

## ***Combustion or gasification? A technical and economic comparison for a potential CCS application in South-West Sardinia***

Alberto Pettinau<sup>(\*)</sup>, Francesca Ferrara, Carlo Amorino, Mario Porcu

Sotacarbo S.p.A. – Grande Miniera di Serbariu, 09013 Carbonia, ITALY

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### **Abstract**

Nowadays, the urgent need to mitigate climate change by reducing CO<sub>2</sub> emissions (in particular from coal-fired power generation plants) requires a great economical effort to build up some demonstration units capable to optimize the processes and solve the main technical and economic problems which currently limit a large-scale diffusion of this kind of systems.

This paper compares, from the economic point of view, the two main power generation technologies available to a short-term demonstration of the CCS processes: integrated gasification combined cycle (IGCC) and ultra supercritical pulverized coal combustion (USC). The Sulcis coal basin, considered as a reference location for the comparative analysis reported in this study, could represent a very important site to test carbon capture and storage technologies (through ECBM and aquifers techniques), being representative of a lot of potential storage site in the world.

In particular, for both IGCC and USC technologies, three different configuration have been compared: a conventional configuration (without CCS), a CO<sub>2</sub>-free configuration and a hybrid solution in which CCS system is only applied to a portion of produced gas.

The analysis here presented, based on a detailed economic performance simulation model, shows that USC technology presents a higher net present value than IGCC in their conventional configuration, whereas IGCC is more profitable than USC if a CO<sub>2</sub>-free configuration is considered. Due to the high CCS costs and to the specificity of the site, the investment, for all the considered configurations, is not profitable if not supported by an incentive for the CCS demonstration, acknowledged according to the Italian laws for the Sulcis coal basin. Moreover, the economic assessment confirms the failure of the market of CO<sub>2</sub> if the price of carbon dioxide emission licenses remains lower than 40-50 €/t.

**Keywords:** Coal gasification; Ultra supercritical plant; Carbon capture and storage; Sulcis coal

\* Corresponding author:

email: [apettinau@sotacarbo.it](mailto:apettinau@sotacarbo.it)  
phone: +39 0781 670444  
fax: +39 8781 670552