

B4_PS1 Q1.3

What are the main considerations on technology selection for new and refurbishment HVDC projects

LCC based HVDC converters are widely used in HVDC applications, and they also have the capability of controlling DC fault current. The disadvantage is that commutation failures could occur during an AC voltage dip, especially during inverter operation. Due to large penetration of HVDC transmission systems in a bulk AC grid, one commutation failure could trigger commutation failures in other HVDC inverters. As a consequence, a cascaded HVDC system trip event could occur, which could potentially lead to unacceptable power system disturbances.

VSC based HVDC converters have no commutation failures, and they can also support a weak AC grid by controlling reactive power independent of active power, and they can even form the AC grid voltage by creating the desired voltage magnitude and frequency when the traditional power plants are absent which is a desired capability in the coming years when traditional power plants are phased out and replaced with renewable resource based power. The flexible and fast active power control allows different range to share the primary and secondary reserves, thus increasing the grid resilience.

Therefore, the VSC HVDC may be the proper choice if one of the following conditions/requirements is on the list of the project conditions/requirement

- One of the connected AC networks requires black-start function
- One of the connected AC networks requires HVDC converter injecting fault current during AC short circuit faults
- One of connected AC networks requires AC voltage control/reactive power control for enhancing voltage stability
- Very fast active power change in power level as well as in direction in order to facilitate “reserve” sharing or fast frequency control
- Receiving end/inverter side AC network is very weak (e.g., $SCR < 2$, or $ESCR^{*1} < 2$, $CSCR^{*2} < 2$)

Note: *1: ESCR means effective short circuit power ratio

*2: CSCR means composite short circuit power ratio, refer to IEC TR 63401-1