Contribution ID: **110** Type: **Oral Presentation**

# Complexity of decision-making process through sensitivity analysis for decarbonization technologies

*Thursday 9 October 2025 13:20 (20 minutes)*

The iron and steel industry contributes significantly to global greenhouse gas emissions, accounting for 7.2% of the total. The predominant BF-BOF ironmaking route, responsible for 70% of global pig iron production, is primarily coal-based, posing substantial challenges for decarbonization. As steel industry stakeholders strive to reduce carbon footprints while maintaining economic viability, the transition from coal to alternative energy sources such as electricity, natural gas, and hydrogen becomes imperative. However, these alternatives often entail higher and more volatile costs, influenced by regional factors and market dynamics. Furthermore, uncertainties persist regarding the future availability and pricing of critical raw materials like steel scraps and high-grade pellets (Fe > 67%) and of green energies like hydrogen.

To address these complexities, the SMS plant assessment tool offers a robust framework for evaluating the carbon footprint, energy consumption, and operating costs of integrated steel plants based on various configurations. This tool enables the simulation of diverse decarbonization pathways, allowing stakeholders to predict key performance indicators (KPIs) under varying regional conditions, including energy and raw material prices and CO2 certificate costs. By conducting sensitivity analyses, the tool identifies resilient decarbonization strategies that minimize economic impact.

The application of the SMS plant assessment tool across different steel industry challenges demonstrates its efficiency in formulating optimal decarbonization roadmaps. Sensitivity analyses further enhance this process by assessing the robustness of proposed strategies against fluctuating market conditions. This methodology provides a comprehensive approach to navigating the complexities of the decision-making process for decarbonization, ensuring sustainable and economically feasible outcomes for the steel industry.

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**Session Classification:** Process Transformation & Strategy

**Track Classification:** CO2 mitigation in iron and steelmaking