



European
Commission

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INNOVATION FUND

Driving clean innovative technologies towards the market

SHARC: Sustainable Hydrogen and Recovery of Carbon

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

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Project summary

The SHARC (Sustainable Hydrogen and Recovery of Carbon) project will reduce emissions at the Porvoo refinery in Finland, by moving away from the production of grey (fossil-fuel based) hydrogen towards both green hydrogen production (through the introduction of electrolysis) and blue hydrogen production (by applying carbon capture technology). Combined with the offshore storage of carbon dioxide (CO₂), this project will maximise the environmental impact and development of a strong supply chain covering the oil refinery, the CO₂ capture and transport facilities and the storage site. It will also lay the foundation for a European hub for renewable hydrogen and CO₂ capture, storage and utilisation. In the first ten years of operation, the SHARC project will avoid more than 4 Mt CO₂eq.

COORDINATOR

Neste Oyj

LOCATION

Finland

SECTOR

Hydrogen

AMOUNT OF INNOVATION FUND GRANT

EUR 88 286 266

GHG EMISSION AVOIDANCE

4.0 Mt CO₂eq

STARTING DATE

01 March 2022

PLANNED DATE OF ENTRY INTO OPERATION

Q3 2025

Climate Action



Neste Porvoo refinery

The integration of advanced technologies to decarbonise oil refineries

The current oil refinery uses grey hydrogen, which is produced by means of a natural gas-fuelled process called steam methane reforming (SMR). SMR is the established approach to generating hydrogen and represents around 95% of global hydrogen production. The produced hydrogen is used in oil refining to produce fuels for transportation. The SHARC project aims to replace part of the grey hydrogen the refinery uses with a combination of green and blue hydrogen.

SHARC's main innovative aspect is the integration of advanced technologies at a scale never demonstrated before in a refinery, forming a basis for European hub for renewable hydrogen and CO₂ capture, storage and utilisation. In particular, a water electrolysis technology - alkaline electrolysis, which reduces the electrolysis power consumption - is applied at an unprecedented scale (50 MW), making SHARC one of the largest green hydrogen projects in the EU. The renewable electricity required for the production of green hydrogen will be sourced through Power Purchase Agreements (wind PPAs). In addition, a hydrogen distribution terminal will be installed to enable demonstration of hydrogen in mobility use.

Furthermore, there will be production of blue hydrogen based on an innovative carbon capture technology with both a much higher CO₂ capture rate (> 96%) and higher CO₂ purity than established technologies.



Neste Employees at Porvoo refinery

The aim of the carbon capture unit is to enable efficient reduction of CO₂ emissions from the current natural gas based hydrogen production while the green hydrogen capacity is being gradually increased.

A model for the green transformation of refineries

Given that hydrogen production alone contributes to approximately 35% of the refinery's emissions, SHARC will contribute to Neste's ambition to make Porvoo the most sustainable refinery in Europe by 2030. In addition, SHARC investment supports commitment to reach carbon-neutral production of Neste by 2035 and hence it supports the objective of achieving a climate-neutral EU by 2050. Using a combination of green and blue hydrogen, the SHARC project will avoid the emissions of more than 4 Mt CO₂eq of absolute GHG emissions during its first ten years of operation.

The entry into operation of SHARC will contribute to the delivery of the EU Hydrogen Strategy, which calls for the installation by 2030 of at least 40 GW of renewable hydrogen electrolyzers in the EU and up to 10 Mt of renewable hydrogen production. The SHARC project will bring forward the European electrolyser industry, in terms of integrating RES-powered electrolytic hydrogen into industry processes and kick-starting the sustainable transition of the Finnish fuel production sector.

The main aim of the SHARC project is to provide low-carbon transportation fuels, which contributes to the objectives of the EU Sustainable and Smart Mobility Strategy to reduce transport related emissions by 90% by 2050. This endeavour also dovetails with the EU Energy System Integration Strategy by providing low carbon fuel solutions in hard-to-decarbonise end use applications as well as by providing an option for supplying waste heat for district heating. The electrolysis process generates a significant amount of excess heat. Neste is in the process of studying ways to utilise it, both in its own processes and in district heating. Overall, this energy supply would cover around a quarter of Helsinki Capital Region's total heat demand.

The EUR 88 million grant will have a huge impact in developing the SHARC project and is a significant enabler for Neste's Porvoo refinery to become the most sustainable refinery in Europe by 2030.