

SPACE POWER SYMPOSIUM (C3)
Wireless Power Transmission Technologies, Experiments and Demonstrations (2)

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SPACETOSPACE POWER BEAMING (SSPB) AS A CIS-LUNAR UTILITY SERVICE

Abstract

An evolving set of commercial Technology Development, Demonstration, and Deployment (TD3) Missions can help start Cis-Lunar Utility Services (i.e., between Low Earth Orbit and Lunar Orbit). We provide a substantive update on the mission development work that has been accomplished since the original paper was presented at IAC 2016.

A consortium has been formed with the intent to realize Cis-Lunar Utility services, starting from TD3 missions leveraging the International Space Station (ISS) under a proposed public-private partnership.

This paper will address the characterization, optimization, and operation of a Cis-Lunar utility service for beamed-power. Paths are described for progressing from ISS Space-to-Space Power Beaming TD3 missions to operational commercial services.

Investigating operational mission concepts has allowed further definition of the TD3 mission requirements. The list of potential missions enabled by Cis-Lunar utility services has been expanded. The missions range from LEO ISS co-orbiting spacecraft, to grouped and/or fractionated space systems in a variety of Earth orbits, to Lagrange point transfer/relay orbits, to stable lunar orbits, as well as lunar/asteroid surface locations. The availability of Cis-Lunar utilities to augment or replace spacecraft solar arrays can be mission enhancing if not mission enabling. Furthermore, as the fielded systems improve, resource availability can dramatically increase and the cost per delivered kWh can be brought down.

The conceptual unbundling of space electrical power systems has resulted in the identification of multiple instances where a technology development push could significantly improve realistically achievable efficiency.

It is becoming increasingly apparent that there are advantages to be gained at the system level from treating the transmission frequencies involved with beamed energy (i.e., Ka band through optical) as variable, allowing them to be optimized for the needs of each mission.

The paper will show that the ability to orchestrate the TD3 investments to better leverage the planned exploration, science, and resource development investments can be transformative. Creating the opportunity for the international community to have a significant role both in terms of cooperation and collaboration is essential to the realization of these efforts. By articulating at least one viable path forward we intend to provide a framework for the collaborative activities needed to develop and deploy an effective and useful service.