Xiong Wu, Nailiang Li, Mingkang He, Xiuli Wang, Song Ma and Jingjing Cao, 2021, Risk-constrained day-ahead scheduling for gravity energy storage system and wind turbine based on IGDT, *Renewable Energy,* Available online 27 December 2021.

Abstract To cope with the risk from the uncertain power output of wind turbines (WTs), energy storage system (ESS) is employed to coordinate with WTs as a combined agent to participate in power market. Due to the limitation of conventional ESSs, gravity energy storage (GES) is invented and developed recently. This paper establishes a day-ahead scheduling model for an economic and environment-friendly GES and WTs. The studied GES is charged when bricks are lifted up by cranes and discharged when bricks fall down to drive generators. Information-gap decision theory (IGDT) is employed to attain the profit against uncertainties from market price and wind power, and a risk-constrained IGDT-based day-ahead scheduling model of the GES and WT is proposed. According to the risk preference of the decision maker, a robustness model for the risk-averse strategy and an opportunity model for the risk-seek strategy are proposed to obtain the minimum and windfall profits, respectively. Finally, the effectiveness of the IGDT-based model is verified by numerical simulations. Simulation results indicate that the expectation of decision makers with a risk-averse or risk-seek strategy could be satisfied by the proposed model. Additionally, the market price has a vital impact on achieving a windfall profit.

Keywords Gravity energy storage (GES), Wind turbine, Combined system, Information-gap decision theory (IGDT), Uncertainty, Market price