

Detailed analysis and experimental results of the control system of a UPFC

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Abstract-

This paper explains the decoupled control of the power flow through a transmission line using a PWM based Unified Power Flow Controller (UPFC). The dynamic model of the UPFC has been developed using the space-vector representation of the instantaneous three-phase variables. The Park's transformation and the reference frame selected reduce the control of the real and reactive-power flows to the control of the d- and q-axis currents, respectively. The proposed control scheme produces fast and decoupled response of the real and the reactive-power flow through a transmission line. It also achieves tight control of the d.c.-link capacitor voltage, thanks to the careful coordination between the control of the series and shunt compensators of the UPFC. A 15 kVA prototype with 750 Hz switching frequency has been built to illustrate the main contributions. Experimental results agree closely with the theoretical analysis.

Index Terms- PWM invertors; compensation; load flow control; power transmission control; power transmission lines; reactive power control

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