

SPACE POWER SYMPOSIUM (C3)
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Author: Mr. Lukas Hoffmann
Germany

Mr. Idriss Sisaïd
O'SOL, France

Mr. Enrique Garcia Bourne
O'SOL, France

O'MOON: POWER PRODUCTION AND STORAGE FOR A LUNAR MODULAR POWER
INFRASTRUCTURE

Abstract

While no manned missions have gone beyond Low Earth Orbit since the end of the Apollo Program, recent years have seen a renewed interest in manned exploration, and in permanent settlements in space. Companies and space agencies from around the world are now trying to reach the Moon again, with the aim of establishing a permanent presence. Notable examples include ESA's Moon Village proposal and the private teams competing in the Google Lunar X Prize. The O'Moon project aims facilitate this new drive towards a permanent presence on the Moon by designing a modular, autonomous and deployable solar generators to rapidly build a power infrastructure on the lunar surface. This paper studies some of the key design constraints faced by the generators. These include the key power requirements, but also the solar irradiance and the duration of the night period at different locations on the lunar surface, as well as radiation levels and the effects of the lunar dust. This study then discusses how these different constraints affect the design of the power system. This includes an analysis of different means of power production, including different types of photovoltaic cells, and how they are affected by the aforementioned constraints. Different power storage solutions are then analysed, and their behaviour under the conditions faced on the Moon is discussed. This paper offers recommendations on the most suitable power production and power storage technologies based on their efficiency, cost, weight and degradation over time. Ultimately, this paper aims to serve as a guide towards designing a power production and storage system such as proposed by O'Moon. As such, this paper provides information on several technologies, on the conditions faced on the Moon and proposes a possible solution. This paper is part of the O'Moon Youth Research Program, which led a series of studies centered on some of the key aspects of the project and including engineering, business, legal and organisational aspects of the project.