Scheduling Strategy Design for Unit Commitment with Energy Storage System and Solar Energy Resource

Abstract

Unit commitment, pre-setting scheduling and arrangement of the electrical generator operation, plays a critical role in the power system optimization problem which aims to utilize power resources rationally and enhance the efficiency of operational economy under the condition of safe operation of power system. With the high penetration of renewable energy, which increases deregulation when renewable energy is fed into the traditional power system and attention of safety operation in power system, there is a growing focus on optimization with uncertainty. We propose a day-ahead unit commitment model to minimize the impact of uncertainty. The scheduling strategy is composed of two main cases which correspond to the two intervals of the probability distribution of the solar power output. The energy storage system is dispatched to guarantee the power system security when the margin of error is beyond the confidence interval of solar power probability. Facing with both volatile load demand and the solar power, interval optimization is adopted to reduce the complexity of this optimization problem. Priority list is considered so that the energy storage system is flexible to maintain the power balance with an acceptable cost and maximum the utilization of the renewable energy.