

PhD Topic 3: Adaptive Micro Grid Control and Protection

First Supervisor	Prof. Dr. Wolfgang Gawlik
Second Supervisor	Prof. Dr. Silvia Miksch
Primary Field	Green Business
Secondary Field	Algorithmic Modeling, Simulation, Optimization
Interdisciplinary References	C2, C3, C4, E2, E4

With distributed energy resources, i.e. decentralized generation capacity and decentralized energy storage, being increasingly integrated into the power network, designated areas of the power network may have the ability to be operated in island mode as well as connected to the overall grid. These micro grids, however, require adaption of both control and protection schemes depending on their status.

Generally, it can be assumed that fault levels in network connected mode are mainly given by the capacity of the network connection and will be significantly lower in island mode operation. Therefore, protection schemes need to be adapted in order to safely and selectively identify faults in the micro grid and allow system protection to disconnect the faulted parts of the micro grid.

Likewise, during network connected mode any imbalance in the micro grid will be balanced out by the overall network, while the micro grid must be able to provide stability for both frequency and voltage on its own in island mode.

The coordination and adaption of the control algorithms used for decentralized generation and storage capacity as well as demand side management options requires communication, optimization and a holistic approach using all information available inside the micro grid. Protection schemes need to be adapted online and based on the current status of the micro grid.

Simulation tools for planning, analyzing and optimizing such systems need to include both physical behavior of the micro grid components as well as the communication technology applied and real time computation methods adopted to operate the micro grid.

References:

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