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Wind photovoltaic Synchronous Generating System integrating with a SMES for a Grid Forming Renewable Energy System

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The intermittent characteristics and low system inertial are two major problems for the renewable energy sources (RESs) dominated power system. This paper proposes the novel idea of integrating the wind and photovoltaic power generators with a superconducting magnetic system (SMES) as a whole to behave as a grid-forming renewable energy system. The proposed grid forming system can provide inertial and frequency for the grid and smooth the renewable power output. The fluctuation characteristics of wind and solar are complementary to some extent, which reduces the energy storage capability requirement of SMES. The Wind, photovoltaic, and SMES share the same power converter, which also reduces the investment cost. It is therefore more economic than the stand-alone wind, photovoltaic, and SMES system. Simulation model of a 1MW prototype is set up. Simulation results verify the efficacy of the proposed approaches.

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