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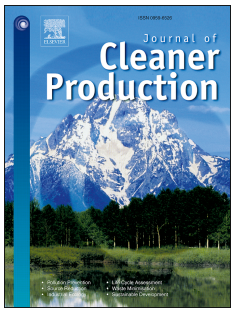

A capacity-investment model of wind power with uncertain supply-price under high penetration rate

Lingcheng Kong, Zhong Li, Ling Liang, Yu Xia, Jiaping Xie

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A capacity-investment model of wind power with uncertain supply-price under high penetration rate

KONG Lingcheng[1], LI Zhong[2], LIANG Ling[3], XIA Yu[4], XIE Jiaping[4]*

1. Business School, East China University of Science and Technology, Shanghai, 200237, PR China;

2. School of Management, Shanghai University of Engineering Science, Shanghai 201620, PR China;

3.Tourism and Event Management School, Shanghai University of International Business and Economics, Shanghai 201620, PR China;

4.School of International Business Administration, Shanghai University of Finance and Economics, Shanghai 200433, PR China

Abstract: With the rapid development of renewable energy, the proportion of wind power in power supply has grown significantly. Also, it influences the power price fluctuation. Since the marginal cost of wind power is almost zero, the growth of wind power's penetration rate has led to a crowding-out effect and challenged traditional power generation technology, substantially reducing the power price in the market. In perfect competition market, the real-time balance between supply and demand of power is regulated by the real-time power price fluctuation. So this paper models the intermittence of wind power as uncertain supply, and develops a capacity-investment model under the uncertainties of both supply and demand. We introduce priority dispatch elasticity to describe the crowding-out effect and take the power price to be endogenous in order to model the situation of high penetration rate. We compare the optimal wind power capacity decision under the strategy of priority grid connection and abandoned power management. Our results show that optimal capacity investment is inversely related to priority dispatch elasticity under both strategies. However, the profit from power generation is always higher when adopting the abandoned power management strategy.

Keyword: wind power; intermittent energy; capacity planning; high penetration rate

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