GLOBAL STATUS OF CCS 2025

STAYING THE COURSE



GLOBAL CCS INSTITUTE



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About us

The Global CCS Institute (the Institute) is a leading global authority on carbon capture and storage (CCS). Headquartered in Melbourne, Australia, along with a presence in key regions, the Institute delivers independent analysis and knowledge sharing to support policy development and the effective implementation of CCS worldwide.

The Institute was established in 2009 in response to the growing recognition within the international climate policy community that CCS would be essential to achieving deep emissions reductions. As momentum around CCS increased, so did the need for a dedicated organisation to provide expert technical, policy and regulatory guidance, global and local CCS experience, and cross-sectoral coordination across the entire value chain and various stakeholders. The Institute was created to fulfil that role: an independent, international think tank with a singular focus – to advance the deployment of CCS as a vital component of global climate mitigation.

The Institute is an official observer to the United Nations Framework Convention on Climate Change (UNFCCC) and serves as the secretariat of the Carbon Management Challenge (CMC) – reflecting its formal role in supporting international collaboration and championing the critical role that CCS plays in reaching net zero.

Our membership includes national governments, industry, research institutions, and civil society organisations across the entire CCS value chain, united in their commitment to advancing climate action through carbon management. Our government members comprise governments at both national and sub-national levels. Currently, our government members include Australia, China, Japan, the Kingdom of Saudi Arabia, the United Kingdom, and the United States of America, and at the sub-national level include Alberta in Canada and the Northern Territory and Victoria in Australia, reflecting the Institute's global reach and active engagement in international climate and energy policy.

The Institute's work is structured around four principal pillars:

Knowledge and Insight

We produce independent, evidence-based analysis to share understanding of the critical role that CCS plays and help inform policy, regulation, and strategy across the CCS value chain. This includes global status reporting, policy briefs, market intelligence, and technical assessments –designed to equip decision-makers with credible, up-to-date information. Our team consists of in-house technical experts and on-the-ground regional leaders helping to drive the global CCS agenda.

Advocacy

We engage directly with governments and international climate forums – such as the COP and the Clean Energy Ministerial (CEM) – to support development of effective policy and regulatory frameworks for CCS. Through formal submissions, strategic dialogue, and institutional partnerships, we support the integration of CCS into national and international climate strategies and advocate for CCS as a critical lever in reaching net zero.

Capacity Building and Consulting

We provide training, workshops, and strategic consulting to strengthen institutional, technical, and human capacity. Our support enables stakeholders to navigate CCS planning, regulation, and readiness within their specific policy and market contexts.

Collaboration and Convening

We bring together stakeholders across the entire CCS value chain, multiple sectors, and regions to foster alignment, accelerate knowledge exchange, and address shared barriers to deployment. Through global forums, regional roundtables, and targeted dialogues, the Institute facilitates strategic cooperation in support of advancing CCS deployment to help reduce emissions.



Carbon America FrostCC™ Pilot Plant at the National Carbon Capture Center (NCCC), US image courtesy of Carbon America, NCCC, and Southern Company.

About the report

This report summarises the key milestones in the global adoption of CCS over the past 12 months. It highlights how CCS is advancing across regions, albeit at varying rates of progress.

CCS is recognised globally as a critical tool to address climate change. Today, over 30 countries expressly include CCS in their Nationally Determined Contributions (NDCs) under the Paris Agreement, and a variety of policy tools are unlocking private sector investment. Gigatonne-scale deployment will require long-term collaborative action to achieve a sustainable and low-carbon future.

This report identifies advancements in the deployment of CCS around the world. Japan is covered in its own section for the first time due to its domestic advances and increasing influence in the Asia Pacific region. This authoritative snapshot of the global CCS industry is based on the Institute's database of CCS facilities (CO_2RE) and analysis by the Institute's global team.

Since our last Global Status Report a year ago, the number of facilities in operation has risen to 77 from 50, while the total number of facilities in the development pipeline has increased to 734 from 628. The increase in projects reflects how governments and companies are staying the course in progressing this critical technology despite geopolitical headwinds in some regions.

How to navigate this report

These symbols on the right panel of the document can be used to navigate the pages and Sections. There are three buttons with icons.

Legend

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More information

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Axens DMX™ Carbon Capture Technology Demonstration plant at Arcelor Mittal France Dunkirk, image courtesy of Axens.

From the CEO

Global status of CCS: Staying the course



Jarad Daniels, CEO

It has been an eventful year, marked by major policy advancements in some regions and new uncertainties in others. Yet overall, the direction of travel is clear: CCS is scaling up, supported by increasingly durable policy frameworks, rising private-sector engagement, and expanding global infrastructure.

As of 28 July, 77 commercial CCS projects are in operation with a combined capture capacity of 64 million tonnes per annum (Mtpa). Importantly, an additional 44 Mtpa of capture capacity is currently under construction, meaning operating capacity is set to increase by nearly 70% in the coming years as these projects come online.

Many of these next-generation projects are first-of-a-kind at commercial scale, including in sectors such as cement production and natural gas-fired power generation. These breakthroughs mark a critical step forward in demonstrating that CCS can be applied in a wide range of industrial settings and play a key role in decarbonising critical industrial sectors.

Different regions are adopting distinct policy models to enable this progress. In the United States, CCS deployment has been driven by a combination of direct federal investments and federal tax incentives such as the 45Q credit encouraging private investment and innovation.

However, recent shifts in US climate and policy are creating uncertainty about long-term funding consistency and regulatory direction. Nonetheless, the 45Q tax credit continues to receive bipartisan support, and was even enhanced this year. At the state level, we continue to see strong support for CCS and projects progressing.

The United Kingdom has taken a centrally coordinated path, implementing a sequenced strategy to develop integrated CCS clusters through competitive government selection and funding. In the Middle East and China, strong government direction and financial backing are allowing projects to transition from planning to operation at a much faster pace.

These varied approaches reflect each country's regulatory context and policy priorities, but together they are driving toward a common goal: large-scale carbon management. China, in particular, is beginning to see several large-scale CCS projects stand up, underscoring its potential to play a pivotal role in global deployment. CCS is expanding in Australasia and developing SE Asia as well. There are two operating CCS facilities in Australia and one in New Zealand. Indonesia and Malaysia each host one facility in construction.

Global momentum is also reflected in infrastructure growth. Dedicated CO_2 transport and storage projects are increasing – doubling in Europe between 2023 and 2024 alone – laying the foundation for shared CCS networks that improve scalability and reduce costs. Projects like the East Coast Cluster in the UK, Saudi Arabia's CCS hub in Jubail, and Norway's Longship initiative are setting the standard for integrated CCS networks. Longship's commissioning marks a major achievement in CCS history, and the recent Final Investment Decision to expand its storage capacity sends a strong signal that full-chain CCS is ready to scale.

There is also healthy growth in planning around CO_2 shipping with CO_2 vessels in design, construction and commissioning. The Institute in November will publish a report on shipping – Needs, Opportunities and Prospects for CO_2 Shipping in CCS Projects – which will report that CO_2 shipping is poised for rapid growth as more CCS projects opt for maritime transport over pipelines, especially where distances are long or volumes are variable. Regulatory and technical challenges remain, but momentum is building for CO_2 shipping to become a major player in global climate mitigation. These developments in transport and storage infrastructure can help enable emitters of all sizes to access carbon management solutions, not just those with in-house capabilities.

“Global momentum is also reflected in infrastructure growth. Dedicated CO_2 transport and storage projects are increasing – doubling in Europe between 2023 and 2024 alone – laying the foundation for shared CCS networks that improve scalability and reduce costs.

From the CEO (cont.)

Importantly, the financial sector is becoming increasingly engaged. Non-recourse debt financing is being secured for CCS projects, such as for the Net-Zero Teesside and Northern Endurance Partnership projects, where robust policy frameworks and offtake mechanisms are in place. This milestone signals a growing maturity in the financing environment, supported by the emergence of specialised insurance products, standardised contracts, and dedicated project finance structures.

Industry sector engagement and demand for low-carbon solutions is also rising sharply, particularly in hard-to-abate sectors such as cement. Multiple pilot and commercial-scale projects are now underway – including operational cement CCS plants in China and Norway – signalling strong sectoral commitment to achieving net zero concrete by mid-century and underscoring CCS as a critical enabler for industrial decarbonisation.

In parallel, the push for low-carbon, firm power generation is creating significant interest in CCS for natural gas plants, especially in North America, where electricity demand is surging due to AI, data centres, and digital infrastructure. At the same time, demand for high-quality carbon removals is fuelling investment in Direct Air Capture (DAC) and Bioenergy with Carbon Capture and Storage (BECCS). These technologies are being supported by voluntary carbon markets and corporate climate commitments, opening new avenues for scalable carbon removal pathways.

While we have made progress this year, we are still far from meeting our carbon management deployment targets. Even if all of the projects in the current pipeline become operational, we will still not meet our gigatonne-scale CO_2 capture goals. Every year of delay makes it harder and more costly to achieve our climate targets.

The road ahead is not without challenges. Recent policy uncertainty in key jurisdictions has introduced new headwinds at a critical time.

Many regions still face policy and regulatory gaps, uncertain financing frameworks, and public awareness barriers. It's certainly not all roses and much work remains, particularly on creating investible markets for carbon management. But in the face of uncertainty, it is more important than ever that we stay the course. The Institute remains committed to working with the global CCS community to actively address these issues by sharing knowledge and insights, initiating meaningful discussions, convening decision-makers, and developing partnerships in every region of the world to achieve our collective gigatonne-scale goals.

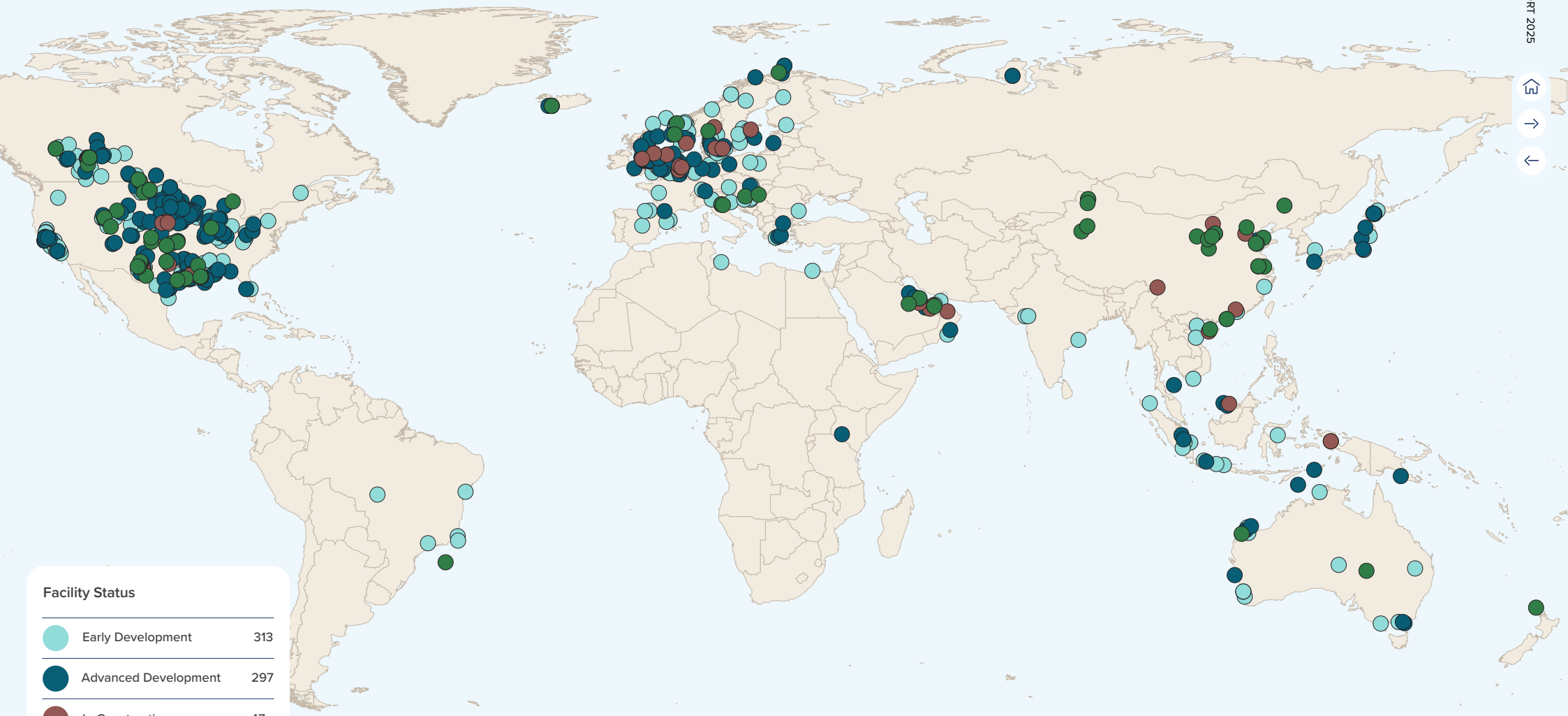


Capsol Technologies' CapsolGo® demonstration unit at Mälarenergi, Sweden. Image courtesy of Qudsia Parveen, Capsol Technologies.

Global Snapshot

1.0

CCS is expanding across regions in 2025 amid strengthened policy commitments



Facility Status	
Early Development	313
Advanced Development	297
In Construction	47
In Operation	77

*The ENI Structures A&E CCS Project in Libya is added to this map, but is not included in project counts in this report.

Where there is policy, there are projects

The past 12 months have seen significant CCS-specific policy, legal and regulatory progress in many countries, and this is reflected in the increase in the number of commercial CCS projects that are now in operation, construction, and development. In several jurisdictions worldwide, it is now increasingly possible to draw a link between the timely development of national policy and regulatory foundations and the emerging pipeline of CCS projects.

The implementation of supportive policy, law and regulation continues to be a critical driver for the scale-up of CCS projects globally. Strengthened policy commitments that recognise the mitigation potential of CCS and offer pathways for financial support, coupled with enabling legal and regulatory regimes, help to shape and sustain widespread commercial deployment.

Transboundary considerations remain critical for policymakers and regulators in several regions, with projects dependent on the development of policy, legal and regulatory solutions that support the movement of CO_2 across geographical borders.

Further ratifications of the 2009 transboundary amendment to the London Protocol, as well as notifications of its provisional application, have been submitted by national governments and recorded by the International Maritime Organization (IMO), highlighting the emphasis placed upon this critical topic. In parallel, several governments across Europe and the Asia Pacific are continuing to develop policy and regulatory frameworks, as well as formal agreements between nations, that will underpin these transboundary value chains and ensure their climate mitigation potential is formally recognised.

While the pace of policy and regulatory development at the regional and national level varies greatly, notable advances in the past 12 months are providing greater certainty for industry and investors. In several first-mover nations, such as the United States and United Kingdom, new policies and regulatory initiatives are being introduced to expand and strengthen existing frameworks and regimes.

In other countries, policymakers and regulators are bringing forward new policy initiatives, as well as first examples of national and subnational law and regulation. Although the global picture remains far from complete, these developments have marked important progress towards removing many of the remaining barriers in several regions and jurisdictions.

Across the Americas region, the policy, legal and regulatory environment continues to advance, albeit at varying levels of complexity and speed. In the United States, the reversal of some Biden administration climate polices and the proposed repeal of GHG emission standards for fossil fuel-fired power plants stands in contrast to continued support for the 45Q tax credit scheme and new state-level legislation aimed at supporting carbon management activities. Elsewhere in the region, both the Canadian and Brazilian governments have signalled their continued support for CCS, with the extension of incentive schemes and new legislative proposals.

In Europe, significant new policy initiatives from the European Commission continue to position CCS as a critical component in achieving the EU's climate change and net zero commitments. In parallel, several Member States are also taking important steps to greater integrate CCS within domestic policy regimes, including through the provision of incentives and direct support for commercial projects. In the UK, where there has been long-held policy support for CCS, there have been positive investment outcomes for government-supported projects.

Addressing gaps

Policy and regulatory developments have also proven an important aspect of national governments' CCS activities across Asia. In Japan, the government has strengthened its commitment to CCS and further recognised its role in achieving the nation's net zero targets. The development of a new legal and regulatory regime for domestic CO_2 storage operations has addressed a significant gap in the national framework and affords further certainty for investors and project proponents.

The implementation of legislation in Indonesia and Malaysia will support domestic CCS operations, but it will also address an important barrier for those third-party countries seeking to send their CO_2 to either country as part of cross-border CCS value chains. Ongoing discussions between the governments of Australia, Indonesia, Japan, Malaysia, Singapore, and South Korea will undoubtedly lead to further project announcements and policy development in the coming years.

In the Middle East and China, where governments continue to drive significant project-level development, there has been increased focus on the development of policy, legal and regulatory frameworks. Significant policy developments in China, for example, have highlighted the government's ongoing support for CCS activities within particular sectors, while the proposed expansion of its carbon trading market may offer future incentives for more widespread deployment of CCS.

"While the pace of policy and regulatory development at the regional and national level varies greatly, notable advances in the past 12 months are providing greater certainty for industry and investors.

Number of facilities in operation rises 54% year on year

77

Number of facilities in operation rises 54% year on year

64 Mtpa

Capture capacity in operation rises 25% year on year

734

Total number of facilities rises 17% year on year

46%

Increase in the capture capacity of facilities in advanced development (FEED) from 180 to 262 Mtpa.

513 Mtpa

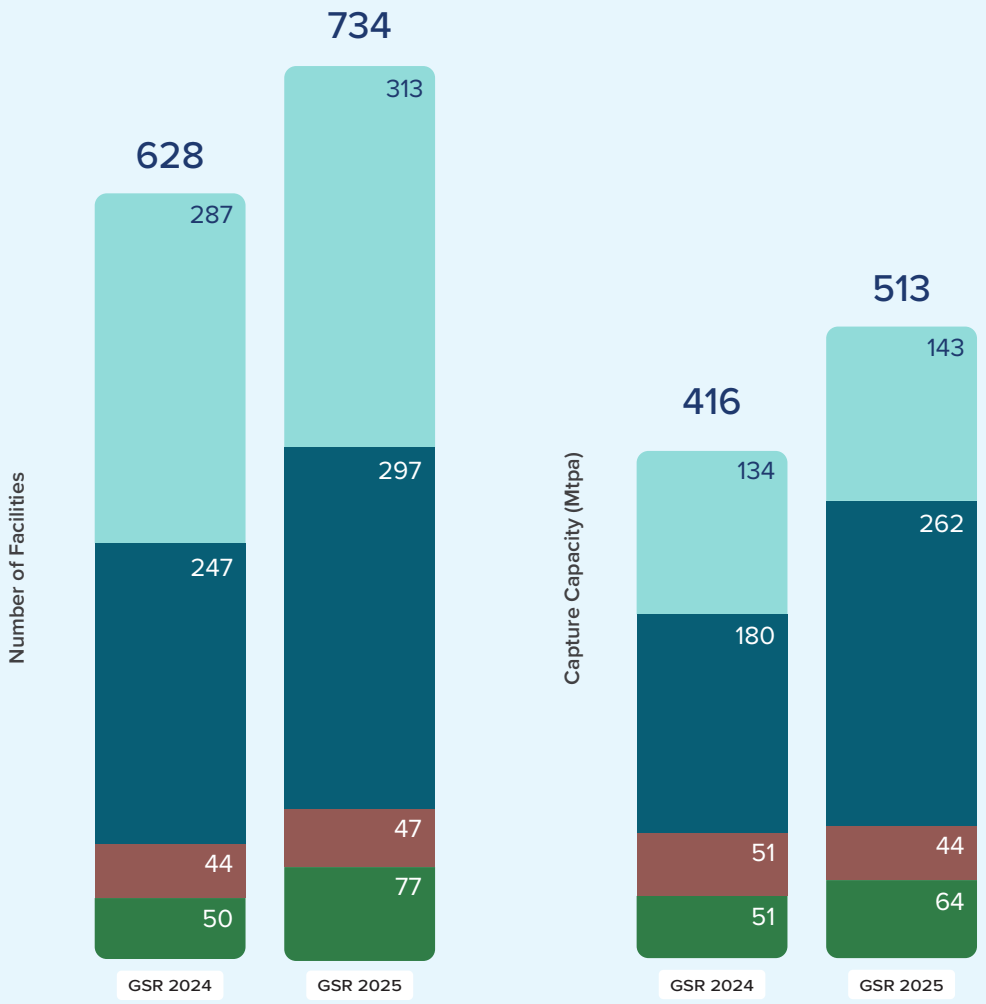
Total capture capacity rises 23% year on year

44 Mtpa

Capture capacity in construction in July 2025

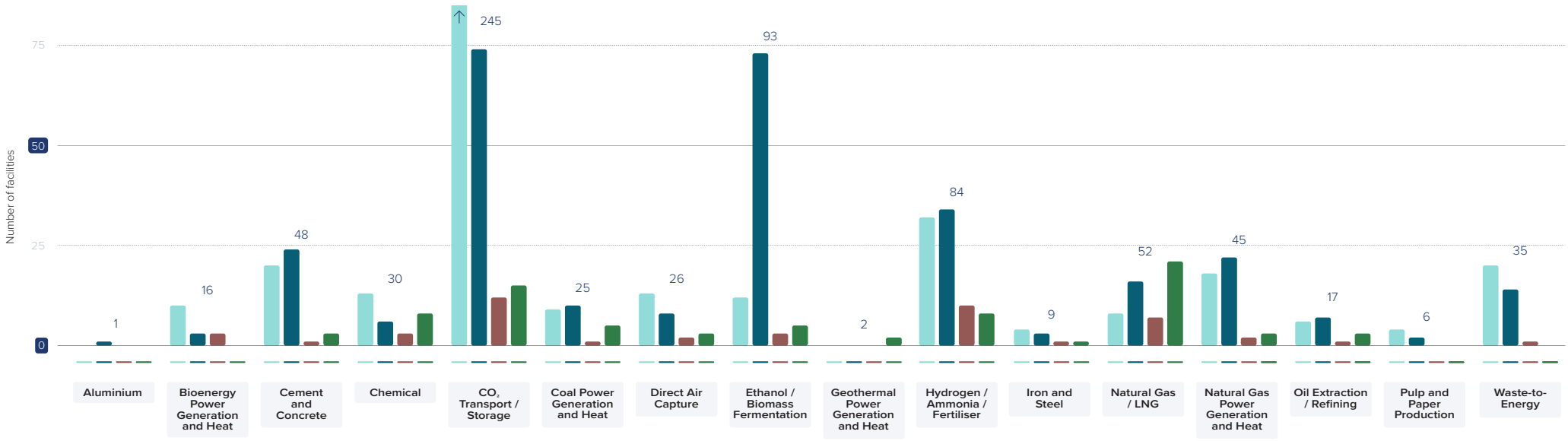
* Current as of July 2025.

Commercial CCS facilities by number and total capture capacity



Investment in transport and storage surges as business models mature

Number of projects by industry and stage of development



Financial maturity fuelling investor confidence

The carbon management sector is entering a new phase of financial maturity in 2025, with sustained interest emerging in the CO_2 transport and storage sector. For the first time, CCS projects have secured non-recourse debt financing (Net Zero Teesside, Northern Endurance Partnership), supported by robust policy frameworks and offtake agreements. This milestone reflects growing lender confidence, aided by standardised contracts, emerging insurance solutions, and dedicated project finance structures.

Private capital is also stepping up. In May 2025, Eni partnered with Global Infrastructure Partners to co-own CCS assets in the UK, Netherlands, and Italy, signalling increased institutional investment.

Several projects have recently reached FID or financial close in Europe, highlighting the growing pipeline of bankable projects across the region – Northern Lights Phase 2 in Norway, EniHynet North West in the UK, and Stockholm Exergi BECCS in Sweden.

Carbon markets are evolving in parallel. The EU and UK ETS linkage agreement marks renewed regional cooperation, while Norway and Switzerland's Article 6.2 deal creates one of the first frameworks for international carbon removals.

The voluntary carbon market is also expanding rapidly, with Microsoft increasing its BECCS offtake from Stockholm Exergi to over 5 Mt, and the European Commission exploring an EU-level carbon dioxide removal (CDR) purchasing programme to boost early demand.

Facility Status	
Early Development	313
Advanced Development	297
In Construction	47
In Operation	77
Overall Total	734

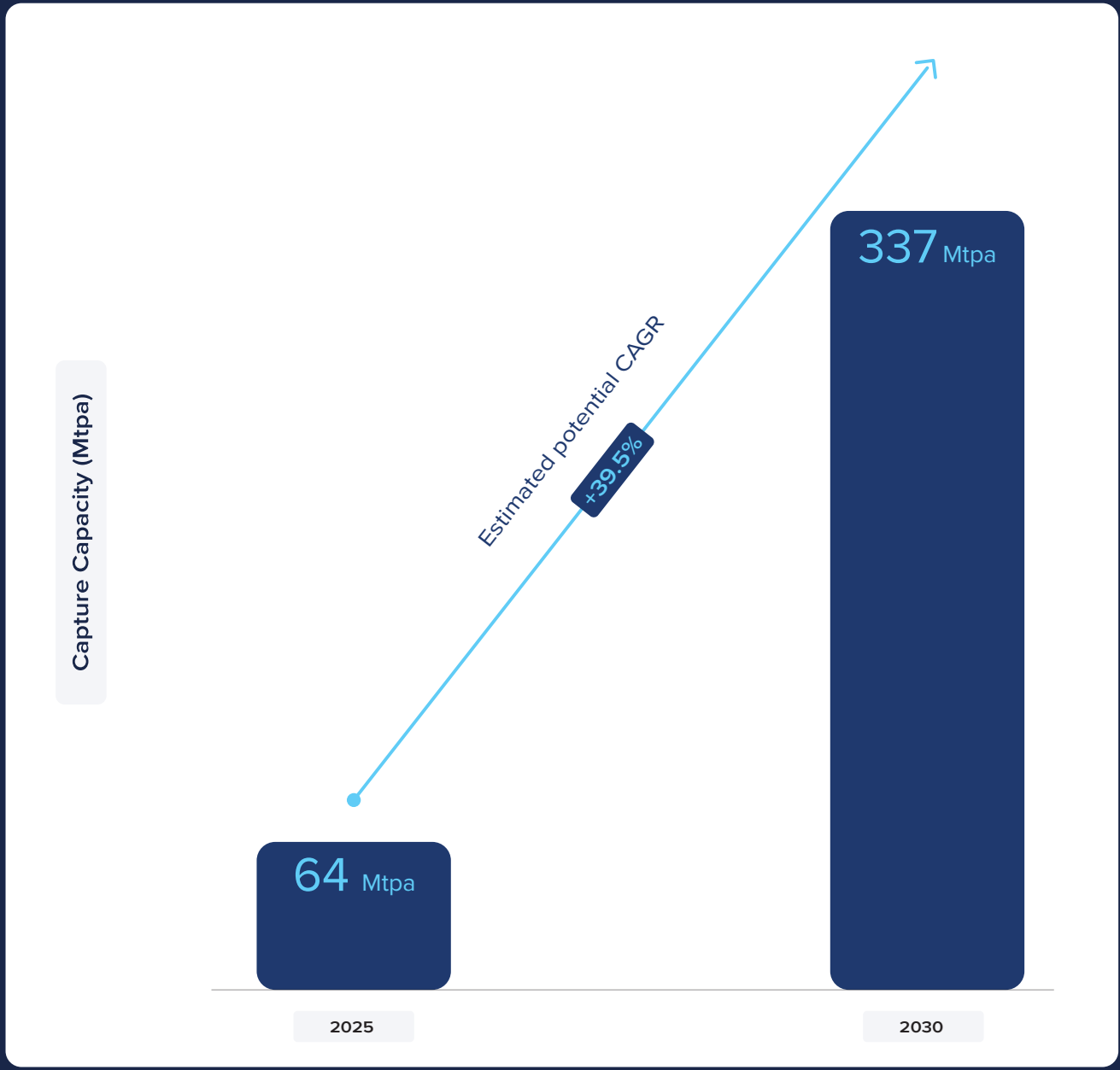
CCS capture capacity continues to expand and grow through 2030

The capture capacity of facilities in operation globally in 2030 is projected to be five times higher than in 2025, based on the development and construction pipeline captured by the Institute's CO_2RE database.

Considering projects currently under development, the total operating capacity could increase to 337 Mtpa within the next five years, from 64 Mtpa today, with a potential compound annual growth rate (CAGR) of nearly 40%.

Including planned projects, or projects commencing operations after 2030, takes the total capture capacity in the pipeline to 513 Mtpa. While significant, it remains well short of the required deployment to meet climate agreements, and additional capacity expansion must be brought online.

Potential capture capacity 2025-2030, based on entire CO_2RE project database pipeline



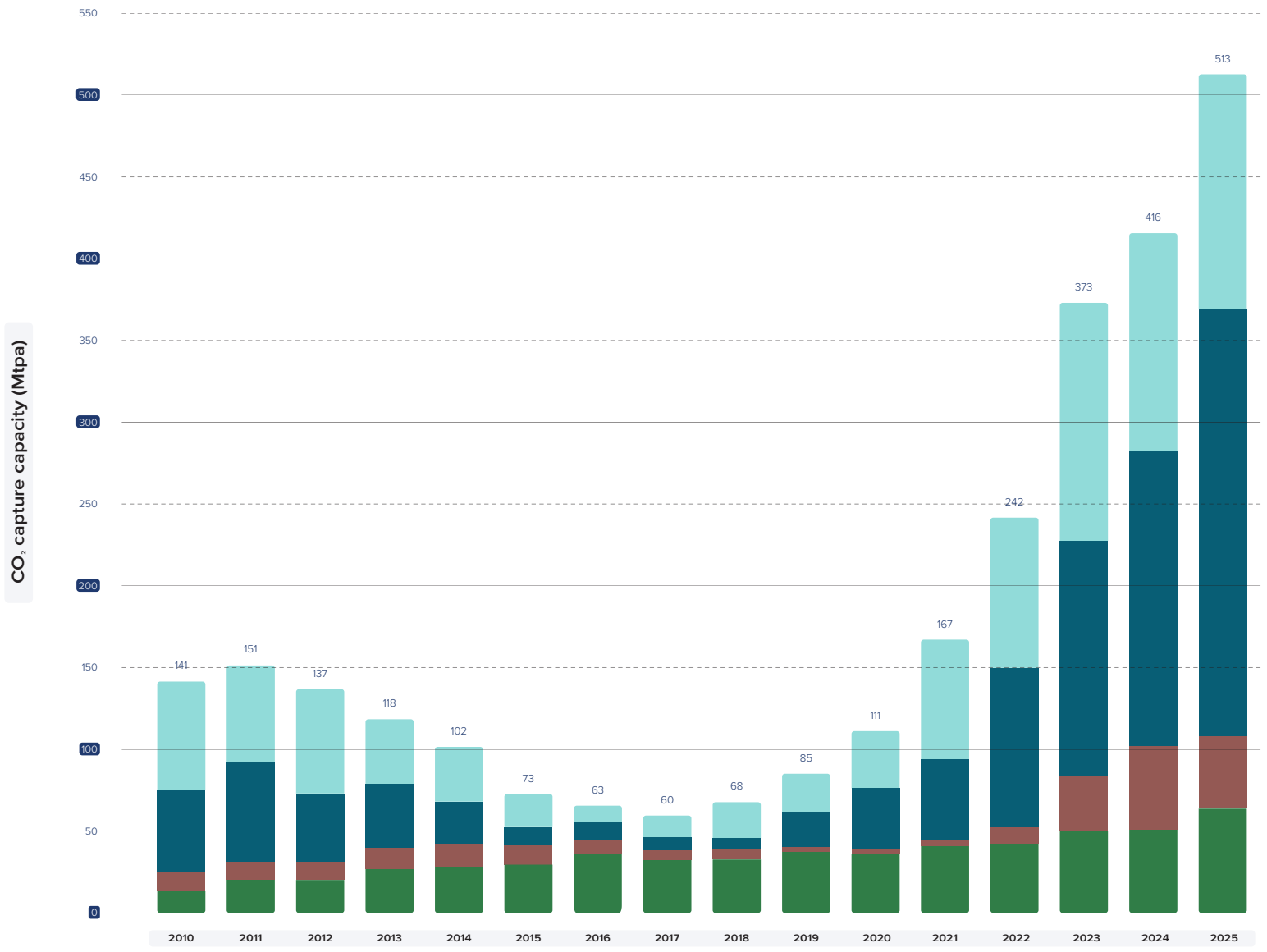
Global capture capacity pipeline trending higher since 2017

The CCS project pipeline continues to grow at a robust pace, with 2025 marking another year of strong momentum; 27 projects have commenced operations and another 30 have entered the construction phase since the 2024 Global Status of CCS report.

The number of CCS facilities in development has again increased substantially in the past year, driven by policy support, commercial interest, and the growing recognition of CCS as a critical climate solution.

Capture capacity continues to rise, with strong growth across all stages of development. Since 2017, total planned capture capacity has grown at a compound annual rate of over 30%, with the past year maintaining that upward trajectory.

CO_2 capture capacity of commercial CCS facility pipeline since 2010



Facility Status

- Early Development
- Advanced Development
- In Construction
- In Operation

Expansion across all industries gaining pace, led by low-carbon hydrogen

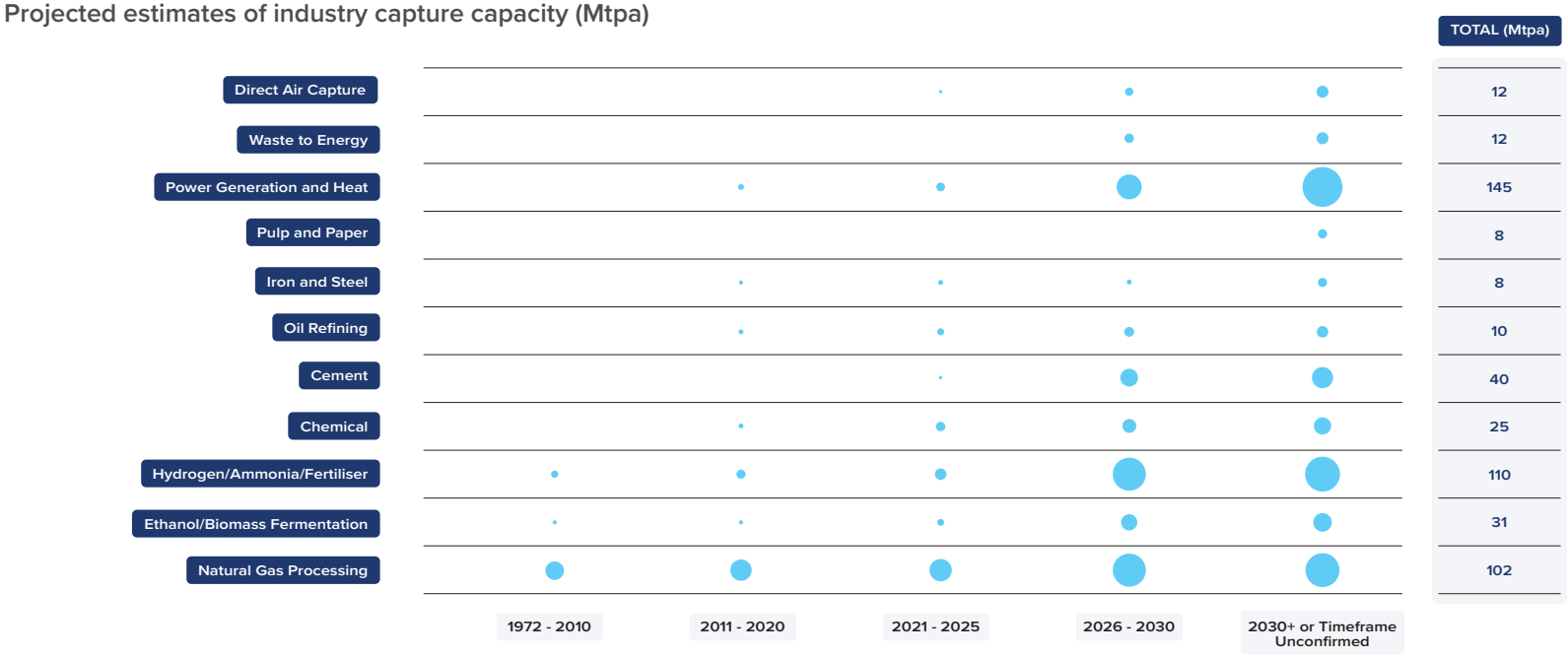
By 2030, operating CCS capacity is expected to expand significantly and across a more diverse range of industries. While natural gas processing has been the dominant CCS deployment industry since 1972, deployment in the low-carbon hydrogen and ammonia sector is anticipated to assume the top spot by 2030, with an estimated CCS capture capacity addition of more than 100 Mtpa, before potentially being overtaken by power generation and heat.

Strong capture capacity expansion is also anticipated in the power generation and heat sector, though the timeframe for many of those projects is yet to be confirmed.

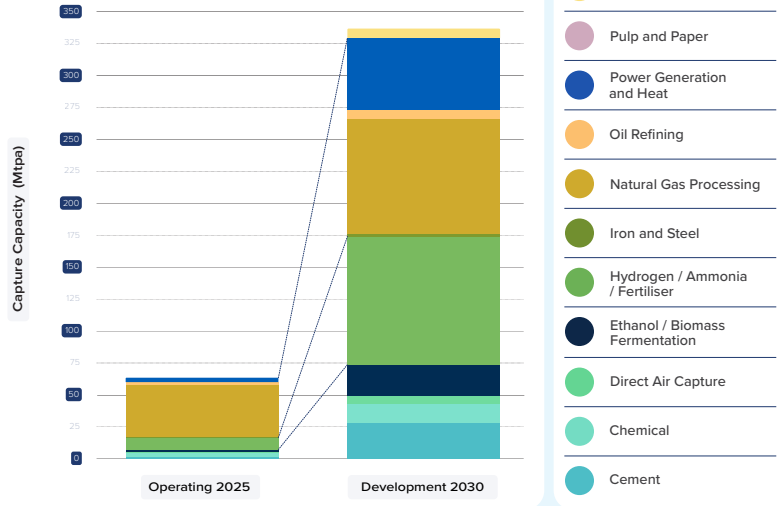
Projects not yet in feasibility stages or without a confirmed timeline are excluded from the 2030 regional and industry projections.

By region, North America is anticipated to continue to lead CCS development at the 2030 mark, with the strong momentum seen in Europe expected to elevate the region to second overall by capture capacity, from under 3 Mtpa of operational capacity operating today to estimates above 90 Mtpa in just 5 years' time.

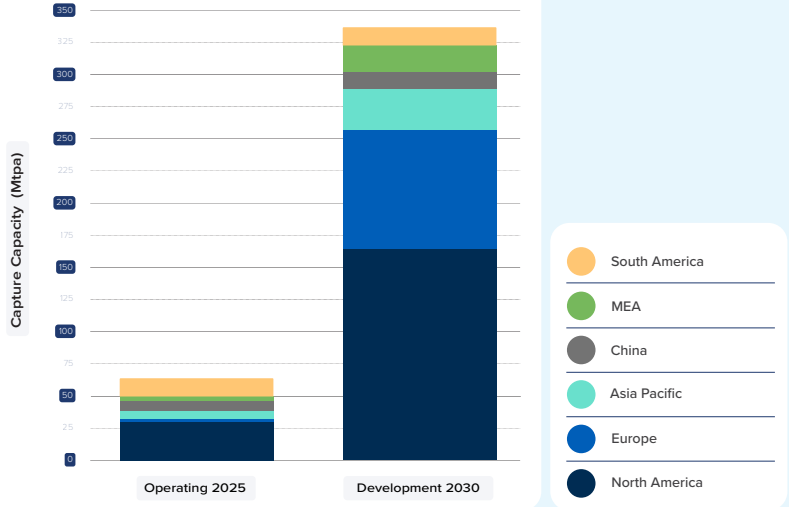
Projected estimates of industry capture capacity (Mtpa)



Projected estimates of capture capacity by industry



Projected estimates of capture capacity by region



Regional Spotlight

2.0

Americas

CCS progressing across region at varying rates

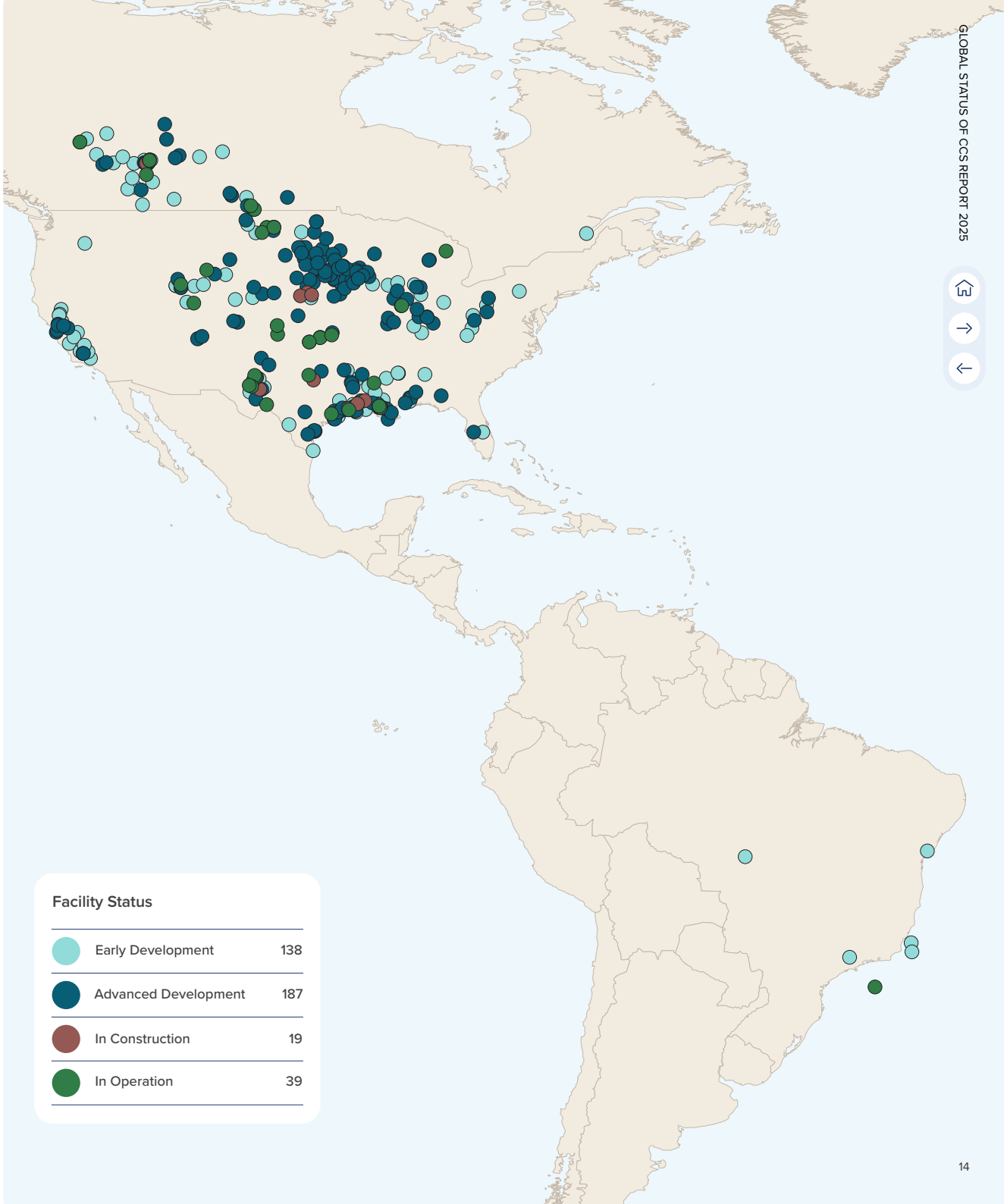
The US and Canada are continuing to support tax credit policies, and Brazil, which is leading Latin America, is making positive progress in regulatory development. The Americas have stored over 223 Mt of CO_2 as of 2023, and 39 projects are currently operational. This number is expected to grow with upcoming projects, such as Blue Point-Louisiana (JERA, 2025) and BKV-South Texas (BKV, 2025), reaching final investment decisions.

Dynamic – Readiness, policy support, and infrastructure vary widely across the Americas, yet the region is moving towards CCS adoption. The US and Canada are surging ahead with supportive tax policy and permitting activities in North America, while Brazil is leading the development of the regulatory foundation in Latin America.

Growth – Natural Gas Combined Cycle (NGCC) power generation with CCS can provide firm, low-carbon, cost-competitive, reliable baseload electricity to meet the power demands and fluctuations of future AI data centres across the Americas, while also creating jobs and providing economic benefits for local governments.

Foundation – Geologic storage with enhanced recovery, ongoing in the Americas (Brazil, Canada, and the US), offers a strong business case for early CCS projects while developing the infrastructure for wider deployment. Robust monitoring, reporting, and verification protocols are integral to these projects to demonstrate and ensure that the CO_2 is permanently stored.

Catalysts – Financial incentives, emerging revenue models, and global trade are accelerating near-term CCS deployment in the Americas as companies begin to prepare for trade-linked carbon accountability for exports.



Artificial intelligence data centres are a key driving force in electricity demand growth. Companies are contemplating the installation of new power generation to support data centre hubs across the Americas. At least eleven natural gas-fired power plants have been announced in US and Canada related to data centres as of mid-2025:

- Alberta Wonder Valley: 1.4 GW (Alberta, 2025)
- Beason AI: 4.5 GW (Giacobone, 2025)
- CloudBurst: 1.2 GW (Cloudburst Data Center, 2025)
- Edge ConneX: 0.12 GW (EdgeConneX, 2025)
- Engine No. 1, Chevron and GE Vernova: 4.0 GW (Chevron, 2025)
- Exxon Mobil: 1.5 GW (George, 2024)
- Frontier Infrastructure: 0.27 GW (Frontier Infrastructure, 2025)
- Homer City Redevelopment and Kiewit: 4.5 GW (Homer City Redevelopment, 2025)
- Meta Hyperion: 5.0 GW (Akhtar, 2025)
- Tallgrass-Crusoe: 1.8 GW (Jean, 2025)
- Williams Socrates: 0.4 GW (Williams, 2025a)

Companies like Alphabet (Panettieri, 2025) and Microsoft (Microsoft, 2025) have very aggressive goals of achieving a net zero or carbon-negative status by 2030. To meet emission reduction targets, leaders like the US, Canada, and Brazil are developing policies, demonstrating technology readiness, and offering incentives to project developers. Their leadership and sharing of lessons learned will help emerging countries accelerate their progress.

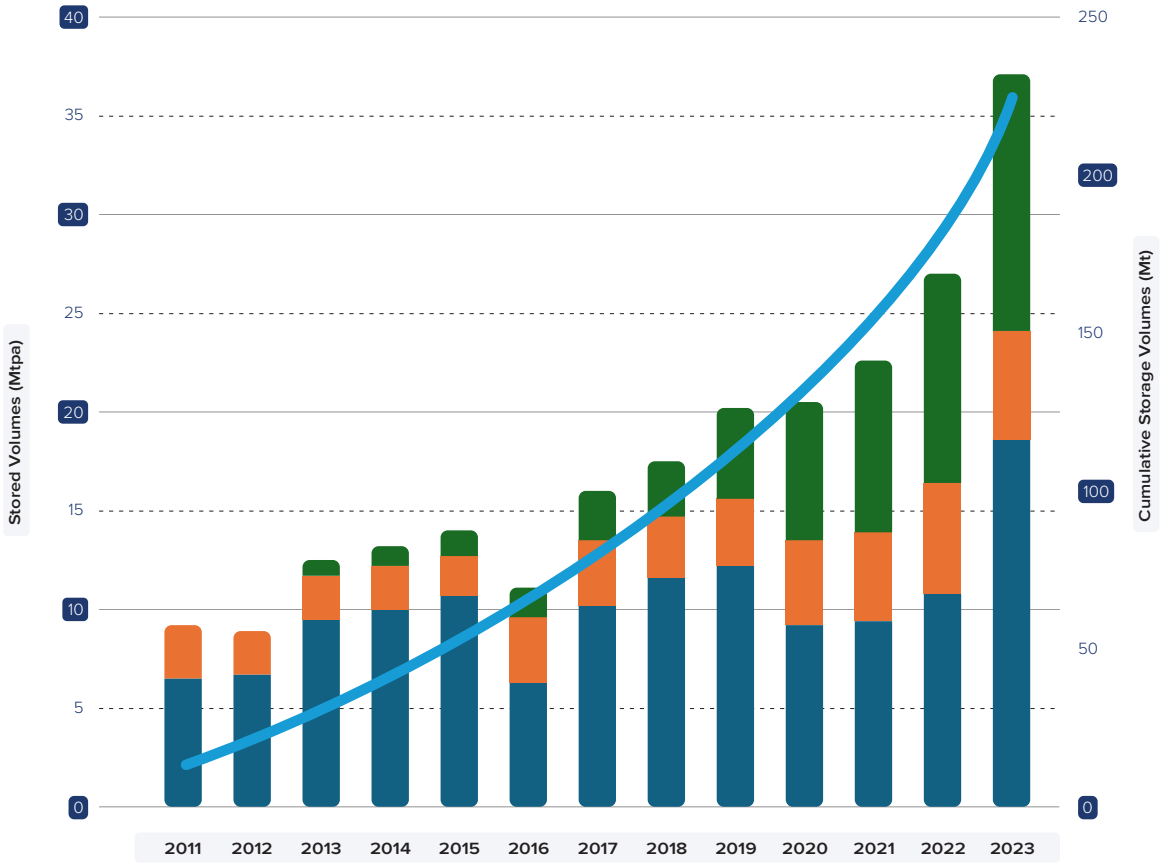
Economic growth is a top priority for both federal and state governments.
The convergence of AI-driven power demand, CCS-ready infrastructure, and state-level regulatory readiness is creating a rare opportunity for states to become economic beneficiaries of the AI energy boom.
This could lead to thousands of jobs and significantly boost a state's economy.

For example, the Meta Hyperion facility in Richland Parish, Louisiana, is anticipated to employ approximately 5,000 workers during construction, and generate 500 permanent jobs and 1,000 indirect jobs, with employee average salaries exceeding 150% of the state's per capita income (Louisiana Trade & Commerce, 2025). States receiving CCS investments are expected to benefit from these direct investments and related spillover effects, increasing state economic activity and associated jobs.

The Institute analysed Louisiana's potential overall economic benefits, based on estimated project announcements of $29.5 billion using our GENZO model (Williams, 2025b). Institute analysis suggests that $29.5 billion in carbon management infrastructure investments, with 45Q support and additional downstream CCS investments, could generate $90.2 billion in economic value for Louisiana over the next two decades. During the same period, these activities are estimated to support nearly 120,000 direct and indirect jobs each year, amounting to about 2.4 million job-years over 20 years (Li et al., 2022).

The Trump administration plans to pull the US out of the UN Framework Convention on Climate Change per the Executive Order 'Putting America First in International Environmental Agreements' (The White House, 2025) and is reversing climate policies of the Biden Administration.

Americas Region CO_2 Stored Volumes



Source: GCCSI, using the best available public data.

Policy

National elections have influenced CCS policies. Canada's recent election of Mark Carney as Prime Minister signals ongoing support from the federal government for CCS. One of the party's first actions was to extend the CCUS tax credit through 2035 (Merchant, 2025). Additionally, the Government of Canada announced an investment of over $14 million to the Energy Innovation Program (Merchant, 2025), moving forward with $21.5 million in clean energy projects in Alberta (Natural Resources Canada, 2025), and working to finalise its DAC quantifications protocol (The International CCS Knowledge Centre, 2024). The Pathways Alliance Oil Sands CCS project FID determination is expected in 2025 (Canada Natural on behalf of Pathways Alliance, 2024).

In the US, some uncertainty and mixed signals could curtail CCS deployment. The Trump administration plans to pull the US out of the UN Framework Convention on Climate Change per the Executive Order 'Putting America First in International Environmental Agreements' (The White House, 2025) and is reversing climate policies of the Biden Administration. In late spring, the US DOE announced the termination of 24 projects, including projects for CCS and decarbonisation initiatives, totalling $3.7 billion (Department of Energy, 2025) and the Environmental Protection Agency (EPA) proposed to repeal all greenhouse gas emission standards for fossil fuel-fired power plants (EPA, 2025) However, the US Congress continues to support the 45Q tax credit (GCCSI, 2025) and recently increased the credit for CO_2 utilisation and geologic storage with enhanced recovery.

Individual states are continuing to enact legislation in support of advancing CCS, with many making progress in developing their regulatory frameworks. When states proactively pass legislation, they send positive signals to industry about their regulatory readiness for CCS projects, which could attract AI data centres and other industries to their states, further stimulating economic growth.

In 2025, 12 states passed 24 carbon management legislative acts, with Louisiana leading the way; and four states (Louisiana, North Dakota, West Virginia and Wyoming have been granted CO_2 injection permitting authority, with two more states (Arizona and Texas) pending final approval in 2025 (EPA Underground Injection Control, 2025).

Brazil continues to lead CCS progress in Latin America and will host COP30. Brazil emerged as a leader in CCS with its Fuels of the Future Bill (Brazil, 2024a) and the introduction of the Brazilian Greenhouse Gas Emissions Trading System (Brazil, 2024b). By enacting these policies, Brazil continues to move forward with CCS, building on regulatory actions and investments made by its state oil company, Petrobras. Together, Brazil's leadership and Petrobras' experience can accelerate CCS deployment in other Latin American countries.

Mexico's pilot emissions trading system (Mexico, 2025) has concluded its pilot phase and was scheduled to enter its operational phase in 2025; however, regulations for this phase had not been published at the time of writing. There are also signs of ongoing progress from other Latin American countries, as evidenced by the Regional Dialogues on Carbon Pricing (REDiCAP), which aims to evaluate policy and carbon pricing tools to meet each Latin American country's Nationally Determined Contributions.

Read More

Pathways Alliance Oil Sands CCS Project

Read More

Case study:
Brazil's regulatory actions and Petrobras' investments are the catalyst to CCS in Latin America

US state legislation

State	Legislation	
Arkansas	H.B.1411	To Clarify the Regulation of Carbon Capture and Sequestration; And to Establish the Carbon Dioxide Storage Fund
	H.B.1412	To Clarify Regulation of Pipeline Safety Authorization for Transportation of Hazardous Liquids or Carbon Dioxide
Colorado	H.B.25-1165	Geologic Storage Enterprise & Geothermal Resources
	S.B.25-307	Decarbonization Tax Credits Administration Cash Fund
Illinois	S.B.1723	EPA sole-source aquifer
	S.B. 1697	Carbon capture compensation
Indiana	H.B.1001	State Budget-Funds Carbon Sequestration Project Program and CO_2 Pipelines and Facility Trust Fund
	S.B. 457	Carbon Dioxide Sequestration
Louisiana	H.B.2	Capital Outlay: Provides authorization of LSU PERTT Lab Well No. 3
	H.B.304	Civil/Venue: Provides relative to venue for claims involving expropriation for carbon capture
	H.B.548	Energy: Provides for the dedication of revenue from carbon dioxide sequestration on state lands and water bottoms
	H.B.691	Energy: Establishes public safety and accountability procedures for carbon dioxide sequestration
	S.B.36	Minerals: Provides for carbon sequestration
	S.B.73	Environmental Control: Provides for sequestration of carbon dioxide
	S.B.244	Natural Resources Dep: Provides for the Dept. of Energy and Natural Resources
New Mexico	H.B.458	Carbon Dioxide Storage Stewardship Act
North Dakota	H.C.R. 3016	Recognizing the benefits of enhanced oil recovery and maintaining policies for the development of carbon capture and utilization
	S.B.2333	Low-Carbon Fuels
Oklahoma	S.B.269	Act relating to carbon sequestration
South Dakota	H.B.1052	Act to prohibit the exercise of eminent domain for a pipeline that carries carbon dioxide
Utah	H.B.352	Geologic Carbon Storage Amendments
	H.C.R.9	Establishment of an interstate compact for regional energy collaboration between Utah, Wyoming, and Idaho
West Virginia	S.B.627	Removing the prohibition against leasing state-owned pore spaces underlying lands designated as state parks
Wyoming	S.F.17	Carbon Dioxide and Enhanced Oil Recovery Stimulus

Finance

Financial drivers, innovative value streams, and trade requirements could accelerate the deployment of CCS in the near term. The recent passage of the US' Big Beautiful Bill Act enhances the 45Q tax credit for geologic storage with enhanced recovery, and this increased incentive could create another revenue stream for business models and build out future CO_2 transport infrastructure.

Voluntary carbon markets and potential "green premiums" (Breakthrough Energy, 2022) are other ways to offset capital and operational expenditures. This would help companies meet their emissions reduction targets and help finance current and future projects.

Global carbon trading requirements could impact future imports into the EU through CBAM (European Commission, 2024) where non-EU members must provide data on embedded emissions of the products if they sell to the EU. For example, CBAM could result in higher import costs for ammonia produced without CCS, given its higher carbon intensity, and although LNG is not included at this time, indirect effects could emerge if LNG is a feedstock for ammonia production.

By 2030, CBAM's scope is expected to extend and likely candidates include chemicals, polymers and plastic, and oil refining projects. The overall impact would result in higher costs for imports that do not reduce their carbon intensity to meet these new trade requirements.

Read More

Geologic storage with enhanced recovery

45Q Tax Credit Modifications – One Big Beautiful Bill Act (2025)

Feature	Inflation Reduction Act (2022)	One Big Beautiful Bill Act (2025)
Credit Value (per ton)	• $85: Point source → Geologic storage (GS) • $180: DAC → GS • $60: Point source → Utilisation / GS with enhanced recovery • $130: DAC → Utilisation / GS with enhanced recovery	• $85: Point source → GS • $180: DAC → GS • $85: Point source → Utilisation / GS with enhanced recovery • $180: DAC → Utilisation / GS with enhanced recovery
Transferability	Allowed as of 2023	Allowed as of 2023
Inflation Adjustment	Commences 2027, with 2025 base index year	Commences 2027, with 2025 base index year
Foreign Entity of Concern (FEOC) Restrictions	Not applicable	New restrictions

The bill maintains the 45Q tax credit for point-source capture at $85/tonne and direct air capture (DAC) at $180/tonne in dedicated geologic storage, preserves transferability, and keeps the inflation adjustment date of 2027 with a base index year of 2025. The tax credit now includes parity for the utilisation of CO_2. In this new bill, CO_2 used or converted into valuable products or injected and geologically stored in a qualified enhanced oil recovery or natural gas recovery project site will qualify for the same dollar value credit as CO_2 that is permanently sequestered in a dedicated geologic storage site. The bill also introduces new restrictions for Foreign Entities of Concern.



Airhive DAC Canada, image courtesy of Airhive.

Case study: US data centres

Between 2025 and 2030, 55 GW of new data centre capacity is projected to come online in the US, with around 30% of facilities expected to incorporate on-site power (Bloom Energy, 2025).
Unfortunately, the grid has not kept pace, leading to emerging bottlenecks in transmission and distribution infrastructure. This causes delays in grid connections and increased costs for grid services. The rapid increase in demand and the slow response of grid capacity are driving the need for more behind-the-meter (on-site) power solutions. Larger data centre customers require power generation to be reliable, cost-effective, have lower emissions, and have flexibility to manage variable power loads.

This is because AI model training causes large and quick fluctuations or bursts in power demand (Ontiveros et al., 2025).

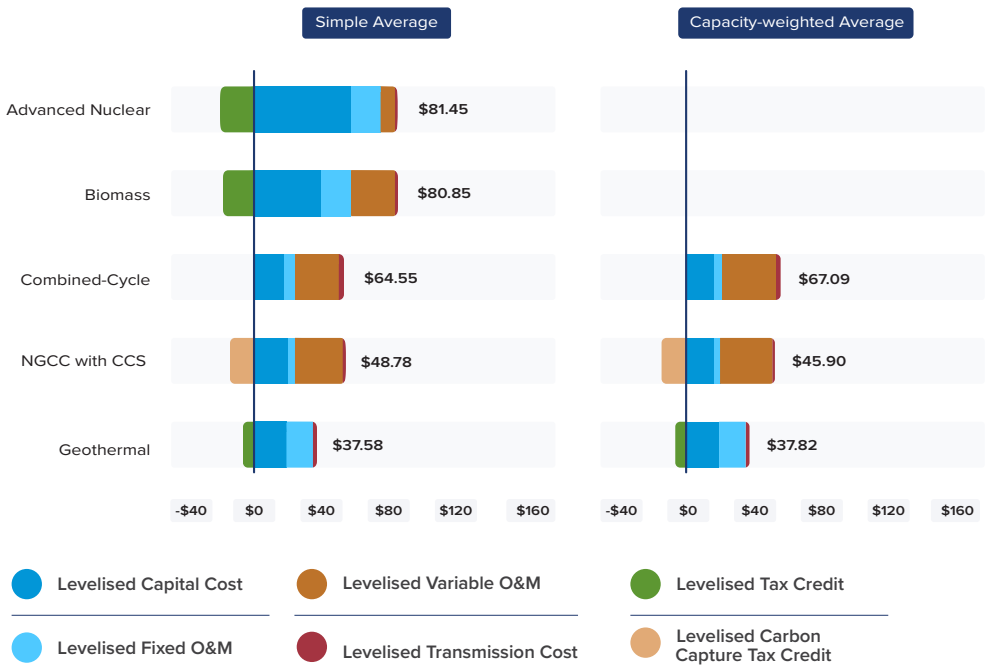
Data centres hosting large training operations could demand up to 1 GW in a single location by 2028 and 8 GW by 2030 (Pilz et al., 2025). NGCC with CCS, small modular nuclear reactors (SMR), and geothermal energy are all being considered to meet the increasing load growth and fluctuations.

US data centre power demand forecasts to 2030



Data source: The graphic represents the range of potential power demand cases in the next five years. (Stuckert et al., 2025).

Levelised costs of dispatchable power technologies in the US



Data source: US Energy Information Outlook, Annual Energy Outlook 2025.

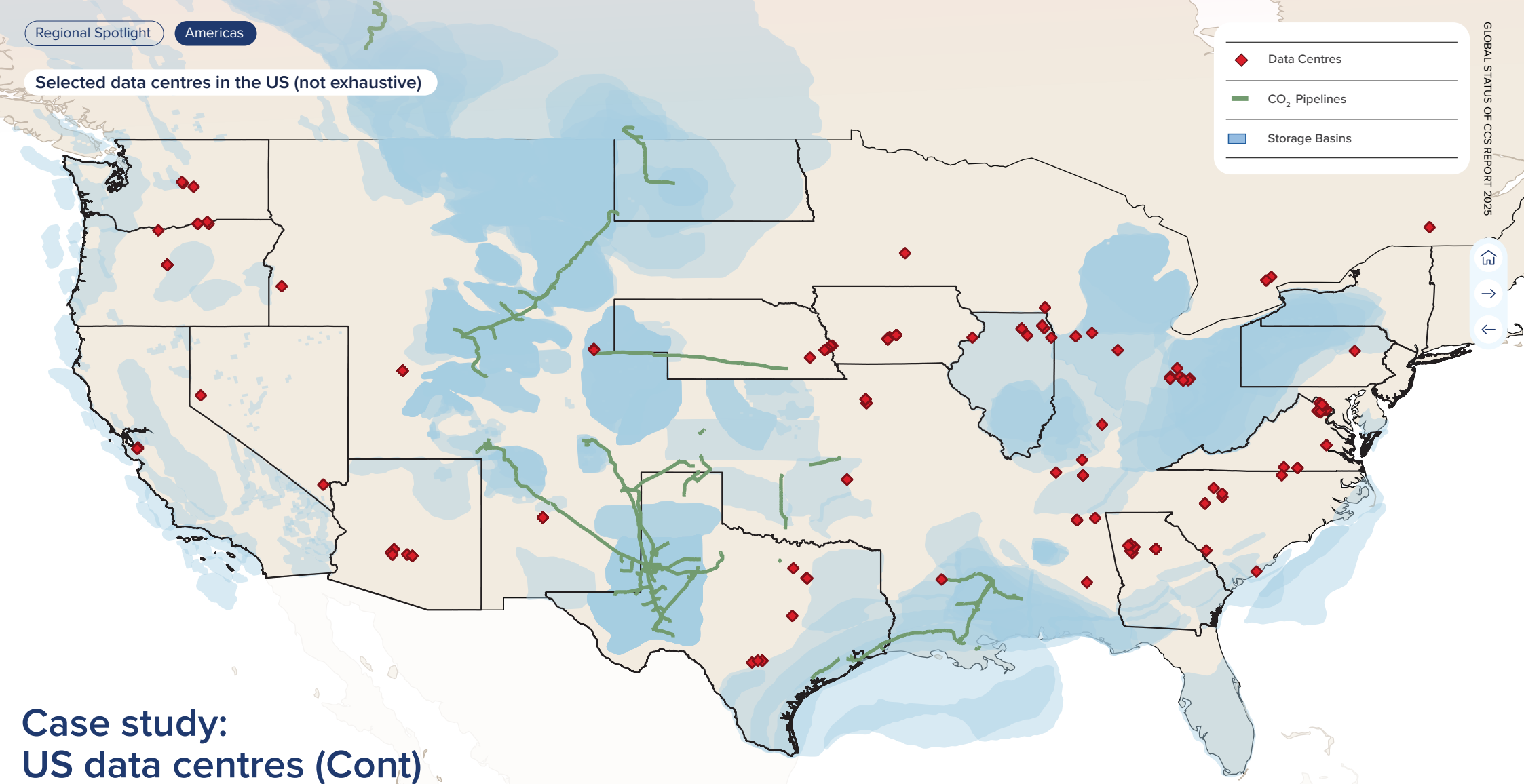
Can NGCC with CCS be the answer?

Data centres require 24/7 dispatchable power supplies. The US Energy Information Administration (EIA) published levelised costs of dispatchable power technologies in the US, as reproduced in the figure above (EIA, 2025). On a simple average cost per MWh and a capacity-weighted average cost, NGCC with CCS is the second lowest cost option – lower cost than nuclear, biomass, and even unabated NGCC when tax credits are included.

Although geothermal is lower cost, locations of the data centres could be constrained by the location of geothermal resources or would have to rely on heavily constrained power grids to bring that power to the data centres.

NGCC with CCS would not have this constraint and could be installed near the data centre behind the meter, providing dedicated power to the data centre.

Speed of deployment is also essential given the rapid growth of data centre demand. NGCC with CCS enables the more rapid deployment of local power generation at a reasonable cost, as well as the ability to decarbonise it with CCS as the required CO_2 transport infrastructure becomes more available.



Case study: US data centres (Cont)

Location, Location, Location

Given current grid limitations for transmission capacity, on-site NGCC plants in the Americas could provide data centres with the reliable and sustainable power generation required to meet demand. Additionally, NGCCs can also dispatch power to the grid when needed and receive credit for their contributions. Data centre locations require specific key factors, and in 2023, 15 states accounted for approximately 80% of the data centre power (Aljbour et al., 2024).

The recent announcement of a new AI data centre in Wyoming, powered by natural gas and featuring CCS technology, signals that the industry is increasingly recognising the value of natural gas generation with CCS (Jean, 2025). The project is expected to consume more electricity than Wyoming's entire state demand, rising to multiples of that over time (Gruver & O'Brien, 2025), demonstrating how NGCC with CCS can avoid the need for large-scale grid infrastructure to be built.

Future locations of data centre hubs that use on-site NGCC can be optimised for efficiencies in regions with abundant low-cost natural gas. Combined with enabling CCS regulatory frameworks, CO_2 pipelines, and geologic storage opportunities, these locations could be prime targets for firm and flexible low-carbon power sources. As identified in the figure above, there is a significant overlap of states, basins, and existing CO_2 pipelines for NGCC with CCS, which in turn increases the capability to provide reliable, sustained low-carbon energy for future data centres.

Data sources: https://www.datacentres.com/; https://datacentres.google/; https://aws.amazon.com/ ; https://datacentres.atmeta.com/ States highlighted are sourced from EPRI (Aljbour et al., 2024) Storage Basins from NATCARB, US DOE (2025).

Europe and UK

Pivotal year sees policy alignments, tangible project progress

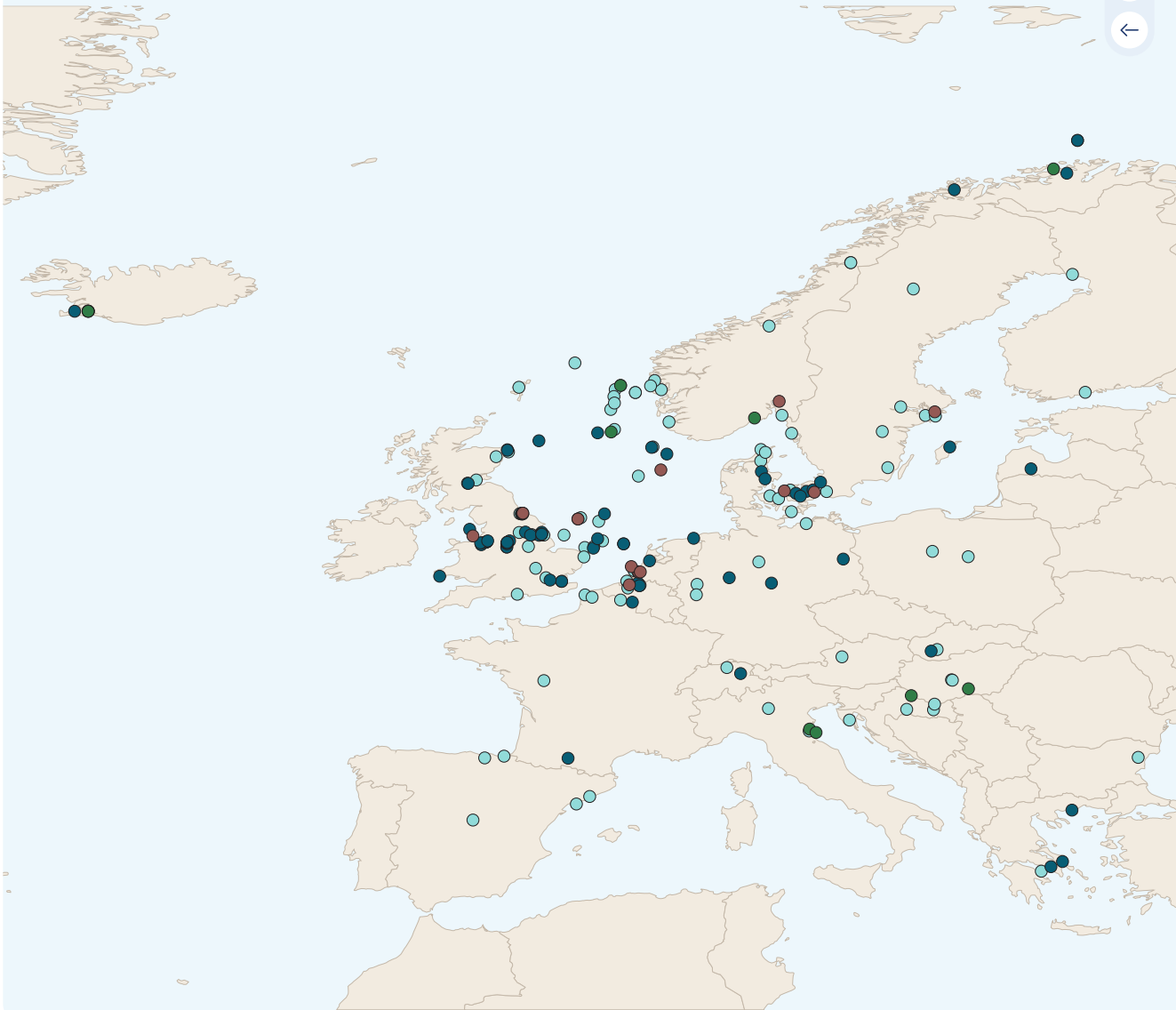
Europe is advancing industrial carbon management as a key component of its climate and industrial policy agenda. 2025 has emerged as a pivotal year, marked by major policy alignments and tangible project progress. The European Commission's Clean Industrial Deal reinforces the union between climate ambition and industrial competitiveness, while the new agreement to link the European Union (EU) and United Kingdom (UK) Emissions Trading Schemes (ETSs) signals a renewed commitment to regional cooperation. These developments, combined with the build-out of CO_2 storage infrastructure and growing investor interest, position Europe as a rising leader in carbon management technologies.

Target – A Delegated Act and Decision under the Net-Zero Industry Act (NZIA) mandate 44 European oil and gas producers to collectively develop 50 Mtpa of CO_2 storage capacity by 2030.

Advancement – Five CCS projects have become operational and seven have entered construction since mid-2024.

Cooperation – New agreements with countries such as Greece-Egypt, Switzerland, Norway and the UK signal expanding cross-border collaboration.

Challenges – Barriers remain, including restricted access to offshore storage outside the European Economic Area (EEA), social resistance to onshore storage, and regulatory gaps for carbon removals.





Brevik CCS Facility, Norway, image courtesy SLB Capturi and Heidelberg Materials.

Europe's CCS sector is witnessing advancements across investment, transparency and cross-border collaboration in 2025, reflecting growing opportunities in the region and a marked increase in project activity across several sectors.

The number of operational CCS projects has more than doubled since July 2024. In particular, Brevik CCS, the world's largest CCS cement plant, started operations in June 2025 (Heidelberg Materials, 2025). Seven additional projects have reached final investment decision or financial close, indicating increasing commercial viability and government readiness to support deployment.

The UK's long-anticipated policy foundations for CCS have translated into concrete investment outcomes, as demonstrated by the December 2024 financial closes for Net Zero Teesside and the Northern Endurance Partnership (UK Government, 2024). This is a significant milestone after years of strategic development under the Track-2 cluster sequencing programme.

Despite strong progress in CO_2 transport and storage infrastructure, CCS deployment in hydrogen production remains underdeveloped. This gap may narrow following the European Commission's adoption of the Delegated Act on low-carbon fuels in July 2025, which aims to provide much-needed clarity for hydrogen certification pathways (European Commission, 2025b).

Recent EU initiatives aim to turn transparency into a practical tool for unlocking CCS investment. Since December 2024, Member States have been required to submit annual reports to the Commission, detailing ongoing CO_2 capture, transport, and storage projects, as well as future capacity needs. The European Commission has made these reports publicly available (European Commission, 2025e). In May 2025, under the Horizon Europe funding programme, the Commission launched a call for proposals to develop a digital atlas of investable underground CO_2 storage capacity (European Commission, 2025h).

Cross-border

Cross-border collaboration remains a core feature of Europe's carbon management strategy, with increasing attention on international partnerships that extend beyond the EEA. In early 2025, a historic agreement between Greece and Egypt marked the Mediterranean's first MoU on CCUS (HEREMA, 2025).

Momentum is also growing for bilateral and multilateral agreements that support cross-border CO_2 transport. France ratified the 2009 amendment to the London Protocol in June 2025, following Germany's inclusion of ratification in its coalition agreement (CDU et al., 2025; Vie Publique, 2025). Norway and Switzerland signed a landmark Article 6.2 agreement, creating one of the first cooperative frameworks for international carbon removals under the Paris Agreement (Norwegian Government, 2025a).

The number of operational CCS projects in Europe and UK has more than doubled since July 2024. In particular, Brevik CCS, the world's largest CCS cement plant, started operations in June 2025.

The EU-UK summit in May 2025 featured the announcement of a strategic agreement to link the EU and UK ETSs (Council of the EU, 2025). This linkage, based on dynamic alignment, is a breakthrough for regulatory interoperability and could unlock long-awaited pathways for cross-border CO_2 transport and storage. Symbolically, it also signals renewed collaboration between London and Brussels on shared climate goals.

Challenges

Despite this progress, several barriers could slow CCS deployment if left unaddressed:

- **Political volatility:** Germany's government collapse in late 2024 led to delays in the adoption of CCS legislation, and France's initial rejection of the London Protocol amendment showed the fragility of public and parliamentary support (Clean Energy Wire, 2025; Vie Publique, 2025).
- **Cross-chain risks:** Current national Carbon Contracts for Difference (CCfD) designs do not adequately protect emitters if transport and storage infrastructure face delays. This exposes projects to cost volatility, subsidy losses, and decommissioning risks. The UK's model, with provisions for subsidy continuity, cost oversight by Ofgem, and de-risking of T&S components, offers a replicable example for EU policymakers (GCCSI, 2025).
- **Insufficient incentives for BECCS and DACCS:** Despite the adoption of the Carbon Removal Certification Framework (CRCF), these technologies are not yet eligible under the EU or UK ETS, limiting their access to stable revenue streams. The UK has expressed intent to include removals in its ETS and proposed a Greenhouse Gas Removals Business Model (UK Government et al., 2025).

Sustainability

Public perception and social concerns about safety and environmental risks continue to pose challenges to the deployment of onshore CO_2 storage across Europe. The suspension of France's Pycasso project in late 2024 due to local opposition illustrates how public resistance can delay initiatives, even those backed by major industrial players (Carbon Herald, 2024).

In contrast, Iceland's Carbfix project received Europe's first onshore CO_2 storage permit under the CCS Directive, demonstrating that with effective stakeholder engagement and transparent communication, social acceptance is achievable (Carbfix, 2025). These different outcomes highlight the importance of early and sustained community involvement.

Policy

The policy environment for CCS in Europe continues to evolve, driven by both continuity from the 2019-2024 European Commission and new initiatives under the 2024-2029 mandate. Among the most transformative policies is the NZIA, which legally mandates oil and gas producers to develop a collective 50 Mtpa of injection capacity by 2030. This represents a shift from voluntary ambition to legal obligation and is a clear signal of the EU's intent to mainstream CCS.

The Clean Industrial Deal, announced in February 2025, reframes industrial competitiveness as a lever for achieving climate neutrality (European Commission, 2025d). Key proposals include the creation of an Industrial Decarbonisation Accelerator Act, potential expansion of the EU ETS to cover CDRs, and the establishment of an Industrial Decarbonisation Bank (European Commission, 2025f, 2025g). These efforts aim to stimulate both supply and demand for low-carbon solutions.

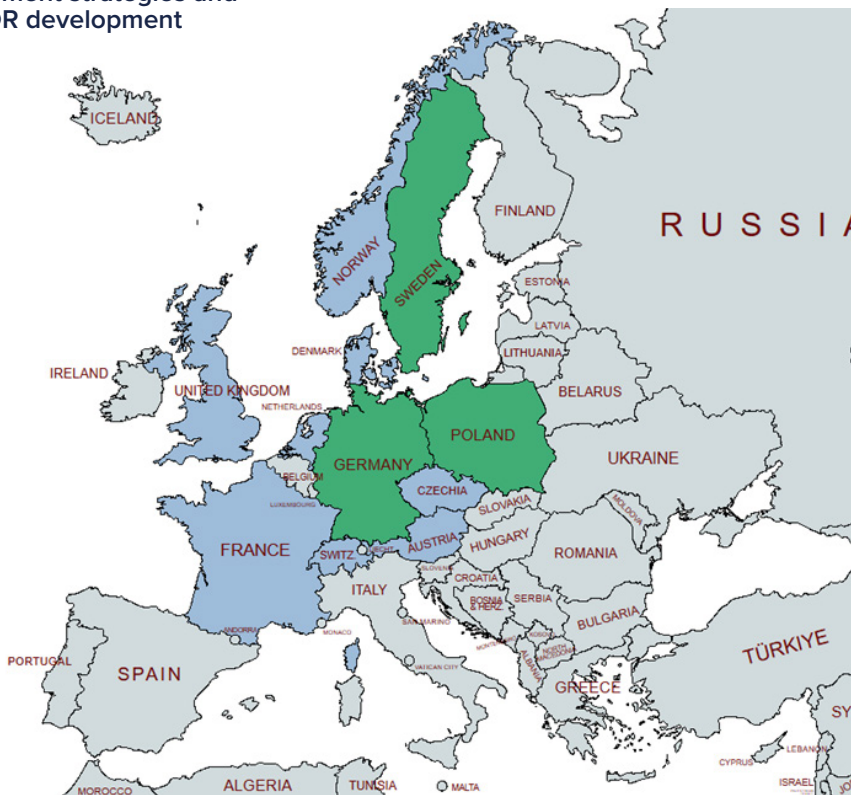
Progress is also being made in removals policy. The EU adopted the CRCF in late 2024, laying the groundwork for voluntary certification of BECCS, DACCS, and other technologies. While full methodologies are still under development, the CRCF sets a precedent for integrating removals into broader policy instruments.

However, critical gaps persist, chief among them the lack of a dedicated EU-wide regulatory framework for CO_2 transport infrastructure. The European Commission plans to release a regulatory proposal to address this in the third quarter of 2026.

CCS projects reaching FID or financial close in Europe (July 2024-July 2025)

Project name	Country	Project type	FID /Financial close date
Net Zero Teesside Power	United Kingdom	Natural Gas Power Generation and Heat	Dec-24
Northern Endurance	United Kingdom	CO_2 Transport / Storage	Dec-24
Project Greensand	Denmark	CO_2 Transport / Storage	Dec-24
Hafslund Oslo Celsio	Norway	Waste-to-Energy	Jan-25
Beccs Stockholm	Sweden	Bioenergy Power Generation and Heat	Mar-25
Eni Hynet North West	United Kingdom	CO_2 Transport / Storage	Apr-25
Fluxys c-grid Antwerp Pipeline	Belgium	CO_2 Transport / Storage	May-25

National carbon management strategies and roadmaps for CCS or CDR development





CO_2 injection well at Carbfix's Hellisheiði site, Iceland image courtesy of Thomas Ratouis. At this site, Carbfix injects CO_2 underground, where it mineralises into stable minerals.

EU Member States

National governments are complementing EU efforts:

Czech Republic: Released a national CCUS action plan (Czech Ministry of the Environment, 2025).

Denmark: Progressed its €1.1 billion CCS fund, shortlisting 10 projects (Danish Energy Agency, 2025).

France: Ratified the London Protocol amendment and signed a bilateral CO_2 transport and storage deal with Norway (Norwegian Government, 2025b).

Germany: Approved a second round of climate protection agreements that include CCS and published a draft revision of the national transposition of the EU CCS Directive (European Commission, 2025a).

Greece: Signed a Mediterranean CCUS MoU with Egypt.

Netherlands: Published a CDR roadmap in March 2025 and signed an MoU with the UK including CCUS cooperation (Dutch Government, 2025; Kingdom of the Netherlands, 2025).

Romania: Revised its transposition of the CCS Directive to accelerate infrastructure development (Romanian Government, 2025).

UK developments

The UK has continued to advance industrial carbon management through:

First CCS Financial Closes (Dec 2024): Follows policy development under the Track-1 cluster process.

UK ETS Reforms (Nov 2024-Jan 2025): Consultations on expanding scope to maritime emissions and non-pipeline CO_2 transport (UK Government et al., 2024).

UK-EU ETS Future Linkage (May 2025): Promotes regulatory alignment and cross-border infrastructure.

CCS Network Code (Jan 2025): Establishes third-party access and operational standards for CO_2 transport (UK Department for Energy Security and Net Zero, 2025).

Updated Licensing Guidance (Feb-Apr 2025): By North Sea Transition Authority for CO_2 storage permits (North Sea Transition Authority, 2025).

GHG Removals (Aug 2025): Released the GHG removals business model.

Finance

Public funding continues to underpin much of Europe's CCS development. In the UK, long-awaited financial backing for the Acorn and Viking projects was confirmed in June 2025 (UK Government, 2025).

At the EU level, the Innovation Fund (€2.4 billion call) and Connecting Europe Facility for Energy (€600 million) remain central instruments for accelerating deployment (CINEA, 2025; European Commission, 2024). These funds are now reinforced by the Clean Industrial State Aid Framework (CISAF), which offers more flexibility to Member States to support industrial decarbonisation (European Commission, 2025c). The CISAF builds on and complements the existing guidelines on State aid for climate, environmental protection and energy (CEEAGs), already used by many countries to support CCS (European Commission, 2022).

However, a major shortfall remains: only a handful of countries offer CCfDs or equivalent instruments. Without long-term revenue guarantees, private investment in carbon capture remains limited in many EU Member States.

Encouragingly, private capital is entering the space. Eni's partnership with Global Infrastructure Partners in May 2025, involving assets in the UK, Netherlands and Italy, reflects growing investor confidence (Eni, 2025).

In parallel, the voluntary carbon market is diversifying, with Microsoft increasing its BECCS offtake from Stockholm Exergi to over 5 Mt (BECCS Stockholm, 2025). The European Commission is now exploring an EU-level CDR purchasing programme to catalyse further demand (European Commission, 2025i). Europe is also making technological strides:

- **CO_2 Shipping**: The continent's first domestic CO_2 carrier was launched in May 2025 to serve Denmark's Greensand project (Ineos, 2025).
- **CCS in Power Generation**: The UK reached the world's first financial close for a CCS-equipped gas power plant (Dec 2024).

State aid schemes supporting CCS developed by EU Member States

EU Member State	Legal framework	Type of projects	Aid instrument	Amount	Scheme duration	Commission decision
The Netherlands	Energy and Environmental Aid Guidelines (EEAGs)	Renewable electricity, gas and heat, use of industrial waste heat and heat pumps, electrification, waste incineration, CCS, and hydrogen	Direct grant	€30 billion	Until 31 December 2025	Dec-20
Denmark	CEEAGs	CCS	Direct grant	€1.1 billion	January-April 2023	Jan-23
Denmark	CEEAGs	BECCS	Direct grant	€350 million	Until 31 December 2024	Dec-23
Sweden	CEEAGs	BECCS	Direct grant	€3 billion	July 2024-December 2028	Jul-24
Greece	CEEAGs	Onshore and offshore infrastructure part of the Prinos project	Direct grant	€150 million	From October 2024	Oct-24
France	CEEAGs	Electrification, CCS, CCU and energy efficiency	CCfD	€3 billion	15-year contract	Dec-24
Germany	CEEAGs	Electrification, CCS, CCU, energy efficiency and hydrogen	Other, direct grant	€5 billion	Until 31 December 2026	Mar-25

Encouragingly, private capital is entering the space. Eni's partnership with Global Infrastructure Partners in May 2025, involving assets in the UK, Netherlands and Italy, reflects growing investor confidence.

UK CCS projects secure landmark private financing

Two of the UK's flagship CCS projects, Net Zero Teesside (NZT) and the Northern Endurance Partnership (NEP), reached financial close following a combined £8 billion in debt financing. These are the largest project financings in the UK in several decades, as well as being the first project financing of a full-chain CCS project. The deals, backed by bp, Equinor, and TotalEnergies, will support carbon transport, storage, and power generation infrastructure in Teesside and the Humber region.

NEP's package will fund a CO_2 pipeline network linking carbon-intensive industries to the Endurance storage site in the Southern North Sea. NZT has secured funding for a 742 MW gas power plant with carbon capture. Both projects share lenders and risk structures, reflecting their integrated nature.

These transactions mark a major milestone in mobilising private capital for UK CCS deployment and complement the government's funding pledge. Additional projects in HyNet, Viking, and Acorn clusters are also progressing toward financial close with institutional backing.



Kalundborg Hub, Denmark, image courtesy of SLB Capturi.

Case study: NZIA Injection Capacity Obligation

The NZIA, adopted in June 2024, represents a strategic signal from the EU in support of CCS (EU Official Journal, 2024). It mandates oil and gas producers to develop at least 50 Mtpa of CO_2 injection capacity within the EU by 2030. In May 2025, the European Commission adopted a Delegated Regulation and an accompanying Decision identifying 44 obligated entities and determining the scale of their respective contributions (EU Official Journal, 2025).

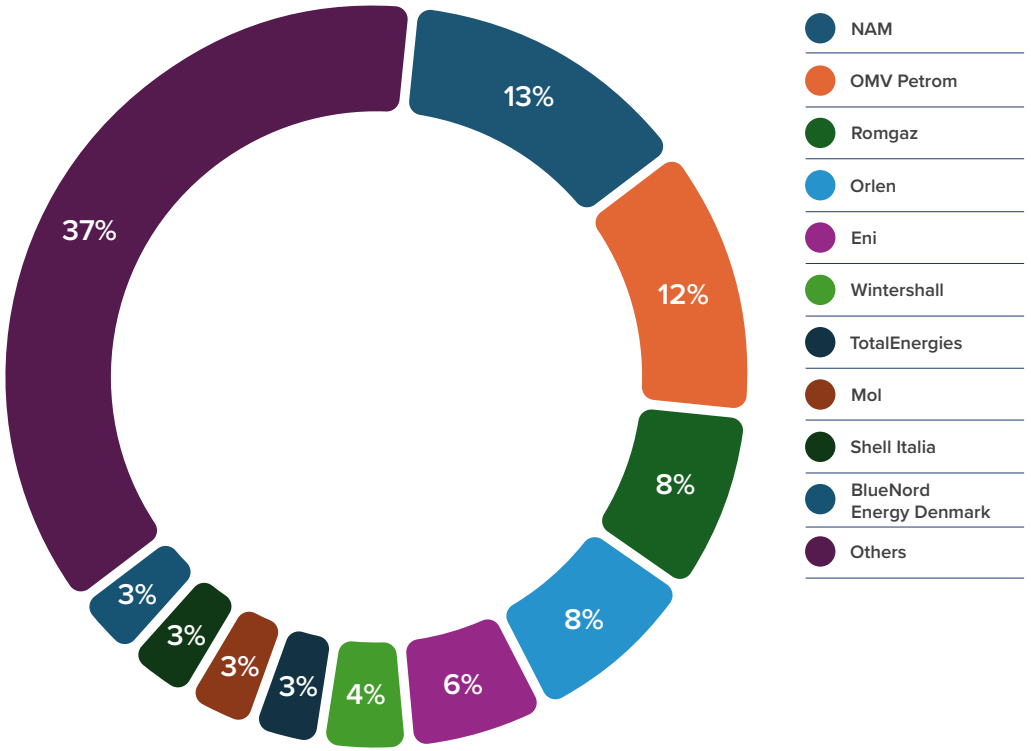
The 44 entities, whose contributions have been calculated pro-rata based on their share of EU oil and natural gas production from 2020 to 2023, are located in 11 EU Member States – the Netherlands, Romania, Italy, Germany, Poland, Denmark, Hungary, Ireland, Croatia, Austria and France.

While this could help address the current geographical imbalance in CO_2 storage development – most of which is still concentrated around the North Sea – the NZIA does not require companies to fulfil their obligations in the country of registration of their hydrocarbon licence. Instead, compliance is permitted anywhere within the EU, offering several possibilities:

- Direct investment in CO_2 storage projects.
- Agreements with other obligated entities to share or transfer responsibilities.
- Partnerships with third-party project developers or investors.

This flexibility benefits countries lacking viable geological storage, but could also intensify competition for the most attractive storage sites. Penalties for non-compliance will be set by EU Member States by mid-2026 and are expected to be a key topic of EU-level debate in 2026.

Obligated entities' CO_2 injection capacity by 2030





Middle East and Africa

Ambition in motion as focus shifts from strategy to implementation

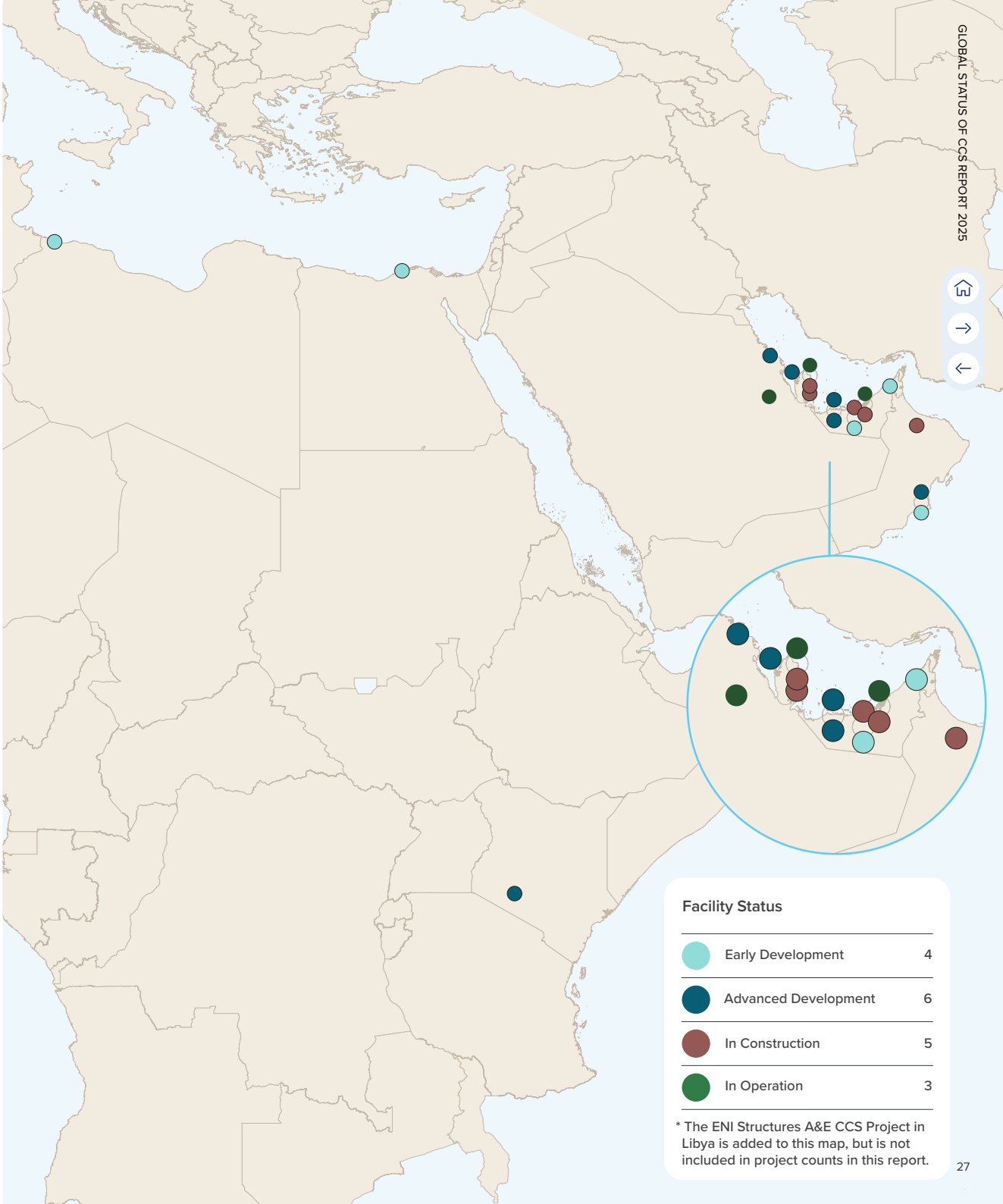
The Middle East and Africa (MEA) region has made significant progress over the past year in translating CCS strategies into tangible projects, investments and policy frameworks. This shift reflects growing momentum towards decarbonisation and climate resilience, backed by national commitments, cross-border partnerships, and technological innovation.

Focus – The region is prioritising CCS hub development and integrated value chains for domestic decarbonisation and low-carbon exports. Saudi Arabia, Oman, Qatar, UAE, Kuwait, Nigeria, and South Africa are embedding CCS into national strategies, enabling early deployment and exploring cross-border cooperation and international market access.

Drivers – Key drivers include net zero targets, industrial decarbonisation mandates, and competitiveness under global carbon rules. Public policy shifts, growing private sector engagement, and partnerships with international players – across the US, Europe, and Asia – are accelerating investment and innovation.

Progress – The first regional CCUS hub is emerging in Saudi Arabia; DAC and modular capture pilots are underway in Saudi Arabia, UAE, and Kenya; and legal frameworks are being established in the UAE and Oman. Kuwait, Nigeria, and South Africa are progressing on storage assessments, pilot projects, and core policy tools to support scale-up.

Challenges – CCS faces key challenges in MEA, including the absence of regulatory frameworks for transport and storage, high upfront costs and limited access to finance. Most technologies remain at the demonstration stage, and underdeveloped carbon markets further limit commercial viability.





CycloneCC Industrial Demonstration Unit, UAE, image courtesy Carbon Clean.

One of the most notable developments in the MEA region is the emergence of its first CCUS hubs, with supporting infrastructure currently under planning in Saudi Arabia and Oman. On Saudi Arabia's eastern coast, the Jubail CCS hub is advancing, and is expected to capture up to 9 Mtpa of CO_2 by 2028 in collaboration with Aramco, SLB and Linde (SLB, 2024). On the western coast, a CCU hub is being developed in Yanbu Industrial City. In its initial phase, the Yanbu CCU hub aims to capture and utilise 2 Mtpa of CO_2 to produce green methanol, low-carbon urea, and other products (Arab News, 2024).

Oman is also making significant strides, with OQGN actively planning a national CO_2 transportation network to connect emission sources with storage and utilisation sites, aligned with the country's Net Zero 2050 strategy. Key initiatives include the development of underground CO_2 storage projects in collaboration with Shell, a CO_2 pipeline for enhanced oil recovery (EOR) in partnership with Oxy Oman, and the Blue Horizons low-carbon ammonia project, currently in its pre-FEED stage, with Shell, OQ, and PDO as partners (Zawya, 2025b).

Additionally, Oman LNG has unveiled a national decarbonisation strategy featuring two CCUS project pathways: a partial CO_2 export option that would deliver captured CO_2 from the Acid Gas Removal Unit to industries in Sur Industrial City, and a full CO_2 export option involving geological storage in upstream wells. The strategy also includes a study to establish a hydrogen hub in Sur that would explore CO_2 capture and utilisation to produce green ammonia, synthetic natural gas, and e-methanol (Oman Observer, 2024).

QatarEnergy has already deployed 2.2 Mtpa of CCS capacity, with plans to scale to 7-9 Mtpa by 2030 and over 11 Mtpa by 2035. CCS is integrated into the country's LNG operations capturing CO_2 from acid gas enrichment and compressing it for injection in the Ras Laffan Industrial City. Since inception, over 7.5 million tonnes of CO_2 have been captured and stored. A CO_2 export project is nearing completion and will deliver captured CO_2 from LNG facilities to Dukhan for EOR.

A new FEED project involving 10 LNG trains aims to capture over 4 Mtpa of CO_2, with six wells to be drilled for reinjection. QatarEnergy is also pursuing future CCS initiatives that include:

- Integrating CCS with existing LNG trains.
- Capturing CO_2 for blue ammonia production.
- Capturing CO_2 from new gas processing facilities.
- Capturing post-combustion emissions from gas-fired turbines and power plants.
- Building CO_2 transport pipeline infrastructure to support large-scale deployment across the value chain (Qatar Energy, 2023).

One of the most notable developments in the MEA region is the emerges of its first CCUS hubs, with supporting infrastructure currently under planning in Saudi Arabia and Oman.

In the UAE, ADNOC has completed its first CO_2 injection and received DNV certification for its geological storage site, both major milestones toward CCS deployment (DNV, 2024). Kuwait has demonstrated early success with its CO_2-EOR pilot project, jointly executed by Shell and Kuwait Oil Company (The Business, 2025). Nigeria finalised its National CO_2 Storage Atlas in partnership with the World Bank and the International Finance Corporation (IFC), providing a detailed assessment of geological storage potential and facilitating informed investment and regulation (IFC, 2025). South Africa, supported by international donors and the IEA, is progressing with its national CO_2 storage assessments, positioning itself for early-stage deployment (World Bank, 2024).

Policy

Governments across the MEA region are beginning to institutionalise CCUS within national policies. The UAE's Federal Decree Law No. (11) of 2024 marks a significant milestone by formally recognising CCUS as a core mitigation strategy to achieve national climate neutrality. The law mandates emissions reporting and introduces enforcement mechanisms, including fines of up to AED 2 million for non-compliance. It also lays the foundation for a national carbon credit registry and empowers the Ministry of Climate Change and Environment to issue detailed regulations on CCUS standards and implementation.

Taking effect in May 2025, the law effectively transforms CCUS from an optional pathway into a regulated obligation for industrial emitters (UAE Government, 2024). Similarly, Abu Dhabi has established an MRV framework, which allows for standardised emissions accounting and integration of CCUS in its climate reporting, including its third Nationally Determined Contribution (Abu Dhabi Environment Agency, 2024).

In December 2024, Oman launched the Oman Net Zero Centre under the Ministry of Energy and Minerals as the national body overseeing decarbonisation efforts. The Centre is responsible for defining and regularly updating the 2050 net zero strategy, coordinating project implementation, including energy efficiency and CCS, and providing technical guidance to public and private stakeholders. It operates under a steering committee chaired by the Minister and includes key government entities. The Centre also manages low-carbon product certifications, supports carbon trading mechanisms, builds institutional capacity, and promotes investment to localise sustainable technologies (Foreign Ministry of Oman, 2024).

These developments are crucial for ensuring accountability, attracting investment, and enabling emissions crediting. They also provide the foundation for evolving into mandatory frameworks as CCS deployment scales.



These developments are crucial for ensuring accountablity, attracting investment, and enabling emissions crediting.

Key drivers and enablers of CCS in MEA

MEA Drivers

- Net-zero commitments or NDC targets requiring deep industrial decarbonisation
- Exposure to trade risks under international carbon pricing (e.g. EU CBAM)
- Ensuring market access for carbon-exposed exports (e.g. ammonia, steel, fertilisers)
- Developing low-carbon export vectors (e.g. ammonia, SAF, derivatives)
- Limited mitigation alternatives for hard-to-abate sectors (e.g. cement, refining, petrochemicals, steel)
- Unlocking value from CO_2 storage capacity (regional CO_2 hub, cross-border storage services)
- Positioning for global clean energy value chains (hydrogen, SAF, green shipping fuels)
- Building domestic low-carbon industrial ecosystems (foreign direct investment, technology transfer, workforce localisation)
- Scaling domestic low-carbon tech manufacturing (innovation, localisation)

Country	Enablers
Saudi Arabia	• CCE framework • 44 Mtpa CCS target by 2035 • Aramco CCS target of 14 Mtpa by 2035 • Strong Aramco & MoE support for CCUS hubs (Jubail, Yanbu) • R&D and pilots: DAC, CO_2 mineralisation • CCS in national power decarbonisation (CCS-ready gas plants) • Regional voluntary carbon market launched • Co-lead: CEM CCUS, MI CDR Mission and CMC
UAE	• 10 Mtpa ADNOC CCS target by 2030 • 43.5 Mtpa National CCS target • CCS codified in Federal Climate Law No. 11 as mitigation technology • Mandated national carbon registry • EAD-led MRV programme • DNV-certified CO_2 storage site • CCS legally creditable (Law No. 67, Art. 10) • Planned Cap-and-trade system, Carbon Contracts for Difference (CCfDs) and CO_2 transport & storage regulations
Qatar	• QatarEnergy CCS target of 11 Mtpa by 2035 • QatarEnergy CCS roadmap • CCS required by Qatar Environment and Energy Commission Qatar • Financial Centre's tokenised carbon market ecosystem Low-carbon • Hydrogen development
Oman	• Planned CCS legal and regulatory framework • Oman Net Zero Centre • CO_2 transport infrastructure planning • Low-carbon hydrogen development
Egypt	• Development of CO_2 storage hubs • Cross-border CO_2 storage • Proximity to Europe and the Eastern Mediterranean • Access to Suez Canal infrastructure and port facilities • Development of storage-linked carbon credit systems
Nigeria	• Climate Change Act (2021) and Petroleum Industry Act (2021) provide legal CCS foundation • Nigeria Energy Transition Plan (ETP) includes CCS as a key mitigation tool • IFC-supported CO_2 Storage Atlas and diagnostic assessments (2023–2025) • Identification of 15 potential CCS projects; pilot designs (20 ktpa) under consideration • Institutional partnerships with UNDP, SEforALL for MRV and capacity building • Due diligence protocols under development to align with ICVCM/VCMI integrity standards
Kenya	• National CCS assessment for Kenya Rift underway (basalt storage potential) • DAC pilot projects targeting mineral storage • Climate Change (Carbon Markets) Regulations (2024) codify industrial emissions reductions, enabling CCS as non-land carbon project • Private sector mobilisation through KEPSA–WBG carbon market guidance for enterprises • World Bank and IFC building local carbon market infrastructure to mobilise private climate capital
South Africa	• Climate Change Act (2024) sets carbon budgets and mitigation plans that allow CCS integration • Council for Geoscience (CGS) leading site mapping and storage readiness in Mpumalanga • World Bank-funded pilot storage project launching 2025 with regulatory support • SACCCS under SANEDI driving national CCS capacity and coordination • Article 6 carbon credits permitted against carbon tax liabilities

Read More | See full list of References

Cross-border

Cross-border collaborations are increasingly viewed as necessary for enabling economies of scale and reducing costs. Saudi Arabia has initiated discussions with Greece to export captured CO_2, while Egypt is exploring similar arrangements with Greece and Cyprus (Greek City Times, 2025), (Egypt Government, 2025). These bilateral initiatives are focused on shared infrastructure, shipping logistics, and storage potential.

Oman's MoU with Gasunie outlines a potential CO_2 and hydrogen corridor connecting the Gulf Cooperation Council (GCC) to European demand centres (Oman Sustainability Week, 2025). Delivering such a corridor will require investment in CO_2 liquefaction, maritime transport, MRV systems, and regulatory alignment with EU carbon accounting frameworks. It also necessitates domestic readiness: Oman must accelerate the development of certified storage sites, carbon registries, and cross-border policy interoperability to operationalise its export ambitions.

On the commercial side, ADNOC has taken a 35% equity stake in ExxonMobil's Texas hydrogen and CCS project, marking a strategic entry into global low-carbon energy value chains (ADNOC, 2024a). ADNOC has also signed a partnership with Malaysia's Petronas to explore offshore CO_2 storage, further solidifying its international CCS footprint (ADNOC, 2024b). Most recently, ADNOC's investment arm XRG agreed to explore a joint venture with Occidental's 1PointFive on the Stratos DAC facility in Texas, one of the world's largest, targeting 500,000 tpa of CO_2 removal (Oxy, 2025).

This signals ADNOC's expanding role in global carbon removal infrastructure and DAC deployment. In parallel, Aramco Ventures has backed Germany's largest DAC demonstration project through seed investment in Ucaneo, supporting the scale-up of European carbon removal technologies and positioning Saudi Arabia within emerging CDR markets (Aramco Ventures, 2025).

Leadership

Several countries are demonstrating leadership in the deployment of emerging technologies. Aramco and Siemens Energy have piloted Saudi Arabia's first DAC unit in Dhahran, highlighting the country's ambition to lead in carbon removal (Reuters, 2025). In the UAE, Fertiglobe deployed Carbon Clean's CycloneCC modular capture unit at TA'ZIZ, capturing 10 tonnes per day of CO_2 to decarbonise ammonia production (Zawya, 2025a).

Aramco has acquired a 50% stake in the Blue Hydrogen Industrial Gases Company (BHIG) in Jubail, in partnership with Air Products Qudra. BHIG aims to supply hydrogen – including blue hydrogen produced from natural gas with CO_2 capture and storage – in coordination with Aramco's CCS activities, supporting large-scale low-carbon hydrogen production in Jubail Industrial City (Aramco, 2025).

The Omani start-up 44.01 continues to push the frontier of carbon mineralisation, implementing peridotite-based storage, and has received additional funding to demonstrate its mineralisation technology (ADNOC, 2024c; Oman Sustainability week, 2025). These examples illustrate how MEA countries are integrating CCS with low-carbon fuels like hydrogen, ammonia, and sustainable aviation fuel (SAF), reinforcing their roles in both regional decarbonisation and global clean fuel exports.



Cross-border collaborations are increasingly viewed as necessary for enabling economies of scale and reducing costs.

Government-to-government cross-border collaboration

From	To	Focus	Category
Saudi Arabia	Greece	CO_2 export & storage	Storage
Saudi Arabia	France	CCUS in hard-to-abate sectors (cement, aviation, marine, petrochemicals)	CCUS / Industrial Decarb
Egypt	Greece	CO_2 export & shared infrastructure	Storage
Egypt	Cyprus	CO_2 export & storage	Storage
Egypt	UAE	Industrial Transition Accelerator (ITA)	CCUS Industrial Decarbonisation
Oman	Netherlands	Hydrogen & CO_2 corridor	Policy/Infrastructure
Oman	Türkiye	Carbon capture cooperation	CCS
Oman	Japan	Industrial decarbonisation, tech transfer, CCUS pilots	CCUS, Industry, Japan

Business-to-business cross-border collaboration

From	To	Country	Focus	Category
OQGN (Oman)	Gasunie (Netherlands)	Netherlands	Carbon capture technologies	Policy/Tech
ADNOC (UAE)	ExxonMobil (USA)	US	Low-carbon H_2 & CCS	Hydrogen / CCS
ADNOC (UAE)	Petronas (MY)	Malaysia	Offshore CO_2 storage	Storage
ADNOC (UAE)	Occidental (USA)	US	DAC JV – Stratos facility	Direct Air Capture
Aramco Ventures (KSA)	Ucaneo (Germany)	Germany	DAC technology scale-up	Direct Air Capture
Oman LNG (Oman)	Kanadevia (Japan)	Japan	Methanation pilot with CCU & green H_2	Power to X / CCU

Read More | See full list of References

Opportunities

The MEA region possesses several unique opportunities to lead in global CCS deployment. Vast and underutilised geological storage potential exists in countries like Saudi Arabia, the UAE, Nigeria, Mozambique, Egypt, and South Africa, providing a critical asset base for regional hubs. As the global demand for low-carbon products and carbon credits grows, MEA countries can leverage CCS to ensure market access and export competitiveness, particularly in sectors facing border adjustment mechanisms such as the EU CBAM.

Technologically, the region is well-positioned to become a first mover in areas such as DAC, mineralisation, and modular capture systems. Kenya's Octavia Carbon, for example, is advancing DAC pilots that integrate geothermal energy, presenting a blueprint for clean energy coupling in African contexts (Empower Africa, 2024).

Similarly, Saudi Arabia's NEOM project is exploring mineralised concrete using technologies like CarbonCure, demonstrating new CCS applications in the built environment (Gas World, 2024).

Private sector involvement is also expanding, with national oil companies, industrial players, and start-ups showing growing interest in CCS as a climate and business solution.

Furthermore, cross-border interest from Europe and Asia – including countries seeking to import CO_2 or invest in low-carbon hydrogen – presents new partnership models for MEA exporters. These trends position the region to become not just a deployment zone, but also a global CCS hub.

Challenges

Despite this momentum, several challenges remain. A key barrier is the lack of fully developed legal and regulatory frameworks for CO_2 storage, transport, and liability. While progress is being made, particularly in the UAE and Oman, many jurisdictions still lack clarity on permitting, access rights, and long-term stewardship.

High upfront capital expenditure remains a constraint, especially for CO_2 pipelines and storage infrastructure. With limited public finance and carbon pricing signals, projects often struggle to achieve bankability. Scaling CCS from pilot to commercial scale will require de-risking investments through public-private partnerships, concessional finance, and clearer revenue models.

Moreover, most CCS technologies in the region remain at the demonstration stage. Broader commercial deployment will require extensive subsurface validation, robust MRV systems, and transparent standards for carbon crediting. Voluntary carbon markets remain emerging, and without strong governance and trust, credit pricing may not justify the cost of capture.

Institutionally, a clear definition of roles, streamlined approvals, and regional autonomy in implementation are critical to prevent bureaucratic slowdowns.

However, with a foundation of policy support, expanding infrastructure, and an appetite for innovation, CCS is becoming embedded in the MEA region's energy and climate future. The transition from strategy to execution has gained momentum, and while challenges remain – including high capital requirements, policy fragmentation, and infrastructure limitations – the region is well-positioned to scale deployment. Strategic autonomy, international cooperation, and technology leadership will be vital to sustaining this progress and securing MEA's position as a global CCS leader.

Oman Net Zero Centre

The Oman Net Zero Centre (ONZC) is mandated to prepare and update the national plan for transition to net zero in coordination with relevant entities. Guided by His Majesty Sultan Haitham bin Tarik's commitment to achieving net-zero carbon emissions by 2050, the Centre monitors projects, supports stakeholders, and adopts global best practices and technologies.

CCS is recognised as a critical pillar of Oman's decarbonisation pathway, particularly for hard-to-abate sectors such as oil and gas, refineries, cement, and heavy industry. The Centre advances CCS by facilitating research, enabling regulatory frameworks, and promoting investment in large-scale projects, leveraging Oman's significant geological storage potential.

ONZC is responsible for refreshing Oman's 2050 Net Zero Strategy through a phased approach covering baseline assessments, sectoral roadmaps, and enabling policies and finance. CCS is embedded within these pathways, with milestones and capacity targets integrated into national planning, while the Centre coordinates both pilot and commercial-scale projects and ensures they are supported by appropriate regulatory, monitoring, and financing mechanisms.

The Centre coordinates decarbonisation efforts across sectors through the Oman Net Zero Platform (Meezan), which provides emissions monitoring, forecasting, and reporting. This ensures CCS deployment progresses in parallel with other mitigation measures such as hydrogen and renewables.

ONZC also leads carbon market development, managing certificates, a national registry, and frameworks for trading. By prioritising cost-effective CCS projects and engaging global investors, the Centre attracts finance, fosters technology localisation, and builds domestic expertise, positioning Oman as a regional leader in low-carbon industrial development.

Saudi Arabia's Jubail CCS Hub

The Jubail CCS Hub stands as one of the most ambitious carbon sequestration projects in the region and globally, aiming to capture and store up to 9 Mtpa by 2028. The initiative is led by Aramco (60% equity), with SLB and Linde as strategic partners (20% each). The shareholder agreement was signed in late 2024, following an initial MoU in 2022 – marking a significant step in the Kingdom's carbon management agenda.

The project aggregates CO_2 from multiple sources: Approximately 6 Mtpa from Aramco's gas processing operations and 3 Mtpa from nearby industrial emitters with transport to onshore saline formations for permanent geological storage. The hub will include dehydration, compression, pipeline infrastructure, and a robust measurement, reporting, and verification (MRV) system aligned with global standards. FEED and site development and early works have been completed and other major EPC packages are being awarded.

Beyond its scale, the project demonstrates a replicable model for shared CCS infrastructure in the region, enabling cross-sector coordination, long-term liability frameworks, and regional leadership in carbon management deployment.

Regional Spotlight

APAC and India

Critical role of CCS creating both opportunities and challenges

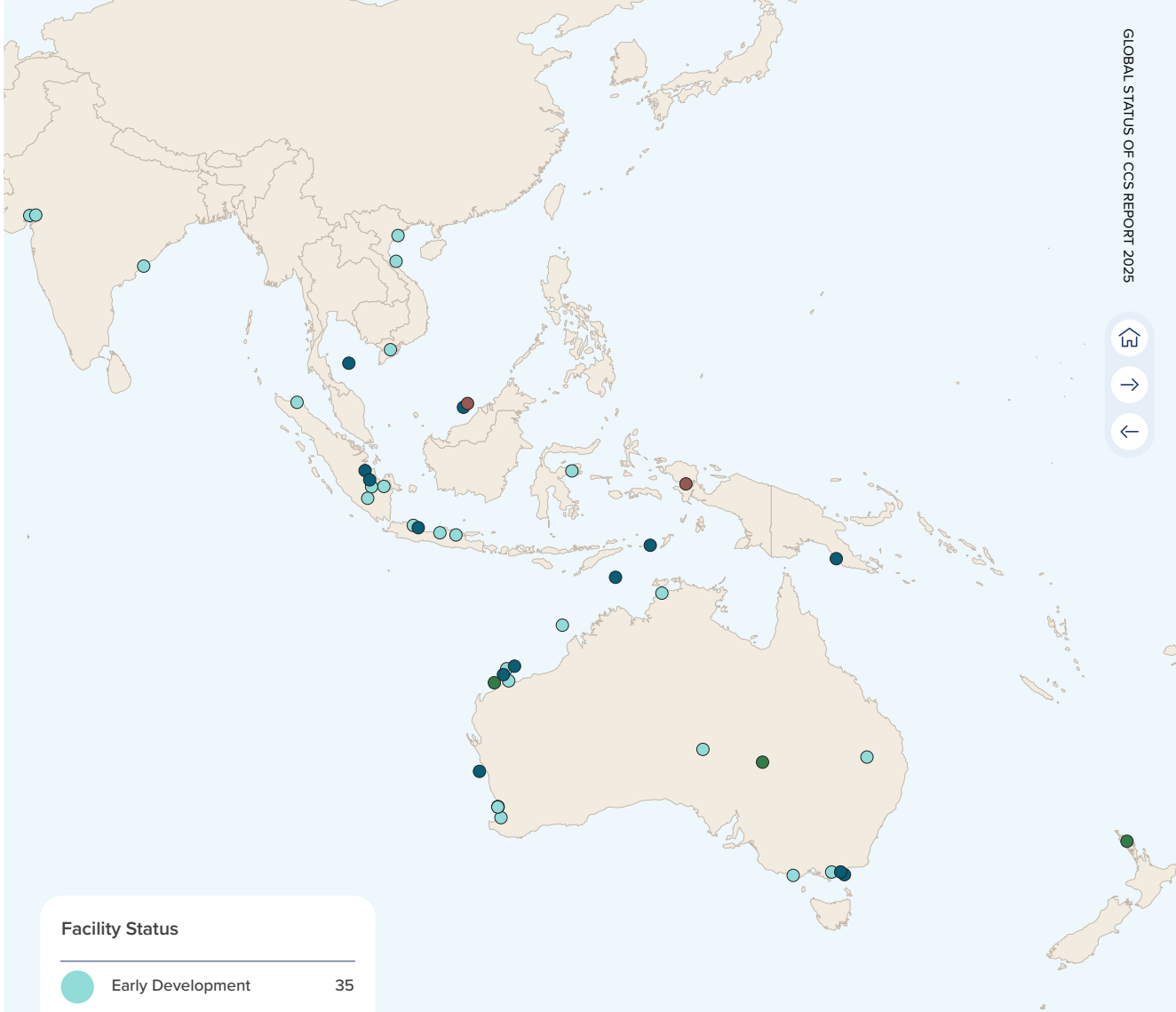
Rapid economic growth in the emerging economies of the Asia Pacific region is driving demand for energy to power industry and cities. Collaboration across the private and public sectors is ramping up to find ways to make CCS more investable. Governments are developing regulations, supporting studies and discussing cross-border CO_2 transport for permanent storage. Companies are forming joint ventures, developing projects and turning the key on the region's first commercial CCS facilities. But progress is uneven and the business case for CCS remains challenged, putting net zero commitments at risk.

Progress – 2024/2025 was a significant year for CCS in the APAC region, with the region's third CCS facility commencing operation, two more in construction and significant positive regulatory developments in Australia, Indonesia and Malaysia.

Collaboration – Cross-border transport and storage of CO_2 will be key to the successful deployment of CCS, necessary to achieve net zero commitments. Governments have begun negotiating agreements to allow this trade, and companies are forming joint ventures and executing MoUs with the intent of participating in this value chain.

Challenge – The first tranche of lowest-cost CCS facilities associated with gas production is being developed; however, policy support is not yet sufficient to drive investment in the next tranche of higher-cost applications.

Momentum – Despite the challenges, new CCS projects, studies and related initiatives continue to be announced as governments and companies improve their understanding of the economic and environmental opportunities of carbon capture and storage.



Facility Status

Early Development	35
Advanced Development	14
In Construction	2
In Operation	3

* PTTEP reached FID for the Arthit CCS project after the cut-off date for this report. Arthit is In Construction as of October, however facility statistics in this report record Arthit as Advanced Development as of July.

Efforts to create cross-border CCS value chains in the Asia Pacific region have continued over the past 12 months. Governments and industries from countries with limited storage capacity – Japan, South Korea, Singapore – are progressing with feasibility studies and cooperation agreements with neighbouring countries. Potential regional storage providers – Indonesia, Malaysia, Thailand and Australia – continue to position themselves as storage hubs, with regulatory frameworks, licensing regimes, and commercial models in place or beginning to take shape. As legal, logistic, and financial frameworks evolve, the region is rapidly laying the foundations for cross-border CO_2 transport and storage.

The first movers in the region are oil and gas companies, and a geothermal power company. In Australia, Chevron's Gorgon and Santos' Moomba CCS facilities collectively store 3.3 Mtpa of CO_2. The Ngawha Geothermal Power Station is reinjecting up to 120 ktpa of CO_2 in New Zealand. Petronas, bp and PTTEP have CCS facilities in construction; Kasawari in Malaysia, Tangguh in Indonesia, and Arthit in Thailand, respectively. There are an additional 54[1] facilities in earlier stages of development across the Asia Pacific[2] excluding Japanese domestic facilities and China, which are covered in other sections of this report. Momentum continues to grow with increasing recognition of the necessity of CCS to achieve net zero emission targets as demonstrated through CCS' inclusion in national policies, plans and regulations. However, the most difficult challenge yet to be overcome is making more CCS projects investable.

Challenges

Perhaps the most pressing issue facing CCS in the region is that policy incentives are currently insufficient to create a business case for investment. The specific circumstances that enabled investment in the facilities that are operating or in construction are not broadly applicable. Without stronger policy, few additional positive financial investment decisions in the region are likely, putting net zero commitments out of reach.

Whilst there has been rapid development of CCS regulation in Indonesia and Malaysia, which is a prerequisite for investment, beyond Australia, CCS regulation is incomplete or absent and the geological storage of CO_2 outside of oil or gas tenements is generally not able to be authorised.

Relatively few South-East Asian government officials understand CCS, which could slow policy and regulatory development. Community and environmental groups that do not understand the stringent regulatory requirements that will apply to transboundary CO_2 transport and geological storage are concerned that the import of CO_2 is a form of waste dumping, similar to the dumping of other foreign wastes, which has been problematic in the past. There is an urgent need to engage these stakeholders and provide information that addresses their concerns.

Finally, bilateral agreements between CO_2 exporting and importing nations, essential to enable cross-border transport and storage of CO_2, have not yet been negotiated.

Sustainability

CCS is essential to achieve global net zero emissions and has a more prominent role in rapidly growing economies such as those of South-East Asia and India. Approximately two-thirds of the CO_2 required to be captured and stored to 2050 is in emerging and developing economies (IEA, 2023). These nations are characterised by strong energy demand growth and growing consumption of fossil energy.

CCS reduces the cost of achieving net zero commitments by several trillion dollars[3] across Asia Pacific countries whilst maintaining energy security and continued economic growth.

It enables a just transition for communities that rely on heavy industry by mitigating their emissions and facilitates the creation of new low-emission industries such as carbon transport and storage services, low-carbon hydrogen, ammonia and fertiliser production.

Once established, CCS hubs are expected to attract further investment in the decades ahead from industries such as cement, steel, and power generation that require CO_2 management services. These economic, social and sustainability benefits are why the governments of Malaysia, Indonesia and Thailand are supporting CCS developments.

Policy

The Indonesian and Malaysian governments are promulgating legislation to enable the storage of domestic and imported CO_2. Similarly, the Australian Government has taken several steps since 2023 to establish cross-border transport and storage of CO_2, including the declaration of provisional application of the 2009 amendment to the London Protocol on 7 November 2024 (GCCSI, 2024).

The Indonesian Ministry of Energy and Mineral Resources issued Regulation No. 16 of 2024 on the Organization of Carbon Storage in Carbon Storage Permit Areas (Wilayah Izin Penyimpanan Karbon or WIPK) on 24 December 2024. The regulation provides for the authorisation of geological storage resource exploration, and CO_2 storage and transport, independent of hydrocarbon exploration/production activities (Draps & Ibnuaji, 2025).

On 25 March 2025, the upper house of the Malaysian Parliament passed the Carbon Capture Utilisation and Storage (CCUS) Act, which establishes a framework for comprehensive regulation of all stages of the CCS life cycle as well as the transport and importation of CO_2 (Choong & Thani, 2025). This Act does not apply to the states of Sabah or Sarawak. Sabah has not promulgated CCS regulations whilst Sarawak has regulations in place. Regulations under the CCUS Act are being prepared by the Malaysian Government.

In September 2024, India's Bureau of Energy Efficiency included Carbon Capture Use and Storage within the scope of India's Carbon Credit Trading Scheme (CCTS) (Bureau of Energy Efficiency, 2024). Once a methodology has been published, abatement delivered by CCUS in India will be recognised by the CCTS. This follows an announcement by the Indian Government in August 2024 of its intent to develop a CCUS Mission to drive research, development and commercial deployment of CCUS. The mission is expected to include a range of supportive policies to enable the application of CCS across key sectors, including steel, cement, oil and gas, petrochemicals and fertilisers (Climate Change Newse, 2024).

In May 2025, New Zealand released a new policy framework, the Enabling CCUS package, introducing regulatory guidance and incentives for investment in carbon capture technology and aiming to include CCS in the domestic emissions trading scheme (George, 2025).

International collaboration to create cross-border CCS value chains in South-East Asia continued in 2025 with discussions between the governments of Australia, Indonesia, Japan, Malaysia, Singapore and South Korea. Petronas has signed memoranda of understanding with nine countries – among them Japan and South Korea – to store their excess CO_2 emissions in depleted fossil fuel sites off the coast of peninsular Malaysia and Sarawak (Budgen, 2025).

In Australia, Royal Vopak signed an MOU with the Northern Territory Government in August to construct a CO_2 import terminal at the Port of Darwin, with the aim of beginning operations in 2030 (ABC News, n.d.). In January, Indonesia's Coordinating Ministry for Economic Affairs and ExxonMobil signed an MoU to advance the petrochemical sector and develop CCS technology with an estimated investment of US$10 billion.

[1] Excludes projects that have been announced but for which feasibility studies have not yet commenced.

[2] Includes India.

[3] GCCSI Analysis using the Global Economic Net Zero Optimisation Model (GENZO): Present Value to 2065.



Gorgon CO_2 injection and monitoring wells, Western Australia, courtesy of Chevron.

Finance

CCS facilities are capital-intensive, typically costing hundreds of millions to over a billion dollars, depending on their scale, and therefore must make a positive return for the investor. There are six CCS facilities that have reached a positive financial investment decision in Australia and South-East Asia and all are associated with gas re-injection. Gorgon, Moomba and Ngawha Geothermal are operating. Kasawari, Tangguh and Arthit are in construction. Both Gorgon and Kasawari, primarily LNG projects, were required to use CCS to capture and store reservoir CO_2 as a condition of their project approvals. After the additional capex and opex arising from the requirement to use CCS to reduce CO_2 emissions were considered, investment in these LNG projects and their associated CCS infrastructure was able to proceed.

Investment in Tangguh and Moomba was enabled by additional value drivers. At Tangguh, injected CO_2 will produce additional gas for sale through enhanced gas recovery. At Moomba, the capture and storage of CO_2 creates Australian Carbon Credit Units, which may be sold or used to offset Santos' emissions at other facilities, subject to monitoring and verification of CO_2 storage. In both cases, these additional value drivers provided a sufficient return to enable investment in the CCS facility.

Storage project developers in the region are planning to generate revenue by providing CO_2 storage services for a fee. The most advanced projects, such as Kasawari and Moomba, will initially store their own CO_2 but intend to utilise excess capacity to store third-party CO_2.

* PTTEP reached FID for the Arthit CCS project after the cut-off date for this report. Arthit is In Construction as of October, however facility statistics in this report record Arthit as Advanced Development as of July.

Technology

The transport of CO_2 by ship from capture hubs to storage operators is critical to the optimum deployment of CCS in the Asia Pacific region. Larger ships better suited to longer shipping distances, with capacities of up to 80,000 cubic meters, are being designed by various shipbuilders for the Asia Pacific Market.

In June 2025, Mitsui OSK Lines (MOL) and Mitsubishi Shipbuilding received approval from the ship classification society ClassNK to develop the world's first liquefied CO_2 and methanol combination carrier. The vessel will transport captured CO_2 to a synthetic methanol production plant on its outward journey and then carry synthetic methanol on the return voyage (Savvides, 2025). This dual-cargo approach eliminates empty return trips, significantly increasing transport efficiency compared to using dedicated vessels for a single cargo type.

Moomba CCS Project

Santos' and Beach Energy's Moomba CCS project in Australia's Cooper basin commenced capturing and storing 1.7 Mtpa CO_2 from the Moomba Gas Plant in October 2024. With a total cost of less than US$30/tonne, Moomba stands out as a low-cost project and a clear example of how CCS can be delivered within a commercial model when supported by strong policy frameworks (Moomba CCS, n.d.).

Carbon dioxide is separated from methane using conventional Benfield Acid Gas Removal units. This CO_2 would normally be vented to atmosphere, but at Moomba it is captured. Water is removed from the CO_2 stream before it is compressed to approximately 14 Mpa (approximately 140 times atmospheric pressure) in a four-stage compressor. Waste heat from the compressor is used to generate steam that powers a turbine generating electricity that is used at Moomba. The compressed CO_2 is transported by a 50 km pipeline to the injection wells where it is injected into the Strzelecki-Marabooka depleted gas reservoir for permanent geological storage, 1.8 km below the surface.

Santos has a 66.7% interest in the Moomba CCS project with the remaining equity being held by Beach Energy. The total project capital cost was approximately US$250 million. Moomba CCS is registered with the Australian Clean Energy Regulator (CER) and is applying the CER's CCS Methodology to generate Australian Carbon Credit Units (ACCUs), which it can do for up to 25 years. As of July 2025, ACCUs were trading at AU$35 (Carbon and Environmental Price Updates, n.d.).

Moomba CCS is critical to Santos' and Beach Energy's plans to reduce emissions and meet their obligations under Australia's Safeguard Mechanism. This requires companies that emit more than 100,000 tCO_2e per year to reduce their emissions below their baseline by 4.9% per year, each year, between 2023 and 2030.

Emission reduction rates for 2030-2035 had not been announced by the Australian Government at the time of writing. These factors combined to create a business case for the project, demonstrating how government policy and regulation can deliver material emissions abatement through private sector investment in CCS.

700,000

That's the emissions reduction equivalent of taking 700,000 petrol cars off the road a year[1].

28%

Equivalent to around 28% of total emissions reduction across Australia's electricity sector in 2023.

1.7 Mtpa

Moomba CCS phase 1 has the capacity to store 1.7 Mtpa of CO_2.

Moomba CCS Project, Australia. Image Courtesy of Santos.

[1] Based on a blended emissions factor considering both light and heavy passenger vehicles, calculated per statistics for distance travelled each year (ABS - Survey Motor Vehicle Use Australia 2020).

China

Entering new phase led by world's largest coal power CCS project

China's CCS efforts are entering a transformative phase, characterised by large-scale demonstration projects and the adoption across sectors. While the country is still in the early stages of developing its national policy and regulatory framework, this new phase is being boosted by positive policy signals and tailored tools. China is on track to scale up CCS deployment around 2030, with the extent of success contingent upon continued advancements in technology, the success of demonstration projects, policy and regulatory developments, and the evolving landscape of global climate governance.

Milestone – Huaneng's 1.5 Mtpa project established China as a leader in the application of CCS to coal-fired power generation. The operation of this facility marks a breakthrough not just for China, but for the global CCS community. As the world's largest CCS project attached to a coal-fired power plant, it sends a signal: large-scale decarbonisation of fossil infrastructure is technically and operationally achievable.

Foundation – Positive policy signals are propelling China's CCS demonstrations into the new phase. Policy support for CCS in China has steadily strengthened since 2024, with clearer signals from the Central Government that incorporate CCS into sectoral transition plans, particularly within coal-fired power generation. Some policy programs specifically prioritise demonstrations that encompass the entire value chain. This clarity is empowering a new generation of more integrated projects capable of capturing higher volumes of CO_2.

Progress – Advancement remains strong across technology innovation, manufacturing capacity, and on-the-ground demonstrations as China's CCS ecosystem continues to mature. Chinese technology innovators and equipment providers are making progress in improving capture efficiency, reducing costs, and tailoring solutions to a broader range of industrial processes and contributing to global CCS projects.

Momentum – With the planning process for the country's 15th Five-Year Plan (2026–2030) underway, CCS will be shaped by whether and how it is embedded in national and sectoral development plans for the next five years. If formally included, CCS could benefit from clearer long-term policy certainty.



* The absence of plots on the Regional Spotlight - China map is intentional. The general location of facilities can be seen on page 6.

China continues to make steady progress in advancing large-scale CCS demonstrations[1] in 2025. A major global milestone was reached with the operation of Huaneng's 1.5 Mtpa CCS project — the largest of its kind at a coal-fired power plant anywhere in the world. This project, along with several other key project advancements, underscore China's growing technological and engineering capacity in the sector. Policy signals have remained supportive, guiding the rollout of CCS demonstrations across both heavy industry and the power sector.

Projects

China's coal-fired power generation sector continues to lead the country's CCS efforts. In addition to the Huaneng project, China National Petroleum Corporation (CNPC) broke ground in April 2025 on a 1 Mtpa coal power CCS project in Xinjiang, which aims to scale up to 2 Mtpa in the future. In November 2024, China National Energy Investment (CNEI) Jinjie Company registered a 4 Mtpa coal power CCS project with the Yulin city government in Shaanxi. Although in the early stages of development, this project underscores CNEI's ambition in taking a leading role in deploying CCS for coal power decarbonisation.

In hard-to-abate industries such as the chemicals sector, CNEI Ningxia Company began operating a 500 ktpa CCS facility at one of its coal-to-liquids plants in Yinchuan city in September 2024. This project is part of a broader strategy to scale up to 3 Mtpa by 2030. As one of China's largest CCS initiatives in the coal-to-chemicals industry, it may demonstrate a viable low-carbon pathway for a sector that is both massive and still rapidly growing.

In the cement sector, Beijing BBMG Group has launched a 100 ktpa CCS demonstration project in Beijing, marking China's third operational CCS project in this industry. China Resources is also constructing a 60 ktpa cement CCS facility in Hainan. Both projects utilise amine-based capture technology. In 2024, China United Cement Group started an oxy-fuel combustion CCS project in the cement sector with an annual capture capacity of 200 kt (GCCSI, 2024), the largest in the world of its kind.

In the oil and gas sector, CNOOC launched China's first offshore CO_2-EOR project in May (SCIO, 2025). Located approximately 200 km southwest of Shenzhen, Asia's largest offshore oil production platform is now set to inject over 1 million tonnes of CO_2 over the next decade. In addition, CNPC began construction of a two-phase 400 km CO_2 pipeline in April, with a transport capacity of 4 Mtpa – four times larger than the capacity and length of China's first industrial-scale CO_2 pipeline in Shandong, owned by SINOPEC. The scaling-up of the CO_2 pipeline network will be a key enabler for more large-scale CCS projects across the country, further strengthening China's carbon capture and storage infrastructure.

Cross-border

Dalian Shipbuilding Industry Co. delivered the first two liquid CO_2 transport ships to Norway's Northern Lights project in late 2024 (Offshore Energy, 2025b), marking a significant milestone in global CCS supply chain collaboration. In February 2025, the AGOGO FPSO, the world's inaugural floating production storage and offloading (FPSO) vessel equipped with offshore post-combustion carbon capture technology (Offshore Energy, 2025a) with a capacity of 230 ktpa (SASAC, 2025), was officially unveiled at COSCO SHIPPING Heavy Industry. This FPSO will be utilised by Azule Energy off the coast of Angola, a joint venture between bp and ENI. In June 2025, Shanghai achieved the world's first ship-to-ship offloading of liquefied CO_2 captured directly from a container ship (MarineLink, 2025).

Policy

China continues to strengthen its climate policy while exploring policy tools for advancing CCS. Last August, the Chinese government made a clear commitment to shift from carbon intensity-based targets toward total emission cap as the primary target by 2030. In March, China unveiled a work plan to expand its carbon trading market to include the steel, cement, and aluminium industries. The three sectors together account for around 3 billion tonnes of CO_2 equivalent emissions annually. While this expansion may not immediately influence China's CCS deployment, the establishment of a mature carbon market as well as a carbon cap around 2030 will encourage companies to plan for long-term climate goals, including decisions regarding CCS.

On CCS, the Central Government has consistently signalled support for large-scale demonstrations, particularly within the coal-fired power generation sector. This policy commitment is reflected in at least three major policy documents:

- Action Plan for Low-Carbon Transformation and Construction of Coal Power Plants (2024-2027), released in July 2024.
- Opinions on Strengthening the Clean and Efficient Utilization of Coal, issued in September 2024.
- Implementation Program for the New Generation of Coal Power Upgrading Special Action (2025-2027), published in March 2025.

The Special Action also launched a call for proposals based on these policy frameworks. The selected coal power CCS projects will benefit from government support.

Meanwhile, the Advanced Green and Low-Carbon Technology Demonstration Project Implementation Program awarded funding to seven CCS projects in April 2025. These include three integrated CCS projects, a capture project in the cement sector, a long-distance CO_2 pipeline project, and capture projects at a fertiliser factory and a lithium-ion battery production facility.

[1] In China, demonstration projects can be operated for an entire project lifetime, not just a short period.

Dalian Shipbuilding Industry Co. delivered the first two liquid CO_2 transport ships to Norway's Northern Lights project in late 2024, marking a significant milestone in global CCS supply chain collaboration.

Huaneng Longdong: A global benchmark for decarbonising coal-fired power

The Huaneng Longdong Energy Base 1.5 Mtpa CCUS project represents a transformative leap in the global fight against climate change. It is the world's largest carbon capture facility integrated with a coal-fired power plant and China's most ambitious CCS initiative. This flagship facility, situated in Gansu province in China's west, pioneers a pathway for coal-dependent energy systems to achieve net zero emissions and establishes a replicable model for scalable, cost-effective carbon management worldwide.

Key Impacts

- Scale and Integration: Integrated with the 2 × 1000 MW Zhengning coal-fired power plant and paired with 6 GW of renewable energy, the project creates a hybrid energy infrastructure that balances fossil fuel reliability with renewables and CCUS. This ensures deep decarbonisation of the "last mile" of CO_2 emissions, setting a precedent for coal-to-clean transitions.
- Cutting-Edge Technology: At its core is Huaneng's proprietary HNC-7 hybrid solvent technology, which reduces energy consumption (≤2.3 GJ/tonne CO_2) and solvent consumption while minimising its environmental footprint. This breakthrough achieves a decarbonisation cost of under Yuan 220/ton CO_2, positioning it as a commercially viable, globally competitive solution.
- Full-Chain CCUS Demonstration: The facility showcases China's first large-scale, full-chain CCUS facility in the power sector, featuring the nation's deepest saline formation storage well and a supercritical CO_2 pipeline network capable of sequestering 200,000 tpa (rising to 500,000 tpa in Phase II). Real-time dynamic monitoring demonstrates permanent storage, enhancing trust in geological carbon management.
- Global Commercial Blueprint: By demonstrating mature, scalable CO_2 capture technology and a sustainable business model, Huaneng's project can help accelerate the global commercialisation of CCUS. It offers developing economies a pragmatic template to reconcile coal reliance with climate goals by illustrating that low-cost, high-efficiency carbon capture is achievable.



Huaneng Longdong CCUS project, image courtesy of Huaneng Clean Energy Research Institute.

Catalyst for action

The Longdong Energy Base project illustrates China's leadership in CCUS innovation and helps to redefine the outlook for coal-powered energy. Its success underscores the critical role of advanced carbon capture in achieving net zero targets, offering a replicable framework to decarbonise heavy industries and fossil-dependent grids. As the most advanced commercial-scale CCS demonstration in the coal sector, this project is a cornerstone for accelerating global climate resilience and equitable energy transitions.

Japan

Clear policy shifting CCS closer to commercial reality

Clear policy, a new law, and business-led momentum are shifting Japan's CCS sector toward execution. With new legislation in place, government-backed projects progressing, and bilateral agreements with Malaysia and Singapore under discussion, Japan is establishing a solid foundation for the commercial deployment of CCS. However, challenges remain in ensuring long-term storage access, cost competitiveness, and public acceptance.

Momentum – The Japanese government has reaffirmed CCS as a central pillar of its 2050 net zero strategy, with nine Advanced CCS Projects selected and a national roadmap targeting up to 240 Mtpa of CO_2 storage by 2050.

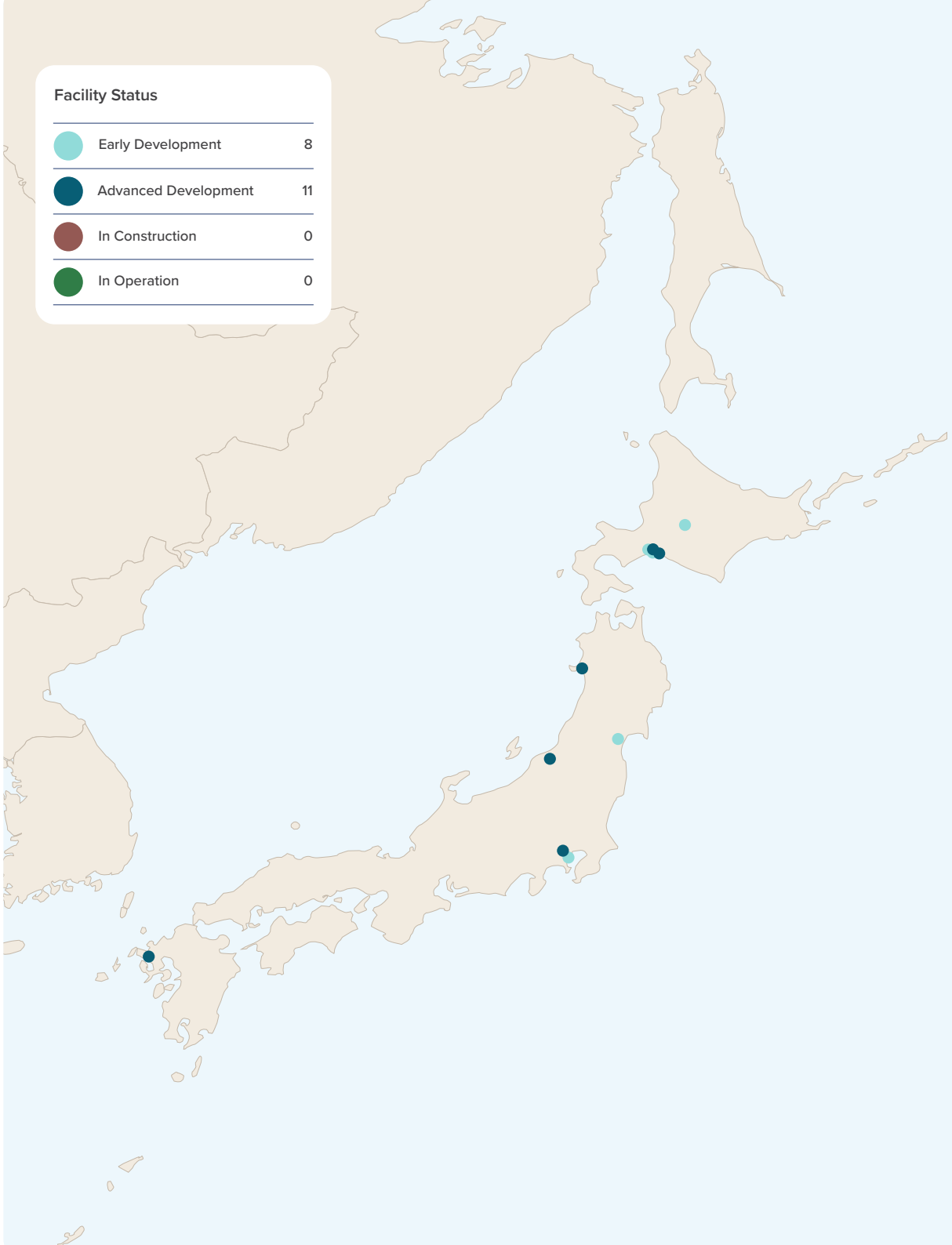
Drivers – The CCS Business Act, enacted in May 2024, establishes a legal framework for licensing site exploration, storage, and pipeline operations, boosting investor confidence and providing regulatory clarity. With the planned introduction of a cap-and-trade emissions trading system into the carbon credit market in Japan (GX-ETS) in April 2026, an increasing number of companies appear to be seriously considering domestic CCS deployment.

Progress – With demand for Liquefied CO_2 (LCO_2) carriers from CCS projects that transport CO_2 collected in Japan to storage sites by sea expected to grow, the Japanese government has initiated:

- R&D and Demonstration of CO_2 Ship Transportation, commissioned by NEDO (New Energy and Industrial Technology Development Organization)
- JOGMEC (Japan Organization for Metals and Energy Security) has established a council in collaboration with METI (Ministry of Economy, Trade and Industry) aimed at standardising specifications for CO_2 ship transport and reducing associated transportation costs.

In parallel, seven private companies are jointly studying how to establish standard specifications and designs for LCO_2 carriers.

Challenge – Japan's limited onshore storage options heighten its reliance on international partnerships, while public awareness remains an area that needs attention. To operate nine Advanced CCS Projects from 2030, each project proponent is required to make a final investment decision in 2026. The Japanese government is planning to support the cost of exploratory drilling required for the final investment decision.





Tomakomai CCS Demonstration Project, image courtesy JCCS.

Japan's policy ambition is backed by law, projects, and funding. As demonstration turns to deployment, success will hinge on timely permitting, international partnerships, and public support. Japan is not only scaling CCS at home but also shaping the regional ecosystem for decarbonisation.

Policy

Japan's CCS Business Act, passed in May 2024, provides a comprehensive legal foundation for CO_2 geological storage and transportation, setting a model for regulatory certainty and private-sector mobilisation.

The Act introduced a licensing regime (both onshore and offshore) for:

- Exploration rights for geological surveys.
- Storage rights for CO_2 injection and monitoring.
- CO_2 pipeline regulations under a notification system to expedite CO_2 pipeline development.

The Seventh Energy Strategy Plan produced by METI in February 2025 noted that "CCUS can achieve decarbonisation in areas that are difficult to decarbonise through electrification and a shift to non-fossil sources using hydrogen and its derivatives. Therefore, CCUS is indispensable for simultaneously achieving energy security, economic growth, and decarbonisation."

Under the Designation of Specified Area in the CCS Business Act, METI designated an offshore location in Tomakomai City in Hokkaido Prefecture as a specified area in February 2025. The first granting of an exploration licence under the CCS Business Act was issued in September 2025.

Projects

Early projects laid Japan's CCS foundation:

- Tomakomai Demonstration Project: Full-chain pilot project by JCCS (2016–2019), storing 300,000+ tCO_2 offshore.
- Osaki CoolGen: Ongoing IGCC/IGFC demonstration near Hiroshima with capture-ready design.

In June 2024, JOGMEC announced nine CCS Advanced CCS Projects, focusing on feasibility studies to capture and store CO_2 emissions. These projects are strategically located across industrial regions, aiming to leverage existing infrastructure and suitable geological formations. Five are expected to store CO_2 domestically, and four to store CO_2 in Malaysia (three) and Oceania (one). The initiative aligns with Japan's carbon neutrality goals and its objectives around enhancing technological capability, and reflects a nationwide push for CCS adoption.

Japan recognises that cross-border CCS is essential to overcome its domestic storage constraints. As an example, it is negotiating CO_2 export frameworks with Malaysia.

Finance

Robust public support continues:

- Japan Climate Transition Bonds are a government-backed financing tool for CCS and other transition infrastructure. The proceeds from the Bonds have not yet been allocated to CCS projects, but may be in future. (Ministry of Finance et al., 2024)
- METI in January initiated discussion of a new CCS funding scheme that is expected to be consolidated by the end of 2025.

The scheme aims to provide support to address the uncertainty of the gap between the cost of CCS and the cost of unabated CO_2, which can include taxes, the cost of purchasing credit, profit/loss due to low environmental value, and other factors. The support will target not just capex to start the CCS project but also opex to sustain the project.

Advances

Japan is advancing CO_2 separation and capture technologies under the Green Innovation Fund, targeting low-concentration (below 10%) and low-pressure flue gas sources such as from natural gas power plants and industrial exhausts. The initiative aims to achieve a CO_2 capture cost of under Yen 2,000 per tonne by 2030, supporting both large-scale and mid-sized capture applications.

Seven major R&D projects are underway, covering a broad range of technologies: solid sorbents, membranes, cryogenic methods, electrochemical separation, and innovative absorbents. Notable participants include Chiyoda Corporation, JERA, DENSO, Resonac, Sumitomo Chemical, Air Water Inc., and Toho Gas, as well as universities and national research institutes.

These projects are designed not only for power and industrial decarbonisation, but also as enabling technologies for BECCS and DAC.

Standardised testing infrastructure for CO_2 separation materials is also being developed, led by AIST (National Institute of Advanced Industrial Science and Technology) and RITE (Research Institute of Innovative Technology for the Earth), to promote international alignment.

The program is supported by approximately Yen 38 billion in public funding from NEDO, covering all seven projects through to 2030.

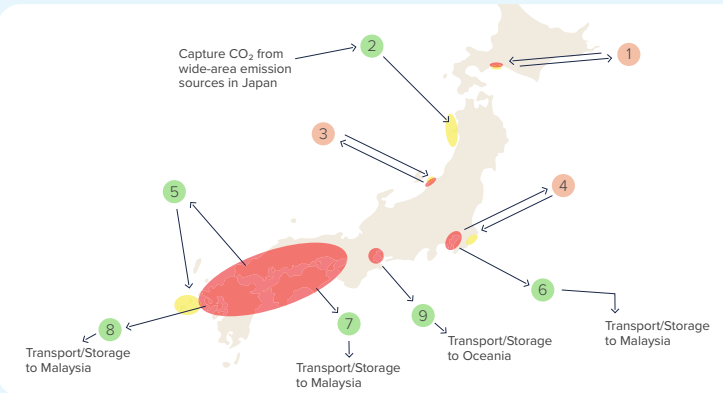
This initiative is expected to contribute significantly to Japan's industrial decarbonisation strategy and strengthen its leadership in carbon capture technologies. The integration of capture systems with downstream CO_2 utilisation pathways is also being explored, including chemical production and e-fuel synthesis (NEDO, 2025).

Japan is advancing CO_2 separation and captgure technologies under the Green Innovation Fund, targeting low-concentration (below 10%) and low-pressure flue gas sources such as from natural gas power plants and industrial exhausts.

9 selected Japanese Advanced CCS Projects

Source: JOGMEC

- Potential Area of CO_2 Emission
- Potential Area of CO_2 Storage
- Project transporting CO_2 by Ship
- Early Development CO_2 by Pipeline



	Project	Participants	Location
1	Tomakomai Area CCS	Japex Idemitsu Hepco	Hokkaido
2	Tohoku Region West Coast CCS	Itochu Nippon Steel Taiheiyo Cement Inpex Mitsubishi Heavy Industries Taisei	Tohoku
3	Higashi-Niigata Area CCS	Japex Mitsubishi Gas Chemical Hokuetsu Tohoku Electric Power Co. Inc.	Niigata
4	Metropolitan Area CCS	Inpex Nippon Steel Kanto Natural Gas Development	Tokyo Bay Area and Chiba
5	Offshore Western Kyushu	ENEOS ENEOS Xplora J-Power	Offshore Kyushu
6	Northern Offshore of Peninsula Malaysia CCS	Mitsubishi Corporation ENEOS ENEOS Xplora Nippon Shokubai JFE Cosmo Petronas	Tokyo Bay Area, for transport/storage to Malaysia
7	Offshore Sarawak CCS	Japex JGC "K" Line Petronas JFE Mitsubishi Gas Chemical EnerGia Mitsubishi Chemical Group Nippon Gas Line	Western Japan, for transport/storage to Malaysia
8	Southern Offshore of Peninsular Malaysia CCS	Mitsui & Co Kansai Electric Power Cosmo EnerGia J Power Kyushu Electric Power Co. Inc. Resonac Mitsubishi UBE Cement	Western Japan, for transport/storage to Malaysia
9	Oceania CCS	Mitsubishi Corporation Nippon Steel ExxonMobil Mitsubishi Chemical Group Mitsubishi Corporation Clean Energy	Chubu, for tranposrt/storage to Oceania



EXCOOL transportation ship, image courtesy JCCS.

Standardisation of specifications for CO_2 ship transport

Public sector

JOGMEC has established a council in collaboration with METI to support the promotion and expansion of CCS projects. The council aims to standardise specifications for CO_2 ship transport and reduce associated transportation costs. The resulting guideline (first edition) for use as a reference for future CCS projects considering CO_2 ship transport was finalised in 2025 and is publicly available (JOGMEC, 2025).

Private sector

As the demand for LCO_2 carriers is expected to grow from various CCS projects that transport CO_2 collected in Japan by sea to storage sites, it is necessary to build and supply LCO_2 carriers in Japan to realise the CCS value chain and improve economic efficiency.

Seven companies have agreed to conduct a joint study to establish standard specifications and designs for LCO_2 carriers and to establish a construction supply chain – “K” LINE, MOL, NYK Line, Mitsubishi Shipbuilding, Imabari Shipbuilding, JMU, and Nihon Shipyard (“K” LINE et al., 2024).

R&D and demonstration

A consortium led by Japan CCS Co., Ltd., which included the Engineering Advancement Association of Japan, ITOCHU Corporation, Nippon Gas Line Co., Ltd. (from Nov. 2023), Nippon Steel Corporation (to March 2024), was jointly commissioned by NEDO in June 2021 to conduct the R&D and Demonstration of CO_2 Ship Transportation Project.

With a view to the implementation of CCUS around 2030, the project conducts technology development and demonstration of CO_2 ship transportation from emission sources to utilisation/storage points to advance the establishment of integrated liquefied CO_2 transportation technology.

The demonstration tests on the transport of liquefied CO_2 by ship at low temperatures and low pressure (-50°C, 0.7 MPa, etc.) are the first of their kind globally, and are expected to yield significant results in the safe and low-cost, long-distance mass transport of CO_2.

Since November 2024, the demonstration ship EXCOOL has been transporting CO_2 back and forth between the Maizuru and Tomakomai terminals, with liquefied CO_2 repeatedly unloaded, stored, and loaded at both terminals under various temperature and pressure conditions. Safety and design standards will be proposed after the collection and analysis of demonstration test data, contributing to the social implementation of CCUS. International rules required for the long-distance, mass transportation of liquefied CO_2 will also be proposed, along with a business model for CO_2 ship transportation.

Facilities List

3.0

In Operation

Facility Name	Country	Operational Year	Industry	Capture Capacity (Mtpa CO_2)	Storage Type
Occidental Terrell	USA	1972	Natural Gas / LNG	0.5	N/A
Permian Pipeline Delivery System	USA	1972	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	N/A
Enid Fertilizer	USA	1982	Hydrogen / Ammonia / Fertiliser	0.68	Enhanced Oil Recovery
Oxy Denver Unit	USA	1983	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
ExxonMobil Shute Creek Gas	USA	1986	Natural Gas / LNG	7	N/A
Scout Energy Rangely	USA	1986	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
Mol Szank Field CO_2-EOR	Hungary	1992	Natural Gas / LNG	0.16	Enhanced Oil Recovery
Equinor Sleipner CCS	Norway	1996	Natural Gas / LNG	1	Deep Saline Formation
Great Plains Synfuels Plant	USA	2000	Hydrogen / Ammonia / Fertiliser	3	N/A
Weyburn and Midale Oil Field	Canada	2000	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
Core Energy CO_2-EOR South Chester plant	USA	2003	Natural Gas / LNG	0.35	Enhanced Oil Recovery
Oxy Hobbs Field	USA	2003	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
Equinor Snohvit	Norway	2008	Natural Gas / LNG	0.7	Deep Saline Formation
Petrobras Santos Basin Pre-Salt Oil Field	Brazil	2008	Natural Gas / LNG	14.2	Enhanced Oil Recovery
Arkalon CO_2 Compression	USA	2009	Ethanol / Biomass Fermentation	0.5	Enhanced Oil Recovery
Delhi EOR Project	USA	2009	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
Longfellow WTO Century Plant	USA	2010	Natural Gas / LNG	5	N/A
ExxonMobil Gulf Coast Pipeline Network	USA	2011	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	N/A
Bonanza BioEnergy CCS	USA	2012	Ethanol / Biomass Fermentation	0.1	Enhanced Oil Recovery
Yanchang Integrated Demonstration	China	2012	Chemical	0.05	Enhanced Oil Recovery
Air Products Valero Port Arthur Refinery	USA	2013	Hydrogen / Ammonia / Fertiliser	1	N/A
Nutrien Geismar CCS	USA	2013	Hydrogen / Ammonia / Fertiliser	0.3	N/A
Contango Lost Cabin Gas Plant	USA	2013	Natural Gas / LNG	0.9	N/A
Coffeyville Gasification Plant	USA	2013	Hydrogen / Ammonia / Fertiliser	0.85	Enhanced Oil Recovery
Carbfix Storage	Iceland	2014	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Mineral Carbonation
SaskPower Boundary Dam	Canada	2014	Coal Power Generation and Heat	1	N/A
CO_2 EOR Project Croatia	Croatia	2014	Natural Gas / LNG	0.4	Enhanced Oil Recovery
Aquistore Project	Canada	2014	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Deep Saline Formation

In Operation

Facility Name	Country	Operational Year	Industry	Capture Capacity (Mtpa CO_2)	Storage Type
Saudi Aramco Uthmaniyah	Saudi Arabia	2015	Natural Gas / LNG	0.8	Enhanced Oil Recovery
Shell Quest	Canada	2015	Hydrogen / Ammonia / Fertiliser	1.3	Deep Saline Formation
Xinjiang Dunhua Karamay	China	2015	Chemical	0.1	Enhanced Oil Recovery
ADNOC Al-Reyadah	United Arab Emirates	2016	Iron and Steel	0.8	Enhanced Oil Recovery
ADM Illinois Industrial	USA	2017	Ethanol / Biomass Fermentation	1	Deep Saline Formation
Petra Nova Carbon Capture	USA	2017	Coal Power Generation and Heat	1.4	Enhanced Oil Recovery
Campo Viejo Gas Processing Plant	USA	2018	Natural Gas / LNG	Not Specified	Enhanced Oil Recovery
CNPC Jilin Oil Field	China	2018	Natural Gas / LNG	0.6	Enhanced Oil Recovery
Midstream 30-30 Gas Plant	USA	2019	Natural Gas / LNG	0.01	Enhanced Oil Recovery
Chevron Gorgon	Australia	2019	Natural Gas / LNG	4	Deep Saline Formation
QatarEnergy LNG	Qatar	2019	Natural Gas / LNG	2.2	Deep Saline Formation
Enhance Clive Oil Field	Canada	2020	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
Wolf Alberta Carbon Trunk Line	Canada	2020	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	N/A
Nutrien Redwater	Canada	2020	Hydrogen / Ammonia / Fertiliser	0.3	N/A
NWR Sturgeon Refinery	Canada	2020	Oil Extraction / Refining	1.6	N/A
Climeworks Orca	Iceland	2021	Direct Air Capture	0.004	N/A
China National Energy Guohua Jinjie 1	China	2021	Coal Power Generation and Heat	0.15	Not Specified
Sinopec Nanjing Chemical	China	2021	Chemical	0.2	Enhanced Oil Recovery
Yanchang Yan'an CO_2-EOR	China	2021	Chemical	0.1	Enhanced Oil Recovery
Dark Horse Storage	USA	2021	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Deep Saline Formation
Entropy Glacier Gas Plant (Phase 1A,1B)	Canada	2022	Natural Gas Power Generation and Heat	0.054	Deep Saline Formation
Gevo Net Zero North	USA	2022	Ethanol / Biomass Fermentation	0.18	Deep Saline Formation
Sinopec Qilu-Shengli	China	2022	Chemical	1	Enhanced Oil Recovery
Targa Red Hills natural gas processing complex	USA	2022	Natural Gas / LNG	0.5	Deep Saline Formation
Yanchang Yulin CO_2-EOR	China	2022	Chemical	0.3	Enhanced Oil Recovery
Barnett Zero CCS	USA	2023	Natural Gas / LNG	0.21	Deep Saline Formation
China National Energy Taizhou	China	2023	Coal Power Generation and Heat	0.5	Not Specified
China National Energy Xinjiang Chemicals CCUS Phase 1	China	2023	Chemical	Not Specified	Enhanced Oil Recovery

In Operation

Facility Name	Country	Operational Year	Industry	Capture Capacity (Mtpa CO_2)	Storage Type
CNOOC Enping Storage Demonstration	China	2023	Natural Gas / LNG	0.3	Deep Saline Formation
Guanghui Energy Methanol Plant Phase 1	China	2023	Chemical	0.1	Enhanced Oil Recovery
Harvestone Blue Flint Ethanol	USA	2023	Ethanol / Biomass Fermentation	0.2	Deep Saline Formation
Huaneng Yangpu Gas-fired Carbon Capture Demo Project	China	2023	Natural Gas Power Generation and Heat	0.002	N/A
Ngawha Geothermal Reinjection	New Zealand	2023	Geothermal Power Generation and Heat	0.1	Deep Saline Formation
Sinopec Jinling Petrochemical (Nanjing Refinery)	China	2023	Oil Extraction / Refining	0.3	Enhanced Oil Recovery
Climeworks Mammoth	Iceland	2024	Direct Air Capture	0.036	N/A
Eni Casalborsetti Natural Gas Plant	Italy	2024	Natural Gas Power Generation and Heat	0.02	N/A
Bantam DAC	USA	2024	Direct Air Capture	0.005	Enhanced Oil Recovery
Eni Ravenna Phase 1	Italy	2024	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Depleted Oil and Gas Field
Beijing BBMG Cement	China	2024	Cement and Concrete	0.1	Not Specified
China National Energy Ningxia Phase 1	China	2024	Chemical	3	Enhanced Oil Recovery
Qingzhou Oxy-Fuel Combustion Carbon Capture Project	China	2024	Cement and Concrete	0.2	N/A
Santos Moomba CCS	Australia	2024	Natural Gas / LNG	1.7	Depleted Oil and Gas Field
Xinjiang Jinlong Shenwu	China	2024	Coal Power Generation and Heat	0.2	Enhanced Oil Recovery
Northern Lights Transport and Storage	Norway	2024	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Deep Saline Formation
On Power Silverstone Geothermal Plant	Iceland	2025	Geothermal Power Generation and Heat	0.03	N/A
CF Industries Donaldsonville	USA	2025	Hydrogen / Ammonia / Fertiliser	2	N/A
Heidelberg Materials Brevik Cement Plant	Norway	2025	Cement and Concrete	0.4	N/A
CNOOC Bozhong 26-6	China	2025	Oil Extraction / Refining	Not Specified	Enhanced Oil Recovery
CNOOC Enping CCUS Project	China	2025	Natural Gas / LNG	0.1	Deep Saline Formation

In Construction

Facility Name	Country	Operational Year	Industry	Capture Capacity (Mtpa CO_2)	Storage Type
New Generation Gas Gathering (NG3)	USA	2025	Natural Gas / LNG	1.2	N/A
Imperial Oil Strathcona Refinery	Canada	2025	Hydrogen / Ammonia / Fertiliser	0.5	N/A
Green Plains Central City BioRefinery	USA	2025	Ethanol / Biomass Fermentation	0.33	N/A
Green Plains Wood River BioRefinery	USA	2025	Ethanol / Biomass Fermentation	0.35	N/A
Green Plains York Biorefinery	USA	2025	Ethanol / Biomass Fermentation	0.14	N/A
44.01 Project Hajar	Oman	2025	Direct Air Capture	0.001	Mineral Carbonation
Baotou Steel Phase 1	China	2025	Iron and Steel	0.5	Not Specified
China Resources Hainan Changjiang Cement	China	2025	Cement and Concrete	0.06	Not Specified
CNPC Huabei Oil Field	China	2025	Chemical	0.2	Enhanced Oil Recovery
Huaneng Longdong Energy Base	China	2025	Coal Power Generation and Heat	1.5	Enhanced Oil Recovery
Qatar Petroleum North Field East	Qatar	2025	Natural Gas / LNG	2.1	Not Specified
STRATOS (1PointFive Direct Air Capture)	USA	2025	Direct Air Capture	0.5	Deep Saline Formation
Trailblazer Pipeline	USA	2025	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	N/A
Fluxys c-grid Antwerp Pipeline	Belgium	2026	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	N/A
Linde Beaumont Hydrogen Plant	USA	2026	Hydrogen / Ammonia / Fertiliser	2.2	N/A
Orsted Asnaes CHP Plant	Denmark	2026	Bioenergy Power Generation and Heat	0.28	N/A
Orsted Avedore CHP Plant	Denmark	2026	Bioenergy Power Generation and Heat	0.15	N/A
Yara Sluiskil	Netherlands	2026	Hydrogen / Ammonia / Fertiliser	0.8	N/A
Air Liquide Rotterdam	Netherlands	2026	Hydrogen / Ammonia / Fertiliser	0.5	N/A
Shell Pernis Refinery Rotterdam	Netherlands	2026	Oil Extraction / Refining	1.15	N/A
ADNOC Habshan	United Arab Emirates	2026	Natural Gas / LNG	1.5	Not Specified
CNPC Xinjiang Karamay Coal-Fired Power Plant Integrated Project Phase 1	China	2026	Coal Power Generation and Heat		Enhanced Oil Recovery
BKV Cotton Cove CCS	USA	2026	Natural Gas / LNG	0.05	N/A
Entropy Glacier Gas Plant Phase 2	Canada	2026	Natural Gas Power Generation and Heat	0.16	Deep Saline Formation
Petronas Kasawari	Malaysia	2026	Natural Gas / LNG	3.7	Depleted Oil and Gas Field
QAFCO Ammonia-7 Blue Ammonia	Qatar	2026	Hydrogen / Ammonia / Fertiliser	1.5	Not Specified
Porthos CO_2 Transport and Storage	Netherlands	2026	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Depleted Oil and Gas Field

In Construction

Facility Name	Country	Operational Year	Industry	Capture Capacity (Mtpa CO_2)	Storage Type
Project Greensand	Denmark	2026	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Depleted Oil and Gas Field
BKV Freer	USA	2026	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
CapturePoint Solutions Central Louisiana Regional Carbon Storage (CENLA) Hub	USA	2027	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Deep Saline Formation
Air Products Rotterdam	Netherlands	2027	Hydrogen / Ammonia / Fertiliser	Under Evaluation	N/A
BKV East Texas	USA	2027	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Enhanced Oil Recovery
Northern Endurance Transport and Storage	United Kingdom	2028	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Deep Saline Formation
Eni Hynet North West CO_2 Transport and Storage	United Kingdom	2028	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Depleted Oil and Gas Field
Shell Atlas Carbon Storage Hub	Canada	2028	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	Deep Saline Formation
Air Products Blue But Better	Canada	2028	Hydrogen / Ammonia / Fertiliser	3	N/A
Dow Fort Saskatchewan ethylene CCS	Canada	2028	Chemical	2	N/A
NZT Power	United Kingdom	2028	Natural Gas Power Generation and Heat	2	N/A
Beccs Stockholm	Sweden	2028	Bioenergy Power Generation and Heat	0.8	N/A
Shell Polaris (Scotford Complex)	Canada	2028	Hydrogen / Ammonia / Fertiliser	0.65	N/A
ADNOC Hail & Ghasha Concession Fields	United Arab Emirates	2028	Natural Gas / LNG	1.5	Enhanced Oil Recovery
Air Products Louisiana Clean Energy Complex	USA	2028	Hydrogen / Ammonia / Fertiliser	5	Deep Saline Formation
BP Tangguh LNG	Indonesia	2028	Natural Gas / LNG	3	Enhanced Gas Recovery
CF Industries Blue Point	USA	2029	Hydrogen / Ammonia / Fertiliser	2.3	N/A
Hafslund Oslo Celsio Waste-to-Energy Plant	Norway	2029	Waste-to-Energy	0.35	N/A
CNPC Jilin Pipeline	China	Under Evaluation	CO_2 Transport / Storage	N/A (CO_2 Transport / Storage)	N/A
Yulin Integrated Coal Liquefication	China	Under Evaluation	Chemical	4	Enhanced Oil Recovery

Read More: Click Here

To see the complete list of 734 faciliities in the CO_2RE data base as of 24 July 2025, including those in Early Development and Advanced Development, click here.

Amendments received after the cut-off date of 24 July:

Facility Name	Country	Amendment
PTTEP Arthit	Thailand	Status: In Construction
Eni Structures A&E	Libya	Status: Early Development
KAES Iowa Fertiliser Complex	USA	New Project in Construction
Saudi Aramco Blue Hydrogen	Saudi Arabia	New Project in Early Development
China National Energy Ningxia 3 Mtpa Phase 1	China	Status: In Operation Storage type: Deep Saline Formation and Enhanced Oil Recovery
CNPC Xinjiang Coal Power Plant Integrated 2 Mtpa Phase 1		Name and capture rate to 0.5 Mtpa
Yulin Chemical 4 Mtpa CCS Demonstration		Name and capture rate to 1 Mtpa
CNOOC Enping CCUS		Name and storage type: Deep Saline Formation
Huaneng Longdong Energy Base		Status: In Operation Storage type: Enhanced Oil Recovery
China National Energy Xinjiang Chemicals CCUS Phase 1		Removed
CNPC Jilin Pipeline		Operational year: 2026

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Twence CCU Facility, Europe, image courtesy of SLB Capturi.

Key Terms & Acronyms

Project status - definition

Early Development
Is completing or has completed a pre-feasibility or feasibility study.

Advanced Development
Is completing or has completed a front-end engineering and design (FEED).
For storage sites, the proponent is completing a submission or submitted a field development plan or equivalent to regulators.

In Construction
A positive final investment decision (FID) has been reached.

In Operation
CO_2 is being actively captured, transported, and stored or utilised/converted.

***Announced** Has been announced and is recognised by all proponents (via media release, memorandum of understanding, etc). Announced projects are included in CO_2RE database but not included in the Institute's reported data, for example in the Facilities List of the Global Status Report.

Acronyms in this report

BECCS Bioenergy with Carbon Capture and Storage
capex Capital Expenditure
CBAM Carbon Border Adjustment Mechanism
CCfD Carbon Contract for Difference
CCS Carbon Capture and Storage
CCUS Carbon Capture Utilisation and Storage
CDR Carbon Dioxide Removal
CEM Clean Energy Ministerial
CER Certified Emission Reduction
CO_2 Carbon Dioxide
CO_2e Carbon Dioxide Equivalent
COP Conference of the Parties (UNFCCC)
DAC Direct Air Capture
DACCS Direct Air Capture and Storage
EC European Commission
EEA European Economic Area
EU European Union
FID Final Investment Decision
IEA International Energy Agency
IPCC Intergovernmental Panel on Climate Change
IPR Intellectual Property Rights
ISO International Organization for Standardization
JV Joint Venture
ktpa Kilotonne per Annum
LNG Liquefied Natural Gas
MoU Memorandum of Understanding
MRV Measurement, Reporting, and Verification
Mt Million Tonne
Mtpa Million Tonnes per Annum
MW Megawatt/s
NDC Nationally Determined Contribution
NG Natural Gas
NGCC with CCS natural gas combined cycle with CCS
opex Operational Expenditure
R&D Research and Development
tpa Tonne per Annum
tpd Tonne per Day
UAE United Arab Emirates
UK United Kingdom
UN United Nations
UNFCCC United Nations Framework Convention on Climate Change
US United States (of America)

Key terms in this report

CCS/CCUS The process of capturing CO_2 formed during fossil fuel-fired power generation and industrial processes and storing it so that it is not emitted into the atmosphere. CCS or carbon capture and storage includes utilisation when CO_2 storage is permanent and verified. CCUS is the preferred term in some regions.

utilisation/conversion Includes the conversion of captured carbon oxides, primarily CO_2, into economically valuable products such as chemicals, fuels, building materials, plastics, and bioproducts. It also includes use of CO_2 as a working fluid for enhanced hydrocarbon recovery (EOR or EGR). Conversion is used when referring to carbon uptake, catalytic conversion, and mineralisation. Utilisation is used when referring to enhanced hydrocarbon recovery with monitoring and verification for long-term storage.

geologic storage Refers to CO_2 storage in dedicated reservoirs and enhanced hydrocarbon recovery projects that include monitoring, verification, and reporting of the amount of CO_2 stored.

carbon management Includes both natural and technological solutions for removing ambient CO_2 from the air or capturing CO_2 emissions from industrial processes, with the goal of preventing/mitigating their contribution to climate change. These solutions encompass CDR technologies (such as direct air capture and reforestation), and carbon capture technologies (which capture CO_2 emissions from higher concentration sources like fossil fuel-fired power plants and refineries).

CDR includes activities that remove CO_2 from the atmosphere and durably store it in geological, terrestrial, or ocean reservoirs, or in products. CDR includes enhancement of biological or geochemical sinks and DAC/DACCS but excludes natural CO_2 uptake not directly caused by human intervention.

DAC/DACCS A process that removes CO_2 from ambient air. When paired with CO_2 storage strategies, it is referred to as DACCS.

Project Terms

facility One company (or JV) owning a full value chain is one facility regardless of the distance between capture and storage. One company owning CO_2 transport and storage infrastructure is one facility. Two separate power stations with CCS owned by one company would be two facilities.

cluster A geographic concentration of interconnected businesses, suppliers, and associated institutions, typically due to proximity to raw materials, transport options such as ports, or to labour supply and markets.

hub Central collection or distribution point for CO_2. One hub would service the collection of CO_2 from a capture cluster, or the distribution of CO_2 to a storage cluster.

network A connection between two facilities via the use of a transport facility, regardless of ownership.

- Capture network: CO_2 captured and collected from multiple facilities with different owners.
- Transport/storage networks: CO_2 collected from multiple facilities, transported through one or more types of transport (pipeline, truck, ship) and stored in one or more storage sites.

anchor project A large emitter that provides a significant proportion of the CO_2 in a cluster of CO_2 capture projects. Typically bears the fixed costs of the initial infrastructure.

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GLOBAL CCS INSTITUTE

Find out more

The Global CCS Institute is a leading global authority on CCS. Our members include governments, companies, research bodies and NGOs, all with a commitment to CCS as part of achieving a net zero future.

Any questions

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