Title:	Optimal placement of unified power flow controllers to improve dynamic voltage stability using power system variable based voltage stability indices
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Abstract:

This study examines a new approach to selecting the locations of unified power flow controllers (UPFCs) in power system networks based on a dynamic analysis of voltage stability. Power system voltage stability indices (VSIs) including the line stability index (LQP), the voltage collapse proximity indicator (VCPI), and the line stability index (Lmn) are employed to identify the most suitable locations in the system for UPFCs. In this study, the locations of the UPFCs are identified by dynamically varying the loads across all of the load buses to represent actual power system conditions. Simulations were conducted in a power system computer-aided design (PSCAD) software using the IEEE 14-bus and 39- bus benchmark power system models. The simulation results demonstrate the effectiveness of the proposed method. When the UPFCs are placed in the locations obtained with the new approach, the voltage stability improves. A comparison of the steady-state VSIs resulting from the UPFCs placed in the locations obtained with the new approach and with particle swarm optimization (PSO) and differential evolution (DE), which are static methods, is presented. In all cases, the UPFC locations given by the proposed approach result in better voltage stability than those obtained with the other approaches.