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POTENTIAL CONTRIBUTION OF SPACE SOLAR POWER TO NATIONAL SECURITY – A CRITICAL ANALYSIS

Abstract

Energy resiliency is a measure of the diversity, flexibility, redundancy, and sustainability built into energy systems. The United States currently has limited energy resiliency due to its systemic dependence on nonrenewable fossil fuels such as oil, natural gas, and coal, a dependence compounded by a heavy reliance on imported energy sources. This creates vulnerabilities in the U.S.'s ability to maintain a viable domestic and international defense posture. The U.S. can improve energy resiliency and national security by diversifying its energy portfolio and increasing sources of sustainable, renewable energy. One highly renewable, sustainable resource is space-based solar power.

Studies over the past 30 years conclude that significant cost and engineering challenges prevent large-scale space-based solar power development efforts. However, recent improvements in solar cell efficiency, wireless power transmission technologies, and Earth-to-orbit launch capabilities are driving the U.S. and other countries to revisit space-based solar power as a viable option. Commercially, space-based solar power is gaining momentum. Two U.S. commercial power companies are developing this technology, one of which has patented its solar collection system and begun development.

The authors will provide an overview of current designs of space-based solar power systems, particularly including collection and beamed power receiving technologies. The authors will then critically analyze these technologies and related applications for their potential to improve national security through increased defense energy resiliency. The analysis will include a preliminary evaluation of the feasibility of space-based solar power against the major categories of energy-dependent defense functions.