Paper ID: 81407
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IAF SYMPOSIUM ON INTEGRATED APPLICATIONS (B5)
Satellite Applications for Sustainability and Climate (3)

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LIFTING EXTREME MASSES TO SUPPORT SOLAR POWER SATELLITE ASSEMBLY AT GEO WITH SPACE ELEVATORS

Abstract

Reaching Sustainable Development Goal 7, Affordable and Clean Energy, is very difficult when considerations for global reach is included. Lack of resources and supporting distribution infrastructure leads to inequality and climate stressing. Space Solar Power satellites will provide "clean inexpensive" power with remarkable reach to anywhere north and south of the equator – equally. However, to implement this remarkable energy (clean and cheap) distribution requires huge satellites to GEO capturing the Sun's energy and transferring it to the Earth's surface. With this in mind, the enthusiasm – and resulting funded programs – focus on meeting future energy demands and Climate Change goals inexpensively and robustly with massive satellites at GEO. A Dual Space Access Strategy would leverage the ability to 1) early assemble 2,000 tonne (++?) prototype satellites in LEO [with advanced rockets], and 2) move massive operational satellite segments to GEO for assembly [with future space elevators]. The strengths of advanced rockets will enable near term prototyping of systems in LEO and MEO while refining design and assembly approaches. The strengths of space elevators will then move massive segments of huge satellites to GEO for assembly with the following strengths: 1) Raising cargo from the ocean's surface to GEO routinely with electricity from the Sun – efficiently and daily; 2) Delivering massive cargo to GEO with lifts of 14 tonnes per day per space elevator leading to 30,000 tonnes per year at initial operational capability [estimated 2038]; and, 3) Eliminates multiple rocket launches with damaging rocket fuel combustion artifacts with each lift-off leaving us with a Green Road to Space. When the reality of the number of Space Solar Power satellites, which are required to meet the Global Climate goals and future base energy demands, are summarized [somewhere in excess of 300 satellites x 2,000 tonnes] the challenge to lift them to GEO is gargantuan unless space elevators are incorporated as early as possible. This research explored the developmental approach for space elevators while analyzing customer demands. The analysis leads to a major conclusion: Space Elevators are mandatory if Space Solar Power satellites are to be accomplished within a reasonable timeline. In addition, by providing electricity to the surface of the Earth from space which is cheap, clean, and with global distribution, SDG 7 will be met along with many other SDGs positively impacted.