

Master Thesis Proposal

Development and Implementation of Network Reconfiguration Algorithm for Hybrid AC-DC Networks

The power systems are at a turning point. Coexistence of consumers and prosumers, increase of Distributed Energy Resources (DERs) and spread of innovative automation applications lead to smart grid systems completely integrated into the electrical network. The introduction of Direct Current (DC) solutions in the medium voltage distribution systems is opening new paradigms and possibilities that still require investigation effort to be completely defined. With respect to this, hybrid AC-DC grid is composed of traditional Alternate Current (AC) network interfaced to DC grid via AC-DC power converters.

The concept of network reconfiguration consists in operating (open or close) the switches installed in the electrical grid in order to change the topology of the network; hence the structure of the distribution system is modified to improve the power flow and reduce the electrical losses. Moreover, in hybrid AC-DC grid the action of power converters can be directly controlled to pursue the same objective, enhancing the energy management in the whole system.

Objective of the thesis is the development of an innovative algorithm for the enhancement of power flow in hybrid AC-DC distribution grids, the implementation and test on real time application.

Your tasks:

- Review of existing approaches for network reconfiguration and power flow control of AC-DC converters.
- Starting from a basic network reconfiguration algorithm (result of previous research activity), extend it to include converter control and additional features.
- Implement the algorithm in Python code.
- Conduct multiple tests to evaluate the robustness of the algorithm in different boundary conditions, using the hybrid AC-DC grid model developed with the Real Time Digital Simulator (RTDS).

Your profile:

- Student of electrical engineering at RWTH Aachen University.
- Basic knowledge of Python is beneficial or willing to learn it quickly.
- Fundamental knowledge about distribution power system.
- Experience with modelling and simulations is beneficial.

Contacts:

Alberto Dognini, M.Sc.

Tel. +49 241 80 49590

adognini@eonerc.rwth-aachen.de

ACS | Institute for Automation of Complex Power
Systems

ERC | E.ON Energy Research Center

RWTH Aachen University

Mathieustr. 10, 52074 Aachen, Germany