

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

Mohammad safar ali najjar<sup>1</sup>, Mohsen saniei<sup>2</sup>

1-MSc Student in Electrical Engineering, Dezful Branch, Islamic Azad University, Dezful, Iran,  
2- Shahid Chamran University of Ahvaz, Ahvaz, Iran, Mohsen.saniei@gmail.com, PhD.

### **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 (DER<sub>s</sub>). The Virtual Power Plant (VPP) is a decentralized energy management system tasked to aggregate of capacity some Distributed Generations (DG<sub>s</sub>), storage facilities, and Dispatchable Loads (DL<sub>s</sub>) for the purpose of energy trading and/or providing system support services. Due of stochastic behavior of the prime sources of some DG<sub>s</sub>, 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 DG<sub>s</sub> generation handled through increasing the amount of required reserve. The proposed model allows a VPP to decide on the unit commitment of its DER<sub>s</sub>, 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