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Abstract
After considering the constraint of system reliability, an optimal capacity evaluation model was developed to simulate the optimal photovoltaic/battery (PV/BTY) allocation of a stand-alone photovoltaic generation system under different load types and PV/BTY price ratios. The total loss of load hours for one year on the customer-side was conducted as the reliability index. The thesis provides the optimal allocations during the planning of photovoltaic generation system. Simulations with detailed discussions show the effectiveness of results on the optimal allocations for PV/BTY. The Lagrange equation was formulated and constrained by the system reliability index, the Loss of Load Hours (LOLH), to optimize the problems of photovoltaic generation planning. The constraint function was well formulated from the results of polynomial regression in items of different orders (two to six). Tests for variance analysis, slope analysis and goodness of fit were conducted to confirm the representative of the resultant constrain function. The Lagrangian constrained optimization equation was solved to get the optimal capacity allocations for PV/BTY. The cost ratio variations for the capacity of PV/BTY and different load types were also discussed to the impacts of the optimal results. The real solar radiation/temperature data from the YongKang weather station on the years 2003 to 2007 have been tested to simulate the practicability of planning results for the photovoltaic generation in the YongKang terrain.
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