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TECHNO-ECONOMIC ANALYSIS OF POWER SYSTEM NETWORK WITH EVCS AND RENEWABLE BASED DISTRIBUTED GENERATOR

Rupika Gandotra, Kirti Pal*

Electrical Engineering Department, School of Engineering, Gautam Buddha University Greater Noida, UP, India

Abstract

As electric vehicles become more widely used, the need for Electric Vehicle Charging Stations (EVCS) rises dramatically, placing additional strain on the infrastructure that is already in place. In response to this challenge, the study focuses on the integration of Photovoltaic Distributed Generator (PVDG) and Wind Turbine Distributed Generator (WTDG) systems to mitigate the adverse impacts of EVCS load escalation. Using hybrid GA-PSO (Genetic Algorithm-Particle Swarm Optimization) algorithm, the paper explores optimal placement and sizing strategies for PVDG and WTDG within the IEEE-33 bus system under three distinct scenarios: 100%, 150% and 200% loading with three EVCS. The study evaluates system performance based on critical parameters including minimum voltage levels, real and reactive power losses, conventional generator output and fuel costs. Furthermore, the optimization process facilitated by the GA-PSO algorithm ensures the attainment of efficient and reliable solutions, enhancing system resilience and sustainability in the face of escalating load demands. The findings underscore the feasibility and effectiveness of leveraging renewable energy sources and distributed generation technologies to accommodate the increasing trend of EV adoption and facilitate the transition towards a more sustainable and resilient power distribution infrastructure.

Keywords: EVCS, fuel cost, MATPOWER, power losses, renewable based distributed generators, voltage profile improvement

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* Author to whom all correspondence should be addressed: e-mail: kirti.pal@gbu.ac.in