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Micro grids toward the smart grid

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Summary

Worldwide electrical grids are expecting to become smarter in the near future, with interest in Microgrids likely to grow. A microgrid can be defined as a part of the grid with elements of prime energy movers, power electronics converters, distributed energy storage systems and local loads, that can operate autonomously but also interacting with main grid. Thus, the ability of intelligent Microgrids to operate in island mode or connected to the grid will be a keypoint to cope with new functionalities and the integration of renewable energy resources. The functionalities expected for these small grids are: black start operation, frequency and voltage stability, active and reactive power flow control, active power filter capabilities, and storage energy management. In this presentation, a review of the main concepts related to flexible Microgrids will be introduced, with examples of real Microgrids. AC and DC Microgrids to integrate renewable and distributed energy resources will also be presented, as well as distributed energy storage systems, and standardization issues of these Microgrids. Finally, Microgrid hierarchical control will be analyzed looking at three different levels: i) a primary control based on the droop method, including an output impedance virtual loop; ii) a secondary control, which enables restoring any deviations produced by the primary control; and iii) a tertiary control to manage the power flow between the microgrid and the external electrical distribution system.

Keywords: Micro grid, smart grid