GLOBAL STATUS OF CCS 2024

COLLABORATING FOR A NET-ZERO FUTURE

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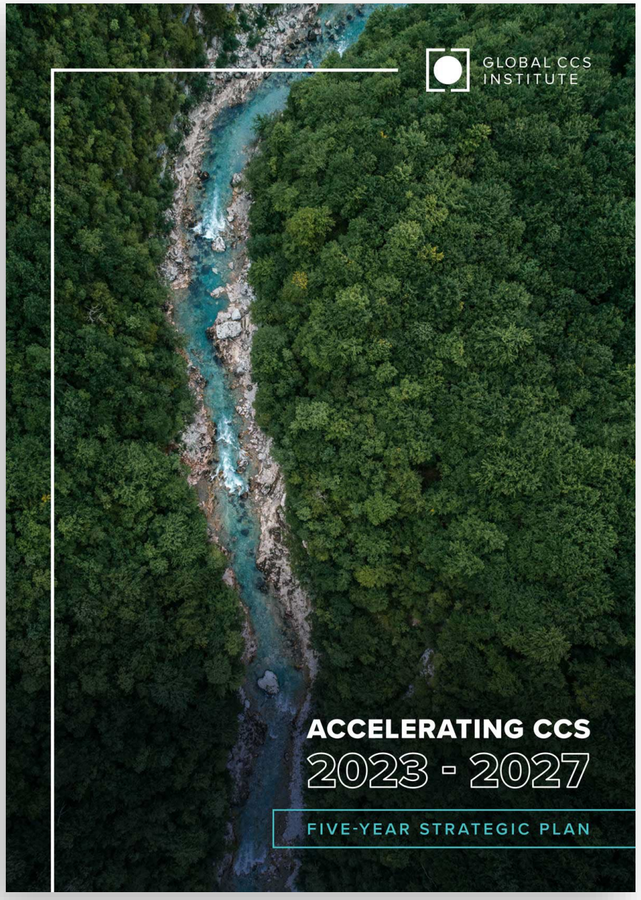
WHO WE ARE
Independent climate change think tank
Not-for-profit; Member-based
Over 215 members across governments, global corporations, private companies, research bodies and NGOs

MISSION:
Accelerating the deployment of CCS for a net-zero emissions future.

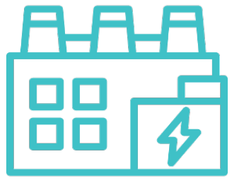
WHAT WE DO
Fact-based advocacy, thought leadership, knowledge creation and sharing, networking.



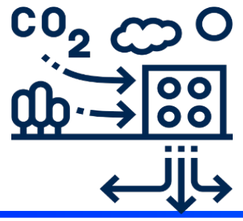
WHY: CCS IS ESSENTIAL TO REACH NET ZERO

Achieving deep decarbonisation in hard-to-abate industry.

Enabling the production of low-carbon hydrogen at scale.

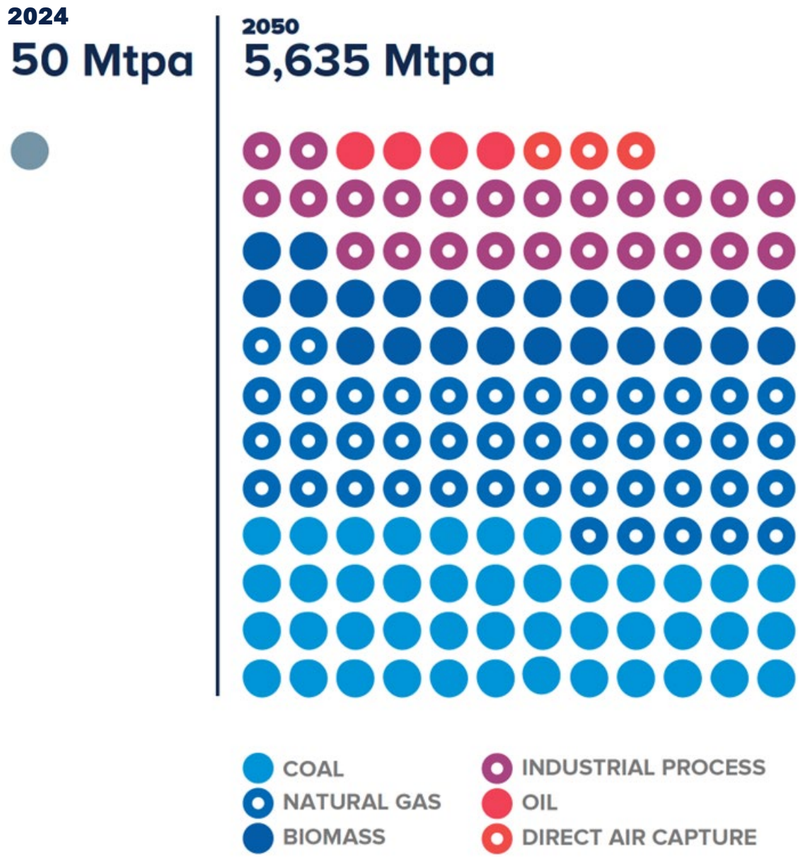


Providing low carbon dispatchable power.

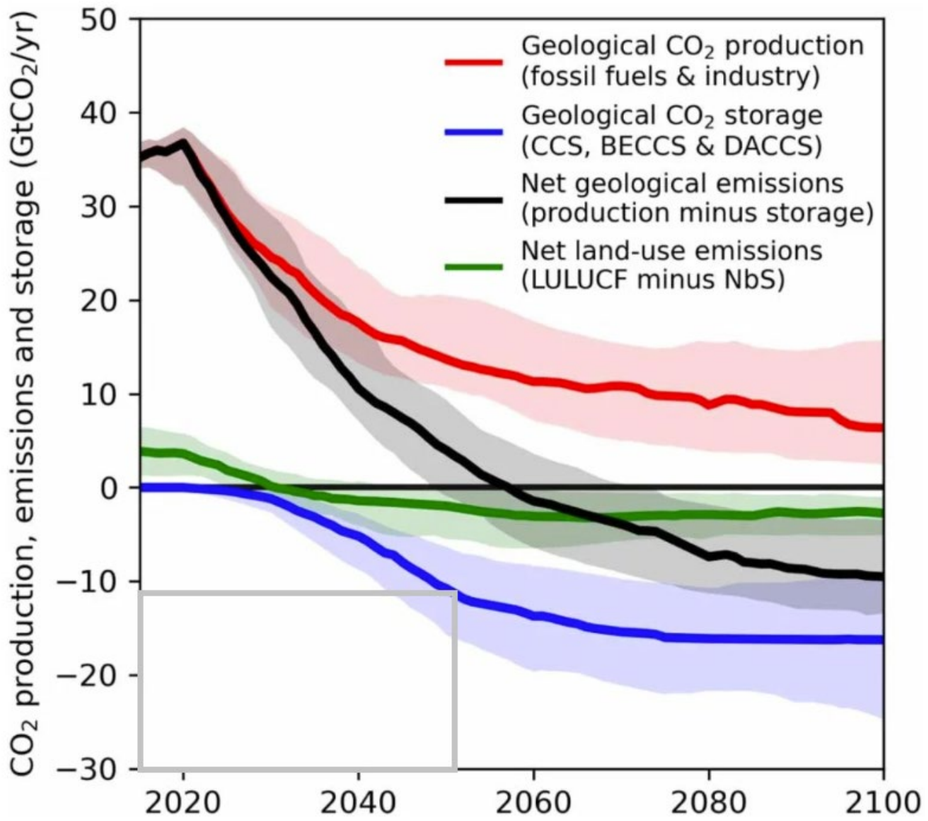


Delivering negative emissions.

CCS GROWTH REQUIREMENTS



Updated from IEA SDS report 2019



Source: Jenkins (2023): 1.5◦C- compatible scenario produced from IPCC's AR6 scenario database.[

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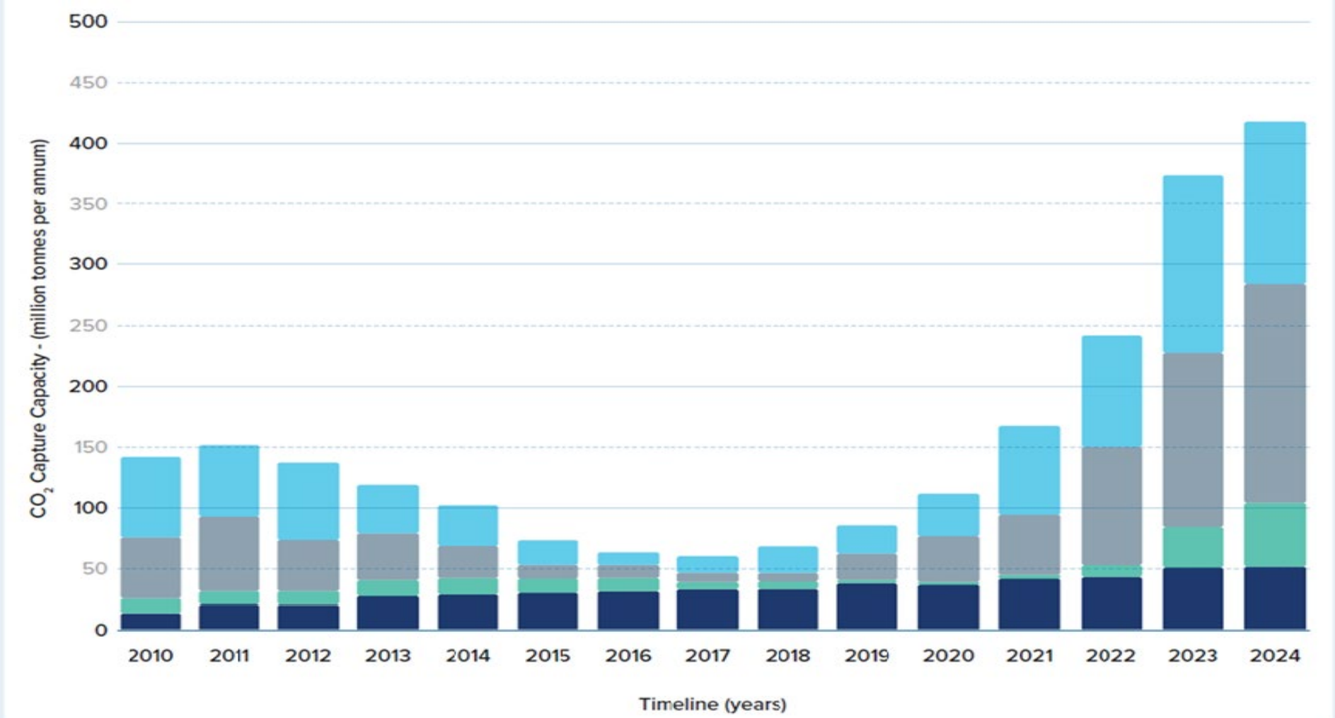
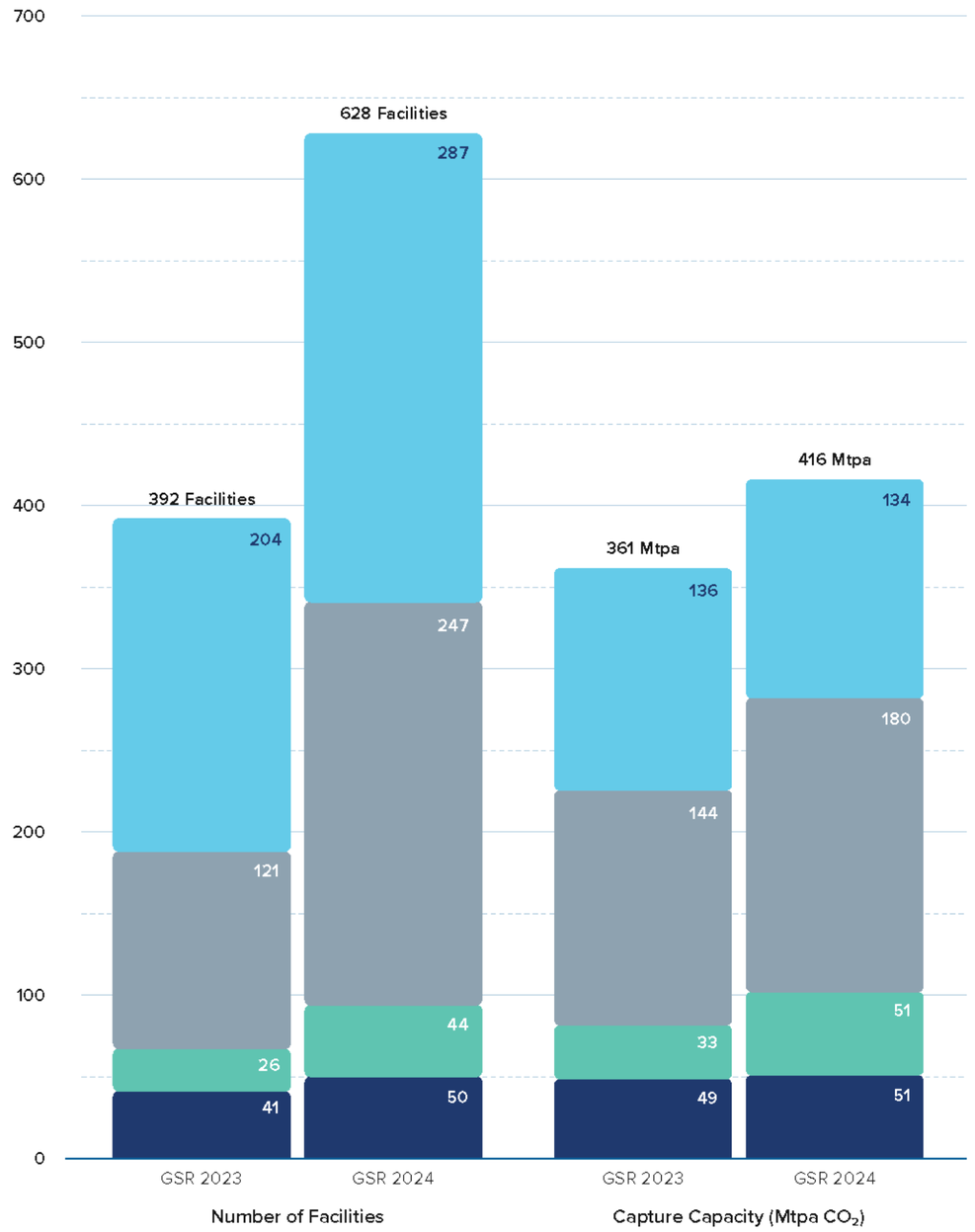
PROJECTS PIPELINE: GSR2024

Figure 3.1-2
CO_2 capture capacity of commercial CCS facility pipeline since 2010

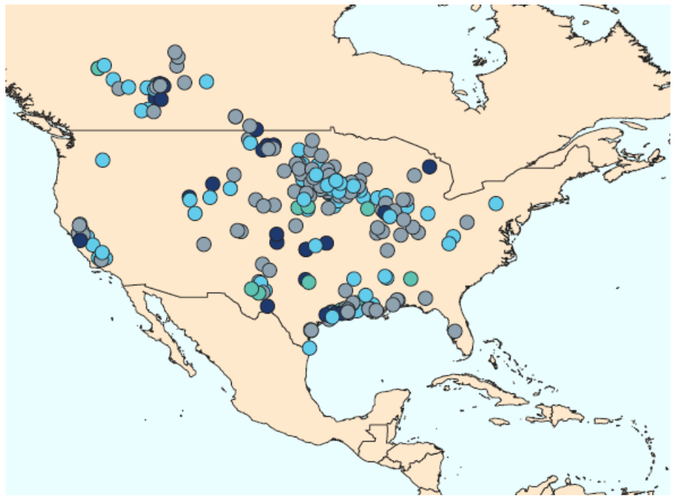


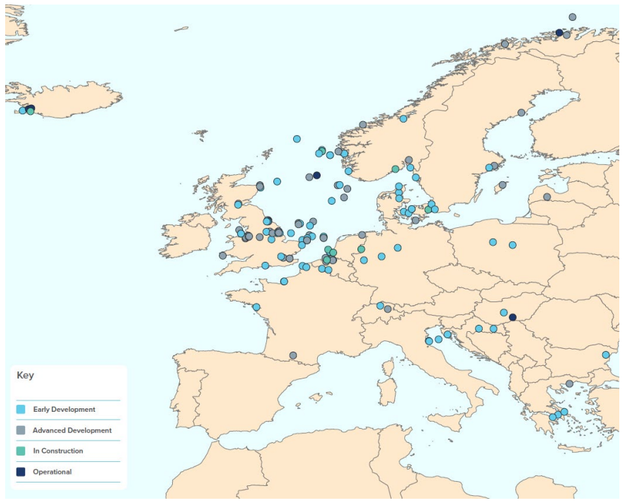
Early Development | Advanced Development | In Construction | Operational

Commercial CCS facilities by number and total capture capacity



PROJECTS: WHERE?





Early Development

Advanced Development

In Construction

Operational

These maps do not include the following:
- Pilot and Demonstration Facilities
- Announced Facilities
- Facilities where precise location is yet to be confirmed

Source: GCCSI GSR2024.

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Capture, transport and/or storage capacity (Mtpa CO_2)
0.2
1
5
Direct Air Capture
Aluminium
Waste to energy
Power Generation and Heat
Pulp and paper
Various[1]
Iron and Steel
Oil Refining
Cement
Chemical
Hydrogen/Ammonia /Fertiliser
Bioenergy/Ethanol
Natural Gas Processing
CO_2 Transport / Storage
1972-2010
2011-2020
2021-2025
2026-2030
2031-2035
Timeframe unconfirmed
Key
Early Development
Advanced Development
In Construction
Operational
Capacity Undefined
Not Applicable
[1] CO_2 captured from more than one industry within the project boundary.

GLOBAL DEVELOPMENTS WEST-TO-EAST

CCS DEVELOPMENTS: USA

- 27 facilities **operational** across US, Canada & Brazil; 18 in construction.
- Deployment rates highest in ethanol, nat gas processing, hydrogen/ammonia/ fertilizer
- USA: 276 CCS projects (GSR2024) vs 154 (GSR2023)
- Class VI applications queue growing: 161 applications for 56 projects under EPA review*.
  - North Dakota, Wyoming, Louisiana and West Virginia have received primacy. Alabama, Alaska, Arizona and Texas next.
- First "stick" mechanism: US EPA: coal and new gas-fired power plants to capture 90% of emissions by 2032, partially through CCS.
- CO_2 pipeline projects: social resistance, prompting new state laws in Sth Dakota, CAL + Illinois
- The Department of Interior is developing regulations for offshore storage and the Pipeline & Hazardous Material Safety Administration is updating CO_2 pipeline standards.

*As of February 2025

CCS DEVELOPMENTS: CANADA & BRAZIL

7 Operational CCS facilities in Canada

5 Facilities in construction in Canada

Canada

- Federal investment tax credit approved by Parliament (up to 50% capex until 2030)
- Federal carbon price increased to C$95/tonne in April (+C$15/yr up to C$170 by 2030)
- Canada Growth Fund established 2nd CCfD for CCS projects (gas and wte)

Brazil

- Petrobras CCS project in the Santos Basin injected 13Mt in 2023 (10.6 Mt in 2022); Aim to inject cumulative total of 80 Mt CO_2 by 2025.
- In Brazil, a CCS breakthrough occurred with the passage of the Fuels of the Future Bill → foundation for CCS regulations – first country in South America to develop such provisions.

CCUS DEVELOPMENTS: EUROPE

UNITED KINGDOM:

4 clusters capturing 20-30 mtpa (2030);
£21.7 billion allocated 2024;
£960 million GIGA fund;
27 storage permits issued;
GGR integration with UK ETS anticipated

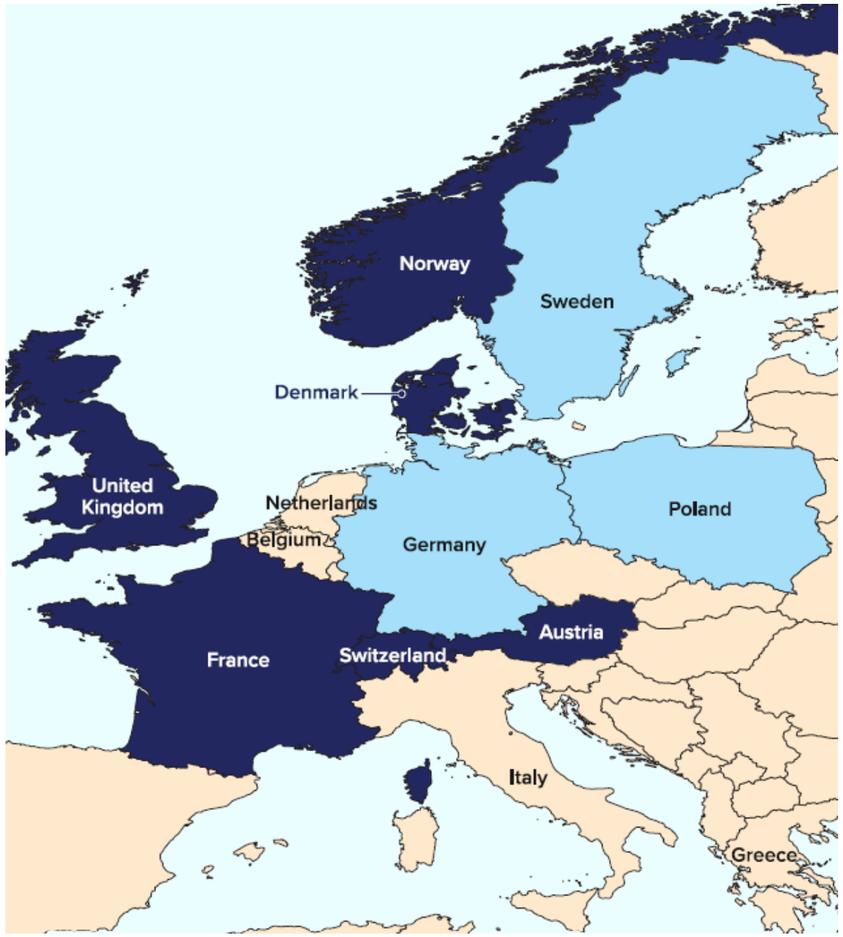
THE NETHERLANDS: SDE++; Aramis; Delta-Rhine and Delta-Antwerp corridor; Porthos FID & construction; 13 Mtpa storage target; Pension fund interest in T&S

DENMARK: Government funding, incl. for BECCS. Permits onshore + offshore; 4 Mtpa storage target

NORWAY: Northern Lights and Brevik now ready; Growth beyond Northern Lights

SWEDEN: BECCS support

POLAND: 4 Mtpa storage target



GERMANY: Key principles for a Carbon Management Strategy; Carbon Storage Act adopted by Federal Cabinet ; CCfDs; 5 Mtpa storage target

AUSTRIA: Nat Carbon Mgmt Strategy

ROMANIA: Delayed adoption of National Integrated Energy and Climate Change Plan; 10 Mtpa storage target

GREECE: EU IF success; active storage regulator; Prinos too small? access to Egypt?

ITALY: Injection at Ravenna; CCS committee; 7 Mtpa storage target

SWITZERLAND: call for CCS projects

FRANCE: Draft CCUS strategy released; CCfD's; tender

BELGIUM: Bilateral agreements; pipeline network incl. regional regulation; offshore pipeline to Norway; EU IF success; PCI success

National Carbon Management strategies: Published In preparation

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CCUS DEVELOPMENTS: EUROPE (2)

- 5 projects in operation / 2 ready to operate
- 12 projects in construction (FID taken)
- 191 CCS projects (GSR24) vs 120 (GSR23) vs 73 (GSR22)
- Hydrogen, ammonia, fertilizer, power gen, cement, biomass to power/heat
- Industrial Carbon Management Strategy, the enactment of the NZIA
- 14 crossborder CO_2 infrastructure projects on the PCI – PMI list
- Bilateral and multilateral agreements
- NZIA aims for 50 Mtpa storage (2030) → current permits approx. 40,000 km2
- UK £21.7B; Germany €3.3B; Denmark €3.8B; EUCOM approved €5.2 billion worth of state aid for CCS related investments in Sweden, Poland, and Portugal

CCUS DEVELOPMENTS: EUROPE (3)

Clockwise:

- Brevik Cement (HeidelbergMaterials)
- Porthos (EBN, Gasunie, PoR)
- Yara Sluiskil
- Northern Pioneer (Northern Lights)

CCS DEVELOPMENTS: MIDDLE EAST AND AFRICA

PROJECTS: 3 facilities in operation capturing 3.8 Mtpa CO2; 6 in construction
Regional operational CCS capacity = 8% of global total capacity (GSR23)

QATAR: Qatar Gas aiming for11 Mtpa CCS (2035)
KSA:

- Al Jubail CCUS industrial hub targeting 9 Mtpa (2027)
- Aramco aiming for 14 Mtpa CCS commitment (2035)
- National target of and 44 Mtpa (2035)

UAE:

- ADNOC took 1.5 Mtpa FID on Habshan facility; aiming for 10 Mtpa (2030)
- Long-term strategy aiming for CCS = 32% of industrial GHG reductions (2050)

→ Projected regional CCS capacity 65 Mtpa (2035)

CCS DEVELOPMENTS: ASIA PACIFIC

- APAC facility count +22 from GSR2023: 76 CCS facilities (19 operating; 9 in construction).
- Natural gas processing and chemical manufacturing – EOR dominates
- Significant PLR development across the region: Indonesia, S.Korea and Japan have released reg. frameworks; Malaysia expected to follow March 2025. Much to be done (SEACA)

Singapore

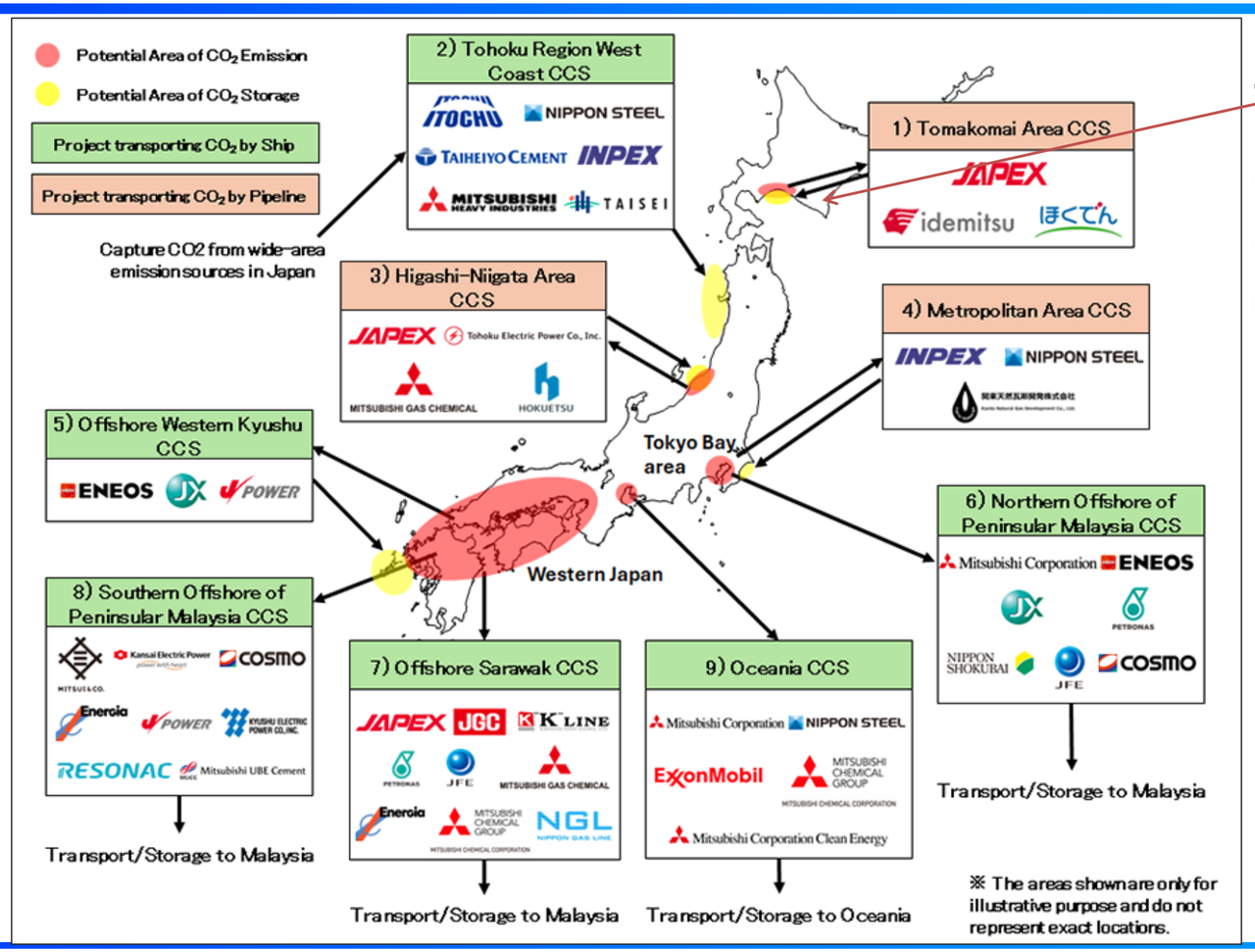
- S-hub project: 2.5 Mtpa objective by 2030 (NDC). MoU signed. LoI w/ Indonesia.

Indonesia

- Regulation allowing storage operators to reserve 30% of capacity for imported CO_2. Significant investment needed.

CCS DEVELOPMENTS: JAPAN

- CCS LT roadmap: 240 Mtpa/ 2050
- CCUS Business Act
- METI regulatory framework
- Financial mechanisms ¥
- Cross-border
- GCCSI membership



Tomakomai designated 1st commercial scale CCS project

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CCS DEVELOPMENTS: CHINA

- Carbon price ETS on power stations.
- 16 operating projects, incl. on/offshore, EOR
- CCUS increasingly highlighted in China's green transition policies.
  - **Carbon Emission Reduction Facility:** Low-cost loan for decarbonization projects.
  - **Green & Low-carbon Tech Demonstration Program** - Direct governmental support
  - **Action Plan for Low-Carbon Coal Power Transformation (2024-2027)** – Financial support to the selected coal power CCUS projects.
- NDRC selected 47 projects, 6 = CCUS

CCS DEVELOPMENTS: CHINA (2)

The CO_2 Storage Tanks at the Qingzhou Oxy-fuel Combustion Cement Project Site (provided by Tianjin Cement Industry Design & Research Institute)

SINOPEC 1 Mtpa CCUS Project in Petrochemical Sector

National Energy 500 Ktpa CCUS Project in Coal Power Sector

CCS DEVELOPMENTS: AUSTRALIA – NEW ZEALAND

- AUS government ratified the London Protocol 2009 amendment
- Federal budget for 2024-2025 makes inclusions for CCS, incl. for characterization
- "Safeguard Mechanism": Carbon baseline reduction targets for industry; ACCU=A$75/t
- New Zealand government confirms CCUS to be recognized by ETS

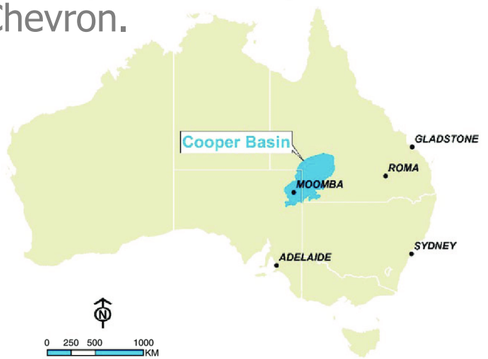
CCS DEVELOPMENTS: AUSTRALIA – NEW ZEALAND (2)

- Gorgon continues to operate, storing around 1.6Mtpa;
- Moomba operational
- Two QLD storage projects blocked due to deemed groundwater risk.

Gorgon LNG facility, WA. Image courtesy of Chevron.

Ngawha 3 geothermal power plant, NZ (source: Top Energy)

Santos Moomba project in the Cooper Basin – 1.7 Mtpa (source: Beach Energy)



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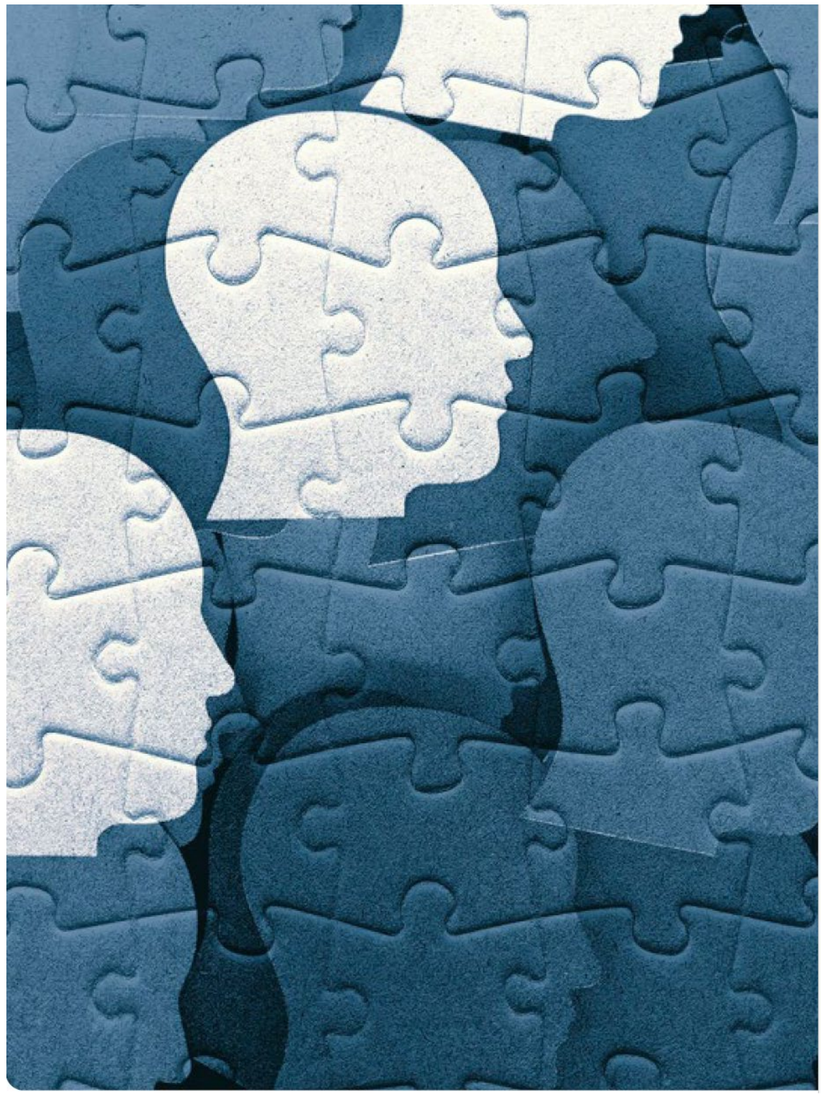
Global CCS needs global collaboration



Outlook is positive for CCS

Increasing policy support, new investments, & project deployments worldwide

Challenges still to overcome

Difficult investment settings, community concerns, regulatory barriers

Collaboration is key to global CCS deployment

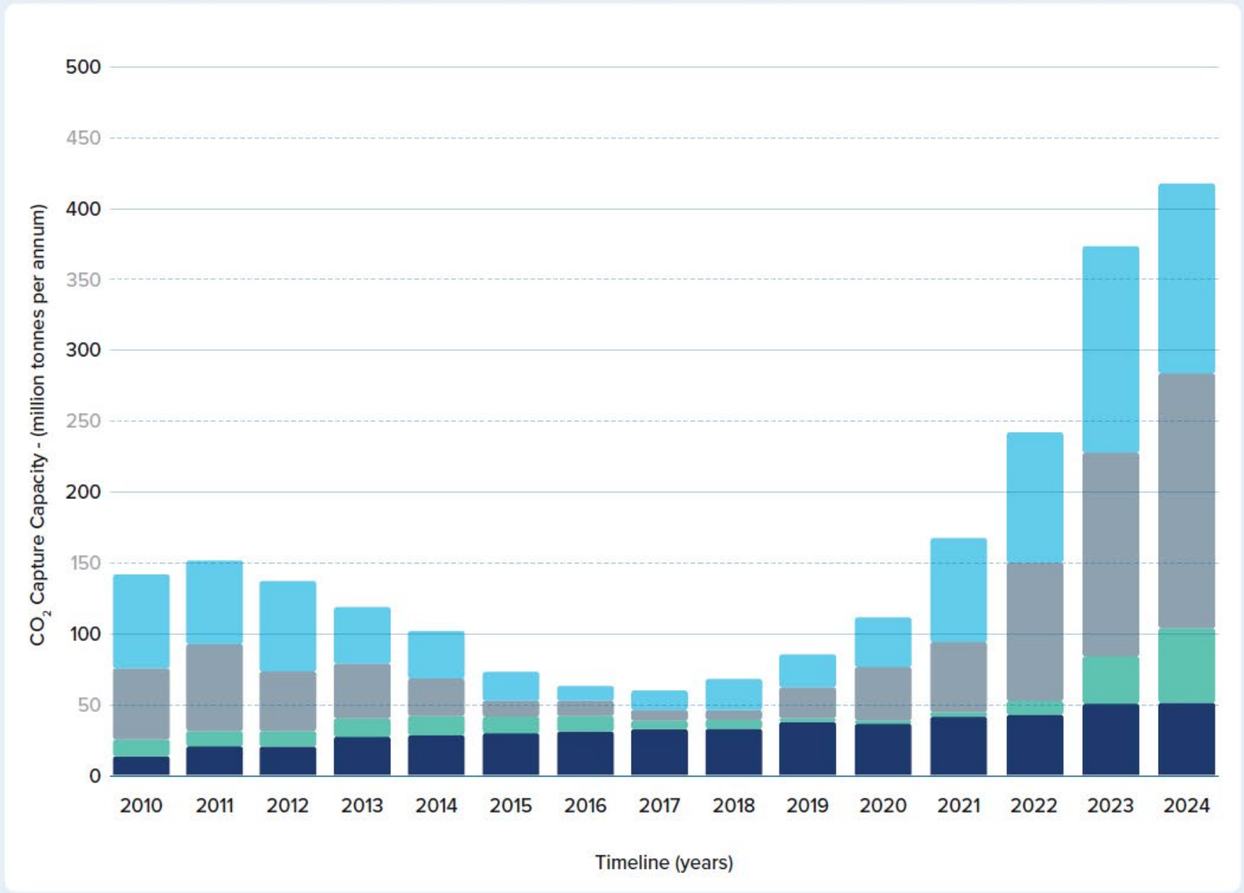
Governments, industry, and research community must work together to remove barriers, lower costs and drive investment

Global Status of CCS 2024

Thank you

PROJECTS PIPELINE: UNPRECEDENTED LEVELS

Figure 3.1-2
CO_2 capture capacity of commercial CCS facility pipeline since 2010



Projects		
2023		2024
41	Oper.	50
26	Constr.	44
325	Dev't	534
392	TOTAL	628

57%
year-on-year increase in CO_2 capture capacity under construction

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REALISING CCS AT SCALE GLOBALLY

Existing pledges and commitments can get us to hundreds of million tonnes per annum scale.

WHAT'S NEEDED?

Business case → FID

Policy

Infrastructure incl. regulation

Public Acceptance

Collaboration to cut lead times

Emerging markets deployment