VESSELS OF THE FUTURE WORKSHOP

Drivers of Change – Vessel Decarbonisation

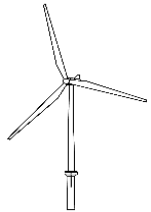
Our mission is to accelerate the move to a decarbonised future.

5
continents

300+
experts and consultants

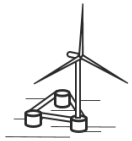
20
years of experience in sustainability consultancy

World leading offshore wind programmes



The Offshore Wind Accelerator (OWA)

Carbon Trust's flagship collaborative RD&D programme for bottom-fixed offshore wind.



The Floating Wind JIP (FLW JIP)

The Floating Wind JIP Overcomes challenges and advance opportunities for commercial scale floating wind

The Offshore Renewables JIP (ORJIP)

Offshore Renewables JIP aims to reduce consenting and environmental risks for offshore projects.

The Integrator

The Integrator is designed to examine the interplay between offshore wind, existing infrastructure, and other technologies to highlight opportunities for innovation investment.

£110m

Invested in projects since 2008

25

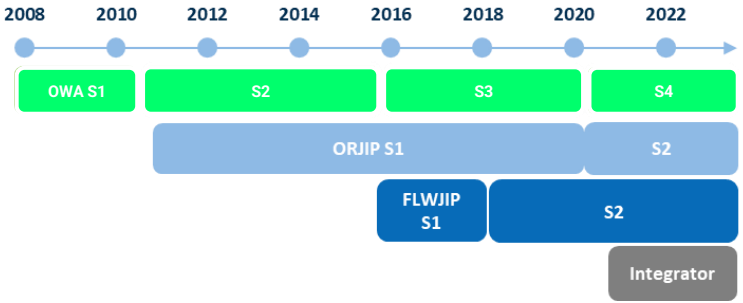
Partners across government and industry

218

Research and Development Projects

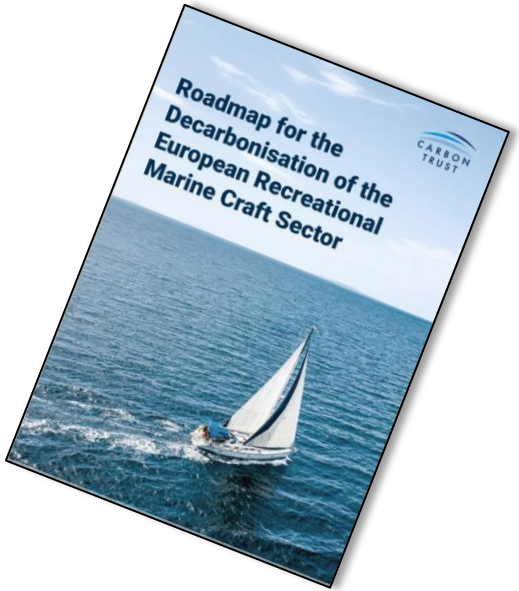
26:1

Industry leverage for FLW JIP common R&D projects



Carbon Trust Vessel Work

- Through both advisory and collaborative R&D project work Carbon Trust are working to support the decarbonisation of vessels.
- Through our OWA programme we ran the Low Emission Vessel Competition (LEVC) project which supported four different vessel operators vessel concepts.
- Recently completed work on behalf of DfT (Department for Transport) where we produced the Roadmap for Decarbonisation of the European Recreational Marine Craft Sector.
- Currently Working on a project through our OWA programme focused Vessel Emissions Metric Development (VEMD) in context to the offshore wind sector.



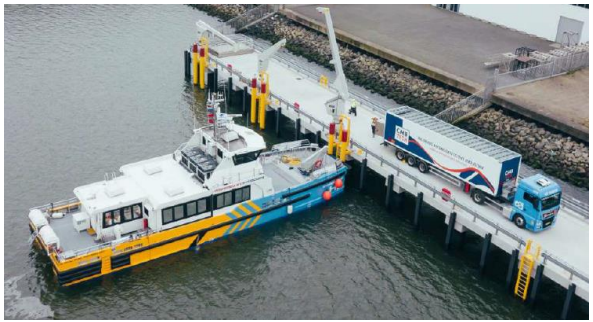
Case study - offshore wind vessel development

Technology options

- Novel technologies are being developed to reduce, and ultimately eliminate Co2 Emissions from these vessels. These innovations include:
  - Battery or hybrid power (pictured)
  - Hydrogen / alternative fuel cells
  - Hydrogen co-combustion (pictured)
  - Methanol fuelled vessels

- Other interventions will be key to the uptake of these technologies, such as:
  - Offshore charging (taking electricity or producing hydrogen directly from a wind farm)
  - Quay side power provision – will need infrastructure to be installed in order to provide the necessary electricity and or Hydrogen to repower vessels

CWind Pioneer vessel



Windcat Hydrocat vessel

Infrastructure required

Technology options

- For all of the different vessel technology developments sufficient infrastructure is going to be required to ensure that these innovative vessels can be used.
  - Ports will require electrical charging capacity as well as hydrogen bunker capability.

- Within offshore wind there are several potential infrastructure solutions currently in development, including:
  - Charging buoys
  - WTG-mounted charging stations
  - Offshore sub station (OSS) mounted charging stations
  - Mothership charging stations

- It is likely that we will see the demand for both hydrogen and electrical infrastructure increase in the immediate future given that both options being considered as part of the wider fuel diversification for alternative fuels vessels.

CMB hydrogen facility in the port of Antwerp

Maersk / Orsted offshore charging buoy

Offshore Wind Collaboration

- The output from the OWA Vessel Emissions Metric Development project potentially could be applied across the maritime industry. However, given that the project is currently ongoing and we are awaiting output from it, it still remains to be seen in what capacity any outputs could potentially be shared.
- We would envisage that as different technology innovations are developed there is certainly potential for this to feed into the wider maritime sector.
- We have already seen some significant developments in regards to the development of low emission vessels within the offshore wind sector. As a result, this is a development that is set to continue as more is learnt and understood regarding alternative fuel systems for vessels.
- Sharing of information around emissions will be critical to support wider developments and innovations to help bring about the wider reductions necessary across the maritime sector.

Fishing Vessel Emissions

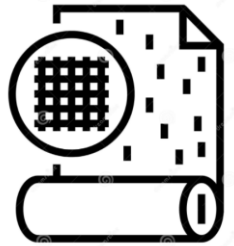
Understanding where the major emissions lie will help us to decarbonise quickly by directing innovation

Operational emissions

CO_2, N_2O, NOx, CO etc. from fuel emissions

Lifecycle emissions

Ensuring any emission reduction does not drive increased emissions either upstream or downstream



Materials and end of life emissions

Some materials used in vessel construction are difficult to recycle

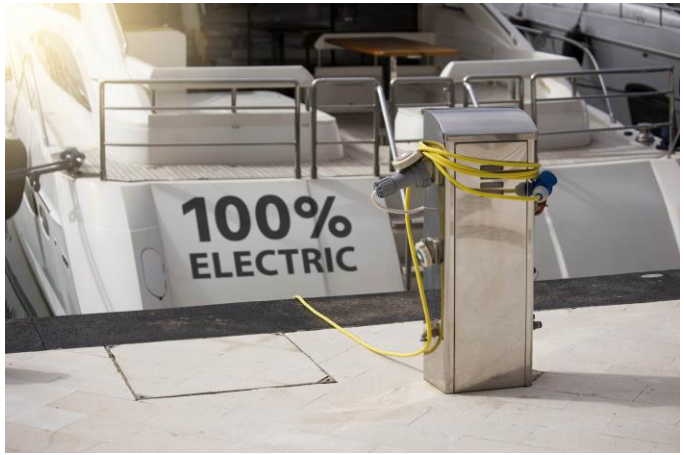
Decarbonisation technologies, key barriers and enablers

Tech. category	Technology	Barriers	Enablers
Technical design and performance	Hull design	• Can be costly • Limited R&D budget from small manufacturers	• Specific R&D grants directed to hull efficiency improvements
	Hydrofoils	• High capex • Adds degree of complexity to operations	• Incentives for uptake (e.g. financial incentives or efficiency/emission reduction targets) • Targeting luxury market in short-term
Drive train hybridisation/ electrification	Hybrid / electric drive trains	• Poor power-to-weight ratio & reliability and higher capex • Limited power outputs due to low voltage • Lack of charging points	• Hybrids as bridging technology • Regulation & training for higher voltage • Government & private sector investments in infrastructure upgrades
Alternative fuels	Hydrogen & biofuels	• Larger storage tanks required (H2) • High price of fuel & higher capex • Lack of refuelling infrastructure / fuel • Lack of safety regulations & training (H2)	• R&D in improving hydrogen storage systems • Incentives on fuel price to close price gap • Government & private sector investments in infrastructure upgrades • Develop safety regulations & training

Drivers of change to support decarbonisation

Recommendations

- Continued support to be provided to vessel owners/operators from the wider fishing industry – forums such as the Fisheries Innovation Scotland group could be used to help promote alternative vessel technologies and solutions.
- Policy makers should provide a clear timeline for the industry to shift towards net zero emission technologies (not just operational emissions).
- More data needs to be collected and shared with the wider fishing industry to enable more accurate LCA calculations within an agreed approach.
- As a significant proportion of emissions are associated with the operations, policy makers need to encourage R&D and cost reduction (e.g. financial incentives, taxation) and support smaller fishing vessel owners/operators.
- Harmonisation of standards across regions would help to increase uptake and collaboration between vessel builders and engine OEMs to ensure effective integration.



Drivers of change to support decarbonisation

Recommendations

- Large ports may be able to invest in technology but the full benefit will not be realised without a network of upgrades across the wider infrastructure.
- Important that policy makers break the potential stalemate between ports wanting to invest in infrastructure upgrades only when demand occurs, and vessel owners switching only when the infrastructure is in place.
- Promotion of low emission technologies and knowledge sharing between port owners and vessel operators.
- Investment is needed to upgrade facilities, reduce recycling costs and reward design and construction that promotes easy separation of components / alternatives to FRP.

Planning your route map to get there

The Route to Net Zero Standard helps organisations measure and manage their emissions, create carbon reduction strategies, and set targets for the future – all with tailored advice from our trusted experts.

With our established experience in consulting with corporates on their sustainability strategies and certifying their efforts for over 20 years, we created the only certification that recognises the progress on the journey to Net Zero.

The Route to Net Zero Standard – for your journey towards climate leadership, certified by your trusted partner.

CARBON TRUST

The Standard could be applied to organisations within Scottish fishing industry to provide support across different Net Zero ambition areas

ROUTE TO Net Zero STANDARD

Support with the reporting and certification with regards to carbon emissions, and most importantly **reductions**.

Standard would help organisation to obtain **third-party verification** that recognises that efforts are consistently aligned with their own targets.

The certification is designed to increase ambition over time, and help provide members with **guidance to stay on track** with science and best practice

It allows a organisation to obtain **actionable insights** on the path forward by completing the carbon management questionnaire, and work with leading experts to assess their efforts.

Thanks for listening

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