Space Solar Power (SSP) from Spacecraft and Stratospheric Platforms Systems (SPS)

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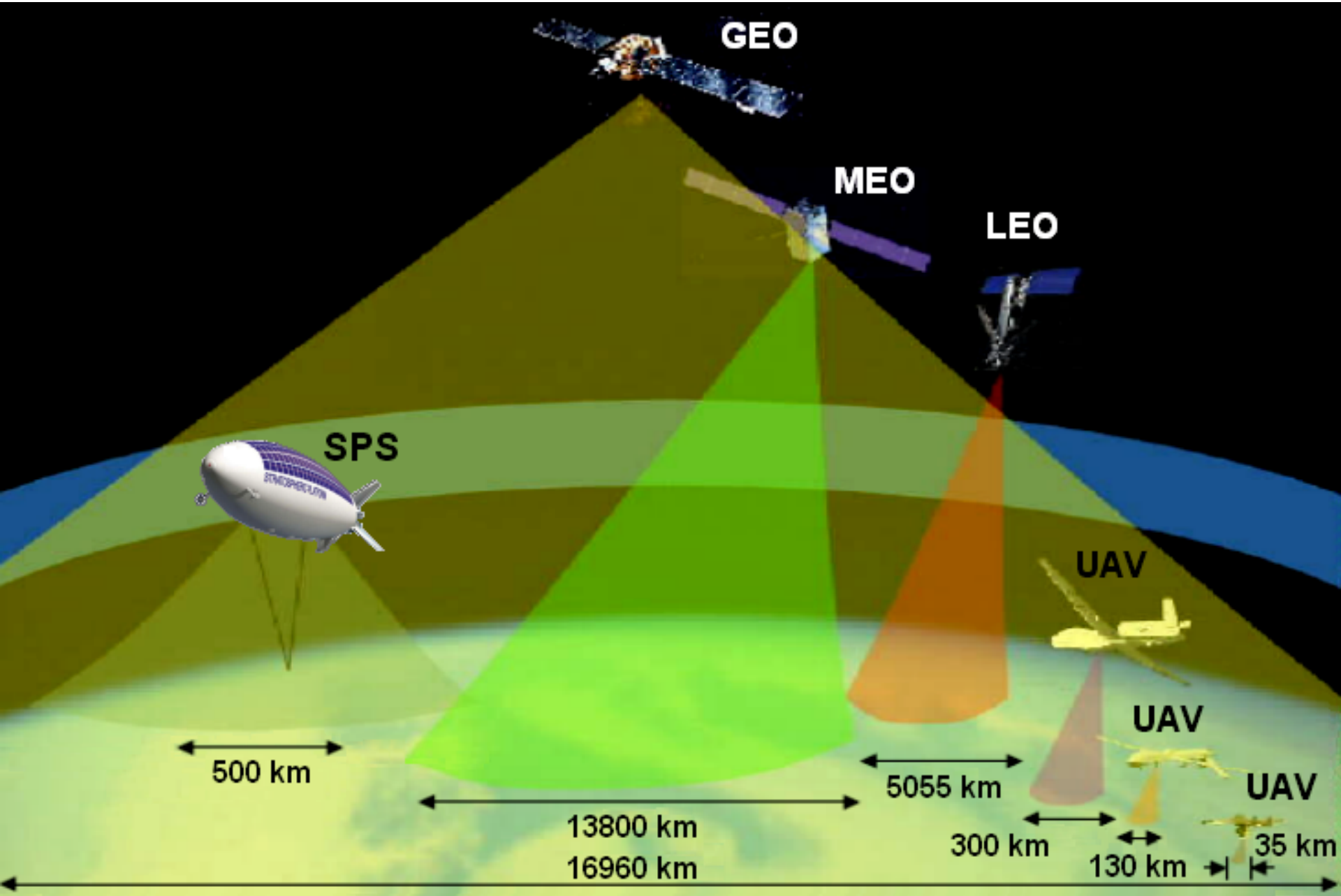
Space Satellites and Platforms



Advantages of Space Solar Power (SSP)

There are a number of key advantages that make Space Solar Power (SSP) more an attractive alternative than Ground Solar Power (GSP):

a) There is more energy to be collected, because the Sun is 8-10 times more intense in orbit than on the surface of the Earth;

b) The SSP systems can collect energy almost around the clock, while GSP systems suffer from many weather phenomena such as clouds, precipitation, dust and so on. Namely, SSP system do not (though the increasing amount of junk in orbit poses a similar hazard);

c) Real estate costs are minimal, the only land that need be acquired is the land for the receiving station; and

d) Transmission line costs are reduced compared to the remote generation facilities if the ground station is located near existing transmission lines.

Challenges of Space Solar Power (SSP)

There are 2 primary challenges to making space based solar a reality:

1. It will be not so difficult for converting solar energy into radio frequencies, but in getting a solar array into space and successfully commissioning it from the Earth.

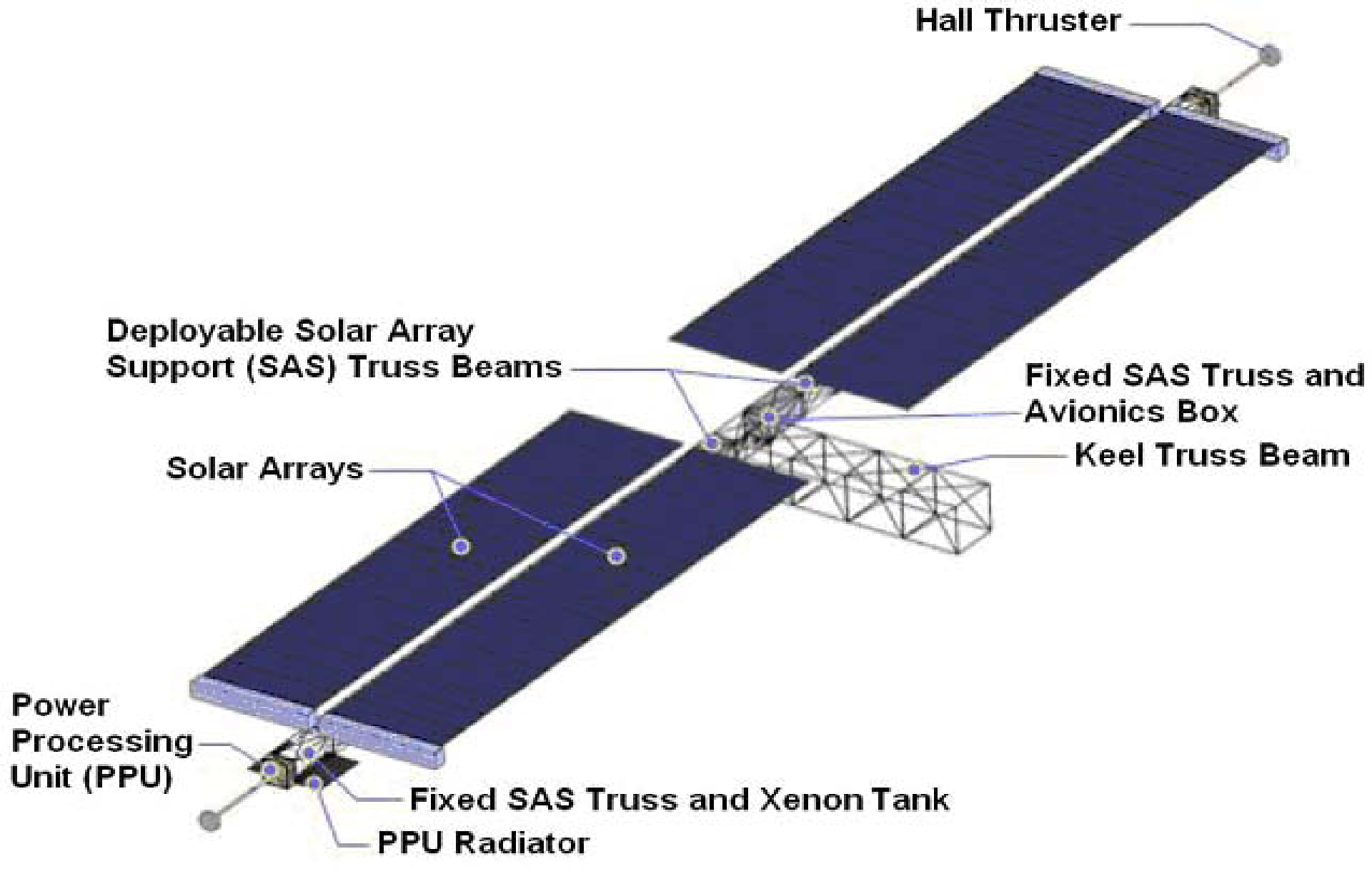
2. May the cost involved in building a solar power plant in space ever be competitive with GSP?

Some of SSP solutions, such as Huge Mirror SSP in GEO Satellite orbit or Lunar Solar Rings over Moon Equator, are huge and very expensive projects. It's going to take a lot of solar panels to power the world, and launching all of those up into space will not be cheap.

In this presentation are introduced and depicted many great designs and projects done by the US, Japan and many other western countries.

SSP via Geostationary Earth Orbit (GEO) Satellites

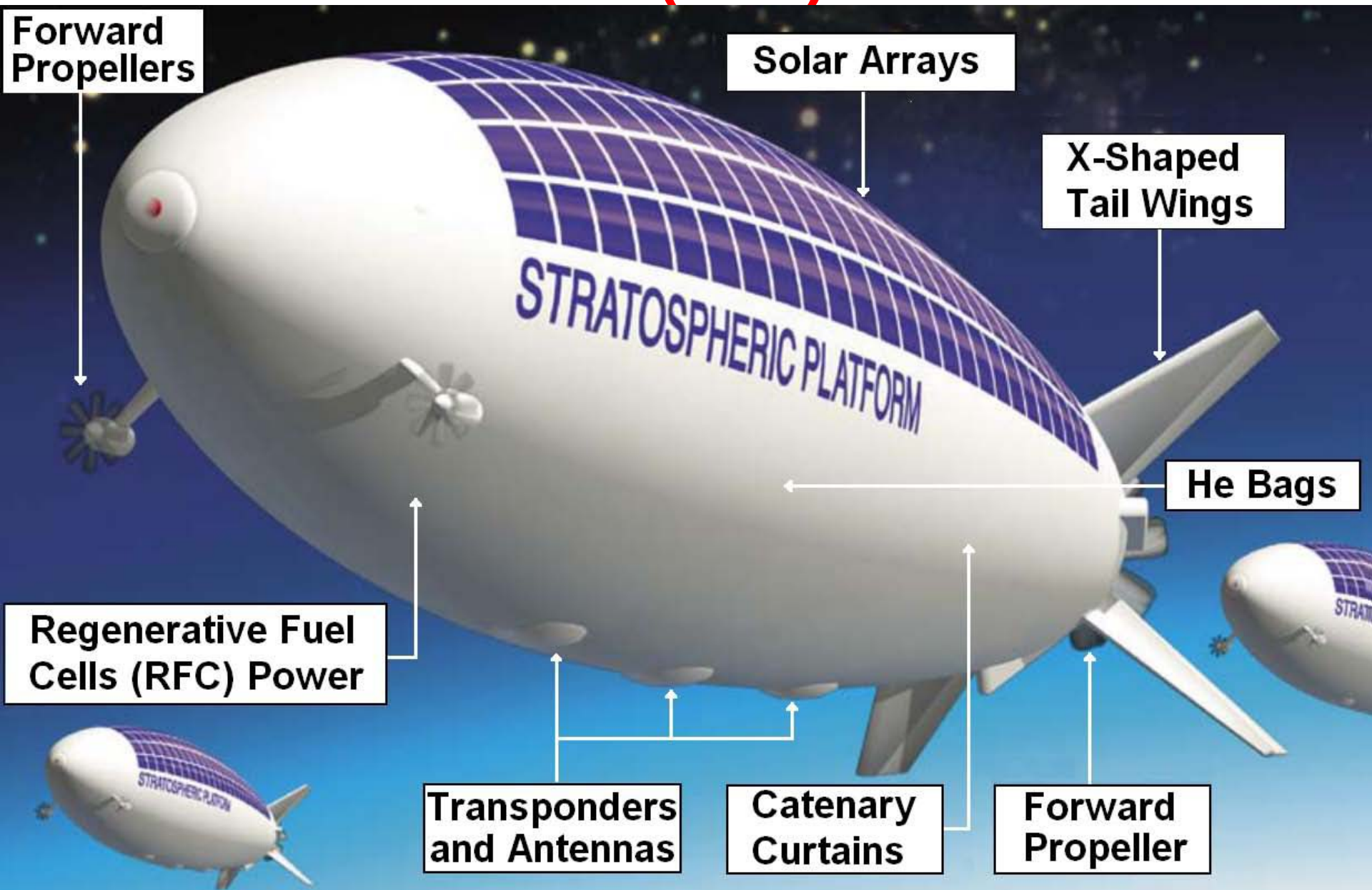
Design of SSP GEO Subsystems Capable of Producing 50 to 2000 MW Electrical Power



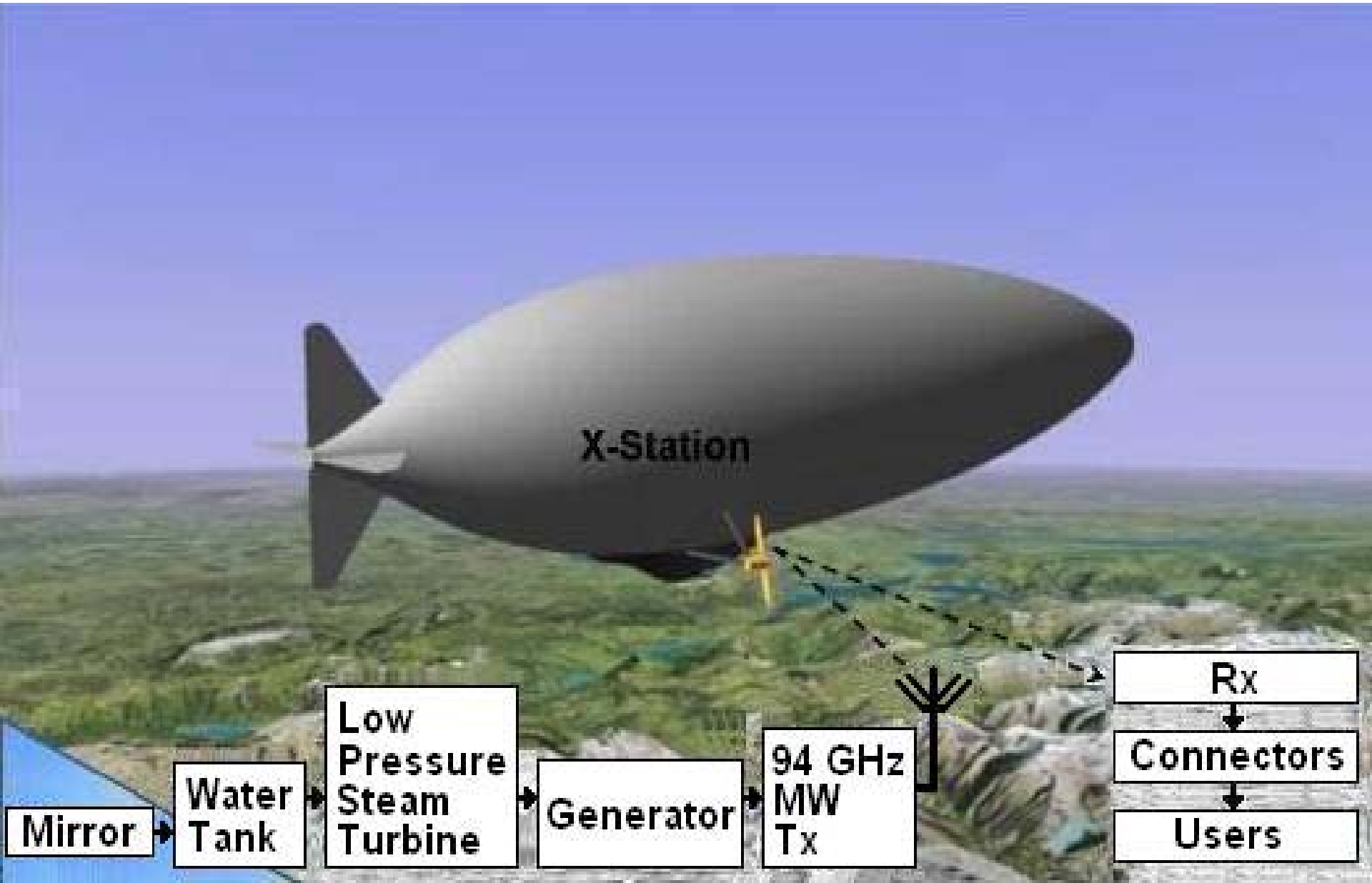
Energy Distribution via Stratospheric Platform Systems (SPS)

On altitudes with ample sunlight, the sunbeam will be concentrated by the use of mirrors to produce high temperature steam. The high temperature steam will then be passed through a low pressure steam turbine to create electricity. Electricity will be converted into MW (microwaves) at 94 GHz and subsequently transmitted to an SPS or High Altitude Platform (HAP) located at an altitude of 20 km. The MW radiation will be received by large rectenna antennas on the SPS station. A repeater will then transmit MW to locations on the ground without the need for cables with an efficiency of over 95%. The microwave emissions is collected on a ground rectenna and then fed into the power grid to provide electricity.

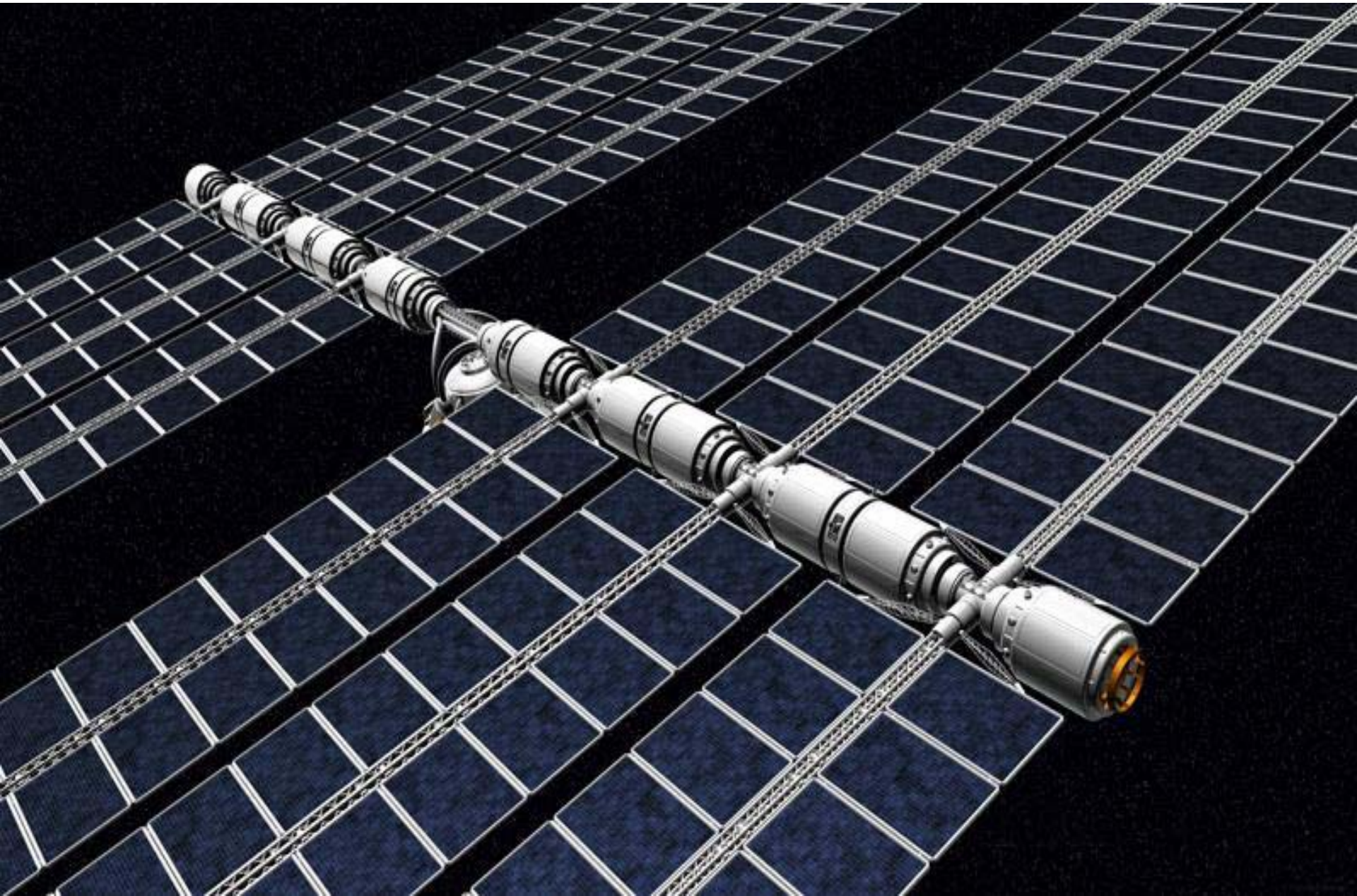
SPS for Communication, Navigation and Surveillance (CNS) and SSP



SPS Infrastructure for SSP



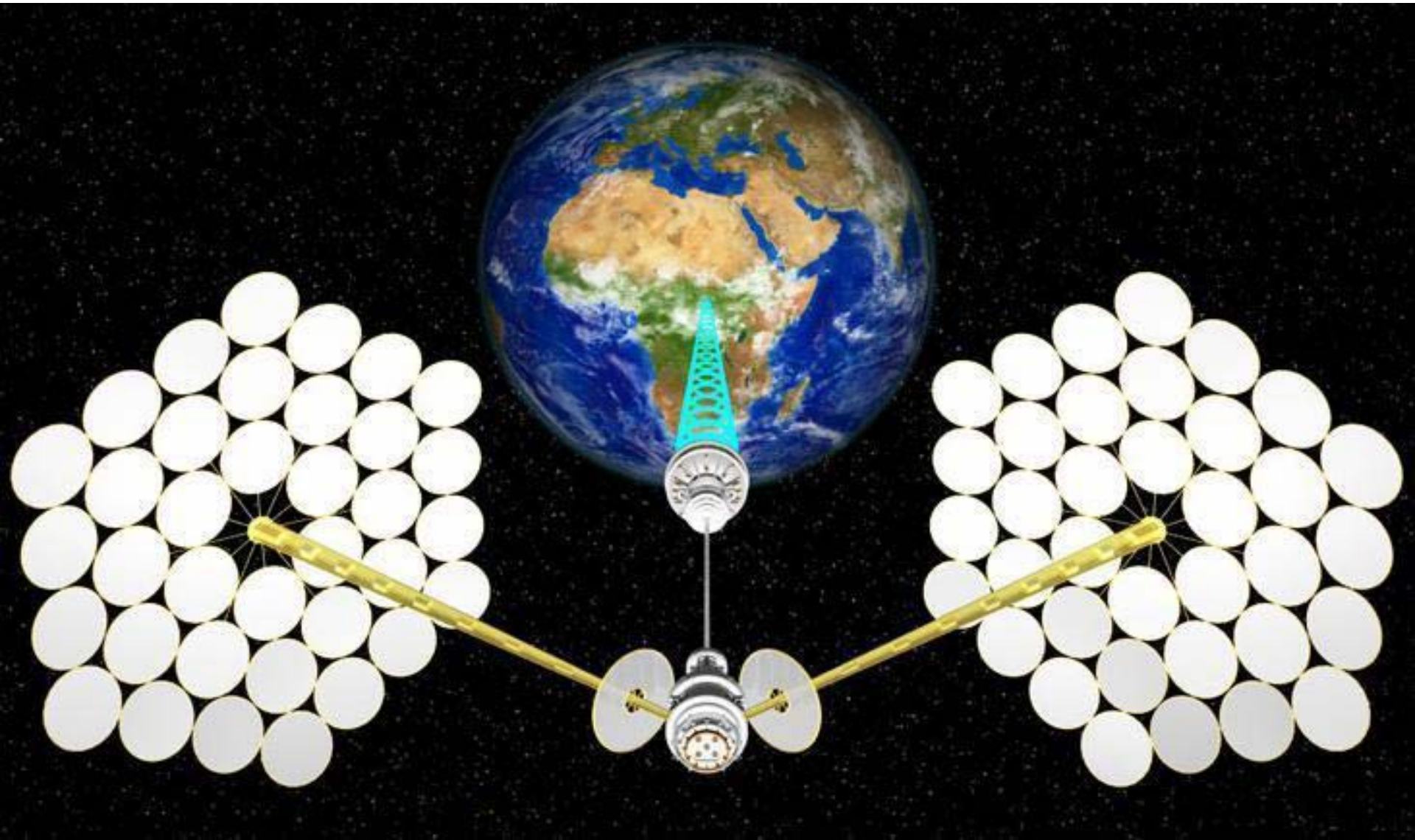
Solar Cells aboard GEO Satellite



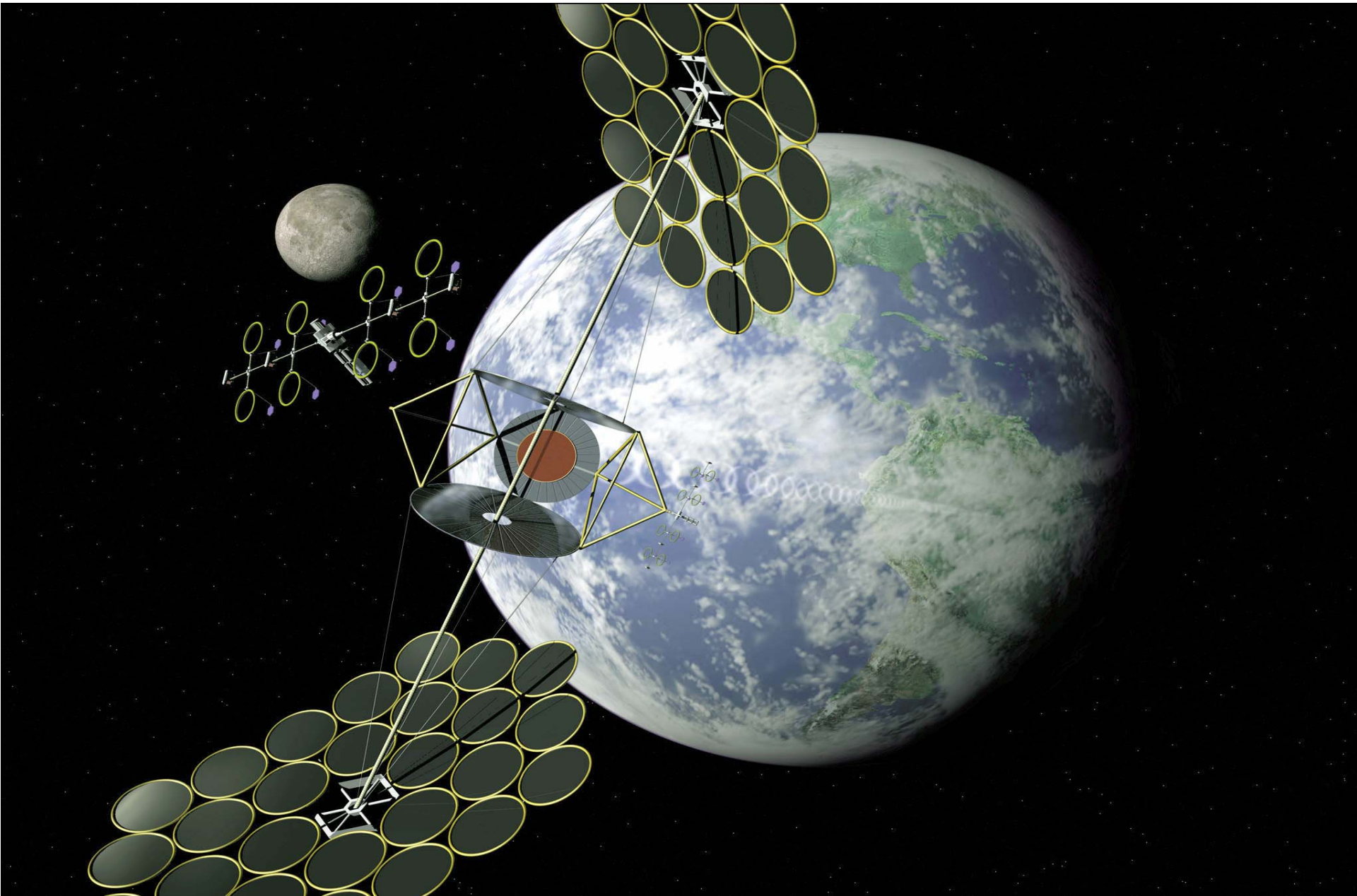
GEO Satellite Single Beam Energy to the Earth

GEO Satellite Multi Beams Energy to the Earth

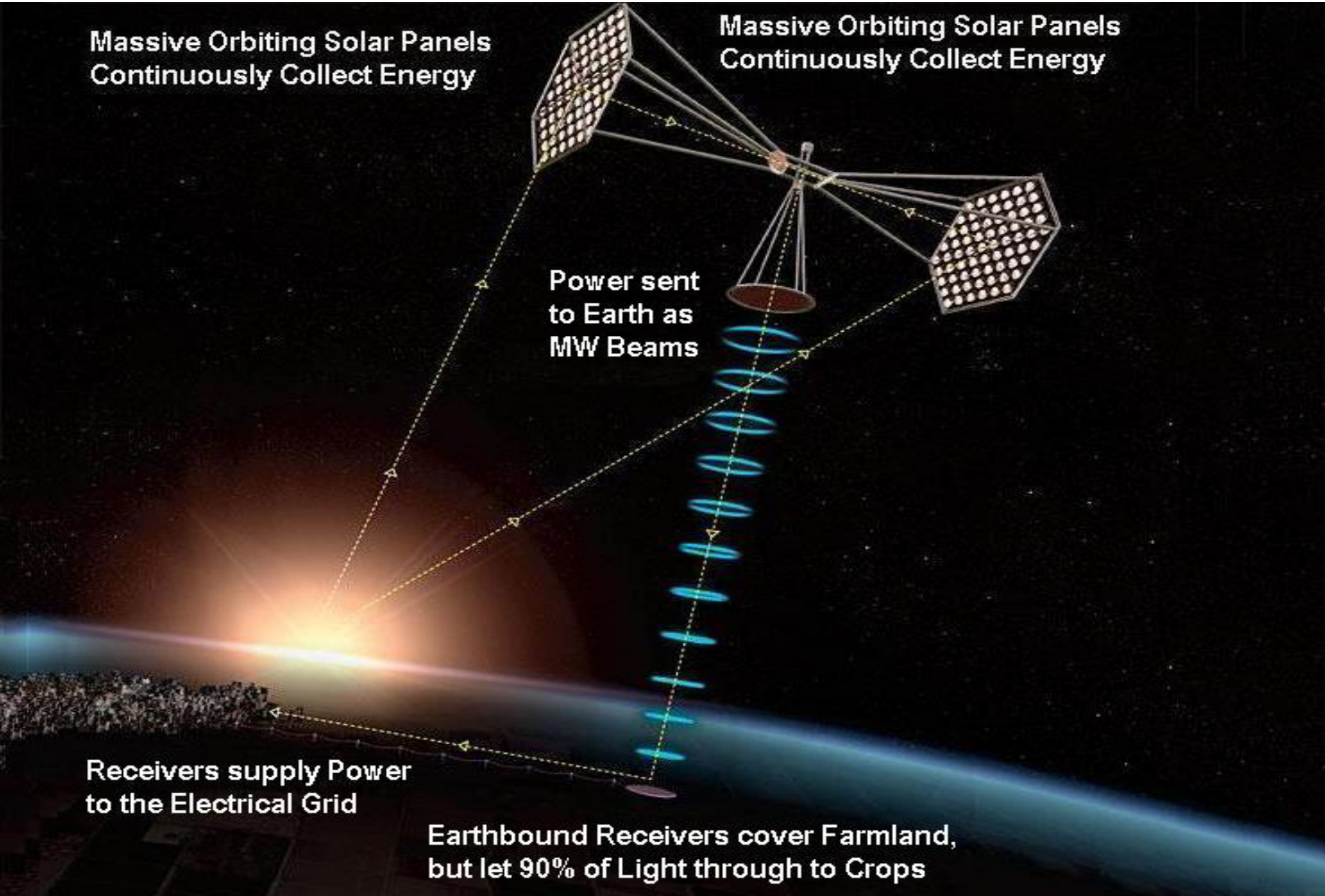
GEO Satellite Vast Arrays of Mirrors Concentrate Collected Sunlight onto Much Smaller Photovoltaic Solar Panels and Beam Energy to the Earth



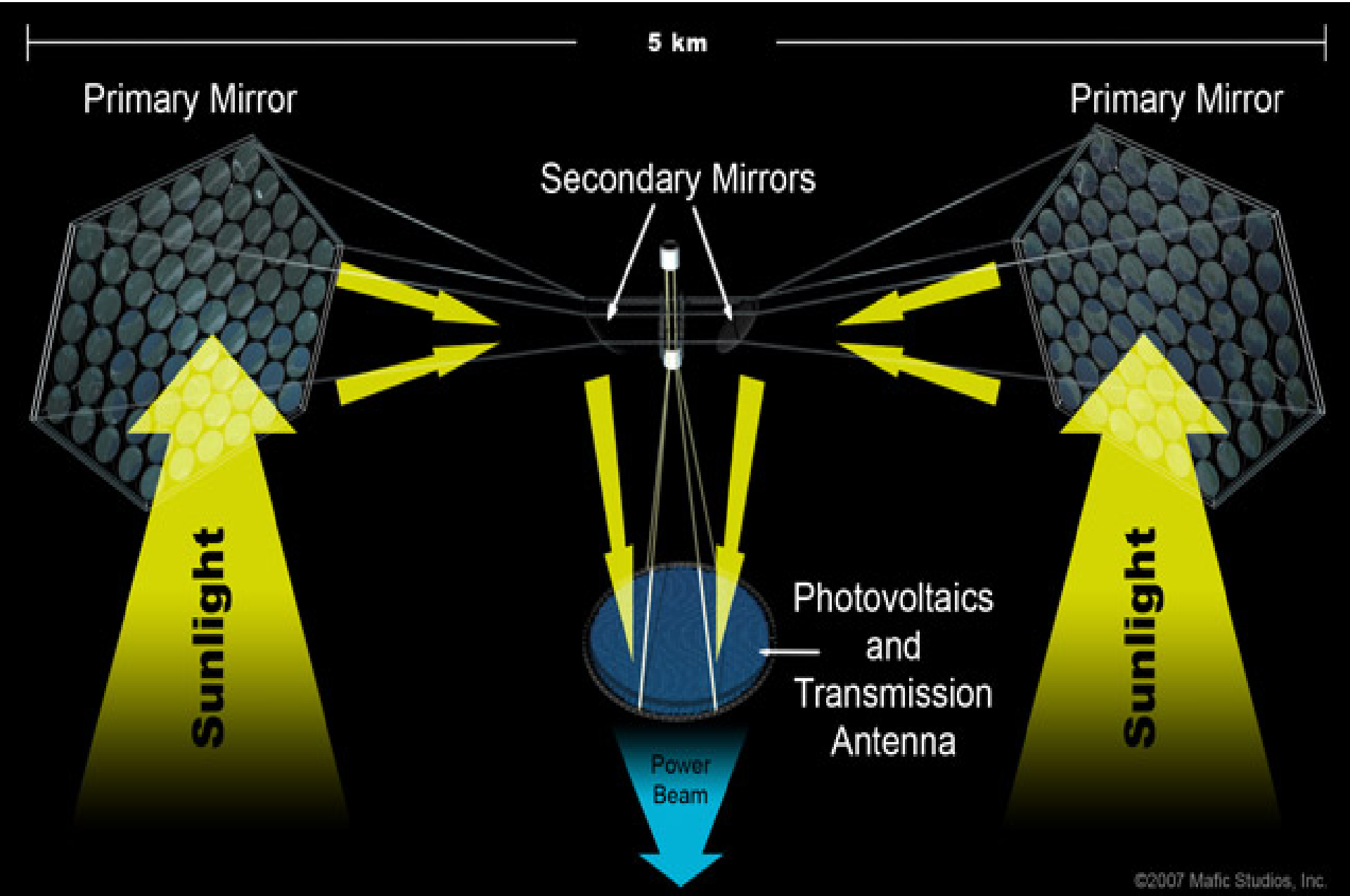
Sandwich Concept SSP Station in the GEO



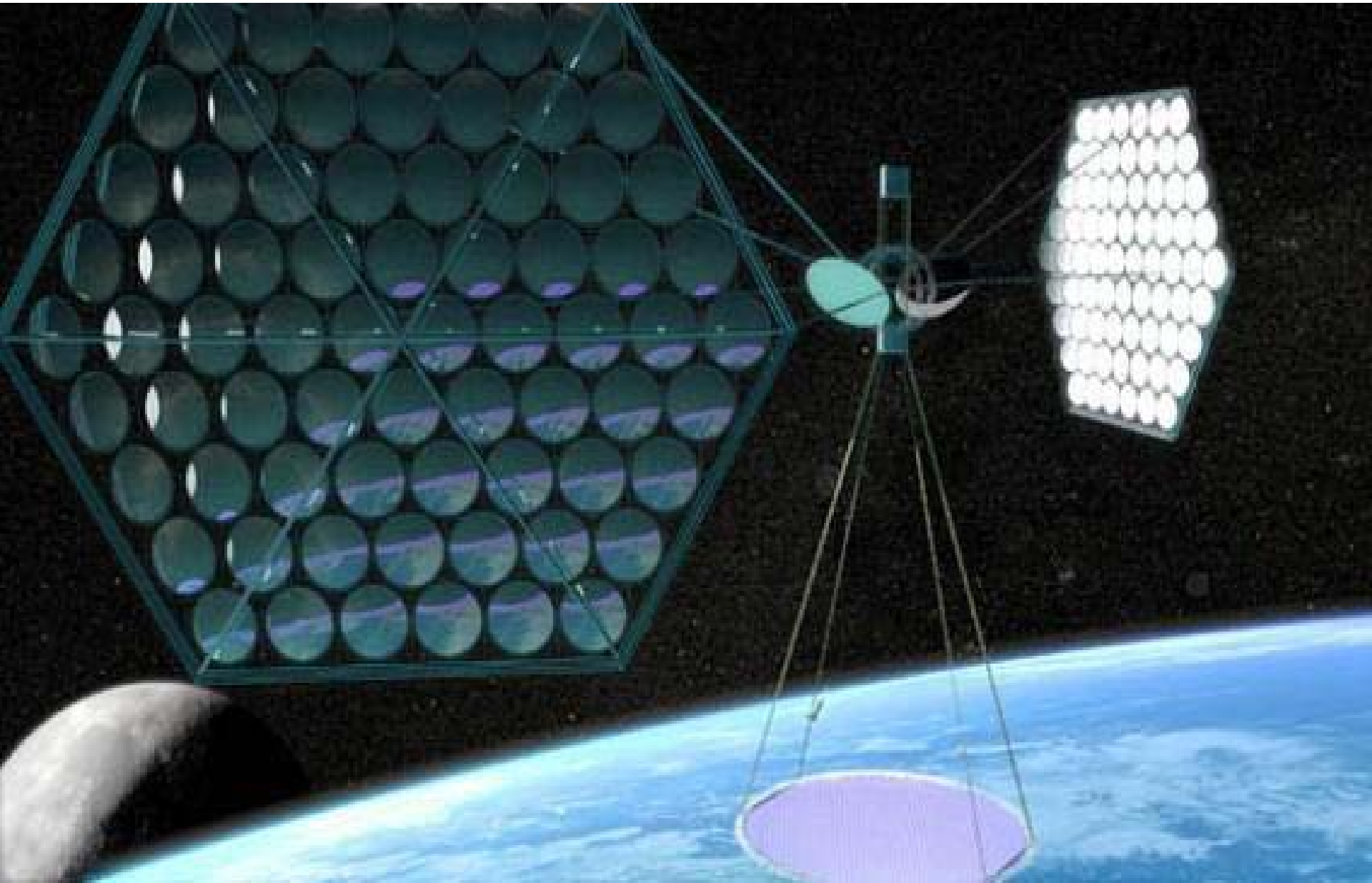
Massive Orbiting Solar Panels in GEO



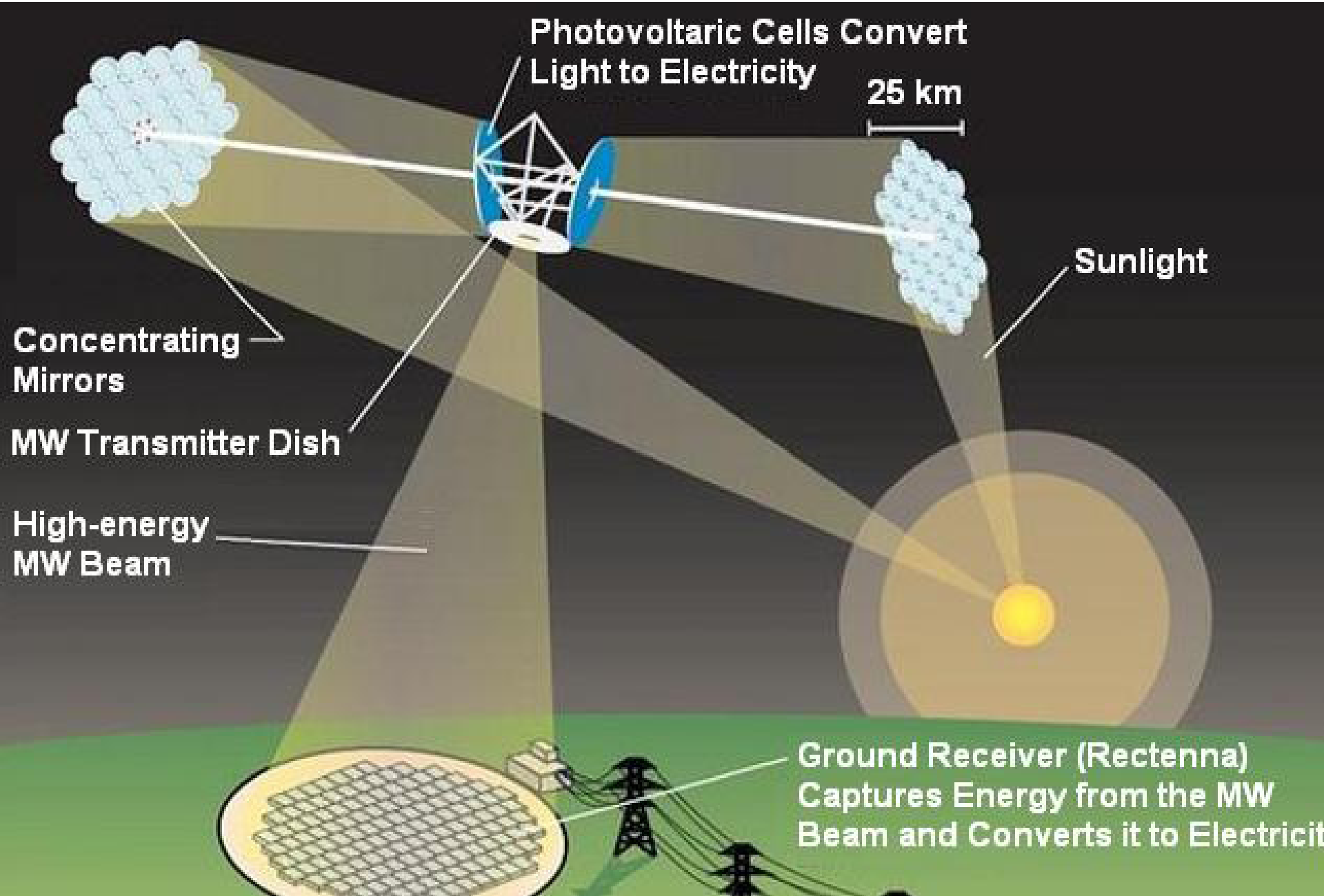
Kilometer-wide Solar Array in the Space



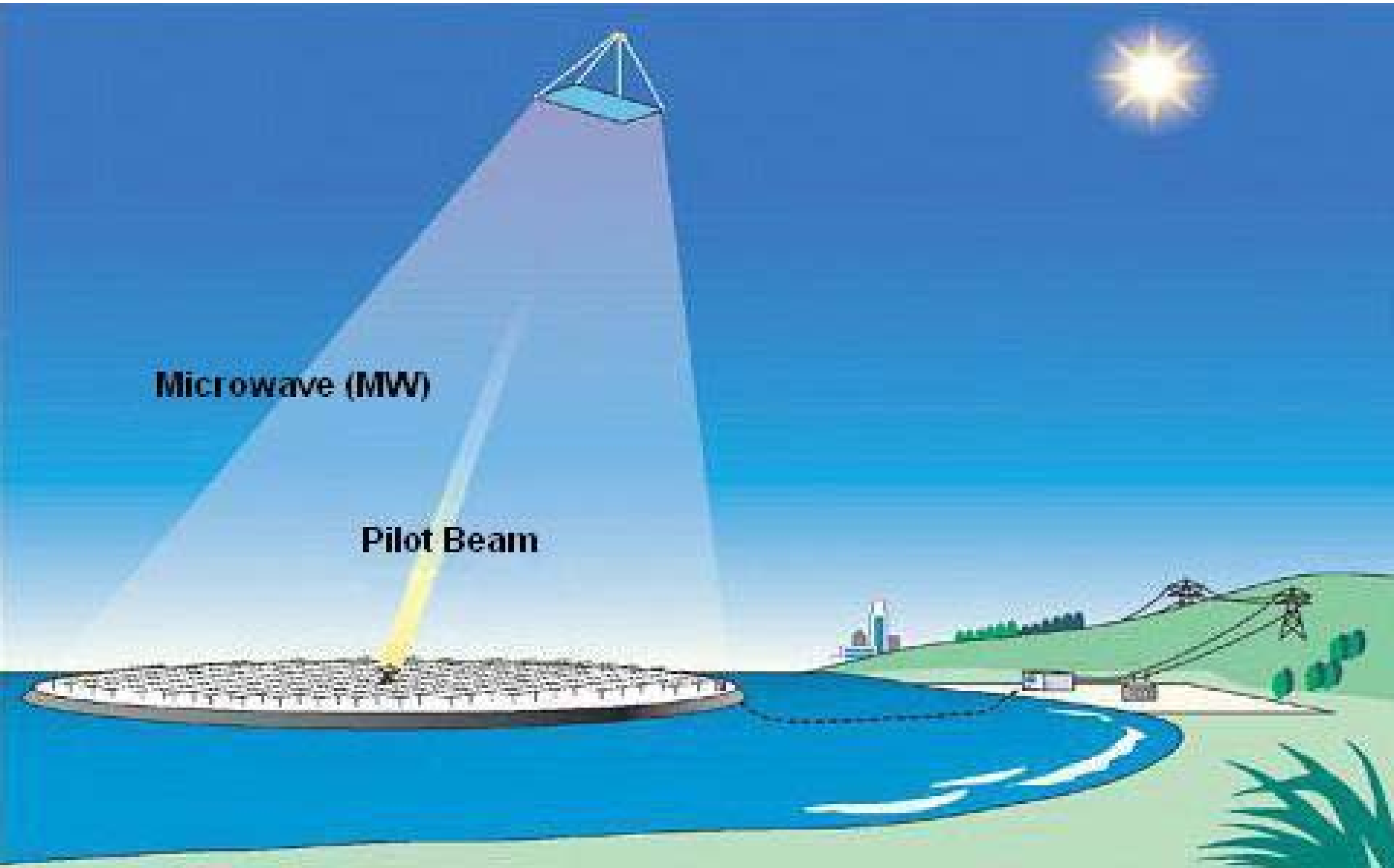
Solar Cells in the Space and Rectenna on the Earth Surface



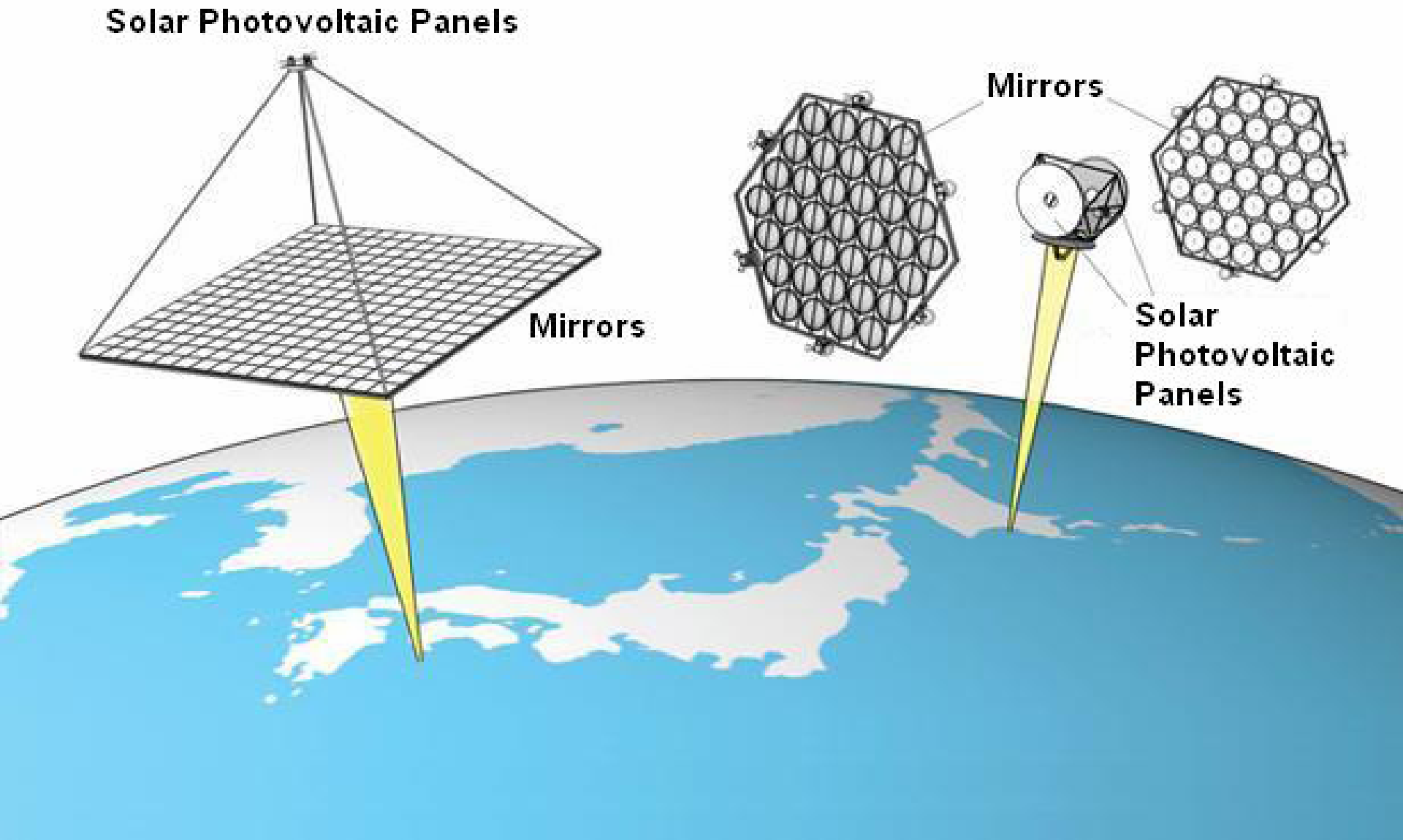
Integrated Symmetrical Concentrator Concept



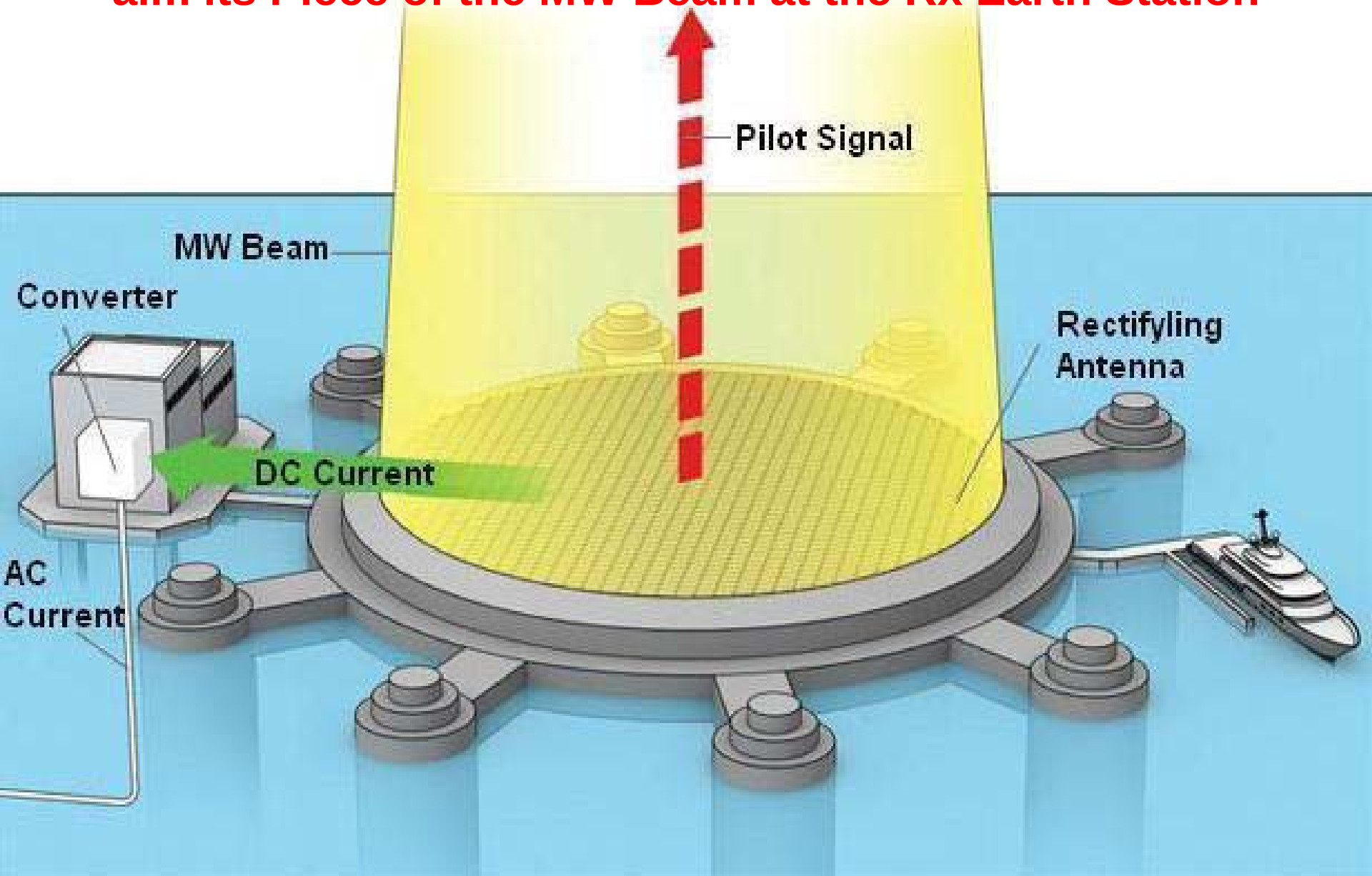
Design of GEO Mirror Subsystem Presented in below Figures a) and b)



a) GEO Satellites Transmitting (Tx) Antenna Panels Radiate SSP Beams from the Mirrors to the Earth Receiving (Rx) Earth Stations capable of Producing 1 GW DC Current



b) Many MW-Tx GEO Satellite Antenna Panels Receive a Pilot Signal from the Ground allowing each Tx Panel to Separately aim its Piece of the MW Beam at the Rx Earth Station

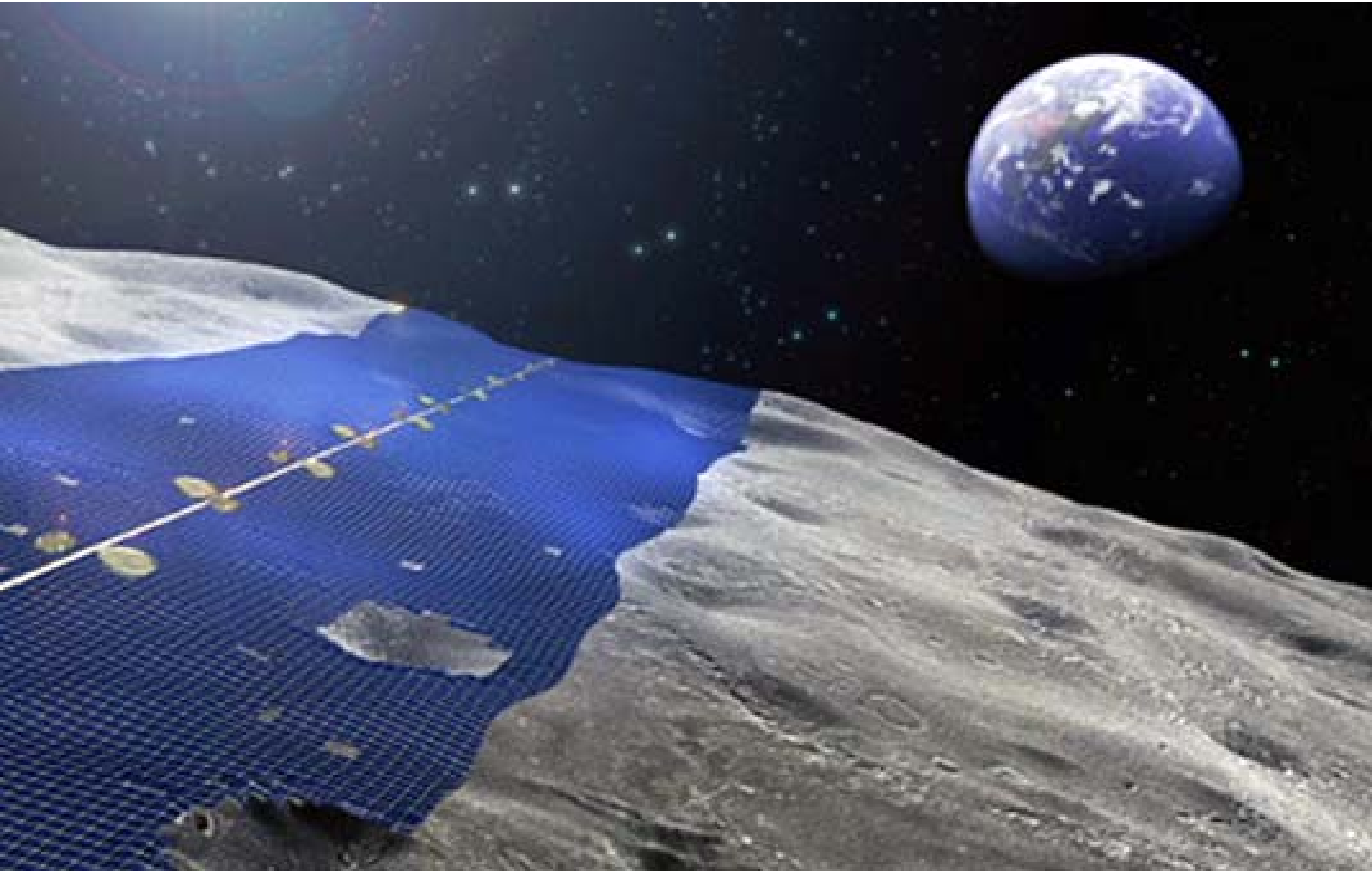


Type of Ground Rectenna as Receiving Earth Station of SSP

Rectenna – SSP Receiving Station

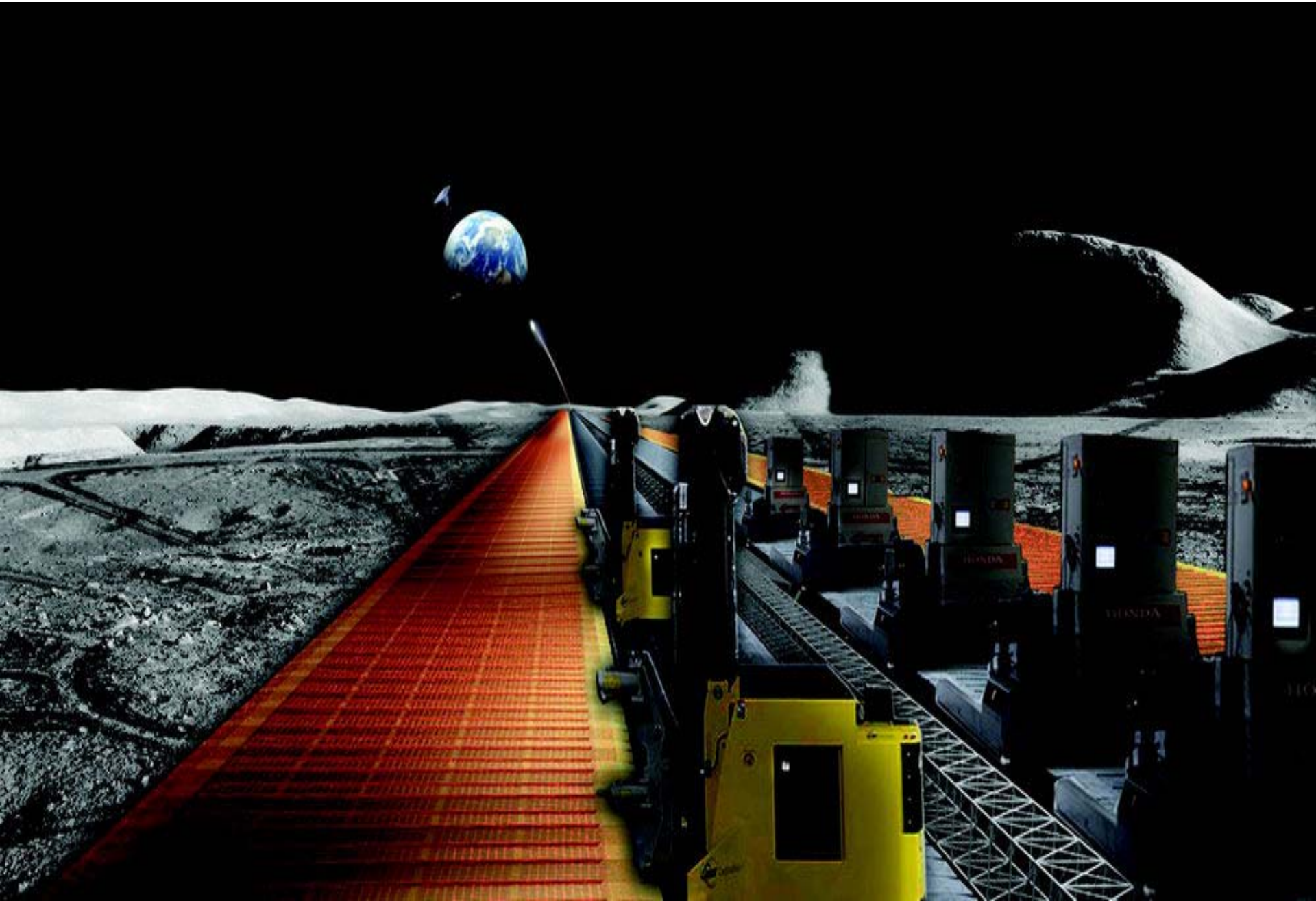
Lunar Ring build of Solar Panels around Moon Equator for Collecting SSP and Transmitting to the Earth via MW Beam

Solar Lunar Ring over Moon Equator for Transfer of SSP to the Earth



Solar Energy from the Moon Beamed Down to the Earth

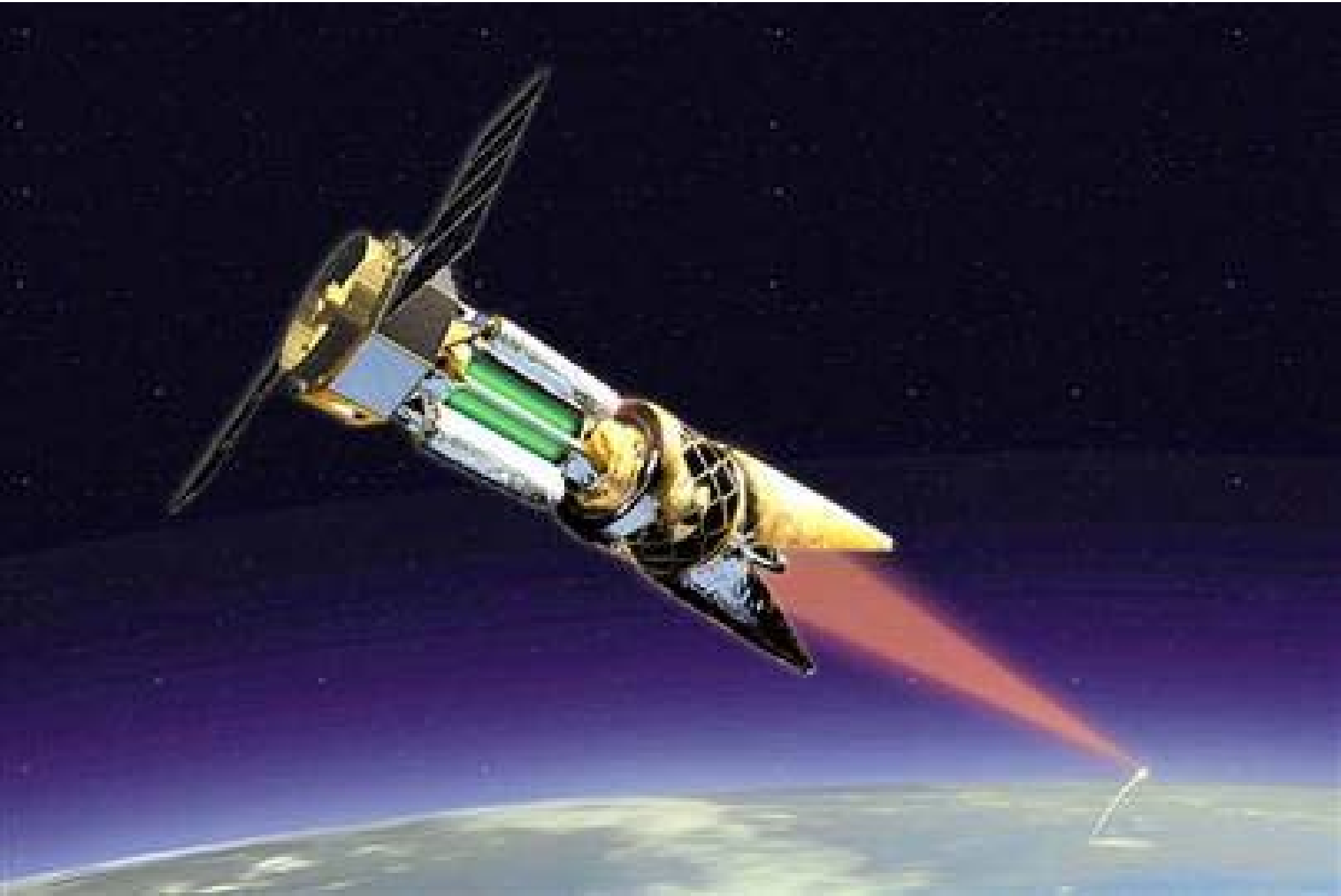
Solar Panel Factory on the Moon



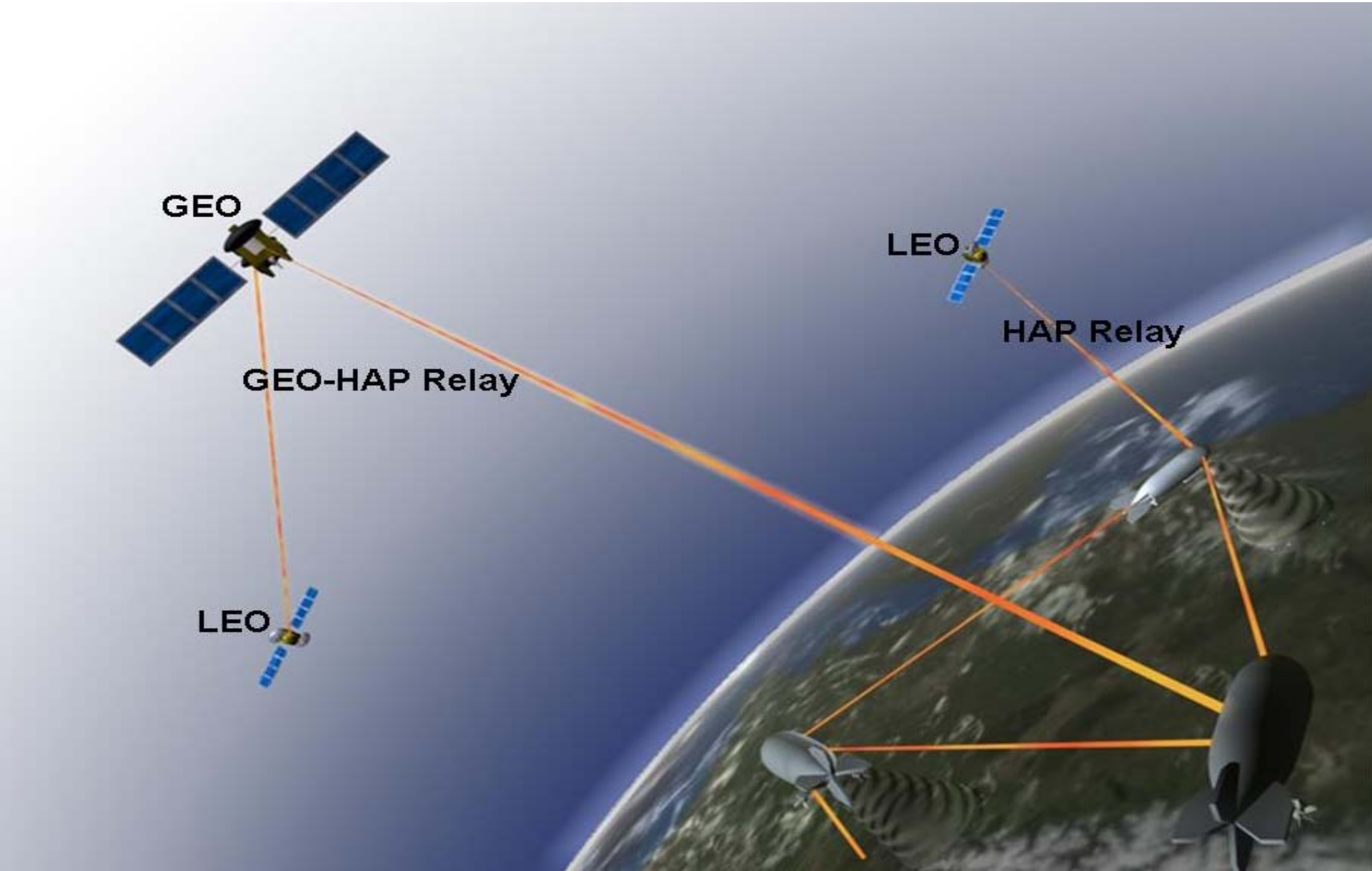
SSP Subsystems in GEO send via Laser Beam Electrical Energy to the Ground Rectenna

Intersatellite Laser Transfer of SSP

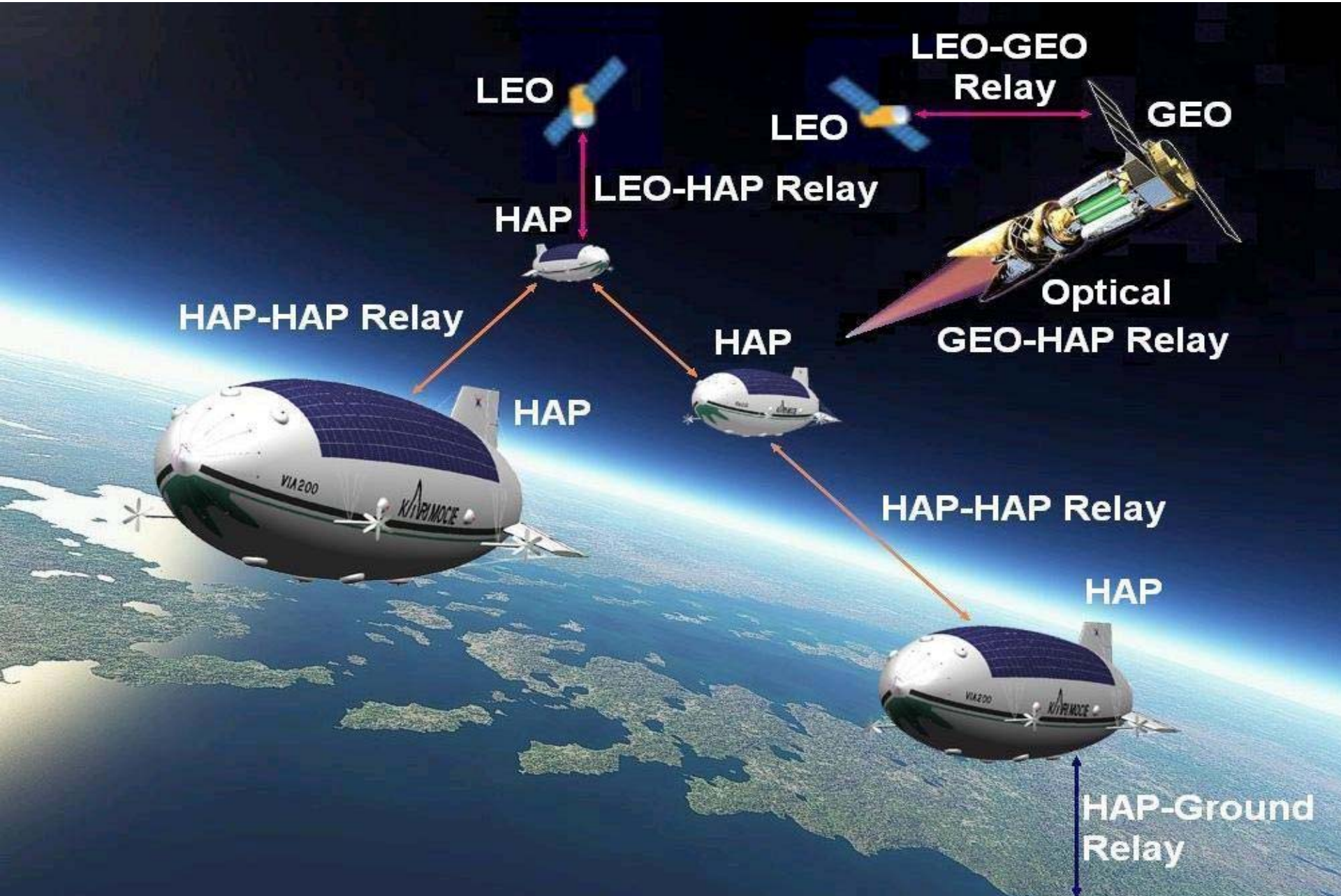
Interplatform Laser Transfer of SSP



Laser (Optical) or MW Interplatform Links for Transfer of SSP to the Earth



Relay Optical Links from Satellites via SPS



Thanks for your attention!!!

Please, any questions?!

The End

Thank you for your attention!

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