LETA

Low Emission Technology Australia

Submission to the inquiry into Glencore's proposed carbon capture and storage project

MAY 2024

Foreword

Low Emission Technology Australia (LETA) is a A$700 million fund established in 2006 by the Australian black coal industry to invest in technologies that significantly reduce emissions and support the transition to a low emission global economy, in line with the Paris Agreement.

LETA partners with government, research institutions, universities and industry locally and internationally to develop projects that can, over time, reduce and remove greenhouse gas emissions from large-scale industrial processes such as power generation, steel and cement manufacturing, mining, and future energy sources such as cleaner (lowcarbon) hydrogen. Further information about LETA can be found on our website, at www.letaustralia.com.au.

LETA welcomes the opportunity to make this submission to the Committee's inquiry into Glencore's proposed carbon capture and storage project (CTSCo).

LETA has been a partner in the CTSCo project since 2014, as part of a group that has provided funding and technical support in collaboration with the Federal Government, ANLEC R&D, Marubeni and JPower.

This inquiry comes at a critical time for Australia's transition to a net zero economy. Low emission technologies, operating alongside renewables, will play a critical role in the transition. As part of a portfolio of action to reduce emissions, CCS can further empower Australia to meet its emission reduction targets while also supporting the continuation of critical industries like cement, steel and chemicals.

LETA would welcome the opportunity to discuss this submission with the Committee. If you have any questions, or if we can provide any assistance to the Committee, please do not hesitate to contact , Director of External Affairs on or at

Key points

- Low Emission Technology Australia (LETA) is a A$700 million fund established in 2006 by the Australian black coal industry to invest in a range of technologies that significantly reduce greenhouse gas emissions and support the transition to a low emission global economy, in line with the Paris Agreement and Australia's emissions reduction targets.
- LETA has been a partner in the CTSCo project since 2014, as part of a group that has provided funding and technical support in collaboration with the Federal Government, ANLEC R&D, Marubeni and JPower.
- CCS is an established technology currently being used to abate millions of tonnes of CO_2 every year at sites in Australia and around the world.
- Both the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC) have recognised that reaching net zero without technologies like CCS will be "virtually impossible". In Australia, the Climate Change Authority has found that carbon sequestration is a necessary part of our rapid decarbonisation, presenting a huge opportunity for Australia.
- For a range of facilities covered under the Safeguard Mechanism, CCS presents one of the few on-site carbon abatement options that can be deployed to reduce emissions. This includes in industries like steel and cement that employ over 100,000 workers.
- Australia has a natural competitive advantage to implement CCS with known high-quality, stable geological storage basins, existing infrastructure, world-class technical expertise and regulatory regimes.
- Once operational, CTSCo will be a major contributor to the Australian and Queensland Government's emission reduction goals.
- The project will store 330,000 tonnes of almost pure food-grade CO_2—similar to that found in soft drinks, beer or champagne—at depths of more than 2,300 metres.

- The rock into which the food grade CO_2 will be injected contains non-drinkable water with fluoride levels six times above safe drinking level and is not used by any agricultural producer within a 50 kilometre radius.
- The CTSCo project has been subject to extensive and rigorous environmental assessment, through a detailed and public Environmental Impact Statement (EIS) process. The final EIS submitted by CTSCo contained over 3,000 pages of peer-reviewed science.
- The project has been reviewed by expert third-party institutions, including the Australian Government Independent Expert Scientific Committee (IESC), the Queensland Office of Groundwater Impact Assessment (OGIA) and CSIRO who concluded that any impacts would be local and minor.
- Onshore storage of CO_2 is critical for the long-term viability of key industries like cement, steel and chemical manufacturing—industries in which Australia has an existing competitive advantage. Without access to carbon storage, these industries, particularly in Queensland, in communities like Gladstone, Mackay and Townsville are at risk to competition from overseas industries who have an emission reduction solution.
- Countries including the United States, United Kingdom, Canada, Japan, Korea, Norway, Netherlands and Denmark have already committed tens of billions of dollars to CCS projects to support their own industries reduce emissions and remain competitive in a net zero global economy. Australia is being left behind when it comes to supporting the adoption of this technology.
- The success of the CTSCo project is an essential part of ensuring the future of CCS in Australia and subsequently our ability to decarbonise a wide range of local industries.

1.

Introduction

Low Emission Technology Australia (LETA) is a A$700 million fund established in 2006 by the Australian black coal industry to invest in technologies that significantly reduce emissions and support the transition to a low emission global economy, in line with the Paris Agreement.

LETA partners with government, research institutions, universities and industry locally and internationally to develop projects that reduce and remove greenhouse gas emissions from large scale industrial processes such as power generation, steel and cement manufacturing, mining, and future energy sources such as low-carbon hydrogen. Further information about LETA can be found on our website: www.letaustralia.com.au.

LETA welcomes the opportunity to make this submission to the Senate Environment and Communications Committee's inquiry into Glencore's proposed carbon capture and storage project (CTSCo).

Carbon capture and storage (CCS) can be used to capture more than 95 per cent of carbon dioxide (CO_2) emitted from industrial facilities and power stations. Once this CO_2 is captured it can either be transported to an injection site and stored permanently underground in geological formations or repurposed by industry.

LETA has been a partner in the CTSCo project since 2014, as part of a group that has provided funding and technical support in collaboration with the Federal Government, ANLEC R&D, Marubeni and JPower.

This inquiry comes at a critical time for Australia's transition to a net zero economy. Low emission technologies, operating alongside renewables, will play a critical role in the transition. As part of a portfolio of action to reduce emissions, CCS can further empower Australia to meet its emission reduction targets while also supporting the continuation of critical industries like cement, steel and chemicals.

CCS is an established technology currently being used to abate millions of tonnes of CO_2 every year at sites in Australia and around the world. Australia cannot afford to be left behind when it comes to supporting the adoption of this technology. The success of the CTSCo project is an essential part of ensuring the future of CCS in Australia and subsequently our ability to decarbonise a wide range of local industries.

2.

The role of CCS in mitigating climate change

There are four key ways in which CCS technology can contribute to Australia's clean energy future:

1. Retrofitting carbon capture units, attaching them to existing power and industrial plants to separate and capture greenhouse gas emissions.
2. Reducing emissions in hard to abate sectors like cement, steel and chemicals manufacturing where Australia has existing competitive advantages.
3. Enabling the production of low-carbon hydrogen, a least-cost option in several regions around the world.
4. Directly capturing emissions from the atmosphere through direct air capture, removing greenhouses gases from the atmosphere that are otherwise difficult to avoid.

Almost all advanced economies have committed to reach net zero greenhouse gas emissions by 2050 or earlier. At the same time, both the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC) have recognised that reaching net zero without technologies like CCS will be "virtually impossible".[1] In Australia, the Climate Change Authority has found that carbon sequestration is a necessary part of our rapid decarbonisation, presenting a huge opportunity for Australia.[2]

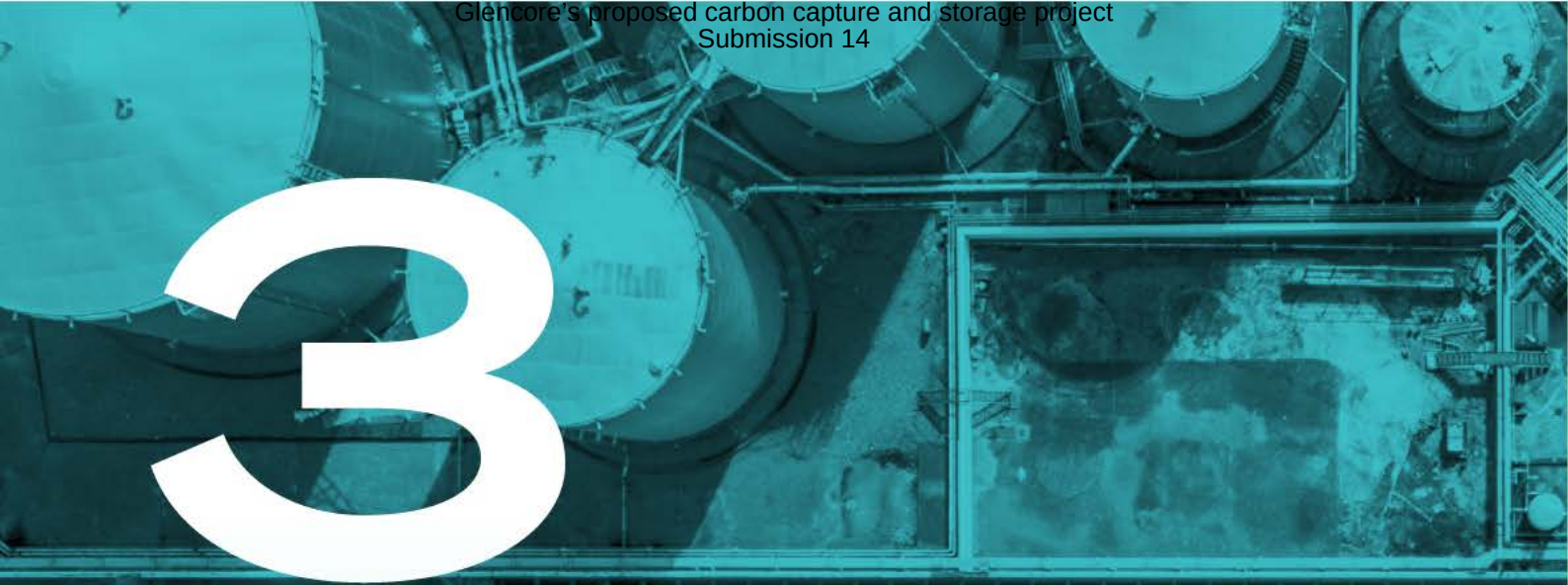
Australia's commitment to a 43 per cent emissions reduction on 2005 levels by 2030 and a commitment to net zero emissions by 2050 also means Australia's continued economic prosperity, productivity performance and our ability to harness the opportunities presented by a cleaner energy future depends on our access to all forms of energy and internationally competitive industries.

For a range of facilities covered under the Safeguard Mechanism, CCS presents one of the few on-site carbon abatement options that can be deployed to reduce emissions. This includes in industries like steel and cement that employ over 100,000 workers. Over time, CCS could provide these industries with a viable, cost-effective pathway to net zero without businesses relying solely on carbon offset initiatives.

Importantly, given the scale of emissions reduction required to meet global emissions reduction commitments, CCS technology can make a significant contribution in the short-term and support cost competitive cleaner fuels like low emission hydrogen solutions like hydrogen. In 2022, 94 million of the 95 million tonnes of global hydrogen were produced using coal and gas. The opportunity for CCS to technology to reduce carbon emissions from this process is huge, particularly in regions where the cost of green hydrogen generation is high. As the IEA has noted, low emission hydrogen production from coal and natural gas with CCUS can be a:

> ... lower cost option to hydrogen produced by electrolysis in regions with abundant low-cost gas and/or coal resources and CO_2 storage capacity ...

Active policy support from government in Australia would help to unlock the full potential of this technology, and to drive development at the required scale. In the transition to a net zero global economy, LETA submits that a technology neutral approach is required. This approach must embrace all available technology options, where commercial readiness and capacity to significantly reduce emissions, underpinned by a market-based approach and supported by coordinated government policy, is the primary driver of deployment.



3

Australia's CCS opportunity

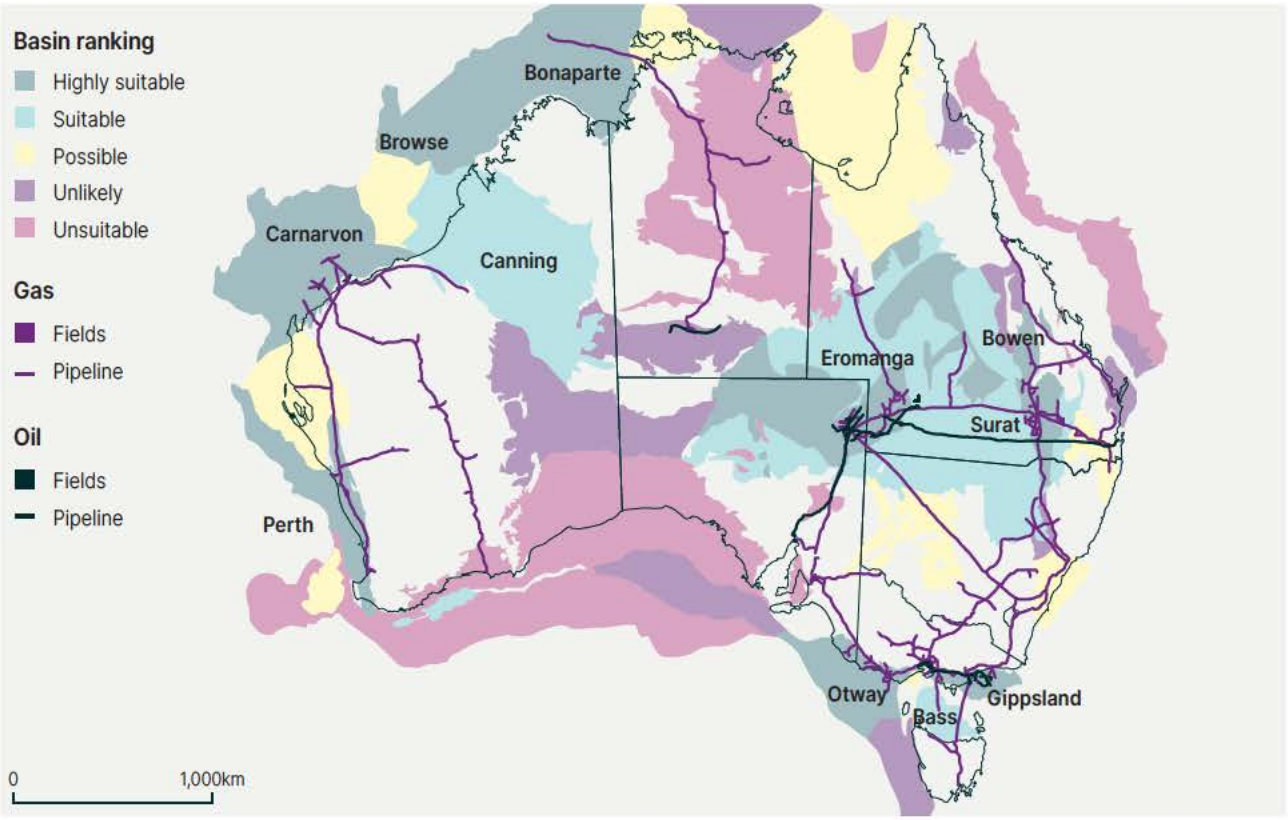
CCS is not new technology and includes a suite of technologies that have been used to capture, compress and transport CO_2 since 1972 to be used in a range of applications or for injection into geological formations where it is trapped and permanently stored.

Australia has a natural competitive advantage to implement CCS with known high-quality, stable geological storage basins, existing infrastructure, world-class technical expertise and regulatory regimes (including environment protection, carbon accounting and reporting, financial services).

A benchmark study from 2004 found that, at a regional scale, Australia has a CO_2 storage potential of more than 1,600 years of annual total net emissions. More recently, Geoscience Australia, the University of NSW and the University of Queensland have all completed extensive work in this field.

Figure 1, produced by Geoscience Australia from work by the Carbon Storage Task Force, identifies potential storage locations at a national and basin level.

Figure 1: National and basin scale assessment of Australia's potential for CCS



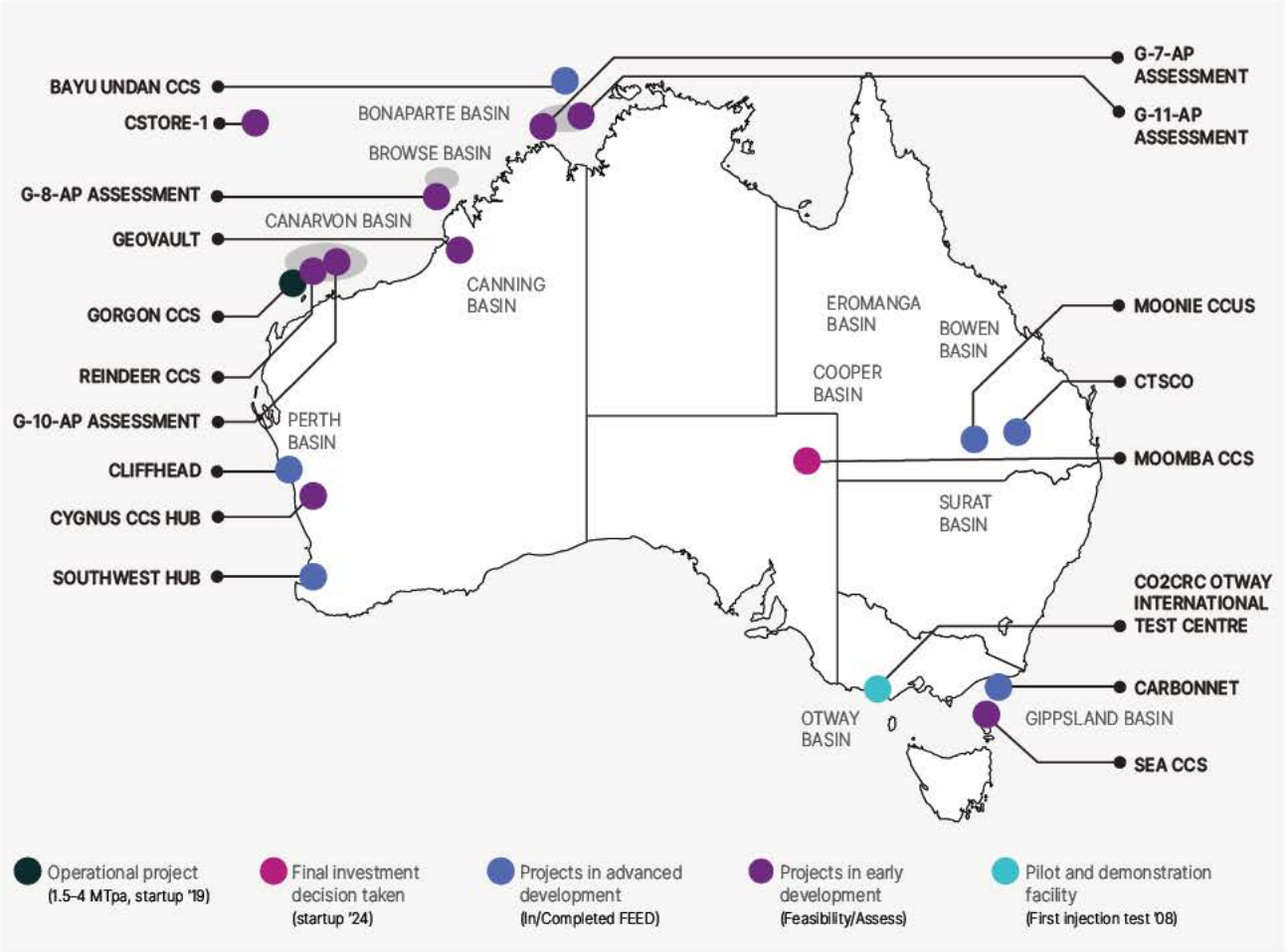
SOURCE: CARBON STORAGE TASK FORCE (2009)

There in one large scale CCS project in operation in Australia, Chevron's Gorgon Project (currently the world's largest dedicated CCS project). Santos' Moomba project has almost completed construction and there are a range of other Australian projects in the development stage. Figure 2 illustrates CSS projects currently underway or under development in Australia as at 2023. This includes the CO2CRC project operating at the Otway International Test Centre where almost 100,000 tonnes of CO_2 has been injected since 2008 into a fresh water aquifer.

New analysis by the CO2CRC released in April 2024 shows the number of proposed CCS projects in Australia had risen from five to 17 in 2020. LETA is committed to supporting the growth of CCS through projects like CTSCo. Around the world, 41 CCS projects are in operation, capturing an impressive 49 million tonnes per year of CO_2, with another 351 projects currently in construction and development. Attachment 1 includes examples of international CCS projects.

Many countries are looking towards Australia, with our favourable geology, to take advantage of this technology. In 2022 IEA Executive Director Dr Fatih Birol singled out CCS, renewable energy and hydrogen as areas that Australia should be prioritising.[3]

Figure 2: Australian CCS Projects, 2024



SOURCE: CO2CRC (2024).


Around the world, 41 CCS projects are in operation, capturing an impressive 49 Mtpa of CO_2, with another 351 projects currently in construction and development.

4

Australian CCS could reduce emissions around the world

There is a huge opportunity for Australian CCS to play a leading role in reducing emissions both at home and around the world. Many of Australia's largest trading partners have announced target dates to achieve net zero greenhouse gas emissions, such as Japan, South Korea and Vietnam in 2050, China in 2060 and India in 2070. A key goal for each of these nations is achieving their emissions reduction targets at the lowest possible cost while maintaining energy security, which includes security of critical supplies and grid stability.

Many of these trading partners have rapidly growing economies that depend on coal and natural gas. They also have relatively 'young' generation, steel, alumina and cement plants, meaning that there is an important role for low emission technologies to assist in reducing emissions in these hard-to-abate sectors.

CCS will become increasingly important to enable the ongoing energy security delivered by traditional energy sources while providing lower emission sources of power, steel, cement and chemicals at competitive cost. Due to the nature of storage opportunities and infrastructure networks for transport, regional solutions to meet growing demand are also likely to become important.

In other words, in order to reach a country's net zero goal at least cost while maintaining economic growth a range of both local and regional solutions, will be required:

Local: harnessing cost-effective storage if available while taking into account CO_2 point sources, transport options and geological storage capacity.

Regional: some countries have limited storage, but they could still use hydrogen and other feedstocks from fossil fuels with the storage occurring where the coal and natural gas reserves are located (in Australia or Indonesia, for example) as part of attaining net zero.[4]

LETA is currently collaborating with key trading partners like Japan and Korea on CO_2 capture hubs. These hubs would target emissions from industrial facilities (eg steel and chemicals) which often rely on Australian resources like coal and natural gas.

This approach lets Australia maintain its energy exports while working with partners on net zero solutions. The benefits are two-fold: continued energy security for trading partners and new opportunities for Australia in CO_2 storage, leveraging our existing strengths in energy and resources.

5

Glencore's Carbon Capture and Storage Corporation (CTSCo) project

Glencore's CTSCo is one of the most progressed and important projects that LETA funds. Once operational, this project will be able to prove up hundreds of millions of tonnes of potential CO_2 storage and de-risk investment decisions for other potential projects to decarbonise a wide range of Australian industries. As a major investor in the project, LETA recognises the significance of the CTSCo project as a contributor to the Australian and Queensland Government's emission reduction goals.

CTSCo will capture CO_2 from the Millmerran coalfired power station in Queensland, purifying the CO_2 and safely and permanently storing it deep underground in the Surat Basin in Queensland.

The project will store 330,000 tonnes of almost pure food-grade CO_2—similar to that found in soft drinks, beer or champagne—at depths of more than 2,300m. Due to the immense pressure underground, the CO_2 plume once injected will cover an area of just 1.4km^2.

The rock into which the food-grade CO_2 will be injected contains non-drinkable water with fluoride levels six times above safe drinking level and is not used by any agricultural producer within a 50km radius.

The CTSCo project has been subject to extensive and rigorous environmental assessment, through a detailed and public Environmental Impact Statement (EIS) process. The final EIS submitted by CTSCo contained over 3,000 pages of peer-reviewed science.

The project has been reviewed by expert third-party institutions, including the Australian Government Independent Expert Scientific Committee (IESC), the Queensland Office of Groundwater Impact Assessment (OGIA) and CSIRO who concluded that any impacts would be local and minor.

A successful Surat Basin CCS Project will help:

- Develop emissions solutions for Australia's newest base load generators and many emissions intensive industries including cement and chemicals.
- Demonstrate the feasibility of CCS in regions close to pockets of heavy industry, particularly in Queensland.
- Enable future industries including clean hydrogen and carbon recycling.
- Foster international collaboration and leadership on technology and emissions reduction.

Onshore storage of CO_2 is critical for the long-term viability of key industries like cement, steel and chemical manufacturing—industries in which Australia has an existing competitive advantage. Without access to carbon storage, these industries, particularly in Queensland, are at risk to competition from overseas industries who have an emission reduction solution.

The success of Glencore's CTSCo project is crucial to ensuring that Australia can achieve large-scale onshore CO_2 storage and that heavy industry does have a path to net zero in the short-medium term.

Attachment 1: International CCS projects

The Global Status of CCS 2023 report by the Global CCS Institute (GCCSI), found that in 2023 there were 41 facilities in operation world-wide with a staggering 351 projects in various stages of construction and development with a capacity to capture 244 million tonnes of CO_2 per annum. This is growth of almost 50 per cent CO_2 capture capacity over a 12 month period.

Figure 3, taken from the Global Status of CCS 2022 report, shows the increase in the capacity of CCS projects (at various stages of development from 'early development' to 'operational') from 2010 until mid-September 2022.

Notably, the figure show that there has recently been an acceleration in activity, with 2021 and 2022 in particular showing the growing momentum of CCS projects around the world. The project pipeline, in terms of facility numbers and capture capacity, is now at a record high. Since 2017, capture capacity has grown at a compound rate of over 34 per cent a year.

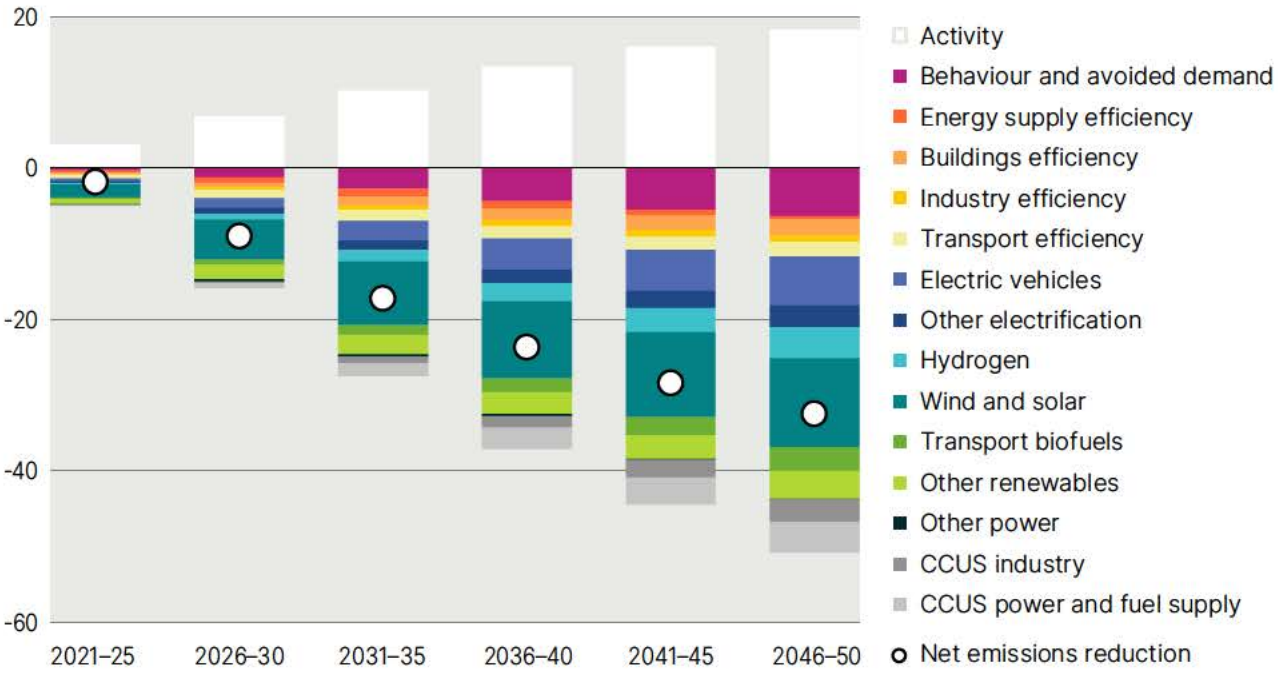
Looking out to 2030, CCS projects will become increasingly diverse, with facilities responding to a broad range of sectors including power generation, liquefied natural gas (LNG), cement, steel, waste-to-energy, direct air capture and storage and hydrogen production.

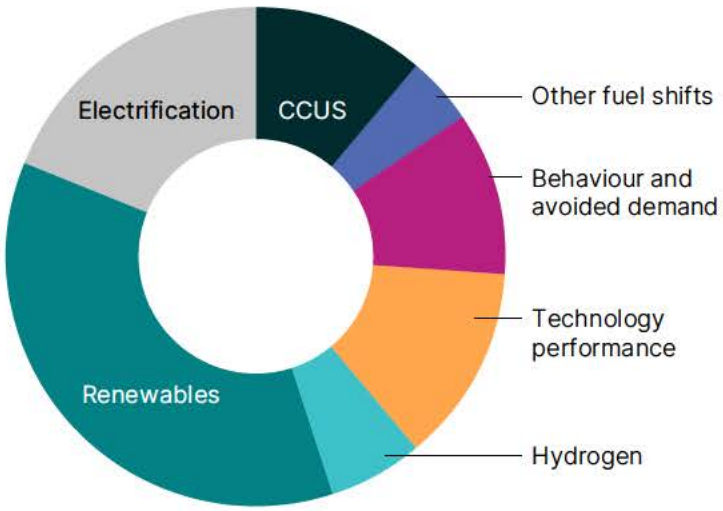
Figure 3: Pipeline of commercial facilities Since 2010 by capture capacity[5] Mtpa CO2

SOURCE: GCCSI (2023)

To achieve net zero by 2050, renewables and electrification will likely make large contribution to reducing emissions, but a wide range of other measures and technologies including significant volumes of CCS will also be required.

Figure 4: Average annual CO_2 reductions from 2020–2050 in the IEA's Net Zero Scenario[6] ($GtCO_2$) and Cumulative emissions reduction by mitigation measure in the Net Zero Scenario, 2021-2050[7]





SOURCE: IEA (2021).

The United States

The United States has been a world leader in development CCS and has recently increased its focus on and support for expanded CCS activities. On 16 August 2022, US President Biden signed the *Inflation Reduction Act 2022* (IRA) into law.[8] The Act includes significant funding for CCS activities and enhancements to the existing Section 45Q tax measures.

Section 45Q of the United States 'tax code' provides a performance based tax credit for power plants and industrial facilities that capture and store CO_2 that would otherwise be emitted into the atmosphere. The tax credit applies both to the capture and permanent storage of CO_2 in geologic formations and to the use of CO_2 as a feedstock to produce fuels, chemicals, and products such as cement.

The recent enhancements include an extension of the eligible start date for projects from 1 January 2026 to 1 January 2033 and a significant increase in the credit amounts.[9] The inception of the credit jumpstarted new investment into CO_2 capture technologies and, according to the GCCSI, it has been the most progressive CCS-specific incentive globally. The IEA says it:

> … helps unleash the innovation and business savvy of the private sector. No doubt, in this field the United States has clearly taken a strong global leadership role. This kind of incentive will drive innovation to further reduce the costs of CCUS technologies and will be crucial to reducing emissions in both the United States and worldwide.[10]

In addition, the *US Infrastructure Investment and Jobs Act 2021* provides approximately $US12 billion across the CCSS value chain over the next five years. Support is offered through a number of policy mechanisms, such as R&D funding, loans and permitting support.

Canada

In Canada, the 2022 Federal Budget proposed an investment tax credit for CCSS projects between 2022 and 2030, valued at around 37–60 per cent depending on the type of project.[11]

The European Union

The European Union has continued support for CCS through regional funding programs (such as the Connecting Europe Facility – Energy and the Innovation Fund[12]) and revisions to cross-border regulations to include CO2 storage. National subsidy schemes (such as those in Denmark and the SDE++ in the Netherlands) have also supported CCS projects.[13]

Most recently, the EU Commission has commenced a public consultation on an *Industrial carbon management – carbon capture, utilisation and storage deployment* initiative,[14] which will assess:

- What role CCS technologies can play in decarbonising the EU economy by 2030, 2040 and 2050, respectively.
- Measures needed to optimise their potential, including in the deployment of EU-wide CO2 transport and storage infrastructures.

Importantly, in commencing the consultation process the EU Commission noted:

> Carbon capture, utilisation and storage plays an important role in achieving carbon neutrality in the EU by 2050. It provides a decarbonisation option for some hard-to-abate sectors and can be instrumental in advancing industrial carbon removals.

The announcement also notes the Commission will:

> … propose an EU strategy to create an industrial carbon management market by 2030 to support efforts in hard-to-abate sectors who need to apply carbon capture and storage, carbon capture and utilisation or industrial carbon removals to become climate neutral. The strategy will be based on the most recent 2050 modelling results available to the Commission, the results of two ongoing studies on CO_2 transport and storage infrastructure, input from the Carbon Capture, Utilisation and Storage Forum (CCUS Forum),[15] a stakeholder consultation platform dedicated to industrial carbon management issues and the results of a public consultation.

The Commission will consider including the following elements in the strategy:

- proposing storage infrastructure targets for 2040 and 2050 to de-risk and better guide investments in the emerging market for industrial carbon management solutions;
- identifying regulatory needs for emerging CO_2 transport and storage infrastructure, including third-party access, CO_2 quality standards, regulatory oversight and long-term infrastructure planning;
- exploring the role of industrial carbon removals in EU climate policies;
- exploring coordinated EU and Member State funding in industrial carbon management projects that leverage private investment in solutions for long-term decarbonisation and CO_2 use;
- exploring a role for an industrial initiative;
- setting milestones for market development;
- exploring other potential measures that could facilitate the deployment of industrial carbon management in Europe
- exploring the issues related to industrial carbon management public awareness.

Norway

In Norway, the Northern Lights project[16] will be the first ever cross border, open-source CO_2 transport and storage infrastructure network and will receive CO_2 captured from across Europe.

Alongside industry, the Norwegian Government funded approximately twothirds of this project and in the process has made significant steps towards meeting not just Norway's climate goals, but those of the entire region.[17]

The United Kingdom

The UK Government has an ambition to deploy CCUS from the mid-2020s and at scale during the 2030s. The government has noted this is essential to the UK achieving its commitment to net zero by 2050.[18]

In December 2023, the UK Government released *Carbon Capture, Usage and Storage: a vision to establish a competitive market*. This document sets out the UK Government's vision for the UK CCUS sector in the 2030s, which involves:

- Making the UK a global leader in CCUS.
- Creating a self-sustaining CCUS sector that supports thousands of jobs.
- Reducing emissions to ensure a better environment for future generations.

Its purpose is to increase investor confidence in the UK's CCUS market.

The UK Government has found:

> … the economic opportunities from CCUS are huge, with significant investment in CCUS projects creating up to 50,000 jobs in the UK. In addition, tapping into our North Sea resources and assets will help us maximise the economic opportunity that the transition to net zero brings.

The government aims to make this vision a reality through the development of a CCUS market, where we envisage the respective role of government and industry evolving over time. We see this happening in three stages:

1 Market creation: Getting to 20–30 Mt CO_2 by 2030.
2 Market transition: The emergence of a commercial and competitive market.
3 A self-sustaining CCUS market: Meeting net zero by 2050.

In addition, in the UK, Net Zero Teesside is a collection of industrial power and hydrogen businesses which aim to decarbonise their operations through the deployment of CCUS. This project was selected by the UK Government as the premier east coast net zero project and will receive a share of the UK Government's £1 billion dedicated CCS infrastructure fund. It is also expected to create more than 25,000 jobs by 2050.[19]

Japan

Japan is actively exploring a global supply network for cleaner energy production, shipping and other applications. This included investing in the Hydrogen Energy Supply Chain (HESC) project[20] which trialled hydrogen production from coal gasification in Australia for importation to Japan. This is a significant example of Japanese, Australian and Victorian government collaboration with the private sector to build international supply chains.

Another is Japan's desire to import ammonia supplies from various countries including Australia with geological storage in the producing country, as evidenced most recently with J-Power and Marubeni announcing investments in the CTSCo Project.[21]

Japan also established and leads the Asia CCUS Network,[22] which aims to share information on CCS technologies and development options, including the prospect for shared international hub infrastructure in ASEAN and possibly northern Australia. This will enable production of lower emission chemicals and other products for use in Japan as it transitions to a cleaner energy future.

The Tomakomai[23] project is Japan's first full-chain CCS project taking CO_2 from the production of hydrogen. It also obtained valuable data supporting storage permanence following a naturally occurring earthquake near the injection site. This project was a collaboration between Japanese industry, the Ministry of Economy, Trade and Industry and the New Energy and Industrial Technology Development Organisation.

Most recently, the Japanese Ministry of Economy, Trade and Industry (METI) on 13 June 2023 announced[24] that the Japan Organization for Metals and Energy Security (JOGMEC) had selected seven role model projects aiming for business scale-up and cost reduction by 2030 as Japanese Advanced CCS Projects, with the aim of implementing CCS projects on a full scale to achieve carbon neutrality by 2050. Through these projects, Japan aims to secure CO_2 storage of approximately 13 Mtpa by 2030, to support reaching net zero greenhouse gas emission in Japan by 2050.

METI announced:

> The seven selected projects target a wide range of industries such as electric power, oil refineries, steel, chemical, pulp/paper, and cement, and capture CO_2 emitted from industrial clusters in Hokkaido, Kanto, Chubu, Kinki, Setouchi and Kyushu regions, etc., while also aiming to store approximately 6 to 12 Mtpa of CO_2 in total by 2030. The projects (five of which plan to store CO_2 in Japan, and the remaining two to do so in Asia and Oceania) aim to secure total storage of approximately 13 Mtpa of CO_2. Through these projects, JOGMEC will seek to achieve approximately 120 to 240 Mtpa of CO_2 storage by 2050, eventually contributing to the stable supply of energy resources and carbon neutrality in Japan.

In these ways, Japan is illustrating the value of bilateral and multilateral CCUS collaboration aimed at promoting international trade in clean energy products produced from fossil fuels. This world leading initiative should encourage more regional hub solutions to complement national ones to assist in achieving net zero emissions across Asia. Japan's strategy, which has a strong element of international cooperation, could have a positive global impact and contribute to the creation of new synergies regarding international energy trading and business cooperation. These will be crucial to drive development and make technologies more affordable.[25]

The Republic of Korea

Korea has announced plans to invest up to $US1.2 billion to develop CCUS technologies by 2030. Around 30 per cent of this investment will be used to assess CO_2 storage resources, with the majority of the remainder earmarked to develop an offshore full-chain CCUS project.

Indonesia

In early 2022, Indonesia announced that it is drafting regulations to establish a legal and regulatory framework for CCUS activities—the first of its kind in the region.

ASEAN

In the ASEAN region, most states are focused on economic development and will use coal and natural gas for power generation to accelerate their economic development ambitions. However, CCUS will be particularly crucial as a technology that can contribute to the transition of ASEAN countries in meeting the goals of the Paris Agreement whilst allowing for a supply of affordable energy to meet growing energy demands to support economic growth.[26]

China

In its Aprill 2024 analysis[27] (which built on earlier work from 2023), the Global CCS Institute found CCUS has emerged as a pivotal component of China's carbon neutrality strategy. Momentum has been building since the country's commitment in 2020 to peak CO_2 emissions by 2030 and achieve carbon neutrality before 2060.[28]

Since then, China has developed the first integrated megaton-scale CCUS project, the first offshore CO_2 storage project, the first 1.5 Mt-scale coal power CCUS project, and the first commercial-scale CO_2 pipeline.

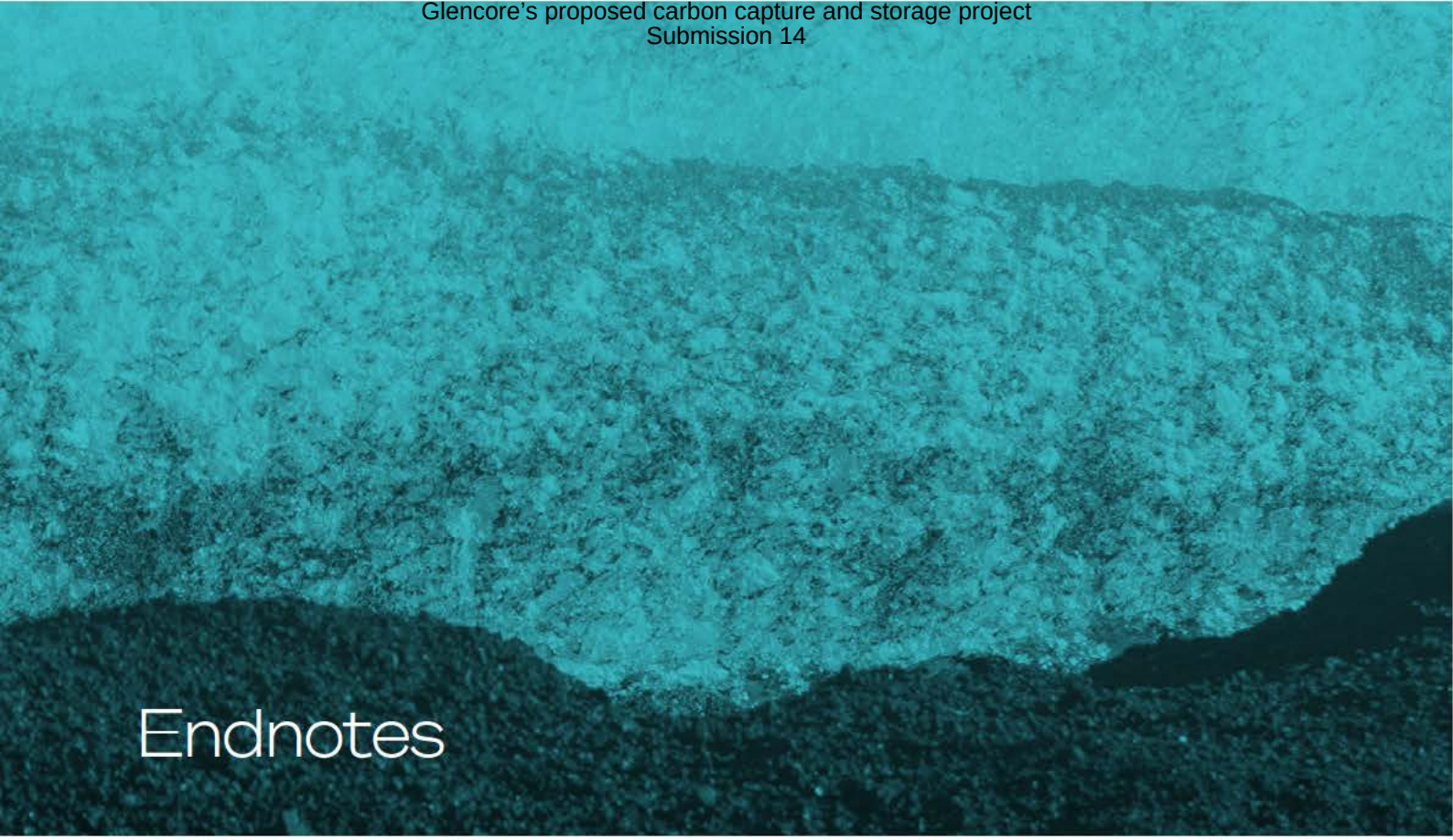
CCUS demonstrations have also been gathering unprecedented pace in China. As of July 2023, there were around 100 CCUS pilots and demonstration projects with various scales and in different phases in the country.

Both state-owned and large-scale private enterprises are rapidly advancing CCUS projects across various sectors, from power generation to petrochemicals, coal to chemicals, and cement production.

China now stands among the major economies with integrated megaton-scale CCUS projects in operation.

Other countries

Several other countries also have commercial CCS facilities under development, including Belgium, Denmark, Hungary, Indonesia, Italy, Malaysia and Sweden.



Endnotes

1 International Energy Agency (2020), CCUS in Clean Energy Transitions (available at www.iea.org/reports/ccus-in-clean-energy-transitions); Intergovernmental Panel on Climate Change (2022), Summary for Policymakers: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (available at www.ipcc.ch/report/ar6/wg3).

2 Climate Change Authority (2023), *Reduce, remove and store: The role of carbon sequestration in accelerating Australia's decarbonisation* (available at www.climatechangeauthority.gov.au/publications/reduce-remove-and-store-role-carbon-sequestration-accelerating-australias-decarbonisation).

3 Macdonald-Smith, A (2022), "Australia 'missed big opportunity in CCS': IEA Head", *The Australian Financial Review*, 15 July (available at www.afr.com/companies/energy/australia-missed-big-opportunity-in-ccs-iea-head-20220713-p5b1dr).

4 A number of these regional solutions were discussed in the recent House of Representatives Standing Committee on Climate Change, Energy, Environment and Water Inquiry Into the 2009 and 2013 Amendments to the 1996 Protocol to The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Protocol), which reported in June 2023 (see www.aph.gov.au/Parliamentary_Business/Committees/House/Climate_Change_Energy_Environment_and_Water/LondonProtocol/Report) and recommended the Australia Government ratify both the 2009 and the 2013 amendments to the London Protocol. The 2009 amendment enables the export of CO2 streams from a "Contracting Party" to another country for the purpose of sequestration in sub-seabed geological formations. The Australian Government subsequently introduced into Parliament on 22 June 2023 the Environment Protection (Sea Dumping) Amendment (Using New Technologies to Fight Climate Change) Bill 2023 (see www.aph.gov.au/Parliamentary_Business/Bills_Legislation/Bills_Search_Results/Result?bId=r7052 for more information).

5 GCCSI (2023), Global Status of CCS 2023 (available at: status23.globalccsinstitute.com/new-facilities).

6 IEA (2021), *Net zero by 2050: a Roadmap for the Global Energy Sector* (available at www.iea.org/reports/net-zero-by-2050).

7 IEA (2022), *Fuels and Technologies: Hydrogen* (available at www.iea.org/fuels-and-technologies/hydrogen).

8 The White House (2023), *Building a Clean Energy Economy: a Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action* (available at www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook) and the Department of Energy (2022), *Inflation Reduction Act Summary Energy and Climate Provisions* (available at www.energy.gov/sites/default/files/2022-10/IRA-Energy-Summary_web.pdf).

9 Increasing the credit amounts for enhanced oil recovery to $US60/tonne, for industrial and power facilities to $US85/tonne, for capture and utilisation of carbon to $US130/tonne and for direct air capture to $US180/tonne.

10 Dr Fatih Birol (2019), Testimony to the US Senate Energy and Natural Resources Committee, 28 February.

11 See, for example www.budget.canada.ca/2022/report-rapport/chap3-en.html and www.canada.ca/en/department-finance/news/2022/08/additional-design-features-of-the-investment-tax-credit-for-carbon-capture-utilization-and-storage-recovery-mechanism-climate-risk-disclosure-and-k.html.

12 See commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/connecting-europe-facility_en for more information.

13 For a comprehensive overview of policies supporting CCUS, see IEA (2022), *Carbon Capture, Utilisation and Storage, Energy system overview* (available at www.iea.org/reports/carbon-capture-utilisation-and-storage-2). Australia's relative absence from this list is notable.

14 See ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13848-Industrial-carbon-management-carbon-capture-utilisation-and-storage-deployment_en for more information. The public consultation process ends on 30 August 2023 with a Commission decision on next steps expected before the end of 2023.

15 The Carbon Capture, Utilisation and Storage Forum (CCUS Forum) was established in 2021 and brings together representatives from the EU institutions, EU and third countries, NGOs, business leaders and academia to facilitate the deployment of CCUS technologies. The Forum is supported by four Working Groups that are considering CO_2 infrastructure, an industrial partnership for CCUS, public perception and CCUS Strategy. See energy.ec.europa.eu/topics/oil-gas-and-coal/carbon-capture-storage-and-utilisation/ccus-forum_en and circabc.europa.eu/ui/group/75b4ad48-262d-455d-997a-7d5b1f4cf69c/library/e1cd51e6-10e1-41a5-b042-899da01929ea for more information. It is notable that no similar process exists in Australia.

16 See www.equinor.com/energy/northern-lights for more information.

17 IEA (2021), *CCUS around the world* (available at www.iea.org/reports/ccus-around-the-world).

18 See www.gov.uk/government/publications/carbon-capture-usage-and-storage-a-vision-to-establish-a-competitive-market for more information.

19 See, for example, www.teesworks.co.uk/news/government-selects-teesside-to-lead-uks-zero-carbon-targets.

20 See www.hydrogenenergysupplychain.com for more information about the HESC project.

21 The J-POWER Group operates power generation and transmission and transformation facilities in Japan and around the world (see www.jpower.co.jp/english for more information). Marubeni Corporation encompasses a diverse range of business activities and offers a variety of services, makes internal and external investments, and is involved in resource development. See www.marubeni.com/en for more information.

22 See www.asiaccusnetwork-eria.org for more information.

23 See www.japanccs.com/en and www.iea.org/reports/ccus-around-the-world/tomakomai-ccs-demonstration-project for more information.

24 See www.meti.go.jp/english/press/2023/0613_001.html for more information.

25 International Centre for Sustainable Carbon (2022), *The role of low emission coal technologies in a net zero Asian future*, page 173 (available at www.sustainable-carbon.org/report/the-role-of-low-emission-coal-technologies-in-a-net-zero-asian-future).

26 Economic Research Institute for ASEAN and East Asia (2020), *Study on the Potential for the Promotion of Carbon Dioxide Capture, Utilisation and Storage in ASEAN Countries*, page xii (available at www.eria.org/publications/study-on-the-potential-for-the-promotion-of-carbon-dioxide-capture-utilisation-and-storage-in-asean-countries-current-situation-and-future-perspectives).

27 Global CCS Institute (2024), *A Gap Analysis of China's Regulatory Framework for CO2 Geological Storage* (available at www.globalccsinstitute.com/resources/publications-reports-research/a-gap-analysis-of-chinas-regulatory-framework-for-co2-geological-storage) and Global CCS Institute (2023), CCS Progress in China—A Status Report (available at www.globalccsinstitute.com/resources/publications-reports-research/ccs-progress-in-china.

28 China's commitment in 2020 to peak CO_2 emissions by 2030 and achieve carbon neutrality before 2060 was outlined by President Xi during the 75th session of the United Nations General Assembly in September 2020 (see news.un.org/en/story/2021/09/1100642).

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