

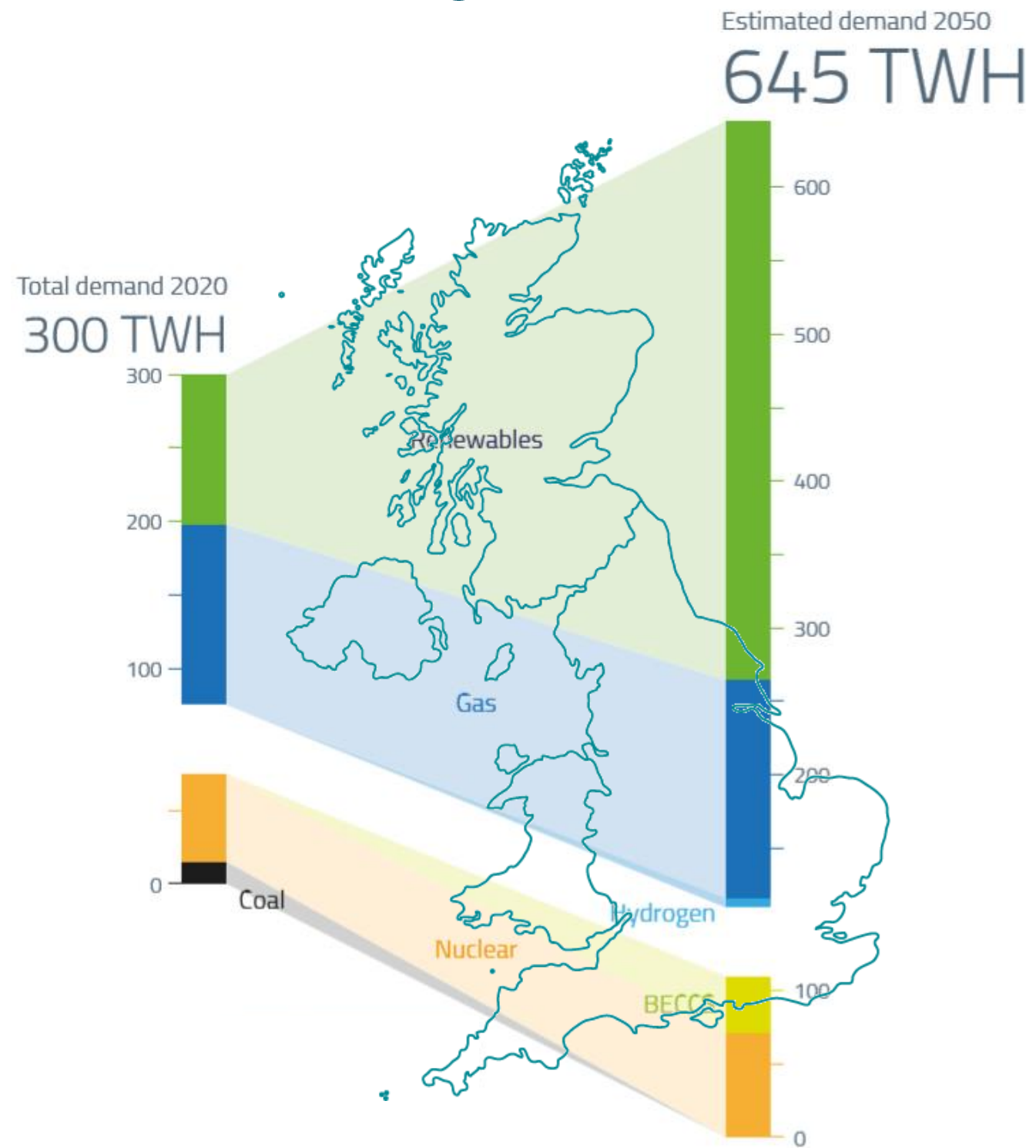


The Net Zero North Sea Vision

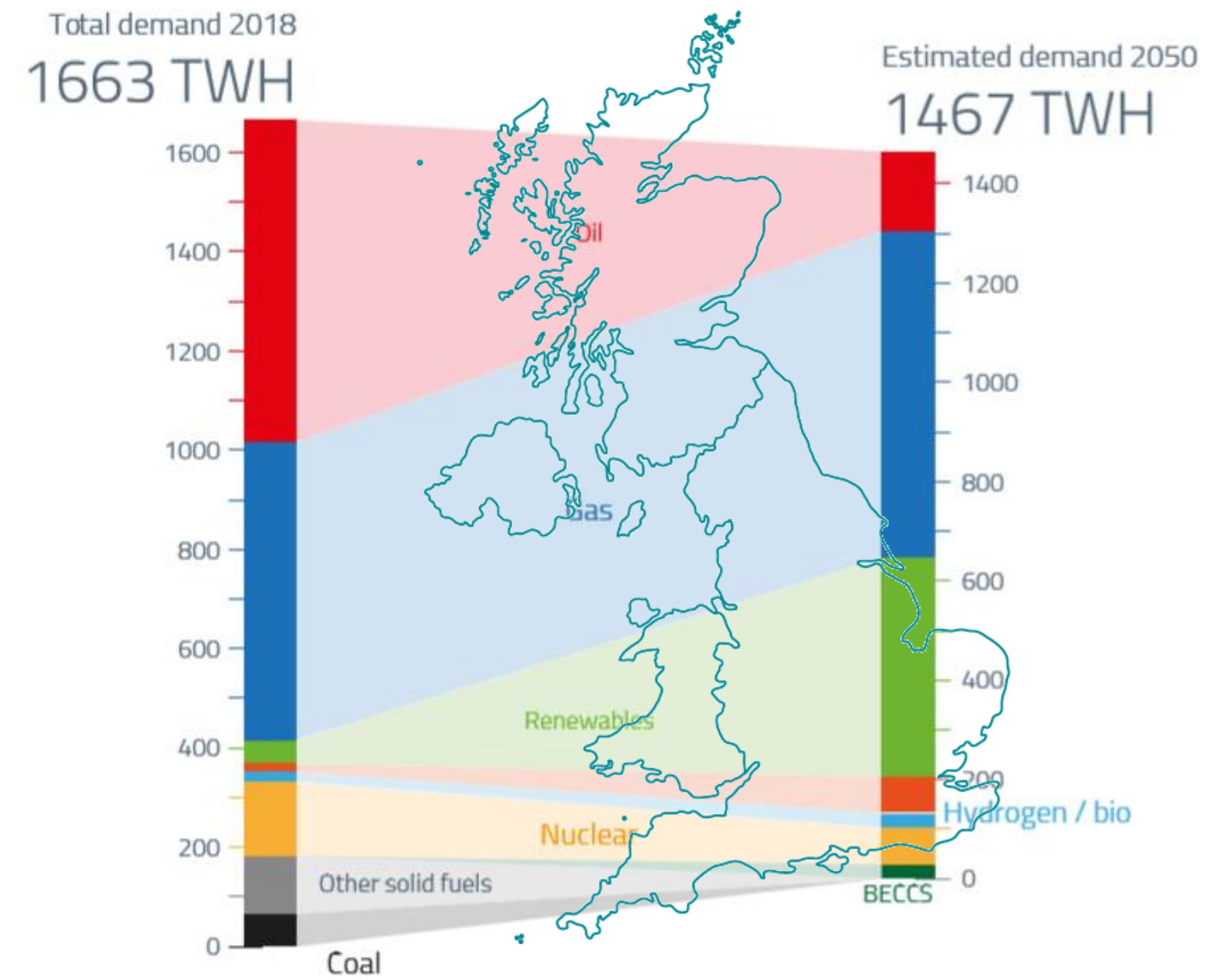
Luca Corradi
08/09/2021

Electricity Demand

2020 – 2050
A UK Perspective



Power Demand



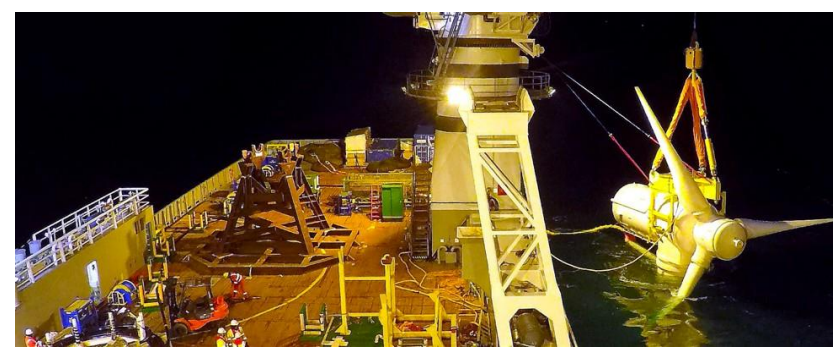
Resource	WIND	WAVE & TIDAL	SOLAR	OIL & GAS	HYDROGEN	CARBON CAPTURE
	95-250 GW	~ 100 GW	> 150 GW	1.7bn BOE Gas 3.8bn BOE Oil	> 270 TWH GH2 17 – 270 TWH BH2	78 Gtonne



Reimagining the UK's energy sector

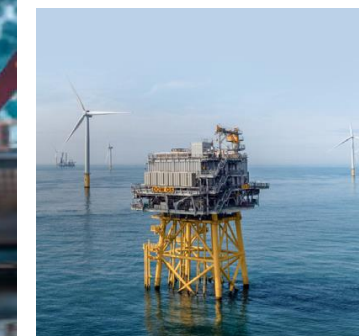
£125bn opportunity

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



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



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



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

232,000 jobs

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

Technology

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



Resilience

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

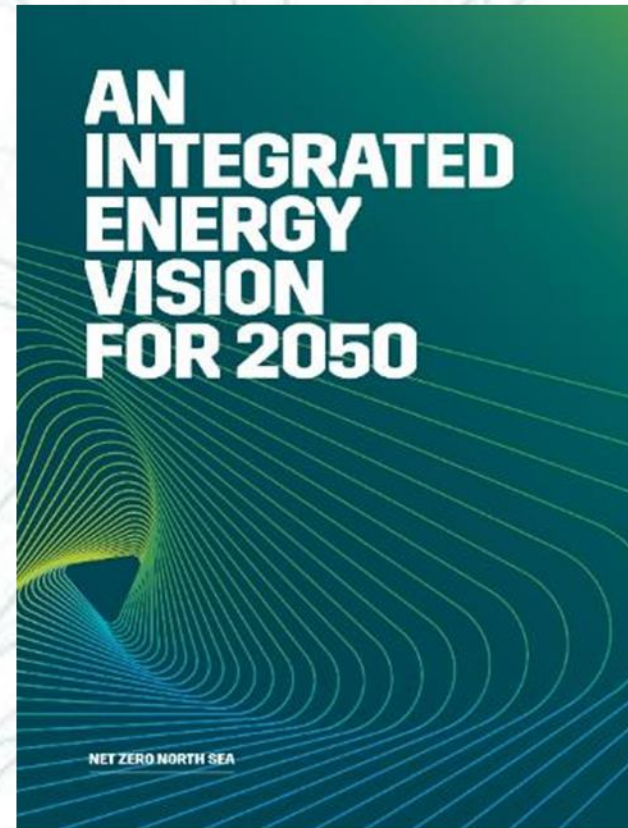


Exports

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



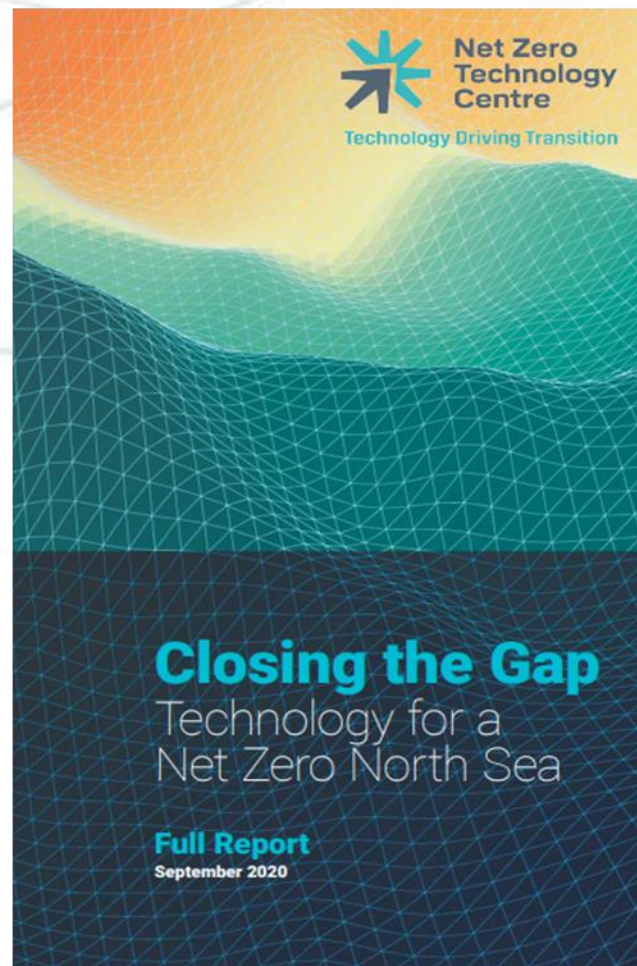
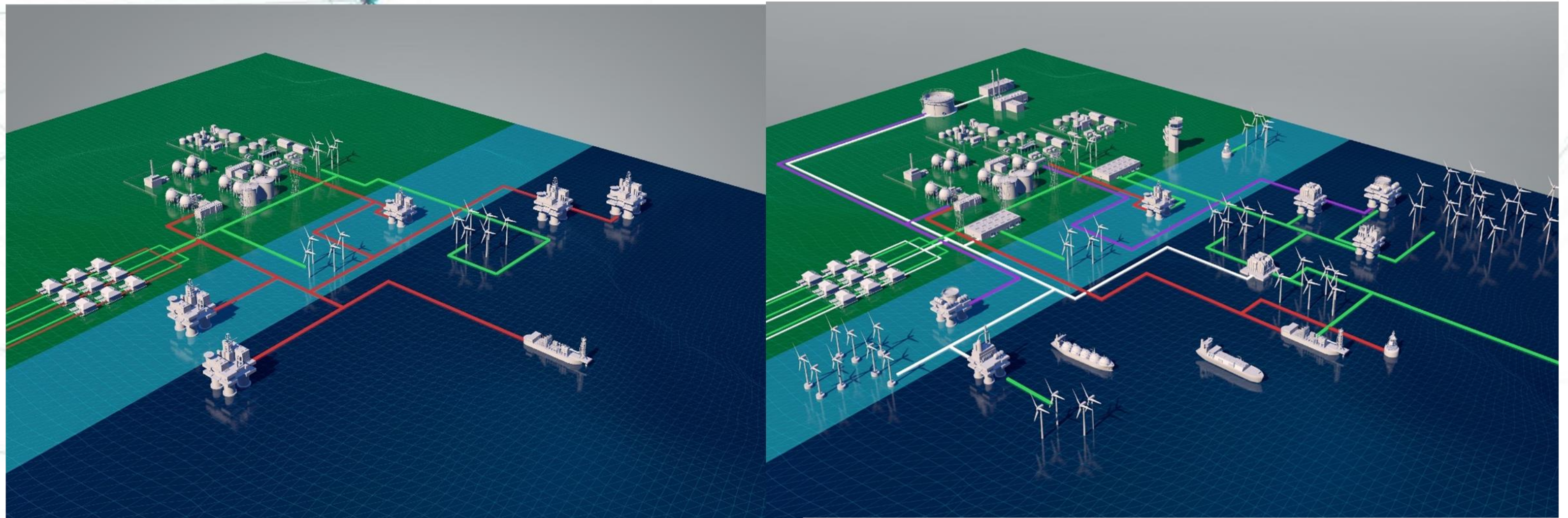
An integrated energy future



Up to **£416bn** investment required over next 30 years

Potentially contribute **£125bn** per year to the UK economy by 2050.






Support more than **230,000 jobs**.



Closing the technology gaps:
Offshore wind; Hydrogen; Carbon, capture & storage; Oil & Gas electrification and transportation

2050 Scenarios At a Glance

The size of the challenge is surpassed only by the potential rewards of success

	TODAY 2020	EMERGING 2050	PROGRESSIVE 2050	TRANSFORMATIONAL 2050
 Summary	<ul style="list-style-type: none"> > 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 	<ul style="list-style-type: none"> > Blue hydrogen plays a major role > Large reliance on imported gas > Negligible role for floating wind > Significant requirement for CCS 	<ul style="list-style-type: none"> > Blue and green hydrogen play a major role > Moderate reliance on gas imports > Large role for floating offshore wind > Significant requirement for CCS 	<ul style="list-style-type: none"> > 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

 Offshore wind	Electricity 32TWh	Electricity 289TWh	Electricity 380TWh Hydrogen 101TWh	Electricity 380TWh Hydrogen 340TWh
 Hydrogen	27TWh	270TWh	Blue 195TWh Green 75TWh	Blue 17TWh Green 253TWh
 Oil & Gas	~40% IMPORTS Oil 640TWh Gas 700TWh	81% IMPORTS Oil 270TWh Gas 801TWh	72% IMPORTS Oil 270TWh Gas 555TWh	54% IMPORTS Oil 270TWh Gas 333TWh
 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%

TECHNOLOGY FOR 2050

We have identified a range of critical technologies, which include but are not limited to:



Oil & Gas

Ammonia or other low-carbon fuelled turbines

Marine hydrogen transport solutions

Platform electrification (AC/DC cabling solutions)

Subsea electrification cost reduction



Offshore Wind

UK-specific floating wind foundations

Innovative floating wind mooring systems

Dynamic cabling solutions to reduce wind downtime



Carbon Capture & Storage

Modelling of geological behaviours of CO2

Modular, retrofittable carbon capture solutions

Direct air/seawater capture

CO2-compatible well plug and abandonment techniques

High-capacity sorbents durable at high temperatures



Hydrogen

Seawater electrolysis

Electrolyser catalyst innovation

Subsea electrolyser systems incorporating compression

Improved efficiency of existing SMR and ATR technology

Enhanced SMR reactor membranes and catalysts

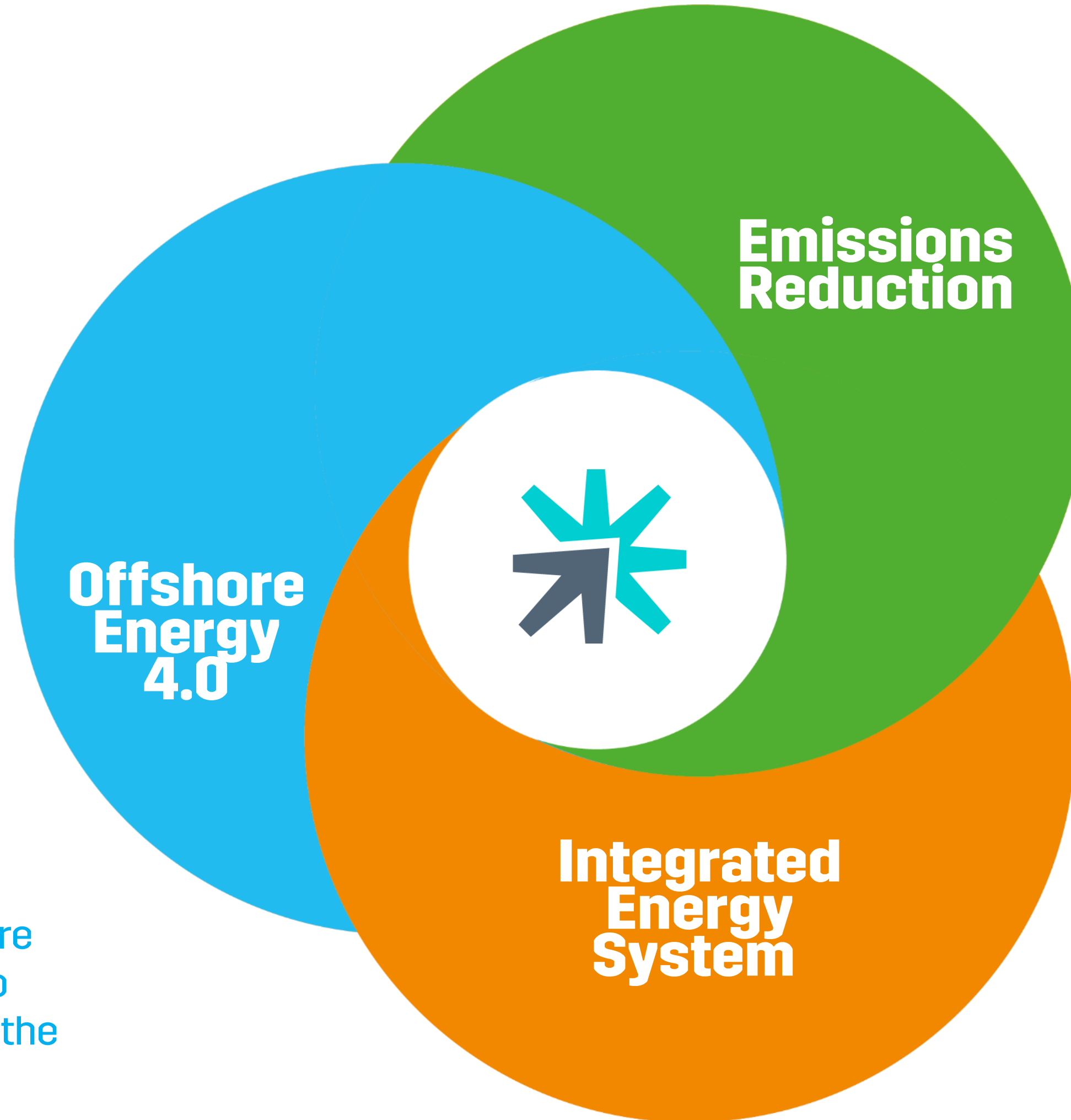
Alternative blue hydrogen production methods

Inter-seasonal hydrogen storage



One Net Zero Solution Centre

3 clear programmes



Oil and gas are key part of the future energy mix, but we must decarbonise operations

Digitisation and automation are critical for a net zero future, to reduce emissions and unlock the potential of a smart basin

We need investment and innovation in new affordable clean offshore power and storage solutions to create an integrated energy future

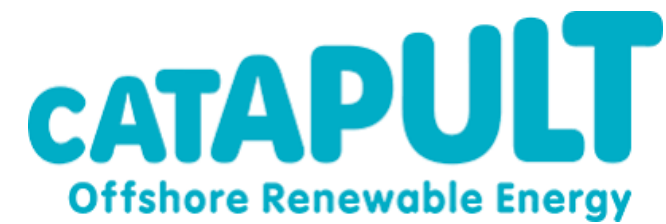


Alliances and partnerships



Energy Transition Alliance (ETA)

5 year roadmap.
5 initial projects.



5 year partnership with AIRTO

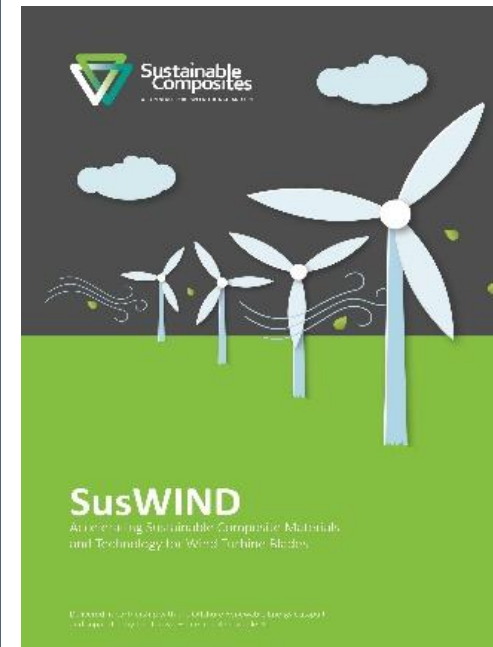
Mapping Net Zero initiatives across IRTOs.

Scotland Net Zero Roadmap (SNZR)

Collaborative project led by NECCUS and funded by ISCF-Innovate UK based on Hydrogen and CCS.

End2End Hydrogen

Review of technology gaps and innovation needs for hydrogen production and distribution with partners OREC, HVMC, ESC, ATI, APC.



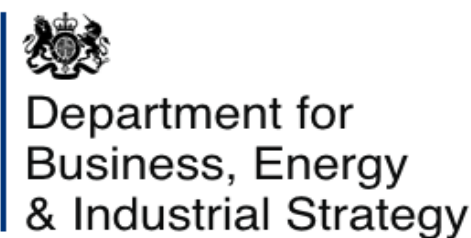
SusWIND Program

Accelerates Sustainable Composite Materials and Technology for Wind Turbine Blades.



One North Sea

Collaboration project with TNO (NL) to map energy integration projects across borders.



Hydrogen Advisory Council (HAC)

Deployment Roadmap for 2020s, led by BEIS

**We exist to transform
the energy industry.**

**We exist to drive down
costs, increase efficiency
and help deliver a net zero
energy system.**



#HelloFuture



**Net Zero
Technology
Centre**

Technology Driving Transition