The Use of Statistic Factors for the Analysis of Power System Dynamics Including Uncertainties of Synchronous Generator Parameters

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Abstract

Nowadays, when analyzing the power system (PS) operation, more and more often the assessment of the possibility of cooperation of existing power sources with newly planned ones is required. During the PS analysis, there often appears a problem of the lack of reliable parameters of the mathematical models of the newly designed and already operating in PS devices [6]. This problem can be solved in many ways [2, 4, 5], among others by carrying out repeated calculations for the values of unknown parameters being changed in a given search interval [4, 5]. In the paper there is proposed a method for estimating the reliability of the obtained results based on tracking the statistic factors describing the set of the solutions being obtained. The multi-criteria comparative analysis of different statistic factors was performed. The analysis was made for a factory medium voltage (15 kV) power network. The investigated network included the already installed asynchronous generator of 1.9 MW rated power and a newly designed synchronous generator of 4.56 MW rated power. Low voltage induction motors supplied from inverter systems were connected to the network. There were investigated the transient states associated with transition of the analyzed network to islanding operation and those caused by the changes in power of particular groups of loads. The uncertainty of the mathematical model parameters of the generating units [1, 2, 3] and the uncertainty of the PS load state based on the measured and recorded average values of the active power taken from the PS.

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