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Global Carbon Capture and Storage Institute Ltd:

# Key Messages

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# Global CCS Institute - Key Messages

## 1. Paris climate change targets cannot be reached without CCS.

CCS is a pivotal climate change technology. Its ability to remove carbon dioxide (CO2) emissions at their source and enable large-scale decreases to CO2 already in the atmosphere via CO2 removal technologies, make it an essential part of the solution.

CCS is the only available technology today to deeply decarbonise hard-to-abate sectors such as cement and steel. These require high temperature heat, for which there are few mature alternatives to the direct use of fossil fuels whilst process emissions, which result from chemical reactions, cannot be avoided by switching to alternative fuels.

According to the Intergovernmental Panel on Climate Change (IPCC), all pathways that limit global warming to 1.5°C project the use of carbon dioxide removal in addition to the implementation of emissions reduction policies. CCS provides the foundation for technology-based carbon dioxide removal, including bioenergy with CCS (BECCS) and direct air capture with carbon storage (DACCS). Given the scale of carbon dioxide removal needed, both technology-based as well as nature-based solutions will be needed.

## 2. CCS is vital to reaching net-zero emissions by the middle of the century.

IPCC Special Report on Global Warming of 1.5 degrees Celsius highlighted the importance of reaching net-zero emissions by mid-century. It presents four scenarios for limiting global temperature rise to 1.5 degrees Celsius – all require CO2 removal and three involve major use of CCS. The scenario that does not utilise CCS requires the most radical changes in human behaviour.

It is this urgent need to address emissions in order to stabilise by mid-century that makes CCS so vital.

The role for CCS implicit in the IPCC 1.5 Special Report is somewhere between 350 and 1200 gigatonnes of CO2 that needs to be captured and stored this century. Currently, some 40 megatonnes of CO2 are captured and stored annually. This must increase at least 100-fold by 2050 to meet the scenarios laid out by the IPCC.

## 3. CCS has been working safely and effectively since the 1970s. It is real and happening with 65 large-scale facilities in commercial operation or various stages of development around the world.

CCS is a proven technology. Currently, there are 26 large-scale CCS facilities in commercial operation, three in construction, two with operations suspended and 34 in various stages of development[1] These facilities are already capturing almost 40 mt of CO2 per annum and more than 260 mt of CO2 has been safely injected underground to date.

[1] As of December 2020

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## 4. CCS is the only clean technology capable of deeply decarbonising hard-to-abate industry.

The iron and steel, cement, and chemicals sectors emit carbon dioxide due to the nature of their industrial processes, and high-temperature heat requirements. They are among the hardest to decarbonise. Several reports, including from the Energy Transition Commission and the IEA conclude that achieving net-zero emissions in hard-to-abate industries like these may be impossible and, at best, more expensive without CCS. CCS is one of the most mature and cost-effective solutions.

## 5. CCS is the conduit to a new energy economy of hydrogen production, and CO2 utilisation.

Hydrogen is likely to play a major role in decarbonising hard-to-abate sectors. It may also be an important source of energy for residential heating and flexible power generation. Coal or natural gas with CCS is currently the cheapest way to produce low-carbon hydrogen.

$CO_2$ utilisation will expand investment in carbon capture technologies and can be used to permanently sequester $CO_2$ at locations where transportation pipelines are impractical or not economically feasible. It can allow businesses to engage in the circular carbon economy.

## 6. CCS enables technology-based carbon dioxide removal.

Residual emissions in hard-to-abate sectors need to be dealt with. CCS provides the foundation for technology-based carbon dioxide removal, including bioenergy with CCS (BECCS) and direct air capture with carbon storage (DACCS). While carbon dioxide removal is not a silver bullet, every year that passes without significant reductions in CO2 emissions, makes it more necessary. Investment in CO2 transport and storage infrastructure today will also facilitate carbon dioxide removal in the future.

## 7. CCS reduces emissions from fossil-fuel power generation and enhances the reliability of the power grid.

Decarbonising power generation is crucial to achieving net-zero emissions. CCS equipped power plants supply flexible low-carbon electricity that complements the intermittent nature of many renewables and especially solar and wind generation. This capability enables power grids to decarbonise while maintaining their reliability and resilience.

CCS is also essential for reducing emissions from the global fossil fuel power fleet we already have. Without CCS retrofit or early retirement, coal and gas-fired power stations – current and under construction – will continue emitting CO2 at rates that will consume 95 per cent of the IEA's Sustainable Development Scenario carbon budget by 2050.

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## 8. CCS creates jobs, sustains communities, and facilitates a just transition.

One of the main challenges to achieving a just transition is that job losses from high emissions industries may be concentrated in one place, while low-carbon industry jobs are created somewhere else. Even where geography is not a barrier, it is rare that mass job losses are followed quickly by wide scale opportunities. CCS facilitates a just transition by allowing existing industries to transform to low carbon opportunities and make sustained contributions to local economies while moving toward net-zero.

## 9. Geological storage of CO2 is safe and effective, and there are abundant storage resources to support widespread CCS development.

With more than 12,000 billion tonnes of potential CO2 resources identified, there is an abundance of underground storage resources at our disposal. Most of the world's key CO2 storage basins have been well assessed and almost every high-emitting nation has demonstrated substantial storage potential.

Geological storage of CO2 uses the same forces and processes that have trapped oil, gas (including naturally occurring CO2) and other hydrocarbons in the Earth's subsurface for millions of years. According to the IPCC, CO2 retained in appropriately selected and managed geological reservoirs is very likely to exceed 99% over 100 years and is likely to exceed 99% over 1,000 years.

## 10. CCS is cost effective, and costs continue to decrease with further deployment.

CCS is applicable to a variety of emissions sources and due to its versatility. However, its costs vary: the higher the concentration of the CO2 in the flue gas waste stream, the lower the cost to capture. In some applications such as natural gas processing, ethanol and fertiliser production the cost of CCS can be as low as USD20/t CO2. Indeed, the IEA has estimated that as much as 450 mt CO2 can be captured and stored globally with a commercial incentive as low as USD 40/t of CO2.

Learning rates and economies of scale will drive costs further down as successive CCS facilities come online. Indeed, there is evidence that capture costs have already reduced. The cost of capture reduced from over USD 100/t at the Boundary Dam facility to below USD 65/t for the Petra Nova facility.

The Energy Transitions Commission states that achieving net-zero emissions in hard-to-abate sectors without CCS "will probably be impossible, and certainly more expensive". The IPCC found that it would be, on average across the models examined, 138 per cent more expensive to reach global climate goals without the deployment of CCS.

## 11. Policy confidence is needed to accelerate the deployment of CCS.

To achieve net-zero emissions, today's worldwide installed capacity of CCS must increase more than a hundredfold by 2050. Stronger policy to incentivise rapid CCS investment is overdue. The current fleet of commercial CCS facilities provides examples of the mix of policies and project characteristics that have facilitated investment, demonstrating that the private sector will invest in CCS when the right incentives are in place.

Policy priorities for governments involve creating conditions for investment, including placing a value of CO2 emission reductions and direct financial support, facilitating investment in transport and storage infrastructure, and clarifying key regulatory and policy issues.