Sizing and Operational Loading of Reactive Power Compensators for Grid Connected Wind Farms Considering Various Transmission Option

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Abstract

The analysis of reactive demands of high voltage transmission links connecting wind farms to the central grid is considered in this paper. Both High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC) options as well as overhead and cable transmission alternatives are considered in the analysis. Therefore, the presented work is applicable for both onshore and offshore installations considering various transmission technologies. The sizing of the required reactive power compensators for the transmission system is the main objective of the manuscript. The target is to keep acceptable operating voltage limits through appropriate amounts of reactive power injection or absorption at the wind farms interface bus. The considered wind farm is made up with Doubly Fed Induction Generators (DFIGs). Based on the reactive power capability limits of the DFIGs comprising the wind farm, the minimum rating, and type of external reactive power compensating devices are determined for various transmission options. In addition, the reactive power loading on the compensators at various operating conditions of the wind farm is determined. The salient conclusions are listed in the results, and conclusions sections.

American Journal of Energy and Power Engineering 2017, November