Insight Paper/Report Overview: LETA/CIAB Report: China's Impressive Strides Towards Carbon Capture, Utilisation and Storage (CCUS)

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Introduction

The LETA1/CIAB2 report, entitled "China's impressive strides towards carbon capture, utilisation and storage (CCUS)", reviews China's evolving role in CCUS technology deployment. Prepared by LETA's Nathan Bongers, the report emphasises how China is increasingly integrating CCUS into its coal-based power and heavy industry sectors. Published in May 2025, the report positions CCUS as a critical enabler of global net-zero

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[1] Low Emission Technology Australia (LETA) is a not-for-profit investment fund that accelerates the development and large-scale deployment of technology solutions to reduce and remove greenhouse gas emissions from critical industries like steel, cement and power generation.
[2] The Coal Industry Advisory Board (CIAB) consists of a group of high-level executives from coal-related enterprises. CIAB is a member of the IEA Greenhouse Gas R&D Programme (IEAGHG).

ambitions: the International Energy Agency (IEA) has warned that achieving net zero without CCUS will be "all but impossible". The report analyses how China is seeking to scale CCUS cost-effectively and rapidly, and draws lessons for other jurisdictions.

Overview of CCUS technology

The report describes the three main components comprising CCUS:

- Capture: extracting CO_2 from fossil-fuelled power plants, industrial processes or bio-based sources.
- Transport: moving CO_2 (via pipeline, ship, rail or road) to a use site or storage location.
- Utilisation / Storage: either using CO_2 as a feedstock in industrial processes (utilisation) or injecting it into geological formations for long-term storage.

The report notes that CCUS is already applied across hard-to-abate sectors including cement, steel, fertilisers, natural-gas processing and coal-fired power generation and, thus, is central to reducing emissions in these sectors.

China's strategic rationale

China, with its large and young coal-fired power fleet, heavy reliance on steel and chemicals industries, and significant geological CO_2-storage potential, has a strong strategic interest in CCUS. The report emphasises that China's "Dual Carbon" objectives – peaking emissions by 2030 and achieving carbon neutrality by 2060 – align with deploying CCUS: shutting or replacing coal assets rapidly is costly, retrofitting CCUS provides an alternative pathway to decarbonise while maintaining energy security. The report underscores that China's government backing, large domestic coal and industrial base, and ability to mobilise investment give it a favourable position to scale CCUS.

Deployment experience and cost learning

The report outlines that China has moved beyond small pilots to an increasingly sophisticated CCUS network. It highlights that coal-based CCUS deployment in China began with the first capture from a coal-fired plant in 2007 (at the Beijing Gaobeidian plant) and that more recent large-scale deployments and demonstrations are underway. The report notes that worldwide, as of July 2024, there were about 50 operating CCUS projects with ~51 Mt CO_2/a capture capacity, 44 under construction with ~51 Mt CO_2/a, and a total pipeline of some 628 projects amounting to ~416 Mt CO_2/a potential capacity.

China is reported to have over 100 CCUS projects in operation or development. The report emphasises that this scale of activity is enabling China to achieve "learning-by-doing" cost reductions and to improve operating performance – especially through retrofits of existing assets and through government-driven project support. China's cost

performance is emerging as competitive in international terms (though the report cautions that challenges remain to reach widespread commercial status).

Policy, institutional and regulatory frameworks

The report describes the policy ecosystem in China supporting CCUS, including:

- Inclusion of CCUS in the 14th Five-Year Plan and other national policy documents as part of low-carbon development and circular economy goals.
- More than 55 distinct national/regional policies in China mapped by the Global CCS Institute that support CCUS deployment.
- Active international collaboration (for example via U.S.–China cooperative frameworks) intended to accelerate large-scale CCUS projects; China's participation in international standards development (e.g., co-leading ISO TC265 on CCUS) is noted.

The report emphasises that policy clarity, regulatory frameworks for storage, standards for environmental protection and liability (especially for underground CO_2 storage) are critical enablers to scaling CCUS.

Case studies and industrial applications

The report showcases detailed Chinese case studies (though the summary does not list all) which focus on coal-fired power generation and heavy industry retrofits, illustrating how CCUS is being deployed in real operational settings. The focus is on how retrofit feasibility, integration with existing plants and industrial cluster configurations are being advanced in China, enabling more rapid deployment than would be possible with new-build assets alone.

The report emphasises that China is deploying post-combustion capture widely, because post-combustion capture allows retrofit of existing coal and industrial plants, reducing time and cost to deployment. The demonstration of CCUS integrated into coal power, chemicals and metallurgy is highlighted as a strength.

Key findings and lessons for scaling CCUS

Some of the key take-aways the report identifies include:

- Scale-up matters: To deliver meaningful emissions reductions in hard-to-abate sectors, CCUS must move rapidly from pilot to commercial scale. China's large-scale ambitions and government-backed deployment help support this.
- Cost reduction via learning: China's experience suggests it can drive down capital and operational costs through multiple deployments, retrofit learning and industrial cluster economy of scale.

- Retrofit potential: Because China's coal-fired power and heavy industry assets are relatively young, retrofit of CCUS is technically feasible and economically more attractive than full plant replacement – a lesson relevant for other coal-reliant jurisdictions.
- Policy and regulatory framework are key enablers: China's coordinated policy approach, industrial strategy and regulatory actions show how a national strategy can accelerate CCUS deployment.
- Integration of CCUS into wider industrial systems: The report emphasises that CCUS must be integrated – not just capture but also transport, storage and utilisation – and that industrial cluster approaches and shared transport/storage infrastructure enhance viability.
- Need for urgency: Despite China's progress, the report reinforces that global CCUS deployment still falls far short of the levels required to meet net-zero goals; faster deployment is required worldwide.

Implications for international actors

The report suggests that other energy- and industry-dependent economies can learn from China's model – particularly around retrofit strategies, cluster infrastructure, cost reduction through serial deployment, and the importance of policy/regulatory frameworks to de-risk investment in CCUS. For global climate targets to be met, hard-to-abate sectors will need CCUS deployment at scale – and China's progress is one of the most advanced examples of how a large industrial economy is tackling this challenge.

Summary outlook

In conclusion, the LETA/CIAB report presents China as a leading example in advancing CCUS technology deployment – deploying retrofits, building scale, driving cost reduction and integrating CCUS into large coal- and industry-based systems. While tough challenges remain (especially on commercial economics, storage infrastructure, regulatory certainty and international co-ordination), China's progress offers valuable lessons. The report emphasises that CCUS must be treated as a core component of decarbonisation in heavy-industry economies and that scaling the technology now is urgent if net-zero targets are to be achieved.