AMERICAN FOREIGN POLICY COUNCIL

US can’t afford to dawdle on investing in space-based solar power

January 26, 2023 **Richard M. Harrison** *The Hill*

Related Categories: SPACE; China

Is a limitless source of green energy within reach? With unrelenting global reliance on fossil fuels, a worsening climate, and growing dependency on (often-unreliable) renewables, the world desperately needs a solution.

Scientists in the U.S. appeared to come close to one with a recent breakthrough in fusion technology. Unfortunately, while a positive technological advancement, several decades of development are still necessary before fusion becomes a commercially viable energy alternative. Yet there may be another way to alleviate our energy dilemma — and soon. The answer lies in space-based solar power (SSP).

The premise is simple. Traditional terrestrial solar power is a suboptimal source of energy because it is inhibited by the Earth’s atmosphere and unavailable at nighttime. By contrast, by placing large solar energy collecting satellites in space and transmitting energy via microwave beams down to rectifying antennas on Earth, it would be possible to obtain power 24 hours a day, 7 days a week.

This may sound like science fiction, but the idea has been around for decades. SSP as a concept was first formally proposed way back in 1968. Fast forward more than half-a-century, and today most of the technology needed to accomplish this esoteric feat is readily available.

Domestically, the U.S. military is at the forefront of pioneering SSP component technology and developing a proof of concept. In April of 2022, the Naval Research Laboratory (NRL) conducted a successful terrestrial microwave power beaming test to demonstrate the feasibility of electrical energy transmission. The following month, the NRL launched the Photovoltaic Radio-frequency Antenna Module (PRAM) to test capturing sunlight and converting it to microwaves on board the secretive X-37B orbital space plane. Meanwhile, the Air Force Research Laboratory is investing in the Space Solar Power Incremental Demonstrations and Research Project (SSPIDR), which will culminate in a demonstration of solar energy collection in space, conversion to microwave energy, and power beaming down to Earth in 2025.

The economic potential is enormous. A constellation of commercial SSP satellites could produce cost-competitive clean energy, serve as a complement to renewable sources, and help phase out fossil fuel use. All of which would lead to strengthened U.S. economic security.

American national security would benefit greatly as well. With satellites able to collect energy and beam it to anywhere on the globe, the U.S. military would be able to provide energy to forward operating bases and conflict zones without worrying about adversaries cutting off vulnerable energy supply lines. SSP could similarly power America’s drones to carry out persistent surveillance, since costly and time-consuming refueling would be rendered unnecessary.

Some in the private sector have begun to recognize SSP’s potential. For instance, a decade after it received a generous donation to support SSP initiatives, CalTech just launched a Space Solar Power Demonstrator (SSPD) to evaluate multiple energy collection and transfer technologies. At least three U.S. startups are developing the tech as well, and one U.S. design is also being considered as a model for development by the European Space Agency (ESA).

But that interest isn’t matched in the U.S. government — at least not yet.

While the U.S. military is investing in SSP, and the private sector is now beginning to experiment with the concept, there is — as yet — no concerted government-led effort to develop a commercially viable SSP architecture.

Why the failure to launch? Historically, the concept of SSP has not been without its detractors, due to a variety of flaws, from photovoltaic inefficiency to prohibitive launch costs. But times have changed, and dramatic improvements in technology have yielded new possibilities. In just one example, the advent of reusable rockets has reduced launch costs by roughly 95 percent over the last two decades — and more savings are on the horizon, with SpaceX’s reusable Starship waiting in the wings. Moreover, the feasibility of SSP is now on solid ground, with more and more policy institutes and foreign governmental entities advocating for SSP deployment.

The most prohibitive cost, however, might be in not acting on the promise of SSP.

America’s allies and adversaries are all forging ahead with plans to have SSP power their electric grids. The European Space Agency has developed an activity plan for 2025; Japan has plans for an SSP demonstration in 2025, and the UK has set up a Space Energy Initiative (SEI). But the biggest worry is China, which is currently the leader in the SSP space sector. Beijing has already constructed a massive power receiving station, is planning SSP experiments on their new Tiangong space station, has laid the groundwork for a high voltage space-to-ground test in 2028, and has laid out plans for an SSP operational capacity equivalent to a nuclear power plant by 2050.

Recent years have given the world a glimpse at the true face of Xi Jinping’s China, with its gross human rights abuses, flouting of global norms, and growing international belligerence. If the PRC manages to become the world’s leading supplier of cheap, clean energy as well, the consequences would be massive — and the power Beijing would gain over global commerce and diplomacy would expand exponentially.

To avoid such a dystopian future, the U.S. government needs to start investing in space-based solar power now. And in the process, we can help address the climate issue, as well as bolster both U.S. economic and national security.

There’s not a moment to waste.

Richard M. Harrison is the vice president of operations and director of defense technology programs at the American Foreign Policy Council in Washington, D.C. He also co-directs the Council’s Space Policy Initiative and is co-author of the forthcoming book “The Next Space Race: A Blueprint for American Primacy” (Praeger, March 2023).
