

Protection against DC Faults in Voltage Sourced Converters

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Abstract. One of the main limitations of VSC is that converters are defenceless against DC faults, it should also be taken into account that their fault current withstand is much lower than classic HVDC converters, which are thyristor-based. DC faults have been avoided as hard as possible, not having any DC fault is the protection method utilised. As they appear more often in overhead lines, the VSC systems are cable-based or do not have any transmission circuit. Nowadays, no commercial overhead line system is operating

Key words: Voltage Sourced Converters, Direct Current, DC fault, protection.

1. DC fault in a VSC system

When a DC fault appears in a VSC link, the condenser short-circuits and the anti-parallel diodes conduct as a rectifier bridge, feeding the fault. The converter is not able of extinguishing the fault current. The fault current is only limited by the reactance impedance, causing high currents that can destroy the semiconductor devices. The current withstand of the IGBT is typically twice the nominal rated current.

This is the main disadvantage of a VSC in comparison with a classic HVDC. For this reason, the most suitable applications of VSC systems are Back-to-Back stations and cable links where there are no overhead lines, and the risk of DC faults is reduced. Up to now no commercial overhead system has been put into operation.

2. Conclusions

This paper analyses the different performances of traditional HVDC Systems and VSC Systems when DC faults appear. Resonance has also been analysed in VSC

converters. Several methods for extinguishing the fault current and several solutions for the overcurrent and overvoltage that appears in DC faults have been presented. The application for multiterminal systems has been included.

Due to the analysis made, it can be concluded that VSC Systems can survive DC faults. It is possible that VSC systems, point-to-point and multiterminal, in the future will be implemented with overhead lines.

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