

Linear power flow algorithm with losses for multi-terminal VSC AC/DC power systems

J.C. Fernández Pérez; F.M. Echavarren Cerezo; L. Rouco Rodríguez

Abstract-

Power flow analysis is a key tool for planning, operation and control of power systems. With future hybrid Supergrids in mind, a wide variety of power flow algorithms for multi-terminal VSC AC/DC systems have been proposed. However, the nonlinear nature of these formulations represents a challenge for its use in real power systems. Whereas in the study of AC networks linear approximations are frequently utilized to speed up multi-scenario steady-state analysis, an equivalent tool has not been proposed for hybrid AC/DC grids. This paper fills that gap by formulating a linear MW-only power flow algorithm with losses for multi-terminal VSC AC/DC systems. The proposed algorithm provides a consistent estimation of converters' losses and allows modelling of all branches within the converter stations. Moreover, two novel schemes for the inclusion of DC network losses are proposed and a circuit-equivalent model of the linear power flow problem in multi-terminal VSC AC/DC systems is suggested.

Index Terms- AC/DC, DC power flow, HVDC transmission, linear power flow, multi-terminal DC (MTDC), VSC.

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