European Commission

INNOVATION FUND

Driving clean innovative technologies towards the market

ANRAV-CCUS - an innovative stakeholder supported CCUS value chain to realize the first CCUS cluster in Eastern Europe, supporting the Balkan region to reach its climate goals by 2030

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

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Project summary

The ANRAV project aims to be the first complete carbon capture, utilisation and storage (CCUS) value chain project in Eastern Europe. It will link CO_2 capture facilities at the Devnya Cement Plant in Bulgaria, a subsidiary of Heidelberg Materials, with CO_2 storage in a depleted gas field in the Black Sea, through an onshore and offshore pipeline system. The objective is to maximize the percentage of CO_2 that is captured from the cement kiln, reaching a maximum CO_2 purity level, whilst achieving minimal energy usage and and reducing technical risks. The demonstration project will take place within an existing kiln line to ensure high retrofit capability. This will result in the avoidance of 95% of the greenhouse gas (GHG) emissions that would otherwise have occurred in the absence of the project, during the first ten years of operation.

COORDINATOR
Devnya Cement JSC

BENEFICIARIES
Devnya Cement JSC, Petroceltic Bulgaria EOOD

LOCATION
Devnya, Bulgaria

SECTOR
Cement and Lime

GHG EMISSION AVOIDANCE
7.8 Mt CO_2 eq

AMOUNT OF THE INNOVATION FUND GRANT
EUR 189 694 949

STARTING DATE
1 January 2023

PLANNED DATE OF ENTRY INTO OPERATION
1 April 2028

Climate Action

Ultra-efficient innovative hybrid capture technology

ANRAV will demonstrate an innovative capture technology by merging oxyfuel and amine in a unique way. The cement produced will be low-carbon as the CO_2 emissions from Devnya plant will be sequestered with 99% efficient capture. This will result in an emission avoidance of 7.8 Mt CO_2 equivalent over the first ten years of operation, which represents approximately 13% of Bulgarian emissions over one year.

The unique characteristic of the hybrid and staged oxyfuel/amine concept is that it combines a very high capture efficiency with the ability to retrofit existing kiln lines. The CO_2 from the oxyfuel calciner is going to a CO_2 Processing Unit (CPU). Each CPU unit has some CO_2 losses, which normally are not recovered. However, with this innovative hybrid approach, the losses (the so-called CPU slipstream CO_2) are sent to the amine capture unit. Thus, the amine capture unit will deal with two CO_2 input streams: the flue-gas of the kiln itself and the slipstream of the CPU from the oxyfuel calciner.

This staged and hybrid approach finally results in 99% capture efficiency. Due to this innovative hybrid concept, the cement plant can maintain the same burning conditions of the main burner during the critical phase of the clinker production as for traditional kilns. This eliminates the risk of changing or deteriorating the clinker quality, which is of paramount importance from a business perspective.

A solution for carbon neutrality and achieving the Fit for 55 targets

Decarbonising cement production is necessary to achieve the EU objective of climate neutrality by 2050 and to address climate change. The ANRAV solution will be a flagship project for the cement industry in Eastern Europe and is consistent with the modernisation and decarbonisation objectives of the European Industrial Strategy.

Further, ANRAV is in line with energy efficiency policy instruments in Europe, as it reduces the additional thermal energy requirement from 65% to only 5%, in comparison with a reference kiln with amine capture.

CCUS cluster development in Eastern Europe

The project will be key in supporting the development of a strategically important CCUS cluster in the industrial zone of Devnya and beyond. The project will provide an invaluable opportunity to gain competence in the innovative hybrid oxyfuel/amine capture technology for the deployment in other existing kiln lines and to encourage a CCUS cluster development in a densely industrial area. The ANRAV Capture Unit at Devnya Cement Plan will safely store up to 0.8 Mt CO_2 equivalent per year in the depleted Galata gas field. Further scalability is achieved by constructing a pipeline with a planned annual capacity of 1.5 Mt CO_2 equivalent connecting other industrial emitters in the region to the open-access infrastructure.