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LARGE SCALE DEVELOPMENT OF A 1GW SOLAR POWER SYSTEM ON THE MOON

Abstract

Future electrical energy needs for the Earth have been proposed to be addressed by the deployment of massive solar arrays in space with power beaming back to Earth. Such solar power satellites will require significant launch capacity and drastically reduced launch costs to be cost effective. However, these challenges can be mitigated by the use of an ever present satellite - the Moon, where the properties of the Moon including in-situ resources and the presence of a nominal gravitational acceleration can significantly aid in the deployment of solar cell arrays in space. In this scenario through the use of in-situ resources, only the TOOLS necessary to manufacture solar cells will be required to be launched to the Moon resulting in a significant reduction in launch capacity and resultant launch costs. The deployment of massive arrays of solar cells on the Moon is accomplished by the fabrication of thin film silicon solar cells DIRECTLY on the surface of the Moon via a Cell Paver machine utilizing raw materials extracted from the lunar regolith via a Regolith Processor machine. The Cell Paver vacuum deposits an interconnected array of solar cells, while a swarm of Cell Pavers would have the capacity to fabricate square kilometers of solar cell arrays on the Moon. Such arrays would be robotically integrated with power management systems and power beaming systems to get the majority of the electrical energy to the Earth. A design study using a multitude of Cell Pavers and a concomitant number of Regolith Processors will show the capability of fabricating over 1GW of solar cells on the Moon within a 5-year period of time.