
MIDDLE EAST & AFRICA
MEMBER MEETING
GLOBAL CCS
INSTITUTE
7 NOVEMBER 2024 - ABU DHABI, UAE

MEA MEMBER MEETING 2024 - AGENDA

AGENDA ITEM	SPEAKER
Welcome Remarks	Kamel Ben Naceur, Global CCS institute, Board Member
Remarks from COP 28	Dr Abdulla Malek, Director of Energy Transition, COP 28
Remarks from the UK Government	Alex Milward, Department of Energy Security and Net-Zero, UK Government
Global Status of CCS 2024	Dr Mohammad Abu Zahra, Head of MEA Region, Global Status of CCS
Panel Discussion | The Future State of CO_2 Storage and Transport Infrastructure: Supporting the Development of Hubs and Clusters	• Barclays – Professor Niall Mac Dowell, Global Head of Carbon Management Technology (moderator) • ADNOC – Hernan Silva, Vice President, Carbon Capture Utilization & Storage • Bapco Energies – Dr. Hassan Al-Mulla, VP - NES Program Implementation • Petroleum Development Oman – Dr. Nabil Al Bulushi, CCUS Manager • SLB – Ahmed Sabry, Global Asset Consulting - Central Operations Manager • Department for Energy Security and Net Zero, UK Government – Alex Milward, Director, Carbon Capture Utilisation & Storage
Networking Break	
Facilitated Workshops: • **Blue Hydrogen** • **Carbon Markets**	Blue Hydrogen Facilitators: • Hiroshi Hasegawa, Executive Director, Japan External Trade Organisation (JETRO) Dubai • Maryem El Farsaoui, MEA Business Development Manager, Global CCS Institute Carbon Markets Facilitators: • Subhendu Biswas, Director of Climate Action & Regulations at the Global Carbon Council • Daniela Peta, Public Affairs Lead, Global CCS Institute
Workshop Session Findings	• Global CCS Institute • Japan External Trade Organisation (JETRO) Dubai • Global Carbon Council
Concluding Remarks	Dr Mohammad Abu Zahra
Networking Break	
CCS Site Visit	Al Reyadah CCS Site Visit – Facilitated by ADNOC

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

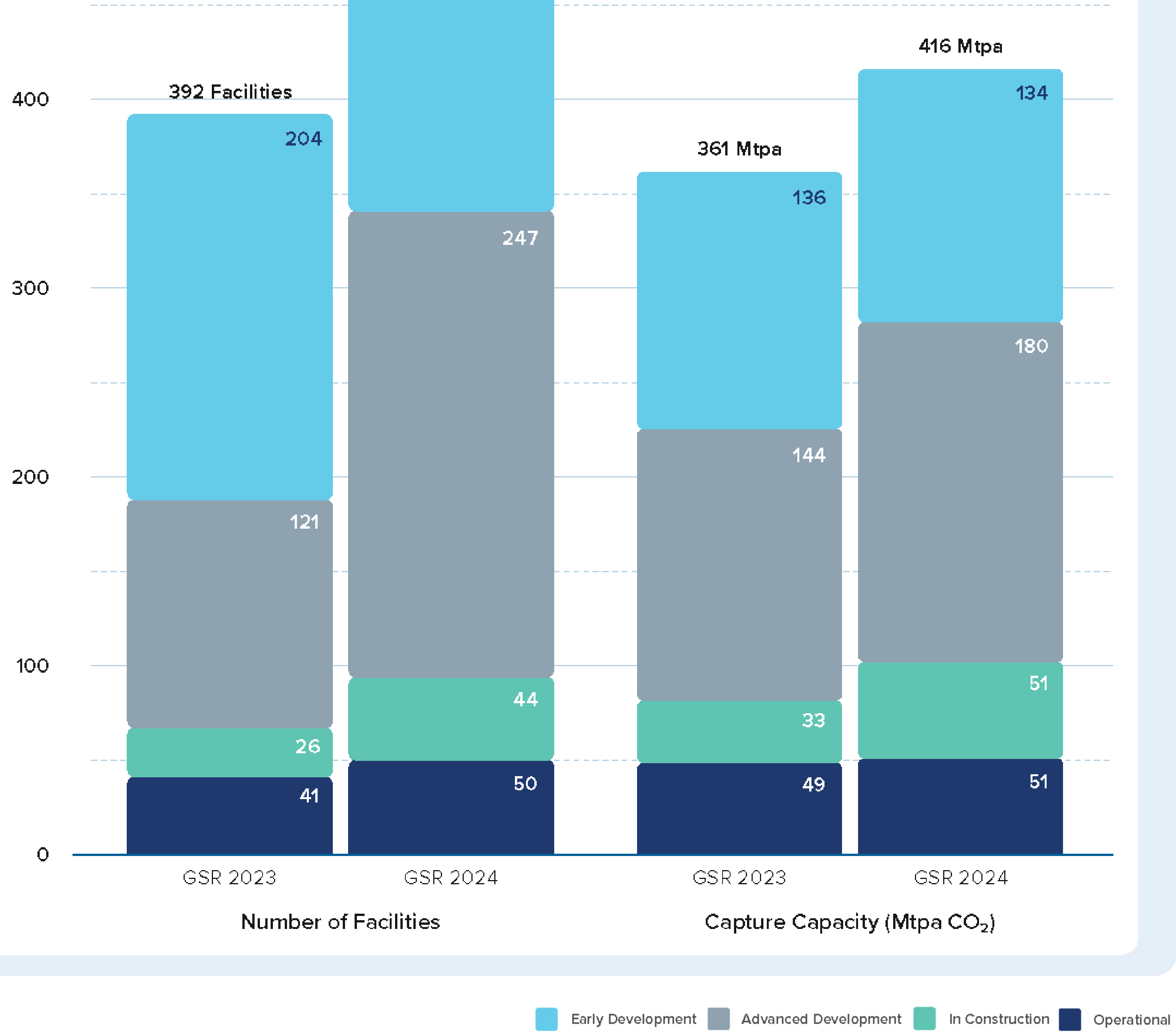
- Technology companies ⟷ Project developers
- Shipping companies ⟷ Ports
- Industrial emitters ⟷ Transport & storage developers

• Global facilities &

628 Projects in the pipeline

Significant growth in the (

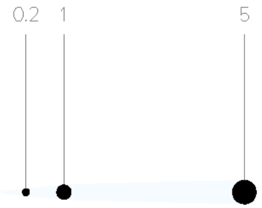
50 Facilities in operation



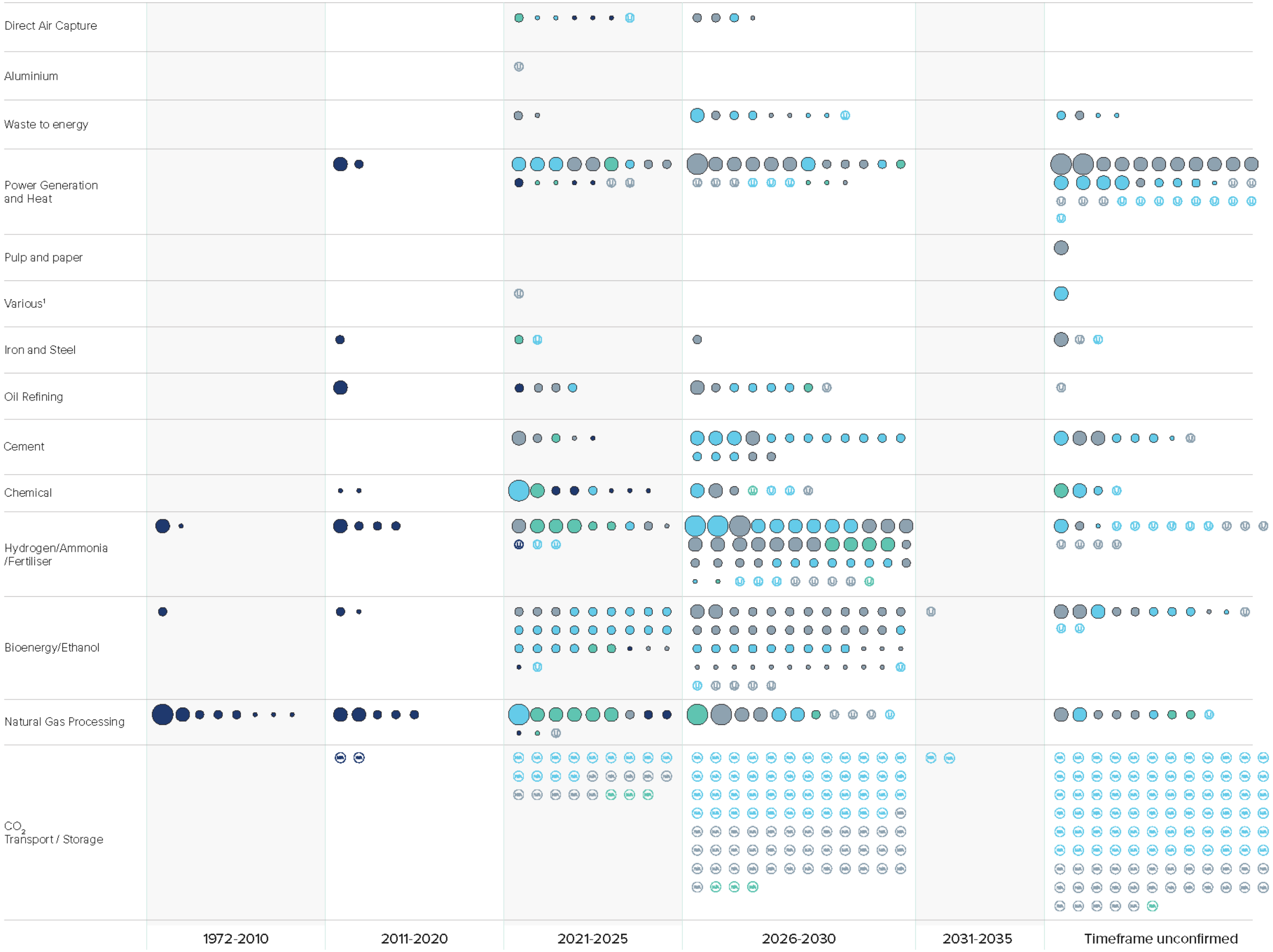
• CCS project pipeline

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

Capture, transport and/or storage capacity (Mtpa CO_2)



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

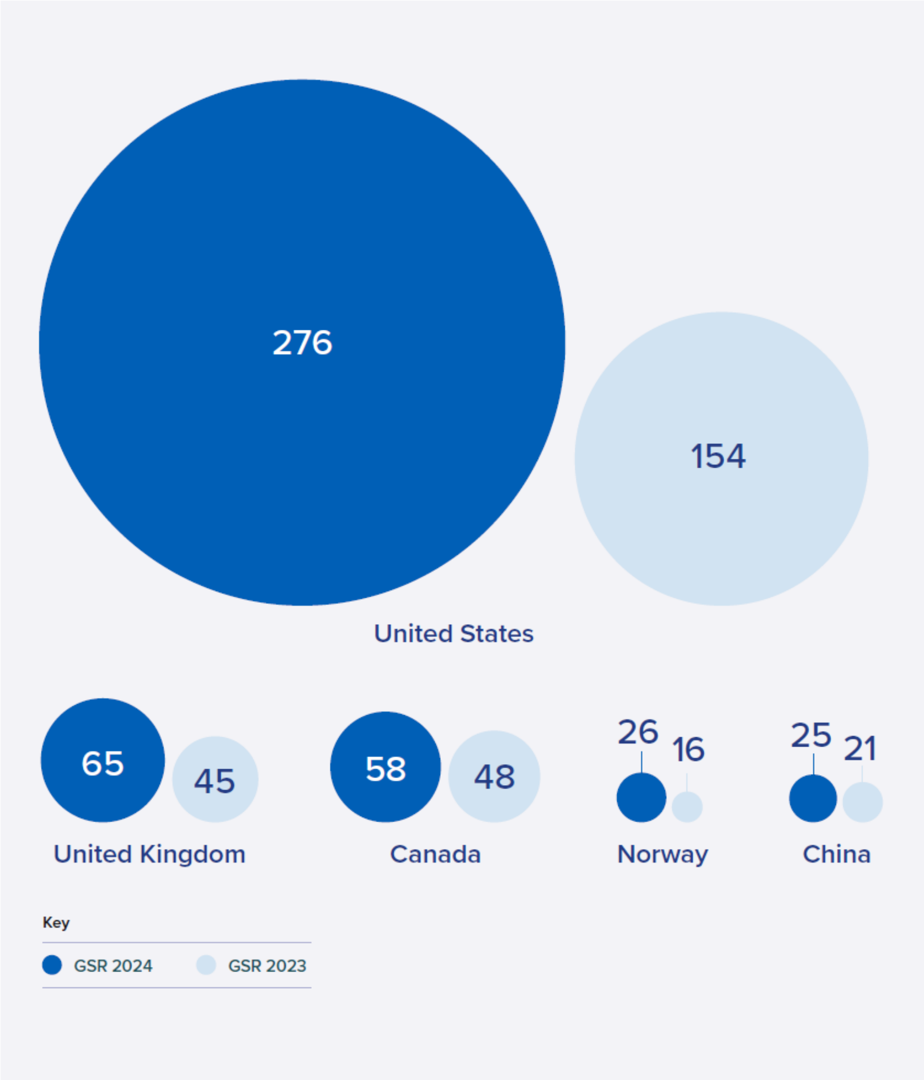
Multilateral initiatives

- 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

- GLOBAL STATUS OF CCS REPORT

- REGIONAL OVERVIEW

• 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)

- BIL includes more than 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 green 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

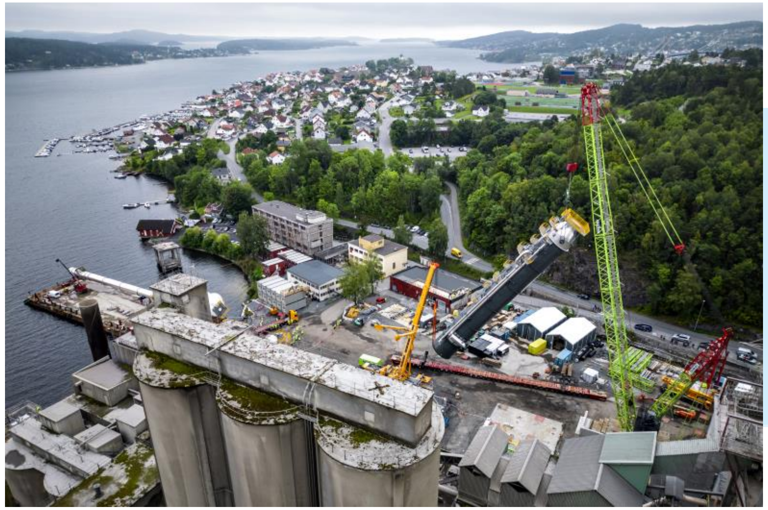
- EU Industrial Carbon Management Strategy
- Net-Zero Industry Act
- UK Green Industry Growth Accelerator
- £21.7 billion support for Teesside & Merseyside clusters

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

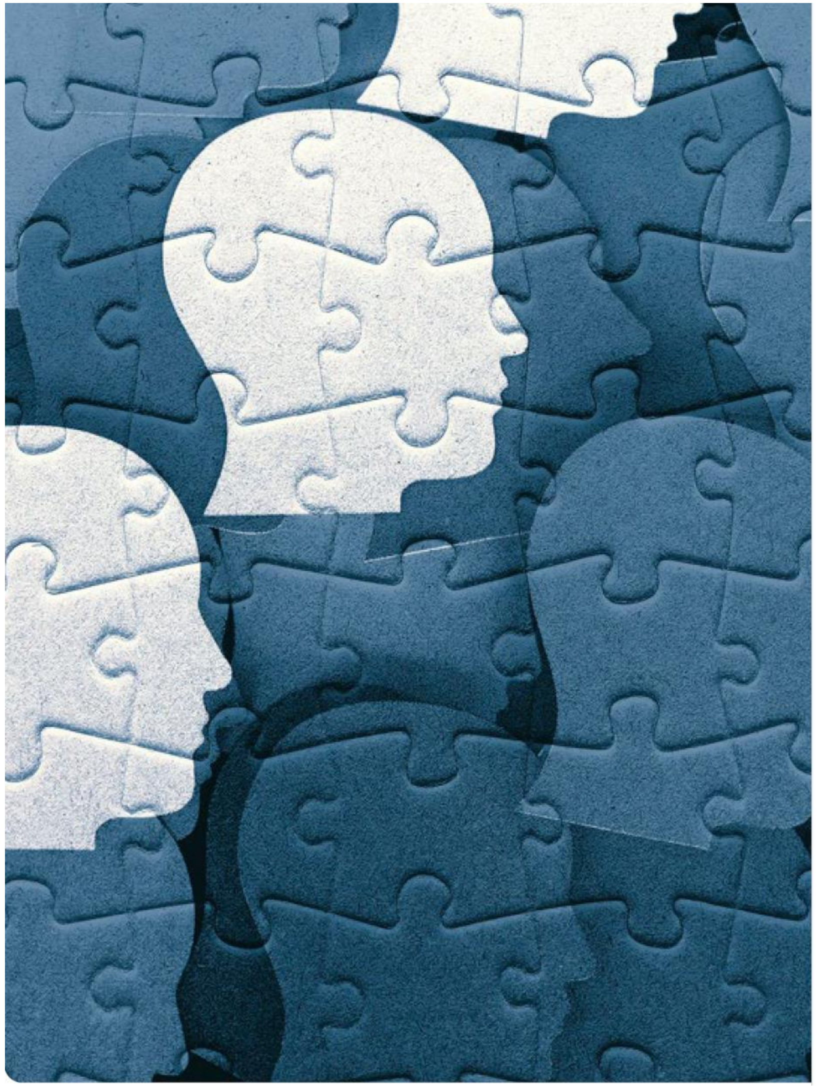
- Advancing technology & DAC projects
- Establishing cross-border projects & CCS hubs

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

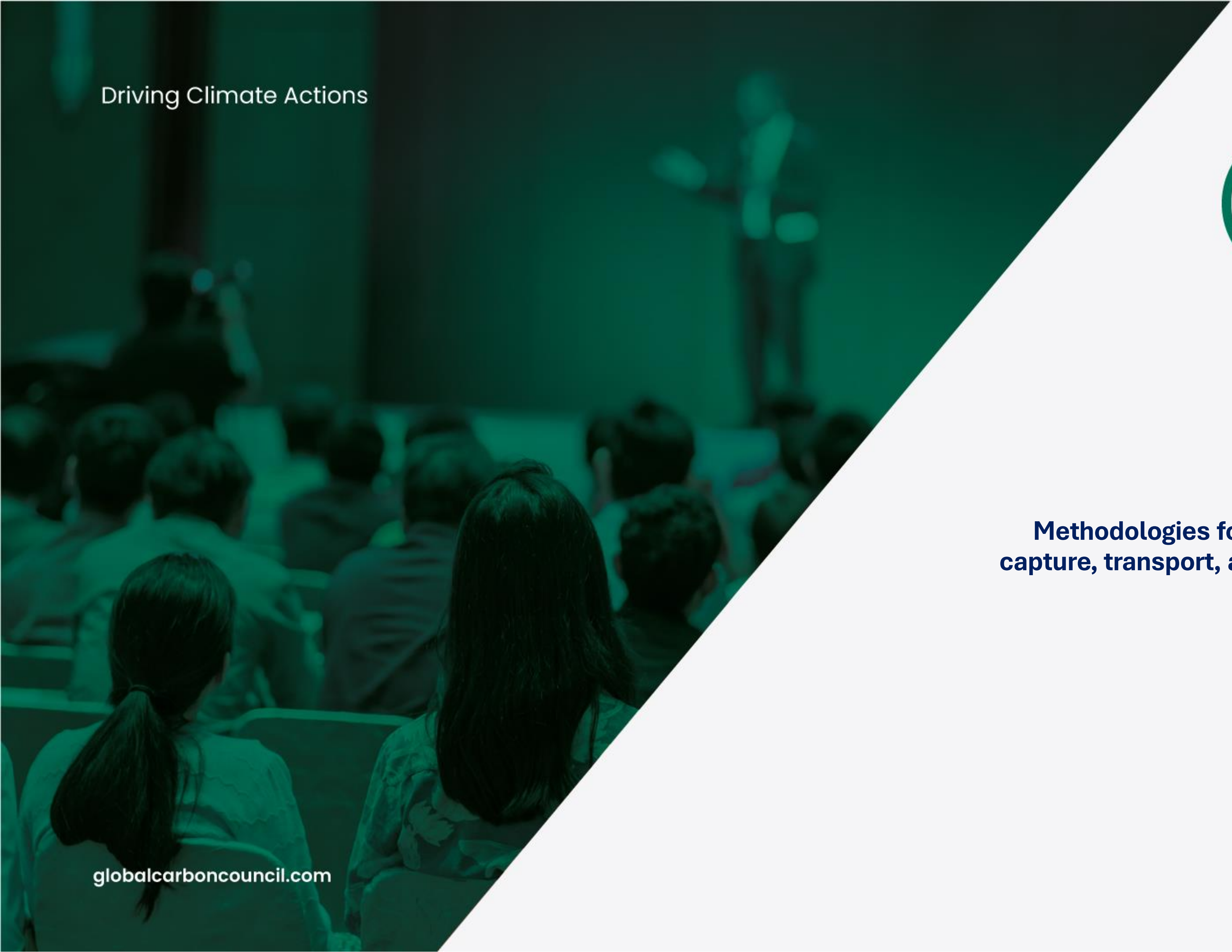
Difficult investment settings, community concerns, regulatory barriers

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/



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Methodologies for project activities involving the capture, transport, and geological storage of carbon dioxide –

Subhendu Biswas
Director, Global Carbon Council

Contents

Project based methodological standards available for use

- Alberta Emission Offset System
- ACR
- British Columbia Offset program (Draft)
- Gold Standard
- Puro.Earth
- CCS+(VERRA)
- Global Carbon Council
- Isometric

Key Differentiating features

Applicability Conditions

Project Boundary

Site selection and Characterization

Baseline emissions

Project emissions

Leakage

Additionality

Monitoring

Non Permanence

Environmental and social risks

Sustainability

Pictorial view of the standard and guidance

Efforts in this Methodology

2.5 yrs of work into development of methodology

Review by governance committee (4 Rounds)

Peer review by industry experts (10 independent entities from Academia, technology provider, sub surface experts, financial institution & Legal firms)

Global stakeholder consultation for period of 45 days,

Uniqueness of the methodology

- First Global methodology in voluntary market for point source emissions
- Separate Guidance document on aspects related to site selection, assessment of environmental and social Impacts, monitoring requirement etc.
- Unique mechanism to ensure conservative estimation of emission reduction/removals
- Provides guidance for projects undertaken in geographies which do not have CCS related regulations
- Contributes toward "Coal Phase down" regulations by way of allowing retrofit projects in energy sector only in geographies with such regulations

Treatment of fossil fuel systems and conservative estimates

Introduction of adjustment factor to account for renewable energy penetration rate in the connected grid and *ex-post* annual moderation of the grid emission factor with the adjustment factor

For projects where the capture plant affects the performance of the source plant (e.g. energy penalty in energy generation systems) the historical average emissions prior to project is used to cap the amount of credits claimed from these projects

For new built the benchmark performance of top 20% plants in the region used to cap the amounts of credits claimed from these projects

In all scenarios the actual amount of Co2 injected into sub-surface is compared with the baseline calculations and lower of the two is claimable in the project.

Several safeguards incorporated to avoid excess claims by way of changing feedstock or process resulting in more emissions

Crediting period limited to remaining technical lifetime of the source plant or 30 years which ever is lower.

Salient features _ IETA compilation

Methodological Component	Global Carbon Council
Definitions	**A comprehensive list of definitions in including:** • Geological storage site • History-matching • Net reversal of storage • Significant deviation • Storage complex (similar to Area of Review applied in U.S. legislation)
Project Boundary	**Above-ground components, including, where applicable:** (a) The facility (Part of the Source plant) where the CO_2 is captured; (b) The CO_2 capture equipment; (c) Any CO_2 treatment facilities; (d) Transportation equipment, including pipelines and booster stations along a pipeline, or offloading facilities in the case of transportation by rail, road, or ship tanker; (e) Any reception facilities or holding tanks at the injection site; (f) The CO_2 injection facility. *NOTE: embodied CO_2 and upstream emissions are excluded from the boundary/scope.* Subsurface components within the storage complex, including the geological storage site, connected infrastructure (e.g., wells injection, observation, production, abandoned wells, etc.), any pressure front associated with displaced brines, and all potential sources of seepage

Salient features _ IETA compilation

Methodological Component	
Applicability Conditions	**CO_2 capture from:** • industrial process sources (dilute or high-purity) • fossil point point sources (boilers, turbines etc) • biogenic point sources ("BECCS") • mixed bio and fossil sources (e.g. waste incineration with CCS) • direct from air (DAC) **CO_2 transportation:** • Pipelines, rail, or road tanker **CO_2 storage:** • Saline aquifers • Depleted hydrocarbon reservoirs • Enhanced oil recovery is excluded **Site permitting:** • In jurisdictions where the requirements for storage are entirely fulfilled by local regulations, the local regulations shall prevail. • In jurisdictions where any of the requirements for storage are not specified in local regulations, project owners must follow the GGCS. A permit to store CO_2 from a national authority must also be provided

Salient features _ IETA compilation

Methodological Component	
Storage Site Characterization	**Subject to the national laws and regulations, following steps shall be applied:** • **Step 1**: Data and information collection, compilation, and evaluation • **Step 2**: Characterization of the geological storage site architecture and surrounding domains • **Step 3**: Characterization of dynamic behavior, sensitivity characterization, and risk assessment • **Step 4**: Establishment of a site development and management plan ***Extensive technical guidance and reporting templates are provided in the GCC Guidance for Geological CO2 Storage (GGCS).*** **The GGCS consists of the following:** 1. GEOLOGICAL STORAGE SITE SELECTION AND CHARACTERIZATION 2. RISK AND SAFETY ASSESSMENT 3. ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACT ASSESSMENT 4. MONITORING REQUIREMENTS 5. SITE DEVELOPMENT AND MANAGEMENT PLANS

Salient features _ IETA compilation

Methodological Component	
Baseline Emissions	**Baseline scenario**: a similar type of "Source Plant", with similar levels of output, that would occur in the absence of the financial incentive to capture (or remove) and store CO2 offered by project crediting under GCC. **Baseline emissions:** Distinguishes between (i) retrofit or (ii) new-build. (i) retrofits tend towards using historical emissions (performance-based) (ii) new-builds towards using a benchmark (standards-based) There cases presented with decision support matrix. • **Case 1**: Actual emissions measured in each project year • **Case 2**: Historical emissions (average of three years) • **Case 3**: Average emissions of similar "Source plants" undertaken in the previous five years, in similar circumstances, and whose performance is among the top 20 percent of their category [Various sub-types covered for different types of source plants] **DACCS and BECCS** have zero removal/emissions baseline.
Additionality	**Applies CDM "TOOL01:** Tool for the demonstration and assessment of additionality". • CCS and BECCS: supplemental guidance provided to guide assessment. • DACCS considered to all be additional unless mandatory.

Salient features _ IETA compilation

Methodological Component	
Project Emissions (including seepage)	**Project emissions include the following:** (a) CO_2 emissions due to fossil fuel combustion from stationary sources (i.e., used to power CO_2 capture, treatment, transportation by pipeline, reception, and injection of the CO_2) and from mobile sources (e.g., in the transportation of CO_2 by rail, road and/or ship tanker) within the project boundary; (b) CO_2 emissions from electricity consumption relating to the capture, treatment, transportation by pipeline or rail (if applicable), reception and injection of the CO_2; (c) CO_2 emissions from bought-in heat consumption used for the capture of the CO_2; (d) CO_2 removals arising from the injection and geological storage of biogenic CO_2 or direct air capture (accounted for as negative project emissions); (e) Fugitive (non-seepage) CO_2 emissions occurring across the project activity due to losses (leaks) from pipelines, loading and unloading etc.; (f) Potential CO_2 emissions from seepage of CO_2 from the geological storage site, which can potentially occur at any time after injection commences. **Three key parameters included for the Geological Storage Complex:** 1. Conditions of use - operational safety margins and appropriate conditions of use to avoid activating pressure-driven processes in the injection formation. 2. CO_2 migration analysis - history matching to confirm that there is an agreement between the numerical modelling of the CO_2 plume distribution in the geological storage site and the monitored behavior of the CO_2 plume. 3. Geological storage site architecture - monitoring of the geological storage site architecture (i.e., features), based on comparison with base-level survey data collected during site characterization. ***CO_2 flux rate measurements must be applied where seepage is detected.***

Salient features _ IETA compilation

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Methodological Component	
Monitoring	**Monitoring plan covers two types of parameters:** (a) Those that are determined ***ex-ante***, and therefore not monitored during the crediting period, and (b) Those that are to be monitored during the crediting period. **CCGS:** Sets out detailed requirements for preparing a CO2 Storage Complex Monitoring Plan. **Focus is on establishing techniques to fulfil the three-project emission elements described above** • **Conditions of Use;** • **CO2 Migration;** • **Storage Site Architecture**
Leakage	**Two variants covered:** 1. Electricity generating plant de-rating (Energy Penalty) 2. Biomass projects (Competitive use of biomass and transportation related)

Salient features _ IETA compilation

Methodological Component	
Permanence Liability for CO2 Reversal	**Operational phase:** Seepage from the CO2 Geological Storage Site should be treated as project emissions. Where reductions/removals exceeded in a monitoring period, net removal of storage applies. **Net reversal of storage (i.e. seepage exceeds reductions/removals):** **Buffer pool.** Where net reversal occurs, an equivalent number of ACCs shall be cancelled from the GCC pooled buffer account for geological carbon storage. **Post-injection monitoring, cessation of monitoring and transfer of stewardship:** • Project owner continues MRV to the GCC for a minimum of **five years** after the cessation of injection. • If evidence from MRV indicates that the risk of seepage is sufficiently low and that permanent storage is highly likely to be achieved, site closure can occur and monitoring can be discontinued • If evidence does not show permanent storage after five years post injection monitoring, **MRV shall continue in two-year increments until such conditions are met.** • After monitoring ceases, host country liable for undertaking any future monitoring as per paragraph 4(v) of Volume 2, Chapter, 5, Section 5.7.1, of the IPCC 2006 Guidelines

Salient features _ IETA compilation

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Methodological Component	
Transfer of Liability	**Transfer can be initiated if** • Actual Behavior of the injected Co2 conforms to the model behavior • There is no detectable leakage and • Storage site is evolving towards long term stability The static geological model should remain significantly unchanged for 5 years prior to transfer. The operator should specify the range of uncertainty in the key parameters for the static geological model. Altering key parameters outside the specified range of uncertainty would constitute a significant change to the model. Key monitored parameters to evaluate long term stability may include • Pressure within the storage complex • Plume movement and • Integrity of sealing mechanism of the well.

Salient features _ IETA compilation

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Methodological Component	
Environmental and Social Impacts	**Methodology:** • Project owners must apply the GCC "Environment and Social Safeguards Standard – V4.0" **CCGS:** • Sets out detailed requirements for Environmental and Social Risk and Impact Assessment (for CO_2 geological storage sites)
Sustainability	**Methodology**: • Project owners required to follow the GCC Project Sustainability Standard – V4.0.

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Thank You

Facilitated workshops:
Carbon markets and blue hydrogen

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Carbon Markets Workshop
Topics and themes discussed:

1. Regulatory frameworks enabling carbon markets

2. The role of permanence as it relates to the integrity carbon credits and the carbon market

3. Transfer of liability and its broader impact on CCS and carbon markets

4. Impacts of the carbon price

Blue Hydrogen Workshop
Topics and themes discussed:

1. Barriers to scaled development of low-carbon hydrogen

2. Pathways to enhancing low-carbon hydrogen trade

3. Latest advances in hydrogen transport

4. Certification of low-carbon hydrogen

5. The value of collaboration to accelerating the development of regional and international hydrogen market

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