MILP model for assessment and analysis of carbon utilization strategies

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This study presents an optimization-based framework to identify and evaluate carbon utilization strategies for energy production from coke oven gas. In achieving the goal, we first generate a carbon-to-energy superstructure which includes multiple strategies consisting of separation, conversion and synthesis technologies, along with the corresponding feedstocks, intermediates and final products. We then develop process models of the involved technologies to obtain technical (efficiencies and utility consumptions) and economic (capital and operating costs) parameters. The network information from superstructure and the associated parameters from the process models are then used to develop optimization models which allow us to assess carbon utilization strategies based on four different objective functions. The proposed framework can deal with a range of questions related to COG utilization: i) what is the best strategy to produce a specific fuel from available feedstocks? and ii) what is the best pathway to utilize a certain feedstock? Based on the study, we could provide useful guidelines to policy-makers and stakeholders related to the energy business as well as steel industries.