GLOBAL STATUS OF CCS 2024

COLLABORATING FOR A NET-ZERO FUTURE

GLOBAL CCS INSTITUTE

Agenda

Welcome

Alex Zapantis - General Manager, Global CCS Institute

Pre-recorded remarks

HE Mr Rafizi Ramli - Minister of the Economy, Malaysia

Overview of Global Status of CCS 2024 Report

Alex Zapantis - General Manager, Global CCS Institute

Panel discussion

Rosie Johnstone - Head of CCS Solutions, Geovault
Chair, CCUSNA

Scott Neilson - Partner, A&O Shearman

Takashi Hongo - Senior Fellow, Mitsui & Co Global Strategic Studies Institute

Webinar close

Pre-recorded remarks

HE Mr Rafizi Ramli

Minister of the Economy

Malaysia

GLOBAL STATUS OF CCS 2024

COLLABORATING FOR A NET-ZERO FUTURE

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Collaborating for a net-zero future

International collaboration platforms

- Clean Energy Ministerial
- Mission Innovation
- Carbon Management Challenge
- Asia CCUS Network

Public-private partnerships

- **Jubail CCUS Hub**
  Saudi Arabia, Saudi Aramco, SLB & Linde
- **Shepherd CCS Project**
  Malaysia & South Korea, Lotte Chemical, Petronas, Samsung E&A, Samsung Heavy Industries, SK Earthon, KNOC, Hanwa Corporation, Air Liquide and Shell

Government bilateral agreements

>50 bilateral agreements or MOUs between governments executed since 2020 that include CCS within their scope

Private sector cooperation

- Technology companies ↔ Project developers
- Shipping companies ↔ Ports
- Industrial emitters ↔ Transport & storage developers

Global facilities & trends

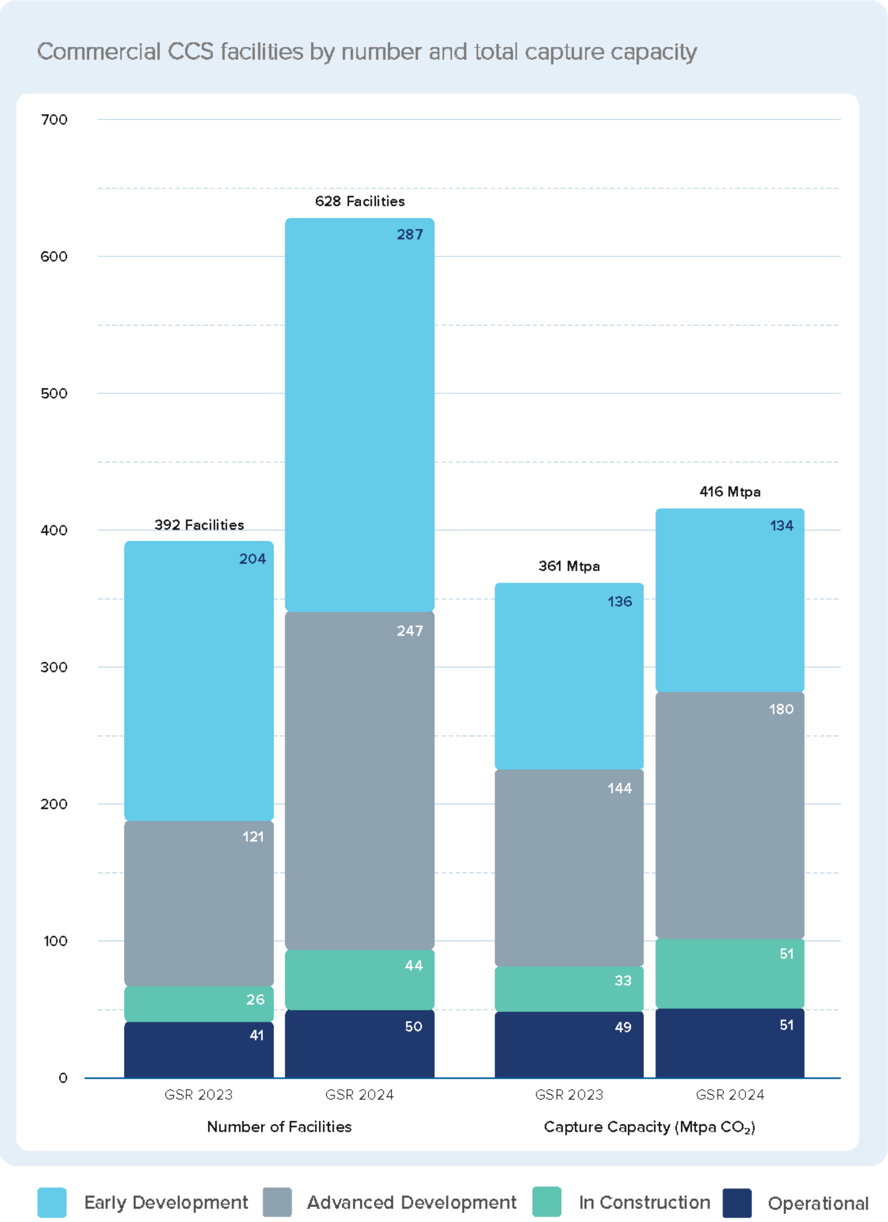
628 Projects in the pipeline

416 Mtpa Cumulative capture capacity

Significant growth in the CCS facilities pipeline

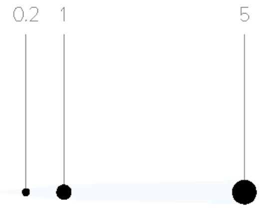
50 Facilities in operation

44 Projects in construction

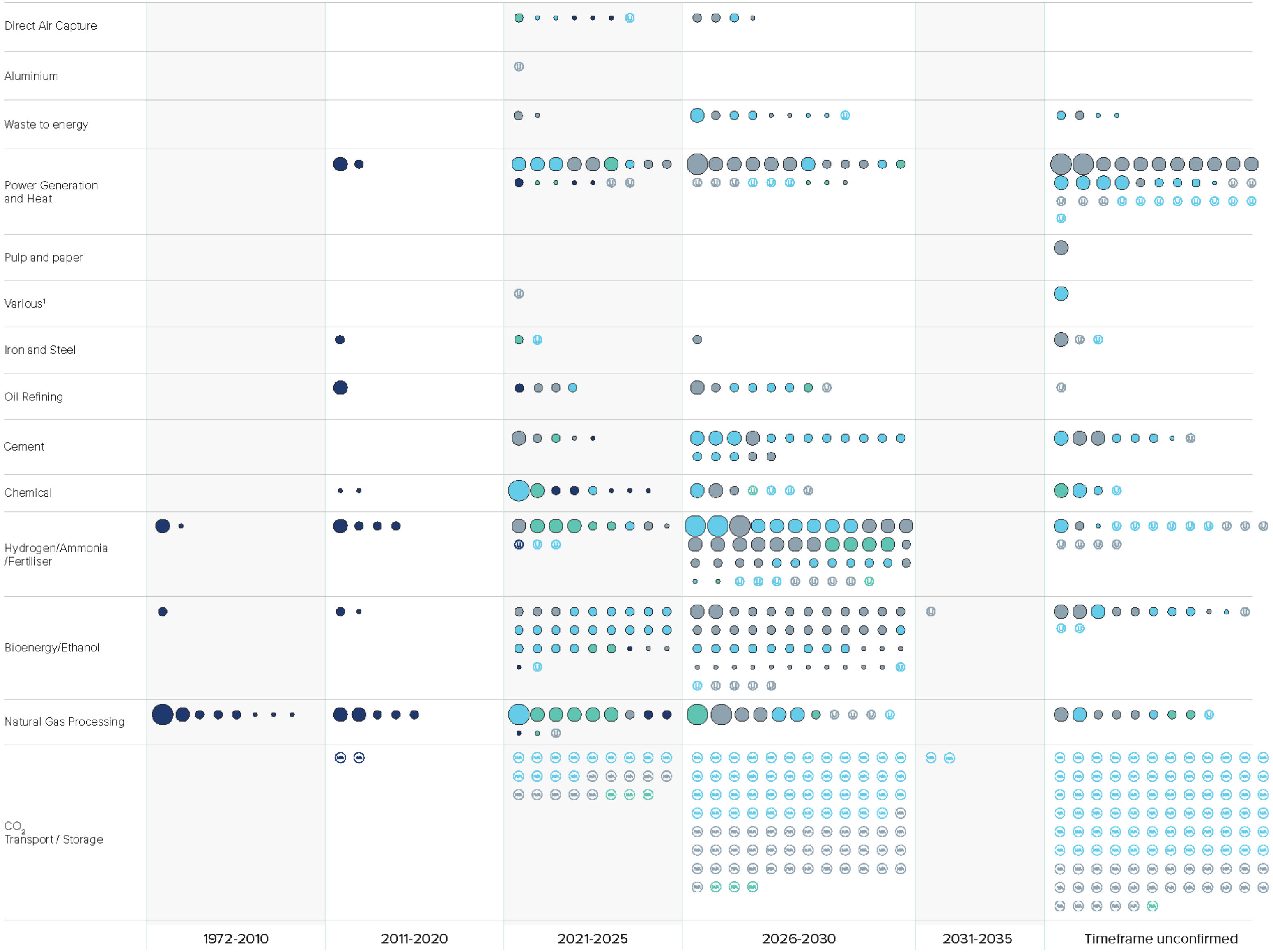


CCS project pipeline

CO_2 capture capacity of operating facilities on track to double to >100 Mtpa once projects under construction come online.



CCS project pipeline by industry & year operational



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 policy, legal & regulatory trends

Sustained and strengthened policy support continues to drive global CCS deployment

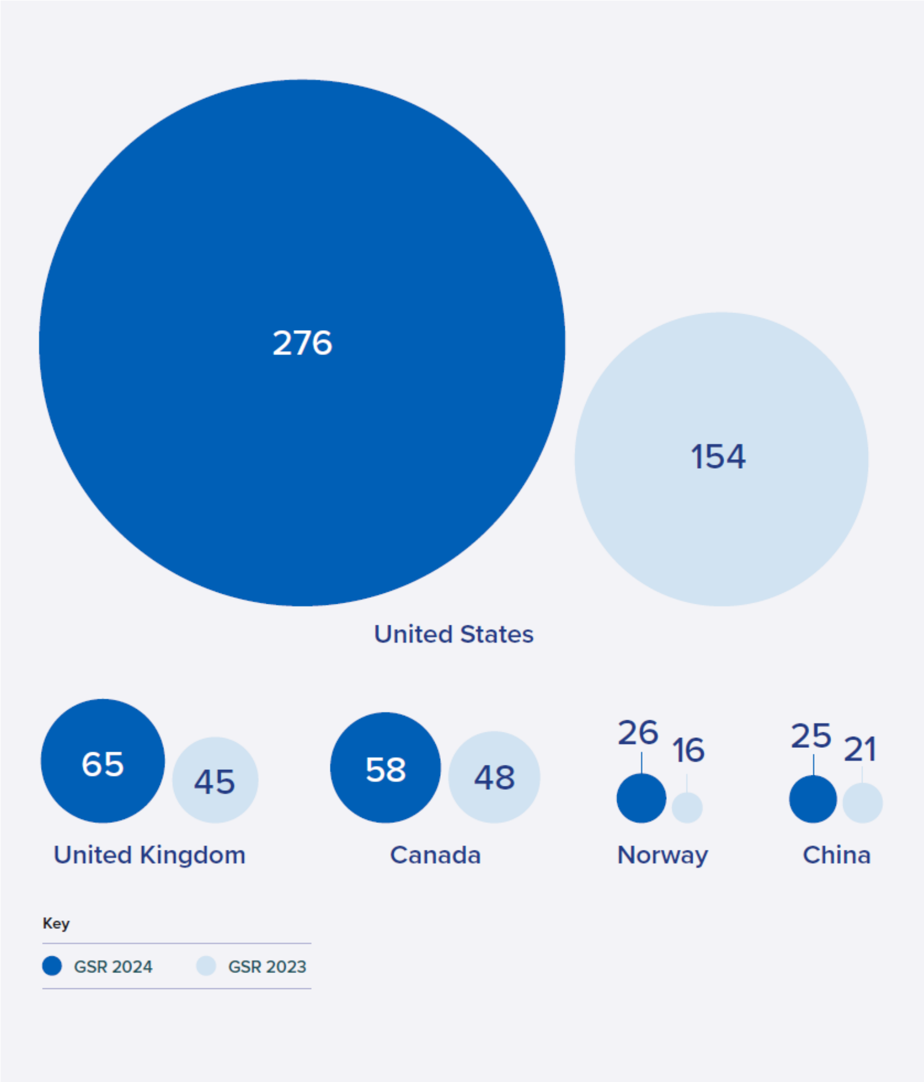
Multilateral initiatives

- CCS in the **Global Stocktake**
- Upcoming **NDCs 3.0** expected to include CCS investment plans (February 2025)

New & strengthening CCS legal frameworks

- **US**
  Expanding & refining existing regimes
- **Europe, UK, Australia**
  Building-on & refining existing regimes to allow transboundary movement of CO_2
- **Middle East, Southeast Asia, Brazil**
  Developing CCS legislation for deployment

Top 5 countries with CCS projects in 2024 v 2023
(by number of projects)



CCS business models & financing

Project derisking remains key to CCS investment

- Long-term direct or indirect government support needed – financial support, public-private partnerships, clear/efficient permitting and approval, long-term liability assurances

Policy-improved financing prospects partially offset by multiple factors

- Cost inflation
- High interest rates
- Permitting challenges
- Political uncertainty

Potential tailwinds for CCS

- Need for reliable baseload power
- Demand for high-quality carbon credits including removal credits – started with DACCS & evolved to include BECCS
- Increasing Multilateral Development Bank support for CCS – could fund critical activities
- Momentum in equity investments and M&As – could be a positive for debt financing of CCS projects

CCS Progress: the United States

US continues to lead global CCS facility count

19 Operational projects in the US

13 In construction in the US

Federal funding & policy incentives continue to drive investment in CCS

Bipartisan Infrastructure Law (BIL)

- >US$12 billion investment for carbon management & hydrogen hubs

Inflation Reduction Act

- Increased tax credit for geologic storage of CO_2
- Lowered capture thresholds to qualify for tax credits
- Added provisions for direct pay & tax credit transferability

"Long-term" coal units & new gas-fired power plants

- By 2032, required to capture 90% of CO_2 emissions - partially through CCS

Queue of Class VI applications growing

- 49 projects with 148 applications under review across 15 US states and one tribal nation
- Additional 39 projects with 83 applications under review in states with Class VI primacy (WY, LA, ND)

Support for High-Quality CDR Credits

- March 2024, the DOE launched the Voluntary Carbon Dioxide Removal Challenge

CCS Progress: Canada & Brazil

Combination of mandates & policies drive development in Canada

7 Operational CCS facilities in Canada

5 Facilities in construction in Canada

Federal carbon price increased

- CA$80 per tonne in 2024, rising CA$15 per tonne annually to CA$170 per tonne in 2030

Investment tax credit for CCUS projects released

- Covers up to 50% of capital costs for projects (60% for DAC) until 2030

Growth Fund allocation for Carbon Contracts for Difference announced

- Up to CA$7 billion allocated

CCS legislation in Brazil a milestone for South America

- **Fuels of the Future Bill signed into law on 8 October** provides foundation for CCS regulations in Brazil

Brazil continues successful CCS operations at its Santos Basin ore-salt reservoirs

- 13 Mt CO_2 injected in 2023

CCS Progress: Asia Pacific & India

Storage hubs & cross-border CCS projects a major focus & dominant trend

1 Operational CCS facility in Asia Pacific

4 Facilities in construction in Asia Pacific

Standalone CCS legislation released

- Indonesia
- South Korea
- Japan
- Western Australia (Australia)
- Malaysia (expected by end 2024)

Transboundary transport & storage of CO_2 in discussion

Australia → Timor-Leste

Japan, Singapore, South Korea → Australia, Indonesia, Malaysia

CCS potential remains strong in India

Four interministerial CCUS taskforces collectively working on range of issues including development of technical standards

Gorgon LNG facility incorporating CCS system, Western Australia. Image courtesy of Chevron.

CCS Progress: China

CCUS forging ahead in China

CCUS prominent in climate policies

- **Implementation Plan for Green and Low-Carbon Technology Demonstration Program**
  - selected 6 CCUS projects for grants & low-cost financing

Plan released to reduce emissions from coal-fired power plants – includes 3 main strategies

- CCS
- Co-firing with low carbon ammonia
- Co-firing with biomass

Central Government leading international collaboration

- Sunnylands Statement with the US
  5 large scale CCUS projects each by 2030
- Research exchange with France

Projects scaling-up and setting records

World's largest oxy-fuel project in cement sector now operational

- 200,000 ktpa capacity

Huaneng coal power on track for completion

- 1.5 Mtpa capacity – world's largest

Phase 1 of Xinjiang Oilfield coal power project under construction

- 1 Mtpa capacity - Phase 2 will add another 1Mtpa

Huaneng Longdong CCUS project under construction. Image courtesy Huaneng Clean Energy Research Institute.

CCS Progress: Europe & the UK

Decarbonisation policies & robust CCS market anticipation drive new projects

5 Operational CCS facilities in Europe

10 Facilities in construction in Europe

CCS a key focus in climate & industrial policy agendas

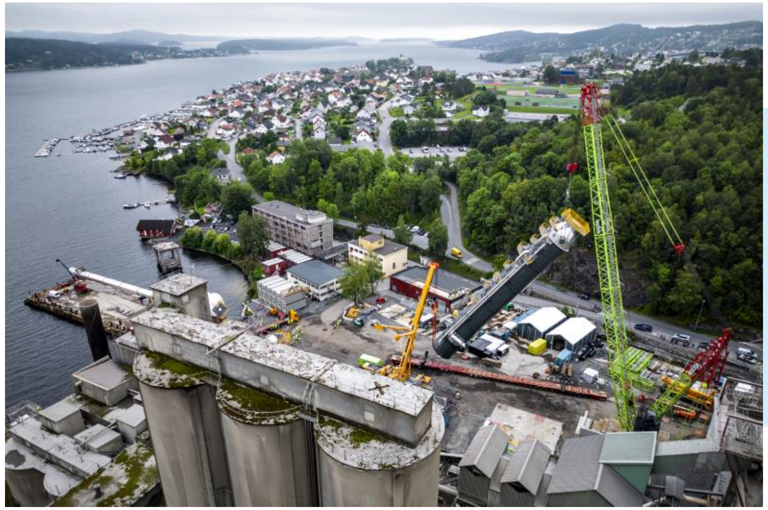
- EU Industrial Carbon Management Strategy
- Net-Zero Industry Act
- UK Green Industry Growth Accelerator
- £21.7 billion support for Teesside & Merseyside clusters

Roadmaps for CCS deployment make significant progress

- **9 countries**, in addition to the EU, introduced or announced industrial carbon management strategies or roadmaps for CCS deployment

CO_2 transport & storage facility development surged

- Across Europe, the number of transport & storage facilities in development reached 77 – **doubling** in a year



Brevik CCS facility in Brevik, Norway. Image courtesy of SLB Capturi.

CCS Progress: Middle East & Africa

Decarbonisation & low-carbon fuel development shift focus for CCS in MEA

3 Operational CCS facilities in MEA

6 Facilities in construction in MEA

CCS policy in region advancing quickly

- **UAE** Industrial Decarbonisation Roadmap includes CCS
- **Saudi Arabia** outlining ambitious targets

Carbon markets being established to support deployment

- **UAE**'s Air Carbon Exchange
- **Saudi Arabia**'s carbon crediting scheme

Collaboration at fore of development

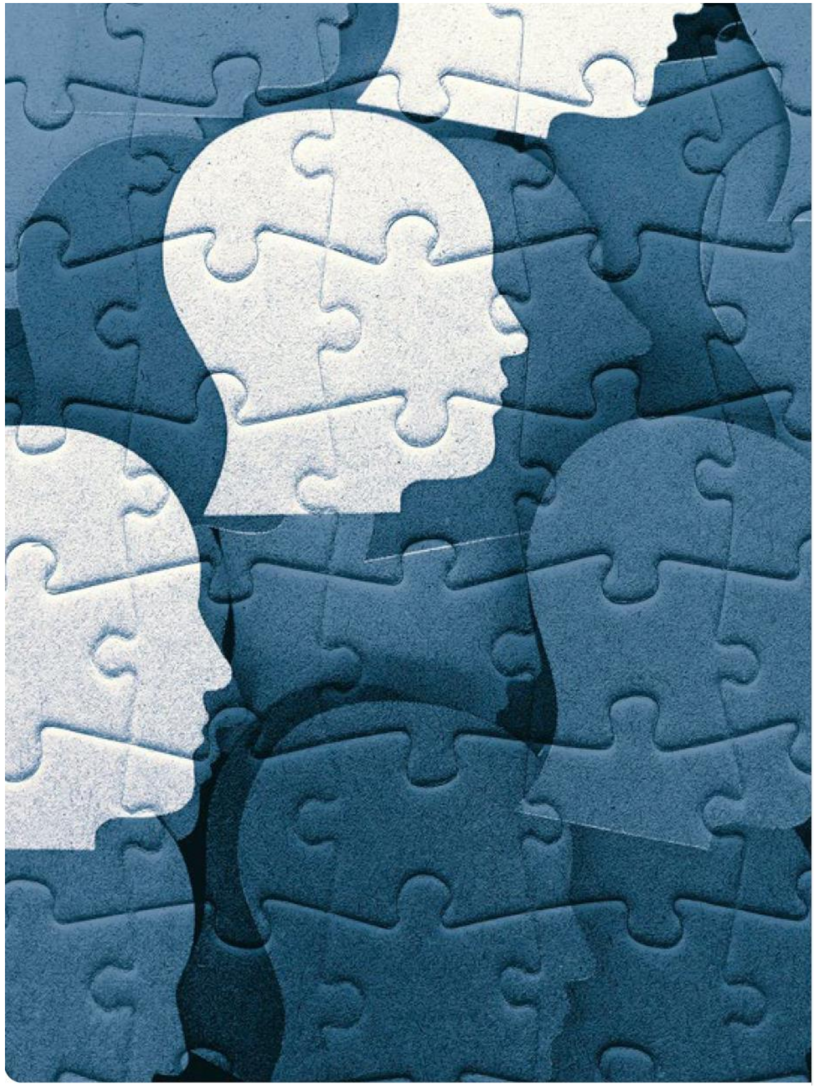
- Advancing technology & DAC projects
- Establishing cross-border projects & CCS hubs

Notable developments move CCS forward in Africa

- Identification of storage sites progressing in **Egypt**
- CCUS pilot well drilled in **South Africa**
- Small-scale DAC project launched in **Kenya**

CycloneCC Industrial Demonstration Unit in the UAE. Image courtesy of Carbon Clean.

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

Download the full report

www.globalccsinstitute.com/global-status-report/

Panel discussion

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Head of CCS Solutions, Geovault
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Partner, A&O Shearman

Thank you

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