Hailiang Rong and Jia Wang, 2026, Optimal operation and profit maximisation of a wind-integrated energy hub under risk-taking strategy: A case study on renewable energy integration and storage capacity analysis, *International Journal of Energy Technology and Policy*, Vol. 20, No. 3–4.

Abstract This study investigates the optimal operation of a wind-integrated local energy hub aimed at maximising profit while coordinating with electrical, thermal, and natural gas networks. The system comprises combined heat and power (CHP) units, heat pumps, and both electrical and thermal energy storage, with wind energy as the sole renewable source. To address wind speed uncertainty, information gap decision theory (IGDT) was applied under both risk-averse and risk-taking strategies. A mixed-integer linear programming (MILP) model was developed and solved using GAMS, incorporating detailed constraints related to energy balance, storage, ramping, and market exchanges. Sensitivity analysis across 20 scenarios revealed that risk-taking strategies yielded higher profits but required more operational adjustments. Notably, the electrical network particularly significantly enhanced economic outcomes. Demand response programs such as time-of-use (TOU) and direct load control (DLC) were also integrated to improve operational flexibility. The findings demonstrate that robust, market-responsive strategies enhance both profitability and renewable energy utilisation.

Keywords wind energy, profit maximisation, energy storage, info-gap decision theory, risk-taking strategy, demand response, mixed-integer linear programming, MILP, renewable energy integration.

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