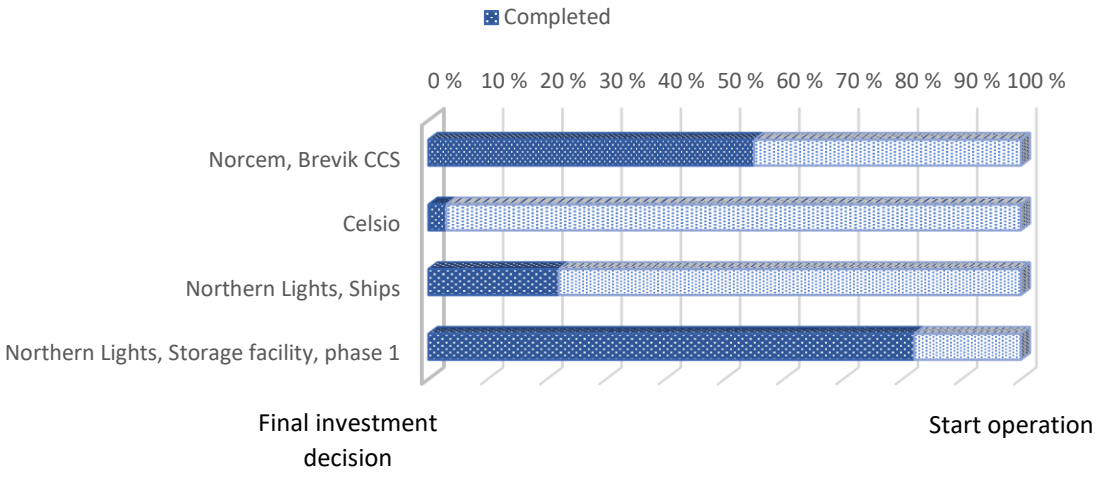
Status, Longship 31.03.2023

Highlights

- Construction of the Northern Lights CO_2 transport and storage infrastructure and Heidelberg Materials' and Celsio's CO_2 capture plants is progressing. Brevik CCS is 55,1% completed, Northern Lights storage facility is 81,6% completed and Celsio's CO_2 capture project at the waste-to-energy plant in Oslo started in August 2022 and is 2,7% completed.
- Overall progress of Longship's construction phase:



Background – about Longship

- The CCS project Longship, partly funded by the Norwegian government, includes the capture, transport and storage of CO_2.
- A carbon capture facility is currently being built at Heidelberg Materials' cement plant in Brevik, Norway, by Heidelberg Materials. According to plan, the facility will capture approximately 400,000 tonnes of CO_2 annually from late 2024.
- Celsio has also started building a carbon capture facility and will, according to plan, capture approximately 400,000 tonnes of CO_2 annually from its waste-to-energy plant in Oslo from 2026.
- Northern Lights is currently developing a solution for the transport and storage of CO_2. The CO_2 will be transported by ship from the various emission sources 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_2 emissions and make industrial carbon removals possible.

Roles in Longship

- **Ministry of Petroleum and 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 Petroleum and Energy
- **Northern Lights** – Transport and storage company receiving CO_2 from Heidelberg Materials and Hafslund Oslo Celsio, and aiming to provide transport and storage as a service to multiple companies.
- **Brevik CCS – Heidelberg Materials** – Capture site under construction at the cement plant in Brevik
- **Hafslund Oslo Celsio** – Capture project under construction at the waste-to-energy plant in Oslo

Status Northern Lights

- Construction of the Northern Lights CO_2 storage facility is **82%** completed (2023.02.28) and on schedule to start operations in 2024 as planned.
- At the receiving terminal, construction of the visitor centre is completed and was opened in October by the Norwegian prime minister Jonas Gahr Støre. Fabrication and installation of the onshore plant is ongoing.
- Northern Lights concluded the drilling operations for a CO_2 injection well and a contingent injection well in October. Preliminary results confirm the storage capacity of at least 5 million tonnes CO_2 per annum. The first offshore CO_2 injection well was drilled already in 2020.
- Fabrication of CO_2 pipeline is ongoing. The umbilical is completed and installed.
- Dalian Shipbuilding Industry Co., Ltd. (DSIC) is building two ships dedicated for CO_2 transport for the Northern Lights. The overall progress for the ships, including detailed design, engineering, procurement etc., are now **22 %** completed (2023.02.28) and the first ship will be delivered in 2024.
- Yara and Northern Lights have signed the world's first commercial heads of agreement on cross border CO_2 transport and storage, where main conditions are agreed. From early 2025 800,000 tonnes of CO_2 could be captured from Yara's ammonia and fertiliser plant in Sluiskil in the Netherlands and transported and stored by Northern Lights. With that, the first phase of Northern Lights is fully booked. Northern Lights has developed plans to expand the capacity, depending on investment decisions and permissions.
- Northern Lights has, together with partners in several European countries, applied for updated status as Project of Mutual Interest (PMI) by the European Commission. This status has to be renewed every second year. Northern Lights has had this status for several years and has received Connecting Europe Facility (CEF) funding for a phase 2 studies.
- The Phase 2 onshore and jetty FEED studies are finalised and an investment decision for Phase 2 is expected before summer 2023. In phase 2 the capacity of the storage site will increase from 1,5 million tonnes a year to 5 million tonnes a year.
- Four potential customers to Northern Lights passed selection for Innovation Fund support in the first round (2021) and funds for these projects are allocated by EU. Three potential new

customers passed the selection in Innovation Fund's second round in July last year. Maturing commercial agreements between potential customers and Northern Lights is continuing. Northern Lights is also in dialogue with customers applying for new rounds of Innovation fund, national funding and customers not relying on external funding.

Northern Lights' CO_2 receiving terminal in Øygarden.

Status Heidelberg Materials

- Overall accumulated actual progress is **55,1%** for the Brevik CCS Project (2023.02.28).
- Generally, Brevik CCS is progressing well, but the project organisation expresses some concern about delays from subcontractors due to the global disturbances in crucial supply chains caused by war in Ukraine and covid-19, leading to major uncertainties in supply of critical materials, equipment, and logistics.
- Heidelberg Materials and the Norwegian state is, in accordance with the state aid agreement, in ongoing negotiations over financing the communicated cost overrun in the project. In the meantime, the project is progressing as planned.
- Brevik CCS has experienced vast interest internally and externally. Heidelberg Materials now has several emerging projects in other countries, mainly in Europe and North America. BrevikCCS is the frontrunner both within the company and within the industry.
- On 22nd March, Norcem changed its name to Heidelberg Materials. This is part of global name change for Heidelberg Materials subsidiaries. The company is a fundamental pillar of the global building materials industry world-wide, with a concrete target: to become the sector´s first net-zero company.

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

Status Celsio

- In June 2022 the Minister of Petroleum and Energy Terje Aasland signed the support agreement that ensures the realization of carbon capture at Hafslund Oslo Celsio's (Celsio) waste incineration plant at Klemetsrud in Oslo. The agreement marked that the Norwegian state, Oslo Municipality and Celsio's owners; Hafslund, Infranode and HitecVision, will realize the world's first carbon capture plant on waste incineration in a full value chain with transport and permanent storage of CO_2.
- Celsio's carbon capture project started the civil works, blasting and ground works on site in August 2022. Technip Energies has continued the detail engineering of the CCS plant at Klemetsrud, and engineering of the harbour terminal has started. Blasting and ground works continues at Klemetsrud, and the demolition of the old administration building was done in January 2023. Contract negotiations are ongoing related to adjustment of scope of work.
- According to the current plan, construction of the capture plant will be capturing 400 000 tonnes of CO_2 from 2026.

Hafslund Oslo Celsio's CO_2 capture plant will be capturing 400 000 tonnes of CO_2 from 2026.

CO_2 storage in Norway

- In total, three exploration licenses to store CO_2 have been awarded in Norway pursuant the CO_2 Storage Regulations in addition to Northern Lights' exploitation permit. Two new areas for CO_2 storage on the Norwegian continental shelf have recently been announced by the Ministry of Petroleum and Energy..
    - Equinor ASA, Neptune Energy Norge AS, Storegga Norge AS, Sval Energi AS, Wintershall Dea Norge ASA, Aker BP, Altera Infrastructure Group, OMV (Norge) AS and Horisont Energy have applied for CO_2 storage acreage in 2023. According to the plan, two acreages will be awarded before summer this year.
    - In October 2022 two companies - Wintershall Dea Norge AS og CapeOmega AS - have been offered exploration license for CO_2 storage in an acreage in the Norwegian part of the North Sea.
    - In April 2022 three companies were offered exploration licenses to store CO_2 in two areas on the Norwegian Continental Shelf. The area in the North Sea was offered to Equinor ASA, and the area in Barents Sea was offered to a group including Equinor ASA, Horisont Energi AS and Vår Energi AS.
    - Northern Lights was awarded an exploration permit for the storage part of Longship in 2019.

Resources

- Spørsmål og svar om Langskip-prosjektet - regjeringen.no
- Tidslinje for Langskip (CCS) - regjeringen.no
- Full-scale CCS project in Norway - Longship | Reaching the climate goals (ccsnorway.com)
- Northern Lights (norlights.com)
- Time-lapse video: Time-lapse construction of the Northern Lights CO2 transport and storage infrastructure 2021 - YouTube
- Norcem og karbonfangst | Norcem
- https://www.celsio.no/karbonfangst-ccs/

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