBRIDGE ECONOMETRICS LIMITED, ISTITUTO PER INNOVAZIONI TECNOLOGICHE BOLZANO SCARL, FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON, INTELLIGENT ENERGY LIMITED, PRAGMA INDUSTRIES, ELEMENT ENERGY LIMITED, COMMISSARIAT À L'ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES, NUCELLSYS GMBH

MAIN OBJECTIVES OF THE PROJECT

- Development of an overarching communication strategy.
- Robust assessment of macro-economic & societal benefits of FCH technologies.
- Creation of web portal for FCH technologies: 'one stop shop' for the general public.
- Pan-European cross-sectoral 'Hydrogen in Society' roadshow with a comprehensive media campaign in each country.
- Sector-specific dissemination events for mobility, stationary fuel cells, green H2 & energy storage, e.g. workshops & open days.

PROGRESS/RESULTS TO-DATE

- Validation of the communication strategy with the consortium with targets and tools.
- Collection of all inputs for the database and first assumptions on the scenarios and modelling.
- Workshop with external FCH stakeholders from industries and European Commission members for sharing first assumptions.
- First route for the roadshow with selection of stops and consultation of local organisations for supporting us into the dissemination.

FUTURE STEPS

- Share of the strategy with external Parties.
- Messages written & validated for the targeted audiences.
- Choice of the scenarios for the study and modelling to be initiated.
- Decision on website: subcontractort responsibility & choice.
- Validation of the presence of a local organisation or partners / affiliated entities to support the roadshow at each selected stop.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- Need to define & disseminate one H2 sector voice, adapted to all target audiences.
- HY4ALL will target mainly the general public and local decision makers thanks to the planned tools and actions (website, roadshow...).
- Hydrogen Europe will be project sponsor, with an influence strategy at top levels.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAIP 2014-2020
Build political support & societal acceptance for FCH technol. in EU	Dissemination in Member States, targeted messages / key figures	Preparation phase only: nothing done at this stage	100 %	Project is the largest action targeted (d raising political support & social acceptance for FCH technol.	HY4ALL is part of an overall H2 strategy to tackle this objective.
Improve public acceptance & risk perception on FCH technologies	Extensive & varied set of awareness-raising activities	Preparation phase only: nothing done at this stage	100 %	as above	HY4ALL is part of an overall H_2 strategy to tackle this objective
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:					AIP 2014
Study on macro-economic & societal benefits of FCH technol.	Maximise use of existing research & inputs from consortium	Almost done.	100%		Initially planned by 2015, extended to mid-2016
Disseminate the results of the meta-study	Dissem. activities (study), lobbying strategy (policymakers, NGO, EC)	Workshop with external FCH stakeholders already organised.	100%		Dissemination will mainly begin when first results are available
Supply a 'one stop shop' web portal	One stop shop' web portal: accessible language & tools	Subcontractor choice/role to be clarified.	100%	No single place for public to learn on benefits of the technologies	WP delayed waiting for strategy styudy
Technical content suitable for general public	Website to include content adapted for the public (videos)	This tasks is part of the website WP which is going to begin.	100%	Hard to find non-corporate info on H_2 technologies adapted general public	WP delayed waiting for strategy styudy
Supply demonstrational items	Exhibition items for into roadshow from project & external partners	Exhibit items from partners listed External items to be organised	100%	Project will show items in all H_2 technology sectors	Part of roadshow organisation: ongoing
Organise public debates in different Member States	30 public debates in different EU States, min. 2 for politicians	This is part of the roadshow organisation and not yet planned	80%	Debates are usually organised in parallel to dedicated events or tour.	Nr of debates depends on nr of stops & local parties involvement
(c) Other project objectives					
Be active in 11 EU member states plus Norway	Not applicable	Route to be defined, including selection of the countries	80%	H2moves Scandinavia's European H_2 Road Tour 2012: 5 countries, 9 stops	Need to secure strong local involvement at each stop
Dissemination activities in green H_2 and stationary FC sector	Not applicable	Workshops & open days planned from end 2016	100%		Dedicated budget

HYACINTH

Hydrogen acceptance in the transition phase

PANEL 6
Cross-cutting

ACRONYM	HYACINTH
CALL TOPIC	SP1-JTI-FCH.2013.5.3: Social acceptance of FCH technologies throughout Europe
START DATE	1/09/2014
END DATE	28/02/2017
PROJECT TOTAL COST	€0,9 million
FCH JU MAXIMUM CONTRIBUTION	€0,6 million
WEBSITE	http://hyacinthproject.eu/

PARTNERSHIP/CONSORTIUM LIST

CENTRO NACIONAL DE EXPERIMENTACION DE TECNOLOGIAS DE HIDROGENO Y PILASDE COMBUSTIBLE CONSORCIO, I PLUS F FRANCE SARL, FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV, ABERDEEN CITY COUNCIL*, CENTRO DE INVESTIGACIONES ENERGETICAS, MEDIOAMBIENTALES Y TECNOLOGICAS-CIEMAT, FUNDACION CIDAUT, RAZVOJNI CENTER ZA VODIKOVE TEHNOLOGIJE, NORSTAT DEUSTCHLAND GmbH, UNIVERSITY OF LEEDS, UNIVERSITY OF SUNDERLAND, CONSULTORIA DE INNOVACION Y FINANCIACION SL

MAIN OBJECTIVES OF THE PROJECT

The objective of HYACINTH is to gain a deeper understanding of the social acceptance of hydrogen and fuel cell technologies across Europe in the transition phase, between demonstration projects and a full market deployment, by combining specific qualitative and quantitative methods and samples of European citizens and stakeholders in 7 European countries. The main aims are to:
identify and understand awareness and acceptance of HFC technologies, identify its main drivers and develop a support toolbox.

PROGRESS/RESULTS TO-DATE

- Context analysis done: policies, projects and stakeholders in the selected countries and information for the methodological design.
- Research concept for the data gathering realized.
- Questionnaires for the general public and the stakeholders (quantitative and qualitative) parts done.
- Information gathered from the general public surveys obtained and most of the stakeholders part (interviews and surveys) done.

FUTURE STEPS

- To finalize the analysis of the general public awareness and acceptance study.
- To finalize the analysis of the stakeholders awareness and acceptance study.
- To develop and implement the support toolbox.

- To disseminate the results of the project (social awareness and acceptance studies and the support toolbox).

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- Different levels of response between countries for the stakeholders part of the project due to different state of HFC technologies in each country.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:				MAIP 2008-2013
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:				AWP 2013
Current state of public awareness and public acceptance of FCH technologies in Europe	Interviews of up to 7,000 European citizens and 455 stakeholders in 7 different countries	General public surveys done, finalizing stakeholder interviews	100 %	Information gathered for general public. Last interviews are been carried out now (1-2 month delay)
What kind of fears is associated with FCH technologies to date? How is hydrogen safety perceived?	To identify bottlenecks. To discern handicaps geographically linked or for a certain application	Analysis ongoing for general public and stakeholders	100 %	Analysis started for stakeholders and general public. Some delay (1-2 months) expected in the stakeholders part
How can a successful transition towards the use of hydrogen in the mobility sector be achieved?	Development of a specific toolbox. Dissemination	Design of toolbox completed. Performing Dissemination Plan	100 %	Development and trials for toolbox prepared for the last part of the project

HYCORA

Hydrogen contaminant risk assessment

PANEL 6
Cross-cutting

ACRONYM	HYCORA
CALL TOPIC	SP1-JTI-FCH.2013.1.5: Fuel Quality Assurance for Hydrogen Refuelling Stations
START DATE	1/04/2014
END DATE	31/03/2017
PROJECT TOTAL COST	€3,9 million
FCH JU MAXIMUM CONTRIBUTION	€2,1 million
WEBSITE	http://hycora.eu/

PARTNERSHIP/CONSORTIUM LIST

Teknologian tutkimuskeskus VTT Oy, COMMISSARIAT À L'ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES, JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION, PROTEA LIMITED, STIFTELSEN SINTEF, Powercell Sweden AB

MAIN OBJECTIVES OF THE PROJECT

The main objective of HyCoRA project is to provide information to reduce cost of hydrogen fuel quality assurance (QA).
However, it will also provide recommendations for revision of existing ISO 14687-2:2012 standard for hydrogen fuel in automotive applications.

PROGRESS/RESULTS TO-DATE

- A recirculation cell and stack hardware has been developed, enabling anode gas humidification by recirculation and fuel utilisation of 99.5 %.
- The effect of formaldehyde and formic acid have been studied and it seems that the limits in ISO 14687-2:2012 standard are too low.
- The results show that the drive cycle and anode operation mode (open anode vs recirculation) has significant effects on the contamination dynamics.
- A first sampling campaign at hydrogen refuelling stations has been completed and results have been disseminated.
- A qualitative risk and quantitative risk models for hydrogen fuel contamination have been developed.

FUTURE STEPS

- The effect of formaldehyde and formic acid will be studied in more detail to enable the review of the limits in ISO 14687-2:2012 standard.
- The effect of internal air bleed on the CO poisoning dynamics will be measured with help of CO with carbon 13 isotope.

- Evaluation of analytical techniques with focus on challenging/cost driving analyses (i.e. total sulphur and halogenates).
- Conduct and analyse hydrogen samples from second measurement campaign from new hydrogen refuelling stations.
- Quantitative risk model for hydrogen fuel contamination will be developed further and implemented in Matlab.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- Hydrogen fuel contamination studies require high fuel utilisation and right hardware in single cell and PEMFC system level.
- A pre-concentration device may be necessary for reducing the analytical techniques in hydrogen quality assurance.
- The limits of both formic acid and formaldehyde in ISO 14687-2:2012 standard seem to be too low.
- The use of CO canary species may be problematic when contaminant level of CO is very low.
- Risk model results indicate that current FCEVs with high anode platinum have very low risk for CO contamination incident.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:				MAIP 2008-2013
To reduce cost of hydrogen fuel quality assurance (QA) so that €5-10/kg is possible to reach	H_2 price dispensed at pump €5-10/kg (2020)	MAIP 2008-13	100 %	Hydrogen fuel quality assurance (QA) part of the hydrogen cost can be reduced to lower level
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:				AIP 2013-1
Understanding hydrogen contaminant research in PEMFC system level	Completing current knowledge by identifying the impurity limits of PEMFCs	Critical contaminants for the quality assurance have been identified and studied	80 %	Work is progressing mostly as planned
To find out quality variation for automotive grade hydrogen in production and HRS nozzle	Providing technical data on fuel composition and impurity concentrations at HRS	The first measurement campaign has been completed	95 %	Work is progressing as planned
Work is performed International co-operation	Build on existing knowledge, as well as international networking and exchange	Co-operation and contacts have been established with LANL, ANL, NREL and JARI	100 %	Work is progressing as planned
Constructing a probabilistic risk assessment model for determining quality assurance needs	Establish a simplified and diversified set of requirements for hydrogen fuel quality	Qualitative risk model has been completed as well as first version of quantitative model	100 %	Work is progressing as planned
Constructing a probabilistic risk assessment model for determining quality assurance needs	Simplifying fuel quality control by enhancing knowledge of gas impurity concentrations	The first measurement campaign has been completed and samples have been analysed	90 %	Work is progressing as planned
Simplify and reduce cost of analysis by reducing the number of analytical techniques required	Establishing new analytical methodology relevant for gas impurity quantification	Manufacturing and testing of the pre-concentration device and sub-components is ongoing	90 %	Work is progressing as planned
Simplify and reduce cost of analysis by reducing the number of analytical techniques required	Designing and verifying of gas sampling instrumentation applicable to HRS operation	Verifying of gas sampling instrumentation is complete. Particle sampling will be verified	100 %	Work is progressing as planned

HYPACTOR

Pre-normative research on resistance to mechanical impact of composite overwrapped pressure vessels

PANEL 6
Cross-cutting

ACRONYM	HYPACTOR
CALL TOPIC	SP1-JTI-FCH.2013.5.6: Pre-normative research on resistance to mechanical impact of pressure vessels in composite materials
START DATE	1/04/2014
END DATE	31/03/2017
PROJECT TOTAL COST	€4 million
FCH JU MAXIMUM CONTRIBUTION	€2,1 million
WEBSITE	http://www.hypactor.eu

PARTNERSHIP/CONSORTIUM LIST

COMMISSARIAT À L'ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES, L'AIR LIQUIDE S.A, HEXAGON RAUFOSS AS, INSTITUT DE SOUDURE ASSOCIATION, POLITECHNIKA WROCLAWSKA, NORGES TEKNISK-NATURVITENSKAPELIGEUNIVERSITET NTNU, ALMA CONSULTING GROUP SAS

MAIN OBJECTIVES OF THE PROJECT

To provide recommendations for RCS regarding the qualification of new designs of Composite Overwrapped Pressure Vessel (COPV) and the procedures for periodic inspection in service of COPV subjected to mechanical impacts.
To this aim, experimental and numerical work will be combined with feedback from experience

PROGRESS/RESULTS TO-DATE

- Review of international impact related incidents on pressure composite cylinders.
- Investigation of industrial constraints for the use of non-destructive testing (NDT) in industrial sites.
- Definition of project impact test matrix.
- Review of NDT techniques and protocols to characterize impact damage.
- First results of impact campaign on 36L 70MPa tanks.

FUTURE STEPS

- Technical report on impact testing with characterization of induced tank damage.
- Choice of 2-3 relevant impact conditions to study residual performance.
- Definition of test matrix on the impact testing and residual performance assessment.

- Definition of NDT protocols.
- Modelling of residual performance of impacted COPV with given damage.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- First experimental database with impact parameters and characteristics of induced damage.
- First comparative assessment of NDT techniques and protocols to characterize impact damage.
- Conclusions on short/long term residual performance of impacted tanks.
- Define most appropriate NDT and pass/fail criteria for periodic inspection or qualification.
- Provide normative committees with scientific feedback.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAIP 2008-2013
Assess NDT and define protocols to inspect composite damaged by impact	Recommendations to industry and for international standards development	On-going on WP2 impacted tanks	100 %	No literature reference	Impact testing in progress(XX impacts / XX impacted tanks). NDT development, damage characterization and short/long term residual performance assessment under progress
Revised methodology for qualification, inspection and testing to RCS committees	International cooperation strategy /safety	Not started	100 %	MAE methodology under investigation in USA	Critical damage definition under progress, dedicated workshop (intra consortium) is planned in sept 2016 to synthesize project results and draw first recommendations guidelines.
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:					AIP 2013-1
To determine damage characteristics induced by impacts	Identify types of alterations produced by mechanical impacts and develop an understanding of their consequences on short and long term structural integrity	On-going (WP2 and WP3)	100 %	No literature reference	Under progress (WP2 and WP3)
To identify impact conditions that produce short term failure; by testing, immediate failure	Through a combination of experimental, analytical and/or modelling approaches, establish a relation between severity of impact, level of damage, and effect on structural integrity.in order to determine which impacts may cause a pressure vessel to fail in service	On-going	100 %	No literature reference	nearly completed (still waiting for repeatability testing and water load conditions)

HYRESPONSE

European hydrogen emergency response training programme for first responders

PANEL 6
Cross-cutting

ACRONYM	HYRESPONSE
CALL TOPIC	SP1-JTI-FCH.2012.5.3: First responder educational and practical hydrogen safety training
START DATE	1/06/2013
END DATE	31/05/2016
PROJECT TOTAL COST	€2,6 million
FCH JU MAXIMUM CONTRIBUTION	€1,8 million
WEBSITE	http://www.hyresponse.eu/

PARTNERSHIP/CONSORTIUM LIST

ECOLE NATIONALE SUPERIEURE DES OFFICIERS DE SAPEURS-POMPIERS, AIR LIQUIDE HYDROGEN ENERGY, UNIVERSITY OF ULSTER, AREVA STOCKAGE D'ENERGIE SAS, FAST – FEDERAZIONE DELLE ASSOCIAZIONI SCIENTIFICHE E TECNICHE, THE CCS GLOBAL GROUP LIMITED, CRISIS SIMULATION ENGINEERING SARL

MAIN OBJECTIVES OF THE PROJECT

1. Define emergency scenarios and first response strategies.
2. Create an educational training material.
3. Build an operational training facility as a platform with multiple workshops exercises.
4. Imagine and develop an virtual reality training platform (reproduce a nerve centre for crisis management to simulate frames exercises).
5. Execute three pilot training sessions to more than 50 first responders.
6. Promote recommendations and dissemination all around Europe (also in US and Japan countries).

PROGRESS/RESULTS TO-DATE

- Definition of tactical manoeuvres to eliminate the hazard or due incidents to the use of responders (firemen or industrial sites security guards).
- Definition of educational training scenarios using the above defined tactical manoeuvres.
- Construction of the physical platform with 5 modules (clarinets, explosion area, simulating hydrogen vehicles, mikados, refuelling station).
- Elaboration of theoretical courses and construction of a virtual reality platform.
- Animation of three pilot training sessions (71 trainees, more than 15 observers).

FUTURE STEPS

- Second and final international workshop in September 2016 (15-16).
- Creating of an educational training material and recommendations guide.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- This project is becoming the first European training centre at the discretion of the hydrogen risk.
- It is regularly offer to all European stakeholders training sessions mixing theoretical courses, practical exercises and virtual reality approaches.
- This program has also had the effect of creating and meeting together a community of experts in this domain.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:				MAIP 2008-2013
3 training levels developed: discovery, advanced (as regulators), and expert	Developing training programmes at all levels	Lectures, practical training scenarios and 2 exercises in virtual reality for each level have been developed	100 %	
2 international workshops for European firefighters and 3 advisory consultation panel (ACP) meetings	Dissemination of the programme results through public awareness events and initiatives	1 international workshop for European firefighters and 3 advisory consultation panel (ACP) meetings	85 %	The last international workshop will be done on September 15-16 at ENSOSP school (Aix-en-Provence, France)
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:				AIP 2012
Construction of a physical platform and also a virtual reality platform	Install an European Hydrogen Training Platform on which will be realised full scale exercises	5 physical modules and several virtual reality exercises have been developed	100 %	

HySEA

Improving Hydrogen Safety for Energy Applications (HySEA) through pre-normative research on vented deflagrations

PANEL 6
Cross-cutting

ACRONYM	HySEA
CALL TOPIC	FCH-04.3-2014: Pre-normative research on vented deflagrations in containers and enclosures for hydrogen energy applications
START DATE	1/09/2015
END DATE	31/08/2018
PROJECT TOTAL COST	€1,5 million
FCH JU MAXIMUM CONTRIBUTION	€1,4 million
WEBSITE	www.hysea.eu

PARTNERSHIP/CONSORTIUM LIST

GEXCON AS, THE UNIVERSITY OF WARWICK, UNIVERSITA DI PISA, FIKE EUROPE BVBA, IMPETUS ADVANCED FINITE ELEMENT ANALYSES AS, University of Science and Technology of China

MAIN OBJECTIVES OF THE PROJECT

The main objective of the HySEA project is to conduct pre-normative research on vented deflagrations in containers and smaller enclosures for hydrogen energy applications. The aim is to facilitate the safe and successful introduction of hydrogen energy systems by introducing harmonized vent sizing requirements in international standards. The project entails the development of predictive models and validation against experimental results.

PROGRESS/RESULTS TO-DATE

- Completed kick-off meeting and first progress meeting.
- Established logo, website, advisory board, etc.
- Designed experimental rigs.
- Initiated modelling activities.
- Scheduled first HySEA workshop.

FUTURE STEPS

- Complete construction of experimental rigs.
- Initiate experiments in small-scale enclosure.
- Initiate full-scale experiments in ISO containers.
- Complete first blind-prediction study with publication.
- Progress on modelling and dissemination activities.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- The work progresses according to schedule.
- The first experimental results are expected in Q3 2016.
- The modelling will progress in parallel with the experiments.
- On-going dialogue with standardizing committees.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAWP 2014-2020
Safety	Overarching projects / cross-cutting activities	Planning and implementation	90 % (good control of experiments and modelling)	The HySEA project will define the international state-of-the-art in vented hydrogen deflagrations for actual industrial enclosures up to the size of 20-ft. ISO containers	MAWP 2014 – 2020
Pre-normative research	Overarching projects / cross-cutting activities	Initial networking	75 % (depends on standardizing committees)	The HySEA project will define the international state-of-the-art in vented hydrogen deflagrations for actual industrial enclosures up to the size of 20-ft. ISO containers	MAWP 2014 – 2020
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:					AWP 2014

IRMFC

Development of a portable internal reforming methanol High Temperature PEM fuel cell system

PANEL 6
Cross-cutting

ACRONYM	IRMFC
CALL TOPIC	SP1-JTI-FCH.2012.4.2: Demonstration of portable generators, back-up power and Uninterruptible Power Systems & SP1-JTI-FCH.2012.4.4: Demonstration of portable fuel cell systems for various applications
START DATE	1/05/2013
END DATE	31/10/2016
PROJECT TOTAL COST	€3,4 million
FCH JU MAXIMUM CONTRIBUTION	€1,5 million
WEBSITE	http://irmfc.iceht.forth.gr/

PARTNERSHIP/CONSORTIUM LIST

FOUNDATION FOR RESEARCH AND TECHNOLOGY HELLAS, ADVANCED ENERGY TECHNOLOGIES AE EREUNAS & ANAPTYXIS YLIKON & PROION-TONANANEOSIMON PIGON ENERGEIAS & SYNAFON SYMVOULEFTIKON Y PIRESION*ADVEN, UNIWERSYTET MARII CURIE-SKLODOWSKIEJ, FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWAND-TEN FORSCHUNG EV, UNIVERSITY OF PATRAS, ZENTRUM FUR BRENN-STOFFZELLEN-TECHNIK GMBH, JRC -JOINT RESEARCH CENTRE- EURO-PEAN COMMISSION, ENERFUEL INC, ARPEDON METRITIKES DIATAXEIS KAI ORGANA MICHANIMATA YPRESIES EPE

MAIN OBJECTIVES OF THE PROJECT

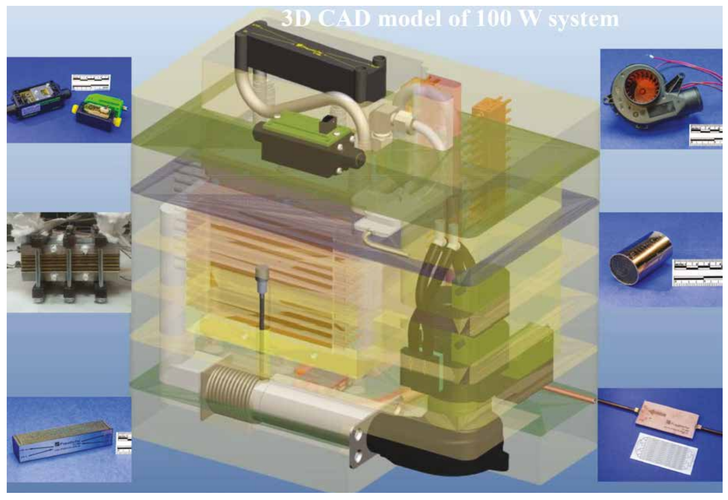
Development/demonstration of 100 W internal reforming methanol high temperature PEM fuel cell system for portable applications. It includes: Scale-up synthesis and optimization of the main components (HT-MEAs, methanol reforming catalysts, BoP) developed within the framework of previous FCH-JU IRAFC 245202 project.

PROGRESS/RESULTS TO-DATE

- Scale-up synthesis and long term cycling stability of ultra thin Cu-based methanol reformer; highly active at 210 °C; easy embedding in the cell.
- Scale-up synthesis of MEAs operating at 210 °C; high stability (500 h) under simulated reformate gas; poor stability under on-off cycling tests.
- New graphite- and metal-based bipolar plates operating under IRMFC conditions.
- Integration/testing of short IRMFC modules (210 °C, 650 mV/MEA at 0.2 A/cm^2). Poor cycling tolerance (thicker MEAs will be employed in the final stack).
- BoP and main stack components already delivered, covering the size and weight restrictions. 100 W stacks tests will start in summer 2016.

FUTURE STEPS

- 100 W graphite- and metal-based stacks integrated and tested.
- Self-sustaining operation at 100 W net power output (no external power supply).



CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- The first 36 months results clearly demonstrate the IRMFC functionality and open future perspectives in fuel cell market for portable applications.
- Crosslinking methodology adopted herein for the first time resulted in MEAs operating at 210 °C under reformate conditions.
- Poor cycling stability of MEAs will be confronted with thicker membranes in the final stacks; modified polymer electrolytes are under development.
- New-type methanol reformer (ultrathin and lightweight) and bipolar plates (operation at 200-230 °C) delivered and tested for >1,000 h.
- Promising results obtained from short modules testing gives high perspective to achieve the main objectives of the project.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAIP 2008-2013
Self-sustaining operation of 100 W Internal Reforming Methanol Fuel Cell (no external power supply)	Small-Micro Fuel Cells-logistic non-hydrogen fuel-Mini (50-500 W)	Main components (reformers, MEAs, BPPs, BoP) delivered and final stacks testing is under way	<70 % (due to limited cycling capability of MEA)	No direct comparison. Closest commercial systems: (i) Truma VeGa 250 W (LPG fuel, 140 kg/kW, 384 L/kW); (ii) SFC EFOY (105 W DMFC, 75 kg/kW, 20 % efficiency); (iii) UltraCell XX55 RMFC (50 W, 12V, 1.6 kg)	Poor cycling stability of MEAs due to expansion/shrinkage phenomena during cooling/heating runs which result in severe degradation of the membranes. Improved with thicker membranes
<€5,000/kW	2015 target: Cost of €24,000/kW for industrial/commercial units	A rough estimation of cost for mass production of the stack plus peripherals is below the target	100 % (for mass production)	N/A	The final cost is much higher because a single unit will be delivered
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:					AIP 2012
Electrical efficiency >30 % at 210-220 °C (MeOH/H_2O fuel)	Electrical efficiencies of 30 %+ (based on a logistic fuel input)	Efficiency >30 %	100 %	N/A	Design and evaluation report on the engineering issues of BoP completed. Integration/testing of the final system will start at the end of summer 2016
100 W IRMFC system fuelled with MeOH/H_2O will be tested at 210 °C (including 100 start-stop cycles)	1,000 h lifetime including 100 start-stop cycles	N/A	<70 % (limited on/off capability of membranes)	N/A	Integration/testing of the final system will start at the end of summer 2016

KNOWHY

Improving the knowledge in hydrogen and fuel cell technology for technicians and workers

PANEL 6
Cross-cutting

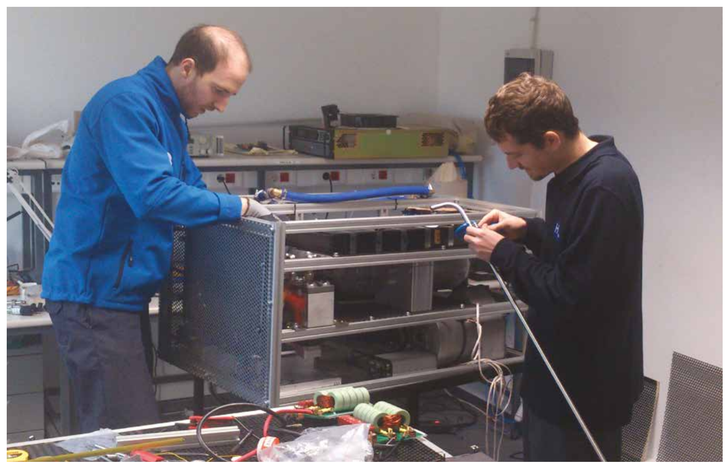
ACRONYM	KNOWHY
CALL TOPIC	SP1-JTI-FCH.2013.5.2: Training on H_2&FC technologies for Operation & Maintenance
START DATE	1/09/2014
END DATE	31/08/2017
PROJECT TOTAL COST	€1,4 million
FCH JU MAXIMUM CONTRIBUTION	€1 million
WEBSITE	http://knowhy.eu/

PARTNERSHIP/CONSORTIUM LIST

TECHNISCHE UNIVERSITEIT DELFT, FUNDACION PARA EL DESARROLLO DE LAS NUEVAS TECNOLOGIAS DEL HIDROGENO EN ARAGON, FUNDACION SAN VALERO, TECHNISCHE UNIVERSITAET MUENCHEN, PARCO SCIENTIFICO E TECNOLOGICO PER L'AMBIENTE – ENVIRONMENT PARK SPA, CAMPUS AUTOMOBILE SPA-FRANCORCHAMPSASBL, THE UNIVERSITY OF BIRMINGHAM, INSTITUTO SUPERIOR TECNICO, FAST – FEDERAZIONE DELLE ASSOCIAZIONI SCIENTIFICHE E TECNICHE, VERTIGO GAMES BV, PNO CONSULTANTS BV, KIWA TRAINING BV, McPhy Energy SA

MAIN OBJECTIVES OF THE PROJECT

The main objective of the project is to create blended learning program for technicians working with FC&H_2 applications and correspondingly train minimum of 1,000 technicians by the project end. To achieve this, several objectives are defined: identify training needs, identify the target group defining the profile of the technicians to be addressed, identify training modules based on survey with FC&H_2 organisations and companies, develop teaching methodology, set the online course platform, create course content in 7 languages along with serious games & practical sessions.



PROGRESS/RESULTS TO-DATE

- Stakeholders identified, market survey conducted & based on the results, training modules identified.
- Teaching methodology defined, course platform, the project website and LinkedIn page established.
- Target group of technicians to be addressed in the training identified & pilot course in progress in the Netherlands.
- Dissemination documents established & KnowHy disseminated at several events; publications also released.
- The course platform updated with the core module & one specialisation module in English and Dutch language.

FUTURE STEPS

- Four more specialisation modules to be created, validated & uploaded on the course platform.
- Translation of all modules in languages: English, Dutch, German, Spanish, Portuguese, French & Italian.
- Technician enrolment to begin soon and thereby courses will be provided in several countries in Europe.
- Establishment of KnowHy joint venture along with business case proposal.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- A special purpose vehicle will be set up to enable effective collaboration beyond the end of the EU-funded project.
- Based on interviews, survey & market analysis; five specialisation courses have been identified related to FC&H_2 applications.
- Interactions with participant industries of the pilot course gave positive results & highlighted the need for such courses.
- Some improvements are suggested by the pilot course participants to make the course more appealing to technicians.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAIP 2008-2013
An offer of five courses based on applications of FC&H_2 technology along with a basic course	Ensure the human capital necessary in developing FC&H_2 technology in the mid-term is developed	40 %	90 %	No existing FC&H_2 training available online for technicians. OEMs normally train the technicians in-house	Target group & the training modules identified. The online course platform is set. Website and dissemination documents finalised. 2 courses uploaded on the platform & a pilot training is ongoing.

MATHRYCE

Material testing and recommendations for hydrogen components under fatigue

PANEL 6
Cross-cutting

ACRONYM	MATHRYCE
CALL TOPIC	SP1-JTI-FCH.2011.2.8: Pre-normative research on design and testing requirements for metallic components exposed to H_2 enhanced fatigue
START DATE	1/10/2012
END DATE	30/09/2015
PROJECT TOTAL COST	€2,4 million
FCH JU MAXIMUM CONTRIBUTION	€1,2 million
WEBSITE	http://www.mathryce.eu/

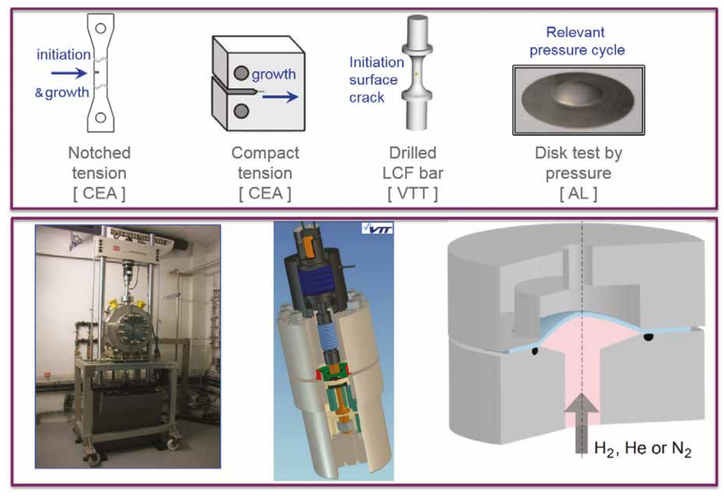
PARTNERSHIP/CONSORTIUM LIST

COMMISSARIAT À L'ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES, L'AIR LIQUIDE S.A, Teknologian tutkimuskeskus VTT Oy, JRC - JOINT RESEARCH CENTRE- EUROPEAN COMMISSION, THE CCS GLOBAL GROUP LIMITED, CENTRO SVILUPPO MATERIALI SPA, DALMINE SPA

MAIN OBJECTIVES OF THE PROJECT

The MATRHYCE project aims to develop an easy to implement hydrogen gas vessel design and service life assessment methodology based on lab-scale tests. The main outcomes are:

1. A reliable testing method to characterize materials exposed to hydrogen-enhanced fatigue.
2. Generating characterization data of metallic materials for hydrogen service.
3. Definition of a methodology for the design of metallic components exposed to hydrogen enhanced fatigue.
4. Dissemination of prioritized recommendations for implementations in international standards.



PROGRESS/RESULTS TO-DATE

- Comparison of existing codes on a given case, highlighting the main differences (advantages and drawbacks).
- 3 types of lab-scale tests under hydrogen pressure have been developed to address both fatigue crack initiation and fatigue crack propagation.
- Hydraulic as well as hydrogen pressure cyclic tests on full components performed.
- Analysis of the results at lab-scale and full scale, helped by numerical simulations.
- Methodology proposal.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- The results obtained favour the use of a fracture mechanics approach to design cylinders under hydrogen cyclic pressure.
- In presence of a defect, it appears that the fatigue crack initiation step under hydrogen can be neglected.
- At low DK, it is necessary to use the fatigue crack growth rate law including the change of behaviour at such low values, not to be too conservative.
- A methodology and associated recommendations have been proposed and presented to ISO and CEN experts.
- A draft, including some of the Mathryce project recommendations, for an appendix to draft ISO/CD 19884 has been proposed to the ISO working group.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:			MAIP 2008-2013
To propose dedicated RCS for design of Hydrogen pressure vessels	RCS strategy – Development of RCS to avoid major barriers for the commercialisation of FCH products	Finished	Recommendations for RCS have been proposed and presented to the ISO and CEN experts of the field on the September 21 workshop.
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:			AIP 2011
Three types of tests are developed and applied to the metallic material AISI 4130	Metallic material characterization for hydrogen service	Finished	All the tests have been achieved. Only one material could be tested within the project.
Development of service life assessment methodology based on lab-scale tests under hydrogen gas.	Experimental implementation of design approach and design testing approach	Finished	Both lab-scale and full-scale tests have been used to identify an appropriate testing method under hydrogen gas.
Development of a design methodology taking into account hydrogen enhanced fatigue.	Design code for pressure equipment with metallic components in hydrogen service	Finished	Methodology as well as RCS recommendations have been presented to ISO and CEN experts.

SOCTESQA

Solid oxide cell and stack testing, safety and quality assurance

PANEL 6
Cross-cutting

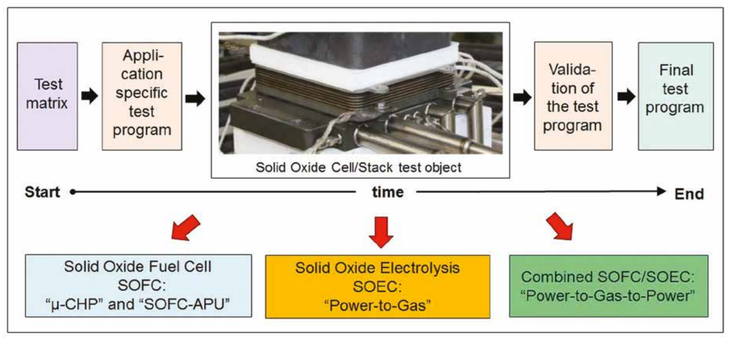
ACRONYM	SOCTESQA
CALL TOPIC	SP1-JTI-FCH.2013.5.4: Development of industry-wide uniform performance test schemes for SOFC/SOEC cells & stacks
START DATE	1/05/2014
END DATE	30/04/2017
PROJECT TOTAL COST	€3,2 million
FCH JU MAXIMUM CONTRIBUTION	€1,6 million
WEBSITE	http://www.soctesqa.eu/

PARTNERSHIP/CONSORTIUM LIST

DEUTSCHES ZENTRUM FUER LUFT – UND RAUMFAHRT EV, COMMISSARIAT À L'ÉNERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES, DANMARKS TEKNISKE UNIVERSITET, AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE, L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE, JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION, EIFER EUROPAISCHES INSTITUT FUR ENERGIEFORSCHUNG EDF-KIT EWIV

MAIN OBJECTIVES OF THE PROJECT

The main objective of the project is to develop uniform and industry-wide test programs for solid oxide cell (SOC)/stack assembly units. The project addresses three different operation modes, which are solid oxide fuel cell (SOFC), solid oxide electrolysis cell (SOEC) and combined SOFC/SOEC operations. Both stationary and mobile application areas will be covered. Moreover, advanced characterization techniques, as electrochemical impedance spectroscopy, are integrated in the test programs. The test modules are experimentally validated on 5-cell solid oxide short stacks.



PROGRESS/RESULTS TO-DATE

- Ten important test modules addressing function, performance, durability and degradation were developed.
- Four applications specific test programmes for SOFC, SOEC and combined SOFC/SOEC were developed.
- Test modules and programmes were validated and optimised among the partners in two testing campaigns.
- Results of the different test modules show a very high reproducibility and consistency between the different test laboratories.
- SOCTESQA has established a close interaction with the main standards developing organisations, e.g. ISO, IEC and CEN/CENELEC.

FUTURE STEPS

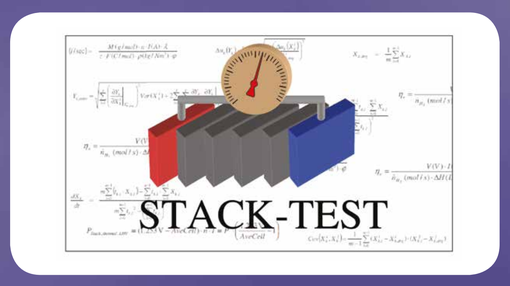
- Optimization of test modules by a second validation campaign.
- Testing of stacks for SOFC APU application and validation of corresponding test modules.
- Finalization of the optimized test modules by round robin testing campaign.
- Sensitivity analysis of the operating conditions on the results.
- Synchronisation/Implementation of the project outcome to standards development organizations and industrial advisory board (IAB) in the frame of a joint liaison project workshop.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- Proper definition and monitoring of all interfaces between short stack and test station are very important.
- The first results between the partners shows a high consistency.
- A high sensitivity of the stack behaviour towards operating temperatures and stability of the inlet process gases was found.
- Even little changes/differences of the operating conditions at the interfaces can strongly influence the stack results.
- These high sensitivity parameters have to be addressed in the test modules and programs.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAIP 2008-2013
Definition, development and experimental validation of testing procedures for SOFC/SOEC applications	Facilitating testing and certification procedures for fuel cell and hydrogen technologies	9 generic test modules and 4 application specific test programs have been developed and optimized	100 %	Only few documents exist, which address test procedures for SOFC or SOEC technology: "FCTESQA" project, IEC document (IEC 62282-7-2 TS Ed.1), "RELHY" project	Start up, j-V characteristics, Electrochemical impedance spectroscopy, Reactant gas composition and utilization, Temperature sensitivity, Operation under constant and varying current, Shut-down
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:					AIP 2013-1
Identification of the most relevant testing procedures and test protocols for Solid Oxide technology	Emphasis of cross-cutting issues: testing standards for SOFC and SOEC	All specifications, nomenclatures, test matrix and test modules and test programmes were defined	100 %	This project is setting the actual state-of the art	All corresponding Deliverables D2.1 (SOC Specifications), D2.2 (SOC Test Procedures), D3.1 (Test Matrix) and D3.2/ D3.3 (Test programs for validation) have been uploaded to FCH-JU portal
Establishment of methodologies for the uniform collection, analysis and presentation of test data	Emphasis of cross-cutting issues: testing standards for SOFC and SOEC	A general master document (TM00) was developed, which is dedicated to general testing guidelines	100 %	This project is setting the actual state-of the art	TM00 contains guidelines which describe methodologies, collection, formulary, analysis and presentation of test data
(c) Other project objectives					
The test procedures will be developed in close interaction with national and international standard development organizations (SDOs)	Not applicable	Establishment of close interaction with standards developing organisations	100 %	Not applicable	Liaison with the main bodies currently working on regulations for hydrogen and fuel cell technologies: – ISO Technical Committee 197 – IEC TC105 (Creation of a new working group WG13) – CEN/CENELEC



STACKTEST

Development of PEM fuel cell stack reference test procedures for industry

PANEL 6
Cross-cutting

ACRONYM	STACKTEST
CALL TOPIC	SP1-JTI-FCH.2011.5.4: Development of EU-wide uniform performance test schemes for PEM fuel cell stacks
START DATE	1/09/2012
END DATE	31/08/2015
PROJECT TOTAL COST	€5,6 million
FCH JU MAXIMUM CONTRIBUTION	€2,9 million
WEBSITE	http://stacktest.zsw-bw.de

PARTNERSHIP/CONSORTIUM LIST

ZENTRUM FUER SONNENENERGIE- UND WASSERSTOFF-FORSCHUNG, BADEN-WUERTEMBERG, COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ÉNERGIES ALTERNATIVES, DANMARKS TEKNISKE UNIVERSITET, DEUTSCHES ZENTRUM FUER LUFT – UND RAUMFAHRT EV, INSTYTUT CHEMII PRZEMYSLOWEJ IM. PROF. IGNACEGO MOSCICKIEGO, AALBORG UNIVERSITET, EWE-Forschungszentrum für Energietechnologie e. V., FUNDACION CIDETEC, FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V, JRC –JOINT RESEARCH CENTRE- EUROPEAN COMMISSION, SYMBIOFCELL SA

MAIN OBJECTIVES OF THE PROJECT

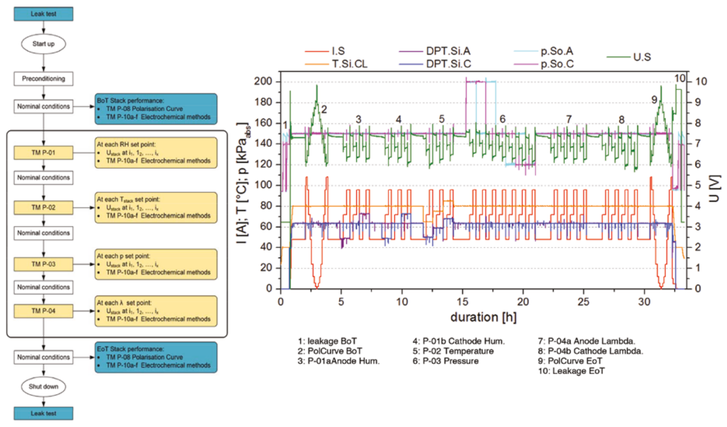
Propose and validate harmonized, and industrially relevant test procedures for PEM fuel cell stacks in form of generic test modules and application specific test programs.
Address functional / performance, endurance, and safety testing.
Interact with industry.

PROGRESS/RESULTS TO-DATE

- Generic test modules, and application specific test programs for performance, endurance and safety testing developed.
- Experimental validation completed.
- Four Stakeholder workshops held.
- Feedback from workshops and industrial advisory group included into the documents.
- Test modules and test programs in their final versions publicly available from the project web page.

FUTURE STEPS

- The project has ended in August 2015.
- A New Work Item Proposal on PEM-stack testing has been accepted in International Electrotechnical Commission Technical Committee-105.



CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- Based on results from previous projects, the methodology of PEM fuel cell stack testing has been reviewed and improved.
- Generic test modules and application oriented test programs have been defined and finally validated after two iterations.
- Two different sets of stack test samples were supplied to the participants for validation purpose.
- Consistent results in performance testing were achieved using static and dynamic load.
- Endurance testing experiments have been carried out, however, understanding of the test results needs to be refined.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:				MAIP 2008-2013
Provide a methodology for PEM-stack performance, endurance, and safety / environmental tests	Provide a coherent framework to monitor progress	Generic test modules and application oriented test programs were published via the web-page	100 %	
Provide annually updated review of RCS relevant for PEM fuel cell stack testing	Maintain, consolidate and disseminate results of RCS and PNR activities	Corresponding reports were delivered. New work Item proposal in IEC-TC-105 accepted.	100 %	
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:				AIP 2011
Provide experimentally validated test procedures for performance, endurance and safety testing.	Development of harmonised testing protocols for PEM stacks.	Project is completed, test modules and test programs are available.	100 %	

SUSANA

Support to safety analysis of hydrogen and fuel cell technologies

PANEL 6
Cross-cutting

ACRONYM	SUSANA
CALL TOPIC	SP1-JTI-FCH.2012.5.2: Computational Fluid Dynamics (CFD) model evaluation protocol for safety analysis of hydrogen and fuel cell technologies
START DATE	1/09/2013
END DATE	31/08/2016
PROJECT TOTAL COST	€2,1 million
FCH JU MAXIMUM CONTRIBUTION	€1,1 million
WEBSITE	http://www.support-cfd.eu

PARTNERSHIP/CONSORTIUM LIST

Karlsruher Institut fuer Technologie, UNIVERSITY OF ULSTER, NATIONAL CENTER FOR SCIENTIFIC RESEARCH "DEMOKRITOS", JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION, HEALTH AND SAFETY EXECUTIVE, ELEMENT ENERGY LIMITED, AREVA STOCKAGE D'ÉNERGIE SAS

MAIN OBJECTIVES OF THE PROJECT

The project is built on the complementarities of expertise of leading European experts in the field of computational fluid dynamic (CFD) use for provision of hydrogen safety to achieve the synergy and consolidate the CFD excellence in application to safety design of FCH systems and infrastructure.
The project aims to support all stakeholders using CFD for safety engineering design and assessment of FCH systems and infrastructure, especially those who have no specialised knowledge in associated CFD modelling/simulations practice, through the development of the CFD Model Evaluation Protocol and specific databases.

PROGRESS/RESULTS TO-DATE

- Completion of SUSANA database and data sets (verification and validation problems).
- Development of best practice guidelines resulting from benchmarking exercises and expert workshop.
- Completion of a model evaluation protocol (MEP).
- Finalising of documentation on project results and database for publishing.

FUTURE STEPS

- Final dissemination activities (publications on the final results and database in specific journals).
- Execution of two Webinars concerning the uses of SUSANA database and content.

- Restructuring of project website to provide datasets and public deliverables as open source for the future.
- Incorporation of SUSANA database in major research activities and platforms those like H_2FC and HySafe.

CONCLUSIONS, MAJOR FINDINGS AND PERSPECTIVES

- State of the art review on CFD protocols based on critical analysis and requirements to CFD models.
- Database based on multitude data sets on verification and validation problems, including reviewed publications and experimental data sets.
- Best practice guidelines resulting from benchmarking exercises.
- Model Evaluation Protocol.

CONTRIBUTION TO THE PROGRAMME OBJECTIVES

PROJECT OBJECTIVES / TARGETS	CORRESPONDING PROGRAMME OBJECTIVE / QUANTITATIVE TARGET (SPECIFY TARGET YEAR)	CURRENT PROJECT STATUS	PROBABILITY OF REACHING INITIAL TARGET	STATE OF THE ART 2016 – VALUE AND REFERENCE	COMMENTS ON PROJECT PROGRESS / STATUS
(a) Project objectives relevant to multi-annual objectives (from MAIP/MAWP) – indicate relevant multi-annual plan:					MAIP 2008-2013
Support to CFD applicable in FCH simulation	Database for CFD to support numerical simulation in FCH	Achieved	90 %		mainly achieved, data sets and/or reviewed publications for modelling and simulation regarding fuel cells generally not available
(b) Project objectives relevant to annual objectives (from AIP/AWP) if different than above – indicate relevant annual plan:					AIP 2013-2
Support to CFD model evaluation protocols for safety analysis of hydrogen and fuel cell technologies	Development of a CFD model evaluation protocol for safety analysis and fuel cells	Achieved	100 %	State of the art review on international level. Development of protocols for safety analysis. Database of the suitable experiments incorporated into database	Achieved
Protocol containing procedures, recommendations and criteria	Critical analysis and requirements to physical and mathematical models and modelling procedures	Achieved	100 %	Protocols containing procedures, recommendations and criteria. Validation and Verification procedure. Best practice procedure ready to be discussed with international experts.	Achieved
(c) Other project objectives					
Simulation benchmarking and best practice guidelines	Not applicable	Achieved	100 %		Achieved
Model evaluation protocol (MEP)	Not applicable	Achieved	100 %	Model evaluation protocol in one of the first protocol which exists on that status	Achieved