

Local hosting capacity increase by means of wind farm voltage control provision

E. Saiz, E. Lobato, I. Egido

Abstract— This paper identifies when the transmission network local hosting capacity for a wind harvesting network may be limited because of steady-state bus voltage limits. In addition, the paper addresses how with the wind farm voltage control provision, such constraints may be overcome and the local hosting capacity can be increased. To answer these questions, actual Spanish system data is used on different network models of increasing complexity. Firstly, a simplified model of both transmission network and harvesting network is discussed to show that generally, only buses with low short-circuit power and low or high reactance-resistance ratio may limit local hosting capacity significantly. Secondly, in order to assess how modeling simplifications affect the results, the full model of an actual Spanish harvesting network is considered: the real reactive capability of the harvesting network at the transmission network connection node is computed and the local hosting capacity recalculated. Finally, in the last step, the results of the aforementioned simplified models are validated using the complete model of the Spanish transmission network. In addition, a complementary area hosting capacity analysis is included in order to show the importance of steady-state bus voltage constraints when large amounts of power need to be transported over long distances.

Index Terms— Flexible AC transmission systems, voltage control, wind energy.

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