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Abstract As the number of distributed energy resources (DERs) increases, so would their influences on the power systems. Toward managing the intermittent nature of DERs, and providing market participation capability, the concept of virtual power plant (VPP) has been developed in the smart grid era. This paper proposes a novel offering strategy method for a VPP consisting of wind power generation along with storage capacity and flexible demand. In the proposed method, two different sources of uncertainty are addressed: stochastic method, applied in dealing with market price uncertainty, and information-gap decision theory (IGDT), incorporated in the offering model counting for wind power production uncertainty. This method enables us to formulate the offering strategy problem as a stochastic IGDT-based optimization. Within the framework of the proposed approach, we explore different operating facets that can affect the solution methodology and how the offering curve is constructed. The theoretical strategy is thoroughly demonstrated and then validated through numerical studies.

Keywords Distributed energy resources (DERs), Energy management, Virtual power plant (VPP), Uncertainty.