

IAF SPACE POWER SYMPOSIUM (C3)
Interactive Presentations - IAF SPACE POWER SYMPOSIUM (IPB)

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SEEDS: A SALTWATER-BASED POWER GENERATOR FOR EUROPA'S SUBSURFACE
EXPLORATION

Abstract

In the roadmap of the solar system exploration, the high interest in ocean worlds such as Europa is growing. These celestial bodies have a hydrosphere on their subsurface which is potentially able to host an extra-terrestrial life. However, an exploration of these celestial bodies is a complex task, especially in terms of power. The solar exposition is low on the surface and non-existent below it, preventing from using a fully solar-based power generator. In this context, a study carried out within the framework of the 14th edition of the European master program SpacE Exploration and Development Systems (SEEDS) has been done regarding Europa surface and subsurface exploration.

Considering the willingness of avoiding radio-isotope thermoelectric generator (RTG) in future space missions, some innovative systems of power generators must be defined. This paper tackles the direct use

of the salty water of Europa's Ocean. Our solution is a hybridized system for the surface, composed of a salty water and a solar generator, and a system for the subsurface only powered by a saltwater based generator. The advantage of this salty water power generator that it is non-dangerous for life, thus limiting the contamination of Europa prior to human exploration, and is also compatible with hypothetical future manned missions. Even though this technology is recent, its evolution is rather fast thanks to the interest of the industry and will be soon mature enough to be considered in a space system. This study goes through the different aspects of this technology: its power generation capabilities, the way to implement it on a space exploration system and the safety aspect. From the preliminary study, our system shall succeed in providing up to 500W with 35V power buses, which is sufficient for our submarine. Hence, the salty water-based power generation is a sustainable system and could become a key element for the future of the solar space system exploration. In this respect, we have done a preliminary study on this key technology.