RWTH AACHEN UNIVERSITY

E.ON Energy Research Center
ACS | Institute for Automation of Complex Power Systems

Master Thesis Announcement

Development of an Innovative Grid Emulator

The connection of power electronics driven energy sources is calling for special requirements. A typical case is given by the tests performed for photovoltaic inverters. Testing procedures have been developed in the past to check if the control system is providing a behavior that can be considered "grid friendly", i.e. supporting the stability of the grid and not inducing undesired behavior such as oscillations.
Grid Emulators, as one solution, are based on pre-calculated waveforms applied to a power amplifier. In this case, there is no concept of feedback from the device under test. Another solution is to use a power amplifier jointly with a real-time simulation platform, which implements the reaction of the device under test in the form of a network model. This option is typically more realistic, but significantly more expensive and typically less user friendly.
Our goal is to enrich a classical grid emulator with an innovative way to emulate the grid's behavior. It allows the reconstruction of transient behavior characteristics, which are neglected fully in classical grid emulators. Furthermore, classical grid emulators are not able to represent typical undesired behavior such as resonances caused by filtering devices or by interactions of multiple inverters in a local grid. Such resonances will never emerge as problem when using classical grid emulators, but could be a major source of problems in real power system operation.

Your tasks:

- Review of existing approaches proposed for grid emulators
- Continue existing theoretical development of innovative way to emulate the grid's behavior
- Implementation of developed theory in a transient simulation tool
- Implementation of developed theory on a power amplifier in the ACS laboratory
- Comparison of new solution with a classical grid emulator and a real-time simulation based Power-Hardware-in-the-Loop setup

Your profile:

- Student of electrical engineering at RWTH Aachen University
- Knowledge on modeling and simulation of power systems is beneficial
- Knowledge on power electronics and control, especially DC/AC inverters
- Interest in theoretical, simulation-based and practical laboratory work
- Willingness to learn about new topics
- Autonomous and reliable way of working

Contact:

Robert Uhl, M.Sc.
Tel. +49 (0) 241 / 80 - 49727
RUhl@eonerc.rwth-aachen.de

Sriram Gurumurthy, M.Sc.
Tel. +49 (0) 241 / 80 - 49751
SGurumurthy@eonerc.rwth-aachen.de