

# Power2X Subgroup

Workshop Webinar  
18<sup>th</sup> of February




# Contents

- 10.00 – Introduction
- 10.05 – Results of member poll and forward plan – Neil Wilkinson
- 10.20 - Hydrogen landscape in Scotland – Paul O’Brien
- 10.30 – Future Hydrogen calls – John Sinclair
- 10.40 – Discussion forum
- 11.00 - End of webinar

# Results of member poll and forward plan

## Neil Wilkinson





# Results of member poll and forward plan

Neil Wilkinson, Low Carbon Lead, Aker  
Solutions

# Member Engagement

What is your main reason for joining the subgroup?

What are the main **challenges** for growth?

What are the main **drivers** for growth?

What are **the most relevant** topic areas?

What should the subgroup focus on?



# Engagement Results

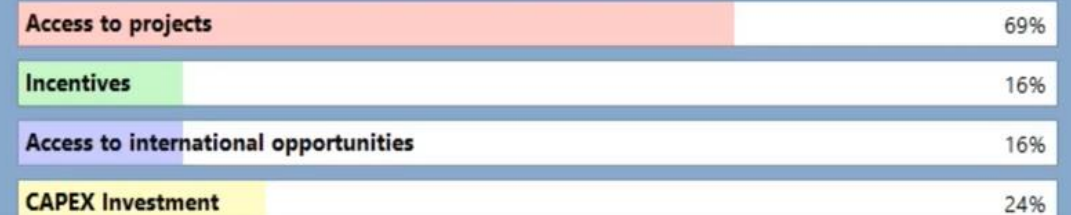
## 1. What is your main reason for joining the subgroup?

Poll Results (multiple answers allowed):



## 2. What are your main challenges for growth in this sector?

Poll Results (multiple answers allowed):



## 3. How important are the following to realising your ambition in the sector?

Poll Results (multiple answers allowed):



## 4. Within Power2X, what areas of growth are most relevant to your company?

Poll Results (multiple answers allowed):



# Engagement Results & Way Forward

## 5. What would you expect the subgroup to focus on?

Poll Results (multiple answers allowed):



### Knowledge Sharing

- International collaboration with other member organisations – WAB etc.
- Cross-sector engagement (Oil and Gas, Hydrogen and offshore wind)
- Large UK and EU project presentations
- Technology challenges and opportunities
- SME Presentations
- Updates on Funding, legislative & regulatory changes
- COP26 engagement
- Industry Body engagement (SHFCA, ONE, Subsea UK and OGTC).

### Unlocking Opportunities

- Access to meet the buyer webinars/meetings
- Access to international projects
- Identification of opportunities to create consortia and drive game changing projects, studies, demonstrators and enabling investment
- Supply chain database for Hydrogen based companies - ongoing

# Hydrogen Landscape in Scotland



# Introduction

- The Scottish Government's Hydrogen Policy paper from December 2020 sets a target of 5GW of hydrogen production by 2030.
- A further ambition for 2045 is to have 25GW of hydrogen generation with 20GW being green hydrogen.
- This would require 40GW of offshore and onshore wind to deliver this installed capacity (5GW of onshore currently in the pipeline)
- Scotland is looking to double its current offshore wind pipeline to 20GW through the addition of the ScotWind leasing round which will be followed by a further ScotWind round in 2023.
- Grid infrastructure is weak in the West and North of Scotland, where new offshore wind sites are located, and these areas have the highest grid connection and use of transmission charges in the UK.
- In order to deliver 20GW of hydrogen production capacity by 2045 we would need to start dedicating a significant proportion of ScotWind 1 to hydrogen and almost all of ScotWind 2.



# Scottish Hydrogen Assessment Scenarios



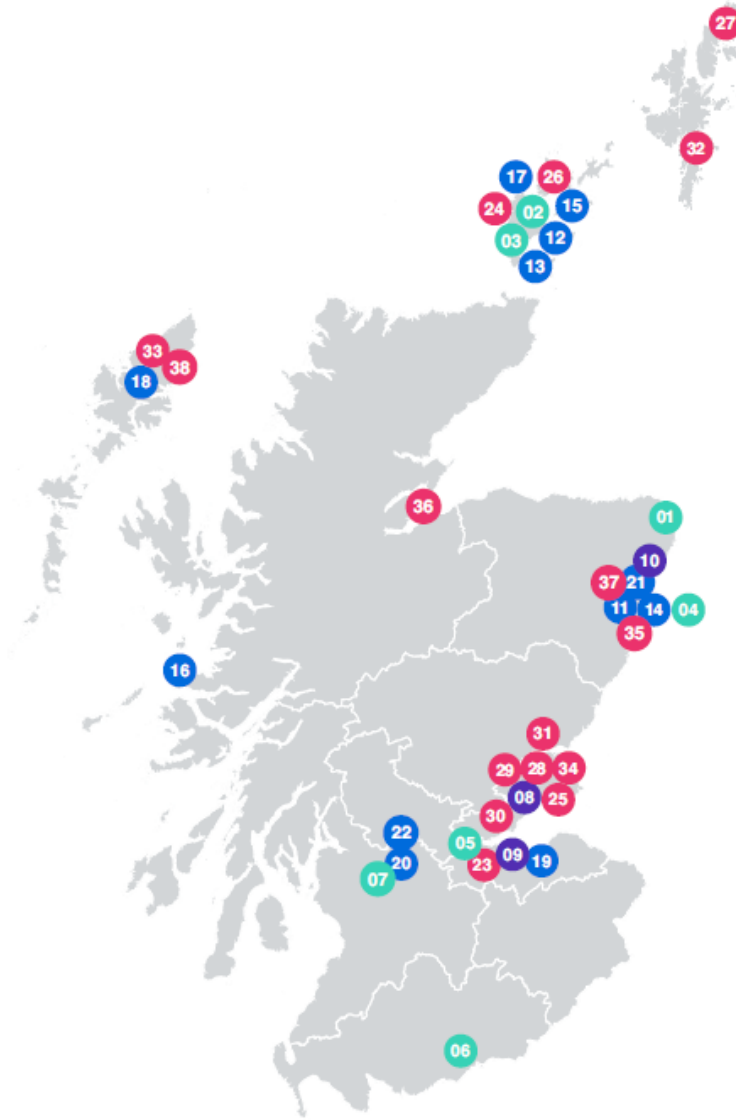
|                              | HYDROGEN ECONOMY                                                                                                                                                 | GREEN EXPORT                                                                                                                                                                | FOCUSED HYDROGEN                                                                                                                                                          |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | Hydrogen is one of the main ways in which Scotland's energy system is decarbonised. A balanced mix of blue and green hydrogen is extensively across all sectors. | Scotland's vast renewable resources, particularly offshore wind, but also wave, tidal and onshore are used to produce green hydrogen. This serves a European export market. | Hydrogen plays a supporting role in decarbonising the energy system in sectors that are hard to decarbonise by other means. Hydrogen is produced near to where it's used. |
|                              | <b>PRODUCTION</b>                                                                                                                                                |                                                                                                                                                                             |                                                                                                                                                                           |
|                              | 46 TWh                                                                                                                                                           | 126 TWh                                                                                                                                                                     | 14 TWh                                                                                                                                                                    |
|                              | <b>END USE</b>                                                                                                                                                   |                                                                                                                                                                             |                                                                                                                                                                           |
| TRANSPORT                    | 11 TWh                                                                                                                                                           | 22 TWh                                                                                                                                                                      | 7 TWh                                                                                                                                                                     |
| DOMESTIC AND COMMERCIAL HEAT | 35 TWh                                                                                                                                                           | -- TWh                                                                                                                                                                      | 6 TWh                                                                                                                                                                     |
| INDUSTRY AND ELECTRICITY     | 19 TWh                                                                                                                                                           | 11 TWh                                                                                                                                                                      | 7 TWh                                                                                                                                                                     |
| EXPORT                       | 20 TWh                                                                                                                                                           | 94 TWh                                                                                                                                                                      |                                                                                                                                                                           |



The aim of the Scottish offshore wind industry has to be the Green Export path - the creation of a large scale export market for green hydrogen which will rival the Natural Gas production industry in the North Sea at its height.



- |                                                            |                                        |
|------------------------------------------------------------|----------------------------------------|
| 01 Project Acorn                                           | 20 Glasgow hydrogen transport project  |
| 02 Hydrogen Offshore Production Project                    | 21 TECA fuel cell                      |
| 03 Surf 'n' Turf                                           | 22 Glasgow hydrogen bus project        |
| 04 Dolphyn ERM                                             | 23 HyStorPor                           |
| 05 Caledonian Clean Energy Project                         | 24 BIG HIT                             |
| 06 Chapelcross                                             | 25 Methilltoun                         |
| 07 Green hydrogen for Scotland                             | 26 REFlex                              |
| 08 H100                                                    | 27 Promoting Unst Renewable Energy     |
| 09 Grangemouth to Granton future local transmission system | 28 The Hydrogen Office                 |
| 10 Aberdeen Vision                                         | 29 Levenmouth Community Energy Project |
| 11 Hydrogen Bus Project                                    | 30 East Neuk Power to Hydrogen         |
| 12 HySeas I - III                                          | 31 Michelin Scotland Innovation Parc   |
| 13 HySpirits                                               | 32 Shetland Hub                        |
| 14 HyTrEc                                                  | 33 100% Green Hydrogen Hub             |
| 15 HyDIME                                                  | 34 Hydrogen Accelerator                |
| 16 SWIFTH2                                                 | 35 Aberdeen Hydrogen Hub               |
| 17 HyFlyer                                                 | 36 Cromarty Firth Hydrogen Hub         |
| 18 Stornoway hydrogen refueler                             | 37 Energy Transition Zone              |
| 19 Hydrogen refuelling station                             | 38 Outer Hebrides Local Energy Hub     |



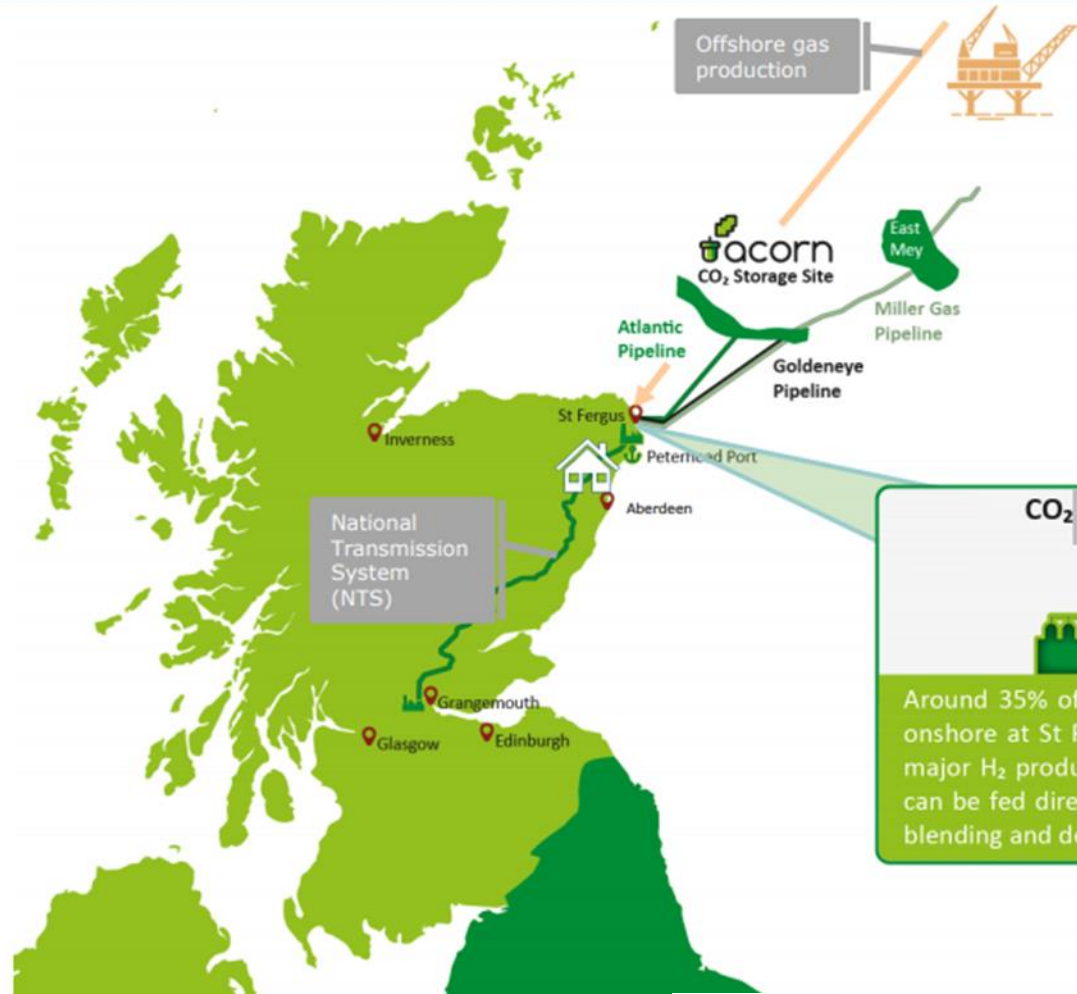
- KEY**
- Production
  - Transmission/distribution
  - End user
  - Multi-vector

The recent Scottish Hydrogen Assessment from the Scottish Government listed 38 hydrogen projects in Scotland

This presentation will look at those that are related to offshore wind or may have synergies with offshore wind as per the following:

- 01 Acorn Project
- 04 Dolphyn
- 08 H100
- 09 Future LTS Network

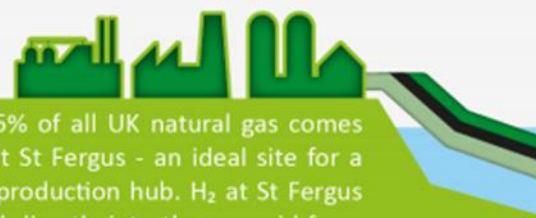
# 01 Acorn Project



A Blue Hydrogen and CCS project using depleted oil and gas assets for CO2 storage offshore

Scottish networks company, SGN, will inject a 2% hydrogen blend into their gas grid. They also plan to supply 100% hydrogen to the Aberdeen gas grid beyond 2030

**CO<sub>2</sub> H<sub>2</sub> Production Hub**



Around 35% of all UK natural gas comes onshore at St Fergus - an ideal site for a major H<sub>2</sub> production hub. H<sub>2</sub> at St Fergus can be fed directly into the gas grid from blending and decarbonising gas.



# 01 Acorn Project

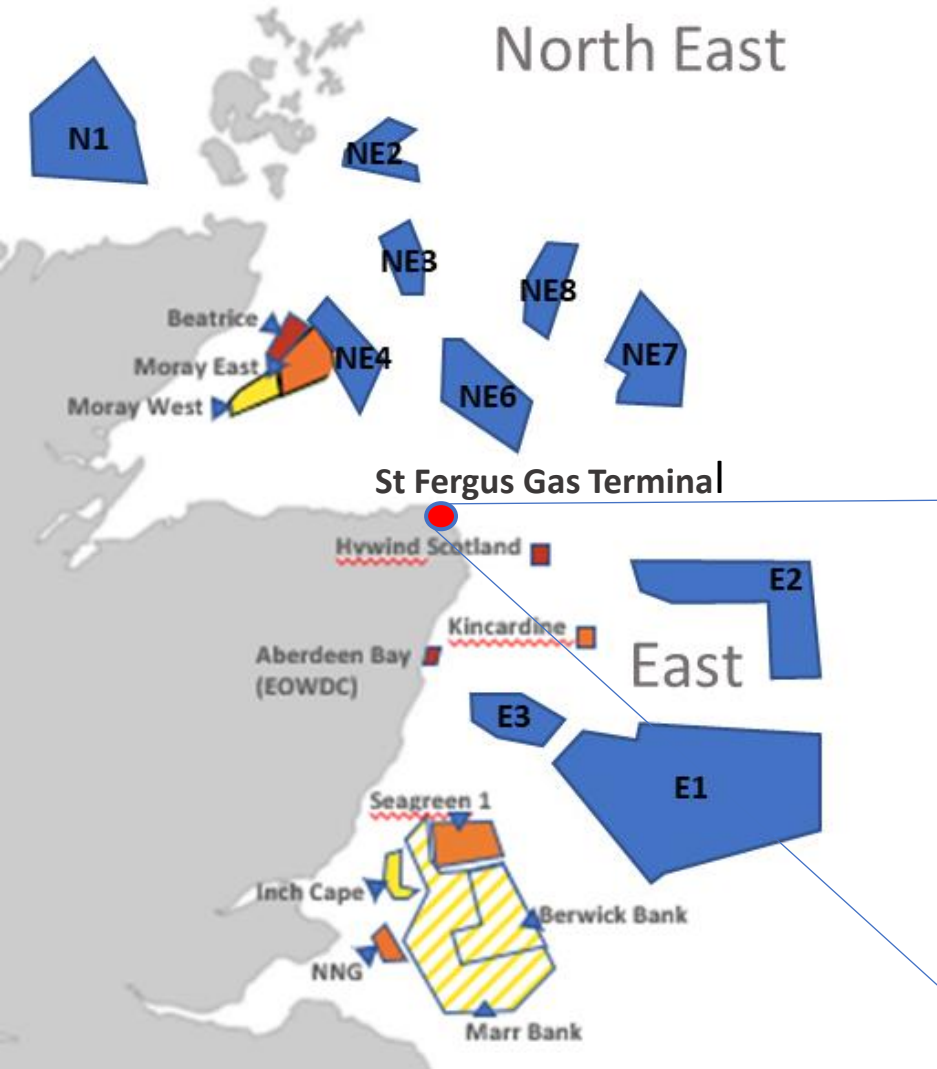
DeepWind is interested in the opportunity to for ScotWind offshore wind projects (NE4, NE6, NE& and NE8) to produce hydrogen offshore and use pipelines to deliver it to St Fergus Gas Terminal where the National Transmission System (UK Gas Grid) is located

The St Fergus industrial site is ideal for collocating green ammonia plant and LOHC infrastructure which can be exported from the near by Peterhead port

The Acorn project will have CO2 from the reformation of Natural Gas which could be used along with the green hydrogen to produce green methanol and jet fuel



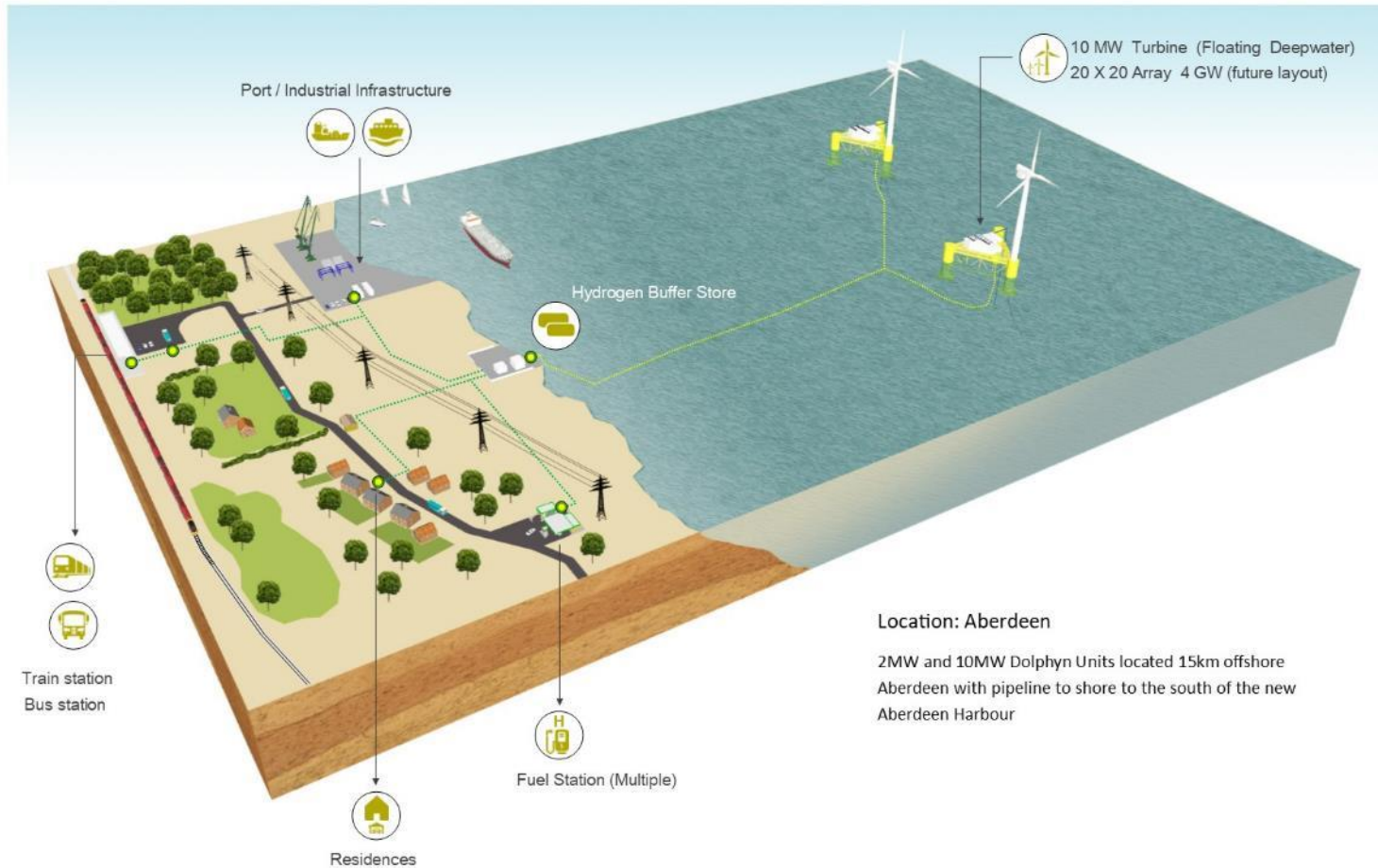
European Hydrogen Hub showing St Fergus which is a proposed node



# 04 Dolphyn

## ERM DOLPHYN Hydrogen Project

### Schematic for Deepwater Offshore Production of Hydrogen



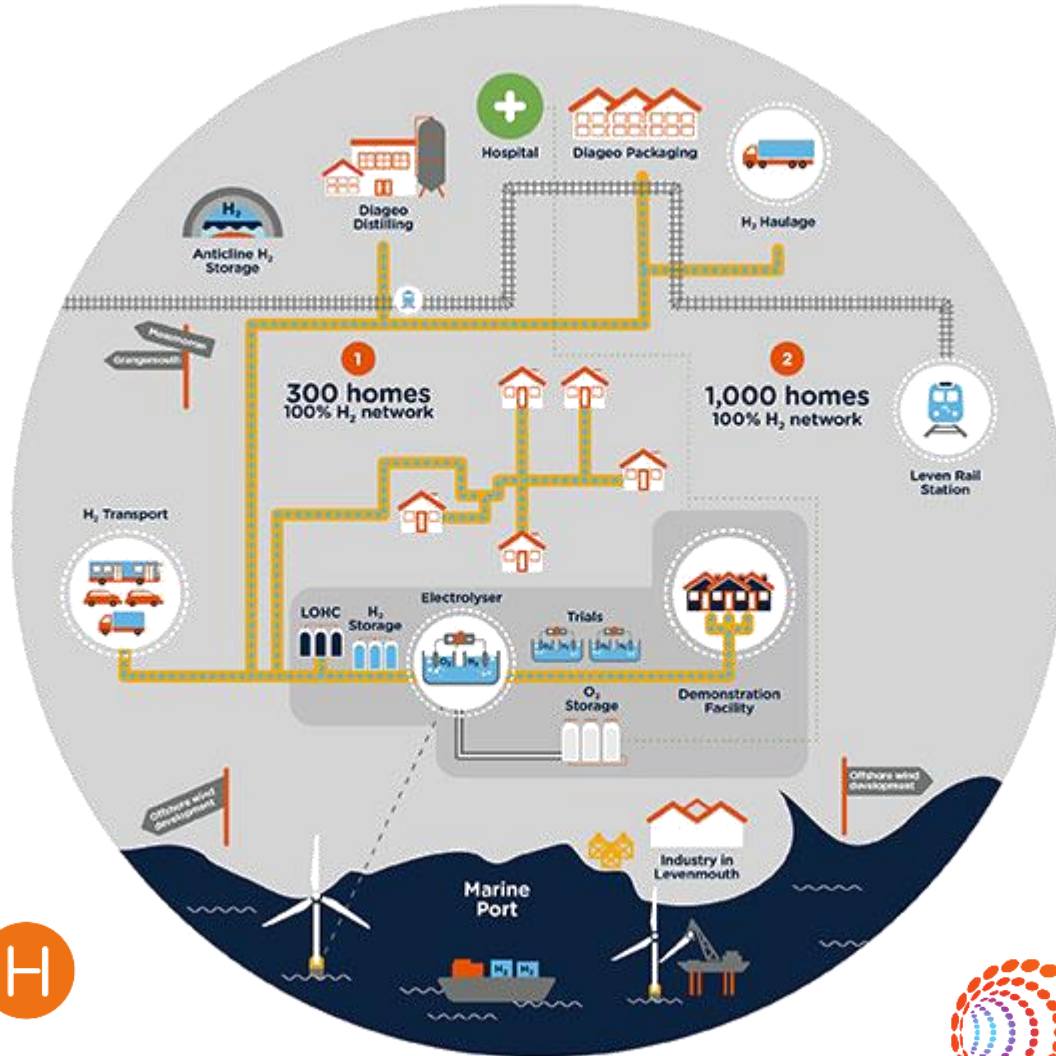
© Copyright 2019 by ERM Worldwide Limited

The Dolphyn project proposes to use a floating wind system with offshore desalination and electrolysers on the substructure to produce hydrogen. The plan is to use a subsea hydrogen pipeline back to shore and Aberdeen has now been selected as the land fall site.

DeepWind member ERM have carried out a concept and FEED study for the first 2MW system and will now proceed to FID later this year to deliver the prototype in 2024.

They plan to follow up with a commercial scale 10MW platform by 2027.

08 H100



Scottish gas network company, SGN, will deliver the world's first 100% hydrogen domestic gas grid in the Fife coastal town of Levenmouth. Phase 1 will involve 300 homes with delivery by 2022.

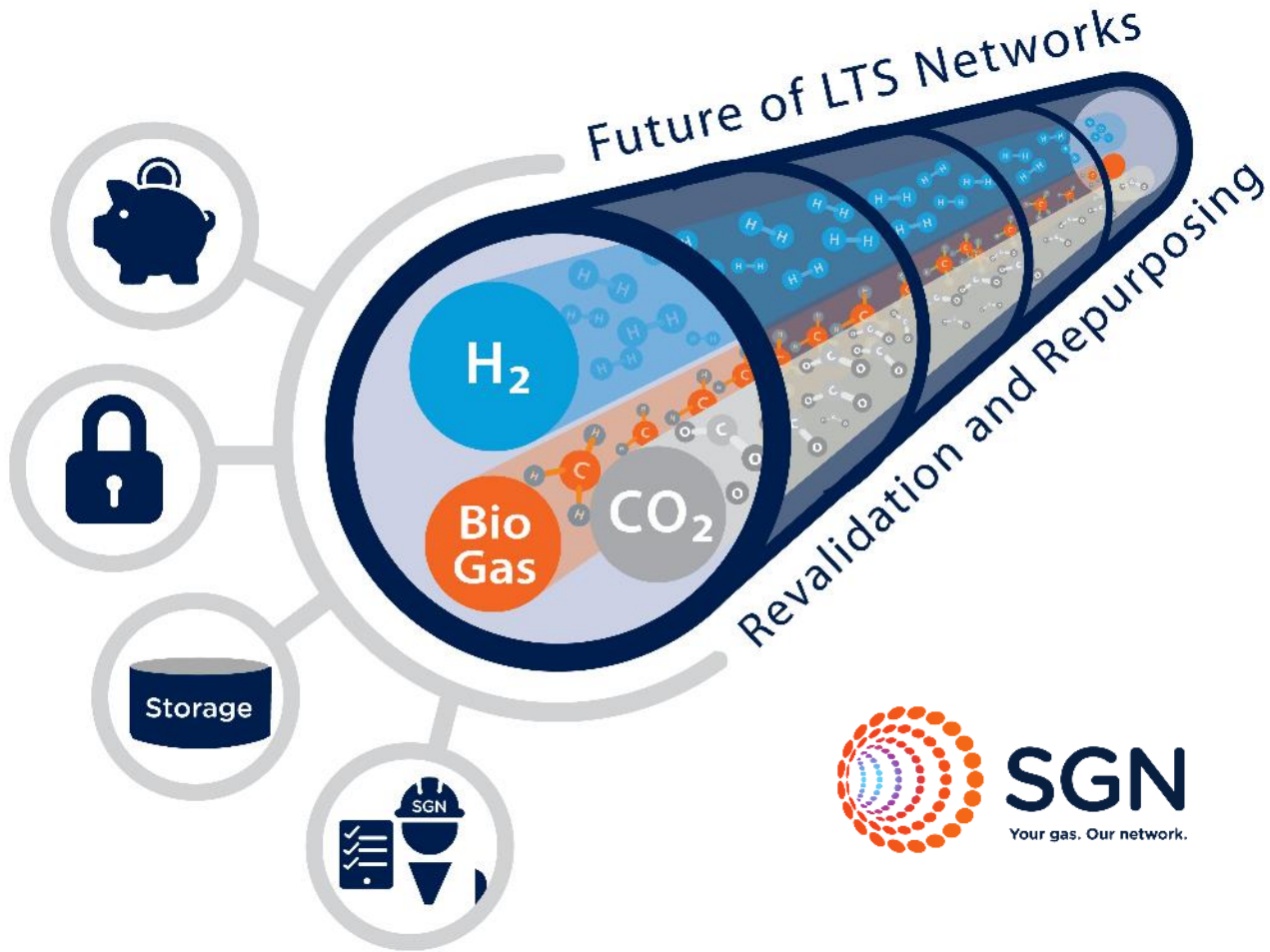
Phase 2 will increase this to 1,000 homes

The green hydrogen will be supplied by electrolyzers powered by a 7MW offshore wind turbine.

Hydrogen storage and a demonstration facility will also feature in the project.



## 09 Future LTS Network



Gas network company, SGN, manages much of the gas transmission infrastructure in Scotland.

They operate over 3,100km of Local Transmission Systems (LTS) which are high pressure pipelines

SGN are now looking at adapting the LTS networks to carry pure hydrogen, hydrogen blends and CO<sub>2</sub>

The LTS Future project will look at this from both a technology and regulatory angle. Their initial assessment found that 91% of the LTS can carry 100% hydrogen. A more in-depth investigation of each pipeline and asset's data records is underway to help understand their suitability and risk profile.





# UKCS Energy Integration – Hydrogen Hubs

### Northern Scotland and Islands

- Electrification of new O&G developments
- Blue H<sub>2</sub> and CCS
- Windpower expansion and Green H<sub>2</sub>
- Leveraging O&G terminals and other infrastructure

### Central Belt of Scotland

- Carbon capture from industrial cluster and transport to storage facilities
- Blue H<sub>2</sub> production from natural gas

### East Irish Sea

- Carbon capture from industrial cluster and transport to storage facilities
- Blue H<sub>2</sub> production from natural gas
- O&G and windpower synergies, including Green H<sub>2</sub>

21TWhs of demand

Shetland

Orkney

Moray Firth

### Moray Firth & North East Scotland:

- Electrification of a large O&G province
- Strong windpower expansion driving synergies with O&G and Green H<sub>2</sub>
- CCS and blue H<sub>2</sub> at St Fergus

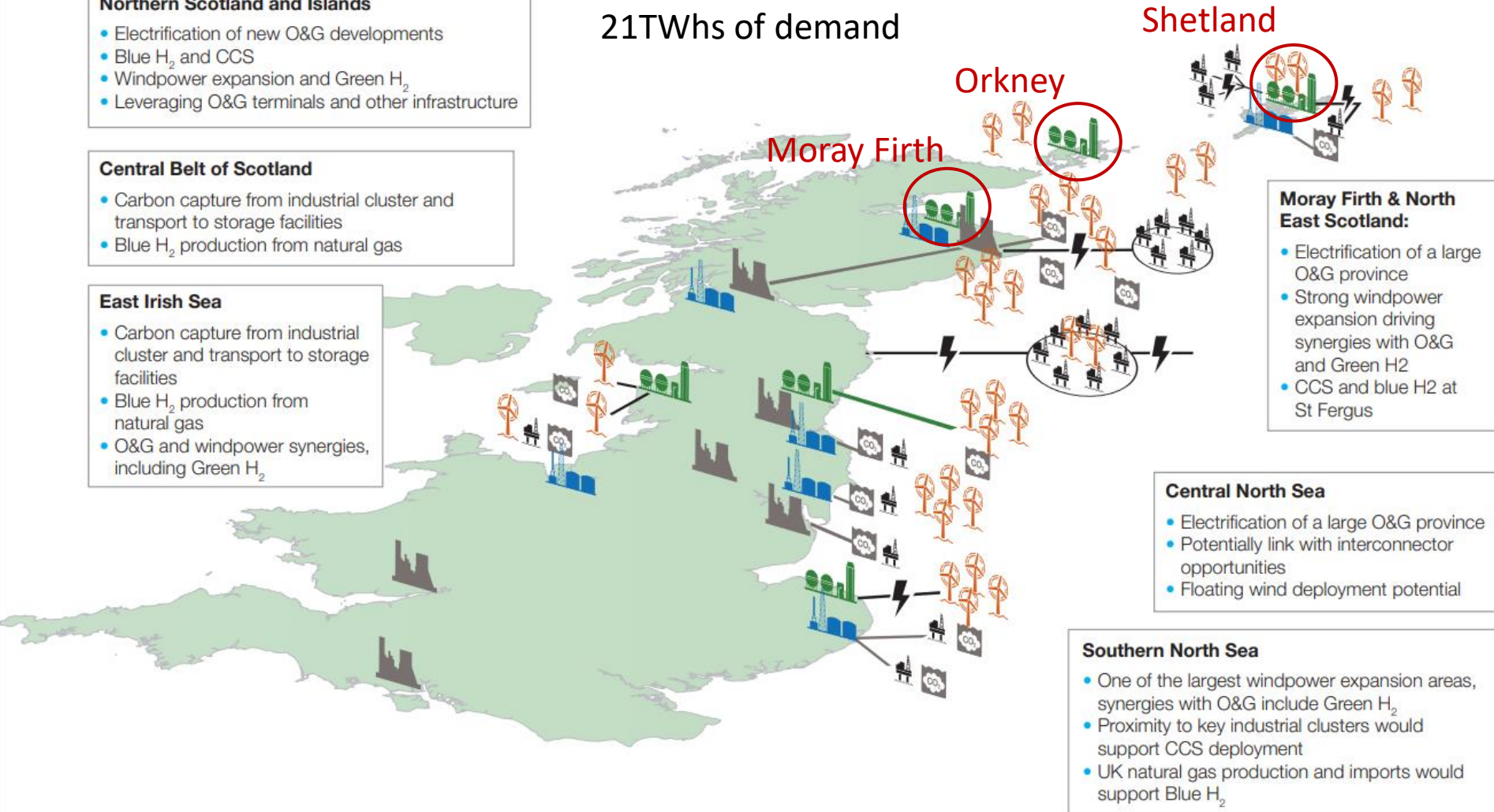
### Central North Sea

- Electrification of a large O&G province
- Potentially link with interconnector opportunities
- Floating wind deployment potential

### Southern North Sea

- One of the largest windpower expansion areas, synergies with O&G include Green H<sub>2</sub>
- Proximity to key industrial clusters would support CCS deployment
- UK natural gas production and imports would support Blue H<sub>2</sub>

| Legend |                                  |
|--------|----------------------------------|
|        | O&G platforms                    |
|        | Offshore cables and ring-mains   |
|        | Onshore decarbonisation clusters |
|        | CO <sub>2</sub> storage capacity |
|        | Blue hydrogen reformers          |
|        | Windpower expansion              |
|        | Green hydrogen electrolyser      |

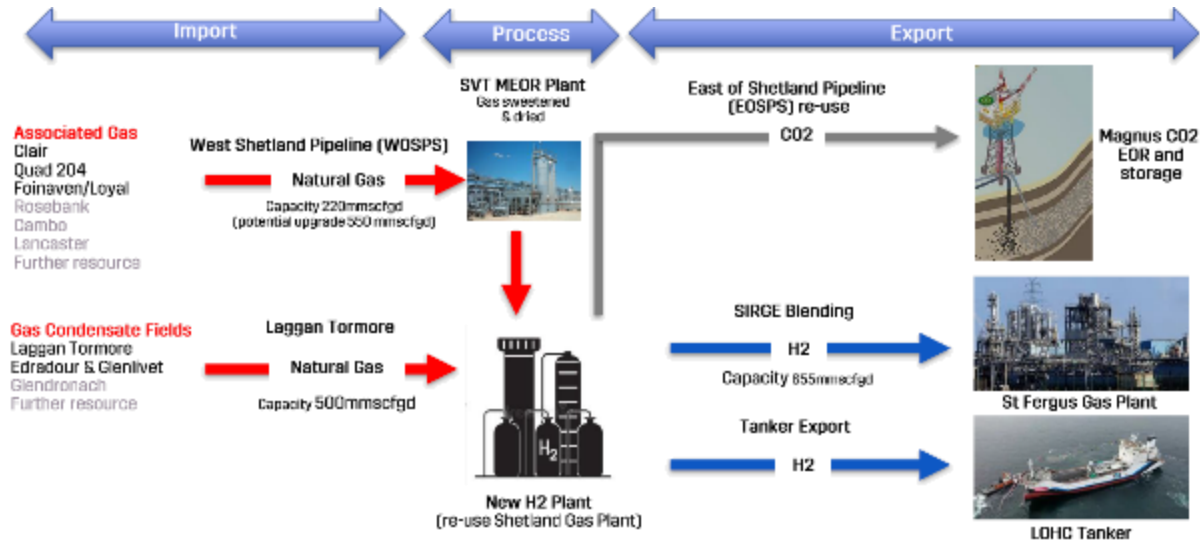


An additional 5-6GW of offshore wind by 2035?



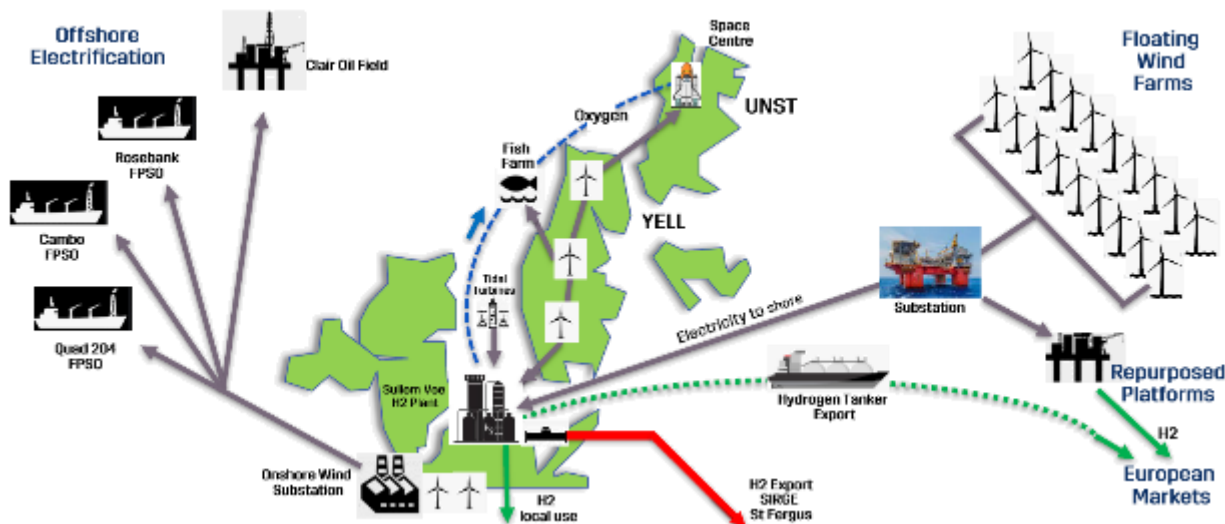
# ORION Project – Shetland Hub

## Opportunity Renewables Integration Offshore Networks



### Blue Hydrogen

- Shetland Island Council and the OGTC are working together in partnership with industry to develop an energy island
- Electrification of offshore using a combination of onshore and offshore wind
- Produce clean fuels on Shetland to replace imported fossil fuels
- Harness offshore wind to develop green hydrogen at scale for export
- Repurpose onshore infrastructure to develop both green and blue hydrogen
- Utilise the skills and experience of a highly competent workforce



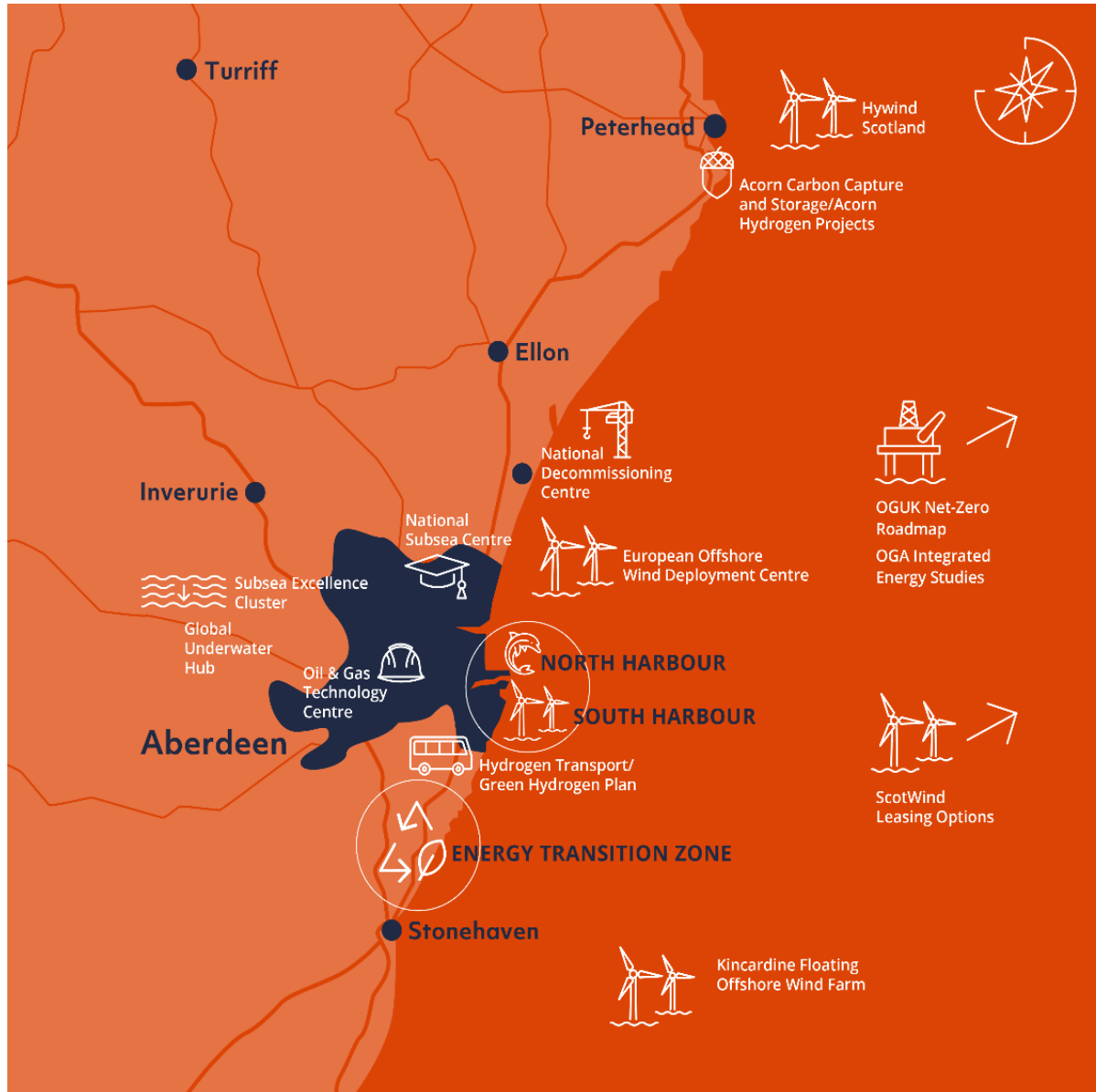
### Green H2 & Electrification

# Cromarty Hydrogen Hub



- Opportunity Cromarty Firth is a public private partnership body looking at a regional Hydrogen Hub project
- They have identified the demand for green hydrogen across the various industries in the area
- While the initial plan is to utilise onshore wind to produce this green hydrogen they are looking to offshore wind projects in the Cromarty Firth to achieve scale for future exports of hydrogen from the 3 ports in the area
- The plan is to deliver a central electrolyser bank to be powered by offshore wind

# Aberdeen Hydrogen Hub



- Aberdeen City Council have decided to expand on the success of their hydrogen bus project with the creation of a new Aberdeen Hydrogen Hub
- The Aberdeen Hydrogen Bus project, which now includes 10 double decker buses, a world first, over and above the original 10 buses is the largest hydrogen fleet in the UK
- A new Energy Transition Zone will also host companies looking at decarbonising offshore oil and gas facilities
- The Hub aims to deliver a large-scale hydrogen production facility from renewable energy to decarbonise transport, heat, and industrial sectors
- One of the projects that could supply renewable H<sub>2</sub> to the hub will be ERM's floating wind to hydrogen Dolphyn project

# Food for thought?

- Huge amount of offshore wind required by 2045 to deliver Scottish Government's 25GW H<sub>2</sub> target for 2045
- Even if we have 3 ScotWind rounds of 10GW each with the 3<sup>rd</sup> in 2025 can we build it all in time?
- The Contract for Difference scheme is for 15 years after that time, in 2033-2045, we could see wind farms (onshore and offshore) switching to hydrogen production if it offers a steady market price – unlike a merchant electricity operation
- In order to reach Government H<sub>2</sub> goals for 2045 we also need to consider increasing projects scale to 5-10GW per project
- We need H<sub>2</sub> projects of scale to come out of the current ScotWind round to begin to build the necessary industry in Scotland

# Future Hydrogen calls John Sinclair



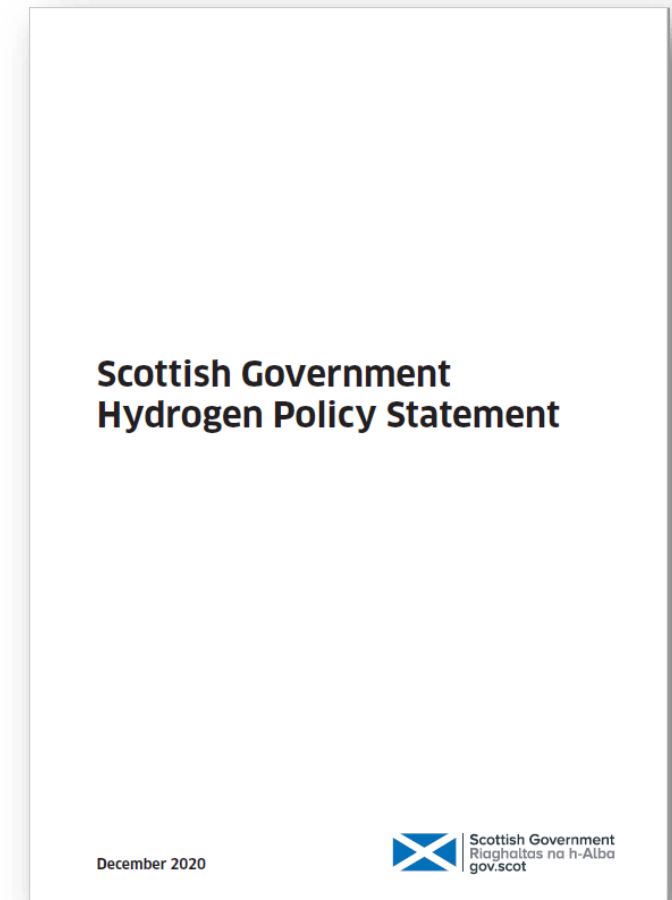
# Future Hydrogen Calls

John Sinclair

18.02.2021

# Hydrogen Policy Statement

- Scottish Government's Hydrogen Policy Statement introduced the 5GW target by 2030
- It also introduced the **£100 million** funding to boost excellence in research, innovation development and demonstration of secure, low-cost clean hydrogen production between 2021 and 2026.
- This new fund, £20m per annum, will kick off with the publication of the Scottish Hydrogen Action Plan in early Spring
- The P2X Subgroup needs to be ready to respond



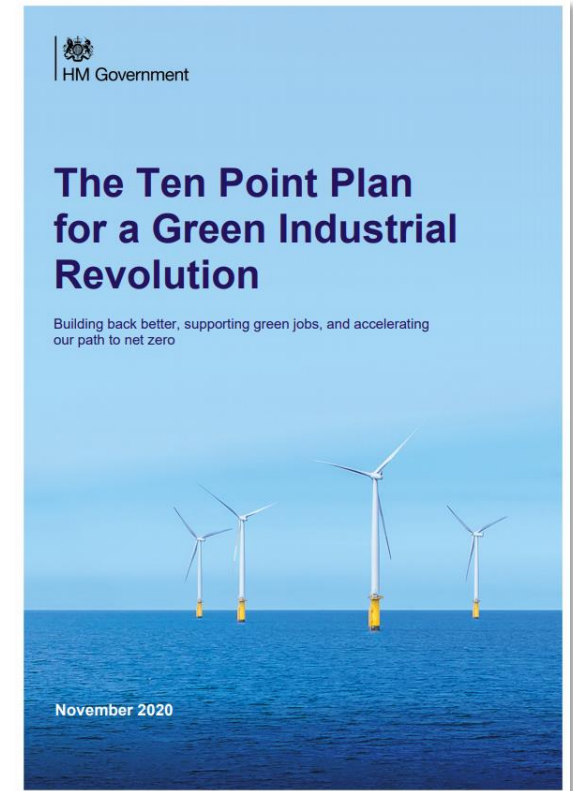


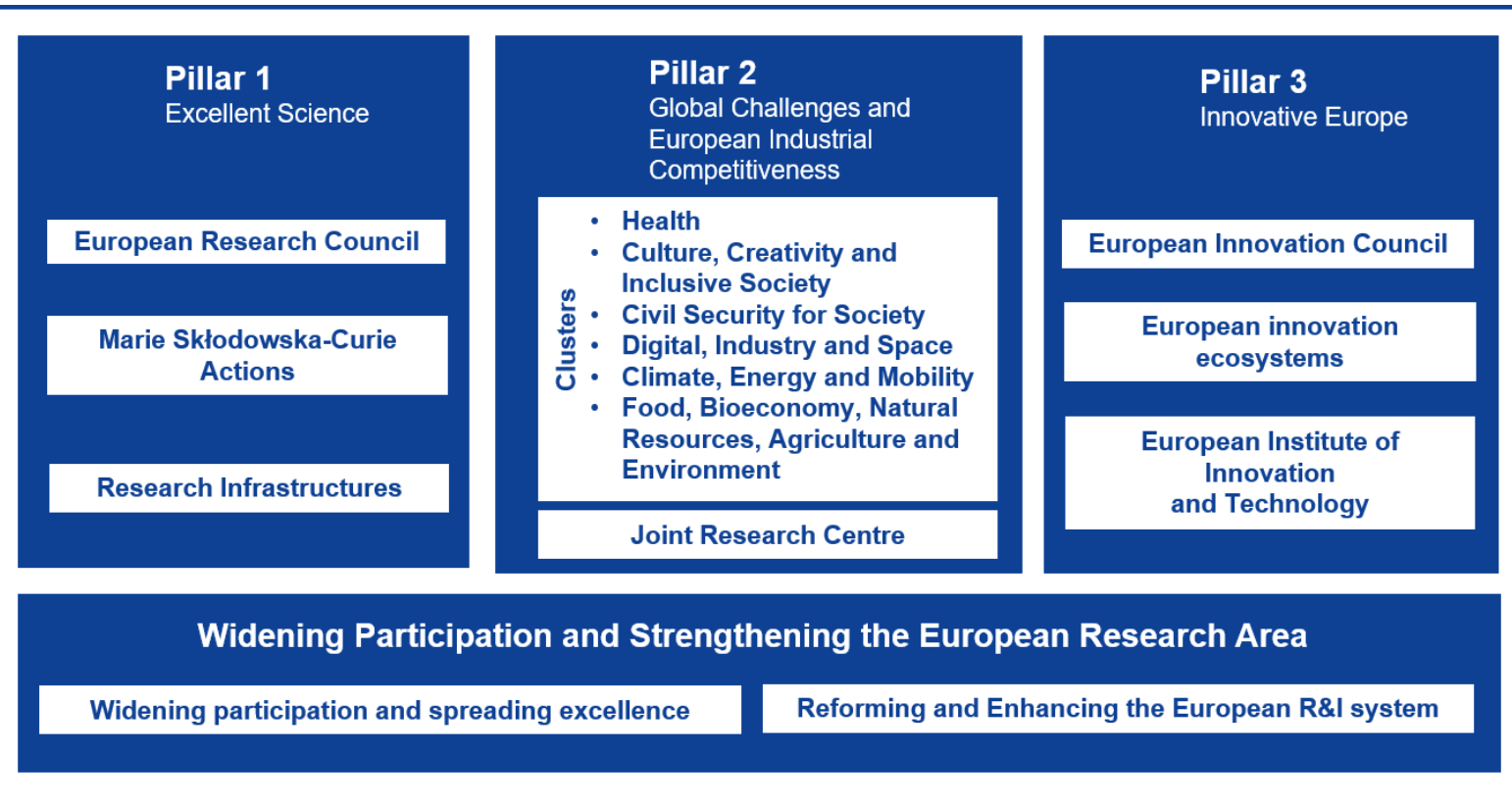
# Ten Point Plan

- Ten Point Plan – Point 2: Driving the Growth of Low Carbon Hydrogen – 5GW production capacity by 2030
- Hydrogen Economy Team - Rita Wadey, Deputy Director
- Hydrogen Advisory Council, co-chaired by Shell – includes DeepWind members SSE, Orsted, Equinor and BP
- UK Hydrogen Strategy due in early Spring including a **£240 million Net Zero Hydrogen Fund**
- A recent report for BEIS highlighted a key driver would be the introduction of a Contracts for Difference scheme for hydrogen with a suitable Strike Price
- The P2X Subgroup needs to be ready to respond



Department for  
Business, Energy  
& Industrial Strategy





- Horizon Europe calls will open in April 2021
- Pillar 2 – Global Challenges and European Industrial Competitiveness - Climate, Energy and Mobility
- Will run from 2021-2027
- UK companies can lead bids
- Offshore Wind, Hydrogen and Mesh Grid calls

- **C5-D3-RES-02-2021: Next generation of renewable energy technologies**

Contribution per project **EUR 3m**

The production of renewable hydrogen directly from renewable energy sources is within the scope of the topic.

- **C5-D3-RES-63-2022: Renewable energy carriers from variable renewable electricity surplus and carbon emissions from energy consuming sectors**

Contribution per project **EUR 9m**

The incorporation of hybrids of renewable electricity with algal or synthetic renewable fuels in energy intensive sectors by integrating the conversion of surplus renewable electricity and carbon emissions from these sectors to liquid renewable energy carriers by algal, artificial photosynthesis or homologous non-solar pathways will be demonstrated.

- **C5-D3-RES-65-2022: Direct renewable energy integration into process energy demands of the chemical industry**

Contribution per project **EUR 3-5m**

technology developments must directly target renewable energy integration into process energy demands of the chemical industry beyond electricity

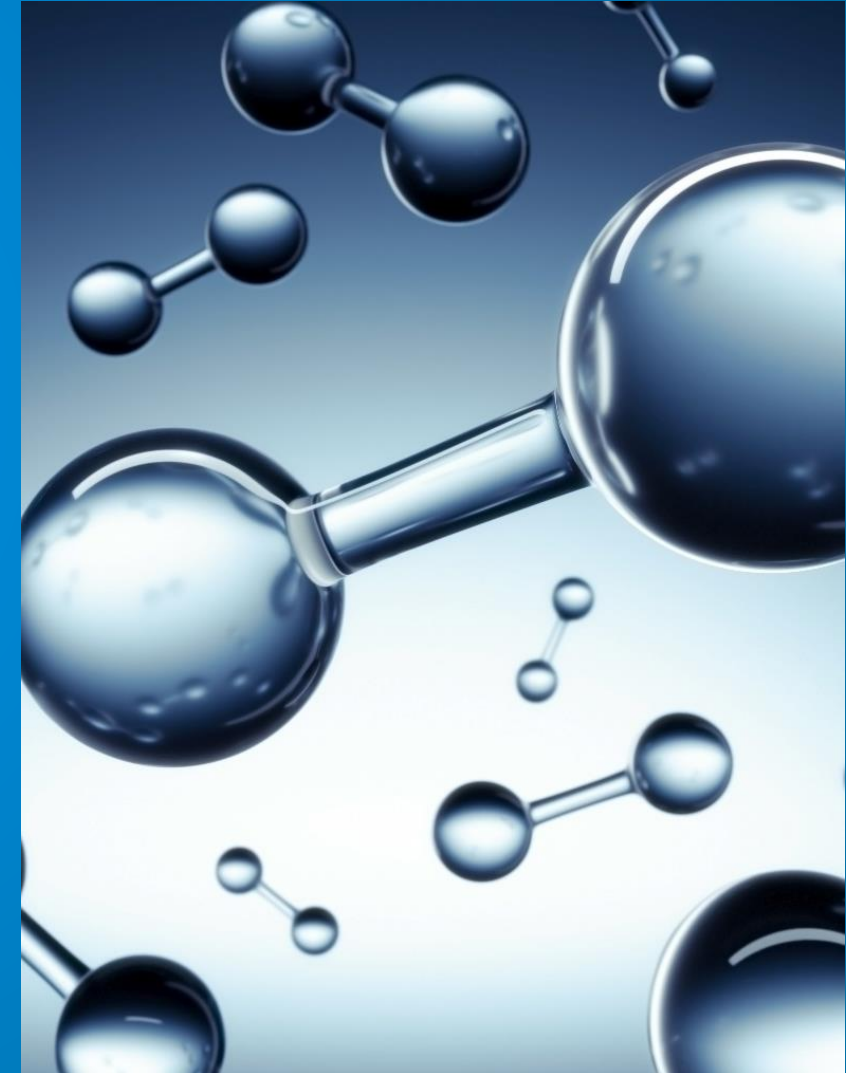
- **C5-D3-ESGS-13-2022: Demonstration of innovative forms of storage and their successful operation and integration into innovative energy systems and grid architectures**

Contribution per project **EUR 8-9m**

The demonstrated technologies should include interfaces for connecting with existing infrastructure, e.g. of hydraulic systems for innovative hydropower or **the use of natural gas storage sites for hydrogen** or biomethane storage, or abandoned infrastructure such as mines, or storage solutions in district heating networks.

## Subgroup models for bidding into projects?

- **Creation of consortia and partnerships? – key result from poll**
- SPV for taking forward collaborative projects?
- How to bid into EU calls? - DeepWind's developer group represents 8 Member States and 1 Associate Member which should help with EU call criteria
- Utilise our collaborations with other European clusters e.g. WAB (Germany), Norwegian Offshore Wind Cluster and Wind'Occ (France), to form EU partnerships?



# Discussion Forum