Japan CCS Forum 2025

MOL's Initiatives for CCS

December 4th, 2025

Mitsui O.S.K. Lines, Ltd.
Daisuke Fujihashi

Company Introduction - Mitsui O.S.K. Lines, Ltd. (MOL)

MOL Fleet Scale

World's Second Largest

935 vessels

LNG Carriers Owned

World's Largest

107 vessels

Consolidated Ordinary Profit

USD 2.8 bil.

Number of MOL Group Employees

10,500

Global Presence

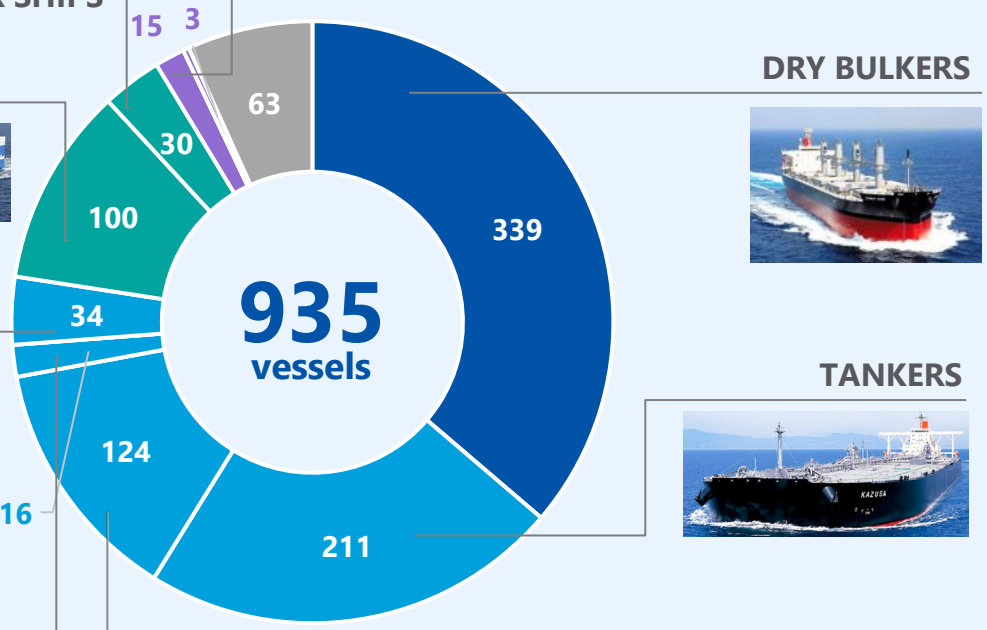
27 countries

Fleet Composition

CONTAINER SHIPS

CRUISE SHIPS, Ferries, others

CAR CARRIERS



DRY BULKERS

TANKERS

Others(Energy)

Offshore Business

LNG CARRIERS

FSRU/FSU

CO_2 & Next-Generation Energy Value Chain

- CCUS Business Development Team
- Coordination and Carbon Recycle Business Development Team
- Next-Generation Energy Development Team
- Carbon Removal Team
- Each Business Organization, Relevant organization/region

BLUE ACTION MOL

CO_2 Value Chain

Upstream	Midstream	Downstream
Fossil fuel (Industry, energy)-derived CO_2 Capture	CO_2 transportation	CO_2 storage
Natural and atmospheric CO_2 capture (including technical systems)		CO_2 Utilization: Synthetic fuels / Raw materials / etc.

captura, alt carbon, Marubeni, climeworks, Heirloom, Kansai Electric Power (power with heart)

VM

Next-generation energy value chain

Upstream	Midstream	Downstream
Energy production (not necessarily limited to cases where CO_2 is used)	Transportation	FSRU, fuel purchase/ use, bunkering business, etc.

Clean Hydrogen Works (Creating a Cleaner Future), twelve, HIF, WIND HUNTER

Comprehensive Decarbonization Effort in Carbon Solution Development Unit

✓ Our unit is engaged in a wide range of business development contributing to carbon neutrality and negative emissions.

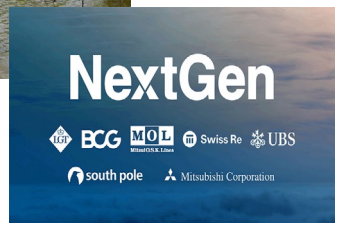
Carbon Removal

CO_2 capture from nature and atmosphere

- Blue Carbon Project: OKI REDD+ Plant mangroves and trees in South Sumatra, Indonesia to absorb and fix CO_2.

NextGen CDR Facility

- Joint carbon credit purchase : NextGen Purchase more than 1 million tons of technical CDR credits by 2025 and expand the market.



CCUS

Develop and promote LCO_2 marine transportation business

- Contribution to the CCUS value chain creation through partnerships and joint investments.

Collaborative study with business partners

- Accumulate knowledge and achievements through collaboration in CCUS value chain.

Coordination and Carbon Recycle

Onboard CO_2 Capture and Storage

- Establish Onboard Carbon capture technology for MOL fleet
- Save transportation energy and cost
- Approach to onboard CCUS standardization and legislation

Research, develop business and manage carbon recycling

- Promote technical research and commercial development
- Study of onboard recycling for captured CO_2

Next-Generation Energy

Manufacture and Develop next -generation energy project

- Invest in clean ammonia and e-fuel production
- Produce "Wind Hunter", which produces MCH using wind power

Utilize and transport next-generation energy

- Ammonia, methanol and hydrogen fuel/carrier ship
- Ammonia FSRU, and bunkering ship

Overview of MOL's CCUS Business -Collaboration with Partners-

Industry & Research

GLOBAL CCS INSTITUTE / CCSA / ASIA CCUS NETWORK / CCUSNA / ICCSC / CTUCA / zep / SIGTTO / LETA / FUTURE ENERGY EXPORTS / SINTEF / CO2LOS / CO2LOS / DNV

Maximize Service with Partners (Capital alliance/Partnership)

CO_2 Shipping Transportation

Track Record of CO_2 Shipping

- ✓ Liquefied CO_2 shipping is a proven technology and Larvik Shipping, in which MOL hold 25% share, has a track record of CO_2 shipping transportation for more than 35 years.

Larvik Shipping MOL
Your partner in transport of liquefied CO_2

Larvik Shipping CO_2 Delivery to Northern Lights Project

Source: Larvik Shipping LinkedIn

Development of LCO_2 Shipping under LP

- ✓ Considering the demand for the large-scale, long-distance transportation of CO_2 in APAC region, it is considered necessary to transport under low pressure condition(LP). Since there is not yet any commercial track record under LP, R&D is currently underway.

CO_2 Demonstration Ship called "EXCOOL"

Source: NEDO Website

MOL's Commercial Development for Liquefied CO_2 Carrier

Remark
FS – Feasibility Study
R&D – Research & Development
MoU – Memorandum of Understanding
TS – Term Sheet
SA – Service Agreement

2021

2022

Feb PETRONAS (MoU)
Nov Chevron (JSA)
Dec Kansai Electric Power
Kansai Electric (MoU)

2023

Mar LarvikShipping MOL
Your partner in transport of liquefied CO_2
(25% Share Acquisition)
May KN Energies (FS)
Jun NEDO (R&D)

Aug J-POWER ENEOS ENEOS Xplora
Advanced CCS Project (FS)
Sep PETRONAS (Term Sheet)
Oct COSMO
Cosmo Oil (MoU)
Nov Kansai Electric (SA)
Dec Bapco Energies (MoU)

2024

Feb ENEOS Xplora (MoU)
Feb ITOCHU HIF JFE
Itochu, HIF, JFE Steel (MoU)
Mar idemitsu HIF
Idemitsu, HIF (MoU)
May KN Energies (PCI grant)
Oct Advanced CCS Project (FS)

2025

Jun
jules nautica


PETRONAS misc
JV Establishment with PETRONAS Group

MOL's Technological Development for Liquefied CO_2 Carrier

BLUE ACTION MOL

Nov 2021
Concept Study on LCO_2 Carriers (7,500m³, 53,000m³)

Mar 2022
Concept Study on NH_3/LCO_2 Dual-Cargo Carriers (50,000m³)

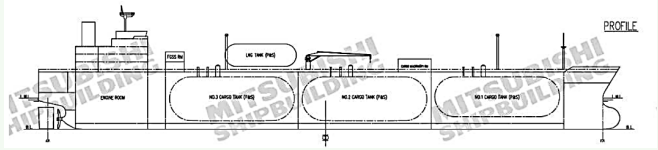
Aug 2022
AiP from ClassNK (64,000m³)

Sep 2022
HAZID and AiP from DNV (50,000m³)

Jun 2023
AiP for LCO_2 Carriers and FSO (87,000m³, 14,000m³) (87,000m³ with DPS, 96,000m³ FSO)

Aug 2023
R&D Projects Agreement regarding LCO_2 under LP

Sep 2024
AiP Acquisition from ABS and ClassNK (23,000m³, 50,000m³)



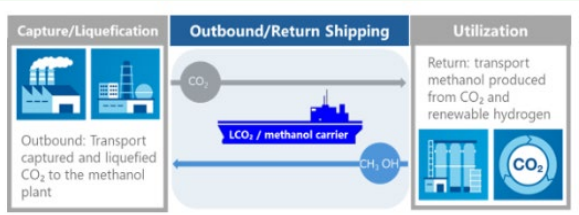
ClassNK ABS

Source: MLIT 第６回「船舶産業の変革実現のための検討会」資料*2-3*

Jun 2025
FEED, GASA from DNV (62,000m³)

jules nautica

Jun 2025
World's First AiP Acquisition on Methanol/LCO_2 Dual-Cargo Carriers

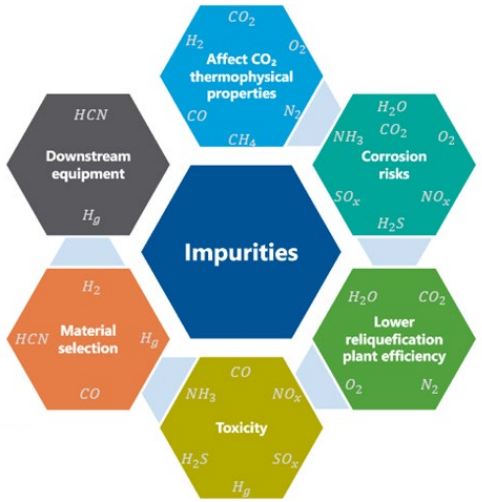


MITSUBISHI SHIPBUILDING

Key Technical Issues for Implementing CCS

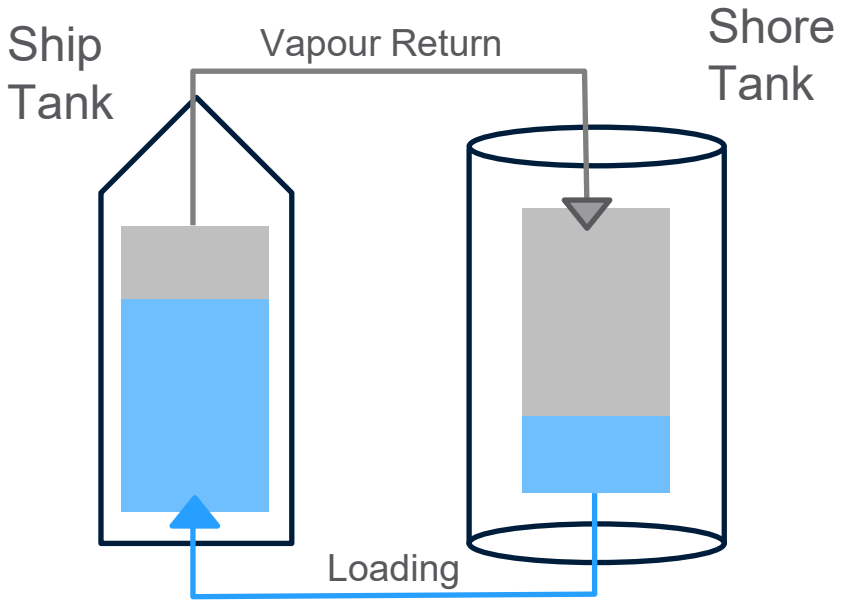
Impurities

- ✓ There is at present no standard CO_2 specification for LP.
- ✓ The LP condition demands more stringent specifications than MP condition, particularly with regard to the presence of water and light components.



Vapour Return

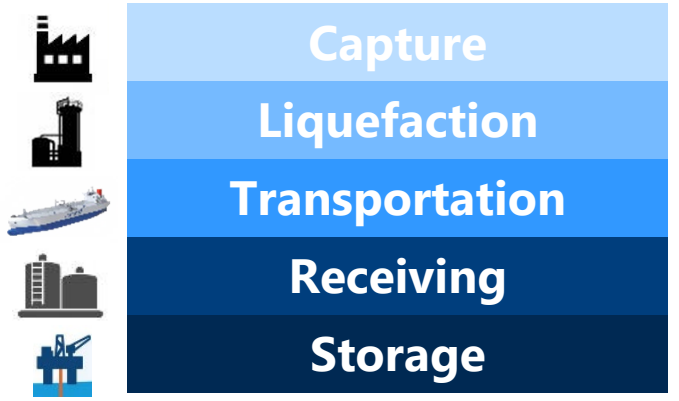
- ✓ In CO_2 transport operations, vapour return lines enable the balance of pressure between ship and shore.
- ✓ When multiple emitters from different industries share common infrastructure, the mixing of different impurity profiles can cause the unexpected chemical reaction.



Key Commercial Issues for Implementing CCS

Economic Viability

- ✓ For the implementation of CCS, the total accumulated cost for CCS should be lower than carbon price.



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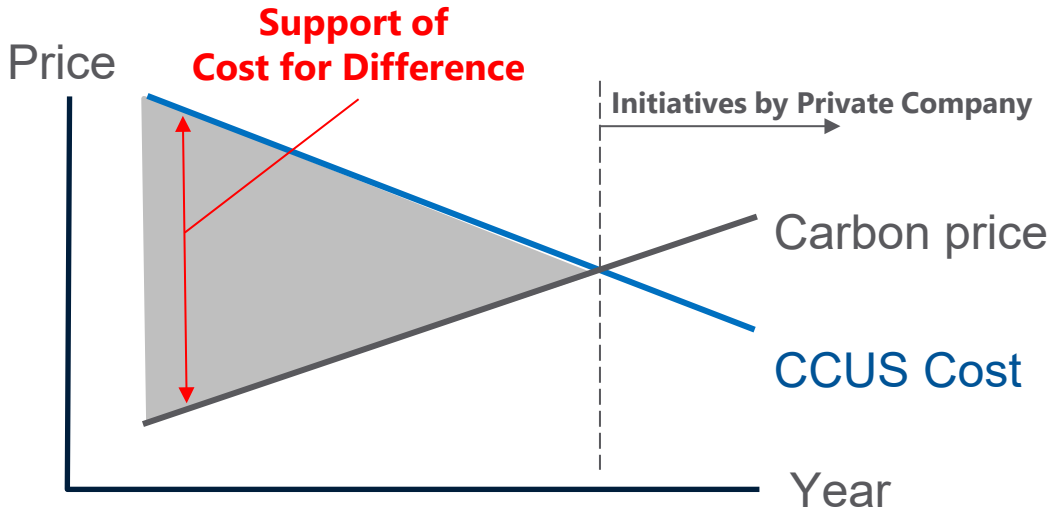
Source: Trading Economics - EU Carbon Permits

- ✓ Governmental support such as cost for difference between CCUS cost (Capture+Transport+Storage) and carbon price will also be crucial for the implementation of CCS.



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