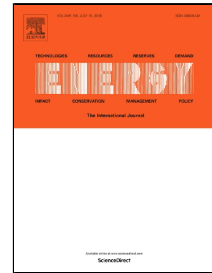


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Optimal planning of capacities and distribution of electric heater and heat storage for reduction of wind power curtailment in power systems

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

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

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