Probabilistic assessment of DSTATCOM operation in distribution systems using data clustering method

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Abstract-

The importance of probabilistic assessment in distribution systems is very high due to the increasing penetration of renewable energy sources (RESs) with their fluctuating behavior. Also, there are some other uncertain variables in distribution systems such as loads fluctuations. More awareness of the system state by considering many uncertainties provides more certainty in decision making and causes better risk management. Moreover, the distribution static compensator (DSTATCOM) has been recently implemented due to its efficient abilities in the distribution systems operation especially when RESs are integrated into them. This article investigates the probabilistic assessment of DSTATCOM operation in a distribution system using the k-means-based data clustering method (DCM). The uncertainty of load demands, wind speed, and solar radiation are considered in this study. The performance of DCM is compared to the Monte Carlo simulation (MCS) and Latin Hypercube sampling (LHS) methods in terms of accuracy and computational burden. The efficiency of k-means-based DCM is investigated in the IEEE 69-node test system.

Index Terms- distribution system; uncertainty; renewable energy source; DSTATCOM; probabilistic assessment; data clustering method