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Modeling and Performance Analysis of Solid Oxide Fuel Cell Based Distributed Generation System

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Abstract

Fuel cells are widely recognized as one of the most promising technologies to meet the future power generation requirements. The accurate modeling and performance study is crucial to the success of their deployment in the power system. This paper presents the dynamic model of solid oxide fuel cell (SOFC) based distributed generation system for isolated application. The model is implemented and its performance has been studied in MATLAB/SIMULINK software. The developed model reflects the electrochemical reaction dynamics and major voltage losses in SOFC. A constant utilization mode has been adopted for operation of fuel cell using current feedback to adjust the hydrogen input flow rate. The proposed scheme has been used to study the dynamic performance of the SOFC based DG system for step change in three phase isolated load. A DC/DC power electronic converter and PWM based three phase inverter topology is considered to regulated the fuel cell voltage and interface the three phase AC load respectively along with the control schemes. The simulation results reported in the paper shows that the developed model is able to maintain load voltage constant and also the follow load changes accurately.