

BIG HIT

BUILDING INNOVATIVE GREEN HYDROGEN SYSTEMS IN AN ISOLATED TERRITORY: A PILOT FOR EUROPE



Project ID	700092
PRD 2022 Panel	6 – H2 valleys
Call topic	FCH-03.2-2015: Hydrogen territories
Project total costs	EUR 7 748 848
Clean H ₂ max. contribution	EUR 5 000 000
Project period	1/5/2016 – 30/4/2022
Coordinator	Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón, Spain
Beneficiaries	Calvera Maquinaria e Instalaciones SL, Scottish Hydrogen And Fuel Cell Association Ltd, Shapinsay Development Trust, Community Energy Scotland Limited, Ministry For Transport, Infrastructure and Capital Projects, Orkney Islands Council, Giacomini SpA, Symbio, ITM Power (Trading) Limited, The European Marine Energy Centre Limited, Danmarks Tekniske Universitet

<http://www.bighit.eu/>

PROJECT AND OBJECTIVES

The BIG HIT project is a major first step towards creating a genuine hydrogen territory in the Orkney Islands. Orkney has over 50 MW of installed wind, wave and tidal capacity, generating over 46 GWh of renewable power per year, and it has been a net exporter of electricity since 2013. Hydrogen is proposed as a solution to minimise the curtailment problems in Orkney caused by the weak connection with the UK mainland. The hydrogen produced is used in thermal, power (cogeneration) and transport applications locally.

NON-QUANTITATIVE OBJECTIVES

- BIG HIT aimed to perform a life cycle assessment study; this is now complete. The first report has been submitted, and the final report will be produced at the end of the project, including operational data.
- The project aimed to perform a business model study for integrated energy systems based on hydrogen technologies across the islands. The first report has been submitted; the final report will be produced at the end of the project, including operational data.
- It aimed to perform a social life cycle assessment. The first report has been submitted; the final report will be produced at the end of the project, including operational data.
- The project aimed to set up the Hydrogen Territories Platform; this platform has been launched. Four webinars have been conducted to date.

The platform will be used in the HEAVENN and Green Hysland projects.

- BIG HIT aimed to perform a first analysis of lessons learnt in the project about the connection of electrolyzers in power grids with high penetration of renewable energy sources (optimal model), marinisation of electrolyzers, etc.

PROGRESS AND MAIN ACHIEVEMENTS

- The main project equipment has been built: 5 H₂ trailers (250 kg of H₂ storage), a H₂ catalytic boiler (30 kW), a 1 MW electrolyser, 5 H₂ fuel cell vans and a 75 kW fuel cell (cogeneration).
- The project developed the logistics of moving hydrogen through an archipelago (a multi-element gas container moving H₂ between the islands by ferry, logistics optimisation).
- BIG HIT developed the Hydrogen Territories Platform.

FUTURE STEPS AND PLANS

- The project will finish in 2022, and a final project event will be hosted in Orkney by June 2022.
- BIG HIT will perform an impact analysis. Final reports on the environmental and social impact and the business model analysis will be published and made available to the public.
- The main project results, conclusions and lessons learnt will be presented at the final project event.

QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
MAWP Addendum (2018–2020)	Demonstration of a hydrogen catalytic boiler (thermostatic application)				
	Power	kW	40	30	
	Availability of fuel cell light-duty vehicles (including cars) – fuel cell vans in BIG HIT				
	Availability	%	98	98	✓
	Hydrogen-refuelling stations' durability				
	Time	years	10	Fourth year of operation	

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GREEN HYSLAND

DEPLOYMENT OF A H₂ ECOSYSTEM ON THE ISLAND OF MALLORCA



Project ID	101007201
PRD 2022 Panel	6 – H2 valleys
Call topic	FCH-03-2-2020: Decarbonising islands using renewable energies and hydrogen – H2 islands
Project total costs	EUR 20 453 569.28
Clean H ₂ max. contribution	EUR 9 999 999.50
Project period	1/1/2021 – 31/12/2025
Coordinator	Enagás SA, Spain
Beneficiaries	Redexis Gas Servicios SL, Hycologne GmbH, Ajuntament de Lloseta, Asociación Ibérica de Gasnatural y Renovable para la Movilidad, Asociación Chilena de Hidrógeno, Instituto Balear De La Energía, Gemeente Ameland, Enecy BV, HyEnergy TransStore BV, Stichting New Energy Coalition, Redexis Gas SA, Energy Co-operatives Ireland Limited, Calvera Maquinaria e Instalaciones SL, Asociación Española del Hidrógeno, Autoridad Portuaria de Baleares, Consultoria Técnica Naval Valenciana SL, Diktyo Aeiforikon Nison Toy Aigaiousae, Empresa Municipal de Transportes Urbans de Palma de Mallorca SA (EMT Palma), Centro Nacional De Experimentación de Tecnologías de Hidrógeno y Pilas de Combustible Consorcio, Baleària Eurolíneas Marítimas SA, Acciona Generación Renovable SA., Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón, Fédération européenne des agences et des régions pour l'énergie et l'environnement, European Marine Energy Centre Limited, Agência Regional da Energia e Ambiente da Região Autónoma da Madeira, Universidad de La Laguna, Universitat de les Illes Balears, National University of Ireland Galway, Commissariat à l'énergie atomique et aux énergies alternatives

<https://greenhysland.eu/>

PROJECT AND OBJECTIVES

Green Hysland is developing all the infrastructure the island of Mallorca (Spain) needs to produce and consume at least 330 t of green hydrogen from newly built photovoltaic plants per year. Green hydrogen will have multiple applications on the island: a fuel supply for a fleet of fuel cell buses and other vehicles, generation of heat and power for commercial and public buildings, a new hydrogen-refuelling station and injection into the island's gas pipeline network. The project includes the development of a roadmap to 2050 in Mallorca and replication activities on seven other islands.

NON-QUANTITATIVE OBJECTIVES

Green Hysland aims to develop public awareness and create a base for skills development. The project has been presented at almost 60 events. 5 workshops have been conducted and 11 activities have been organised jointly with other EU projects.

PROGRESS AND MAIN ACHIEVEMENTS

- Green Hysland has delivered and installed a 2.5 MW electrolyser.

- The project awarded the tender for the EMT Palma H₂ buses.
- The project completed the conceptual design of the 6 project sites.

FUTURE STEPS AND PLANS

- The H₂ plant will go into operation. The electrolyser was delivered in December 2021 and the plant is expected to be operational from summer 2022.
- The tender for H₂ buses was launched in December 2021 and was awarded in March 2022. They are expected to be delivered in the first quarter of 2022.
- During 2022, tenders are expected to be launched for the purchase of the fuel cells for the Puerto Deportivo Naviera Balear, Lloseta and hotel sites in Palma, and for a fleet of 10 vehicles (rental cars and vans). The project is working on defining the technical and administrative specifications of the tender documents.
- The sites are expected to receive the equipment in June 2023. At least 2 years of operation of the complete ecosystem is expected within the project period.

QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Achieved to date by the project	Target achieved?
Project's own objective	Electrolyser	MW	7.5	2.5	

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HEAVENN

HYDROGEN ENERGY APPLICATIONS FOR VALLEY ENVIRONMENTS IN NORTHERN NETHERLANDS

New
Energy
Co



HEAVENN

Project ID	875090
PRD 2022 Panel	6 – H2 valleys
Call topic	FCH-03-1-2019: H2 valley
Project total costs	EUR 96 191 883.93
Clean H ₂ max. contribution	EUR 20 000 000
Project period	1/1/2020 – 31/12/2025
Coordinator	Stichting New Energy Coalition, the Netherlands
Beneficiaries	Shell Nederland Verkoopmaatschappij BV, TotalEnergies Marketing Nederland NV, TotalEnergies Gas Mobility BV, Gemeente Hoogeveen, Hydrogen Ireland Natural Resources Association Company LBG, Nederlandse Particuliere Rijnvaart-Centrale Coöperatie UA, UVO Vervoer BV, Lenten Scheepvaart BV, Bytesnet Groningen BV, EWE Gasspeicher GmbH, Energy BV, Green Planet Real Estate BV, Emmtec Services BV, Gemeente Emmen, HyEnergy TransStore BV, H2Tec BV, Gemeente Groningen, Groningen Seaports NV, Engie Energie Nederland NV, Energie Beheer Nederland BV, HyEnergy Consultancy Limited, European Research Institute for Gas and Energy Innovation, PitPoint.Crew BV, PitPoint. Pro BV, Qbuzz BV, Nederlandse Aardolie Maatschappij BV, PitPoint.CNG BV, Cemtec Fonden, Gemeenschappelijke Regeling Samenwerkingsverband Noord-Nederland, Logan Energy Limited, Hincio SA, Stichting Energy Valley, Nobian Industrial Chemicals BV, Fundación para el Desarrollo de las Nuevas Tecnologías del Hidrógeno en Aragón, NV Nederlandse Gasunie, European Marine Energy Centre Limited, Rijksuniversiteit Groningen

<http://www.heavenn.org/>

PROJECT AND OBJECTIVES

HEAVENN is a large-scale demonstration project bringing together core elements – production, distribution, storage and local end use of H₂ – into a fully integrated and functioning hydrogen valley that can serve as a blueprint for replication across Europe and beyond. The main goal is to make use of green H₂ across the entire value chain, while developing replicable business models for wide-scale commercial deployment of H₂ across the entire regional energy system.

NON-QUANTITATIVE OBJECTIVES

- HEAVENN aims to achieve regulations, codes and standards certification. All relevant green H₂ value chains will be tested against the CertifHy protocol.
- Safety issues will be covered by permitting procedures.

PROGRESS AND MAIN ACHIEVEMENTS

- The H₂ salt barge's design and build contract was signed. The long-term contract for deployment of a H₂-powered vessel for internal transport of salt on the Delfzijl–Rotterdam route was finalised. The design of the ship and configuration of the H₂-electric propulsion were initiated, including a fluid dynamics calculation to determine the required installed capacity and hull shape.

- Gasunie successfully conducted the first static tests and demonstrated that H₂ can be safely stored in salt caverns. The connections specification study was completed, covering various options. This study considered different market situations/developments and the scalability of the design, resulting in a plot plan and capacity-range definition. The designs and site layout plans of subsequent H₂ caverns are in progress.
- The detailed design and site layout plan of and permit application for the Emmen hydrogen-refuelling station were completed. The launching customer has been secured. Commissioning is planned for June 2022.

FUTURE STEPS AND PLANS

- The critical assessment of deliverables is planned. Since the grant agreement, a number of changes have occurred. The tasks and deliverables will be critically reassessed and updated if necessary.
- Securing co-funding is a prerequisite for the project to succeed. Talks with governments about State aid will continue, aiming to speed up the process and secure all co-funding in 2022.
- Much effort will be put into connecting the various hydrogen valley projects, sharing experiences and lessons learnt, creating synergies and thus strengthening each other.

QUANTITATIVE TARGETS AND STATUS

Target source	Parameter	Unit	Target	Target achieved?	SoA result achieved to date (by others)	Year of SoA target
MAWP 2014–2020	Fuel cell and hydrogen passenger cars					
	FC system cost	€/kWh	60		100	2019
	H ₂ production (electrolysis) – PEM					
	Energy commission consumption	kWh/kg	50		55	2020
	Storage, distribution and H ₂ supply					
	Large storage system cost	€/kg	0.8		N/A	–

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