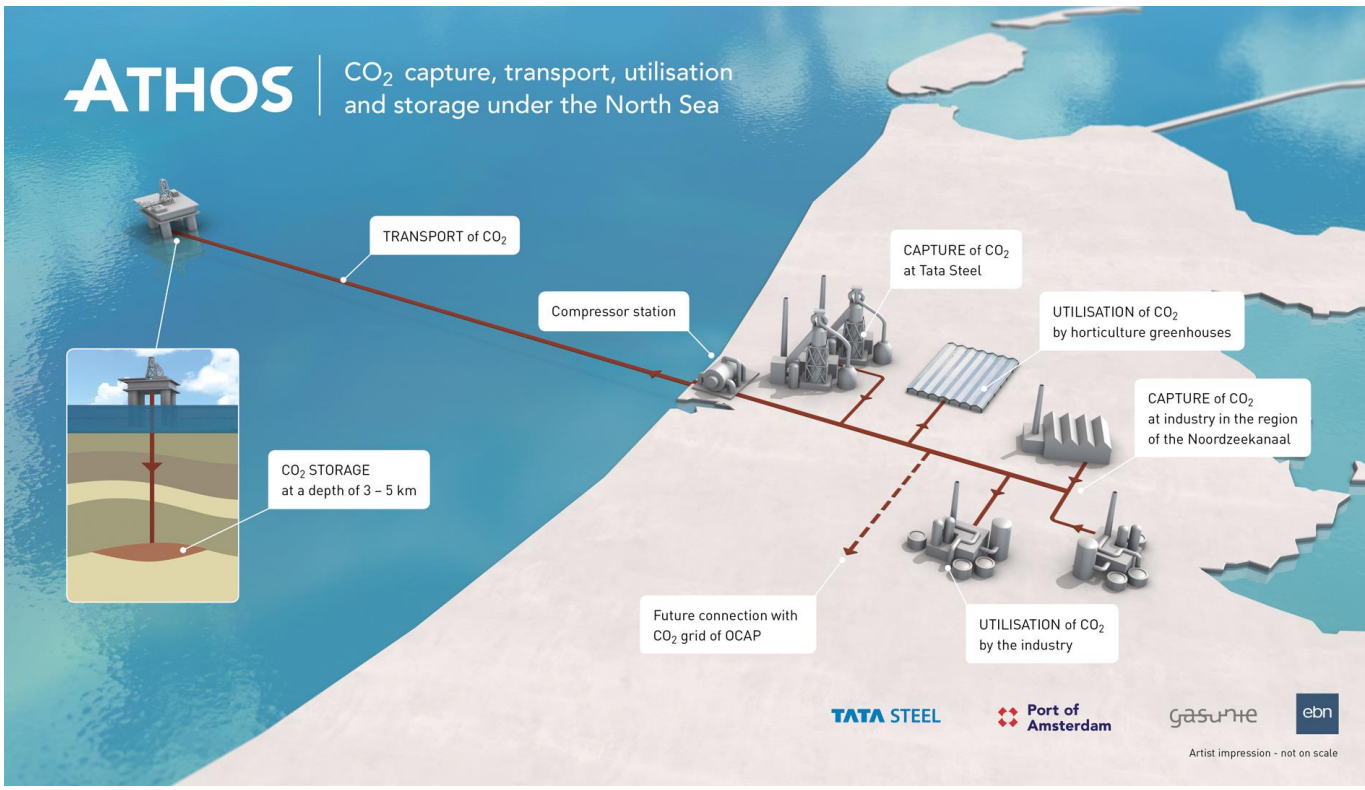
Public Report

The Athos project has been initiated for the construction of a basic capture- and transport infrastructure in the North Sea Canal area, to enable the usage or storage of CO_2.



Project name: Athos

Participants: Gasunie, EBN, Tata Steel IJmuiden B.V., Port of Amsterdam

Study: Concept Select study

Medegefinancierd door de financieringsfaciliteit voor Europese verbindingen

De inhoud van dit document valt onder de verantwoordelijkheid van Athos en komt niet automatisch overeen met de mening van de Europese Unie.

Het project is uitgevoerd met Topsector Energiesubsidie van het Ministerie van Economische Zaken.

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1. Introduction

ATHOS is the abbreviation for Amsterdam-IJmuiden CO_2 Transport Hub & Offshore storage and was initiated by the partners Gasunie, EBN, Port of Amsterdam and Tata Steel in 2018 with the purpose to explore the feasibility of the development of a CCUS project in the region of the Noordzeekanaalgebied (NZKG). The aim of the consortium was to study the feasibility of a large-scale, open-access transport and storage system to enable emission reduction for industrial CO_2 emitters.

In June 2019 the feasibility phase was concluded. The purpose of the concept select phase was to select a concept and to prepare the project for the execution of Front-End Engineering & Design (FEED) studies in the next phase. It was planned that the concept select phase will be concluded in Q1 2021, however this was not possible due to two external circumstances.

1. The discussions with offshore operators and the results of the Request of Information (RFI) process showed that offshore parties do not want to provide CO_2 storage as a standalone service. Therefore it was not possible to select a storage for ATHOS. As it is unclear what the roles of state-owned companies in the CCS value chain will be, the storage selection process by ATHOS could not move forward.
2. Moreover, the start of the permitting process is influenced by a process of EZK called the "Ruimtelijke Verkenning". ATHOS cannot start its permitting process before this process is concluded.

The aim of this report is to show the analyses and results of what has been investigated so far during the concept select phase.

2. Concepts considered

Commercial

During the concept select phase, the project team identified potential suppliers of CO_2 and the possible volume of CO_2 to be supplied to the Athos network located in the NZKG. A total of 14 companies that responded resulting in a potential CO_2 supply of 1 Mton/a in 2023 increasing to 18,3 Mton/a CO_2 in 2034.
The cumulative CO_2 volumes for CCU was up to 2 Mton/a.

CO_2 storage

Overall, this interest covered almost 15 Mton/a liquid CO_2 and 11 Mton/a of gaseous CO_2 (emitters that could potentially be connected via onshore pipelines).
It has been decided to develop liquid CO_2 and gaseous CO_2 in different phases. Phase 1 consists of developing a transport system for gaseous CO_2 , and phase 2 the development of liquid CO_2 intake. We see that plot space for the liquid intake is challenging for the coming decade.

CO_2 utilisation

In the feasibility phase of ATHOS the use of the ATHOS system for the purpose of utilization of CO_2 (CCU) was identified to have significant potential in the NZKG. During the concept select phase the potential for CCU in the NZKG was re-confirmed during meetings with parties developing synthetic fuel projects and the horticulture sector.

Technical

Storage select

As it became clear during the concept select phase that emitters are aiming for a SDE++ application for their capture projects in October/November 2021 instead of 2022 and state-owned companies were not allowed to hold a position in 'storage' in the CCS value chain, it was decided that emitters have to start talking with storage operators directly to contract a CO_2 storage service. ATHOS will develop the CO_2 transport network between the CO_2 capture plants of the emitters and the storage of CO_2.

CO_2 conditions and composition

The composition of the CO_2 from each emitter will differ. The impurity components H_2O and H_2S can cause corrosion of the pipe materials. The impurities of the composition will also affect the dew point line, with effect on the development of the compressor design and reservoirs. During concept select phase a study was executed to investigate the effects of impurities.

Onshore gathering pipeline

To connect Amsterdam with Ijmuiden, a pipeline of 20-25 km should be developed. Regarding the pipeline between Amsterdam and IJmuiden, two options are being investigated: re-use of the existing 20" Petrogas pipeline and the installation of a new pipeline
The sizing and pressure is dependent on the amount of CO_2 to be transported.

Central facility

The proposed concept for the next phase of ATHOS includes a central facility that comprises a compressor station that will receive gaseous CO_2 from Tata Steel and gaseous CO_2 from the IJmuiden – Amsterdam pipeline. Based on a design capacity of 11 Mton/a (maximum technical capacity), the estimated space for the Central Facility is 30.000 m^2 (3ha). As no storage has been selected yet, two or more scenario's will need to be developed during the coming period to allow the final selection of the store determine the final scenario in a later stage.

Offshore pipeline

The concept design of the high pressure offshore pipeline and storage depends on the selected storage. The ATHOS project has during the concept select phase mainly focussed on developing a point to point solution as a stand-alone CCS solution, however discussions are ongoing with other CCS initiatives to cooperate together to realize synergies for the offshore transport system. This could result that ATHOS will tie-in on a backbone.

3. Economic feasibility

The investments required for the realization of the Athos project are substantial. In the Concept Selection phase, an explicit effort was made to create sufficient scale on the supply side to guarantee the affordability of the infrastructure, while at the same time taking possible future growth into account when sizing the system. This will also involve “volume risks” and it is therefore important that appropriate forms of financing become available that make this possible.
With a well-sized system, after commissioning, the threshold for emitters to proceed to CO2 reduction using CCS will be greatly lowered, which will improve the feasibility of the goals of the climate transition.

Grants

During the concept selection phase, the subsidy strategy for the pre feed / feed phase was drawn up
The subsidy strategy is based on the knowledge and the current state of affairs.

In addition to capex subsidies, there are also tax subsidies that can contribute to lowering costs because less tax has to be paid.
The list with eligible investment is published each year.

4. Conclusions

After completion of the Concept Selection phase of the project, the partners will make a decision on how to proceed further. The Athos project is being further developed so that eventually all preparations, procedures for obtaining permits and the spatial integration of the landside infrastructure and the compressor station. Furthermore, the partners will finalize the financing of the project and make the relevant preparations for the future operational organization.
Once the irrevocable permits have been obtained for the realization of the project, the partners will take the final investment decision.