RICARDO

EXECUTIVE SUMMARY

GREEN NORTH SEA SHIPPING CORRIDOR

PORT OF TYNE

Zeehaven IJmuiden NV

DFDS

KVSA

CONTENTS

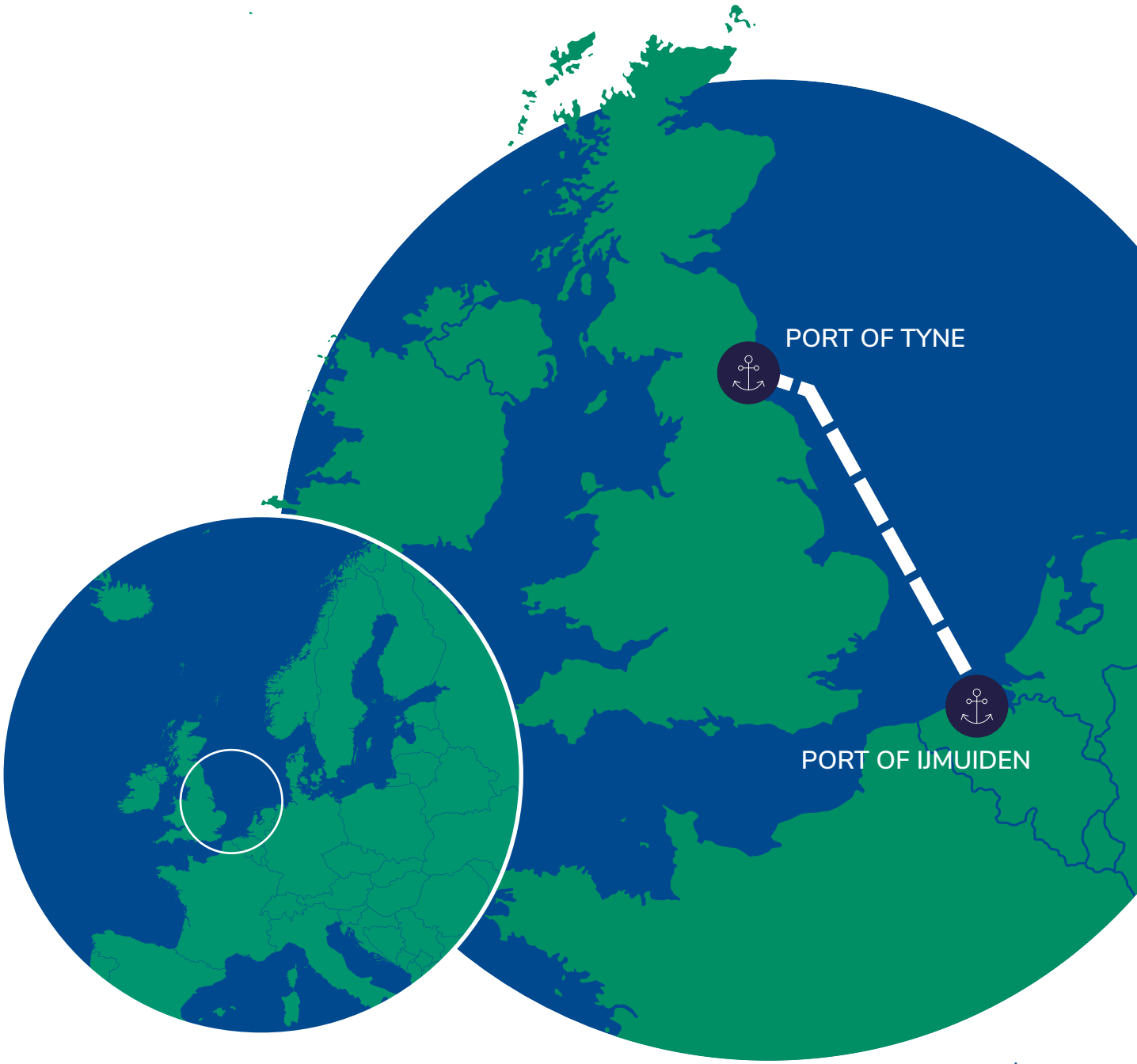
This project is part of the Clean Maritime Demonstration Competition: International Green Corridors Fund (CMDC5: IGCF). It is jointly funded by the UK Department for Transport (DfT) and the Netherlands Ministry for Water & Infrastructure. The funding is being delivered by Innovate UK and the Netherlands Enterprise Agency (RVO).

CMDC5: IGCF is part of the Department's UK Shipping Office for Reducing Emissions (UK SHORE) programme, a £206m initiative focused on developing the technology necessary to decarbonise the UK domestic maritime sector.

Front cover image courtesy of DFDS

CONTEXT AND OPPORTUNITY

The maritime sector faces increasing regulatory and commercial pressure to decarbonise in line with net-zero goals. The UK and the Netherlands both support the creation of Green Shipping Corridors (GSCs) as a way to accelerate adoption of zero and near-zero GHG emission fuels. The Ro-Pax route between the Port of Tyne and the Port of IJmuiden, operated daily by DFDS, provides a controlled, well-defined context in which to evaluate the use of methanol and Onshore Power Supply (OPS) as viable decarbonisation solutions.

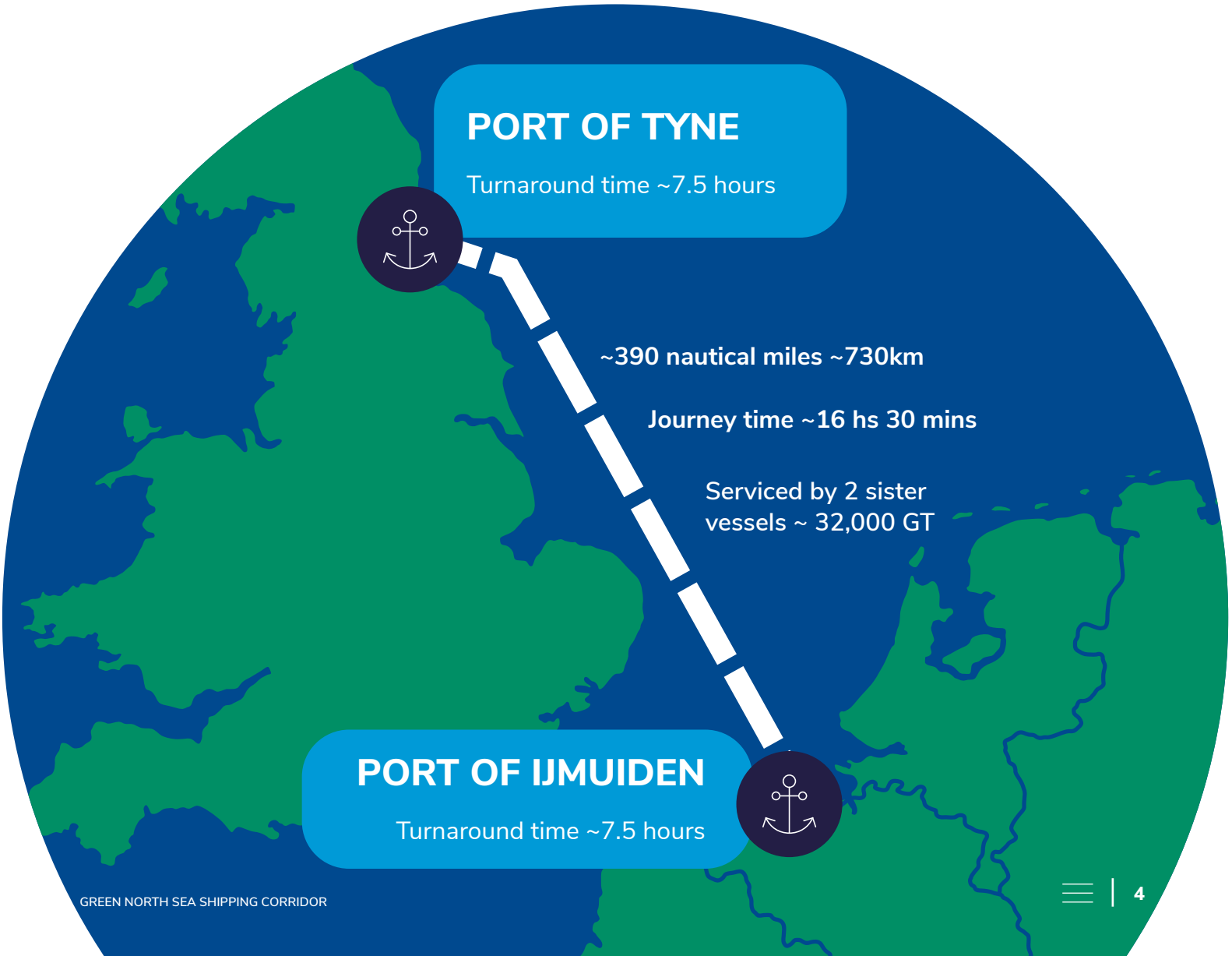


PURPOSE AND GOALS

This project assessed the technical and commercial feasibility of implementing a Green Shipping Corridor between Newcastle in the UK and Amsterdam in the Netherlands. The focus was on replacing the two existing vessels operating on the route with new green methanol-fuelled vessels and supporting port infrastructure, including bunkering and OPS.

The study aimed to identify operational requirements, infrastructure investments, and regulatory implications, while also modelling environmental benefits and indicative cost ranges.

The findings are intended to inform deployment planning and offer a scalable model for similar short-sea Ro-Pax services across Europe.



CAN IJMUIDEN'S TERMINAL SAFELY ACCOMMODATE DFDS'S NEW METHANOL-READY VESSELS?

Vessel manoeuvrability studies confirmed that DFDS's new, larger vessels can operate safely in IJmuiden under specific conditions. If equipped with Azipod thrusters, the vessel remains controllable in wind conditions up to Beaufort 7. In contrast, twin-skeg vessels would require tug assistance in winds above Beaufort 5. Manoeuvring is constrained when fishing vessels occupy the opposite berth near the harbour entrance and needs further alignment to ensure safety margins are met.

The quay infrastructure can support the new vessel class with targeted upgrades. The preferred option retains the existing quay wall and RoRo ramp, with additional reinforcement, berth deepening, and installation of a sloped or hydraulic ramp.

Proposed changes to the terminal layout must undergo further review with DFDS to ensure optimal operational efficiency. The terminal currently handles approximately 142,000 vehicles per year, with volumes expected to grow to around 195,000. The preferred layout includes revised check-in and customs flows, restructured marshalling lanes, and integration of shore power, without requiring expansion beyond the existing footprint.

Terminal performance depends on key operational assumptions, including a reduced maximum trailer dwell time of 1.5 days and the ability to begin loading trailers during passenger disembarkation. However, achieving a 1.5-day dwell time may be challenging and warrants further investigation.

Additional technical verification is required before finalising the design. This includes confirming quay wall anchor performance, selecting an appropriate fendering system, ensuring corrosion protection measures, and making adjustments based on the final vessel design and tug requirements.

CAN TYNE AND IJMUIDEN SUPPORT METHANOL AND SHORE POWER INFRASTRUCTURE?

Both the Port of Tyne and the Port of IJmuiden are technically capable of supporting methanol and liquid hydrogen bunkering, with ship-to-ship transfer identified as the preferred option due to spatial constraints and operational flexibility. Truck-to-ship bunkering may also be feasible for ad hoc top-ups.

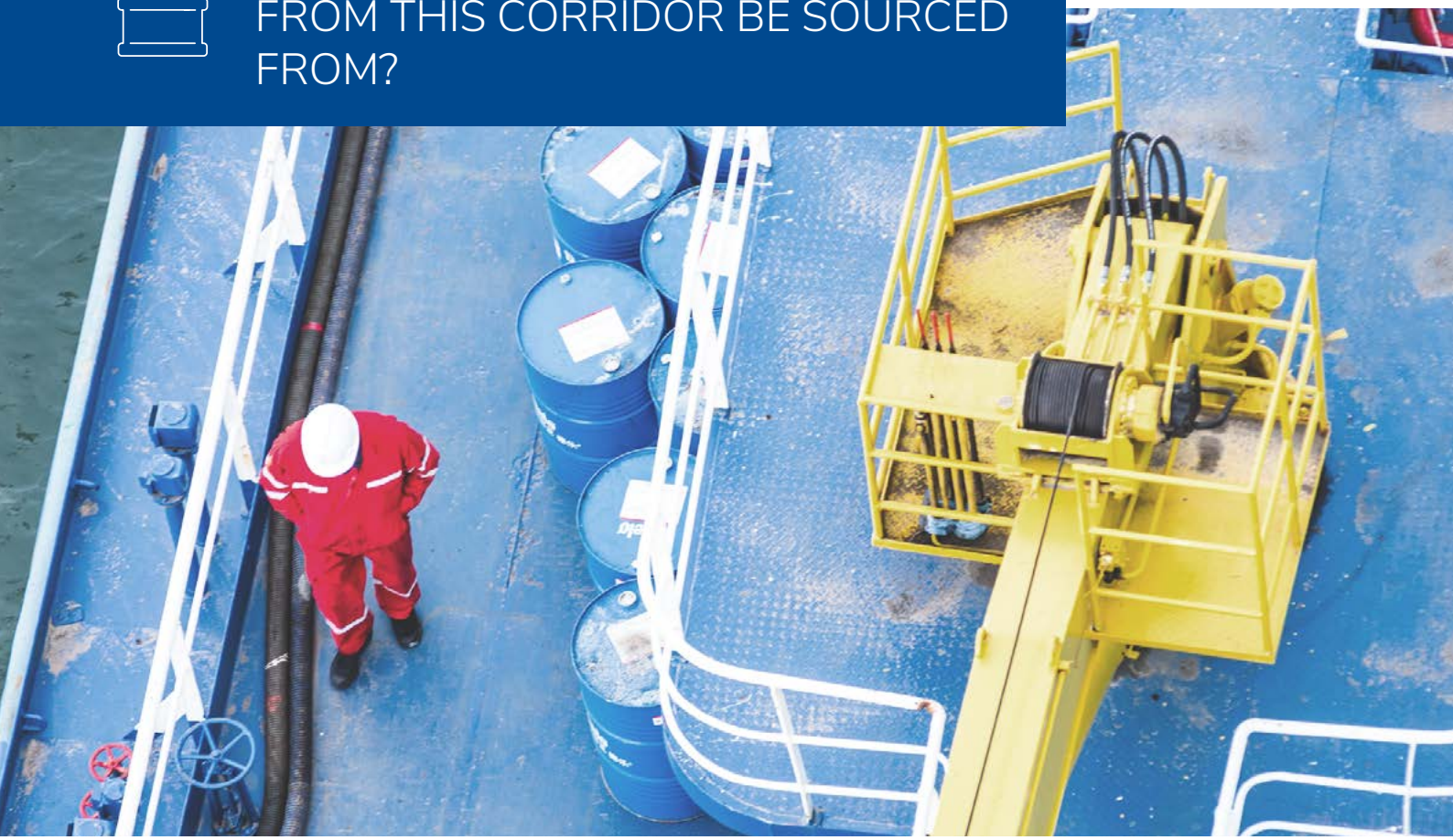
At the Port of Tyne, a significant grid upgrade has now been secured, providing greater capacity to support future electrification initiatives. Discussions are ongoing with DFDS to align the port's shore power and battery-charging capabilities with the operational requirements of vessels on the corridor, with battery buffering remaining an important consideration for optimising energy use and grid stability.

Battery energy storage systems are likely to be needed to reduce peak loads and support cost-effective grid integration at both ports. These would smooth OPS power demand and help avoid over-investment in grid infrastructure.

Fixed or mobile cable management systems will be required to deliver OPS reliably. IJmuiden is better positioned to accommodate a fixed system, while Tyne may require mobile or modular solutions due to space and traffic constraints.

Operational layouts and separation zones have been reviewed, confirming that updated safety systems, firefighting capacity, and berth layouts will be necessary to support bunkering and OPS alongside vehicle and passenger flows.

WHERE COULD THE METHANOL FROM THIS CORRIDOR BE SOURCED FROM?



Annual methanol demand for the route is estimated at 41,000 tonnes, based on current trip frequencies and fuel consumption projections.

Ship-to-ship bunkering at IJmuiden has been identified as the most feasible near-term solution, using barge supply from Rotterdam. This approach replicates existing operations and avoids the need for large-scale onshore storage that would trigger Control of Major Accident Hazards Regulations thresholds (COMAH is the UK implementation of the EU Seveso Directive).

Future UK-side production is possible but remains uncertain. Teesside has announced projects that may support green methanol production by 2030. However, transport and storage infrastructure would need to be developed to serve the Port of Tyne.

At IJmuiden, availability of green hydrogen and CO_2 is comparatively stronger, with local projects like H2ermes and H2era expected to deliver more than 80 kt/year of green hydrogen by 2027. CO_2 import is possible from the Port of Rotterdam via the OCAP pipeline.

Bio- and e-methanol supply chains in Europe are expanding, with over 40 commercial-scale projects identified across the continent. Rotterdam is expected to remain a key bunkering hub, offering resilience and proximity advantages.

Green methanol is likely to be sourced from Rotterdam

WHAT ARE THE REQUIREMENTS FOR SAFE HANDLING AND USE OF METHANOL?

Methanol is regulated under interim IMO guidelines (MSC.1/Circ.1621) and will soon be formalised under the IGF Code Part A-1 for low-flashpoint liquid fuels.

Port-side methanol storage above 500 tonnes will trigger COMAH obligations, requiring site-specific risk assessments. This is avoided for ship-to-ship refuelling.

OPS systems must meet EU Alternative Fuel Infrastructure Regulation requirements at IJmuiden and comply with UK HSE standards at Tyne. OPS design must account for quay layout, passenger access routes, and tide conditions.

Crew training aligned with the STCW Convention[1] and IGF Code[2] is essential, with defined modules for basic, advanced, and vessel-specific training, including emergency response for fire and toxic vapour events.

Methanol's flammability and toxicity require enhanced detection, containment, and ventilation systems, with bunkering only permitted under risk-controlled conditions. Zoning and scheduling will be required to avoid conflicts with other port operations.

25m safety exclusion zones must be maintained during bunkering, which may impact operations, particularly in IJmuiden's narrow channel. Risk-based mitigation may involve using vessel hulls or fendering as physical separation where space is constrained.

[1] STCW - Convention on Standards of Training, Certification and Watchkeeping for Seafarers
[2] IGF Code - International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels

WHAT IS THE POTENTIAL FOR EMISSION REDUCTION ACROSS THE GREEN SHIPPING CORRIDOR?

Compared to conventional fuels well-to-wake (WtW) emissions savings from green methanol range from 71-80% based on typical bio- and e-methanol pathways.

These savings can vary and are highly dependent on the upstream energy and carbon intensity of the methanol supply pathway.

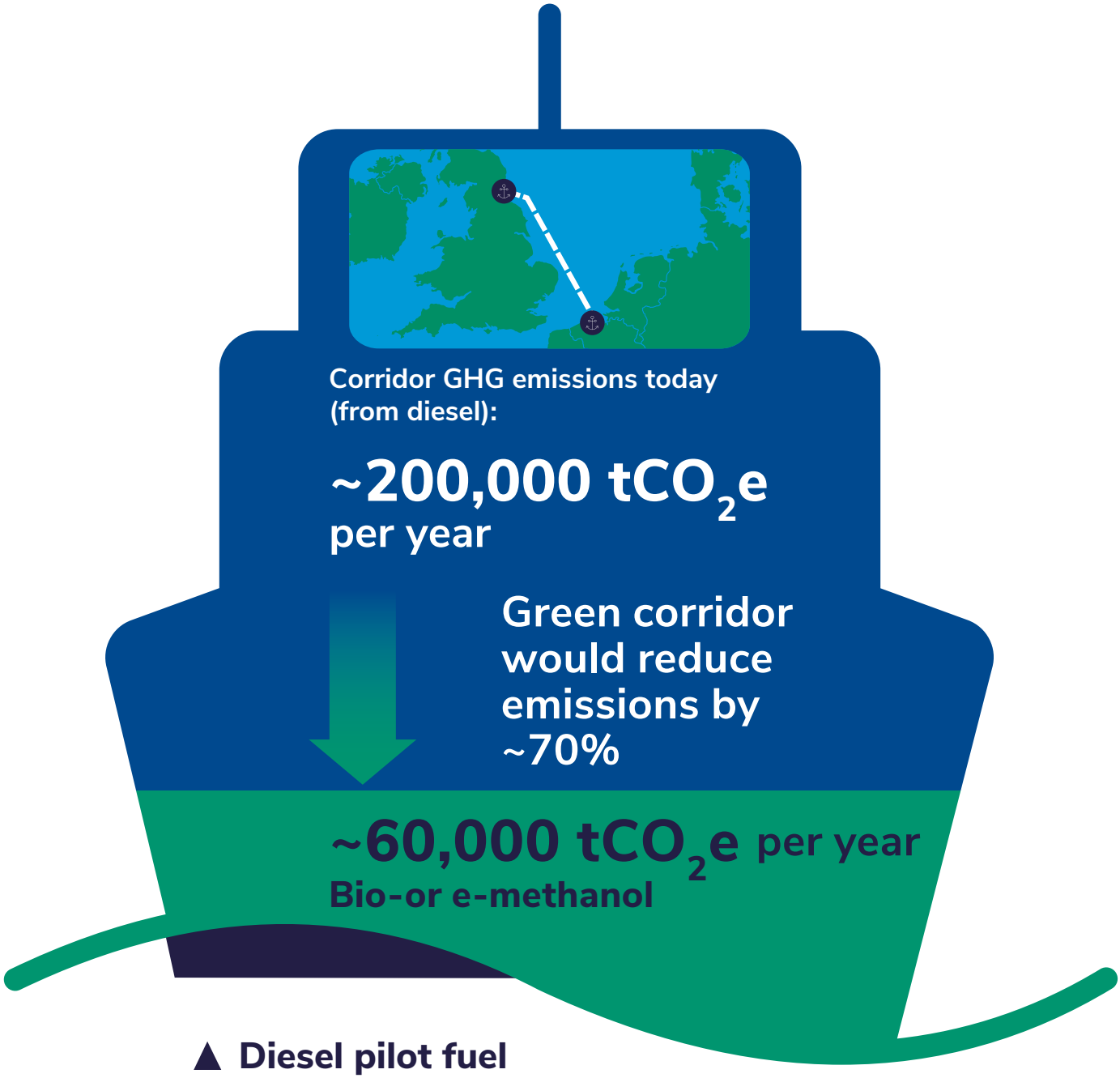
OPS delivers an additional 10–15% GHG reduction, by avoiding use of ships auxiliary engines during time in port. Lifecycle modelling indicates that OPS alone can extend compliance for conventionally fuelled vessels until 2030 at IJmuiden, or 2034 if deployed at both ports. Beyond this point, switching to an alternative zero- or near-zero-emission fuel becomes the only viable compliance pathway.

These savings can contribute to FuelEU Maritime compliance from 2025 onward, although mandatory OPS use at EU ports for relevant vessel categories applies from 2030.

FuelEU Maritime requires progressive WtW emissions reductions. Switching to green methanol powered vessels in 2025 would ensure compliance through to 2049. Beyond this, further emissions control or cleaner pilot fuels may be needed.

Emissions performance is highly sensitive to upstream parameters, including electricity grid carbon intensity, hydrogen source, and CO_2 origin. Fuel certification and emissions accounting will be critical for compliance and reputational assurance.

[3] After the analytical work on this study had been concluded the IMO proposed a new regulatory framework aimed at accelerating the transition to net zero by or around 2050. The emission intensity reduction targets defined in this framework are more stringent than those of FuelEU Maritime from 2029 onwards, it is expected the EU to review FuelEU Maritime targets in light of this. This study did not explore alignment to the IMO targets.



▲ **Diesel pilot fuel**
Shore power electricity rated zero emissions, saving ~6,000 tCO_2e/year

IS IT ECONOMICALLY VIABLE TO OPERATE THIS GREEN SHIPPING CORRIDOR?

The economic case for the Tyne–IJmuiden corridor highlights both opportunity and risk. Preliminary analysis suggests that adopting methanol and OPS could significantly reduce regulatory penalties through to 2060, saving an estimated £89 million in EU ETS charges and £331 million in FuelEU Maritime GHG and OPS penalties. These gains may match the total CAPEX cost of £388 million for the GSC, but are insufficient to compensate for the higher operational expenditure, mainly fuel costs.

DFDS has conducted its own internal analysis, which supports the economic feasibility of transitioning the Tyne–IJmuiden route to methanol. Based on these findings, the company is planning to order two new methanol-powered vessels for this corridor, with deliveries expected in 2029 and 2030. Realising this transition will require a shift in the operating model, with a greater focus on freight volumes and a reduced emphasis on passenger capacity compared to the current vessels.

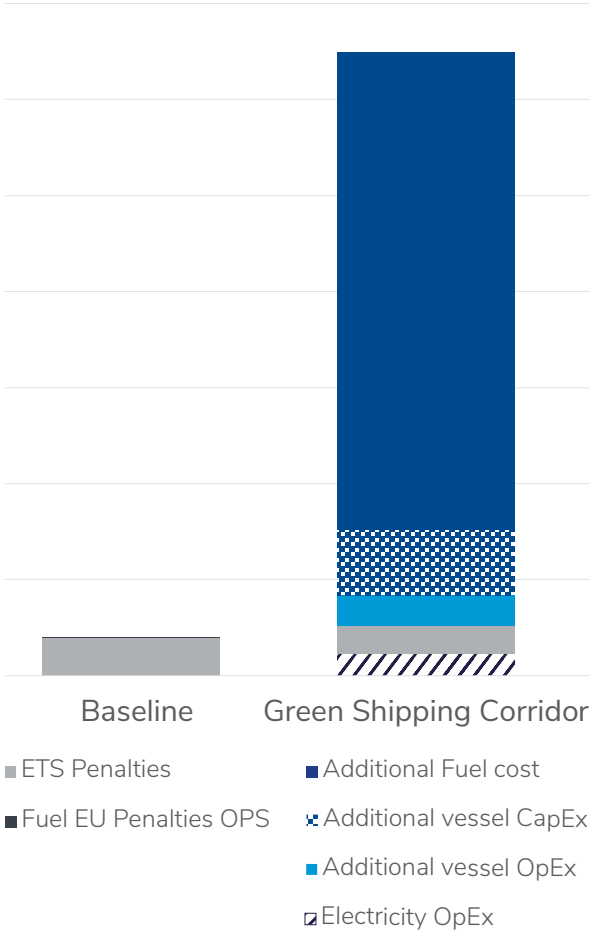
Methanol price is the dominant variable influencing the long-term business case. A sensitivity analysis revealed that if green methanol prices fall within the range of £350 to £450 per tonne, consistent with optimistic cost projections for e-methanol production, the cost gap with fossil fuels could narrow considerably, making the GSC business case profitable. Without progress on cost reduction, large-scale investment decisions may be delayed or will necessarily require public co-financing to proceed.

OPS offers a lower risk, near-term opportunity for emissions reduction and compliance. The OPS infrastructure, while requiring an investment of £8.6 million, contributes to a 9.6% reduction in methanol consumption. Across the corridor fleet, this equates to annual operating cost savings of around £6 million, due to avoided methanol purchases when vessels use grid electricity instead of auxiliary engines while at berth. This evidence suggests that investing in OPS is a strategic action that could be pursued independently. Battery energy storage integration and delivery models, such as power purchase agreements (PPAs) with the provision of OPS infrastructure, which is paid during the PPA timeframe to the energy supplier at favourable financing conditions, could help manage capital costs, distribute risks, and support early deployment.

Transitioning the corridor now could give operators a first mover advantage as compliance requirements become more stringent under both EU and IMO regulations. The adoption of FuelEU Maritime and the EU ETS, alongside the agreement of the IMO's mid-term measures at MEPC 83, confirms a clear regulatory trajectory that favours low-carbon fuels and penalises high-emitting operations. Early implementation of the corridor would help mitigate future compliance costs, align with global decarbonisation targets, and position operators as leaders in sustainable maritime transport.

Annualised cost comparison for the corridor (2030–2060)

While the GSC scenario shows higher costs due to investment in alternative fuels and infrastructure, penalties incurred in the baseline (e.g. ETS and FuelEU Maritime) are expected to increase over time, improving the long-term economic viability of the GSC.[4]



[4] Some compliance costs exist in the GSC case as MGO was assumed as a pilot fuel - these could be avoided through the use of a sustainable alternative

KEY TAKEAWAYS AND NEXT STEPS

The Tyne–IJmuiden corridor is technically and operationally feasible as a Green Shipping Corridor using methanol as a fuel and Onshore Power Supply. Ship-to-ship bunkering using existing barge infrastructure at IJmuiden presents a near-term opportunity with limited infrastructure burden. OPS deployment is possible at both ports, but grid limitations, especially at the Port of Tyne, may require additional investment or energy buffering solutions.

The overall emissions reduction potential is significant, and both methanol and OPS are aligned with evolving FuelEU Maritime requirements. However, lifecycle performance depends heavily on upstream fuel inputs, highlighting the importance of sourcing strategy and certification.

Operational constraints, particularly around simultaneous operations and quayside safety are solvable through coordination and risk-based planning. Regulatory frameworks for methanol use are emerging but sufficient to proceed with detailed design and permitting under existing IMO and EU guidelines.

The Tyne–IJmuiden route offers strong replication potential for other North Sea Ro-Pax services with similar vessel profiles and port configurations. Lessons from this study can support future deployment of alternative fuel and OPS infrastructure, inform regulatory development, and help shape investment strategies across the short-sea shipping network. Continued collaboration between vessel operators, port authorities, regulators, and fuel suppliers will be essential to move from feasibility to implementation and ensure alignment with long-term decarbonisation goals.

Image courtesy of DFDS

FIND OUT MORE

For further information, or to explore partnership opportunities in developing Green Shipping Corridors, please contact:

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