Abstract

Renewable sources of energy are being integrated into the power grids due to their economic and environmental merits as compared with the traditional fossil-fuel-fired power generation. However, their significant penetration demands a thorough research in terms of system reliability, that is, security and stability. In this paper, Security Constrained Multi Objective Dynamic Economic Dispatch (SCMODED) problem considering cubic thermal cubic cost function, wind, solar penetration, cubic transmission power losses and cubic emissions cost function as objectives is first formulated. Both HVDC and HVAC lines are included in their formulation. Various approaches like probabilistic load flow (PLF), scenario based method, participation factors and Harmony Search algorithm etc. are employed in the solution process. Security and stability effects of renewable energy (RE) penetration are investigated and analyzed. The simulated results reveal that RE penetration leads to reduced cost and emissions and increased security concerns. Further, there is increased power system instability and hence increased load shedding so as to help the power system attain steady state stability. Inclusion of HVDC lines facilitates rapid and fast control to increase the transient stability limit by the action of the converter ignition angle (CIA) and converter extinction angle (CEA).