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

The outcome of recent numerical simulation shows that the conversion of an AC transmission line to a simultaneous AC-DC line improves the system stability. This paper presents a mathematical model, suitable for the stability analysis of a simultaneous AC-DC transmission system, transmitting both AC and DC powers simultaneously through an existing AC line. The model is based on the principle of equal area criterion. The salient feature of this model is the introduction of a solution technique of an integral component of the model, which avoids the trial and error approach for the analysis. The model development process considers a single machine-infinite bus system with a transmission line connecting the machine and the infinite bus. The process also considers the severe most fault at the sending end bus. 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 standard software, MATLAB-Simulink, based circuit simulations. The model is also applied to a realistic system and IEEE benchmark systems to verify its capability of evaluating the benefits of a simultaneous AC-DC transmission system.

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