European Commission

OTHER ENERGY INTENSIVE INDUSTRIES

INNOVATION FUND

Deployment of net-zero and innovative technologies

CIRQLAR: Low temperature heat recovery for industrial use by heat pumps

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

| Project Factsheet

The CIRQLAR project will enable the recovery of low-temperature waste heat at around 100°C and its upgrading to 150°C by using heat pumps. Newly developed concepts and technologies will be integrated in a unique waste heat recovery solution, that will abate 100% of greenhouse gas (GHG) emissions during its first ten years of operation, compared to the reference scenario. This new unit will be integrated in the real production environment of A Coruña Refinery in Spain and will be the first step in an ambitious plan to replicate the concept in other refineries and other intensive-energy industries.

The CIRQLAR project will be the first of its kind in Europe and will be used to pave the way for other similar facilities. The project will produce up to 4 megawatt (MW) of usable heat in the form of steam, through the recovery of 3 MW of low-temperature waste heat from a symbiotic

COORDINATOR
REPSOL SA

LOCATION
Spain

CATEGORY
Energy intensive industries (EII)

SECTOR
other

AMOUNT OF INNOVATION FUND GRANT
EUR 2,169,262

EXPECTED GHG EMISSIONS AVOIDANCE
59,497 tonnes CO2 equivalent

STARTING DATE
01 April, 2023

ENTRY INTO OPERATION DATE
30 November, 2025

FINANCIAL CLOSE DATE
30 April, 2024

Updated on 02 December 2024

production ecosystem. The project will reduce the energy consumption of the processing unit by 24%, increasing its energy efficiency and flexibility, while also reducing the GHG emissions associated with heat production. The system will use industrial heat pumps and the available waste heat to electrify the process. The electrification will reduce natural gas combustion and therefore abate 0.059 million tonnes of CO2 equivalent of GHG emissions.

CIRQLAR will overcome the main barriers to uptake that have been faced by low-temperature heat recovery technology, such as the optimisation of the thermodynamic cycle, the reliability of the machines working in severe conditions, and its integration into an energy network. This will be driven by the technologies' main advantages: emission reduction potential compared to existing options, efficiency of heat recovery and the expanded operability and flexibility of the system.

CIRQLAR is a first-of-a-kind technological concept that combines a set of innovative strategies and key integrated enabling technologies. These innovations and technologies will be developed and deployed at industrial scale, to exploit the Heat Circularity concept, in a cost-efficient and technologically viable manner. The development of each technological component will advance the current state-of-the-art, increasing the energy efficiency in the project site, whilst also allowing CIRQLAR to contribute to the fight against climate change.

The project will exploit a concept that could potentially apply to any energy-intensive industry. This will allow key industrial sectors to offer their products and services in a more efficient and sustainable way to consumers whilst reducing their external energy cost dependence. CIRQLAR will reinforce the EU industry value chain of waste heat recovery and heat pumps, providing a cost-competitive technology to the market. It will deliver more sustainable processes with lower emissions, which will respond to today's environmental challenges, while also reducing consumption and dependence on natural gas throughout the EU.

| Participants

REPSOL PETROLEO SA	Spain
REPSOL SA	Spain
EXPANDER TECH SL	Spain