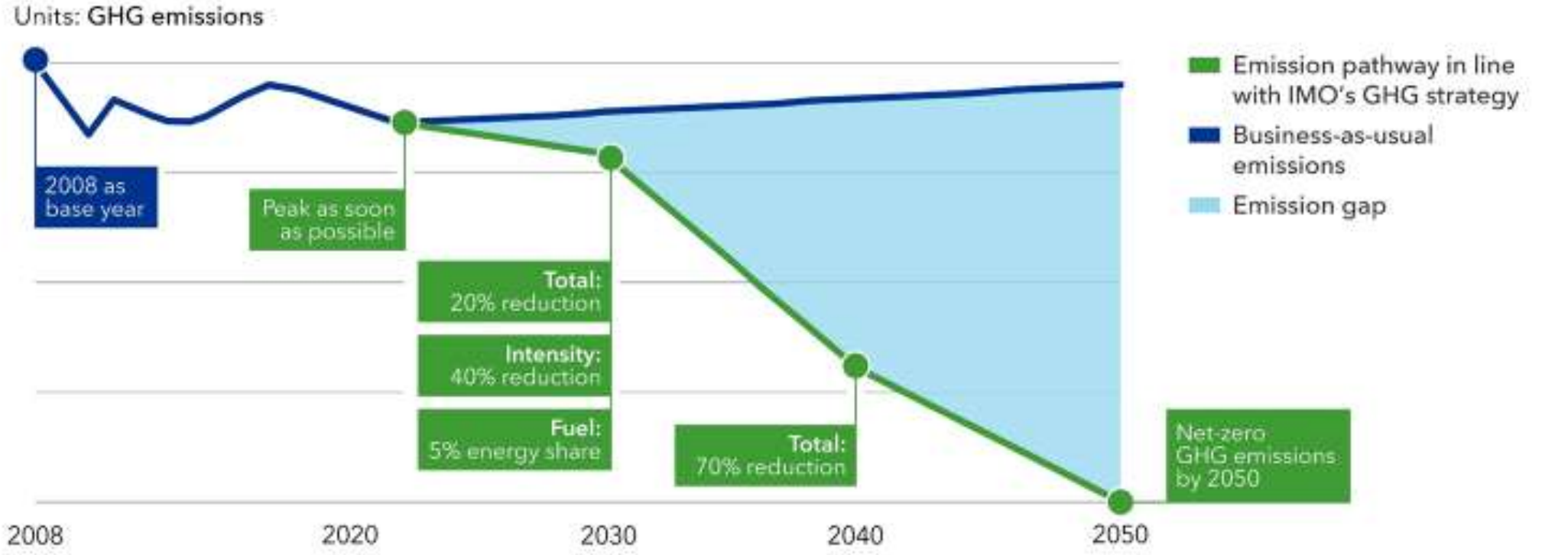
Future Fuels Safety Seminar

DMS Safety Meet

Mikael Johansson Head of Section Maritime Advisory Sweden & Denmark

2023-08-30

The back drop we all know – Shipping will change dramatically over the next decades



Total: Well-to-wake GHG emissions; **Intensity:** CO_2 emitted per transport work; **Fuel:** Uptake of zero or near-zero GHG technologies, fuels and/or energy sources

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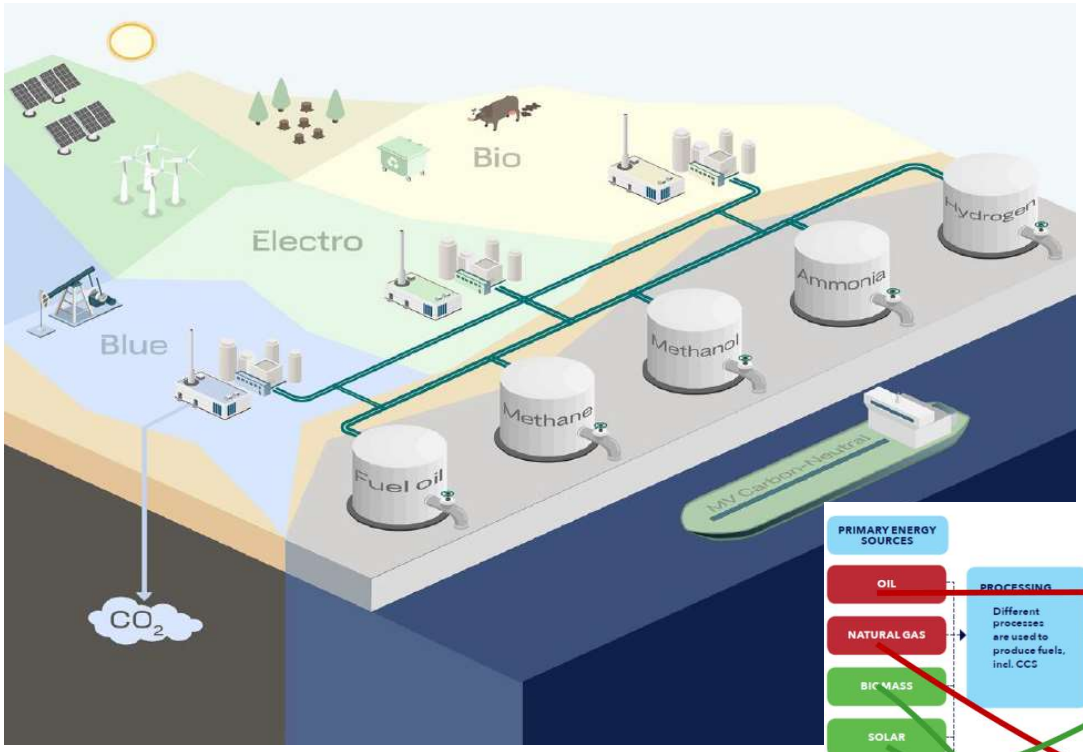
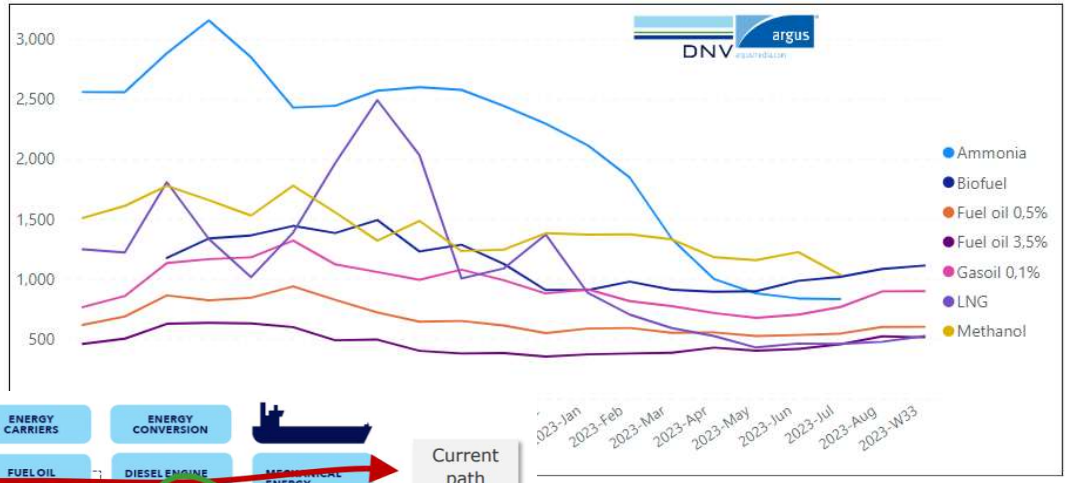
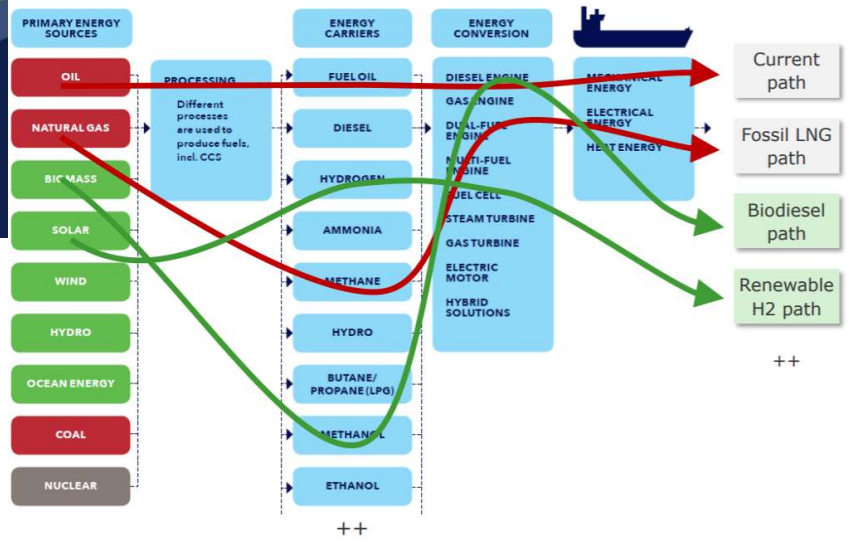
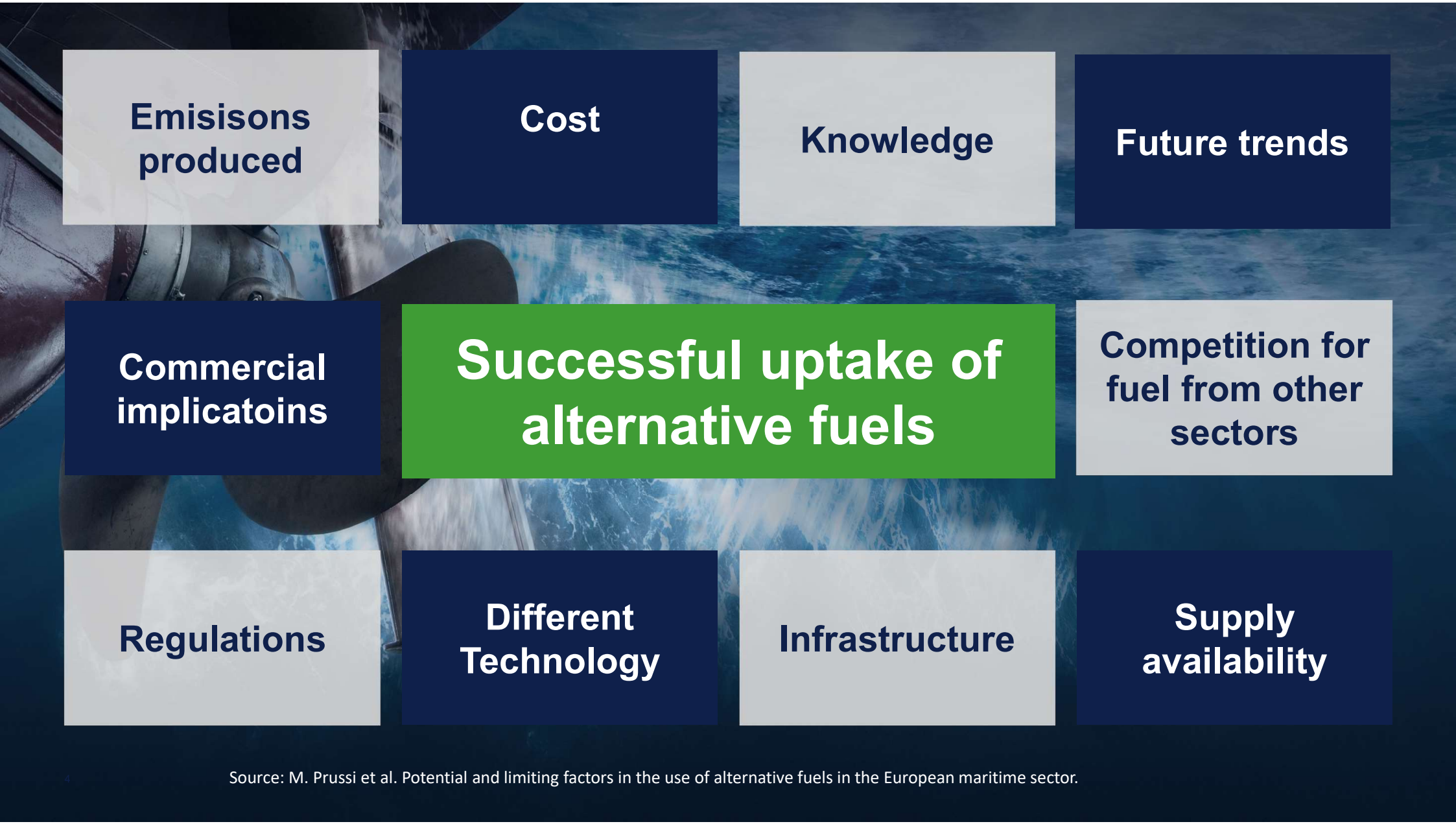
The fuel challenge is also heavily discussed



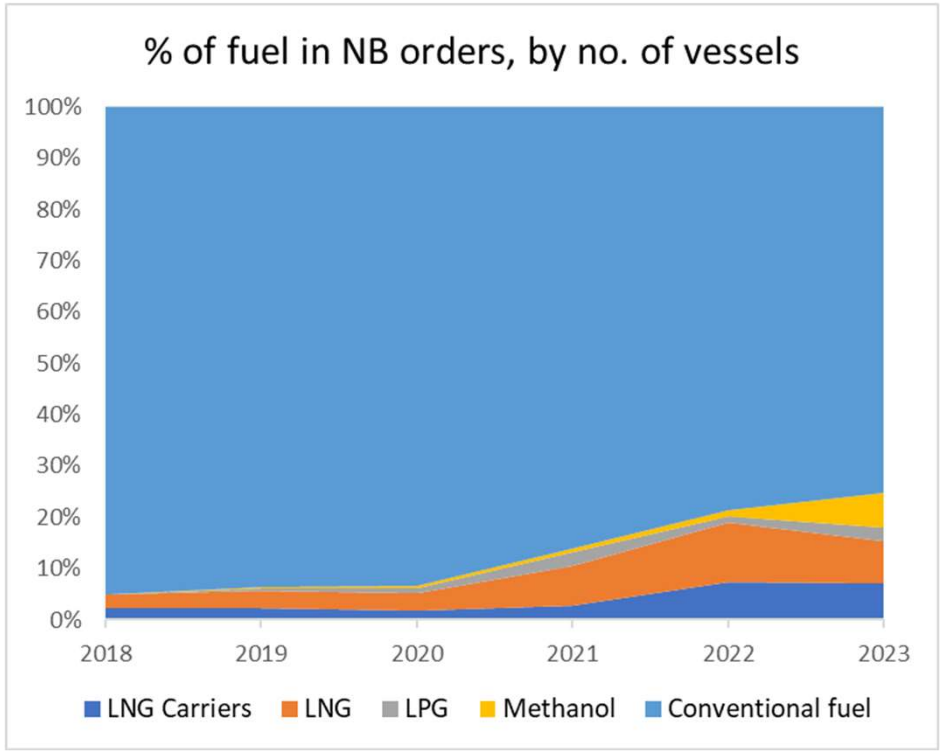


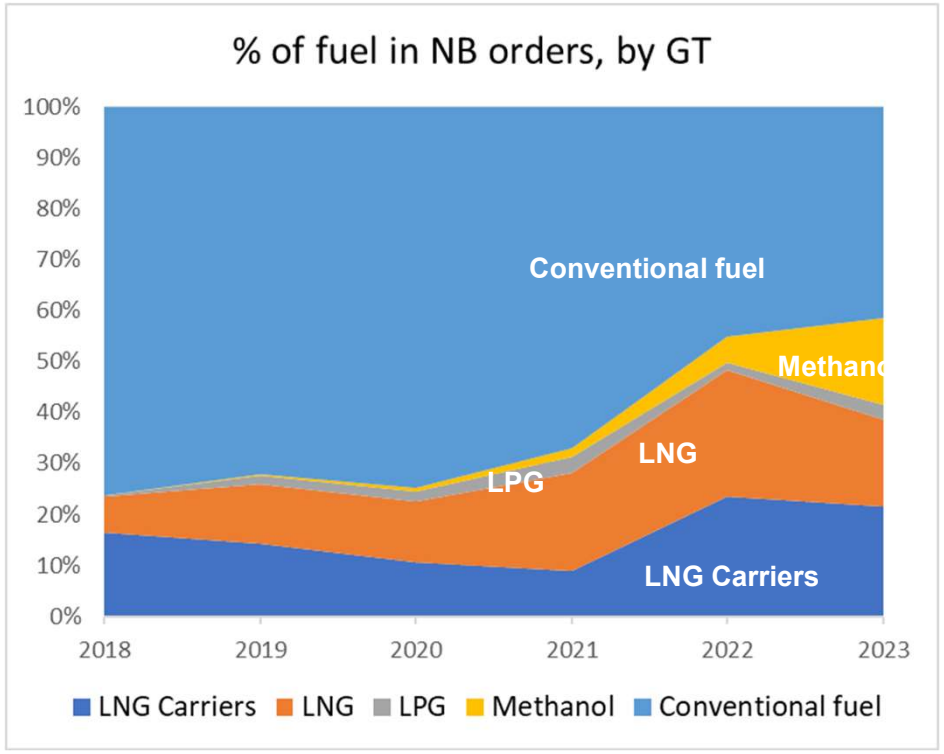




Source: M. Prussi et al. Potential and limiting factors in the use of alternative fuels in the European maritime sector.

Alternative fuels gaining market share





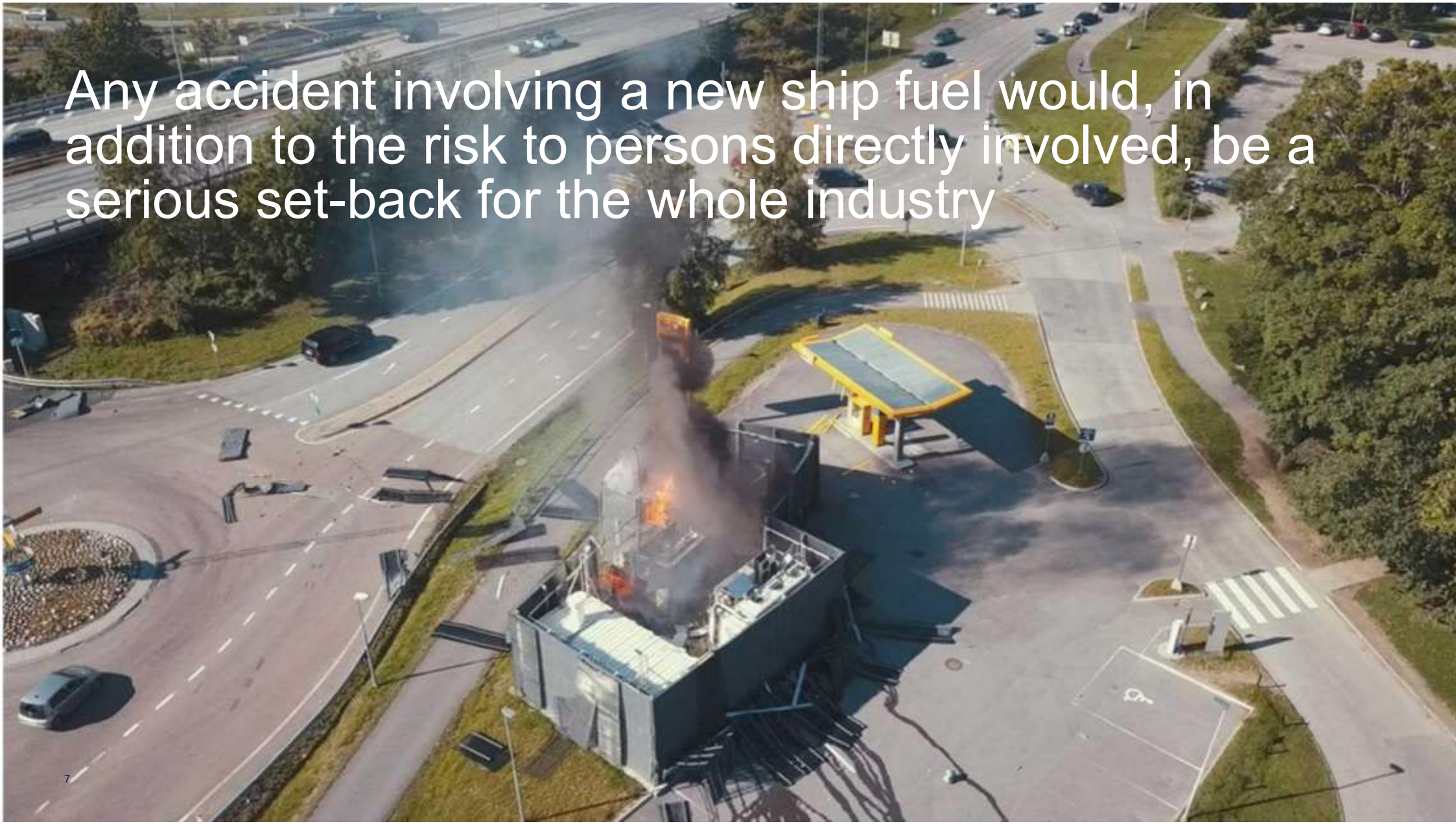
The safety landscape will change

	Flashpoint (°C)	Flammability range (%vol. fraction)	Minimum ignition energy (mJ)	Auto-ignition temperature (°C)	Laminar burning velocity (m/s)
Methane	-*	5.3-17	0.274	537	0.37
Methanol	12	6-36.5	0.174	385	0.48
Ammonia	-*	15-28	40-170	650	0.07
Hydrogen	-*	4-77	0.017	585	2.7

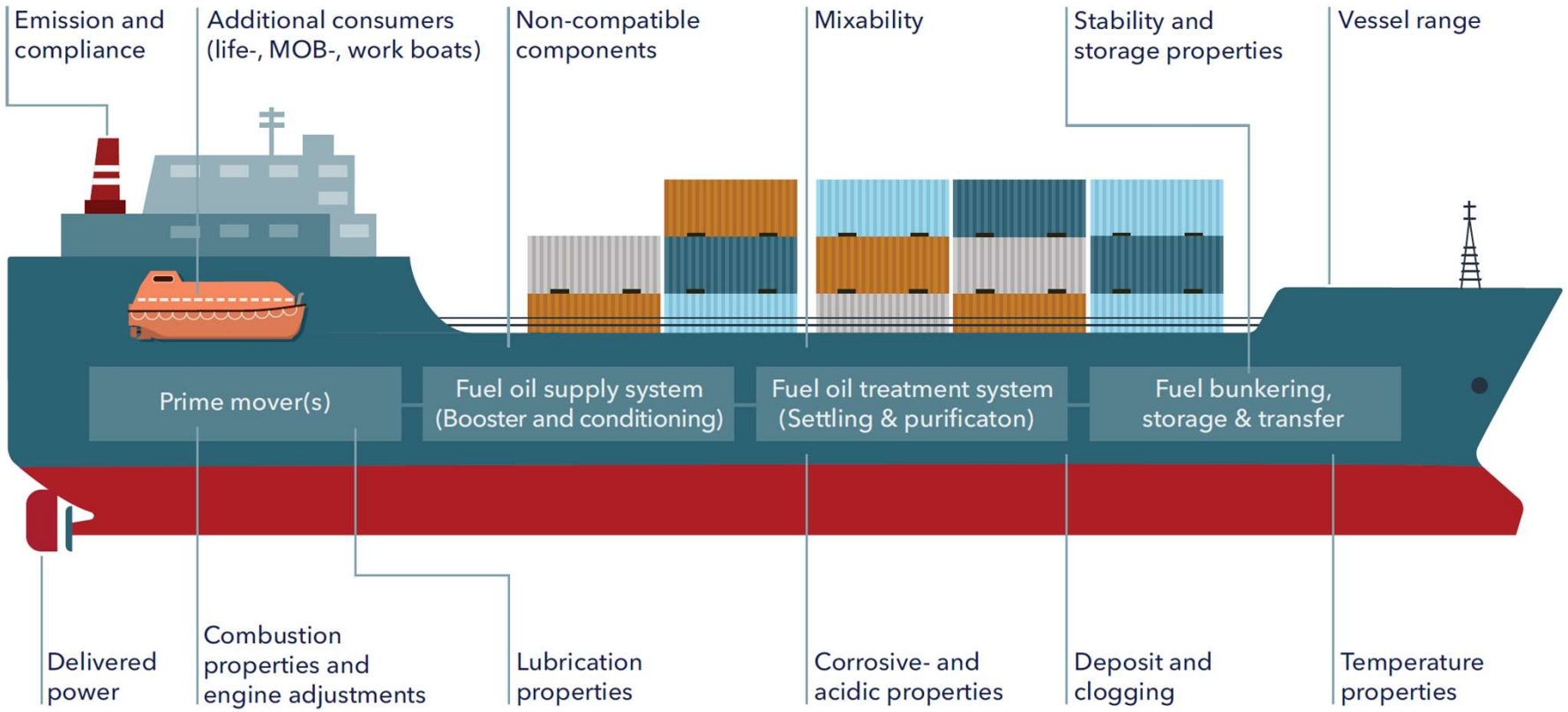
	Normal boiling point (°C)	Density (kg/m^3)		Expansion ratio liquid NBP/gas NTP	Toxicity IDLH (ppm)
		(G,NBP)	(G,NTP)		
Methane	-162	1.819	0.6594	600	Asphyxiation
Methanol	64.9	-	1.11*	-	6000
Ammonia	-33.4	0.89**	0.610**	850	300
Hydrogen	-253	1.312	0.0827	847	Asphyxiation

FLAMMABUILITY

STORAGE, RELEASE AND DISPERSION

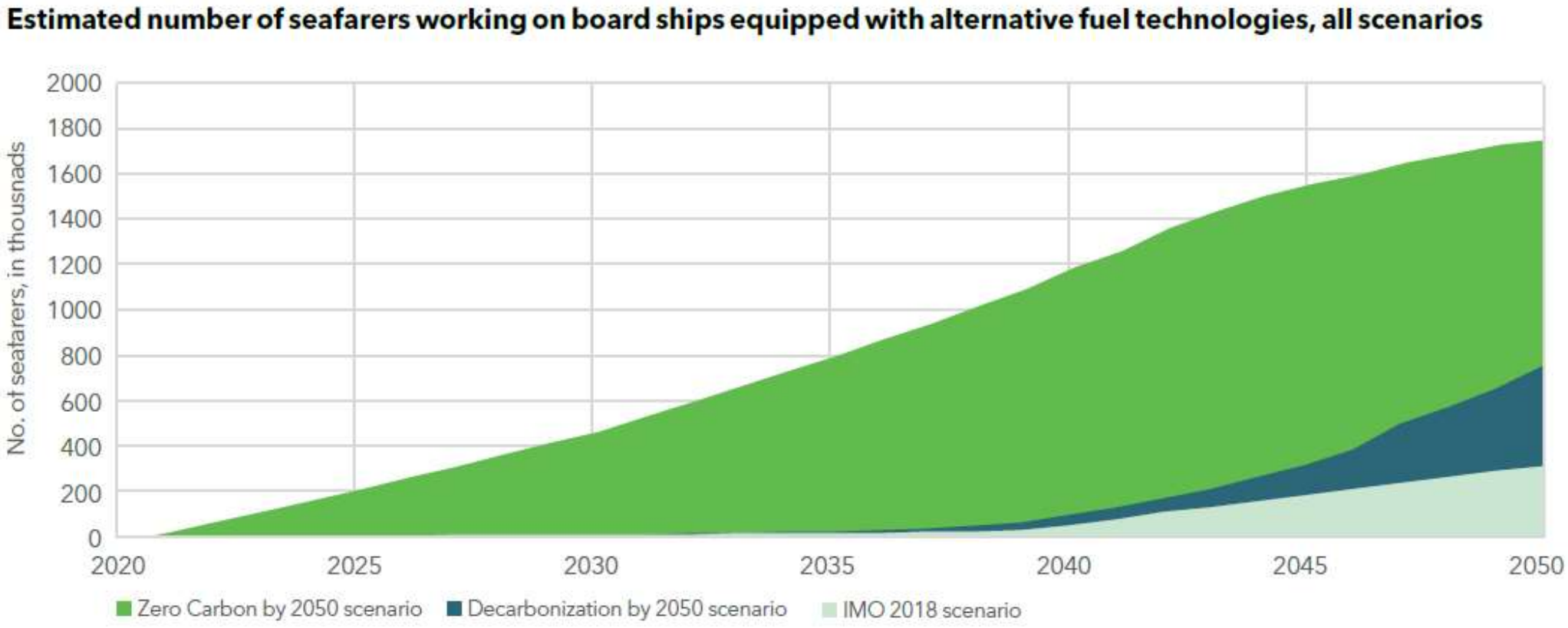

Any accident involving a new ship fuel would, in addition to the risk to persons directly involved, be a serious set-back for the whole industry

The overall vessel as a system needs to be addressed




Are the regulations in place to facilitate development
IMO
ARBETSMILJÖ VERKET
IACS
International Association of Classification Societies
MSB
Myndigheten för samhällsskydd och beredskap

Training is instrumental – How Do we as an industry manage?



Decarbonization include safety challenges and need for new knowledge and skills

- Technology outpace regulatory development
- Knowledge and experience
- Training facilities
- Competent trainers
- Retainment

Safety is a prerequisite for successful and timely introduction of carbon-neutral fuels

- **1030 LNG – FKAB**
- **1045 Batteries - Corvus**
- **1100 Biofuels - Goodfuels**
- **1115 Break**
- **1125 Wind – Oceanbird**
- **1140 Ammonia – Wärtsilä**
- **1155 Methanol – Stena**
- **1210 Break**
- **1230 Fuel cells – Powercell**
- **1245 Hydrogen – DNV**
- **1300 Nuclear – Seaborg**
- **1315 Summary**

DNV

Thank you for listening!

Mikael Johansson – Head of Section Maritime Advisory Sweden & Denmark

Mikael.Johansson@dnv.com
+46 730 49 72 22

www.dnv.com