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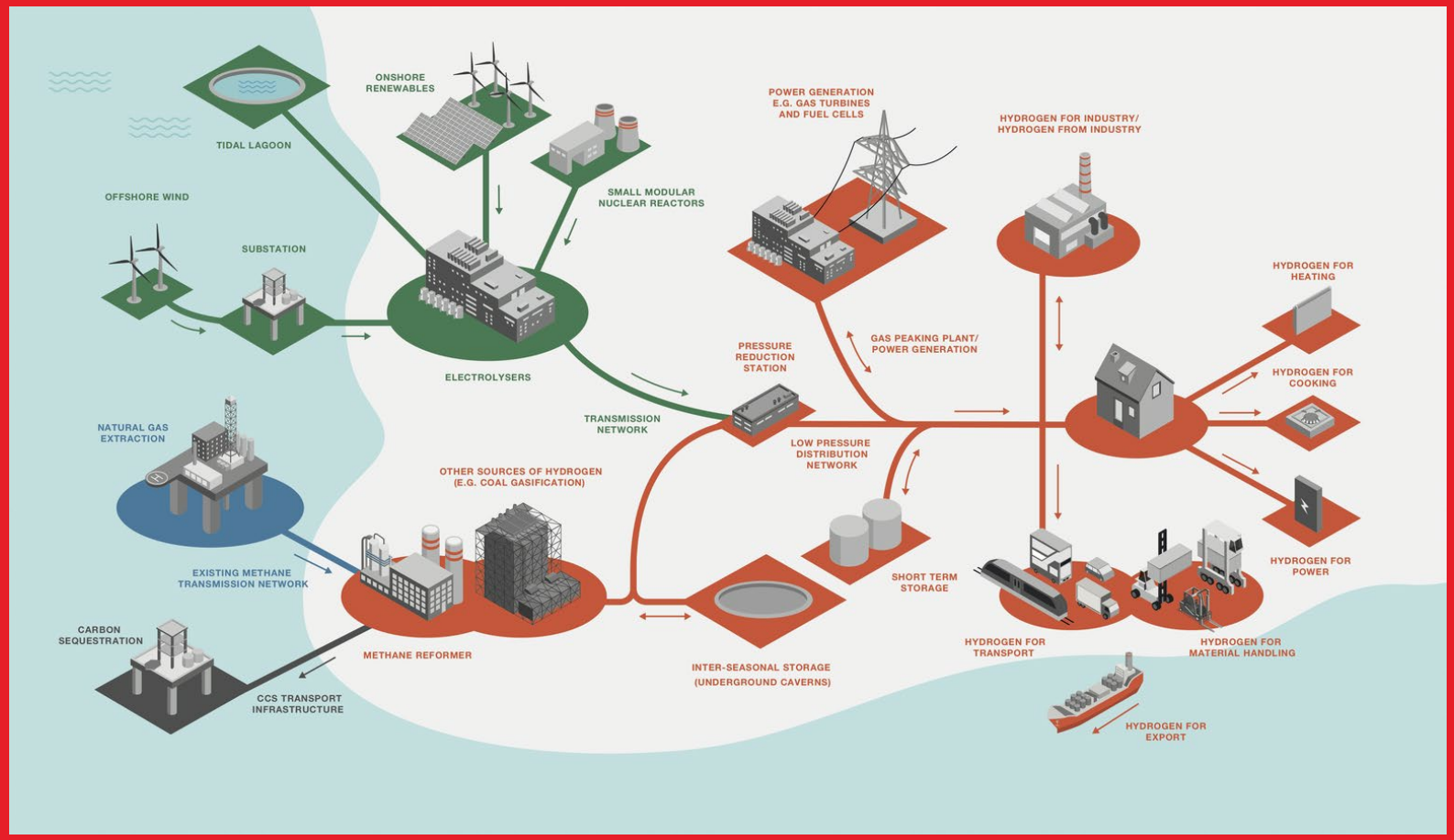
State of Hydrogen

David Hogg



18/01/2022

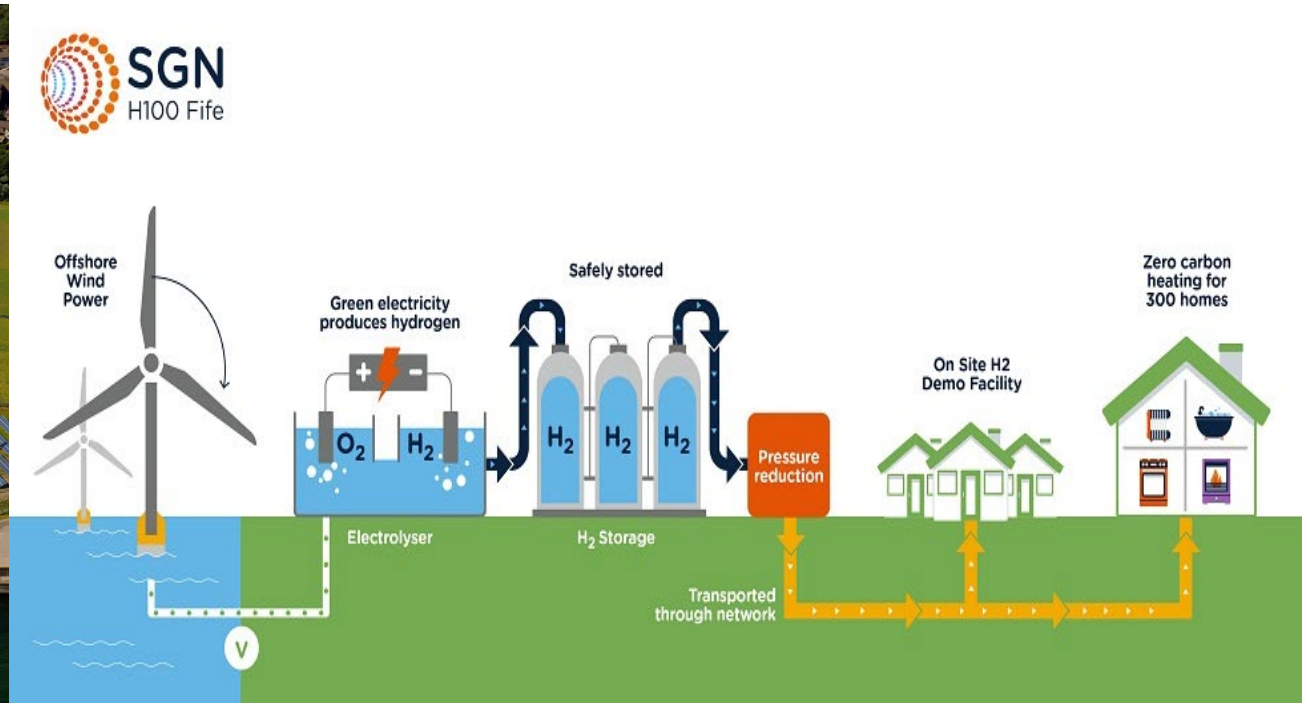
Agenda

- Introduction
- Hydrogen – the basics
- State of the art of hydrogen
- The future energy system
- Hydrogen economics

Introduction

All about Levenmouth

Levenmouth Community Energy Project



H100 Fife

Hydrogen – the basics

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What?

- Powers the sun through fusion
- Utilising as an energy vector for over 100 years already
- Hydrogen used in Edinburgh in early 1900's

Hydrogen – the basics

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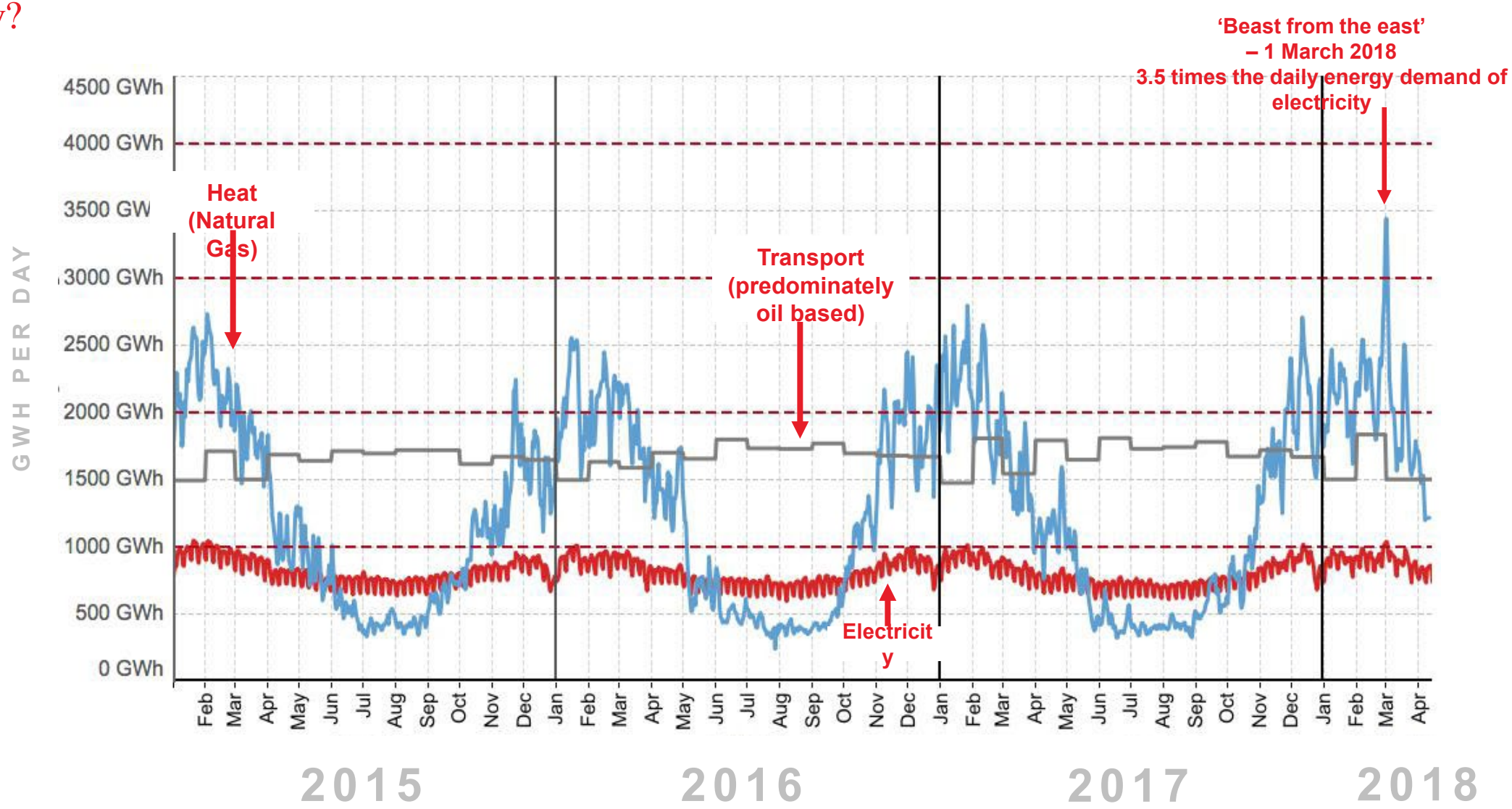
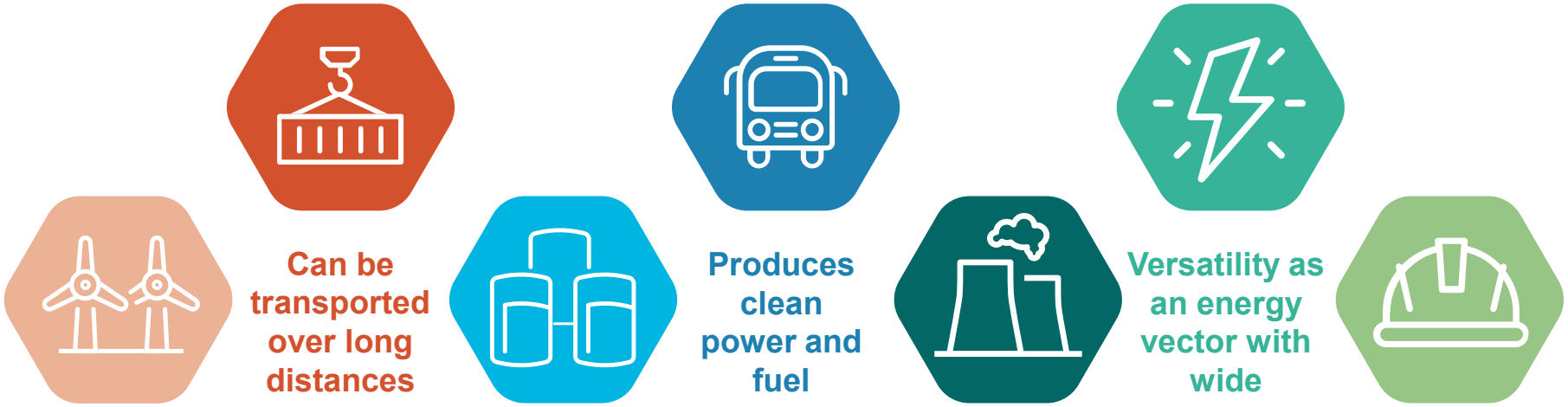
Why?



Hydrogen – the basics

Why?



Hydrogen – the basics

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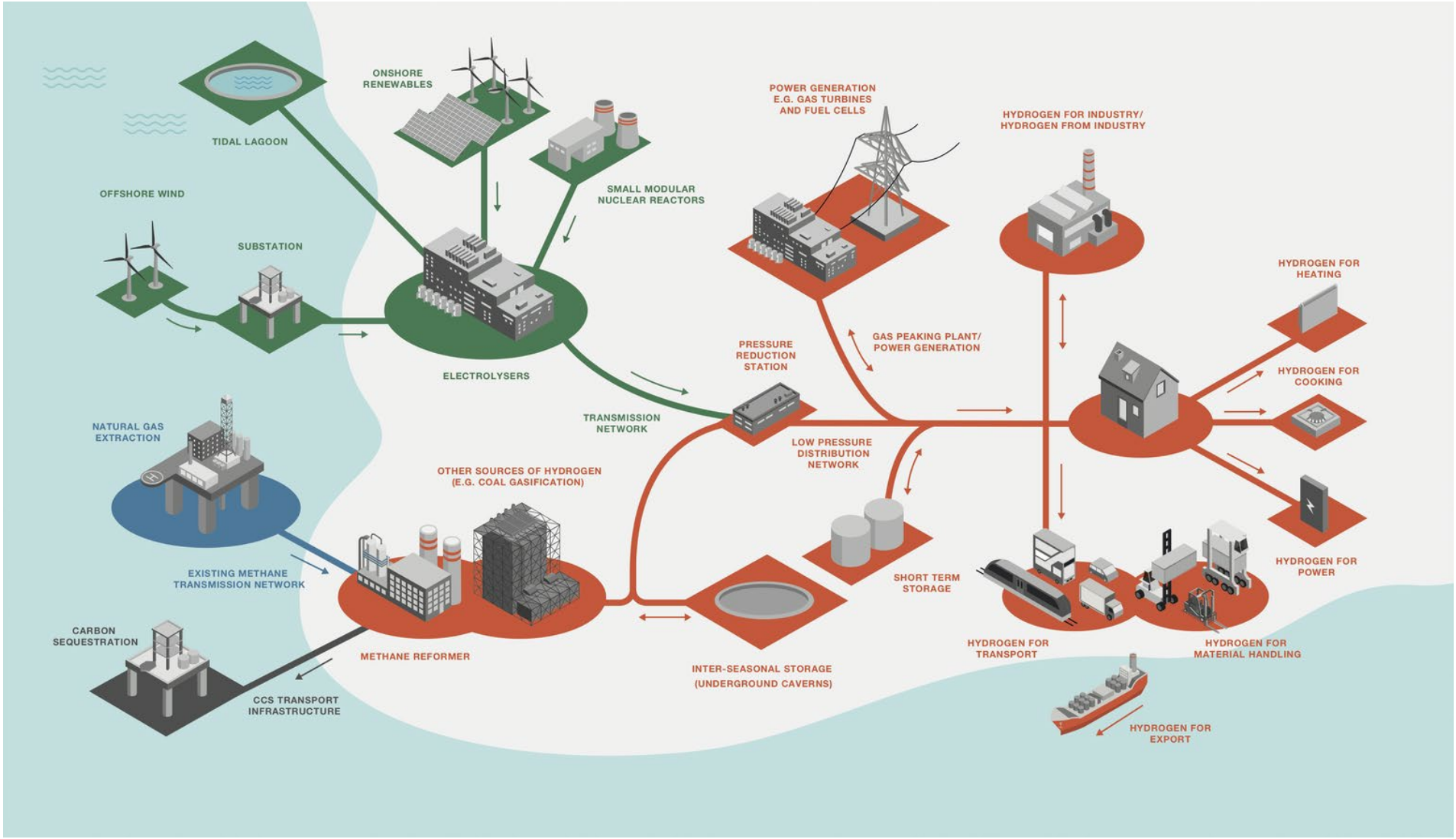
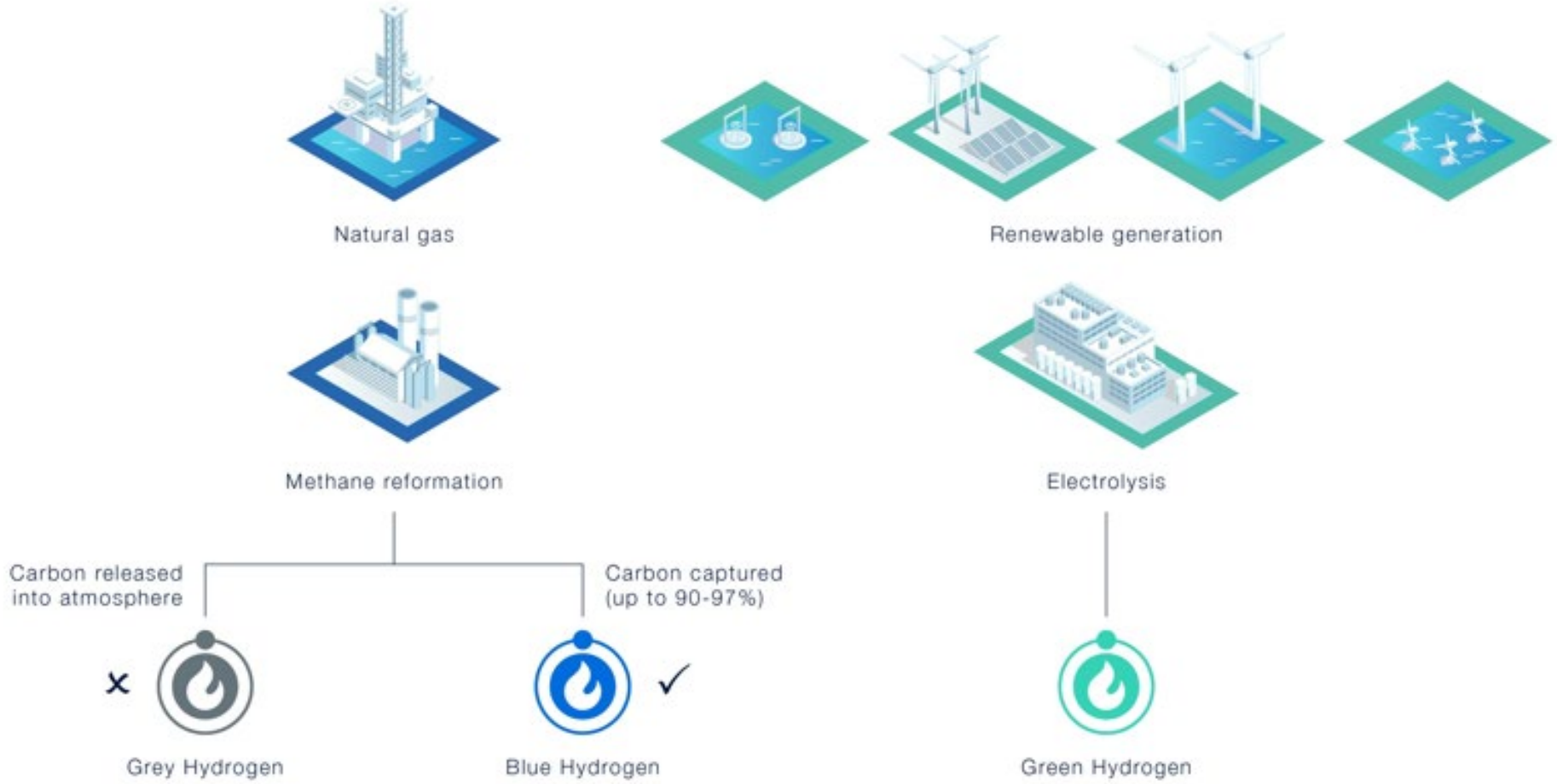
How?



Hydrogen – the basics

How?



State of the art of hydrogen

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Hydrogen deployed

State of the art of hydrogen

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Key Projects – Scottish Hydrogen Assessment Project

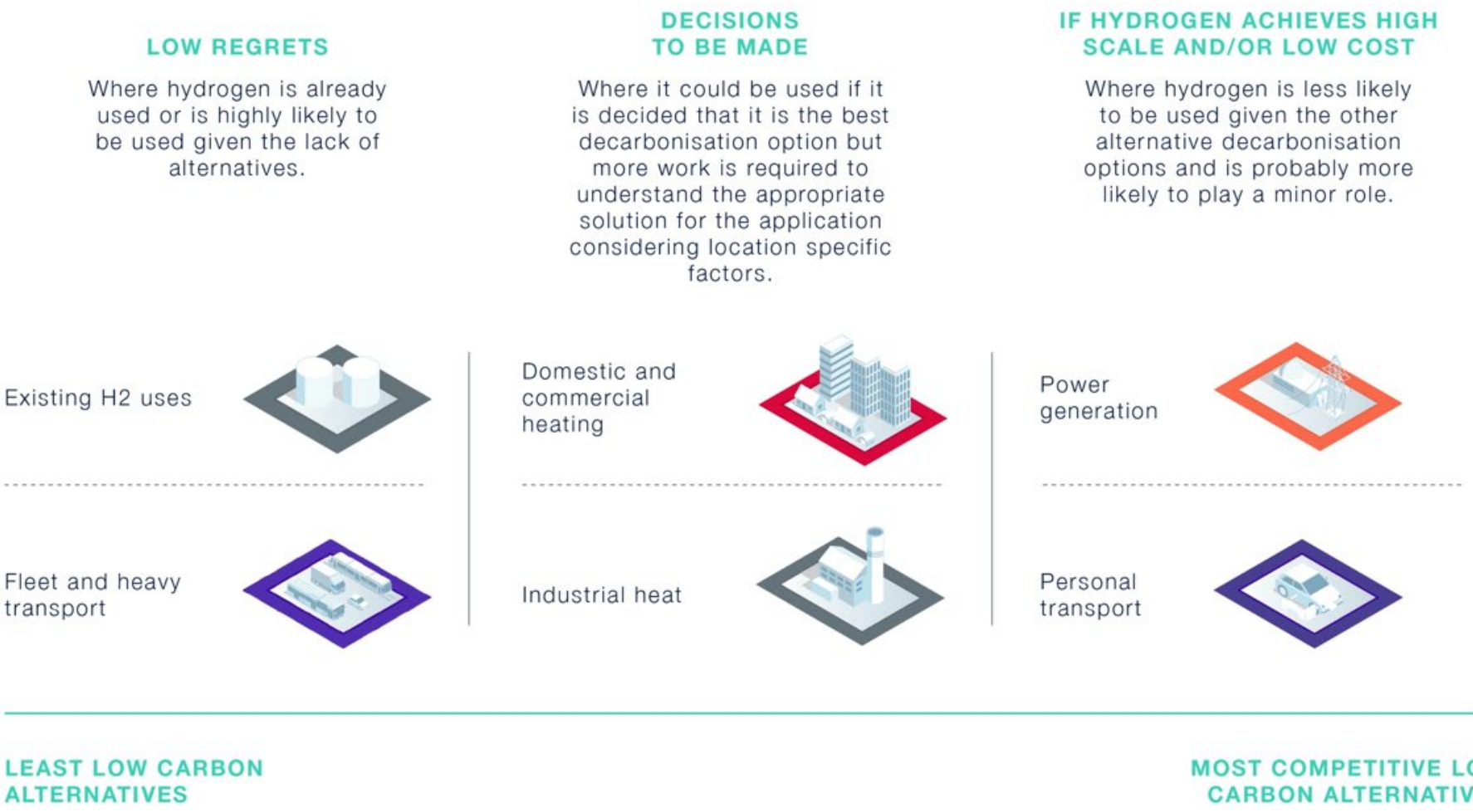

Image from Scottish Hydrogen Assessment

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Key projects – H100 Fife – Domestic heat

SGN
H100 Fife

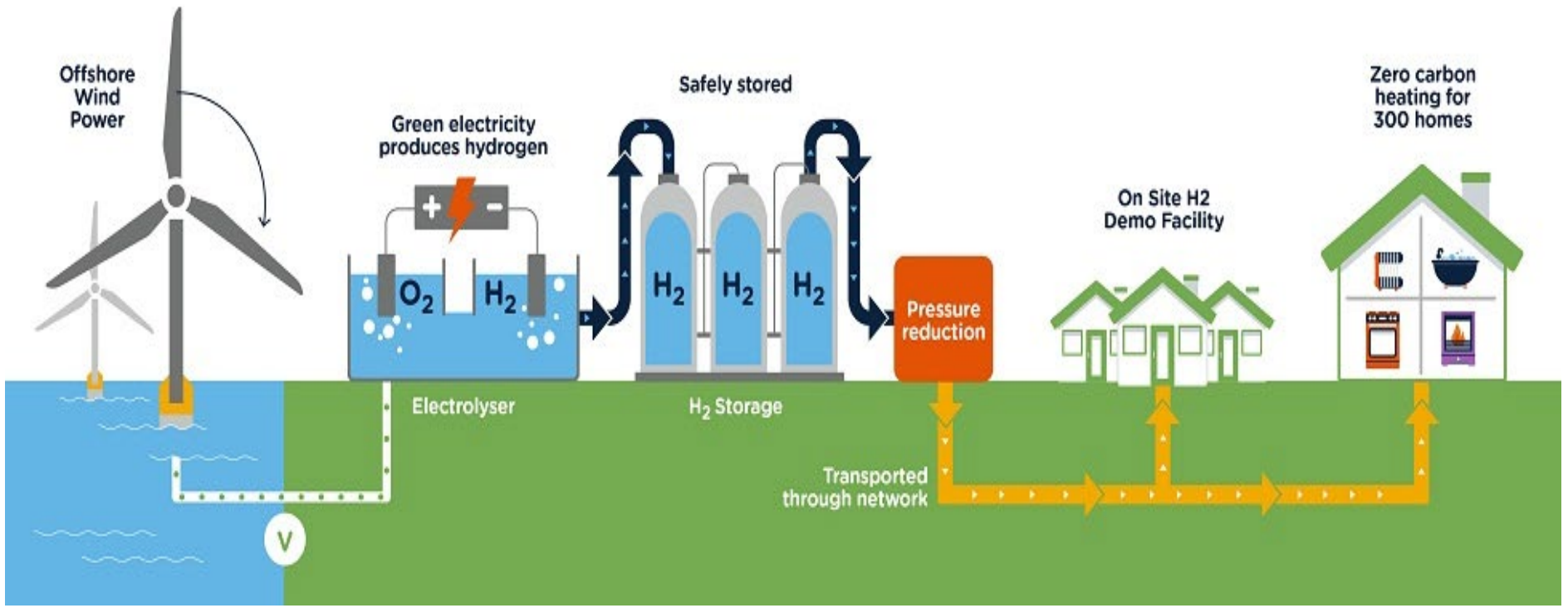

Image from SGN Press Release

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Key projects – Orkney – Whole energy systems

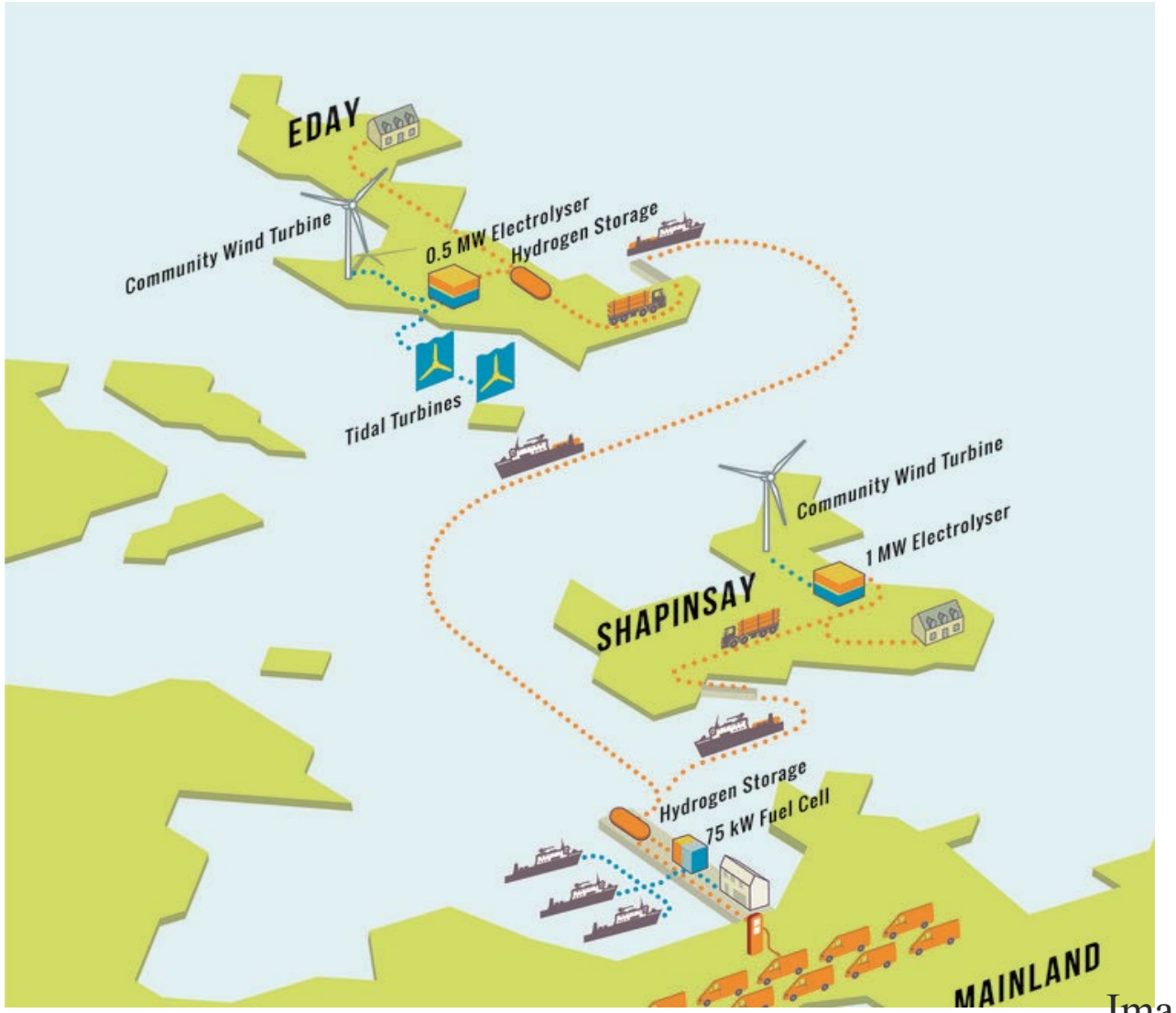

Image from BIG HIT Press Release

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Key projects – Whitelee Wind Farm – Green hydrogen

Image from Scottish Power Press Release

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Key projects – Project Acorn – Blue hydrogen

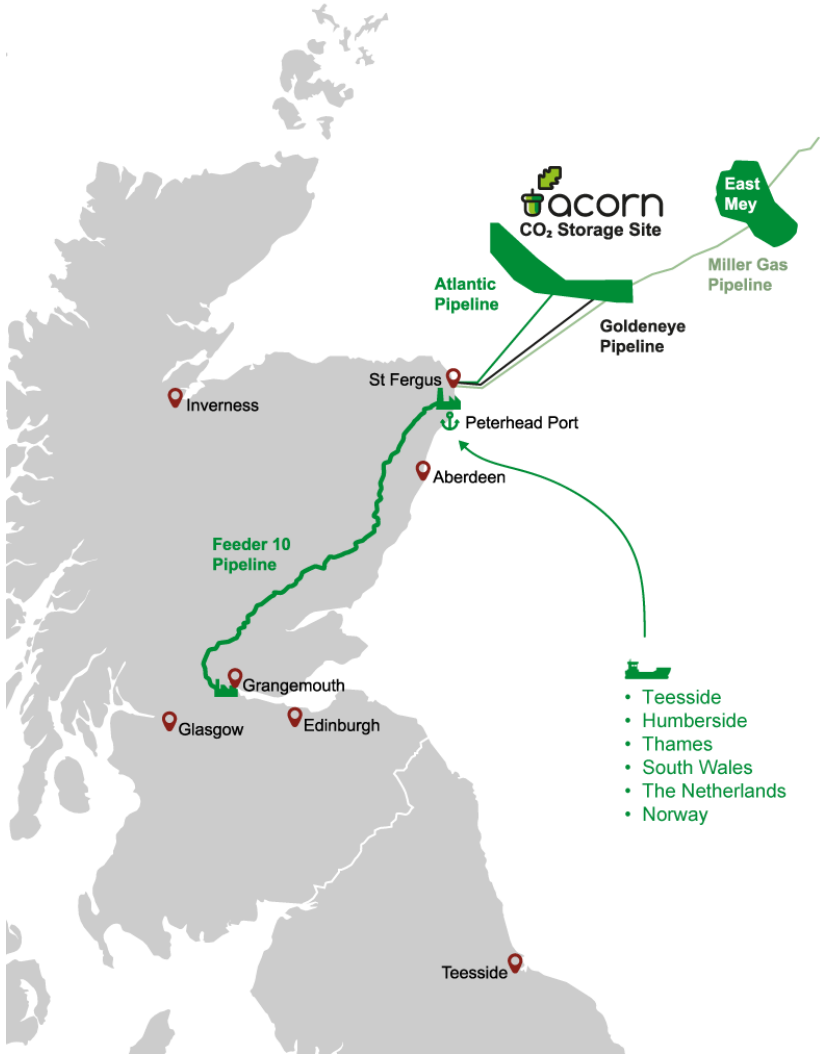

Image from Project Acorn website

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Key projects – HyNet – Industrial decarbonisation

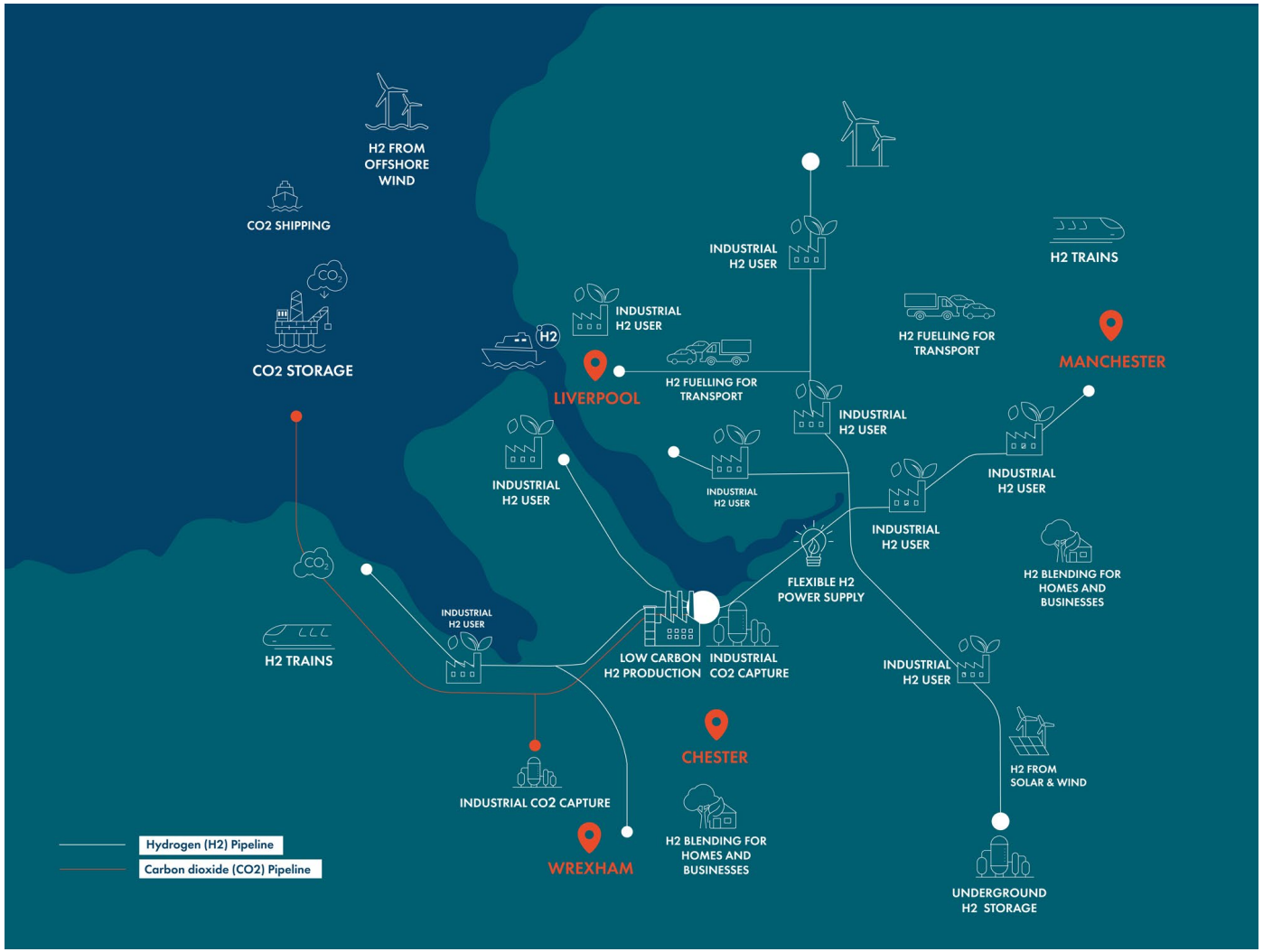

Image from HyNet website

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Key projects – H21 – Reuse of the Gas Network

Image from H21 website

State of the art of hydrogen

Key projects – Hy4Heat – Hydrogen for heating

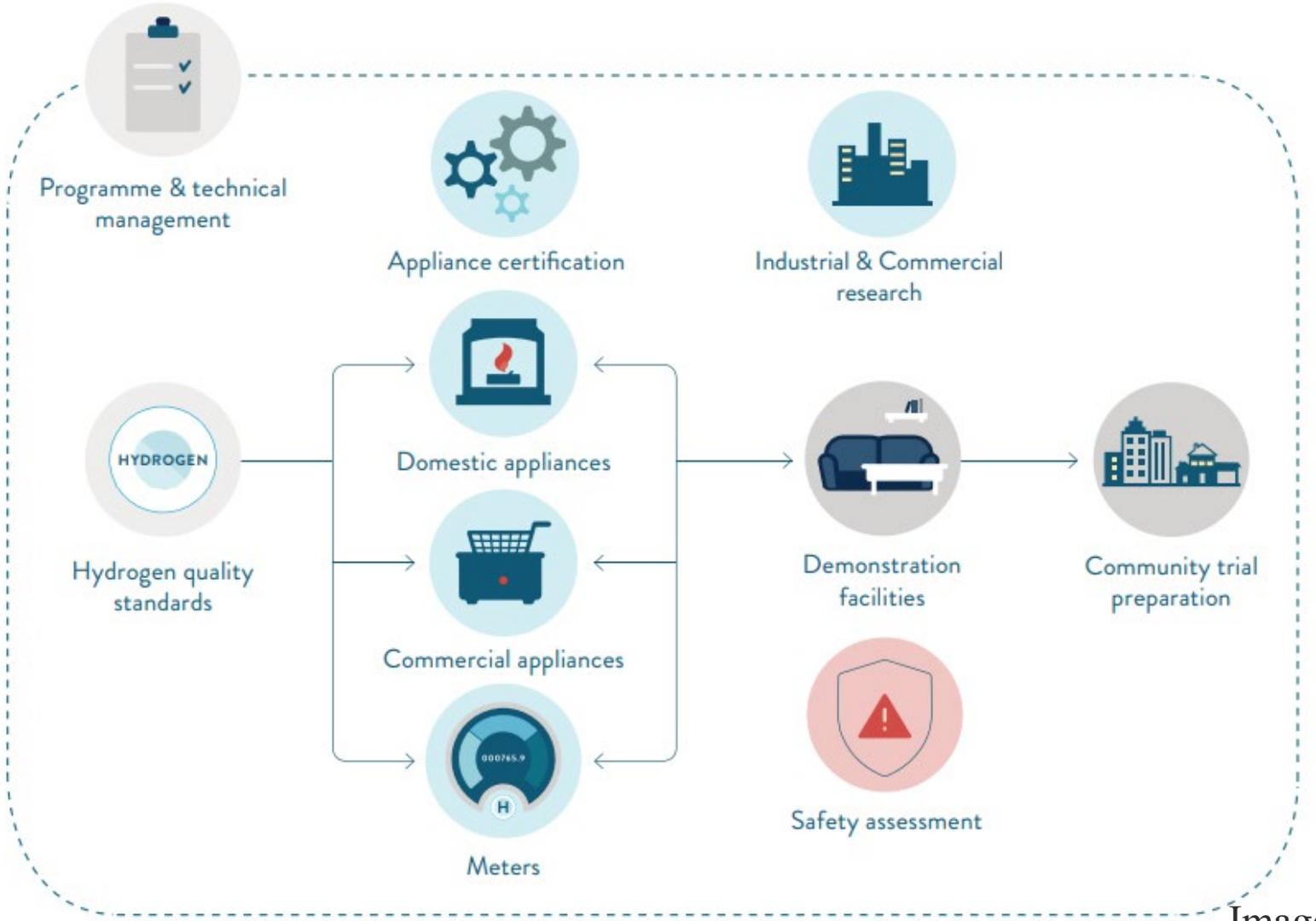

Image from Hy4Heat website

State of the art of hydrogen

Key projects – Scotland

Map 1 - Some of Scotland's Current Hydrogen Projects

End User
01 Cloverhill's Aberdeen Hydrogen First
02 Eden Mill distillery
03 Glasgow Hydrogen Gritters
04 HECTOR project
05 HyDIME
06 HyFlyer
07 HySeas III
08 HySpirits
09 Hytransit Project - Aberdeen Hydrogen Busses
10 Hytrec
11 JIVE 2 - Dundee Hydrogen Transport
12 Kirkwall Airport Decarbonisation
13 Liquid Organic Hydrogen Carriers (LOHC) for the transportation of hydrogen
14 Project HyLaddie
15 Scottish Hydrogen Train project
16 TimberLINK
17 Uist Distilling Company

Multi-vector
18 Aberdeen Hydrogen Hub
19 Aberdeen Vision
20 BIG HIT
21 East Neuk Power to Hydrogen
22 GENCOMM - AD
23 ITEG - Integrating Tidal Energy into the European Grid
24 North of Scotland Hydrogen Programme
25 OHLEH - Outer Hebrides Local Energy Hub
26 Orion Project
27 PITCHES
28 ReFLEX (Responsive Flexibility) Project
29 SWIFTH2
30 PURE Energy Centre
31 Flotta Hydrogen Hub

Production
32 Aberdeen Hydrogen Centre (ACHES)
33 Acorn CCS
34 Acorn Hydrogen
35 Caledonia Clean Energy Project
36 Chapelcross Initiative
37 Dolphyn Project
38 Edinburgh International Festival decarbonisation project
39 Green Hydrogen for Glasgow
40 Hammars Hill Green Ammonia project
41 Kittybrewster Refuelling Station
42 Skelmonae Green Hydrogen
43 'Surf 'n' Turf'

Storage
44 Eday Flow Cell Battery Project
45 HyAI
46 HyStorPor Project

Transmission/distribution
47 H100 Fife project

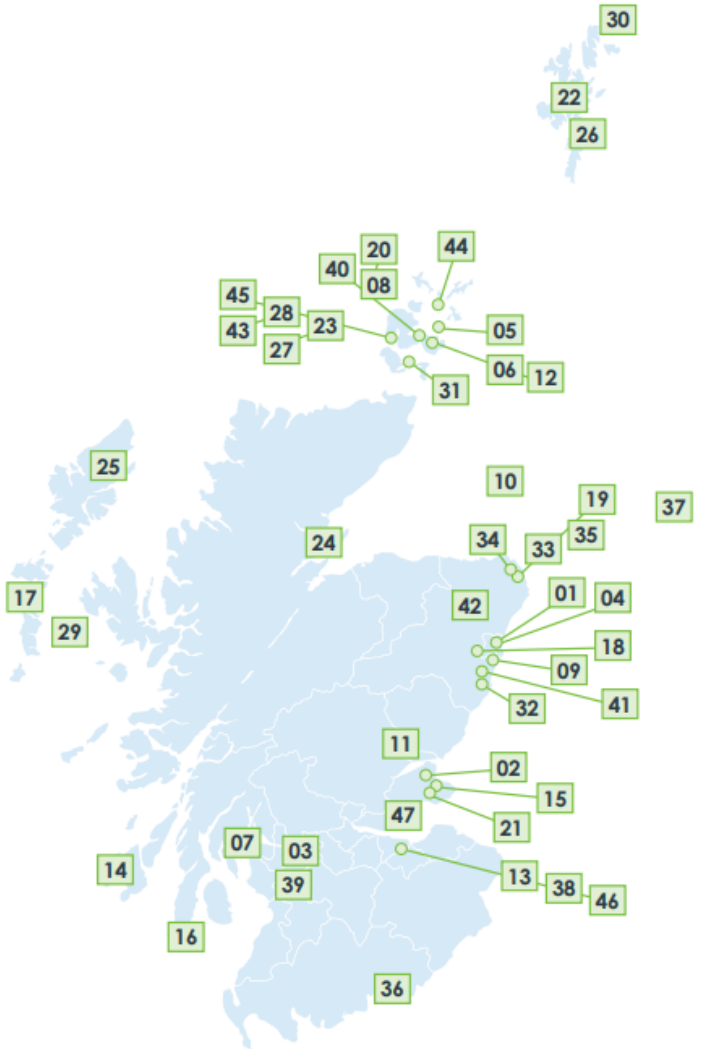

Image from Scottish Hydrogen Action Plan

State of the art of hydrogen

UK Hydrogen Strategy

Figure 2.1: Hydrogen economy 2020s Roadmap

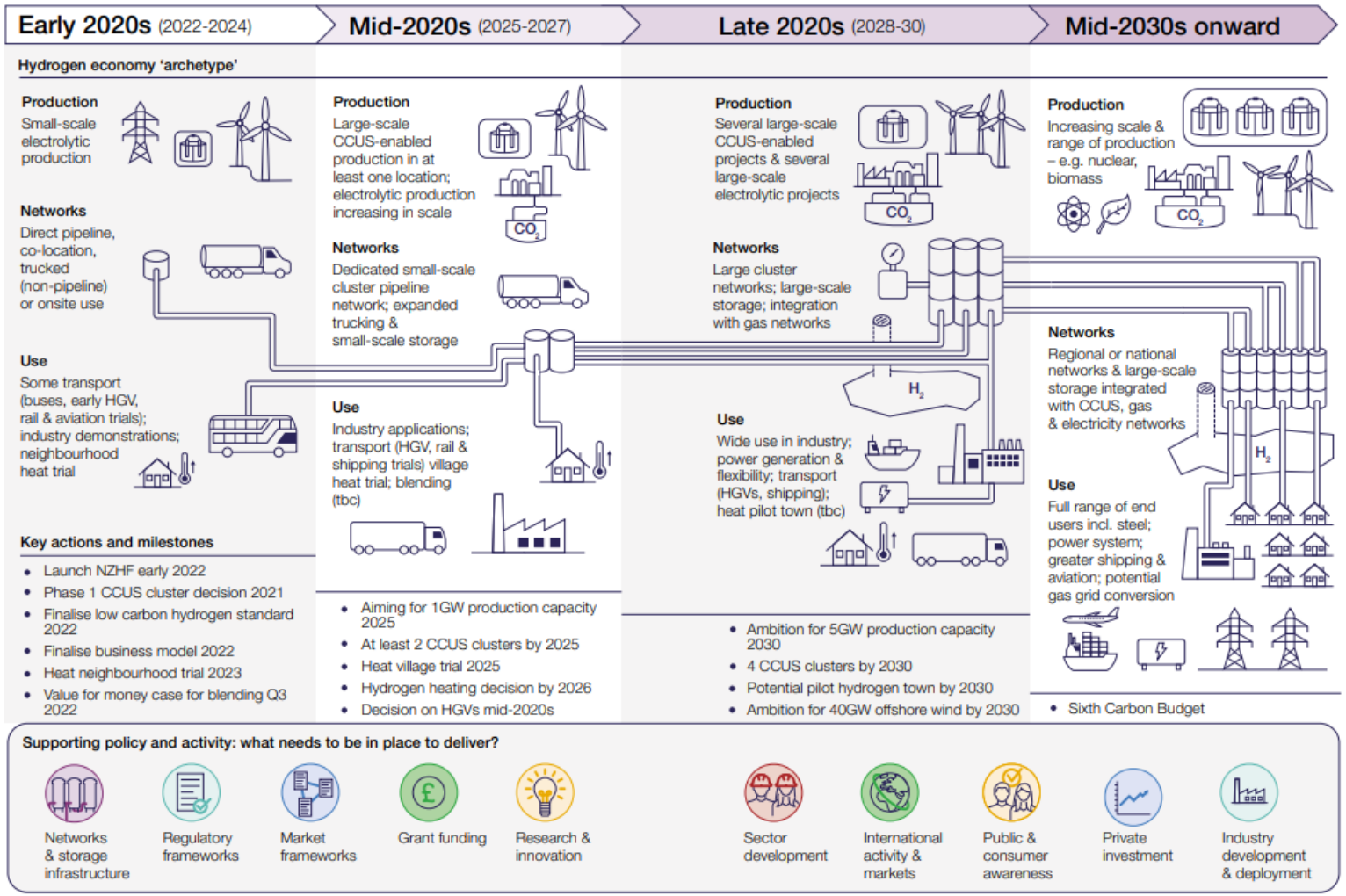

Image from UK Hydrogen Strategy

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UK Hydrogen Strategy

Figure 1.3: Proposed UK electrolytic and CCUS-enabled hydrogen production projects

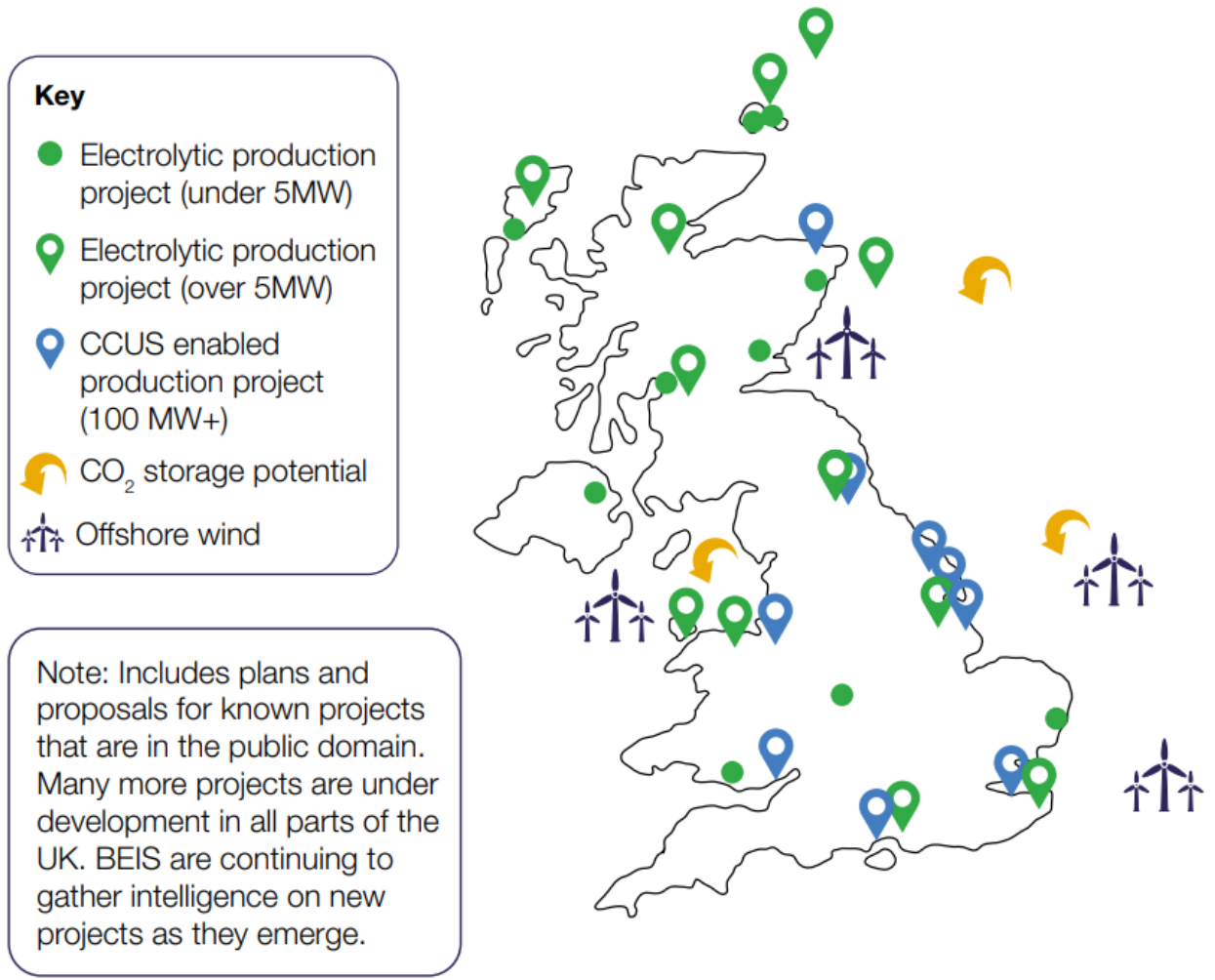

Image from UK Hydrogen Strategy

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Scottish Hydrogen Action Plan (Draft)

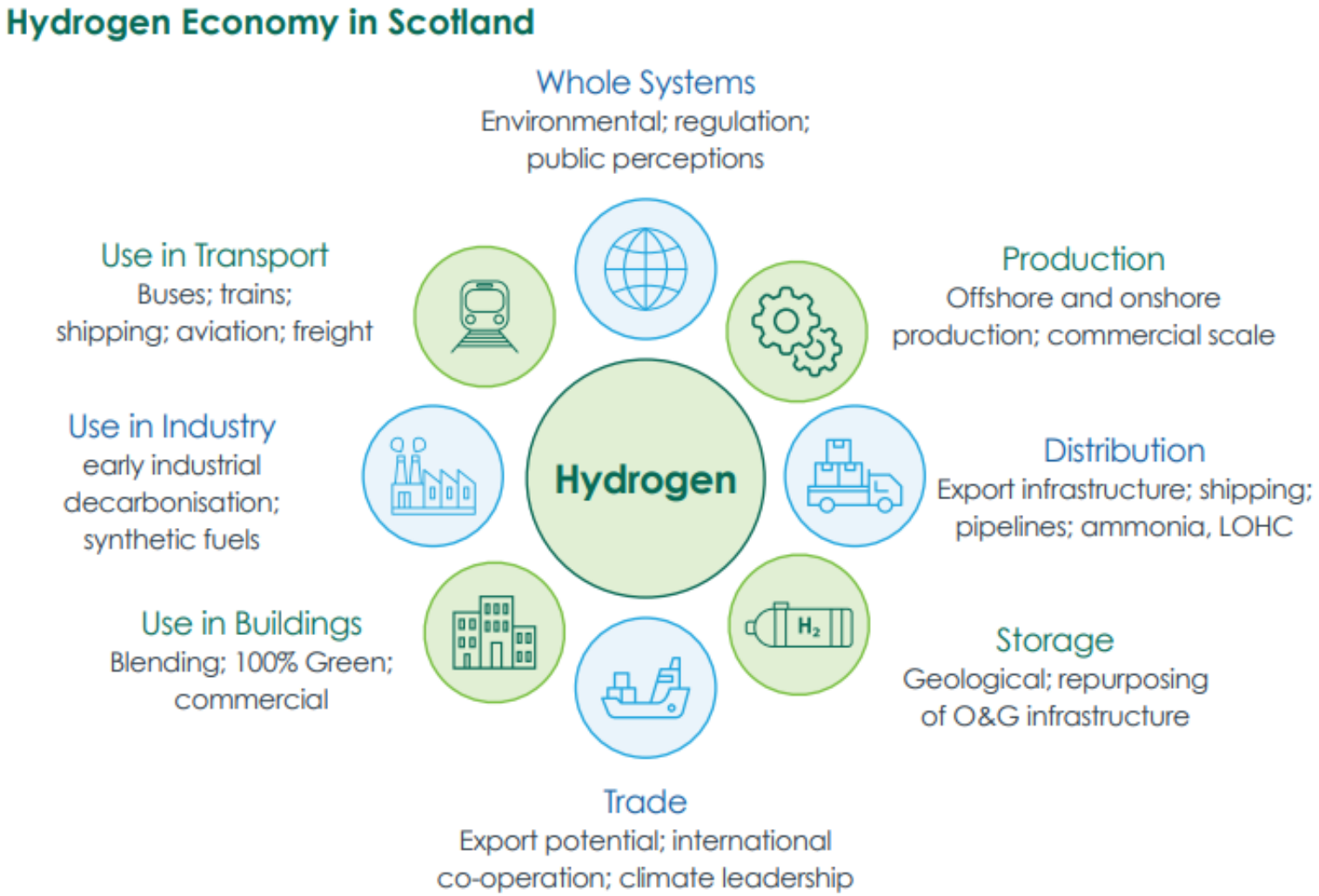

Image from Scottish Hydrogen Action Plan

The future energy system

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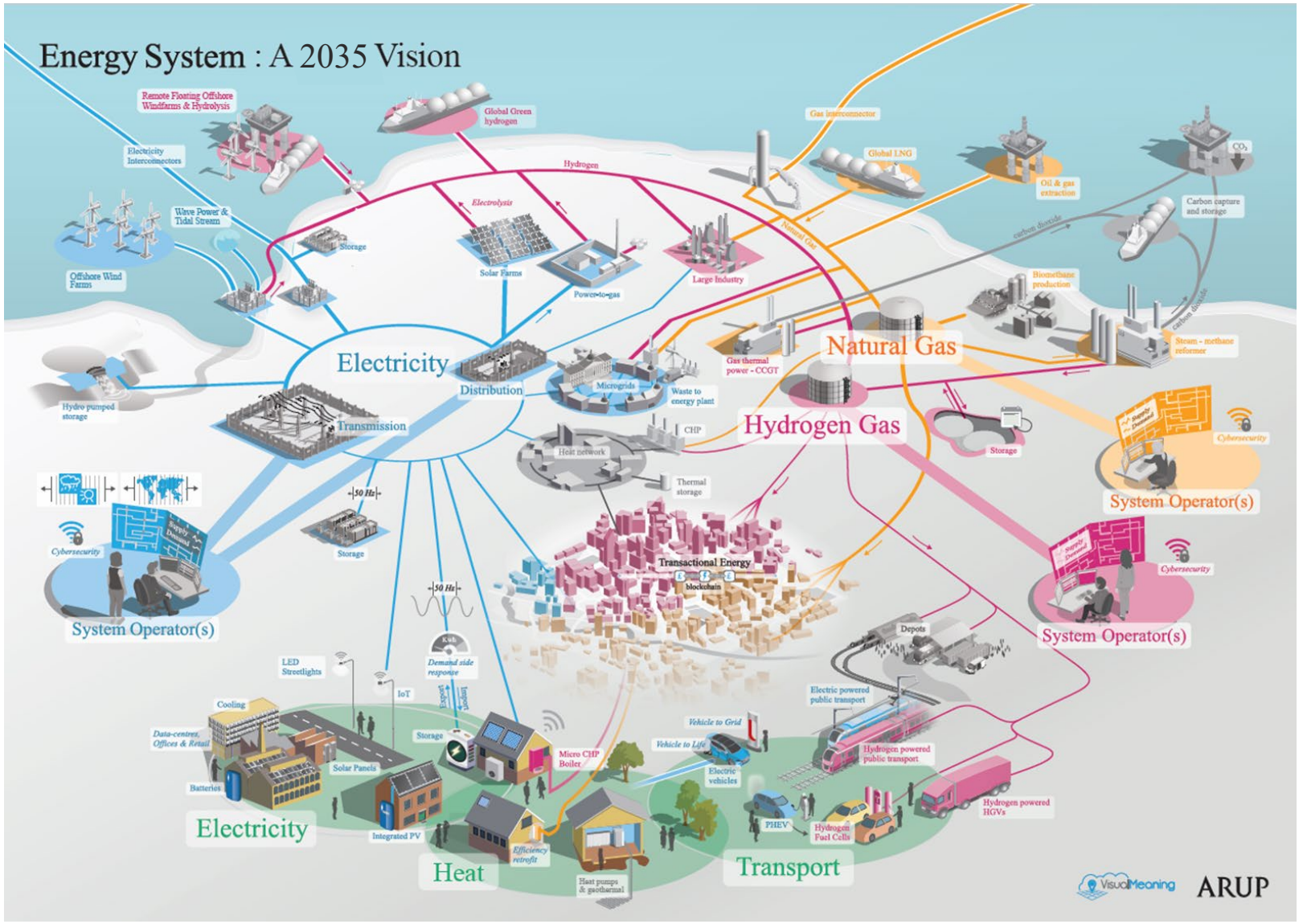

The future energy system

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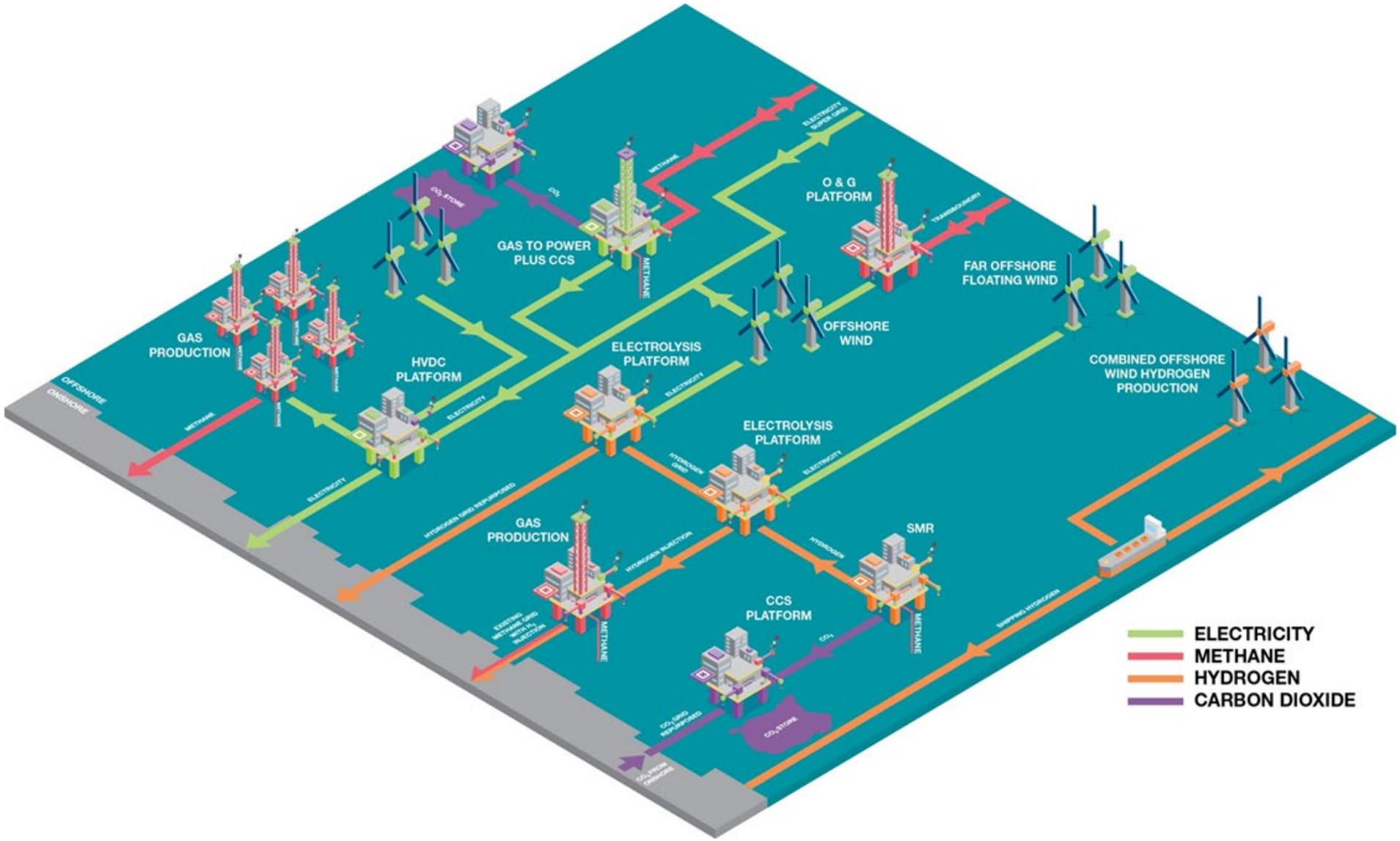

Hydrogen economics

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Relative consumer values for heat, electricity and transport per kWh using current energy supply vectors and hydrogen normalised to the price of heat. Based on current, fully taxed, average UK prices paid by consumers for delivery of the energy/work per kWh.

	Heat	Electricity	Transport
Current energy supply vector	1	3.3	9.8
Via Hydrogen	1	1.6	3.9

http://www.h2fcsupergen.com/our-work/whitepapers/

Hydrogen economics

Blue v Green

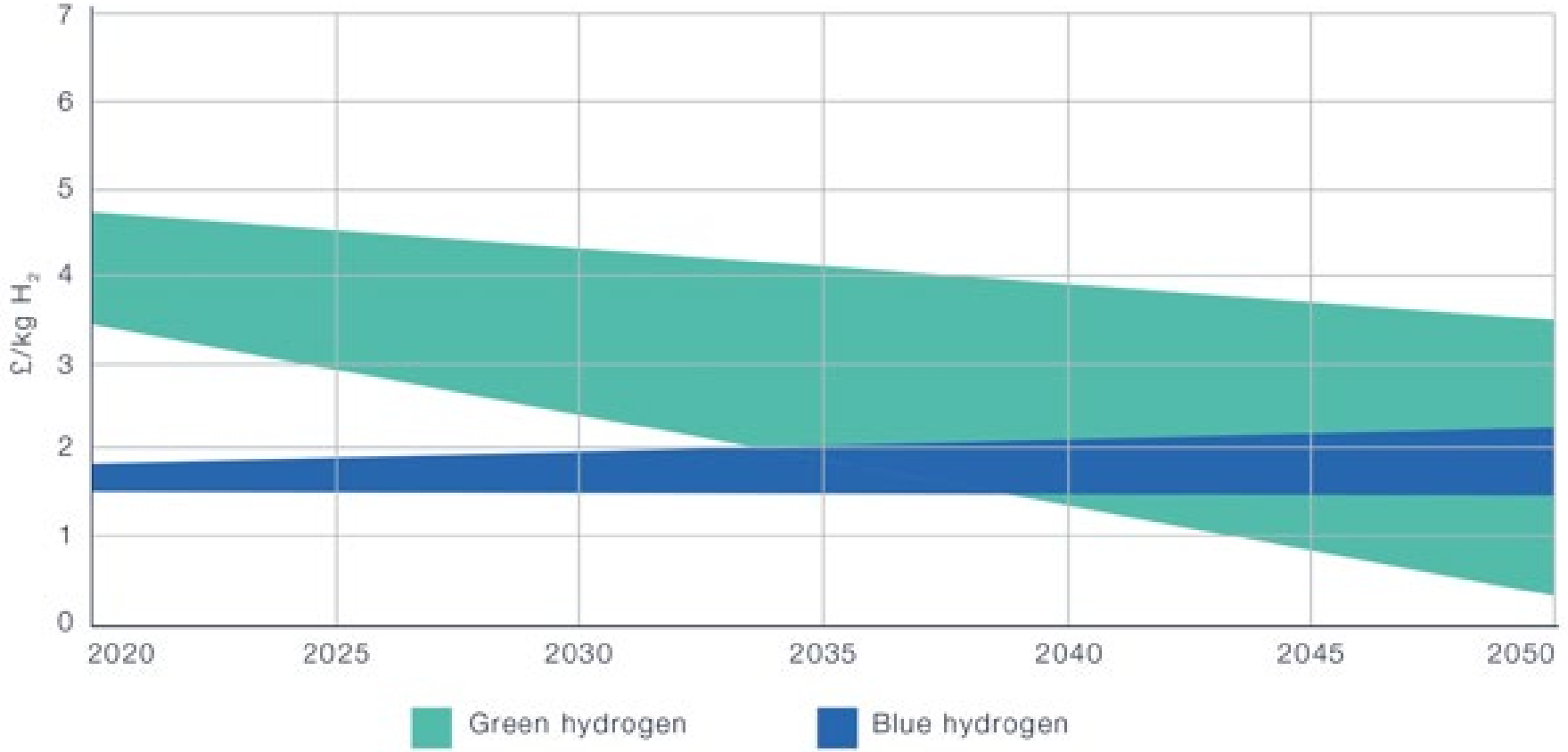

Image from Scottish Hydrogen Assessment

Hydrogen economics

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Share Publication

Governments, regulators, investors, and operators around the world are grappling with the complex challenge of how to meet society's growing future energy needs whilst decarbonising the global economy.

Hydrogen can play a significant role in this effort, but requires investment in the underlying infrastructure. Policy makers need to create the right environment to catalyse private sector investment.

Together with Global Infrastructure Investor Association (GIIA), Arup explores hydrogen through the uncompromising eyes of investors around the world. The analysis draws on investors' opinions to identify barriers to investment in the infrastructure required to enable the hydrogen economy.

With the right frameworks in place, we can drive the investment needed to deliver

https://www.arup.com/perspectives/publications/research/section/catalysing-hydrogen-investment

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Thanks for listening