PRESS RELEASE

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Chiyoda, NYK, and KNCC Conduct Quantitative Comparison of CO2 Liquefaction, Temporary Storage, and Transportation

--Combining Engineering and Shipping Expertise --

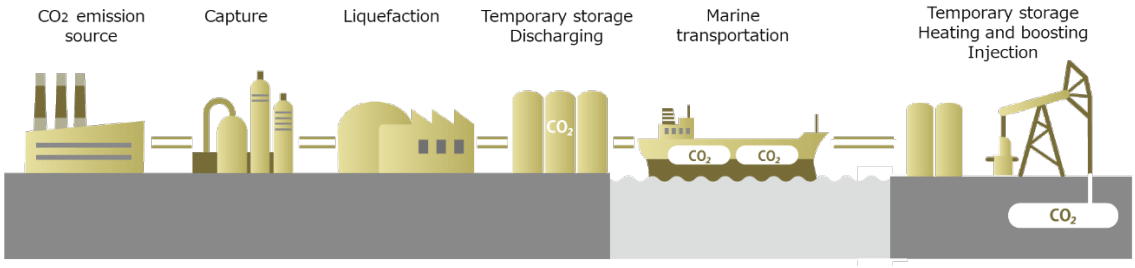
Chiyoda Corporation
Nippon Yusen Kabushiki Kaisha (NYK)
Knutsen NYK Carbon Carriers AS

Chiyoda Corporation(Chiyoda) , Nippon Yusen Kabushiki Kaisha (NYK), and its affiliate Knutsen NYK Carbon Carriers AS (KNCC) have conducted a joint study to quantitatively evaluate and verify the feasibility of the CCUS (carbon capture, utilization, and storage) value chain — including liquefaction, temporary storage, and marine transportation of carbon dioxide. The study covered the three methods of EP (elevated pressure), MP (medium pressure), and LP (low pressure), which are assumed to be the technologies for CCUS. Going forward, the three companies will combine their engineering and shipping expertise to promote technical and economic studies of the three methods further and contribute to the social implementation of CCUS.

Many CCUS projects are currently being planned worldwide, and several CCUS projects are expected to be launched in Japan in the late 2020s and beyond. In those projects, the prolonged construction period for installing large tanks on land will likely become a significant issue. The MP and LP methods assume the installation of Type-C tanks* on liquefied CO_2 carriers and large tanks at onshore storage facilities as the primary method. On the other hand, the EP method assumes the utilization of cylinder tanks, which are based on the manufacturing principle of existing pipelines, not only for liquefied CO_2 carriers but also for onshore storage facilities. In this joint study, the three companies confirmed that using these cylinder tanks for onshore storage facilities will lead to a significant reduction in the construction period, effective use of land, reduction of investment and operating costs, and improvement of energy efficiency required for operation.

The three companies will present details of their findings in March at an event hosted by the Global CCS Institute (GCCSI),** an international think tank on CCUS. For more information on the event, click here.

Overview of CCUS value chain



Scope of each company

Company	Scope
Chiyoda Corporation	Liquefaction, temporary storage, discharging and receiving side facilities (including ancillary facilities up to injection conditions)
NYK, KNCC	Study of liquefied CO_2 carrier and simulation of marine transportation

Comparison items

	Items
1	Economic evaluation of capital expenditure and operation expenses
2	Comparison of required site area for onshore temporary storage tanks
3	Comparison of estimated construction period
4	Quantitative evaluation of CO_2 emissions
5	Clarification of issues such as laws and regulations

* Type-C tank

One of the types of tanks for gas cargo specified in the IGC Code and the only type with pressure-resistant performance.

** GCCSI

An international think-tank established to promote the use of carbon capture and storage (CCS) technologies worldwide.

Website: https://www.globalccsinstitute.com/

Company Overviews

Chiyoda Corporation
Head office: Minatomirai Grand Central Tower
4-6-2, Minatomirai, Nishi-ku, Yokohama 220-8765, Japan
Representative: Masakazu Sakakida, Chairman of the Board & CEO
Website: https://www.chiyodacorp.com/en/

Nippon Yusen Kabushiki Kaisha (NYK)
Head office: 2-3-2 Marunouchi, Chiyoda-ku, Tokyo, Japan
Representative: Takaya Soga, President
Website: https://www.nyk.com/english/

Knutsen NYK Carbon Carriers AS
Head Office: Haugesund, Norway
Representative: Anders Lepsøe, CEO
Website: https://www.kn-cc.com

For more information, please contact:
Chiyoda Corporation
IR、PR＆Sustainability Advanced Section
Email: irpr@chiyodacorp.com
URL: https://www.chiyodacorp.com/en/contact/index.php