

Augmentation of Variable Speed Wind Turbine Fault Ride Through using a New Phase Lock Loop Scheme

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The major aim of successful synchronization of a wind turbine system to the grid is to mitigate both electrical and mechanical stresses on the wind generator. During transient, the gearbox, shaft and rotor of the wind generator could be damaged due to mechanical stress. Also, the rotor and stator windings of the wind generator together with its insulation could be affected. The Phase-Locked-Loop (PLL) computes phase displacement of the grid required to achieve orientation and synchronization control. Consequently, it helps in preventing power system distortion due to stator-grid interphase. This paper proposes a new PLL control strategy and Series Dynamic Braking Resistor (SDBR) combined approach to augment the fault ride through capability of a variable speed wind turbine DFIG-based. The SDBR helps in the post fault recovery of the wind generator. Furthermore, investigation of the SDBR optimum size and best location in the DFIG architecture considering the best switching signal was also carried out. Simulations were run in Power System Computer Aided Design and Electromagnetic Transient Including DC (PSCAD/EMTDC). The results show that the proposed combined control strategy helps in the fast recovery of the DFIG wind generator variables during fault conditions.

Biography

Kenneth Eloghene Okedu was Massachusetts Institute of Technology (MIT) Fellow, in the department of Electrical and Computer Engineering, 2013 at Cambridge, Boston, USA. He obtained his Ph.D. in the department of Electrical and Electronic Engineering, Kitami Institute of Technology, Hokkaido, Japan in 2012. He received his B.Sc. and M. Eng. degrees in Electrical and Electronic Engineering from the University of Port Harcourt, Nigeria in 2003 and 2007 respectively, where he was retained as a Faculty since 2005 till date. He was also a visiting Faculty to The Petroleum Institute, (ADNOAC), Abu Dhabi. He is presently a visiting Faculty to Caledonian College of Engineering, Muscat, Oman (a university college with Glasgow Caledonian University, UK). His research interests include renewable energy, stabilization of wind farm using doubly fed induction generator variable speed wind turbine, augmentation and integration of renewable energy into power systems, power system stability, grid frequency dynamics, wind energy penetration, FACTS devices and power electronics, renewable energy storage, hydrogen and fuelcells.

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