

SPACE POWER SYMPOSIUM (C3)
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COMPARATIVE STUDY OF POWER GENERATION METHODS FOR MARS MISSION:
POTENTIAL OF SPACE SOLAR POWER (SSP) SYSTEM**Abstract**

Mars has experienced a surge of growing popularity since the late 20th century due to its geographic similarity to Earth and the great potential of human exploration. Recent discoveries from scientific observation have further aroused interest in Mars study and power generation is no doubt an integral part to support future research activities. This paper presents the recent progress in power generation methods on Mars, including surface-based solar power systems and nuclear systems. The investigation seeks to present the challenges existing in current systems and casts light on an alternative solution: Space Solar Power (SSP). The SSP system harvests the energy from the sun in space and transmits the energy wirelessly through microwave or laser to the surface. It shows great advantages as a long-lasting, near continuous, and high efficiency energy strategy. Unlike the surface-based solar power system, its behavior is much less affected by dust storms. The research conducted offers a detailed description of the system architecture and its operation scheme. Based on state of the art industrial and experimental data, it provides a comprehensive comparison among nuclear systems, surface-based solar power systems and space solar power systems on different figures of merit, including costs, mass, risks and reliability, power density, and efficiency under the same surface power scenario. The paper shows that the SSP system is capable of providing energy in a practical manner and has a large potential in future Mars Mission.