

ELEKTRA

ADVANCED ELECTRIFICATION OF KEY INDUSTRIAL REACTIONS

Project Public Presentation

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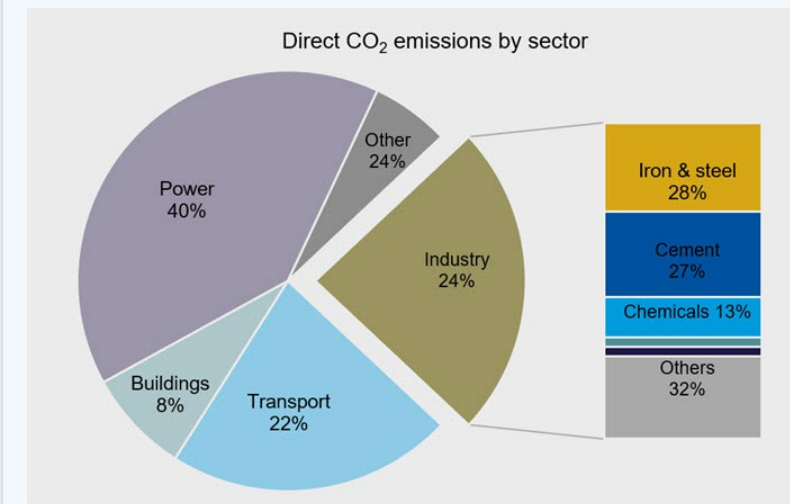
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Steel Sector Context

- Steel industry accounts for **7-8% of global CO₂ emissions**.
- Steel sector has strong **pressure to decarbonise** (EU ETS, CBAM, net-zero targets).
- Transition towards **low-carbon steel technologies** is necessary to reach ambitious objectives.
- High CAPEX and operational risks **slow down the adoption**.
- **Market uncertainty** on costs, value chains, and business models.



Project objectives

Main Objectives

ELEKTRA's main objective is to accelerate the **decarbonisation of steelmaking** by replacing conventional fossil-fired, heat-driven reactor units with compact, efficient and flexible electrified technologies.

The project will design, build and demonstrate a technology platform based **on three intensified electrified reactors**. Each reactor targets a different bottleneck in the transition from today's carbon-intensive steel production to future low-carbon and hydrogen-based steelmaking.

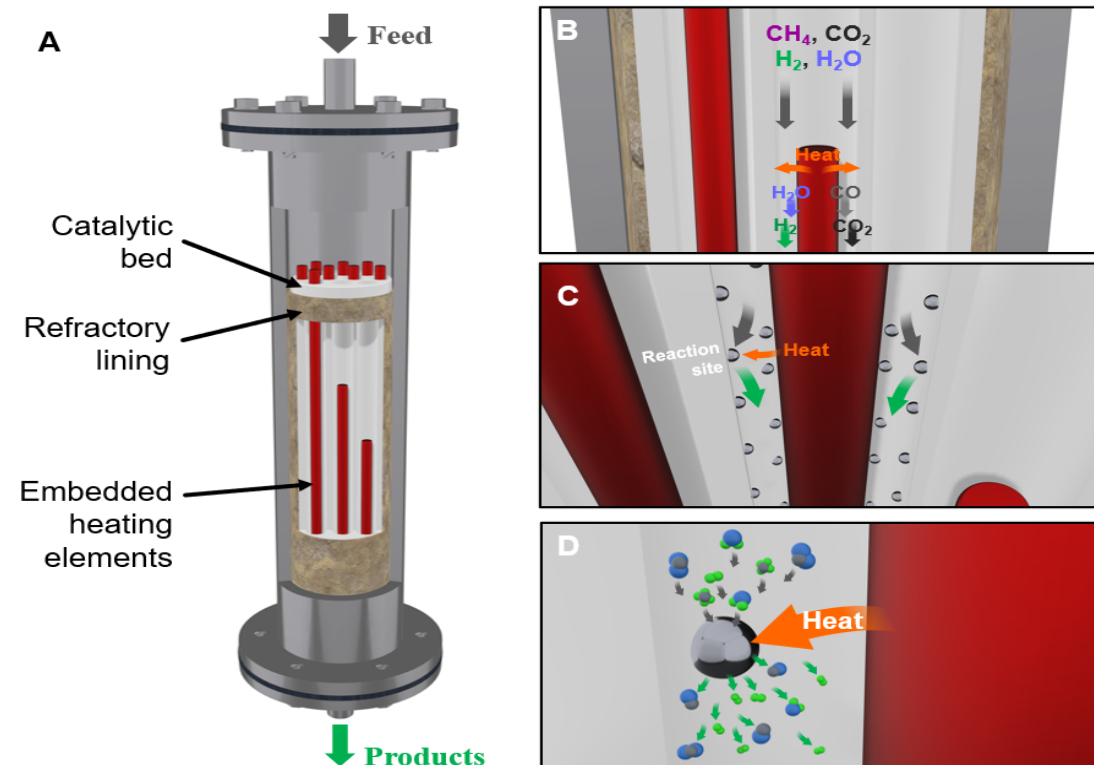
By combining renewable **electricity, hydrogen carriers and carbon recycling**, the project offers a practical bridge between short-term efficiency improvements, medium-term hydrogen integration and long-term circular steel production



Project objectives

Objective 1

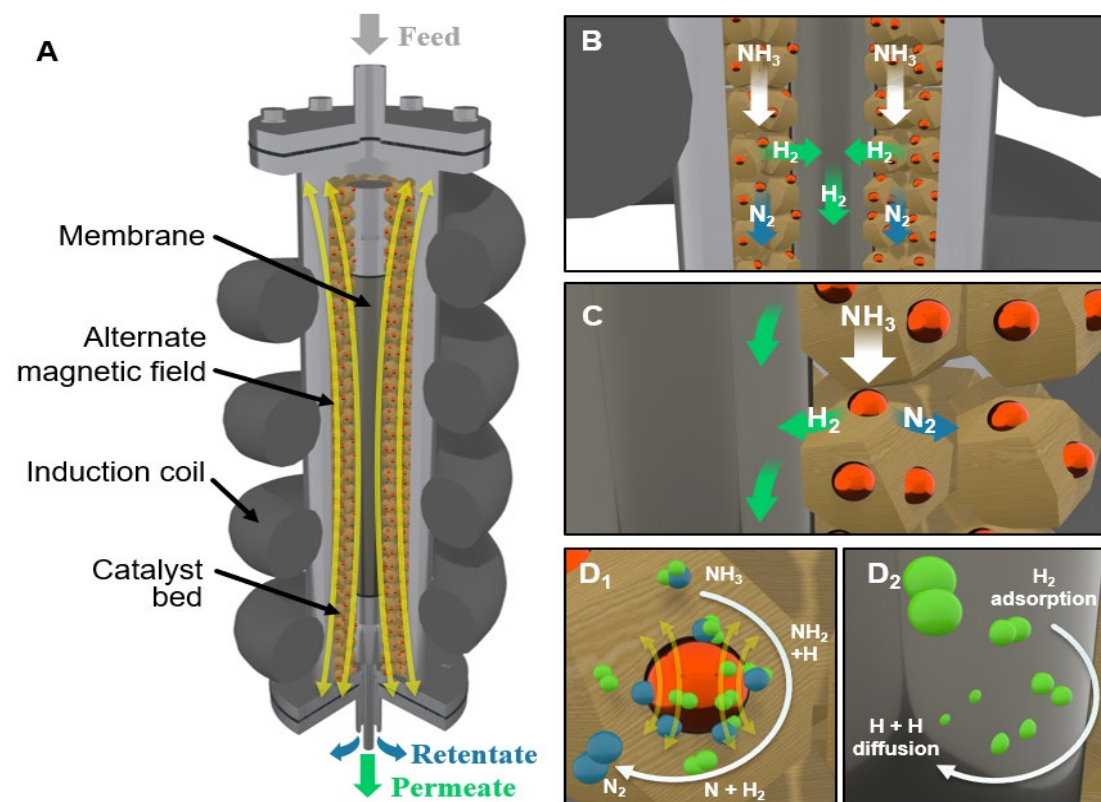
The first objective is to demonstrate an **electrified reformer for natural gas and direct reduced iron top gas**. This Joule-heated reactor will replace conventional fired reforming units, which currently consume fuel, generate flue gas emissions and suffer from limited flexibility. By supplying heat directly with electricity, the reactor aims to improve thermal efficiency, eliminate combustion-related CO₂ emissions and produce flexible syngas streams suitable for DRI processes. The system will be validated under industrially relevant conditions, with steel-specific requirements such as gas composition, ramping behaviour and integration into existing DRI loops.



Project objectives

Objective 2

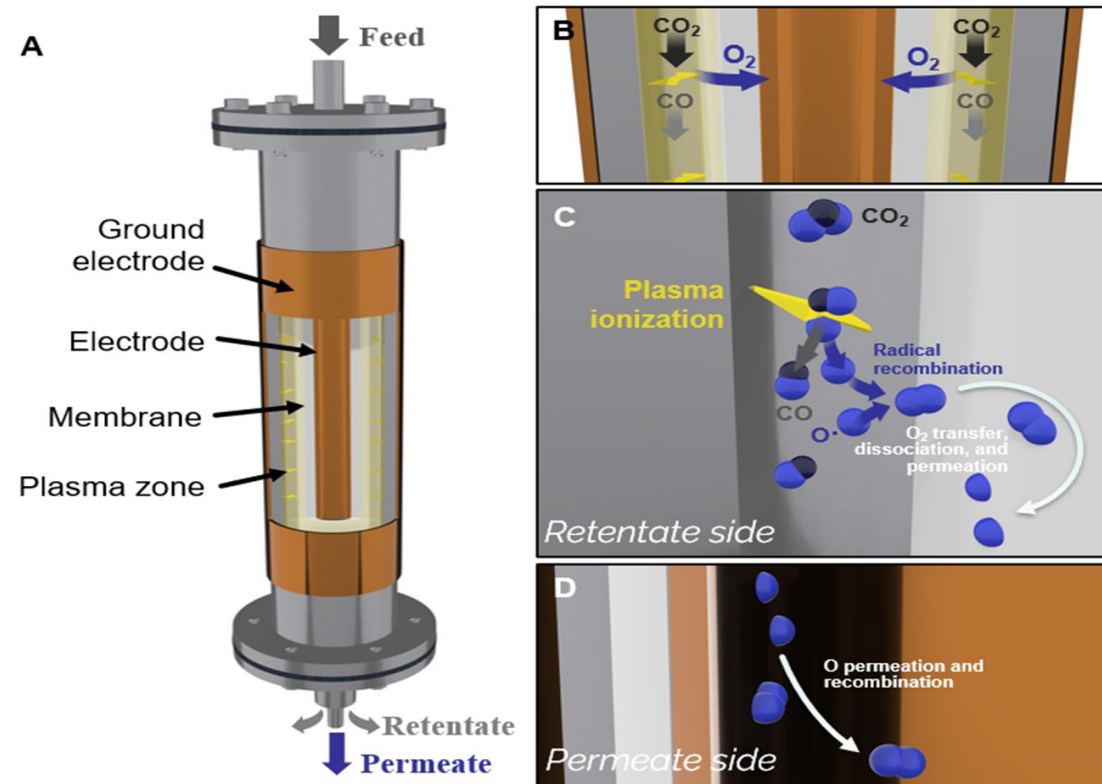
The second objective is to demonstrate an **electrified ammonia cracker** able to provide high-purity hydrogen for green steelmaking. Ammonia is expected to become a major carrier for imported renewable hydrogen, but today's crackers are often bulky, energy-intensive and dependent on downstream purification. ELEKTRA will develop an induction-heated catalytic membrane reactor that combines ammonia decomposition and hydrogen separation in a single compact unit. The goal is to produce pure hydrogen with very low ammonia slip, lower operating temperatures and reduced energy demand. This hydrogen can support both hydrogen-based DRI and blast furnace hydrogen injection.



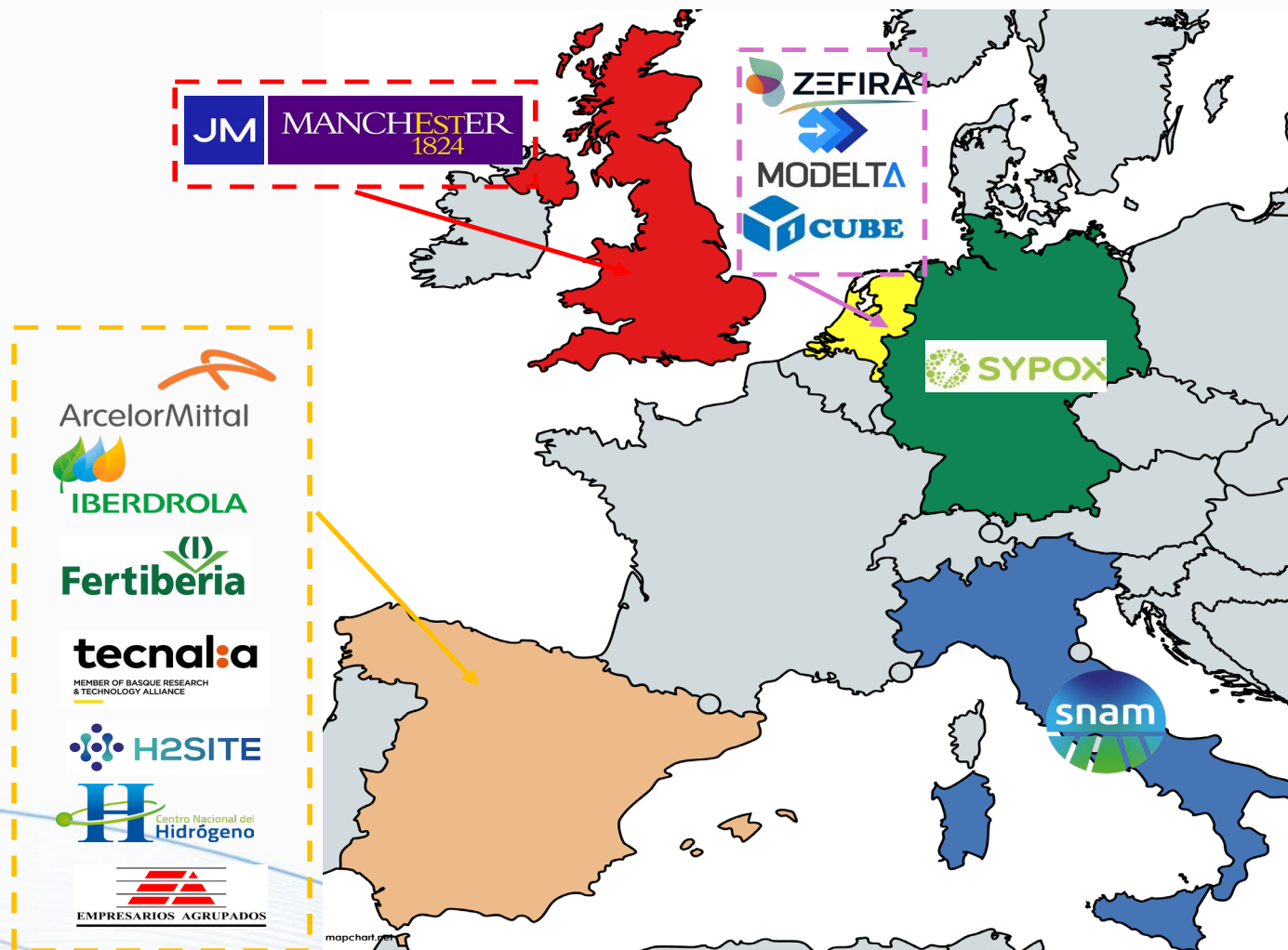
Project objectives

Objective 3

The third objective is to develop a **plasma-assisted CO₂ recycling reactor that converts process CO₂ into CO** for reuse in ironmaking. Instead of treating captured CO₂ only as a waste stream to be stored or exported, ELEKTRA aims to transform it into a useful reducing gas. The plasma-membrane reactor will split CO₂ into CO and oxygen, allowing CO to be reinjected into blast furnace or DRI processes. This can reduce coke demand in blast furnaces, lower hydrogen demand in hydrogen-DRI, and create a more circular carbon loop inside the steel plant.



Project Partners



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and civil society are welcome.



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Thank you

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