Abstract   The "Two Detailed Rules" clearly point out that the deviation assessment of wind farms' participation in the market operation should be carried out. The uncertainties of electricity prices and wind power outputs under the market mechanism further increase the profit risks of wind farms' participation in the spot market. The info-Gap Decision Theory (IGDT), however, has the ability to have the optimistic decisions under the background of severe uncertainties. Therefore, an IGDT based day-ahead decision model for the combined wind storage system is proposed. Firstly, based on the traditional day-ahead decision model of the combined wind storage system, the deviation penalty term is introduced into the objective function to quantify the real-time cost risks caused by the day-ahead decision. Secondly, considering the difference of the decision makers' risk preferences, the IGDT uncertainty model of the electricity prices with the "risk aversion" and the "speculation and arbitrage" risk preferences is constructed. At the same time, the beta distribution is used to describe the distribution characteristics of the wind power outputs, and the interval sampling of the super-Latin cube is used to effectively quantify the decision makers' risk preferences in the wind power output uncertainty. Finally, the McCormick envelope is used to solve the original problem with the commercial solver after convex relaxation. The numerical example shows that the model can meet the different risk preferences of the decision makers and further improve the daily returns of the wind storage system.