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POWER SUPPLY SYSTEMS FOR CREWED PRESSURIZED ROVERS ON THE LUNAR SURFACE THAT ENSURE SAFETY AND CONTINUITY.

Abstract

In crewed pressurized rovers operating in the lunar environment, a continuous power supply is essential for the astronauts' living conditions, life support systems, communication equipment, thermal systems to manage day-night temperature variations, and for the rover's mobility. The rover's power supply system uses lithium-ion batteries (LIB) as a power source, not only for lunar driving missions but also for supplying power during extravehicular activities (EVA) and to other systems like the Lunar Terrain Vehicle (LTV). The LIBs are independently installed in two power supply systems: one for driving and one for PR system. Additionally, each power supply system is designed with redundancy, allowing for minimal operation in case of a failure. In the power supply system, the LIBs are charged using solar power generation (SAP) and regenerative fuel cells (RFC) while the rover is stationary. During the day, when solar power generation is available, electricity generated by SAP is used to charge the LIB and to electrolyze water with the RFC. During the long lunar nights, when solar power generation is not possible, the LIB is charged using electricity generated from hydrogen and oxygen produced by water electrolysis. By combining LIB charging through SAP and RFC, a redundant design of the power supply system, and energy management, a method is established to ensure the safety and continuity of the rover's activities on the lunar surface.