Paper ID: 90913
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IAF SPACE PROPULSION SYMPOSIUM (C4)
Joint Session on Nuclear Power and Propulsion Systems, and Propellantless Propulsion (10-C3.5)

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MARKET STUDY ON NUCLEAR ELECTRIC PROPULSION FOR SPACE APPLICATIONS

Abstract

Nuclear Electric Propulsion (NEP) offers groundbreaking capabilities for both exploration missions and in-space logistics. In the context of the New Moon race and the aspiration to establish a Mars colony, NEP holds potential application for space transportation, when other propulsion means can be inefficient. Compared to chemical propulsion, the main advantage of nuclear electric propulsion is its engine efficiency. Additionally, when compared to solar electric propulsion, NEP's ability to provide significantly more power enables the transportation of heavy cargo while remaining independent from the sunlight.

This paper proposes a market study to assess the potential applications of NEP. By comparing costs and the time efficiency with existing propulsion methods, our analysis aims to identify the demand and future opportunities for the NEP. The performed analysis serves as a basis for defining the design parameters for the future nuclear electric propulsion system. The paper analyses various use-cases (LEO-GEO transfer, lunar orbit), enabling the identification of gaps in existing technologies that nuclear electric propulsion can address. This analysis is performed as a part of ESA's RocketRoll project, or "pReliminary eurOpean reCKon on nuclEar elecTric pROpuLsion for space appLications".