Simulation of a 220 kW Hybrid SOFC Gas Turbine System and Data Comparison

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The advancement of efficient hybrid fuel cell systems requires the evolution of analysis strategies for evaluating and developing cycle design. This paper addresses the performance of a recently developed simulation tool for the analysis of tubular SOFC power systems as compared to observed hybrid operation data. Descriptions of the Advanced Power Systems Analyses Tools (APSAT) modeling package and of the world's first hybrid SOFC gas turbine system are presented. Through simulation of the Siemens Westinghouse 220 kW hybrid the analysis program is evaluated to verify the simulation capability and accuracy of the tool. Results show that the APSAT program predicts electrical power generation and efficiency (net AC/LHV) that are in line with observed performance data. In addition, the tool accurately predicts key process temperatures throughout the system. Finally, sensitivity analyses of several major system parameters were accomplished to identifying key development needs and improvement potential for hybrid SOFC gas turbine cycles.