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Wireless Power Transmission Technologies and Application (2)

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LEO SATELLITE SWARM FOR SUSTAINABLE UTILITY OF EXISTING GROUND-BASED SOLAR INFRASTRUCTURES: ENERGY, ECONOMICS AND MISSION DESIGN VALIDATION

Abstract

Our world is becoming a geological dystopia due to human intervention, which is circumvented to the bare minimum by the sustainable reforms adopted worldwide, including the promoted use of renewable energy sources. A significantly underestimated source is the Sun, even when providing 1 percent of its total radiated energy to the Earth, powers a large fraction of the energy needs of nations. Several nations have spearheaded efforts towards this over the years and established solar panel infrastructures, but still needs expansion and motivation to progress. Since the advent of space technology with the Space Race and culminating into the rise of risk-tolerant nanosatellite constellations to replace monolithic large satellites with capability to perform a plethora of operations with diverse applications, ranging from Earth Observation and Navigation to new applications such as space-based Power beaming. A strategic innovative cost-effective solution to execute the COP26 and Glasgow Summit Pact outcomes is the establishment of a network of COTS small satellites using AI, active thermal control, LASER and MASER to beam Solar Power harvested from space, to direct the energy to solar panels at night, thereby utilizing existing infrastructures to generate more renewable energy and decrease the carbon footprint of all participating nations significantly for remote power reception facilities located at regions with minimal access to ground-based electricity resources. This work utilizes a previously designed and validated small satellite configuration, has designed and validated the multi-altitude multi-inclination LEO Sun-synchronous Polar orbits and flower constellation for 5 year operation using GMAT and Taitus for optimum beaming with least distance, maximum hover time, maximum coverage area, minimized drag for maximum mission life, contact opportunities and in conjunction an assessment of energy economics of all nations and simulations have revealed a significant increase of power production with the passes and eclipse duration. Generated data provided projections of energy production, costings, financial projections, Project Gantt charts and business model for implementation, proving commercial viability with high ROI for low-cost to participating nations. The same constellation may also be upgraded for future projects for internet service provision to these rural and remote areas amongst the rest, revolutionizing space operations and exploration in terms of what mankind has imagined and defined it to be, advancing the vision of every global citizen with passion for the space domain, to be part of a spacefaring utopia unlimited by distance and time.