



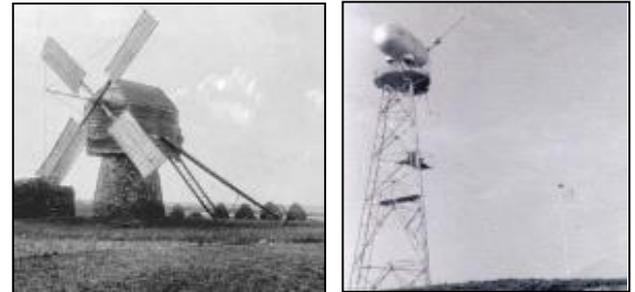
Orkney:

Pushing decarbonisation from the edge.

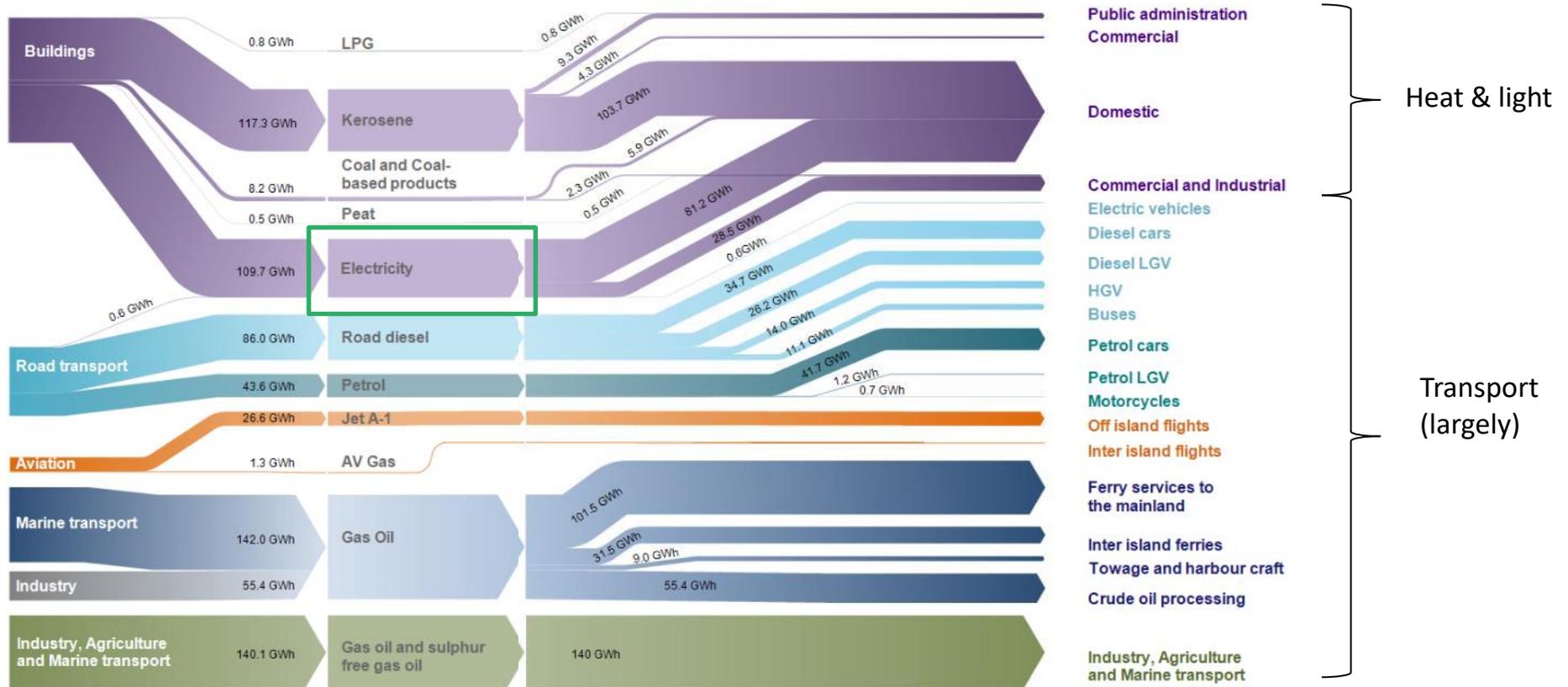
Neil Kermode
Managing Director

Orkney's Energy history

- Wind, hydro, tide and biomass all used in the past.
- Early “electro-aero generators” tested in Orkney 1950s & 1980s
- Flotta Oil Terminal - 10% of the UK's oil since 1974
- World's largest wind turbine 1984-97 (3MW)
- 1990s: UK's highest CO₂/person
- 1998: Orkney Renewable Energy Forum
- 2000+ Embraced set up of EMEC and pushed on with wind development
- 2013 Became net electricity exporter

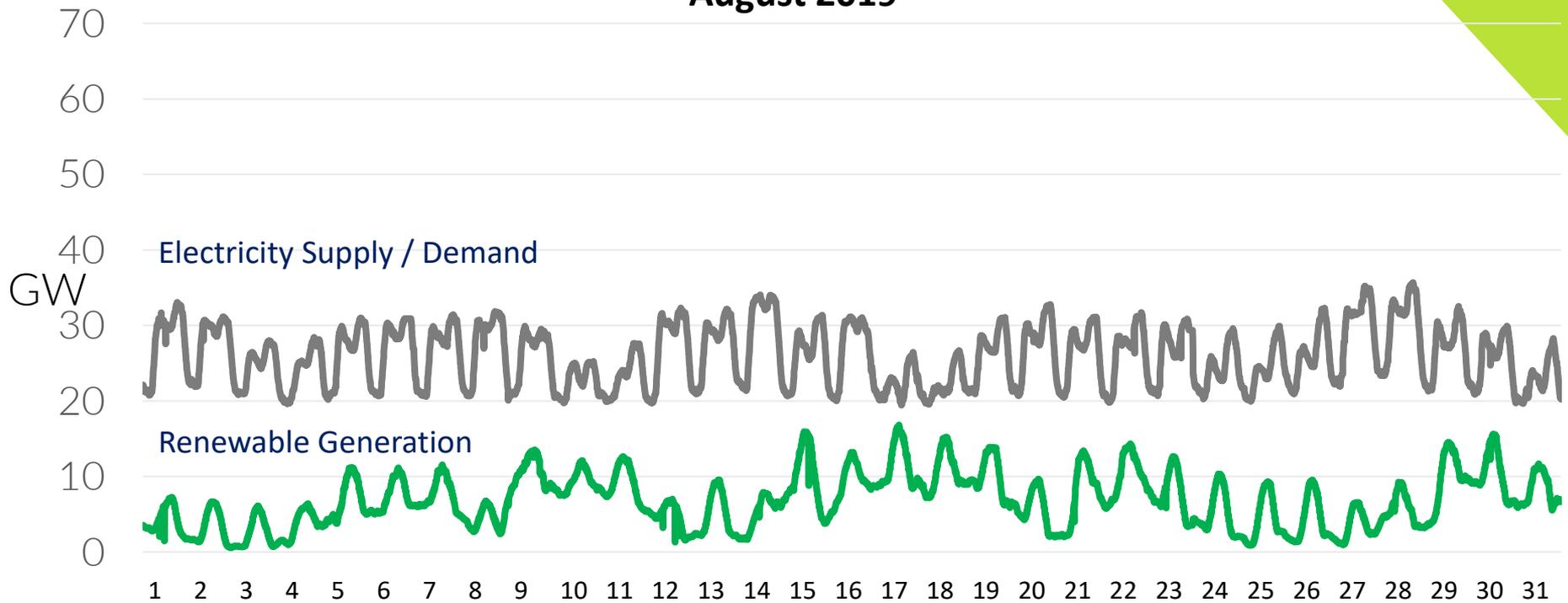


Orkney Energy 2019



UK electricity system - today

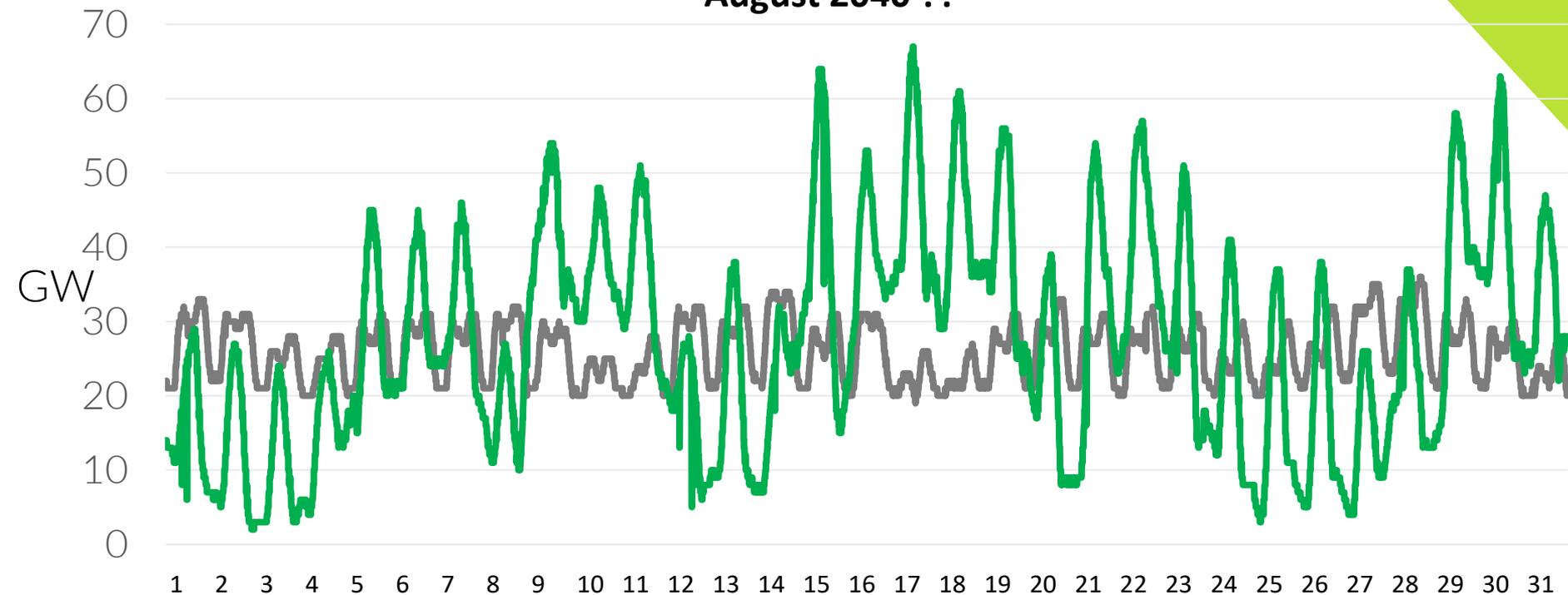
August 2019



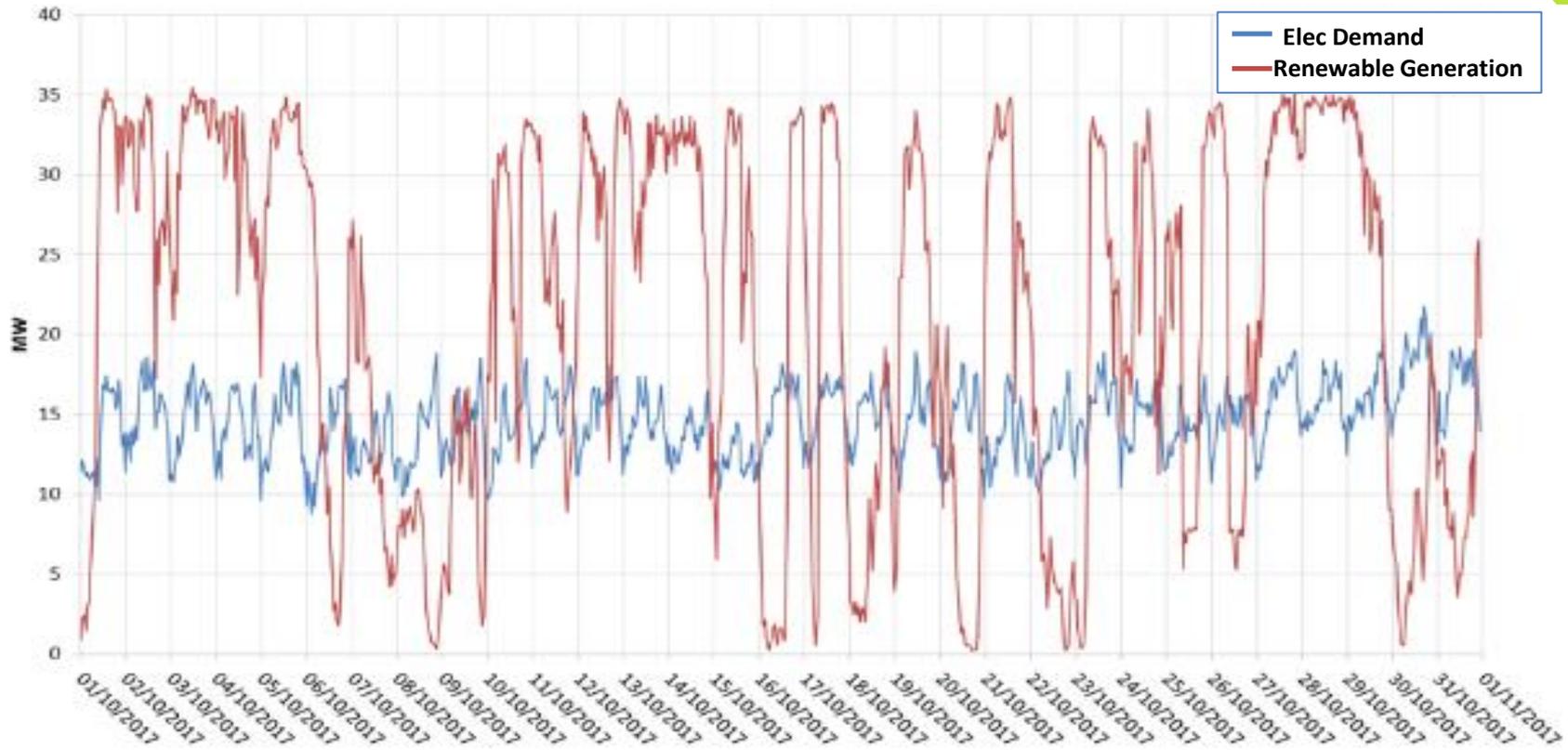
UK electricity system – 2040

(4x current renewables)

August 2040 ??

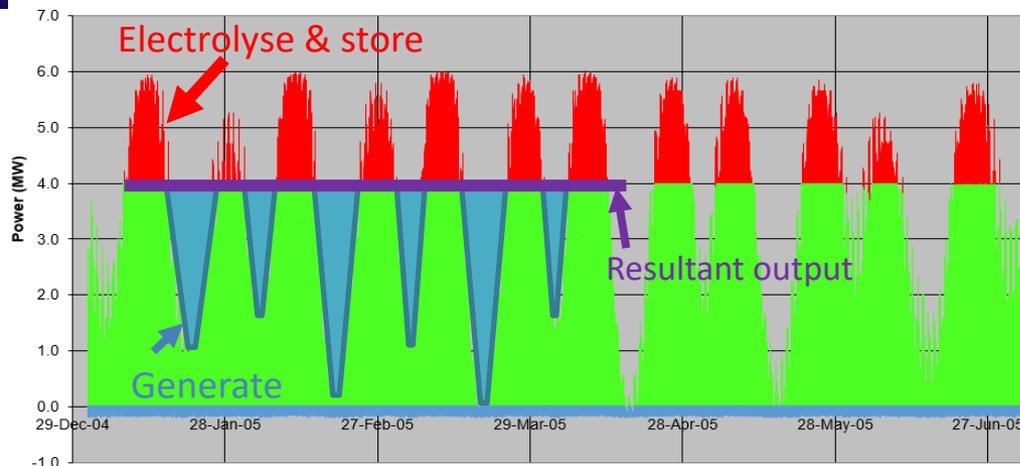


Orkney electricity system – today

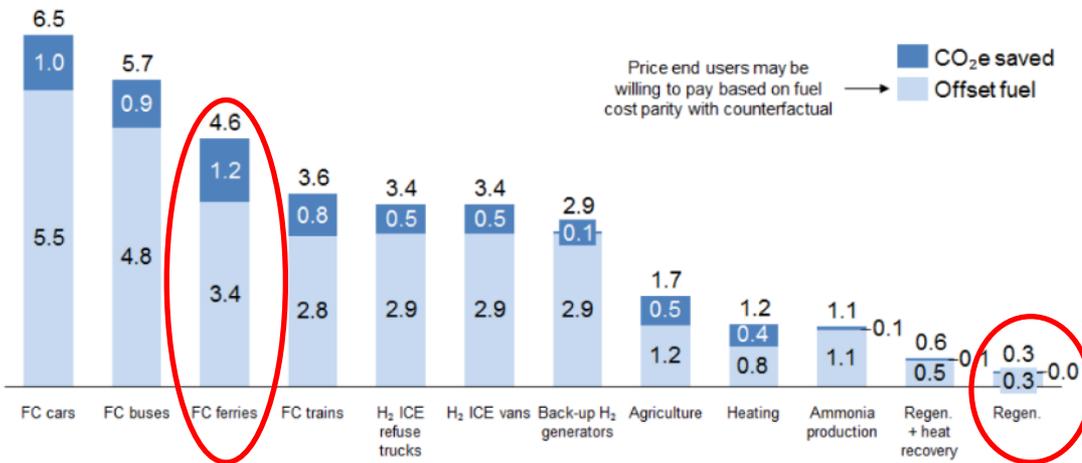


Hydrogen as storage?

16MWh of diesel
a day

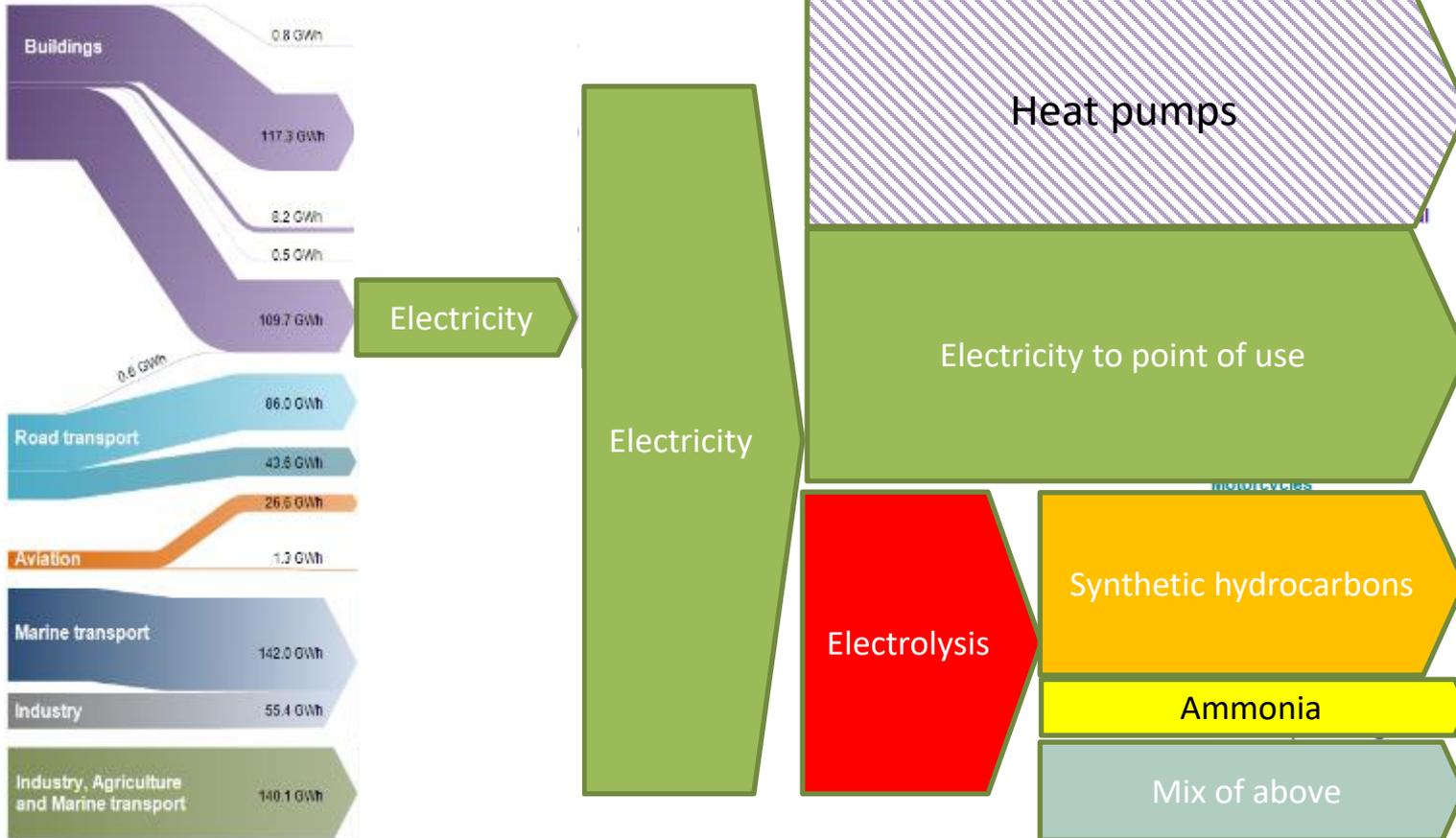


Value of hydrogen at point of use by application area (£/kg)



Source: Xodus/Element Energy study, 2016

Orkney Energy 2030?



Not strictly to scale

Eday tidal substation



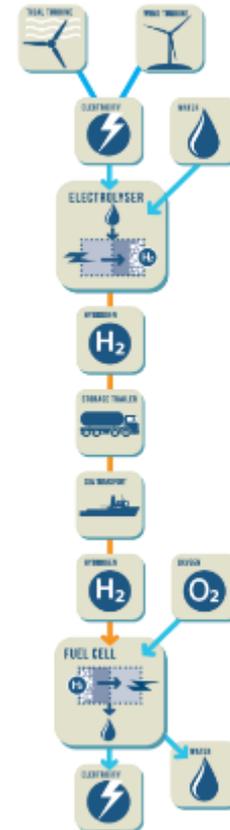
Surf n Turf - BigHit



CENTRE LTD



THE SURF 'N' TURF CONCEPT



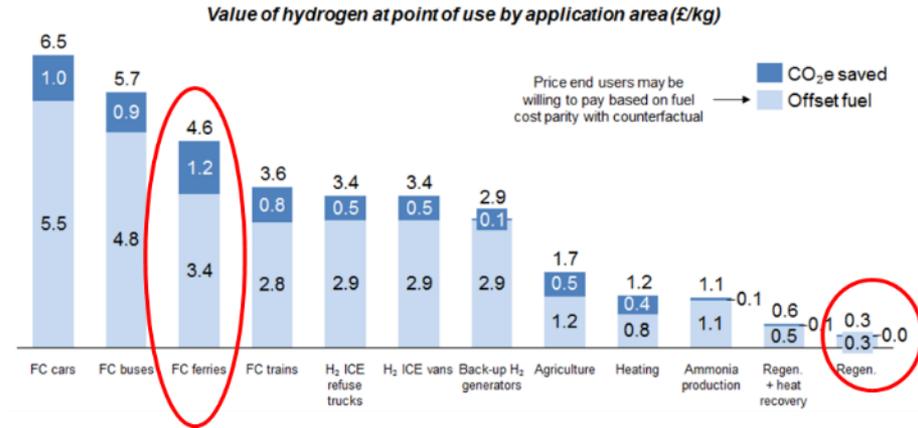
HyDime project -MV Shapinsay



Hydrogen knowledge



Production



Value



Storage and transport



Supply

HyFlyer 1 & 2

- **HyFlyer I - ZeroAvia** develops and integrated the hydrogen-electric powertrain;
- **EMEC** commissioned mobile H₂ infrastructure;
- **HyFlyer II** set to commercialise 19-seater.



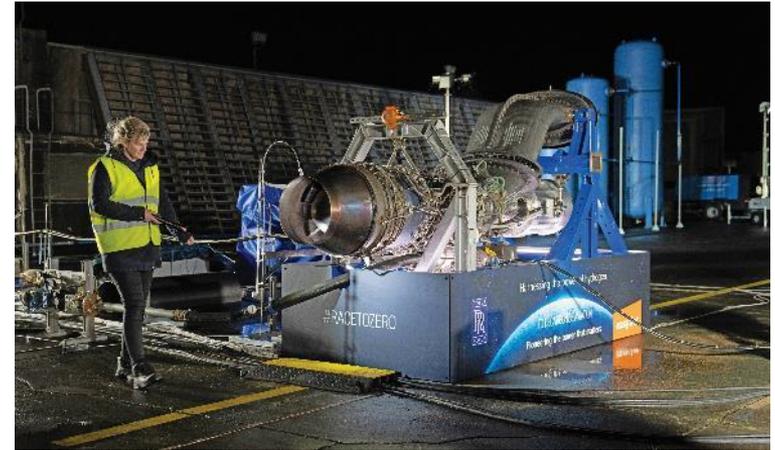
UK's First Commercial-Scale
Electric Flight



Refueller

Rolls Royce

- **Green hydrogen** used to fuel the ground test of a Rolls-Royce jet engine.

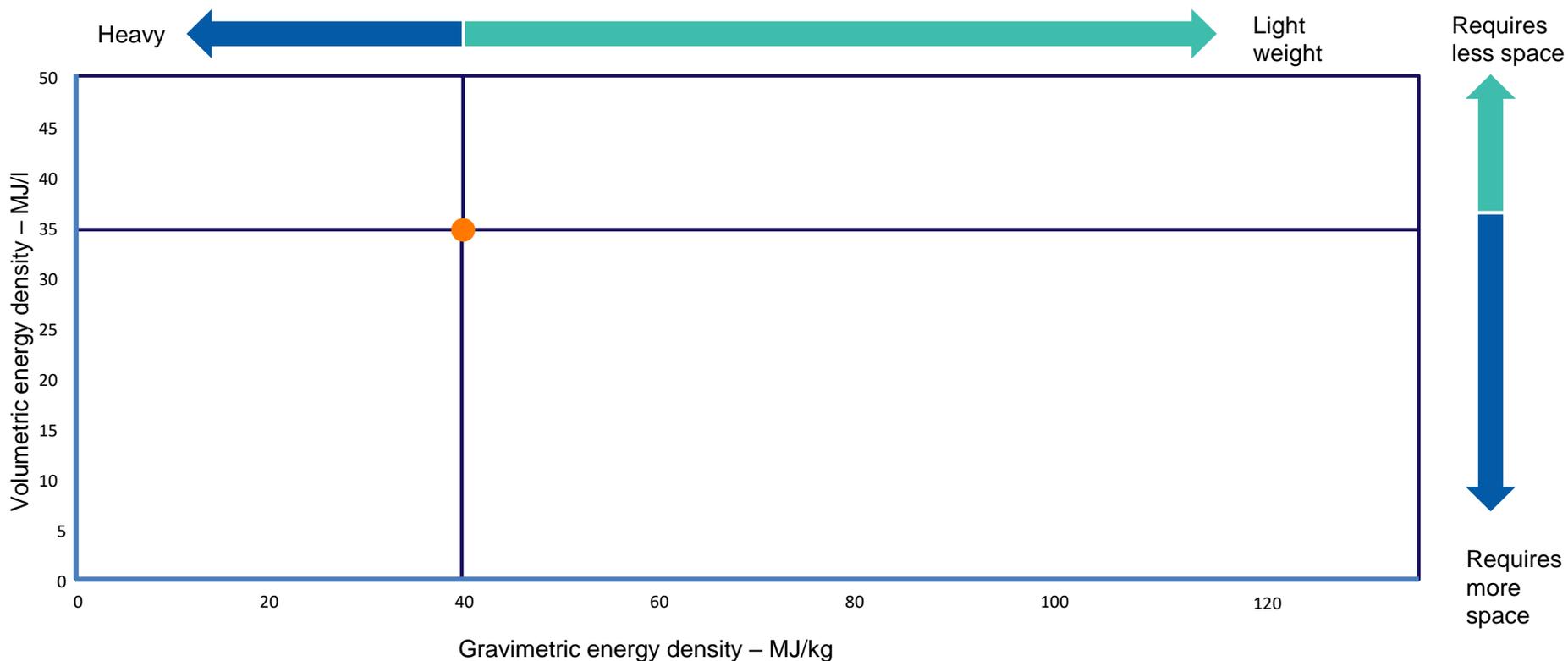


IGTL

- Demonstrated the creation of synthetic gasoline;
- Temporary plant installed onshore at EMEC's wave test site;
- EMEC supplied H₂ produced from water by electrolysis;
- Royal Air Force used gasoline for their first synthetic fuel flight.

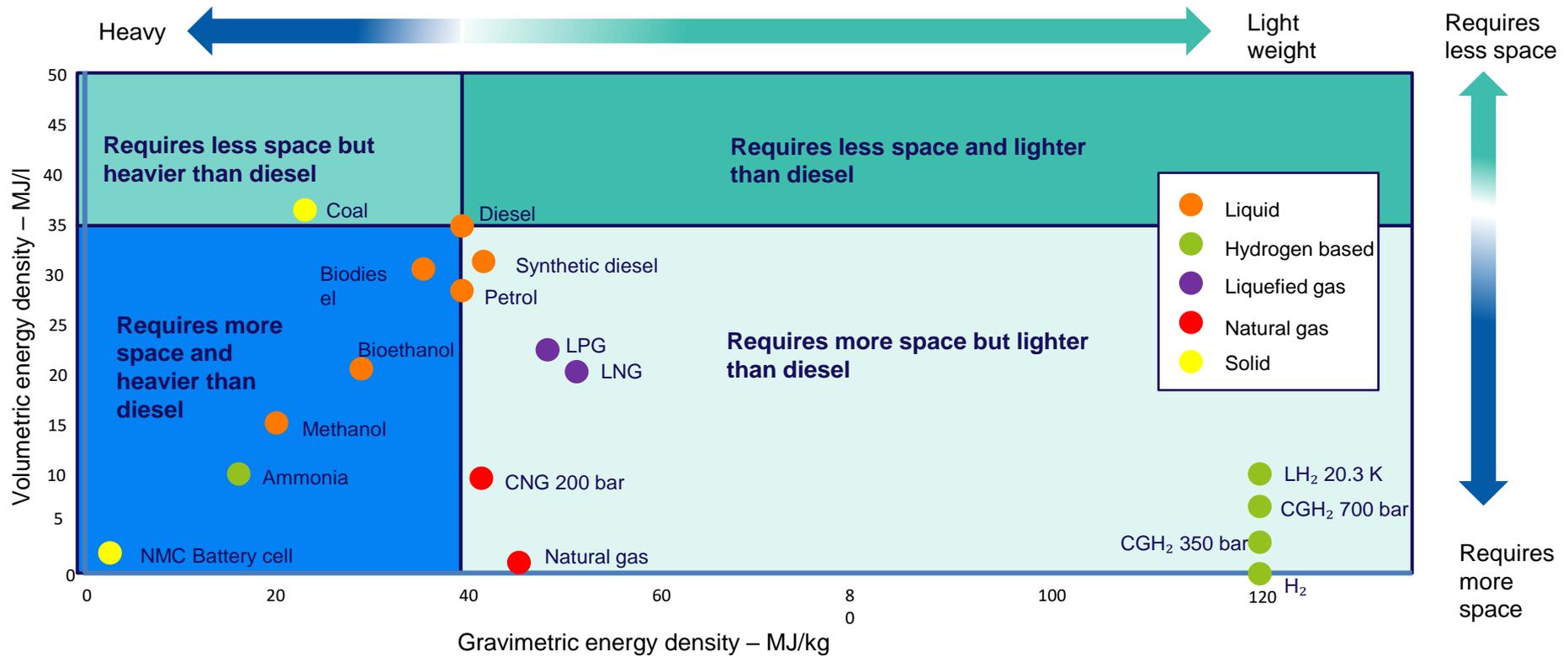


Chemistry: Diesel/Kerosine

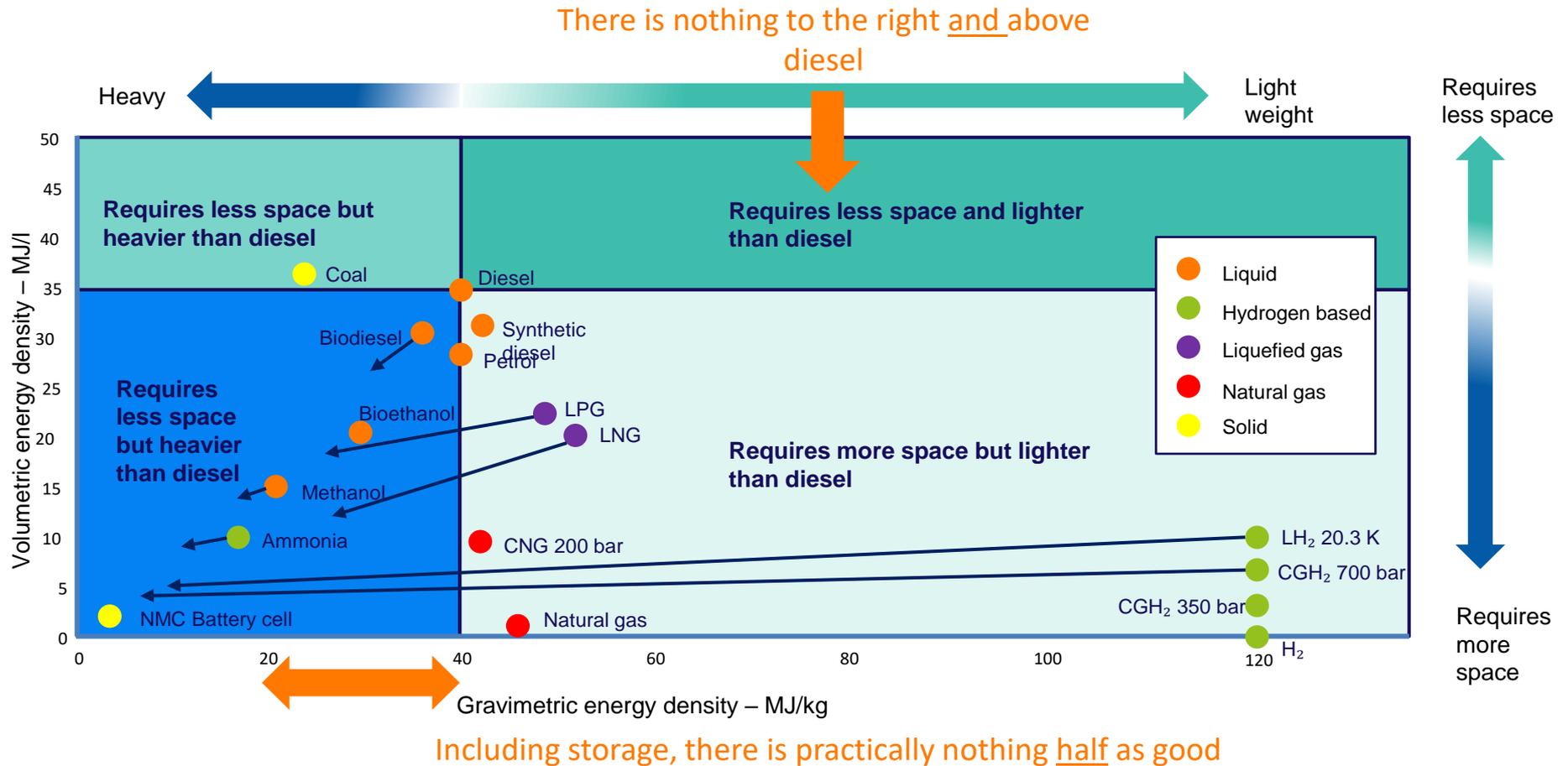


Original source material & graphics: DNV

Diesel/Kerosine



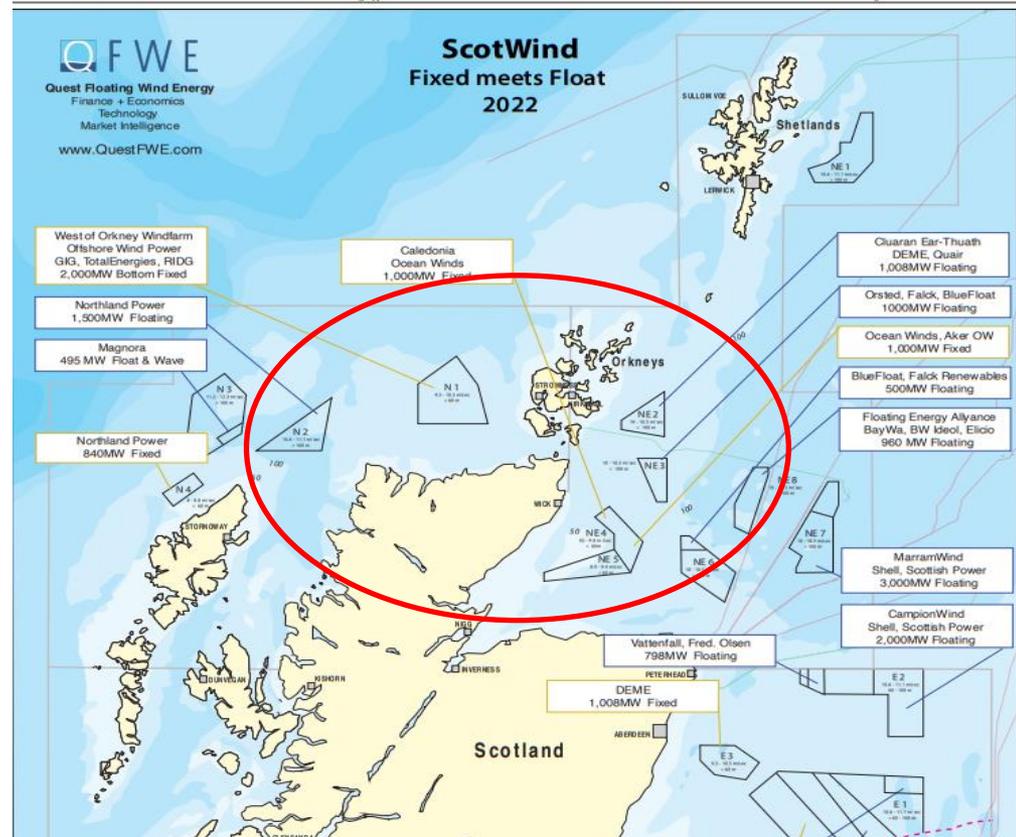
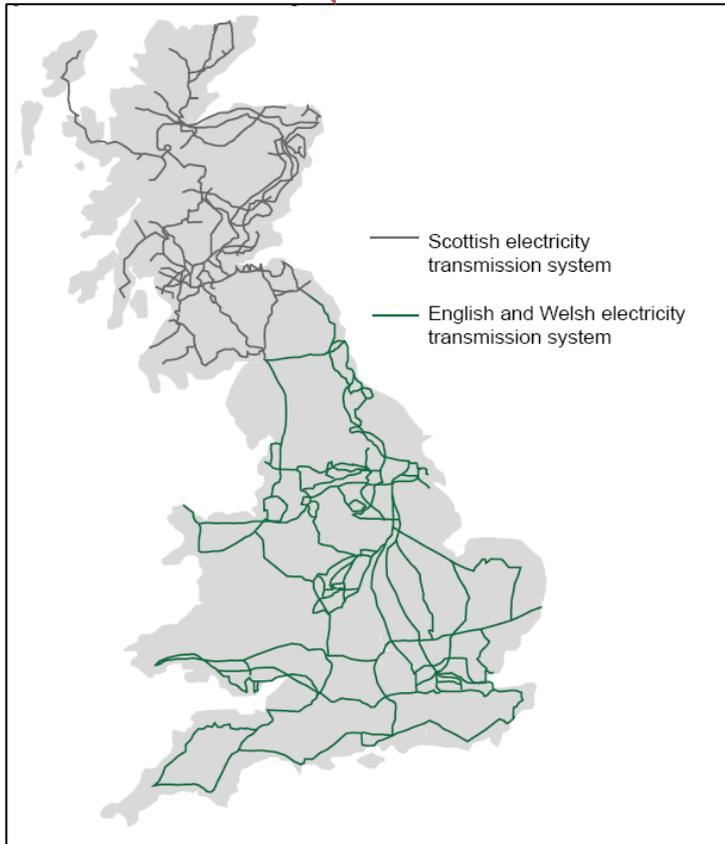
The alternatives



Changing Energy



Not even on the map!



Online 36.5GW

Coming 25GW

Gridwatch 28/3/22 20:11

Flotta Hydrogen Hub

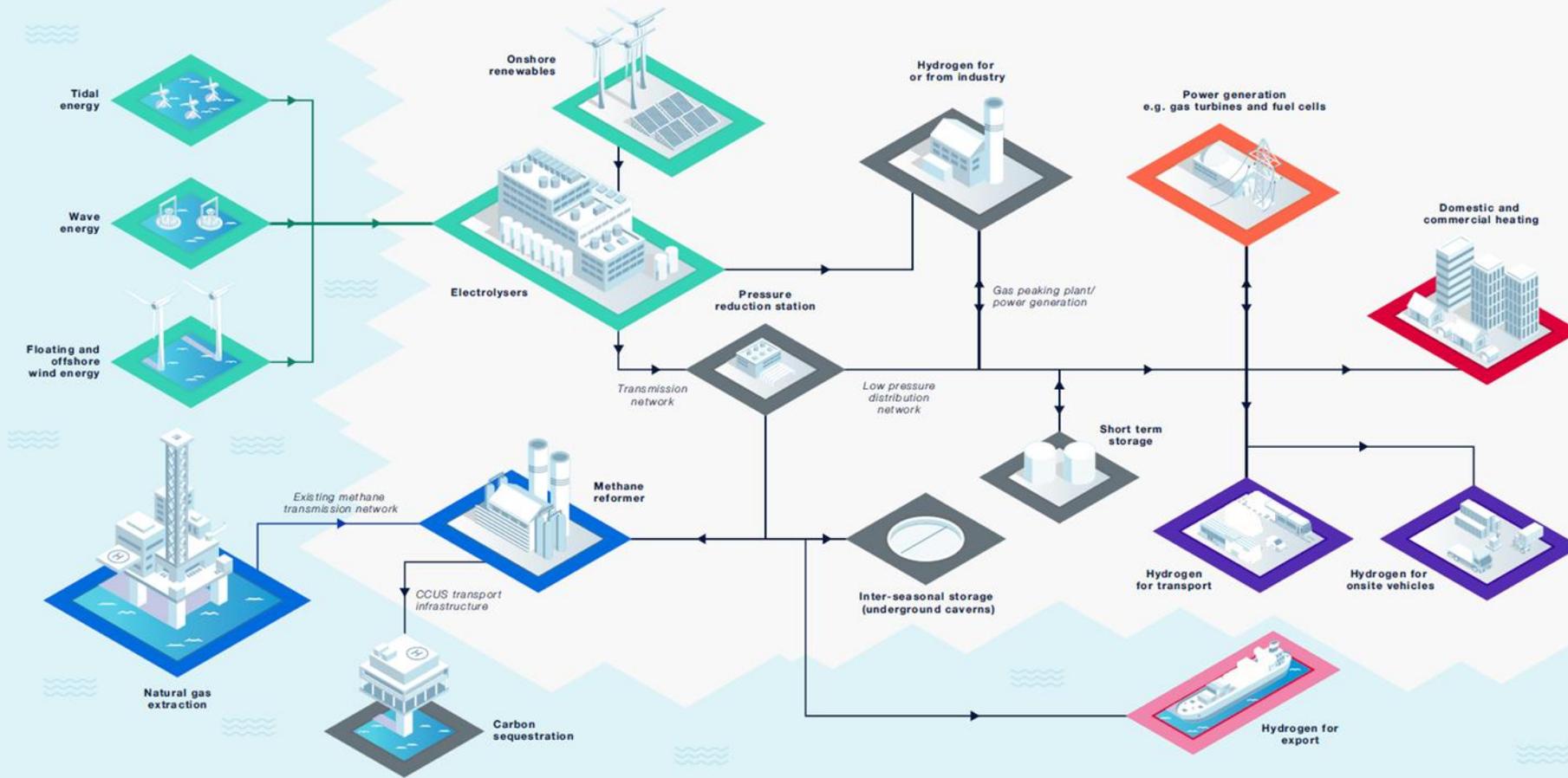


Green Hydrogen Opportunities for Scotland

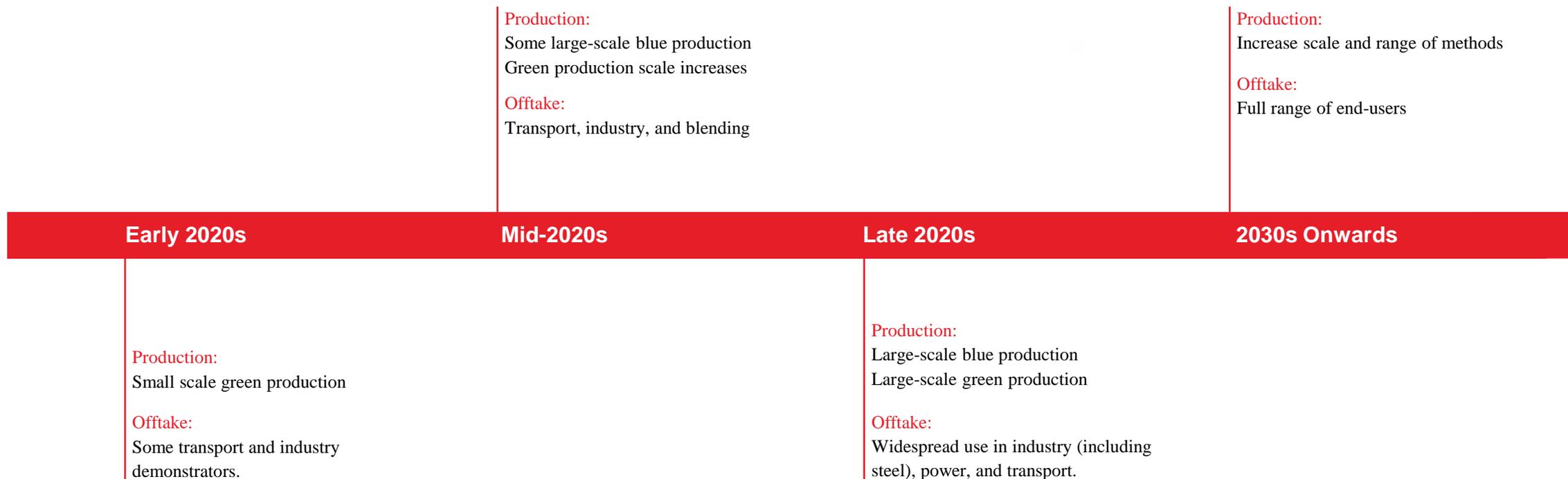
David Hogg – Senior Energy Systems Consultant



The Hydrogen Ecosystem



Roadmap for Growth



Moving and Using Energy

Hydrogen networks

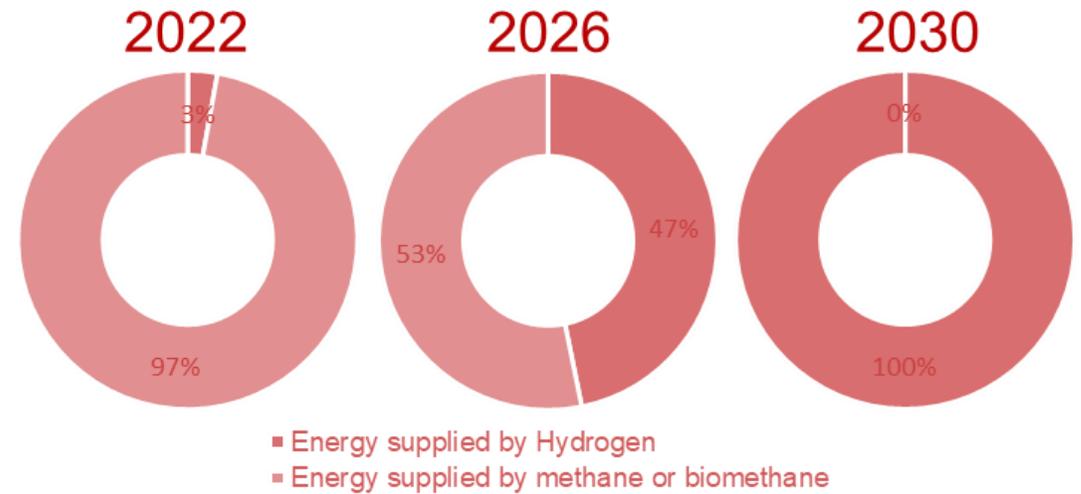


SGN
H100 Fife

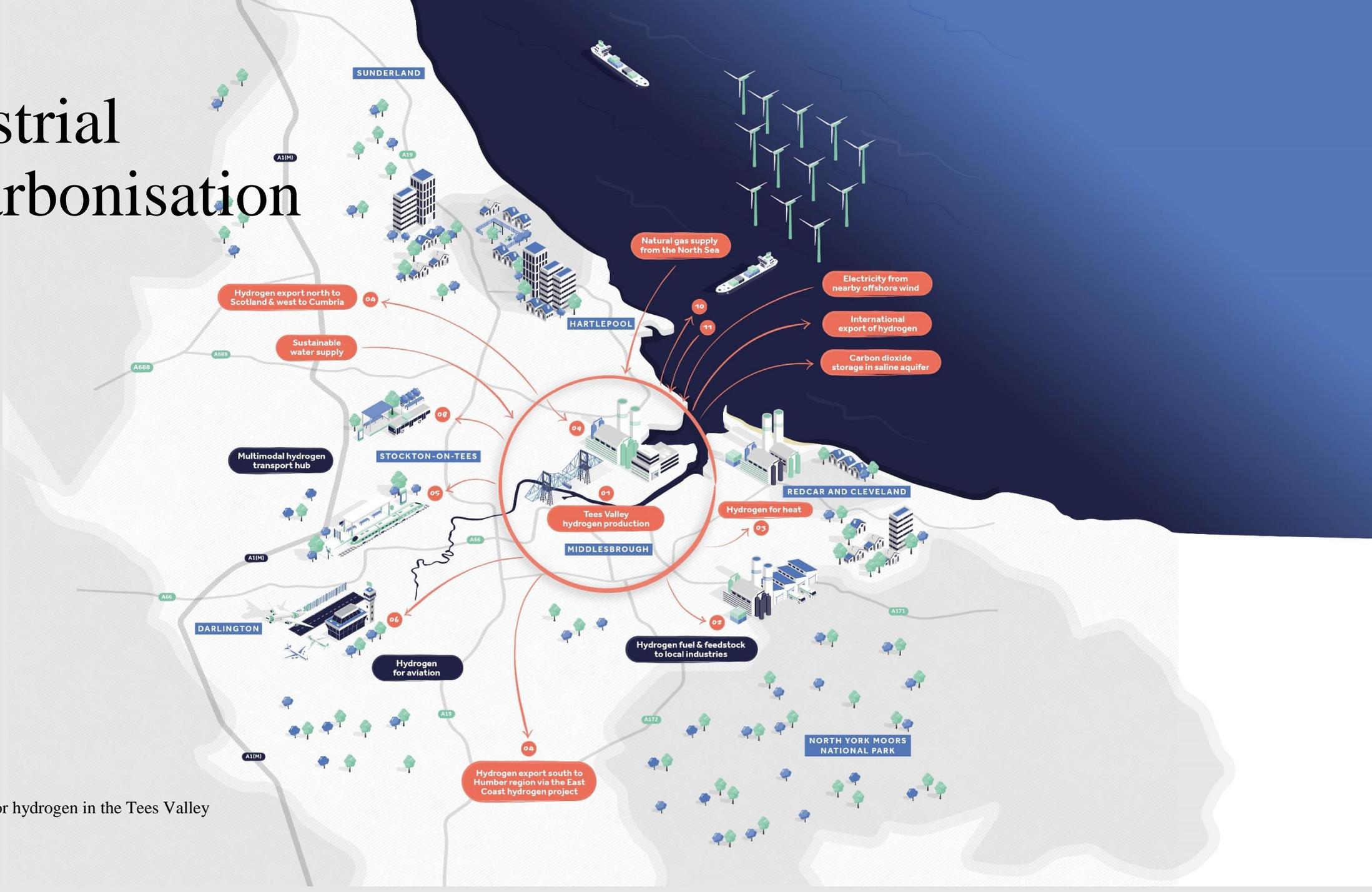
An end to end 100% hydrogen system

Zero Carbon Whisky

InchDairnie Distillery



Industrial Decarbonisation

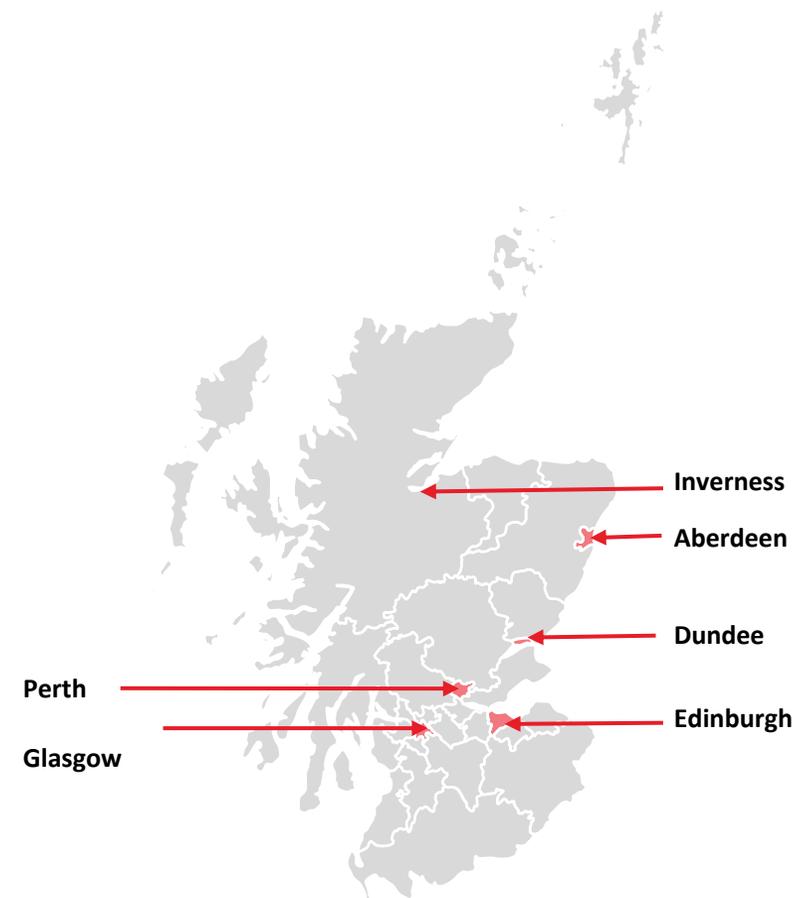
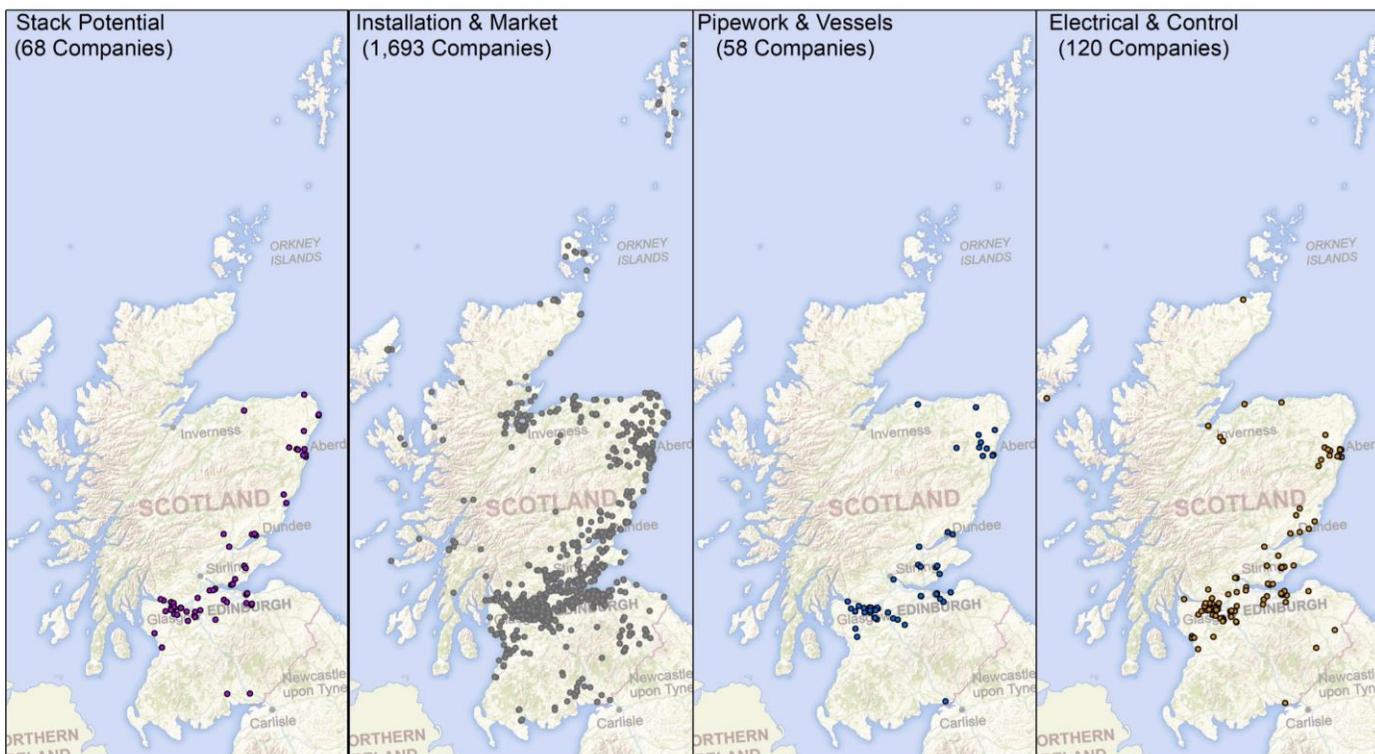


Source: A vision for hydrogen in the Tees Valley

Scottish Supply Chain

Assessment of Electrolysers

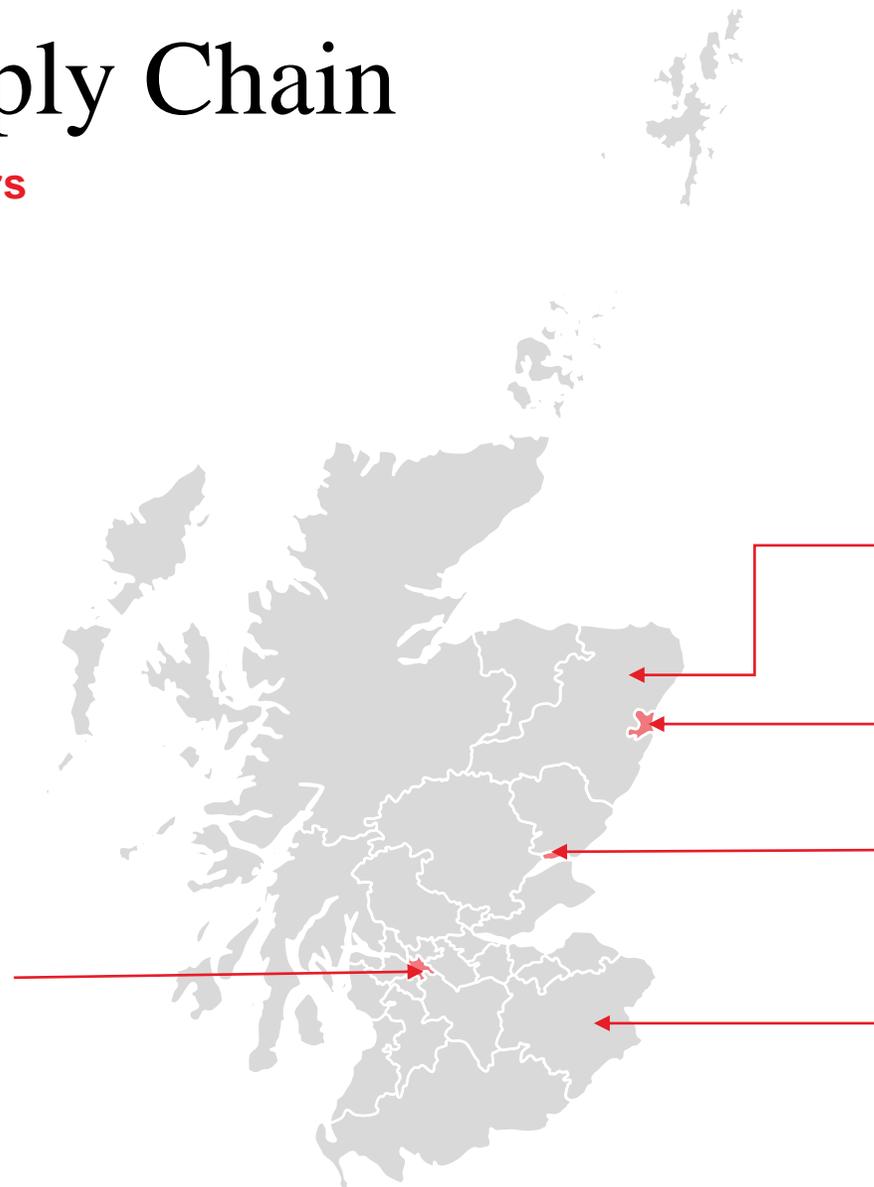
Electrolyser Supply Chain- High Level Analysis



Companies House data from http://download.companieshouse.gov.uk/en_output.htm has been combined with OS CodePoint Open and filtered to display Standard Industrial Classification (SIC) codes that represent the above sectors. Ordnance Survey (GB) data © Crown copyright and database right 2022. Royal Mail (GB) data © Royal Mail copyright and database right 2022

Scottish Supply Chain

Assessment of Electrolysers



Howden – Glasgow

Hydrogen compression solutions



Forsyth Group – NE Scotland

Piping, modular units (e.g. compressors), pressure vessels, structural steel, cable reels, electrical and instrumentation, scaffolding, civil works and specialist coatings



Hydrasun – Aberdeen

Integration, site installation and maintenance of hydrogen systems



Ames Goldsmith Ceimig – Dundee

Platinum catalysts used in PEM fuel cells and electrolysers

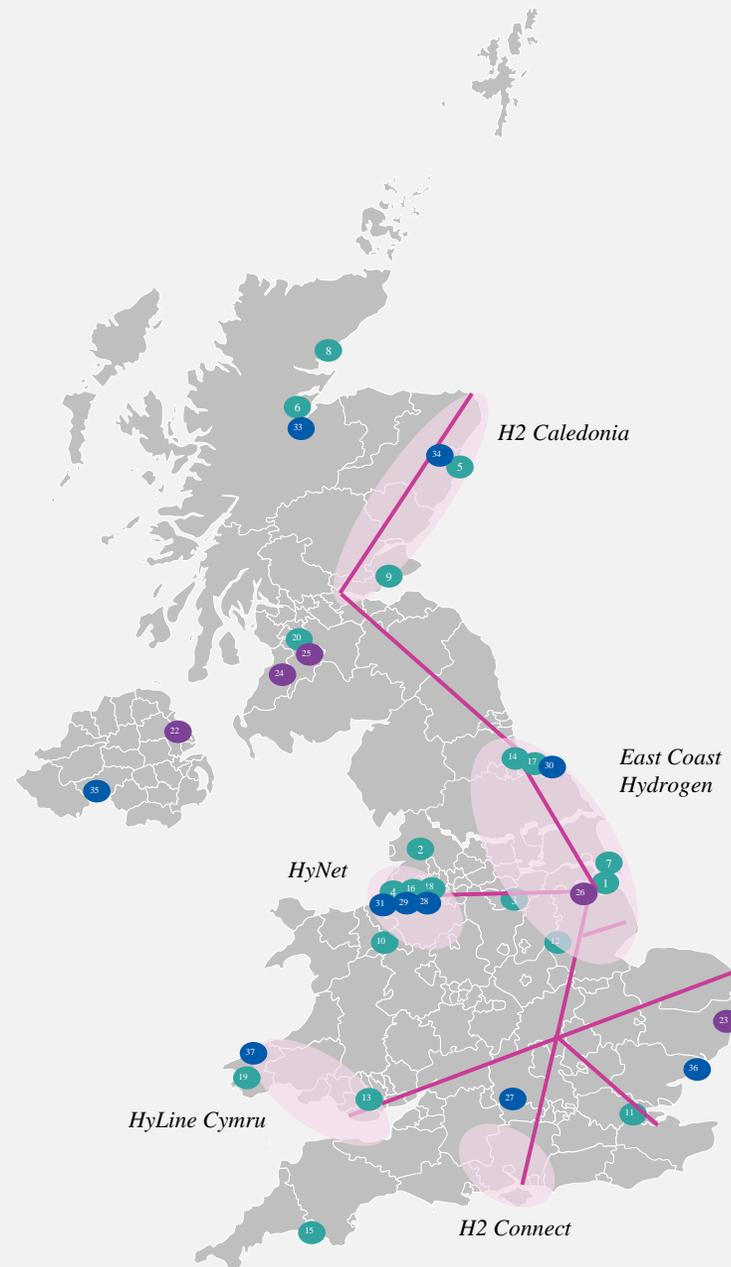


Aqualution – Duns, Borders

Novel electrolyser technology developer (OEM)

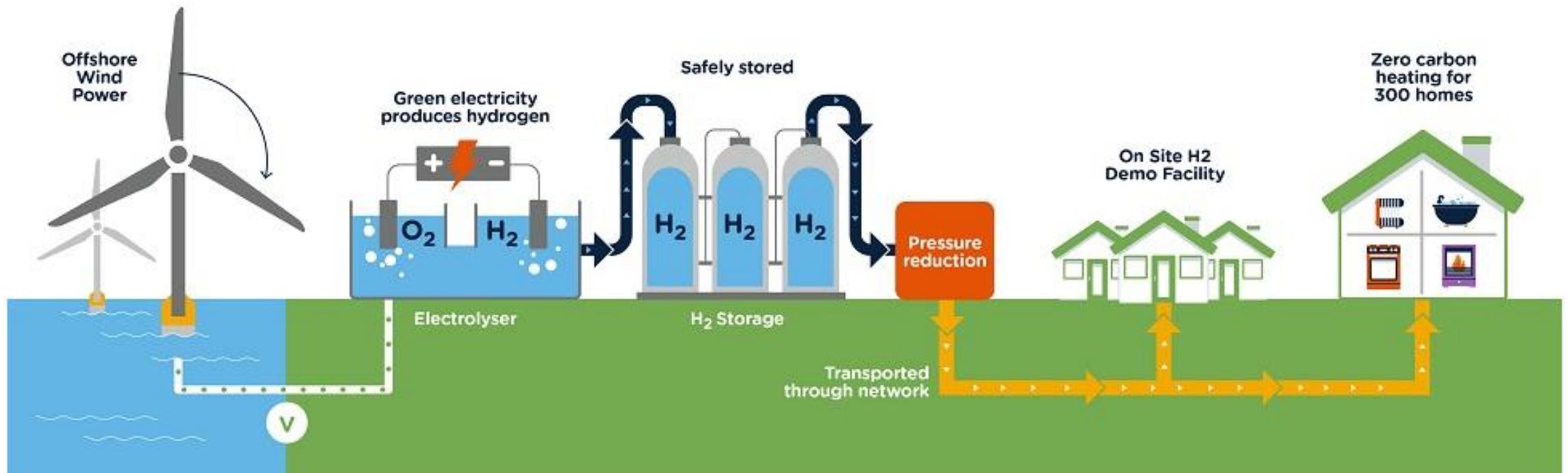
Key Thoughts

Transmission



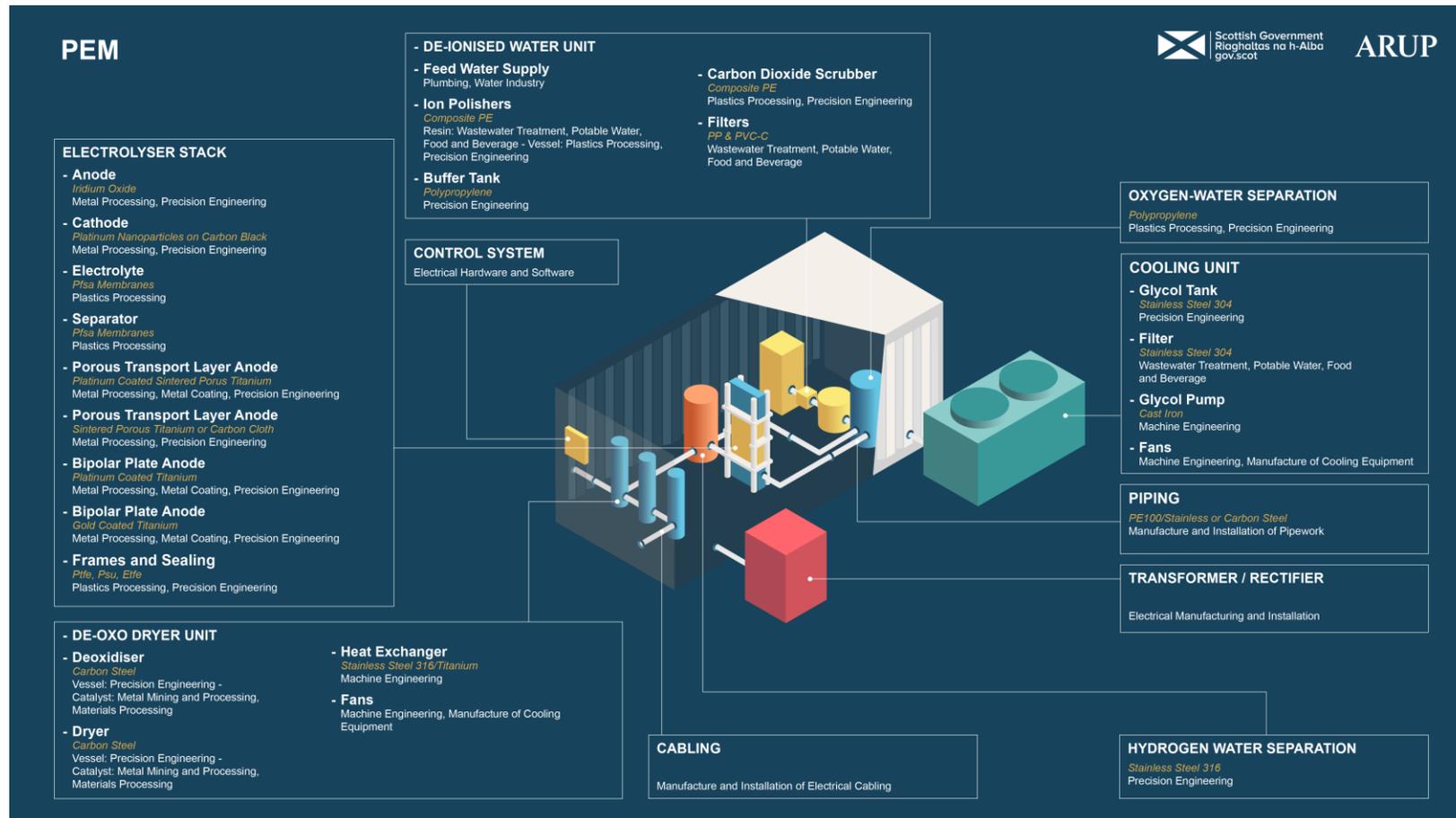
Key Thoughts

Planning



Key Thoughts

Supply chain



ARUP