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

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ECSM: EUROPEAN CHARGING STATION FOR THE MOON

Abstract

The increased interest in lunar exploration has led to the development of the Global Exploration Roadmap, which details the phases for returning to and establishing a sustained human presence on the Moon. After the first NASA-led phase of returning humans to the lunar surface, the surface capabilities will be expanded. It is in this second phase that there will be a need to provide electrical power to any established architecture. For missions on the lunar surface, a key consideration is energy availability and, in particular, the ability to store power to survive and perform operations during the lunar night. The European Charging Station for the Moon (ECSM) is a European-led novel solution that will provide power to lunar surface assets for a two-year baseline duration. It is envisioned to be a payload of the Argonaut lander and could be launched to the Moon in 2030 – 2032.

Two primary ECSM missions have been identified in the European Space Agency (ESA)'s Concurrent Design Facility (CDF) study as reference use cases. The Astronaut Science Enabler (AstroSci) allows a

targeted continuous power of 7.7 kW to be provided to users during the lunar day, as well as a reduced supply during the night. The AstroSci with Peak Power Capability (PeakPwr) aims to maximise the power provision during the lunar day, including a peak power boost for a short period of time.

The ECSM Pre-Phase A study led by Space Applications Services has advanced its design, allowing ESA to present the ECSM as a credible potential Argonaut payload in the next period of the Terrae Novae programme. Through derivation of the engineering requirements and a high-level architecture and configuration trade space, a baseline system design has been developed for both AstroSci and PeakPwr. These use a combination of solar arrays, secondary batteries and Regenerative Fuel Cell Systems to generate, store and distribute the required power to up to three external users. These designs have included the definition of the subsystem components, including thermal, structural and command and data handling designs, and the calculation of top-down budgets for mass, power and communications. From this, a baseline Concept of Operations, a development plan for critical technologies and a programmatic dossier have also been compiled.