



JX Nippon Oil & Gas Exploration



FUTURE
ENERGY
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Cooperative Research Centre

LETA

Low Emission
Technology
Australia



Mitsui O.S.K. Lines

Daigas
Group

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JX Nippon Oil & Gas Exploration Corporation

Future Energy Exports CRC Limited

Low Emission Technology Australia

Mitsui O.S.K. Lines, Ltd.

Osaka Gas Co., Ltd.

Australian Japanese partners execute R&D Project Agreement to develop safe and efficient solutions for industrial-scale shipping of CO₂

JX Nippon Oil & Gas Exploration Corporation (“**JX NOEX**”), Future Energy Exports CRC Limited (“**FEnEx CRC**”), Low Emission Technology Australia (“**LETA**”), Mitsui O.S.K. Lines, Ltd. (“**MOL**”), and Osaka Gas Co., Ltd. (“**Osaka Gas**”) have executed a Project Agreement for the “**LP Technology R&D Project**” to conduct research and development to demonstrate the technical feasibility and operability of low-pressure and low temperature solutions for the bulk transport of CO₂ by ships.

The **LP Technology R&D Project** will involve studying behaviour and boil off characteristics of liquid CO₂ under dynamic operating conditions and the impact of non-CO₂ components through the following activities. This LP Technology R&D Project will be executed by FEnEx CRC, University of Western Australia, Curtin University, Seoul National University and deepC Store Pty Ltd.

1. Conducting experiments using laboratory scale facilities (such as pressure cell and boil-off apparatus) to study the phase behaviour and boil off characteristics of liquid CO₂ under dynamic operating conditions and the impact of non-CO₂ components;
2. Incorporating new data into custom engineering models for CO₂ boil off and phase behaviour calculations developed by the FEnEx CRC and using the new data to test predictions made with existing software tools; and

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3. Designing pilot-scale Carbon Capture, Utilisation &/or Storage (CCUS) demonstration tests or project needed to validate the engineering models anchored to laboratory data that can be up-scaled as part of a subsequent project.

The current design of liquefied CO₂ vessels has a limited storage volume due to their operating pressure and temperature (18 bar, -26 °C). Low pressures and low temperatures (approximately 7 bar, -49°C) are considered one of the best options to significantly reduce costs for CO₂ vessel design. However, there is no record of liquefied CO₂ transportation by ship under low pressure and low temperatures conditions. Therefore, it is necessary to address operational risks and enhance the likelihood of technical feasibility.

Through this LP Technology R&D Project, we aim to mature the technologies needed to safely and efficiently ship large quantities of CO₂. Through future demonstration of this LP Technology, we aspire to assist Australia and the broader Asia Pacific region reach Net Zero by linking key emission sources to long-term utilisation and storage solutions.

Comment from JX NOEX Executive Officer, General Manger, Sustainable Business Unit, Yasuto Ariga

“We will make collaborative efforts with Project partners to develop a feasible CO₂ bulk transportation method through this Project. In addition, we are taking this opportunity to build good relationship with industry, government and academia in Australia for its large potential CO₂ sequestration capacity, and also promote cooperation with Project partners for realisation of an overseas CCS project.”

Comment from FEnEx CRC Chief Executive Officer & Managing Director, Professor Eric May

“Australia has a unique opportunity to take a leadership role in developing industrial-scale CO₂ transport. Successful research in this area will help maximise economic opportunities for Australia as well as forge increased international collaboration and cooperation vital to progressing our decarbonisation goals.

Comment from LETA Chief Executive Officer, Mark McCallum

“LETA has been investing in low emissions technologies for more than a decade to significantly reduce emissions and support the transition to a low emission global economy. LETA is proud to be investing in this project, which can assist in proving up technologies to enable transport of commercial quantities of CO₂ from industrial facilities in Asia to storage locations in Australia and to build on the key trading and commercial relationship Australia’s export industries have spent generations building.”

Comment from MOL Executive Officer, Yasuchika Noma

“We are very honoured and excited to have this opportunity to jointly collaborate with Australian research institutions and Japanese companies to advance the technical and commercial maturation for liquefied CO₂ shipping transportation under low pressures and low temperatures. We believe the result of this project can be one step closer to the realization of a lower carbon future.”

Comment from Osaka Gas Associate Director, Norio Hatanaka

“Daigas Group declared its commitment to take on the challenge of achieving carbon neutrality by 2050 in January 2021. In the “Energy Transition 2030” formulated in March 2023, we have declared its commitment to contribute to a sustainable society by establishing a CO₂ value chain that includes capturing CO₂ emitted and reusing it as e-methane, a carbon-neutral synthetic methane, and reducing environmental impact by injection and storage of excess CO₂ deep underground. Low pressure and low temperature liquefied CO₂ is an essential technology for economical CO₂ transport. We expect to gain knowledge for handling CO₂ under this demonstration condition which we have not experienced before.”

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