

电工理论与新技术

移动式直接冷却高温超导磁储能系统试验研究

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摘要:

该文介绍了中国自行研制的第一套移动式直接冷却高温超导磁储能系统(moveable conduction-cooled high temperature superconducting magnetic energy storage system, M-SMES)的工作原理、组件结构、性能实验、动模实验和现场试验。该系统额定值为380 V/35 kJ/7 kW, 包括高温超导磁体及杜瓦、制冷单元、变流器、监控单元、箱体等主要组件及其它辅助部件, 可吊装至集装箱车上移动到所需的位置, 通过简单接线即可投入使用。针对该系统分别进行了电力系统动态模拟实验和现场试验。各项试验结果表明: 该M-SMES具有四象限功率快速调节能力, 具有良好的移动性和抗震性, 现场运行性能稳定, 能够抑制电力系统功率振荡, 稳定系统电压, 在电力系统中具有良好的应用前景。

关键词: 移动式 直接冷却 高温超导磁储能 现场试验

Development and Test of Moveable Conduction-cooled High-temperature Superconducting Magnetic Energy Storage System

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Abstract:

This paper introduces the first moveable conduction-cooled high temperature superconducting magnetic energy storage system (M-SMES) made in China. The M-SMES is rated at 380 V/35 kJ/7 kW, consisting of the high temperature magnet confined in the dewar, the cryogenic unit, the converter, the monitoring and control unit, and the container, etc. The proposed M-SMES can be loaded to a truck to transport to the desired place and put into use through easy connection. The laboratory and field test results were given. Test results indicate that the M-SMES is functioned with energy storage, featuring with fast response to four-quadrant power regulation. The accessories for moveable feature and anti-shock property are well designed. The M-SMES performs well during the field test. The power oscillation is damped and bus voltage is improved. It is feasible to be put into utility in the future power system.

Keywords: moveable conduction-cooled high-temperature superconducting magnetic energy storage system (SMES) field test

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