Paper ID: 83085
oral

IAF SPACE POWER SYMPOSIUM (C3)
Advanced Space Power Technologies (3)

Author: Mr. Jeffrey Csank
National Aeronautics and Space Administration (NASA), United States

Mr. George Thomas
National Aeronautics and Space Administration (NASA), United States
Mr. Joe Piboontum
NASA Glenn Research Center, United States
Dr. Aaron Weaver
National Aeronautics and Space Administration (NASA), United States

ENABLING UNIVERSAL ACCESS TO POWER ON THE LUNAR SURFACE

Abstract

The National Aeronautics and Space Administration (NASA) Artemis Missions will return human astronauts to the lunar surface, demonstrate technologies that establish a sustained presence on the lunar surface and enable human missions to Mars, and help create a lunar commercial economy. Creating a sustained permanent presence on the lunar surface will require access to continuous and highly reliable power to support mission needs. During Artemis, lunar surface operations will evolve and grow over time (years), requiring an increase in the amount of power needed (100s of kW) and distance that the power must be transmitted (up to 10 km during early Artemis missions). A lunar commercial economy is likely to exceed this power demand to the MW level and distance in the 100s of km. This increased distance and demand for highly reliable power drives the need to create an electric power grid by connecting localized lunar power systems (e.g., habitats, in-situ resource utilization plants, etc.), each containing one or more loads and/or sources. Developing a lunar surface power grid will allow lunar surface operations to resemble electrical utility operations on Earth; it allows power to be generated where it is convenient and allows power to be consumed where it is convenient and required. A lunar surface electric power grid will facilitate the growth of a lunar commercial economy because it provides a means to connect new loads to an existing electrical power system. To take full of the benefits of an electric power grid, similar to the terrestrial power grid, requires a common standardized interface to the grid and a set of standardized voltages. NASA Glenn Research Center is leading an effort to create universal access to power through the development of the Universal Modular Interface Converter (UMIC). The UMIC is designed to have a common interface that connects sources and loads compliant with the International Space Power System Interoperability Standard (ISPSIS) to a higher voltage AC transmission system or power grid. This presentation will further discuss the evolution of power during the Artemis missions, challenges associated with creating a sustained presence on the lunar surface, progress made on the UMIC, and future opportunities for technology development and standards.