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Intelligent Control of Doubly Fed Induction Generator Wind Turbine for Smart Grid

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Abstract : Due to the growing penetration of wind energy into the power grid, it is very important to study its interactions with the power system and to provide good control technique in order to deliver high quality power. In this paper, an intelligent control methodology is proposed for optimizing the controllers' parameters of doubly fed induction generator (DFIG) based wind turbine generation system (WTGS). The genetic algorithm (GA) and particle swarm optimization (PSO) are employed and compared for the parameters adaptive tuning of the proposed proportional integral (PI) multiple controllers of the back to back converters of the DFIG based WTGS. For this purpose, the dynamic model of WTGS with DFIG and its associated controllers is presented. Furthermore, the simulation of the system is performed using MATLAB/SIMULINK and SIMPOWERSYSTEM toolbox to illustrate the performance of the optimized controllers. Finally, this work is validated to 33-bus test radial system to show the interaction between wind distributed generation (DG) systems and the distribution network.

Keywords : DFIG wind turine, intelligent control, distributed generation, particle swarm optimization, genetic algorithm
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