

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

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SOLAR POWER ENERGY GENERATION IN SPACE FOR MOON AND MARS

Abstract

The current race for space exploration requires efficient and sustainable energy sources for Moon and Mars colonization. This study presents a tentative mission for a space-based orbiting power generating system that utilizes solar flares to generate electricity. Due to the absence or thinness of atmosphere, solar energy is the optimal energy source for these celestial bodies. The proposed approach uses Meta-Materials capable of absorbing high electromagnetic radiation to convert pulsed radiation from the Sun into electricity. The Meta-material absorber captures a broad frequency range of radiation and re-emits it in a narrow band to a precisely tuned photovoltaic cell for efficient conversion. Onboard control algorithms and observation of parameters such as orbital decay, solar and cosmic radiation pressure, atmospheric drag, and orbit perturbations are essential for proper functioning. The system is orbited at an altitude of 30km from the Moon and placed in a suitable orbit for Mars. The generated electricity is wirelessly transmitted to power-receiving stations on the Moon and Martian base. The proposed concept represents a revolutionary technology in power generation and transmission for space exploration, with potential use as fuel for orbiting flybys. The algorithms and technology stack utilized have undergone rigorous scientific experimentation and development.