

## **CCS: an essential ingredient for the energy transition towards net zero**

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Renewables and electrification of new sectors (especially residential and industrial heating and mobility) will be the main ingredients for the energy transition. However, for a quick and just transition towards the net zero target, other ingredients will be needed.

CO<sub>2</sub> capture and storage (CCS) is one of such ingredients. While its application in the power sector is expected to be a niche in mature economies, CCS will be essential for the decarbonization of some hard-to-abate industrial sectors (e.g. cement, waste-to-energy) and will be highly competitive (both economically and environmentally) in other sectors where competing with “green” alternatives (e.g. hydrogen production, primary steel, chemical industry).

“Second generation” biomass, being a unique source of renewable energy and renewable carbon, will also offer opportunities for decarbonizing important sectors of the economy. Its limited availability and the increasing value of atmospheric CO<sub>2</sub> removal will generate a competition among the different potential uses, where the achievement of high carbon utilization efficiency will be key. This will be possible through either CO<sub>2</sub> sequestration (i.e. BECCS systems) or by converting the excess carbon into an “e-bio-product” by the addition of green-hydrogen.

After an overview summarizing the priorities in the deployment of different technologies on the road to net zero, some of the most interesting outcomes from recent process engineering research in the field of CCS for cement plants and biomass conversion will be presented.