

Simulation-based investigation of the performance of small-scale solid oxide fuel cell system for domestic application

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The residential fuel cell is a small boiler which can be produce electricity, and satisfy heat demands of both space heating and domestic hot water. FC-based residential micro-combined heat and power(MCHP) system may be modelled either system-level or sub-system approaches, however, the system complexcity due to many balance-of-plants(BOP) and unclear kinetics makes it difficult to build up the model using the system-level approach. In this study, the SOFC-MCHP system is modelled using subsystem approaches, which the fuel cell system is broken down into separable functional elements. Because it is required to consider a dynamic behavior for fast load-response and stable nomial operation, the model is developed as one-dimensional dynamic-based one. The developed model can be used to predict the system performance, find optimal operating conditions, and control as load changes. Modelling and simialtion are executed by gPROMS, and the model is verified by literature data.