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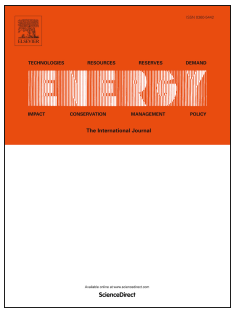

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A Novel Priority-based Stochastic Unit Commitment Considering Renewable Energy Sources and Parking Lot Cooperation

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Abstract

Environmental concerns have caused application of renewable energy sources as a clean appropriated alternative for conventional thermal generators in power system planning. These uncertain and variable sources have challenged the power system scheduling to ensure that it still remains reliable and economical. Also, plug-in electric vehicles may potentially alter load demand in uncontrolled charging mode and impose new challenges to the unit commitment problem. This paper demonstrates the fast heuristic method based on priority list to solve the stochastic unit commitment problem and applied it to a basic 10-unit case study system accompaniment with an electric vehicle parking lot, a wind farm and a solar farm over a 24-hour time horizon. As it is reported, scenario generation with Monte Carlo simulation can relatively compensate for the intermittent behavior of renewable energy sources and result in more economical and robust planning. Moreover, the integration of plug-in electric vehicles and their controlled charging/discharging is considered. Thermal units are scheduled by priority list method with their relevant constraints such as minimum up/down time, spinning reserve, load demand and capacity limitation. The simulations results verify that the penetration of the mentioned renewable energy sources can improve the operational cost and computation time, effectively.

Keywords: Unit commitment problem, Plug-in electric vehicle, Monte Carlo simulation, Scenario generation, Renewable energy sources

Nomenclature:

i	set of thermal generation units
h	set of time period
s	set of scenarios
N	Number of thermal generators
H	Number of hours
S	Number of scenarios

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