ETC (2022) "Carbon capture, utilisation & storage in the energy transition: vital but limited"- Key Messages - Top-line

Clean electrification is the backbone of global decarbonisation. Nonetheless, carbon capture, utilisation and storage has a vital, albeit limited role to play in delivering a net-zero economy by mid-century, alongside zero-carbon electricity, clean hydrogen and the use of sustainable low-carbon bioresources.

Key Messages

A limited and complementary role for CCUS:

- A profound transformation of the energy system is necessary to deliver a net-zero-emission economy by mid-century. By 2050, clean electricity could provide 65-70% of the world's final energy demand, with a major role for low-carbon hydrogen, and a modest role for sustainable, low-carbon bioresources.
- As a low-carbon, not zero-carbon technology, CCUS has a complementary role to play in decarbonisation but it must not lead to a continuation of fossil fuel consumption at today's levels.

Carbon capture, utilisation or storage will be essential to reaching net-zero in a number of areas:

- To decarbonise industrial processes such as cement production which by their nature produce CO_2 and therefore cannot be decarbonised via clean electrification, hydrogen, or bioenergy.
- To deliver the carbon dioxide removals needed to put the world on track to a 1.5°C target, alongside a portfolio of other negative emission solutions including afforestation.
- To capture carbon needed to produce synthetic fossil products used to decarbonise aviation and plastics
- **In addition, in some sectors and geographies CCUS may provide a low-cost decarbonisation solution** given local resource availability and costs, such as the chemical industry, hydrogen production or balancing the power system.

A limited role to play in the energy transition but needs to be scaled up

7-10 GtCO_2/year of carbon capture is likely to be required by 2050 - equivalent to 18-25% of today's CO_2 emissions. This is compared to only 40 MtCO_2 captured each year today[1], or 0.1% of global emissions. For CCUS to play this role in global decarbonisation, capture rates will need to be at or above 90%.

Around half of this will be used to capture emissions from industry and power and around half to remove CO_2 from the air via BECCS & DACCS. These engineered CDR solutions constitute around 20% of all negative emissions required between now and 2050.

CCUS must not lead to a continuation of fossil fuel consumption at today's levels: in 2050 CCUS could be used to capture 2.5 – 4.0 GtCO_2/year of emissions from fossil fuels– i.e. capturing the equivalent of less than 10% of the emissions from the use of fossil fuels today.

Provided strong regulations are in place, CCUS can be technically reliable and permanent. Existing CCUS projects and natural CO_2 stores have demonstrated a very low risk of leakage from storage of CO_2 underground in large-scale geological stores, provided sites are well managed and strongly regulated.

CO_2 utilisation plays a secondary role – where available, in most cases, storing CO_2 is likely to be cheaper than using it. Most CO_2 use will likely be in producing synthetic jet fuel, building materials and high value chemicals (often as feedstocks for plastics).

CO_2 can be transported safely and at low-cost via pipeline, truck or ship. The majority of transported CO_2 is likely to be via onshore and offshore pipelines.

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[1] IEA (2021) *About CCUS*

The need to accelerate progress in the 2020s

Today, just 40 Mt/year of carbon is captured, from around 30 facilities. Growth has been slow with multiple project cancellations. Partly this reflects improved economics for other routes to decarbonisation but also policy and coordination failures that must be addressed.

Early deployment in the 2020s is essential to achieve sufficient capacity by 2050 and reduce overall costs. Much of the growth – particularly of DACC – will occur after 2030 but significant development in the 2020s is needed to make this feasible.

A plausible but ambitious deployment trajectory could see 0.8 Gt/year of carbon capture in 2030 across a suite of technologies, at over 300 facilities. Achieving this will require reduced project development time, developing shared transport and storage infrastructure and ramping up investment.

What will CCUS cost and how will it be financed?

The total investment requirement in CCUS infrastructure is estimated at between $3.3 to $4.9trn by 2050. This is less than 5% of the total cost of the energy transition and equivalent to 0.1% of projected global GDP over this period. Point source capture, transport and storage, 55% of total investment, is the bulk of investment in the coming decade, with most investment for DACC only post-2040.

The majority of CCUS costs are in CO_2 capture and typically reflect the concentration of CO_2 in the gas stream, with more diffuse sources (e.g. air) requiring more energy to extract the CO_2 than higher concentration sources (e.g. fossil industrial processes).

The private sector can finance most of the costs with both industry and governments playing a role in developing incentives (e.g. carbon pricing, low-carbon product mandates), and developing shared transport and storage infrastructure.

6 Key Actions by Government, Corporates & Finance in the 2020s

Coordinated action by government, corporates and investors is crucial to achieving the scale of CCUS needed in the next decade. 6 critical actions in the 2020s are:

1. **Overcoming the green premium to make CCUS deployment economic through e.g. carbon pricing, early-stage financial support where needed** - scaled through a combination of government and industry mechanisms (e.g. low-carbon product standards, buyer coalitions, procurement mechanisms).
2. **Developing enabling infrastructure such as shared transport pipelines and storage sites.** Government and industry can develop CCUS hubs that enable economies of scale.
3. **Targeting R&D and deployment support towards high capture, next-generation CCUS technologies**, as well as developing innovative business models to extend CCUS from large players only to midcap entities.
4. **Regulating and managing risks to ensure responsible and secure CCUS development** by assigning long-term responsibility for storage sites and meaningful penalties for leakage.
5. **Setting standards and regulation to ensure high CO_2 capture rates,** alongside developing transparent, best-practice monitoring of CCUS .
6. **Building public support for CCUS' appropriate role as a low-carbon technology** by articulating a clear strategic, but limited role for CCUS, and ensuring transparency on performance.