Title	A Mathematical Model for the Loadability Analysis of a Simultaneous AC-DC Power Transmission System
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Abstract

Simultaneous AC–DC power transmission system can, generally, increase the load carrying capability of an existing long AC transmission line. A mathematical model of a simultaneous AC–DC transmission system, transmitting power through an existing AC transmission line, is proposed in this paper. The model is based on the development of expression for AC and DC power flow of simultaneous AC–DC system in terms of the power flow of original AC system. It incorporates the thermal constraint of the line, the allowable maximum percentage of DC voltage mix in an already installed AC line and the operating practice of a long transmission line. The validation of the model is executed through two different approaches; comparison of the results obtained applying the proposed model to the power system with the published ones in the literature and with the results obtained using two different standard software packages, PSpice and MATLAB simulink, based circuit simulations. The model is also applied to a realistic system to verify its capability of evaluating the benefits of a simultaneous AC–DC transmission system. The model is an analytical tool for transmission planners to take the decision whether an existing AC transmission system would increase the power transfer capability if it were converted into a simultaneous AC–DC system.