

Holistic modelling of a combined Photovoltaic, Wind and Fuel Cell power system

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Abstract – The research work presented in this paper is focused on the holistic modelling of a combined Photovoltaic (PV), Wind and Fuel Cell, (FC) power system. The modelling approach is based on the Handel C programming language and is using the DK5 modelling / design environment from Mentor Graphics. The aim of the research was to achieve a combined model of a photovoltaic – wind-fuel cell energy system, enabling an holistically optimized digital control system design, followed by its rapid Field Programmable Gate Array (FPGA) prototyping. Initially, the functional simulations of the integrated system were performed, than, the controller design was downloaded in hardware onto a RC10 development board containing a Xilinx Spartan FPGA and was successfully tested experimentally. This approach enables the design and fast hardware implementation of efficient controllers for Distributed Energy Resource (DER) hybrid systems.

Index Terms — FPGA, renewable energy, modelling, control systems, power systems.

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