Prof. Dr.-Ing. habil. Christoph M. Hackl
ISES Institute for Sustainable Energy Systems
LMRES Laboratory for Mechatronic and Renewable Energy Systems
Department of Electrical Engineering and Information Technology
Hochschule München / University of Applied Sciences
Lothstr. 64, 80335 Munich

Master Thesis, Hauptseminar, Forschungspraxis

Modeling and emulation of grid dynamics for stability analysis of renewable energy control systems

Due to less inertia (rotating masses) in future grids, the focus of current research is on inertia emulation control methods for renewable energy systems to ensure grid frequency stability. Validating of new inertia emulation control methods requires to model the grid connection. However, existing simplified reduced-order grid models derived for conventional power generation may not be sufficient as modern power electronics based energy systems are not taken into account. The work is needed for the HM-project *Ganzheitliche Zwillinge für die elektrischen Subsysteme und die Netzanbindung* (HM-GZESN) which is part of the joint project *e-TWINS – Ganzheitliche digitale Zwillingstechnologie für das Energiesystem* and supported by the *Bundesministerium für Wirtschaft und Energie* (BMWi).
The work packages are:

- Literature research on state-of-the-art modeling and emulation of grid dynamics for stability analysis
- Implementation of the grid model (in Matlab Simulink)
- Identification of potential grid emulation methods for our lab-hardware (e.g. for two-level inverters or voltage amplifiers)
- Implementation and validation of the emulation (in dSPACE at our laboratory)

Please send your application with CV and transcript to Andre Thommessen andre.thommessen@hm.edu