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TECHNICAL STUDY UPON THE CONCEPT OF ENERGY PRODUCTION NEAR LUNAR POLES BY MEANS OF MESHED NETWORK ARRANGEMENT OF THERMOELECTRIC GENERATORS

Abstract

Ever since NASA's Lunar Reconnaissance Orbiter (LRO) has started data-keeping from its orbit in high accuracy, it has continued to help narrow down the possible locations feasible for a human settlement for the future. These locations are shortlisted, usually, either based upon the availability of sunlight present throughout the year as in case of Peaks of Eternal Light (PELs) or they employ the geographical features of the local terrain for the purpose of radiation protection as in case of skylights and lava tubes/lava caves.

What remains common in all such sites is that they are all primarily powered by solar energy, based upon which an electricity-driven manned base shall function. So the permanent visibility of the Sun or at least an unhindered access to solar power remains a crucial factor when it comes to operating these bases for long duration. However, it is equally important to see that for redundancy purposes, sunlight should not be relied upon as the sole basis of energy especially during the times when a situation involving a shortage/outage of power comes up, such as eclipses.

Along the same line of thought, this paper attempts to empirically evaluate the feasibility of setting up and using a large number of interconnected Thermoelectric Generator (TEG) mesh as an alternative to making use of large thermal gradients found in-situ near the polar regions of the Moon. In addition to that, the idea of drawing sufficient amount of usable energy is also explored, from the vast temperature difference that exists locally on the sunlit side of the Moon particularly near places like poles, mountains, skylights and the craters near the permanently shadowed regions (especially the likes of Shackleton and Malapert among others that exist around the Lunar South Pole). Thereby, a fresh perspective towards a non-conventional method of energy generation is introduced by bringing in a supplementary way of siphoning usable power without putting additional burden over the existing state of the manufacturing and installation abilities of our times.

Sufficient efforts are further made to present a fair comparison of such an alternative by evaluating its efficiency, power budget, setup costs and operational challenges with other conventional methods. The observations and results of the study towards the end present promising outputs if the proposed setup of TEGs is employed over the previously mentioned locations.