

考虑发电商风险偏好的电力市场均衡分析

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Modeling risk preference in equilibrium analysis of electricity markets with wind power

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摘要 大规模的风电并网会增加常规发电商的市场竞争风险, 在此环境下, 具有不同风险偏好的常规发电商会通过不同的策略竞争性竞争行为, 来协调其市场竞争收益和风险. 针对具有风电并网发电的电力批发市场, 采用均值-方差效用理论, 建立了一个考虑发电商风险偏好的电力市场供应函数均衡模型, 并给出了其解析解. 理论分析着重研究了风电出力的不确定性和常规发电商风险偏好对发电商策略性行为和市场均衡结果的影响. 算例仿真验证了理论分析的合理性. 研究表明, 当存在风险厌恶的常规发电商时, 风电出力不确定性的增加会使得均衡市场价格上升; 常规发电商风险厌恶程度的增大也会导致均衡市场价格升高.

关键词: 电力市场 风力发电 风险偏好 供应函数均衡

Abstract: Large-scale wind power penetration in power systems will significantly increase the market risk faced by the conventional strategic generators. In this environment, the conventional generators with different risk preferences will balance their market profits and risks through different strategic behaviors. Using the mean-variance utility theory, a supply function equilibrium model for electricity wholesale markets with wind power generation was developed taking account of the conventional generators' risk preferences. The analytical solution of this model is also presented. The impacts of the uncertainty in wind power output and the conventional generator's risk preference on generators' strategic behaviors and market equilibrium were investigated by theoretical analysis. Numerical examples were used to verify the reasonableness of the theoretical analysis. It is shown that under the presence of risk-averse generators, the equilibrium market price will increase with increasing the uncertainty in wind power output. In addition, as the conventional generators become more risk averse, the equilibrium market price will also increase.

Key words: electricity market wind power risk preference supply function equilibrium

收稿日期: 2010-09-11;

基金资助:国家自然科学基金(70871074); 上海大学"十一五"211建设项目

引用本文:

王晔, 康小宁, 张少华. 考虑发电商风险偏好的电力市场均衡分析[J]. 系统工程理论实践, 2012, (8): 1850-1857.

WANG Xian, KANG Xiao-ning, ZHANG Shao-hua. Modeling risk preference in equilibrium analysis of electricity markets with wind power[J]. System Engineering - Theory & Practice, 2012, (8): 1850-1857.

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