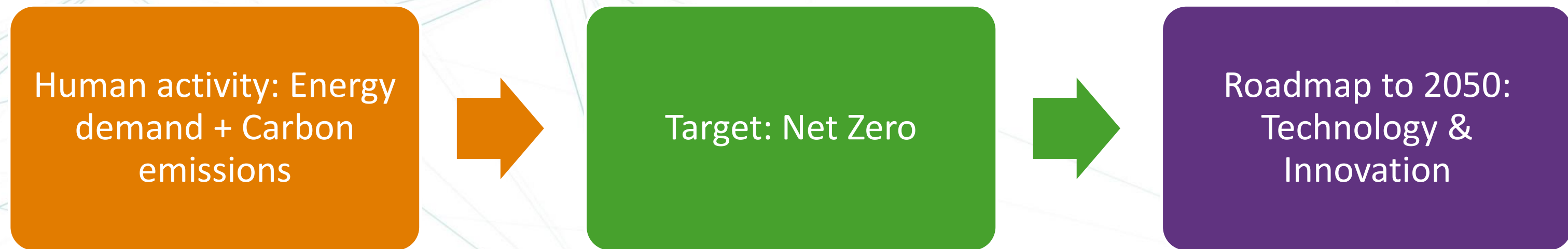




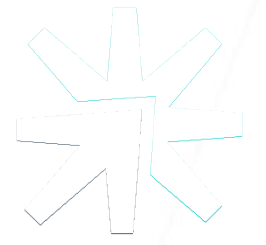
Technology and Innovation: How to deliver a Net Zero Offshore Industry

SPE Simplified Series
4th December 2019

Outline



Human activity & Energy demand



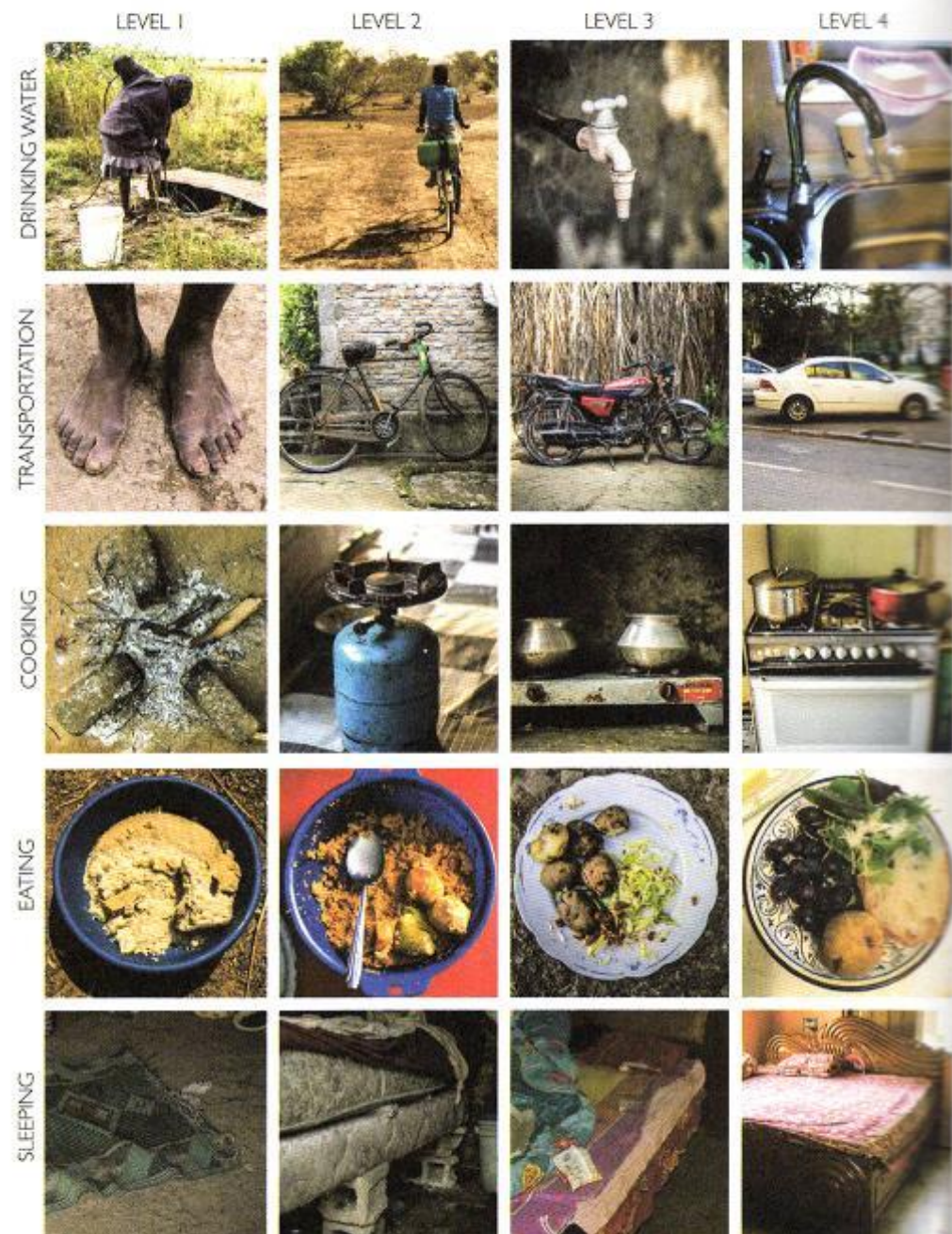
Growing population

Social & economic opportunities improving

Energy demand increasing by 25% to 2040

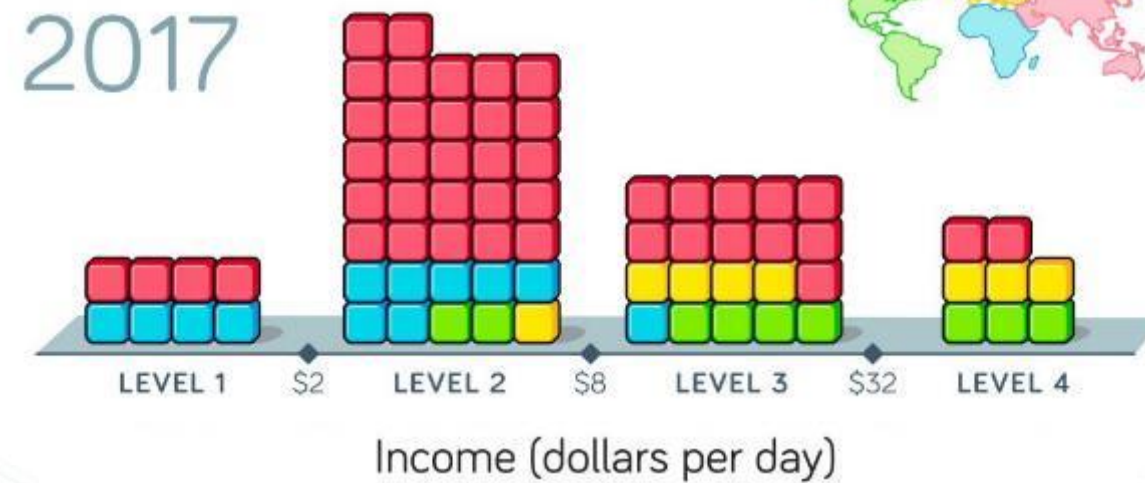
CO₂ emissions rising to record values

LIFE ON THE FOUR INCOME LEVELS

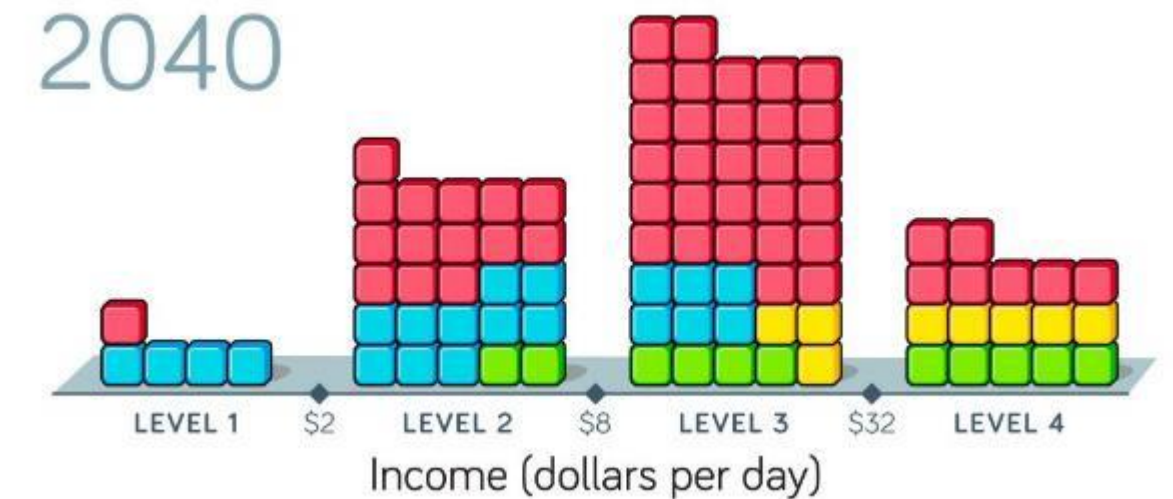


NUMBER OF PEOPLE BY INCOME AND REGION

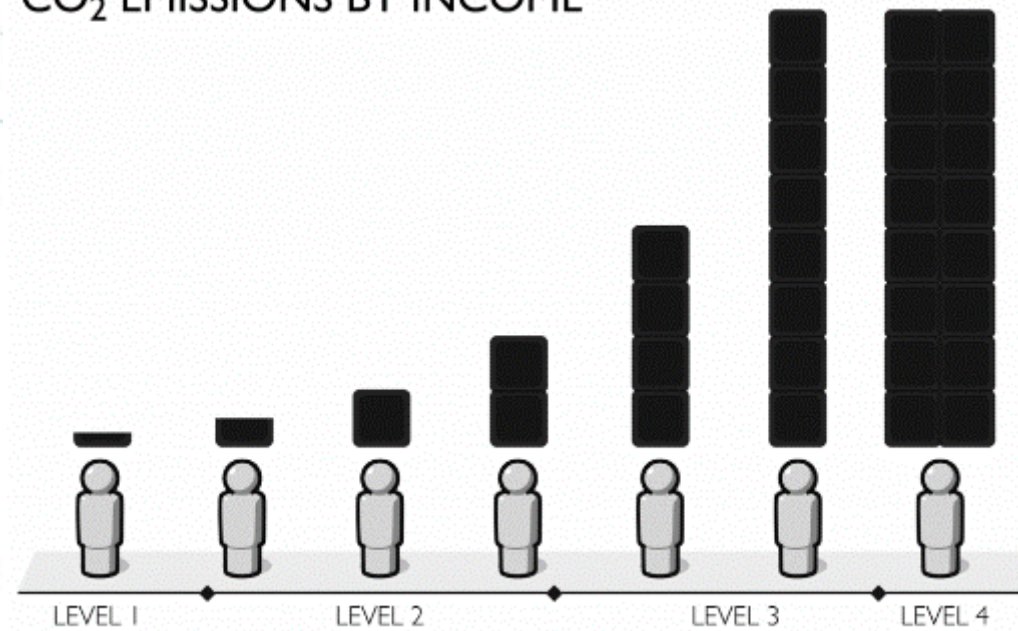
Each cube is 100 million people, colored by region.



Assuming that current trends continue, this is what the world might look like in 2040.



CO₂ EMISSIONS BY INCOME



Source: Gapminder[5] based on CDIAC

CO₂ EMISSIONS BY INCOME





A brief history of CO2 emissions:

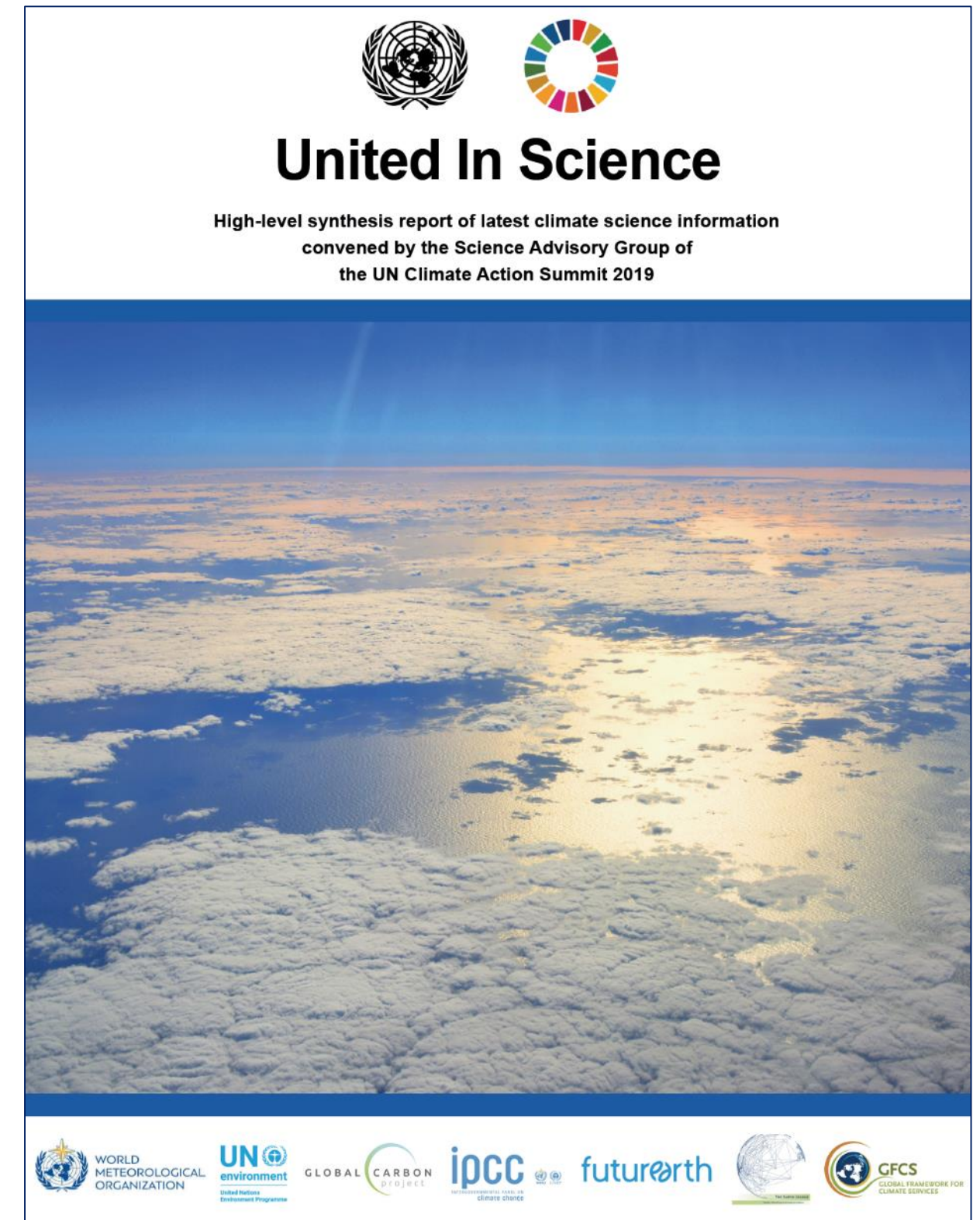
<https://www.youtube.com/watch?v=EQ7S0D1iucY>

Carbon Emissions: What is the problem?

Climate Spirals: <https://openclimatedata.net/climate-spirals/from-emissions-to-global-warming-line-chart/>

Robert Gieseke and Malte Meinshausen, www.pik-potsdam.de/primap-live

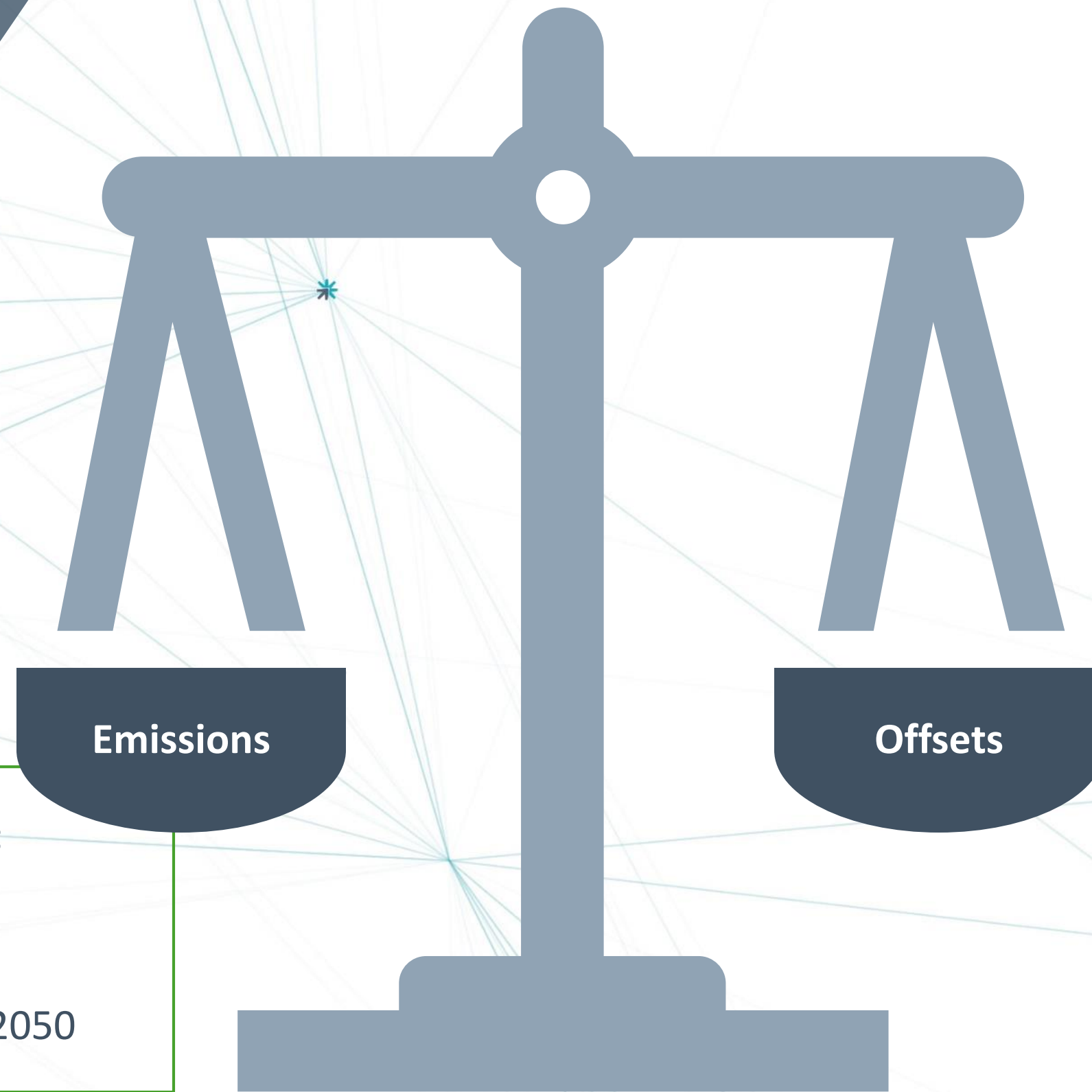
Where are we now?



Published September 2019

Net Zero

what & why



UK Government Targets:
Scotland: Net Zero by 2045
UK : Net Zero by 2050
Wales: 95% reduction in GHG by 2050

Sequestration: capture and utilisation or long-term storage.

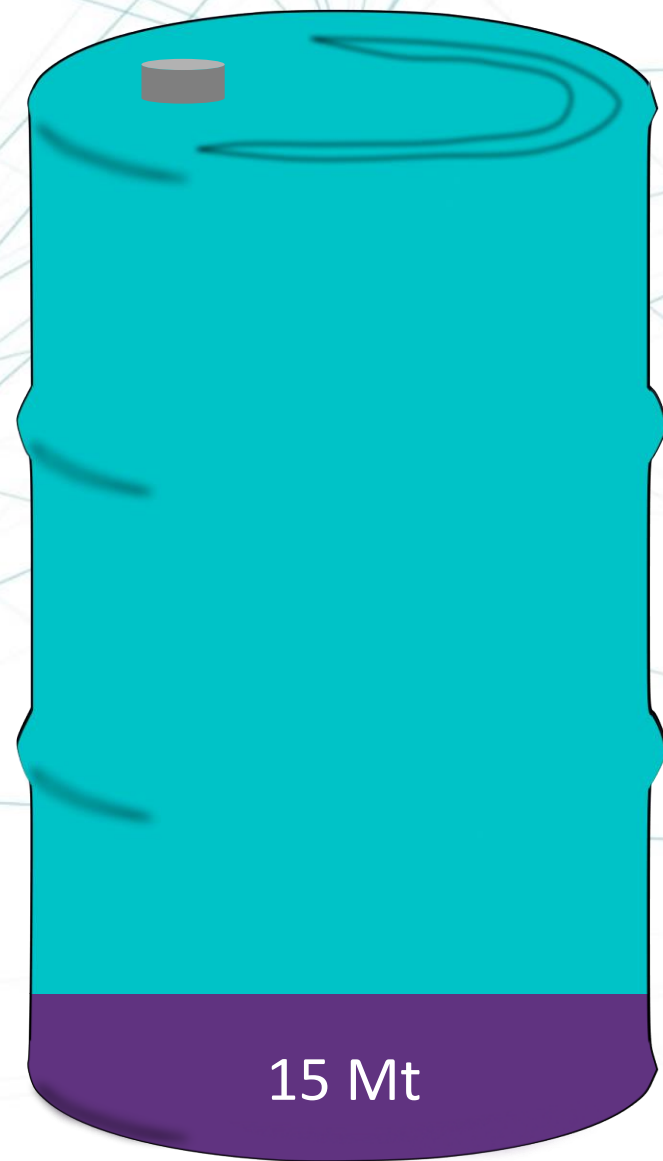
Mitigation: lowering the rate of emissions into the atmosphere

Oil & Gas

Problem or Solution?



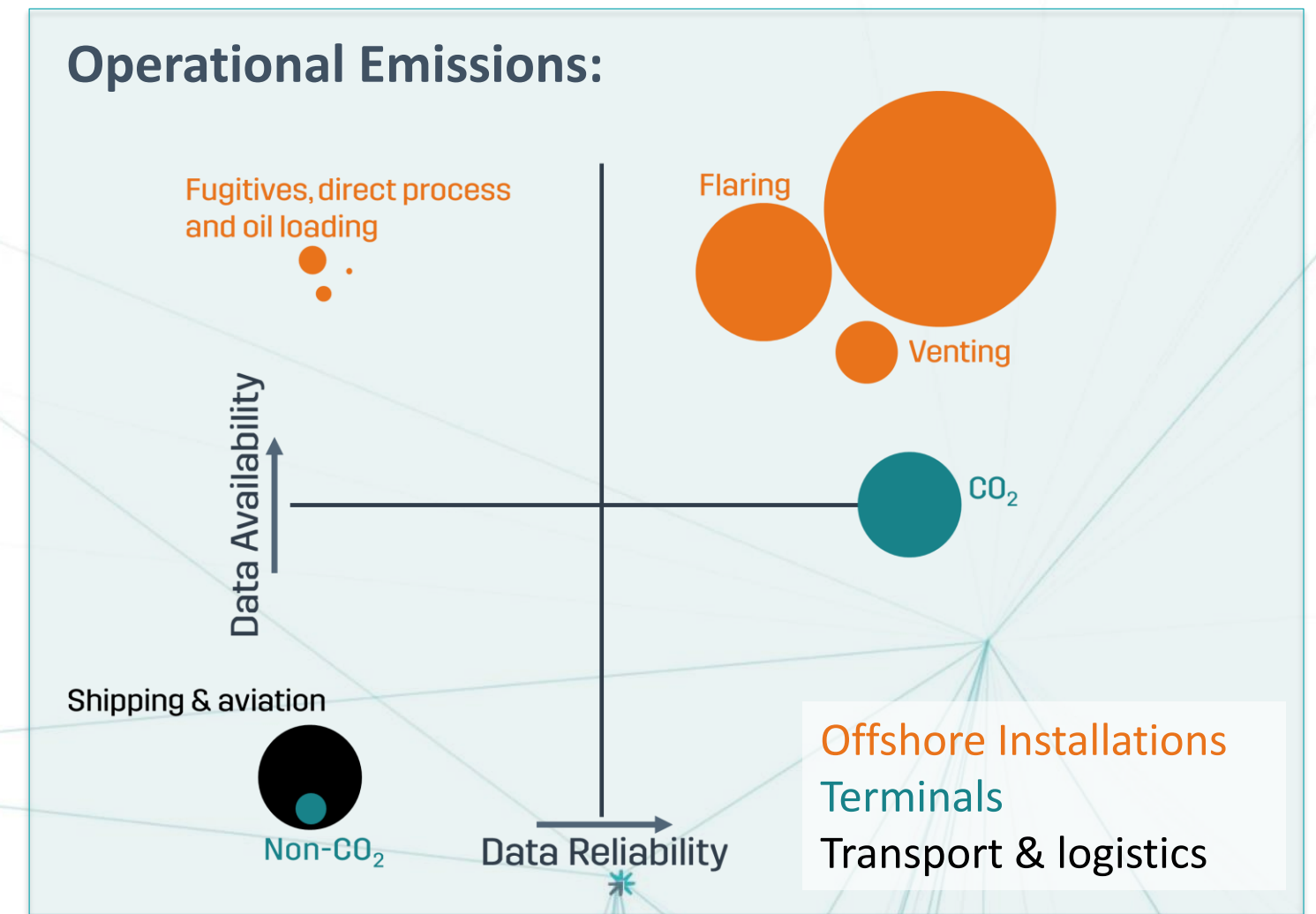
Tracking emissions:



Consumption emissions

Operational emissions

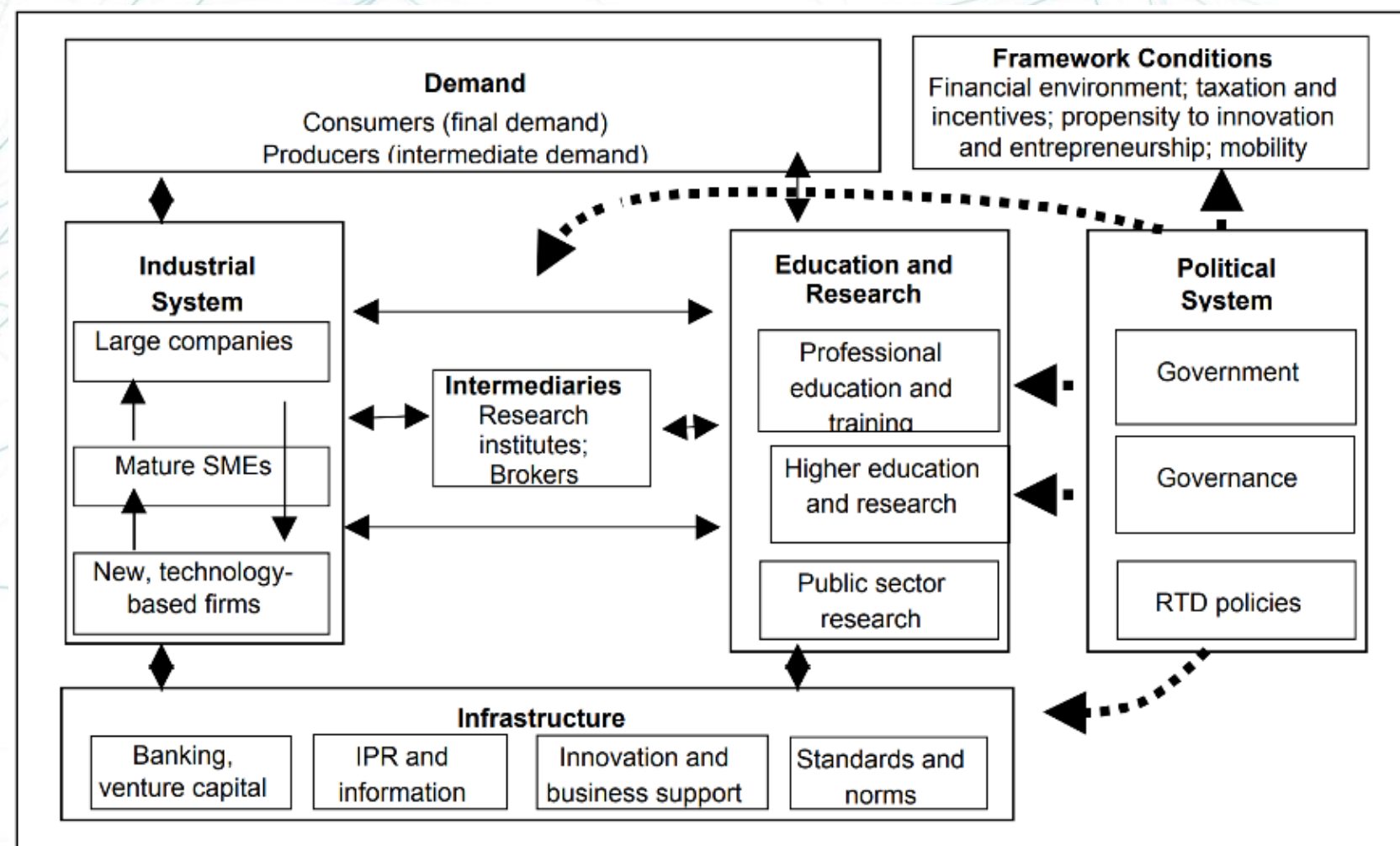
Operational Emissions:



Oil & Gas Problem or Solution?

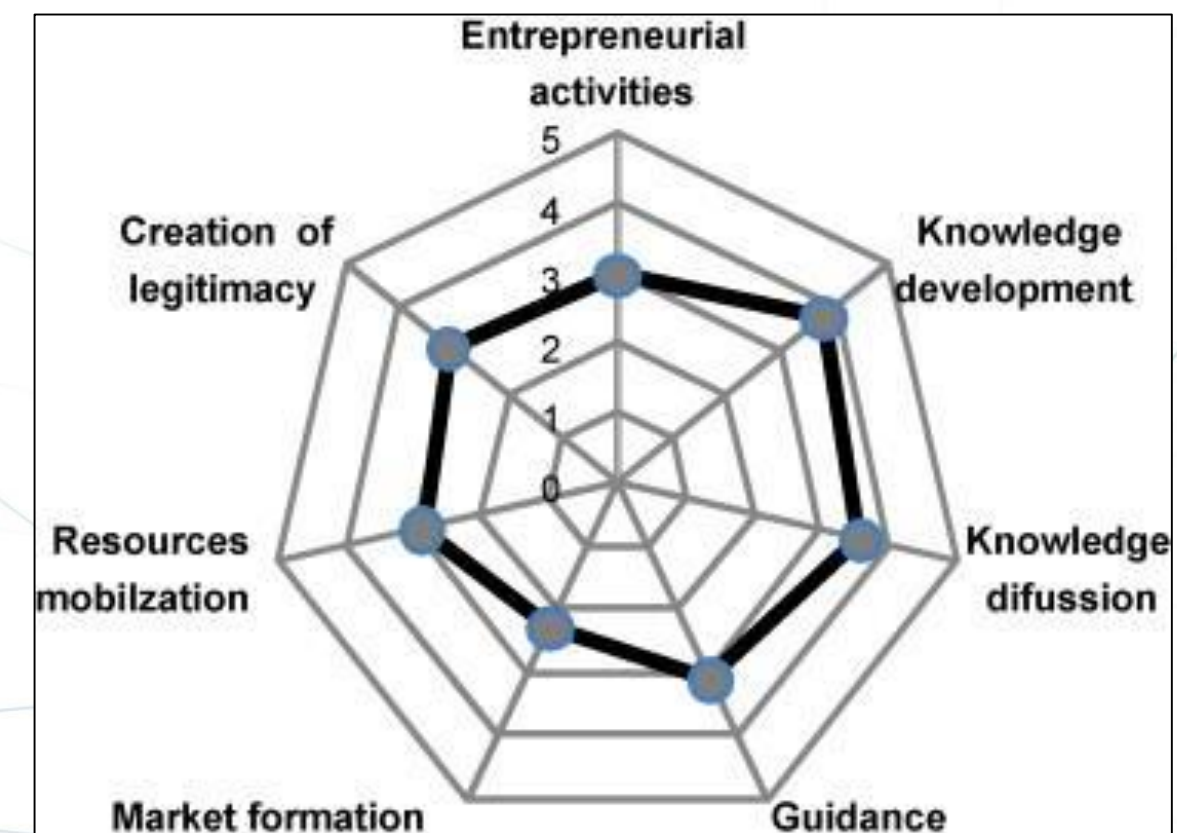


Many players contribute to an innovation system.
Well established in the O&G sector.*



A Model for an Innovation System
Source: E. Arnold and S. Kuhlman

Processes needed simultaneously to develop an innovation system:



Key processes for development of innovation systems: Analysis on CCS.
Source: K. Alphen, M. Hekkert, W. Turkenburg

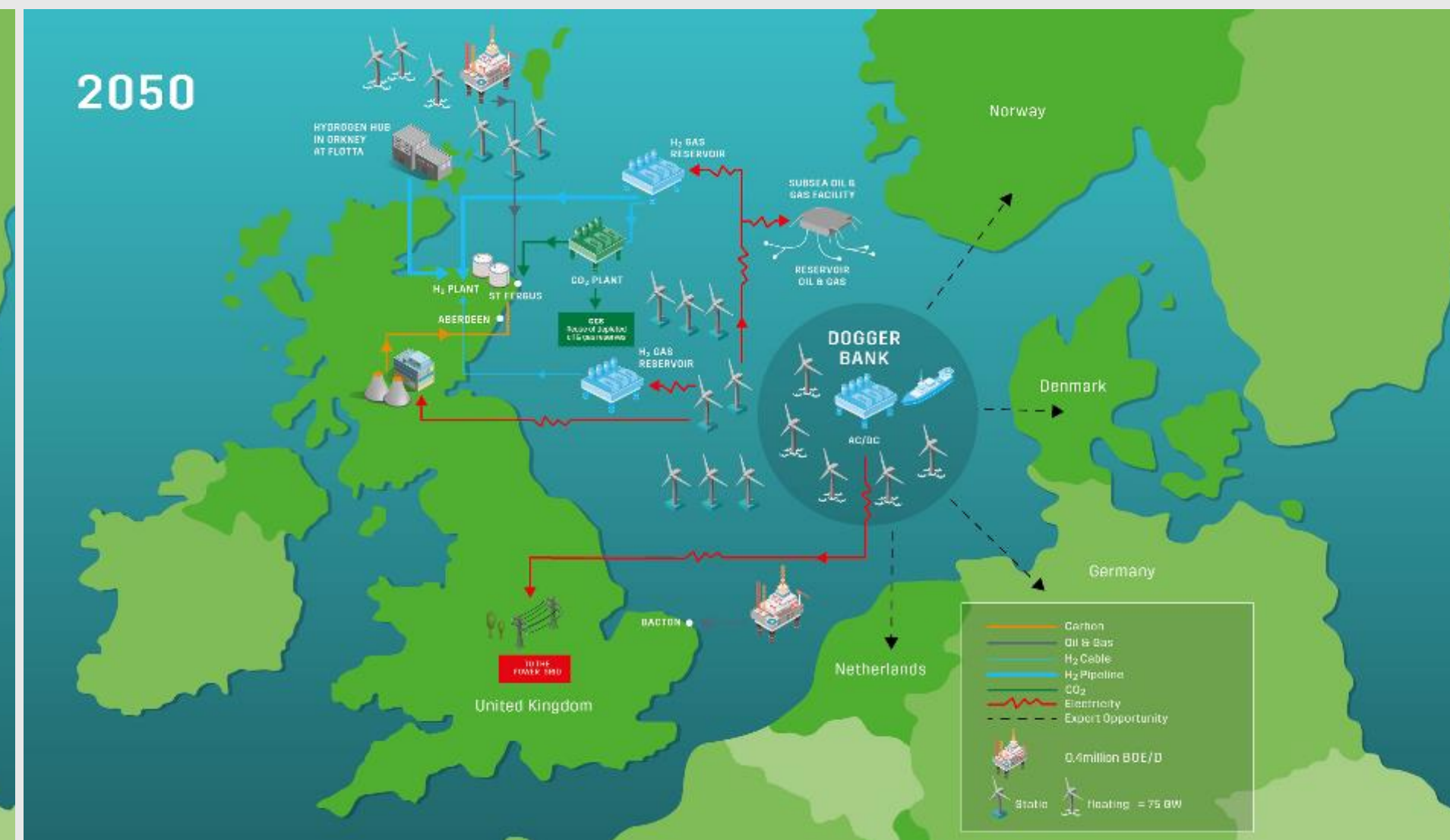
Energy transition: an opportunity to shape the future of the energy system

UKCS now:

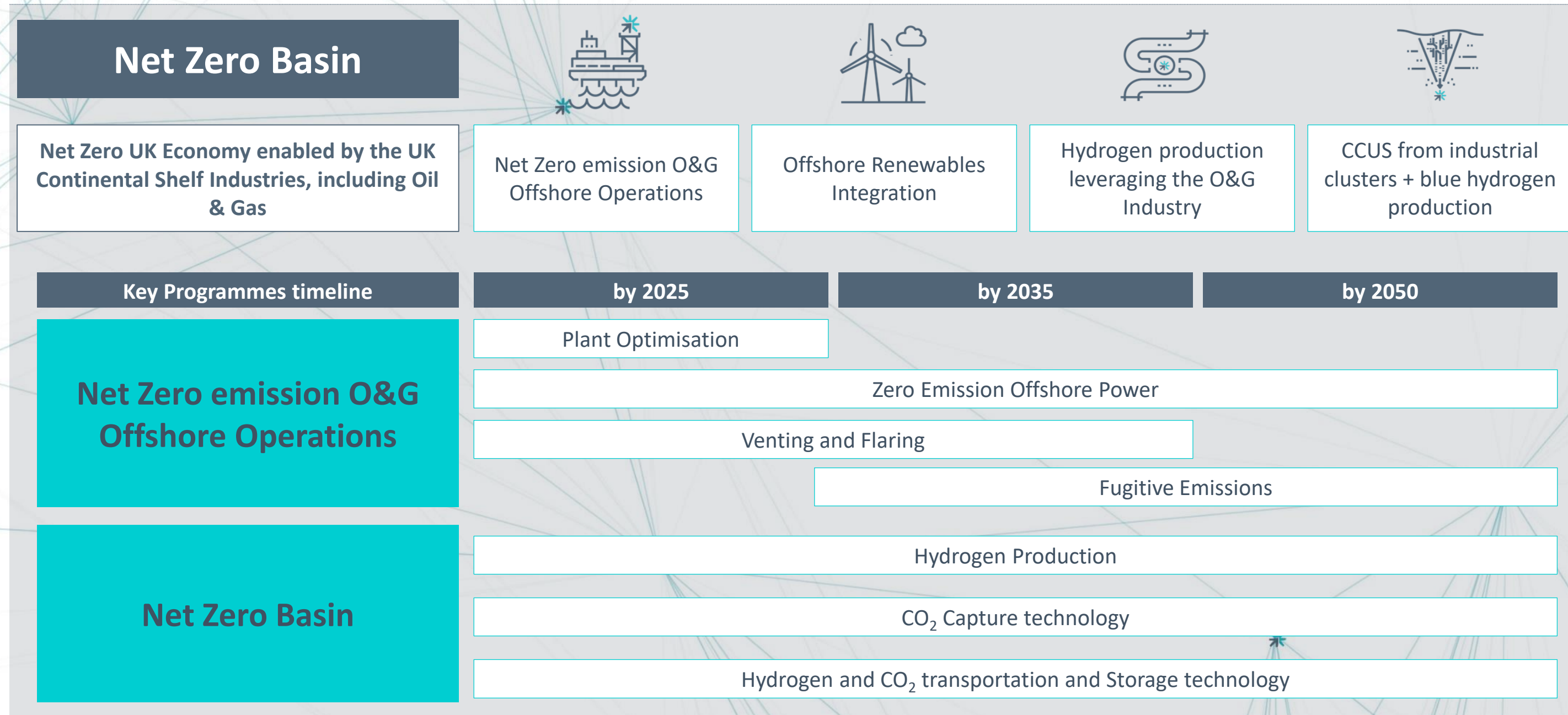
- Mature basin
- 250 assets
- 45,000 km of pipelines
- £58bn forecast decommissioning costs
- 45,000 directly employed
- 300,000 jobs sustained by Industry

Future UKCS:

- Integrated energy industry in the North Sea
- Net zero emissions
- Expanded offshore wind / renewables industry
- O&G production powered by renewable energy
- Carbon storage hub connected to industrial clusters
- Hydrogen industry driven by O&G infrastructure reuse & renewable power



Roadmap to 2050

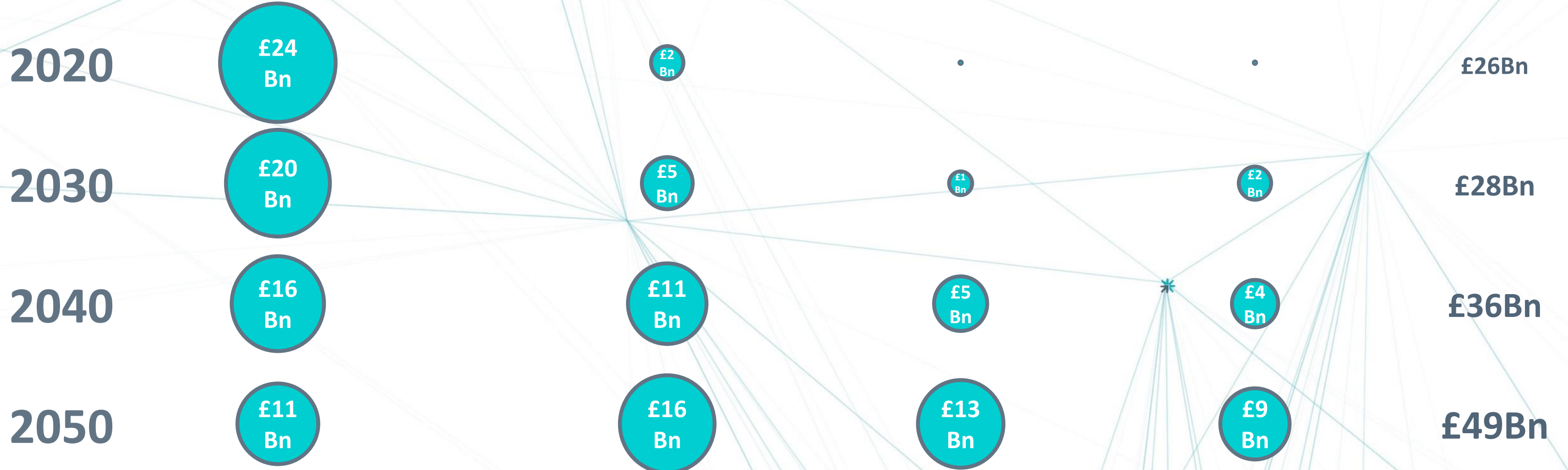
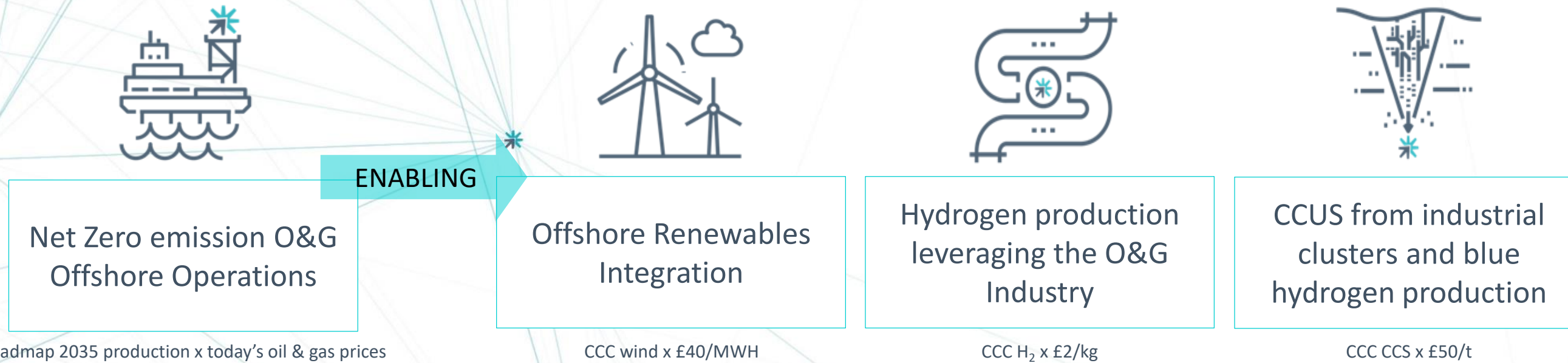


Ambition: A carbon neutral basin developing, testing and exporting technology

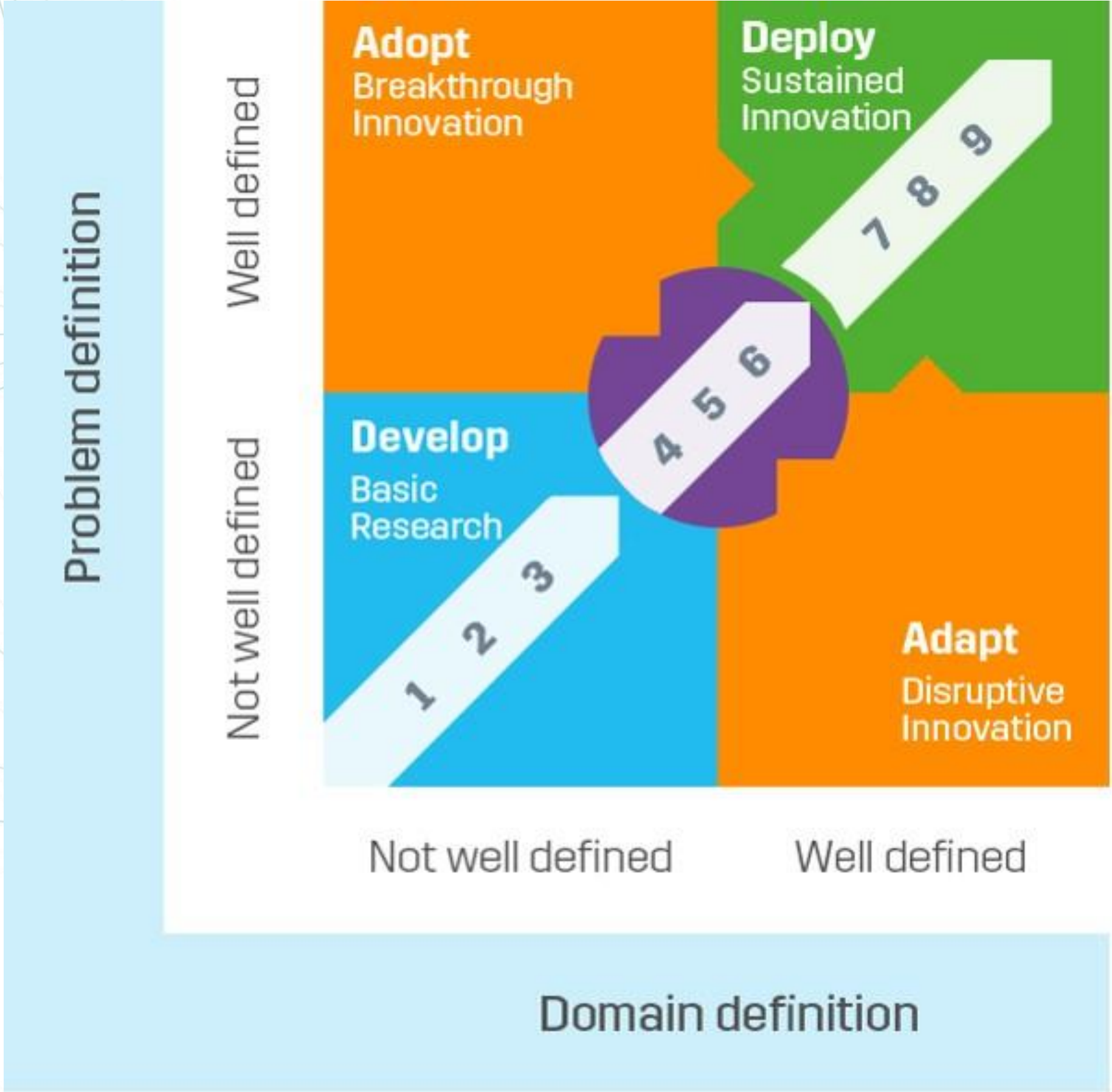
Roadmap to 2050



A Net Zero UK Economy enabled by the UK Continental Shelf Industries, including Oil & Gas.



Innovation Approach



Collaborative Innovation Model – Bringing the Outside In

The model in action



Start from the top: Industry problems

- Problems known and understood, but not well solved yet.
- Looking for solutions from within and outside the Industry



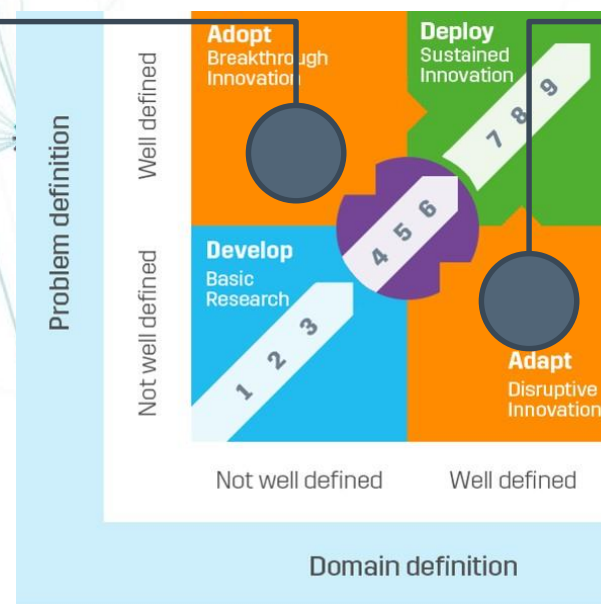
Extend the reach beyond Industry networks by engaging with:

- Innovation Networks. E.g. NCUB, KTN, EIC, Academic Panel & Network, etc.
- **Specific networks / CoPs based on the technology theme**



End result:

Projects to solve the initial challenge



Start from the bottom: technology trends

- Technology Trends emerging from other sectors / industries.
- Looking for applications in Oil & Gas that would provide benefits / opportunities.



Horizon Scanning to identify Tech trends with a possible impact in O&G and

- Inform / educate the Industry about the technology key features.
- **Engage / connect experts in the technology with industry expert to identify use cases and co-develop potential applications for O&G**



End result:

Projects to define and develop the opportunity

Two main roads to innovate – converging

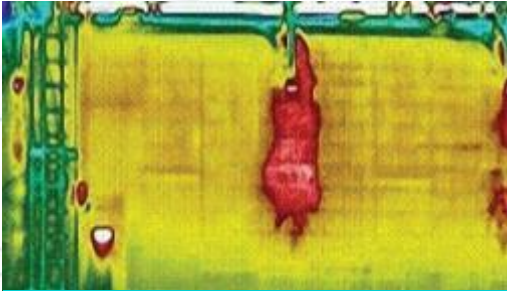
Technology Vision



Fix today



Data access



Asset inspection



Production optimisation



Revitalise exploration

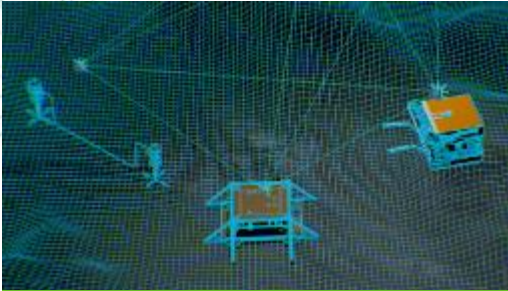


Efficient decommissioning



Alternative well barriers

Maximise recovery



Tieback of the Future



Integrated energy



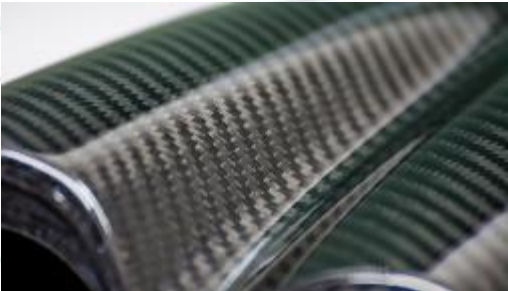
Automation



Remote operations



Artificial intelligence



New materials

Transform tomorrow



Low carbon operations



Reusable infrastructure



Hydrogen delivery



Data driven



Unmanned facilities



Zero carbon developments

Transforming the industry for the low carbon future

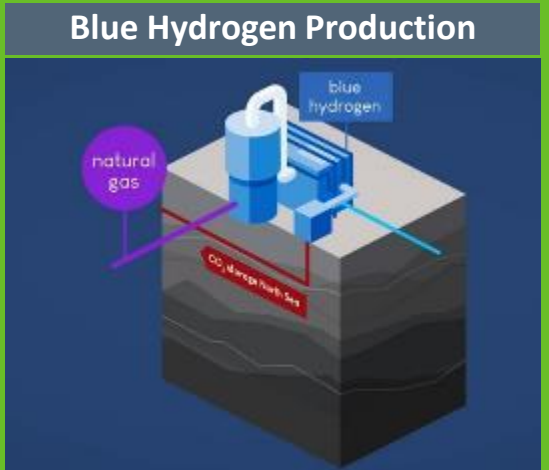
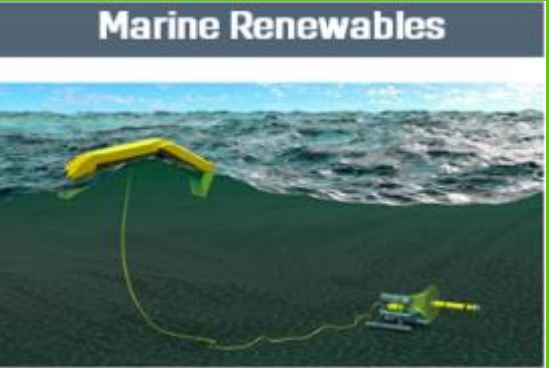
Technology on the Horizon



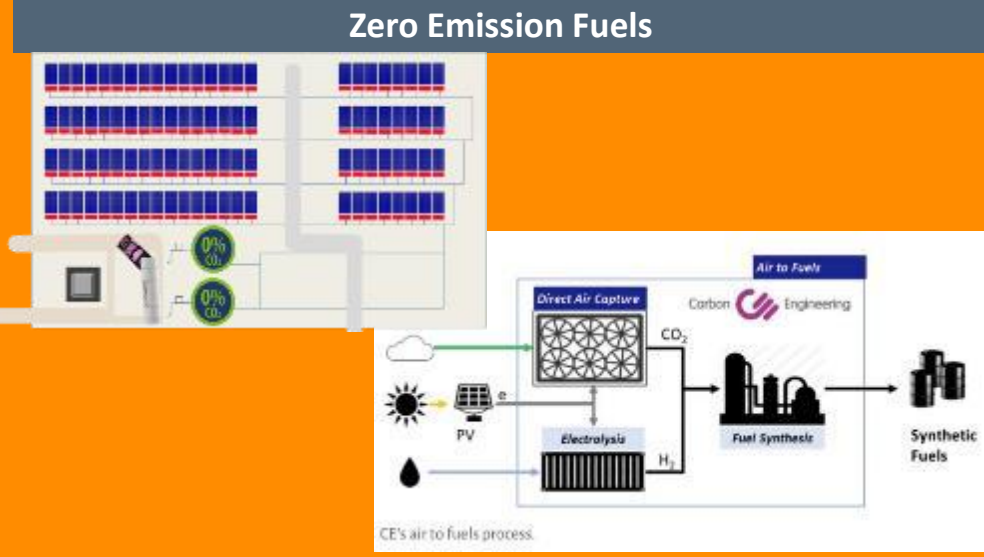
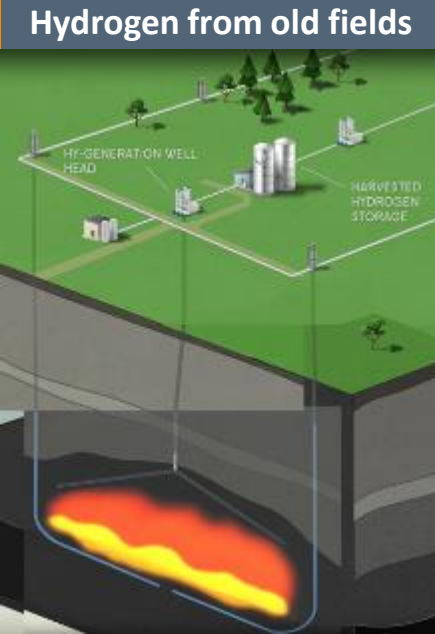
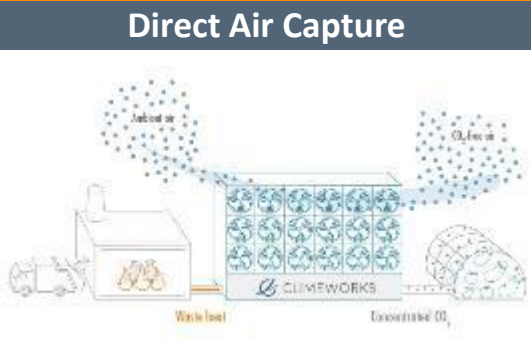
Short



Mid



Long





Summary

- Human activity and energy consumption are interlinked
- Greenhouse gas emissions will continue to rise to 2030
- Target: reaching Net-zero emissions by 2050
- Oil & Gas can contribute to the development of other UKCS industries and support development of a net zero economy
- Joint action required to develop effective solutions
- Innovation will contribute to the development of new technologies and industrial strategies.

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