BIG HIT: Building Innovative Green Hydrogen systems in an Isolated Territory: a pilot for Europe

WP6 Dissemination & Exploitation Activities

Deliverable 6.7 – First Workshop Event in Scotland

Kirkwall, 15th May 2018

GRANT AGREEMENT 700092

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Draft Rev 1	29th August 2018	Nigel Holmes
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1 EXECUTIVE SUMMARY

The Orkney Islands of Scotland were selected by FCH2JU for the BIG HIT development of a new European-wide hydrogen project, called BIG HIT (Building Innovative Green Hydrogen systems in an Isolated Territory: a pilot for Europe). BIG HIT is a five-year project, involving 12 participants based across six EU countries, and started in May 2016. BIG HIT is creating a replicable hydrogen territory in the archipelago of Orkney (Scotland) by implementing a fully integrated model of hydrogen production, storage, transportation and utilisation for heat, power and mobility. BIG HIT will absorb curtailed energy from two wind turbines and tidal turbines on the islands of Eday and Shapinsay, and use 1.5MW of PEM electrolysis to produce 50 tonnes per year of 'green hydrogen'.

The key elements of the BIG HIT project and links with the Surf 'n' Turf project are shown in Figure 1 below. This schematic representation of BIG HIT has been used extensively in the communications and dissemination activities, as it help to present the complete 'Hydrogen Valley' approach being deployed by BIG HIT in the Orkney Islands:

Figure 1. Schematic of BIT HIT project in the Orkney Islands

This graphic has been very effective for presentations and wider communications

The formal opening of the BIG HIT project facilities in the Orkney Islands was successfully carried out on the 15th May 2018, at a whole day event attended by 98 delegates, including industry and government. Senior representatives included the Fuel Cell and Hydrogen Joint Undertaking, the Scottish Government, and the Government of Aragon.

This report provides an update on these Dissemination and Exploitation activities for BIG HIT Work Package 6.

The BIG HIT project in the Orkney Islands has achieved wide recognition, both nationally and throughout Europe, and has been recently quoted by Brendan Devlin of the European Commission as part of a 'global exemplar' clean energy island initiative.

2 LAUNCH WORKSHOP OBJECTIVES

BIG HIT is the one of the most ambitious demonstrations of the hydrogen economy concept, and 3 of the 8 strategic objectives are clearly linked to WP6 dissemination activities:

- Objective 2: Develop expandable solutions that can be replicated elsewhere, thus ultimately initiating a wider market for hydrogen and fuel cell technologies.
- Objective 6: Facilitate the planned roll out of hydrogen technologies through dissemination activities to engage with the local population, raise awareness of FCH technologies, with partner experts answering questions in open session.
- Objective 7: Act as a leading by example demonstration of a hydrogen territory for other remote locations, through the participation of Malta as the follower territory, and the development of effective business models.

The BIG HIT launch workshop supported Objectives 6 and 7, through a range of dissemination activities carried out to demonstrate the facilities and communicate the benefits of the BIG HIT hydrogen economy concept.

BIG HIT is not as a stand-alone demonstration project, but an opportunity to catalyse activities in other isolated territories where the types of solutions developed can be replicated. The BIG HIT dissemination activities undertaken and planned reflect this approach.

3 DESCRIPTION OF LAUNCH WORKSHOP

The launch event and workshop activities took place in Kirkwall (see Figure 1), and the BIG HIT press release for 15th May is included as Appendix 1. The main programme of activities included:

11:30 – 12:30	Kirkwall Harbour Demonstration & Photos
12:30 – 13:30	Lunch & Networking at the Pickaquoy Centre
13:30 – 15:00	Plenary launch
15:15 – 16:00	Networking
16:00 – 17:00	Visit to Hatston Hydrogen Refuelling Station

A key part of the event was the opportunity for encouraging networking and exchange of ideas between the 98 delegates throughout the day. This is reflected in the schedule for the day, which also included an evening informal dinner event in Kirkwall for all delegates.

3.1 Kirkwall Harbour Trailer Demonstration and FC-CHP Visit

On Tuesday 15th May the BIG HIT Grand Launch event took place in Kirkwall, and this included morning and afternoon visits. During the morning of 15th May there was a visit to Kirkwall harbour to see one of the hydrogen tube trailers loading and unloading from the Shapinsay ferry, as well as opportunity to visit the 75kW fuel cell CHP on the dockside, which provides power to ships berthed in the harbour (cold ironing).

Figure 2. BIG HIT trailer demonstration at Kirkwall harbour, morning of 15th May 2018

This morning visit was very well attended by about 70 of the launch event delegates, and allowed delegates to visit the FC-CHP facility and ask questions about the installation and operation.

Tuesday 15th May – Grand Launch, Kirkwall

Harbour Demonstration and Networking Lunch at Pickaquoy Centre.

11:00	Kirkwall Harbour. Photo-opportunity at Shapinsay slip and visit to see the Harbour Hydrogen Fuel Cell
11:40 & 12:00	J&V Coach to move delegates to Pickaquoy Centre, two trips
12:20	Pickaquoy Centre Lunch & Networking

3.2 Afternoon Workshop Plenary Presentations

The afternoon workshop and plenary presentations took place at the Pickaquoy Centre in Kirkwall. This was a high profile event to celebrate the official opening of the BIG HIT project as it moved into the operational phase.

Figure 3 (above left). Bart Biebuyck, Executive Director of the FCH-JU, speaking in the BIG HIT plenary session at the Pickaquoy Centre in Kirkwall, 15th May 2018.

Figure 4 (above right). Fernando Palacin, Director of the Aragon Hydrogen Foundation, at the BIG HIT plenary session at the Pickaquoy Centre in Kirkwall, 15th May 2018.

Agenda: BIG HIT Plenary Session

Welcome by James Stockan, Leader of Orkney Islands Council

Keynote: Stuart McKay, the Scottish Government.

Bart Biebuyck, Executive Director, Fuel Cell & Hydrogen Joint Undertaking

Dr Fernando Palacín, Managing Director, Aragon Hydrogen Foundation

Alan Hobbett, Chairman of Community Energy Scotland

Neil Kermode, Managing Director, the European Marine Energy Centre

Prof Roger Putnam CBE, Chairman of ITM Power

Closing Comments. James Stockan, Leader of Orkney Islands Council

The speakers during the plenary session highlighted the important links between partner regions, and the opportunities for hydrogen and fuel cells to maximise the benefits of local renewables, add value and economic impact, and deliver the energy transition to low carbon systems.

3.3 BIG HIT Hydrogen Refuelling Station Visit

After the plenary launch presentations were completed there was the opportunity for all delegates to visit the recently commissioned Hatston Hydrogen Refuelling Station in Kirkwall, where the fleet of five FC Kangoos are refuelled.

Figure 13. Catherine McDougall explaining the key features of the ITM Power Hydrogen Refuelling Station located at Hatston in Kirkwall.

Figure 14. Afternoon launch visit on 15th May to the Hatston Hydrogen Refuelling Station in Kirkwall.

4 CONCLUSIONS

BIG HIT is one of the most ambitious demonstrations of the 'Hydrogen Valley' concept to date and entered the operational phase with the launch workshop event held on 15th May 2018.

Effective use has been made of communication channels, including industry market announcements, press releases, social media, and radio. The activities have engaged with industry and policy stakeholders, as well as the communities in the Orkney Islands and more widely.

Participants in the launch workshop included partners from the BIG HIT follower territoty of Malta. All of the BIG HIT project members worked very closely together on the communication and dissemination activities, and significant use has been made of the links with the 'Surf 'n' Turf' project on Eday through partners OIC, ITM Power, CES, and EMEC. This has helped to provide clear and consistent messages about the use of hydrogen to overcome local grid constraints and deliver local benefits to the communities in the Orkney Islands.

The practical demonstrations at the harbour and the hydrogen refuelling station as part of the dissemination of BIG HIT has helped reinforce the practical nature of BIG HIT and the ability to develop local hydrogen economies in isolated territories. This event helped to further raise the awareness and profile of BIG HIT, both within the sector and more widely, and will play a key part in identifying further replication opportunities.

5 APPENDICES

APPENDIX 1. Launch Workshop Delegates for 15th May 2018

A total of 98 delegates registered for the BIG HIT launch workshop activities in Kirkwall on 15th May 2018:

Delegate Name	Organisation
Ian Johnstone	Aquatera
Jesús Sánchez Farraces	Aragon Government
Fernando Palacín	Aragon Hydrogen Foundation
Jesús Simón	Aragon Hydrogen Foundation
Enrique Troncoso	Aragon Hydrogen Foundation
Ben Todd	Arcola Energy
Stephen Tindall	Arcola Energy
Bryan Rendall	BJRE Ltd
James Anderson	Caledonian Marine Assets Ltd
Andy Crossan	Caledonian Marine Assets Ltd
Rafael Calvera	Calvera
Ricardo Calvera	Calvera
Fabrizio Nardini	Commune Spilamberto
Ailsa Skuodas	Community Energy Scotland
Mark Hull	Community Energy Scotland
Ian Garman	Community Energy Scotland
Peter Long	Community Energy Scotland
Guangling Zhao	Danish Technical University
Jan Falconer	Dumfries & Galloway Council
Jesús Manuel Gil Jiménez.	Enagás
Roddy Scott	Energy Skills Partnership
Katharina Bouchaar	ESC Sustainability
Neil Kermode	European Marine Energy Centre
Jon Clipsham	European Marine Energy Centre
Erica Mathers	European Marine Energy Centre
Matthew Finn	European Marine Energy Centre
Elaine Buck	European Marine Energy Centre
James Ferguson	European Marine Energy Centre
Steven Pyke	European Marine Energy Centre
John Skuse	European Marine Energy Centre
Chris Dunn	Ferguson Marine
Bart Biebuyck	Fuel Cell & Hydrogen Joint Undertaking
Samuele Molina	Giacomini
Simon Williams	Gillespie MacAndrew
Maurizio Schembri	Government of Malta
Joseph Scicluna	Government of Malta
Elaine Hanton	Highlands & Islands Enterprise

Graeme Harrison	Highlands & Islands Enterprise
Iain Ashman	Iain Ashman Graphics
Richy Ainsworth	ICIT, Heriot-Watt University
Amy Houston	ICIT, Heriot-Watt University
Giulio Raimondi	InnoInd
Roger Putnam	ITM Power
Kris Hyde	ITM Power
Catherine McDougall	ITM Power
Madadh Maclaine	ITM Power
Colin Keldie	K4Graphics & Photography
Bill Ireland	Logan Energy
Trond Strømgren	Maritim Forening Sogn og Fjordane
Patrick Cnubben	North Netherlands New Energy Coalition
Michael Foubister	Northwards
John Flett Brown	Orkney Iinternational Science Festival
James Stockan	Orkney Islands Council
Adele Lidderdale	Orkney Islands Council
Sweyn Johnston	Orkney Islands Council
Shona Croy	Orkney Islands Council
Karen McKnight	Orkney Islands Council
Luke Fraser	Orkney Islands Council
David Hartley	Orkney Islands Council
Stuart Allison	Orkney Islands Council
Eibhlin Lee	Orkney Islands Council
Brian Archibald	Orkney Islands Council
Gavin Barr	Orkney Islands Council
Alistair Buchan	Orkney Islands Council
Emma Clements	Orkney Islands Council
Karen Greaves	Orkney Islands Council
Stephen Heddle	Orkney Islands Council
David Hibbert	Orkney Islands Council
Andrew Blake	Orkney Islands Council
Darren Richardson	Orkney Islands Council
Graham Sinclair	Orkney Islands Council
Kevin Woodbridge	Orkney Islands Council
Alice Albinia	Orkney Renewable Energy Forum
Stephen Kemp	Orkney Renewable Energy Forum
Elizabeth Johnson	PURE Energy Centre
Gregor Hogg	Ricardo - Sustainable Islands Initiative
Imogen Sawyer	Sanday Development Trust
Steve Ray	Sanday Development Trust
Charles Abbott	Scotland Europa
Douglas Hyslop	Scottish Enterprise
Neil Ferguson	Scottish Enterprise
Carolyn Vannan	Scottish Environmental Protection Agency

Tim Poole	Scottish Environmental Protection Agency
Stuart McKay	Scottish Government
Margo Mciver	Scottish Government
Nigel Holmes	Scottish Hydrogen & Fuel Cell Association
John Sammon	Scottish Water Horizons
Donald Macbrayne	Scottish Water Horizons
David Campbell	Shapinsay Development Trust
Sean Haughey	Shetland Council
Gareth Norquoy	Shetland Council
Bertrand Joubert	Symbio
Dimitri Mignard	University of Edinburgh
Dr Paul Farras	University of Galway
Mark Shiner	University of Highlands & Islands
Chris Heatley	Westray Development Trust
Leanne Bloor	Wood Group
Rebecca Peterson	Xodus

APPENDIX 2: BIG HIT Press release for Grand Launch on 15th May 2018

BIG HIT Creates Exemplar 'Hydrogen Islands' Energy System for Orkney

Building Innovative Green Hydrogen systems in an Isolated Territory: a pilot for Europe (BIG HIT)

Press Release. Embargoed until 14:00 on Tuesday 15th May 2018

Today the official opening of BIG HIT took place in Kirkwall, the Orkney Islands, bringing together communities, industry, and politicians who are all working together to deploy one of Europe's leading energy systems. This will enable more renewable energy to be produced and used locally in the Orkney Islands of Scotland and also support similar deployments more widely.

Energy Minister Paul Wheelhouse said: "*We are very supportive of the BIG HIT initiative because it will help alleviate grid constraints in the Orkney Islands by enabling excess renewable energy generated locally, but what cannot be transmitted to the mainland to be stored and used to produce hydrogen. As a versatile and low carbon energy solution, hydrogen therefore has the great potential to play an important role in transport, heating, and industry. "This innovative project will add to our growing understanding of the potential role of hydrogen in Scotland's future energy system, as identified in Scotland's Energy Strategy which I published in December. "The Scottish Government has already supported a number of world-leading hydrogen demonstration projects, such as; the Orkney Surf'n'Turf project; and the introduction of zero emission hydrogen buses and hydrogen refuelling stations in Aberdeen*."

This 'Building Innovative Green Hydrogen Systems in an Isolated Territory' (BIG HIT) project is a major first step towards creating a genuine hydrogen territory in the Orkney Islands. BIG HIT has been widely recognised as the leading project of its kind in Europe. BIG HIT is a five-year project, involving 12 participants based across six EU countries, funded by the EU FCH JU. The Orkney Islands of Scotland were chosen for this development because of the need to store excess renewable energy and utilise the stored energy locally for transport and heat.

Hydrogen & Fuel Cell Deployments in the Orkney Islands of Scotland

The BIG HIT project provides a blue print for renewable hydrogen deployment for island systems and new hydrogen territories. This will benefit communities and businesses who want to use more locally generated renewable energy.

Orkney Islands Council Leader James Stockan said: *"Orkney is at the heart of the BIG HIT project, which aims to demonstrate how hydrogen produced locally using renewable energy can be used sustainably in ways which benefit islands and other remote communities. Our community is the ideal test bed for this important initiative. The Council has ambitions to become carbon neutral and so it was great to see the Council's new zero-emission vans - the first vehicles to have a 'fill-up' of Orkney-produced hydrogen – at the launch event, providing clear evidence that BIG HIT is up and running."*

Mark Hull, Head of Innovation for Community Energy Scotland, added: "*The launch of this project is the hard earned result of a truly unique partnership of technical, public and local community partners coming together. We are looking forward to seeing it not only lead the way internationally, but also create real benefit to the local community, especially in Shapinsay and Eday.*"

Neil Kermode, Managing Director of the European Marine Energy Centre said: *"By piloting the generation of hydrogen from renewable energy sources, BIG HIT is helping avoid grid shortcomings, while supporting further development of renewable energy projects in Orkney. It is breaking through the barriers to delivering renewable transport and heat, opening up new markets around the world."*

Clive Brookes, the Chair of Eday Renewable Energy added *"Eday Renewable Energy are proud and pleased to be part of BIG HIT and the emerging Hydrogen economy here in Orkney. This is an exciting time for the community of Eday and will create new opportunities for making better use of renewable energy generated from wind and tidal sources on Eday".*

The Orkney Islands have over 50 MW of installed wind, wave and tidal capacity generating over 46 GWhr per year of renewable power and has been a net exporter of electricity since 2013. Energy used to produce the hydrogen for BIG HIT is provided by the community-owned wind turbines on the islands of Shapinsay and Eday, two of the islands in the Orkney archipelago.

At present the Shapinsay and Eday wind turbines are often 'curtailed', losing on average more than 30% of their annual output, limited by grid capacity restrictions in Orkney. This wasted energy from the locally owned Shapinsay wind turbine will be used by the BIG HIT project to produce renewable hydrogen using a 1 MW PEM electrolyser supplied by ITM Power. Storing excess renewable energy as renewable hydrogen in this way increases the utilisation of the installed wind capacity without the need to reinforce the grid connection.

Prof Roger Putnam CBE, Chairman of ITM Power, added: "*BIG HIT is an important blue-print for the design of hydrogen energy systems utilising intermittent renewable energy. The project perfectly illustrates the use of electrolysis for energy storage and its subsequent use as a clean fuel and for renewable heat. ITM Power are delighted to be part of such an important project*"

BIG HIT builds on foundations laid by the Orkney Surf 'n' Turf initiative, which has established production of hydrogen on the island of Eday using wind and tidal energy. BIG HIT and Surf 'n' Turf are both recognised as world leading pilot and demonstration projects, which put in place a fully integrated model of hydrogen production, storage, transportation and utilisation for low carbon heat, power and transport. These projects have successfully address a number of operational and development challenges including the logistical and regulatory aspects for transport of hydrogen fuel between islands, and the orientation and familiarisation with new hydrogen building and transport technologies.

Fernando Palacin, the Managing Director of The Foundation for the Development of New Hydrogen Technologies in Aragon, coordinators of the BIG HIT project, said: *"Hydrogen technologies provide solutions to some of the most important challenges that humankind has to face in terms of sustainability, environmental concerns, and a better use of local renewable resources for improvement the socio-economic structure of the region or territory where they are deployed. They*

also offer public & private entities business opportunities, allowing them to increase competitiveness and social cohesion. The BIG HIT European project is a pioneer project and the first step worldwide towards establishing a real locally-integrated hydrogen economy, The Foundation is delighted to join and lead this consortium to demonstrate and make visible & tangible the benefits of hydrogen technologies in Orkney".

The local authority partner in BIG HIT is Orkney Islands Council, providing local input together with the Shapinsay Development Trust (SDT), Community Energy Scotland (CES), and the European Marine Energy Centre (EMEC). Calvera, Giacomini, ITM Power, and Symbio are the industry partners providing equipment and technical expertise. Technical University of Denmark (DTU) is the technical partner and the Scottish Hydrogen & Fuel Cell Association (SHFCA) is dissemination partner. The Ministry for Transport and Infrastructure (MTI) represents Malta as the lead follower territory for project replication. The overall BIG HIT project coordinator is Fundación Hidrógeno Aragón (FHA, The Foundation for the Development of New Hydrogen Technologies in Aragon).

Orkney Islands Council has taken a leading role in the BIG HIT project, by purchasing 5 electric vans which have each been fitted with a hydrogen fuel cell by Symbio to provide twice the normal operational range. These adapted Renault Kangoo vans are part of the Council's operational fleet, and the hydrogen fuel cells give these them a wider range than their battery-powered electric counterparts.

Shapinsay Development Trust works to secure the future of the resilient island community of about 300 people in Shapinsay, one of the many inhabited islands in the Orkney archipelago. Shapinsay islanders are empowered and resourced by the efforts of the Trust in whose work many of them are intimately involved as trustees, volunteers or employees.

Community Energy Scotland (CES) is a registered Scottish charity and has been at the forefront of community energy developments in Scotland. CES has been leading the Surf 'n' Turf project which is work closely with BIG HIT on areas such as hydrogen logistics.

European Marine Energy Centre (EMEC) is the first and only centre in the world to provide developers of both wave and tidal energy converters with purpose-built open-sea testing facilities, and also is host to the Surf 'n' Turf project funded by the Scottish Government's Local Energy Challenge Fund.

Calvera specialises in the manufacture of storage and transport systems for compressed gas, and particularly Hydrogen for high pressure. The company has provided bespoke systems for 30 years to industrial and medical gas companies, and provides turnkey solutions including European approvals. In addition, the company maintains and refurbishes gas transport systems.

Giacomini is a leader in the field of components for heating and cooling, and has been involved for more than 10 years in the field of hydrogen as renewable energy source using an innovative condensing boiler based on a hydrogen catalytic burner.

ITM Power is an energy storage and clean fuel company, committed to clean sustainable energy solutions based on water electrolysis using Polymer-Electrolyte-Membrane (PEM) technologies. ITM Power will be providing the project's electrolysis, the hydrogen refuelling station and will be conducting much of the safety analysis.

Symbio is a European leading parts manufacturer, specialized in hydrogen fuel cell kits that can be incorporated into various types of electric vehicles and are associated with a range of digital services.

Danmarks Tekniske Universitet (Technical University of Denmark, DTU) is one of Europe's foremost technical universities with world class expertise in fuel cells, electrolysis, hydrogen storage and related technologies.

Scottish Hydrogen & Fuel Cell Association (SHFCA) is the sector body for the development and deployment of hydrogen and fuel cell technologies in Scotland.

The Ministry for Transport and Infrastructure (MTI) promotes and develops the transport sector in Malta by means of proper regulation and by the promotion and development of related services, businesses and other interests, both locally and internationally.

The Foundation for the Development of New Hydrogen Technologies in Aragon (FHa) is a non-profit private entity founded in 2003 to carry out the organization, management and deployment of a wide range of actions

with the purpose of promoting the use of the hydrogen as an energy vector. Based in Huesca, Spain, its team of experienced professionals performs R&D as well as consultancy projects, in cooperation or assisting local, national and international companies, contributing to their industrial modernization and to improve their competitiveness.

About the FCH JU. The Fuel Cells and Hydrogen Joint Undertaking is a unique public-private partnership supporting research, technological development and demonstration activities in fuel cell and hydrogen energy technologies in Europe. Its aim is to accelerate the market introduction of these technologies, realising their potential as an instrument in achieving a carbon-lean energy system. The three members of the FCH JU are the European commission; the fuel cell and hydrogen industries, represented by Hydrogen Europe; and the research community, represented by research grouping Hydrogen Europe Research.

The BIG HIT project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No. 700092. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme, Hydrogen Europe and Hydrogen Europe research. The FCH 2 JU selected BIG HIT as the only hydrogen project of its kind to receive funding in 2016, and €5 million has been allocated to the project, which has total estimated costs of €10.9 million. For more information about BIG HIT see https://www.bighit.eu/

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BIG HIT Press Release ends.

For further information about BIG HIT and interviews please contact Nigel Holmes

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