Shipping Technology

De-Risking Energy Transition

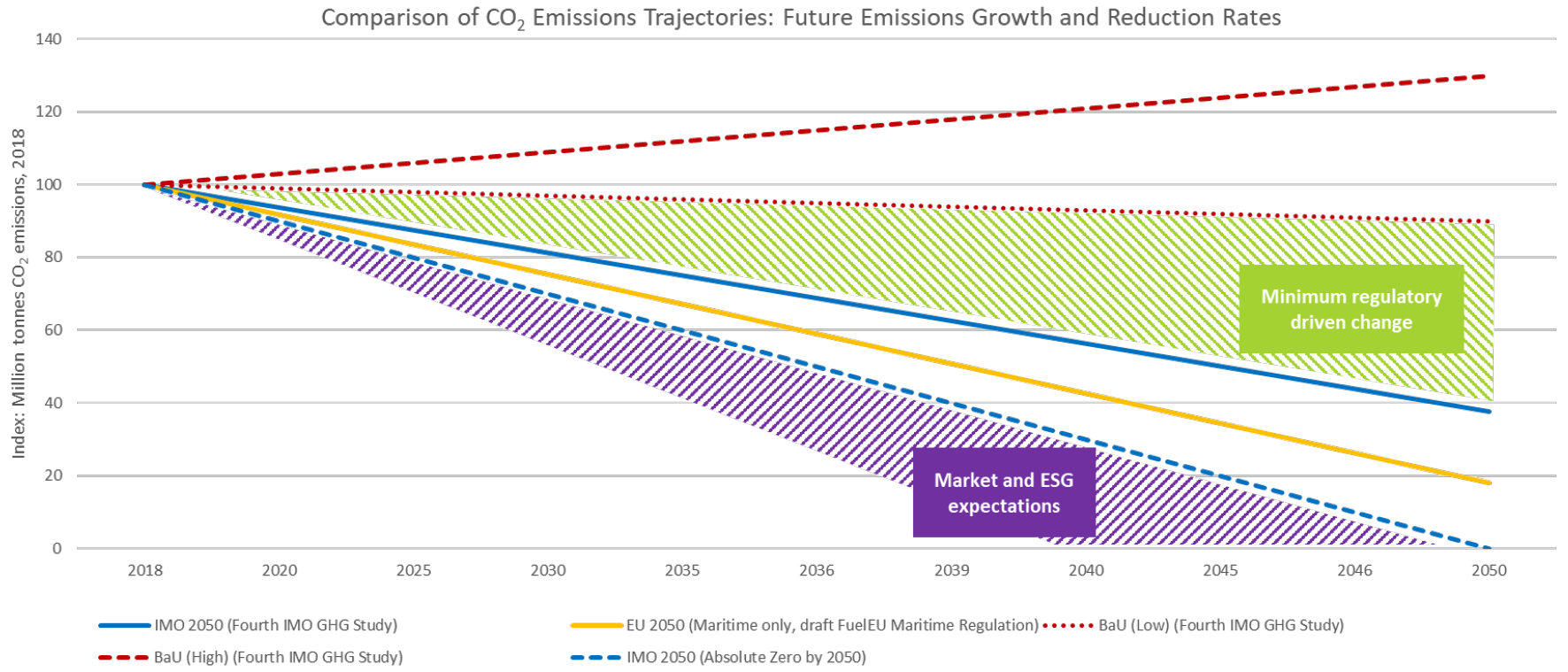
IUMI , 20th September 2023, Edinburgh

Gautam Puri- Vice President, (Business Adv.)

IUMI

CONTENTS – De-risking Energy Transition

Maritime Energy Transition: Significant change required, regardless of motivation



Key Drivers

Regulation

International, regional and national regulatory interventions driven by the Paris Agreement temperature goals

Market

Value chain expectations of lower GHG emissions in upstream and downstream transport

ESG

Socially conscious investors screening companies using non-financial criteria

Lloyds Register – Insuring a Safe Transition to Net Zero

Insurers Challenges

Demand
- Inflation
- VESSEL Turnarounds
- Lower Trade Volumes

Risk
- New Risks
- Transition from Monolithic Oil
- Array of Fuel/Technologies

Digital
- Data Driven Underwriting
- Data Analytics
- Collaboration & Aggregation

Business Models
- Telematics
- Pay Per Mile Insurance
- Technology Driven Model

Technological shift
- MASS Autonomous Operations,
- Training STCW and
- Remote Monitor Stations

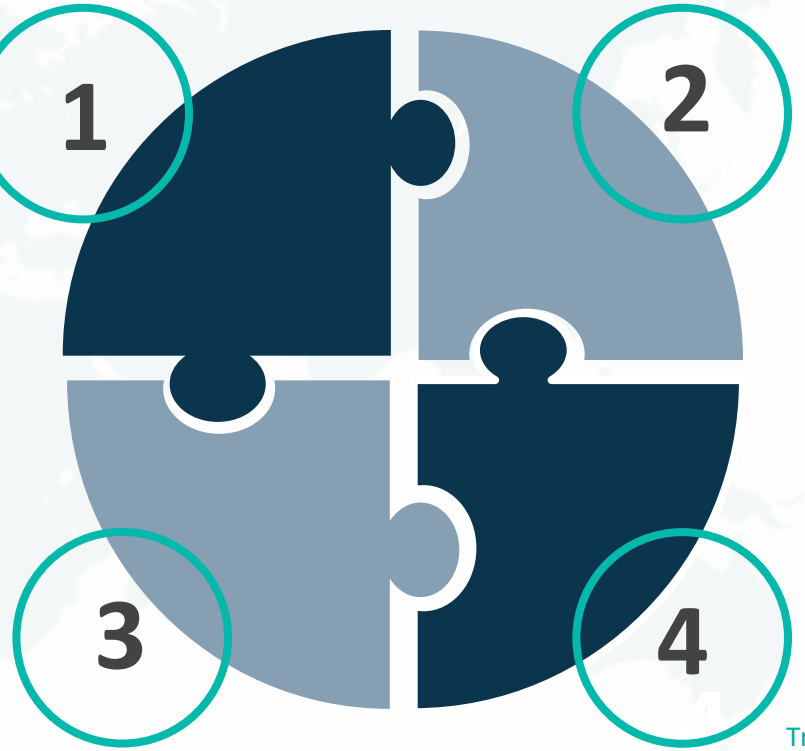
De-Risking Physical & Transition Risk

1 New Technologies

Designs, Fuels, Climate Technologies – LR's Risk Based Certs, Technology Qualification

2 Leaders in Assurance

LR's validation and verification approach provides assurance to the stakeholders



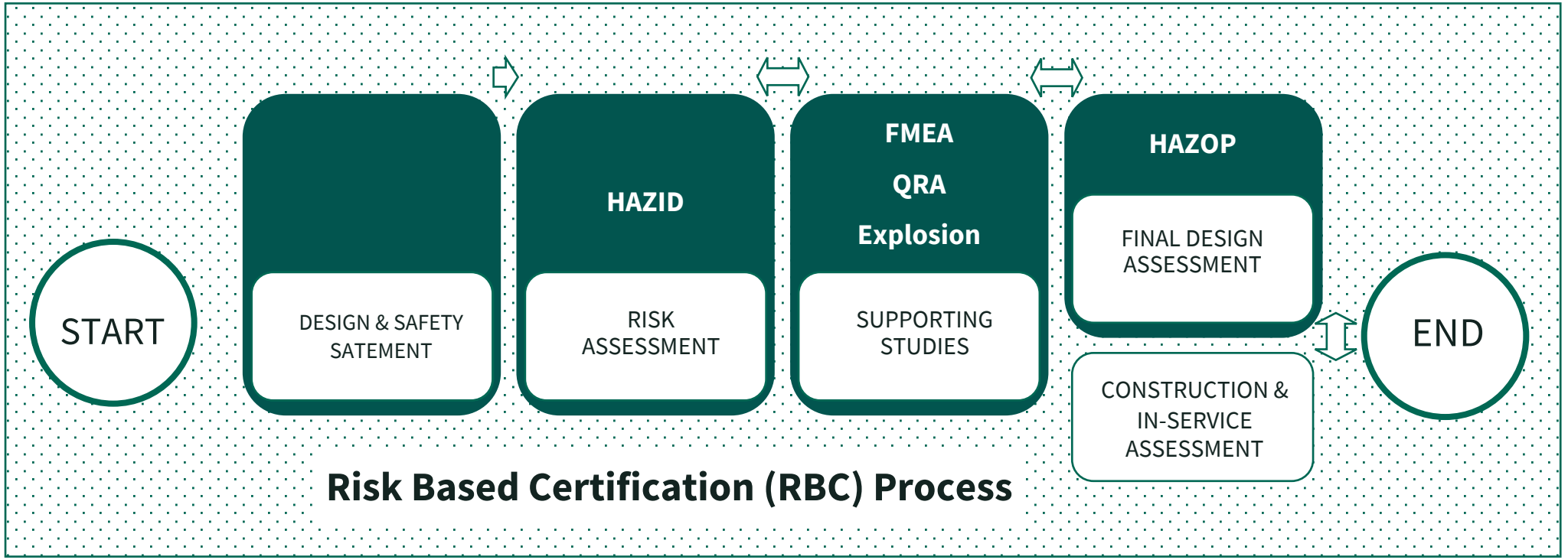
3 Autonomous Operations

Digital Transformation, Ship Performance Data, Connectivity & Cyber-Resilience, MASS, AI Assurance

4 Human Capital

Training and Awareness, Closing Skills Gap, LR Partners with MTF, Safety Tech Accelerator – Mental Health

LR Risk Based Certification



ShipRight
Design and Construction

Risk Management

Risk Based Certification (RBC)

September 2021

LR – CTQ (Certification through Technology Qualification) & AiP (Approval in Principle)

"The outcome from this three-stage assessment process enables a novel technology to be certified, although still being refined or incapable of conforming to the requirements of published Standards or normative Rules. Technology Qualification can be applied at any stage of the technology development, though there are distinct advantages to early engagement with the process".

LR – CTQ (Certification through Technology Qualification) & AiP (Approval in Principle)

P to X with Offshore Wind

ERM's Deepwater Offshore Production of Hydrogen (Dolphyn)

LR AiP following a review- Seaplace's CROWN active ballast control system.

Nuclear SMR Revival

Unpressurised THOR MSR with limited evacuation zone, LR works on Assurance Framework with Core Power

Ulstein Project THOR

Autonomy and Generative AI

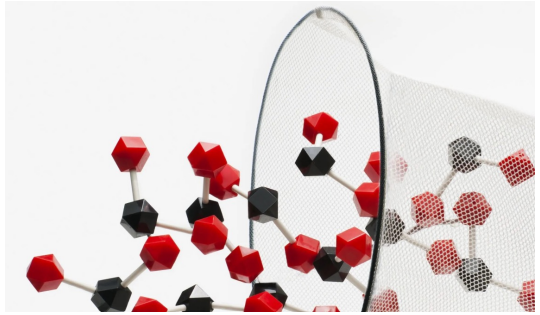
Furuno obtained LR approval for a Digital Twin Certificate relating to Herm Ace VDR.

DRIX Maritime surface Drone

Alternate Fuels

LR H2 Rules & Classed its first H2 - fuelled crew boat, Hydroville, owned by CMB & H2-fuelled tug, Hydrotug

LR awarded Mitsui E&S (AiP) NH3 Gas Carrier. Li-Ion Batteries Risks.



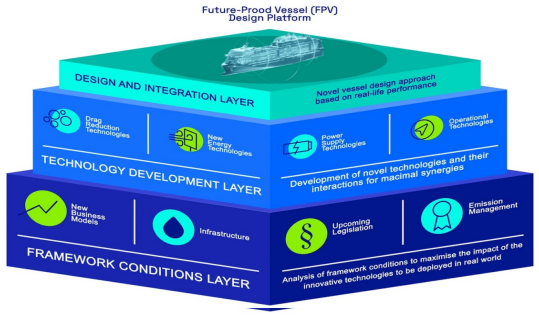
Carbon Capture & Storage

LR has granted Approval in Principle for Value Maritime's Carbon Capture and Storage Filtree (CCS) System – installed on EPS Vessel Pacific Cobalt

Advanced Technologies

LR has awarded (AiP) to Empresa Naviera Elcano for steam-to-hybrid conversion of steam turbine LNG carriers to a dual-fuelled prop. system

LR Technology, Safety and Decarbonisation Industry Initiatives



CHEK Project

The CHEK project budget of €10.00M aims to develop two full scale two first-of-a-kind vessel concept designs - Kamsarmax bulk carrier and Meraviglia class cruise ship

Castor Initiative

Ammonia-fuelled tanker Joint (JDP), an industry-led project, to research use of NH3 as a marine fuel to reduce carbon emissions. Members include Samsung Heavy, MAN, MISC , Total, Yara ASA.

Container Fires & CFLII

Risks will evolve in an arena of new marine fuels & Batteries – training, storage, toxicity, pollution. Other risk areas include digitalisation, cyber security, operational issues such as ship stability and parametric roll.

Technology Accelerator

Methane Slip Abatement LR awards AiP for Daphne Technology's Slip Pure™ solution.

Current Direct Initiative as a part of Horizon 2020

Silk Alliance

Regional green corridor cluster in Asia, with Key players involved in System Thinking Phase, Foresight and Co-creation. MPA, Keppel, ING, NUS, MSC, PIL, Wartsilla

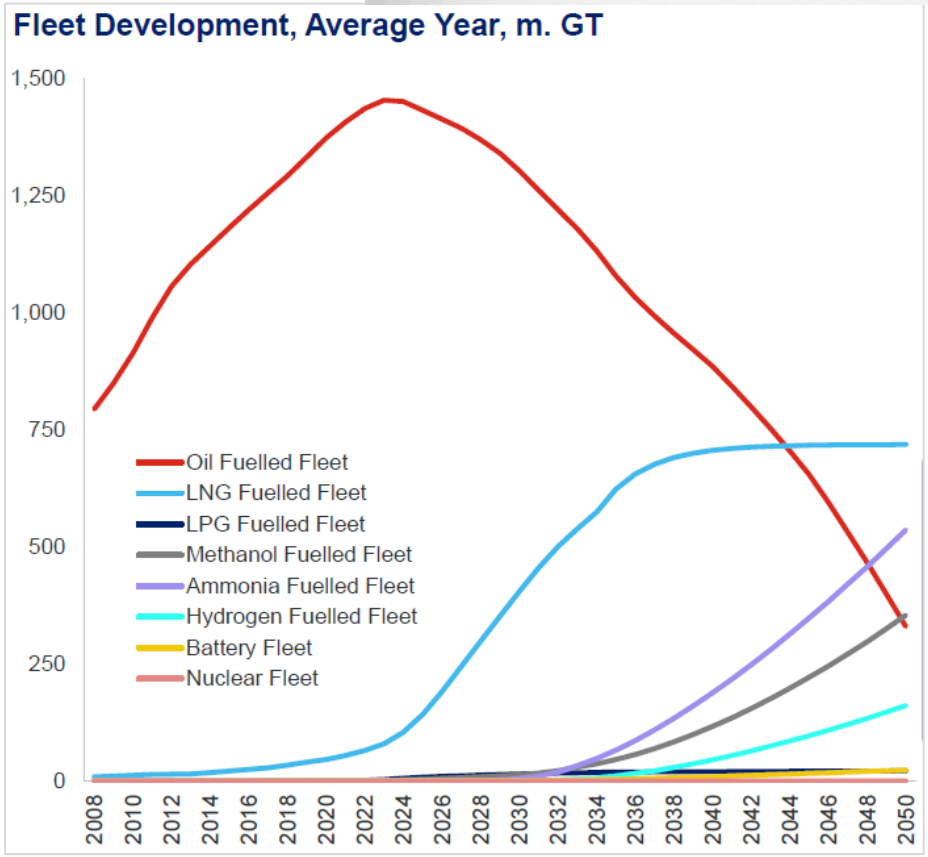
Poseidon Principles

Framework to quantitively assess and disclose the climate alignment of marine insurers' underwriting portfolios towards NZIA

Fuelling Future Ships - Alternative Fuel Options

LR issues world's first rules for hydrogen fuel

- **Liquified Natural Gas (LNG)**
  (Mass 0.8x MGO, Vol. 2x MGO)
- **Methanol**
  (Mass 1.8x MGO, Vol. 2.4x MGO)
- **Ammonia**
  (Mass 1.8x MGO, Vol. 2.9x MGO)
- **Hydrogen**
  (Mass 0.3x MGO, Vol. 3.3-15.5x MGO)
- **LPG, Biofuels, Electricity, Nuclear**



Source: Clarkson's Research

Zero-Carbon alt. fuels: 34%

LNG: 34%

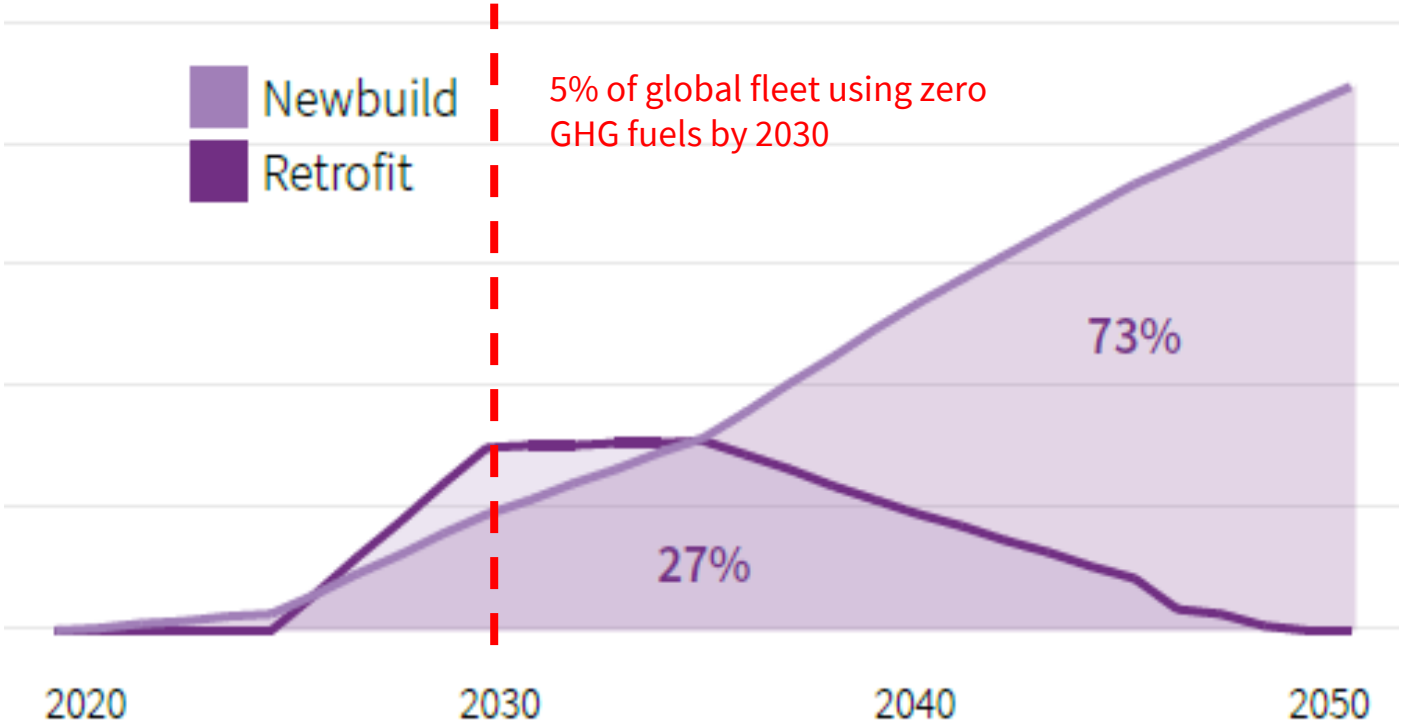
Other Low Carbon alt. fuels: 18%

Oil: 15%

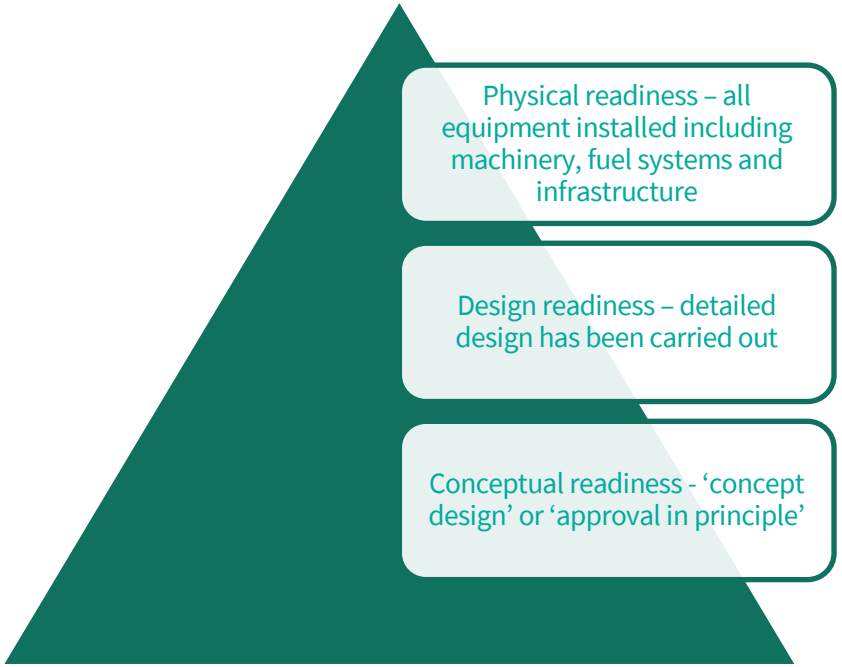
In 2017, LR classed its first hydrogen-fuelled vessel, Hydroville, owned by Belgium's CMB. first hydrogen-fuelled tug, the LR-classed Hydrotug, which went into service last year in Ostend, involving two hydrogen-fuelled ferries due to enter service in 2025 on Norway's longest ferry route, operated by Torghatten

Fuelling Future Ships - A deeper look at the transition

A mix of Newbuilds and Retrofits required



TRL					IRL				CRL			
Resource	Production	Bunkering	Ship storage	Ship Propulsion	Resource	Production	Bunkering	Ship	Resource	Production	Bunkering	Ship



A Perceived level of readiness can lead to expensive and timely retrofits

Fueling Future Ships – Risk Considerations

Key Emerging Risks

- **Introduction of new hazards on onboard**
- **Portfolio GHG Emissions**
- **New/Novel technology and systems**
- **Re-balancing of voyage dynamics and chartering strategies**

Thank-You

gautam.puri@lr.org

+44 7974 046 975