

## Functional needs and potential technologies, to enable the stepwise development of HVDC multi-terminal grids

**Dr. Florent Morel**

SuperGrid Institute

Research group leader

23 rue Cyprian CS 50289

69628 Villeurbanne Cedex – France

<https://www.supergrid-institute.com>

### Abstract:

The introduction of modular multilevel converters (MMCs) created a new momentum in the field of high voltage direct current (HVDC). HVDC is not anymore used only in point-to-point links embedded in ac systems or between asynchronous areas. It is now also used to transport power from offshore wind farms (OWF) far from shore to land and multi-terminal direct current (MTDC) systems are becoming a reality. With the expected massive development of renewable energy sources and the limited rights-of-way to create new overhead lines in many countries, the power system must evolve and HVDC technologies will have a major role to play. This presentation will remind the motivations for dc and MTDC solutions and give a brief state-of-the-art of HVDC converters. Some examples of MTDC will be presented. An insight on the stepwise development of MTDC will highlight new functional needs which can be provided thanks to devices involving power electronics: DC current breakers, DC/DC converters, power flow controllers (or current flow controllers), integration of energy storage elements... For these needs, some technologies and their status of development will be reviewed.



### Biography:

Florent Morel is an alumnus of École normale supérieure (ENS) de Cachan, France. In 2002, he obtained his “agrégation” in Electrical Engineering and he received an MSc in Electrical Engineering from INSA de Lyon, France in 2004. He pursued his PhD at INSA de Lyon on the control of electrical drives. He considered especially the association of a permanent magnet synchronous machine with a three-phase matrix converter. From 2007 to 2019, he was Associate Professor at École Centrale de Lyon and the Ampère Laboratory. He taught electrical engineering and power electronics. His research activities focused on power electronics converter design. He especially considered electromagnetic compatibility (EMC), use of silicon carbide devices, power supply of circuits with a high-voltage insulation and converters for high voltage grids (including railway). He is currently with SuperGrid Institute, Villeurbanne, France where he is leading the research activities on converters for HVDC applications. With the research engineers and PhD students in his team, he is especially working on innovations for HVDC ac/dc and dc/dc converters, power flow controllers and integration of energy storage in multilevel modular converters.