RÉPUBLIQUE FRANÇAISE
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DKarbonation

ADEME AGENCE DE LA TRANSITION ÉCOLOGIQUE

EXPERTISES

Etude de pré-faisabilité d'une infrastructure de transport de CO2 dans les Hauts-de-France

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AAP ZIBAC – Projet DKarbonation

The objective of this feasibility (or pre-feasibility) study is to examine the various technical, environmental, and cost-related aspects associated with the development of a CO2 transport network covering the Hauts-de-France region and extending to the Grand-Est and Normandy regions, enabling the transport of CO2 captured at the main industrial CO2-emitting sites in these regions and connecting them to the compression station developed by NaTran in Dunkirk as part of the DKHARBO project. The CO2 can then be injected into an offshore pipeline in Dunkirk bound for permanent geological storage sites in the North Sea.

This feasibility study includes:

• The definition of requirements, in the form of several scenarios, to preliminarily assess and compare, from a technical and economic standpoint, the CO_2 transport trunk lines connecting major industrial emitting sites in the relevant regions to the Port of Dunkirk.

• A description and technical and economic evaluation, for each scenario, of the necessary transport infrastructure.

The initial scope, focused on the Hauts-de-France region, has been expanded to include the Grand Est and Normandy regions. However, this document will focus primarily on the results pertaining to the Hauts-de-France region.

This study follows up on the previous potential and opportunity study led by NaTran and conducted by the consulting firms Blunomy and Pôlénergie. The objectives of that study were:

• To assess the potential for CO_2 capture and transport in the Hauts-de-France region.

• To conduct an in-depth regional analysis of emission sources.

• To model projected CO_2 volumes through 2050.

• To assess the infrastructure required for implementing the CCUS logistics value chain.

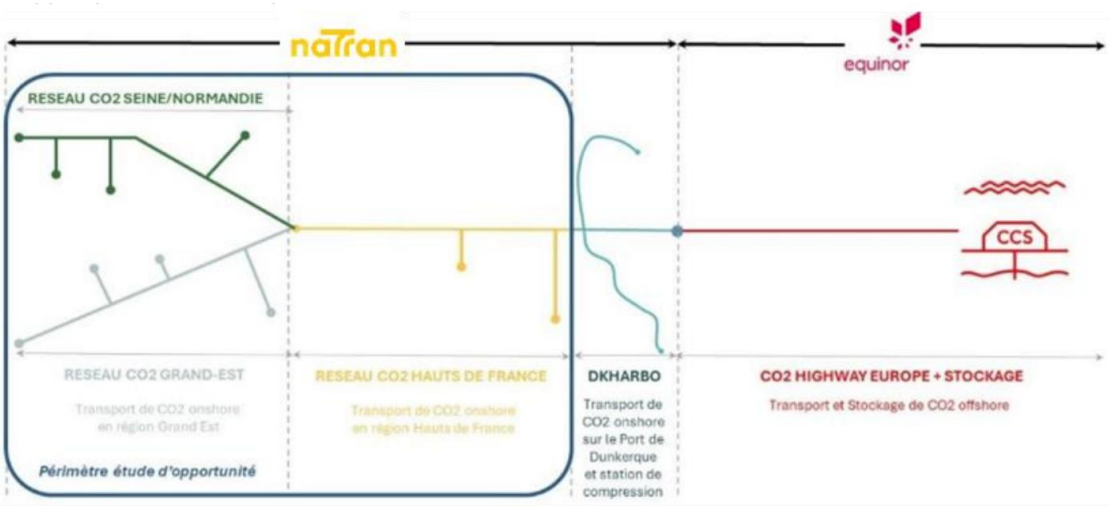
Project overview

NaTran conducted this feasibility study to assess the technical and economic challenges associated with establishing an onshore CO_2 transport network in northern France. This network would cover the Hauts-de-France, Grand Est, and Normandy regions, and would connect the main industrial CO_2 emitting sites in these regions to the compression station developed by NaTran as part of the DKHARBO project at the Port of Dunkirk. The CO_2 transported via this infrastructure would then be injected into the offshore pipeline developed by Equinor, heading toward permanent storage sites located in the North Sea off the coast of Norway, as part of the CO_2 Highway Europe project. This study is therefore part of the broader NaTran–Equinor partnership, whose goal is to develop a large-scale CCS chain originating in northern France.

Scope of the study

In line with NaTran's master plan for the development of a national CO_2 transport infrastructure, the backbone in Hauts-de-France will be supplied by volumes from emitters along its route as well as from emitters in the Grand-Est and Normandy regions.

The CO2 transport infrastructure examined in this feasibility study fits into the CCS chain co-developed by NaTran and Equinor as follows:



The study compared the respective technical and economic merits of various backbone options:

- Different scenarios for transported volumes and collection sites
- Different route options
- Different transport types: gaseous / dense (and potentially a combination of both)

• Different types of pipelines: new / retrofitted

Transport infrastructure design principles

The design of the proposed transport infrastructure complies with regulations governing CO2 transport: the new underground steel pipelines will be inspectable using special inspection pigs.

Network sizing and maximum pperating pressure

Network simulations and technical studies conducted during the feasibility study made it possible to determine the sizing of the network's main pipelines as well as the maximum operating pressure for CO2 transport needs ranging from 2.8 to 9.6 Mt CO2/year, depending on the scenario considered.

Scenarios studied

Two scenarios were examined in this study: the "Cluster" and "Hauts-de-France" scenarios. The "Cluster" scenario encompasses emitters in the Hauts-de-France, Grand-Est, and Normandy regions that are sufficiently close to the shared facility to be connected from a technical and economic standpoint. The "Hauts-de-France" scenario, on the other hand, is limited solely to the Hauts-de-France region (both for the emitters and for the shared facility, which is sized accordingly).

CO2 quality specification

NaTran proposes adopting its own CO2 specification, on a non-binding basis at this stage.

The CO2 specification proposed by NaTran will evolve based on advances in the sector's technical knowledge, the results of laboratory tests on the effect of certain impurities, standardization efforts, regulatory requirements currently being defined, and requirements related to the downstream CO2 export chain to geological storage sites, particularly via offshore pipelines.

Timeline

This feasibility study constituted the first phase of technical analysis for this major national onshore CO2 transport infrastructure project, preceding the launch of a call for expressions of interest (currently underway), which is intended to confirm market interest (from major industrial CO2 emitters in the covered regions) in implementing this infrastructure. If there is sufficient market interest (through client commitments with co-financing for the subsequent technical studies), the feasibility study could be launched in early 2026.

Cost sstimate

The feasibility study provided an initial cost estimate for the two scenarios considered regarding the capital (CAPEX) and operating (OPEX) costs of implementing the CO_2 pipeline network connecting the identified emitters to the DKHARBO network in Dunkirk.

Pricing principles

The tariff structure is identical to that presented in the report on the feasibility study for the CO2 network in the Dunkirk area.

A tariff based on the principle of capacity at the offshore pipeline inlet will apply and will be included in the transportation contract. For customers who use it, this tariff is added to the tariff for the CO2 gas transportation network. It is based on a pricing principle for offshore pipeline entry capacity combined with long-term capacity subscriptions.

This subscription entitles shippers to use this transport capacity at any time during the subscription period, ranging from 0% to 100% of the subscribed capacity.

The price paid by shippers for the CO2 transport service is expressed as:

• A capacity tariff component that applies to the shipper's offshore pipeline entry capacity and is expressed in €/t/h per year.

• A volume-based tariff component representing the variable cost of OPEX (in particular the energy required for compression) and is expressed in €/ton injected.

RÉSUMÉ

This study analyzes the feasibility of a CO_2 transport network in the Hauts-de-France, Grand Est, and Normandy regions. The project aims to connect major industrial emitters to a compression station developed by NaTran in Dunkirk, in order to transport CO_2 to geological storage sites in the North Sea via an offshore pipeline.

The study compares several network, route, and transport technology scenarios to assess the technical requirements and associated costs. Two main scenarios were examined: a network limited to Hauts-de-France and a network extended to neighboring regions.

This study serves as a first step toward a feasibility study scheduled to begin in 2026, subject to sufficient commitment from the relevant industrial partners.

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