Steel Snapshot

Carbon Capture Utilisation (CCU)

Carbon Capture and Storage (CCS)

Carbon Capture Utilisation and Storage (CCUS)

WHAT

CCUS and CCS are technologies that can help reduce greenhouse gas (GHG) emissions by capturing carbon dioxide equivalents (CO_2e) before they are released into the atmosphere. They are then either stored underground or used for industrial processes.

WHO

Several companies in the steel industry are using CCUS and CCS technologies to reduce their carbon footprint. Internationally ArcelorMittal, Tata Steel, ThyssenKrupp and SSAB are investing in projects. In Australia, BlueScope Steel, the Steel Research Hub and several start-ups, such as Hazer Group and Mineral Carbonation International (MCi), are working on CCUS and CCS technologies that could be applicable to the steel industry.

WHY

Steelmaking is a highly carbon-intensive industry with many technical barriers to reducing its footprint. CCUS and CCS technologies are seen as potential solutions to reduce net emissions as part of a suite of options. CO_2 must be stored safely and permanently and not result in negative direct or indirect impacts.

CCU, CCS and CCUS Steelmaking Programs

Climate Action Program

GLOBAL | POLICY | WORLDSTEEL

The program supports developing and deploying low-carbon technologies such as CCUS/CCS and using renewable energy sources and energy efficiency improvements. The Worldsteel position paper on CCUS/CCS, highlights the potential of these technologies to reduce greenhouse gas emissions in the steel industry. It emphasises the importance of collaboration between industry, government, and other stakeholders to support the development and deployment of CCUS/CCS technologies and calls for policies and incentives to promote their uptake.

CCU Methanol

JAMSHEDPUR, INDIA | COMMERCIAL | TATA STEEL

The project involves capturing CO_2 emissions from the steelmaking process and using them to produce methanol, which can be used as a fuel or chemical feedstock. The project has the potential to capture up to 60,000 tonnes of CO_2 per year and reduce the carbon footprint of the steelmaking process.

Steelanol

GHENT, BELGIUM | COMMERCIAL | ARCELORMITTAL & LANZATECH

The project captures CO_2 emissions from the steelmaking process and uses them as feedstock for the production of bioethanol. The project is expected to produce around 80 million litres of bioethanol per year and significantly reduce the carbon footprint of the steelmaking process.

HYBRIT Australia

AUSTRALIA | START-UP | SSAB, MINERAL RESOURCES, WORLEY

Collaboration: Swedish steelmaker SSAB, Australian mining company Mineral Resources, and Australian energy company Worley

The project aims to produce fossil fuel-free steel using hydrogen instead of coal as a reducing agent and CCUS to capture and store the resulting CO_2 emissions.

Graphite from methane

AUSTRALIA | START-UP | HAZER GROUP

The process involves capturing CO_2 emissions and converting them into graphite, which can be used in a range of applications, including steel production. Hazer Group is commercialising its technology.

CCU Waste Heat

AUSTRALIA | START-UP | MGA THERMAL

MGA Thermal uses a modular system to capture waste heat and convert it into electricity, which can be used to power industrial processes, reducing greenhouse gas emissions.

Mineral Carbonation

AUSTRALIA | START-UP | MINERAL CARBONATION INTERNATIONAL (MCI), AUSTRALIAN GOVERNMENT & ORICA

Mineral carbonation involves capturing CO_2 emissions and reacting them with naturally occurring minerals to create stable, solid carbonates. The process is low-cost and has the potential to store CO_2 emissions permanently. MCi is currently working on commercialising its technology and has received support from the Australian government and industry partners, namely Orica. It has also received a Banksia Sustainability Circular Transition Award.

CO2CRC

AUSTRALIA | RESEARCH

CO2CRC is an Australian research organisation that is focused on developing and deploying CCUS/CCS technologies. The organisation has developed a range of technologies, including a carbon capture system for industrial processes, and is also involved in the development of the CarbonNet CCS project in Victoria.

CarbonNet

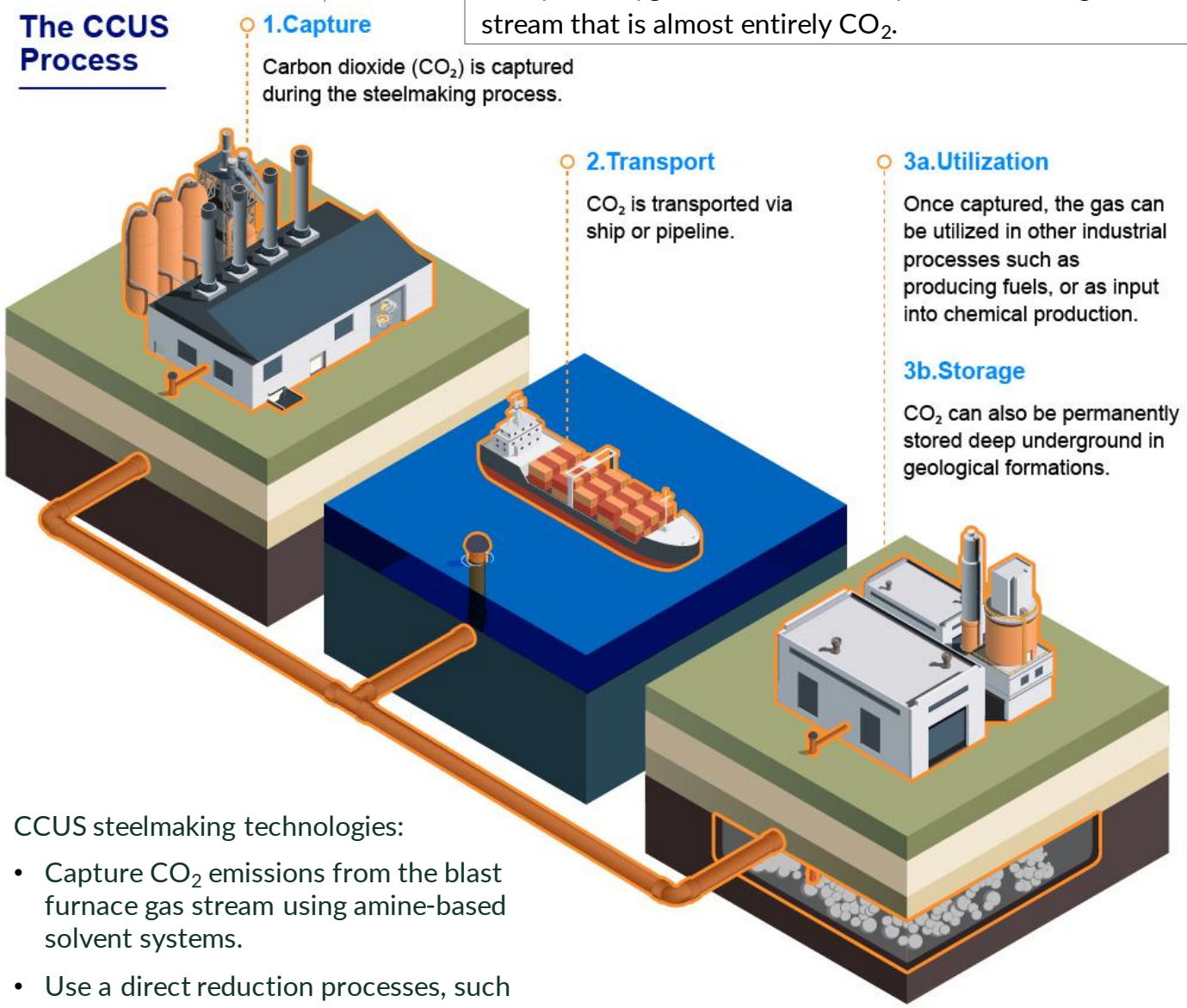
VICTORIA, AUSTRALIA | PROPOSED

A proposed large-scale CCS project aims to capture and store CO_2 from various industries, including steel and cement production.

CCU, CCS and CCUS Steelmaking Process

Post-combustion capture: CO_2 is captured from the flue gas stream after combustion.

Oxy-fuel combustion: the combustion process is fueled with pure oxygen instead of air to produce a flue gas stream that is almost entirely CO_2.



CCUS steelmaking technologies:

- Capture CO_2 emissions from the blast furnace gas stream using amine-based solvent systems.
- Use a direct reduction processes, such as the Midrex process, which can be fuelled with hydrogen produced using renewable energy sources.

Source: Visual Capitalist https://www.visualcapitalist.com/sp/understanding-global-demand-for-steelmaking-coal/