Newsletter No 7
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DEEP REMOVAL OF CO_2 & INNOVATIVE ELECTRIFICATION CONCEPTS

Welcome to the DRIVE project!

The DRIVE project continues to advance the frontiers of industrial decarbonisation through electrified, flexible CO_2 capture systems. In this issue, we spotlight our strong presence at PCCC-8, where the project was represented with two scientific contributions on ultra-deep CO_2 removal and electrochemical solvent regeneration. We also share updates from the 4th Consortium Meeting in Lisbon, where partners aligned on final preparations for the large-scale pilot campaigns of MeDORA, ZEUS, and CODEC, and discussed modelling, LCA/TEA developments.

From technology commissioning and data modelling to public engagement and scientific dissemination, the DRIVE project is entering a new and exciting phase.

Stay tuned for pilot results, industry outreach, and knowledge-sharing actions in early 2026.

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PROJECT NEWS

Pilot Systems Enter Preparation Phase

The DRIVE project is progressing toward the implementation of its lab campaigns ith ZEUS and CODEC at TNO. The CODEC and ZEUS, are moving into final integration and pre-testing stages. Both units are currently being commissioned, and lab tests and TNO and the on-site operation at industrial partner site is being prepared. These tests will demonstrate how modular and electrified CO_2 capture systems perform under real industrial conditions.

Techno-Economic and Life Cycle Assessment Underway

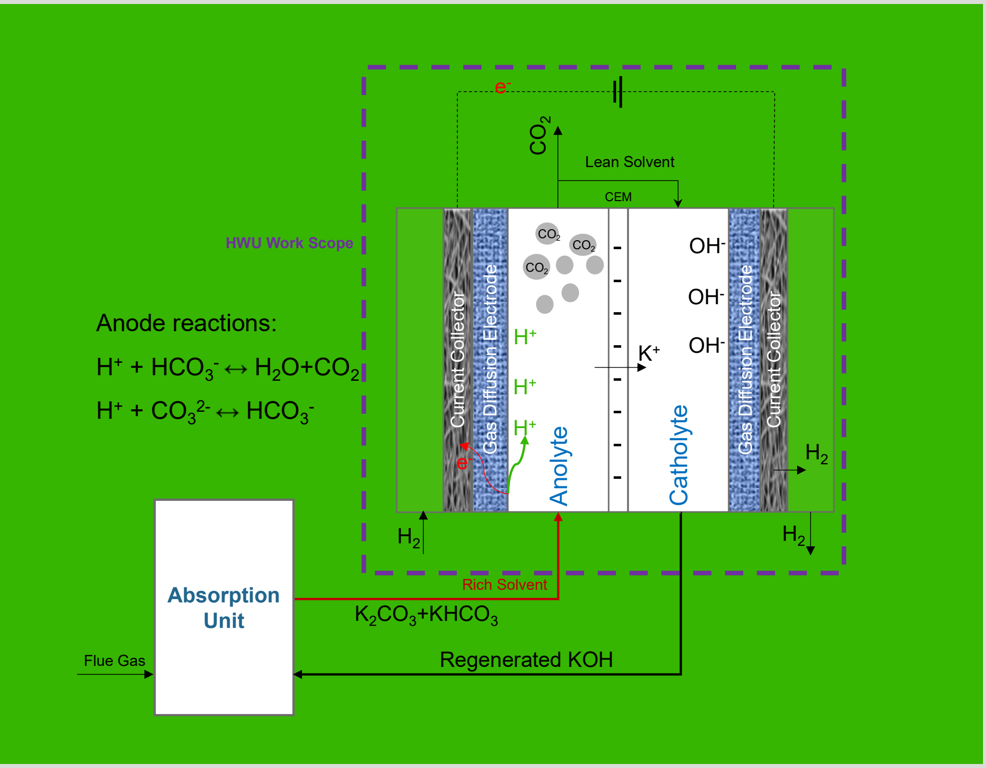
Techno-economic assessment (TEA) and life cycle analysis (LCA) activities have started using initial pilot data. The focus is on evaluating energy efficiency, CO_2 purity levels, and environmental impact. These insights will feed into comparative scenarios and policy-relevant conclusions about the advantages of DRIVE solutions across different industrial sectors.

Modelling and System Optimisation in Progress

Partners are refining system models to access the performance of electrochemical and thermal CO_2 regeneration technologies. Current simulations focus on validation of the models to real test results, thereby refining the models for future use. These efforts aim to optimise the models to be used in the assessment of future large-scale deployment strategies.

DRIVE Showcased in Two Technical Presentations at PCCC-8

The DRIVE project was strongly represented at the 8th Post Combustion Capture Conference (PCCC-8) held in Marseille on 16–18 September 2025, with two technical contributions highlighting its innovations in CO_2 capture. The first presentation, delivered by RWE, TNO, and Hovyu, focused on ultra-deep CO_2 removal using CESAR1 solvent, sharing pilot-scale results from Niederaussem with capture rates exceeding 99.9% and analysis of solvent ageing effects. The second, presented by Hovyu and TU Eindhoven, introduced the ZEUS electrochemical regeneration process, exploring its potential for solvent regeneration under mild conditions using bipolar membranes and renewable electricity. Together, these contributions underline DRIVE’s technological leadership in both thermal and electrified CO_2 capture pathways.



A schematic of the pH-swing electrochemical regeneration system that has been modeled by HWU in the DRIVE project

Heriot-Watt University (HWU) Advances Modeling in pH-Swing Electrochemical Regeneration Systems

At Heriot-Watt, we rely on modelling to steer the development of our pH-swing electrochemical regeneration system built on TNO's GDE-based CODEC technology (as depicted in the figure).

Our predictive electrochemical model breaks down the main contributors to cell overpotential, ohmic losses, ionic resistance in cation exchange membranes (CEMs), and electrode activation barriers, allowing us to pinpoint exactly where performance is constrained. This clarity helps us target the most impactful improvements, from enhancing membrane conductivity to refining electrolyte conditions or advancing electrode kinetics, providing an evidence-driven pathway for design optimization.

Our analysis shows that reaching an energy intensity of 3.0 GJ per tonne of CO_2, which is the target set within the DRIVE Project, is theoretically achievable, assuming optimal operation of both the absorber and the electrochemical stack. This corresponds to about 65% irreversibility losses relative to the thermodynamic minimum. However, the model also underscores the practical challenges here. Pushing to higher current densities increases throughput for a given area of the stack, but it simultaneously amplifies ohmic losses, raising the specific energy consumption for each unit of regenerated CO_2. Conversely, operating at lower current densities delivers higher efficiency and more attractive operating costs, though with reduced productivity. Overall, this modelling framework gives us a powerful decision-making tool to strike the right balance between performance and efficiency as CODEC technology progresses toward TRLs 5-7.

OUR PARTNERS

ACTIVITIES

DRIVE's 4th Consortium Meeting

The 4th Consortium Meeting of the DRIVE project took place on 29–30 October 2025 in Lisbon, hosted by IDMEC.
Partners from across Europe met to assess progress across all work packages, with a strong focus on the upcoming pilot campaigns and integration of the CODEC and ZEUS systems.

Technical discussions centred around the performance of thermal and electrochemical CO_2 regeneration technologies, modelling challenges, and alignment on LCA/TEA approaches.
The consortium also reviewed dissemination milestones, including upcoming scientific publications, video content, and the organisation of the first industry-focused workshop.
The next consortium meeting is planned for March 2026 in Larissa, Greece, hosted by IED.

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