Abstract for CO_2-based Fuels and Chemicals Conference 2026

Title: Challenges and Pitfalls in the LCA of CCU Systems

Topic: CCU & Sustainability
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Life Cycle Assessment (LCA) plays a central role in evaluating the environmental performance of CO_2-based fuels and chemicals and in supporting credible sustainability claims for Carbon Capture and Utilisation (CCU) technologies. However, applying LCA to CCU systems remains methodologically challenging and, in practice, often leads to inconsistent results and misinterpretations.

This presentation discusses key challenges, common practices, and recurring pitfalls when conducting LCAs of CCU systems. While established standards such as ISO 14040/14044 and ISO 14067 can be—and have been—successfully applied to CCU pathways, they lack explicit provisions for several CCU-specific questions. In response, dedicated CCU LCA guidelines have emerged, yet these are not fully harmonised and sometimes diverge significantly, particularly regarding system boundaries and allocation approaches.

Special attention will be given to the definition of functional units and system boundaries, which in many CCU cases require integrating the CO_2-emitting process with the utilisation route. Closely linked to this is the question of how environmental burdens and benefits are allocated between the emitter and the CCU process and ultimately to the resulting CO_2-based products. The presentation will also address data availability and technology maturity, highlighting uncertainties related to CO_2 sources, capture quality, and process performance, and the implications for comparative assessments with conventional fossil-based incumbents.

Finally, the talk will focus on interpretation and communication of LCA results, outlining best practices to avoid over- or misinterpretation of findings. Addressing these methodological challenges is essential to ensure robust, transparent, and decision-relevant LCAs that can effectively support the development and market deployment of CCU technologies.