Circular economy for the wind sector

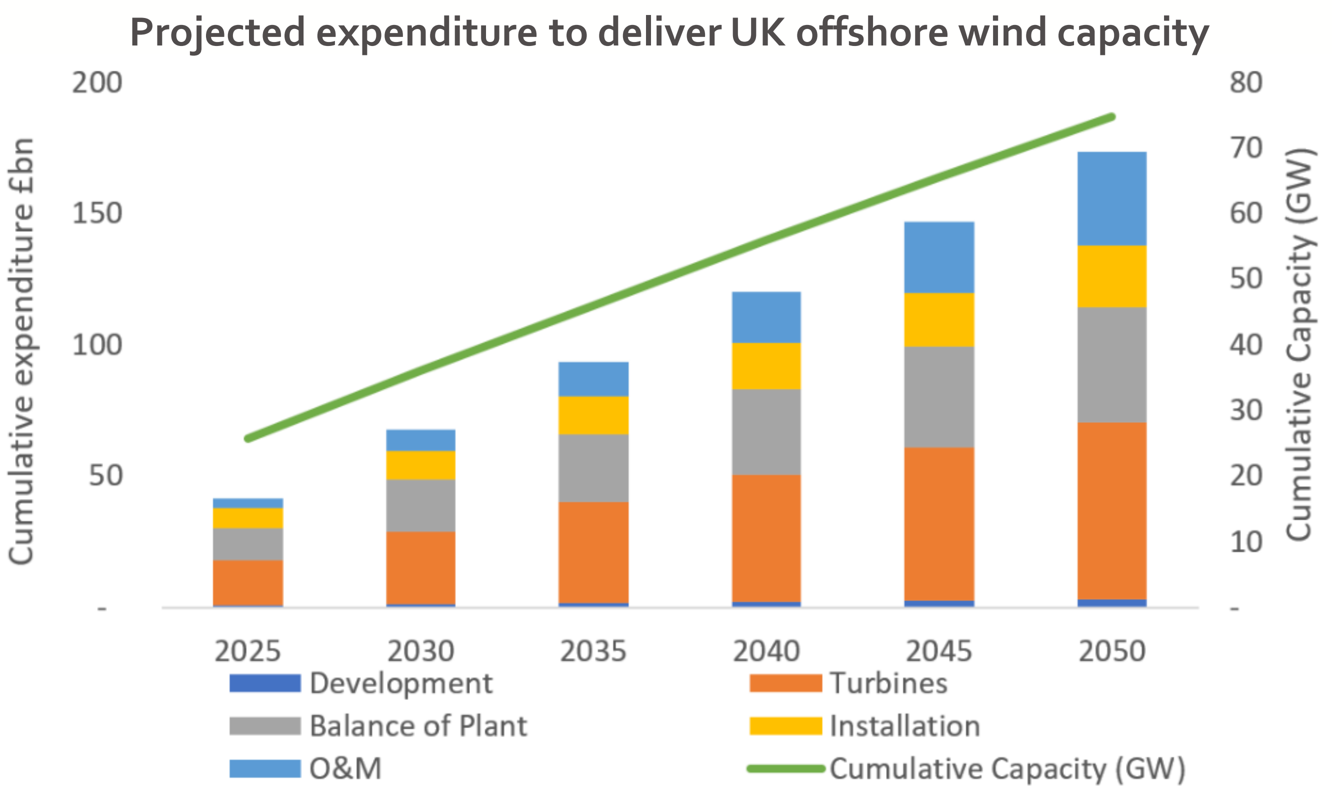
17th Feb 2021 | Steve Ross

CATAPULT Offshore Renewable Energy

So why are we even looking at this?

UK economic growth on the path to Net Zero

The UK needs to quadruple low-carbon power supply by 2050, including at least 75 GW of offshore wind*



The UK growth potential from offshore renewables is truly enormous.

*Committee on Climate Change Net Zero report, May 2019

.....BUT – The UK has a multi-fuel strategy that cant be ignored or viewed in isolation......

Who are Offshore Renewable Catapult?

The Offshore Renewable Energy Catapult

- Over 220 engineering, research and sector experts
- World-leading test and demonstration facilities

8 UK Regional Centres

Aberdeen • Blyth • Fife • Glasgow • Hayle • Grimsby
Lowestoft • Pembroke Dock

3 UK Academic Research Hubs

Universities of Manchester & Strathclyde - Electrical Infrastructure

University of Bristol - Blades

University of Sheffield - Power Trains

International Research and Innovation Centre

Yantai, China

Our Impact

CATAPULT Offshore Renewable Energy

SMEs supported
235
803
SINCE 2013

International projects
63
114
SINCE 2013

Active R&D projects
156
328
SINCE 2013

Value of test facilities
¼ bn

OUR IMPACT IN 2019/2020

CATAPULT Offshore Renewable Energy

Companies supported with product development
44
188
SINCE 2013

Academic collaborations
264
556
SINCE 2013

Year-on-Year uplift in total revenue
36%

Year-on-Year uplift in competitive R&D
9%

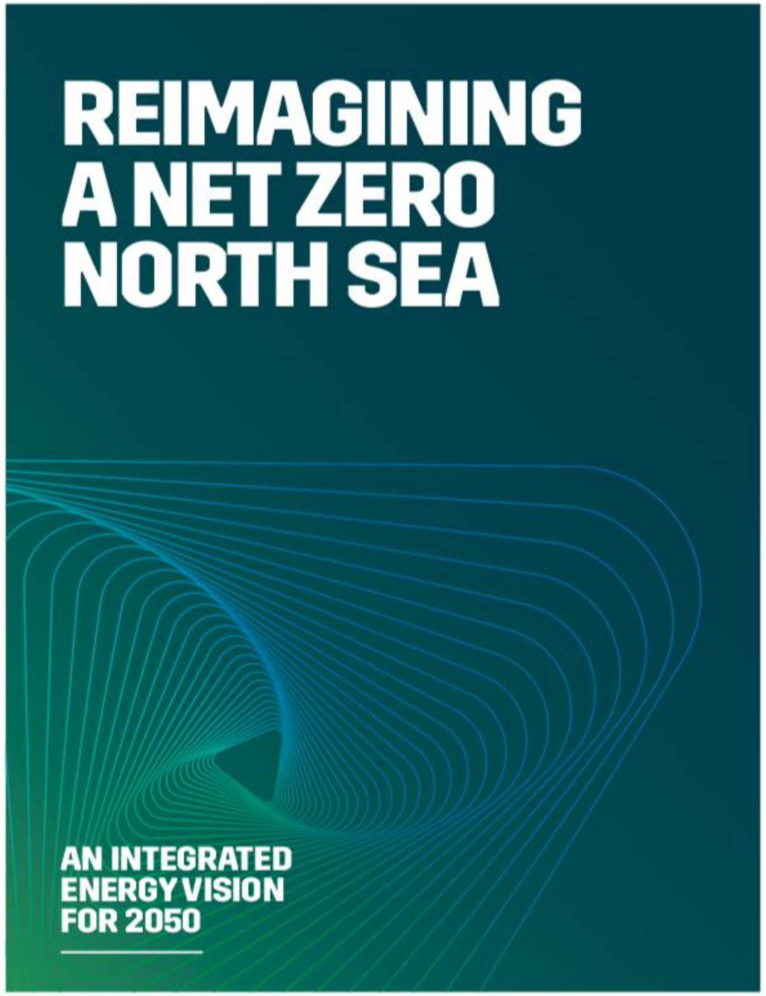
Industry collaborations
154
802
SINCE 2013

Options to deliver decarbonised UK energy.

In the **Emerging** scenario, renewable energy plays an increasing role, with gas still a significant contributor to the offshore energy mix and a significant requirement for carbon capture and storage (CCS).

In **Progressive**, an increased share of offshore renewables dominates the electricity market alongside a blue/green hydrogen mix, with a major role for CCS.

Transformational outlines an energy system which is driven by offshore wind and green hydrogen, with oil and gas demand matched by clean domestic supply.



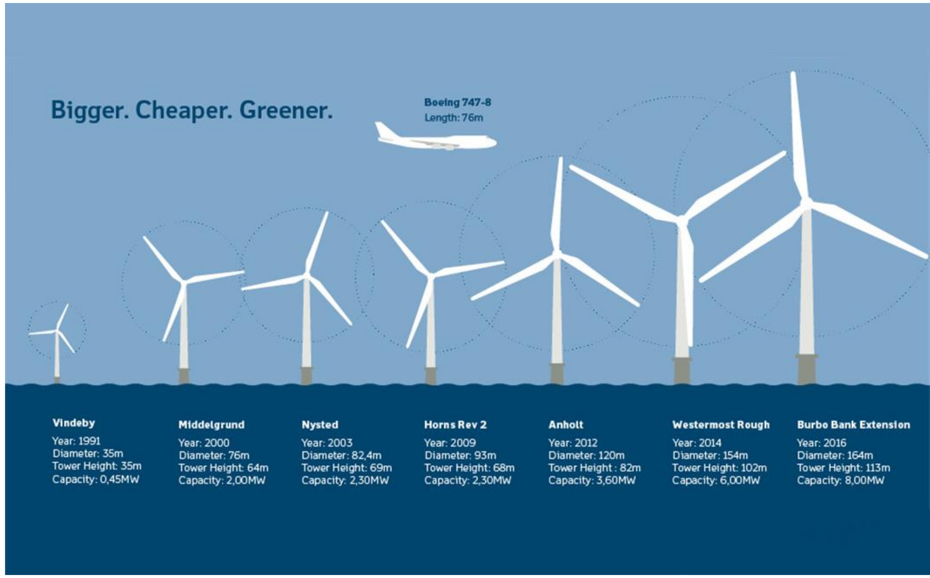
Reimaging a Net Zero North Sea

What will it cost in the UK?

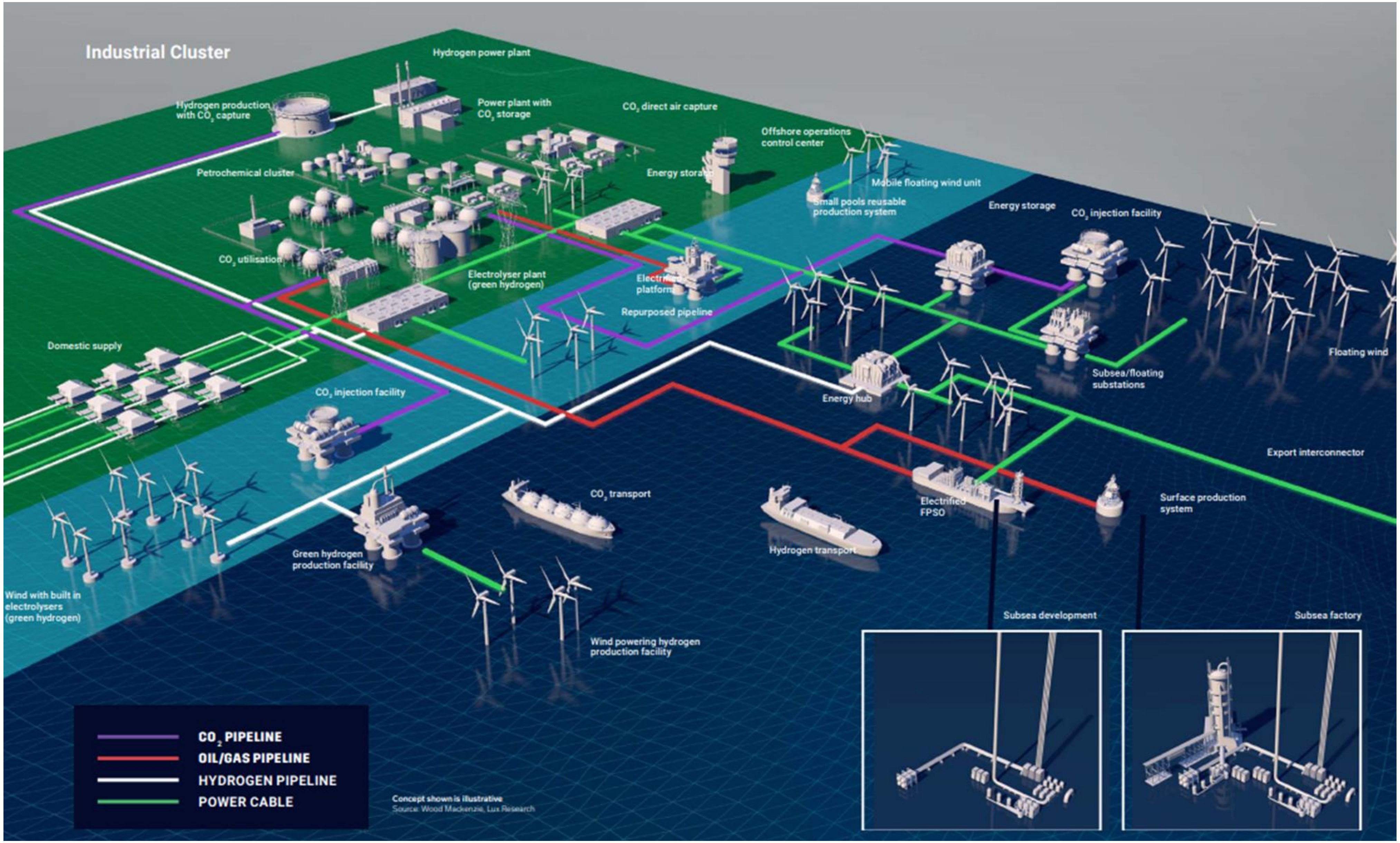
Early investment is essential – up to **£416bn over the next 30 years** – to unlock **potential value of £125bn per year** for the UK economy and support up to **232,000 jobs**. Investment at pace, together with commitment to a net zero North Sea, will accelerate new job opportunities which could mitigate major job losses otherwise expected over the next decade.

Focused investment in technology innovation could also deliver **savings of £154bn by 2050**, reducing costs for consumers and delivering affordable clean energy for UK homes and businesses. Being a leader in clean energy skills and technology presents a valuable export opportunity that the UK must seize.

Decarbonisation represents a major environmental and cost impact for the wind sector – especially offshore



What it could look like



Integrated Energy Vision

CATAPULT Offshore Renewable Energy

AT A GLANCE

AN INTEGRATED ENERGY VISION FOR 2050

	TODAY 2020	EMERGING 2050	PROGRESSIVE 2050	TRANSFORMATIONAL 2050
Summary	> Blue and green hydrogen not commercially available > Gas import dependency rising year on year > Floating wind trials in UK waters > CCS under development but not operational	> Blue hydrogen plays a major role > Large reliance on imported gas > Negligible role for floating wind > Significant requirement for CCS	> Blue and green hydrogen play a major role > Moderate reliance on gas imports > Large role for floating offshore wind > Significant requirement for CCS	> Green hydrogen plays a major role > Low reliance on imported gas > Crucial role for floating wind > Moderate requirement for CCS
Economy	£40bn Total Economic Impact	£80bn Total Economic Impact	£100bn Total Economic Impact	£125bn Total Economic Impact
Jobs	140,000 Direct & Indirect	113,000 Direct & Indirect	158,000 Direct & Indirect	232,000 Direct & Indirect
Imports	UKCS / Imports ~45%	UKCS / Imports ~45%	UKCS / Imports ~30%	UKCS / Imports ~10%
Investment	£10bn Average historic CAPEX p.a	£6.5bn Average CAPEX p.a	£9.4bn Average CAPEX p.a	£13.4bn Average CAPEX p.a

Offshore energy mix

	TODAY 2020	EMERGING 2050	PROGRESSIVE 2050	TRANSFORMATIONAL 2050
Offshore wind	Electricity 32 TWh	Electricity 289 TWh	Electricity 380 TWh, Hydrogen 101 TWh	Electricity 380 TWh, Hydrogen 340 TWh
Hydrogen	27 TWh	270 TWh	Blue 195 TWh, Green 75 TWh	Blue 17 TWh, Green 253 TWh
Oil & Gas	~40% IMPORTS; Oil 640 TWh, Gas 700 TWh	81% IMPORTS; Oil 270 TWh, Gas 801 TWh	72% IMPORTS; Oil 270 TWh, Gas 555 TWh	54% IMPORTS; Oil 270 TWh, Gas 333 TWh
Carbon Capture & Storage (CCS)	0 $MTCO_2$/year	140 $MTCO_2$/year	113 $MTCO_2$/year	81 $MTCO_2$/year

Technology priorities

Technology priorities				Innovation cost savings	
Green Hydrogen	Electrolyser catalyst innovation	Seawater electrolysis	Subsea electrolyser solutions incorporating compression	£55bn	Cost Reduction 61%
Offshore Wind	Reduced cost floating wind foundations	Innovative floating wind mooring systems	Dynamic cabling solutions to reduce downtime	£97bn	Cost Reduction 24%
Blue Hydrogen	Enhanced SMR reactor membranes and catalysts	Alternative production methods eg. plasma pyrolysis	High-capacity sorbents more durable at high temperatures	£6.5bn	Cost Reduction 32%
Carbon Capture & Storage	Modular retrofittable carbon capture solutions	Modelling geological behaviour of CO_2	Direct air / seawater capture	£1.3bn	Cost Reduction 13%

REIMAGINING THE UK'S ENERGY SECTOR

Economy

£125bn

Up to £125bn per year in total economic activity in the UK energy offshore sector by 2050, depending on the path selected

Technology

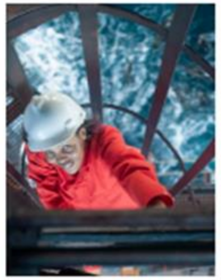
Critically, a reimagined North Sea will drive blue and green hydrogen production at scale and create a significant role for marine renewables, while driving improvements to storage, networks and interconnection

Offshore wind

Commitment to significant expansion of floating and fixed offshore wind, combined with anticipated cost savings, will boost energy security, reduce dependence on imported energy and increased production of green hydrogen

Carbon capture

Cost-effective, widespread deployment of carbon capture and storage will enable the broadest range of technologies and industries to contribute to the zero-emissions vision



Reduced costs

Innovation can drive increased affordability across a number of technologies and ultimately reduce the cost of energy to consumers in the net zero world

Jobs

232,000

232,000 offshore energy jobs are possible by 2050, up from 140,000 direct and indirect today; the severity of the predicted employment downturn this decade can be considerably reduced

Continuity

UK hydrocarbons will continue to fulfil necessary UK energy demand through net zero domestic production, reducing reliance on imports and reducing emissions through technologies such as electrification

Exports

The opportunities of net zero will multiply beyond UK borders: green hydrogen as a commodity, carbon sequestration as a service, the transfer of hard-won skills and expertise to new markets

An integrated energy vision for the UK North Sea will enable investment by operators, developers and the supply chain in infrastructure and critical technologies, while simultaneously allowing regions and educators to plan for the skills of tomorrow.

The right actions, adopted now, will not only establish a well-marked path towards net zero, it will open the door to the opportunities of a reimagined North Sea and the full range of benefits from a positive, just transformation.

…BUT - Wind Power has to also start thinking about decommissioning….

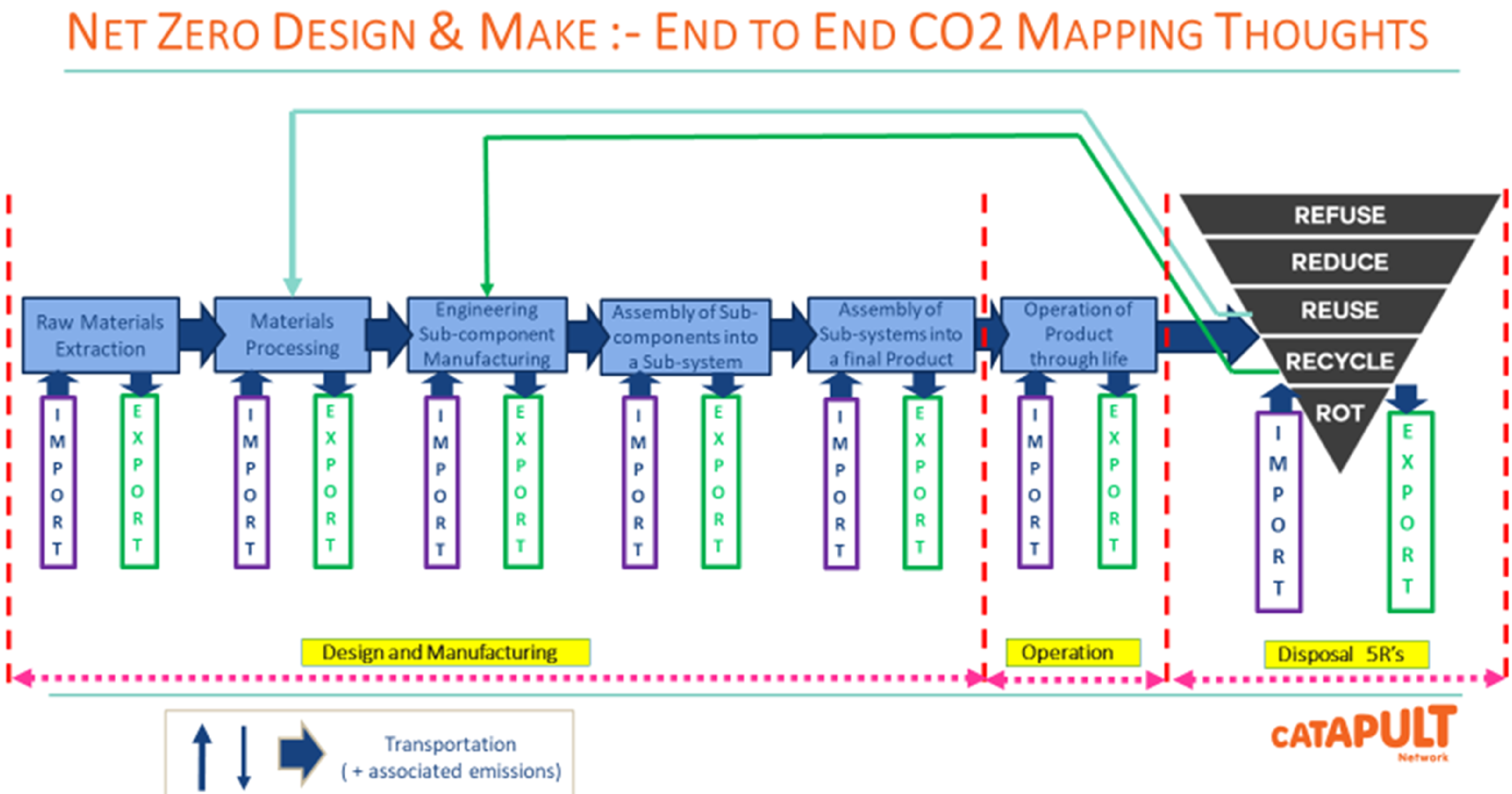
Decommissioning – a simplistic viewpoint

At commissioning 100% of costs and risk

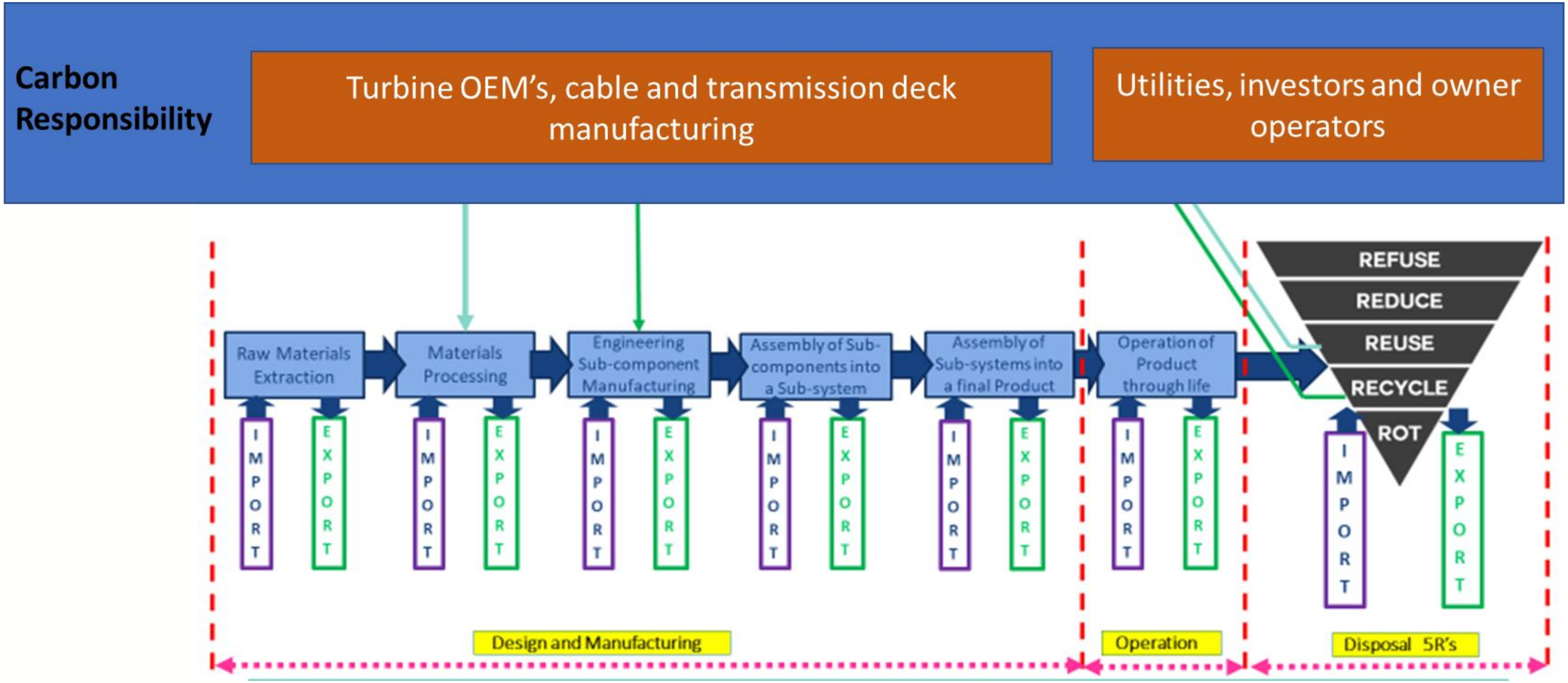
Year 8-10 construction and installation costs recovered

Year 25+ profit for the asset owner and plan for decommissioning and repower

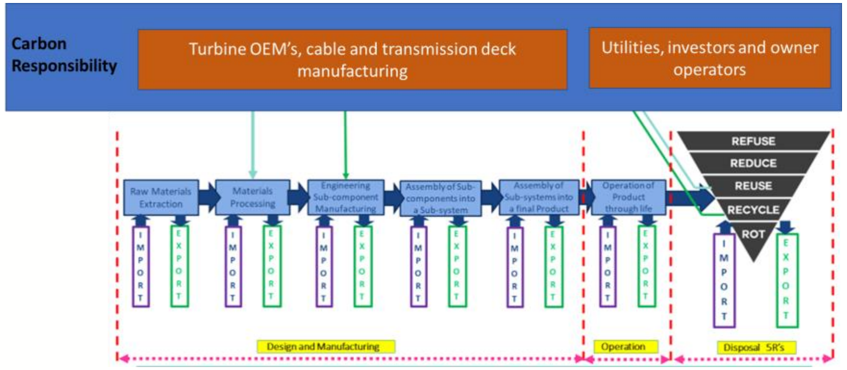
What makes up a turbine



Who is responsible for what and when



Components and recyclets



High Proportion of Materials

- Carbon Fibre
- Composites
- Copper
- Steels
- Concrete
- Plastics

Low Proportion of Materials

- Magnets
- Rare Metals
- Fluids (oils, coolant etc)
- Lead

CEWS Programme 2021/2026+

- Cost Strategy
- End of Life Monopiles
- Recycling and Route Mapping
- Repowering Strategy

Involvement

- Asset owners/ managers (global)
- OEM's
- Governments
- Wide collaborations (ECAH, SusWIND, WFO, ZEBRA, WindEurope, NREL…….)
- Integration with O&G for skills and understanding of decommissioning
- Solution providers
- Industry funded with UK govt support and other govt (Denmark, Netherlands and Germany interested..)
- £2m per year budget

Cost strategy - thumbnail

Project Overview

At the point where a lease agreement is made with an operator and BEIS, a bond is lodged to cover the cost for decommissioning. This process has been adopted from the O&G sector, where it has caused concern and issue from having a bond value that comes short of true decommissioning costs.
ORE Catapult plan to deliver a detailed understanding of the current cost for decommissioning (2020) and extrapolated cost for 2025, 2030 and 2040…..

Once the cost structure and value is understood start to focus on key high value cost areas and look to drive these costs down in terms of innovation and lessons learnt from other sectors such as O&G, Nuclear and other subsea sectors.

Deliverables and Milestones

Phase 1 – Agreement from the group as to the structure of the programme

Phase 2 – Research from OREC and academia to the sector and UK govt to determine initial (2020) cost understanding

Phase 3 – detailed understanding of the key cost areas and their value

Phase 4 – Development of industry challenges to drive down these costs and improvements

Thankyou for your interest – questions?

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