Part II The *Keys* to Space Solar Power

Studies of Space Solar Power have consistently identified a half dozen key technologies that separate SSP from near term commercial feasibility. While all these key technologies are relatively mature, such as space transportation and photovoltaics, they have not been focussed into hardware ready and able to support the construction and operation of an SSP system.

This is why many reviews of SSP done in prior years suggested it was not ready to be built. As we will see in this section, we ***are*** ready to initiate design and construction of a demonstration SSP satellite now through the proven vehicle of the Sunsat Act. We will examine each of these critical technologies.

Foremost among these is space transportation, specifically the shipping costs to GeoSynchronous Orbit (GSO) – 35,000 km up. As we will see in the next chapter, space transportation costs, the market and the technology required to serve that market are interdependent. This is not surprising, since every product and market is technology dependent.

Not everyone is familiar with these technologies for SSP market development, however. Specifically, we will begin by noting that space transportation costs must be much lower in order to enable the construction of an SSPS. Fortunately, this is not difficult, technically – it is a market design choice that has not been available, ... yet.

To lower space transportation costs, market demand for moving freight to orbit must be much greater. And indeed, the quantity of materials, or freight, an SSPS company must orbit to make any impact in the global energy market would be immense - at least 5000 rocket flights per year, or a thousand metric tons a day. A successful rocket company today, 2004, is happy with five flights a year. 5000 rocket flights per year would knock the bottom out of space transportation market costs.

Carrying people is more expensive than carrying unpilotted freight. Carrying large volumes of freight to orbit will

(1) lower costs,
(2) increase volume,
(3) improve technology and
(4) increase safety

much faster than carrying people to orbit. Growing competition improves products with each cycle. That is how we enable and facilitate freight prices low enough to potentiate SSPS construction. It would also create other industries beyond our earth-bound

imaginations. A few that have been developed into business models are rapid global package delivery, asteroid mining, and space tourism.

Obviously, it is cheaper to refurbish a space vehicle than to have it crash and burn after every flight. That is a key reason why space travel is so expensive now. Costs would be lower if space vehicle maintenance were no different than changing the oil, battery, spark plugs, tires, air filter, etc., on your car, boat or airplane. SpaceShipOne flies this way.

If astronauts, tourists or passengers, are aboard, redundant life support and safety systems also add further substantial weight and expense. Flying freight only and not people is another key to quickly lowering costs.

Finally, space transportation has been a government monopoly for over fifty years, since we brought V2 rockets from Germany. Imagine what your car would have cost if NASA had built it. We wouldn't own one. Only multi-millionaires would have one. We must add a new *competitive focus* to our existing space transportation industry. A market focus.

The Aldridge Committee ("Moon, Mars, and Beyond") report echoed many who pointed out that private companies can provide better and lower cost space transportation services than government rockets. SpaceShipOne from Scaled Composites, Falcon from SpaceX, XCOR and Kelly's Astroliner are a just few of the growing fleet of lower cost spaceships. We can have a better space program using truly competitive transportation contracts. How?

The US solved this same puzzle before in 1962. The solution was Comsat - a Congressionally chartered private corporation with shares held by American citizens and investments from related industries. Very simply, the nascent aerospace community partnered with the established telephone company to build a private commercial space communications company with special access, federal loan guarantees and subsidies. It worked extremely well.

Comsat became the grandparent of virtually every satellite in space today. These satellites are all essentially communications satellites, serving innumerable markets now worth $100 Billion annually. Comsat has returned Trillions of dollars in business revenue since its inauguration in 1962. A SunSat Corporation – focussed exclusively on power satellite design, construction, marketing and operations would eventually exceed that return on investment.

We have identified in the first section of this book those drivers that show why SSP must be built soon. In the next half dozen chapters we shall review, in order those key technologies that must be focussed together. Expanding their markets will also lower SSP costs, permitting the SunSat Act and SunSat Corporation to succeed. Another key principle we will see adapted in this section is the encapsulation of risk into appropriate corporate and organizational vehicles.

What does that mean? For an example, Grandma's Jams and Jellies contracts with Fed-Ex or UPS to handle their package delivery. Grandma's contracts with Corning Glass or Crystal Bottle to provide packaging. Corning or Specialty is paid to worry about the purity and safety of that package. Grandma's contracts with Valley Fruit, Peach Mountain and Dew Drop Berries to provide them with consistently premium quality fruit. Grandma doesn't fret about any of these.

Just like Grandma's, SunSat Corporation shouldn't worry about space transportation. SunSat should be total focussed on better serving their electric power downlink customers. Just like Grandma's, SunSat would contract for technology to build, operate develop the SSP fleet and market.

They would rely on many competing producers for space transportation services, photovoltaic materials, cabling, communications, electronics, and hundreds of other products and services. The key is that no company or consortium today has the financial horsepower to provide "take it to the bank" contracts to all these emerging and participating industries. SunSat Corporation would.

"Education is not the filling of a pail but the lighting of a fire.
- William Butler Yeats