

IAF SPACE POWER SYMPOSIUM (C3)
Space Power System for Ambitious Missions (4)

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LUNAR POWER STATION

Abstract

One of the difficulties in developing lunar landers and rovers is the requirements for large power storage capacity required to keep these systems' temperatures above survival temperature limits during the long lunar night, which lasts 14 earth days. This requirement is not compatible with the evolving trend to develop miniaturized landers and rovers for lunar explorations. One possible solution is to use thermos nuclear power generation, which can generate at least sufficient power to keep these systems in a safe state during the lunar nights. However, this is not an option of choice especially when considering internationally recognized policies and regulations relating planetary protection. In particular the risk of contamination due to any probable fail our modes. This paper proposes a lunar exploration system that utilizes a centralized large capacity rentable solar energy power generation and storage base station that can support a number of lunar exploration rovers in at least two ways. The rovers can dock to the base station at lunar dusk and utilize the base's stored energy to keep them worm. Or to recharge and enable explorations during the lunar night if that was required. The study also looks into the feasibility of charging the rovers using contactless energy transfer methods. Some of these techniques have already been proposed to transfer power from a solar power harnessing satiate and transmitting it to ground by making use of microwave RF techniques. Future development of such a centralized power base station may apply in situ resource utilization to generate power, should suitable resources be found on the moon. This may include decomposing ice into hydrogen and Oxygen during sun lit day and recombining them at night back into water, as one possible scenario. The propose base station can also be utilized as a commercial supplier of energy to other users , in this case miniaturized rovers that do not want, or unable to invest in such infrastructure, which for sure will require an initially costly investment. A business case may be presented to show that such an operation may be economically self-sustaining. Otherwise, Space Agencies may need to invest through government funding to seed such lunar power plants.