Simulation, Digital Tools and Electrified Process Designs for Industrial Carbon Management —Pitch of ideas & potential contribution

CETPartnership Joint Call 2026 | CM2026-04 Industrial carbon management (TRI3) & CM2026-09 Integrated industrial energy systems (TRI6) | Pre-proposal deadline: 08 Oct 2026

Our CCUS research team from the **Institute of Low-Carbon Industrial Processes** at the **German Aerospace Center (DLR)** is working on:

- **Rigorous, validated rate-based models** of absorption-based CO_2 capture in Aspen Plus and adsorption-based Direct air Capture (steady-state and dynamic) to represent accurate system-level digital shadow of the respective process as a first step that can be later extended to a digital twin [1].
- **Optimal Heat pump integration for electrified and energy-efficient CC technologies**: Heat pumps upgrade and recycle internal waste heat mitigating external steam demand — covering two dominant solvent families (amines and aqueous ammonia)[2,3].
- **Overall CCU process simulation and retrofitting CC to local CO_2 sources** — detailed system-level process models to minimise overall production cost and maximise energy efficiency over the whole process chain as well as optimally retroffiting CC concepts to local production sites and CO_2 sources (via DLR's CoDeOpt-Tool)[4,5,6].

Idea for CM2026-04 and CM2026-09 — Digital tool for cost- and energy-efficient carbon management value chains

Screening instruments exist — NETL's retrofit database scales nine fixed US reference plants[7], CMU's IECM (Integrated Environmental Control Model) targets power plants[8], CaptureMap maps emitters from reported emissions data[9], CATF's Europe tool covers transport and storage[10] — but **none resolves a specific emitter's actual flue gas and site energy system, physics-based, free, and usable by non-experts**. We propose to close this gap with a continuous digital pipeline: surrogate models trained on rigorous, validated rate-based CC simulations spanning composition, flow, impurity and utility space, deployed as a **free online screening tool** that returns site-specific capture cost and energy demand for the user's own flue gas. The tool will reach TRL 5+ through validation against measured plant data, blind testing on real industrial cases, and evaluation by end users; commercially, it serves as an entry point to detailed pre-FEED consultancy. The tool converts a **single-site demonstration** into an **EU-wide pipeline**: validated hardware data feeds the surrogate models, letting the tool project the particular technology's cost and performance across different industrial sectors. It enhances **CCU market visibility** and and turns tool users into potential future customers, without requiring the hardware partners to build screening capability themselves.

Who we would like to hear from:—

Consortia in formation under CM2026-04 – We develop a free online screening tool (TRL 5+) built on surrogate models from validated rate-based capture simulations — delivering site-specific capture cost and energy demand for any emitter's flue gas. These results directly serve the call's "**System-level Improvements**" topic (cost- and energy-efficient carbon management value chains through digital tools) by **de-risking capture adoption** for hard-to-abate emitters, while the electrified designs address the capture-technology topic by cutting regeneration steam demand and the plant's own footprint. For any CCU technology validated within a hardware-focused consortium, the tool also extends its exploitation reach by projecting its performance across European production sites.

The above idea also works under **CM2026-09**, where CCUS retrofitting procedures can be assesed based on detailed digital shadows of the production processes. These results cover pathways 1B, 2B, and 1C across two focus areas, directly contributing to the call's expected outcomes of integrated demonstration and commercial-readiness advancement

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