THE FABRICATION OF SILICON SOLAR CELLS ON THE MOON USING IN-SITU RESOURCES. A. Ignatiev, Space Vacuum Epitaxy Center, Science and Research I, University of Houston, Houston TX 77204-5507, USA (Ignatiev@uh.edu).

The exploration and development of the solar system depends critically on the availability of electrical energy. In addition, the long term potential for humans to settle space requires self-sufficiency and therefore, self-sustaining electrical power systems in space locations remote from the Earth. It is projected, based on data from average power usage in developed countries (including an addition allocation for life support), that 6 to 10 kW of continuous power will be required per person to support humans in space. Robotic outposts would require less, but if expanded to incorporate significant space presence, could grow to nearly the 100 kW to 1 MW values required for human outposts. The ability to supply such power to remote space locations is currently quite limited. The presently permissible power technology for space is solar power. However, considering the large mass requirements for solar power systems (~ 20-30 kg/kW) and high launch costs, it is doubtful that the current approach of fabricating and assembling solar power systems on Earth, and then launching then into space will be viable for major outposts. What is required is an electric power system, the kernel for which is a fabrication facility which can be installed on remote moons and planets, which will utilize the resources of the moon or planet to fabricate solar cells on location, and will be self replicating in that it will use the power that it produces to produce more solar cells.

Such a revolutionary power system utilizes the indigenous resources present on moons and planets accompanied by an *in situ* electric power system fabrication approach based on the production of solar cells by a thin film growth technology. For the case of the Earth's Moon, thin film silicon-based solar cells can be fabricated in the vacuum environment of the surface of the moon utilizing raw materials generated from the processing of the lunar regolith. The thin film solar cells will be vacuum deposited directly on the surface of the Moon by a facility that incorporates both regolith processing and solar cell fabrication. Such a facility can have the capacity to fabricate a 1 MW power system on the surface of the Moon in several years.

This unique approach for the emplacement of a safe electric power system would require transportation of a much smaller mass of equipment to the Moon than would otherwise be required to install an electric power system, and would result in a power system that was repairable/replaceable through the simple fabrication of more solar cells. This approach of supplying only the robotic fabrication facility to generate remote power capability would also result in significant major cost reductions through the major decrease in required mass to target. A similar technical approach could also work on Mars with modification. This new autonomous electric power system architecture will allow for human and robotic presence in space independent of Earth.