

Abstract

The growing trend of DG is easily to be recognized because of various political, economic and environmental reasons. However, their integration poses some impacts on power systems, especially to the operations of distribution systems. In order to be prepared for problems that may happen when the expectation of a high penetration level of DG comes true, some work has been done and presented here as:

- To study if the apparently continuous disturbances caused by the integration of DG will act as a chain to lead to some dangerous events in the electrical network itself. This question is answered by investigating the relation between the eigenvalues of the state space model of the electrical network and the reasonable expectations of the time interval of two successive disturbances. The results indicate that because the dynamics of the electrical network generally die out quite fast, the apparently successive stochastic disturbances have nearly independent influences on the network. Hence these impacts can be studied independently.
- To study the impacts of high penetration of DG on the small signal stability of distribution systems. In this part, modal analysis is adopted for the investigation. The results demonstrate that the integration of DG will not lead to any small signal instability problem, even if the penetration level of DG is high. Besides, proper shunt reactive compensation, such as the use of STATCOM, improves the small signal stability of the system as well as the penetration level of DG.
- To study the impacts of high penetration of DG on the voltage stability of distribution systems. In this part, continuation power flow is used to investigate the voltage stability margin improvement after the integration of DG. The results illustrate that the integration of DG is helpful to improve the voltage stability of distribution systems. Further, DG operation mode has a great influence on the improvement of the voltage stability. The greatest improvement is obtained when the DG is operated under the constant nodal voltage mode.