Electric Power Systems Research, vol.191, pp.106871-1-106871-13, February, 2021.

Optimal allocation of static synchronous series compensator (SSSC) in wind-integrated power system considering predictability

B. Mohammadi-Ivatloo; M. Nazari-Heris; S. Galvani; S. Rezaeian-Marjani

Abstract-

The state of renewable energy sources such as renewable generation uncertainties, the uncertainty of loads and system component's probable failure make predicting the power systems state more and more difficult. The correlation between uncertain variables intensifies this challenge. Accurately predicting the power network state has significant importance mainly in the decision-making process of system operation, bidding strategies, and management of risk.

This study proposes an optimal location and reference set point for static synchronous series compensator (SSSC) for maximizing the system predictability, minimizing the total active power loss, and increasing the reliability of the system, simultaneously. A multi-objective biogeography-based optimization (MOBBO) algorithm is used to handle the multiple objective functions considering the operational constraints. The uncertainty of the system is modeled using the Cholesky decomposition technique. The necessity of considering predictability indices in obtaining optimal location and setting point of the SSSC are comprehensively discussed. The probability distributions of apparent power and voltage magnitude of the SSSC converter are obtained, which can be very useful in deciding on the sizing of SSSC. The performance and advantage of the presented method are evaluated through simulation reports and investigation on the IEEE 57-bus system.

Index Terms- Correlation; Multi-objective biogeography-based optimization algorithm; Optimal allocation; Predictability; Reliability; Static synchronous series compensator; Uncertainty

Citation:
Galvani, S.; Mohammadi-Ivatloo, B.; Nazari-Heris, M.; Rezaeian-Marjani, S. "Optimal allocation of static synchronous series compensator (SSSC) in wind-integrated power system considering predictability", Electric Power Systems Research, vol.191, pp.106871-1-106871-13, February, 2021.