

15th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND
DEVELOPMENT (D3)Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and
Development (3)

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O'MOON: MECHANICAL AND THERMAL DESIGN OF A MODULAR DEPLOYABLE GENERATOR
TO BUILD A LUNAR 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 to design deployable, modular and autonomous generators which will be used to rapidly build an electrical infrastructure on the Moon. This infrastructure will then be used to support future missions, both robotic and crewed, and provide one of the pillars for future inhabited lunar bases. O'Moon used as a basis the design for a mobile deployable generator developed by O'Sol, a French startup company, for use on Earth. This paper aims to analyse O'Sol's design and transpose it from a terrestrial application to lunar application. This study included an analysis of the deployment system and its vulnerability to cold welding and lunar dust. This study also performed a thermal analysis of the generator and proposed a top-level design for a thermal control system able to ensure a thermal balance both during daytime and night-time. This included a discussion on the effects of thermal conduction through the lunar ground, and how this could be exploited by an active thermal control system. Finally, this paper discusses the expected lifetime of a generator as proposed by O'Moon on the lunar surface, and how this lifetime may be prolonged if the appropriate maintenance could be carried out either by robots or astronauts. Ultimately, this paper aims to assess the suitability of O'Sol's generator and its deployment system as part of the O'Moon concept. It highlights some of the key differences between the designs of a solar generator for terrestrial and lunar applications. It also provides some recommendations regarding the mechanical and thermal design, including potential countermeasures for constraints such as lunar dust. 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.