

# **Reactive-power coordination in VSC-HVDC multi-terminal systems for transient stability improvement**

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**Abstract—** This paper proposes a new control strategy for the reactive-power injections of Voltage Source Converters in High Voltage Direct Current (VSC-HVDC) multi-terminal Systems to improve power system transient stability. A reactive-power supplementary signal is provided for each converter. Its value is proportional to the frequency deviation of its corresponding AC bus with respect to the weighed-average frequency of the multiterminal system stations. The purpose is to increase (decrease) the electromagnetic torque of generators close to those terminals in which the frequency is above (below) the weighed-average frequency used. The AC frequency for all VSC stations is always available locally for synchronisation purposes and could be used by a central controller. Simulations have been carried out using PSS/E and the results have shown that transient stability can be improved using this strategy. Since this approach uses global measurements of all VSC stations, the impact of the communication delays has been analysed, concluding that the negative effect is small, for realistic latency values.

**Index Terms—** VSC HVDC, HVDC transmission, multiterminal, transient stability, reactive power, power systems.

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