RWTH AACHEN UNIVERSITY

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

Master Thesis

Analysis of Power Converters Behavior in Hybrid AC-DC Distribution Networks under Fault Conditions

To date most of the distribution electrical networks rely on Alternating Current (AC) systems, due to the induction principle of generators, motors and transformers. On the other hand, the deployment of Direct Current (DC) solutions has been limited to portions of some peculiar high voltage transmission systems.
Because of the continuous increase of DC-based loads and Distributed Energy Resources (DERs), the DC technology represents a good candidate to be integrated in the existing medium voltage distribution grids.
To interconnect different portions of the network, the adoption of DC technology requires the deployment of AC-DC converters, whose studies on their optimal management and efficient applicability at medium voltage levels are ongoing, particularly considering the presence of exceptional fault conditions.
In fact, occurrence of faults in the electrical distribution grid requires the prompt intervention of protective switching devices, to isolate the faulted area and reconfigure the energized network.

Objectives of this thesis are the analysis of operating conditions for AC-DC converters in faulted hybrid AC-DC networks, composed by AC and DC sub-portions, and their mathematical modelling. These models will be integrated in the protection reconfiguration algorithm and validated via simulations of different grid conditions.

Thesis tasks:

- Review the state-of-the-art operational control for medium voltage AC-DC converters, which interface AC and DC grid sub-portions.
- Model the suitable converter controls, considering fault occurrence, and integrate them (in Python language) in the protection reconfiguration algorithm for hybrid AC-DC distribution grids.
- Deploy simulations to validate the developed models and quantify their impact on the grid reconfiguration process.

Your profile:

- Master student in electrical engineering at RWTH Aachen University.
- Good attitude for programming and knowledge of Python language.

- Experience with power systems modelling is beneficial.

Notes:

The supervision language will be English.
In case of interest in this thesis position, please, reply to this announcement by providing your CV and Transcript of Records.

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