

Capturing CO₂ and Transforming it into Valuable Products

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In the transition towards a future with zero net emissions, all the scenarios developed by important organizations (e.g., IPCC, IEA) attribute a very important role to Carbon Capture Utilization and Storage (CCUS) technologies. In fact, the various CCUS options are considered suitable solutions to manage part of the CO₂ emissions that will inevitably be produced pending an overall conversion of the energy, industrial and domestic systems. Today, however, these options are developing too slowly to reach the desired targets. For example, the geological storage of CO₂ (CCS) has a capacity of about 40 Mtpa with 28 active projects (most of which are dedicated to EOR) but we are 2 orders of magnitude lower than the 4 Gtpa target foreseen by IEA for 2035. On the other hand, the conversion of CO₂ into valuable products, with very few exceptions, is still in its infancy. In fact, consider that the main product obtained from CO₂ is urea, a very common fertilizer, whose production, however, does not bring any environmental benefit, since carbon dioxide is re-emitted upon use within a few months. Despite this, the use of CO₂ in conversion processes is today a very hot topic in modern research, favored by the belief that, in a near future, carbon dioxide will be a resource rather than a waste. In this way, the production processes of numerous goods will be reconverted to employ CO₂ as carbon feedstock instead of the fossil sources used today.

The factors that hinder the development of CCUS chains today are severe and concern not only technical aspects but also social acceptance. Remaining in the technical field, the main concern is the high energy required by the CO₂ capture and conversion processes. The energy, whether it is supplied physically (electricity or heat) or chemical (hydrogen), must have a low carbon footprint and this is reflected in the final cost of the product, making it uncompetitive with respect to that produced in a conventional way. This does not justify a lowering of the guard because the technologies developed today will be essential to continue producing goods with a low environmental impact and without the use of fossil sources.

Eni has set the ambitious target of achieving carbon neutrality (net zero emissions) by 2050, from production to the use of energy products by customers (Scope 1 + 2 + 3). CCUS is an important pillar in the strategy defined to reach this target and the main initiatives under development will be briefly illustrated.