

Space-Based Solar Power: From the Realm of Science Fiction to Reality

O. M. Ramahi

University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1

Extended Abstract

For technology-dependent societies, where technology has become the solution to a host of problems, energy has become not only critical for growth, but more importantly, critical for survival. The cleanliness of renewable energy should not be the only driving force behind the interest in these new clean energy alternatives. Our survival and adaptation techniques have, for better or worse, become highly technology dependent that not only clean but more energy sources would be needed. Also, in light of the effect of energy sources on political conflicts, these sources need to be reliable, independent and immune from geo-political intrigues. This aspect precisely exhibits the strategic significance of developing technology to access practically infinite supply of clean energy.

Solar-based solar power (SBSP), a concept of collecting power from space on a satellite via photo-voltaic solar cells and then transporting or beaming the power to earth using microwaves was proposed in the 1940s within the realm of futuristic science fiction. Up until the 1990s, several technology pundits and scientists deemed the feasibility of SBSP very unlikely. However, early assessments were based on present (then) and future technology projections. All those assessments,

or most of them, have been revised at the beginning of the 20th century to the point that countries such as India and Japan started aggressive exploration of SBSP. In fact, Japan and China have put into action plans to have prototype space-based

power plants operational within a decade. Most recently, the USA has significantly accelerated its SBSP technology development by conducting preliminary tests in 2021. Clearly, despite the projected high cost of installing a space-based power plant, the lure of free supply of energy is overwhelming, both strategically and economically.

In this talk, I will provide an assessment of the feasibility of SBSP and the transformation of the concept from the realm of science fiction to the prototype stage. I will also discuss some technology aspects that could have accelerated the enthusiasm for SBSP and, more importantly, its feasibility