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Operation Strategy of Multi-Energy Storage System Considering Power System Reliability

Authors : Wook-Won Kim, Je-Seok Shin, Jin-O Kim

Abstract : As the penetration of Energy Storage System (ESS) increases in the power system due to higher performance and lower cost than ever, ESS is expanding its role to the ancillary service as well as the storage of extra energy from the intermittent renewable energy resources. For multi-ESS with different capacity and SOC level each other, it is required to make the optimal schedule of SOC level use the multi-ESS effectively. This paper proposes the energy allocation method for the multiple battery ESS with reliability constraint, in order to make the ESS discharge the required energy as long as possible. A simple but effective method is proposed in this paper, to satisfy the power for the spinning reserve requirement while improving the system reliability. Modelling of ESS is also proposed, and reliability is evaluated by using the combined reliability model which includes the proposed ESS model and conventional generation one. In the case study, it can be observed that the required power is distributed to each ESS adequately and accordingly, the SOC is scheduled to improve the reliability indices such as Loss of Load Probability (LOLP) and Loss of Load Expectation (LOLE).

Keywords : multiple energy storage system (MESS), energy allocation method, SOC schedule, reliability constraints
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