

## Short term scheduling of a virtual power plant in a Day-Ahead market under uncertainties using point estimate method

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### **Abstract:**

Environmental concerns, improvements in renewable energy technologies, governmental incentives for the use of these resources, and increased T&D costs, are the main factors driving the energy sector into a new era, where considerable portions of electrical demand will be met through widespread installation of Distributed Energy Resources (DERs). The Virtual Power Plant (VPP) is a decentralized energy management system tasked to aggregate of capacity some Distributed Generations (DGs), storage facilities, and Dispatchable Loads (DLs) for the purpose of energy trading and/or providing system support services. Due of stochastic behavior of the prime sources of some DGs, such of wind speed and temperature, the steady state analysis of the system with integration of such DG unit requires a probabilistic approach. in this thesis, a probabilistic Price Based Unit Commitment (PBUC) approach using Point Estimate Method (PEM) is employed to model the uncertainty in market price and generation sources, for optimal bidding of a VPP in a day-ahead electricity market. Also, the uncertainty of stochastic DGs generation handled through increasing the amount of required reserve. The proposed model allows a VPP to decide on the unit commitment of its DERs, and the optimal sale bids to the day-ahead market. The proposed optimization algorithm is applied to an 18-buses system And solved by GAMS.

**Keywords:** Virtual power plant; Price Based Unit Commitment; Point estimate method; Distributed enery resources; Interruptible load