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A novel method for fast computation of saddle node bifurcation in power systems using an optimization technique

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Abstract

In this paper, a new method for computation of saddle node bifurcation is presented. In this method, initially, the problem is converted to an optimization problem, then solving the optimization problem, the obtained optimum point is the saddle node bifurcation. Here, instead of calculating several power flows, with very few iterative solutions of the optimization equations, which are similar to power flow equations, the saddle node bifurcation is obtained. The number of iterations in which the optimization problem is solved depends directly on the number of reactive power resources reaching their limits before saddle node bifurcation occurs. In the proposed method, for the increase of active power at PV buses, the loss function has been considered. The simulations use a typical network to highlight that the proposed method can rapidly compute the voltage collapse point much faster than other techniques.

Keywords: Power system; Saddle node bifurcation; Optimization

1. Introduction

Progressive energy demands associated with shortages in installed capacities have resulted in power systems being operated at or close to their mid-term voltage stability boundary. In power

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