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COMMERCIAL RPS – A NEW POWER GENERATION PARADIGM FOR MID-SIZE DEEP SPACE MISSIONS

Abstract

Missions to planets and other bodies in the solar system are extremely valuable scientific opportunities, despite all of the challenges these missions present to designers. One challenge that planetary science missions must face is that of Planetary Protection, the prevention of contamination between the Earth and the planetary body a craft is studying, undertaken to ensure an uncompromised scientific environment. Biological contamination has been a significant area of focus in Planetary Protection, but it is not the only type of compromising factor that a spacecraft from Earth might bring with it on its mission. Many exploration spacecraft have been or currently are powered by radioisotope power systems (RPS), which provide constant energy and thermal output throughout the solar system. Multiple governments and commercial companies are developing RPS technology for the first time, including the use of novel radioisotopes. Thermal and ionizing radiation from RPS aboard exploration spacecraft could impact future planetary protection considerations, which could pose a potential constraint on system design or mission plans. This paper analyzes existing planetary protection regimes for guidance or requirements relevant to the potential impact of radiation exposure from RPS operating on celestial bodies. The regimes studied include actual space agency regimes as well as relevant academic literature. This paper provides an initial analysis to understand the interaction between planetary protection policies and use of space RPS for deep space exploration.