BACKGROUND NOTES - May 20th 2021

Alternative Fuels:
Impacts on Maritime Safety and the Environment in the Baltic Sea region

Alternative fuels play a critical role in the transitioning of the maritime sector towards a more sustainable industry that is aligned with the EU's climate objectives. The conference provided an introduction to the **political ambitions** as well as **key policy initiatives** that are already underway in achieving the transition.

Speakers included perspectives from the **maritime industry**, with an eye to the **benefits** and **opportunities** that the **transition to alternative fuels** can provide, in addition to the **challenges** and **barriers** that need still need to be overcome in relation to **safety**, **regulation,** and **environmental concerns**. Presenters also spoke to the technical side of implementation and the role of **research** and **innovation**.

Throughout the conference, it was clear that the Baltic Sea Region holds great potential for collaboration in establishing an alternative fuel ecosystem. With many bordering countries harbouring a high diversity of vessels in an environmentally sensitive area, it has required a tradition of strong competences to be established. With the region's status as a sustainability front runner and center for innovation, the BSR is well positioned to ride the wave of the green transition and lead the way in establishing clean, green, and safe shipping with the use of alternative fuels.

The conference was organized in a collaborative effort across four policy areas under the **EU Strategy for the Baltic Sea Region (EUSBSR): PA Ship, PA Transport, PA Energy,** and **PA Safe**. The four Policy Areas have different priorities, however they are united in the understanding of the key role that alternative fuels will play in the climate and sustainability objectives of the Baltic Sea Region, as well as the development and prosperity of the region into the future.

Keynote speaker

Magda Kopzcynska, Deputy Director-General, DG Move and Q&A

To enable the EU Green Deal and achieve the 55% GHG reduction by 2030, the European Commission is developing the Fit for 55 Package, which will be released July 14th.

- **Will include several objectives related to shipping**, although the package covers all sectors.

- **"A basket of measures" forthcoming relating to FuelEU Maritime Proposal**, including carbon pricing, energy efficiency proposals, and complimentary measures to renewable energy directive.
- **To achieve the goal of the EU becoming a climate neutral continent by 2050, GHG emissions from shipping must be reduced by 90% by 2050 compared to 2008 levels.** Requires shipping to become more efficient and use of renewable and low carbon fuels.
- **Renewable and low carbon fuels must constitute more than 80% of fuel mix** to achieve the target of carbon neutrality and 90% reduction in transportation emissions by 2050 in the EU Green Deal.
- **European companies can deliver zero emissions technologies, and by setting ambitious policy it helps to build the market and industry.** "European companies are at the forefront of innovative development in transportation…and by putting a political legislative framework in a correct way, we actually create a market and demand for the products that they can deliver."
- **Under the Fit for 55 Package a revision for the Directive on Deployment of Alternative Fuels Infrastructure is being carried out** to ensure that all core ports will supply ships with alternative fuels, thereby ensuring demand and supply go hand in hand.
- **Zero-emission requirements will be created for ships at berth in ports.** Consideration will be given to the availability for an adequate supply of on-shore-power (OPS), **with understanding that infrastructure requires lead time** and that ships are prepared to connect.

Policy based on GHG intensity will set clear requirements until 2050, providing predictability and legal certainty for companies

- **Dictating GHG intensity rather than type of fuel**, enables the needed diversity of solutions.
- **The GHG intensity requirements** will be both for sailing and at berth and will become **more stringent over time** with specific targets provided until 2050.
- **The approach based on lifecycle analysis from a well-to-wake approach,** with a focus on three main greenhouse gases: CO_2, methane, and N2O.
- **Proposal for EU fuel maritime does not exclude LNG**, but gradual tightening of GHG intensity will ensure that LNG will not be sufficient to meet GHG intensity requirements in the future and will need to be replaced by bio and e-gasses. LNG vessels can be retrofitted.

Innovation and investments are already underway by many actors in the BSR

- Financing development of zero emission technologies through different programs Horizon 2020, such as electric ferries
- **Zero Emission Waterborne Partnership** is a public-private-partnership co-funded by the European Commission. Its objective is to develop zero emission technologies ready for the market in 2030 for short sea shipping and for inland waterways.
- **Industrial alliances bring together actors across the entire value chain** to deliver on decarbonisation objectives. Low carbon fuel alliance will bring together actors

including producers and distributors in a voluntary collaboration to focus on low carbon fuels deployment in EU.

EU Financing is available

- Includes instruments under EU budget such as the InvestEU program.
- The EU's objective is to allow for long term funding of various components of the maritime cluster and mobilise private sector investments in sustainable transport infrastructure, clean fuels, digitalisation, and fleet renewal.
- Innovation funds will be available for zero emission EU projects.

First Session

Maria Skipper Schwenn, Executive Director, Danish Shipping

Alternative Fuels: Impacts on Maritime Safety and the Environment in the Baltic Sea region

- ***"Game of fuels "*** **No clear winners at this time,** since no one fuels fits all segments.
- **More investment is needed on land than on vessels.** A study by the University Maritime Advisory Services and the Energy Transitions Commission estimated that **up to 87% of the investment needed for low-carbon fuels is for land-based infrastructure**.
- **Safety is critical.** Ammonia and methanol is poisonous and hydrogen is highly flammable. Safety for crew and personnel must be a main consideration.
- **IMO regulation must be fit for purpose and support the transition to alternative fuels.** Danish Shipping would like to see a fast-track approach to this new regulation, since reality is moving faster than regulation.
- **Regulatory alignment is needed.** Need to align IMO and EU regulation with each other to avoid regulation to work against each other. Since some EU member states do not have a shipping community, shipping can end up being a bargaining chip in the climate negotiations, which would be a hindrance to the transitioning of shipping.
- **Regulation needs to support long-term transition.** There is currently no incentive for over-performance with regards to the use of alternative fuels.
- **The Baltic Sea Region holds great potential for collaboration.** Geography supports collaboration. Further, many different ship types and environmentally sensitive area means that strong competences are present in the area. Danish Shipping invites stakeholders to make the BSR a sandbox for new solutions.

Maja Bendtsen, Chief Business Officer, Port of Rønne

A green east-west shipping corridor through the Baltic Sea

- **Port of Rønne has a vision for a green corridor through the BSR.** Focus on hydrogen, ammonia and methanol since they believe that these fuels will be the dominant ones in the future.
- **The port is currently conducting a feasibility study into alternative fuels.** Next step will be investing in alternative fuel infrastructure.
- **Alternative fuels have lower energy density than fossil fuels, which is a huge challenge to shipping.** This is because more bunkering operations will be needed – or alternatively, larger bunker tanks on board vessel are needed.
- **Port of Rønne has the potential to be a bunker hub in the BSR.** If more bunkering operations are needed, a need for offshore bunkering spots might be needed. Currently, 3.5 pct of vessels passing by Bornholm are bunkering in Port of Rønne. Potential for more. However, a huge amount of energy is needed to facilitate the transition to carbon neutral fuels.
- **Alternative fuels need to be placed further away from residential areas than fossil fuels due to toxicity. This represents a very practical problem for the port.**

Jan Otto de Kat, Director, American Bureau of Shipping

Alternative Fuels: Impacts on Maritime Safety and the Environment

- **A complex landscape for transitioning to alternative fuels is developing**, with many industry drivers. IMO, EU, financial, social, corporate governance and shareholders, charterers, and other stakeholders
- **Right now, the world is only on track to decarbonise shipping by ~35 % by 2050.**
- **Different fuels create different challenges** with regards to safety, infrastructure, volume requirements, etc.

Fuel	Production efficiency PtX (%)	Boiling point (°C)	Safety Risk	Storage volume compared to MGO	Infrastructure	Tank-to-wake CO_2 emissions	Impact on newbuilding ship cost
Hydrogen (H_2, liquid)	68	-253	High	4.6	Nothing available Costly to establish and transport	None	High
Ammonia (NH_3)	64	-33	Low/Med	3.6	Existing LPG network can be used > 700 LPG carrier	None	Medium
Methanol (CH_3OH)	54*	65	Low	2.5	Infrastructure in place available in many ports	Similar to MGO	Low
Methane (CH_4)	56*	-163	Low	1.9	Infrastructure under development, costly to transport	Similar to MGO (methane slip included)	High
Diesel ($C_{16}H_{34}$)	~38*	360	Low	1.0	Infrastructure in place worldwide	Same as MGO	Low

* Capturing CO_2 results in lower production efficiency

- **IMO Safety codes include the IGC Code** (the international code for the construction and equipment of ships carrying liquefied gases in bulk) **and IGF Code** (the international code of safety for ships using gases or other low-flashpoint fuels),

EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION
POLICY AREA 'SHIP'

EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION
POLICY AREA 'SAFE'

EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION
POLICY AREA 'TRANSPORT'

EUSBSR EU STRATEGY FOR THE BALTIC SEA REGION
POLICY AREA 'ENERGY'

    - **IGF code requires a risk assessment** in certain instances for low flashpoint fuels.
    - **IGC code contains requirements for carrying anhydrous ammonia in bulk**, including measures to prevent stress corrosion, availability of PPE, and toxic vapor detection.
- **Currently, no guidelines for ammonia as a fuel is in place.** Interim guidelines for the use of methanol have just been published.
- **Risk management is important to consider for LNG bunkering**, with a series of regulations and guidelines by IMO, ISO, and SGMF. Controlled zones can manage risk during bunkering, to manage safety in hazardous areas

Second Session

Markus Helavuori, Professional Secretary, HELCOM

HELCOM work related to alternative fuels and green technologies

- **Green Technology and Alternative Fuels Platform for Shipping, HELCOM Green Team** gathers national administrations, industry, research community and NGOs involved in green technologies and alternative fuels and works to enhance development and uptake of green technology and alternative fuels in shipping.
- **To investigate the main barriers, obstacles and challenges hindering the development of green technologies and alternative fuels the Reporting Mechanism and Method was established.**
    - Results will be used to facilitate knowledge and information sharing among the public and private sectors, as well as decision making bodies, and to promote an early introduction of new technological solutions and alternative fuels.
    - Take the (10 minute) survey to share challenges you have faced related to green technologies and/or alternative fuels in shipping. Click for the link
- **HELCOM Baltic Sea Action Plan (BSAP) sets a vision for a healthy and resilient Baltic Sea**, and goals including that the Baltic Sea is: a healthy and resilient ecosystem, unaffected by hazardous substances and litter, unaffected by eutrophication, and sea-based activities are environmentally sustainable.
- **Existing BSAP actions and commitments have not yet been accomplished, but more actions have been proposed.** Maritime related actions include topics such as: maritime safety, non-indigenous species, pollution from ships, sustainable pleasure boating.
- **Proposed BSAP actions include** Enhancing the use of alternative fuels and sources of energy, enhancing the use of alternative fuels and sources of energy, enabling onshore power in the Baltic Sea region, among others. Note that negotiations are still ongoing.

Jane Amilhat, Head of Unit for Emission Future Industries, DG Research & Innovation

Horizon Europe Zero Emission Waterborne Transport Partnership - R&I on alternative fuels for ships

- **Ambition on the policy level**:
  - IMO: **By 2050, minimum 50% net GHG reduction** compared to 2008, towards 0% by end of century
  - EU Green Deal: Becoming the world's first climate-neutral continent by 2050. **By 2030; 55% less EU GHG emissions**, zero emission ships market ready. By 2050 at least 90% less transport emissions.
  - **Paris Agreement**: limit global temperature increase to well below 2°C, aim to limit increase to 1.5°C
- **'Basket of measures' for the maritime sector:** potential for extension of ETS to the maritime sector, stimulate uptake of sustainable alternative transport fuels, mix of legislative and non-legislative measures to support positive choices and Mobilising Research and Innovation- Horizon Europe Zero Emission Waterborne Transport Partnership**.**
- **Zero-emission waterborne transport partnership is mobilising critical mass to achieve zero-emission ships.**
  - R&I to develop and **demonstrate zero-emission solutions for all main ship types and services by 2030** which will **enable zero-emission waterborne transport by 2050**.
  - **Include efforts to eliminate GHG emissions from new ships and retrofitted existing ships** by means of sustainable alternative climate-neutral fuels, renewable energies, electrification and energy efficiency.
  - **Cutting coastal and inland pollution to air** by at least 50% compared to current levels, and **elimination of pollution to water** (including harmful underwater noise) from ships.
- **European Commission has planned funding calls for alternative fuels/power R&I areas in 2021-22**
  - Publication of calls expected in June, see: Funding & tenders (europa.eu)
  - Areas include hydrogen and ammonia fuels, ammonia engines at large scale, electrification, addressing and preventing methane slip for LNG engines, and other areas addressing the challenge of zero emission ships such as wind, retrofits to existing ships and digitalisation.

Habil. Dr., Prof. Vytautas Paulauskas, University of Klaipeda

Alternative fuels for the transport sector in transit period

- **Terminal equipment also needs to be decarbonized as is currently reliant on diesel fuel.** To reduce emissions, options include electrification, use of cleaner fuels (LNG). hybrid machines (LNG + electricity)

- **Cargo handling equipment at port terminals can be a major source of emissions** that may not be adequately accounted for.
- **Ship control inaccuracies (manoeuvres) - can increase emissions by up to 15 - 20%**
- **New innovative hybrid ships** include designs that combine LNG fuel with solar panels and a hard sail, as well as LNG and battery hybrid designs

Fuel type energy density and energy capacity

• Diesel	838 kg/m³	11,9 MWh/t
• LPG	540 kg/m³	13,9 MWh/t
• LNG	430 kg/m³	13,7 MWh/t
• Hydrogen	71,1 kg/m³	33,2 MWh/t
• Ammonia	602 kg/m³	5,6 MWh/t

Fuel types offer trade-offs, certain types suit certain sectors better

	Availability	Infrastructure & Storage	Maturity of technology	Energy density	Price	Green credentials
VLSFO/MGO						
LNG						
LPG						
Methanol						
Biofuels						
Hydrogen						
Ammonia						

- **Current alternative fuel update is low:** less than 1% of existing fleet is run on alternative fuels, with 10% of current new builds ordered with alternative fuels and 20% of new builds ordered in 2020 with alternative fuels.
- **Alternative fuels require infrastructure investment and requires a division of risk between shipping companies and ports.** i.e., LNG bunkering requires addressing safety risks.
- **Operational possibilities for reducing emissions from ships requires education and training,** including qualification of ship crew, port pilots, tugboat masters, port VTS staff, and port moorings.