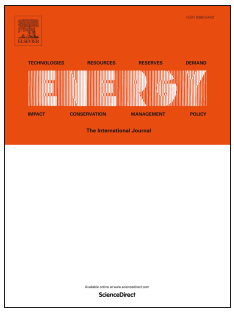
Accepted Manuscript



Optimal trade-off planning for wind-solar power day-ahead scheduling under uncertainties

J.J. Chen, Y.L. Zhao, K. Peng, P.Z. Wu

PII: S0360-5442(17)31983-7

DOI: 10.1016/j.energy.2017.11.125

Reference: EGY 11913

To appear in: *Energy*

Received Date: 20 June 2017

Revised Date: 17 November 2017

Accepted Date: 20 November 2017

Please cite this article as: Chen JJ, Zhao YL, Peng K, Wu PZ, Optimal trade-off planning for wind-solar power day-ahead scheduling under uncertainties, *Energy* (2017), doi: 10.1016/j.energy.2017.11.125.

Optimal trade-off planning for wind-solar power day-ahead scheduling under uncertainties

J.J. Chen[a,*], Y.L. Zhao[a], K. Peng[a], P. Z. Wu[b]

[a] *School of Electrical and Electronic Engineering, Shandong University of Technology, Zibo 255000, P.R. China*

[b] *Stephenson Institute for Renewable Energy, Department of Physics, University of Liverpool, Liverpool L69 7ZE, UK*

Abstract

This paper proposes a bi-probability-interval optimization (BPIO) model for wind-solar power day-ahead scheduling (WSP-DAS) under uncertainties, which aims to obtain the optimal trade-off planning by balancing profit and risk brought by uncertain wind power and solar power penetration. First, the confidence intervals of wind power and solar power are formulated under given confidence levels of wind speed and solar radiation, respectively. Then, the distribution probabilities of each wind power and solar power are obtained accordingly based on the cumulative distribution function (CDF) of wind speed and solar radiation, respectively. Finally, the framework of BPIO based WSP-DAS is developed to balance the profit and risk, considering a conditional expectation based optimization objective. Comparative experiments are conducted on two day-ahead scheduling systems under the dynamic uncertain wind and solar power penetration. The empirical results fully demonstrate that the proposed BPIO can significantly improve the reliability and effectiveness of evaluating WSP-DAS, in terms of obtaining a trade-off planning between profit and risk against the integration of uncertain wind-solar power.

Keywords: Bi-probability-interval optimization, day-ahead scheduling, wind-solar power, risk aversion, distribution probability

*Correspondence author: J. J. Chen.
Email address: jjchen@sdut.edu.cn (J.J. Chen)