

Project ID:	671438
Call topic:	FCH-01.7-2014 - Large scale demonstration of refuelling infrastructure for road vehicles
Project total costs:	€ 62,305,033.3
FCH JU max. Contribution:	€ 32,000,000
Project start - end:	01/06/2015 - 31/05/2020
Coordinator:	ELEMENT ENERGY LIMITED, UK
Website:	www.h2me.eu



BENEFICIARIES: AGA AB, AIR LIQUIDE ADVANCED BUSINESS, AIR LIQUIDE ADVANCED TECHNOLOGIES SA, AREVA H2GEN, BAYERISCHE MOTOREN WERKE AKTIENGESELLSCHAFT, BOC LIMITED, CENEX - CENTRE OF EXCELLENCE FOR LOW CARBON AND FUEL CELL TECHNOLOGIES, COMMUNAUTE D'AGGLOMERATION SARREGUEMINES CONFLUENCES, DAIMLER AG, DANISH HYDROGEN FUEL AS, EIFER EUROPAISCHES INSTITUT FUR ENERGIEFORSCHUNG EDF KIT EWIV, FALKENBERG ENERGI AB, H2 MOBILITY DEUTSCHLAND GMBH & CO KG, HONDA R&D EUROPE (DEUTSCHLAND) GMBH, HYOP AS, HYUNDAI MOTOR EUROPE GMBH, ICELANDIC NEW ENERGY LTD, INTELLIGENT ENERGY LIMITED, ITM POWER (TRADING) LIMITED, LINDE AG, LINDE GAS GMBH, McPhy Energy SA, NEL HYDROGEN AS, Nissan Motor Manufacturing (UK) Limited, NUCELLSYS GMBH, OMV REFINING & MARKETING GMBH, RENAULT SAS, SYMBIOFCELL SA, TOYOTA MOTOR EUROPE, WaterstofNet vzw.

PROJECT AND OBJECTIVES

Hydrogen Mobility Europe (H2ME) brings together Europe's four most ambitious national initiatives on hydrogen mobility (in Germany, Scandinavia, France and the UK). The project will expand their developing networks of Hydrogen Refuelling Station (HRS) (29 new stations will be deployed) and the fleets of FCEVs operating on Europe's roads (325 vehicles) creating both a physical and a strategic link between these four regions and three 'observer countries' (Austria, Belgium and the Netherlands), who will use the learnings produced by this project to develop their own strategies.

NON QUANTITATIVE OBJECTIVES

- Minimum of 100 FCEVs and 23 HRS
- Further activities for deployment of HRS and FCEVs after project
- HRS to be accessible for private users and integrated in petrol courts
- Ensure cross-fertilization of knowledge acquired in the project

PROGRESS & MAIN ACHIEVEMENTS

- Successful start of the demonstration: 220 vehicles and 6 HRS deployed to date (325 FCEVs and 29 HRS are planned by the end of the project)
- Project's HRSs achieved and demonstrate good level of availability: 97.5% (based on six stations and 5 operators)
- Fruitful cross-fertilization of knowledge acquired inside and outside of the project - including via a 300 people event in Brussels

FUTURE STEPS & PLANS

- All 29 HRS planned for the project expected to have been commissioned and be in operation
- All 325 vehicles planned for the project expected to be deployed including the first next generation Daimler GLC F-CELL
- Solid and growing basis of operational data from vehicles and stations and further fact based analysis on vehicles and HRS performances
- Further exploitation of results

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

The development of a low cost FCEV will require many €100's millions of investment by OEMs, as well as some security of eventual sales volumes – an investment which is challenging when facing a) uncertainties about the customer response to the technology (many OEMs have been disappointed by the market response to battery vehicles), b) technological uncertainties about the eventual cost of the vehicles, and c) uncertainty that the HRS infrastructure will be in place. To overcome these problems, a series of national initiatives have been assembled to synchronise investments between OEM and HRS providers, pool risks and to attempt to cement a first mover advantage for early investors.

Increase the electrical efficiency and the durability of the different fuel cells

All stations will achieve a production-to-nozzle hydrogen production efficiency between 60% and 70% (depending on the method of production). Partners will aim for result in the upper-end of this range. All vehicles are designed to be operated for min. 6,000 h.

QUANTITATIVE TARGETS AND STATUS

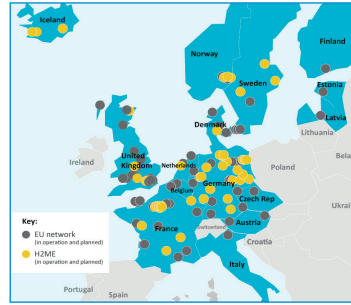
FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	DESCRIPTION
Fuel Cell Electric Vehicles					
TTW consumption NEDC (descriptive parameter)	%/100km	0.76	1.15	✓	Toyota Mirai in France and Germany
Availability	%	100	98	✓	Toyota Mirai in France and Germany
Hydrogen Refuelling Stations					
Availability	%	99.7	96	✓	HRS in Hovik (Norway)
Durability	years	5	5	✓	HRS in Hovik (Norway)
Lifetime	years	5	12	✗	HRS in Hovik (Norway)
Durability	years	10	5	✓	HRS in Sandviken (Sweden)
CAPEX	Thousand EUR/(kg/day)	15.56	4-2.1	✗	HRS in Hovik (Norway)
Lifetime	years	15	12	✓	HRS in Sandviken (Sweden)

* As identified in MAWP Addendum 2018-2020, Target year 2020



Project ID:	700350
Call topic:	FCH-03.1-2015 - Large scale demonstration of Hydrogen Refuelling Stations and FCEV road vehicles - including buses and on site electrolysis
Project total costs:	€ 104,112,613.33
FCH JU max. Contribution:	€ 34,999,548.5
Project start - end:	01/05/2016 - 30/06/2022
Coordinator:	ELEMENT ENERGY LIMITED, UK
Website:	www.h2me.eu



BENEFICIARIES: AGA AB, AIR LIQUIDE ADVANCED BUSINESS, AIR LIQUIDE ADVANCED TECHNOLOGIES SA, ALPHABET FUHRPARKMANAGEMENT GMBH, AREVA H2GEN, AUDI AKTIENGESELLSCHAFT, BAYERISCHE MOTOREN WERKE AKTIENGESELLSCHAFT, BRINTBRANCHEN, CENEX - CENTRE OF EXCELLENCE FOR LOW CARBON AND FUEL CELL TECHNOLOGIES, COMMUNAUTE URBAINE DU GRAND NANCY, COMPAGNIE NATIONALE DU RHONE SA, DAIMLER AG, EIFER EUROPAISCHES INSTITUT FUR ENERGIEFORSCHUNG EDF KIT EWIV, GNVRT SAS, H2 MOBILITY DEUTSCHLAND GMBH & CO KG, HONDA R&D EUROPE (DEUTSCHLAND) GMBH, HYDROGENE DE FRANCE, HYOP AS, hySOLUTIONS GmbH, ICELANDIC NEW ENERGY LTD, INTELLIGENT ENERGY LIMITED, ISLENSKA VETNISFELAGID EHF, ITM POWER (TRADING) LIMITED, KOBENHAVNS KOMMUNE, LINDE GAS GMBH, MANUFACTURE FRANCAISE DES PNEUMATIQUES MICHELIN, McPhy Energy SA, MINISTERIE VAN INFRASTRUCTUUR EN WATERSTAAT, NEL HYDROGEN AS, NEW NEL HYDROGEN AS, Nissan Motor Manufacturing (UK) Limited, NUCELSYS GMBH, OPEN ENERGI LIMITED, RENAULT SAS, RENAULT TRUCKS SAS, SOCIETE D'ECONOMIE MIXTE DES TRANSPORTS EN COMMUN DE L'AGGLOMERATION NANTAISE (SEMITAN), SOCIETE DU TAXI ELECTRIQUE PARISIEN, STEDIN DIENSTEN BV, SYMBIOFCELL SA, TECH TRANSPORTS COMPAGNIE, THE UNIVERSITY OF MANCHESTER

PROJECT AND OBJECTIVES

H2ME 2 brings together actions in 8 countries in a 6-year collaboration to deploy over 1,100 vehicles and 20 new HRS and builds on activities conducted as part of the H2ME project. The project will perform a large-scale market test of a large fleet of fuel cell electric vehicles operated in real-world customer applications across multiple European regions. In parallel, it will demonstrate that the hydrogen mobility sector can support the wider European energy system via electrolytic hydrogen production.

NON QUANTITATIVE OBJECTIVES

- Min of 200 fuel cell vehicles and 20 HRS
- Demonstration of electrolyser integrated HRS operating in grid balancing services
- Vehicles supplied from multiple OEMs, including cars and utility vehicles
- Ensure cross-fertilization of knowledge acquired in the project

PROGRESS & MAIN ACHIEVEMENTS

- Successful start of the demonstration: 113 vehicles and 3 HRS deployed to date (1100 FCEVs and 20 HRS are planned by the end of the project)
- Delivery of 50 FCEVs in Paris for taxi fleet operation leading to growing interest for this and other sites for similar and more ambitious deployment
- Fruitful cross-fertilization of knowledge acquired inside and outside of the project - including via a 300 pp event in Brussels

FUTURE STEPS & PLANS

- All 20 HRS planned for the project expected to have been commissioned and be in operation
- Most of the 1100 vehicles planned for the project expected to be deployed
- Solid and growing basis of operational data from vehicles and stations and further fact based analysis on vehicles and HRS performances
- Further exploitation of results with key event during the European week of Cities and regions in Brussels

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

The development of a low cost FCEV will require many €100's millions of investment by OEMs, as well as some security of eventual sales volumes – an investment which is challenging when facing a) uncertainties about the customer response to the technology (many OEMs have been disappointed by the market response to battery vehicles), b) technological uncertainties about the eventual cost of the vehicles, and c) uncertainty that the HRS infrastructure will be in place. To overcome these problems, the project is bringing together the key stakeholders in the H2 transport sector and is supporting these activities as well as allowing exchange of best practices between stakeholders and national initiatives.

Increase the electrical efficiency and the durability of the different fuel cells

The H2ME 2 project brings together the same alliance (now expanded to include the Netherlands), but with a focus beyond the deployment of stations alone, and instead working on three main pillars:

- Targeted interventions aimed at improving the performance of fuelling stations, through the deployment of new state of the art stations to support the roll-out plans in each market
- An increase in the scale of deployment of novel "second generation" FC vehicles across all initiatives
- Proving the value of electrolytic hydrogen production as a component of the overall European energy mix, particularly in facilitating the increased penetration of renewables.

All electrolysers will demonstrate an energy consumption lower than 60 kWh/kgH₂ from the project start. All vehicles are designed to be operated for min. 6,000 h.



QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	DESCRIPTION
TTW consumption NEDC (descriptive parameter)	kg/100 km	0.77	1.15	✓	Honda fleet (Denmark)
Yearly Maintenance Costs	EUR/km	0.037	0.03	✗ but 2017 SoA achieved	Honda fleet (Denmark)
FC Durability	Hours	5000	5000	✓	Symbio fleet (Germany)
TTW consumption NEDC (descriptive parameter)	kg/100 km	0.95	1.15	✓	Hyundai fleet (France)
Availability	%	100	98	✓	Hyundai fleet (France)

* As identified in MAWP Addendum 2018-2020, Target year 2020



HAWL

HYDROGEN & WAREHOUSE LOGISTICS

HAWL

LARGE SCALE DEMONSTRATION OF SUBSTITUTION OF BATTERY ELECTRIC FORKLIFTS BY HYDROGEN FUEL CELL FORKLIFTS IN LOGISTICS WAREHOUSES

Project ID:	325381
Call topic:	SP1-JTI-FCH.2012.4.1 - Demonstration of fuel cell powered material handling equipment vehicles including infrastructure
Project total costs:	€ 9,018,435
FCH JU max. Contribution:	€ 4,278,555
Project start - end:	01/09/2013 - 31/08/2017
Coordinator:	AIR LIQUIDE ADVANCED BUSINESS, FR
Website:	https://hawproject.eu/en

BENEFICIARIES: AIR LIQUIDE ADVANCED TECHNOLOGIES SA, BT PRODUCTS AB, CESAB CARRELLI ELEVATORI SPA, CROWN GABELSTAPLER GMBH & CO KG, DIAGMA, FM France SAS, FM LOGISTIC CORPORATE, FM POLSKA SP ZOO, HYPULSION SAS, Toyota Material Handling Europe AB



PROJECT AND OBJECTIVES

The project aims at accelerating market penetration of fuel cell technologies in warehouses in Europe. 8 different fuel cells were developed and certified for use in Europe. Following a successful trial, 46 forklifts are now running at FM warehouse in Neuville aux Bois (France). Productivity is confirmed for a specific application. H2 solution brings flexibility for the operations, reduces risk and is preferred by users of the previous battery solution. A French regulation for warehouse H2 operations was published: this will reduce time for future deployment of H2 forklifts.

PROGRESS & MAIN ACHIEVEMENTS

- Deployment of 50 forklifts: the HAWL deployment becomes one of the main Hydrogen warehouse in Europe
- Publication of a French regulation for warehouse H2 applications which reduces permitting time and brings confidence to the logistic industry.

FUTURE STEPS & PLANS

Project is finished

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

During the project, 8 types of forklifts were qualified for the European market. They can be used in any site in Europe



QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	DESCRIPTION
System Electrical efficiency, rated	%	45	50	✗	Including forklift vehicles: Crown ESR, ToyotaRRE, ToyotaLPE in Neuville
Vehicle lifetime	Hours	87,600	20,000	✓	

* As identified in MAWP Addendum 2018-2020, Target year 2020

Project ID:	621219
Call topic:	SP1-JTI-FCH.2013.1.1 - Large-scale demonstration of road vehicles and refuelling infrastructure VI
Project total costs:	€ 39,060,997.33
FCH JU max. Contribution:	€ 17,970,566
Project start - end:	01/04/2014 - 31/03/2018
Coordinator:	GREATER LONDON AUTHORITY,UK
Website:	http://www.hyfive.eu/

BENEFICIARIES: AIR PRODUCTS PLC, BAYERISCHE MOTOREN WERKE AKTIENGESELLSCHAFT, COPENHAGEN HYDROGEN NETWORK AS, DAIMLER AG, DANISH HYDROGEN FUEL AS, ELEMENT ENERGY LIMITED, Foreningen Hydrogen Link Danmark, HONDA R&D EUROPE (DEUTSCHLAND) GMBH, HYUNDAI MOTOR EUROPE GMBH, ISTITUTO PER INNOVAZIONI TECNOLOGICHE BOLZANO SCARL, ITM POWER (TRADING) LIMITED, LINDE AG, OMV REFINING & MARKETING GMBH, PARTNERSKAB FOR BRINT OG BRAENDSELS CELLER, THINKSTEP AG, TOYOTA MOTOR EUROPE.



PROJECT AND OBJECTIVES

HyFIVE is an ambitious flagship project that has committed four years to demonstrating the commercial viability of hydrogen vehicles and stations in Bolzano, Copenhagen, Innsbruck, London, Munich and Stuttgart. HyFIVE has seen the delivery of six new refuelling stations, integrating an existing nine, with an initial plan to deliver 110 vehicles – this was revised to 185 in 2016. 154 vehicles were subsequently delivered by BMW, Daimler, Honda, Hyundai and Toyota therefore meeting our original objectives.

PROGRESS & MAIN ACHIEVEMENTS

- Deployed and operated six new state of the art hydrogen refuelling stations (compatible with the SAE J2601 and ISO standard)
- 154 FCEVs delivered and manufacturers involved have developed momentum behind the full commercial introduction of FCEVs around 2020
- Policy changes across Europe to commercialise the sector and prepare the market for high volumes of hydrogen vehicles and interoperable stations.

FUTURE STEPS & PLANS

Project is finished

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

Through the project's aim to deploy more than 100 FCEVs, the project enhanced the technical readiness of FCEVs for genuine commercial deployment in Europe, costs to consumers would be considered.

Increase the electrical efficiency and the durability of the different fuel cells

Improvements in Honda's Clarity Fuel Cell system, for example, has achieved an increase in maximum motor output to 130 kW and a power density of the fuel cell stack increased by 60% to 3.1 kW/L. The Clarity Fuel Cell is equipped with a high-pressure tank (70 MPa), increasing the mass of hydrogen that can be stored and extending the range of the vehicle compared to its predecessor FCX Clarity. Coupled with the efficient powertrain and reduced

vehicle energy consumption, the Clarity Fuel Cell achieves a best in-class fuel cell vehicle range per full tank of over 700 km in the Japanese JC-08 cycle.

Increase the energy efficiency of production of hydrogen mainly from water electrolysis and renewable sources while reducing operating and capital costs

Around two thirds of the dispensed hydrogen were produced via electrolysis with electricity supplied by renewable energy, only 1 per cent was produced via electrolysis using electricity from fossil energy, and one third was produced from natural gas via steam reforming.



QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	DESCRIPTION
Fuel Cell Electric Vehicles					
TTW consumption NEDC (descriptive parameter)	kg/100 km	0.76-0.95	1.15	✓	Consumption range for Hyundai, Honda, Toyota in different countries
Hydrogen Refuelling Stations/Electrolyser					
Electrolyser Footprint	KW/m2	71.90	100	✓	London Teddington, Rainham and Cobham electrolyser
CAPEX for the HRS	Thousand EUR/(kg/day)	less than 1.7	4.-2.1	✓	Cobham HRS
Availability	%	up to ≈99	96	✓	Various HRS

* As identified in MAWP Addendum 2018-2020, Target year 2020

JIVE



ZERO EMISSION

JIVE JOINT INITIATIVE FOR HYDROGEN VEHICLES ACROSS EUROPE



Project ID:	735582
Call topic:	FCH-01-9-2016 - Large Scale Validation of fuel cell bus fleets
Project total costs:	€ 106,009,175.36
FCH JU max. Contribution:	€ 32,000,000
Project start - end:	01/01/2017 - 31/12/2022
Coordinator:	ELEMENT ENERGY LIMITED, UK
Website:	https://www.fuelcellbuses.eu/projects/jive

BENEFICIARIES: ABERDEEN CITY COUNCIL*, BIRMINGHAM CITY COUNCIL, DUNDEE CITY COUNCIL, EE ENERGY ENGINEERS GMBH, ESWE VERKEHRSGESELLSCHAFT MBH, EUE APS, FONDAZIONE BRUNO KESSLER, HERNING KOMMUNE, HyCologne - Wasserstoff Region Rheinland e.V., HYDROGEN EUROPE, hySOLUTIONS GmbH, IN-DER-CITY-BUS GMBH, LONDON BUS SERVICES LIMITED, MAINZER VERKEHRSGESELLSCHAFT MBH, PLANET PLANUNGSGRUPPE ENERGIE UND TECHNIK GBR, REBELGROUP ADVISORY BV, REGIONALVERKEHR KÖLN GMBH, RIGAS SATIKSME SIA, SASA SPA AG SOCIETA AUTOBUS SERVIZID'AREA SPA, SÜDTIROLER TRANSPORTSTRUKTUREN AG, THINKSTEP AG, TRENTO TRASPOTI SPA, UNION INTERNATIONALE DES TRANSPORTS PUBLICS, VERKEHRS-VERBUND MAINZ-WIESBADEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, WEST MIDLANDS TRAVEL LIMITED, WSW MOBIL GMBH

PROJECT AND OBJECTIVES

JIVE is an exciting project that promises to facilitate and expedite the full commercial viability of hydrogen fuel cell buses in Europe. Twenty-two project partners across seven member states are grouping together in three clusters to deploy 139 hydrogen fuel cell buses over six years in the largest project of its kind in Europe. Targets include the operation of 50% of the vehicles for at least 36 months of the project, HRS availability of near 100% and bus availability of 90%, with a requirement that buses cost no more than €650,000 each. The project is ongoing and experiencing delays.

NON QUANTITATIVE OBJECTIVES

- Lessons learnt from joint procurement
- Operators' guide to FCB deployment
- Lessons learnt in operator forum
- Collation of training materials
- Project and wider FCB dissemination and communication activities

PROGRESS & MAIN ACHIEVEMENTS

- The development of a procurement framework by Transport for London should make future FCB procurements an easier process, not just in the UK
- Transport providers have noticed that the demand

for FC buses stimulated by the project has already brought about capex price reductions in FC buses

FUTURE STEPS & PLANS

- Despite delays, we plan for most buses to be on the road by October 2020
- The Zero Emission Bus Conference will be held in Cologne in November 2018
- A number of project deliverables associated with reports of lessons learnt and guidance for future procurements to be submitted by October 2020

- TfL framework for bus procurement is expected to be utilised by JIVE, JIVE 2 and future projects to speed up the bus ordering process

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

Demand stimulation for fuel cell buses should help drive down the price of fuel cells for transport through economies of scale and other associated efficiency gains.



QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	SoA result achieved to date by other group/project (SoA year)
HRS Availability of station (after teething period of max. six)	%	HRSs not yet operational.	Target is 98% as a minimum with aspiration to achieve >99%	✘	85 (2012)
Speed of dispensing	kg/min	HRSs not yet operational.	Target is > 3kg/min	✘	N/A
Vehicle capex	EUR	So far all procurements have stuck to this requirement	625,000 (Project Target <650,000)	✔	850,000 (2014)

* As identified in MAWP Addendum 2018-2020, Target year 2020





HYLIFT-EUROPE

HYLIFT-EUROPE - LARGE SCALE DEMONSTRATION OF FUEL CELL POWERED MATERIAL HANDLING VEHICLES

Project ID:	303451
Call topic:	SP1-JTI-FCH.2011.4.1 - Demonstration of fuel cell-powered Material Handling vehicles including infrastructure
Project total costs:	€ 15,680,960.2
FCH JU max. Contribution:	€ 6,896,871
Project start - end:	01/01/2013 - 31/12/2018
Coordinator:	Ludwig-Boelkow-Systemtechnik GmbH, DE
Website:	http://www.hylift-europe.eu/

BENEFICIARIES: AIR LIQUIDE ADVANCED BUSINESS, AIR PRODUCTS GMBH, COPENHAGEN HYDROGEN NETWORK AS, DANThERM POWER A.S, ELEMENT ENERGY LIMITED, FAST - FEDERAZIONE DELLE ASSOCIAZIONI SCIENTIFICHE E TECNICHE, H2 Logic A/S, HEATHROW AIRPORT LIMITED, JRC - JOINT RESEARCH CENTRE- EUROPEAN COMMISSION, MULAG FAHRZEUGWERK HEINZ WÖSSNER GMBH U. CO. KG, PRELOCENTRE, STILL GMBH



PROJECT AND OBJECTIVES

The aim of HyLIFT-EUROPE is to demonstrate more than 200 fuel cell materials handling vehicles and associated refuelling infrastructure at ≥ 2 sites across Europe (the initial plan foresaw 5-20 sites), making it the largest European trial of hydrogen fuel cell materials handling vehicles so far. This continues efforts of the previous FCH JU supported HyLIFT-DEMO project. In the HyLIFT-EUROPE project the partners demonstrate fuel cell systems in materials handling vehicles from the partner STILL and from non-participating OEMs.

NON QUANTITATIVE OBJECTIVES

- Validation of Total Cost of Ownership & path towards commercial target
- Plan and ensure initiation of supported market deployment beyond 2018
- Best practice guide for hydrogen refuelling station installations
- European dissemination and supporting of the European industry

PROGRESS & MAIN ACHIEVEMENTS

- Demonstration of about 200 hydrogen powered fuel cell materials handling vehicles and the

corresponding hydrogen infrastructure at 2 sites

- Demonstration respectively real-world operation of indoor hydrogen refuelling stations including hydrogen supply at two European sites
- Development of a best practice guide for HRS installations and European dissemination and supporting of the European industry in this field.

FUTURE STEPS & PLANS

- Continuation of demo operations at both sites
- Improvement of vehicle performance
- Further increase of vehicle and HRS availability towards 100%
- Opening ceremony respectively dissemination activity in second half of 2018
- TCO and performance evaluation for both demonstration sites.

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

The deployment of ~200 fuel cell systems in materials handling vehicles constitutes the largest fleet of these vehicles in Europe and therefore contributes to economies of scale.



QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	SoA result achieved to date by other group/project (SoA year)	DESCRIPTION
Forklifts in Prelocentre-System Electrical efficiency, rated	%	45	50	✘	53 (2015)	HYLIFT-EUROPE - Class I forklifts in Prelocentre
Forklifts in Prelocentre-Vehicle lifetime	Hours	87,600	20,000	✔	N/A	

* As identified in MAWP Addendum 2018-2020, Target year 2020



Project ID:	303467
Call topic:	SP1-JTI-FCH.2011.1.1 - Large-scale demonstration of road vehicles and refuelling infrastructure IV
Project total costs:	€ 17,769,854.34
FCH JU max. Contribution:	€ 6,999,999
Project start - end:	01/01/2013 - 31/12/2018
Coordinator:	BOC LIMITED, UK
Website:	http://aberdeeninvestlivevisit.co.uk/Invest/Aberdeens-Economy/City-Projects/H2-Aberdeen/Hydrogen-Bus/Hydrogen-Bus-Project.aspx



BENEFICIARIES: ABERDEEN CITY COUNCIL*, DANTHERM POWER A.S, ELEMENT ENERGY LIMITED, HYDROGEN, FUEL CELLS AND ELECTRO-MOBILITY IN EUROPEAN REGIONS, PLANET PLANUNGSGRUPPE ENERGIE UND TECHNIK GBR, STAGECOACH BUS HOLDINGS LIMITED, VAN HOOL N.V.

PROJECT AND OBJECTIVES

The HyTransit project started in 2013 and will run through to the end of 2018. The project aims to contribute to the commercialization of hydrogen buses in Europe through the introduction of a fleet of six hybrid fuel cell buses and a hydrogen production and refuelling station in Aberdeen (Scotland). The main project objective is to demonstrate that a fuel cell bus is capable of meeting the everyday operational performance of an equivalent diesel bus on demanding inter-city routes in the UK.

NON QUANTITATIVE OBJECTIVES

- Safety issues report
- Project and wider FCB dissemination and communication activities
- Scottish hydrogen bus fleet case study
- Outreach to other European bus projects
- Strategy for continuing bus operation and HRS

PROGRESS & MAIN ACHIEVEMENTS

- 99.4% availability of the Kittybrewster HRS since the beginning of operation

- Nearly 1 million kilometres driven by the hybrid fuel cell buses
- 100 tons of CO2 saved in comparison to Euro VI buses

FUTURE STEPS & PLANS

- Consortium meeting to discuss the key lessons learnt from the project
- Complete, and finalize, the outstanding deliverables for the project in preparation for the project end in December 2018
- Finalize a strategy for the post-project operation of the buses and the HRS

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

HyTransit forms the backbone of the Aberdeen Hydrogen Bus Project, which together with four buses from the High V.LO-City project led to the deployment of Europe's largest fleet of hydrogen buses to date (JIVE and JIVE 2 projects).

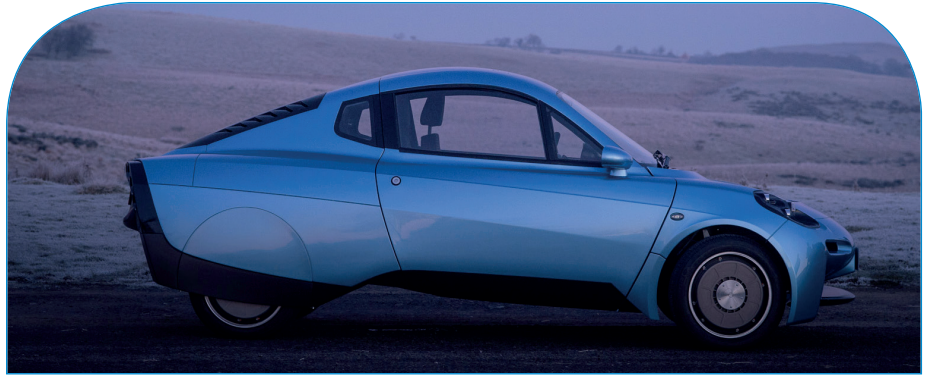


QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	SoA result achieved to date by other group/project (SoA year)	DESCRIPTION
Fuel Cell Buses						
Availability of bus	%	77	95	✗	69 (2012)	Buses in Aberdeen
TTW consumption SORT 1	kg/100 km	9.62	8	✗	9 (2010)	
TTW consumption SORT 2	kg/100 km	9.07	8	✗	9 (2010)	
Hydrogen Refuelling Station						
Fuel cell system durability	Hours	12,000	20,000	✗	N/A	HRS in Aberdeen
Availability, in period 2017	%	98.6	96	✓	95 (2015)	

* As identified in MAWP Addendum 2018-2020, Target year 2020



Project ID:	303485
Call topic:	SP1-JTI-FCH.2011.1.1 - Large-scale demonstration of road vehicles and refuelling infrastructure IV
Project total costs:	€ 15,294,319.66
FCH JU max. Contribution:	€ 6,712,985.6
Project start - end:	01/10/2012 - 31/10/2018
Coordinator:	ELEMENT ENERGY LIMITED, UK
Website:	http://www.swarm-project.eu/

BENEFICIARIES: AIR LIQUIDE ADVANCED TECHNOLOGIES SA, BIRMINGHAM CITY COUNCIL, COVENTRY UNIVERSITY ENTERPRISES LIMITED, DEUTSCHES FORSCHUNGSZENTRUM FUER KUNSTLICHE INTELLIGENZ GMBH, EWE-Forschungszentrum für Energietechnologie e. V., GESPA GMBH, H2O E-MOBILE GMBH, JADE HOCHSCHULE WILHELMSHAVEN/OLDENBURG/ELSLETH, PLANET PLANUNGSGRUPPE ENERGIE UND TECHNIK GBR, RIVERSIMPLE ENGINEERING LIMITED, RIVERSIMPLE LLP, RIVERSIMPLE MOVEMENT LIMITED, SERVICE PUBLIC DE WALLONIE, THE UNIVERSITY OF BIRMINGHAM, TUV SUD AG, TUV SUD PRODUCT SERVICE GMBH, UNIVERSITAET BREMEN, UNIVERSITE DE LIEGE, UNIVERSITE LIBRE DE BRUXELLES

PROJECT AND OBJECTIVES

This project will establish a demonstration fleet of small passenger vehicles that builds on and expands existing hydrogen refuelling infrastructure. Three European regions will be participating in this effort: the UK (the Midlands and Wales), Belgium (the Brussels area and Wallonia), and North Rhine Westphalia Germany (Cologne/Weser Ems). Each of these regions will deploy a new hydrogen refuelling site to close the gaps in a continuous 'hydrogen highways' that leads from Scotland via the Midlands to London, connecting to Brussels and on to Cologne and Hamburg/Scandinavia/Berlin.

NON QUANTITATIVE OBJECTIVES

- Low cost small vehicles – the vehicles produced in this project will all have low volume production costs
- New regional hydrogen fuelling networks
- Strong representation of European SME's and European research institutions
- Demonstrate a complementary approach to hydrogen vehicle drive trains

PROGRESS & MAIN ACHIEVEMENTS

- Development and operation for five Microcab Hydrogen Electric Vehicles (H2EVs) since 2015 alongside H2 refuelling in Coventry and Birmingham (UK)
- Preparation for trial of 20 cars and associated HRS in Abergavenny (UK) completed by Riversimple
- Air Liquide HRS in Brussels and Frechen (DE) built and respectively in operation since mid-2016 and mid-2018
- Development

FUTURE STEPS & PLANS

- Delivery of 3 next gen H2EVs and 3 Left Hand Drive vehicles by Microcab
- Trial fully started in Abergavenny with 20 vehicles and associated refuelling station
- 2 prototypes Elano e-mobiles developed by Jade University
- All activities completed by October 2018

RELEVANCE TO FCH JU OVERARCHING OBJECTIVES

Reduce the production cost of fuel cell systems to be used in transport applications

- Delivery and operation of a critical mass of passenger and delivery vehicles and infrastructure,
- Extensive performance monitoring via GMS/GPS protocols
- Development of commercialization and market entry strategies
- Enlargement and extension of existing hydrogen infrastructure by interlinking the (new) project sites with existing sites and projects in order to establish a chain of hydrogen refuelling stations from Scotland to North Scandinavia, and South & East Germany via London and Brussels
- Intensive liaison and interaction with existing demonstration projects,
- Hydrogen delivery at 10€/kg
- Implementation of cost reduction strategies for the second phase equipment,
- Low cost vehicles and standardized refuelling equipment for achievement of stringent cost reduction targets

QUANTITATIVE TARGETS AND STATUS

FCH JU Programme Targets*

PARAMETER	UNIT	RESULT ACHIEVED TO DATE	TARGET	TARGET ACHIEVED?	DESCRIPTION
CAPEX for the HRS	Thousand EUR/(kg/day)	16.5	4-2.1	✗	Coventry HRS
Availability, in period 2017	%	97	96	✓	
Mean time between failures (MTBF)	days	5.16	2	✓	
Lifetime	years	10	12	✗	Birmingham HRS
Durability	years	5	5	✓	
Availability, in period	%	100	96	✓	
Availability, since start	%	70	96	✓	

* As identified in MAWP Addendum 2018-2020, Target year 2020