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The Norwegian CCS Research Centre: Industry-driven innovation for fast-track CCS deployment

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Abstract

NCCS is a world-class national and international multi-disciplinary CCS Research Centre, linking operators, vendors and academia that have united to address one of the greatest challenges of our time: climate change. Through targeted R&D, we will build the knowledge base needed to capture, transport and store billions of tonnes of CO₂ which will help increase the confidence and lower the costs to fast-track CCS deployment in Norway and beyond.

Keywords: CCS, CO₂ capture, CO₂ transport, CO₂ storage, CCS value chain, R&D centres, industry-driven

1. Introduction

CCS must be fast-tracked if EU climate targets are to be met. The Norwegian CCS Research Centre, NCCS, has a clear vision: to fast-track CCS deployment by addressing any remaining barriers identified in demonstration and industry projects through industry-driven, science-based innovation. This includes developing large-scale CO₂ storage and enhanced oil recovery, as well as CO₂ transport and capture technologies that will make CCS economically viable. It means upgrading CCS technologies to a higher technology readiness level by building on the significant knowledge base that already exists in industry, previous research projects and infrastructure.

2. Research approach

NCCS: a world-class partnership. NCCS comprises international oil and gas companies, CCS technology vendors and technology users in the private and public domain. The research partnership consists of SINTEF, NTNU, UiO, NGI and other highly ranked research institutes and universities. As a world-class CCS centre, the partnership includes world-class scientists, state-of-the-art laboratories and research facilities, and advanced simulation tools that will be expanded and complemented in NCCS.

Overall objective: NCCS will enable fast-track CCS deployment through industry-driven science-based innovation, addressing the major barriers identified within demonstration and industry projects, aiming at becoming a world-leading CCS centre.

Focused on two industry-driven deployment cases. NCCS will provide consistent, targeted research in areas that will contribute most significantly to large-scale CCS deployment. NCCS industry partners have already agreed on two key deployment cases (Figure 1), ensuring industrial ownership and governance of the Centre and industrial relevance for the prioritized scientific tasks: 1) *CCS for Norwegian Industry* capturing CO₂ from industrial sources in Norway and transporting it by ship for storage on the Norwegian continental shelf and 2) *Storing Europe's CO₂ in the North Sea Basin* capturing CO₂ from a variety of sources in Europe and transporting it via a pipeline network to Norwegian storage sites.

In Deployment Case 1, NCCS will support and align with the Norwegian full-scale CCS project in order to realize the Government's ambition to have this operational in 2022. This includes addressing technical and legal barriers via targeted research covering the full CCS chain. NCCS will pave the way to the development of future CCS chains in Norway, by providing research-based support for how to utilize the capacity of the Norwegian full-scale project and use this as a kick start to large-scale CCS.

In Deployment Case 2, NCCS will develop science-based strategies for large-scale CO₂ storage and be a key facilitator for storage in the Norwegian North Sea Basin. This includes aligning with European CCS projects, while addressing technical and legal barriers via research on the full CCS chain.

In addition, NCCS has the following objectives:

Scientific and innovation objectives: To provide a frontier knowledge base for the technology breakthroughs required to fast-tracking full-scale CCS, with industrial relevance throughout the Centre period by use of efficient decision gates in accordance with priorities of the NCCS industry partners. NCCS will fulfil the commercial ambitions and needs of industry and society, while maximizing innovation in the NCCS deployment cases. As new knowledge gaps are identified, NCCS will establish new research projects.

Outreach objective: In addition to academic publications, outreach activities and informational material aimed at governmental agencies, stakeholders and the general public will be arranged by the Centre.

Recruitment objective: Recruit and educate young people, reflecting gender balance and equal opportunities, with first-class competence in CCS-related topics to ensure recruitment to both industry and research institutions.

International objective: To be a CCS research hub benefitting from close cooperation between highly ranked academic institutions in Europe and North America. Influence Europe's CCS strategies by participating in the development of the SET Plan, the Integrated Roadmap for CCS and working programmes in Horizon 2020 as members of the ZEP Technology Platform and the European Energy Research Alliance (EERA) on CCS. Support and strengthen the memorandum of understanding (MoU) between the US DOE and the Norwegian Ministry of Petroleum and Energy on CCS research.

3. Research Activities: Tasks in NCCS

NCCS currently has 12 research teams with members from research in industry partners, selected to support one or both deployment cases. Task 1: CCS Value Chain and Legal Aspects, Task 2: Solvent technology – environmental issues, Task 3: Low emission H₂ production, Task 4: CO₂ conditioning through liquefaction, Task 5: Stable, clean

and efficient gas turbine operation in CO₂-capture schemes, Task 6: CO₂ capture process integration, Task 7: CO₂ transport, Task 8: Thermodynamics and fiscal metering, Task 9: Structural derisking, Task 10: CO₂ site containment, Task 11: Reservoir management and EOR, Task 12: Monitoring technologies. An overview of the tasks is shown in Figure 1.

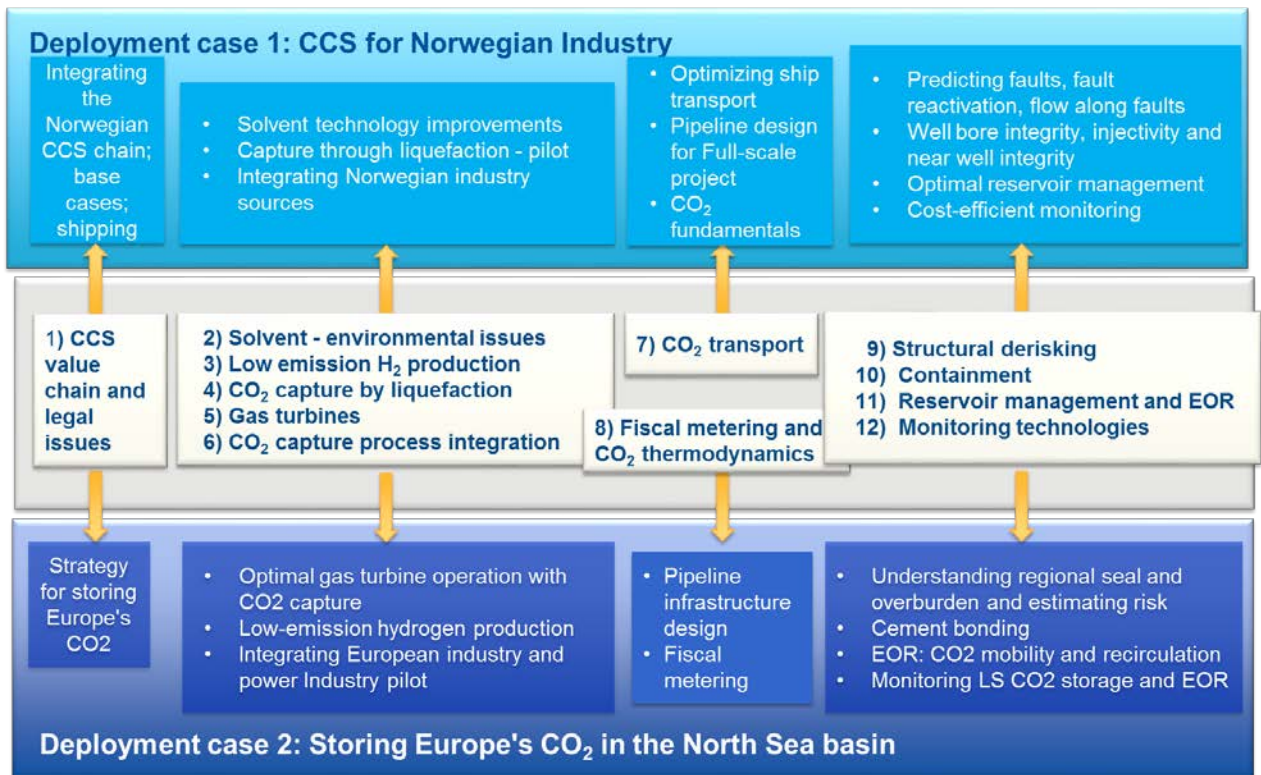


Figure 1: NCCS Deployment Case and Task structure

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