

Abstract

Power quality is an important issue for the distribution network companies. They must guarantee the electricity supply fulfilling the requirements for the consumers. In this thesis we investigate specifically voltage requirements. We use transformers and tap changers to see how the voltage works in an electric system and we analyze the relationships with other aspects of the system's performance, like power losses or tap changer operation.

Lunds Energi wants to investigate any change that could improve the voltage quality. For that purpose, they provide us with real data of their systems, consisting of a city system and a countryside system with the characteristics of the lines, the transformers, the generation and the loads. Also, they supply the load profiles over one day which are made up of 24 values, one per hour. Analyzing the systems in PowerWorld simulator, we do not find a significant voltage problem in the city system, however, there is a low voltage problem at some costumers of the countryside system. Changing the settings of the transformer would improve the voltage quality and also the addition of a line drop compensation system would be positive. Globally, based on the results of the simulations, we confirm that there is a direct relation between the voltage set point and the losses and, also, between the deadband amplitude and the tap changer operation.

In the case of the countryside system, Lunds Energi considers connecting wind turbines to the net. We simulate this case as well, in order to analyze the problem of too high voltage in some buses and we calculate the power we are allowed to generate without going out of the voltage limits. The conclusion is that this is a very interesting solution because we can inject enough power to feed all the loads and since the generation is close to the consumer we are reducing the power losses too. We propose some turbines those are currently in the market and are suitable for the system.