



# INNOVATION FUND

Driving clean innovative technologies towards the market

## HySkies - A partnership to develop Sustainable Aviation Fuel

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

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### Project summary

The HySkies project contributes to the European and aviation industry's decarbonisation by building the first large-scale synthetic sustainable aviation fuel (SAF) production facility in Sweden. The plant will produce around 82 000 tonnes SAF and 9 000 tonnes of renewable diesel per year. Fossil-free hydrogen from a 200 megawatts (MW) electrolyser, biogenic CO<sub>2</sub> captured from a waste-to-energy plant, and sustainable ethanol will be fed into a two-step process consisting of gas fermentation and alcohol-to-jet (AtJ). The project will result in the relative avoidance of 94% greenhouse gas (GHG) emission avoidance compared to the reference scenario over the first ten years of operation.

#### COORDINATOR

Shell (NL)

#### BENEFICIARIES

Vattenfall (SE), LanzaTech (US)

#### LOCATIONS

Uppsala and Forsmark, Sweden

#### SECTOR

Refineries

#### GHG EMISSION AVOIDANCE

2.7 Mt CO<sub>2</sub> eq

#### AMOUNT OF THE INNOVATION FUND GRANT

EUR 80 200 000

#### RELEVANT COSTS

EUR 375 674 769

#### TOTAL PROJECT COSTS

EUR 5 181 156 514

#### ESTIMATED CAPEX

EUR 778 780 734

#### STARTING DATE

1 January 2023

#### PLANNED DATE OF ENTRY INTO OPERATION

16 March 2027



## Scale and novel technologies in a first-of-its-kind project

HySkies will demonstrate the technological and economic viability of the integration at scale of four processes: carbon capture, electrolysis, gas fermentation and AtJ to produce synthetic SAF. This innovative process integration will enable low costs, high yields and greater flexibility in the production of synthetic SAF.

CO<sub>2</sub> capture is a mature technology and plants larger than HySkies are already in operation. The HySkies 200 MW electrolyser is, on the other hand, significantly larger than those plants in operation today, which have a 10-20 MW capacity. HySkies' gas fermentation technology is implemented at commercial scale with a 46 000 tonnes per year ethanol facility, which has been operating since 2018, as well as multiple other commercial facilities that have been started since, across a wide range of feedstocks. While the fully integrated HySkies' AtJ technology is less mature, it has been successfully proven on a smaller scale. It is also based on standard refinery operations that have been used widely for decades.

The project is expected to contribute to reaching EU climate neutrality objectives by avoiding 2.7 Mt of CO<sub>2</sub> equivalent of GHG emissions during the first ten years of operation. The annual saving is equivalent to the CO<sub>2</sub> absorbed by approximately 10 million trees.

## Proving technologies essential to decarbonise the aviation sector

In 2018, aviation was responsible for around 13% of the EU's transport emissions. Although SAF is essential to decarbonise the aviation sector, its use is limited by the high production cost. In 2018, for example, SAF accounted for less than 0.05% of jet fuel sold. However, SAF demand is on the rise, partially owing to policies supporting its use. The EU's goal is for SAF to represent 20% of the aviation fuel by 2030. The Nordic countries are at the forefront and have decided that 27% of the aviation fuel will have to be SAF by 2030. The HySkies project will contribute to these objectives and, because the feedstock is sustainable and does not compete with food and feed, it has great growth potential.

## Positive impact on the economy

The HySkies project will positively contribute to the development of the Uppsala region where it will be implemented. HySkies is estimated to add 50 direct jobs, as well as 200 temporary construction jobs, excluding those of any third parties or subcontractors.

Beyond realising this first-of-a-kind SAF production facility, the consortium partners will look into scaling this approach, pushed by an expected increase in SAF demand. The project site at Forsmark (where the hydrogen and SAF production facilities will be installed) has a high potential to further expand; and there are many opportunities for acquiring additional CO<sub>2</sub> feedstock nearby. Most importantly, the HySkies technological approach can be replicated across the EU and worldwide.

## HySkies

