Utilization of Captured Carbon Dioxide – CCU

One of the technologies allowing the management of CO2 emissions is its utilization (CCU, Carbon Capture and Utilisation). This allows the captured CO2 (from emitting installations or from the air) to be further used instead of fossil carbon, especially in industries with emissions that are difficult to eliminate. CCU is part of the CO2 value chain, which also consists of capture (Capture), transport and storage (Storage). Combining the utilization of CO2 (CCU) and its sequestration (CCS) is considered most beneficial.

There are many CO2 utilisation technologies of varying technical and commercial maturity. A basic division distinguishes between methods without conversion (enhanced oil recovery (EOR), geothermal systems, refrigeration) and with conversion (production of synthetic fuels, methanol, urea, polymer production, mineralisation, algae cultivation). The assessment of their potential includes the sustainability of CO2 elimination, energy efficiency, safety, technology readiness and scalability, among others. Enhanced recovery technologies demonstrate greatest maturity but cannot be seen as effectively reducing CO2 emissions because per se they involve the extraction of fossil hydrocarbons. Conversely, the time period for which the CO2 is being eliminated from the atmosphere may vary – it is the shortest for fuels, for example, and longer for plastics or building materials.

CCU installations are already feasible at existing emitting sites. An example is the CO2-SNG pilot project implemented in 2018 at the TAURON Wytwarzanie S.A. Łaziska Power Plant Branch, which demonstrated the possibility of converting the captured CO2 into synthetic natural gas (SNG), which can then be stored, injected into the gas grid, or compressed (CNG) and used as fuel. The advantage of this solution is that it combines CO2 capture and utilisation with energy storage, with the possibility of using surpluses from RES to produce hydrogen by electrolysis. This illustrates the possible synergy between CCU and hydrogen networks. CCU technology can also be used 'modularly', as part of complex processes. The advantage of CCU is the freedom of location of the plant, as it can be deployed close to the source of the captured CO2 , minimising the problems associated with its transport.

CCU is only regulated by law to a limited extent. National and EU legislation has traditionally focused on CO2 storage and transport. There is a growing interest in the regulation of CCU, which is reflected in its recognition as part of the EU's industrial CO2 management strategy.

One of the most difficult challenges for CCU is the question of the permanence of CO2 storage in products. We can speak of 'permanent' use (elimination) or only 'temporary' use (deferral of emissions over time). Initially, the ETS regulations stipulated that only CO2 captured and injected into a storage site could be considered as not emitted. The jurisprudence of the CJEU (Schaefer Kalk case) has, through a purposive interpretation of the ETS Directive and the MRR, also recognised as non-emitted CO2 that is converted into another stable chemical substance in the production process. The case concerned the use of CO2 from the calcination of lime to produce precipitated calcium carbonate (PCC). The 2023 revision of the ETS Directive introduced a revised Article 12 (3a), which recognises "the capture of greenhouse gases and their use in such a way that they are chemically bound to the product so that they do not escape into the atmosphere during normal use, including any normal activities taking place after the end of the product's useful life." This has led to the normative recognition of CO2 storage in certain types of products in the context of accounting for its emissions. The Commission is currently preparing a delegated act, setting out the specific conditions under which a given process can be considered as 'permanent storage'. A Carbon Removal Certification Framework (CRCF) will also be part of the development of a legal framework for CCU, which will allow for greater transparency and evaluation of the efficiency of these processes.

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