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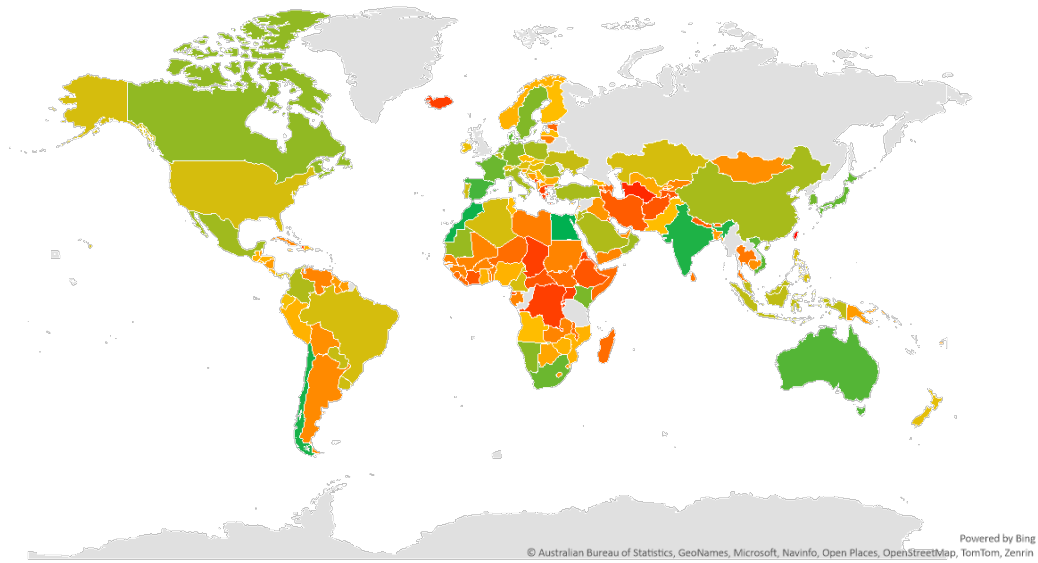
ARUP

# Scottish Supply Chain Opportunities

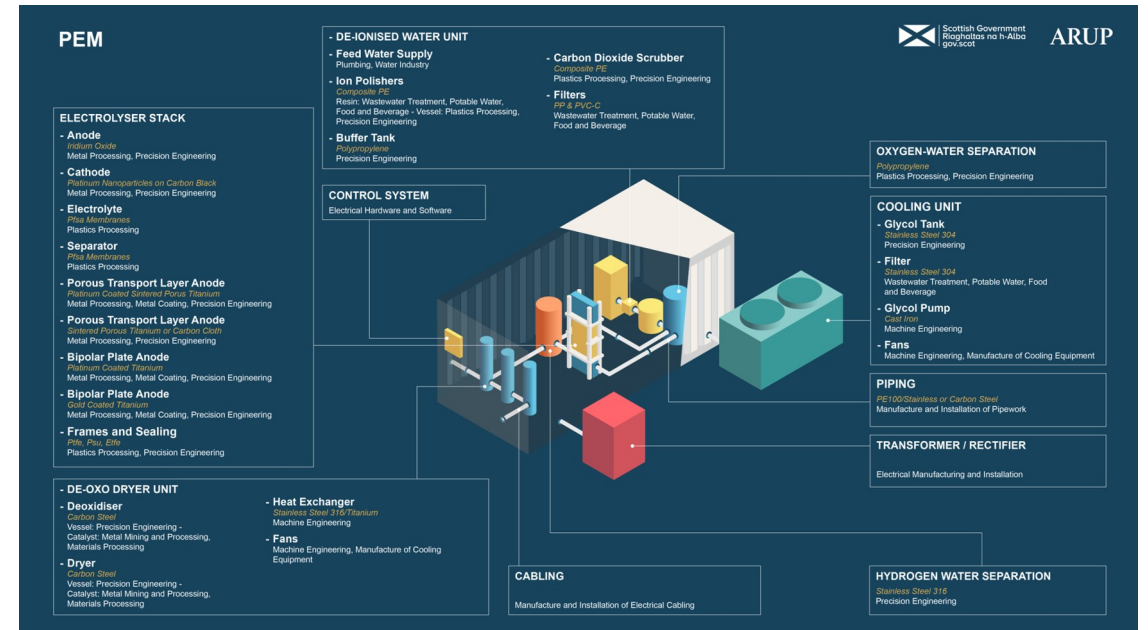
*Home and Away*

**David Hogg**

# Context

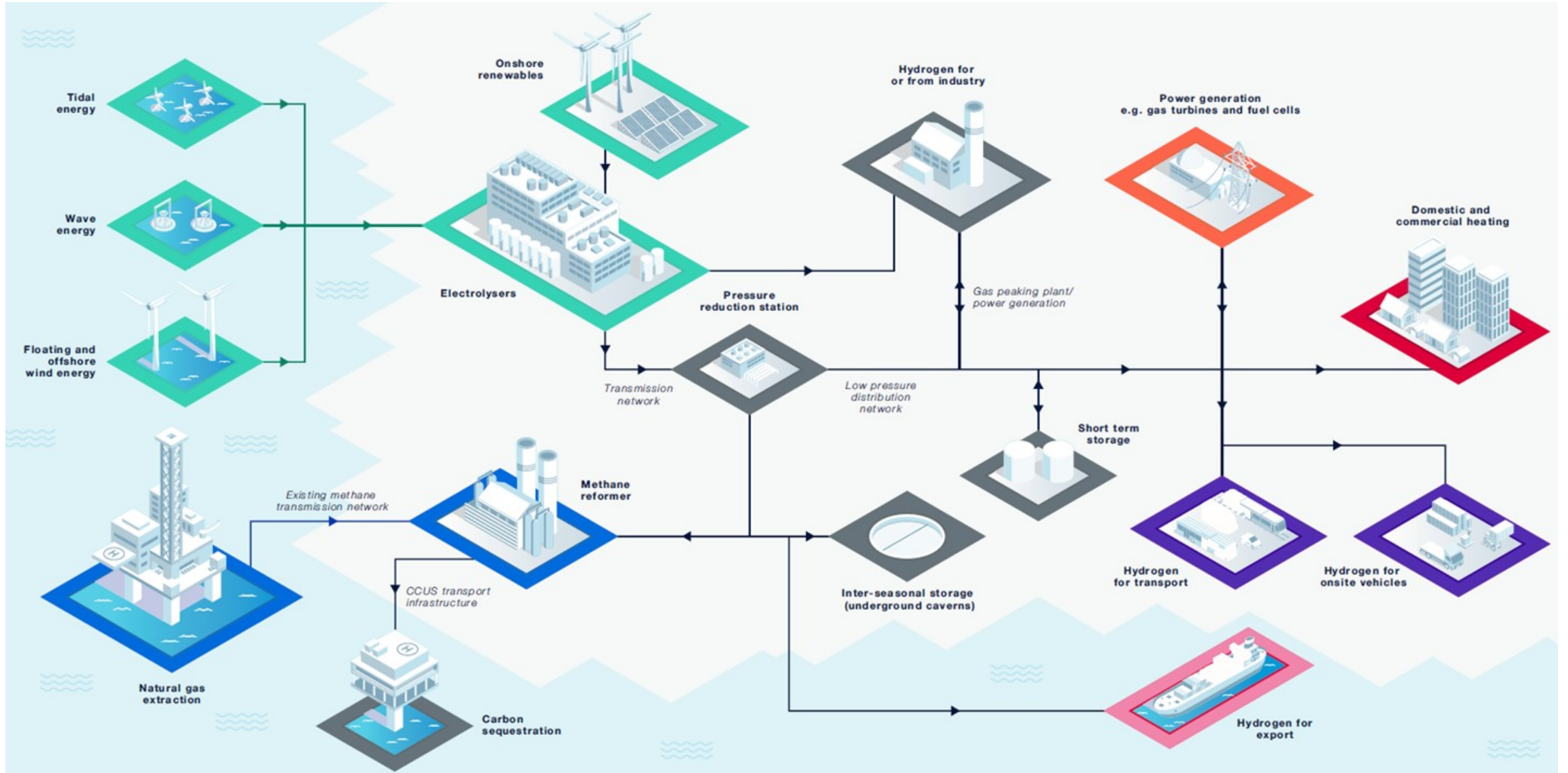


Hydrogen Supply Chain Export Report

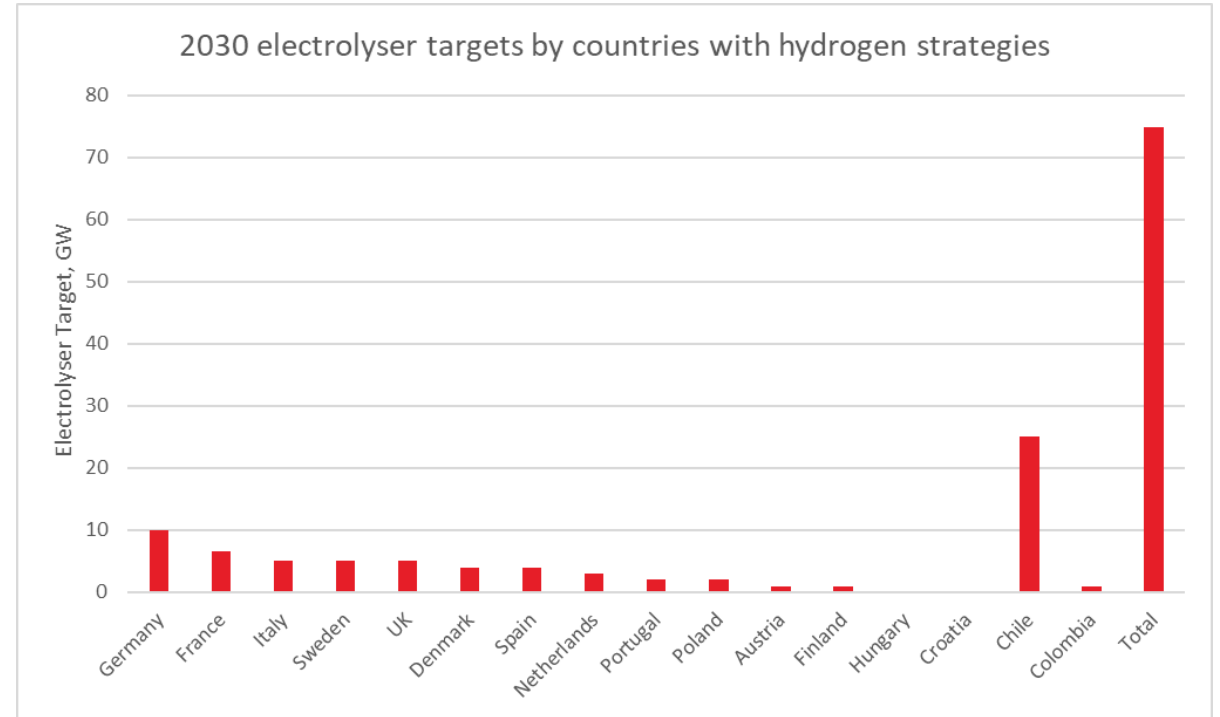
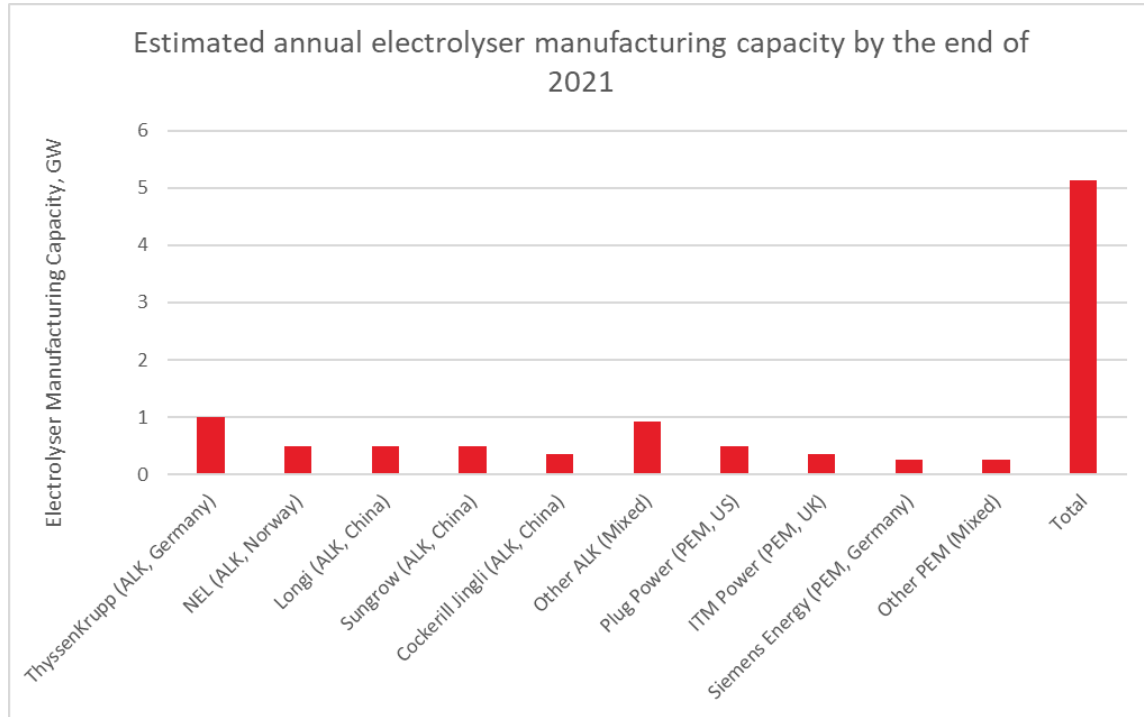


Assessment of Electrolysers

# Context



# Global Supply Chain Capacity

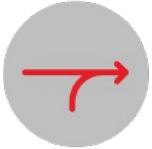


# The Supply Chain



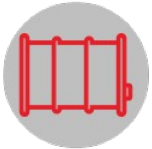
## Production

Producing low-carbon hydrogen using electrolysis or CCS-enabled thermochemical.



## Distribution

Delivering hydrogen from production to storage or end-use.



## Storage

Storing hydrogen to help balance supply and demand.



## Use & Offtake

Using hydrogen across a range of sectors, including production of derivatives.



## Products

Physical elements within the supply chain, such as an electrolyser, compressor, or electrical equipment.



## Solutions

Capabilities that directly deliver products, such as manufacturing, construction, or integration capability.



## Services

Auxiliary capabilities that support the delivery of products, such as engineering, environmental, operations & maintenance or financial services.

# Supply Chain Capabilities

## Raw & Processed Materials

- Metal mining and processing
- Materials processing
- Metal coating
- Plastics manufacture and processing
- Chemical processing
- Semiconductors

## Manufacture of Components

- Electrical equipment manufacture
- Water system manufacture
- Cooling equipment manufacture
- Process equipment manufacture
- Electrolyser/fuel cell manufacturer
- Testing facilities

## System Integration and Installation

- Metalwork and pipework
- Control system – electrical hardware and software
- System integrator
- Electrolyser/fuel cell OEM
- Project management, construction and commissioning

## Operation and Maintenance

- Available source of low carbon and cost-effective electricity
- Know-how to operate and maintain facilities
- Electrical, mechanical, software, control and chemical engineering

## End of Life

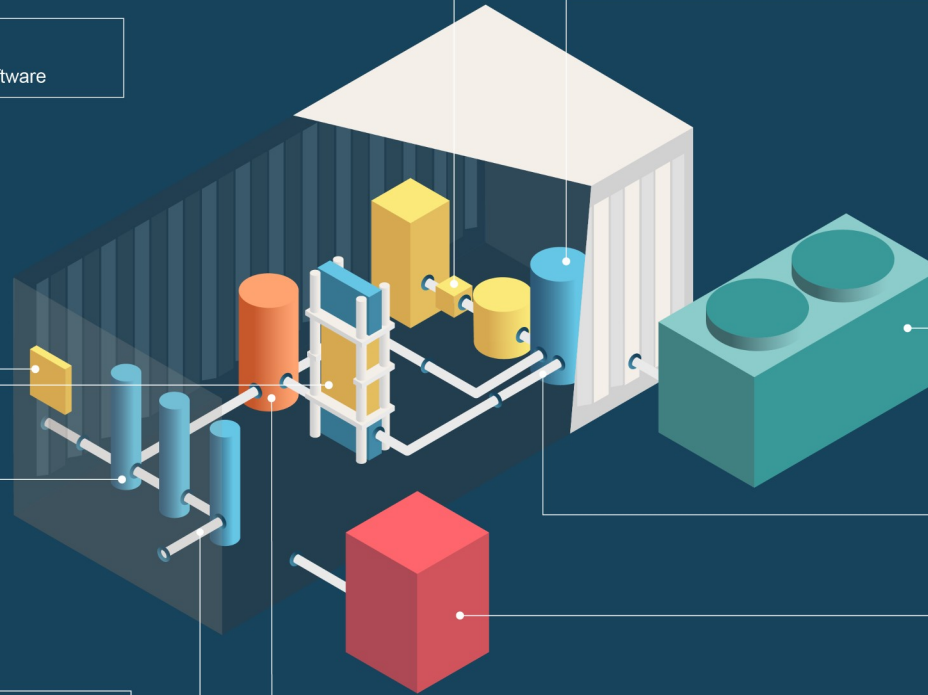
- Decommissioning services
- Material recovery and recycling

## ELECTROLYSER STACK

- **Anode**  
*Iridium Oxide*  
Metal Processing, Precision Engineering
- **Cathode**  
*Platinum Nanoparticles on Carbon Black*  
Metal Processing, Precision Engineering
- **Electrolyte**  
*Pfisa Membranes*  
Plastics Processing
- **Separator**  
*Pfisa Membranes*  
Plastics Processing
- **Porous Transport Layer Anode**  
*Platinum Coated Sintered Porus Titanium*  
Metal Processing, Metal Coating, Precision Engineering
- **Porous Transport Layer Anode**  
*Sintered Porous Titanium or Carbon Cloth*  
Metal Processing, Precision Engineering
- **Bipolar Plate Anode**  
*Platinum Coated Titanium*  
Metal Processing, Metal Coating, Precision Engineering
- **Bipolar Plate Anode**  
*Gold Coated Titanium*  
Metal Processing, Metal Coating, Precision Engineering
- **Frames and Sealing**  
*Ptfe, Psu, Etf*  
Plastics Processing, Precision Engineering

- **DE-IONISED WATER UNIT**
- **Feed Water Supply**  
Plumbing, Water Industry
- **Ion Polishers**  
*Composite PE*  
Resin: Wastewater Treatment, Potable Water, Food and Beverage - Vessel: Plastics Processing, Precision Engineering
- **Buffer Tank**  
*Polypropylene*  
Precision Engineering
- **Carbon Dioxide Scrubber**  
*Composite PE*  
Plastics Processing, Precision Engineering
- **Filters**  
*PP & PVC-C*  
Wastewater Treatment, Potable Water, Food and Beverage

**CONTROL SYSTEM**  
Electrical Hardware and Software



**OXYGEN-WATER SEPARATION**  
*Polypropylene*  
Plastics Processing, Precision Engineering

**COOLING UNIT**

- **Glycol Tank**  
*Stainless Steel 304*  
Precision Engineering
- **Filter**  
*Stainless Steel 304*  
Wastewater Treatment, Potable Water, Food and Beverage
- **Glycol Pump**  
*Cast Iron*  
Machine Engineering
- **Fans**  
Machine Engineering, Manufacture of Cooling Equipment

**PIPING**  
*PE100/Stainless or Carbon Steel*  
Manufacture and Installation of Pipework

**TRANSFORMER / RECTIFIER**  
Electrical Manufacturing and Installation

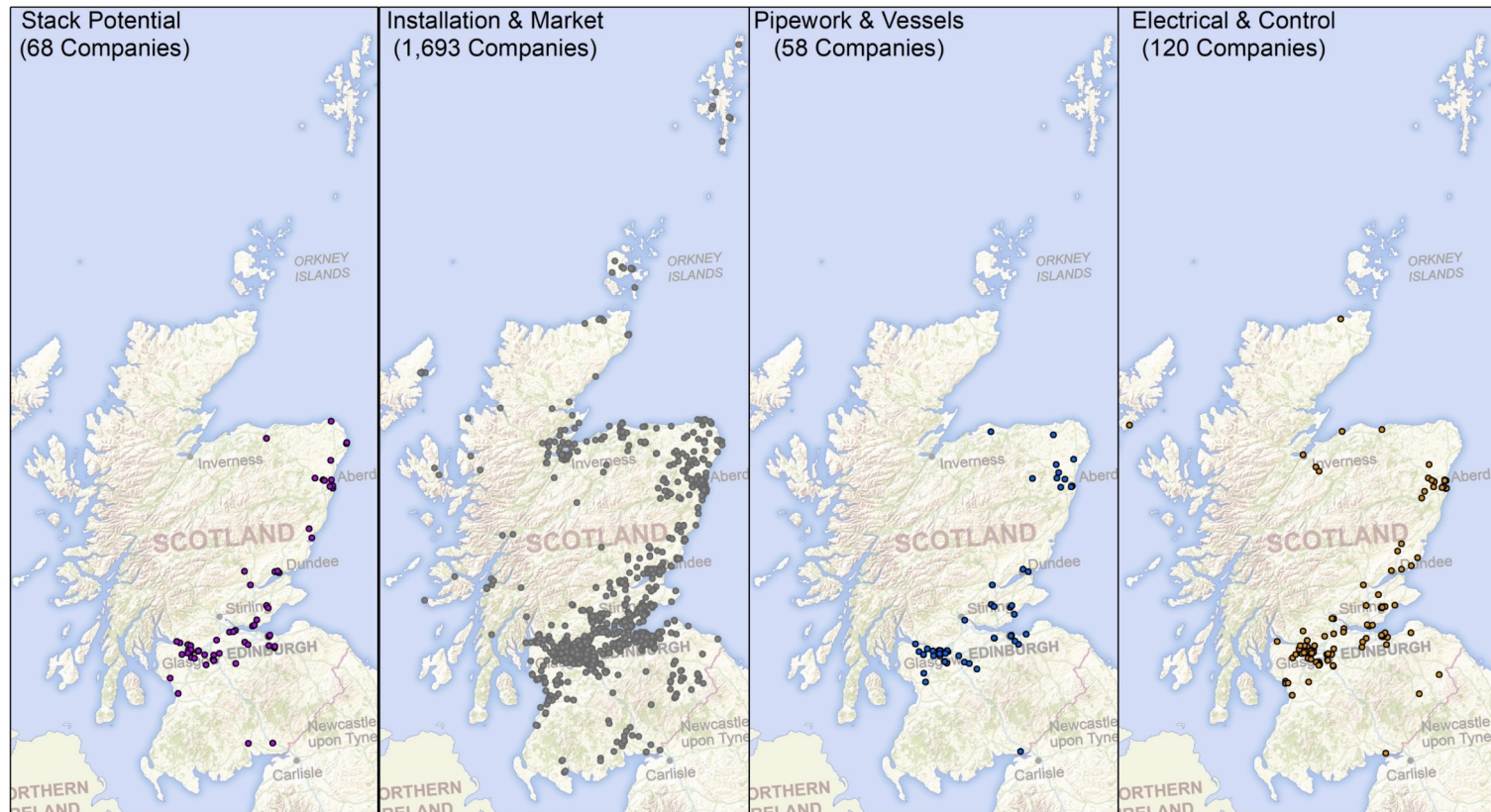
- **DE-OXO DRYER UNIT**
- **Deoxidiser**  
*Carbon Steel*  
Vessel: Precision Engineering - Catalyst: Metal Mining and Processing, Materials Processing
- **Dryer**  
*Carbon Steel*  
Vessel: Precision Engineering - Catalyst: Metal Mining and Processing, Materials Processing
- **Heat Exchanger**  
*Stainless Steel 316/Titanium*  
Machine Engineering
- **Fans**  
Machine Engineering, Manufacture of Cooling Equipment

**CABLING**  
Manufacture and Installation of Electrical Cabling

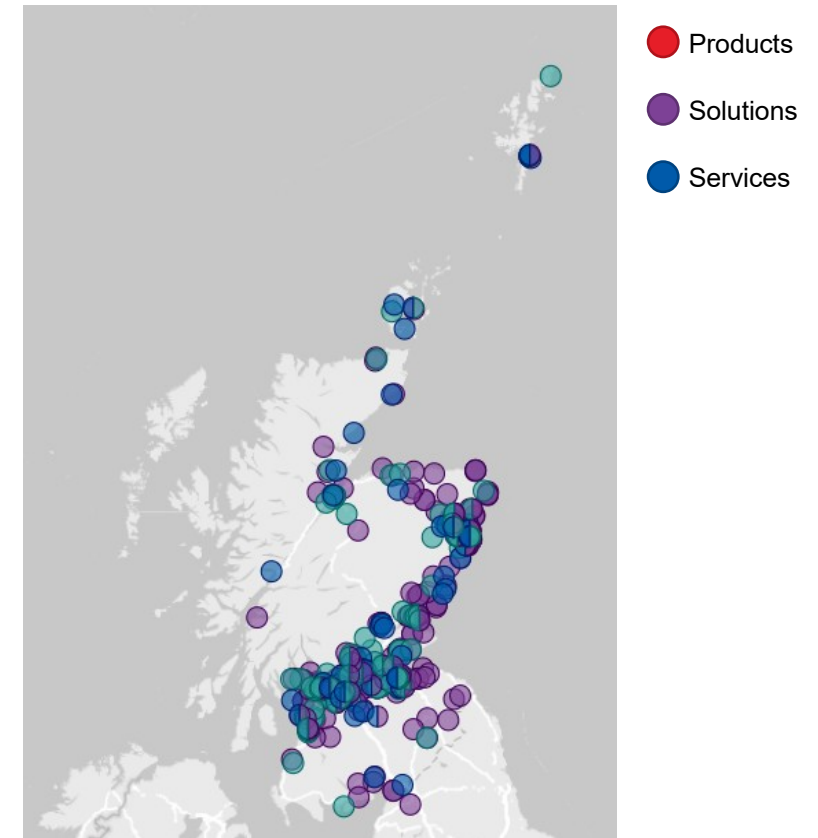
**HYDROGEN WATER SEPARATION**  
*Stainless Steel 316*  
Precision Engineering

# Existing Scottish Company Locations

## Electrolyser Supply Chain- High Level Analysis



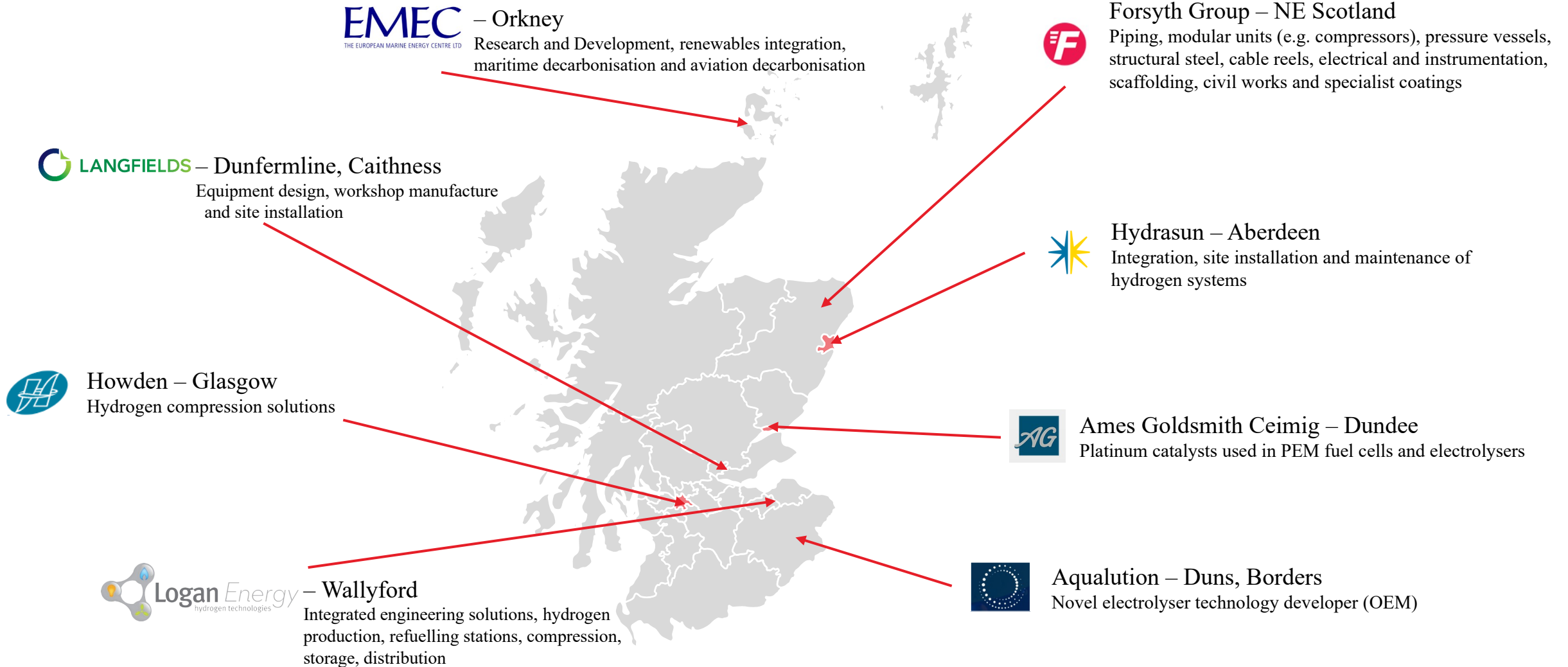
Companies House data from [http://download.companieshouse.gov.uk/en\\_output.htm](http://download.companieshouse.gov.uk/en_output.htm) has been combined with OS CodePoint Open and filtered to display Standard Industrial Classification (SIC) codes that represent the above sectors. Ordnance Survey (GB)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



Scottish companies mapped by capability  
Source: Scottish Enterprise

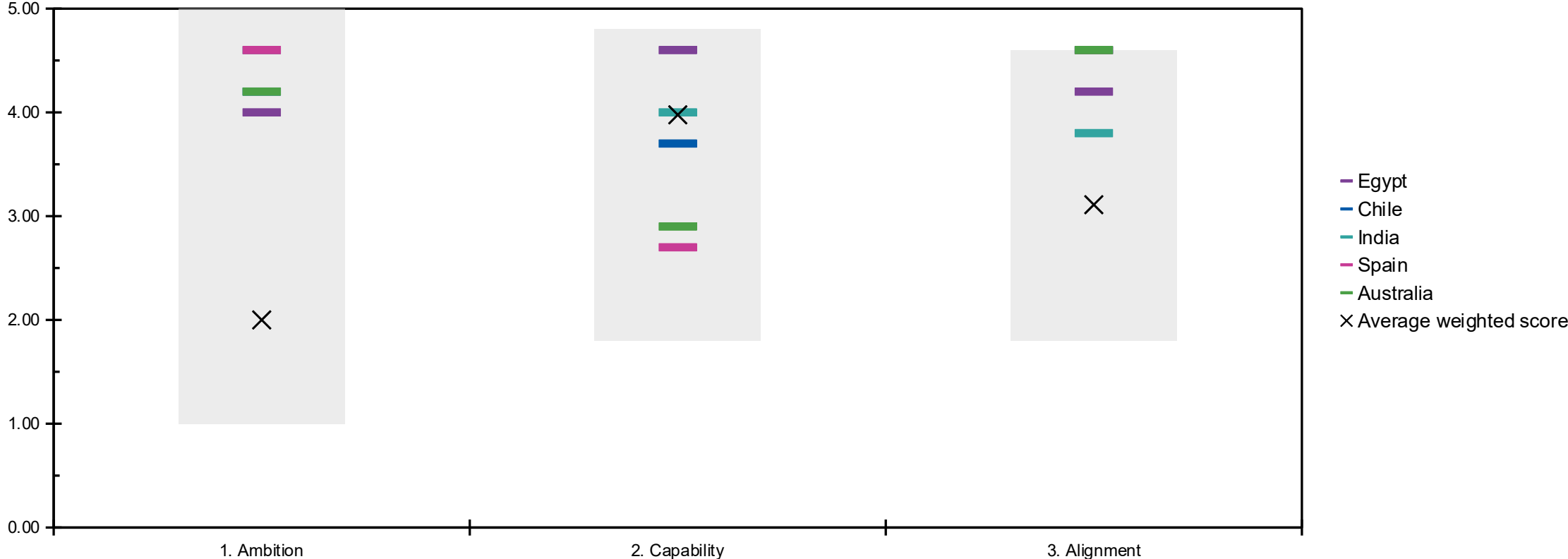


# Example of Active Companies



# Supply Chain Export Opportunities

## Market Prioritisation Results



# Next Steps



Break down supply chain across the hydrogen sector – hopefully coming soon



Understand the Scottish capability further by building on existing data



Further investigation of potential sites to develop hydrogen electrolyser manufacturing



Engage with key partners in target countries to develop a foothold



Encourage Scotland's academic and research base to increase hydrogen and electrolyser focus to attract industry

## Policy Options



Financial support – grants, loans, revenue support



Location support – planning, access and facility packages



Skills / training support – apprenticeships, higher education

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