Title:	An improved power control strategy for grid-connected hybrid microgrid without park transformation and phase-locked loop system
Author(s) Name:	Shameem Ahmad, Saad Mekhilef, Hazlie Mokhlis
Contact Email(s):	ahmad.shameem@aiub.edu
Published Journal Name:	International Transactions on Electrical Energy Systems
Type of Publication:	Journal
Volume:	31 Issue 7
Publisher:	Wiley
Publication Date:	02/05/2021
ISSN:	2050-7038
DOI:	10.1002/2050-7038.12922
URL:	https://onlinelibrary.wiley.com/doi/abs/10.1002/2050-7038.12922
Other Related Info.:	Page e12922, ISI and Scopus indexed

Abstract:

Voltage source converters are important elements of grid-connected microgrid, as these integrate distribution generators of microgrid with utility grid. Often due to lack of efficient and flexible control, these converters do not perform as per expectations. Many control methods based on dq current control theory had been developed for grid-connected microgrids inverters to control power flow between microgrid and grid. However, all these controllers used phase locked loop systems for grid synchronization purposes, which possess slow dynamics and transient response. To overcome these issues, in this article, an improved real and reactive power control method for grid-connected hybrid microgrid's bidirectional voltage source converter is proposed which is based on the dq current control theory without using phase locked loop system and Park transformation. The proposed power controller has possessed better dynamic performance compared with the conventional power controllers consisted of phase locked loop system. In addition, due to the elimination of phase locked loop system and park transformation not only the computational burden is reduced with the implementation of the proposed power controller, but also steady state performance is enhanced. The control hardware-in-loop real time simulation is carried out using real time digital simulator to validate the performance of the proposed power controller during transient state, steady state and power transfer mode by modeling a grid-connected hybrid microgrid. From the simulation results, it has been observed that the settling time has improved to 0.08 second compared to 0.15 second of conventional controller, power ripples are significantly reduced, and total harmonic distortion of converter output current obtained is 2.226%.