4-E analyses of Chemical Looping Combustion based Coal-Fired Power Plants for Sustainable Thermal Power and Hydrogen production

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Coal-fired power plants (CFPPs) are still the major sources of power generation in many countries and have become the major sources of anthropogenic carbon dioxide emissions. Chemical looping combustion (CLC) is one of the most promising “next generation” carbon dioxide capture technologies that captures almost all CO_2 emitted from the plant. In this talk, the results of the steady state simulation work carried out on integration of two-reactor and three-reactor configurations of CLC in the Supercritical CFPP for two cases of power alone and power and hydrogen co-generation will be discussed. The overall performance of these cases are analysed based on energy, exergy, ecological and economic (4-E) analyses and will be discussed. The study shows that the CLC based CFPP is energetically, exergetically, ecologically and economically efficient compared to the conventional CFPPs. Hence, this study explores the feasibility of integrating CLC with the Indian power plant and demonstrates the superiority of chemical looping combustion based coal fired power plant for CO2 capture over the conventional plant.