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TECHNO-ECONOMIC ANALYSIS OF POWER SYSTEM NETWORK WITH ELECTRIC VEHICLE CHARGING STATIONS (EVCS) AND RENEWABLE BASED DISTRIBUTED GENERATOR

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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.

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

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