

SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies and Concepts (3)

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NITROGEN-BASED POWER GENERATION DURING THE LUNAR NIGHT

Abstract

The paper presents the current results of the “Lunar Night Nitrogen Power Generation” project (LN²PG), one of the three winners of the DLR Vision Contest 2012. Rooted in the same process utilized in power plants on Earth, the underlying concept applies a thermodynamic cycle to generate electric energy during the 14 days lasting lunar night. The idea is based on the fact that the temperature of the lunar surface, even during the night, is high enough to evaporate liquid nitrogen. LN²PG represents an alternative to the two existing power supply plans for the lunar night scenario: RTGs and energy storage systems, which have to be charged during the day. The initial feasibility analysis, which was part of a corresponding patent application filed in October 2011, had shown, that a liquid nitrogen mass flow rate of 100 kg per hour could yield about 2.4 kW of electric energy. The present study improves on this assessment and breaks down the envisioned closed-loop nitrogen cycle. The paper also introduces the addition of a second heat exchanger (economizer/recuperator) to the system, improving the overall efficiency, and details the heat absorption and dissipation process.