Net Zero Fishing Vessels Study Visit to Norway 5th-10th March

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Packed Itinerary

5 Early Starts – 3 before 5am!

Made some very good contacts for the NI Net Zero Fishing Vessel work

Productive, worthwhile and informative

Good “team-building” event to integrate all NI interests (Government, Fishermen, Producer Organisations, marine consultants, engineers and architects, and fuel suppliers)

Don’t run before you can crawl!

CONTEXT

2.5 million tonnes of fish per annum (Norway Fleet)

1.6 million tonnes of fish per annum (Norway Aquaculture)

Revenue from fishing & aquaculture is £3.3 billion with 90% exported

Fishing is second most important industry behind Oil & Gas.

Norwegian Fishing Vessels 5,620 (18,000 in 1990) with 4,600 between 11m and 14.99m

Bergen – Salt Ship Design – “the pessimists”!

Presentation on the various ships designed by company and power plants systems - mainly larger pelagic vessels.

Alternative propulsion systems and fuels were debated, including:-

- LNG and diesel
- Battery and Flywheel
- Hydrogen
- Diesel and Battery Hybrid
- Diesel and LNG, dual fuel
- Ammonia
- Methanol
- Nuclear

At present time there is no <u>single</u> alternative to diesel for larger vessels.

Florø – Ocean Cluster Hub (Hydrogen Focused)

Established 2012 & currently 170 members (businesses):-

- To be responsible for introducing hydrogen to marine industry

- To create a hydrogen value chain incorporating:
  - Energy and hydrogen production
  - Equipment supplies
  - Ship Design
  - Ports and supply bases

In 2020 there were 9 hydrogen planning applications in Norway - in 2022 there were 50.

“Zerokyst” (Zero Coast)

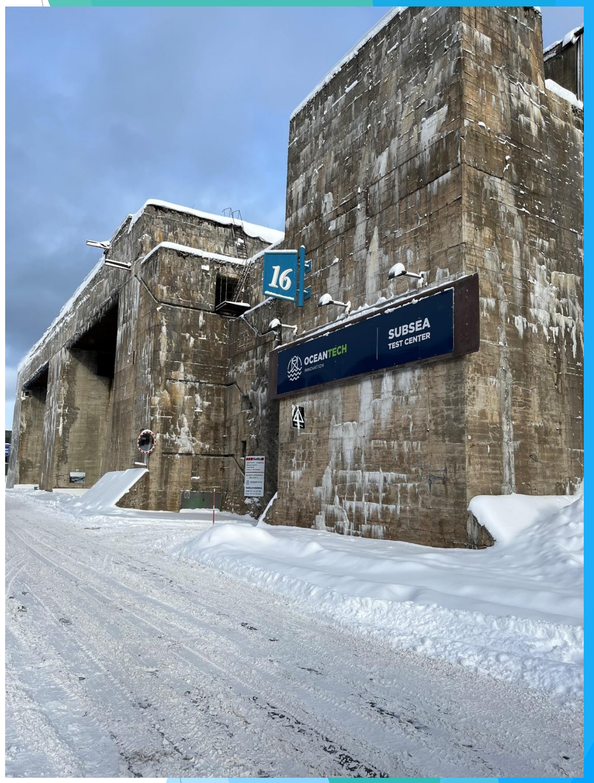
5 work packages in Zerokyst project :-

- Zero emission powertrain
- Zero emission vessel
- Hydrogen supply
- Regional and local energy including bunkering and charging
- Knowledge building, building the marine environment for zero emissions

Only one solution at present (excluding wind, wave, solar and wave) = electricity.
BUT Batteries by themselves are not enough, additional energy to boost the electric system is required, that can be provided by hydrogen, producing electricity via a fuel cell.

Also, working on hybrid solutions for diesel powered fishing vessels, e.g., providing an electrical battery pack which can input energy into the propeller shaft or gearbox with an electric motor - splitting the engine from the gearbox and installing another intermediate gear train with clutches so that an electric motor could input power to the when the diesel engine was not being used.

“The Joker” nobody knows if it will ever be introduced, developed, or adopted, but the possibility is always there (e.g., the iPhone!)



Main lessons from the Norwegian trip:-

• Norway has done a lot of work in the field of zero carbon emission for the maritime sector

• Norway is developing the electrical and hydrogen infrastructure for the zero emission infrastructure

• Long streamlined hulls are necessary for low energy consumption

• Legislation governing fishing should encourage the building of slender streamlined energy efficient hulls

• Zero or very low carbon emission energy alternatives to hydrocarbons are not available and are unlikely to be available in near future for large vessels on voyages of more than 24 hours or fast vessels on voyages of more than 1 hour as the energy requirements are so high

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• Electrification of the marine sector needs big upgrade of electrical grid for fast and rapid charging

• If hydrogen is to be used as a fuel, a huge amount of infrastructure is required to make, store & transport hydrogen and to provide bunkering facilities.

Main lessons (continued):-

• State-of-the art battery powered vessels have been developed, but they are on set routes of limited duration with charging facilities at the ports - largest all electric vessels in Norway are ferries (Hurtigruten).

• Electrification suited to smaller vessels on trips of 12 hours or less, but powering small vessels by electricity alone is not sufficient - another source of energy is also required.

• Norway is already commencing work on the design of electrical/hydrogen powered fish farm and small fishing vessels.

• Fishing modes suitable for electrification and hydrogen are static gear and seining.

• Trawling and dredging require high power/energy, and at this time the only energy source for these modes of fishing with enough energy density is hydrocarbons.

• Lithium ion batteries are challenging in a marine environment, particularly if there is a thermal runaway - the fire is difficult to put out as oxygen is generated as the battery burns. A fresh water mist seems to be the favoured fire fighting method.

• Rules, regulations and standards are well behind the development of electrical and hydrogen powered vessels

• LNG as a fuel for the marine industry is being phased out in Norway

• Genuine and visible “WORKING TOGETHER” evident in Norway

Availability

- The availability of alternative fuels will remain limited for many years to come
- An efficient fishing vessel must land her catch in the most convenient harbour
- Being limited to a few harbours for bunkering will hence result in higher energy consumption and reduced profitability

Reliability

- All alternative fuels (except liquified gas) require new technology which is under development and are to be tested onboard vessels operating in sheltered waters on predictable routs
- A safe fishing vessel depend on reliable power generation as they are operating all year around, often in remote areas far from shelter

Safety

- Rules & regulations on how to handle and store sometimes explosive or toxic fuels in a safe manner are still under development
- Safety aspects are particularly challenging on compact vessel with personnel working on deck, and often visit densely populated harbours

Affordability

- The nature of fishing is unpredictable. As is the energy consumption and bunkering intervals
- A fishing vessel will hence need a large energy storage relative to the vessel size, which is another major cost-driver as all alternative fuels have lower energy density than diesel and will hence require a larger vessel
- A fishing vessel needs a relatively high installed power to ensure safe handling of the fishing gear in demanding situations. Installed power is a major cost- driver in the transition to alternative fuels
- Much of this technology is not commercially available yet, which makes the cost level of a potential future investment very uncertain
- The bunker price for alternative fuel is expected to be higher than diesel for many years. Fishing vessel have limited possibilities for long term fuel contracts from single supplier due to limited availability

Fisheries Sector Input to Climate Action Plan

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Initial steps by the fishing industry

- Industry has commissioned a naval architect to design a net zero fishing vessel. Phase 1 is now complete and they hope obtain funding to take the concept to the build and demonstration phases.

- The Fishing Industry, in partnership with NI Science and Academia, is undertaking research to assess the interaction of fishing gear with the seafloor and assess potential release of carbon from seabed sediments. This will inform development of novel gear designs or fishing practices that reduce seafloor contact.

Carbon Budget Consultation

- Northern Ireland's first ever consultation on Carbon Budgets has been launched by the Department of Agriculture, Environment and Rural Affairs (DAERA).

- DAERA has recently published (21 June) a consultation on Northern Ireland's 2030 and 2040 Emissions Reduction Targets and First Three Carbon Budgets.

- This 16-week consultation, running from 21 June to 11 October 2023, will aim to receive feedback on the proposed first three carbon budgets 2023-2027, 2028-2032 and 2033-2037 as well as 2030 (48%) and 2040 (77%) interim targets.

- As well as consulting on the Carbon Budget, DAERA is working collaboratively with all NICS departments and is seeking views on the Climate Change Committee's (CCC) Advice Report: The Path to Net Zero Northern Ireland published on 2 March 2023.

Climate Action Plan

- The Climate Change Act (Northern Ireland) 2022 sets a statutory target of Net Zero by 2050 and includes a number of requirements such as setting five-year carbon budgets to cap emissions.

- The Act also requires the development, consultation on and publication of Northern Ireland's first Climate Action Plan by the end of 2023.

- There are specific requirements on DAERA to develop and publish sectoral plans for the agriculture sector, fisheries sector and waste management sector.

Fisheries Sector

- DAERA will invest in a range of research and development projects to assess the most suitable technologies for each of the fishing sub-sectors.

- DAERA also plans to invest in range of other research initiatives that will help achieve de-carbonisation of the NI fishing industry.

- By 2027, DAERA will develop a full roll-out plan for electrification, zero-carbon fuels and accompanying fleet retrofits or modifications based on consultation with industry, research findings and best fit for the Northern Ireland fishing industry.