

新能源与分布式发电

组合蓄能离网型自治光伏发电系统优化运行与配置设计

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摘要:

提出了采用电解水制氢与蓄电池相结合的组合蓄能离网型自治光伏发电系统及其优化运行与配置设计方法。该系统不仅能消除太阳能与用户负荷间供需失配的影响,且能实现运行和成本的优化。以不同纬度地区的2个用户为例,对组合蓄能光伏发电系统和常规蓄电池蓄能光伏发电系统进行了对比计算与仿真。仿真结果表明,与常规系统相比,组合蓄能系统不仅能够绿色自治运行,提供不间断的电力供应,且成本较低、体积较小、重量较轻等。

关键词: 组合蓄能 光伏发电 优化设计 离网型 自治运行

Optimal Operation and Configuration Design of Off-Grid Autonomous Photovoltaic Generation System With Hybrid Energy Storage

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Abstract:

An off-grid autonomous photovoltaic generation system with hybrid energy storage, in which the water-electrolytic hydrogen making equipment and battery are integrated to store the energy, is proposed and the approaches for optimal operation and configuration for the proposed autonomous photovoltaic generation system are given. The proposed photovoltaic generation system can eliminate the mismatching between intermittent solar irradiation and the time-varying load demand, and the given optimal operation and configuration design approaches can be employed to optimize its operation and investment cost. Taking two consumers located in different latitudes for example, the comparative calculation and simulation of the proposed autonomous photovoltaic generation system with hybrid energy storage and conventional photovoltaic generation system with battery are performed. Simulation results show that the proposed photovoltaic generation system with hybrid energy storage not only can operate in green autonomous mode and provide uninterrupted power supply, but also possesses such advantages as lower investment cost, smaller volume, light weight and so on.

Keywords: hybrid energy storage photovoltaic generation optimal system design off-grid autonomous operation

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参考文献:

- [1] 王承煦, 张源. 风力发电[M]. 北京: 中国电力出版社, 2003: 1-100.
- [2] 许洪华, Barley C D, Tu P. 西藏4kW风光互补发电系统优化设计[J]. 太阳能学报, 1998, 19(3): 225-230. Xu Honghua, Barley C D, Tu P. The optimization design for 4kW wind/PV hybrid generating system in Tibet[J]. Acta Energetica Sinica, 1998, 19(3): 225-230(in Chinese).
- [3] 丁明, 吴义纯. 基于改进遗传算法的风力: 柴油联合发电系统扩展规划[J]. 中国电机工程学报, 26(8): 23-27. Ding Ming, Wu Yichun. Expansion planning of wind-diesel energy system based on genetic algorithm[J]. Proceedings of the CSEE, 2006, 26(8): 23-27(in Chinese).
- [4] 吴理博, 赵争鸣, 刘建政, 等. 独立光伏照明系统中的能量管理控制[J]. 中国电机工程学报,

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2005, 25(22): 68-71. Wu Libo, Zhao Zhengming, Liu Jianzheng, et al. A novel energy management and control for stand-alone photovoltaic lighting system[J]. Proceedings of the CSEE, 2005, 25(22): 68-71(in Chinese). [5] 卢继平, 白树华. 风光氢联合式独立发电系统的建模及仿真[J]. 电网技术, 2007, 31(22): 75-79. Lu Jiping, Bai Shuhua. Modeling and simulation of conjoint independent power generation system consisting of power generation by wind energy, solar energy and hydrogen energy[J]. Power System Technology, 2007, 31(22): 75-79(in Chinese). [6] 栗文义, 张保会, 巴根. 风/柴/储能系统发电容量充裕度评估[J]. 中国电机工程学报, 2006, 26(16): 62-67. Li Wenyi, Zhang Baohui, Ba Gen. Capacity adequacy evaluation of wind-diesel-storage system[J]. Proceedings of the CSEE, 2006, 26(16): 62-67(in Chinese). [7] 陈树勇, 戴慧珠, 白晓民, 等. 风电场的发电可靠性模型及其应用[J]. 中国电机工程学报, 2000, 20(3): 26-28. Chen Shuyong, Dai Huizhu, Bai Xiaomin, et al. Reliability model of wind power plants and its application[J]. Proceedings of the CSEE, 2000, 20(3): 26-28(in Chinese). [8] 王海超, 鲁宗相, 周双喜, 等. 风电场发电容量可信度研究[J]. 中国电机工程学报, 2005, 25(10): 103-106. Wang Haichao, Lu Zongxiang, Zhou Shuangxi, et al. Research on the capacity credit of wind energy resources[J]. Proceedings of the CSEE, 2005, 25(10): 103-106(in Chinese). [9] 吴义纯, 丁明, 张立军. 含风电场的电力系统潮流计算[J]. 中国电机工程学报, 2005, 25(4): 36-39. Wu Yichun, Ding Ming, Zhang Lijun. Power flow analysis in electrical power networks including wind farms[J]. Proceedings of the CSEE, 2005, 25(4): 36-39(in Chinese). [10] 申洪, 王伟胜. 一种评价风电场运行情况的新方法[J]. 中国电机工程学报, 2003, 23(9): 90-93. Shen Hong, Wang Weisheng. A new method for evaluating operation of wind power plant[J]. Proceedings of the CSEE, 2003, 23(9): 90-93(in Chinese). [11] 陈星莺, 刘孟觉, 单渊达. 超导储能单元在并网型风力发电系统的应用[J]. 中国电机工程学报, 2001, 21(12): 63-66. Chen Xingying, Liu Mengjue, Shan Yuanda. Application of super conducting magnetic energy storage system: SMES in wind power system of network-forming[J]. Proceedings of the CSEE, 2001, 21(12): 63-66(in Chinese). [12] 戴欣平, 马广, 杨晓红. 太阳能发电变频器驱动系统的最大功率追踪控制法[J]. 中国电机工程学报, 2005, 25(8): 95-99. Dai Xinping, Ma Guang, Yang Xiaohong. A control method for maximum power tracing of photovoltaic generation system[J]. Proceedings of the CSEE, 2005, 25(8): 95-99(in Chinese). [13] Hollmuller P, Joubert J M, Lachal B, et al. Evaluation of a 5 kWp photovoltaic hydrogen production and storage installation for a residential home in Switzerland[J]. Int J Hydrogen Energy, 2000(25): 97-109. [14] ?ystein U. Stand-alone power systems for the future: optimal design, operation & control of solar-hydrogen energy systems [D]. Norwegian: Norwegian University of Science and Technology, 1998. [15] Zhou K L, Ferreira J A, de Haan S W H. Optimal energy management strategy and system sizing method for stand-alone photovoltaic- hydrogen systems[J]. Int J Hydrogen Energy, 2008(32): 477-489. [16] Klein S A, Beckman W A, Mitchell J W, et al. Trnsys-a transient simulation program solar energy laboratory[R]. University of Wisconsin-Madison, 2004.

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2. 龙 源|李国杰|程 林|孙元章.利用光伏发电系统抑制电网功率振荡的研究[J]. 电网技术, 2006,30(24): 44-49
3. 黄玲玲|符 杨|郭晓明 .大型海上风电场电气接线方案优化研究[J]. 电网技术, 2008,32(8): 77-81
4. 刘伟 彭冬 卜广全 苏剑.光伏发电接入智能配电网后的系统问题综述[J]. 电网技术, 2009,33(19): 1-6