Suite of publications available on eto.dnvgl.com
Maritime Forecast to 2050 in a nutshell

GHG regulation

World fleet CO₂ outlook

Decarbonization options

Ship design performance
The foundation for the outlook is the IMO GHG strategy

Units: GHG emissions

- 2008 as base year
- Peak as soon as possible
- Intensity: 40% reduction
- Total: 50% reduction
- Intensity: 70%
- Zero emissions as soon as possible within this century
- Within 2100

Emission pathway in line with IMO’s GHG strategy
Business-as-usual emissions
Emission gap
Demand for seaborne transport will grow 39% by 2050

Average growth of 2.3%/yr to 2030, then 0.3%/yr towards 2050

Source: Maritime Forecast to 2050, DNV GL 2018
New ‘CO₂ Barometer’ signals shipping decarbonization is off course

1. World fleet CO₂ emissions
   ▪ Slight increase in CO₂ emissions in recent years

2. Alternative fuels uptake
   ▪ 0.3% uptake on ships in operation
   ▪ 6% for newbuildings

3. Regulation
   ▪ Current policy scenario will not meet the IMO ambitions without further policy

The CO₂ Barometer provides a high-level decarbonization status in the form of a ‘transition pressure level’
Decarbonization options for shipping

- Significant **GHG reduction** can be achieved by technical and operational measures

- **Up to 100%** GHG reduction can only be achieved with alternative fuels. Barriers to implementation includes:
  - Cost
  - Availability and infrastructure
  - Onboard storage
Three main “family types” of fuels, categorized based on energy source.

- Similar fuels can originate from different energy sources, but lifecycle emissions and cost vary greatly.
- A given energy converter (e.g. combustion engine) may apply many alternative fuels.

<table>
<thead>
<tr>
<th>Fossil-based</th>
<th>Electricity-based</th>
<th>Bio-based</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>Methane</td>
<td>Hydrogen/Ammonia</td>
</tr>
<tr>
<td>Diesel</td>
<td></td>
<td>Other fuels</td>
</tr>
</tbody>
</table>
Alternative fuels must evolve over time to increase marked penetration

Gradual steps allow for:
- maturing of technology
- scaling of supply and infrastructure

Not all the options have the potential to reach the deep-sea stage, mainly due to limited energy density

It took LNG around 20 years to climb all steps. To reach the IMO targets, carbon-neutral fuels must mature faster!
Fuel flexibility and bridging technologies – the three pillars

Bridging technologies can facilitate the transition from traditional fuels, via fuels with lower carbon footprints, to carbon-neutral fuels.
In all three pathways modelled, liquefied methane (both fossil and non-fossil) ends up dominating the fuel mix.
What is the future competitiveness of your ship?

DNV GL has developed a model to test **competitiveness** under different scenarios – taken into account:

- Fuel & technology
- Regulations
- Risks related to the market

Competitiveness of individual **ship designs** is assessed using:

- Break-even cost
- CO₂ emissions
What is the exposure to carbon risk under different scenarios?

The model also evaluates the CO₂ emissions of a design to that of the competing fleet.

It is possible to assess the balance between short-term cost reduction and long-term carbon-risk exposure.

CO₂ emissions could become an additional differentiator.
Key findings

- World seaborne trade will grow – gas will grow more
- Shipping decarbonization is off course
- Uptake of alternative fuels is picking up, but needs to breakthrough to the large ocean going ships
- In addition to LNG, carbon-neutral fuels will be needed towards 2050
- Bridging technologies and fuel flexibility can smooth the transition from traditional fuels
- Ships should be future proof in a changing environment, securing competitiveness and mitigating carbon risk
- We have tools to support policy makers, ship owners and other stakeholders
Thank you for your attention

Sergio Garcia
Regional Business Development Manager – Maritime Americas
Sergio.garcia@dnvgl.com
+1 832 392 0030

www.dnvgl.com

SAFER, SMARTER, GREENER