Bulk carrier powering and propulsion options for 2030 and beyond

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The changing decarbonisation landscape and market factors

Position yourself now or be positioned

1st March 2022
Presentation Outline

• Changing landscape on emissions and sustainability
• Know your baseline and understand your metrics
• CII market implications
• Position yourself for reduced risk and increased impact
• Benefit of wider perspective on your specific options
• Closing thoughts
Evolving sustainability landscape

Expectation decarbonisation supply chain:
- Supply chain and “shipping” more visible post “Ever Given”, COP26
- Impact of cutting scope 3 emissions, now understood by governments
- Big business, increasingly committing to net zero targets

Growth in digital investments:
- Exponential growth investments in data platforms, software products
- Benchmarking tools more easily accessible and integrated
- Freight decision and support tools utilise range of metrics

Increasing transparency:
- Incidents more impactful and visible longer
- Ranking used to select vessels and business partners
Baseline and metrics - emissions

- Documentation check, eliminate errors and omissions
- Establish detailed baselines, better decision making - added confidence
- Check clear understanding all your emission related metrics, including EEXI, EEOI, CII, RightShip GHG etc.
- Perform sensitivity analysis to understand the effect of changes within next survey cycle.
CII market implications

- Not a “one and done” regulation
- Operational requirements, actual consumptions impact rating for a year
- Bulk fleet not well positioned without additional measures, EPL not enough
- CII rankings already offered on platforms, will be used for vessel selection
- Rating impact marketability and tradability
Reduced risk, increased impact

- Big variations per sector and trade specific - for individual vessels
- Wider practical perspective needed beyond technical options or regulatory compliance
- Emission reduction expectation from cargo receivers and/ or charterers growing
- Build action plan for decisions against timing for likely scenarios
- Waiting before taking action does not remove the risk or reduce cost
Closing thoughts

- Everything will be benchmarked and ranked
- Emissions metrics important in several areas - vessel selection/ vetting, finance, S&P etc.
- Know your score and sensitivity to changes
- Look outside technical and regulatory options – include commercial
- Start to position yourself now or be positioned by someone else
We partner and collaborate with leading experts, please get in touch to learn more.
Bulk carriers powering and propulsion options for 2030 and beyond.
Powering sustainable shipping by **opening clear pathways**

MAN Energy Solutions **supports all**

Methane  Ethane  Methanol  LPG  Ammonia

ME-GI  353 engines
ME-GA  110 engines
ME-GIE  25 engines
ME-LGIM  39 engines
ME-LGIP  118 engines

→ 2024
Engine Programme and Bulk Carrier power range

- **Handysize** 38-40,000 DWT.
- **Ultramax** 58-62,000 DWT.
- **Kamsarmax** 76-82,000 DWT.
- **Newcastel- & Dunkirkmax** 180-210,000 DWT.
- **VLOC/Valemax/Chinamax** 300-400,000 DWT.

![Graph showing power range and speed for different engine types.](image)
DF Contracting Forecast – Two-Stroke

2021 surpassed the expectation to 32% DF - increasing to 60% in 2030

But vast majority of fuel burned in 2030 will still be fossil fuel-based if nothing drastic is happening
Two-stroke dual fuel contracting by ship type

All brands

![Graph showing 2021 YTD Two-Stroke Propulsion Power Contracted by ship type: Dual fuel vs. Single fuel for Dry Bulk, Container, Crude Tank, Prod Tank, Car Carriers, LNGC, and LPGC.](Image)

Source: IHS Markit & MAN ES FMS - End Sep 2021
Dual Fuel Focus: *Bulk Carrier 2021*

Total 29 Dual Fuel Bulk Carriers won in 2021 with more than 540 MW installed power

**Selected orders:**

Himalaya Shipping, 12 x 210k B/C, NTS, 6G70ME-C10.5-GI-SCR

EP Shipping, 6 x 210k B/C, NTS, 6G70ME-C10.5-GI-SCR, CSE

H-Line, 6 x 210k, Beihai, 6G70ME-C10.5-GI-SCR

EP Shipping, 5 x 210k B/C, NTS, 6G70ME-C10.5-GI-SCR, CMD

**All with ME-GI engines**
ME-GI and ME-LGI engines for future fuels
Modular design enables extensive upgrade/retrofit options

By ensuring full fuel flexibility and extensive upgrade/retrofit capabilities with a proven record, MAN Energy Solutions future proof your investment.

<table>
<thead>
<tr>
<th>Fuel types</th>
<th>ME-C</th>
<th>ME-GI</th>
<th>ME-GA</th>
<th>ME-GIE</th>
<th>ME-LGIM</th>
<th>ME-LGIP</th>
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<tbody>
<tr>
<td>Fuel oil</td>
<td>Design</td>
<td>Design</td>
<td>Design</td>
<td>Design</td>
<td>Design</td>
<td>Design</td>
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<tr>
<td>LNG</td>
<td>Upgrade</td>
<td>Design</td>
<td>Design</td>
<td>Upgrade</td>
<td>Upgrade</td>
<td>Upgrade</td>
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<tr>
<td>LEG (Ethane)</td>
<td>Upgrade</td>
<td>Upgrade</td>
<td>-</td>
<td>Design</td>
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<tr>
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<td>Upgrade</td>
<td>Upgrade</td>
<td>Design</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Upgrade</td>
<td>Upgrade</td>
<td>-</td>
<td>Upgrade</td>
<td>Upgrade</td>
<td>Upgrade</td>
</tr>
</tbody>
</table>

The most important thing is to prepare the ship. The engine is dual-fuel ready!
Thank you very much!

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Disclaimer:
All data provided in this document is non-binding. This data serves informational purposes only and is especially not guaranteed in any way. Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.
Bulk carrier powering and propulsion options for 2030 and beyond

Decision support for existing fleet and NB of bulk carriers

March 01, 2022
What is the current CO2 footprint of shipping?

Global CO$_2$ emissions from shipping correspond roughly to the same as emitted by Germany: 2-3%

Bulk carrier fleet alone contribute 200-250 million tons CO$_2$ per year

At the same time – 80-90% of the world's goods (in tons) are transported by sea
Impact of EEXI for the world Bulker fleet

• Most modern vessels less than 5 years old will be able to comply with EEXI without major changes (EPL may be needed, but may only reduce max speed by 0.5-1.0 knots).

• Most vessels older than 5 years will also be able to comply with EEXI requirements by using EPL, but this may reduce the max speed by 1.5-2.0 knots or more. The older Handy and Capesize fleet may be most impacted.

• EEXI is a one-time measure – once compliance is met, it stays.

Source: DNV calculations based on IHS and AIS data.
Impact of CII for the world Bulker fleet

CII 2023 estimates

- Most modern vessels less than 5 years old will be able to comply with CII at least up until 2026, without major changes (EPL and ESD may be enough, and may only reduce max speed by 0.5-1.5 knots). Beyond 2026, it get more challenging…

- Very few vessels older than 5 years will be able to comply with CII requirements, without either reducing speed significantly (max speed may need to be as low as 8-9 knots in order to stay compliant beyond 2026) or by blending in biofuels (limited bunkers available and very high price).

Source: DNV calculations based on IHS and AIS data.
### Strategy for existing Vessel - EEXI and CII – prepare a roadmap for improvements at the next dd

<table>
<thead>
<tr>
<th>Already implemented</th>
<th>Upgrade in Next dd</th>
<th>Upgrade in Second dd</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hydrodynamics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Hull optimization</td>
<td>■ High-performance coating</td>
<td></td>
</tr>
<tr>
<td>■ High-efficiency propeller</td>
<td>■ Energy-saving device</td>
<td></td>
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<tr>
<td>■ Efficient coating system</td>
<td></td>
<td></td>
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<tr>
<td><strong>Machinery</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Electronic auto-tuning</td>
<td>■ Energy-efficient lighting system (LED, light-emitting diode)</td>
<td>■ New, more-efficient power providers, e.g. fuel cell</td>
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<tr>
<td>■ Improved engine load</td>
<td>■ Variable-frequency drive-controlled pumps, fans and motors</td>
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<tr>
<td>■ Shaft generator PTO/PTI*</td>
<td>■ Waste-heat recovery</td>
<td></td>
</tr>
<tr>
<td>■ Battery hybridization</td>
<td>■ Speed reduction</td>
<td></td>
</tr>
<tr>
<td><strong>Wind</strong></td>
<td>N/A</td>
<td>Wind propulsion</td>
</tr>
<tr>
<td><strong>Operational</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>■ Weather routing</td>
<td>■ Trim optimization</td>
<td>Speed reduction</td>
</tr>
<tr>
<td>■ Voyage planning and execution</td>
<td>■ DWT increase</td>
<td></td>
</tr>
<tr>
<td>■ Speed reduction</td>
<td>■ Biofuel or synthetic fuel</td>
<td></td>
</tr>
<tr>
<td><strong>Fuel</strong></td>
<td>■ LSFO* and/or MDO*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>■ LSFO* and/or MDO*</td>
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</tbody>
</table>

* PTO/PTI: Power take-off/ Power take-in, LSFO: Low sulphur fuel oil, MDO: Marine diesel oil

1. Assess commercial implications of possible speed reduction
2. Evaluate commercial operation and technical management practices
3. Consider design-related measures
4. Sooner or later: biofuels or e-fuels will be the only option
Newbuilds – Alternative fuel strategies

1a: Building the vessel with low-carbon fuel technology

1b: Building the vessel with conventional fuel technology but preparing it to allow a less-costly conversion to low-carbon fuels later (Ready for LNG, LPG, Ammonia, Methanol,....)

2: Building the vessel with conventional fuel technology but preparing it to allow for use of carbon-neutral drop-in fuels
LNG Fuelled bulk carriers with DNV class

• ESL 2x25,6k LNG Fuel bulk carrier at Jingling Shipyard
  - The world’s first LNG-fuelled bulker carrier (contract in 2015, delivered in 2018)

• H-line 4x180k LNG Fuel Bulk Carrier at Hyundai Samho
  - The world’s largest LNG fueled bulk carrier in operation.
  - Operating on the South Korea-Australia route since January 2021, ship-to-ship bunkering outside Malaysia

• U-Ming 4x190k LNG fuel bulk carrier at SWS (under construction)

• Anglo American 6x190k LNG fuel bulk carrier at SWS (under construction)

• H-line 3x210k LNG Fuel Bulk Carrier at Qingdao Beihai SY (under construction)

• 1+1x3,9k LNG Fuel bulk/self unloader for Seawork at Wuhu SY

• 3x7,8k LNG Fuel MPV for Langh at Wuhu SY
We are here to support you!

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Bulk Carrier Powering & Propulsion - 2030 and beyond

Rahul Khanna    March 1, 2022
THE TARGET

Pathways for international shipping’s CO2 emissions

- **Business As Usual**
- **50% reduction by 2050 (85% reduction in carbon intensity)**
- **100% reduction by 2050**

Source: Lloyd’s register
A wide variety of design, operational and economic solutions

Achieving the goals of the Initial IMO GHG Strategy will require a mix of technical, operational and innovative solutions applicable to ships. Some of them, with indication on their approximate GHG reduction potential, are highlighted below.

- **5-15%** Power and propulsion systems
- **50-90%** Full electric
- **35%** Bio-LNG/LPG
- **90%** Biofuel 3rd generation
- **80-100%** Hydrogen and other synthetic fuels
- **1-10%** Voyage optimization
- **1-10%** Energy management
- **2-20%** Hull and superstructure
- **5-25%** Hull biofouling management
- **2-50%** Concept, speed and capability
- **5-50%** Fleet management, logistics and incentives
- **up to 75%** Extensive speed optimization
Insurance Considerations

As an industry let's not repeat mistakes – Risk assessment & mitigation of utmost importance

Insurers likely to include a carbon emission-based metric to evaluate risk of clients

Communicate with your Underwriters

Policy generally not prescriptive on type of fuels however due diligence is required

Ensure all approvals (Class/Flag/OEMs etc) in place prior trials
Thank you