COLLEGE OF ENGINEERING AND COMPUTER SCIENCE

Distinguished Speaker

THREE SEGMENT ADAPTIVE POWER COMPENSATOR FOR NON-PERIODIC CURRENTS

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A new compensation technique is proposed to preserve high power quality even during large load variations. The method provides control references for three co-located devices, each corresponding to one moving calculation window and one decomposed part of the compensated current. The compensator can be implemented using distributed energy resources that are already available in a microgrid such as power converters and energy storage batteries or capacitors. The three components of the compensatos are a slow compensator with high power rating, large calculation window, and low switching frequency; a fast compensator with lower power rating, shorter calculation window, and higher switching frequency; and a reactive compensator which is an ordinary static VAR compensator (SVC). To improve the flexibility of the technique, a fuzzy based adaptive window is proposed for the slow compensator to find the optimum window for different load characteristics. Moreover, three power quality criteria are proposed specifically for the non-periodic current compensation, namely, time-frequency distortion index, modulation index, and high frequency distortion index. The method is verified using both simulation and real-time implementation. First, the proposed method is verified in simulation using real-world data acquired from a local load with large variation. Second, it is validated using a real-time controller-in-the-loop implementation. The proposed compensation approach demonstrates high flexibility and effectiveness in increasing power quality under various non-periodic load conditions. Finally, some practical aspects of the implementation of a three-part compensator including cost analysis are presented.

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