Title:	Optimal placement of unified power flow controller by dynamic implementation of system-variable-based voltage-stability indices to enhance voltage stability
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Abstract:

A new approach of unified power flow controller (UPFC) optimal placement in the power system network based on dynamic analysis of voltage stability is presented in this paper. Voltage stability indices (VSIs), called line stability index LQP, voltage collapse point indicators (VCPIs), and line stability factor Lmn have been employed to explore the most suitable location for UPFC. The locations of UPFC are identified by dynamically varying loads across all the PQ buses by different percentages to satisfy the real power system conditions. The simulations are conducted in a power system computer-aided design (PSCAD) environment where IEEE-39 bus system has been chosen as case study. The effectiveness of the proposed method has been ensured from the simulation results because UPFC's placement in the obtained locations resulted in an improved voltage stability condition. Furthermore, to verify the suitability of the explored locations, a comparative study has been conducted after placing UPFC in the present locations and other locations obtained using optimization techniques like particle swarm optimization (PSO), differential evolution (DE), genetic algorithm (GA), and bacteria foraging algorithm (BFA). In all the cases, UPFC's placement in the identified locations using the proposed approach has resulted in better voltage stability condition improvement compared to heuristics approaches.