AFRL

SPACE POWER BEAMING

Space Solar Power Incremental Demonstrations and Research Project (SSPIDR)

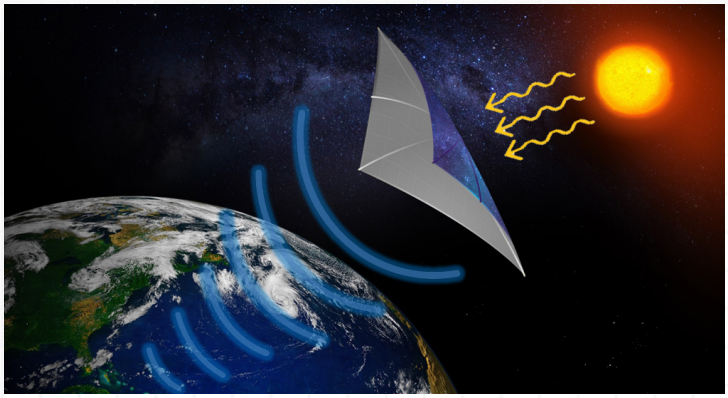
What is it?

SSPIDR is a series of Integrated Demonstrations and Technology Maturation efforts at the Air Force Research Laboratory (AFRL) Space Vehicles Directorate to address space-based power collection and transmission capabilities.

Space solar power beaming is not a new concept; yet until recently, the technology did not have a clear path forward. In conjunction with primary industry partner Northrop Grumman, AFRL established the SSPIDR project to mature technology critical to building an operational solar power transmission system for providing reliable and logistically agile power to expeditionary forces.

How Does It Work?

SSPIDR is a collection of flight experiments designed to mature different critical technologies needed to build an operational solar power beaming system in space. With the end goal in mind, the SSPIDR project team examined the needs of the operational prototype and identified five critical technologies needing further development to make this system a reality. The technologies driving the effort are Deployable Structures, Energy Generation, Thermal, Radio Frequency (RF) Beaming, and Metrology.



The image depicts AFRL's Space Solar Power Incremental and Demonstrations Research Project beaming solar power from space to earth. SSPIDR consists of several small-scale flight experiments that will mature technology needed to build a prototype solar power distribution system. (Image by AFRL)

Scientists and engineers will explore these areas in three planned experiments that feature scalable aspects of the required technologies. Additionally, SSPIDR pursues parallel technology paths – advancing multiple experimental possibilities to find the most innovative technological solution for further maturation efforts. These advancements will feed into the development of the large scale system.

The large-scale system will collect solar energy using high-efficiency solar photovoltaic cells. Northrop Grumman is developing the "sandwich tile" which will convert solar energy to RF and beam it to a receiving station on earth. At this point, the receiving antenna, called a rectifying antenna or "rectenna" will convert the RF into usable power for the end user. AFRL is not developing the final system, but instead is collaborating with Northrop Grumman and the Naval Research Laboratory in researching, maturing, and demonstrating the technologies required to build the objective system.

Why Is It Important?

AFRL's main mission is to develop and mature technologies to benefit the warfighter. Ensuring that a forward operating base receives power is one of the most dangerous parts of a ground operation. Convoys and supply lines, which are major targets for adversaries, are the usual methods to supply power. To utilize the solar power beaming system, a service member would simply set up a rectenna to gain access to power, eliminating costly and dangerous convoys. Essentially, AFRL is enabling the relocation of those supply lines to space, which could save countless lives.

A high possibility exists that this technology could be a highly valued asset in the commercial sector as well. Much like the Global Positioning System (GPS), which started out as a military asset and transitioned to a technology now used by people everywhere, this solar power beaming system could transition to broader usage, providing solar energy regardless of weather, time of day, or latitude.