Ancillary Services 4.0: A Top-To-Bottom Control-Based Approach for Solving Ancillary Services Problems in Smart Grids

Power systems are experiencing a large amount of renewable generation with highly stochastic and partly unpredictable characteristics. This change in energy production implies significant consequences related to the provision of ancillary services (AS). Current markets dedicated to the provision of AS are not able to benefit from the flexible energy resources. They also cannot cope with the new level of stochasticity, non-linearity, and dynamics of generation and flexibility. To overcome such issues and exploit the potential of flexibility resources, a new strategy is required. In this paper, by capitalizing on flexibility resources' potential, AS 4.0 approach is proposed, which offers a comprehensive solution for the AS provision in the smart grid era.

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