

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

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## SOLAR-POWERED ENERGY GENERATION IN SPACE FOR MOON AND MARS

**Abstract**

As of now we are in the race of space exploration and developing a highly sophisticated technology in the colonization of Moon and Mars. The primary need for all the missions is Energy. We present a feasibility study of a tentative mission for developing a space-based orbiting power generating system that could generate electricity from the solar flare for the Moon and Mars. Compare to earth, the moon has no atmosphere, and mars have a very much thin atmosphere, it is optimal to produce solar energy (electricity). Solar flares are a limitless and renewable source of energy. Our novel approach is to convert the pulsed radiation from Sun to electricity. This process could be achieved by using the Meta-Materials (capable to absorb the high electromagnetic radiation). The Meta-material absorber could be used to effectively capture radiation from a broad frequency range and then it could re-emit it in a narrow band to a photovoltaic cell (where we aligned our solar panel structure for energy generation) with a band-gap that is precisely tuned to the wavelength of the re-emitted radiation. So from that, we can convert those radiations into electrical energy. These power transmissions are being controlled by onboard control algorithms and other parameters relating to orbital decay, solar and cosmic radiation pressure, atmospheric drag, perturbations in orbit are needed to be constantly observed by the planning algorithms. This entire system will be orbited at an altitude of 30km from the Moon and for Mars, we can place it in suitable orbit. From our study, our system could perform the wireless power transmission system for Moon and Mars by transferring the generated electricity to the power-receiving stations in the Moon and Martian base. Our proposed concept will be a revolutionary technology in power generation in Space exploration. Furthermore, this is a multi-purpose system in that we can utilize the energy as a fuel for the orbiting flyby. This highly sophisticated system has a high potential to change the traditional way of power generation and transmission. The mentioned algorithms and technology stack used is already under development and proven scientifically through many experimentations.