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电动汽车无线充电技术专辑

含无线充电电动汽车的孤岛直流微电网运行模式研究

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Research on Operation Mode of Islanding DC Microgrid with EV-Wireless Power Transfer System

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摘要

为改进电动汽车充电设施的供电方式,研究了无线充电电动汽车与光储直流微电网的融合,并重点研究充电功率发生变化时微 电网的能量管理策略。分别建立光伏、储能、无线充电电动汽车能量传递的数学模型,推导各部分功率、端口电压电流等的 关联性,基于此设计了相应的控制器。考虑充电功率需求以及储能电池状态信息,定义微电网运行的3种模式,并提出基于功率 缺额判据的能量管理策略。最后搭建实验平台,验证系统的3种运行模式均可实现充电负荷的可靠供电。当充电功率发生变动 时,所设计的能量管理策略可实现模式切换,维持母线电压稳定。

Abstract

The integration of an electric vehicle-wireless power transfer (EV-WPT) system and DC microgrid with photovoltaic (PV) and energy storage (ES) is studied in this paper to improve the power supply mode of EVs charging facilities. The research focuses on the energy management strategy for microgrid when the charging power changes. The mathematical models of power transfer of PV, ES and the EV-WPT system are established, respectively. The correlations of power, port voltage and current of each unit are derived, based on which the corresponding controllers are designed. Considering the charging power demand and the state-of-charge of ES battery, three operation modes of microgrid are defined, and the energy management strategy based on the power gap criterion is proposed. Finally, an experimental platform was built, and results verified that all the three operation modes of the system can achieve a reliable power supply of charging load. When the charging power changed, the designed energy management strategy can realize mode switching and maintain the bus voltage stability.

关键词

无线电能传输 直流微电网 / 电动汽车 / 光伏发电

Key words

wireless power transfer (WPT) / DC microgrid / electric vehicle (EV) / photovoltaic (PV) power generation

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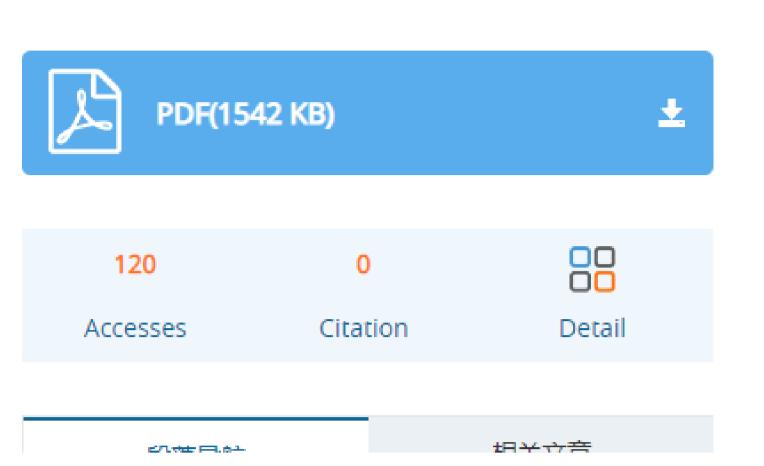
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