## **Optimization Techniques of Doubly-Fed Induction Generator Controller Design for Reliability Enhancement of Wind Energy Conversion Systems**

Authors : Om Prakash Bharti, Aanchal Verma, R. K. Saket

**Abstract :** The Doubly-Fed Induction Generator (DFIG) is suggested for Wind Energy Conversion System (WECS) to extract wind power. DFIG is preferably employed due to its robustness towards variable wind and rotor speed. DFIG has the adaptable property because the system parameters are smoothly dealt with, including real power, reactive power, DC-link voltage, and the transient and dynamic responses, which are needed to analyze constantly. The analysis becomes more prominent during any unusual condition in the electrical power system. Hence, the study and improvement in the system parameters and transient response performance of DFIG are required to be accomplished using some controlling techniques. For fulfilling the task, the present work implements and compares the optimization methods for the design of the DFIG controller for WECS. The bio-inspired optimization techniques are applied to get the optimal controller design parameters for DFIG-based WECS. The optimized DFIG controllers are then used to retrieve the transient response performance of the six-order DFIG model with a step input. The results using MATLAB/Simulink show the betterment of the Firefly algorithm (FFA) over other control techniques when compared with the other controller design methods.

**Keywords :** doubly-fed induction generator, wind turbine, wind energy conversion system, induction generator, transfer function, proportional, integral, derivatives

**Conference Title :** ICPTSEGT 2023 : International Conference on Power Transmission Systems, Electricity, Generation and Transmission

Conference Location : London, United Kingdom Conference Dates : April 17-18, 2023

1