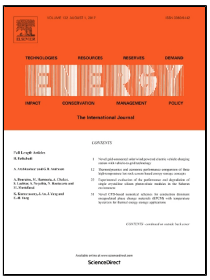
# Accepted Manuscript



Simultaneous Coordination of Distinct Plug-in Hybrid Electric Vehicle Charging Stations: A Modified Particle Swarm Optimization Approach

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# Simultaneous Coordination of Distinct Plug-in Hybrid Electric Vehicle Charging Stations: A Modified Particle Swarm Optimization Approach

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## Abstract

As Plug-in Hybrid Electric Vehicles are environment friendly, it is envisioned as an alternative solution for the existing transportation system. However, simultaneous charging of electric vehicles may stimulate increase in peak load, causing voltage deviation and power loss issues. Different from other approaches, this paper presents an alternative way to tackle these issues. A novel two area distribution system, each following a different mobility pattern is presented. This model considers various sites namely optimal, midst, and unfit site for locating the charging stations in both the areas simultaneously. Moreover, the scheduling of the plug-in Hybrid Electric Vehicle is addressed using a meta-heuristic solving tool as it involves simultaneous scheduling of vehicles in both areas. To illustrate the cost reduction obtained with this model, the performance is evaluated in a standard test system namely IEEE 69-bus radial distribution system. The test results support the efficiency of the proposed two area framework and the new solving tool. The economic and the stability aspect of the system are addressed under various scenarios and several important findings are revealed.

Keywords: Distribution system, Modified Particle Swarm Optimization, Plug-in Hybrid Electric Vehicles, Charging and Discharging.

## Nomenclature

*Abbreviations*

| | |
|---|---|
| PHEV | Plug-in Hybrid Electric Vehicle |
| EPRI | Electric Power Research Institute |
| PSO | Particle Swarm Optimization |
| SOC | State of Charge |