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## Abstract

**Objectives/Scope:** The rapid industrialization and growth in the economic sectors has increase the gap between the energy demand and supply. Among the other environmental issues, the global warming and CO<sub>2</sub> emissions have been evaluated as a major threat for human race. Currently, the coal and natural gas fired power generation systems are being utilized extensively around the world to generate electricity. To address the mentioned issues, the new design integration strategy has been proposed to generate H<sub>2</sub> and syngas that can be either utilized to generated FT (Fisher Tropsch) chemicals or directly burned in a cleaner way to reduce the greenhouse gas emissions.

**Methods, Procedures, Process:** In accordance with the energy demand and control on CO<sub>2</sub> emissions, Integrated Gasification Combined Cycle (IGCC) has been emerging as a viable technology to address both issues due to its higher power generation capacity, control on greenhouse gas emission, diversity to handle multi-feedstock to produce multi-fuels, and potential of integration with other technologies. In this study, IGCC process integration options with the well-developed reforming technologies have been explored to increase the H<sub>2</sub> and syngas generation potentials. Three case studies have been developed in Aspen Plus<sup>®</sup> v10 and compared technically.

**Results, Observations, Conclusions:** Case 1 is based on the conventional IGCC whereas, case 2 represented an idea of integrating gasification and reforming models. The comparative results showed that the case 2 design not only showed a higher power generation potential but also reduces the CO<sub>2</sub> specific emissions. Moreover, the case 2 model also provides a flexibility of utilizing low calorific value fuels and biomasses to reduce the dependence on the conventional oil and gas resources. The results also showed that the case 2 design has a potential to increase the syngas and H<sub>2</sub> production capacities.

**Novel/Additive Information:** The currently operating electricity generation processes are based on Brayton and Rankine cycles using natural gas or coal as a feed stock. In this study, the idea of using multiple feedstocks in the parallel design integration using two standalone technologies (Gasification

and Reforming) has been proposed that can increase the syngas and H<sub>2</sub> production potential compared to the conventional processes.