



Targeted CCUS R&D activities in industrial clusters

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ALIGN-CCUS (Accelerating Low Carbon Industrial Growth through Carbon Capture Utilisation and Storage) is a project from the first ERA-NET Co-fund ACT program. In this program nine European countries, together with the European Horizon 2020 program have made funds available for research and innovation actions related to CO₂ Capture and Storage (CCS). The initiative is called ACT – Accelerating CCS Technologies. The participants of ALIGN-CCUS (ALIGN), which commenced in September 2017, represent the ERA-NET ACT countries of The Netherlands, Germany, Norway, Romania and the United Kingdom. The project aims to accelerate the transition of current industry and power sectors into a future of continued economic activity and low-carbon emissions, in which carbon capture, utilisation and storage (CCUS) plays an essential role.

Although initial CCUS demonstration projects are planned to commence as point-to-point projects, with a single pipeline or ships linking one source to one sink, the concept of ‘CCUS clusters’ is considered to be crucial to maximize the climate change mitigation potential of the technology. ALIGN’s objectives are designed to enable the acceleration of CCUS in specific industrial regions in ERA-NET ACT countries: Teesside and Grangemouth (UK), Rotterdam (NL), North Rhine-Westphalia (DE), Grenland (NO) and Oltenia (RO). ALIGN will combine the results from each of these objectives to deliver actionable blueprints in each region, in which CCUS enables low-emission industries, through geological storage and/or utilization of CO₂.

Each of the 6 industrial clusters covered in the ALIGN project has identified specific development and research needs, centered around developing full-chain CCUS projects. For each of the clusters, a portfolio of storage options, a management plan and the steps needed to approach permit-ready appraisal to assure storage at least cost for future demand will be developed. Details on the clusters, their development priorities, existing and future CO₂ storage locations are provided in Table 1. Whereas some of the industrial clusters have received attention from previous R&D projects, such as UK and Dutch clusters, the work planned in Germany, Norway and Romania will derive completely new insights on the potential deployment of CCUS.

In addition to the specific work completed in individual clusters, additional work is dedicated to cross-cutting technological learning and the development of commercial models for embryonic CO₂ cluster development.

To reach the R&D objectives of each cluster, value chain and scenario analysis, combined with geological and economic modelling will be combined with multidisciplinary desk research. This paper will outline the preliminary results of work completed in each of the industrial clusters, detailing the research objectives, methodologies and modelling approaches used.

Table 1 Locations, development priorities and storage potential related to the industrial clusters covered in the ALIGN-CCUS project

Industrial cluster/ region	Development priority in ALIGN	Existing appraised storage			Extended storage capacity to be identified in ALIGN
		Storage site	Capacity	Status	Target stores
Rotterdam (NL)	Develop plans for centralised CO ₂ removal from natural gas, and increased H ₂ use in power generation and industry	P18-4 Gas Field	8 Mt	Permit awarded	P18, P15 and Ijmuiden fields and sandstone formations
Teesside (UK)	Identify cost reduction opportunities through shared infrastructure / optimise transport and storage plans	Endurance structure	200 Mt	Permit ready	Depleted fields, closures in the Bunter and other sandstone formations
Grangemouth (UK)	Identify cost reduction opportunities through shared infrastructure / optimise transport and storage plans	Goldeneye Field	10-15 Mt	Permit ready	Depleted fields, closures in the Captain and other sandstone formations
North Rhine-Westphalia (GER)	Evaluate CCU as a multi-sector CO ₂ mitigation option in the region	n/a	n/a	n/a	n/a
Grenland (NOR)	Advance engineering plans for an intermediate CO ₂ surface storage facility capable of handling CO ₂ from multiple sources	Smeaheia area	100 Mt	Feasibility study	Closures in the Sognefjord Sandstone and in deeper formations.
Oltenia Region (ROM)	Evaluate multi-modal CO ₂ transportation routes and use in enhanced oil recovery with permanent storage	Deep saline aquifers within a 50km radius of Turceni	1.5 Mt/yr	Feasibility study	Potential storage sites in the Moesian Platform

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