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SPACE BASED SOLAR POWER: CONCEPT FOR SUSTAINABLE LUNAR APPLICATION

Abstract

Lunar exploration activities, both human and robotic, and in-situ resource utilization, are expected to grow in the coming decades. In particular, lunar craters and the poles hold great scientific, economic and strategic value. However, they pose a challenge for solar panels in terms of power generation due to low solar illumination. A sustainable power supply is therefore necessary to ensure the continuity of such activities.

This paper explores the feasibility of a satellite in lunar orbit as a means of solar power generation and transmission to the surface of the Moon. Through trade-off studies of key technologies for space based solar power, we propose a highly efficient satellite which employs a laser beam. A lunar "frozen" operational orbit, proposed by Todd A. Ely and Erica Lieb in 2006, was selected because it constitutes the best compromise between coverage, pointing accuracy and a number of key parameters. After performing a spacecraft design, we can conclude that such a solar power satellite, while expensive, has a good technology readiness level and could become viable during this decade.