

A) General Information



Acronym: IGDySMoV – 20120131-01

Title of the User-Project: Island Grid Dynamic Stability Model Verification
TA Call: Call 5

Host Research Infrastructure: Fraunhofer IWES
Starting Date: planned for August 2012

End Date:

Lead User : Prof. Dr. Jürgen Sachau
Organization: University of Luxembourg
Additional Users: Markus Jostock, PhD

B) Summary of the User-Project

This lab investigation is part of a PhD project, which is investigating the stability of pure inverter driven island grids. The stability and dynamics analysis is based on a control model of the island grid and this control model shall be validated in a real laboratory setup before pursuing further analysis.

A dynamic control model of an island power grid, purely generated by voltage source inverters, without rotating - and thus stabilising - generators has been developed. Without rotating masses, the grid dynamics depend purely on the fast inverter logic, which is not bound to slow, physical, energy-based time constants.

The elaborated control model will serve as foundation for investigations of the necessary boundary conditions for a stable and reliable operation of highly parallelized off-grid inverters in micro grids or power island grids. The main research objective is to provide a safe approximation of the stability of inverter driven power grids and to engineer a new grid for maximum stability.

C) Expected Results

The direct output of this investigation will be

- a set of formal models for high speed off-grid inverter dynamics and a set of parameters which allow to classify inverters with regard to their influence on the grid stability
- a mathematical description of a grid composed of n parallel inverters allowing to perform grid stability analysis by changing the equivalent circuit of the power bus or by adapting the inverter parameters
- laboratory results as verification of the developed linearised inverter driven grid model for stability analysis

In the mid-term, the results of this project serve as a base for further investigations of specific types of grids or inverters. E.g. depending on the voltage level (high voltage or low voltage), the grid power bus behaves rather inductive or rather ohmic and thus the stability can be influenced. The model found in this project allows to adapt the stability analysis to the specific grid model or inverter characteristics.

D) Dissemination of the Results (Planned)

The laboratory experimental phase is part of a PhD thesis and the results will be of direct relevance to the investigations of boundary conditions for a reliable and efficient control of energy systems formed by highly parallelized off-grid inverters. The PhD thesis will probably be published by end of 2013. The thesis will be available in public library services

and there are no limitations or restrictions on the publications.

Intermediate results will already be published in international transactions or conference papers. Particularly after the laboratory verification a publication is foreseen of the elaborated and then verified control model of the inverter driven power grid for discussion in the international science community.

E) Use of the Resources (Planned)

Nr. of Users involved:	2
Access Days:	10
Stay Days:	15