



## Space Based Solar Power ?

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*With Space Solar Power in the news this week, we got our wires crossed and ended up with two Space Solar Power posts. I thought I would put them both up at the same time (see post below Drumbeat), so people who want a different point of view can get one. Gail*

Californian utility PG&E caused a stir in the media recently with an [announcement](#) that they are seeking approval from state regulators for a power purchase agreement with [Solaren Corp.](#) to deliver 200 MW of power by 2016 for a 15 year period.

Californian utilities have been signing deals with a wide range of renewable energy providers in recent years in order to meet the state's mandated clean energy targets - the unusual aspect of this announcement is that Solaren is proposing to generate the power using solar panels in earth orbit, then convert it to radio frequency energy for transmission to a receiving station in Fresno County where it will be fed into the grid.

PG&E's Next 100 blog has an [interview](#) with Solaren CEO Gary Spirnak, in which he claims that while this will be the world's first SSP plant, and no system of this scale and exact configuration has been built before, the "underlying technology is very mature and is based on communications satellite technology". PG&E has promised to buy the power at an agreed-upon rate (comparable to the rate specified in other agreements for renewable-energy purchases) according to company spokesman Jonathan Marshall, however neither PG&E nor Solaren are saying what that rate is. PG&E is not making an up-front investment in Solaren's venture.

PG&E's interest in this sort of ambitious project is prompted by California's [mandates](#) to obtain 20 percent of its electricity from renewable sources by 2010 and 33 percent by 2020.



## The benefits of space based solar power

If Solaren (or other companies pursuing similar ambitions, such as Heliosat, Space Energy, Space Island Group, Powersat and the Welsom Space Consortium) can collect solar energy in space and transmit it to earth they will have opened up a significant new energy resource. The sun's energy is almost continuously available to a satellite located in a geosynchronous orbit about the earth (leading promoters of space based solar power schemes to dub it "baseload solar power").

A 2007 [study](#) by the Pentagon's National Security Space Office which included representatives from DOE/NREL, DARPA, Boeing and Lockheed-Martin found that a one-kilometer-wide band of space in earth orbit receives enough solar energy in just one year (approximately 212 terawatt-years) nearly equal to "the amount of energy contained within all known recoverable conventional oil reserves on Earth today" (approximately 250 TW-yrs). The Pentagon study [suggested](#) such a system could be tested as early as 2012, with the likely first customer being the US military.

There are a number of key advantages that make space based solar power an interesting alternative to ground-based solar power:

- There is more energy to be collected - the sun is more intense in orbit than on the surface of the Earth
- Space based systems can collect energy almost around the clock
- Ground-based systems suffer from weather phenomena such as clouds, precipitation, and dust - space based system do not (though the increasing amount of junk in orbit poses a similar hazard)
- Real estate costs are minimal - the only land that need be acquired is the land for the receiving station.
- Transmission line costs are greatly reduced compared to remote generation facilities if the ground station is located near existing transmission lines

The video below is from the [National Space Society](#), showing what a space based solar plant might look like.

## Challenges

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

The first is the technological challenge of making a scheme like this work - this is not been so much converting solar energy into radio frequencies (which has been done before, though not on Solaren's scale) - but in getting a supersized solar array into space and successfully commissioning it.

The second challenge is one of economics - can the cost involved in building a solar power plant in space ever be competitive with ground based [concentrating solar thermal](#), regular [solar PV](#) or [thin film solar](#) power plants.

Plans for space based solar have traditionally included kilometre long structures of solar arrays connected to satellites, and launching thousands of tons of heavy metal into orbit is exorbitantly expensive.

Solaren's Spirnak says he has a solution - "We want to take the weight out of these systems. We came up with this design concept to break these things into pieces instead of trying to construct many, many kilometers of structures in orbit, which would essentially be unbuildable."

Instead, his station will consist of two to four components that will float free in space (kept in alignment by software controls and small booster rockets rather than heavy wires, cables and struts). According to Solaren's patent, an inflatable Mylar mirror a kilometer in diameter will collect and concentrate sunlight on a smaller mirror that will focus the rays on the solar array. By adopting a concentrating solar power approach, a smaller and lighter array can be deployed, reducing the cost of lifting the components of the structure into orbit.

At this point there is little information about cost available for Solaren's proposal, though [Grist](#) quotes Spirnak as saying the price tag for the 200-megawatt solar power station for PG&E will be "in the several billion dollar range" and will require 4 or 5 rocket launches.

## History

The concept of space based solar power was [first proposed](#) in 1941 by science fiction author Isaac Asimov in his book "Reason," about a space station that collects solar energy and beams it to Earth.

[Wikipedia's](#) article on the topic includes a good [timeline](#) of developments in the field, noting that Dr Peter Glaser was granted a US patent in 1973 for his "method of transmitting power over long distances (eg, from an SPS to the Earth's surface) using microwaves from a very large (up to one square kilometer) antenna on the satellite to a much larger one on the ground, now known as a rectenna".

Asimov continued to promote the idea throughout his life, with this talk ([part 1](#), [part 2](#)) on "Threats To Humanity", delivered to The Humanist Institute In New York in 1989, in which he described the threats of global warming and fossil fuel depletion, and recommended the solution as space based solar power whose delivery is managed by a federal world government / "stable world order".

Another peak oil observer who has regularly promoted the idea of space based solar power is JD at Peak Oil Debunked, who has looked at the idea of solar power plants based on the moon a number of times ([Lunar Solar Power](#), [More on Lunar Solar Power](#)).

## Skepticism

Another space based energy panacea, using [helium 3 from the moon](#) to fuel fusion reactors, has caused some cynics to mutter that this is just a scheme to funnel large amounts of funds to well connected aerospace companies. I suspect that similar charges will be laid against spaced based solar power plans until the economics of them can be proven to match those of terrestrial

The authors of the Pentagon report mentioned earlier noted that space based solar “has the potential to be a disruptive game changer on the battlefield ... [enabling] entirely new force structures and capabilities such as ultra long endurance airborne or terrestrial surveillance or combat systems” - which implies that there might be more than one reason for wanting to deploy space based solar power - like the symbiosis between nuclear weapons development and the nuclear power industry, it may be that space based solar power provides a civilian friendly reason for building 'star wars' type platforms in space.

[Cryptogon](#) has some speculation along these lines, and goes on to wonder if this is another possible example of the introduction of technology developed in "black" military projects (there is a section in my "[Shockwave Rider](#)" review that talks about the 5000 secret patents registered by the USPTO) into the civilian sector (echoing his speculation about the [role of the new GM CEO](#) appointed by the Obama administration).

Another skeptic [commenting](#) on the Solaren proposal at Peak Energy wondered cynically if this was a form of greenwashing by PG&E, saying "This is an opportunity for PG&E to get some free green publicity and "demonstrate" their interest in meeting their RPS requirements. When the power doesn't appear in 2016, they can just throw up their hands and say "we tried, not our fault"."

Most skeptics focus purely on the economics though, with the Motley Fool declaring [Space-Based Solar? That's Just Silly](#) and Energy & Capital asking "Why would anyone be interested in space-based solar power when commercial utility scale solar technology on the ground today costs 0.3% of its price?" in [The Solar Race Will Be Lost in Space](#).

*Cross posted from [Our Clean Energy Future](#).*



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