

June 22, 2021
Nippon Gas Line Co., Ltd.
Kawasaki Kisen Kaisha, Ltd.
Ochanomizu University
Engineering Advancement Association of Japan

Participation in R&D and demonstration project for CO₂ marine transportation

Nippon Gas Line Co., Ltd. (hereinafter NGL), Kawasaki Kisen Kaisha, Ltd. (hereinafter "K" LINE) and Ochanomizu University will participate in the New Energy and Industrial Technology Development Organization (NEDO) project, "CCUS R&D and Demonstration Related Project / Large-scale CCUS Demonstration in Tomakomai / Demonstration Project on CO₂ Transportation" on consignment from Engineering Advancement Association of Japan (hereinafter ENAA) and promote the development for social implementation of liquified CO₂ maritime transportation.

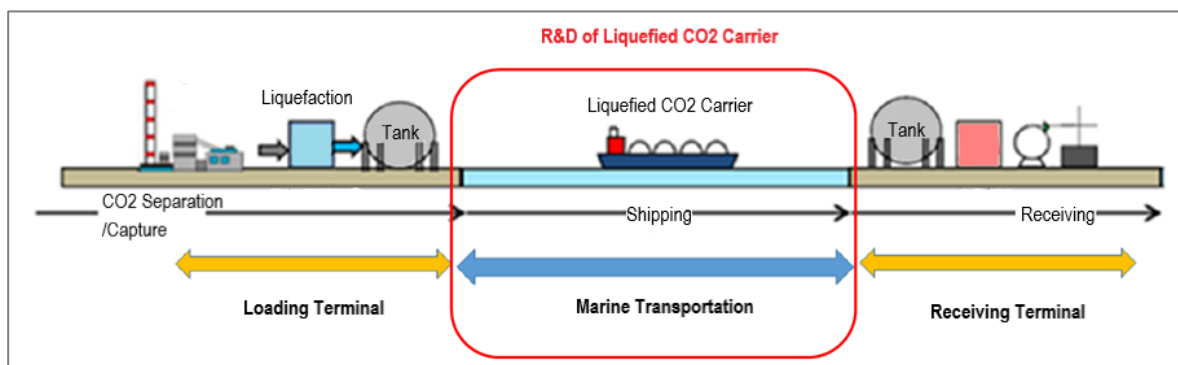
CCUS (Carbon dioxide Capture, Utilization and Storage) is a technology that can capture, effectively utilize and store the CO₂ emissions from fossil power generation and industrial processes. CCUS is expected to play a key role in contributing to the achievement of Carbon Neutrality by 2050. NGL, "K" LINE, Ochanomizu University and ENAA will jointly develop technologies for liquefied CO₂ marine transportation and contribute to the realization of long-distance / large-scale CO₂ transportation enabling cost reduction through the development of CCUS technology in the demonstration project.

Since 1962, NGL has been engaged in marine transportation of LPG and other pressurized liquefied gases nationwide and Asia. We have accumulated skills, knowledge, and experience in ship operation, cargo handling and ship management by continuously owning and managing multiple vessels through our long years of operation business.

We have seriously concerned about environmental issues, especially for the climate change on our planet where we are performing our activities. In 2010, we placed Japan's first electric propulsion LPG carrier "Izumi Maru No.10," which enables to reduce Carbon Dioxide emissions, in service. Additionally, we are carrying renewable fuels such as Palm Kernel Shells (PKS) and Wood Pellets in our ocean-going general cargo shipping business.

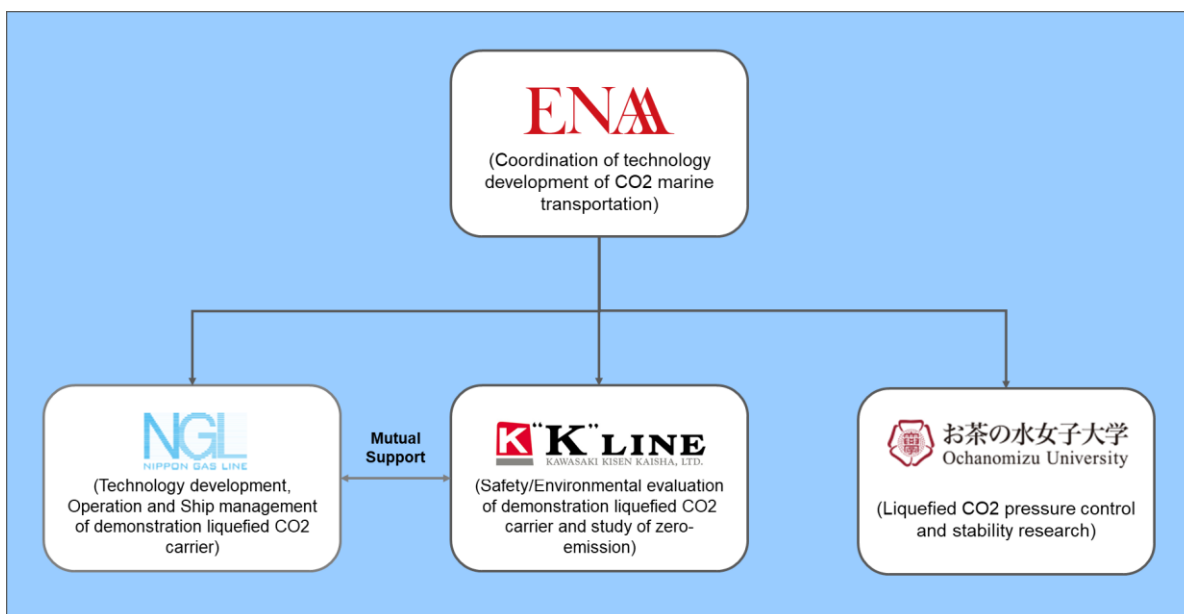
In this project, with utilizing the experiences we have gained for 60 years as a marine transporter of pressurized liquefied gas, we will work on developing safe and efficient technology of liquified CO₂ maritime transportation, and we will operate, manage and handle cargo in the demonstration liquefied CO₂ carrier's operation.

<Our scope of demonstration project>



* The figure is quoted from the materials of the Ministry of Economy, Trade and Industry.

<Our organization chart and role>



Organization name	Role
Engineering Advancement Association of Japan	<p><u>Coordination of R&D and demonstration project for CO2 marine transportation</u></p> <p>Take charge of planning, evaluation, analysis and coordination of R&D and demonstration project of liquefied CO2 carrier based on advanced research of CO2 transportation technology, which started as the NEDO project "Conceptual design of CO2 transportation system" since 2008.</p>
Nippon Gas Line Co.,Ltd.	<p><u>R&D of marine transportation, and Operation and Ship management of the demonstration liquefied CO2 carrier</u></p> <p>Take charge of developing safe and efficient liquefied CO2 marine transportation technology, and operating and managing the demonstration liquefied CO2 carrier based on 60-year experience of pressurized liquefied gas carriers (as one of the largest domestic ship operator specialized in LPG carrier).</p>
Kawasaki Kisen Kaisha, Ltd.	<p><u>Safety / environmental evaluation of the demonstration liquefied CO2 carrier and Study of Zero-emission</u></p> <p>Promote R&D of the demonstration liquefied CO2 carrier with extensive experience of ocean-going liquefied gas vessels. Conduct a safety / environmental evaluation in consideration of regulatory surrounding international liquefied gas carriers and establish technical guidelines.</p>
Ochanomizu University	<p><u>Research of liquefied CO2 pressure control and stability</u></p> <p>Conduct basic research of CO2 physical properties under non-equilibrium conditions and dry-ice phenomenon during marine transportation with experience in studying non-equilibrium phenomena of reactive fluid.</p>