Review of the Lecture
"AC grid protection for grids with VSC-HVDC converters"
by Prof. Helder Leite on the 18th of December, 2013

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A secure and reliable operation of both AC and DC grids cannot be achieved without adequate Protection. AC Grid Protection has some requirements and constraints, e.g. reliability, selectivity, speed and sensitivity, that are extendable to DC Grids operation and that must be coped with.

In order to achieve an appropriate and effective protection, different types of Protection Schemes were developed. The choice of a particular protection scheme is dependent not only on the intrinsic characteristics of each protection scheme but also on the characteristics of the AC grids that will be protected.

However, protective schemes have some limitations and different schemes have to be used simultaneously in order to overcome these limitations. When multiple protection schemes are used, they must be coordinated, and the coordination of the protective relays associated with different protection schemes is a critical step to achieve the operational security of an AC grid.

When in operation, some limitations and operational problems arrive as the result of AC grids configuration and variation in AC quantities. Since VSC-based HVDC links can change almost instantaneously the active and reactive power within the capability curve of the converter, this property can be used to support the AC grid with the best mixture of active and reactive power during stressed conditions (even if power reversal is necessary). However some operational threats can arise during normal and abnormal operation of DC grids, and it is important to know the Impact of VSC-HVDC Links on AC Power System, particularly on:

- Voltage and Power Stability on the AC Network.
- Rating of Circuit Breakers;
- Power System Protection Operation.

The control of the converters is an important concern in the overall control of the DC grid and on the integration of AC/DC grids, especially under transient conditions.

The awareness of the consequences that the operation of DC grids imposes on AC grids, and especially in AC Grids Protection, implies that research must be kept not only within acceptable limits of theoretical analysis, but must also cope with real world operation and limitations.

The framework of Work Package 3: Relaying Protection relies strongly on the accurate modelling and control of the converters and on the integration of the converters on AC and DC grids. The control of the converters and the DC grid will determine the nature and dynamics of AC quantities variations, and therefore the type of conditions that are expected during protective relays operation. An in depth study of these conditions would prove to be very valuable since it would allow a comprehensive study and design of protection schemes and their coordination.