30 June 2023

Climate Change Authority
GPO Box 2013
CANBERRA ACT 2601

RE: ***SETTING, TRACKING AND ACHIEVING AUSTRALIA'S EMISSIONS REDUCTION TARGETS, ISSUES PAPER – MAY 2023*: COMMENTS FROM LOW EMISSION TECHNOLOGY AUSTRALIA**

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, at www.letaustralia.com.au.

LETA welcomes the opportunity to provide a submission to the Climate Change Authority (the Authority) *Setting, Tracking and Achieving Australia's Emissions Reduction Targets, Issues Paper – May 2023* (the Issues Paper).

LETA is also a member of the Australian Industry Greenhouse Network (AIGN), a network of industry associations and individual businesses that contribute to the climate change policy debate and see value in joint industry action on climate change policy issues in order to promote sustainable industry development. LETA has also contributed to the AIGN submission on the Issues Paper.

LETA's submission addresses specific aspects of the Issues Paper, focussing on those areas/questions that are particularly important for the development and implementation of low emission technology in Australia and the contribution they do and can make to reducing emissions in Australia and across the Asia-Pacific region.

Yours sincerely

Mark McCallum
Chief Executive Officer

Low Emission Technology Australia

Submission to the Climate Change Authority *Setting, Tracking and Achieving Australia's Emissions Reduction Targets, Issues Paper – May 2023*

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 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.

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.

LETA's submission addresses specific aspects of the Issues Paper, focussing on those areas/questions that are particularly important for the development and implementation of low emission technology (such as carbon capture, utilisation and storage (CCUS)[1] and clean (low carbon) hydrogen[2]) in Australia and the contribution they do now and can more significantly in the future make to reducing emissions in Australia and across the Asia-Pacific region.

With that mind, the submission focusses on a number of the relevant questions asked in the Issues Paper and is framed around the Authority's approach set out on page 15:

> *… the Authority will advise on any improvements that need to be made to support outcomes at a sectoral or issues level. The Authority will also advise on how any gaps could be managed.*

The sections that follow also address many of the matters considered in Sections 3.1-3.8 (pages 21-29) of the Issues Paper.

2. Why CCUS is important

The Authority's Issues Paper on page 23 notes:

> *Decarbonising the downstream emissions of Australia's export industries can support export destination countries to reduce their emissions more rapidly … Downstream emissions of our exports can be mitigated in three main ways while ensuring energy supply to our customers: by developing low- or no-emissions alternatives such as green hydrogen; by* ***capturing and sequestering the emissions*** *at the point of combustion; or by offsetting emissions by removing carbon from the atmosphere.*

Almost all advanced economies globally have committed to reach net zero greenhouse gas emissions by 2050 (or earlier). With that in mind, the International Energy Agency (IEA) has found that reaching net zero without the second of the mitigation approaches highlighted above, namely CCUS, will be *"virtually impossible"*[3]. The Intergovernmental Panel on Climate Change (IPCC) and others have also pointed to the absolute need for CCUS technologies if we are to have a chance of limiting the impacts of climate change[4].

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[1] In this submission CCUS and CCS are used interchangeably but represent the suite of technology options.
[2] Clean hydrogen, consistent with the approach used by the International Energy Agency (see, for example www.iea.org/fuels-and-technologies/hydrogen) is produced from renewables, nuclear (noting nuclear-based hydrogen is not an option in Australia at present) or fossil fuels with CCUS.
[3] International Energy Agency (2020), *CCUS in Clean Energy Transitions* (available at www.iea.org/reports/ccus-in-clean-energy-transitions).
[4] 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).

Similarly, the Authority's recent *Reduce, remove and store: The role of carbon sequestration in accelerating Australia's decarbonisation* policy insights paper found[5]

> *… sequestration is a necessary part of any rapid, urgent decarbonisation and represents a huge opportunity for Australia.*

This is the case for both key Australian export industries, such as coal and natural gas, and for key Australian domestic industries, such as cement and steel.

It is also important to note the role of CCUS is not part of a 'phase out' of these key export industries (as the Issues Paper implies on page 23), industries which have underpinned much of Australia's economic growth over many decades, but rather a key way to reduce – at scale – emissions from these and other key industrial facilities as they reduce their emissions in the short to medium-term in line with a trajectory to reduce their emissions to net zero by 2050 (or earlier).

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).

As the Authority's policy insights paper found, CCUS is not new technology and includes a suite of technologies that since 1972 have been used to capture, compress and transport carbon dioxide (CO_2) to be used in a range of applications or for injection into geological formations where it is trapped and permanently stored.

Alongside the points noted in the Issues Paper, there are four crucial ways in which CCUS technology can contribute to a cleaner energy future:

- It can be retrofitted to power and industrial plants.
- It can tackle emissions in sectors with limited other options, such as cement, steel and chemicals manufacturing, and in the production of synthetic fuels for long-distance transport.
- It enables the production of low-carbon hydrogen from fossil fuels, a least-cost option in several regions around the world.
- It can remove CO_2 from the atmosphere by combining it with bioenergy or direct air capture (DAC) to balance emissions that are unavoidable or technically difficult to avoid[6].

As well as a way to secure significant and enduring reductions in greenhouse gas emissions, the adoption of CCUS globally is seeing CO_2 emerging as a commercial opportunity. Amongst a range of uses, CO_2 is used in the manufacture of food and beverages, in the production of urea and as a feedstock for fertiliser production[7]. It is also providing a pathway to decarbonise hard-to-abate industries while maintaining their competitiveness and is encouraging innovation and entrepreneurial thought leadership around new ways to use captured CO_2.

3. CCS in Australia

3.1 Australia's CCS storage potential

A range of studies[8] that have examined Australia's CCS storage potential[9] have identified excellent potential for geological storage in Australia.

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[5] 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). LETA's media release in response to the policy insights paper can be found at www.letaustralia.com.au/media-centre/low-emission-technology-australia-supports-critical-work-from-climate-change-authority.

[6] IEA (2020), *CCUS in Clean Energy Transitions* (available at www.iea.org/reports/ccus-in-clean-energy-transitions).

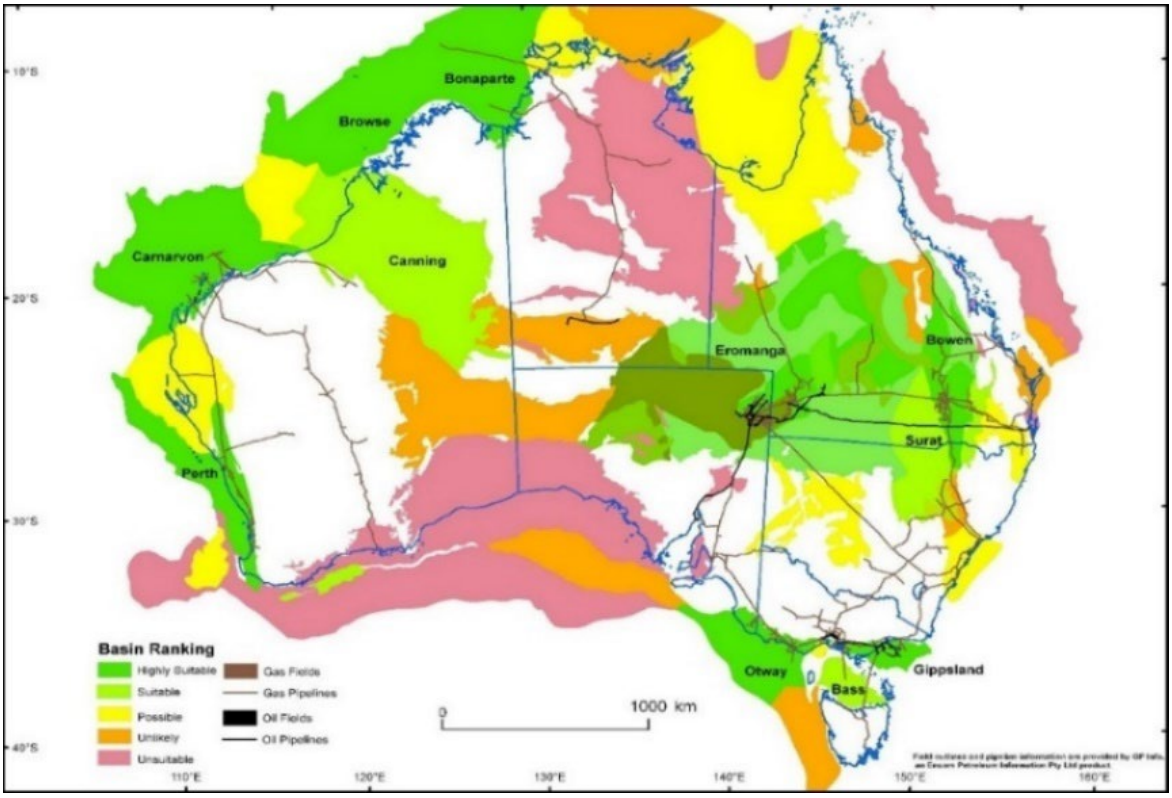
[7] CSIRO (2021), *CO_2 Utilisation Roadmap*, page 4 (available at www.csiro.au/en/work-with-us/services/consultancy-strategic-advice-services/CSIRO-futures/Energy-and-Resources/CO2-Utilisation-Roadmap).

[8] See, for example, www.ga.gov.au/scientific-topics/energy/resources/carbon-capture-and-storage-ccs/geological-storage-studies.

[9] Carbon Storage Taskforce (2009), *National Carbon Mapping and Infrastructure Plan – Australia: Full Report* (available at www.ga.gov.au/__data/assets/pdf_file/0018/111339/NCM_Full_Report.pdf).

Geoscience Australia, the University of NSW[10] and the University of Queensland[11] 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



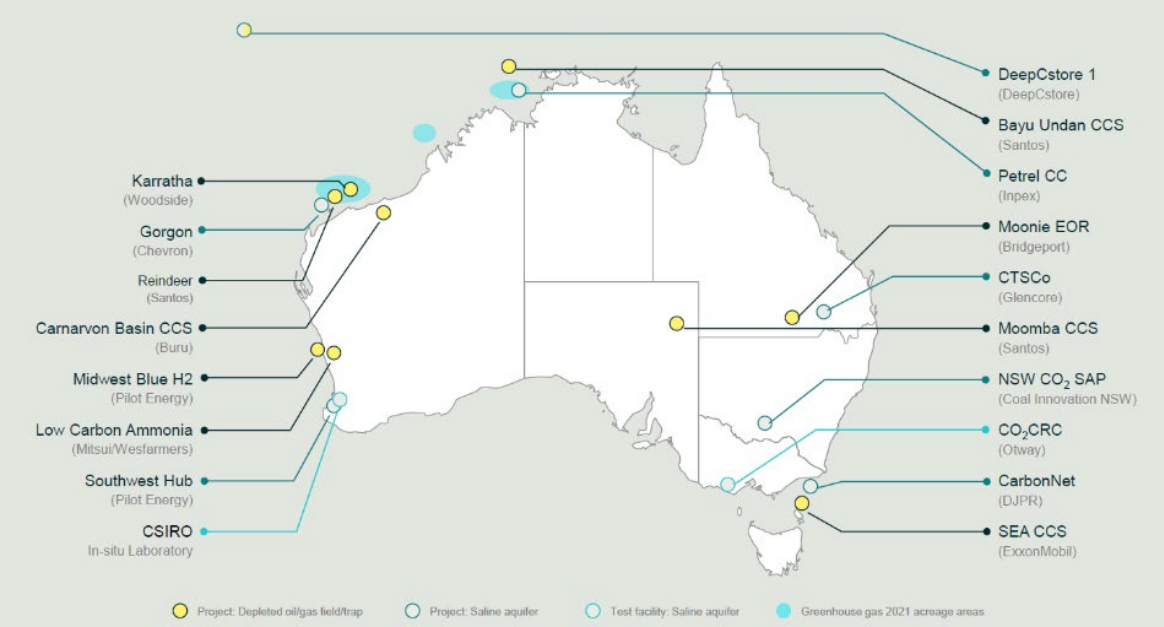
Source: Carbon Storage Task Force (2009).

A benchmark study from 2004 found that at a regional scale Australia has a CO_2 storage potential in excess of 1,600 years of annual total net emissions[12]. More recently, the CSIRO's *CO_2 Utilisation Roadmap* also confirms that Australia is well positioned to become a CCUS leader, particularly if Australia responds to global demand for clean carbon-based products in the medium-term.

The one large scale operating CCUS project in Australia (which is the world's largest CCS system) is the Gorgon Project[13]. The Moomba CCS Project is under construction[14]. In addition, there is a range of CCUS projects in the development stage around Australia. These projects are illustrated in Figure 2.

[10] Bradshaw, J and Allinson, G and Bradshaw, B E and Nguyen, V and Rigg, A J and Spencer, L and Wilson, P (2004), *Australia's CO_2 geological storage potential and matching of emission sources to potential sinks*, (available at ideas.repec.org/a/eee/energy/v29y2004i9p1623-1631.html), pages 1,623-1,631.
[11] Garnett A J, Underschultz J R & Ashworth P (2019), *Executive Summary: Scoping study for material carbon abatement via carbon capture and storage*, The University of Queensland Surat Deep Aquifer Appraisal Project, The University of Queensland (available at natural-gas.centre.uq.edu.au/ccs/final-project-reports and espace.library.uq.edu.au/view/UQ:734604).
[12] Bradshaw, J & Allinson, G & Bradshaw, B E & Nguyen, V & Rigg, A J & Spencer, L & Wilson, P (2004), *Australia's CO_2 geological storage potential and matching of emission sources to potential sinks*, (available at ideas.repec.org/a/eee/energy/v29y2004i9p1623-1631.html), pages 1,623-1,631.
[13] See australia.chevron.com/our-businesses/gorgon-project/carbon-capture-and-storage for more information.
[14] See www.santos.com/santos-energy-solutions for more information.

Figure 2: Australian CCS Projects, 2023



Source: LETA (2023), based on CSIRO (2022).

Many countries are looking towards Australia, with our favourable geology, to take advantage of this technology. For example, in 2022 IEA Executive Director Dr Fatih Birol singled out CCS, renewable energy and hydrogen as areas that Australia should be prioritising[15].

3.2 CCS, Australia's emissions reduction targets and the reformed Safeguard Mechanism

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

A key feature of this journey, and one reinforced by the reforms to the Safeguard Mechanism[16] that commence on 1 July 2023[17], is the need to facilitate an efficient and cost-effective way to reduce CO_2 emissions from industrial activities.

In particular, the requirement for all covered facilities to reset their baselines and for those baselines to reduce each year (at a percentage reduction per year ranging from 4.9 per cent to 1 per cent) means that cost effective emissions reduction opportunities are increasingly important. The Government has itself highlighted that for a range of covered facilities, CCS is a vital emission reduction option.

For many facilities, it represents one of the few 'on-site' abatement options and so facilitating CCUS projects should be a key focus to complement the emissions reduction incentives that have been sharpened through the Safeguard Mechanism reforms. With accelerated investment in CCUS, over time large-scale Australian industries will be able to utilise this critical technology to support their efforts.

[15] 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).
[16] For comments on the Safeguard Mechanism itself, LETA would refer you to the AIGN submission.
[17] See www.dcceew.gov.au/climate-change/emissions-reporting/national-greenhouse-energy-reporting-scheme/safeguard-mechanism for more information.

More broadly, the ability for a very limited range of CCS projects to create Australian Carbon Credit Units under the Emission Reduction Fund[18], or for safeguard facilities to implement a CCS project that could create Safeguard Mechanism Credits[19], now stands as the only policy and regulatory recognition for Australian CCUS developments.

This means, as is considered further in Section 5, Australia is now falling behind other countries in stimulating CCUS projects and related infrastructure hubs.

3.3 Policy and regulatory reforms are required to see CCS fulfil its emissions reduction potential

The Issues Paper in Questions 4, 5 and 6 on pages 15 and 17 and Question 31 on page 29:

4. *What more could the Government do to help you reduce your carbon footprint?*
5. *What are the other challenges and opportunities the global context presents Australia with in responding to climate change?*
6. *What role is there for corporate action to 2030 and beyond?*
31. *What else should the Authority be considering in its advice to Government?*

In the case of CCS, active policy support from government in Australia would serve to facilitate CCUS investment and development at the required scale and drive innovation. This would provide support to key industries to reduce their carbon footprint, provide opportunities for Australia to play a role domestically and across the region to reduce emissions and represent key corporate action to 2030 and beyond.

In that context, the Authority should recommend to Australian Government that it:

- Work with industry to develop a *National CCUS Strategy*, one that complements the development of the renewed and technology neutral National Hydrogen Strategy. A National CCUS Strategy could analyse the domestic and global state of CCUS projects and developments and work with industry to develop a policy and regulatory framework to facilitate the development of the industry in Australia (both onshore and offshore). A similar process, that recently commenced public consultation, is now underway in the European Union, and is considered further in Section 5.3 below.
- Reconsider the funding cuts announced in the October 2022 Budget[20] and work with industry to develop a new, fit for purpose funding program. Such a program could be based on the approach to be taken in the Hydrogen Headstart program[21] announced in the 2023-24 Budget.
- Work with industry to develop and implement a more timely and efficient regulatory approval process to condense, without compromising, project approval processes for CCS projects, both onshore and offshore. This can facilitate the timely development and implementation of CCUS projects that can directly support Australia's short-term and long-term emissions reduction commitments. This work can support CCS as an emissions pathway for a range of important industries (for example, for the cement, steel, aluminium, chemicals, oil and gas, coal industries) that face emissions reduction commitments under the reformed Safeguard Mechanism.

[18] See www.cleanenergyregulator.gov.au/ERF/Choosing-a-project-type/Opportunities-for-industry/carbon-capture-and-storage-method for more information. The *Carbon Credits (Carbon Farming Initiative) Amendment (No. 2) Rules 2023* prevents the registration of new ACCU projects that would solely credit reductions in covered emissions from Safeguard facilities. This means the ability of new projects coming forward to utilise the CCS Method is now very limited, significantly reducing the utility of the Method.

[19] Through the provisions of the *Safeguard Mechanism (Crediting) Amendment Act 2023* (see www.legislation.gov.au/Details/C2023A00014).

[20] The October 2022 Budget saw most existing funding for CCUS activities (such as the Carbon Capture, Use and Storage Development Fund, introduced as part of a $1.9 billion funding package for low emission new energy technologies announced in September 2020 Budget) removed. See www.letaustralia.com.au/media-centre/federal-budget-cuts-destroys-low-emissions-investment-and-clean-energy-jobs for further information.

[21] See www.dcceew.gov.au/energy/hydrogen/hydrogen-headstart-program for more information.

- Ensure CCS projects are eligible (and indeed encouraged) through Major Project Status, which can be used to enable strategically significant projects like CCS that can face complex regulatory challenges to get extra support and coordinated approvals[22]. Similar processes should be mirrored at the State/Territory level for onshore CCUS projects.
- Work with industry to develop proposals to support carbon hubs that, as is considered further in Section 6, can support multi-user CCS projects. Proposals could focus, amongst other things, on regulatory frameworks and the development of common-user infrastructure.

In addition, and consistent with these key recommendations, the Authority should use the Review to reinforce its recommendations from the policy insights paper, including that

- Governments should pursue policies that help ensure there is adequate supply of sequestration (including CCS) to meet demand.
- The Government should prioritise the development of long-lived geological and mineral storage technologies.
- Australia should prioritise sequestration approaches that make optimum use of resources (land, energy, and water) for the volume of carbon stored.
- Australia should invest in scalable and durable sequestration technologies that leverage Australia's non-arable-land, geological storage capacity and renewable energy resources.
- The development of carbon dioxide removal technologies be accelerated with support from existing agencies such as the Australian Renewable Energy Agency and, the Clean Energy Finance Corporation, or new institutions.
- Australian governments should work together to develop a mature, streamlined and coordinated legislative and regulatory framework for onshore and offshore geological storage.
- Governments should explore risk-sharing approaches for Investments in sequestration technologies with high up-front costs, including coinvesting in subsurface basin analyses for geological sequestration and keystone storage and transport infrastructure.
- Consistency across international, national, and subnational regulatory approaches will be needed to enable cooperation, trade, and cross-border movement of CO_2.

Some argue that the reason CCUS has not been rolled out extensively in Australia is due to cost but this argument usually ignores the vast variability in the technology. Capturing CO_2 from the airstream is currently the most expensive approach but some industries, like the oil and gas, LNG production or chemical sectors, capture and split off CO_2 as a process requirement. For cement, steel and chemicals production it can be more cost effective to retrofit CCUS to existing facilities than build new facilities with alternative technology. For example, the estimated costs of CCUS-equipped ammonia and methanol production based on natural gas are around 20-40 per cent higher than their unabated counterparts but the cost of electrolytic ammonia and hydrogen routes are estimated to be 50-115 per cent higher[23].

Importantly, given the scale of emissions reduction required to meet global emissions reduction commitments, this technology can make a significant contribution in the short-term and support cost competitive lower carbon solutions, like hydrogen. Fundamentally, a technology neutral approach is required that utilises 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.

One of the most progressed and important projects LETA is supporting is Glencore's Carbon Transport and Storage Company (CTSCo) Surat Basin CCS Project onshore in the southern Surat Basin in Queensland[24]. An important element of this project will be 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.

A successful Surat Basin CCS Project will help:

[22] See business.gov.au/Grants-and-Programs/Major-Project-Status for more information.
[23] IEA (2021), *Is carbon capture too expensive?* (available at www.iea.org/commentaries/is-carbon-capture-too-expensive).
[24] See www.ctsco.com.au for more information.

- Develop emissions solutions for Australia's newest base load generators and many emission intensive industries including cement and chemicals.
- Show a pathway to commercial scale CCUS projects.
- Enable future industries including hydrogen and carbon recycling.
- Potentially form the foundation for the development of a Queensland Carbon Hub. The role of CCUS hubs and clusters are considered further in Section 6 below.
- Foster international collaboration and leadership on technology and emissions reduction.

CCUS is also not just a technology that can support emissions reductions in existing industries. With investment in CCS technology, coupled to our significant coal and natural gas resources, Australia is well positioned as a world-leading cleaner energy exporter, helping meet our own emission reduction targets as well as of those of our neighbours. This provides an important commercial and emissions reduction opportunity for Australia. For example, the IEA has noted low-cost clean hydrogen made via gasification of coal or natural gas holds significant promise for the world's energy future. Australia's role in clean hydrogen production is considered in more detail in Section 7 below.

4. CCUS and international trade

The Issues Paper asks in Question 15 on page 23:

> *How could Australia partner with other nations to accelerate global progress towards meeting the Paris Agreement goals?*

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 cost possible while taking advantage of the opportunities arising from emissions reduction and maximising 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 and 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.

CCUS 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 solutions, both local and regional, 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[25].

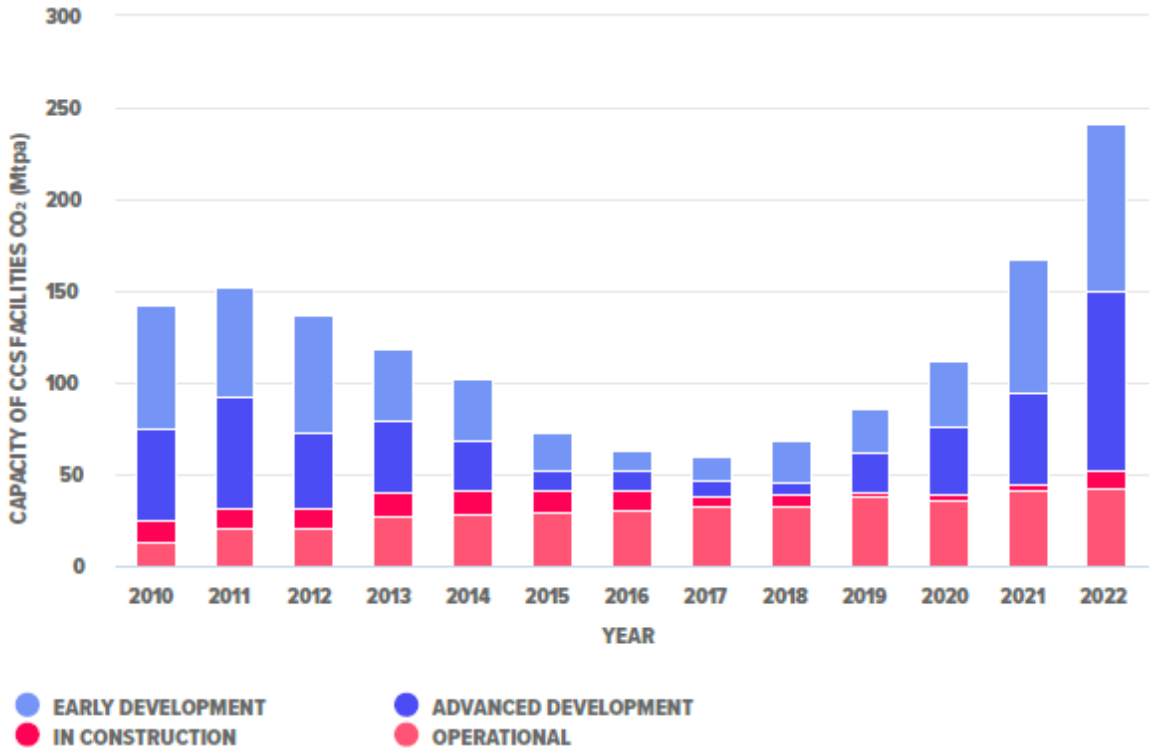
[25] A number of these regional solutions were discussed in the recent House of Representatives Standing Committee on Climate Change, Energy, Environment and Water *Inquiry Into the 2009 and 2013 Amendments to the 1996 Protocol to The Convention on the Prevention of Marine Pollution by Dumping of Wastes 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 CO_2 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).

For example, it is likely that the majority of hydrogen, ammonia and other derivative cleaner energy sources for Japan, South Korea and Taiwan will need to be imported by those economies.

5. CCUS around the world

The *Global Status of CCS 2022* report by the Global CCS Institute (GCCSI), found that in 2022 there were 30 facilities are in operation world-wide and 164 are in various stages of construction and development with a capacity to capture 244 million tonnes of CO_2 per annum. This is growth of 44 per cent over the last 12 months[26]. 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.

Figure 3: Pipeline of Commercial Facilities Since 2010 by Capture Capacity[27]



Source: GCCSI (2022)

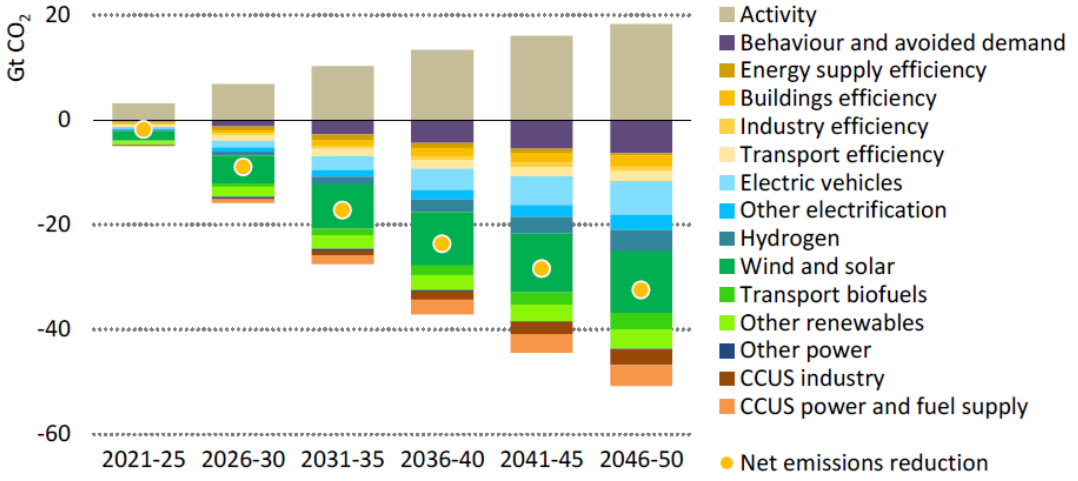
Notably, the figure show that there has recently been an acceleration in activity, with 2021 and 2022 in particular showing the growing momentum of CCS projects around the world. The project pipeline, in terms of facility numbers and capture capacity, is now at a record high. Since 2017, capture capacity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

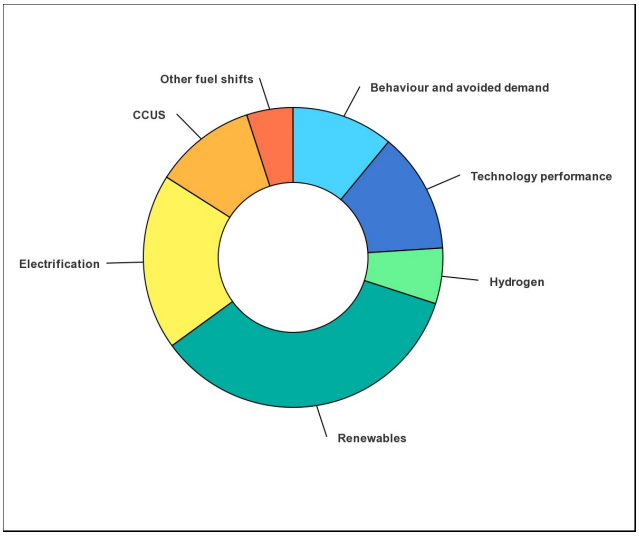
Looking out to 2030, CCS projects will become increasingly diverse, with facilities responding to a broad range of sectors including power generation, liquefied natural gas (LNG), cement, steel, waste-to-energy, direct air capture and storage and hydrogen production.

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 CCUS will also be required.

[26] GCCSI (2022), *Global Status of CCS 2022* (available at status22.globalccsinstitute.com).
[27] GCCSI (2022), *Global Status of CCS 2022* (available at status22.globalccsinstitute.com).

Figure 4: Average annual CO_2 reductions from 2020-2050 in the IEA's Net Zero Scenario[28] and Cumulative emissions reduction by mitigation measure in the Net Zero Scenario, 2021-2050[29]





Source: IEA (2021).

5.1 The United States

The United States has been a world leader in development CCUS and has recently increased its focus on and support for expanded CCUS activities. On 16 August 2022, US President Biden signed the *Inflation Reduction Act 2022* (IRA) into law[30]. Amongst other things, the Act includes significant funding for CCUS 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.

[28] IEA (2021), *Net zero by 2050*: a *Roadmap for the Global Energy Sector* (available at www.iea.org/reports/net-zero-by-2050).
[29] IEA (2022), *Fuels and Technologies: Hydrogen* (available at www.iea.org/fuels-and-technologies/hydrogen).
[30] 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).

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[31]. The inception of the credit jumpstarted new investment into CO_2 capture technologies and according to the GCCSI it has been the most progressive CCUS-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*[32].

In addition, the US *Infrastructure Investment and Jobs Act 2021* provides approximately $US12 billion across the CCUS 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.

As the Issues Paper notes on Page 16, these and the developments in other jurisdictions, outlined below, can have a material impact on our competitive advantages, and risk seeing Australia fall behind other countries as they seek to implement low emission technologies to reduce emissions and secure their industrial base.

5.2 Canada

In Canada, the 2022 Federal Budget proposes an investment tax credit for CCUS projects between 2022 and 2030, valued at around 37-60 per cent depending on the type of project[33].

5.3 The European Union

The European Union has continued support for CCUS through regional funding programs (such as the Connecting Europe Facility – Energy and the Innovation Fund[34]) and revisions to cross-border regulations to include CO_2 storage. National subsidy schemes (such as those in Denmark and the SDE++ in the Netherlands) have also supported CCUS projects[35].

Most recently, the EU Commission has commenced a public consultation on an *Industrial carbon management – carbon capture, utilisation and storage deployment* initiative[36], which will assess:

- What role CCUS 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 CO_2 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.*

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[31] 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.
[32] Dr Fatih Birol (2019), *Testimony to the US Senate Energy and Natural Resources Committee*, 28 February.
[33] 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.
[34] See commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/connecting-europe-facility_en for more information.
[35] 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.
[36] 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.

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)*[37]*, 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.*

In doing so, the Commission's initiative provides a template for the development of a similar strategy for Australia, which could complement the outcomes of the review of the National Hydrogen Strategy. As noted above, a *National CCUS Strategy* could consider the domestic and global state of CCUS projects and developments and work with industry to develop a policy and regulatory framework to facilitate the development of the industry in Australia.

5.4 Norway

In Norway, the Northern Lights project[38] 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 two-thirds 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[39].

5.5 The United Kingdom

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 Governments £1 billion dedicated CCS infrastructure fund. It is also expected to create more than 25,000 jobs by 2050[40].

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[37] 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 CO2 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.

[38] See www.equinor.com/energy/northern-lights for more information.

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

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

5.6 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[41] 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[42].

Japan also established and leads the Asia CCUS Network[43], which aims to share information on CCUS 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[44] 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[45] 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

[41] See www.hydrogenenergysupplychain.com for more information about the HESC project.
[42] 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.
[43] See www.asiaccusnetwork-eria.org for more information.
[44] See www.japanccs.com/en and www.iea.org/reports/ccus-around-the-world/tomakomai-ccs-demonstration-project for more information.
[45] See www.meti.go.jp/english/press/2023/0613_001.html for more information.

synergies regarding international energy trading and business cooperation. These will be crucial to drive development and make technologies more affordable[46].

5.7 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.

5.8 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.

5.9 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[47].

5.10 Other countries

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

All of this illustrates that there are significant projects and initiatives underway globally.

Australia is a notable absentee from this list.

6. CCUS hubs and clusters

CCUS hubs, in which multiple emission sources share transport and storage infrastructure, are becoming the dominant operating model for CCUS.

Heavy industry often exists in clusters close to water and other resources, power generation and transport infrastructure. Abating greenhouse gases in such industrial clusters can be achieved at lower cost through shared CO_2 transport and storage infrastructure that can be accessed by multiple CO_2 sources (that is, customers). This model reduces the CO_2 network capital cost as it is spread over an increased quantity of CO_2. By creating options for multiple customers for the operators of the transport, injection, storage and monitoring business it also reduces cross-chain risk.

The GCCSI and the Center on Global Energy Policy at Columbia University, have identified potential CCS networks by linking potential geologic storage basins to emissions-intensive regions across the globe[48]. Key findings from the report include:

[46] 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).
[47] 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).
[48] GCCSI (2021), *CCS Networks in the Circular Carbon Economy: Linking Emissions Sources to Geologic Storage Sinks* (available at www.globalccsinstitute.com/resources/publications-reports-research/ccs-networks-in-the-circular-carbon-economy-linking-emissions-sources-to-geologic-storage-sinks).

- Potential CCS networks can be identified in almost every industrialised region of the world ranked as 'highly suitable' or 'suitable'.
- These networks provide the greatest opportunity to decarbonise large clusters of power and industrial sources rapidly.
- Inadequate characterisation of geologic storage resources is the critical limiting factor to CCS and CCS network development across the globe with comprehensive national assessments still needed for the majority of nations. Until these assessments are completed, insufficient understanding of geologic storage resources will remain a barrier to CCS network development.
- Pipeline and compression networks require the development of cost models for piping and compression systems for a specific country with local costs of energy and construction. This provides the quantitative basis for decisions in network design.

The technologies to develop CO_2 hubs exist and are mature but experience and learnings from the operation of hubs are still relatively limited[49]. To assist in addressing this, the GCCSI has developed a database on major hubs and clusters being assessed around the world. This information is summarised below (Box 1).

Box 1: Major Hubs and Clusters

Country/region	Operating	Under development
Australia	0	4
China	Xinjiang Junggar Basin CCS Hub	0
Gulf Cooperation Council	Abu Dhabi Cluster (UAE)	0
North America	Alberta Carbon Trunk Line (Canada)	11
South America	Petrobras Santos Basin CCS Cluster (Brazil)	0
Western Europe	0	16
Total	**4**	**31**

Source: GCCSI (2023).

7. The development of an Australian clean hydrogen industry

In addition to its role in direct emissions reduction, CCUS is a platform technology that has the potential to enable significant reductions in emissions across many sectors and play a significant role in providing new clean fuels and decarbonised products across many industries. This includes clean ammonia-based fertilisers, clean fuels for heavy transport like trucks, trains and even passenger vehicles, as well as cleaner ways of producing steel and cement.

In the case of clean (low carbon) hydrogen, CCS can facilitate the production of clean hydrogen from natural gas or coal and as a competitive source of clean hydrogen. This provides an opportunity to bring low-carbon hydrogen into new markets in the near-term at competitive prices. This is particularly relevant considering coal and natural gas (without CCS) were the source of 93 million tonnes of the 94 million tonnes of global hydrogen production in 2021[50].

As the IEA has noted[51], clean 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 …*

[49] Carbon Sequestration Leadership Forum (2021), *CSLF Technology Roadmap 2021* (available at www.cslforum.org/cslf/Resources/Publications/CSLF_Tech_Roadmap_2021_final).
[50] IEA (2022), *Global Hydrogen Review 2022* (available at www.iea.org/reports/global-hydrogen-review-2022).
[51] IEA (2022), *Global Hydrogen Review 2022* (available at www.iea.org/reports/global-hydrogen-review-2022).

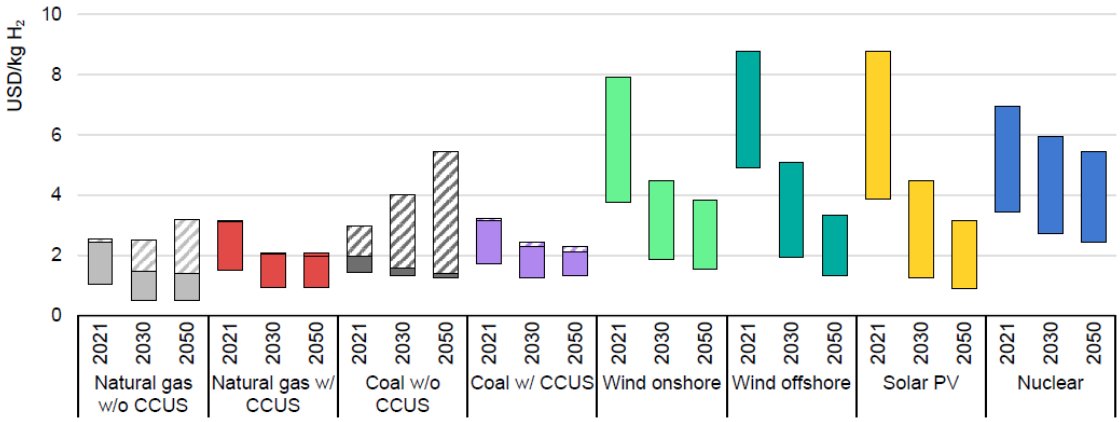
There are a number of challenges to deploying a clean hydrogen economy including: production at scale, infrastructure, investment, bulk storage, distribution, safety considerations and how to grow simultaneous demand and supply for hydrogen technologies. However, even considering these challenges, Australia's competitive advantage in natural resources puts the nation in a strong position to take advantage of any scale of hydrogen demand now and into the future. This also means there are two essential next steps in the success a clean hydrogen industry: creating markets to build scale, and bringing technology costs down.

Reducing costs is a particularly important goal for Australian hydrogen and across all hydrogen production technologies. With electricity and gas prices significantly lower than here in Australia, we are seeing some estimates from competitors in Saudi Arabia of $A1.35 Australian for hydrogen produced without CCS, $A2 for clean hydrogen and $3.30 for hydrogen produced from renewable energy.

Australia must be a low-cost producer to be a competitive supplier if we are to capture our share of growing global markets. With that in mind, Australia has significant brown and black coal reserves that when coupled with CCUS to produce hydrogen could see Australia emerge as a highly competitive exporter of clean hydrogen, that could be complement over time by the emergence of an electrolysis-based hydrogen industry.

Figure 5 below illustrates that hydrogen produced from black coal is commercially competitive now and can play a key role in a cleaner energy future and achieving net zero emissions.

Figure 5: Levelised cost of hydrogen production by technology in 2021 and in the Net Zero Emissions by 2050 Scenario, 2030 and 2050[52]



Source (IEA 2022).

Through leveraging and investing in Australian industry's existing skills, expertise and commercial relationships, as well as existing technology and infrastructure, Australia has what it takes to be a world leader in clean hydrogen production. Under the IEA's Net Zero by 2050 scenario, almost 40 per cent of hydrogen in 2050 will come from fossil fuels utilising CCUS. Similarly in Australia, the Net Zero Australia project final report[53] found that in one of its scenarios, hydrogen produced by coal and natural gas with CCS could play a significant role, alongside renewables and other technology options, in ensuring Australia reaches net zero by 2050.

A technology neutral approach, which focusses on all possible pathways to hydrogen development (both domestically and for exports), is vitally important to Australia achieving the best outcomes from this technology. LETA recommends the Authority reinforce the importance of a technology neutral approach to hydrogen development.

[52] IEA (2022), *Global Hydrogen Review 2022* (available at www.iea.org/reports/global-hydrogen-review-2022).
[53] See www.netzeroaustralia.net.au/final-modelling-results/ for more information.

This will be particularly important for review of the National Hydrogen Strategy[54], which is due to commence shortly. The existing Strategy takes a largely technology neutral approach and continuing a technology neutral approach should be a central principle underpinning the announced review.

In much the same way, LETA recommends the Authority play a role in leading the Australian hydrogen discussion away from the use of terminologies based on colours (grey, blue, green and so on) or other terms that are largely impractical for the contracts that underpin investment. Much as the IEA has recently found[55], the adoption of a framework based on the emissions intensity of hydrogen can bring transparency, facilitate 'interoperability' and encourage a deeper and more liquid market for hydrogen.

Importantly, Australia's global competitors and trading partners (for example, both Japan and Korea have engaged extensively with Australian industry to pursue opportunities to build on Australia's longstanding trade relationships for traditional fuels to explore clean hydrogen export pathways) remain neutral with regards to the type of technology used to produce hydrogen, and focus on the associated emissions. Australia needs to be exploring all potential pathways to build global hydrogen markets and to maximise opportunities for the emerging industry here.

This means that while the Hydrogen Headstart[56] program announced in the 2023-24 Budget provided recognition of the importance of technologies like hydrogen, the program as announced (to provide $2 billion in "revenue support" for large scale renewable hydrogen projects through "competitive hydrogen production contracts"), is a missed opportunity to invest in technologies that will play a critical role in meeting Australian and global emissions reduction targets.

The program, as announced, risks failing to provide economically efficient and environmentally effective support for industry development in Australia. Rather, it focusses exclusively on a renewable-based hydrogen production pathway, and does not pursue a technology neutral approach that would focus on emission reduction outcomes rather than favouring particular technologies. Hydrogen Headstart's focus, on renewable hydrogen only, misses an opportunity to focus on all hydrogen production pathways, including clean hydrogen using coal, gas or biomass with CCS.

It also stands in contrast with the approach taken in the US through the IRA which provides significant support for CCS and for all forms of clean hydrogen production. For example, the Section 45V tax credits[57] available for hydrogen production in the United States are available for all types of hydrogen production, regardless of the production technology, and focus on the emissions profile of the hydrogen produced. Similarly the UK Government's Hydrogen Strategy[58] pursues a:

> *… twin-track approach to supporting both electrolytic 'green' and carbon capture (CCUS)-enabled 'blue' hydrogen production, alongside other potential production routes, which will enable the rapid growth of the sector while bringing down costs.*

The Government also announced in 2023-24 Budget[59] allocation of:

- *$5.6 million in 2023-24 to analyse the implications for Australia of intensifying global competition for clean energy industry, and to identify actions before the end of 2023 to further catalyse clean energy industries, ensure Australian manufacturing competitiveness and attract capital investment.*

[54] See www.dcceew.gov.au/energy/publications/australias-national-hydrogen-strategy for more information. The existing strategy, *Australia's National Hydrogen Strategy*, was launched in 2019 and can be found at www.dcceew.gov.au/sites/default/files/documents/australias-national-hydrogen-strategy.pdf.
[55] IEA (2023), *Towards hydrogen definitions based on their emissions intensity* (available at www.iea.org/reports/towards-hydrogen-definitions-based-on-their-emissions-intensity).
[56] See ministers.treasury.gov.au/ministers/jim-chalmers-2022/media-releases/hydrogen-headstart-power-new-jobs-industry and www.dcceew.gov.au/energy/hydrogen/hydrogen-headstart-program for more information.
[57] The US tax code Section 45V production tax credit provides an income tax credit for every kilogram of qualified clean hydrogen produced (an approach that encompasses all forms of clean hydrogen production). The tiered tax credit approach means lower carbon-intensity hydrogen receives a higher tax credit amount. The tax credit applies for 10 years following the date a project begins operation (project must commence construction by 2033). See www.energy.gov/sites/default/files/2022-10/IRA-Energy-Summary_web.pdf for more information.
[58] See www.gov.uk/government/publications/uk-hydrogen-strategy for more information.
[59] See minister.dcceew.gov.au/bowen/energy-future-plan for more information.

To maintain a technology neutral approach to hydrogen production and development, and to stand alongside the approach taken in countries like the US and the UK, LETA recommends the eligibility criteria – but not the funding – for the Hydrogen Headstart scheme be expanded to include clean hydrogen (hydrogen from coal, natural gas and biomass with carbon capture and storage (CCS)), by including clean hydrogen in the guidelines for the Hydrogen Headstart program that are under development.

LETA also recommends that the allocation of "… *$5.6 million in 2023-24 to analyse the implications for Australia of intensifying global competition for clean energy industry, and to identify actions before the end of 2023 to further catalyse clean energy industries, ensure Australian manufacturing competitiveness and attract capital investment"* include CCS and hydrogen from coal, natural gas and biomass in the analysis.

8. Other issues raised in the Issues Paper

8.1 Target-setting framework

As the Authority considers its advice to the Government on future emissions reduction targets as part of a new Nationally Determined Contribution (NDC) to be lodged in 2025 to specify a 2035 emissions reduction target, LETA notes the following:

- Historically, Australia as a resource rich export-focussed economy, has had a relatively emissions-intensive resource endowment and comparative advantage based on our ability to develop this extensive resource base. Combined with Australia's relatively small and widely dispersed population base, it is little surprise that Australia has, for example, a relatively high level of per capita emissions (although Australia's per capita emissions have been declining over time).
    - While demand for emissions-intensive commodities will decline over time, demand for energy and for the associated goods and service they produce, will remain.
    - This means that as traditional commodities are produced in low carbon ways (utilising, for example, CCUS), demand for those commodities will remain, providing opportunities for Australia, as noted above, to participate in global markets for clean hydrogen and CCUS services.
    - The Authority's advice, considered on Page 19, should highlight these opportunities alongside opportunities in critical minerals and green steel.
- Australia should continue to engage the international community in pursuing identified and beneficial environmental outcomes through greenhouse gas emissions reduction action. Given the global nature of climate change and economic activity, and the global nature of the Paris Agreement, the international context is important when considering an appropriately updated NDC for Australia. The international context is also relevant to how Australia's economy will change over time, and can affect the competitiveness of Australian industry. This last issue is of particular importance, but is often overlooked in the public debate on international action.
- A key area of focus for Australia's export-focused industries, continues to be an assessment of the action of Australia's trade competitors. One of the key factors to consider when assessing any changes to Australia's emissions reduction targets is the action or inaction of trade competitors. This means it is the competitive position facing individual industries; not just broad action or intention to act at the economy-wide level that counts. The actions of competitor countries are key; not just the actions of "major economies/emitters" or "trading partners".

LETA would also refer the Authority to the AIGN submission for a further consideration of issues related to future target-setting and Australia's updated NDC.

8.2 Sectoral pathways: drawing on work by Net Zero Australia and additional economic analysis

The Issues Paper notes on page 19 that in exploring potential pathways, the Authority will draw on the work already done by organisations including the findings of the Net Zero Australia (NZAu)[60] study.

LETA is involved in the NZAu work through the NZAu Advisory Group. LETA would particularly draw the Authority's attention to the findings of the study arising from the one of the six scenarios modelled, the "Constrained renewables rollout (E+RE-) scenario" (a scenario that models renewable rollout rate limited to several times historical levels (to examine supply chain and social licence constraints) and a higher cap on underground carbon storage (to make net zero achievable)).

While many of the other five scenarios have a range of similarities (related to sustained and significantly increased renewable rollout and a rapid increase in electrification), this scenario finds that CCUS plays a very significant role in ensuring Australia achieves net zero emissions by 2050.

More generally, the NZAu study demonstrates that CCS is needed in different ways to achieve net zero emissions across the Australian economy in all six the scenarios modelled as part of the study, further highlighting that Australia will need a range of technologies and solutions that can be deployed to reduce emissions. The study findings also emphasise the need for greater investment in research and development to drive innovation and accelerate the deployment of low-emission technologies.

LETA encourages the analysis undertaken by the Authority to consider the full range of scenarios and the various pathways that may be available to Australia to meet a net zero emissions by 2050 target (and targets for 2030, 2035 and beyond).

In addition, the Issues Paper notes on page 20 that the Authority has commissioned the CSIRO and EY Port Jackson Partners to conduct economic modelling to analyse the impact of varying levels of domestic and international climate ambition. LETA supports this approach and also the use of the modelling results not as an end of themselves but as a way to examine the opportunities and costs for the Australian economy associated with different emissions reduction scenarios and complementing the modelling approach with other data sources, consultation and qualitative research to establish a holistic understanding of the socioeconomic impacts associated with possible emissions pathways.

The Issues Paper also confirms the modelling scenarios and assumptions will be based on international best practice, expert advice, consultation and relevant data sources. LETA would welcome the opportunity to work with the Authority to consider the appropriate scenarios to examine the role low emission technology can play as Australia meetings its emissions reduction targets in an efficient, effective and least cost way.

8.3 Leading indicators

LETA recommends the Authority add to the examples of leading indicators set out on page 21 of the Issues Paper investment in the development of CCUS projects and all forms of clean hydrogen production. Both are examples of leading indicators that

- *can identify barriers to progress and enable them to be addressed early*
- *are forward-looking and measurable sets of data that can be used to anticipate how the economy and associated emissions are likely to change*
- *can provide early indications of whether the transition to net zero is happening fast enough*

In the case of CCUS projects and the project development pipeline, a range of domestic and international data sources can be utilised.

[60] See www.netzeroaustralia.net.au and www.letaustralia.com.au/media-centre/study-highlights-carbon-capture-and-storage-as-essential-for-net-zero for more information.

- The GCCSI's annual *Global Status of CCS* report[61] documents important milestones for CCS over the previous 12 months, its status across the world and the key opportunities and challenges it faces. It is supplemented by the Institute's CCS Facilities Database (CO_2RE) which provides an extensive, up-to-date global database of all CCS facilities and projects[62].
- The IEA maintains a worldwide database of CCUS projects[63]. The IEA established this dataset as part of its efforts to track advances CCUS. It covers all CO_2 capture, transport, storage, and utilisation projects worldwide that have been commissioned since the 1970s, and have an announced capacity of more than 0.1 Mtpa (or 1,000 tpa for direct air capture facilities).

Together, databases provide the Authority with a ready-to-use dataset of leading indicators that can be used to asses at both a domestic and international level, the extent to which CCUS projects and project developments are happening fast enough to support the level of emissions reduction necessary to meet net zero by 2050 or interim emissions reduction targets.

The IEA also maintains a complementary database for global hydrogen developments[64], as part of the IEA's efforts to track advances in low-carbon hydrogen technology. Importantly, the IEA's approach is technology neutral, covering all projects commissioned worldwide since 2000 to produce hydrogen for energy or climate change mitigation purposes. It includes projects which their objective is either to reduce emissions associated with producing hydrogen for existing applications, or to use hydrogen as an energy carrier or industrial feedstock in new applications that have the potential to be a low-carbon technology. Projects in planning or construction are also covered.

8.4 Are Kyoto-era schemes fit for the Paris Agreement era?

The National Greenhouse and Energy Reporting Scheme, established through the National *Greenhouse and Energy Reporting Act 2007*, brought together a series of fragmented and inconsistent greenhouse (and energy production and use) reporting schemes that existed at both a national and sub-national level into a coordinated and consistent system, that now represents world-leading reporting practice and a relatively rare example of some level of greenhouse-related policy coordination and consolidation across jurisdictions.

In part, it provides the basis for Australia's international reporting, including under the Paris Agreement. NGERs also provides a key input into policy formation and information transparency for a range of stakeholders. These uses complement, but stand apart from Kyoto Protocol or Paris Agreement reporting (for example, the establishment of NGERs was not solely to satisfy Kyoto Protocol reporting requirements and the need for a reporting scheme like NGERs would remain even if there was no international agreement like the Paris Agreement).

LETA would also refer the Authority to the AIGN submission for comments on NGER Review issues. LETA will look forward to participating in both the NGER and CFI reviews (including any review of methane measurement, reporting and verification) when they commence.

8.5 Carbon credit integrity

LETA's detailed submission to the Independent Review of Australian Carbon Credit Units has been provided to the Authority along with this submission. LETA supporting the findings of the Review, particularly in relation to the CCS Method, where no changes were recommended. The Method was developed by the Clean Energy Regulator through an extensive, rigorous and conservative co-design approach in 2020 and 2021 and developed in consultation with all relevant stakeholders.

While the changes to the Safeguard Mechanism have significantly reduced the utility of the Method, its approach and development remain leading edge and LETA supports its continuation.

[61] Available at status22.globalccsinstitute.com.
[62] The CO2RE database is available at co2re.co.
[63] The IEA database is available at www.iea.org/data-and-statistics/data-tools/ccus-projects-explorer.
[64] The IEA database is available at www.iea.org/data-and-statistics/data-product/hydrogen-projects-database.

In relation to the comments on pages 27-28 about the use of an “integrity buffer” to introduce further conservativeness into what is an already conservative approach, LETA notes the CCS Method already incorporates a 3 per cent buffer, an amount significantly above any amount supported by a rigorous analysis of any risk of reversal under the Method.

LETA recommends no changes be made to the CCS Method, in particular, the Method does not require an integrity buffer over and above the buffer that is already part of the Method.

In addition, the rigorous and conservative Method design, and its relative youth (having only been finalised in 2021) means no changes to baselines or crediting periods are required.

8.6 International units

LETA notes the Authority’s conclusion on page 29 of the Issues Paper that Australia’s position on the use of international units remains unclear. The use of credible international permits/credits in order to meet obligation under Australian laws to manage greenhouse gas emissions would be an important way to ensure policies like the Safeguard Mechanism can genuinely drive low cost and effective emissions reductions both in Australia and across the region.

The ability to earn, purchase and trade international credits/permits could also facilitate the development of a regional market in emissions reductions and associated low emission technologies. For example, the ability for Australia’s major trading partners to purchase traditional or new energy sources from Australia and enter into commercial arrangements (where Australia receives and stores CO_2 emitted as part of an industrial facility in, for example, Japan or Korea through a CCS project in onshore or offshore Australia) could be underpinned by an ability to enter into a commercial arrangement to share the emissions reductions associated with the CO_2 storage (and any credits/permits that such an activity may create).

Such an outcome, which would reduce emissions in Australia’s key trading partners, help develop new industries in Australia and aid the development of a regional emissions reduction/low emission ecosystem, would also be underpinned by 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)* considered in Section 4 above.

LETA recommends the use of credible international credits/permits be allowed to meet compliance obligations that may arise from the Safeguard Mechanism. LETA also encourages the Authority recommend Australia continue to play an active role in international negotiations around the Paris Agreement rules (particularly Article 6) that will underpin access to these credible credits/permits.

LETA recommends the Australian Government prepare amendments to relevant regulatory and legal frameworks that would allow the Australian Government to move forward to expeditiously allow access to international markets once the arrangements underpinning Article 6 and finalised.

These proposals are consistent with the objective of achieving Australia’s emissions reduction targets at lowest cost to the Australian economy.