Title:	Stabilization of Wind Farm by Using PMSG Based Wind Generator Taking Grid Codes into Consideration
Author(s) Name:	Md. Rifat Hazari, Mohammad Abdul Mannan, Atsushi Umemura, Rion Takahashi and Junji Tamura
Contact Email(s):	mdmannan@aiub.edu
Published Journal Name:	Journal of Power and Energy Engineering
Type of Publication:	Journal
Volume:	6 Issue 11
Publisher:	Scientific Research
Publication Date:	Nov. 26, 2018
ISSN:	2327-5901
DOI:	https://doi.org/10.4236/jpee.2018.611004
URL:	https://www.scirp.org/journal/paperinformation.aspx?paperid=88741
Other Related Info.:	Pages 40-52

Abstract:

This paper presents a new operational strategy for a large-scale wind farm (WF) which is composed of both fixed speed wind turbines with squirrel cage induction generators (FSWT-SCIGs) and variable speed wind turbines with permanent magnet synchronous generators (VSWT-PMSGs). FSWT-SCIGs suffer greatly from meeting the requirements of fault ride through (FRT), because they are largely dependent on reactive power. Integration of flexible ac transmission system (FACTS) devices is a solution to overcome that problem, though it definitely increases the overall cost. Therefore, in this paper, a new method is proposed to stabilize FSWT-SCIGs by using VSWT-PMSGs in a WF. This is achieved by injecting the reactive power to the grid during fault condition by controlling the grid side converter (GSC) of PMSG. The conventional proportional-integral (PI)-based cascaded controller is usually used for GSC which can inject small amount of reactive power during fault period. Thus, it cannot stabilize larger rating of SCIG. In this paper, a suitable fuzzy logic controller (FLC) is proposed in the cascaded controller of GSC of PMSG in order to increase reactive power injection and thus improve the FRT capability of WF during voltage dip situation due to severe network fault. To evaluate the proposed controller performance, simulation analyses are performed on a modified IEEE nine-bus system. Simulation results clearly show that the proposed method can be a cost-effective solution which can effectively stabilize the larger rating of SCIG compared to conventional PI based control strategy.

Keywords: Wind Turbine Generator, Fuzzy Logic Controller, Power System Stability, Power Converter, PI Controller