

Forschungscampus "Flexible Electrical Networks"

Investigation and experimental setup of switching devices for future DC grids of medium voltage (P2)

The *Forschungscampus Flexible Electrical Networks* FEN is consortium of institutes of RWTH University and industrial partners. The aim is to investigate and to develop the flexible power grid. Advances in power electronics enable the construction of DC grids in the medium voltage level for the flexible distribution of electrical energy. A major challenge in the DC technology is the realization of necessary protection concepts and switching devices. Within the framework of the work package WP 2.4 "DC switching", various DC circuit breaker concepts from high voltage and low voltage levels as well as railway technology are identified. Based on previously defined evaluation variables, their applicability in the medium voltage level is examined. Both pure power electronics concepts as well as hybrid approaches, which have an additional mechanical switch to minimize conduction losses, are considered. Furthermore, the DC circuit breaker concepts are compared with commercially available DC circuit breakers with an arc chamber.

In addition to the technical criteria, the evaluation variables also include economic key indicators such as, for example, acquisition and operating costs. For technical evaluation, simplified simulation models of the DC circuit breakers as well as typical DC medium-voltage grids of different grid topologies are constructed. Transient grid simulations allow to determine and compare the amplitudes of the short-circuit currents and the resulting switch-off times in the simulated fault cases. In addition, the mean time between failures (MTBF) is calculated for each DC circuit breaker concept for reliability assessment.

With regard to the technical evaluation criteria, purely power electronic DC circuit breaker concepts are the most suitable. From an economic point of view, however, these concepts are not to be regarded as optimal due to their high operating costs. On the other hand, hybrid DC circuit breaker concepts represent a good compromise between all evaluation categories. The next steps are the conception and a subsequent design of selected hybrid DC circuit breaker concepts. In cooperation with the E.ON Energy Research Center, these DC circuit breaker concepts are being developed and tested as a prototype in the high-current laboratory.

Project information



Partner

- RWTH Aachen
- Siemens AG
- Hager Group
- Schaffner Deutschland
- Infineon Technologies Bipolar
- MR Maschinenefabrik Reinhausen
- ...and 32 others



Facts

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Contact

Maximilian Stumpe, M.Sc.

Academic Staff

Tel.: +49 241 80 99502

stumpe@ifht.rwth-aachen.de