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ORIGINAL PAPER

Hybrid methodology-based energy management of microgrid with grid-isolated electric vehicle charging system in smart distribution network

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Abstract
The integration of renewable energy sources (RESs) and smart power system has turned microgrids (MGs) into effective platforms for incorporating various energy sources into network operations. To ensure productivity and minimize issues, it integrates the energy sources in a coordinated manner. To introduce a MG system, combines solar photovoltaic and small-hydro-power sources. This MG connected to grid includes electric vehicle charging system operates independently from grid. A control method is proposed for MG systems called GOA-THDCNN approach, which is hybrid of Gannet Optimization Algorithm (GOA) and Tree Hierarchical Deep Convolutional Neural Network (THDCNN). It aims effectively manage micro-grid systems. The proposed technique has three primary objectives. Firstly, it aims to manage grid-tied load by employing hybrid PV network injection. It helps maximize power utilization and enhances performance of excitation. Secondly, promote smart distribution cooperation through decentralized system that interfaces with micro-energy grid integration, ensures network power support. Lastly, integration of individual plug-in electric charging and storage devices with unidirectional grid isolation. This combines photovoltaic and hydropower sources with electric vehicle charging and employs maximum power point tracking and control for operation. The performance runs in MATLAB software. As a result, it ensures voltage management, dynamic energy for charging electric vehicles. Compare to suggested technique higher level of power loss using GA, and PSO and SSA methods. So proposed technique gives less power loss than existing methods. The mean of proposed is 1.0935 and existing PSO-1.3372, SSA-1.4844. The proposed method is low compared to existing methods.

Keywords Battery energy storage system · Dump load · Hydropower · Maximum power point tracker · Plug-in electric vehicle

1 Introduction

Energy efficiency is important now due to climate change and growing oil costs in nations that depend on crude oil sales. Most oil used today is in transportation, mostly through vehicles [1, 2]. Oil costs are rising daily, burdening the average person [3]. EVs are a future transportation option for energy security and the environment. Rechargeable batteries were developed in the nineteenth century and were widely used in EVs with power supplies and electric motors [4–14].

Governments encourage electric vehicle usage and invest in sanitary infrastructure to create a healthier environment [15]. As EVs become practical ignition motor vehicles for general shipping, cargo spaces should be extended to local places [16–20].

- An effective hybrid strategy is proposed for the Energy Management of microgrids with grid-isolated EVCS in a smart distribution network. The proposed hybrid technique combines a gannet optimization algorithm (GOA) and a Tree Hierarchical Deep Convolutional Neural Network

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