September 2024

Carbon capture and storage in South Australia

Department for Energy and Mining

Department for Environment and Water

In collaboration with
South Australian Arid Lands Landscape Board

Government of South Australia

LANDSCAPE SOUTH AUSTRALIA SA ARID LANDS

Introduction

The Department for Energy and Mining, Department for Environment and Water and the South Australian Arid Lands Landscape Board are working collaboratively to achieve a zero-emissions economy for South Australia by 2050.

One key way of achieving this, as recognised by the Intergovernmental Panel on Climate Change and International Energy Agency, is through carbon capture and storage (CCS).

The implementation of carbon capture and storage, using depleted oil and gas fields in the Cooper Basin, will decarbonise existing emissions intensive industries and increase their global competitiveness in a carbon constrained future.

Co-regulatory agencies of South Australian Government adopt a science-based assessment process for CCS activities to ensure leading practice standards for safety, engineering and environmental protection are met. Approval decisions are made on a project-by-project basis to account for specific technical information and associated credible risks.

What is Carbon Capture and Storage (CCS)

As shown in Figure 1, CCS is a process that utilises existing technologies to separate carbon dioxide (CO_2) from industrial- and energy-related sources, compress the separated stream (normally over 95% CO_2 with other impurities), transport it to a storage location (normally deep geological structures such as depleted oil or gas fields), and inject the CO_2 stream for permanent storage.

The Moomba CCS Project

The Moomba Carbon Capture and Storage (CCS) project in northeast South Australia will permanently store up to 1.7 million tonnes per year of carbon dioxide into depleted fields of the Cooper Basin – representing a cut of more than seven per cent to South Australia's emissions. The Moomba CCS project, which commenced operation in September 2024, is one of the largest dedicated CCS projects in the world.

The Moomba CCS project is only approved to inject into the Permian-aged Toolachee formation which is a depleted gas reservoir that previously contained hydrocarbons for tens of millions of years. The CO_2 disposal will be in the storage complex of the Strzelecki and Marabooka depleted gas fields as shown in Figure 2 comprising of the depleted Toolachee gas formations (CO_2 shown in white).

The Moomba CCS project, along with all CCS in South Australia, is regulated through the widely recognised leading practice framework under the *Energy Resources Act 2000*, administered by the Department for Energy and Mining (DEM), alongside co-regulating agencies including the Department for Environment and Water (DEW) and the Environmental Protection Authority (EPA). The South Australian Arid Lands Landscape Board is also consulted through its responsibilities under the *Landscape Act 2019*.

Like all other regulated activities under the *Energy Resources Act 2000*, an approved Statement of Environmental Objectives (SEO) must be in place before an activity notification can be submitted to undertake CCS activities. SEOs are developed through an open and consultative process, based on potential risks identified in an associated Environmental Impact Report (EIR). The SEO must state the environmental objectives to be achieved in carrying out specified activities in a specified location, as well as the assessment criteria used to assess if an objective has been achieved.

On 22 April 2021, the Santos Carbon Storage SEO was approved, gazetted and published on the DEM website.

SOUTH AUSTRALIA

Government of South Australia

Department for Energy and Mining
www.energymining.sa.gov.au
map.sarig.sa.gov.au

Level 4, 11 Waymouth Street, Adelaide SA 5000
GPO Box 618, Adelaide SA 5001
DEM.CustomerServices@sa.gov.au
Phone: +61 8 8463 3000

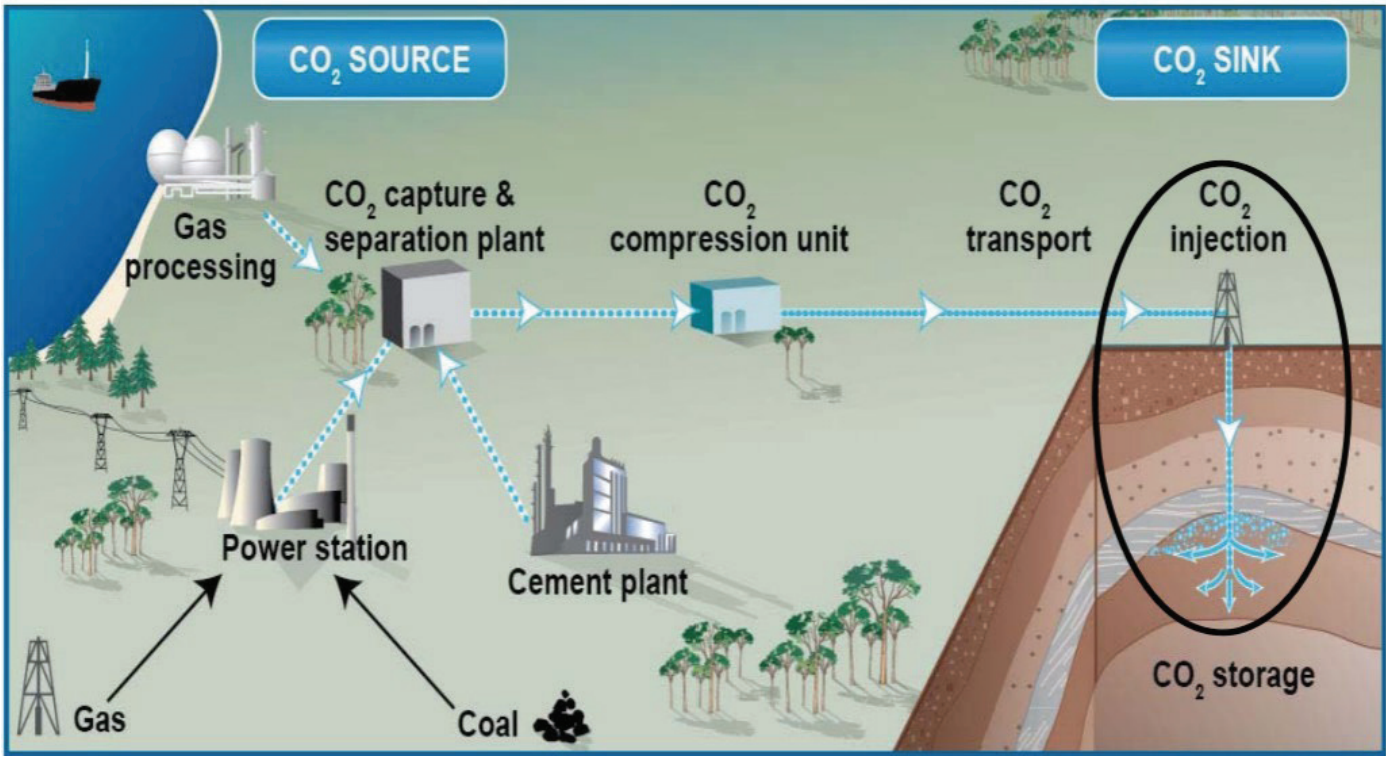

Figure 1 Simple illustration of CCS, Source: CO_2CRC

Managing Risk

There are two risks associated with this project classified as “Low” or “Very Low”.

1. Well integrity issues.
2. Lateral leakage from the storage reservoirs in the Cooper Basin.

Both these risks are controlled and mitigated through the Moomba CCS Monitoring and Verification Plan (M&V Plan) which has been accepted by both departments and approved by the Minister for Energy and Mining.

The M&V Plan is a project specific document with the primary purpose of confirming long-term containment of carbon dioxide, developed in accordance with recognised international and national industry standards and technical specifications.

Key monitoring elements of the M&V Plan include:

- injection telemetry – surface flow, pressure and temperature data;
- reservoir surveillance – pressure monitoring via downhole gauges, carbon dioxide saturation logging, passive seismic monitoring and satellite-based surface displacement;
- well integrity – casing annulus pressure monitoring, cement bond logging, casing and tubing evaluation logging; and
- environmental assurance – downhole water sampling.

Verification under the M&V Plan includes:

- a comparison to baseline measurements and expectations within a set deviation tolerance;
- confirming the absence of injected carbon dioxide in overlying reservoirs of the Great Artesian Basin or separate lateral structures; and
- integration of all monitoring data into a dynamic reservoir model that predicts the movement and behaviour of the carbon dioxide plume.

Closure criteria are also defined in the M&V Plan and must be met before monitoring post-injection may cease and the gas storage licence may be relinquished. It is at this stage where there must be a level of confidence in the monitoring data and reservoir model, such that the residual risk of a loss of containment is low and acceptable to the government.

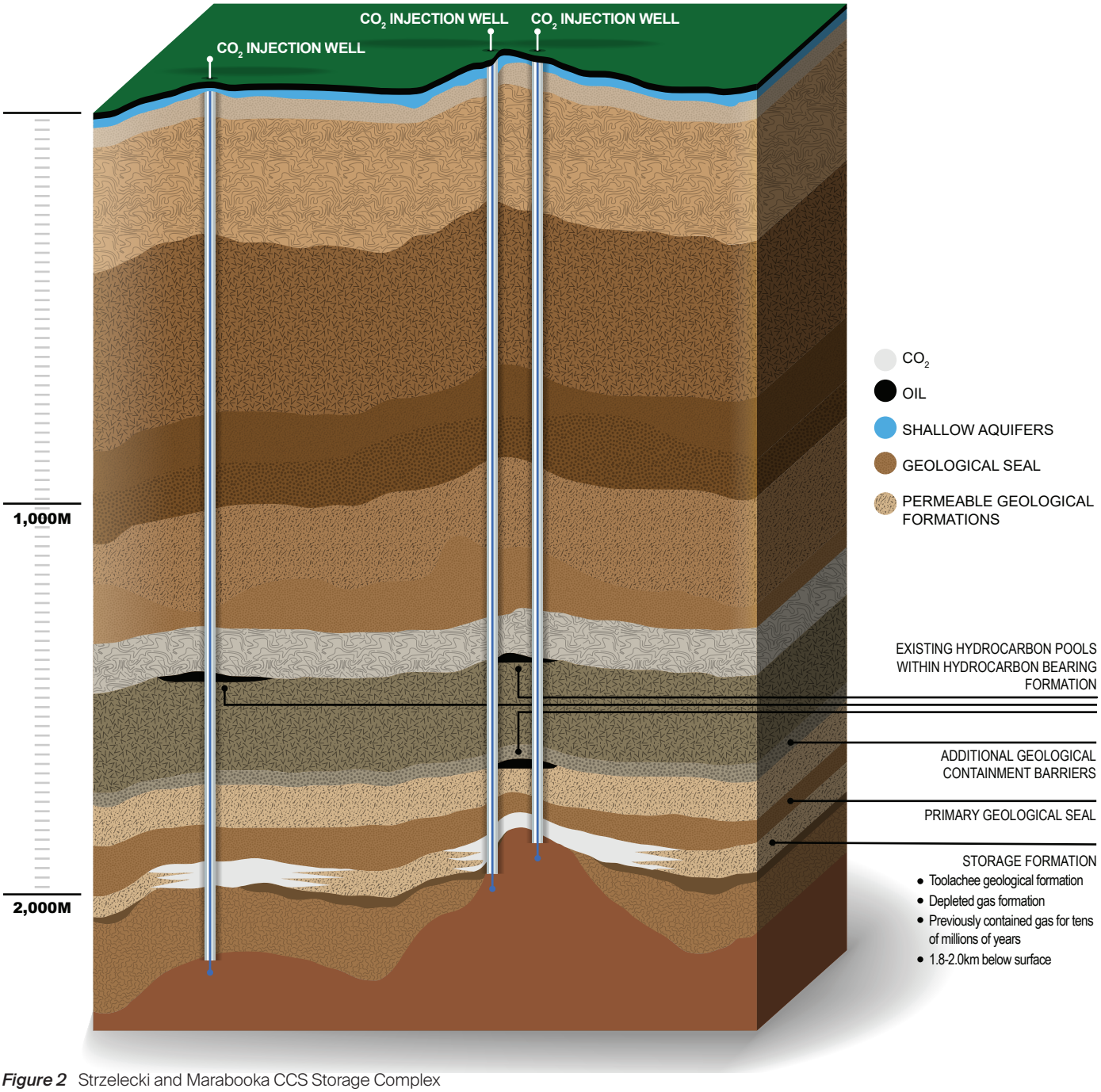

Figure 2 Strzelecki and Marabooka CCS Storage Complex

ACKNOWLEDGEMENT OF COUNTRY

We acknowledge and respect Aboriginal people as the state's first peoples and nations, and recognise them as traditional owners and occupants of land and waters in South Australia. Further, we acknowledge that the spiritual, social, cultural and economic practices of Aboriginal people come from their traditional lands and waters, that they maintain their cultural and heritage beliefs, languages and laws which are of ongoing importance, and that they have made and continue to make a unique and irreplaceable contribution to the state.

We acknowledge that Aboriginal people have endured past injustice and dispossession of their traditional lands and waters.

FURTHER INFORMATION

Department for Energy and Mining
Level 4, 11 Waymouth Street, Adelaide
GPO Box 618 Adelaide SA 5001
T **+61 8 8463 3000**
E **DEM.EnergyRegulation@sa.gov.au**
www.energymining.sa.gov.au

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01/11/2024-205940