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Guidelines for standardized techno-economic assessment of carbon capture and utilization technologies

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Carbon capture and utilization (CCU) technologies have shown the potential to reduce environmental impacts and to entail economic advantages as CO₂ can replace more expensive conventional carbon feedstocks such as fossil resources.^{1,2} A market study of 2016 projected a revenue of up to 800 billion US Dollars for CCU products per year through 2030, relating to an annual uptake of up to 7 billion tonnes of CO₂.³

However, economic advantages are not always guaranteed since CCU technologies face several challenges, for example high energy demands which often lead to increased operational costs. Many economic or financial analyses of identical technologies deviate in their results due to different methods, assumptions or use of data. To enable a fair and comprehensive decision making based on results of economic analyses of CCU technologies, guidelines for systematic and standardized techno-economic assessment (TEA) of CCU technologies have been developed.

Following the standard procedure for Life Cycle Assessment (LCA), the TEA guidelines comprise of the following phases: goal and scope, economic and technical inventory data collection, TEA indicator calculation and the interpretation of results.^{4,5} The goal provides the framework for the overall study, addressing CCU-specific research, development and deployment questions, the scope defines what aspects are included and how the comparison of CCU products with conventional products is being conducted, the inventory collects all relevant data

which is required for the indicator calculation producing the TEA results. The interpretation phase evaluates the results from all phases by analyzing the uncertainty and sensitivity. The goal, scope and all interpreted results are summarized in the final reporting. TEA results will be integrated with LCA results, since decision making often is dependent on economic as well as ecologic aspects of CCU technologies.

Key issues, typically encountered in each phase, such as scope setting, functional unit definition or CO₂ and H₂ prices, will be discussed and guidance on how to address these challenges will be given. The application of the guidelines will be demonstrated with three case studies from different CCU fields: chemicals, fuels and minerals.

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References

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