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Return to the Moon (02)
Lunar Surface Outposts and Enabling Technologies (4)

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STUDY OF A SYSTEM TO GENERATE ELECTRICITY ON THE MOON'S SURFACE DURING THE LUNAR NIGHT

Abstract

One of the biggest challenges of the exploration of the Moon is the survival of the crew and the lunar assets during the lunar night. The environmental conditions on the lunar surface and its cycle, with long periods of darkness, make any long mission in need of specific amounts of heat and electricity to be successful. We have analyzed two different systems to produce heat and electricity on the Moon's surface. The first system consists of the Thermal Wadis, sources of thermal power that can be used to supply heat to protect the exploration systems from the extreme cold during periods of darkness. Previous results showed that Wadis can supply enough heat to keep lunar devices such as rovers above their minimum operating temperature (approximately 243K). The second system studied here is the Thermal Energy Storage (TES) system, which is able to run a heat engine during the lunar night to produce electricity. When the Sun is shining on the Moon's surface, the system can run the engine directly using the solar power and simultaneously heat a thermal mass. This thermal mass will be used as a high temperature source to run the heat engine during the night. In order to choose every component of the TES system, we focused on both the production of the needed amount of energy and the minimization of the weight brought from the Earth to the Moon.