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Production of hydrogen-rich synthesis gas for blast furnace injection by exploiting coke breeze combustion to reform coke oven gas.

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The iron and steel sector leads in CO2 emissions and ranks second in energy consumption among heavy industries. It directly contributes 2.6 gigatonnes of carbon dioxide (Gt CO2) annually, accounting for 7% of the global energy system's total emissions. Currently, it is the largest industrial coal consumer, meeting approximately 75% of its energy demand. Despite global reliance on blast furnaces (BF) for iron ore reduction, the main contributor to CO2 emissions in integrated BF-BOF steelmaking is primarily driven by the need for carbon, typically supplied by coke, as the reducing agent.
In this frame the main objective of the ProSynteg project is to reduce the coke rate and associated CO2 emissions from Blast Furnace (BF) by means of the realization of new module of oxy-combustion of coke breeze that will be installed in an industrial coke plant to test, in a real operating industrial environment, the production process of hot syngas using the CO2 coming from the oxy-combustion of coke breeze for dry reforming of Coke Oven Gas (COG). This process has been designed to be flexible in terms of input streams and to produce a hot syngas, rich in H2, ideal for direct injection in the BF, resulting in the reduction of its coke rate and associated CO2 emissions.
The pilot tests will be complemented with supporting lab works. Moreover, a dedicated process model will also be developed and tuned to extrapolate the pilot results at the full industrial scale of a modern BF. Finally, a full evaluation of the industrial potential of the process will be carried out, with detailed calculations of the CO2 mitigation effect and process economics.

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