

Master Thesis

Model-Based Fault Diagnosis in MVDC Grids

Context:

The medium voltage dc (MVDC) grids based on power electronics technology are promising solution for the integration of renewable energy sources (RES) and flexible power distribution. However, the protection of MVDC grids are still facing great challenges. First, the complexity of the MVDC grids because of loop / meshed grid topology and various controlling modes makes the identification of incipient fault difficult. Moreover, the fault currents in MVDC grids are limited by the power electronics converters in the steady state, which do not differ too much from the normal current. All of these challenges need to be addressed by advanced fault diagnosis approaches.

The previous researches of fault detection and isolation approaches in dc system have been primarily focused on signal analysis, whose feasibility is largely limited by the system topology and parameter. To cope with the fault diagnosis in the complex MVDC system, the model-based fault diagnosis approach has been introduced. Unlike the conventional methods, this approach relies on the state space model of MVDC system and is particularly suitable in the system of high complexity.

Task:

The primary target of this thesis is to develop the suitable model-based fault diagnosis approaches in MVDC grids. To achieve this goal, following tasks are included:

- Study of the model-based fault diagnosis algorithm.
- Elaboration of the state space and the switch models of a MVDC system with dc converters. (in MATLAB / Simulink, etc.).
- Development of the model-based fault detection and identification function for MVDC system. (in MATLAB, etc.).
- Offline test of the proposed fault diagnosis method with the MVDC system model (in MATLAB, etc.).
- Online test of the proposed fault diagnosis method under real-time simulation with RTDS / Opal-RT platform.

The student will receive an introduction in order to start quickly with the required tools. During the work, the student will be supervised by the research associates in the ACS institute. The previous research results about MVDC system modeling are already available for support.

Profile:

For this task the student should have fair knowledge in the state space modeling and control loops.

How to apply:

Please send the following documents:

- letter of application (just briefly explain your interests and relevant experiences)
- CV
- transcript

per email to the contact below.

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