

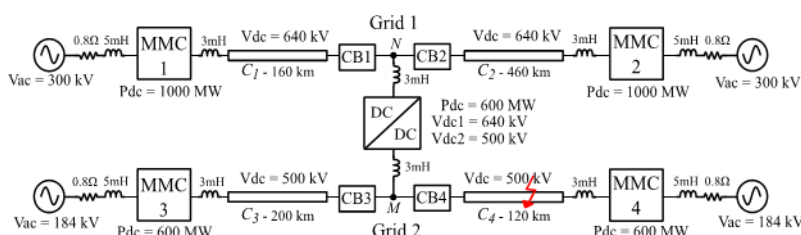


DC-DC Converters for the interconnection of HVDC grids

Modelling, control and simulations of dc/dc converters

CONTEXT

With the growing interest for multi-terminal dc systems (MTDC) and the increasing number of installed point-to-point HVDC links (PTP) (with some of them crossing each other or having close paths), an attractive option to move towards MTDC consists in interconnecting two former PTP. As most of PTP have different technical characteristics (at least the rated dc voltage), the direct interconnection is impossible and a dc/dc converter is needed. Beside the case of two PTP, the DC/DC converters are of interest for most expected configurations of future DC grids. This kind of converter has never been built but this subject draws the attention from industry as shown by the creation of a Cigré working group (B4.76). The challenges to tackle include the choice of the converter topology, the control of the converter and the study of its integration into the grid particularly in case of faults.



TECHNOLOGY DESCRIPTION

This offer corresponds to scripts and simulation files developed during the PhD thesis of Juan Paez.

These files include Matlab/Simulink simulation models of an isolated dc/dc converter (front to front MMC) and of a non-isolated solution (DC MMC). The converter models are provided including “average arm models” (with blocked state to simulate the converter behavior during faults), detailed models (representing the individual behavior of each submodule to analyze switching losses) and the respective control loops. These converters are simulated in the interconnection of two cable based PTP where modular multilevel converters (MMC) are modeled with “average arm models” and the cables are modeled with a wide band model. The control loops of the MMCs are also implemented. The simulation files allow to study the interconnection during normal operation and in case of faults.

APPLICATION DOMAIN

- HVDC multiterminal systems
- Interconnection of two former point-to-point HVDC links

ADVANTAGES

- Ready to run simulation files
- System level simulations considering internal behavior of converters

TRL SCALE



Complete model of an interconnection

DELIVERABLES

Simulation files

SCIENTIFIC REFERENCES

HVDC Converters for the interconnection of HVDC grids, Juan Paez, PhD thesis, Dec 2019.

Study of the impact of DC-DC converters on the protection strategy of HVDC grids, Juan Paez et al., IET ACDC 2019

Overview of DC-DC Converters Dedicated to HVdc Grids, Juan Paez et al., IEEE Transactions on Power Delivery, 2019

Influence of the operating frequency on DC-DC converters for HVDC grids, Juan Paez et al., IEEE EPE 2019