

Fall 2024/Status of CO₂ Management

Report to the Ministry of Foreign Affairs from Gassnova SF (Norway)

Summary

The Northern Lights project is nearing completion, with 98.8% of infrastructure in place. The Øygarden terminal, central to the project's CO₂ reception system, is currently being prepared for operations. This terminal will receive CO₂ from both national and international sources, which will then be transported via pipelines to be stored 2,600 meters below the seabed. Northern Lights also features three dedicated CO₂ transport ships; Ship 1 is 99% complete, Ship 2 is at 96.8%, and Ship 3 is on schedule to support the operational start.

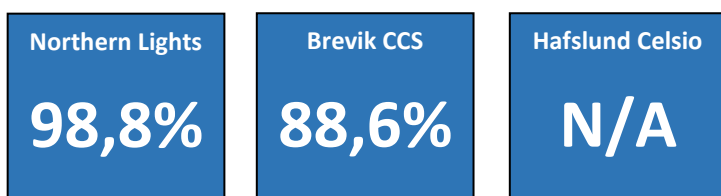
Agreements with international partners, such as Yara and Ørsted, will bring CO₂ from the Netherlands and Denmark, respectively, underscoring Northern Lights' role in Europe's carbon management network. The European Commission has committed €130 million for the project's commercial expansion (phase 2). The project's focus on Health, Safety, and Environment (HSE) has resulted in no major incidents, and its official opening gained substantial media attention.

Brevik CCS is also progressing, with 88.6% of the construction work completed. The facility faced delays due to external factors but is now in the testing phase, preparing to capture CO₂ starting in 2025. Heidelberg Materials, which operates Brevik, sees the project as a template for future CCS initiatives in Europe and North America. Brevik CCS has already launched Evo Zero cement for net-zero emission concrete, initially produced with CO₂ captured at Brevik. Despite cost overruns, the Norwegian government and Heidelberg Materials have agreed to fund up to NOK 150 million to ensure completion.

The Hafslund Celsio project, focused on capturing CO₂ at a waste-to-energy plant in Oslo, is on hold. Efforts are underway to further mature cost analysis, with the goal of making a final investment decision by the end of the year. Once operational, the plant could capture up to 350,000 tons of CO₂ annually, contributing significantly to Oslo's emission reduction goals.

The Longship project is set to be ready for operation in 2025, with CO₂ captured at Brevik CCS, transported, and permanently stored through Northern Lights.

Percentage completed as of the end of October 2024:



Gassnova SF, 1 November 2024

Background on Longship

- **Longship** is a Norwegian carbon capture and storage (CCS) project, partially funded by the government. The project aims to demonstrate industrial CCS in a whole value chain and by that assist Europe in achieving carbon neutrality, help reduce CO₂ emissions from high emission sectors and enable industrial carbon removal by capturing biogenic CO₂ (negative emissions)
- A carbon capture facility is under construction at Heidelberg Materials' cement plant in **Brevik (Brevik CCS)**, with plans to capture around 400,000 tons of CO₂ annually.
- **Hafslund Celsio** began construction of a carbon capture facility at its waste incineration plant in Oslo in August 2022 but paused construction in April 2023 due to cost estimates. The facility is expected to capture approximately 350,000 tons of CO₂ annually.
- **Northern Lights** is developing a solution for the transfer and storage of CO₂. CO₂ will be transported by ship from various emission sources, including Heidelberg Materials and Hafslund Celsio, to a reception facility near Bergen. From there, CO₂ will be piped for permanent storage, 2,600 meters below the seabed.

Roles in Longship

- **Ministry of Energy** – Responsible for Norway's CCS policy and Longship on behalf of the government
- **Ministry of Foreign Affairs** – Coordinates Norway's foreign service and embassies
- **Gassnova** – A state-owned enterprise following up on Longship on behalf of the Ministry of Energy
- **Northern Lights** – A company (a joint venture owned by Equinor, Shell, and TotalEnergies) tasked with receiving CO₂ from Heidelberg Materials and Hafslund Celsio. Northern Lights offers transport and storage services to several companies across Europe
- **Brevik CCS** – Heidelberg Materials' carbon capture project at the cement plant in Brevik
- **Hafslund Celsio** – Owner of a waste incineration plant in Oslo. A new project plan for their CO₂ capture project is under development

Industry Projects in Longship

Northern Lights

Progress and Status

The Northern Lights project has reached 98.8% completion. The onshore and offshore facilities are completed and was officially opened by the Norwegian Minister of Energy on 26 September. The Øygarden terminal, the central part of the CO₂ reception system, is in the commissioning phase to prepare for operational start. The terminal will receive CO₂ from both national and international sources, which will then be transported via pipelines for permanent storage, 2,600 meters below the seabed.

Northern Lights will use dedicated ships to transport CO₂ from industrial facilities. Ship 1 is 99% complete, and Ship 2 is 96.8% finished. Ship 3 is at an earlier stage of construction but is expected to be ready by the planned operational start date.

An experience report, [the Annual Experience Transfer Report](#), was published this summer.

International Agreements and Collaboration

Northern Lights has secured key agreements with international partners for CO₂ transport and storage. Yara will send up to 800,000 tons of CO₂ annually from its plant in the Netherlands to Northern Lights. The Danish energy company Ørsted, supported by the Danish state, will contribute 430,000 tons of CO₂ from bio-powered thermal power plants. This highlights how Northern Lights is already integrated into Europe's greenhouse gas reduction efforts and is contributing to the development of the CDR market.

Northern Lights has received a commitment of 130 million euros in support from the European Commission through the Connecting Europe Facility (CEF), to support an investment decision for the phase 2 commercial expansion. The company had previously received support for studies and pre-investments related to phase 2.

Environment, Safety, and Visibility

Health, safety, and environment (HSE) have been a focus throughout the construction phase. As of September 2024, no serious HSE incidents have been reported, reflecting the project's attention to safety.

Northern Lights has gained visibility both nationally and internationally. In September, an event marking the facility's readiness to receive CO₂, attracted media coverage from outlets such as TV2, NRK, and international media like ZDF. Since construction began in 2021, the facility has had over 10,000 visitors, including political leaders, industrial partners, and international delegations.

Images and illustrations – [News, media and technical reports - Northern Lights \(norlights.com\)](#)

Brevik CCS

Progress and Status

The Brevik CCS project has reached 88.6% completion. Construction of the carbon capture facility has been progressing despite delays (approx. 10 months), related to the pandemic and war in Ukraine. Preparations for commissioning are underway, with testing of systems such as piping, water treatment, and steam and condensate systems. The facility is expected to be ready for the first CO₂ capture in 2025.

Heidelberg Materials has a portfolio of projects following this one, mainly in Europe and North America. The Brevik CCS project is being used as a learning model within the company.

Heidelberg Materials has launched Evo Zero cement, which will enable net-zero emission concrete. Initially, this will be based on cement produced with CO₂ management at Brevik.

[A Lessons Learned Report](#) was published this summer.

Cost Management and Financial Support

The project has faced challenges related to cost overruns. Heidelberg Materials and the Norwegian government have signed an agreement ensuring the project's completion despite

these challenges. The project will receive up to NOK 150 million in startup support when the facility is ready to deliver its first CO₂ load.

International Importance and Future Opportunities

Brevik CCS has garnered attention both nationally and internationally. It is the first carbon capture facility worldwide in the cement industry and will contribute to reducing greenhouse gas emissions. Heidelberg Materials is expanding its CCS efforts with similar projects, such as the Slite CCS project on Gotland, Sweden, which could capture up to 1.8 million tons of CO₂ annually – four percent of Sweden’s total emissions.

Health, Safety, and Environment (HSE)

HSE has been a priority throughout the entire project. As of September 2024, no serious HSE incidents have been reported. The project recently recorded over 1 000 000-man hours worked and maintains strict safety standards during the construction phase. These standards will remain in place during commissioning and operations.

Images and illustrations – [Brevik Media | Heidelberg Materials](#)

Hafslund Celsio

Project on Hold

In April 2023 Hafslund Celsio decided to put the implementation of the CO₂ capture project at the waste-to-energy facility at Klemetsrud, on a cost reduction phase – to assess solutions to the increased cost estimates of the project.

Hafslund Celsio has conducted two FEED projects with SLB Capturi (Aker Carbon Capture), Aker Solutions, to develop carbon capture at the waste-to-energy facility, and Aker Solution for the intermediate storage at the Port of Oslo. The capture facility will be based on SLBs modularized Just Catch 400 unit. The ambition to reach a new investment decision by the end of the year is still valid. When the plant becomes operational, it will be able to capture up to 350,000 tons of CO₂ annually, contributing to reducing Oslo’s greenhouse gas emissions.

The changes to the carbon capture project in Oslo do not affect the completion of Longship as a full-chain CCS project. From 2025, Heidelberg Materials will capture CO₂, and Northern Lights will transport and permanently store it.

Images and illustrations – [Mediebank | Hafslund \(ntb.no\)](#)

More on CCS

Exploration Licenses

As of October 2024, four new exploration licenses have been granted for CO₂ storage on the Norwegian continental shelf. The licenses have been awarded to six companies – Equinor, Aker BP, Vår Energi, OMV (Norge), Lime Petroleum, and PGNiG Upstream Norway. The licenses cover areas in the North Sea and are expected to contribute to the development of CO₂ storage capacity in Norway. Equinor received two of the licenses, each with a potential storage capacity of around five million tons of CO₂ annually. This is part of Norway’s ambition to establish itself as a leader in commercial CO₂ storage for industrial emission sources across Europe.

More Information – [CO2-lagring - Sökkeldirektoratet \(sodir.no\)](#)

The EU Innovation Fund

The European Union's Innovation Fund has allocated over 484 million euros, or approximately NOK 5.7 billion, to support the development of climate-focused technologies in Norway. This represents the largest grant ever awarded to Norwegian projects from the fund, underscoring Norway's leadership in advancing sustainable innovation in line with the EU's 2050 climate goals.

Among the recipients, Altera Infrastructure secured NOK 2.63 billion for its STARFISH project, a major component of the Stella Maris carbon capture and storage (CCS) initiative. The STARFISH project is designed to facilitate large-scale CO₂ sequestration through the use of shared offshore infrastructure. This innovative solution will enable the transportation and injection of liquid CO₂ for secure storage in the Havstjerne reservoir, located off Norway's coast. The project aligns with the EU's environmental objectives.

CO₂ Management in the 2025 National Budget Proposal

Norway has an ambition to reduce greenhouse gas emissions through CCS. CO₂ management is one of the key measures in the government's climate policy, with Gassnova playing a central role as a technological catalyst and advisor. Through projects like Longship and Northern Lights, Norway is facilitating commercial CO₂ storage on the continental shelf and promoting innovative solutions to global climate challenges.

Commercial CO₂ Storage on the Norwegian Shelf

The goal of managing subsurface reservoirs on the Norwegian shelf is to support sustainable energy and industrial production through the safe storage of CO₂. Government supports commercial CO₂ storage by allocating storage areas to companies with industrial plans requiring CO₂ storage. Six licensing rounds have been conducted, and eleven permits have been granted. The seventh licensing round is under planning.

Gassnova

Gassnova SF plays a key role in developing technologies for CO₂ capture, transport, and storage. Gassnova supports the government's goal of developing cost-effective solutions for CO₂ management, including follow-up on the Longship project, the CLIMIT program, and the Technology Centre Mongstad (TCM). TCM is the world's largest test center for CO₂ capture technology. The facility helps reduce costs and risks for the full-scale implementation of CO₂ capture.

Longship Project and Northern Lights

Longship is Norway's flagship full-scale CO₂ management project and will be operational by 2025. From 2024, Northern Lights will be able to receive CO₂ from Ørsted in Denmark and Yara in the Netherlands through long-term commercial agreements. This is a significant step toward developing international infrastructure for CO₂ storage.

Financial Support and Incentives

The government has allocated significant funds to support CO₂ management in Norway (proposals):

- NOK 2,160 million for the Longship project
- NOK 118 million for Gassnova SF for technology development
- NOK 89 million for the Technology Centre Mongstad
- NOK 80 million for research and development through the CLIMIT program

CO₂ Management as a Climate Measure

Norway is a leader in CO₂ management technology, and this plays a key role in the country's greenhouse gas reduction goals. The government promotes CO₂ management internationally, and projects like Longship demonstrate that CO₂ capture and storage are both feasible and safe. The project paves the way for learning and cost reductions for future projects. The Norwegian Environment Agency estimates that CO₂ management could reduce emissions from Norway's land-based industry and waste sector, by up to 5,4 million tons of CO₂ equivalents by 2035.

Barriers and Future Measures

Reports from Oslo Economics and SINTEF Energy have identified barriers and market challenges in the CO₂ management value chain, including high costs and uncertain CO₂ prices. To promote faster implementation of more CO₂ capture plants in Norwegian industry, it is recommended to establish temporary subsidy schemes that treat fossil and biogenic emissions equally. The state should also contribute to coordinating storage and transport services. The government plans to follow up on these recommendations and is considering measures to strengthen the CO₂ management value chain. Efforts will also continue to enhance collaboration with international players like the EU to develop frameworks and regulations for CO₂ management.

More Information – [Statsbudsjettet 2025 - regjeringen.no](https://statsbudsjettet2025-regjeringen.no)

Support

Useful links

- [Spørsmål og svar om Langskip-prosjektet - regjeringen.no](https://sporsmal-og-svar.om-langskip-prosjektet-regjeringen.no) (ENG/NO)
- [Tidslinje for Langskip \(CCS\) - regjeringen.no](https://tidslinje-for-langskip-ccs-regjeringen.no) (ENG/NO)
- [Full-scale CCS project in Norway - Longship | Reaching the climate goals \(ccsnorway.com\)](https://full-scale-ccs-project-in-norway-longship-reaching-the-climate-goals-ccsnorway.com) (ENG/NO)
- [Northern Lights \(norlights.com\)](https://northern-lights-norlights.com) (ENG/NO)
- [Norcem og karbonfangst | Norcem](https://norcem-og-karbonfangst-norcem) (ENG/NO)
- [Oslo CCS | Hafslund](https://oslo-ccs-hafslund) (ENG/NO)

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