AURORA – ACCELERATED DEPLOYMENT OF INTEGRATED CCUS CHAINS BASED ON SOLVENT CAPTURE TECHNOLOGY

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ABSTRACT

AURORA (**A**CCELERATED DEPL**O**YMENT OF INTEG**R**ATED CC**U**S CH**A**INS BASED ON SOLVENT CAPTU**R**E TECHNOLOGY) is a three and a half year HORIZON Europe project funded by EU and kicked off in January 2023. The participants of AURORA represent the following six European countries: Norway (5 partners), United Kingdom (1 partner), Belgium (1 partner), France (2 partners), Italy (1 partner), and Greece (2 partners). The AURORA consortium involves 12 partners from industry, research, and academia and has considerable involvement of industrial companies. The industrial partners are not only supporting the research but have also committed to directly investing and participating in the project's R&D and demonstration activities, boosting the credibility of the project's potential for accelerated decarbonisation of the industry.

Rapid up-scaling and deployment of more cost-efficient and sustainable carbon capture solutions are needed to reduce the emissions of CO_2-intensive industries. Solvent-based carbon capture is an important technology that can be readily adopted to many emission sources. Such technology can achieve high capture rates and deliver CO_2 at high purity with relatively low energy demand. In AURORA, the open and non-proprietary CESAR1 solvent technology will be optimised and qualified for commercial deployment. The technology will be demonstrated at TRL7-8 for three CO_2-intensive industries: refining, cement, and materials recycling, for which there are few other options to achieve climate neutrality. The partners will demonstrate negligible environmental impact (emissions being a potential issue for solvent technology), capture rates at 98%, and capture costs reduced by at least 47% compared to a benchmark process with the MEA solvent. This will

be achieved through the following innovations where CESAR1 is used as a the new benchmark technology (Figure 1): 1) Holistic optimisation of solvent composition, process design, emission monitoring and control, and solvent management, 2) Validated models for use in commercial process simulators, 3) Enhanced waste heat integration with carbon capture for reduced external heat demand and operational costs, 4) Improved and integrated advanced control system for reduced OPEX and optimised performances. These innovations will be integrated into four optimised capture processes and various aspects will be demonstrated in three different pilots of various sizes and complexity (SINTEF's Tiller pilot, ACC's mobile test unit and TCM's large-scale demonstration plant). The partners will ensure the transferability of results to other CO_2 intensive industries thanks to the large variations in CO_2 source, developed clusters addressed in the project, and strong stakeholder participation. The project will also do full CCUS chain assessments for its end-users. It is noteworthy that the end-users are situated in two different regions of Europe (Belgium and Greece), offering different conditions for the implementation of CCUS value chains.

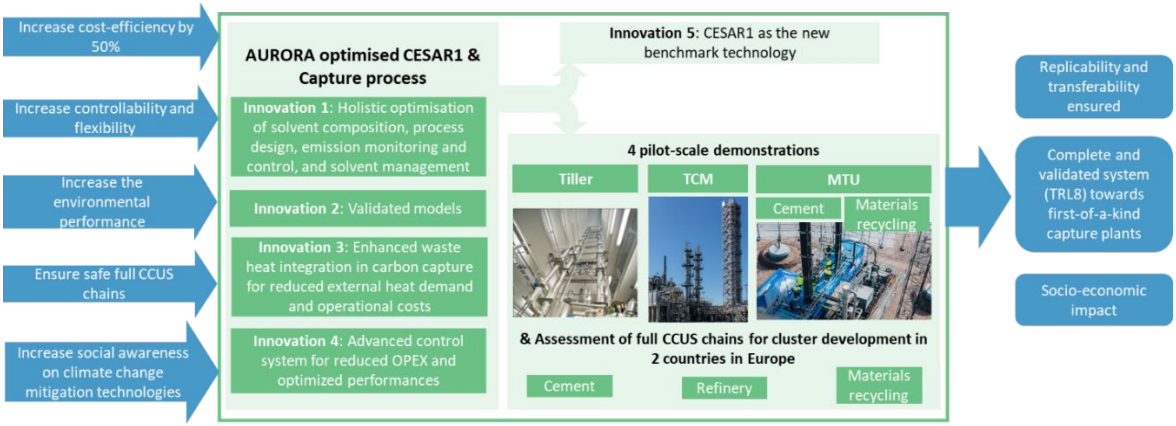

Figure 1: The AURORA project concept

More details about the aims and objectives of the project, the expected outcomes, and the impact and results to be obtained will be presented at the conference. Specifically, the innovations of the project, the Stakeholder Forum to be established as a means for the efficient exchange of ideas and results outside the consortium, and the final plan for the exploitation of the results will be emphasized.

Though the CESAR1 solvent system has been modelled in previous and other ongoing projects like the two ACT projects ALIGN-CCUS[1] and SCOPE[2], the remaining gaps in experimental property data and models will be closed in AURORA. The updated models will be validated using data from all three pilots in the projects such that the models can be used to adequately predict the performance in the total process plant for all solvent conditions (including the water-wash section). The identified gaps and modelling approach in AURORA will be presented at the conference.

[1] ALIGN-CCUS project, ERA-NET ACT, 2017-2020, web-site: https://www.alignccus.eu/
[2] SCOPE project, ERA-NET ACT, 2021-2024, web-site: https://www.scope-act.org/

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