2018-IP17: Port of Rotterdam making great strides to cut its industrial CO_2 emissions

The CEO of the Port of Rotterdam Authority recently announced at the Energy in Transaction Summit they hosted in Brussels that Port Authority, that Gasunie[1] and EBN[2] have completed a feasibility study on CCUS[3]. The feasibility study shows that capturing and transporting CO_2, and storing it deep under the North Sea, is technically feasible. It is also cost-effective in comparison with other measures that contribute to achieving the Dutch government's climate goals. The three companies have investigated whether a next step in the project can be made because of the components engineering, market situation, environment, costs, policy and social acceptance. That has been positive.

The project in question is the so-called Porthos project. That stands for Port of Rotterdam CO_2 Transport Hub & Offshore Storage. The concept for this CCUS project (Carbon Capture Utilization and Storage) consists of a collection pipeline through the port area in Rotterdam, which functions as a basic infrastructure that various companies can connect to for the delivery of the CO_2 they capture.

This CO_2 is then partly used by greenhouse horticulture in Zuid-Holland[4] to allow plants in greenhouses to grow faster. The vast majority, however, will be transported by pipeline to an empty gas field that lies about 25 km off the coast under the North Sea. There, the CO_2 is then pumped into the deep subsurface under the seabed, in the closed reservoir of sandstone where previously natural gas was present. The expectation is that for this project in Rotterdam, 2 to 5 million tons of CO_2 can be stored annually.

CCUS is especially important for the chemical sector, hydrogen producers and refineries in the Rotterdam port area that have insufficient possibilities to fundamentally make production processes more sustainable in the short term. These branches of industry will eventually start using electrification and hydrogen, but that requires a change in the energy system. For these companies, CO_2 capture and storage is an important option to reduce the impact of their production in the short term while simultaneously working on fundamental and structural innovations in production processes.

CCUS therefore mainly applies as a cost-effective and quickly applicable solution that is indispensable to realize the objectives as set out in the Paris Climate Agreement in time. With the outcome of the study, the Port of Rotterdam Authority, Gasunie and EBN are convinced of both the technical feasibility and the urgency to develop CCUS. They will now contribute the results of the study as a building block in the ongoing discussions for a new Climate Agreement.

In the coming months, the Port Authority, Gasunie and EBN will focus on the further financial and technical underpinning of the project. The partners do this each from their own expertise: the Port of Rotterdam Authority from the local situation and market, EBN with its expertise in the deep underground and offshore infrastructure and Gasunie with the experience of gas infrastructure

---

[1] https://www.gasunie.nl/en

[2] Energie Beheer Nederland (EBN) is a company that invests in the exploration, extraction and storage of gas and oil on behalf of the State. In a safe, sustainable and economically responsible manner, EBN realises societal and economic value from the Dutch subsurface. EBN serves a public interest: contributing to an independent, reliable power supply in the Netherlands.

[3] https://www.portofrotterdam.com/nl/nieuws-en-persberichten/co2-opslag-onder-noordzee-technisch-haalbaar-en-kosteneffectief (In Dutch only)

[4] www.the-linde-group.com/en/clean_technology/clean_technology_portfolio/co2_applications/greenhouse_supply/index.html

development and gas transport. Getting the business case around in detail is an important part of the next phase. An investment decision for the CCUS project is expected in 2019.

In a previous study, the Wuppertal Institute looked in detail at which transition pathways the Port of Rotterdam's industrial sector can follow to drastically cut back its CO_2 emissions, while continuing to manufacture products for which there is a public demand like fuels and chemical products.

The main conclusion of this study is that by using a number of different techniques, it is possible to reduce CO_2 emissions by up to 98%. The institute's study was commissioned by the Port of Rotterdam Authority, which aims to turn Rotterdam's port area into a frontrunner in the current energy transition[5].

Press release https://www.portofrotterdam.com/en/news-and-press-releases/study-outlines-how-rotterdams-industrial-sector-can-comply-with-paris

The link to the full report can be found at bottom of the press release

The Wuppertal Institute has researched which options the Port of Rotterdam has to bring its industrial sector in line with the targets set out in the Paris Agreement on climate change. Winding down specific industrial activities is considered to be out of the question, since in the longer term, society will continue to need all sorts of chemical products and fuels. While certain parts of the transport network can be electrified, for the time being, this still presents a challenge in the case of aviation and marine shipping. Ceasing particular industrial activities in Europe would only result in our importing the associated products. On balance, this would merely lead to the relocation of industry, with many people in the Netherlands losing their job. In other words, it makes more sense to realise a transition towards production with a significantly smaller CO_2 footprint. The Wuppertal Institute has worked out four possible transition pathways in this context.

The first pathway is a '***Business as Usual'*** scenario. As its name implies, this scenario does not involve any major breaks in the trend. Improved efficiency in the industrial sector thanks to the implementation of '***best available technology***' will result in lower emission levels. In addition, production is expected to decrease because of a reduced demand for fuels. This scenario will result in 30% fewer CO_2 emissions by 2050. However, this does not meet the e targets set out in the Paris Agreement.

The second scenario, 'Technological Progress' is a lot closer to the mark. The key element in this scenario is the large-scale capture and storage of CO_2 a reduction of 75%,

Two other transition pathways presently suggest a potential CO_2 reduction of 98%. The third pathway is '***Biomass and CCS'***, which relies heavily on a combination of carbon capture and storage and the use of biomass as a feedstock for chemical production. The fourth and final pathway is '***Closed Carbon Cycle'***, which is focussed on closing various loops. While fossil resources are still used in this pathway, they are almost entirely recycled.

[5] The Netherlands has committed to the Paris Agreement climate targets to keep climate change within agreed limits. This needs a very drastic reduction in carbon emissions. The Port of Rotterdam Authority intends to develop the port of Rotterdam into the heartland of the energy transition. "The companies in Rotterdam's port emit considerable CO_2, but they also have a great deal of knowledge about energy, energy-intensive production processes and CO_2 reduction. This puts the port of Rotterdam in a very good position to be an international leader in developing techniques, and applying them on a large scale, to reduce the industry's carbon emissions to virtually zero

Each transition pathway presents its own challenges or bottlenecks, including the availability of sufficient biomass or the difficulty of capturing 100% of CO_2 emissions or arranging a completely sustainable power generation system. Moreover, each transition pathway involves various technological uncertainties. Consequently, none of the aforementioned pathways can be considered a panacea – rather, we will need to use a combination of approaches to achieve our intended objective. In addition, the pathways all have a number of technologies in common, including hydrogen production based on electrolysis powered by sustainable energy (offshore wind power, for example), the electrification of industrial processes and the utilisation of residual heat.

A number of other projects underway in the Rotterdam port area are already in line with these transition pathways. Examples include the development of a regional heat network[6], the conversion of plastic waste into chemical products (waste to chemicals),[7] biobased fuels and chemical industry, the landing of power generated by North Sea wind farms, electrolytic hydrogen production[8], etc. Projects of this kind can serve as drivers and catalysts for the economic renewal of Rotterdam's industrial complex.

John Gale
26/04/2018

[6] https://www.portofrotterdam.com/en/cargo-industry/energy-industry/energy-infrastructure

[7] https://www.portofrotterdam.com/en/news-and-press-releases/partners-start-financing-waste-to-chemistry-project-in-rotterdam

[8] http://royaldutchshellplc.com/2018/01/23/shell-and-itm-power-to-build-worlds-largest-hydrogen-electrolysis-plant-in-germany/