

Voltage control assessment of wind energy harvesting networks

C. Gómez-Sánchez; E. Lobato Miguélez; E. Saiz Marín; I. Egido Cortés

Abstract-

Current technology developments allow the provision of voltage/reactive control of wind turbines. This study focuses on the impact of wind power voltage control on both the transmission network (TNet) and the wind energy harvesting network (HNet). Different possibilities of implementing the control representative of the current situation where wind farms maintain a fixed power factor and future situation where wind farms will provide a proportional voltage control are tested. In addition, optimal controls with a certain objective function such as minimising the HNet losses or optimising the reactive power delivered to the TNet are implemented for comparison purposes. The impact of each implementation of voltage control on the HNet is assessed by means of the value of grid losses, whereas the impact on TNet is measured by the PQ capability curve and the voltage value at the bus that connects the wind energy HNet with the TNet. In addition, the importance of the transformers taps in the control is evaluated and conclusions depending on the topology of the network are obtained thanks to the analysis of two actual Spanish networks.

Index Terms- voltage control; wind turbines; optimal control; wind power; reactive power control

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