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TS5 Sustainable Maritime Transport

Challenges of Berthing in Ports with Alternative Ship Fuels

Dr. Shu-Ling (Peggy) Chen

*Associate Professor
Director, Centre for Maritime and Logistics Management
Australian Maritime College
College of Sciences and Engineering
University of Tasmania*

Email : p.chen@utas.edu.au

UNIVERSITY of TASMANIA



Australian Maritime College

Ports and Alternative Fuel-Powered Vessels



LNG (+BioLNG)



Methanol



Ammonia



Hydrogen

References:

- <https://maritime-executive.com/article/japanese-shipping-makes-progress-on-ammonia-fueled-ship-design>
- <https://www.seatrade-maritime.com/containers/x-press-feeders-orders-up-to-8-methanol-dual-fuel-boxships-at-huangpu-wenchong>
- <https://www.offshore-energy.biz/rina-okays-aurelias-100-hydrogen-powered-ro-ro-design/>



Safety Challenges

Legal and Regulatory Framework

Logistical Challenges

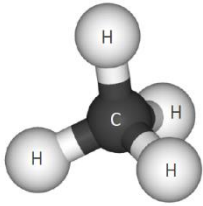


Hazards

HFO

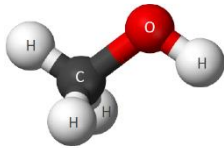


LNG

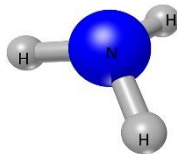


+ Cryogenic Temperatures

Methanol



Ammonia



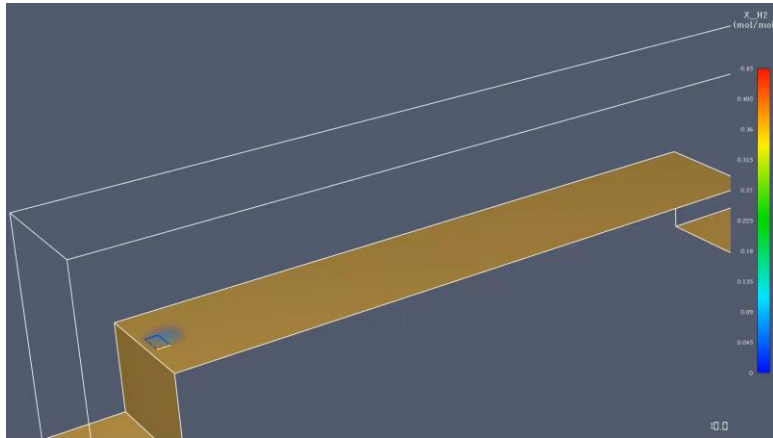
Hydrogen



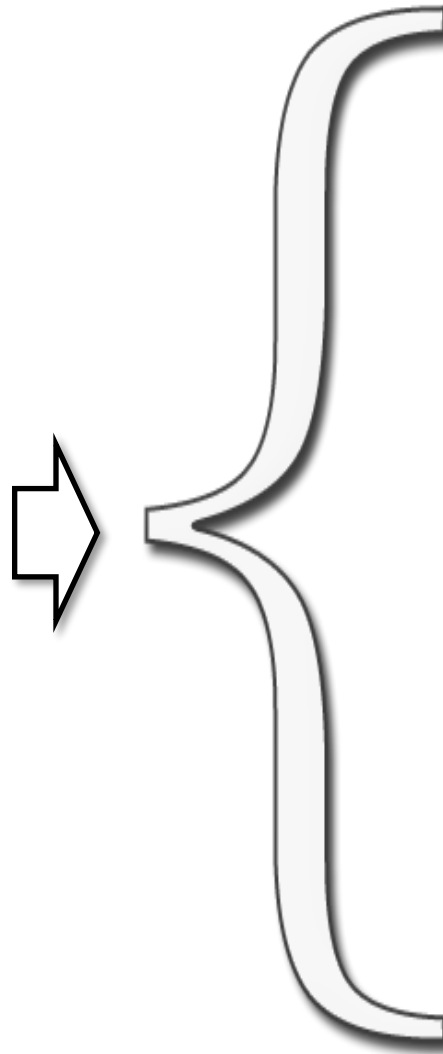
For LH₂ + Cryogenic Temperatures

Mitigations

Quantitative Risk Assessment (QRA)



Example:
Liquid hydrogen leakage



- Zoning and Separation
- Dedicated Berthing Areas
- Advanced Detection and Monitoring Systems
- Training
- Multi-Fuel bunkering operations
- Emergency Response and Preparedness



Safety Challenges



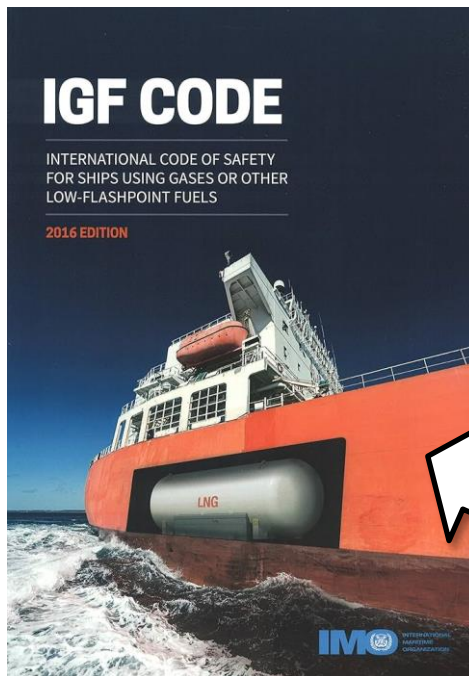
Legal and Regulatory Framework

Logistical Challenges

International Regulations and Standards



International
Organization for
Standardization



- LNG
- Methanol
- Ammonia (under draft)
- Hydrogen (under draft)

- LNG
- Methanol (gap)
- Ammonia (gap)
- Hydrogen (some standards have been developed, like LH₂ loading arms, but insufficient)



Port State Control (PSC) Inspections

National and Port Regulations



- Permits
- Local Environmental Regulations
- Workplace Health and Safety Regulations
- Ports' specialised protocols





Safety Challenges

Legal and Regulatory Framework

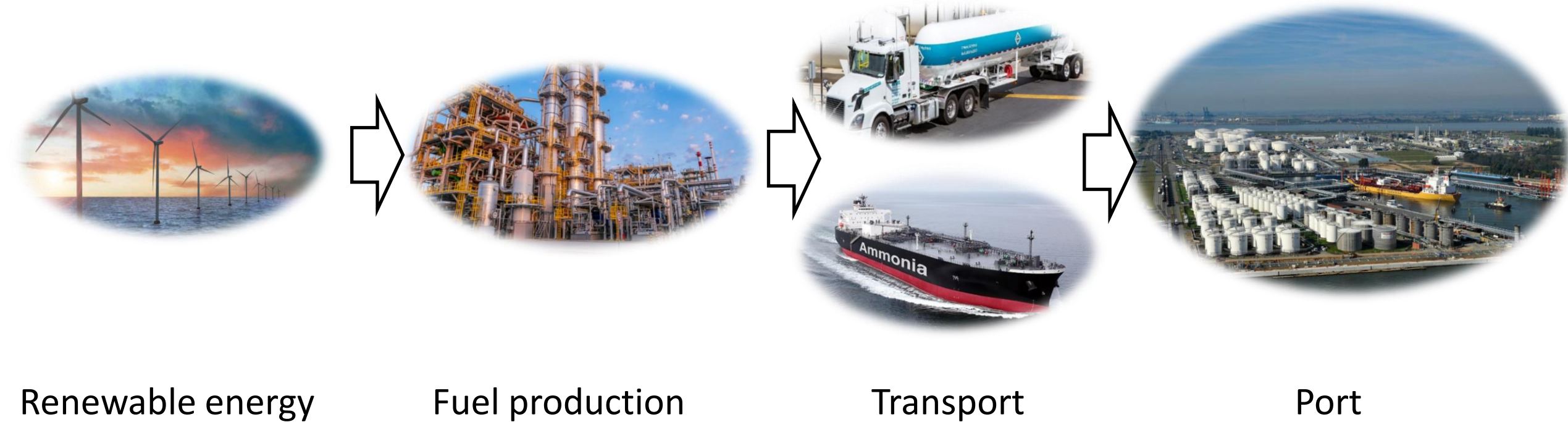
Logistical Challenges

Port Congestion and Traffic Management



- Coordinating vessel arrivals to prevent traffic congestion and reduce the risk of accidents
- May require imposing restrictions on vessel movements and limiting access to certain port areas during bunkering operations

Fuel Supply Chain



Ports should have reliable supply chains for the alternative fuels, which can be challenging given the current limited production capacity for hydrogen, ammonia, and methanol.

References:
<https://www.lloydslist.com/LL1137516/Ammonia-hype-builds-in-shipping-market/>
<https://www.offshore-energy.biz/partners-eye-open-access-green-ammonia-import-terminal-at-port-of-antwerp-bruges/>

Port Infrastructure



phase in alternative fuel infrastructure gradually

- Short term: LNG, Methanol
- Long term: Ammonia, Hydrogen

References:

<https://energyindustryreview.com/oil-gas/uniper-and-vesta-to-develop-green-ammonia-terminal-site-in-the-netherlands/>



Summary:

Safety Challenges

- Risk-based measures

Legal and Regulatory Framework

- International regulations & standards (gaps)
- National regulations
- Port protocols

Logistical Challenges

- Port congestion and traffic management (safety relevant)
- Fuel supply chain (bunkering availability)
- Port infrastructure (phase in)



Thank you !