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IAF SPACE POWER SYMPOSIUM (C3)
Solar Power Satellite (1)

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SPACE-BASED SOLAR POWER PLANTS - OUTCOME OF A THOROUGH COST BENEFIT ANALYSIS IN THE LIGHT OF ACHIEVING THE NET-ZERO CO2 TARGET BY 2050

Abstract

ESA's Agenda 2025, published in April 2021, identifies the objective of pursuing technology breakthroughs and investigating space-based services to support climate neutrality in Europe. Specifically, it recalls that "Space-based services to support the energy transition, and potential space-based solar power generation deserve to be further investigated. ESA will strongly support market creation efforts for new applications in these areas." Several ESA Member States have published ambitious climate neutrality and energy sector transition goals. The European Commission announced the objective of climate neutrality by 2050. In light of recent developments in space transportation and technology, and taking into account several ongoing initiatives at the international level, ESA has made a thorough analysis and engaged with industry on a fresh look on the concept of Space-Based Solar Power i.e. acquiring solar energy directly in space and transmitting it to the terrestrial energy grid to provide clean sustainable energy. While the principle technical feasibility of space based solar power plants has already been confirmed, including by ESA studies conducted 15 years ago, the relatively high upfront implementation costs of SBSP has been one of the main factors against its development. The reduction in launch costs in recent years, and the falling costs of space hardware through mass production processes required the reassessment of the economics of SBSP. The study focussed on an up-to-date cost benefits analysis tailored to European specificities, comparing the use of SBSP to alternative sustainable energy pathways proposed to meet the 2050 carbon neutrality target.

This paper will present the outcome of these efforts, including parallel industrial studies providing a holistic assessment of the required investments, associated costs and risks and expected strategic, environmental, economic and societal benefits of adding this space-based power source to the European energy mix to meet Net Zero carbon target by 2050.