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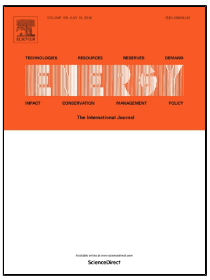

Optimal planning of capacities and distribution of electric heater and heat storage for reduction of wind power curtailment in power systems

Xing Gou, Qun Chen, Kang Hu, Huan Ma, Lei Chen, Xiao-Hai Wang, Jun Qi, Fei Xu, Yong Min

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Optimal planning of capacities and distribution of electric heater and heat storage for reduction of wind power curtailment in power systems

Xing Gou[1], Qun Chen[1, 2*], Kang Hu[1], Huan Ma[1], Lei Chen[2], Xiao-Hai Wang[3], Jun Qi[3], Fei Xu[2], Yong Min[2]

[1] Key Laboratory for Thermal Science and Power Engineering of Ministry of Education, Department of Engineering Mechanics, Tsinghua University, Beijing 100084, China

[2] State Key Laboratory of Control and Simulation of Power Systems and Generation Equipment, Department of Electrical Engineering, Tsinghua University, Beijing 100084, China

[3] Inner Mongolia Power (Group) CO., LTD, Hohhot 010020, China

ABSTRACT: Integrating electric heater (EH) and heat storage (HS) into power systems is a feasible solution to reduce wind power curtailment. However, most researches consider the capacities optimization without their distribution. Based on a practical power grid with eight buses, utilizing the DC power flow model together with the capacity and operation constraints of EH, HS and other power units gives the mathematic model of the integrated energy system. On this basis, applying the economic benefit as the optimization objective gives the optimal capacities and distribution of EH and HS to satisfy certain proportions of heat load. Besides, the concept of "generalized energy storage" is put forward to provide an explanation of the regulating ability of power generation and consumption of a region. The results show that the economic benefit in the optimal case with the optimal distribution of EH and HS is 44.65% higher compared to the case that maintains the same power transmitted after installing EH and HS, and 1.76% higher than that in the case that allocates the electric heaters equally. Besides, the influence of the coal price is nearly twice of the HS price, and 4 times of the EH price on economic benefit.

* Corresponding author, Tel. & Fax: 86-10-62796332; Email: chenqun@tsinghua.edu.cn