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Modeling and optimal management of renewable energy resources using multi-agent systems

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Electrical systems composed of numerous and usually multifaceted components which are difficult to operate and control by efficient ways at the centralized level having problems such as adaptability, mobility, and fault tolerance. Thus, in recent evaluation, renewable energy resources (RERs) have been considered as clean and cost-effective sources for the generation of electrical power at the distributed level. In this context, the awareness of the microgrids (MGs), as sub level technologies of the central grid, booms particularly because of the precise amenities that they can deliver. Therefore, a novel multi-agent system (MAS) based model and the optimal management of a MG integrated with RERs at distributed level is proposed in this paper. Power generation at distributed level comprises of numerous disseminated energy resources having critical and non-critical loads. A controlled architecture of a MG based on the MAS technique is employed for the finest operations of the MG management and power delivery and also offers intelligence to the MG at distributed level. For validation of the proposed model, the power generation within the MG was evaluated by simulation under the capabilities of RERs power production, critical and non-critical load demands, and several grid instabilities. The simulation results prove that the proposed model for the MG management based on MAS technique at distributed level offers robustness and high-performance supervision and control than centralized arrangements.

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