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# Scaling up Hydrogen Valleys & Islands

Dr Nigel Holmes  
CEO, SHFCA

Clean Energy for EU Islands webinar  
23<sup>rd</sup> November 2021

# Scaling up Hydrogen Valleys & Islands

The Orkney Islands of Scotland have established one of the first Hydrogen Valleys with support from FCH JU and projects including BIG HIT.

Further scale-up will support the Just Transition from fossil fuels to low carbon energy, and enable delivery of 2030 and Net Zero climate targets.

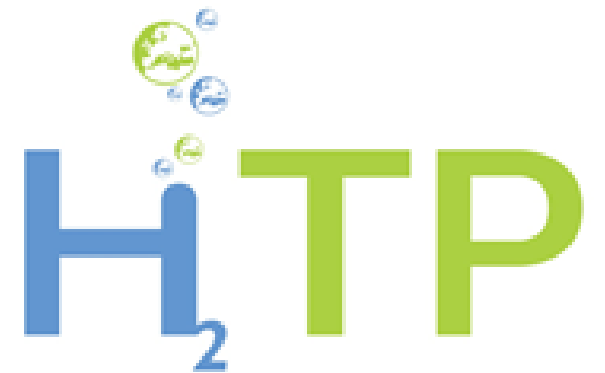
The Hydrogen Territories Platform is sharing lessons from Orkney with other Hydrogen Valleys across Europe, including the FCH JU supported HEAVENN and GREEN HYSLAND projects

Link: <http://h2territory.eu/>

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Nigel Holmes

CEO, Scottish Hydrogen & Fuel Cell Association



# Scotland's Contribution to Stopping Global Warming

Scotland's target: Net Zero by 2045

Year	Scottish CO <sub>2</sub> Reduction
2030	75%
2035	80%
2040	90%
2045	100%

The EU has set a target of 55% GHG reduction by 2030: **Fit for 55**

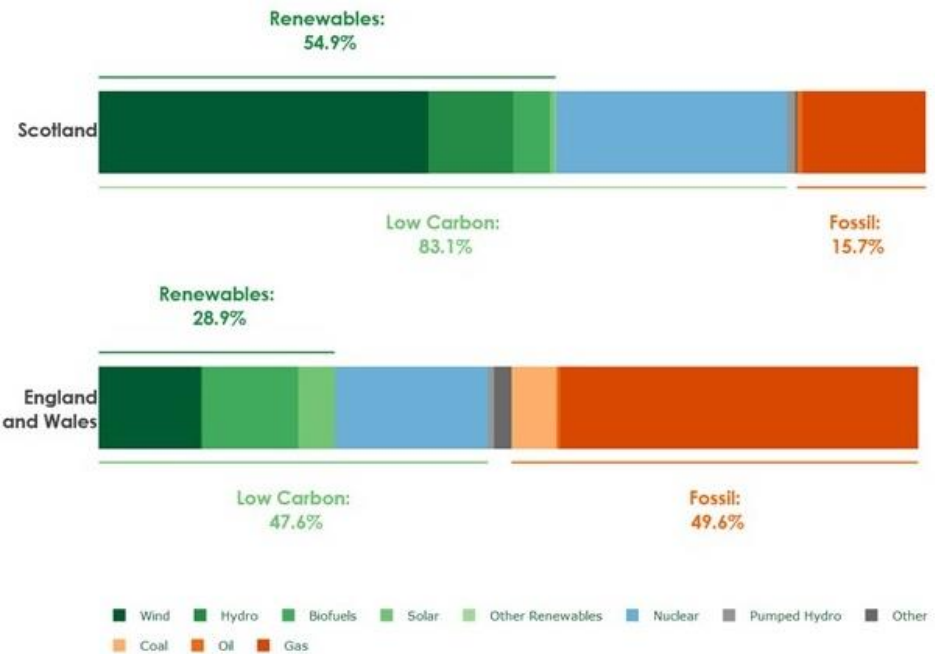




AN INCLUSIVE ENERGY TRANSITION

# Scotland's Transition to Low Carbon Electricity

Proportion of electricity generation by fuel type in 2018 (BEIS data)



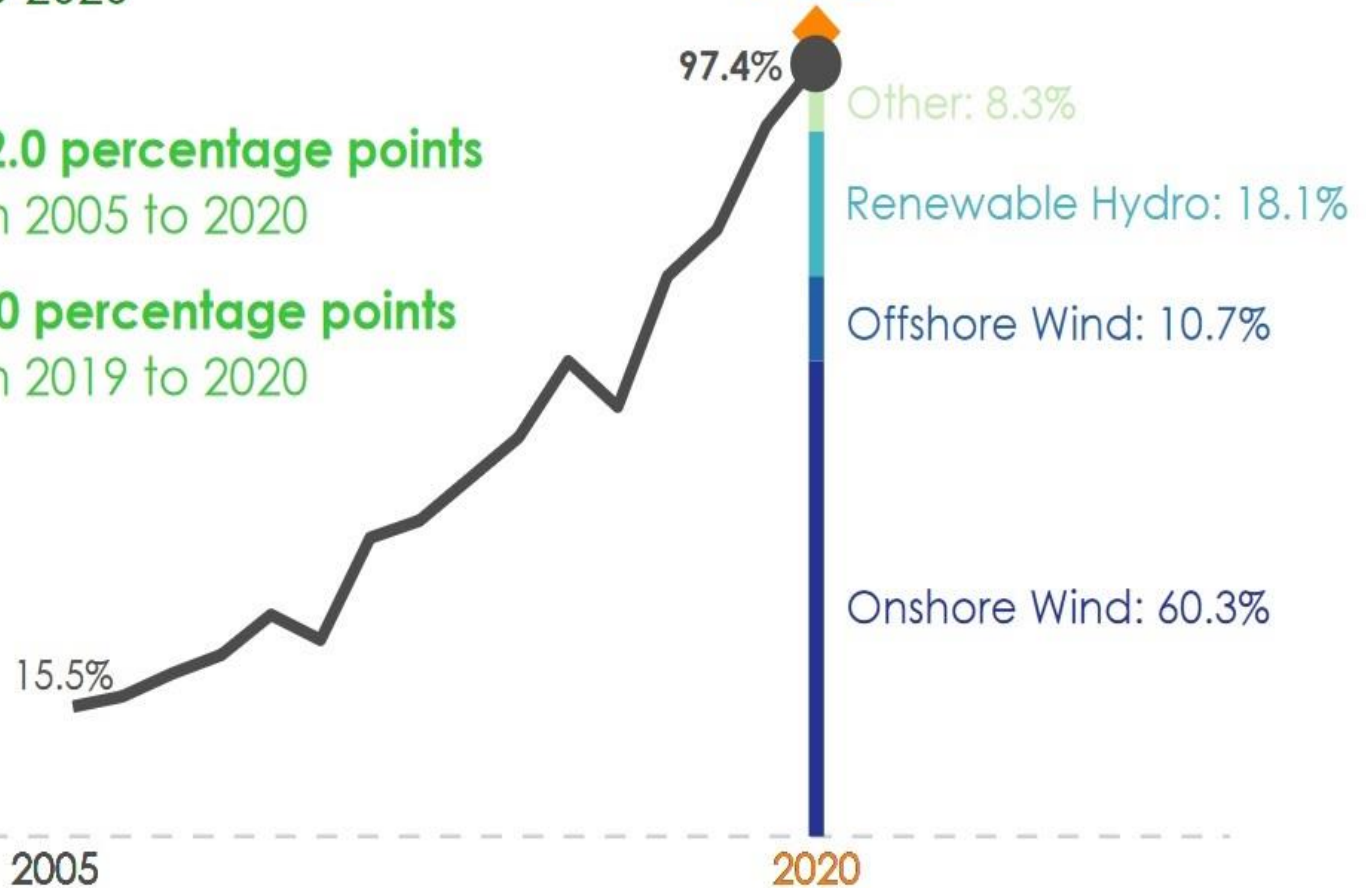
**Renewable electricity target**  
2005-2020

100%  
by 2020

**Provisional**

↑82.0 percentage points  
from 2005 to 2020

↑8.0 percentage points  
from 2019 to 2020

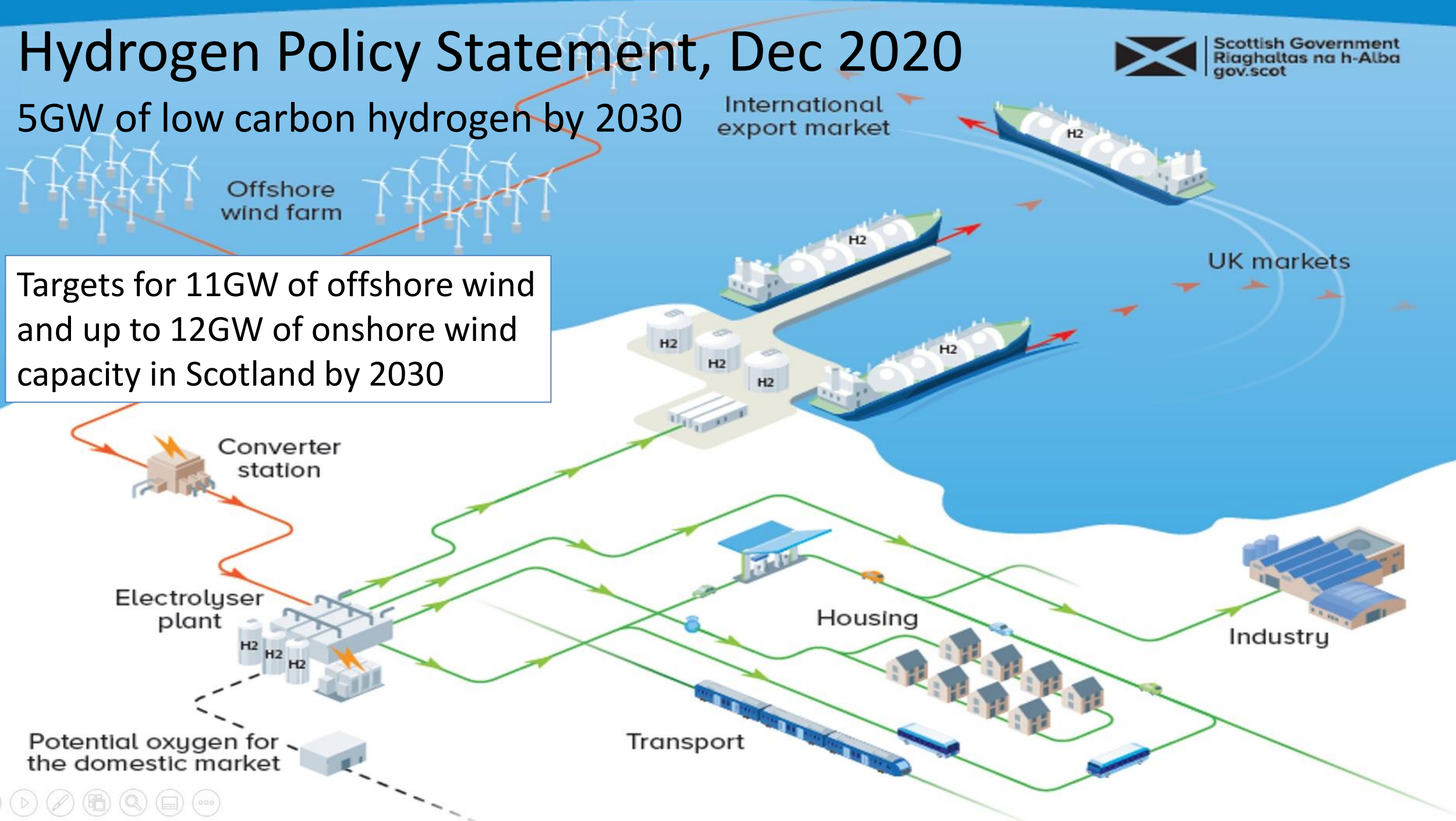


Energy Statistics for Scotland: Q4 2020 Figures (March 2021)

# Hydrogen Policy Statement, Dec 2020

## 5GW of low carbon hydrogen by 2030

Targets for 11GW of offshore wind and up to 12GW of onshore wind capacity in Scotland by 2030



# Orkney: >100% Green Electricity

Renewables generate > 100% of Orkney's electricity

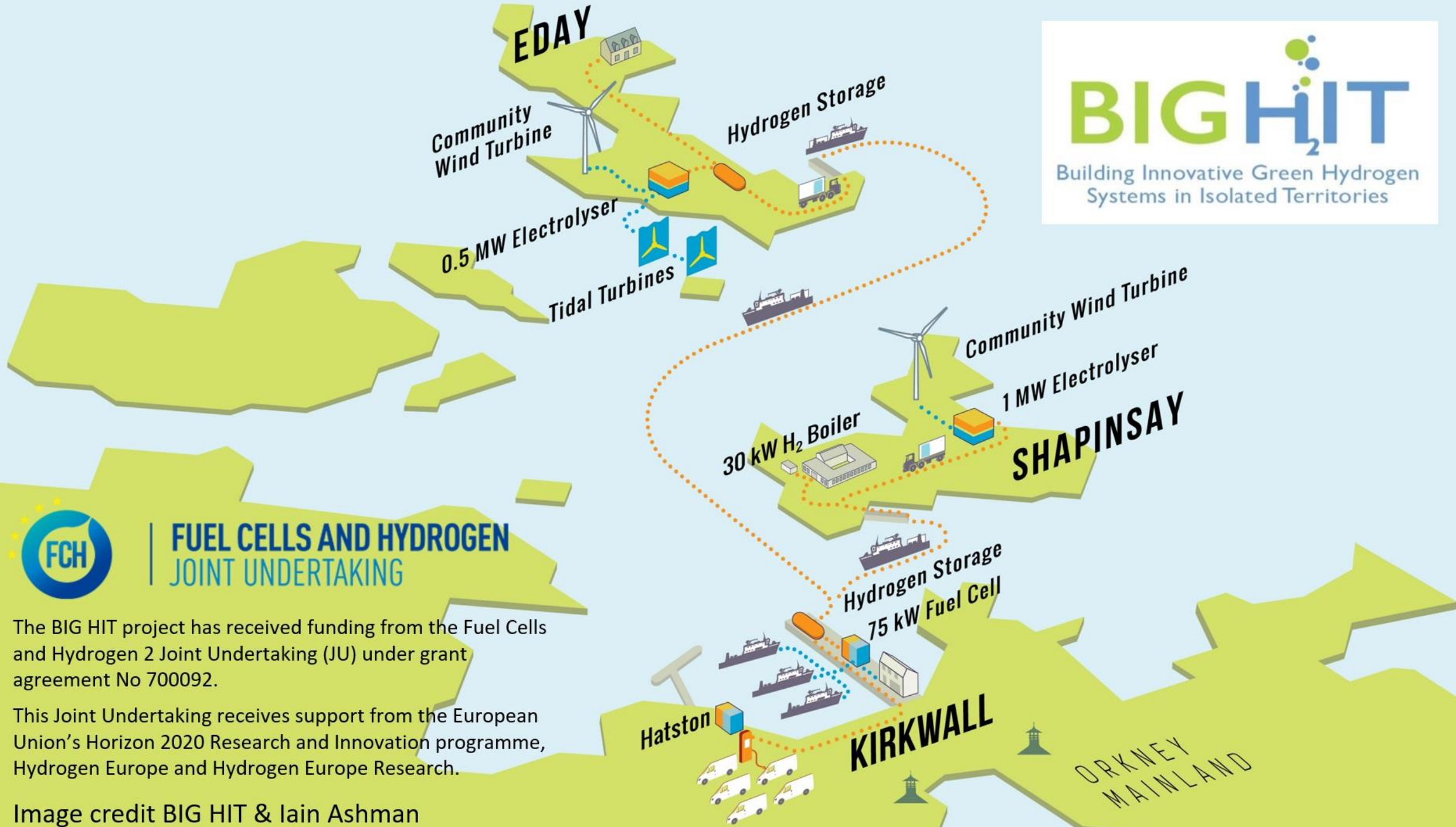
Over 50MW of installed renewable capacity

>1000 renewable installations for 10,000 households



By 2014 Orkney was generating 120% of its annual electrical demand from Renewables





**FUEL CELLS AND HYDROGEN  
JOINT UNDERTAKING**

The BIG HIT project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (JU) 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.

Image credit BIG HIT & Iain Ashman

# 12 Partners from across Europe



Supported by



Innovate UK



# Building a Green Hydrogen Island / Territory



# Hydrogen for Heat, Power, & Transport

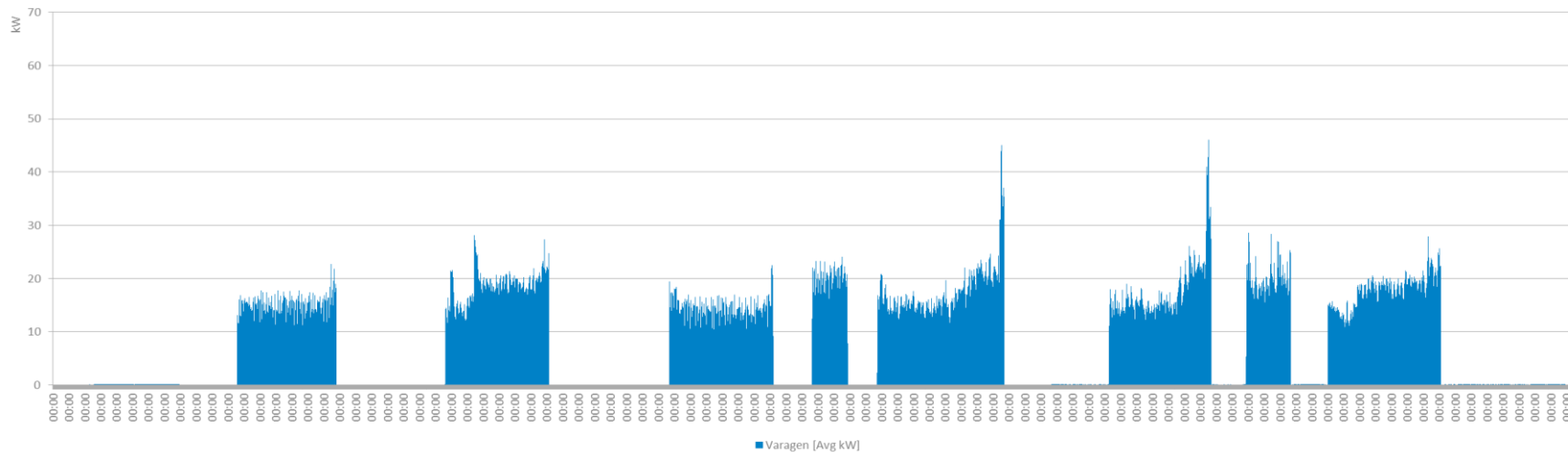
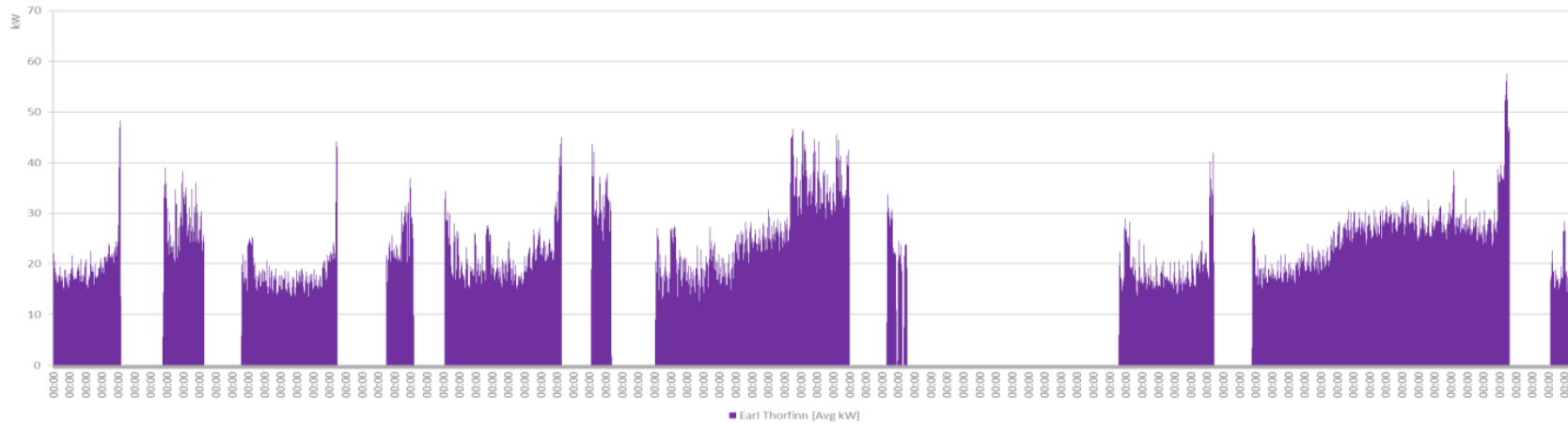


Hydrogen is moved on the Shapinsay ferry by tube trailer, and supplies the harbour fuel cell and hydrogen refuelling station in Kirkwall



Hydrogen refuelling station by ITM Power in Kirkwall, opened May 2018. This HRS efuels the 5 Symbio FC range extended EV vans now used by Orkney Islands Council as part of their fleet.

# Kirkwall Harbour hydrogen fuel cell power



Fuel Cell delivers 15-50kW for up to three ferries when berthed at pier (cold ironing)

# Ferries & Hydrogen trailer logistics Training, skills & crew familiarisation



# Orkney's clean marine hydrogen energy portfolio



[HySeas III – H2020 €21m EU funded project](#) Hydrogen fuel cell ferry now undergoing power system string testing in Norway

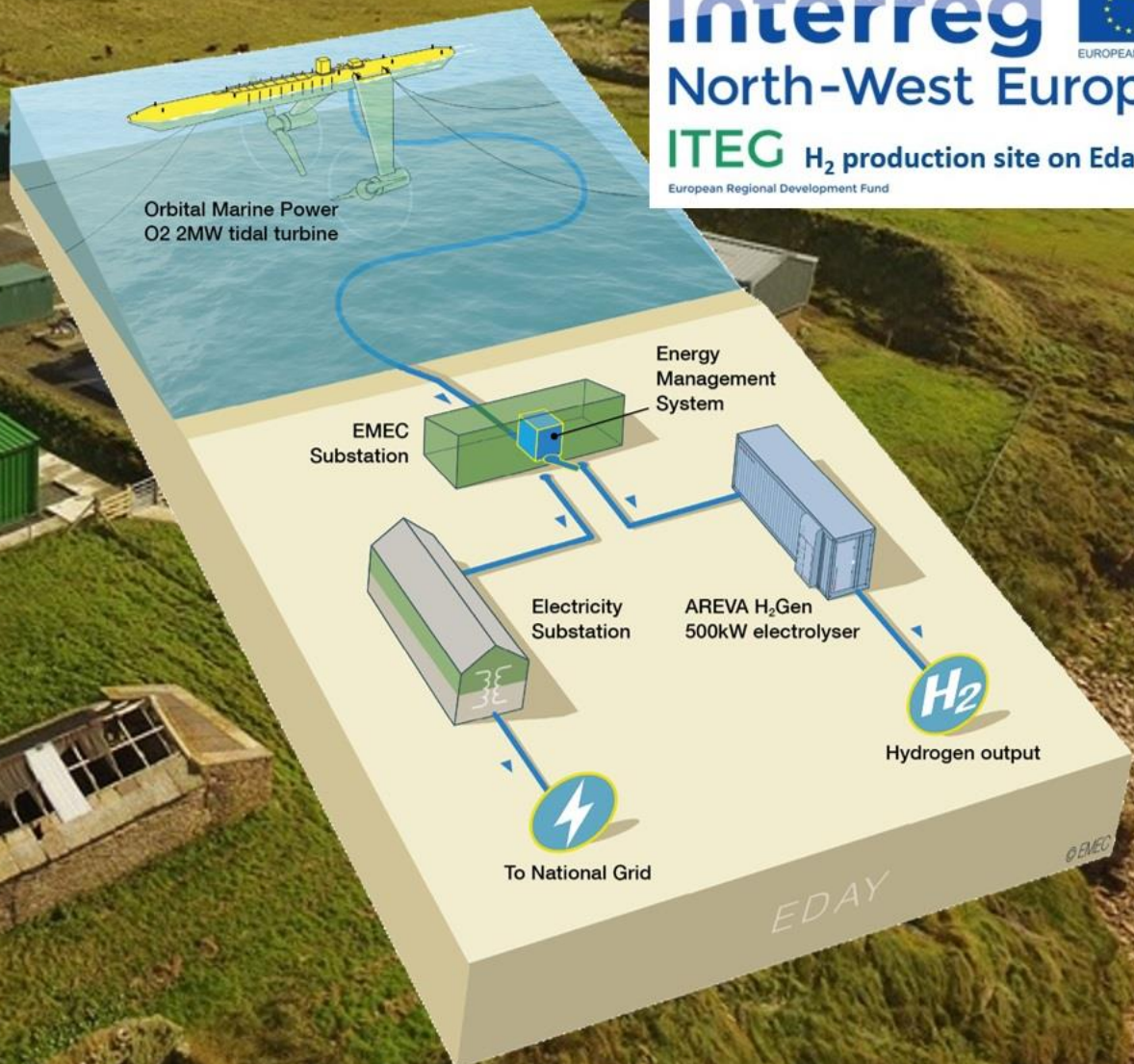
€11m EU INTERREG [Integrating Tidal Energy into the European Grid \(ITEG\)](#)



[HyDime – Innovate UK project](#) UK's first H<sub>2</sub> injection system for hydrogen/diesel APU for Shapinsay ferry. May 2019 completion, led by Ferguson Marine with OIC & EMEC partners.

# ITEG Green H2 on Eday

**Interreg**   
North-West Europe  
**ITEG** H<sub>2</sub> production site on Eday  
European Regional Development Fund

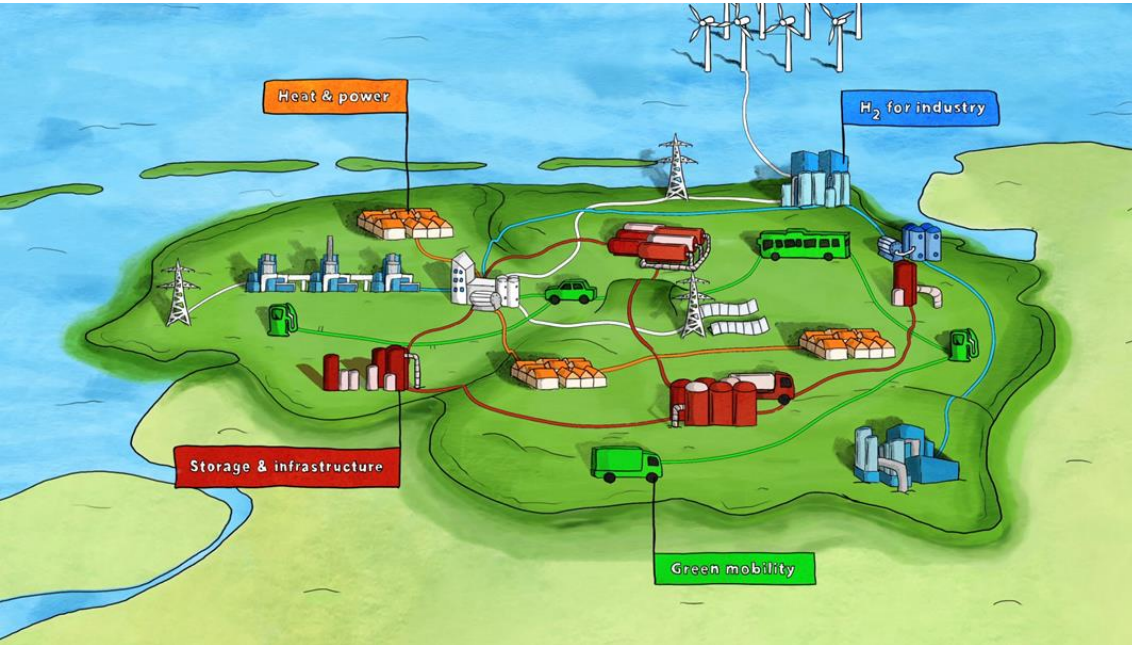


# Orkney: Growing the H<sub>2</sub> Portfolio



Next steps & sharing lessons learned with **H<sub>2</sub>TP**

# HEAVENN: H2 Valley in the North Netherlands

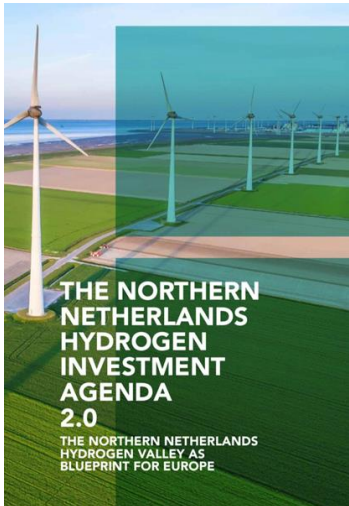


HEAVENN: 30 partners from 7 EU countries

- Total project investment over €98 million
- EU project contribution €20 million
- H2 Valleys represents the next development stage towards a local H2 economy - linking individual projects and developing local H2 infrastructure.

## North Netherlands Economy

- Energy Transition
- Economic Growth

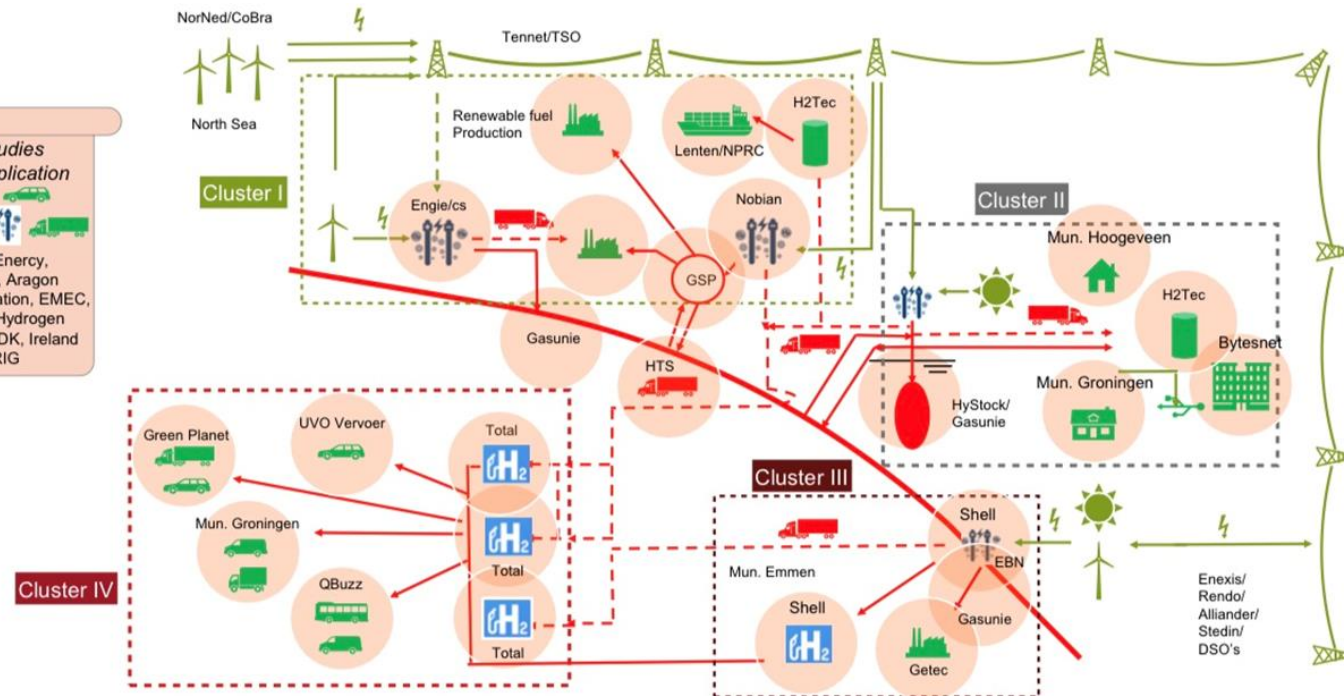


**Studies & Replication**

RUG, Energy, Hincio, Aragon Foundation, EMEC, EWE, Hydrogen Valley DK, Ireland HA, ERIG

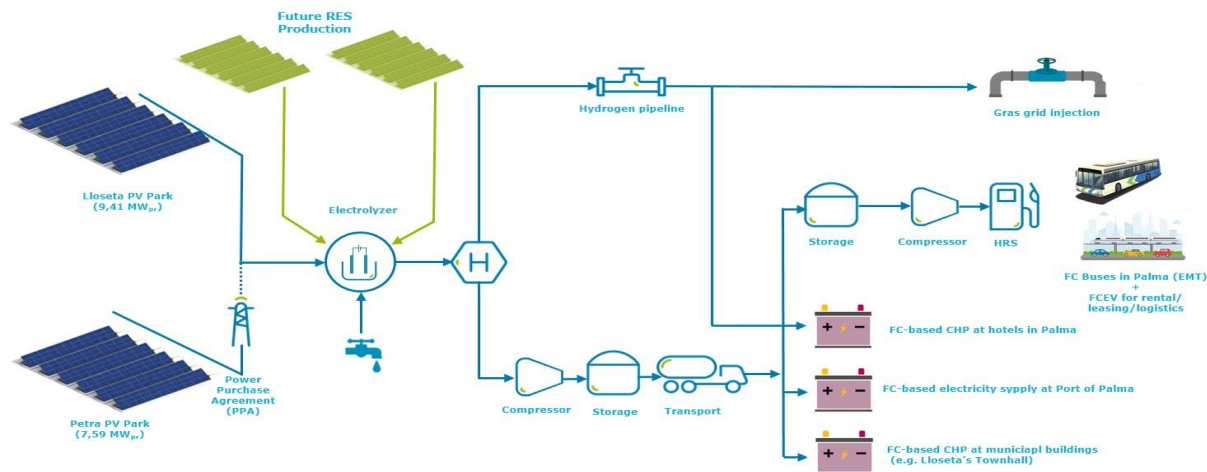


*This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (JU) under grant agreement No 875090. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation programme, Hydrogen Europe and Hydrogen Europe Research.*





# GREEN HYSLAND: Power to Green Hydrogen

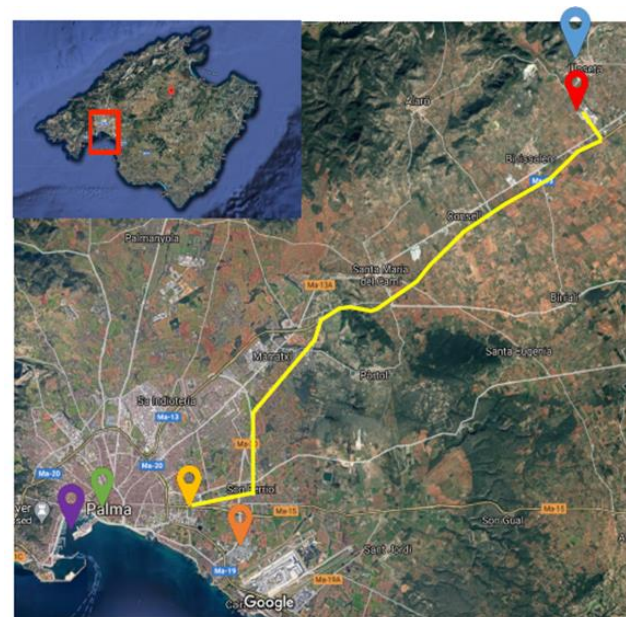


## GREEN HYSLAND: 30 partners

- Total project investment €50 million
- EU project contribution €10 million
- The first Hydrogen Valley project in southern Europe linking energy supply and demand.

## GREEN HYSLAND

Production of green hydrogen by using renewable energy (PV) for its use in multiple applications: mobility (fleet of buses, rent a car...), heat and power for commercial and residential buildings, service sector and industry (CHP, electric supply, feedstock...) and injection into the gas grid.



- Site 1: Lloseta Green H2 plant
- Site 2: Lloseta Municipal building FC
- Site 3: Cas Tresorer H2/NG mixing station & connection to NG gas grid
- Site 4: Palma hotel FC
- Site 5: Palma HRS at EMT bus depot
- Site 6: Port of Palma FC
- Pipeline - Lloseta to Cas Tresorer



FUEL CELLS AND HYDROGEN  
JOINT UNDERTAKING

This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking (JU) under grant agreement No 101007201. This Joint Undertaking receives support from the European Union's Horizon 2020 Research and Innovation programme, Hydrogen Europe and Hydrogen Europe Research.

# Where next for Orkney?



# Zero Emissions H2 Aviation Trials in Orkney



HyFlyer1 ZeroAvia 6-seater zero-emissions aircraft. Trials at Cranfield in July 2020.



Britten Islander 9-seaters already used in Orkney Islands. The project Fresson H2 version flight trials are planned for 2022.

# Kirkwall Airport: Sustainable Aviation Test Hub

**H2-ICE genset for  
heat and power**



# Power-2-X: Green Hydrogen for Green Ammonia

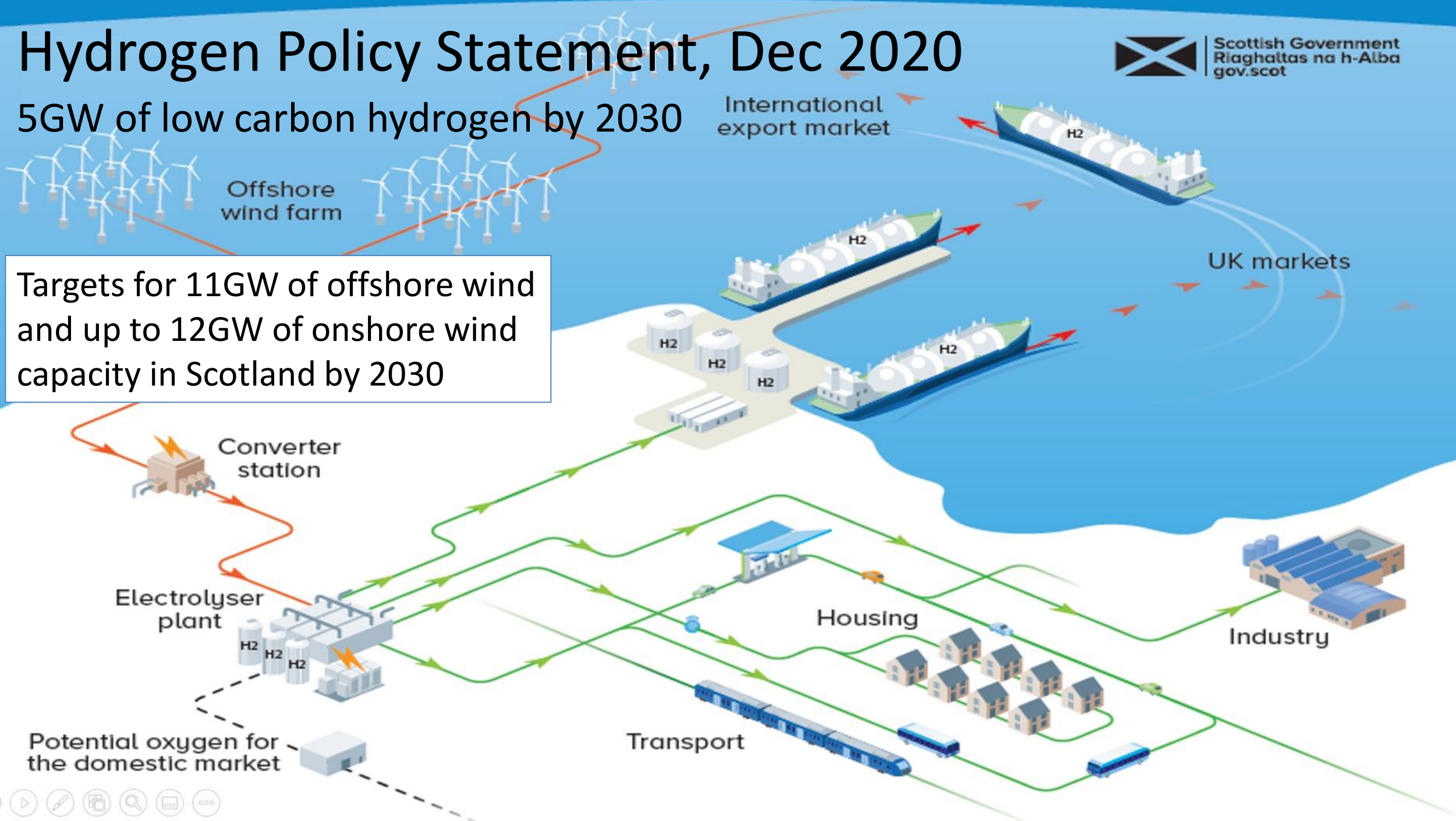
## Eneus Energy proposed development at Hammars Hill



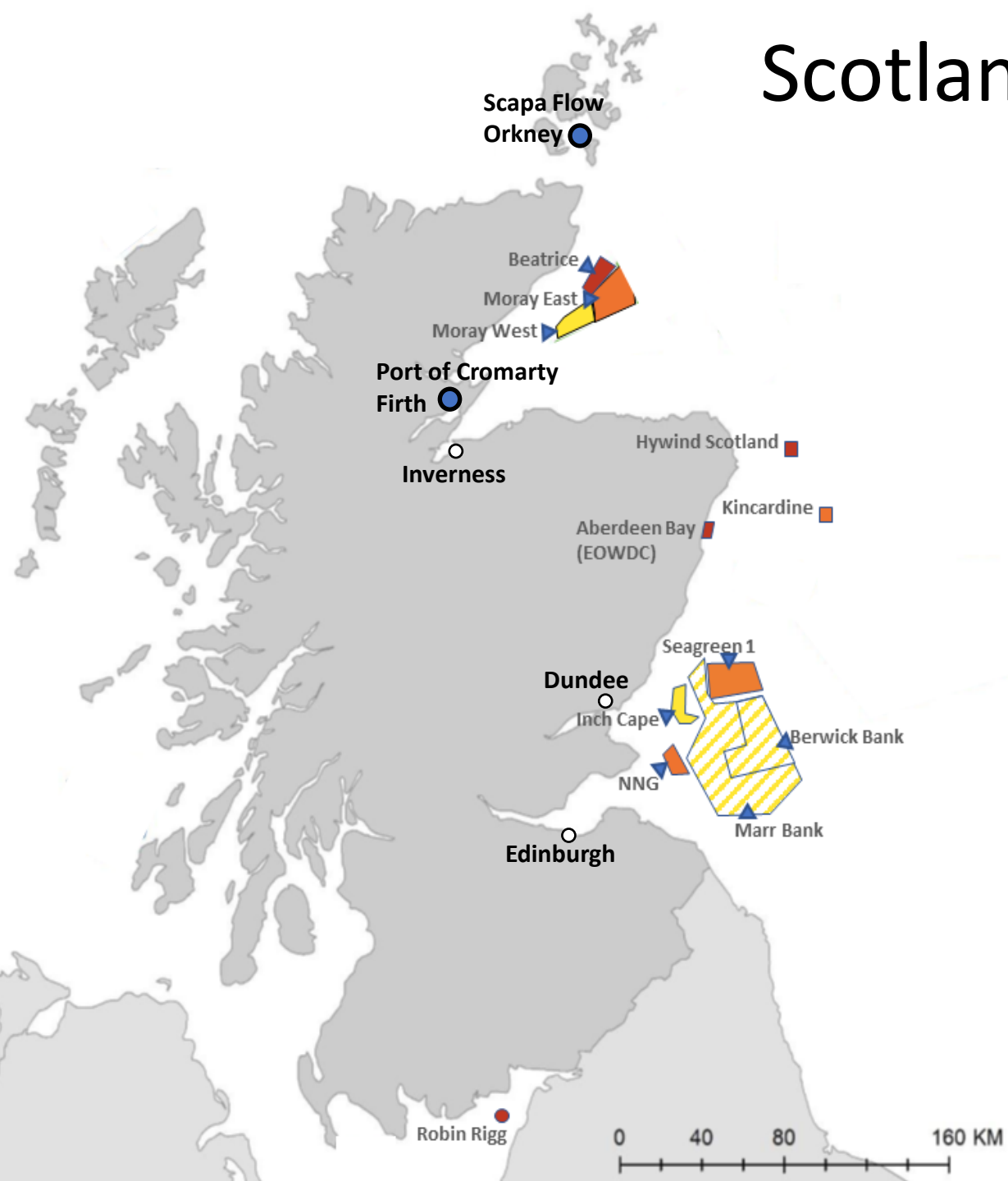
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# Scotland's Offshore Wind Potential



SITE	DEVELOPER	CAPACITY
Robin Rigg	RWE Renewables	174MW
Hywind Scotland	Equinor	30MW
Aberdeen Bay	Vattenfall	93MW
Levenmouth	ORE Catapult	7MW
Beatrice	SSE/Red Rock Power	588MW
Kincardine	Cobra	50MW
Moray East	Ocean Winds	950MW
NNG	EDF Renewables/ESB	448MW
Seagreen 1	SSE Renewables/Total	1075MW
Inch Cape	Red Rock Power	1000MW
Moray West	Ocean Winds	850MW
ForthWind	Cierco	12MW
Berwick Bank	SSE Renewables	2300MW
Marr Bank	SSE Renewables	1850MW

0.89 GW

2.5 GW

1.9 GW

4.15 GW

Current Wind Farms (total 9.4GW)


By status


- Operational
- Under construction
- Consented
- Planned

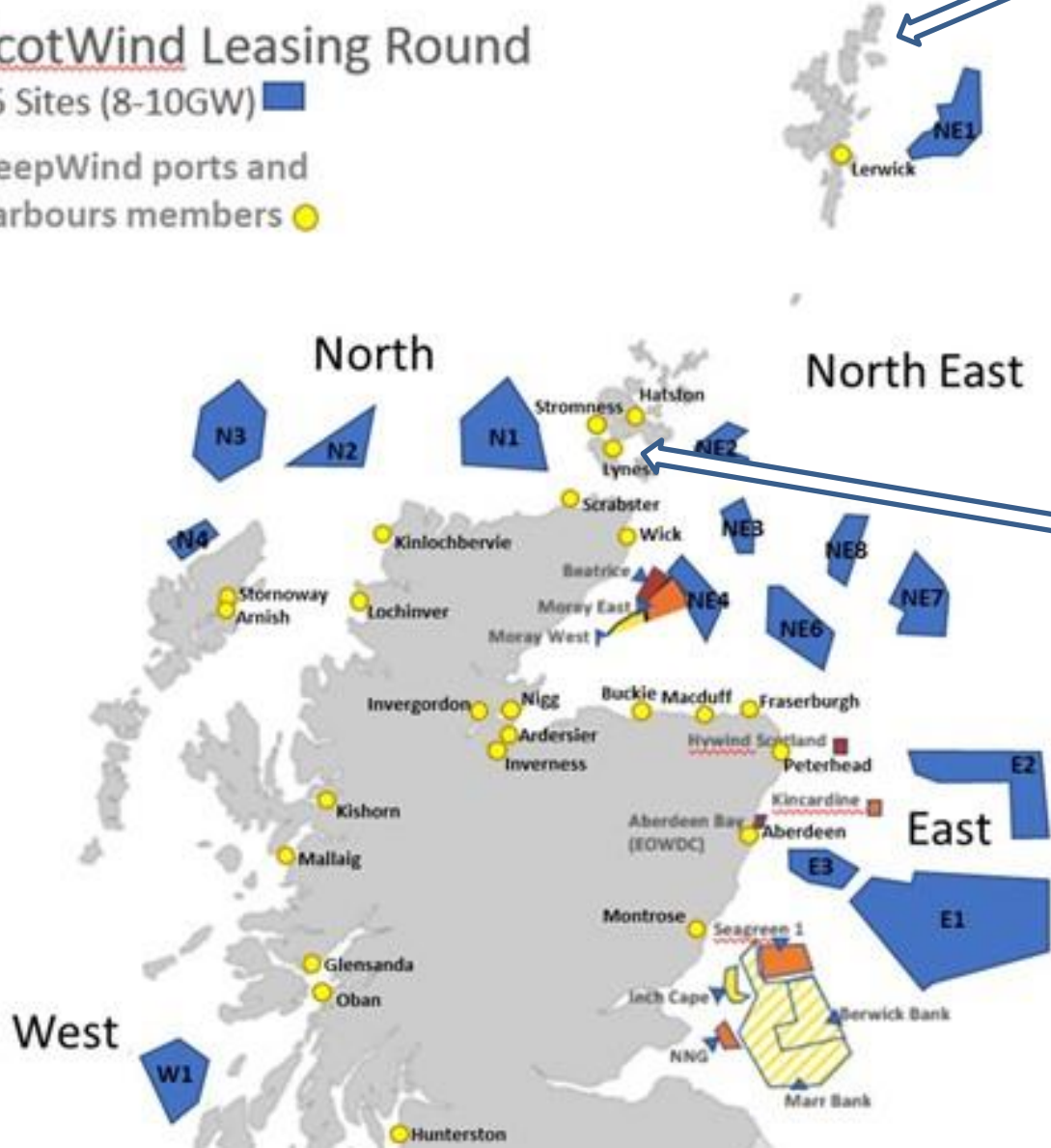


# Scaling up Hydrogen for 2030 with Offshore Wind

## ScotWind Leasing Round

15 Sites (8-10GW) 

DeepWind ports and harbours members 







**Shetland ORION Clean Energy Project**  
Green H<sub>2</sub> from onshore & offshore wind  
Repurpose Sullom Voe oil & gas terminal

<https://www.orioncleanenergy.com/>



**Orkney** proposed Flotta Hydrogen Hub  
Using up to 2GW offshore wind from N1  
Green H2 production by late 2020's



<https://www.flottahydrogenhub.com/>

## Scaling up: Flotta Hydrogen Hub



Flotta Terminal - a potential key role in the energy transition



Green hydrogen - one of the fuels of tomorrow



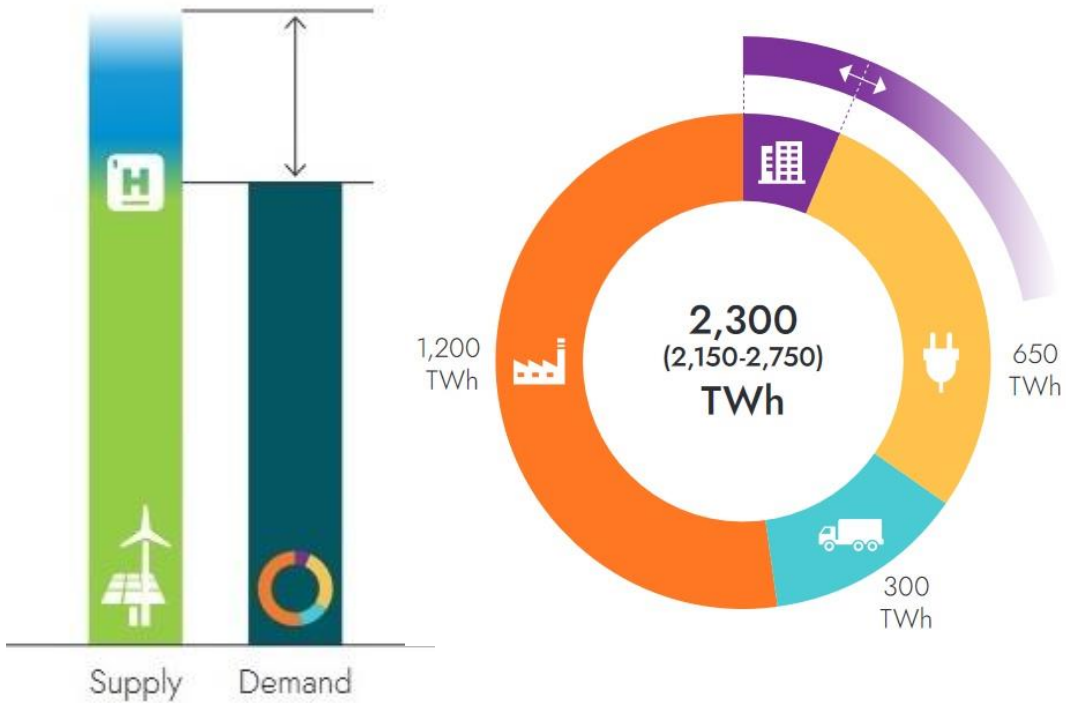
Partners - working together to investigate a greener future

Flotta H<sub>2</sub> Hub: <https://www.flottahydrogenhub.com/>

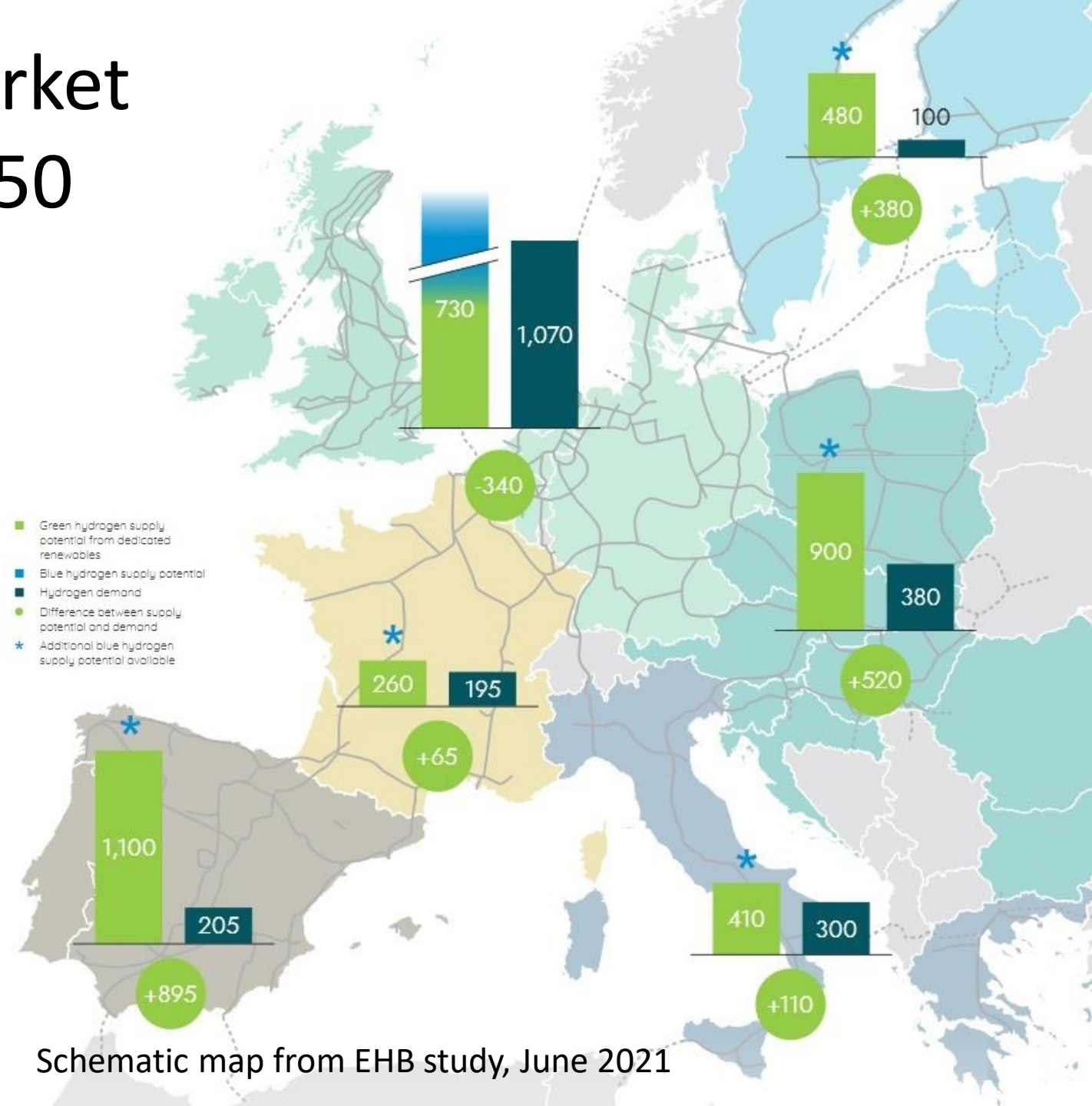
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# European Hydrogen Market Supply & Demand in 2050



*Hydrogen will be crucial to ensure that Europe becomes a climate-neutral continent (EHB study, June 2021)*



Schematic map from EHB study, June 2021

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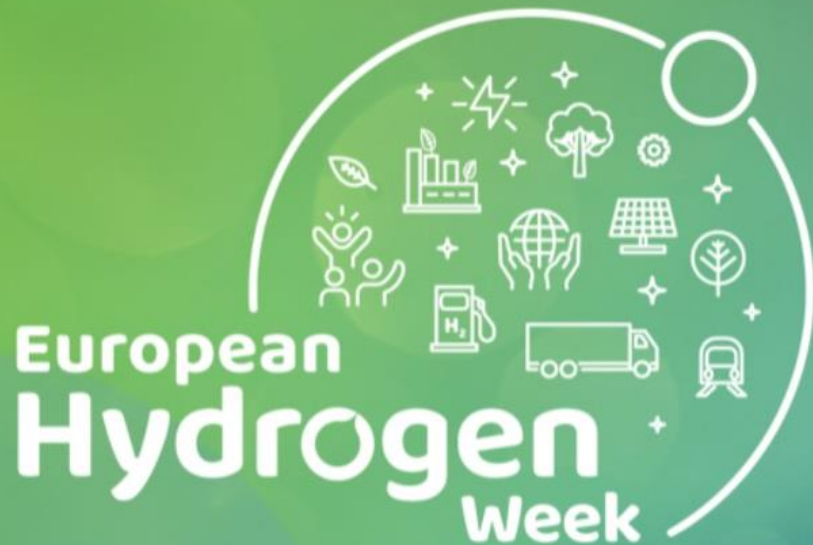
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29 Nov-3 Dec 2021

#CleanHydrogen | #EUHydrogenWeek

**FCH JU Programme Review Days. Thursday 2<sup>nd</sup> December 2021**

**European Hydrogen Valleys. 16:00 – 17:00 CET**

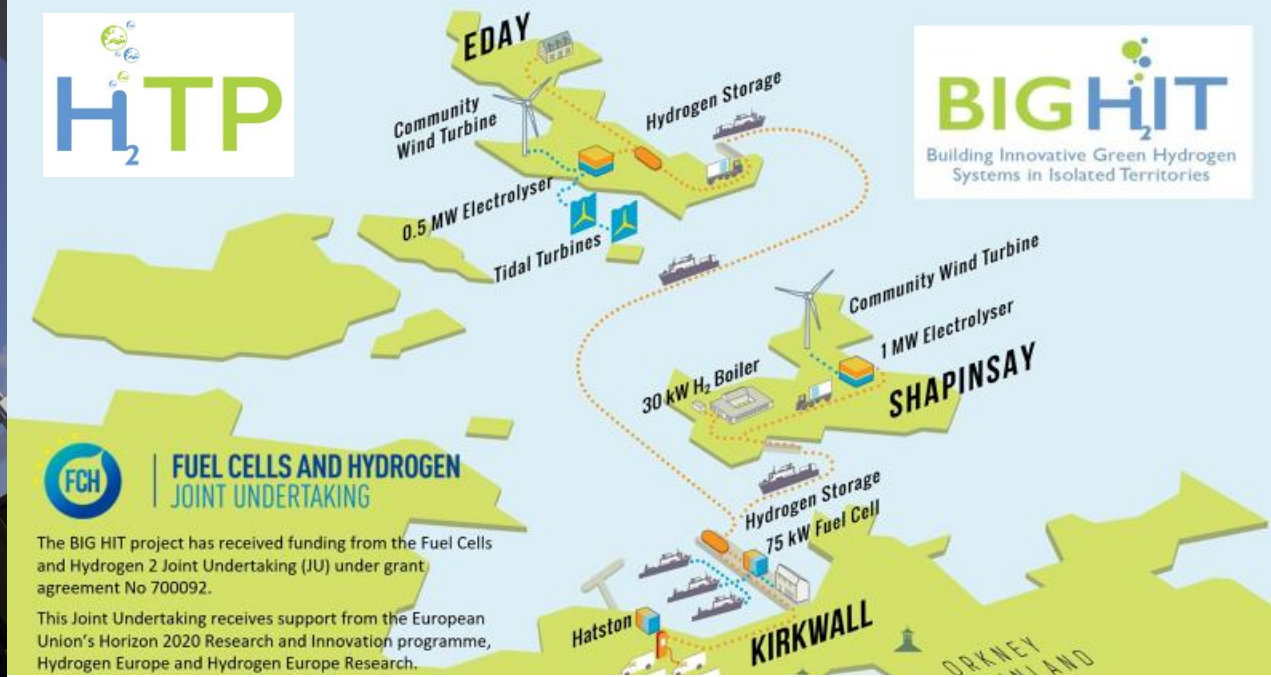
**BIG HIT:** *Building Innovative Green Hydrogen systems in an Isolated Territory: a pilot for Europe.* Jesus Simon, FHA

**HEAVENN:** *Hydrogen Energy Applications for Valley Environments in Northern Netherlands.* Patrick Cnubben & Janke Kappenburg, STICHTING NEW ENERGY COALITION

**GREEN HYSLAND:** *Deployment of a H2 Ecosystem on the Island of Mallorca.* Antonio Martinez Rodriguez, ENAGAS

**MULTICIT'HY:** *Production and distribution stations of decarbonated hydrogen.* Stephane Manginot, Hynamics/EDF Group

Registration: <https://www.fch.europa.eu/news/register-now-attend-european-hydrogen-week-2021>



Hydrogen Territories Platform: [www.h2territory.eu](http://www.h2territory.eu)





SCOTTISH  
**Hydrogen**  
**& Fuel Cell**  
ASSOCIATION

[www.shfca.org.uk](http://www.shfca.org.uk)

Scaling up Hydrogen  
Valleys & Islands

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