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Abstract
The objective of this thesis is to derive an optimal location and operating strategy of capacitor banks and wind energy conversion systems (WECS) installed at the distribution feeder to reduce system power loss. The objective function is formulated by including feeder peak power loss, daily energy loss and capacitor installation cost. In addition, the voltage profiles of the feeder buses and the power factors of the WECS are considered as constraints. The immune algorithm (IA) is applied to solve the optimization problem by representing the objective function and constraints as antigens. After performing the genetic evolution, an antibody which fits the antigen best is determined to be the optimal location and operating strategy of capacitor banks and WECS. The three-phase load flow analysis with considering the mutual coupling effect among conductors and load model is executed to solve system power loss on daily basis with various capacitor banks and WECS planning scenarios. To demonstrate the effectiveness of the proposed IA methodology, two practical distribution feeders in Taipower system are selected for computer simulation. It can reduce daily peak power loss and total energy loss from ask to solve the optimal installation location and operating strategy of capacitor banks and WECS. The results of the thesis can provide the analysis, planning and operating strategies for the DGS manufacturers and utilities.
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