Modelling a Combined Heat and Power Plant based on Gasification, Micro Gas Turbine and Solid Oxide Fuel Cells

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A system level modelling study on two combined heat and power (CHP) systems both based on biomass gasification. One system converts the product gas in a micro gas turbine (MGT) and the other in a combined solid oxide fuel cell (SOFC) and MGT arrangement. An electrochemical model of the SOFC has been developed and calibrated against published data from Topsoe Fuel Cells A/S (TOFC) and Risø National Laboratory, and the modelled gasifier is based on an up scaled version of the demonstrated low tar gasifier, Viking, situated at the Technical University of Denmark. The SOFC converts the syngas more efficient than the MGT reflected in the electrical efficiency of the gasifier and MGT system in opposition to the gasifier and SOFC-MGT configuration - $\eta_{el}=28.1\%$ versus $\eta_{el}=50.3\%$.

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