

submitted to: 2nd European PV-Hybrid and Mini-Grid Conference, Kassel, 2003

Title: New V/f–Statics controlled Battery Inverter – A key component for AC-Coupled Hybrid Systems and Mini Grids

Topic: Components

Presentation: Oral

Authors: Mike Meinhardt,
Martin Rothert (Co-author, SMA), Alfred Engler (Co-author, ISET, Kassel, Germany)

Affiliation: SMA Regelsysteme GmbH, Hannoversche Strasse 1-5, 34266 Sandershausen, Germany,

Contact: Phone: + 49 561 9522 333, Fax : + 49 561 9522 100, E-mail: mike.meinhardt@sma.de

Summary: The paper introduces a new generation of battery inverters for AC-coupled PV-Hybrid systems.

As an introduction a brief overview of PV-hybrid system and mini-grid designs looking at different power sources and PV-hybrid system structures is given. Based on this the principles of DC- vs. AC-coupling of power sources and consumers are compared showing the advantages of AC-coupling for PV-hybrid systems from the lower and upper kW power range.

The control of the PV-Hybrid system guarantees a stable and optimised operation PV-hybrid systems or mini-grid. A classification of the different tasks and associated levels of control of PV-hybrid systems indicates the necessity and the requirements of a dedicated grid control for hybrid systems. The core of this grid control is the droop-mode control which is derived from control strategy of conventional power plants and is based on P/f- and Q/V-statics.

Since the battery inverter is the key component in AC-coupled PV-Hybrid systems the state of the art of commercially available battery inverters comprising a systematic comparison of different battery inverter topologies and features is presented. A new developed inverter is compared to existing commercially available inverters.

The structure of a new developed battery inverter with droop-mode control and the requirements on controller and power electronics hardware for droop-mode realisation are presented. The operational behaviour of this new developed droop-mode controlled battery inverter is shown by means of measurements and simulation results.

Literature: Kleinkauf, W. et. al.: Control and Communication for decentralised photovoltaic hybrid systems, Proceedings of PV in Europe - from PV Technology to Energy Solutions Conference and Exhibition, 7-11 Oct., Rome, Italy

Engler, A.: Control of battery inverters in modular and expandable island grids, Ph.D. Thesis, University Kassel, Germany, 2001