

Iterative Replanning of Diesel Generator and Energy Storage System for Stable Operation of an Isolated Microgrid

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Abstract : The target microgrid in this paper is isolated from the large central power system and is assumed to consist of wind generators, photovoltaic power generators, an energy storage system (ESS), a diesel power generator, the community load, and a dump load. The operation of such a microgrid can be hazardous because of the uncertain prediction of power supply and demand and especially due to the high fluctuation of the output from the wind generators. In this paper, we propose an iterative replanning method for determining the appropriate level of diesel generation and the charging/discharging cycles of the ESS for the upcoming one-hour horizon. To cope with the uncertainty of the estimation of supply and demand, the one-hour plan is built repeatedly in the regular interval of one minute by rolling the one-hour horizon. Since the plan should be built with a sufficiently large safe margin to avoid any possible black-out, some energy waste through the dump load is inevitable. In our approach, the level of safe margin is optimized through learning from the past experience. The simulation experiments show that our method combined with the margin optimization can reduce the dump load compared to the method without such optimization.

Keywords : microgrid, operation planning, power efficiency optimization, supply and demand prediction

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