A Special Edition on "Innovative Concepts of Generating Systems with Energy Management"

The growing demand on efficient power decentralized systems pushes the research community to investigate for innovative solutions in terms of energy management. This special section consists in 5 papers which treat various aspects of this field ranging from large wind turbine technology to domestic co-generation system. However, beyond this great disparity of power range and prime used energy, exists also similarities like the search of efficient maximum power point tracking methods or the search of the most appropriate combination of two complementary storage technologies.

All these contributions were firstly presented at the 2006 EPE-PEMC Conference in Portorõz, Slovenia.

The first paper, "Energy storage and management in wind turbine generator systems" by Abbey et al. considers the role that energy storage may play in the evolving wind generator technologies and how it offers to address many of the present and future requirements that will be placed on wind, in order to mitigate impacts related to power system operation. The concepts are demonstrated using the most prominent wind turbine generator technologies, together with both short and long term energy storage devices.

The second paper, "Efficiency Considerations and Measurements of a Hybrid Energy Storage System based on Compressed Air and Super Capacitors" by Rufer et al. presents an hybrid storage system on the base of a hydro-pneumatic main-storage component, completed with an auxiliary storage device based on supercapacitors. The main goals of developing this hybrid system are to obtain a storage system with much lower aging phenomena as conventional electrochemical batteries, and to reach a good efficiency in a round-trip cycle thanks to different strategies of MEPT (Maximum Efficiency Point Tracking).

The third paper, "Energy Performance of a New Stirling Micro Cogenerator" by Garcia et al. introduces a domestic Stirling cogeneration system. The system consists in a new "double-effect" Stirling engine structure along with a linear induction generator. State-space model of the co-generator under steady-state oscillatory conditions is presented in order to synthesize a controller that ensures robust stability and desired performances through the resistant effort created by the generator on the piston. Finally, a rotating emulator is developed to study the energetic viability of the cogenerator.

The fourth paper, "Variable Speed Small Hydropower Plant Connected to AC Grid or Isolated Loads" by Breban et al proposes an autonomous variable speed small hydro plant structure able to operate on isolated loads or on a power grid. According to a two levels structured modelling, a unified approach for the system control which involves DFIG rotor flux control is determined. Simulations have been carried out leading to an analysis of the transition from grid connected mode to isolated one. Each mode has been tested experimentally on a 3 kW test bench.

The fifth paper, "Laboratory Simulation of the Adjustable Speed Generation Systems" by Chlodnicki et al. discusses the design and performance of a laboratory rig which is used to evaluate different variable/adjustable speed generating system topologies. A programmable torque speed characteristics of a DC machine controlled by a thyristor converter is used as simulator of the different driving engines. Results of laboratory tests of step loads of the conventional adjustable speed generating system and hybrid with additional supercapacitor energy storage are also presented.

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