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An enhanced zero crossing based HVAC phase synchronous inverter for electrostatic generator in microgrid systems (Article)

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Abstract

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Electrostatic Generator (ESG) faced far more challenges when it integrated with the phase synchronous inverter systems as ESG can generate high voltage DC and very low current. This high DC voltage needs to be converted and also low current of the ESG have to be increased for microgrid system which works generally performed by power inverter circuit. Therefore, phase synchronous inverter (PSI) is presented, to increase the inverter output current, with the aid of zero crossing voltage source controller. However, there is an issue to design the inverter which are harmonic distortion and phase angle. In this paper, a zero-crossing circuit is developed to synchronize inverter and microgrid phase and according to the simulation result, the phase angle is 3.22°. In addition, an LCL filter is designed to reduce the harmonic distortion. The performance of the PSI had been demonstrated by modeling it in MATLAB2016a software. The considered parameter of the design is input voltage 10kV, switching frequency 60Hz, modulation index 0.85 and cut-off frequency 33Hz. The simulation results show that the designed inverter can greatly improve the system stability and robustness of the microgrid system and the obtained PSI system efficiency is 97.35% that performed better compared to the related inverter techniques. © 2017, Institute of Advanced Engineering and Science. All rights reserved.

Author keywords

Controller LCL filter Microgrid PSI Transformer Zero crossing

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