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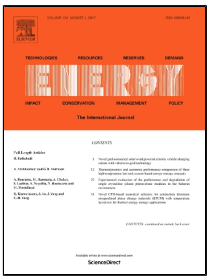

The role of coordinated load shifting and frequency-based pricing strategies in maximizing hybrid system profit

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The role of coordinated load shifting and frequency-based pricing strategies in maximizing hybrid system profit

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Abstract: Nowadays, wind/solar/energy-storage hybrid system is a popular choice to reduce electricity cost. Because of the random nature of renewable generation, it is preferred to implement renewable sources in an autonomous system in coordination with energy storage units, and explore a suitable demand side management approach to compensate the fluctuations in renewable power generation, and adapt with the system load demand. This paper proposes a new strategy for (1) optimal power generation scheduling of wind and photovoltaic sources with the utilization of pump-storage hydro unit, (2) load shifting technique based on the maximum utilization of renewable sources, and (3) maximizing hybrid system profit under incentive-based program (IBP) and frequency-based pricing. The day-ahead load shifting technique proposed in this paper is mathematically formulated as a maximization problem. The use of pump-storage hydro plant in coordination with suitable load shifting technique compensates the uncertainty in wind and solar power generation and maximizes the system profit as well. To verify the efficiency of the method, the strategy is applied to a sample test system. The simulation results demonstrate the effectiveness of the proposed approach.

Keywords: Day-ahead load shifting; maximum utilization of renewable sources; maximizing hybrid system profit; stochastic optimization; frequency-based pricing; pumped storage hydro unit.