

基于价格激励的抽蓄-风-光基地联合优化调度研究 【上架时间： 2023-03-30】



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详细信息

【标题】 基于价格激励的抽蓄-风-光基地联合优化调度研究

【Title】 Research on optimal dispatch of integrated PHS-Wind-Solar power generation systems considering price incentive

【摘要】 以抽蓄风光为主的可再生能源基地是助力实现“碳达峰、碳中和”的重要途径，通过抽蓄-风-光一体化资源配置、规划建设、打捆消纳和调度运行，可以有效提高综合开发经济性和清洁能源利用率，切实提升新能源开发规模、电能质量和竞争水平。依托抽水蓄能电站的良好调节特性，就近打捆风电、光伏电站形成抽蓄-风-光一体化基地，可实现抽蓄电站调节能力的充分利用与常规电源装机替代，助力新型电力系统建设与能源清洁低碳转型。然而新能源出力的随机性与传统抽水蓄能电站的充放策略、价格机制存在时空差异，给一体化运行的协同策略与经济调度方式带来挑战。本文考虑了以风电、光伏、抽蓄电站为主的一体化基地，首先基于现有价格机制，以基地收益最大为目标构建抽蓄-风-光联合优化调度整数线性模型，求解得出最优调度策略；其次提出考虑新能源混合调度的抽蓄调峰价格机制，引导抽蓄进一步发挥调节能力。本文选取江苏抽蓄-风-光一体化基地为研究对象进行算例分析，分析结果表明：利用抽水蓄能的调节能力合理配比风光资源，可以实现抽蓄风光多能互补；制定合理的调峰价格机制，可以促进抽蓄进一步发挥调峰作用。

【Abstract】 Large-scaled integrated Pumped-hydro storage (PHS)-Wind-Solar power generation system is an important way to achieve our country's goal of 'peaking carbon dioxide emissions by 2030, carbon neutral by 2060'. Through scheduling resources of water, solar, and wind, planning construction of power systems, and optimal dispatch operation, the comprehensive economy and clean energy utilization rate can be effectively improved, and the development of clean energy scale, power quality and level of competition can be promoted. Relying on the fast response of PHS stations, wind power and photovoltaic are integrated nearby to form a joint system of water, solar and wind, which can fully utilize the capacity of pumped-hydro storage plants, and replace conventional thermal power plants, as well as facilitate the construction of new-stated power systems and transformation to clean and low-carbon energy. However, there are spatiotemporal differences between the clean energy output and the pumping and planting strategy of traditional PHS stations, which bring challenges to the coordinated strategy and economic dispatch method of integrated operation. This paper considers a large-scaled integrated PHS-Wind-Solar power generation system. Firstly, based on the existing price mechanism, with the goal of maximizing the profit, a mixed integer linear model of PHS-Wind-Solar joint optimal dispatch is constructed, and the optimal strategy is obtained. Secondly, a PHS peak-shaving price mechanism considering clean energy is proposed to promote PHS to further its adjustment capacity. This paper selects a integrated PHS-Wind-Solar power generation system in Jiangsu as a case study. The results show that: using the regulating ability of PHS to reasonably match the wind and solar resources, it is possible to realize the multi-energy complementarity of water, solar and wind; formulating a reasonable peak regulation price mechanism can promote PHS to further play the role of peak shaving.

【关键词】 抽蓄风光一体化；清洁能源消纳；价格激励；抽水蓄能；优化调度

【Keywords】 PHS-Wind-Solar integration; clean energy consumption; price incentive; PHS; optimal dispatch

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