IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Mr. Sotirios Zormpas
Lunar Outpost EU, Luxembourg

Mr. Joe Kenrick
Lunar Outpost, Australia
Mr. Henry Laurie
Lunar Outpost, Australia
Ms. Lauren Fell
Lunar Outpost, Australia
Ms. Antonella Vittoria Tanga
Lunar Outpost EU, Luxembourg
Mr. Tobias Flecht
Lunar Outpost EU, Luxembourg
Mr. Davide Roscani
Lunar Outpost EU, Luxembourg
Dr. Olufemi Olumodeji
Lunar Outpost EU, Luxembourg

LUX-THERMAL AND ROOVER: A USE-CASE OF A POWER GENERATION SYSTEM FOR LUNAR NIGHT SURVIVAL

Abstract

Surviving the Lunar night is one of the most demanding environmental challenges that current and future Moon expeditions are facing; however, it is essential for maintaining a long-term human and robotic presence. LUX-Thermal is an autonomous self-contained thermal energy storage system providing thermal and electrical power on demand to surface payloads, vehicles, and ISRU facilities on the South Pole of the Moon with an estimated date of 2028.

With the goal of storing more than 50 kWh of thermal energy, its reservoir is sized to accept concentrated solar power through a series of optical elements meant to track the sun throughout the Lunar day. During the night, thermal power is transferred directly to the customer or is converted to electricity and then provided to the customer. Lunar night survival is embedded in the design process with thermally decoupling and isolating technologies meant to conserve as much energy as possible in the extreme operating conditions of the Lunar poles where temperatures range between -30 C and -200 C.

Developed by the EU office of Lunar Outpost, the leader in commercial planetary robotics demonstrated by 4 contracted missions including the Australian made Roover co-led by Lunar Outpost Oceania and EPE Oceania, the interaction between LUX-Thermal and the Roover is investigated in the presentation. Specifically, the customer interface is meant to maintain the client at -20 C minimum throughout the Lunar night. Thermal analysis is performed to quantify the amount of thermal power necessary to achieve a survivable temperature distribution on the customer side, the definition of the electrical power interface between the two entities and an investigation on the system's performance for a combined thermal and electrical power profile.

As part of LuxIMPULSE, the LUX-Thermal Earth Prototype (LTEP) is in development and passed PDR in 2024. Simultaneously, the testing of a scaled-down prototype was successfully completed, show-

casing the solar flux collection, thermal energy storage and thermal power transfer functions. The investigation of a realistic use case for LUX-Thermal is expected to increase the fidelity of the customer interface and verify the end-to-end system efficiency.