Multi-frequency power system for renewable source integration in smart grid

Varun Chitransh, Mummadi Veerachary

Abstract— This study presents a new power system enabled by power-electronic technology for renewable source integration in micro-grid. The micro-grid is decoupled into multiple independent power channels. These power channels are used for any source to any load-independent power transfer over the common power transmission line. This system works on the principle of frequency-selective orthogonal power transfer and superposition theorem. To demonstrate the proposed power system, a laboratory-scale prototype of an interconnected two-source two-load system is developed. The two sources independently transfer power to their respective loads at power transmission frequencies of 500 and 0 Hz (DC is also a valid frequency for power transmission), respectively, over the common power transmission path. Thus, a two-source two-load system is decoupled into two independent power channels. The proposed system is modular and scalable in structure and can be extended for any number of sources and loads. Finally, the effectiveness of the proposed system is verified through simulations and experimental results which demonstrates independent transmission of 100 W power in each of the two power channels of the two source-two load interconnected system.

For the published version of record document, go to:
http://dx.doi.org/10.1049/iet-pel.2018.5101