Northern Territory Low Emission Carbon Capture Storage and Utilisation Hub

Transnational CO_2 shipping

CSIRO has undertaken a high level assessment of the technical, logistical and cost considerations of CO_2 shipping to the hub.

This report comprises the first report of the Northern Territory Low Emission Carbon Capture Storage and Utilisation (CCUS) Hub Business Case project.

CSIRO has undertaken a high-level assessment of technologies and logistical considerations around CO_2 shipping and estimation of costs.

The low-emission opportunity in the Northern Territory

The Northern Territory's abundant natural gas, solar resources, and CO_2 storage potential, along with its proximity to international markets, make it a key player in energy exports and decarbonisation in Australia and the region.

The NT Government has adopted a 2050 net-zero emissions target and is seeking ways to rapidly decarbonise existing energy supplies and attract future zero-emission industries.

Capital city Darwin, a gateway to South-East Asia and the location of globally significant liquid natural gas (LNG) export and industrial activity, is the proposed site for a large-scale Low Emission CCUS Hub. Led by CSIRO, a collaboration is underway on a business case project assessing the Hub's viability on the Middle Arm Peninsula.

If realised, the NT CCUS Hub could be one of the world's largest multi-user, multi-access hubs. One of the aims of the business case project is to identify transition pathways for industry in the region by sharing knowledge and experience that will help improve the likelihood of success.

By taking a collaborative and regional view, an accelerated and sustainable industry transition can be explored.

The Northern Territory CCUS business case project

- CSIRO is working to identify decarbonisation and transition pathways for existing and potential future industries that may be established in Low Emissions Hub in the Darwin region of the NT.
- We are working collaboratively with the NT Government and industry on the business case project to assess the viability of a large-scale low-emission CCUS Hub on the Middle Arm of Darwin Harbour.
- This project is also investigating other decarbonisation opportunities as well as CCUS including sector coupling and renewable electrification.
- Task 8 of this project was an assessment of the technical and logistical considerations around CO_2 shipping and estimation of costs.
- Understanding CO_2 shipping is an important consideration in the development of CCUS hubs globally, as it can enable emissions reductions from regions without suitable CO_2 storage geology, and can provide sufficient volume to lower the unit cost of storage.

The role of CO_2 shipping

There is substantial global interest in CO_2 shipping as an enabling mechanism for jurisdictions that have limited geological storage: allowing them to transport captured CO_2 from hard-to-abate industries to areas with more geological storage capacity, and thus reduce their CO_2 emissions.

Given the significant geological CO_2 potential storage capacity of the NT's offshore basins, there is potential for CO_2 captured overseas to be stored there. The Northern Territory's position at the gateway to Asia, and its existing trading relationships with countries which are considering CO_2 shipping as part of their decarbonisation strategies, makes the NT CCUS hub a possible location for imports of CO_2.

The carbon capture, transport and storage (CCTS) value chain is often described in terms of three components:

1. Point source carbon capture, after which the CO_2 is either compressed or liquefied before being transported.
2. Transport, including by pipelines, road/rail or ships.
3. Usage, for example in the production of various chemicals, or storage permanently within deep geological formations.

While the costs of CO_2 shipping are high, previous research has highlighted that for long distances – such as the routes between Darwin and Singapore, South Korea, and Japan – shipping is the only viable transport option.

Importantly, CO_2 shipping is also seen as a way of increasing the capacity for CO_2 storage projects, where greater volumes of CO_2 reduce the unit cost of storage. The approach of including an import-export terminal is part of the business model being considered by many CCUS projects around the North Sea.

As part of the broader economic assessment of a CCUS hub in Darwin, CSIRO has undertaken research to understand the system-level costs of CO_2 shipping.

Approach and key findings

This report:

1. Provides an overview of the CCTS value chain and describes the key assets required to transport CO_2 from its capture source to the final storage site.
2. Describes previous models that have been developed and recent contributions to issues relevant to the value chain.
3. Presents results of the development of a logistics and technoeconomic model to estimate the levelised cost of importing CO_2 from the Port of Kawasaki, Japan, to the Port of Darwin.

CSIRO consulted widely with industry and government stakeholders, including with developers of CO_2 shipping projects for guidance on the inputs into the models used.

The modelling suggests that CO_2 shipping from Japan to Darwin could be realised at costs ranging from A$113/T to $228/T, with the variation driven in part by the annual volumes of CO_2 transported, as well as ship capacity. Achieving the lower end of this modelled cost range depends on using the largest ships modelled and leveraging economies of scale by spreading the fixed infrastructure costs over larger CO_2 volumes.

It should be noted that the results do not consider detailed proponent design considerations, their individual needs or commercial arrangements and further cost optimisations may be identified with more detailed studies.

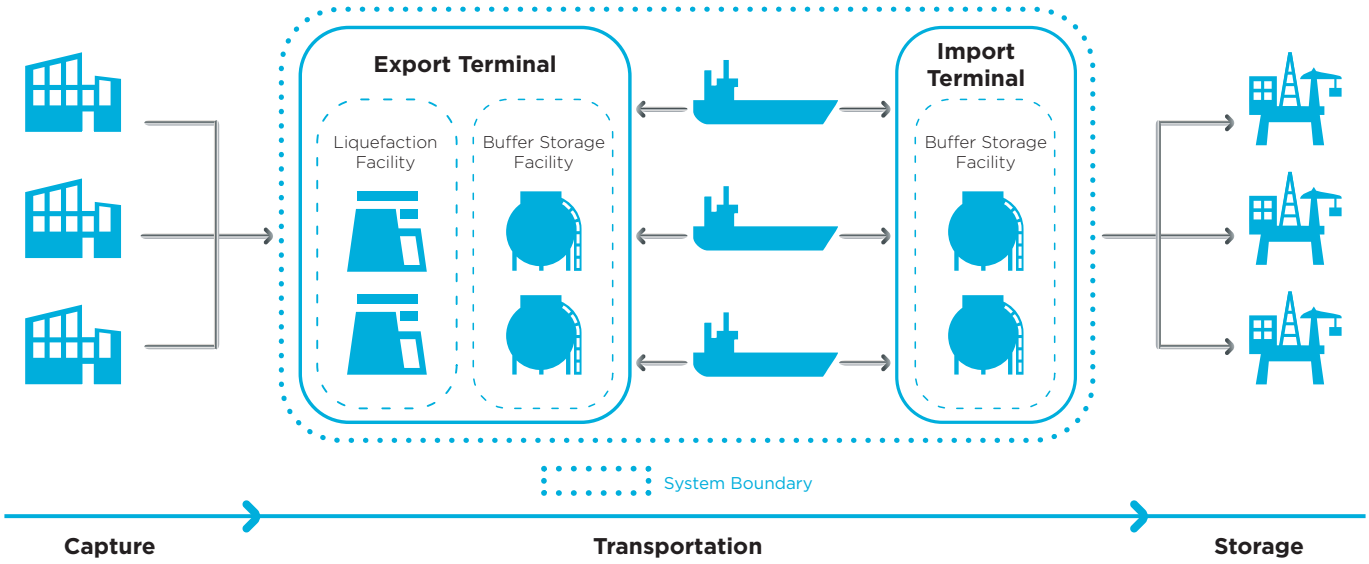

Figure 1: Overview of the CCTS value chain

The CCUS business case project includes inputs from the wider Northern Territory Low Emissions Hub (NT LEH) collaboration group, whose current members include the Northern Territory Government, Xodus, INPEX, Santos, Woodside Energy, Eni, Total Energies, SK E&S and Tamboran Resources. CSIRO has sought feedback from government and industry on the technical content of the report, CSIRO has sole discretion on including such feedback.

More information

Read the report

Learn more about the NT Low Emission Hub Research

For further information

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