THE FUTURE OF PORT CITIES
Decarbonisation, Digitisation and Technological Innovation

THE MARITIME CONTRIBUTION TO NET ZERO

Dr Stephen Jay
Director of LISCO

slido

Join at

slido.com

#1675 458

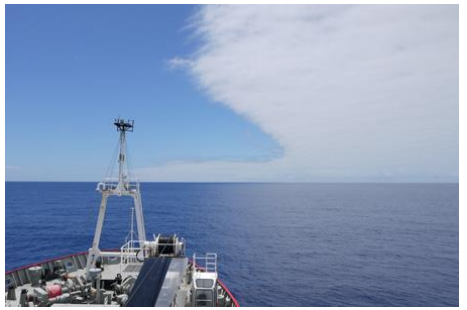
Liverpool Institute for Sustainable Coasts and Oceans

Bringing the natural and social sciences together for the future well-being of the coasts and seas

OUR THREE RESEARCH INSTITUTIONS

OUR RESEARCH THEMES

Blue-Green Energy



Oceans & Climate

Coastal Resilience

The Living Ocean

Ports & Maritime

Sea & Society

https://www.liverpool.ac.uk/liverpool-sustainable-coasts-and-oceans/about

Liverpool Institute for Sustainable Coasts and Oceans

- About LISCO
- Blue-Green Energy
- Coastal Resilience
  - Our People
  - Projects
- Oceans and Climate
- Ports and Maritime
- The Living Ocean
- The Sea and Society
- Our People
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- Contacts

University home > Liverpool Institute for Sustainable Coasts and Oceans > Coastal Resilience > Our People

Our People

Amani Becker

abeck@noc.ac.uk

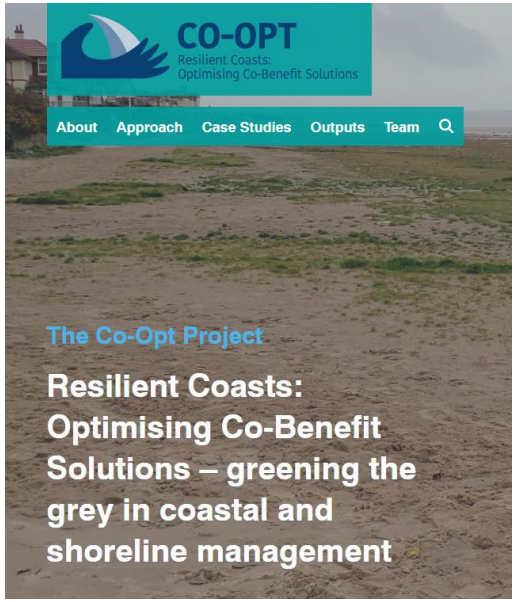
I'm a coastal scientist with expertise in microphytobenthos and sediment biogeochemistry. My research interests are centred on coastal processes and resilience, with a focus on stakeholder engagement, capacity building and achieving impact from research. I am currently involved in projects in the UK, the Southwest Indian Ocean and the Caribbean.

https://noc.ac.uk/n/Amani+Becker

Themes: Blue Green Energy, Coastal Resilience, The Sea and Society, Oceans and Climate

Affiliation: National Oceanography Centre

SOME OF ‘OUR’ PROJECTS



New £4M project to better predict response of Southern Ocean to climate change

Professor Alessandro Tagliabue, from the University of Liverpool’s School of Environmental Sciences, will lead a new £4 million research project that will help to better predict the effects of climate change on the Southern Ocean.

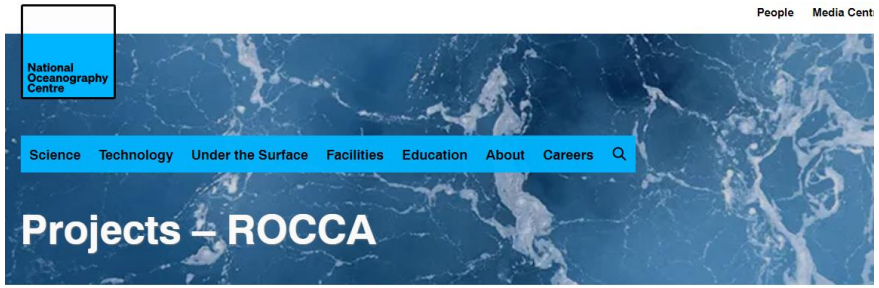
Funded by NERC, and bringing together five UK Universities and eight international partner organisations, the IronMan project will explore the role of micronutrients, specifically iron (Fe) and manganese (Mn), in regulating the Southern Ocean, an issue that has been overlooked by current models.

Space, Time, and Plankton Prediction

Investigator: Chris Follett

Chris Follett at the 2018 Annual Meeting – image courtesy: The Simons Foundation

Light, temperature, nutrient supply and temporal variability all affect the composition of plankton communities, but given their covariance in the environment it is difficult to confirm the mechanistic drivers from field observations. Substantial progress has been made by focusing on model organisms like Prochlorococcus and sharp spatial transitions in the environment (Follett et. al 2021, L&O; 2022, PNAS), but can these ideas be generalized to the 100’s of phytoplankton in computational models and the 1000’s of species found with genetic techniques? An alternative approach is to start from transect data and try to build predictive statistical models but it remains unclear under what conditions these work (Bian et al. 2023, Nat. Comm.). We hypothesize that resource controlled plankton species will be amenable to statistical models whereas top-down control will limit the effectiveness of these approaches. We will focus on predictions of the DARWIN ecosystem model (on the N-S, Gradients 1-3, transect) comparing full model predictions with those made by a single box version of the model configuration (DAR1, Duckworth et. al, Under Review, L&O Methods). We hypothesize that species concentrations along the gradient can be approximated as a sum of a steady term driven by the latitudinal gradient in nutrient supply and a term driven by the local variability (see Follett et. al, 2021, L&O). We will then use this framework to test the statistical models for plankton prediction.



Role of the Overturning Circulation in Carbon Accumulation

Human activities have caused atmospheric CO_2 levels to increase dramatically, but their growth has been slowed by the oceans absorbing approximately one quarter of this anthropogenic carbon (Canth). Globally, the North Atlantic (NA) Ocean stores the highest quantities of Canth, due to local CO_2 uptake from the atmosphere, and large-scale ocean currents, particularly the Atlantic Meridional Overturning Circulation (AMOC) delivering waters high in Canth to northern locations where they cool, get denser and sink to great depths away from contact with the atmosphere.

Website:
PI: Dr. Pete Br
Email: peter.br
Project Dates:
Funding:

TODAY'S PARTICIPANTS

ABB Marine & Ports

Blackpool & Fylde College
(Fleetwood Nautical College)

Carbon Happy World

Catch22

Clean Marine Shipping

Connected Places Catapult

Everyouthful

Irish Sea Rim

Liverpool City Council

Liverpool City Region
Combined Authority

Liverpool John Moores University

Lloyd's Register

Mersey Maritime Ltd

National Oceanography Centre

NatPower Marine

N0MES Centre for Doctoral Training

O'Connors Legal Services Limited

Peel Ports Group

Port Causeway Limited

RelyOn

Roxtec Ltd

Royal Navy

RWE

SQEP LTD

Sowler International Consultancy

Tunley Environmental

UKRI - STFC - Hartree Centre

University of Cumbria

University of Liverpool

University of Manchester

Which aspects of the maritime contribution to net zero are of particular interest to you?

- Green shipping
- Shipping Line NZ targets
- Smart shipping
- Optimisation of routes x 2
- Autonomy
- Development of alternative shipping fleets and infrastructure
- Net zero in ship building activities
- Maritime technology related to electrification plant
- Energy efficient technologies
- Decarbonisation and retrofitting
- Operational efficiency, digitalisation
- Are carbon reduction initiatives really working?
- Blue carbon
- Powering the transition
- Alternative fuels x 8
- Alternative fuels in marine diesel engines
- Fuel cells x 2
- Hydrogen fuel cells and hydrogen evolution from sea water
- Batteries
- Offshore and marine renewable energy x 3
- Wind and tidal lagoons
- Green energy x 2
- Bridge and engine room simulators to control emissions
- Decarbonisation technologies x 2
- Monitoring and modelling the ocean and coastal regions
- Ensuring environmental science underpins decisions/action
- Data linked to the Irish Sea Rim
- Industry perspectives
- Support for the supply chain for maritime industry
- Future plans / steps that the maritime industry will be taking
- How can projects attract investors?
- Strategy policy development
- Current development trends and government policy
- New regulations and policies
- Technical solutions and policy for maritime energy saving
- Opportunities to invest and support LCR green maritime projects & programmes
- How port decarbonisation projects can boost economies through unlocking lands for urban development
- Innovation in the Northwest
- Research collaborations with HEIs/industry

THE MARITIME CONTRIBUTION

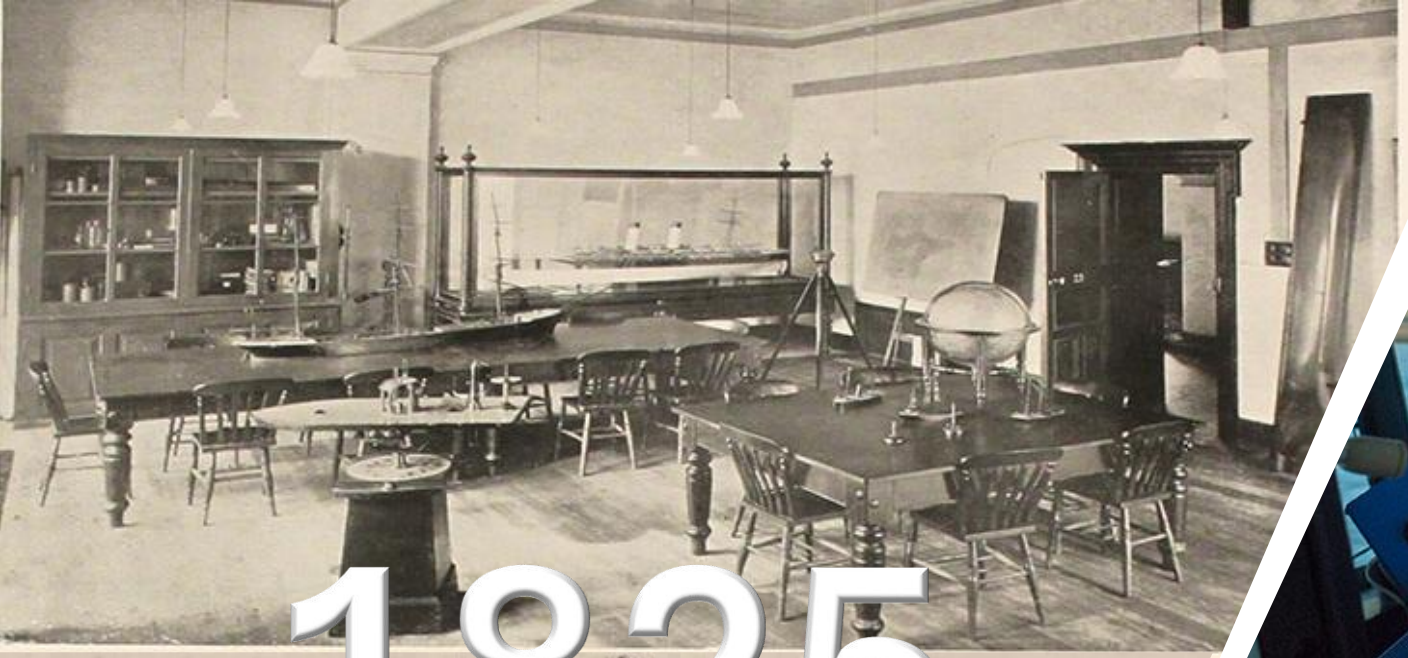
TO NET ZERO

Maritime Contribution to Net Zero

LJMU maritime contribution to Net Zero

Professor Mark Power, Vice Chancellor, Liverpool John Moores University

November 2024

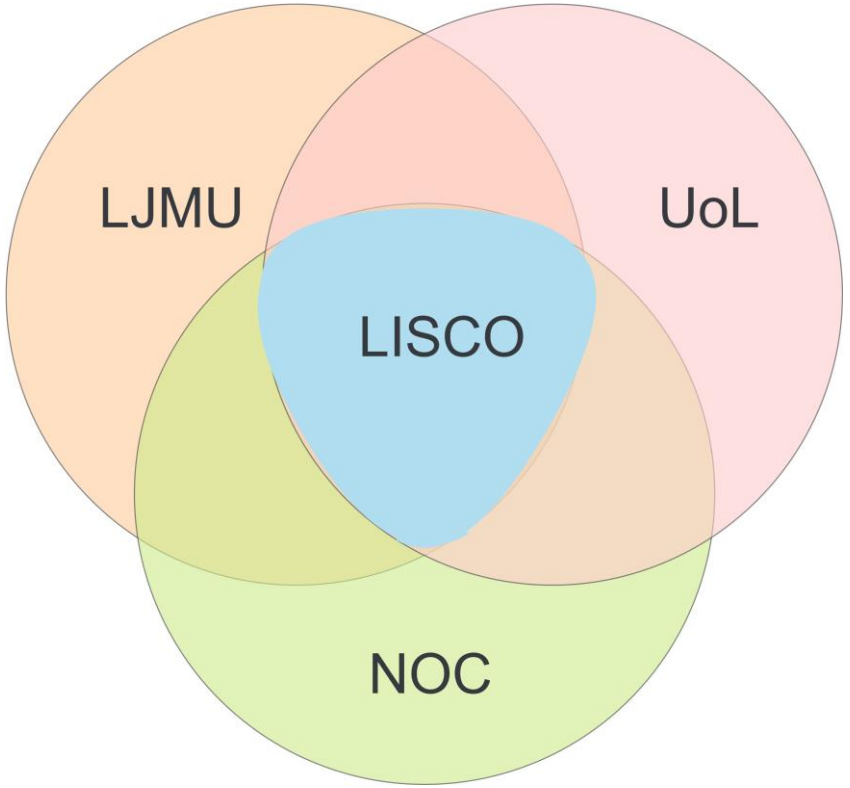


1825

2025

LJMU Maritime Assets

200 years	• England's first Mechanics Inst. 1825, England's first Nautical School 1852
LOOM	• World-leading institute • Equal 1st in UK REF impact score (%4*/3* impact, REF 2021, UoA12)
Maritime & Marine Engineering Education	• 1 of 4 UK univ. MSc Maritime Op./Port • 1 of 10 UK univ. Marine Engineering • Executive board, IAMU (75 maritime univ.)
LJMU Simulation Centre	• UK first 360° bridge + engine simulators • Seafarer vocational training • Industry + Research applications
Local partnerships	• UK-first Freeport doctoral training initiative • £2M Maritime and Last Mile Net Zero (w. UoL) • £8.7M CDT NetZero Maritime Energy (w. UoL)



Global maritime research & innovation


Thank you!

THE MARITIME CONTRIBUTION

TO NET ZERO

National Oceanography Centre

MARINE SCIENCE RESEARCH COLLABORATION AND NET ZERO

PROFESSOR N. PENNY HOLLIDAY

CHIEF SCIENTIFIC OFFICER

OUR PURPOSE

TO GAIN A DEEPER KNOWLEDGE OF THE OCEAN TO HELP EVERY LIVING THING ON OUR PLANET FLOURISH

NOC

WHAT WE DO

WE UNDERTAKE AND ENABLE IMPARTIAL WORLD-CLASS SCIENCE AND TECHNOLOGY DEVELOPMENT

WE PROVIDE WORLD-CLASS RESEARCH FACILITIES AND ACCESS TO DATA AND SAMPLES FOR THE BENEFIT OF SCIENCE, IN THE UK AND INTERNATIONALLY

WE SUPPORT THE DEVELOPMENT OF PUBLIC POLICY, HAZARD ASSESSMENT, OCEAN GOVERNANCE AND REGULATION, AND SUSTAINABLE DEVELOPMENT, BY PROVIDING IMPARTIAL SCIENTIFIC ADVICE

NOC

OUR ORGANISATION

OVER SIX DECADES OF LEADING RESEARCH, TECHNOLOGY AND INNOVATION

INDEPENDENT CHARITABLE ORGANISATION SINCE 2019

FORMERLY PART OF GOVERNMENT

EMPLOYING OVER SEVEN HUNDRED PEOPLE

OPERATES TWO BLUE-WATER, STATE OF THE ART RESEARCH VESSELS

OWNS A GROWING FLEET OF AUTONOMOUS VEHICLES

LOCATED IN SOUTHAMPTON AND LIVERPOOL

TRADING SUBSIDIARY NOC INNOVATIONS LTD

COMMERCIAL RELATIONSHIPS,
WITH ACCESS TO NOC EXPERTISE AND FACILITIES.
PROFITS RECYCLED INTO THE NOC CHARITY

NOC

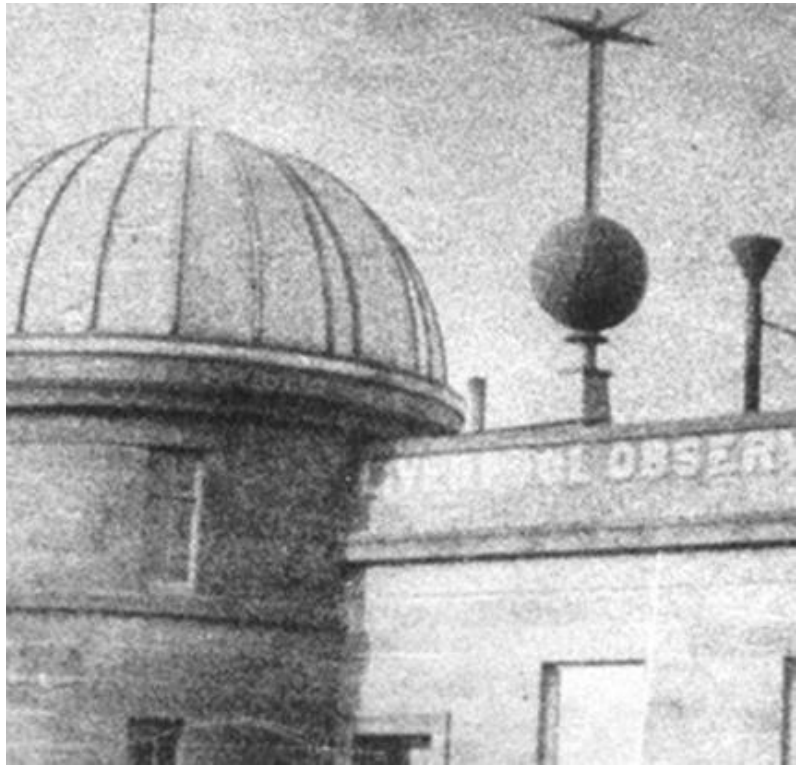
THE FOUR BIG SOCIETAL CHALLENGES THAT DRIVE OUR RESEARCH

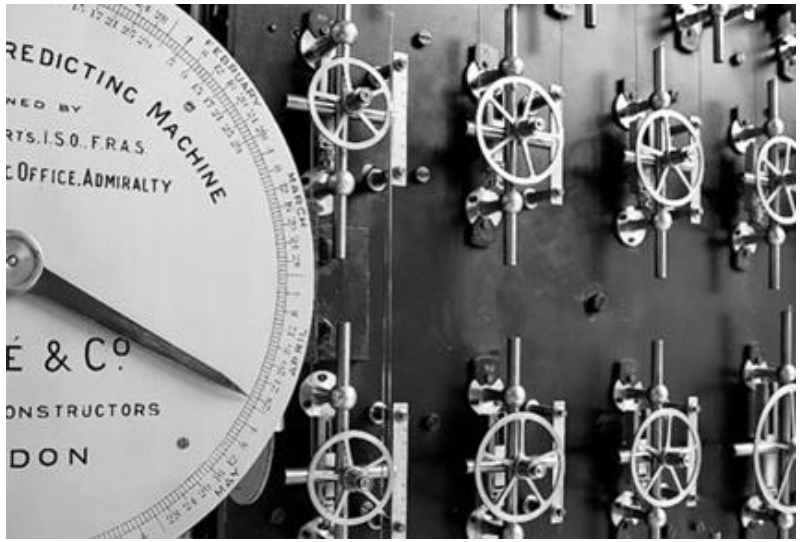
NOC

GLOBAL TO LOCAL

Across these scales we address science questions with a world-class, powerful combination of:

- Skilled people
- Decades of observations from coast to deep ocean
- Ocean, climate and earth system models
- Bespoke new technology for marine sensors and platforms (ships, landers, moorings, autonomy)
- Digital tools





LIVERPOOL

A distinctive place in history:

Liverpool has a long record of sea level measurement and study - considered the UK home of tidal and sea-level science

The National Tidal and Sea Level Facility (NTSLF) and the Permanent Service for Mean Sea Level (PSMSL) are based here.

Our site also houses the British Oceanographic Data Centre (BODC) - a national facility for preserving and distributing oceanographic and marine data.

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RESEARCH STRENGTHS HERE INCLUDE:

- **TIDAL**
- **SEA LEVEL**
- **COASTAL PROCESSES**

PROJECT EXAMPLE

WireWall

WireWall is an innovative and cost-effective system to help optimise sea defence design and early warning processes, reducing construction costs and ultimately protecting coastal communities.

We took a low-cost instrument that had previously been used to measure waves in the open ocean, and converted it into a system (“WireWall”) that would measure coastal overtopping hazard.

NOC

THE OCEAN AS A MEANS TO REDUCE RISK FROM CLIMATE CHANGE

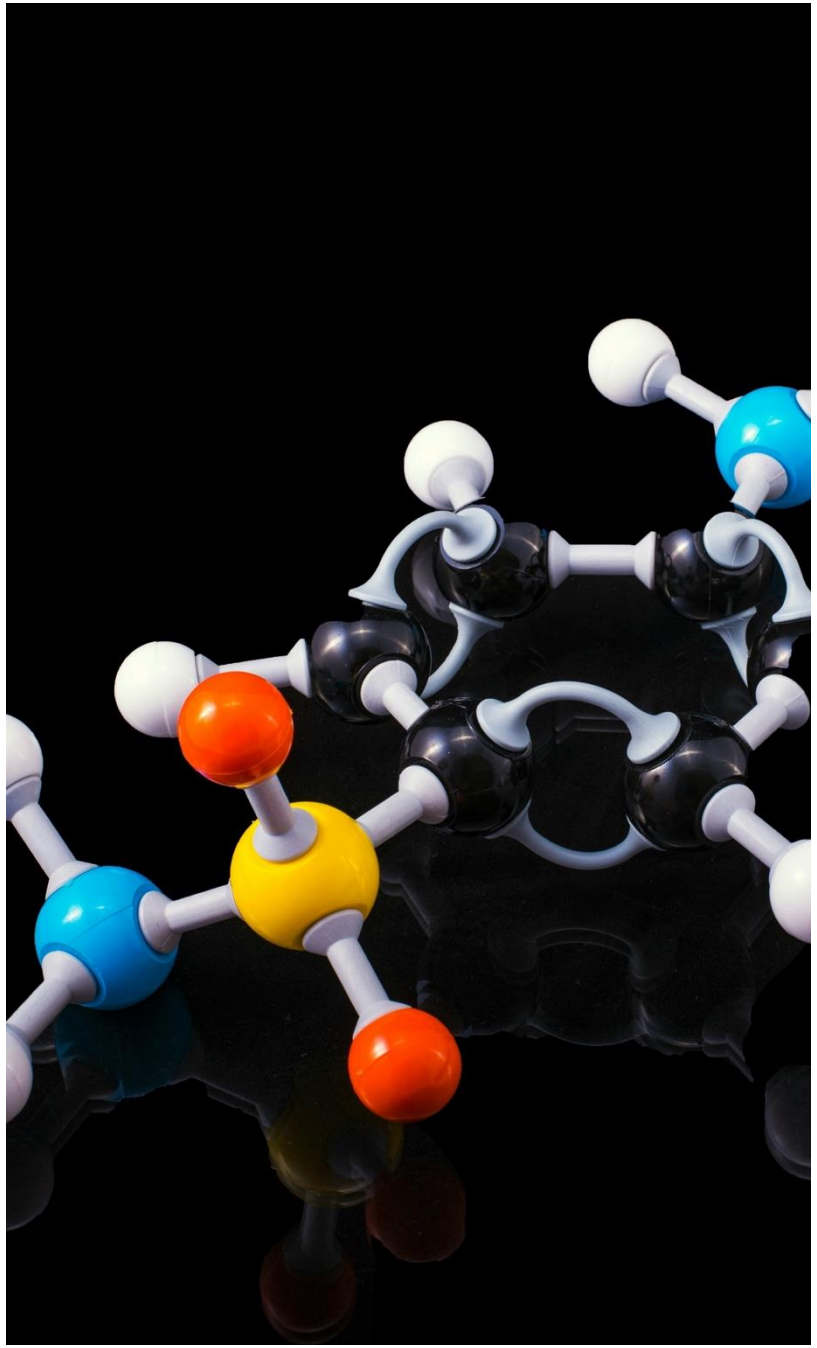
Renewable energy

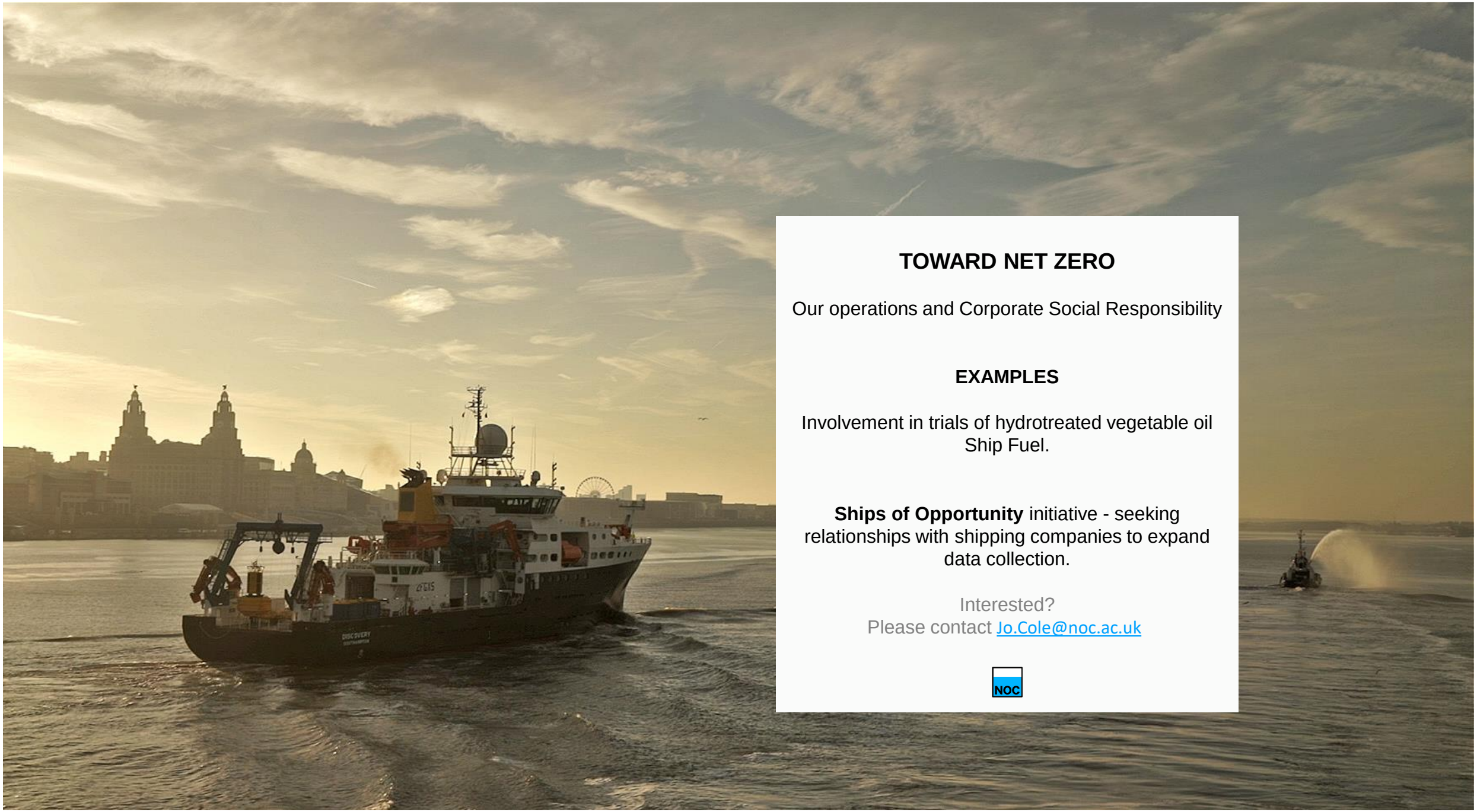
Blue carbon

Marine carbon dioxide removal

Hydrogen storage

… next big climate intervention / mitigation idea





TOWARD NET ZERO

Our operations and Corporate Social Responsibility

EXAMPLES

Involvement in trials of hydrotreated vegetable oil Ship Fuel.

Ships of Opportunity initiative - seeking relationships with shipping companies to expand data collection.

Interested?
Please contact Jo.Cole@noc.ac.uk

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RESEARCH COLLABORATION

KNOWLEDGE OF MARINE SYSTEMS FURTHERED AND USED FOR EVIDENCE-BASED DECISIONS

CAN PROVIDE CRUCIAL INFORMATION FOR IMPROVED KNOWLEDGE OF FUTURE ENVIRONMENTAL CONDITIONS

CRITICAL FOR MEETING NET ZERO GOALS

NOC

National Oceanography Centre

THANK YOU

penny.holliday@noc.ac.uk

NOC.AC.UK

THE MARITIME CONTRIBUTION

TO NET ZERO

UNIVERSITY OF LIVERPOOL

THE MARITIME CONTRIBUTION TO NET ZERO

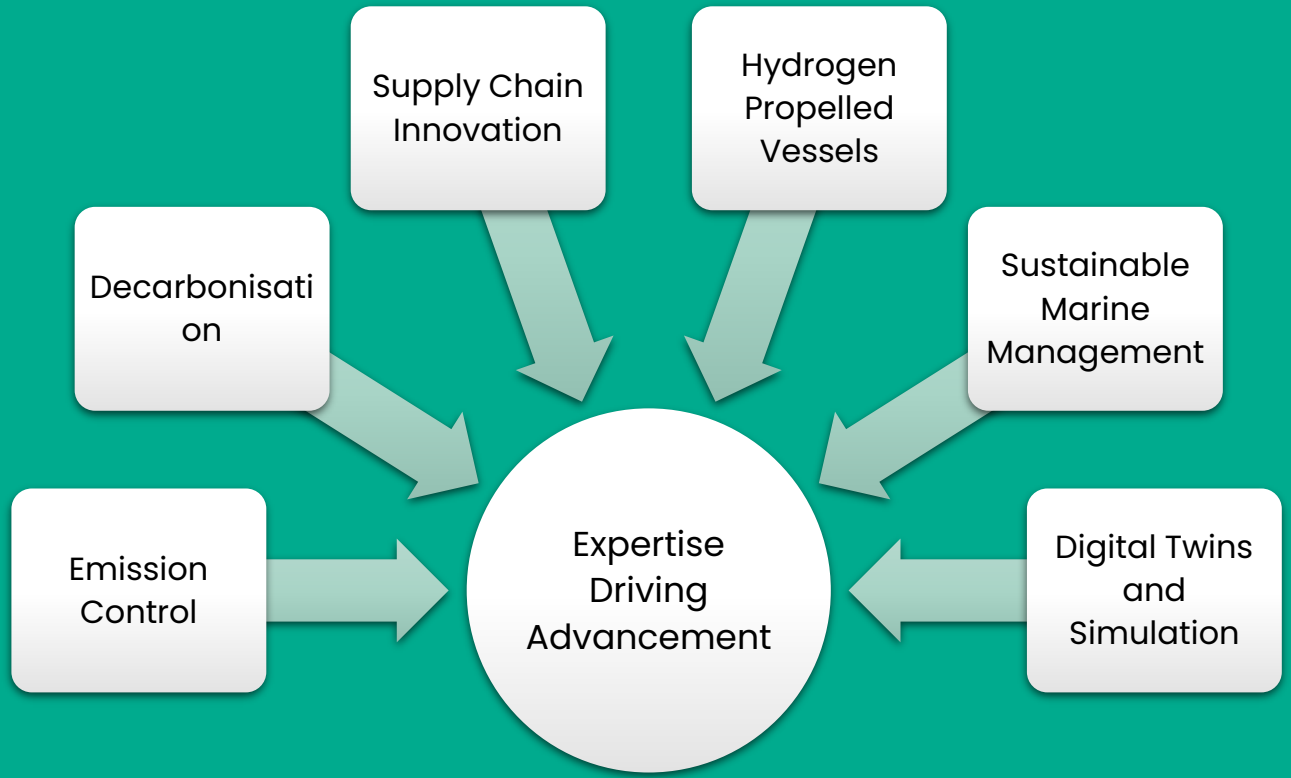
Professor Tim Jones
Vice-Chancellor

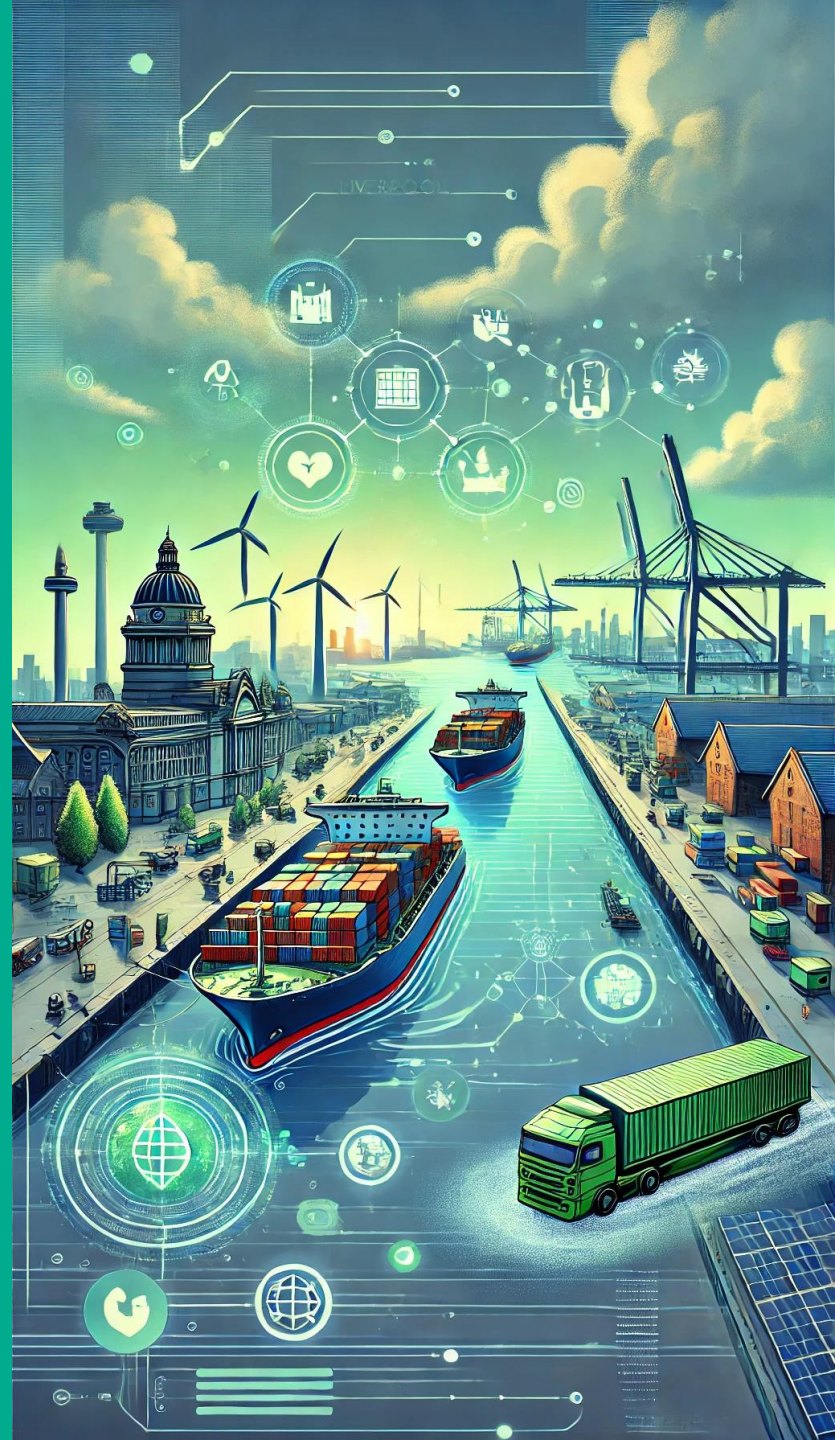
14 November 2024

MARITIME HERITAGE

Liverpool City Region’s rich maritime history contributes to its £5 billion port economy, establishing it as a central player in the UK's maritime sector

UNIVERSITY'S CAPABILITY



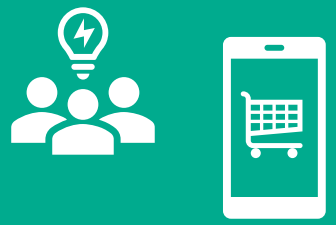


MARITIME NET ZERO INITIATIVES

National Clean Marine Research Hub

- Key partner in this £21.3M EPSRC-funded consortium, which includes 13 universities and over 70 industry partners

Collaboration and Commercialisation



- Leading a proposal (sub 1st Nov), with the 4 LCR universities for the first time and industry to drive commercialisation of maritime and port-related research, aligning with LCR's freeport vision

Training

- Alongside LJMU, training 52 doctoral candidates at the Centre for Doctoral Training in Net Zero Maritime Energy Solutions

THE MARITIME CONTRIBUTION

TO NET ZERO

CATAPULT
Connected Places

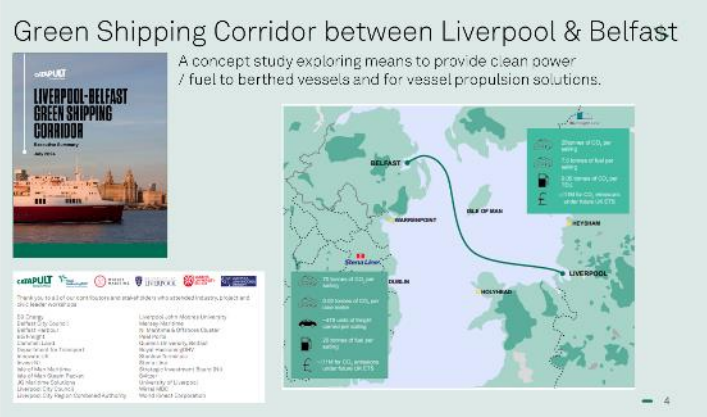
IRISH SEA GREEN SHIPPING CORRIDOR

IUK Pulse Programme

Alex Cousins, Director of Regional Engagement

MOTIVATION – THE START OF SOMETHING BIG ?

Belfast – Liverpool Green Shipping corridor



A Consortium-led plan with 29 projects to drive a *Green Shipping Corridor* to support UK delivery of its COP26 Clydebank obligations for 6 Green shipping corridors by 2030.

Irish Sea Rim Concept Investment and Innovation Zone

Inviting the world to invest and innovate in the *Irish Sea Rim*. Recognising *Ports as Places* which drive decarbonisation, digital, and data innovations. Supporting Maritime Sector growth – higher average wages, higher productivity levels.

UK Sea Region Innovation Concept

Recognising the UK is an island nation and maritime a global sector, build on the lessons from the *Irish Sea Rim* and invite international partners to invest and innovate across other seas, placing the UK at the forefront of maritime investment and innovation.

OBJECTIVES, PARTNERS, PROJECTS

A concept study exploring means to provide clean energy to berthed vessels & propulsion solutions

Thank you to all of our contributors and stakeholders who attended industry, project and civic leader workshops

B9 Energy
Belfast City Council
Belfast Harbour
BG Freight
Cammell Laird
Department for Transport
Innovate UK
Invest NI
Isle of Man Maritime
Isle of Man Steam Packet
JG Maritime Solutions
Liverpool City Council
Liverpool City Region Combined Authority
Liverpool John Moores University
Mersey Maritime
NI Maritime & Offshore Cluster
Peel Ports
Queens University, Belfast
Royal HaskoningDHV
Stanlow Terminals
Stena Line
Strategic Investment Board (NI)
Svitzer
University of Liverpool
Wirral MBC
World Kinect Corporation

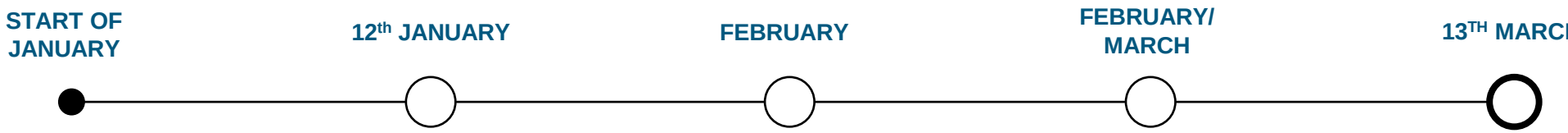
A range of 29 pilot projects developed in collaboration with industry representatives seeking to build on their motivations and existing plans.

Symbols key

Estimated budget range for implementation	
£	Under £250,000
££	£250,000 to £1M
£££	Over £1M

Benefit	
	Reduction in carbon emissions directly
	Improved business and climate resilience
	Provision of skills and learning
	Social benefits to community
	Improvement of local air quality
	Commercials gains (cost, revenue, profit)
	Improvement in operational safety

Project timeline



Project kick-off	Initial stakeholder workshop	Data collection (inc. stakeholder meetings)	Draft findings and pilot projects	Stakeholder feedback workshop

1. Current status

- ❑ Shipping emissions
- ❑ Port infrastructure baseline
- ❑ Digital tools and skills
- ❑ Regional energy

2. Pathways

- ❑ What are the options
- ❑ Demand
- ❑ Impact

3. Enabling ecosystem

- ❑ Civic leadership
- ❑ Skills and resources
- ❑ Policy and regulations
- ❑ Investment

Longlist of pilot projects

Shortlist of pilot projects

CURRENT STATUS

Current status

SHIPPING EMISSIONS

Stena Line

70 tonnes of CO_2 per sailing

0.02 tonnes of CO_2 per lane metre

~478 units of freight carried per sailing

20 tonnes of fuel per sailing

~£7M for CO_2 emissions under future UK ETS

PORT INFRASTRUCTURE

Liverpool – T1 and 12 Quays

- × Terminals are highly utilised
- × Onsite electrical systems at capacity (esp. T1)
- ✓ Nearby DNO substation at 12 Quays with some spare capacity

Belfast – VT2 and VT3

- × Terminals are highly utilised
- × Onsite electrical systems at capacity
- × Nearest ESO substation is several kilometres away

DIGITAL AND SKILLS

Digital

- ✓ Vessel Traffic Service
- ✓ Port Management Information System
- ✓ Terminal Operating Systems
- ✓ Gate Automation
- ✓ Virtual training simulator
- ✓ Portable Pilot Systems

etc.

Skills

- ✓ Educational institutions
- ✓ Local fuel production/ supply
- ✓ Local industry bodies

REGIONAL ENERGY

Liverpool region

- ✓ Local hydrogen production – e.g. Hynet
- ✓ Growing offshore wind energy production – e.g. Burbo Bank
- ✓ Mersey Tidal Power
- × No local methanol or ammonia production planned

Belfast region

- ✓ Local e-fuel production being promoted by Belfast Harbour – CMDC project & Catagen pilot project

Assessment in progress

Regional energy status and outlook

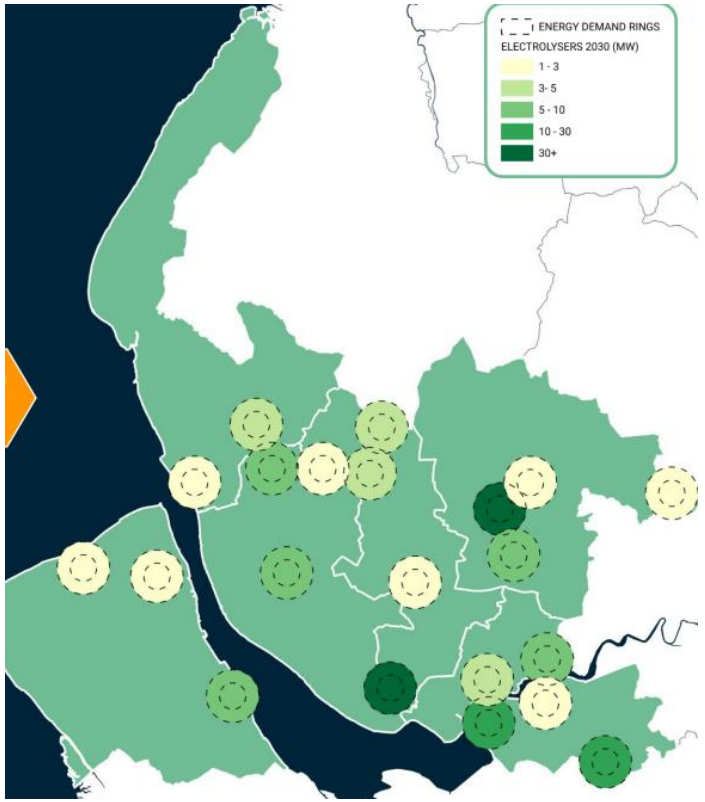
- Electricity generation and connection current status

Energy source for electricity	Merseyside connected capacity (MW)	Wirral connected capacity (MW)	Merseyside capacity that will be connected (MW)	Wirral capacity that will be connected (MW)
Fossil – gas (non-renewable)	82.5	130.8	18.8	65
Biofuel – landfill gas (Renewable)	11.1	3.1	27.6	
Solar (renewable)	7.6		37.1	70
Wind (renewable)	18	90		318
Fossil – oil (non-renewable)	13			
Other (non-renewable)	71	12	28	
Total	203.2	235.9	111.5	453

- Future: Electricity from renewables

Hydrogen

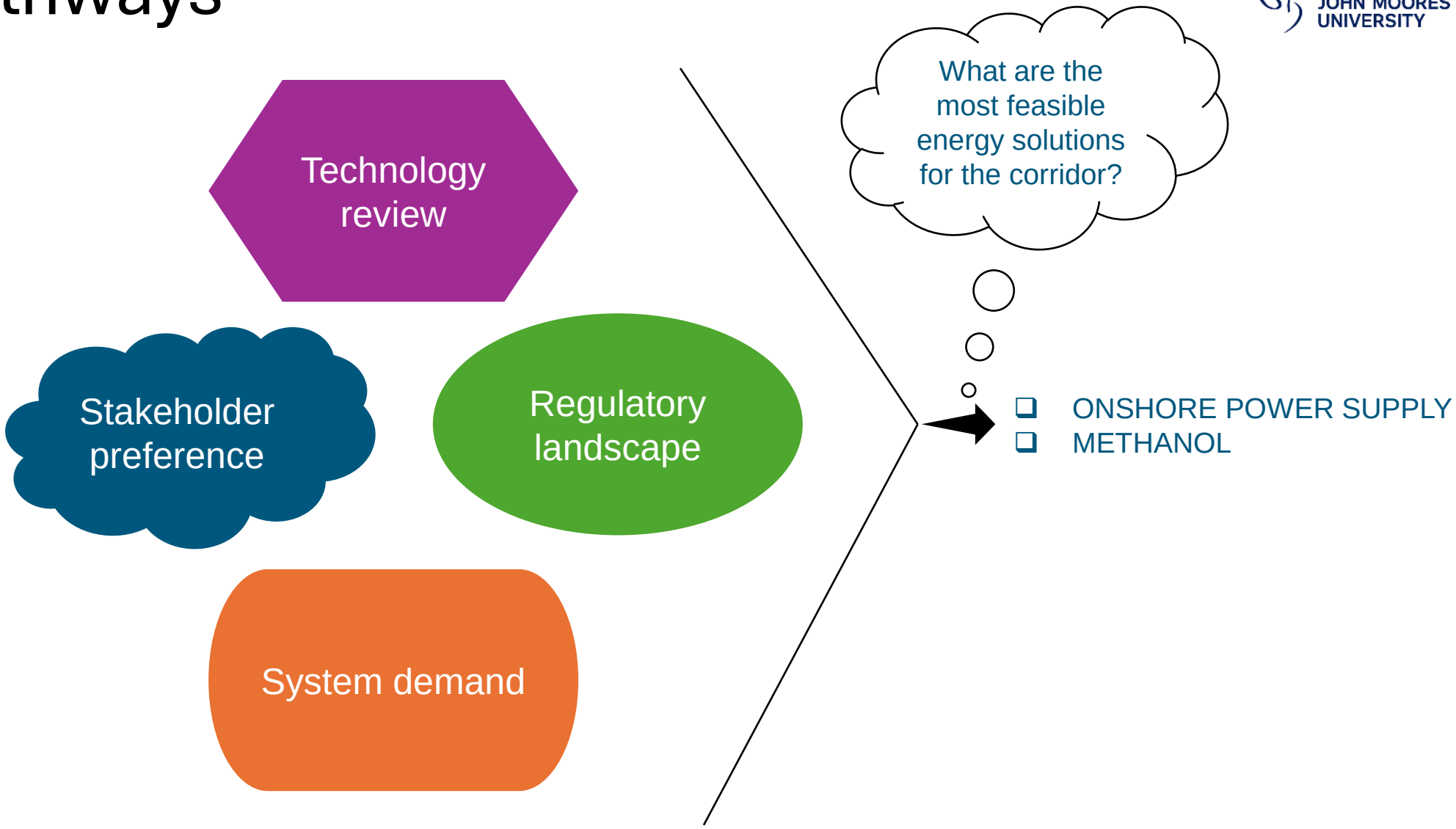
- For Liverpool City Region to achieve net zero by 2040, hydrogen might meet more than 20% of the region's final energy demand.
- LCR is already a leader in hydrogen sector with 10+ local businesses already embracing hydrogen.

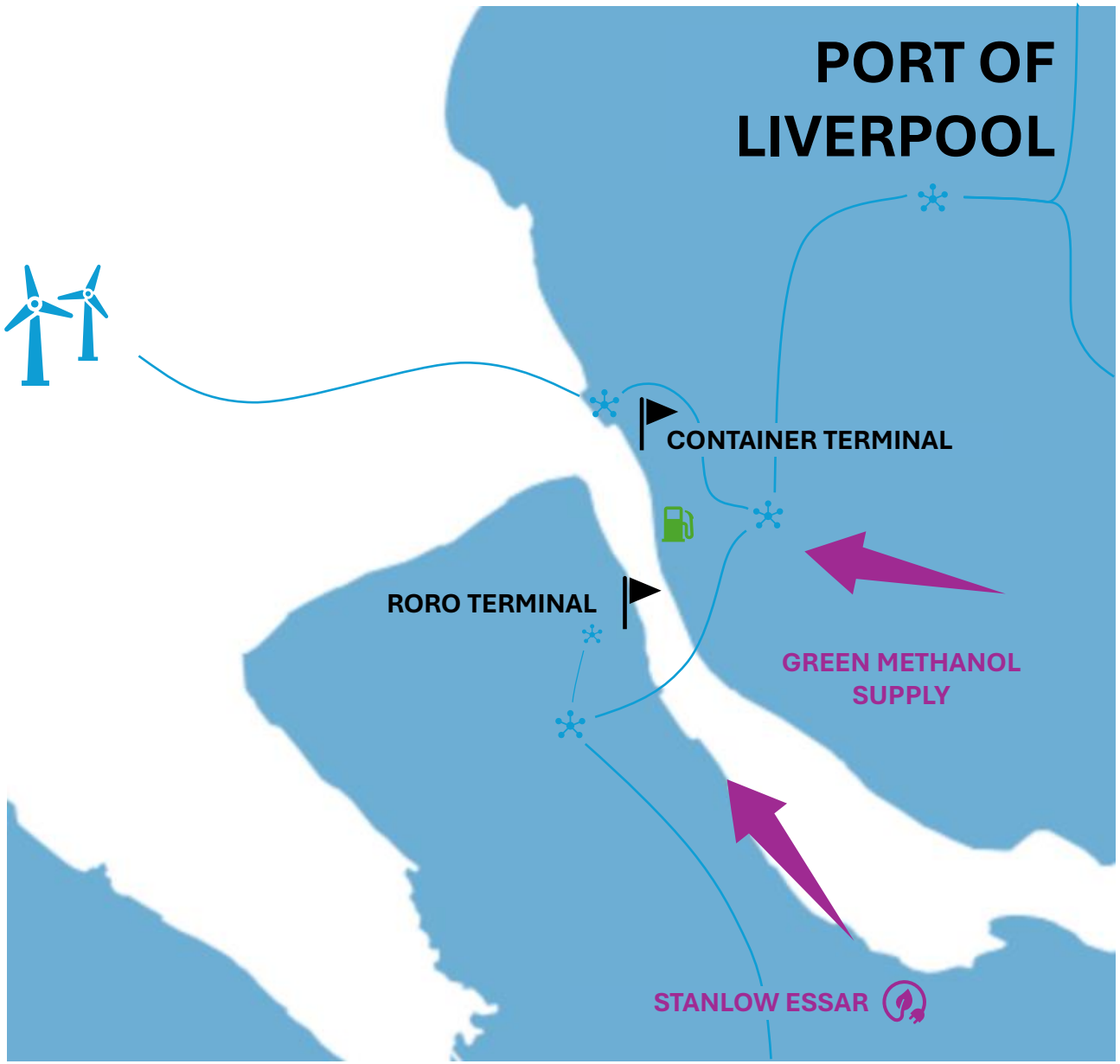


https://api.liverpoolcityregion-ca.gov.uk/wp-content/uploads/LCR-GHV-Exec-Summary-2023.pdf

PATHWAYS

2. Pathways


Technology review
Stakeholder preference
Regulatory landscape
System demand
What are the most feasible energy solutions for the corridor?
ONSHORE POWER SUPPLY
METHANOL



Green methanol

ALTERNATIVE SHIPPING FUEL

- Pipeline or barge from Essar Stanlow
- Truck supply

Clean electricity

SHORE POWER & ELECTRICATION OF PORT OPERATION

- Upgrades to grid infrastructure
- Clean energy supply

Storage and bunkering

FACILITATING NEW FUELS OPERATION

- Alternative fuel storage tanks
- Bunkering vessel upgrade

Green methanol

ALTERNATIVE SHIPPING FUEL

- E-methanol from biogenic source

Storage and bunkering

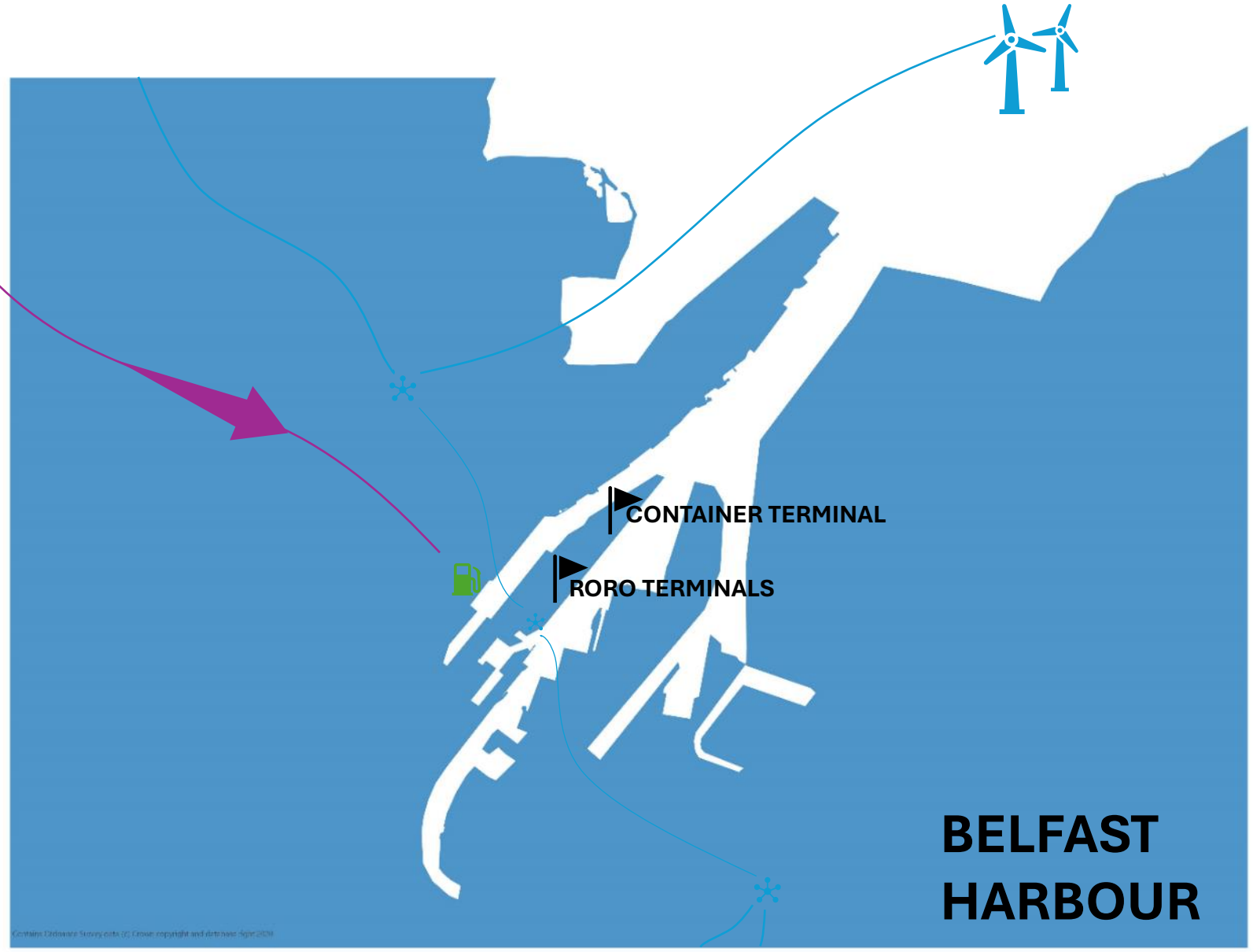
FACILITATING NEW FUELS OPERATION

- New bunkering services

Clean electricity

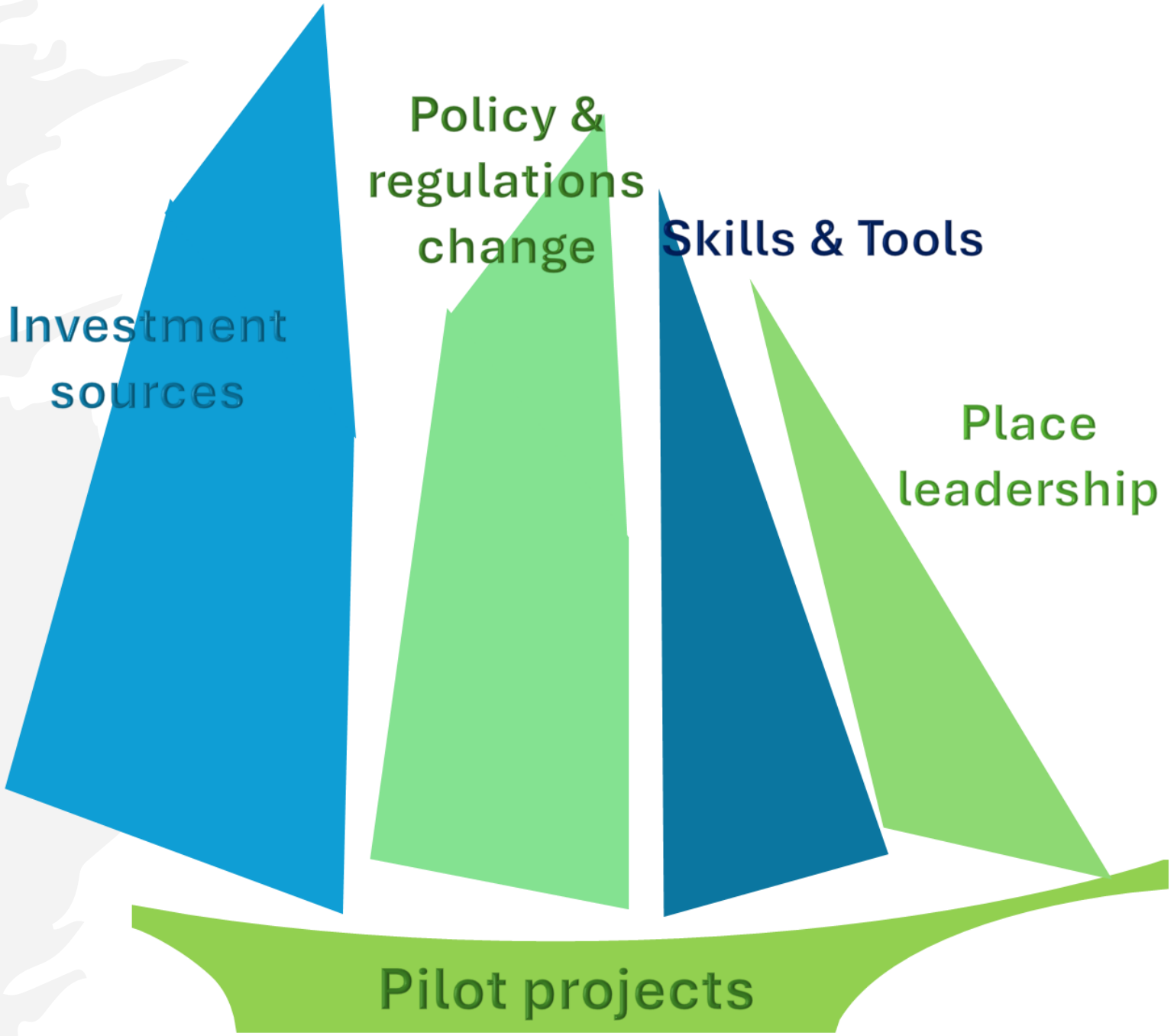
SHORE POWER & ELECTRICATION OF PORT OPERATION

- Upgrades to grid infrastructure



ECOSYSTEM & PILOT DEVELOPMENT

Enabling ecosytem



Longlist of pilot projects

Ref	Theme	Pilot Project
1	Energy Supply	6-month vessel propulsion methanol trial to assess impact & bunkering
2	Port Services	Trial methanol generators on sullage barges or tugboats for hotel load
3	Port Services	Shore Power for tugboats in Belfast York Dock
4	Port Services	Trial use of methanol in tugboats to assess engines/systems
5	Port Infra.	Implement Shore Power for Stena at 12 Quays berth (Lvp)
6	Port Infra.	Implement Shore Power for Stena at VT2 berth (Bel)
7	Energy Supply	Battery storage for feeder vessel shore power at CT1 (Lvp)
8	Enabling	Regional skill scan to define new training programmes for green shipping
9	Enabling	Risk assessment for supplying methanol to vessels in Belfast harbor
10	Enabling	Risk assessment for supplying methanol to vessels in Liverpool port
11	Enabling	Barge and shore-side infrastructure & operational assessment for methanol bunkering services at Belfast and Liverpool ports
12	Fund & Finance	Incentivised commercial model for shore power investment
13	Enabling	Supply Chain market demand assessment for green shipping
14	Fund & Finance	Irish Sea Vessel Energy Simulation Model for Electricity / Alt. Fuel Demand

Ref	Theme	Pilot Project
15	Enabling	Digital Twin for data collection and predictions for alt fuel usage, costs and supply (link to physical trials)
16	Port Services	Validate retro-fit ZEV services for Irish Sea shipping & facilities
17	Enabling	Recommend new regulatory guidelines for alternative fuels in maritime sector in UK
18	Funding & Finance	Investment option identification to fund pilot projects
19	Port Infra.	Energy Management System for Liverpool Seaforth Dock
20	Port Services	Develop digital tools to monitor and validate reduced vessel emissions
21	Energy Supply	Solar PV system at 12 Quays, Liverpool
22	Port Services	Invest in 4x4 electric terminal tractors for Ro/Ro stevedoring (Lvp or Bel)
23	Port Infra.	EV charging for passenger cars using ferry services (Lvp/Bel)
24	Enabling	Capture success lessons from other global corridors
25	Energy Supply	HVO Identification and benefit maximisation
26	Port Services	Trial hydrogen/diesel mix on port workboat (demonstrator)
27	Port Services	Develop hydrogen fuel cell for hotel (at berth) electric load
28	Energy Supply	Shore-based gas engines for large shore power generation
29	Energy Supply	E-Methanol generation from offshore wind (Bel)

Shortlist of pilot projects

	Ref	Pilot project shortlist
Enabling Studies 	9&10	Risk assessment for supplying methanol to vessels in Belfast and Liverpool ports
	11	Barge and shore-side infrastructure & operational assessment for methanol bunkering services at Belfast and Liverpool ports
	13	Supply Chain market demand assessment for green shipping
	17	Recommend new regulatory guidelines for alternative fuels in maritime sector in UK
Energy Supply 	29	E-methanol & methanol-diesel blends as marine fuel
	21	Solar PV system at 12 Quays, Liverpool
	25	HVO Identification and benefit maximisation
Funding & Finance 	12	Incentivised commercial model design for shore power investment
	14	Irish Sea Vessel Energy Supply Chain Simulation Model for Electricity / Alt. Fuel Demand
Port Infrastructure & Technology 	5&6	Shore power implementation for Stena at one berth
	23	EV charging for passenger cars using ferry services
	19	Energy Management System for Liverpool Seaforth Dock

SOME EXAMPLES OF PILOT PROJECTS

Shortlist of pilot projects

	Ref	Pilot project shortlist
Enabling Studies 	9&10	Risk assessment for supplying methanol to vessels in Belfast and Liverpool ports
	11	Barge and shore-side infrastructure & operational assessment for methanol bunkering services at Belfast and Liverpool ports
	13	Supply Chain market demand assessment for green shipping
	17	Recommend new regulatory guidelines for alternative fuels in maritime sector in UK
Energy Supply 	29	E-methanol & methanol-diesel blends as marine fuel
	21	Solar PV system at 12 Quays, Liverpool
	25	HVO Identification and benefit maximisation
Funding & Finance 	12	Incentivised commercial model design for shore power investment
	14	Irish Sea Vessel Energy Supply Chain Simulation Model for Electricity / Alt. Fuel Demand
Port Infrastructure & Technology 	5&6	Shore power implementation for Stena at one berth
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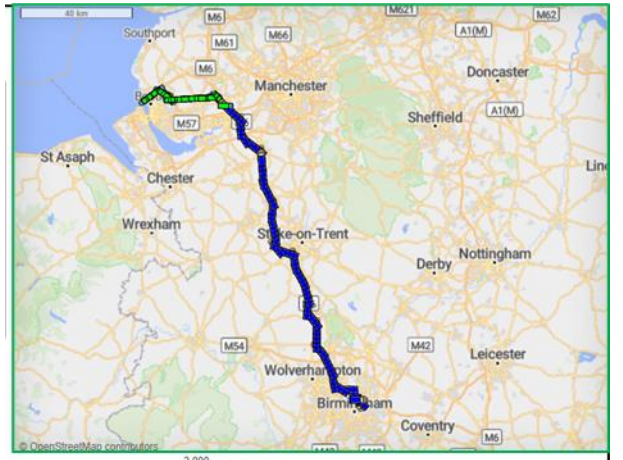
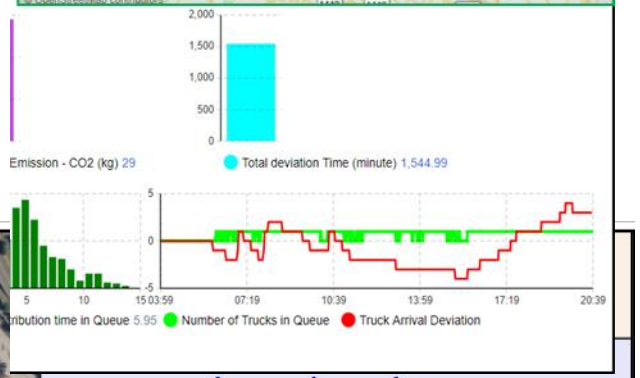
	19	Energy Management System for Liverpool Seaforth Dock

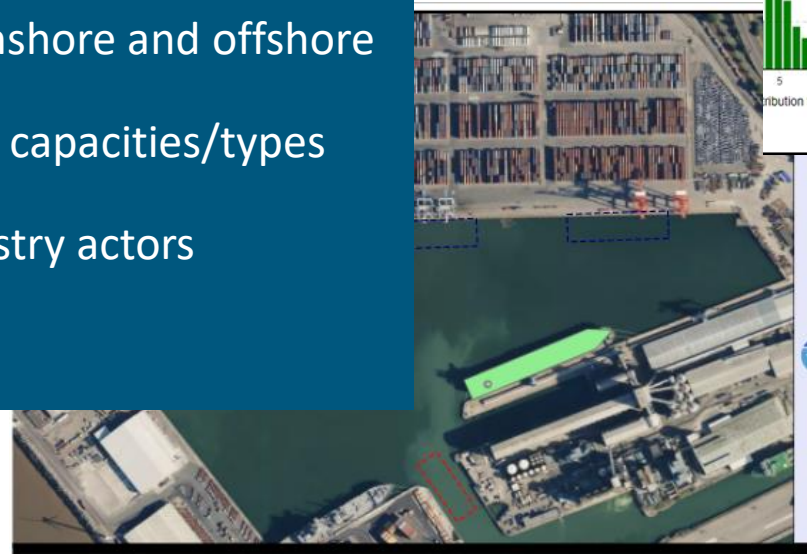
EVALUATE FEASIBILITY OF SUPPLY CHAIN FOR GREEN ENERGY USING SIMULATION

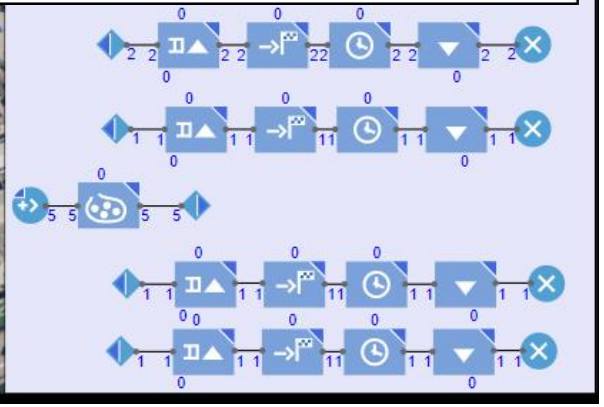
Supply Chain Options for Electricity / Alt. Fuel study using simulation

- Low-cost evaluation before expensive investments
- Estimate demand and energy supply options in different scenarios
- Connections to grid/alternative fuel supply chain and storage
- Different charging/bunkering options, including onshore and offshore
- Operations/growth/demand with different vessels capacities/types
- Guidance for capital investment, policies and industry actors





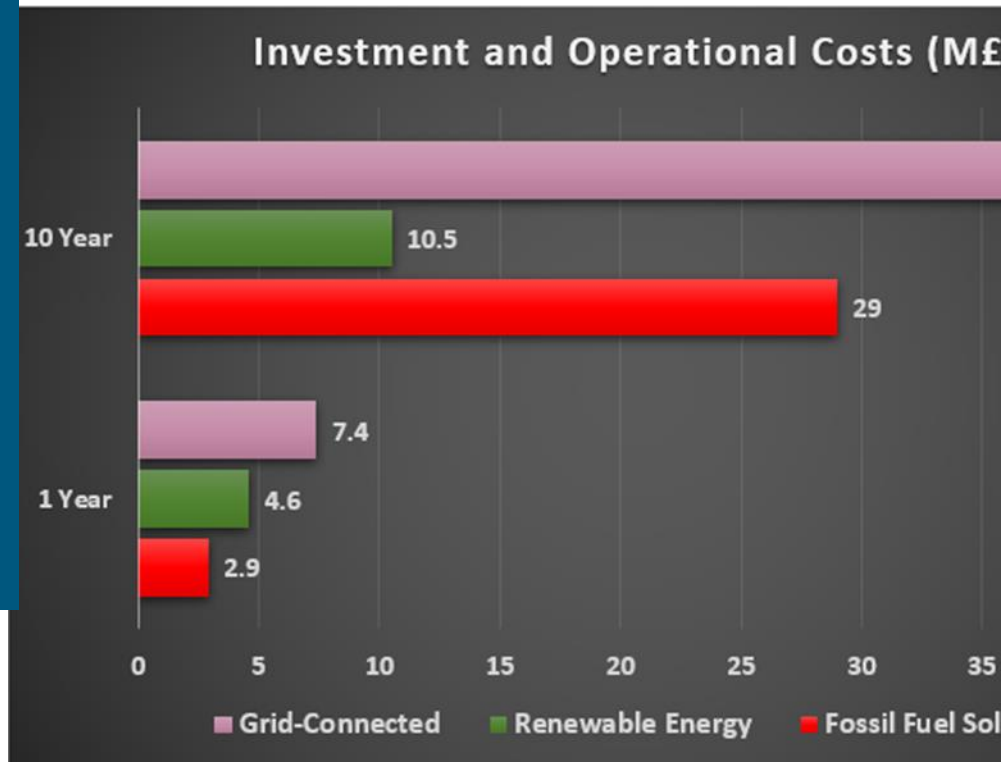




SITE-BESPOKE COMMERCIAL MODEL FOR SHORE POWER

Incentivised commercial model for shore power investment

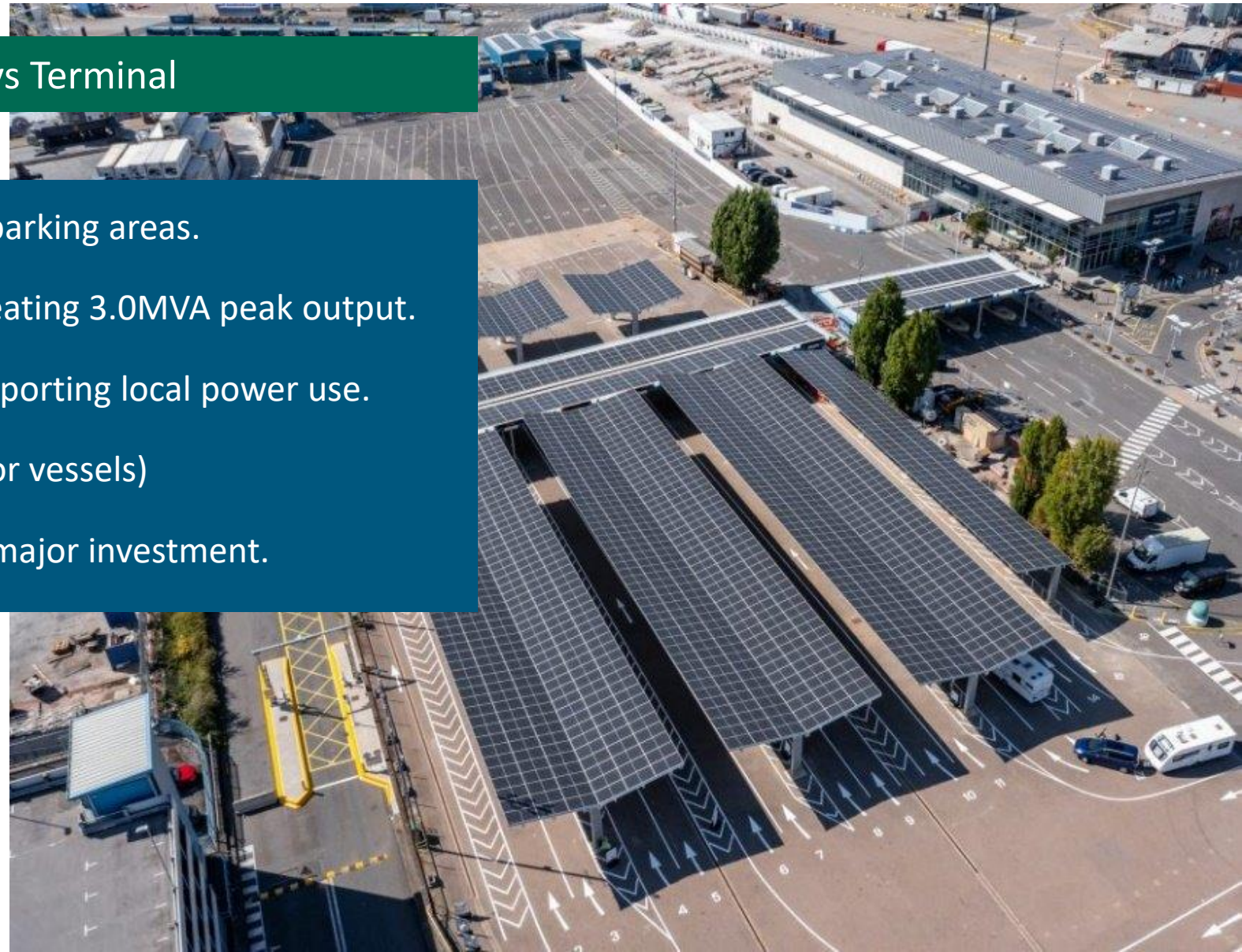
- Full alignment with COP29 (Climate Finance, Carbon market, Capital Market Mechanism), IMO GHG Strategy, and UK/international government policies/tarriff
- Assess and adopt commercial lessons from other industries
- Estimate investment & return for different SP options using modelling
- Understand cost components and funding sources
- Knowledge transfer through industry bodies



USE PORT ASSETS FOR GENERATION

Solar PV on Land & Buildings – 12 Quays Terminal

- Constructed over a canopy structure in parking areas.
- For area of 25,000 sqm, 7,500 panels creating 3.0MVA peak output.
- Energy can be returned to the grid – supporting local power use.
- Stored to shave peaks of demand (e.g. for vessels)
- Infrastructure and grid connections is a major investment.



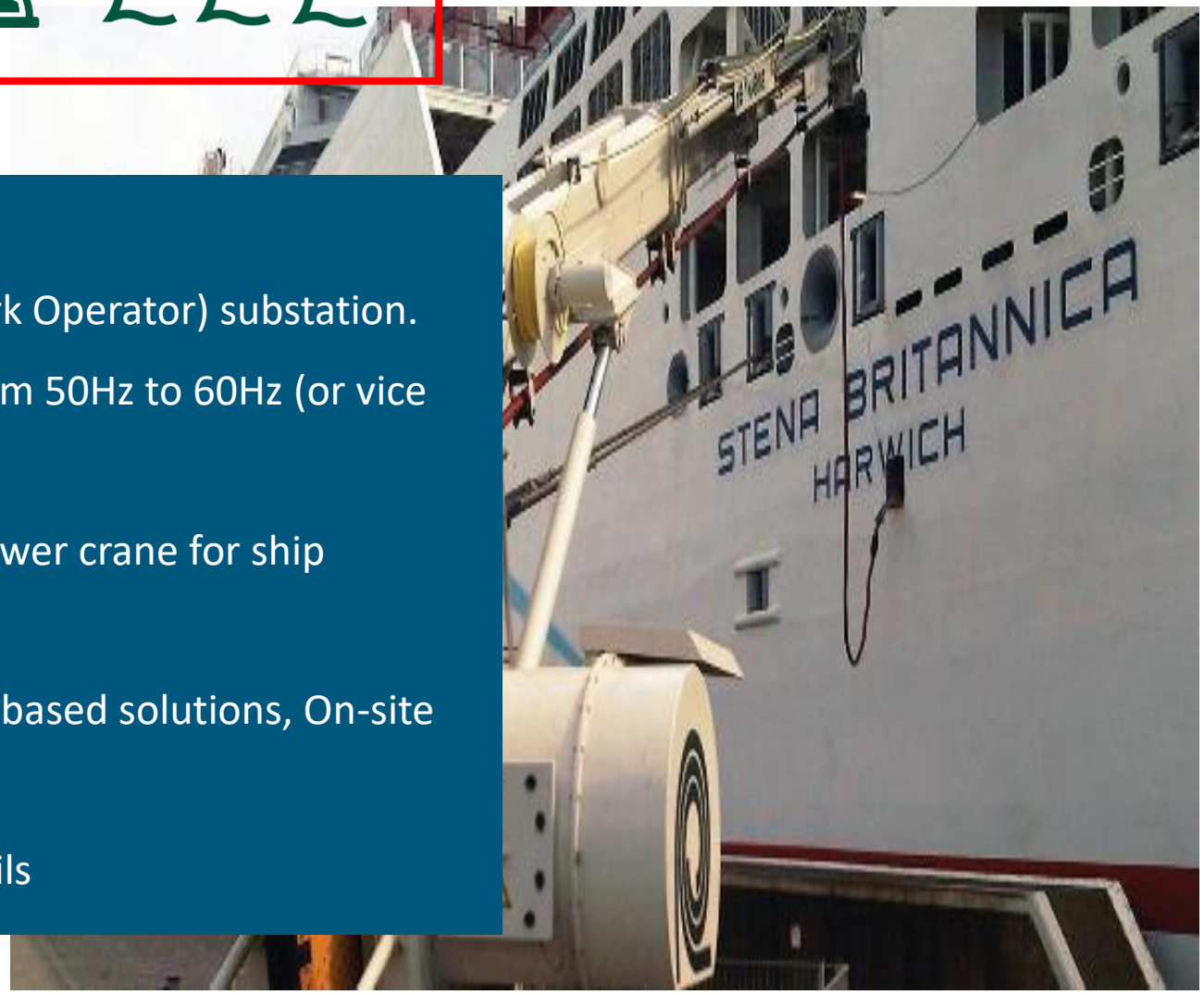
⏳⏳⏳ £££

SHORE POWER IMPLEMENTATION AT A BERTH

⧗⧗⧗ £££

Shore power implementation, feasibility and analysis

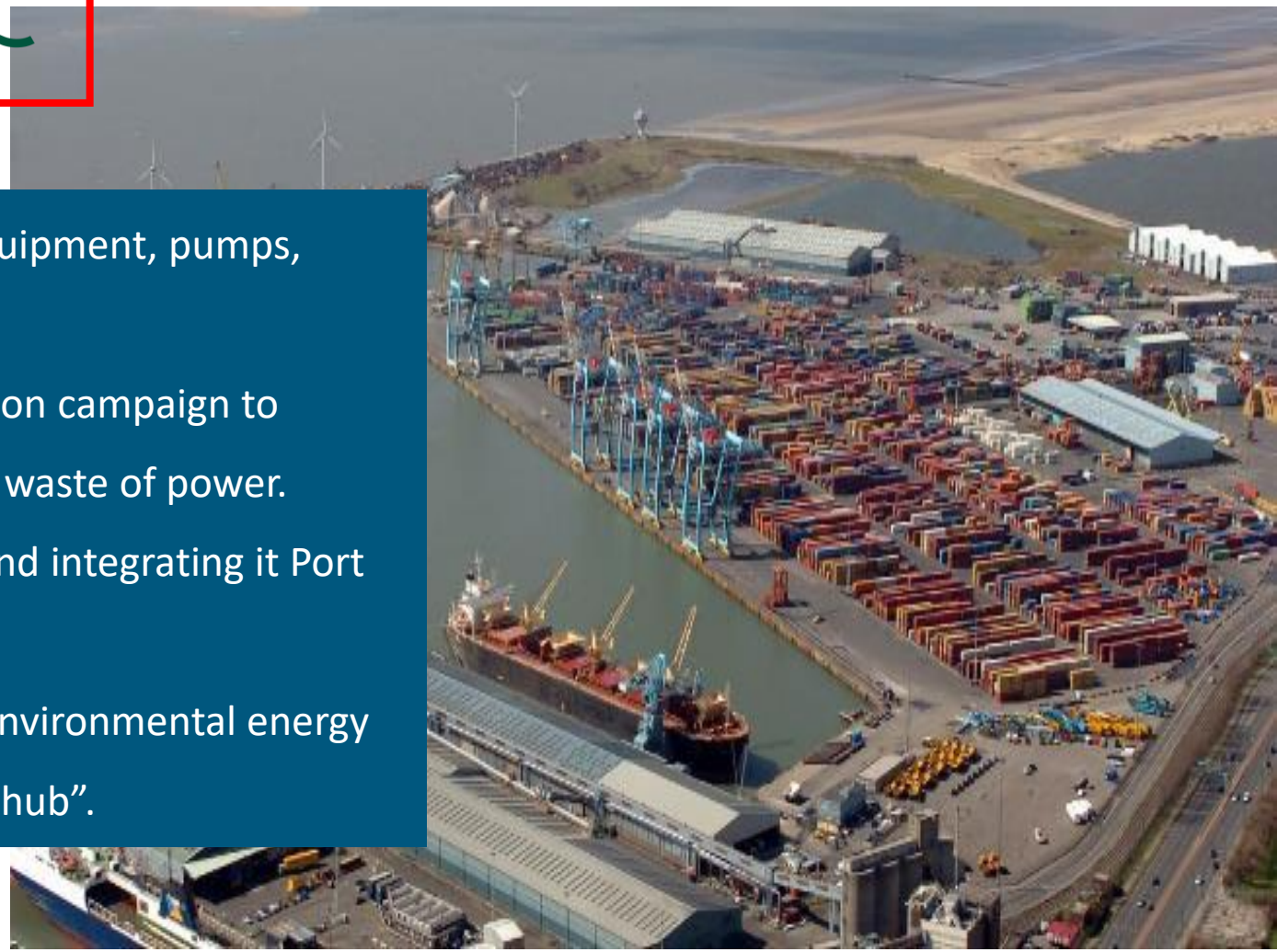
- Grid connected ships during hotelling
- Cabling from the berth to the DNO (Distribution Network Operator) substation.
- Installation of a frequency converter to adapt power from 50Hz to 60Hz (or vice versa)
- New mooring dolphin structure to support the shore power crane for ship interface
- Alternative for future: Renewable based (e.g. Hydrogen based solutions, On-site renewable energy-based solutions, etc.)
- UK-based experience wrt Technical and Economics details



PORT SMART ENERGY MANAGEMENT SYSTEM

Energy and digital management system

- Port has a large range of electricity demand in equipment, pumps, cranes and additional power capacity is limited.
- Smart meter and sub-station monitoring installation campaign to manage energy, create extra capacity and reduce waste of power.
- Digital twining for energy management system, and integrating it Port Digital Twin.
- Future – Integrating power, alternative fuel and environmental energy management systems to support “port as energy hub”.

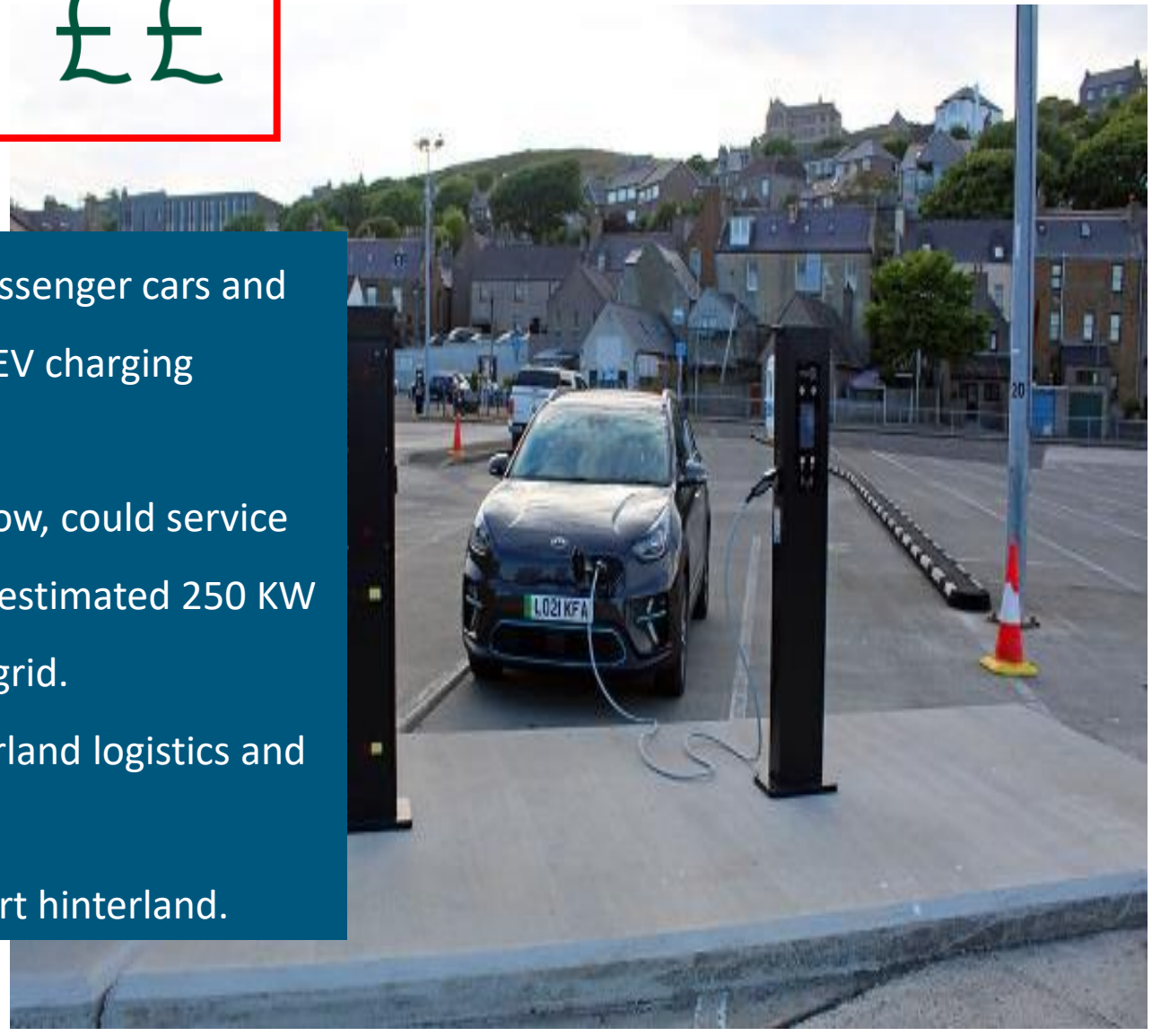


EV INFRASTRUCTURE AND TRENDS

⧖⧖ ££

EV campaign and EV charging infrastructure

- The port receives an increasing number of electric passenger cars and trucks each year, highlighting the need for improved EV charging infrastructure.
- Initial provision of 10-20 EV chargers with room to grow, could service increasing demand. Depending on the charger type, estimated 250 KW x 10 units ~ 2.5 MW demand at peak times from the grid.
- Investigating potential to use more EV trucks in hinterland logistics and analyse the impact on power requirements.
- Future – An electrified smart vehicle campaign for port hinterland.



NEXT STEPS

TIMELINE : WHAT NEXT ?

Raising Awareness & Seeking Investment

- Engaging with key decision makers and investors:
  - **September** - NIMO
  - Belfast Sustainability Meeting
  - LCR Mayor and City Council Leader
  - Outreach with potential investors/developers.
  - Mersey Maritime event at Labour Party conference – Mike Kane / Maritime UK/ LCR/Peel ports.
  - **October** – Royal Haskoning Event in Lisbon.
  - LCR Mayor U.S. trade mission met with investors.
  - **November** – Smart Cities Expo/Smart Ports meeting with C40 and Port of Barcelona.
  - Follow on discussions with Investors/developers.
  - Feedback with UK SHORE/ DfT etc.
  - Proposal for “Mobilisation” funding to move ahead.
  - Conversations with the key sponsors to bring investors, government and civic leaders together to make progress.

THE MARITIME CONTRIBUTION

TO NET ZERO

Liverpool City Region Combined Authority – the Maritime Agenda

Steve Skelton, Interim Director of Policy and Strategy

14 Nov 2024

Liverpool City Region Combined Authority

Corporate Plan 2024 - 2028

Liverpool City Region:
INNOVATING FOR GROWTH

The best place to grow up, grow a family, and grow a business.


10

*As the **UK's Western Global Gateway**, Liverpool City Region's (LCR) £35bn economy is the foundation for significant contributions to national prosperity.*

***A buoyant and innovative Maritime sector** with vertical strengths and features cutting across the innovation ecosystem and key cluster priorities, means the City Region can be at the forefront of developing and adopting cutting edge technologies in areas such as smart and green shipping, robotics, clean growth and ship-tech digitalisation - driven by a dedicated **Maritime Innovation Action Plan**.*

Change.

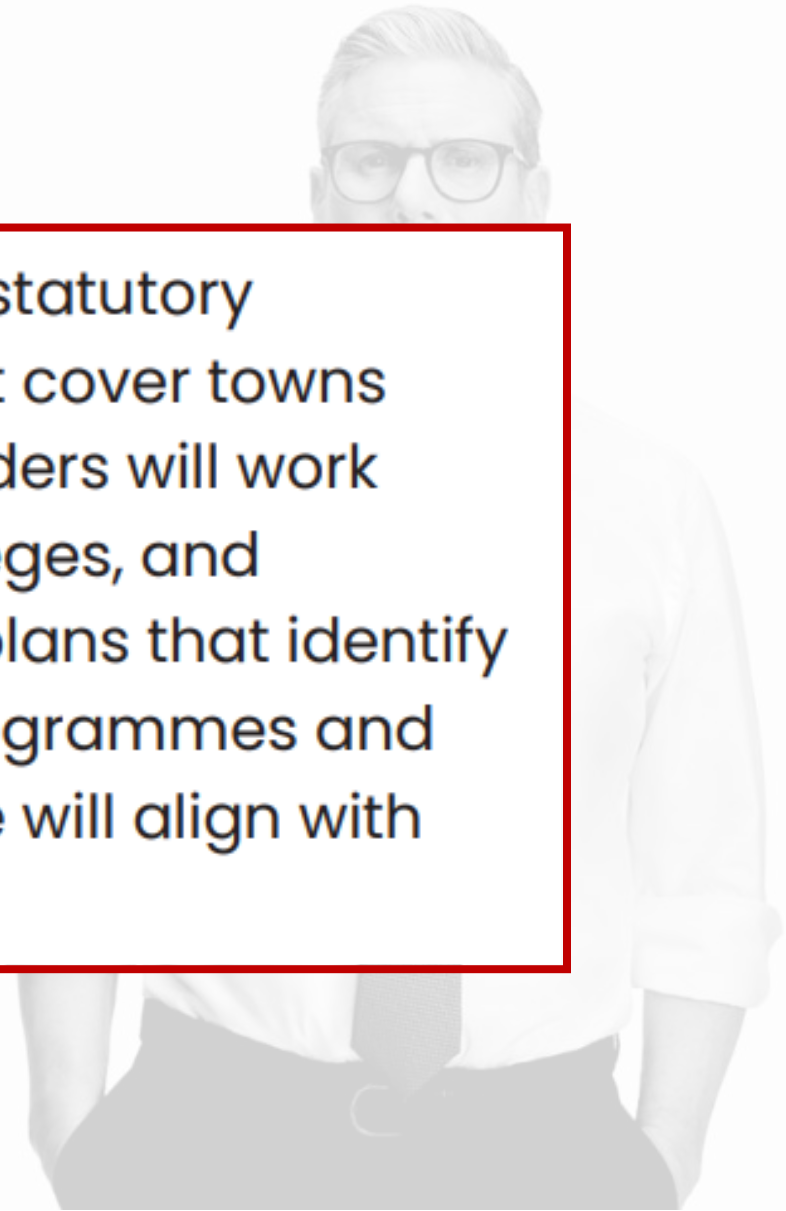
Labour Party Manifesto 2024

Read the Labour Party Manifesto

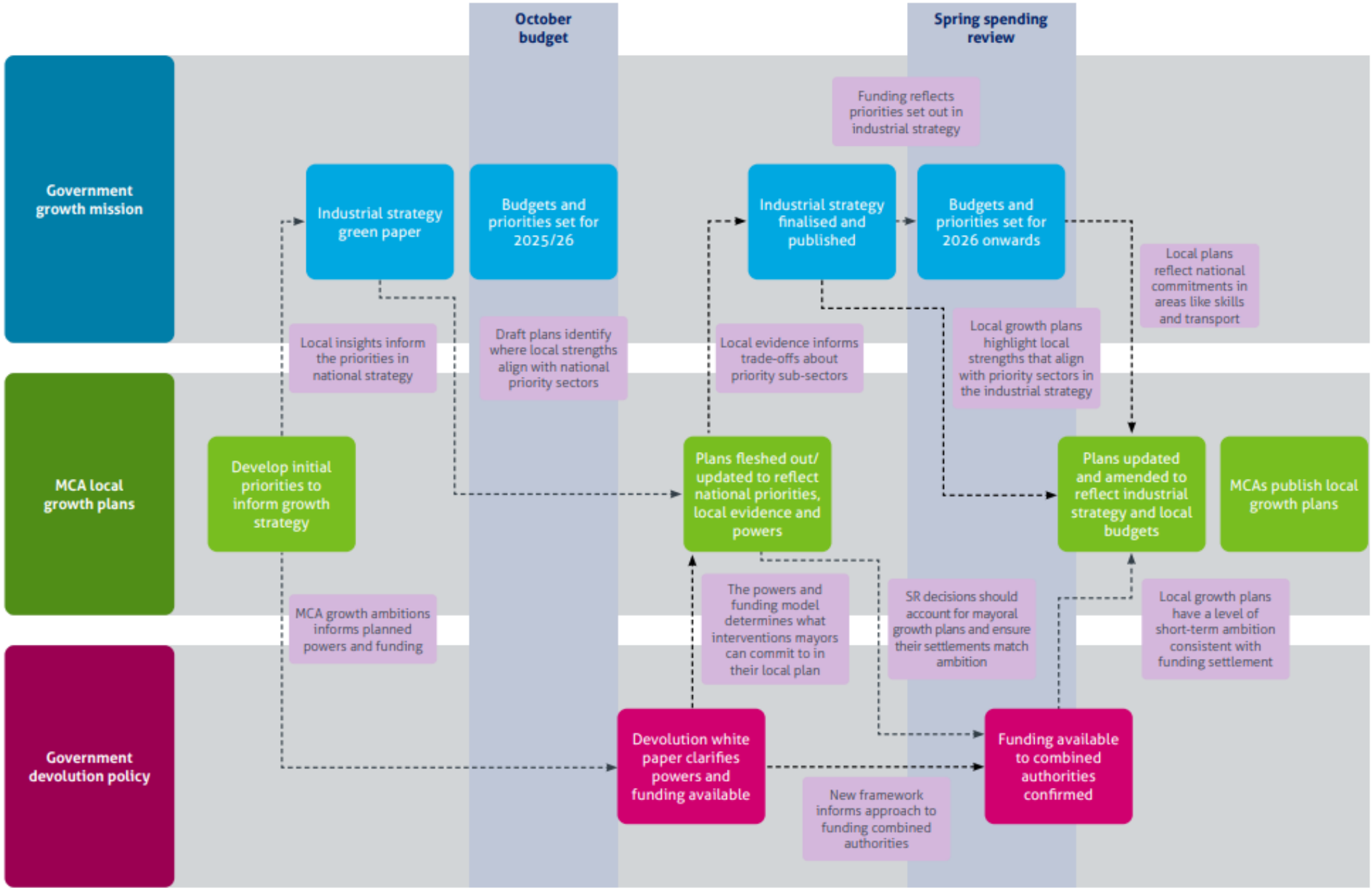
At this election we can change Britain.

We can stop the chaos, turn the page, and start to rebuild our country.

Change.



At the centre of our approach is a new statutory requirement for Local Growth Plans that cover towns and cities across the country. Local leaders will work with major employers, universities, colleges, and industry bodies to produce long-term plans that identify growth sectors and put in place the programmes and infrastructure they need to thrive. These will align with our national industrial strategy.



Source: *Local growth plans: How government should support a place-based approach to its national growth mission (IfG, 2024)*

DEVOLUTION

The octopus as an exciting ideal model for devolution

Claire Spencer says the politics of devolution focuses on red lines, postcode lotteries and unhelpful binaries, and the octopus model overcomes that.

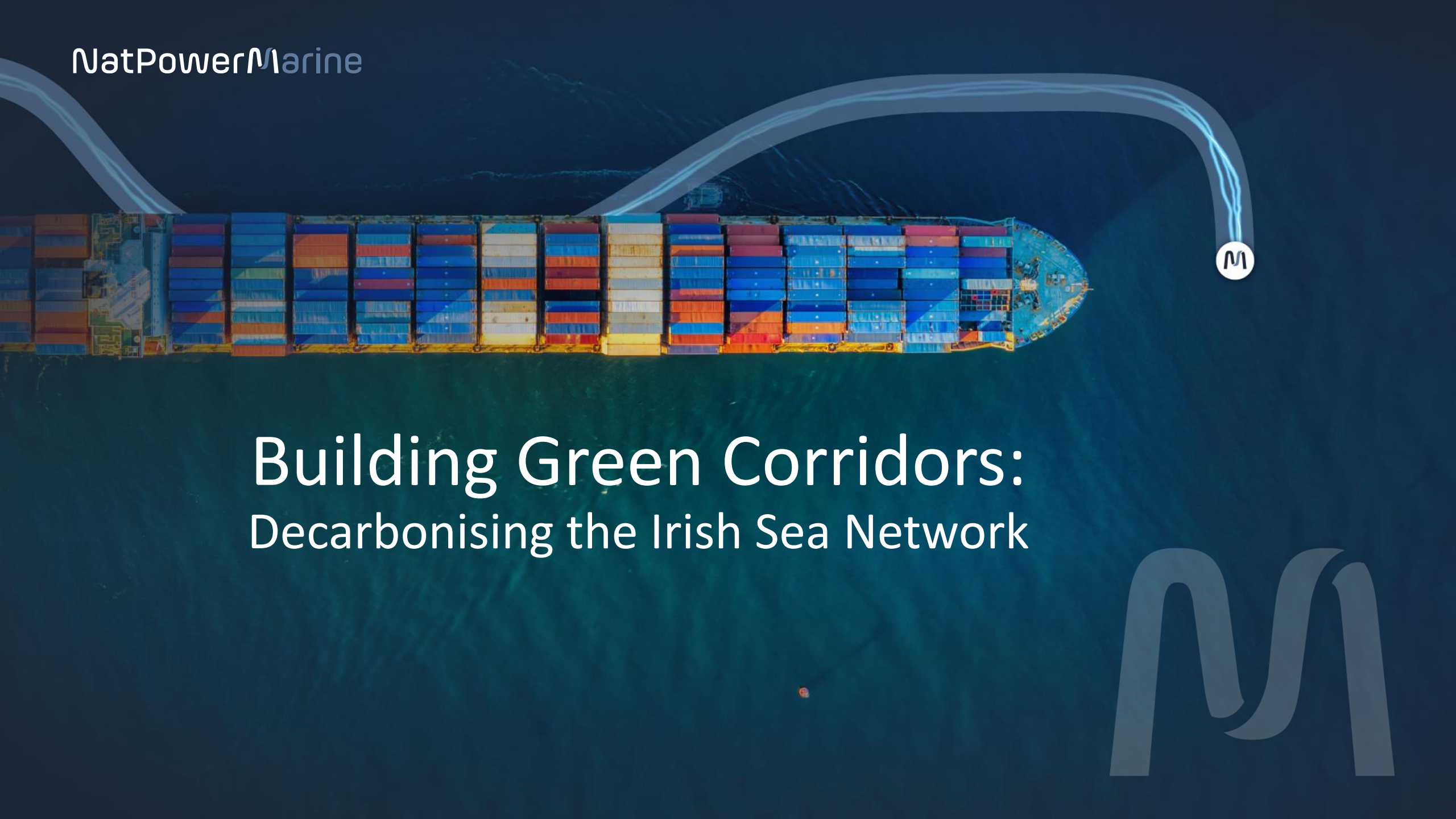
By Claire Spencer | 03 July 2024

SHARE

THE MARITIME CONTRIBUTION

TO NET ZERO

NatPowerMarine



Building Green Corridors:

Decarbonising the Irish Sea Network

Who are NatPower Marine?

We are an independent energy transition enabler. Delivering the largest global, fully integrated, smart network of charging points for cold ironing and propulsion, in key locations around the world powered by clean energy.

So how does NatPower Marine fit in?

- We are building the largest independent Global Network of vessel charging locations
- We provide a fully financed, end-to-end Energy Transition –as-a-Service
- At Berth, at Anchor, and at sea (electricity bunkering)
- Growing network of clean energy infrastructure
- We take the financial risk on capital deployed in tandem with vessel adoption risk
- We take energy trading risk
- We provide local solutions that then link into a global network.

NatPower UK: the leading Independent Energy TRANSITION Development Platform in the UK

22.5 GW
13% total applied grid capacity in UK

£10bn+
Investment driven to the country

28 GW
project development portfolio in UK

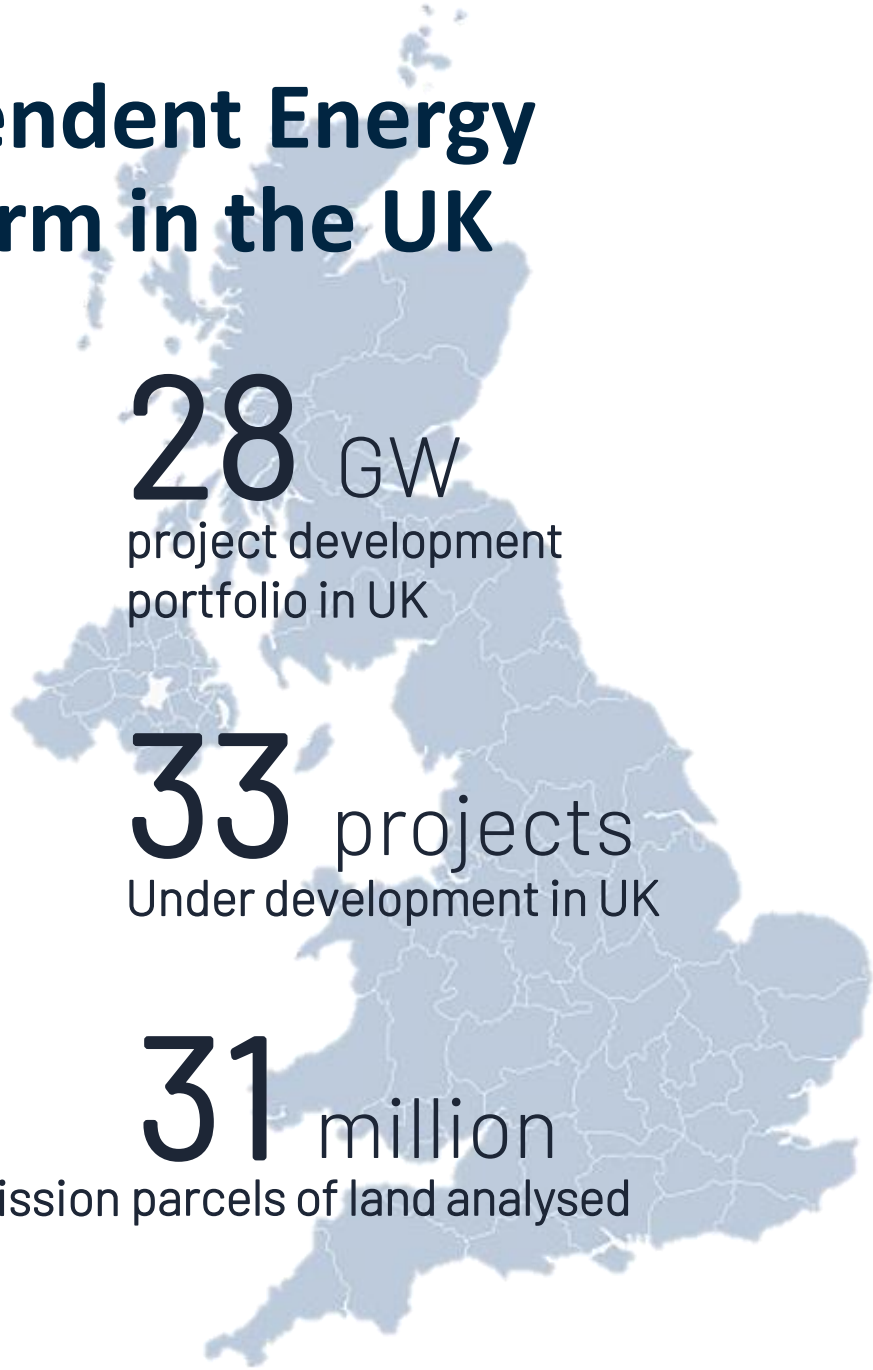
60 GWh
15-20% of UK needs by 2040

£600m
for the grid

33 projects
Under development in UK

1 in 5
of National Grid new transmission level substations

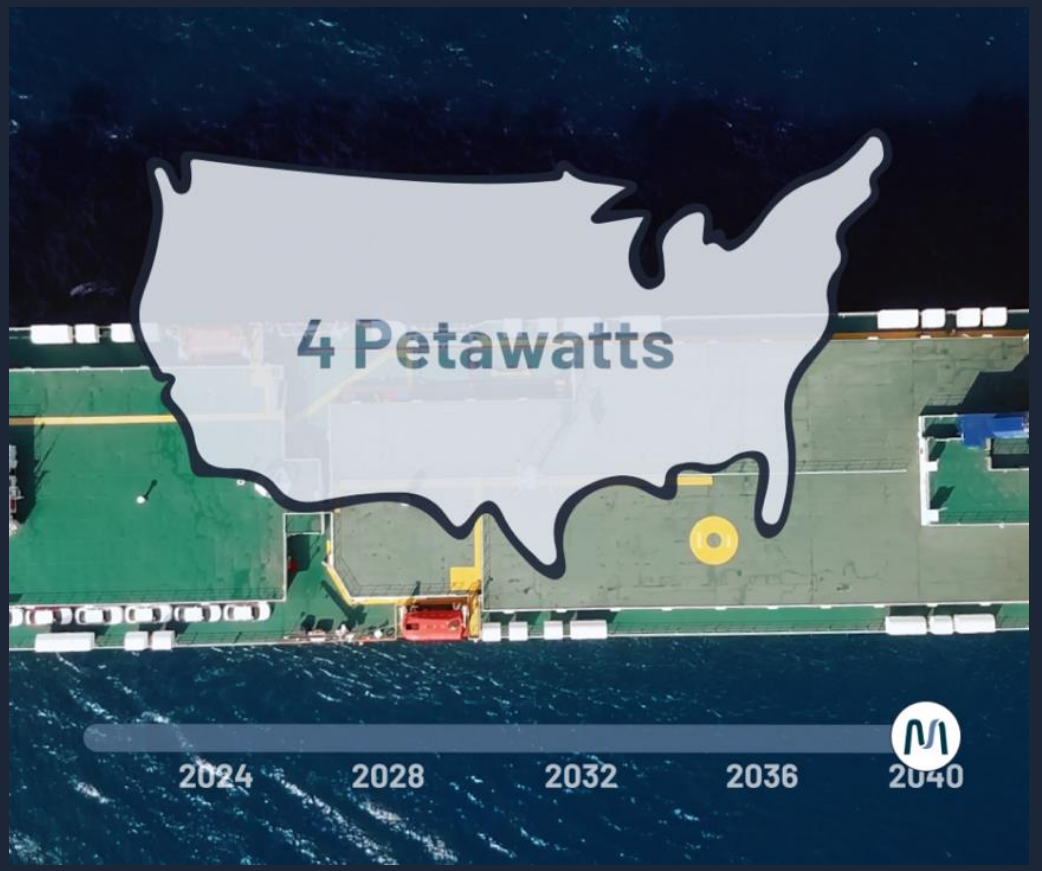
31 million
parcels of land analysed




Belfast
Heysham
Dublin
Liverpool
Irish Sea Network
NatPower
Marine

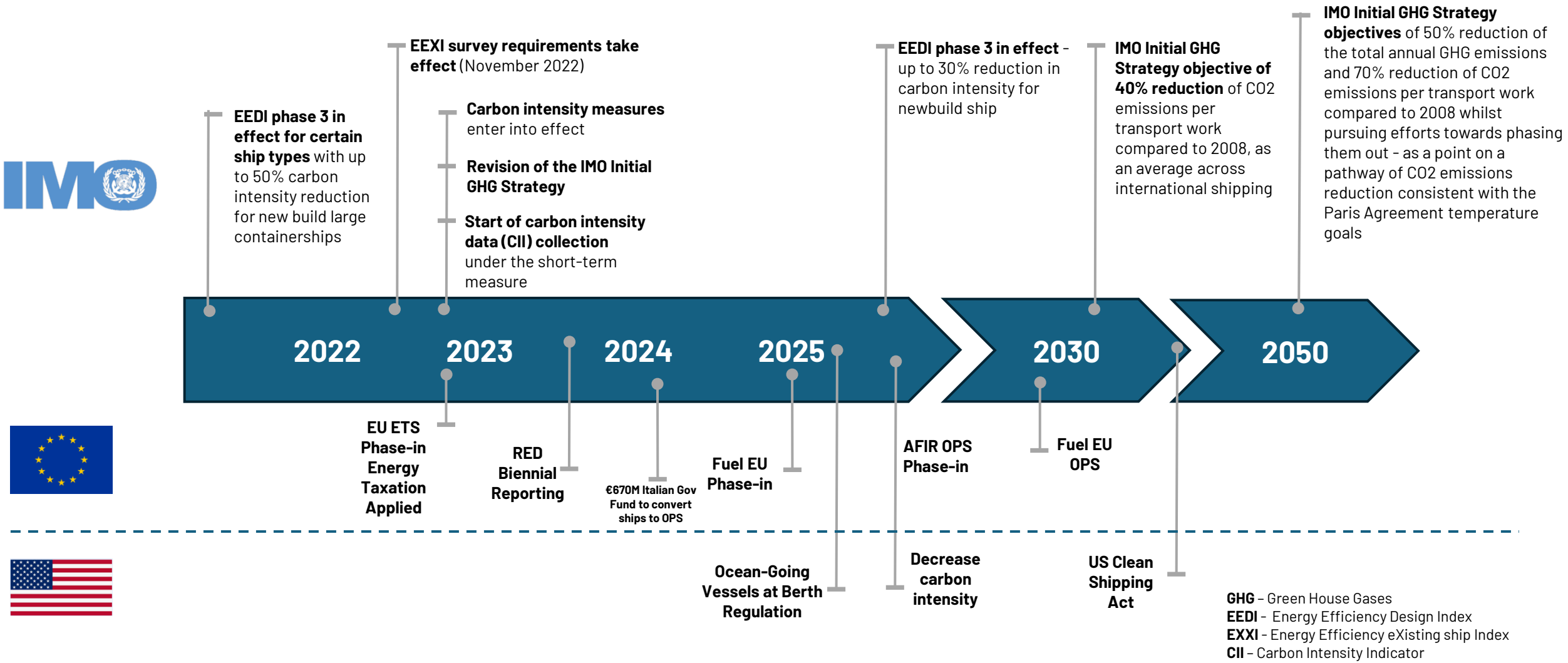
The Challenge!

- 3% of global Co2 emissions are generated by the maritime sectors operations - equivalent to Germany
- 15% of Nox and 13% of SOx emissions also produced by the sector
- **One sixth of a vessel's emissions are emitted whilst at berth.**
- Cold ironing in a port would reduce air particulates by a scale of 89%
- By 2040 the maritime industry will consume as much clean energy annually as the entire USA.
- Our industry faces increasing pressure to cut emissions, but the dilemma remains – shipping lines cannot electrify vessels if port charging infrastructure is unavailable, and ports can't raise capital for charging infrastructure without demand from the shipping lines!
- Individual isolated projects create lack of standardization

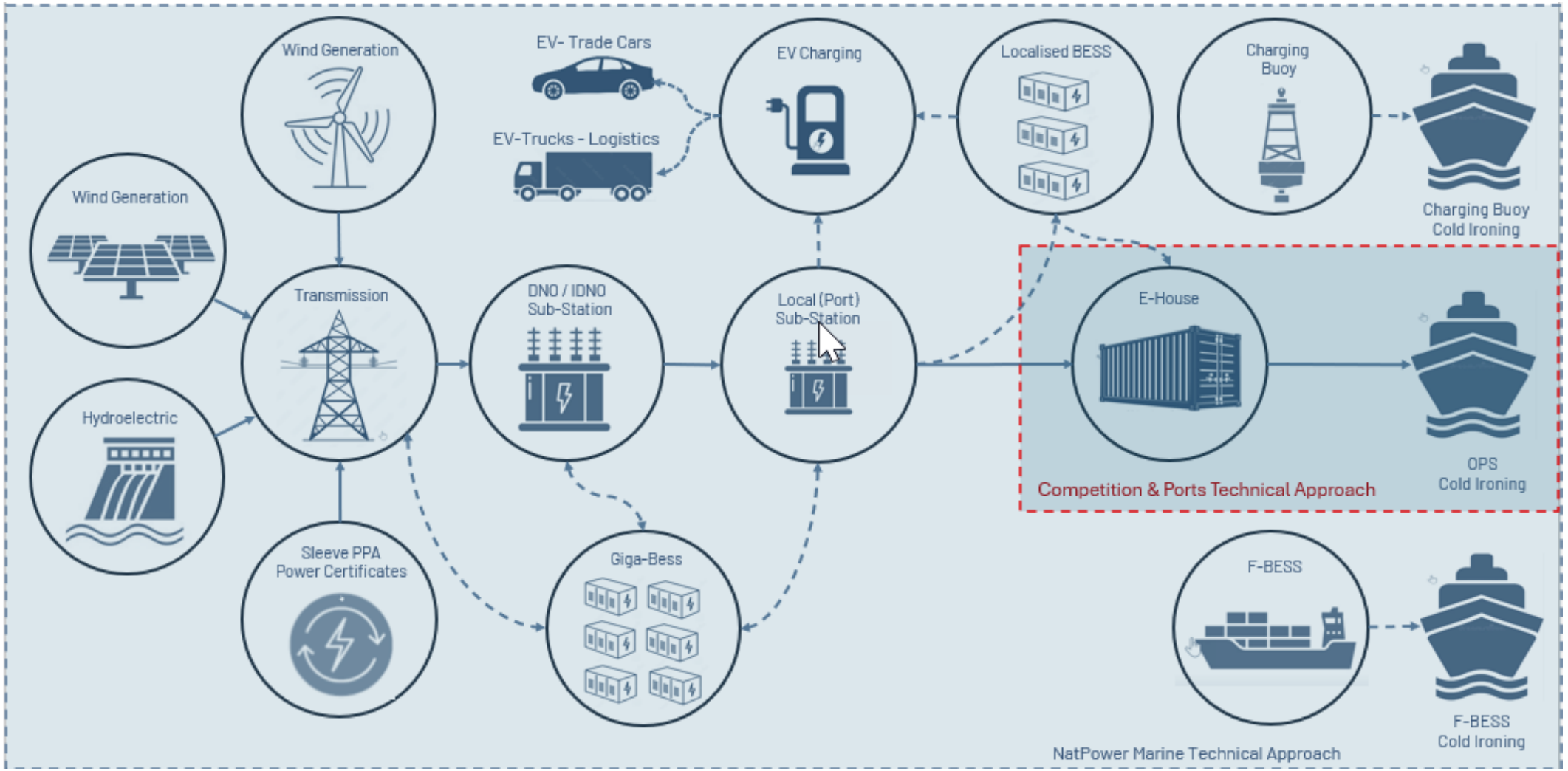


Maritime Regulatory Environment – IMO vs EU vs US

Regulatory requirements for OPS will drive ports to actively engage with OPS providers. However, limited government grants and uncertainty around ship electrification drives the OPS industry towards private investment delivering end-to-end OPS solutions (i.e. finance, deliver, operate).



END-TO-END SOLUTION



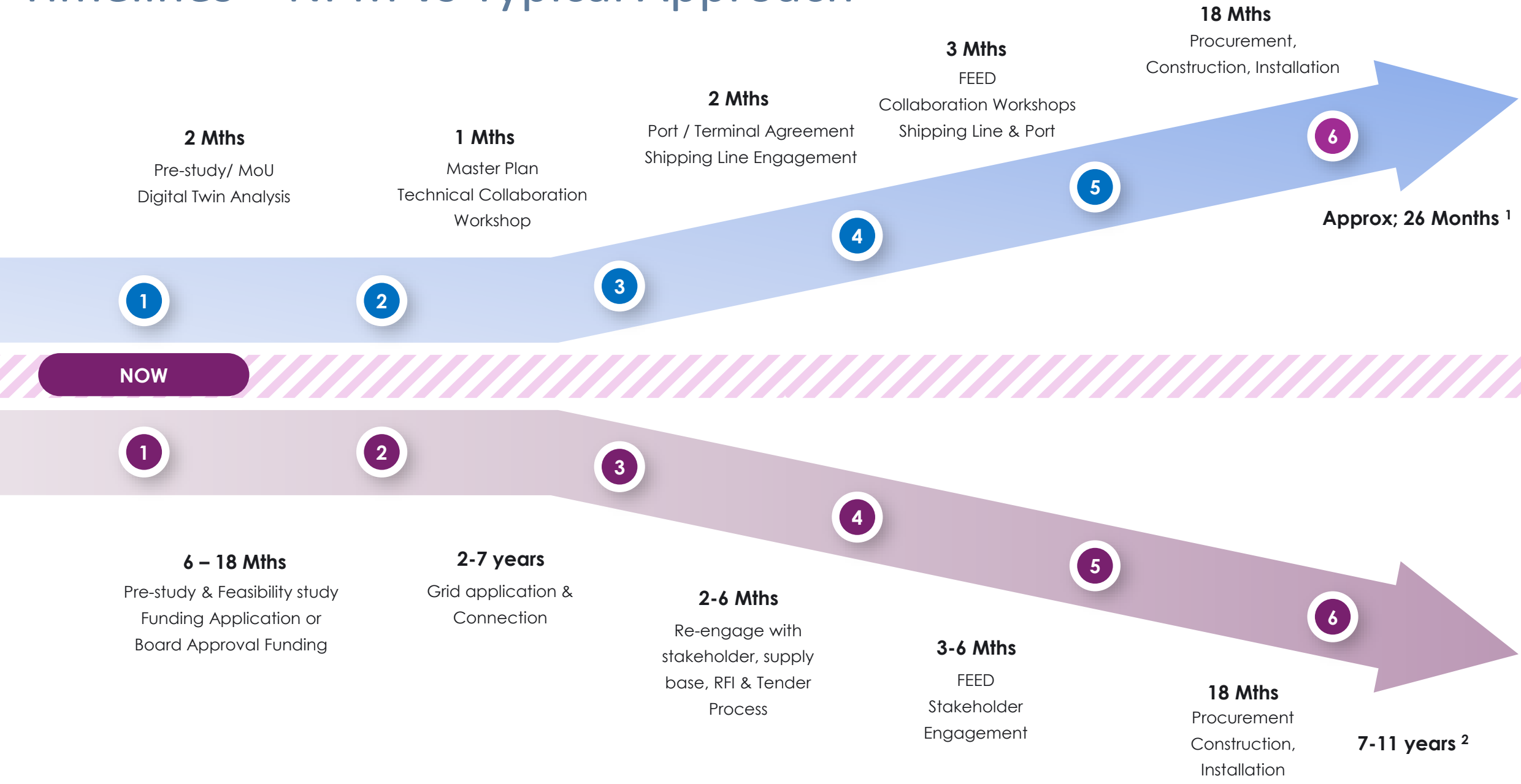
Standardisation

End-to-End

Common working practices

One Interconnected network

Timelines – NPM vs Typical Approach



Action Plan

Stakeholder Engagement

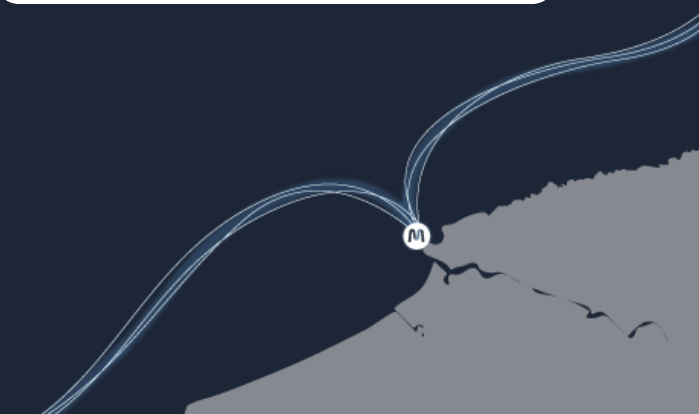
- Define the Key players
- Map and understand the current energy basket
- Map and understand the future energy demands
- Define a step wise strategy

The Challenge

- Define the Energy Gap
- Identify the constraints
- Set key priorities from both Vessel Operator and Port/Terminal perspective

The Plan

- Structure the future network
- Agree the timely implementation
- Develop the commercial model



Any Questions?

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THE MARITIME CONTRIBUTION

TO NET ZERO

MERSEY MARITIME

MARITIME CONTRIBUTION TO NET ZERO

Ruth Wood, CEO - Mersey Maritime

Thursday 14th November 2024

MERSEY MARITIME

ABOUT MERSEY MARITIME

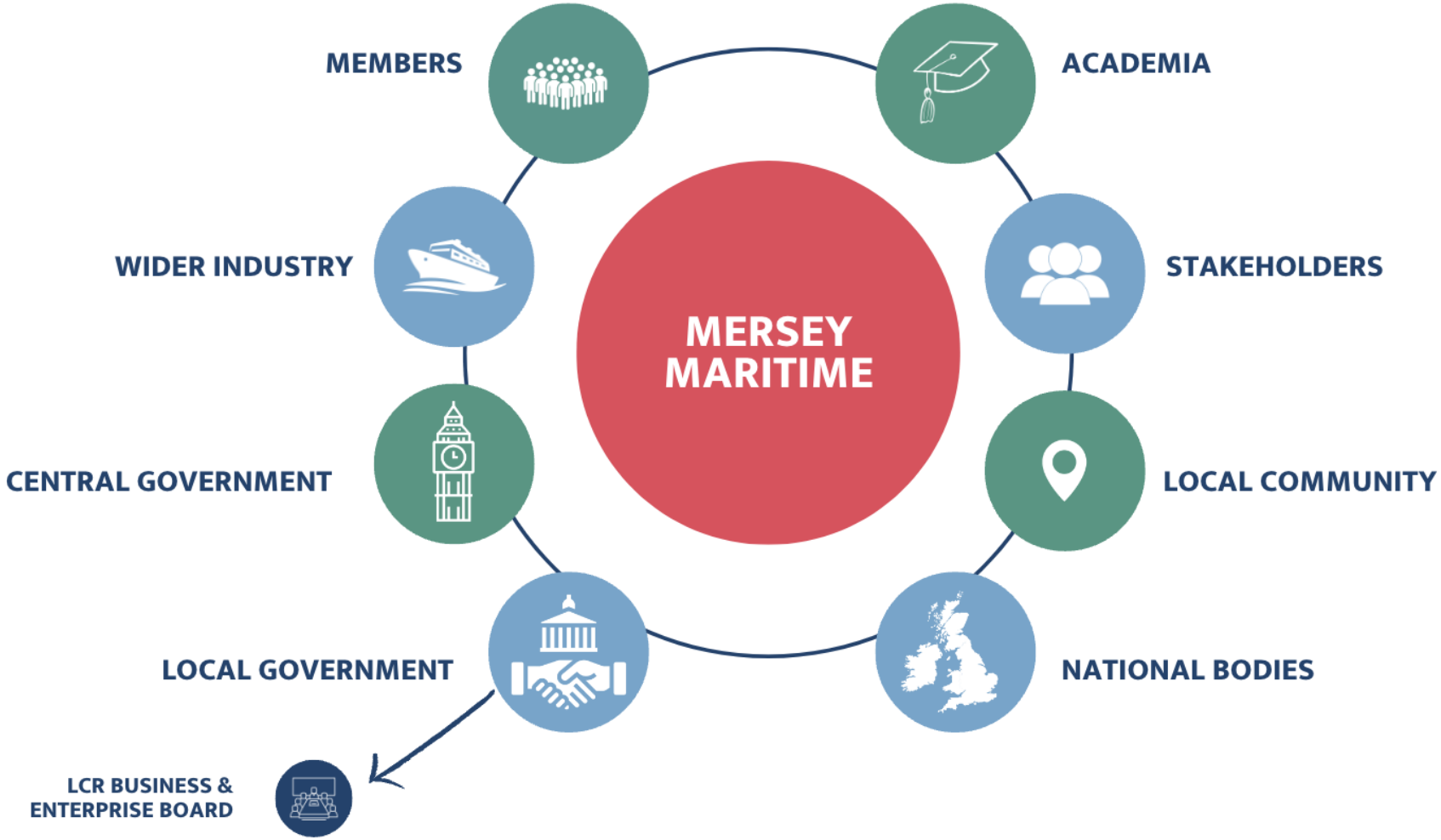
- Mersey Maritime is a not-for-profit North West based regional cluster organisation for the maritime industry
- A regional cluster organisation champions a single industry in a specific region to create jobs and growth
- Our mission is to champion, grow and protect the maritime industry in the Liverpool City Region

MERSEY MARITIME

MEMBER SNAPSHOT

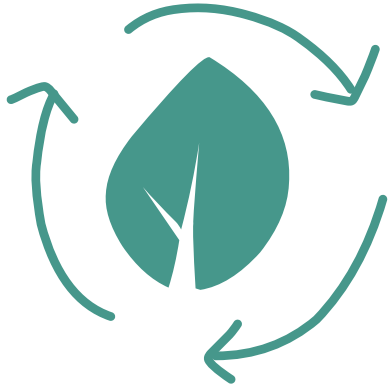
INDUSTRY ENGAGEMENT

MERSEY MARITIME



SECTOR PRIORITIES

INNOVATION



NET ZERO

SKILLS

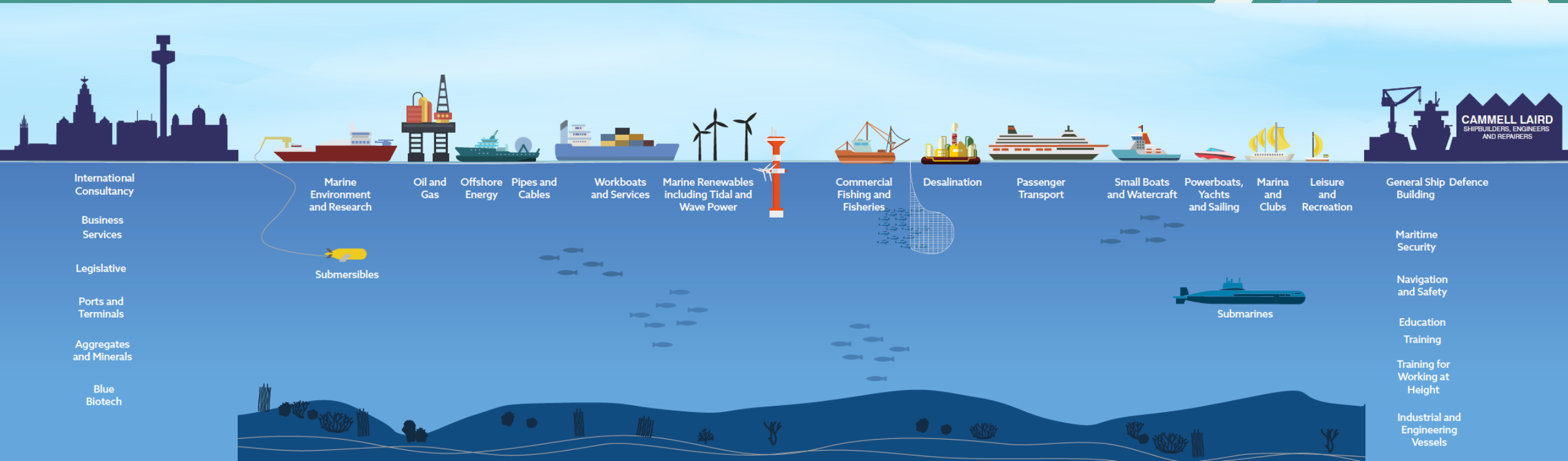
Our current priorities at Mersey Maritime revolve around three key pillars: innovation, net zero and skills.

By collaborating closely with industry stakeholders and strategic partners, we aim to drive positive change, foster innovation, and ensure a resilient and prosperous future for the maritime industry.

WHAT IS MARITIME?

MERSEY MARITIME

- Aggregates and Minerals
- Blue Biotech
- Business Services
- Cables
- Commercial Fishing & Fisheries
- Defence
- Desallination
- Education & Training
- General Ship Building and Repair
- Industrial & Engineering Vessel
- Legislative Advice
- Leisure, Recreation & Tourism
- Marinas & Clubs
- Marine Conservation
- Marine Construction
- Marine Environment
- Marine ICT
- Marine Renewables
- Maritime Security
- Navigation and safety
- Offshore Energy & Ocean Services
- Oil & Gas
- Other International Consultancy NEC
- Passenger Transport
- Pipes
- Ports and Terminals
- Powerboats
- R&D
- Sailing Industry
- Small boats & Water Craft



VALUE OF MARITIME
IN LIVERPOOL CITY REGION

MERSEY MARITIME

Worth
£5 billion
to the LCR economy through business turnover

48,200
jobs supported

Productivity of workers

£93,301 v £56,670
(LCR maritime) (UK economy average)

Supported
4.65 jobs
for every job generated by the sector in 2019

7.2%
growth is expected in real terms between 2021-25

A GROWING SECTOR

MERSEY MARITIME

£174 million

The LCR maritime direct contribution to the UK economy (various taxes such as income, corporation, VAT) - 3.4% of the total

£706 million

Direct impact to the UK economy through exports

490%

Direct turnover growth in the marine engineering and scientific sector, 2010-2019

88% employment growth

since **2010** with **4,000** more direct people employed

181%

LCR maritime growth between **2010 and 2019**

Shipping industry a primary driver of LCR maritime

Shipping turnover accounted for **66%** of the sector in 2019

299% since 2010

83% since 2015

Direct employment growth in marine engineering and scientific roles

IMPACT OF THE PORT OF LIVERPOOL

£750M

Peel Ports have invested £750m over the last 10 years

Liverpool is the UK's leading transatlantic port

Each year the Port of Liverpool handles over 30m tonnes of cargo

In 2022 it was the 4th largest port in the UK upon tonnage handled

Turnover in excess of £200m

Directly employs circa 1200 – 80% of which are from LCR

For every job created in a port, 6 are created in the wider supply chain

For every £1 contributed to ports an additional £2.67 of gross value is added to the economy

INNOVATION & DECARBONISATION DELIVERY

INDUSTRY

- Hynet a nationally significant industry decarbonisation project
- Cammell Laird onshore power solution
- Bibby Marine world's first electric commissioning service vessel
- Maersk green methanol vessels
- GT Wings wind power systems
- Peel Ports largest solar panel project

R&D

- University of Liverpool Clean Maritime Research Hub
- CDT for Net Zero Maritime Energy Solutions
- Connected Places Catapult Green Shipping Corridor Liverpool - Belfast

FUTURE OPPORTUNITIES

ASKS OF OUR NEW GOVERNMENT

- Confirmation of our maritime cluster development bid to support maritime innovation in LCR
- Focus on key maritime strategy and frameworks – Clean Maritime Plan and update to Maritime 2050
- Outcome of the comprehensive spending review and opportunities for maritime – future UK SHORE funding schemes
- Maritime and how it links specifically to HMG ‘missions’ – growth and clean / green energy – they can’t meet net zero goals without our industry transitioning
- Focus and profile on maritime as a vital and foundation sector nationally and more specifically LCR

MERSEY MARITIME

THANK YOU

Ruth Wood, CEO - Mersey Maritime
Ruth.Wood@merseymaritime.co.uk

Find out more about Mersey Maritime:
merseymaritime.co.uk

THE MARITIME CONTRIBUTION

TO NET ZERO

UNIVERSITY OF LIVERPOOL

Department of Civil and Environmental Engineering

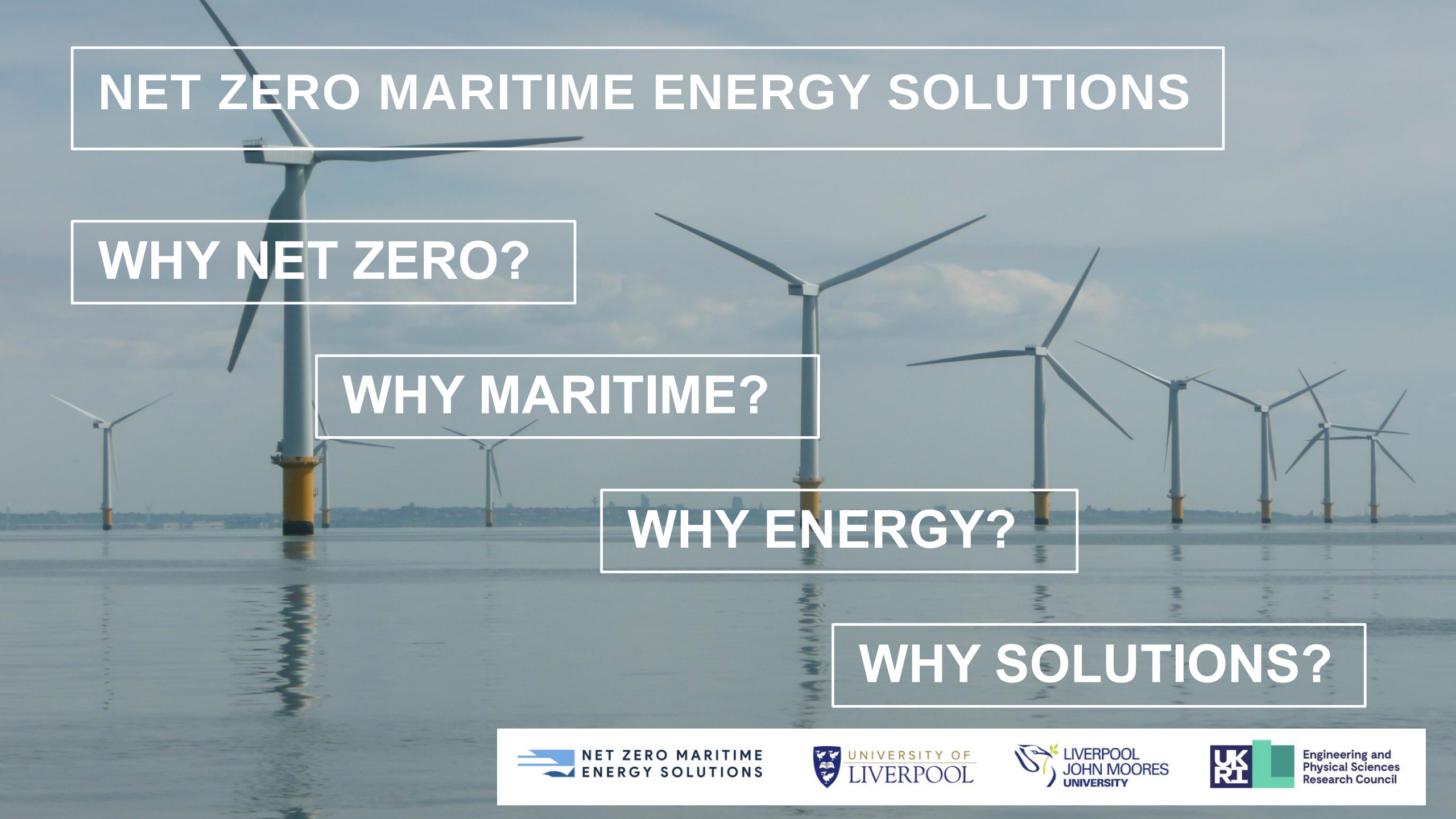
EPSRC CENTRE FOR DOCTORAL TRAINING

NET ZERO MARITIME ENERGY SOLUTIONS

John Bridgeman
JW Hughes Chair in Engineering
Director of the EPSRC CDT in Net Zero Maritime Energy Solutions

14 November 2024

WHAT IS A CDT?



NET ZERO MARITIME ENERGY SOLUTIONS

WHY NET ZERO?

WHY MARITIME?

WHY ENERGY?

WHY SOLUTIONS?

NET ZERO MARITIME ENERGY SOLUTIONS

UNIVERSITY OF LIVERPOOL

LIVERPOOL JOHN MOORES UNIVERSITY

UKRI Engineering and Physical Sciences Research Council

THEMES

- Renewable energy generation (offshore wind, tidal, wave, hydrogen)
- Energy distribution: offshore to inland
- Environmental impacts of energy generation, distribution and storage
- Decommissioning

NET ZERO MARITIME ENERGY SOLUTIONS

UNIVERSITY OF LIVERPOOL

LIVERPOOL JOHN MOORES UNIVERSITY

UKRI Engineering and Physical Sciences Research Council

PROJECTS AND PARTNERS

Global offshore developers:
- RWE
- Ørsted
- Morwind

Energy companies
- EDF
- Cheniere

Renewable energy research and innovation hubs
- Supergen ORE
- ORE Catapult

Maritime and energy clusters
- Mersey Maritime
- MarRI-UK
- RenewableUK

Geotechnical and sustainability consultancies
- Fugro
- Frazer-Nash
- Envorem

Port developers
- Peel Ports
- Peel L&P

Maritime data entrepreneurs
- Maritime Digital Hub

Manufacturing and construction organisations
- Cammell Laird
- Tarmac Marine
- AceOn

National Centre for Digital Innovation
- STFC Hartree Centre

Local SME innovators
- Central Group
- Prime Atlantic
- Atomik
- Liverse Technologies
- CoastSense

Charities
- Our Tide
- NoC
- MAST

Public body
- MMO

Local and Regional Authorities
- LCR Combined Authority
- LCR Freeport
- Wirral Council
- Sefton Council


BROADER
TRAINING

THE UNIVERSITIES

John Bridgeman
Cate Cowton
Kevin Egerton
Matt Fulton
Mike Hessian
Seònaid Lafferty
Vicki O'Kelly

Laura McGarty
Trung Thanh Nguyen
Suzanne Palmer
Sara Parker
Andy Plater
Jin Wang
Karl Whittle
Zaili Yang

NET ZERO MARITIME ENERGY SOLUTIONS
UNIVERSITY OF LIVERPOOL
LIVERPOOL JOHN MOORES UNIVERSITY
UKRI Engineering and Physical Sciences Research Council

UNIVERSITY OF LIVERPOOL

EPSRC CENTRE FOR DOCTORAL TRAINING

NET ZERO MARITIME ENERGY SOLUTIONS

NET ZERO MARITIME ENERGY SOLUTIONS

UNIVERSITY OF LIVERPOOL

LIVERPOOL JOHN MOORES UNIVERSITY

UKRI Engineering and Physical Sciences Research Council

UNIVERSITY OF LIVERPOOL

EPSRC CENTRE FOR DOCTORAL TRAINING

NET ZERO MARITIME ENERGY SOLUTIONS

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THE MARITIME CONTRIBUTION

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