

Solid Oxide Fuel Cell – Gas Turbine Hybrid Power Plant

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Hybrid power plants consisting of gas turbine (GT) and solid oxide fuel cell (SOFC) convert chemically bound energy into electrical energy. They can be operated at high electrical efficiencies within a large range of installed electrical power. The German Aerospace Center (DLR) has been involved in research activities concerning the hybrid power plant since 2006 with the aim to build and operate a hybrid power plant.

A general concept of the hybrid power plant based on planar SOFC stacks and a 100 kW micro gas turbine has been developed with the aim to achieve high electrical efficiencies over a wide power range. A power plant model has been developed based on experimentally validated models of GT [1] and SOFC [2].

The presentation will illustrate the general concept of the power plant. The focus is set on the influence of various parameters (e.g. power ratio between SOFC and GT, SOFC size, thermal insulation) on the operating conditions of the SOFC. Electrical efficiency and power range of the proposed system layout is presented.

[1] T. Panne, A. Widenhorn, J. Boyde, D. Matha, V. Abel, and M. Aigner, "Thermodynamic Process Analyses of SOFC/GT Hybrid Cycles." St. Louis, Missouri, USA: 5th IECEC, June 2007, AIAA 2007-4833.

[2] M. Henke, C. Willich, C. Westner, F. Leucht, J. Kallo, W. G. Bessler, and K. A. Friedrich, "A validated multi-scale model of a SOFC stack at elevated pressure," *Fuel Cells*, vol. 13, pp. 773–780, 2013.