

Space Solar Power

Space Frontier Foundation

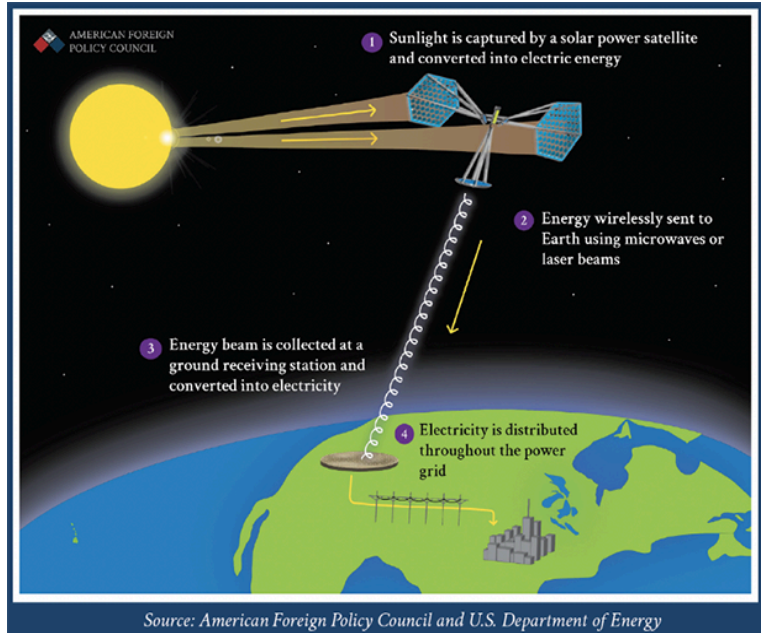
What is Space Solar Power?

Space Solar Power (SSP) collects solar energy in orbit and transmits it wirelessly to Earth using proven microwave or laser techniques. Because satellites receive near-constant sunlight, Space Solar Power delivers 24/7 uninterrupted, zero-carbon, dispatchable power independent of weather, seasons, or geography.

For energy professionals, Space Solar Power is best understood as:

- Firm clean generation with a >95% capacity factor
- A grid-level resource, not a niche technology
- A complement to terrestrial renewables, not a replacement

Space Solar Power directly solves the problems your audience deals with daily: intermittency, grid integration, transmission bottlenecks, and the rising cost and limits of long-duration storage.



Compelling Applications

Space Solar Power unlocks applications that terrestrial systems struggle to serve:

Baseload & Utility Applications	Near-Term, High-Value Demand	Core Value to Energy Industry
24/7 firm renewable power without storage	Data centers requiring firm, clean power	Firmness: Always-on clean power, day and night
Grid stabilization and frequency support	Disaster response and grid-down resilience	Flexibility: Dispatchable where and when needed
Power delivery without new transmission corridors	Shoulder load and peak-shaving without batteries	Operability: Predictable output for real grid planning
Decarbonization of hard-to-serve regions	Remote, islanded, and infrastructure-constrained regions	Resilience: Works during disasters and grid failures

Key Economic Insights

- NASA's 2024 analysis suggests SSP could match and surpass terrestrial intermittent renewables on LCOE alone, at the range of USD \$30/MWh to \$80/MWh by 2050 under reasonable assumptions.

- Similarly, recent European and UK studies estimate SSP's Levelized Cost of Electricity (LCOE) could reach €88–156/MWh by 2050, comparable to coal, gas, and nuclear, and competitive with dispatchable renewables.

Key Recent Demonstrations

<p>DARPA beamed over 800 W of power of laser wavelength across 8.6 km for 30 seconds in 2025, setting new distance and duration world records for terrestrial wireless power transmission (WPT). The U.S. Air Force Research Laboratory will launch end-to-end in-orbit demos to beam microwave to ground in 2025/26</p>	<p>Japan will test beaming 1 kW of solar energy from a satellite in low Earth orbit down to Earth via microwaves in 2026. China Academy of Space Technology is advancing large-scale WPT and planning orbital tests in 2028. First mega-watt scale SSP plants are targeted in 2030.</p>
<p>Caltech's 2023 SSPD-1 mission tested lightweight structures, solar cells, and microwave transmitters in orbit, successfully beaming power wirelessly in space.</p>	<p>Several US and UK startups, backed by >\$100 M including Breakthrough Energy, aim for in-orbit solar power demos by 2028. High-efficiency space-grade solar panels and reusable heavy rockets are now emerging.</p>

Takeaway for Global Leaders

Space solar power is here. Now's the time for global energy and climate leaders to invest and lead. Early movers exploring the technology, partnering with SSP innovators and international governments will shape the country's energy's future and gain a decisive lasting edge.

About the Space Frontier Foundation

The [Space Frontier Foundation](#) is a US-based 501c3 non-profit dedicated to opening the space frontier to the benefit of humanity through the power of free enterprise. We exist to bring the benefits of space to Earth. The energy industry stands to leverage space to address critical energy challenges in production and distribution. Outside of the space industry, Space Solar Power is undervalued as a potential solution. The Space Frontier Foundation is listening, connecting, and translating the value of Space Solar Power to accelerate market arrival.

Bold Statements for Follow-up Discussion

- Space Solar Power has advanced towards deployment readiness
- Space Solar Power can compete on cost with firm renewables — without storage
- Your mental model of space is stuck in the last century. Update the prior beliefs to capture the benefits!

Stay informed with our Newsletter ([energyfrom.space](#)), Reach out to us (Email Below) and Partner with us to showcase Space Solar Power and shape the future of energy!

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