

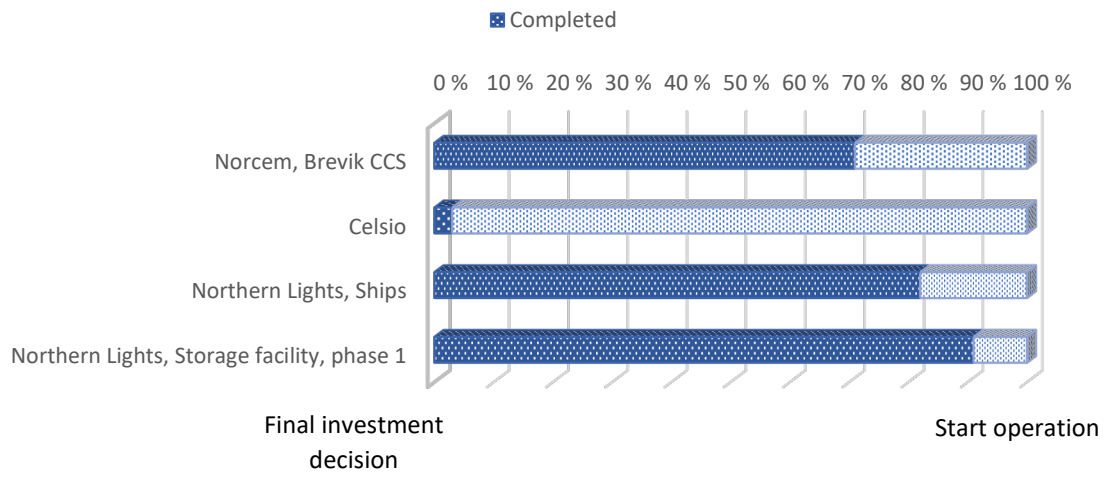
## Highlights

- Construction of the Northern Lights CO<sub>2</sub> transport and storage infrastructure and Heidelberg Materials' capture plant is progressing. Brevik CCS is 71% completed and the Northern Lights storage facility is 91% completed.
- Hafslund Oslo Celsio (Celsio) decided in April 2023 to introduce a twelve-month cost reduction phase and place the construction on hold at the waste-to-energy facility at Klemetsrud. An updated cost estimate showed that the carbon capture project would exceed the maximum budget stipulated in its government funding agreement. A FEED contract with Aker Carbon Capture and Aker Solutions to develop carbon capture is now signed. Celsio has scheduled a new final investment decision in the summer of 2024.
- Longship will be operational in 2025 with captured CO<sub>2</sub> from Brevik, transport and storage, behind the initial plan (late 2024), according to the latest communication from the Government<sup>1</sup>.
- Northern Lights has finalized the transport and storage agreement with Yara to store up to 800,000 tonnes of CO<sub>2</sub> annually from Yara's ammonia and fertiliser plant in Sluskil, Netherlands. Northern Lights has also entered into transport and storage agreement with Ørsted to store 430,000 tonnes biogenic CO<sub>2</sub> per year from two power plants in Denmark from 2026. These projects utilize the overcapacity in the Northern Lights infrastructure already established through the Longship project.
- Northern Lights was selected by the EU Commission in December 2023 to receive € 131 million from Connecting Europe Facility (CEF) for construction works for a Phase 2. Northern Lights are currently in dialogue with the Commission related to the conditions for this potential grant.

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<sup>1</sup> Norwegian Government. (2023). Prop. 1 S (2023–2024

- Overall progress of Longship's construction phase:



## Background – about Longship

- The CCS project Longship, partly funded by the Norwegian government, includes capture, transport and storage of CO<sub>2</sub>.
- A carbon capture facility is currently being built at Heidelberg Materials' cement plant in Brevik, Norway. According to plan, the facility will capture approximately 400,000 tonnes of CO<sub>2</sub> annually.
- Celsio started building a carbon capture facility at their waste-to-energy plant in Oslo in August 2022, but decided to put construction on hold in April 2023 due to a large increase in cost estimates. The project has entered into a cost reducing period of 12 months. According to the initial plan, approximately 400,000 tonnes of CO<sub>2</sub> will be captured annually from Celsio's plant.
- Northern Lights is currently developing a solution for the transport and storage of CO<sub>2</sub>. The CO<sub>2</sub> will be transported by ship from the various emission sources, including the CO<sub>2</sub> from the industrial capture sites of Heidelberg and Celsio, to a receiving facility near Bergen, before being transported by pipeline for permanent storage in a reservoir located 2600 metres below the seabed.
- Several measures are needed to enable European countries to achieve carbon neutrality. Longship will help the hard-to-abate industries reduce their CO<sub>2</sub> emissions and make industrial carbon removals possible through capture of biogenic CO<sub>2</sub> (negative emissions).

### Roles in Longship

- **Ministry of Energy** – Responsible for Norway's CCS policy and Longship on behalf of the Norwegian government
- **Ministry of Foreign Affairs** – Coordinates Norway's foreign service and embassies
- **Gassnova** – State owned company following up Longship on behalf of the Ministry of Energy
- **Northern Lights** – Transport and storage company (Joint Venture owned by Equinor, Shell and TotalEnergies) planning to receive CO<sub>2</sub> from Heidelberg Materials and Hafslund Oslo Celsio, and aiming to provide transport and storage as a service to multiple companies in Europe.
- **Brevik CCS – Heidelberg Materials** – Capture site under construction at the cement plant in Brevik
- **Hafslund Oslo Celsio** – Capture project, now on hold, at the waste-to-energy plant in Oslo

## Status Northern Lights

- Construction of the Northern Lights CO<sub>2</sub> storage facility is **90,1%** completed (2023.12.31). The storage infrastructure consists of an onshore receiving terminal, a subsea pipeline, two injection wells and the storage complex. Northern Lights has completed leak testing of flanges and drying of piping systems in the period. Work scope at Oseberg field center, where the operation will be run from, is completed.
- Dalian Shipbuilding Offshore Co., Ltd. (DSOC) is building ships dedicated for CO<sub>2</sub> transport for Northern Lights. On September 1, Northern Lights awarded the third ship building contract to

DSOC. The overall progress for the first two ships, including detailed design, engineering, procurement etc., are now **82,4 %** completed (2023.12.31) and it will be delivered in 2024.

- Northern Lights has entered into a transport and storage agreement with Yara to store up to 800,000 tonnes of CO<sub>2</sub> annually from Yara's ammonia and fertiliser plant in Sluskil, Netherlands from 2025. The agreement is approved by the Norwegian Ministry of Energy. Northern Lights has also entered into transport and storage agreement with Ørsted to store 430,000 tonnes biogenic CO<sub>2</sub> per year from two power plants in Denmark from 2026.
- Northern Lights has ambitious growth plans and aims to expand its storage capacity in line with market development and the maturation of commercial agreements. For the next phase development, Northern Lights targets an additional capacity of 3.5 million tonnes per year.
- Northern Lights was recently awarded €131 million under the EU Connecting Europe Facility (CEF) funding scheme. Almost €480 million is awarded to four CO<sub>2</sub> transport and storage projects in Europe. According to the European Commission, they constitute the first building blocks of a future Europe-wide carbon value chain that are scheduled for completion before the end of the decade and are therefore expected to contribute to the EU's 2030 decarbonisation objectives.
- Northern Lights has been included a Project of Mutual Interest (PMI) by the European Commission on its [new list of EU energy Projects of Common and Mutual Interest \(europa.eu\)](https://european-council.europa.eu/media/en/press-communications/infographic/infographic-2023-12-14-1)
- Northern Lights received 98 visitors to site in December, bringing the total number of visitors up to a total of approx. 6400 since start.



*Northern Lights' CO<sub>2</sub> receiving terminal in Øygarden.*

## Status Heidelberg Materials

- Overall accumulated actual progress is **71,3%** for the Brevik CCS Project (2024.01.08).
- Heidelberg Materials experiences some delay of installation of piping and structural steel. Most of the piping prefabrication is completed.
- The compressor walls and the CO<sub>2</sub> jetty including the underground CO<sub>2</sub> piping were finished in December 2023.
- A very important milestone was reached in August 2023 with the lifting into position of the absorber and absorber stack. This piece of equipment is now the highest point of the Brevik Plant and is a very visible testimony that Brevik CCS is progressing.
- The Norwegian state and Heidelberg Materials have signed an agreement securing completion of the capture project after the communicated cost overrun. According to the agreement, Heidelberg Materials has undertaken to complete the project and cover increased costs. In return, the company retains a larger share of the potential return on the project. The state will provide a start-up grant of up to NOK 150 million when the facility is ready to ship the first load of CO<sub>2</sub> to Northern Lights.
- Brevik CCS has experienced vast interest internally and externally. The installation of the absorber has received a lot of attention both externally as well as internally within Heidelberg Materials.
- Heidelberg Materials has since the start of Longship further progressed in the field of CCS, and now has several planned projects underway. One of them is Slite CCS on Gotland, Sweden, which is one of Europe's largest CCS projects with a target of capturing up to 1.8 million tonnes of CO<sub>2</sub> annually. This corresponds to 4 % of Sweden's total emissions today.



*Heidelberg Materials' plant will be transformed with a new capture plant on site.*

## Status Celsio

- Hafslund Oslo Celsio (Celsio) have signed a FEED contract with Aker Carbon Capture and Aker Solutions to develop carbon capture at the waste-to-energy facility at Klemetsrud in Oslo, Norway.
- The FEED contract follows Celsio's cost reduction initiative launched in April of 2023 for the Oslo CCS project and will be delivered based on Aker Carbon Capture's modularized Just Catch 400 unit, with a design capacity to capture up to 400,000 tonnes of CO<sub>2</sub> per year. Celsio introduced the cost reduction phase after an updated cost estimate showed that the carbon capture project would exceed the investment decision and maximum budget stipulated in its government funding agreement.
- As part of the cost reduction phase, new vendors were brought in to present alternative solutions that could lower costs. On the basis of feasibility and concept studies conducted, Aker Carbon Capture and Aker Solutions were selected to perform a FEED with the framework for a possible EPCIC.
- They also investigate possible avoided costs and future revenue as important factors before reaching a new final investment decision in the summer of 2024.
- Celsio is owned by Hafslund, Infranode and HitecVision.
- The changes to Celsio's project will not have any impact on the completion of Longship as a whole chain for capture, transportation and storage of CO<sub>2</sub>. The Heidelberg Materials will be able to capture, and Northern Lights will be able to transport and permanently store CO<sub>2</sub> from 2025.



*Ground works on site at Hafslund Oslo Celsio's waste incineration plant in Oslo.*

## CO<sub>2</sub> storage in Norway

- In total, six exploration licenses to store CO<sub>2</sub> on the Norwegian Continental Shelf have so far been awarded pursuant to the CO<sub>2</sub> Storage Regulation, in addition to Northern Lights' exploitation permit.
  - In August 2023, an exploration license for CO<sub>2</sub> storage east of the Sleipner East field was awarded to Sval Energi AS, Storegga Norge AS and Neptune Energy Norge AS.
  - In March 2023, two exploration licenses for CO<sub>2</sub> storage in the southern part of the North Sea were awarded. Aker BP ASA and OMV (Norge) AS was awarded the eastern CO<sub>2</sub> storage acreage. Wintershall Dea Norge AS and Altera Infrastructure Group through its subsidiary Stella Maris CCS AS were awarded the northwestern acreage.
  - In October 2022, two companies - Wintershall Dea Norge AS og CapeOmega AS - have been offered exploration license for CO<sub>2</sub> storage in an acreage in the Norwegian part of the North Sea. CapeOmega's part of the license was sold to Total Energies in August 2023.
  - In April 2022, three companies were offered exploration licenses to store CO<sub>2</sub> in two areas on the Norwegian Continental Shelf. The area in the North Sea was offered to Equinor ASA. The area in Barents Sea was offered to a group including Equinor ASA, Horisont Energi AS and Vår Energi AS. Equinor ASA and Vår Energi AS is no longer part of this license. PGNiG Upstream Norway and Horisont Energi are now partners on the Polaris project (in the Barents Sea) whereas PGNiG is operator.
  - Northern Lights was awarded an exploitation permit (EL001 "Aurora") for the storage part of Longship in 2019.

## CO<sub>2</sub> transport to Norway

- Norway and Germany have agreed to set up a joint Task Force to follow up the results of a joint feasibility study, which is looking into possibilities to transport hydrogen and CO<sub>2</sub> between Germany and Norway. The feasibility study is undertaken by Gassco and dena (Deutsche Energie-Agentur) on behalf of the industry and includes a large number of industrial partners.

## Resources

- [Spørsmål og svar om Langskip-prosjektet - regjeringen.no](https://www.regjeringen.no)
- [Tidslinje for Langskip \(CCS\) - regjeringen.no](https://www.regjeringen.no)
- [Full-scale CCS project in Norway - Longship | Reaching the climate goals \(ccsnorway.com\)](https://ccsnorway.com)
- [Northern Lights \(norlights.com\)](https://norlights.com)
- [Norcem og karbonfangst | Norcem](https://www.norcem.com)
- <https://www.celsio.no/karbonfangst-ccs/>

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