ISES
Institut für Nachhaltige
Energiesysteme

16.11.2025

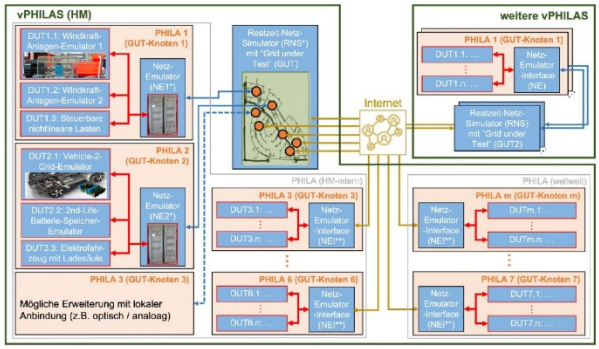
Master of applied research

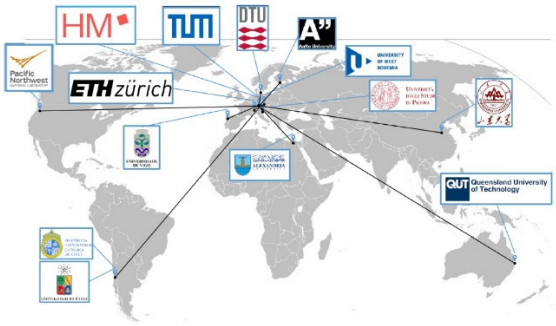
at the Institute for Sustainable Energy Systems (ISES)

Modeling and emulation of hybrid power grids for stability analysis using Power Hardware in the loop (PHIL)

Challenge:

The energy transistion is leading to an increasingly complex and more fragile electrical power system, as conventional synchronous generators are being replaced by power-electronic-based generators and consumers. As a result, grid inertia decreases, frequency and voltage stability deteriorate, and phenomena such as harmonics, and resonances can occur. Therefore real-time capable control and monitoring methods - such as inertia emulation, virtual synchronous generators, voltage control and black start capability - are required. To research and optimize such systems, realistic PHIL experiments are used, which shall connect geographically distributed laboratories worldwide.





Tasks and goals:

- Hardware design of a high dynamic converter (grid emulation interface)
- Implementation of different communication protocols
- Charakterization of converter properties
- Implementation and validation of PHIL emulation
- Opportunity to specialize in an area of your choice
- Support and mentoring from experienced scientists and engineers

What do you bring to the table?

- Good academic performance that demonstrates your commitmend and skills in your field of study
- Interest in the modeling, simulation and emulation of electrical grids
- Initial experience with Matlab & Simulink, KiCad or Altium
- Ability to work in a team and willingness to work in an interdisciplinary manner

Contact
Prof. Dr. habil. Christoph M. Hackl
christoph.hackl@hm.edu

Thomas Sageder
thomas.sageder@hm.edu