Carbon Capture and Storage – Yes or No?

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Carbon capture and storage (CCS) involves capturing, transporting and storing greenhouse gas emissions from fossil fuel consumption into the ground (1). We can use solar or wind instead of fossil fuel power to generate renewable electricity without creating CO2 emissions. However, it's tough for businesses like cement and lime companies to make its important products without generating high emissions (2). The information in this article, is a broad commentary on CCS in both Australia and internationally.

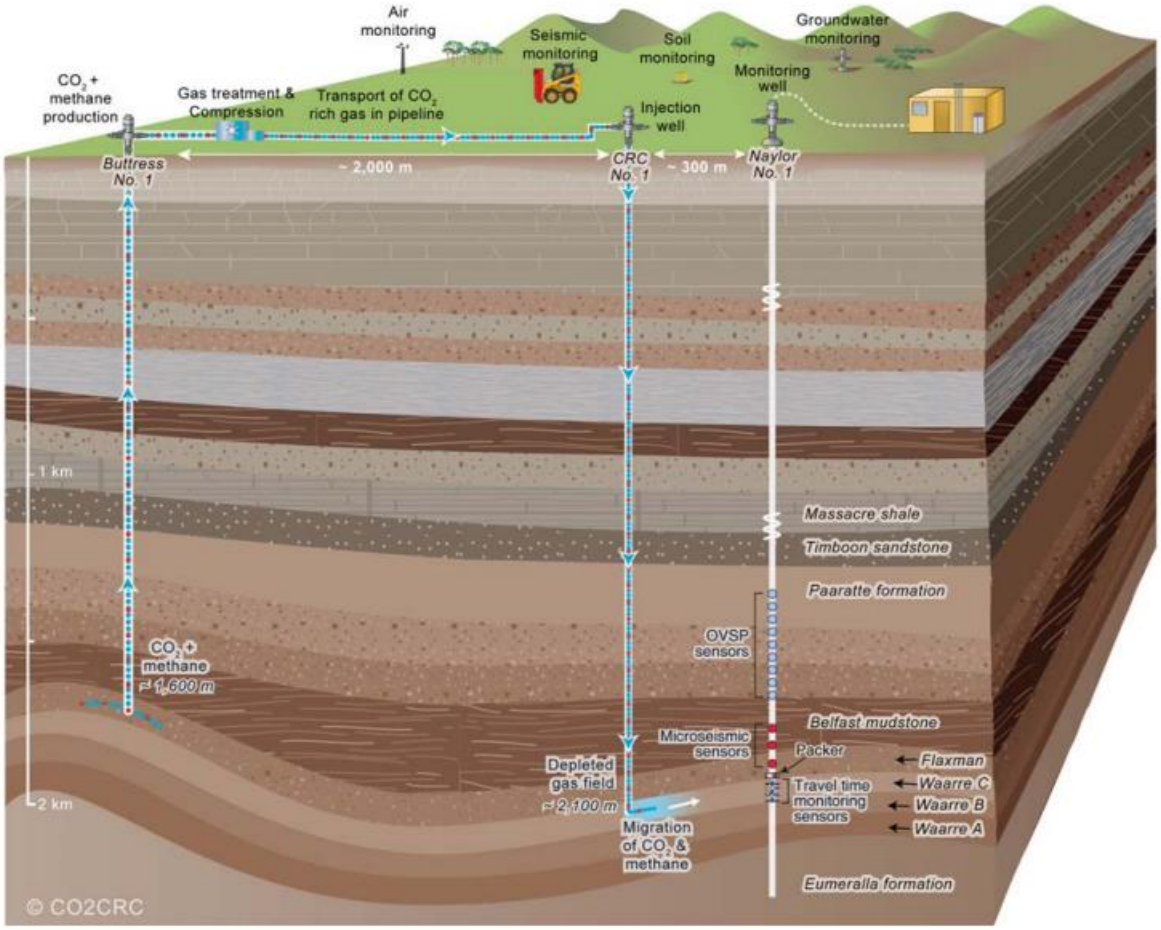

Figure 1: Otway Project, Australia

CCS in Australia

Australia has recognized the importance of CCS as a means to reduce greenhouse gas emissions and has developed a policy and government's commitment to advancing CCS technologies and provides a roadmap for their deployment. The government has provided funding such as Low Emissions Technology Development Fund (3) and Emissions Reduction Fund (4) to support CCS projects. Several CCS projects and initiatives have been undertaken in Australia. These include:

a. Gorgon Project (5): Located in Western Australia, one of the world's largest CCS projects, it captures CO2 from the natural gas production process and stores it underground.

b. CarbonNet Project (6): Located in Victoria, it aims to establish a commercial-scale CCS network that could store industrial CO2 emissions from multiple sources.

c. Otway Project (7): Australia's first CCS demonstration project, it involved injecting and storing CO2 in a depleted gas field in Victoria, providing valuable research and operational experience.

International CCS

Many countries have implemented policies and incentives to promote CCS deployment. These include carbon pricing mechanisms, tax credits, and research funding. The availability of suitable storage sites is crucial for CCS implementation (8). Globally, there are significant storage resources, including deep saline formations, depleted oil and gas reservoirs, and un-mineable coal seams. Developing the necessary infrastructure, such as pipelines for CO2 transport, is an important aspect of CCS deployment.

To reduce CO2 emissions, several countries have initiated CCS projects and research initiatives. Norway's Sleipner and Snøhvit projects (9), Canada's Boundary Dam project (10), and the United States' Petra Nova project (11) are notable examples. International collaboration, The Carbon Sequestration Leadership Forum (CSLF) is a global initiative for cooperation among governments, industry, and research organizations to advance CCS technologies and accelerating CCS deployment (12).

Challenges

Research has revealed that storing carbon dioxide underground is not an exact science and may be risky and uncertain with limited practical and long-term experience of permanently keeping CO2 in the ground (9). Each CCS project has unique geology with storage performance changing over the time that constant high-quality monitoring and engineering is required. Some CCS risks can be identified but others remaining unknown until troubles materialize. These risks and the costs are not being made part of public discourse by either industry or government (13). Therefore, usage of CCS has to overcome the risk as well as high costs, public acceptance, supportive policies and regulations, advancements in technology, and global efforts.

Conclusion

Australia and the international community have recognized the importance of carbon capture and storage as a means to reduce greenhouse gas emissions. Australia has made significant progress in developing CCS projects and establishing a supportive policy framework. Internationally, several countries are actively pursuing CCS initiatives, and collaborative efforts are underway to advance the technology. Overcoming challenges will be crucial in achieving global climate change mitigation goals.

References:

1: What is Carbon Capture and Storage? | Climate Council: https://www.climatecouncil.org.au/resources/what-is-carbon-capture-and-storage/

2: A concrete step forward: Australia's ambitious plan to cut cement and lime emissions - CSIRO: https://www.csiro.au/en/news/All/Articles/2023/November/CCUS-Roadmap

3: Government establishes $1 billion fund to develop low emissions technology | Global Australia: https://www.globalaustralia.gov.au/news-and-resources/news-items/government-establishes-1-billion-fund-develop-low-emissions-technology#:~:text=The%20Australian%20Government%20will%20establish%20a%20%241%20billion,Corporation%20with%20%24500%20million%20from%20private%20sector%20investors.

4: Emissions Reduction Fund ACCU Scheme (cleanenergyregulator.gov.au): https://www.cleanenergyregulator.gov.au/erf

5: World's biggest carbon capture plant running at one third capacity, Chevron Australia reveals - ABC News: https://www.abc.net.au/news/2023-05-17/chevron-australia-carbon-capture-storage-gorgon-third-capacity/102357652

6: CarbonNet project's pipeline approved | Gippsland Times: https://www.gippslandtimes.com.au/news/2023/11/06/carbonnet-projects-pipeline-approved/

7: Otway Basin Pilot Project, Victoria, Australia: https://fossil.energy.gov/archives/cslf/sites/default/files/documents/OtwayBasinPilotProjectPoster0307.pdf

8: Environmental Guidelines for Carbon Dioxide Capture and Geological Storage (nepc.gov.au): https://www.nepc.gov.au/sites/default/files/2022-09/environmental-guidelines-ccs.pdf

9: Norway’s Sleipner and Snøhvit CCS: Industry models or cautionary tales? | IEEFA: https://ieefa.org/resources/norways-sleipner-and-snohvit-ccs-industry-models-or-cautionary-tales

10: Boundary Dam Carbon Capture and Storage Project - Canada | UNFCCC: https://unfccc.int/climate-action/momentum-for-change/activity-database/boundary-dam-carbon-capture-and-storage-project

11: Carbon capture project back at Texas coal plant after 3-year shutdown | Reuters: https://www.reuters.com/business/energy/carbon-capture-project-back-texas-coal-plant-after-3-year-shutdown-2023-09-14/

12: About CSLF | Carbon Sequestration Leadership Forum (energy.gov): https://fossil.energy.gov/archives/cslf/About-CSLF.html

13: Norway’s carbon capture and storage projects augur geological risks in global aspirations to bury carbon dioxide | IEEFA: https://ieefa.org/articles/norways-carbon-capture-and-storage-projects-augur-geological-risks-global-aspirations-bury