

Master/Bachelor thesis

Research area: Optimization and operation of the hybrid AC/DC transmission systems

Title: Access points selection and capacity configuration for multiple VSC-HVDC Links

With the depletion of fossil fuels and the climate change caused by its green-house-gas emission, wind power is growing fast to occupy an important position in the future energy system. Various types of wind farms can be connected to the AC grid through the voltage source converter-based high voltage direct current (VSC-HVDC) transmission systems. Nowadays, as a most efficient and promising means of extending the transmission capacity of power grids, an increasing amount of VSC-HVDC systems is utilized or planned worldwide by power system operators. In order to take better use of control-ability of VSC-HVDC system, it is necessary to search for suitable access points of VSC-HVDC system to grids. How to take controllable advantages of the VSC-HVDC system, reduce the overload problem of the AC line, make power flow distribution within power systems more suitable, is worthy of more in-depth investigation. One direction is to mitigate the overloads of the AC lines by optimizing the active power set-point of VSC-HVDC during the time-based operation process. Another clue is selecting appropriate access points of the HVDC system to take better use of the VSC-HVDC for the line overload issue. When the VSC-HVDC system is connected to the grid at different locations, the impact on the grid and the ability to regulate grid overloads are also different. Thereby, how to wisely choose access points that couples AC and DC systems is especially important.

The aim of this thesis is to design a strategy for access point selection and capacity configuration of the VSC-HVDC links. The strategy designed in this research will mainly focus on the planning of the VSC-HVDC system from the perspectives of technical performance of reducing overload, and the economic investment in the construction of the VSC-HVDC system. For large power grids, there are multiple HVDC planning issues. As for the location determination of multiple VSC-HVDC links, the original proposed method in our publication which ignores the interaction between multiple VSC-HVDC links need to be improved. In this research, we can consider the interaction between multiple HVDC links and design an appropriate coordinated planning strategy for multiple HVDC links, so as to achieve the multi-objective optimization of economy, controllability, and optimal operation of the power grid. The scope and specifications of the thesis are to be coordinated with the supervisors.

The following structure of the work is proposed:

- Literature research on the subject area
- Identification and selection of potential methods for access point selection of VSC-HVDC links
- Research and implement of a suitable method in MATLAB
- Application on an exemplary grid

Following this thesis, the results of the work will be reported in a presentation.

This thesis is to be awarded to students of electrical/information technology and industrial engineering as master's thesis with immediate effect. Parts of the thesis can also be assigned as bachelor thesis.

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