

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – missions current and future (3A)

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DIVERSIFYING MARTIAN ENERGY SOURCES: THE ROLE OF THE MARTIAN ENERGY DOME
IN SUSTAINABLE HUMAN PRESENCE**Abstract**

The establishment of a human presence on Mars necessitates the creation of robust and environmentally friendly energy systems. This paper proposes a Martian energy dome that will incorporate various energy production approaches, including solar, nuclear, geothermal, and photo-bioreactors, to meet the energy demands of human habitation. The dome will feature UV reflectors to protect the solar panels from the harsh Martian environment, while the photo-bioreactors will be positioned beneath the solar panels to optimize the temperature for algae growth and harness the CO₂ input from the atmosphere to generate energy. Additionally, the energy dome will incorporate nuclear and geothermal plants to diversify energy production. The energy generated will be used to power life-support systems, scientific equipment, and other critical infrastructure required for long-term human habitation on Mars. To ensure the safety and sustainability of the energy dome, this paper also considers the drawbacks of each energy production method. Finally, simulation software will be employed to test the dome's performance. While constructing such an energy dome and creating a safe environment for human habitation on Mars will present significant technological challenges, it could prove to be a crucial factor in establishing a sustainable human presence on the red planet.