Constant power loads (cpl) with microgrids Problem definition, stability analysis and compensation techniques

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Abstract

This paper provides a comprehensive review of the major concepts associated with the μgrid, such as constant power load (CPL), incremental negative resistance or impedance (INR/I) and its dynamic behaviours on the μgrid, and power system distribution (PSD). In general, a μgrid is defined as a cluster of different types of electrical loads and renewable energy sources (distributed generations) under a unified controller within a certain local area. It is considered a perfect solution to integrate renewable energy sources with loads as well as with a traditional grid. In addition, it can operate with a conventional grid, for example, by energy sourcing or a controllable load, or it can operate alone as an islanding mode to feed required electric energy to a grid. Hence, one of the important issues regarding the μgrid is the constant power load that results from the tightly designed control when it is applied to power electronic converters. The effect of CPL is incremental negative resistance that impacts the power quality of a power system and makes it at negative damping. Also, in this paper, a comprehensive study on major control and compensation techniques for μgrid has been included to face the instability effects of constant power loads. Finally, the merits and limitations of the compensation techniques are discussed.