

INNOVATION FUND

Driving clean innovative technologies towards the market

Silverstone: Full-scale CO₂ capture and mineral storage

The Innovation Fund is 100% funded by the EU Emissions Trading System



Project summary

The Silverstone project will deploy commercial scale CO₂ capture and mineral storage of the emissions of the Hellisheidi geothermal power plant in Iceland, one of the largest geothermal power plants in the world. The project will bring an innovative technology to full commercial scale, demonstrating its competitiveness and enabling the power plant to reach a near-zero carbon footprint.

CO₂ dissolved in water is injected into underground basalt rock formations

COORDINATOR

CARBFIX OHF

LOCATION

Hellisheidi Geothermal Power Plant in South-West, Iceland

SECTOR

CO₂ Transport and Storage

AMOUNT OF INNOVATION FUND GRANT

EUR 3 867 988

RELEVANT COSTS

EUR 6 446 646

STARTING DATE

01 December 2021

PLANNED DATE OF ENTRY INTO OPERATION

Q1 2025

Injected CO₂ turns into rock

An innovative technology: Carbfix

Project Silverstone* offers permanent CO₂ Capture and Mineral Storage (CCMS) based on the largest application to date of an innovative process known as the Carbfix technology. This imitates and accelerates geological processes that nature has applied for millions of years to regulate long-term CO₂ levels in the atmosphere, turning CO₂ into solid carbonate minerals underground.

The CCMS process involves dissolving CO₂ in water and injecting the solution into underground basalt rock formations, where it is fixed into stable carbonates. The key innovations of the project further include the use of direct water capture of CO₂, compared to traditional solvent-based capture, which avoids the addition of any chemicals. The CO₂ captured will stem from the water from the steam turbines already available as a by-product of the electricity generation at the power plant.

Multiple environmental, economic and safety benefits

The Silverstone project will design, commission, and construct a Carbfix facility that captures and stores 25 000 tCO₂/year. This will result in capturing 95% of the GHG emissions of the power plant, together with the 12 000 tCO₂ captured by the demo plant, which exists at the same site and has already piloted the technology. This roughly corresponds to the annual emissions from domestic aviation in Iceland.

The Carbfix technology has the potential to offer a more economical technology than conventional Carbon Capture and Storage (CCS), which can expand its application in areas rich in basalt rocks. By rapidly and permanently

transforming CO₂ into minerals, the risk of CO₂ leakage associated with conventional CCS technologies is eliminated. The site will be entirely self-sufficient with respect to water, energy, storage and raw materials. It will bring CCMS, which is not yet commercially available, to full commercial scale and demonstrate its competitiveness.

High community support and contribution to Iceland Climate Plan

The Carbfix method has gained the full support of the local community in Iceland, as well as the backing of national and municipal authorities. The rollout of the technology in Iceland is supported by Iceland's Climate Action Plan in which the Carbfix technology is recognized as being instrumental for reducing emissions from geothermal power production and energy intensive industries. The Silverstone project alone will deliver 10% of the Iceland's Climate Action Plan emission reductions: 55% emission reductions by 2030 within the energy and industrial sectors not covered by the EU ETS.

Potential for scale-up to other geothermal plants and other sectors

The project will have considerable scale-up potential, providing a significant possibility for emission reductions within the geothermal sector. There are six large (>50 MWe) geothermal power plants in Iceland, with a combined installed capacity of 750 MWe and emissions of 170 000 tCO₂/yr, where the Carbfix technology is readily applicable. It is expected that it is applicable for a substantial share of the total 10 000 000 tCO₂/yr from the global geothermal sector. Moreover, the replication potential of the project is not limited to the geothermal sector, since the technology is adaptable to different hard-to-abate sectors, including steel, cement, ammonia, and waste management.

* Silverstone is the translation of the Icelandic word for the calcite crystal known as Iceland spar, which has unique properties and a rich history.