

Optimal voltage control by wind farms using data mining techniques

E. Lobato Miguélez; E. Saiz Marín; I. Egidio Cortés

Abstract-

Owing to the rapid growth in the use of wind power, there is a need to carry out an evaluation of the frequency and voltage control of this technology. This study focuses on the voltage control of the evacuation network which connects different wind farms to the transmission network bus. The main contribution of this study is to present a novel real time algorithm which can be used as an alternative to classical techniques such as optimal power flow or artificial intelligence to determine the amount of reactive power that each wind farm should supply in order to minimise the power losses of a whole evacuation network. The optimal voltage control proposed in this study uses data mining techniques (regression rules to estimate the optimum reactive power of the wind farms and classification trees to estimate the optimum transformer taps). The methodology proposed in this study is illustrated with a study of two actual evacuation networks in the Spanish power system. The first one is representative of long feeders whereas the second one is representative of short feeders. The variability in the results of the methodology seems to be dependent on the features of the grids.

Index Terms- power transformers; data mining; power generation control; power grids; optimal control; transmission networks; frequency control; power engineering computing; wind power plants; voltage control; reactive power control

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