

CONSORTIUM



CHALMERS



KANTHAL®



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STAY IN TOUCH



#high-temp-electrification



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Funded by
the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101138392.



ELECTRA

Electrification of high temperature and flexible technologies
for transforming cement, lime and pulp industry



THE PROJECT

The critical challenge addressed by ELECTRA is how to provide the heat to the processes that require high temperatures. Moreover, this must be achieved without compromising product quality and allowing flexibility in the power input. The processes in the cement, lime, and pulp have many aspects in common, but also differences in processing temperatures, raw material properties and product quality requirements. In ELECTRA, the hard-to-abate carbon dioxide emissions of the process industries are tackled with flexible electrification and CO₂ capture. New electrified manufacturing technologies for cement, lime, and pulp industries will be developed, to drastically reduce the greenhouse gas emissions in the EU, by substituting fossil fuels with renewable electrical energy, enabling the efficient capture and use or removal of an undiluted CO₂ stream from the decomposition of the raw material, calcium carbonate, and flexible power loads enabling a higher share of renewable electricity production in the electricity grid. In ELECTRA, we solve these main challenges with several technology concepts, where the main components are plasma heating, resistive heating, rotary kiln, and fluidised bed technologies. We create the best technology concept for each industry and use case as a combination of these key elements. Even though the industries covered in ELECTRA, cement, lime and pulp, utilise similar high temperature processes, there are differences in material behaviour, process conditions, and product quality demands, for example. Thus, several technology concepts are developed in ELECTRA.

OBJECTIVES



Demonstrate high temperature & flexible electrified industrial heating process units



Holistic design advancing new materials, increasing process flexibility and safety and matching renewable electricity generation to heat industrial processes



Validate the applicability at high performance through evidence-based analysis of ELECTRA technologies regarding economic, environmental, and societal impacts



Maximise impact by accelerating the adoption of electric kiln and fluidised bed technologies to decarbonise cement, lime and pulp industries and boosting Hubs for Circularity

IMPACT

Demonstration of Advanced Technologies ELECTRA aims to prove the effectiveness of electric heating technologies in high-temperature demand systems, facilitating the integration of renewable electricity in industries and reducing reliance on fossil fuels.

Economic Viability and Competitiveness The project aims to showcase the scalability and cost efficiency of electrified solutions, enabling their competitiveness in comparison to fossil-based heating systems and enhancing the resilience of the European process industry.

ELECTRA's breakthrough solutions drive substantial reductions in CO₂ emissions from key industries. Our electrified decarbonization methods promise unmatched cost efficiency, potentially cutting expenses in half compared to traditional carbon capture techniques.

01

Operational Objective Alignment

ELECTRA directly contributes to Process4Planet's objective of developing new electrified processes and promoting energy efficiency, aligned with the broader goal of renewable energy utilization.

02

Carbon Capture Enhancement

By elevating CO₂ concentration in flue gas to over 99%, ELECTRA simplifies and reduces the cost of carbon capture, supporting the development of efficient CO/CO₂ capture and purification technologies.

03

FOAK Plant Advancement

Through industrial pilots, ELECTRA advances towards first-of-a-kind (FOAK) plants, driving innovation and derisking investment in electrified processes.

04

Key Exploitable Results (KER)

- Plasma heated rotary kiln for calcination and clinkering
- High-enthalpy plasma torch for oxidising conditions
- High-enthalpy plasma heated rotary kiln for calcination and clinkering
- Resistively heated rotary kiln for calcination
- Resistively heated circulating fluidised bed (CFB) for calcination
- Plasma heated circulating fluidised bed for calcination
- Resistively (embedded) heated bubbling fluidised bed for calcination
- Models of electrified and hybrid industrial plants

