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Utilization of SMRs to supply utility demands of petrochemical plants with an exergy analysis approach

In 2020, direct Green House Gas (GHG) emissions from the petrochemical sector amounted to 1.8 Gt carbon dioxide equivalents (CO2eq) which is equivalent to 4% of global GHG emissions. The value is forecast to reach up to 2.8 Gt CO2eq by 2030, if no action taken. A solution to diminish carbon emission by petrochemical plants could be utilization of SMRs to provide the utility demands of the industry. Solution would be more desire where several petrochemical plants located close together in an industrial zone. As the petrochemical plants consume about 30% of their fossil feedstock to produce their utility demands i.e. process heating, steam, demineralized or soft water (desalination) and electricity power for the plant running, this replacement could lead to saving significant values of fossil fuel consumption. This study proposes use of a nuclear multi-purpose cogeneration SMR to supply utility consumptions of petrochemical plant. The implementation of the idea will be evaluated with an exergy analysis and optimization approach. The GHG reduction also calculated via utilization of SMR rather than fossil fuel consumption. Finally, an estimated financial comparison is added to the study to investigate the idea affordability.

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