

TO BUILD A CONSERVATIVE SOLAR ENERGY SYSTEM FOR RESILIENT POWER SYSTEM IN SPACE

SPACE SOLAR POWER SYSTEM
(ACCELERATING A RENEWABLE FUTURE)

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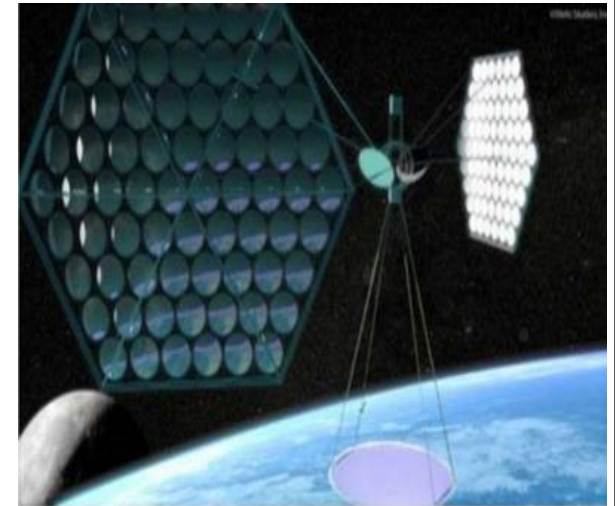
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What is Space based Solar Power??

Space based solar power is a concept of collecting solar power in space using solar power satellite or a satellite power system for use on earth.

Why it is needed??

- ✓ Lack of fuel/resources availability on earth. Increasing demand of fuel for various purposes
- ✓ Increasing prices of the fuel available on earth
- ✓ Usage of the current available fuels leads to various pollutions
- ✓ Reduce the time spent in extracting the energy from natural resources
- ✓ Preserve the nature/environment by not destructing them for extracting energy



Literature Survey

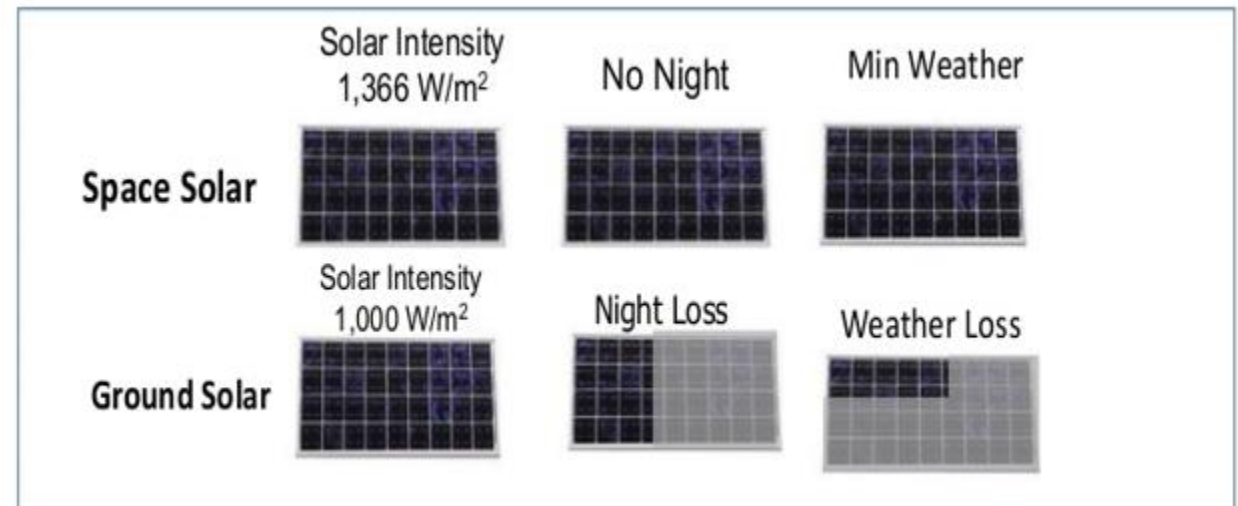
Year	Reference	Author	Publication	Inference
2015	A Study on Space-based Solar Power System	Anveshi Atul	IOSR Journal of Environmental Science, Toxicology and Food Technology	<ul style="list-style-type: none">• An area of 4sq. Kilometer consisting of rows of solar panels would generate 1GW of power.• Solar concentrators, solar cells or heat engine are the best choice for collecting solar power in space.
2012	Space Based Solar Power (SBSP): An emerging technology	Rugved Bidkar	IEEE Xplore	<ul style="list-style-type: none">• Geosynchronous satellites are used for collecting sunlight, harnessing it to produce solar power and transmitting the generated power back to Earth using Wireless power transmission (WPT), safely and reliably.

Analysis on future available energy options

Source	Clean	Safe	Reliable	Base-load
Fossil Fuel	No	Yes	Decades remaining	Yes
Nuclear	No	Yes	Fuel Limited	Yes
Wind Power	Yes	Yes	Intermittent	No
Ground Solar	Yes	Yes	Intermittent	No
Hydro	Yes	Yes	Drought; Complex Scheduling	
Bio-fuels	Yes	Yes	Limited Qty – Competes w/Food	
Space Solar	Yes	Yes	Yes	Yes

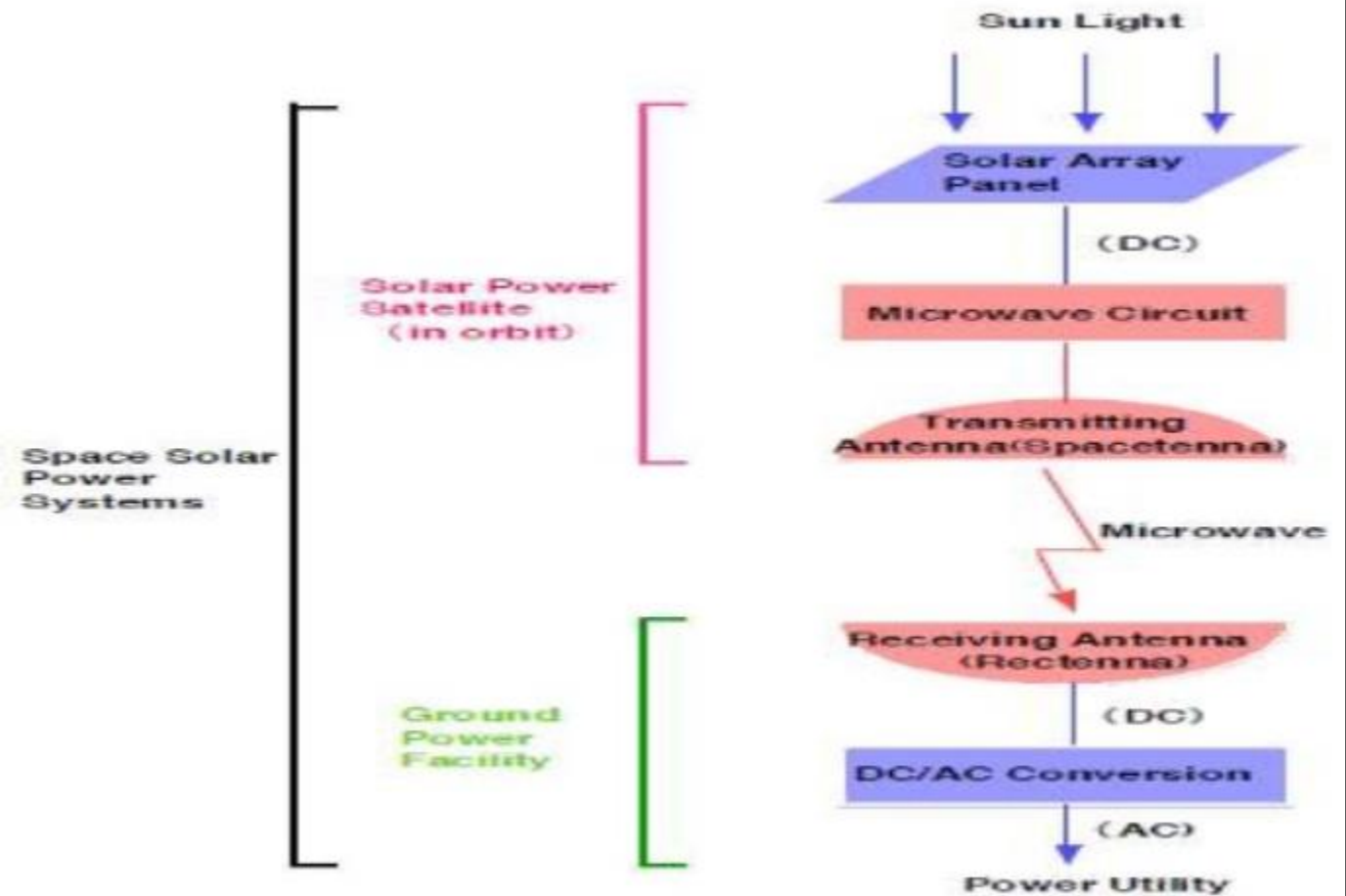
How it would differ??

- ✓ SBSP would differ from current solar collection methods in that the means used to collect energy would reside on an orbiting satellite instead of Earth's surface
- ✓ Higher collection rate and a longer collection period due to the lack of a diffusing atmosphere and night time in space

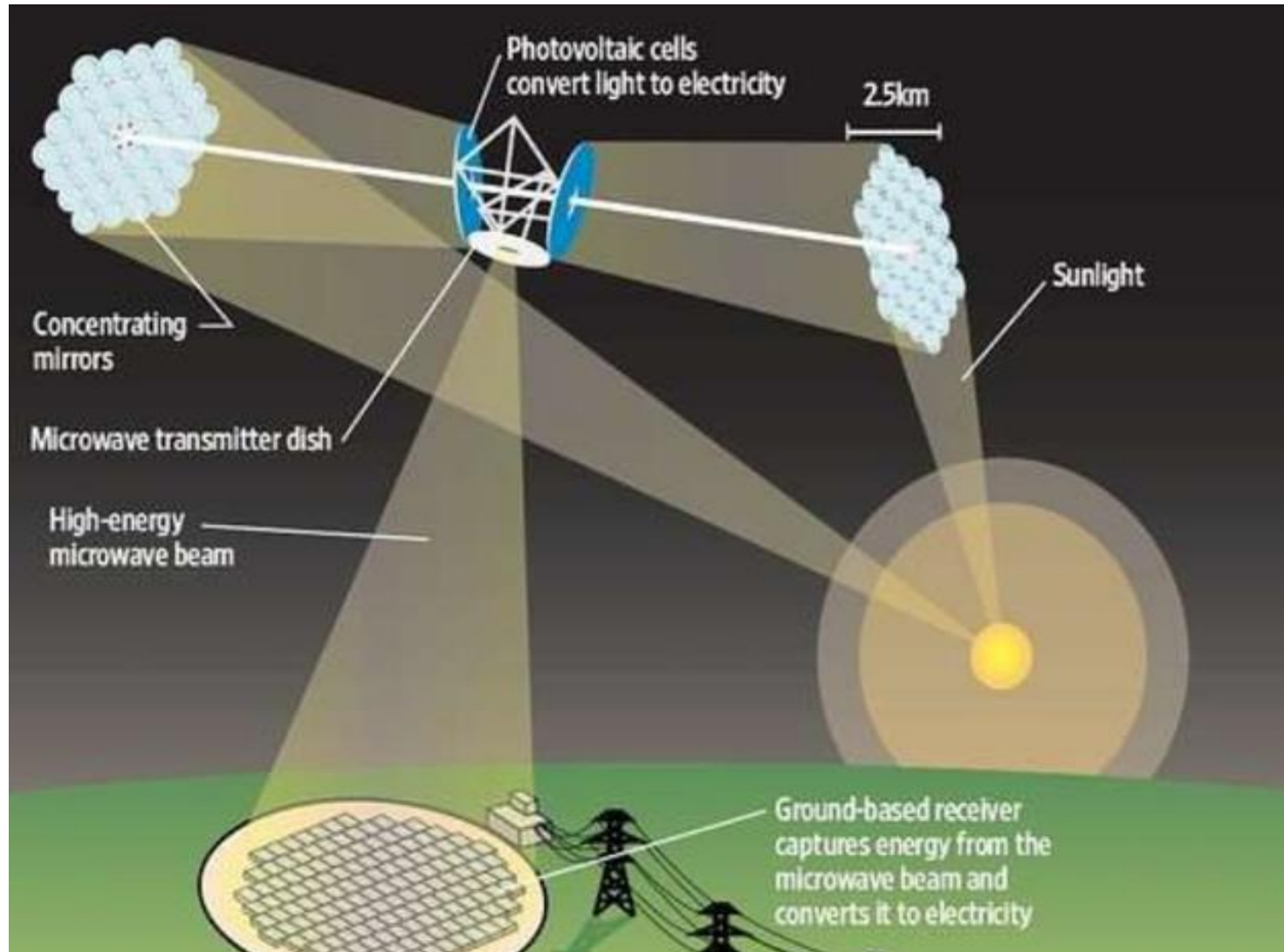


Design

- ✓ Collecting solar energy in space with reflectors or inflatable mirrors onto solar cells
- ✓ Wireless power transmission to Earth via microwave or laser
- ✓ Receiving power on Earth via a rectenna, a microwave antenna

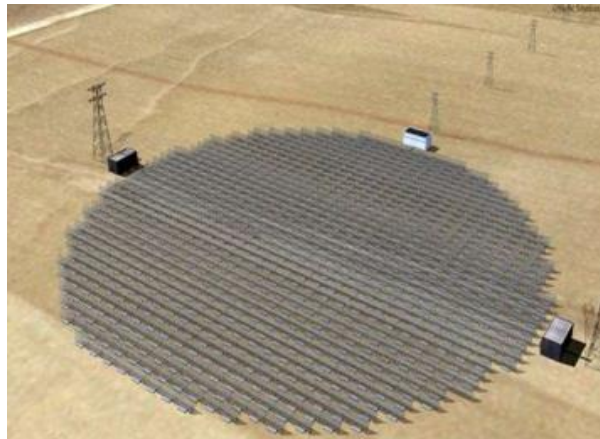


Architecture



Microwave Power Transmission

- ✓ Power Transmission via radio waves can be made more directional, allowing longer distance power beaming with shorter wavelengths of electromagnetic radiation, typically in the microwave range
- ✓ A rectanna may be used to convert the microwave energy back into the electricity.
- ✓ NASA study shows that 1-KM diameter transmitting antenna and a 10KM diameter receiving rectanna is required for a microwave beam of 2.45GHz



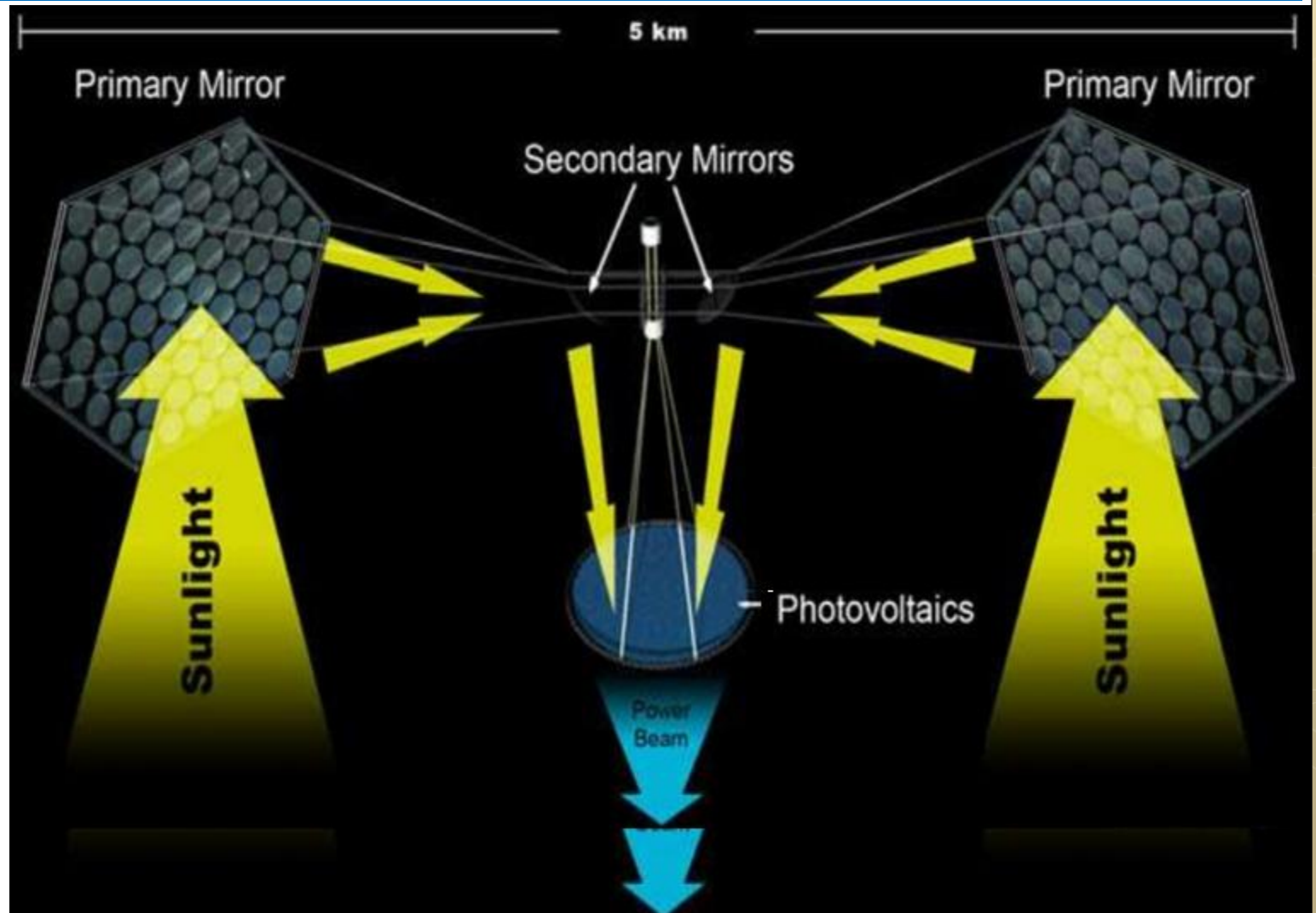
Rectanna

Laser Power Beaming

Convert electricity into laser beam in space using laser converters and then point on the photovoltaic cell on the earth

Features

- ✓ Transmits over long distance
- ✓ Compact size – solid state lasers fits in small space
- ✓ NO radio frequency interference



Pros & Cons



Advantage

- ✓ No emission of greenhouse gases
- ✓ No dependency on resource available on earth
- ✓ No hazardous waste
- ✓ Produces energy 24x7
- ✓ Flexibility in converting the energy as per local needs
- ✓ Increases the scope of aerospace research



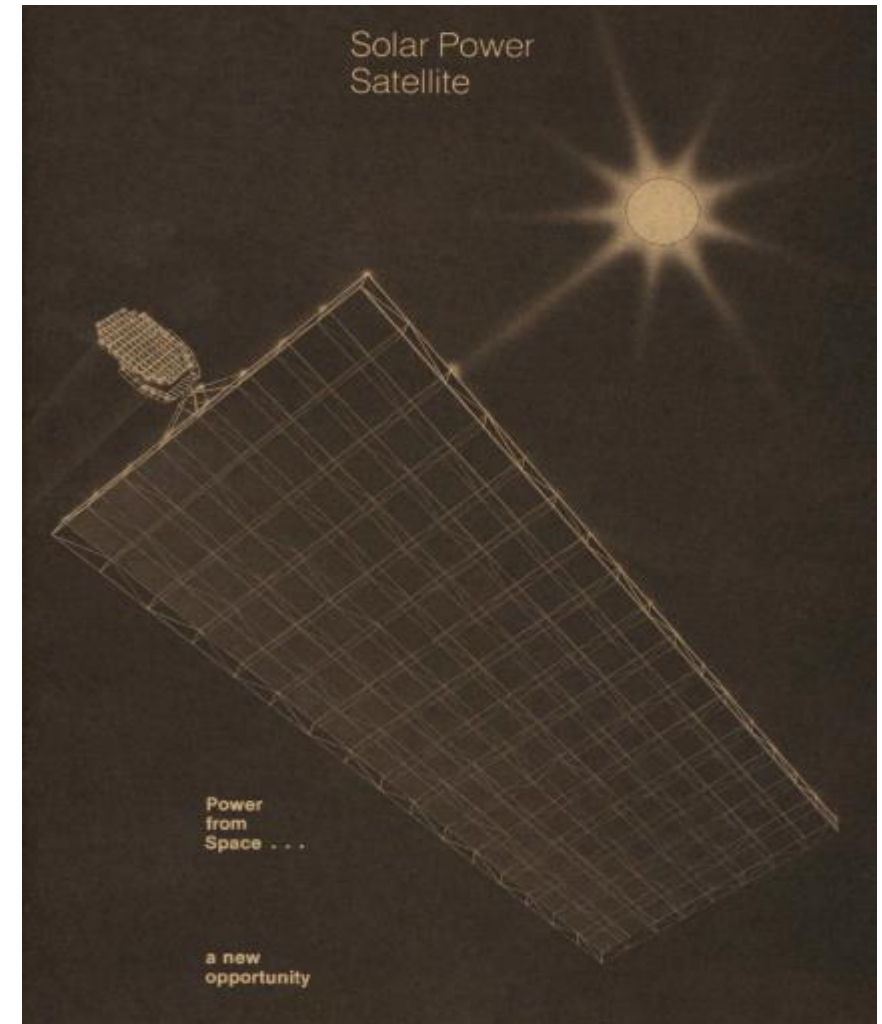
Disadvantage

- ✓ High development cost
- ✓ Demonstration of space to earth power beaming

Conclusion

- ✓ The solar energy available in space is literally billions of times greater than we use today. Space solar power is the largest potential energy source available
- ✓ This technology when combined with the higher efficiency wireless power transmission can supply all the electrical needs of our planet

**Power from space.....
A new Opportunity!!!**





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Objective: Space Satellites
enabling solar power on earth
requirements



Any Questions ?



Thanks