

Progress and challenges in smart grids: distributed generation, smart metering, energy storage and smart loads

Abstract-

The future power system must provide electricity that is reliable and affordable. To meet this goal, both the electricity grid and the existing control system must become smarter. In this paper, some of the major issues and challenges of smart grid's development are discussed, and ongoing and future trends are presented with the aim to provide a reader with an insight on the relevant research topics, challenges and actual engineering tasks in smart grids. The focus areas of this review study are distributed generation, microgrids, smart meters's deployment, energy storage technologies, and the role of smart loads in primary frequency response provision. The exploration of smart grid technologies and distributed generation systems has been accomplished, and a general comparison of the conventional grid and a future smart model is included. The issue of increasing penetration of renewable energy sources to the power system and posers related to the integration of distributed generation are also presented.

Index Terms- Smart grid; Microgrid; Smart meter; Energy storage technology; Smart load; Distributed energy resources

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