

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Moon Exploration – Part 3 (2C)

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LUNAR NIGHT SURVIVAL: POWER GENERATION AND DISTRIBUTION SOLUTIONS TO  
ENABLE A SUSTAINED HUMAN PRESENCE ON THE MOON

## Abstract

Future lunar exploration will involve a combination of human and robotic elements engaging in a variety of activities; science and exploration, resource prospecting, space tourism, and preparing for future exploration of other planetary bodies. In an era of renewed interest in lunar exploration, major spacefaring nations are evaluating missions that enable a sustained human presence on the Moon within the next decade. Reliable, scalable power generation and distribution systems will be the keystone in supporting such missions, especially those that require operation during lunar nights, in which the absence of direct sunlight and extreme temperature variations create a particularly inhospitable environment. In these periods of darkness, temperatures may drop several hundred degrees Celsius within minutes of sunset and subsequent electrostatic changes of the lunar regolith may present additional complications.

As part of the International Space University Summer Session Program 2018, held in The Netherlands, the Team Project “Lunar Night Survival” participants will propose a scalable power generation and distribution system for utilization during lunar days and nights to enable a sustained presence on the moon.

In addition to solar energy and regolith-derived materials, water ice has been identified as an important resource for sustained lunar activity, as it may be repurposed for fuel generation and life support. In-situ resource utilization (ISRU) is also a key enabling technology for a long-term human presence which supports power generation, storage, and distribution, habitat design, and supporting scientific activities such as EVA missions. Further to this, site selection must be carefully considered, as the designated mission location will determine which activities may be conducted and how resources will be used.

The entrance of an innovative commercial space sector presents a significant boon to lunar exploration, as unique business models and access to funding may provide more cost-effective methods to access and benefit from the utilization of lunar resources. This private-sector innovation, fueled by public-sector support, will enable new industries to thrive on the lunar surface and in cislunar space. This increased lunar activity by national and private sector actors increase the justification of well-defined treaties, best practices and standards that may be adopted and adhered to.