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Growing global momentum could accelerate the energy transition, as demonstrated by the UAE Consensus, released in December 2023, that calls on Parties to make a just and orderly transition away from fossil fuels while accelerating zero- and low-emission technologies such as carbon capture, utilization and storage (CCUS), particularly in "hard-to-abate" sectors. This article examines the role that CCUS could play in decarbonizing energy systems and takes a closer look at what it will be needed for it to scale to a globally impactful level.

The global CCUS landscape is also diversifying, with carbon being captured from a wider array of sources. Cement, blue hydrogen, iron and steel, and power together are projected to account for around 85 percent of total uptake by 2050, although large differences are expected between regions.

In cement and lime production, CCUS is the only solution currently capable of decarbonizing process emissions at scale. Overall cement demand and clinker substitution rates drive the uptake of CCUS in this hard-to-abate sector to enable reduced emissions.

In hydrogen, CCUS is currently a cost-effective pathway to rapidly scale low-carbon hydrogen production, but post 2030, green hydrogen may become more cost competitive. A lower-than-expected penetration of hydrogen in some segments (such as road transport) and greater efficiency in end uses, as well as changes in the competitiveness of green compared to blue hydrogen, could result in a lower-than-expected demand for CCUS. However, blue hydrogen is expected to remain a significant demand driver of overall CCUS uptake.

Along with the growth and diversification of the CCUS market, investment into CCUS is also growing. Average annual investments in CCUS could peak close to $175 billion by around 2035, and could surpass today"s gas investments by as early as 2026 under the Achieved Commitments scenario.

Our analysis suggests that more than 70 percent of cumulative global CCUS investments will be concentrated in the ASEAN region, China, India, and North America, with the majority of these investments in hard-to-abate sectors (such as cement and iron and steel), as well as (potentially) in the power sector.

To meet announced net-zero targets, approximately $120 billion in annual average investments ($3.5 trillion cumulative, 0.1 percent of global GDP) will be required globally by 2050 under the Achieved Commitments scenario.1Cumulative investment by 2050 varies between $0.4 trillion and $2.6 trillion in other scenarios. As of 2023, only around one-quarter of the necessary funding for CCUS by 2030 has been earmarked. This significant shortfall underscores the need for a concerted effort to mobilize financial resources and investment in CCUS.

CCUS is subject to considerable uncertainty and may depend on policy incentives, economics by sector and

region, technology development, and interaction with alternative decarbonization technologies. Our analysis suggests it will be increasingly important to watch out for five signposts critical for CCUS development:

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