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INNOVATIVE ENERGY SYNTHESIS ON MARS: FEASIBILITY AND BUSINESS PERSPECTIVES

Abstract

To address logistical and operational challenges of establishing a sustainable human presence on Mars, we require suitable and efficient energy generation systems. The development of such sources of energy requires advance planning and availability of financial resources and proper execution of a business plan. One such proposed method is utilising the abundant carbon resources of Mars by utilising solar-excited semiconductors to convert carbon dioxide into formic acid and carbon monoxide. Synthetic techniques are used to separate gases where they are further synthesised for generating energy and power fuel cells. The proposed system can be designed in such a way to develop “filling stations” for big rovers used for transportation throughout the Martian boundary. Development and design of such a network of gas stations would provide a ready-made available power source for rovers while travelling on Mars. To understand the efficiency of this technique, we present a conceptual research study showcasing the design and efficiency of these gas stations on Mars. We also present a business and economic model, marked by the comprehensive development phase encompassing research, construction of inaugural stations, and establishment of local semiconductor manufacturing capabilities for CO₂ conversion. Presenting a comprehensive analysis of using Martian resources for economic dependence of the system, we showcase utilising in-situ resources for the system and diminishing logistical reliance on Earth. Through meticulous planning and a robust economic model, this initiative aims to power the next phase of Martian exploration and settlement, illustrating a scalable and financially viable pathway towards a self-sufficient Martian future. This paper, written by a team next generation in our ambitions for the space industry, hopes that this paper is also used for educational purposes for others to gain experience in the form of a comprehensive mission design considering the latest technologies and goals for exploring Mars.