# 1AC

# Inherency- No SPS Catalyst

**Technical challenges are closing, but no catalyst remains to stimulate SPS**

Boyle, Science Editor, 07

(Alan Boyle, 10/12/2007, MSNBC, <http://www.msnbc.msn.com/id/21253268/ns/technology_and_science-space/t/power-space-pentagon-likes-idea/>, accessed June 24, 2011, JP)

<In conjunction with the Pentagon report's release, 13 space advocacy and research organizations announced the formation of the [Space Solar Alliance for Future Energy](http://ssafe.wordpress.com/), which pledged to push for implementation of the space power plan.

"While the technical challenges are real, significant investment now can build space solar Power into the ultimate energy source: clean, green, renewable, and capable of providing the vast amounts of power that the world will need. Congress, federal agencies and the business community should begin that investment immediately,” Mark Hopkins, senior vice president of the National Space Society, said in a written statement. It's up to policymakers, business leaders and voters to decide whether space-based solar power, or SBSP, is worth pursuing, according to the acting director of the Pentagon's National Security Space Office, Joseph Rouge.

"It appears that technological challenges are closing rapidly and the business case for creating SBSP is improving with each passing year," Rouge said in his foreword to the report. "Still absent, however, is an appropriate catalyst to stimulate the various interested parties toward actually developing a SBSP capability." The Solar Electric Power Association's Taylor, who advises utilities and other organizations on trends in terrestrial solar power, said the space option "is not something that's on the current solar industry's radar."

He told msnbc.com that putting a large power-generating system in space would pose huge technical challenges — and the potential payoff would have to be similarly huge to justify the risk and expense.

**SPS technologically viable now**

**NSSO, 2007**, SBSP Study Group, 2007, 10 October 2007, (National Security Space Office, Space-Based Solar Power, As an Opportunity for Strategic Security, Phase 0 Architecture Feasibility Study, <http://www.acq.osd.mil/nsso/solar/SBSPInterimAssesment0.1.pdf>)

FINDING: The SBSP Study Group found that Space-Based Solar Power is a complex engineering challenge, but requires no fundamental scientific breakthroughs or new physics to become a reality. Space-Based Solar Power is a complicated engineering project with substantial challenges and a complex trade-space not unlike construction of a large modern aircraft, skyscraper, or hydroelectric dam, but does not appear to present any fundamental physical barriers or require scientific discoveries to work. While the study group believes the case for technical feasibility **is very strong**, this does not automatically imply economic viability and affordability—this requires even more stringent technical requirements.

**Plan solves – catalyzes private action**

**NSSO, 2007**, SBSP Study Group, 2007, 10 October 2007, (National Security Space Office, Space-Based Solar Power, As an Opportunity for Strategic Security, Phase 0 Architecture Feasibility Study, <http://www.acq.osd.mil/nsso/solar/SBSPInterimAssesment0.1.pdf>)

Finding: The SBSP Study Group found that a **small amount** of entry capital by the US Government **is likely to catalyze substantially more investment by the private sector**. This opinion was expressed many times over from energy and aerospace companies alike. Indeed, there is anecdotal evidence that even the activity of this interim study has already provoked significant activity by at least three major aerospace companies. Should the United States put some dollars in for a study or demonstration, it is **likely to catalyze significant amounts of internal research and development**. Study leaders likewise heard that the DoD could have a catalytic role by sponsoring prizes or signaling its willingness to become the anchor customer for the product. These findings are consistent with the findings of the recent President’s Council of Advisors on Science and Technology (PCAST) report which recommended the federal government “expand its role as an early adopter in order to demonstrate commercial feasibility of advanced energy technologies.”

New Inexpensive, Environmentally Friendly Solar Cells Exist

***ScienceDaily (May 23, 2012)<*** <http://www.sciencedaily.com/releases/2012/05/120523133236.htm>>

 — The limitations of conventional and current solar cells include high production cost, low operating efficiency and durability, and many cells rely on toxic and scarce materials. Northwestern University researchers have developed a new solar cell thatwill minimize all of these solar energy technology limitations. **In particular, the device is the first to solve the problem of the Grätzel cell, a promising low-cost and environmentally friendly solar cell with a significant disadvantage: it leaks**. The dye-sensitized cell's electrolyte is made of an organic liquid, which can leak and corrode the solar cell itself. Grätzel cells use a molecular dye to absorb sunlight and convert it to electricity, much like chlorophyll in plants. But the cells typically don't last more than 18 months, making them commercially unviable. Researchers have been searching for an alternative for two decades. At Northwestern, where interdisciplinary collaboration is a cornerstone, nanotechnology expert Robert P. H. Chang challenged chemist Mercouri Kanatzidis with the problem of the Grätzel cell. Kanatzidis' solution was a new material for the electrolyte that actually starts as a liquid but ends up a solid mass. Thus, **the new all solid-state solar cell is inherently stable. "The Grätzel cell is like having the concept for the light bulb but not having the tungsten wire or carbon material**," said Kanatzidis, of the need to replace the troublesome liquid. "We created a robust novel material that makes the Grätzel cell concept work better. Our material is solid, not liquid, so it should not leak or corrode." Postdoctoral fellow In Chung in the Kanatzidis group worked closely with graduate student Byunghong Lee in the Chang group to develop the new cells, achieving performance gains that amounted to approximately 1 percent per month. In the Northwestern cell, a thin-film compound made up of cesium, tin and iodine, called CsSnI3, replaces the entire liquid electrolyte of the Grätzel cell. Details of the new solar cell -- an efficient, more stable and longer lasting cell -- will be published May 24 by the journal Nature. Kanatzidis, the Charles E. and Emma H. Morrison Professor of Chemistry in the Weinberg College of Arts and Sciences, and Chang, a professor of materials science and engineering at the McCormick School of Engineering and Applied Science, are the two senior authors of the paper. "**This is the first demonstration of an all solid-state dye-sensitized solar cell system that promises to exceed the performance of the Grätzel cell**," Chang said. "Our work opens up the possibility of these materials becoming state of the art with much higher efficiencies than we've seen so far." The Northwestern cell exhibits the highest conversion efficiency (approximately 10.2 percent) so far reported for a solid-state solar cell equipped with a dye sensitizer. This value is close to the highest reported performance for a Grätzel cell, approximately 11 to 12 percent. (Conventional solar cells made from highly purified silicon can convert roughly 20 percent of incoming sunlight.) Unlike the Grätzel cell, the new solar cell uses both n-type and p-type semiconductors and a monolayer dye molecule serving as the junction between the two. Each nearly spherical nanoparticle, made of titanium dioxide, is an n-type semiconductor. Kanatzidis' CsSnI3 thin-film material is a new kind of soluble p-type semiconductor. "**Our inexpensive solar cell uses nanotechnology to the hilt**," Chang said. "**We have millions and millions of nanoparticles, which gives us a huge effective surface area, and we coat all the particles with light-absorbing dye**." A single solar cell measures half a centimeter by half a centimeter and about 10 microns thick. The dye-coated nanoparticles are packed in, and Kanatzidis' new material, which starts as a liquid, is poured in, flowing around the nanoparticles. Much like paint, the solvent evaporates, and a solid mass results. The sunlight-absorbing dye, where photons are converted into electricity, lies right between the two semiconductors. Chang chose to use nanoparticles approximately 20 nanometers in diameter. This size optimizes the device, he said, increasing the surface area and allowing enough space between the particles for Kanatzidis' material to flow through and set. Technically, this new cell is not really a Grätzel cell since the hole-conducting material CsSnI3 is itself light absorbing. In fact, **the material absorbs more light over a wider range of the visible spectrum than the typical dye used in Grätzel cells**. In the Kanatzidis-Chang cell, the CsSnI3 plays an additional role in the operation of the cell that is not played by the liquid electrolyte couple, and that role is light absorption. "This is only the beginning," Chang said. "**Our concept is applicable to many types of solar cells. There is a lot of room to grow**." **The lightweight thin-film structures are compatible with automated manufacturing, the researchers** point out. They next plan to build a large array of the solar cells.

**Uniqueness: Solar power makes up a small percentage energy production.**

**Hsu, Systems Engineering & Risk Management, 10**

(Dr. Feng Hsu, “Harnessing the Sun”, Winter 2010, <http://spacejournal.ohio.edu/issue16/hsu.html>, KJ)

<We must set priorities and choose wisely. Within the next 30 years, we're going to have an explosive increase in demand for new sources of fuel. According to recent U.S. Department of Energy data, all renewable sources of energy including biomass, hydropower, geothermal, wind and solar represent only about 6 percent of total U.S. energy production in the US. Nonrenewable energies, namely fossil fuels, represent the other 94 percent.>

**PLAN TEXT: The United States Federal Government should provide financial incentives to the private sector for the production of Solar Powered Satellites that use All-Solid-State Dye-Sensitized Solar Cells technology.**

**Contention 1: Warming**

#### **Anthropogenic warming is the consensus of the scientific community and subsidization of fossil fuels brackets out the only solution**

**Hansen, Director of the NASA Goddard Institute for Space Studies, 12**

(James, January 30, 2012, “Top Climate Scientist on Need for Clean Energy Action”, http://cleantechnica.com/2012/01/30/top-climate-scientist-on-need-for-clean-energy-action/, 7/17/12, atl)

The threat of human-made climate change and the urgency of reducing fossil fuel emissions have become increasingly clear to the scientific community during the past few years. Yet, at the same time, the public seems to have become less certain about the situation. Indeed, many people have begun to wonder whether the climate threat has been concocted or exaggerated. Public doubt about the science is not an accident. People profiting from business-as-usual fossil fuel use are waging a campaign to discredit the science. Their campaign is effective because the profiteers have learned how to manipulate democracies for their advantage. The scientific method requires objective analysis of all data, stating evidence pro and con, before reaching conclusions. This works well, indeed is necessary, for achieving success in science. But science is now pitted in public debate against the talk-show method, which consists of selective citation of anecdotal bits that support a predetermined position. Why is the public presented results of the scientific method and the talk-show method as if they deserved equal respect? A few decades ago that did not happen. In 1981, when I wrote a then-controversial paper (<http://pubs.giss.nasa.gov/abs/ha04600x.html>) about the impact of CO2 on climate, the science writer Walter Sullivan contacted several of the top relevant scientific experts in the world for comments. He did not mislead the public by dredging up and highlighting contrarian opinion for the sake of a forced and unnatural “balance”. Today most media, even publicly-supported media, are pressured to balance every climate story with opinions of contrarians, climate change deniers, as if they had equal scientific credibility. Media are dependent on advertising revenue of the fossil fuel industry, and in some cases are owned by people with an interest in continuing business as usual. Fossil fuel profiteers can readily find a few percent of the scientific community to serve as mouthpieces — all scientists practice skepticism, and it is not hard to find some who are out of their area of expertise, who may enjoy being in the public eye, and who are limited in scientific insight and analytic ability. Distinguished scientific bodies such as national science academies, using the scientific method, can readily separate charlatans and false interpretations from well-reasoned science. Yet it seems that our governments and the public are not making much use of their authoritative scientific bodies. Why is that? I believe that the answer, and the difficulty in communicating science to the public, is related to the corrosive influence of money in politics and to increased corporate influence on the media. It is a tragic and frustrating situation, because when all the dots in the climate-energy story are connected it becomes clear that a common-sense pathway exists that would solve energy needs, stimulate the economy, and protect the future of young people. As I discussed in “Storms of My Grandchildren,” a gradually rising carbon fee should be collected from fossil fuel companies, with the money distributed uniformly to legal residents. This would stimulate the economy, making it more efficient by putting an honest price on fuels, incorporating their costs to society. “Captains of industry” told me they would prefer such a course with knowledge of a steadily rising carbon price, which would stimulate innovations in efficiency and clean energies. Despite the obstacles presented by the role of money in politics and by the huge advertising campaigns of the fossil fuel industry, the urgency of addressing the climate-energy issue demands that we do the best that we can to inform the public. One of the things we can do is try to expose how the public and our democracies are being manipulated for the benefit of those profiting from the public’s fossil fuel addiction. For that purpose I provided the witness statement below in support of an effort to reveal the name of the seed funder of the Global Warming Policy Foundation (GWPF) in the UK. GWPF is “successful” in casting doubt on the reality and significance of human-made climate change. The newsletters of Benny Peiser, Director of GWPF, can be quite entertaining and sometimes include useful references. He pings the impracticality and costliness of an energy approach that relies excessively on renewable energies. But ultimately his purpose seems to be to persuade the public that climate science is flawed. I don’t know if GWPF is supported by the fossil fuel industry, but it seems to me that the public has the right to know. Ultimately, I hope and believe, the public will be able to appreciate how our democracies are being twisted by people with money for their own purposes. But that requires freedom of information. Jim Hansen Some clarification of what this is about, the secret efforts of Lords, the wealthy, the privileged, to dupe the public in our democracies into supporting their continued and growing privileges, is provided by this news article and press release: [http://www.brisbanetimes.com.au/environment/bid-to-out-the-money-behind-the-voice-against- climate-change-20120126-1qjfp.html](http://www.brisbanetimes.com.au/environment/bid-to-out-the-money-behind-the-voice-against-%20climate-change-20120126-1qjfp.html) [http://requestinitiative.org/2012/01/lord-lawson-should-name-funder-of-climate-sceptic-think- tank-judge-told/](http://requestinitiative.org/2012/01/lord-lawson-should-name-funder-of-climate-sceptic-think-%20tank-judge-told/) STATEMENT I, James Hansen of Kintnersville, Pennsylvania, USA, say as follows 1. I am Director of the NASA Goddard Institute for Space Studies in New York City and Adjunct Professor of Earth Sciences at Columbia University’s Earth Institute. I write here in my personal capacity, not representing these institutions. I was trained in physics and astronomy in the space science program of Dr. James Van Allen at the University of Iowa, receiving my Ph.D. in 1967. Since the mid-1970s my research has focused on Earth’s climate and understanding the human impact on global climate. I am a member of the United States National Academy of Sciences, have testified about climate change to our Congress many times, and have met with officials of numerous nations concerning actions needed to stabilize climate and assure a bright future for young people. 2. I make this witness statement in support of Brendan Montague’s appeal. The facts and matters set out in this statement are within my own knowledge unless otherwise stated, and I believe them to be true. Where I refer to information supplied by others, the source of the information is identified; facts and matters derived from other sources are true to the best of my knowledge and belief. References in this statement are to documents in the bundles of documents prepared for the Tribunal hearing. The current situation regarding global climate change is described in a paper, The Case for Young People and Nature: A Path to a Healthy Prosperous Future, which I am preparing with the help of 17 international colleagues for submission to the Proceedings of the National Academy of Sciences, USA. The paper includes more than 100 scientific references supporting the discussion in my statement below. The abstract summarizing our paper is [posted at the top]. Science, as described in numerous authoritative reports, has revealed that humanity is now the dominant force driving changes of Earth’s atmospheric composition and thus future climate. The principal climate forcing is carbon dioxide (CO2) from fossil fuel emissions, much of which will remain in the atmosphere for millennia. The climate system’s inertia, which is mainly due to the ocean and the ice sheets on Greenland and Antarctica, causes climate to respond slowly, at least initially, but in a very long-lasting way to this human-made forcing. Governments have recognized the need to limit emissions to avoid dangerous human-made climate change, as formalized in the Framework Convention on Climate Change. Despite this, the Kyoto Protocol, established in 1997 to reduce developed country emissions and slow emissions growth in developing countries, has been so ineffective that the rate of global emissions has since accelerated to almost 3%/year, compared to 1.5%/year in the preceding two decades. There is a huge gap between rhetoric about reducing emissions and reality. Governments and businesses offer assurances that they are working to reduce emissions, but only a few nations have made substantial progress. Reality exposes massive efforts to expand fossil fuel extraction, including oil drilling to increasing ocean depths, into the Arctic, and onto environmentally fragile public lands; squeezing of oil from tar sands and tar shale; hydro-fracking to expand extraction of natural gas; and increased mining of coal via mechanized longwall mining and mountain-top removal. Governments not only allow this activity, but use public funds to subsidize fossil fuels at a rate of about 500 billion US$ per year. Nor are fossil fuels required to pay their costs to society. Air and water pollution due to extraction and burning of fossil fuels kills more than 1,000,000 people per year and affects the health of billions of people. But the greatest costs to society are likely to be the impacts of climate change, which are already apparent and are expected to grow considerably. Climate change is a moral issue of unprecedented scope, a matter of intergenerational injustice, as today’s adults obtain benefits of fossil fuel use, while consequences are felt mainly by young people and future generations. In addition, developed countries are most responsible for emissions, but people in less developed countries and indigenous people across the world are likely to be burdened the most while being least able to adapt to a changing climate. The tragedy of human-made climate change, should the rush to exploit all fossil fuels continue, is that transition to clean energies and energy efficiency is not only feasible but economically sensible. Assertions that phase-out of fossil fuels would be unacceptably costly can be traced to biased assumptions that do not account for the costs of fossil fuels to society or include the benefits of technology innovations that would emerge in response to an appropriate price on carbon emissions. Fossil fuel emissions so far are a small fraction of known reserves and potentially recoverable resources, as shown in Figure 1. There are uncertainties in estimated reserves and resources, some of which may not be economically recoverable with current technologies and energy prices. But there is already more than enough fossil fuel reserve to transform the planet, and fossil fuel subsidies and technological advances will make more and more of the resources available. Burning all fossil fuels would create a different planet than the one that humanity knows. The paleoclimate record and ongoing climate change make it clear that the climate system would be pushed beyond tipping points, setting in motion irreversible changes, including ice sheet disintegration with a continually adjusting shoreline, extermination of a substantial fraction of species on the planet, and increasingly devastating regional climate extremes. Phase out of fossil fuel emissions is urgent. CO2 from fossil fuel use stays in the surface climate system for millennia. Failure to phase out emissions rapidly will leave young people and future generations with an enormous clean-up job. The task of extracting CO2 from the air is so great that success is uncertain at best, raising the likelihood of a spiral into climate catastrophes and efforts to “geo-engineer” restoration of planetary energy balance. Most proposed schemes to artificially restore Earth’s energy balance aim to reduce solar heating, e.g., by maintaining a haze of stratospheric particles that reflect sunlight to space. Such attempts to mask one pollutant with another pollutant almost inevitably would have unintended consequences. Moreover, schemes that do not remove CO2 would not avert ocean acidification. The pragmatic path is for the world to move expeditiously to carbon-free energies and increased energy efficiency, leaving most remaining fossil fuels in the ground. Transition to a post-fossil fuel world of clean energies will not occur as long as fossil fuels remain the cheapest energy in a system that does not incorporate the full cost of fossil fuels. Fossil fuels are cheap only because they are subsidized directly and indirectly, and because they do not pay their costs to society. Costs of air and water pollution caused by fossil fuel extraction and use, via impacts on human health, food production, and natural ecosystems, are borne by the public. Similarly, costs of climate change and ocean acidification will be borne by the public, especially by young people and future generations.

### We will hit the brink by 2030

Stein 6/26/2011 ((Science editor for the magazine the Canadian) http://www.agoracosmopolitan.com/home/Frontpage/2007/02/26/01381.html) ja

Given time lags of 30-50 years, we might have already put enough extra greenhouse gases into the atmosphere to have crossed a threshold to these bombs exploding, their released greenhouse gases leading to ever accelerating global warming with future global temperatures maybe tens of degrees higher than our norms of human habitation and therefore extinction or very near extinction of humanity. "(T)he science is clear. We need not a 20% cut by 2020; not a 60% cut by 2050, but a 90% cut by 2030 **(1).** Only then do we stand a good chance of keeping carbon concentrations in the atmosphere below 430 parts per million, which means that only then do we stand a good chance of preventing some of the threatened positive feedbacks. If we let it get beyond that point there is nothing we can do. The biosphere takes over as the primary source of carbon. It is out of our hands," George Monbiot says. Ticking Time Bomb by John Atcheson , a geologist writing in the Baltimore Sun, is the best and almost only mainstream media explanation of runaway global warming and how close we are to extinction. "There are enormous quantities of naturally occurring greenhouse gasses trapped in ice-like structures in the cold northern muds and at the bottom of the seas. These ices, called clathrates, contain 3,000 times as much methane as is in the atmosphere. Methane is more than 20 times as strong a greenhouse gas as carbon dioxide." Stephen Connor reported in the February 16, edition of The Independent that, "The long-term stability of the massive ice sheets of Antarctica, which have the potential to raise sea levels by hundreds of metres, has been called into question with the discovery of fast-moving rivers of water sliding beneath their base."

#### **Warming causes extinction**

**Tickell, Climate researcher 2008**

(Oliver, Climate Researcher, The Gaurdian, “On a planet 4C hotter, all we can prepare for is extinction”, 8-11, http://www.guardian.co.uk/ commentisfree/2008/aug/11/ climatechange)

We need to get prepared for four degrees of global warming, Bob Watson told the Guardian last week. At first sight this looks like wise counsel from the climate science adviser to Defra. But the idea that we could adapt to a 4C rise is absurd and dangerous. Global warming on this scale would be a catastrophe that would mean, in the immortal words that Chief Seattle probably never spoke, "the end of living and the beginning of survival" for humankind. Or perhaps the beginning of our extinction. The collapse of the polar ice caps would become inevitable, bringing long-term sea level rises of 70-80 metres. All the world's coastal plains would be lost, complete with ports, cities, transport and industrial infrastructure, and much of the world's most productive farmland. The world's geography would be transformed much as it was at the end of the last ice age, when sea levels rose by about 120 metres to create the Channel, the North Sea and Cardigan Bay out of dry land. Weather would become extreme and unpredictable, with more frequent and severe droughts, floods and hurricanes. The Earth's carrying capacity would be hugely reduced. Billions would undoubtedly die. Watson's call was supported by the government's former chief scientific adviser, Sir David King, who warned that "if we get to a four-degree rise it is quite possible that we would begin to see a runaway increase". This is a remarkable understatement. The climate system is already experiencing significant feedbacks, notably the summer melting of the Arctic sea ice. The more the ice melts, the more sunshine is absorbed by the sea, and the more the Arctic warms. And as the Arctic warms, the release of billions of tonnes of methane – a greenhouse gas 70 times stronger than carbon dioxide over 20 years – captured under melting permafrost is already under way. To see how far this process could go, look 55.5m years to the Palaeocene-Eocene Thermal Maximum, when a global temperature increase of 6C coincided with the release of about 5,000 gigatonnes of carbon into the atmosphere, both as CO2 and as methane from bogs and seabed sediments. Lush subtropical forests grew in polar regions, and sea levels rose to 100m higher than today. It appears that an initial warming pulse triggered other warming processes. Many scientists warn that this historical event may be analogous to the present: the warming caused by human emissions could propel us towards a similar hothouse Earth.

### SPS solves warming entirely, it’s comparatively better than all other solutions.

NSS ’11, National Space Society June 3, 2011, “Space Solar Power: Limitless clean energy from space”, http://www.nss.org/settlement/ssp/)

The United States and the world need to find new sources of clean energy. Space Solar Power gathers energy from sunlight in space and transmits it wirelessly to Earth. Space solar power can solve our energy and greenhouse gas emissions problems. Not just help, not just take a step in the right direction, but solve. Space solar power can provide large quantities of energy to each and every person on Earth with very little environmental impact. The solar energy available in space is literally billions of times greater than we use today. The lifetime of the sun is an estimated 4-5 billion years, making space solar power a truly long-term energy solution. As Earth receives only one part in 2.3 billion of the Sun's output, space solar power is by far the largest potential energy source available, dwarfing all others combined. Solar energy is routinely used on nearly all spacecraft today. This technology on a larger scale, combined with already demonstrated wireless power transmission (see 2-minute video of demo), can supply nearly all the electrical needs of our planet.

**Contention 2: Hegemony**

Energy Crisis will lead to a loss of US HEG

Mahan, author for Citizens for Space Based Solar Power, 2012

(Rob Mahan, <http://c-sbsp.org/sbsp-faq/#01>, Last Modified 06/24/2011, as)

I can remember when gasoline was about 25 cents a gallon in the 1960′s. Today it is often over $3.00 a gallon and crude oil is $100 a barrel. In 1960, the U.S. population was about 180 million and today it is nearly 310 million. There have been several energy crises (increased price or decreased supply) in the U.S. since the 1960′s. The 1973 oil crisis was caused by an OPEC oil export embargo and the 1979 energy crisis was caused by an Iranian revolution. Again in 1990, a spike in the price of oil was caused by the Gulf War. During 2000-2001, a California electricity crisis was caused by failed government deregulation coupled with several instances of business corruption. **The most recent oil price increases of 2004-2007 have been caused by increasing demand from the U.S and China, the falling state of the U.S. dollar and stagnation of production due to the war in Iraq.**

**Energy crises of the future will** likely **be** more **severe. Energy scarcity will give rise to even more international conflicts in the future. As world population grows, the laws of supply and demand will eventually break when the demand for natural resources exceeds the total capacity of the planet to sustainably supply them**. World population is projected to rise from today’s 6.6 billion to 9.2 billion by 2050. (United Nations Population Division, 2007). **Abundant, affordable energy is required to sustain our most basic needs for clean air, clean water and a safe food supply**.

President Bush, in the 2006 State of the Union Address said, “America is addicted to oil.” The U.S. currently imports between 50% – 60% of the crude oil we use and we pay between $400 and $500 billion per year for that imported crude oil. This makes us dependent on many who are not necessarily our friends. Threats of price increases or limitations of supply and come from energy cartels (OPEC) or energy superpowers (Iran, Venezuala, etc.). Carbon emission price increases, penalties and pressure to reduce emissions can come from international bodie like the United Nations and its Intergovermental Panel on Climate Change (IPCC). The Kyoto Protocol (reduction of greenhouse gas emissions) would put significant financial penalties on the U.S. for failing to meet the requirements of the treaty. Our reliance on foreign energy gives others a lever (or a stick) to use against us. Energy independence will give us many more political options when dealing with these external forces.

Space-based solar power addresses many of the issues related to energy independence. Nearly every source of energy we use today can be traced back to the Sun, which is a huge nuclear (hydrogen fusion) furnace. Space-based solar power is a potentially unlimited source of clean energy and it could eventually supply all of our country’s needs. Instead of importing vast amounts of fossil fuels, the U.S. could become a major exporter of energy & technology.

America can use the platform of energy to once again set an example of what being a good citizen-nation of the world is all about. Bill Richardson, governor of New Mexico and former Secretary of Energy (1997-2001), has published his vision for our energy future in a book titled “Leading by Example”. He offers the warning “America is just one crisis away from an energy emergency that will completely disrupt daily life, sharply increase energy prices, and perhaps even lead to military intervention in the world energy markets.” And he also offers hope for our energy future when he states “The American people are full of optimism and ingenuity. The people of the world want to believe that we are responsible and compassionate, that we are committed to freedom and basic fights, and that we want to participate constructively in world affairs. Visionary leadership, and visonary action to implement a new role for the United States, will turn the situation around quickly, and America will find itself surrounded by friends and allies once again.”>

US must lead SBSP development or lose leadership

Mahan, author for Citizens for Space Based Solar Power, 12

(Rob Mahan, <http://c-sbsp.org/sbsp-faq/#01>, Last Modified 06/24/2011, as)

The U.S. Government must take a lead role in creating an environment that will enable the development of space-based solar power. Congress must organize a public – private effort because existing agencies, such as the U.S. House Committee on Science & Technology, the Department of Energy, the Advanced Research Projects Agency – Energy, the Pentagon’s National Security Space Office and NASA, are not set up for the large scale manufacturing that will be required.

The U.S. private sector will be key in the development of space-based solar power, and there is much precedent for Congress to foster just that kind of private sector development. The 1984 Commerical Space Launch Act was signed by President Reagan and the 1990 Launch Services Purchase Act was signed by President Bush. These Acts resulted in the private partnership, the United Launch Alliance (ULA), which places most U.S. payloads in orbit today. Arianespace, another private company, is similarly responsible for most European payloads. Commercial Orbital Transportation Services (COTS), such as Space Exploration Technologies (SpaceX) and Rocketplane Kistler (RpK) are already competing for U.S. orbital services contracts. Virgin Galactic, owned and operated by Sir Richard Branson and Burt Rutan, are already making inroads in space tourism.

**Heg is key to the economy**

Mandelbaum, Director & Professor of American Foreign Policy Program @ Johns Hopkins University, 20**05**

(Michael The Case for Goliath, its an actual book)

It is satisfying because if the strings that manipulate events the world over lead back to Washington and New York, then the world may be seen as intelligible, coherent, and rational, if not benign. It is plausible because, as by far the most powerful member of the system of sovereign states, the United States surely does exercise considerable influence. Globalization—the spread around the world of cross-border economic transactions—is not an American invention, nor does the United States control the trade and investment that enriches some, harms others, and alters the daily routines of tens of millions; but American-based firms certainly do conduct a large part of the world's trade and investment, American economic policies do affect conditions in the rest of the world and the system of global market relations within which these often disruptive transactions take places does rest on the military might and the economic strength of the international system's most powerful member.

**Economic decline causes global nuclear war.**

Mead, Henry A. Kissinger senior fellow for U.S. foreign policy at the Council on Foreign Relations, **2009**

[ Walter Russell ,” 2/4/2009 The New Republic, “Only Makes You Stronger,” <http://www.tnr.com/politics/story.html?id=571cbbb9-2887-4d81-8542-92e83915f5f8&p=2>, ]

So far, such half-hearted experiments not only have failed to work; they have left the societies that have tried them in a progressively worse position, farther behind the front-runners as time goes by. Argentina has lost ground to Chile; Russian development has fallen farther behind that of the Baltic states and Central Europe. Frequently, the crisis has weakened the power of the merchants, industrialists, financiers, and professionals who want to develop a liberal capitalist society integrated into the world. Crisis can also strengthen the hand of religious extremists, populist radicals, or authoritarian traditionalists who are determined to resist liberal capitalist society for a variety of reasons. Meanwhile, the companies and banks based in these societies are often less established and more vulnerable to the consequences of a financial crisis than more established firms in wealthier societies. As a result, developing countries and countries where capitalism has relatively recent and shallow roots tend to suffer greater economic and political damage when crisis strikes--as, inevitably, it does. And, consequently, financial crises often reinforce rather than challenge the global distribution of power and wealth. This may be happening yet again. None of which means that we can just sit back and enjoy the recession. History may suggest that financial crises actually help capitalist great powers maintain their leads--but it has other, less reassuring messages as well. If financial crises have been a normal part of life during the 300-year rise of the liberal capitalist system under the Anglophone powers, so has war. The wars of the League of Augsburg and the Spanish Succession; the Seven Years War; the American Revolution; the Napoleonic Wars; the two World Wars; the cold war: The list of wars is almost as long as the list of financial crises. Bad economic times can breed wars. Europe was a pretty peaceful place in 1928, but the Depression poisoned German public opinion and helped bring Adolf Hitler to power. If the current crisis turns into a depression, what rough beasts might start slouching toward Moscow, Karachi, Beijing, or New Delhi to be born? The United States may not, yet, decline, but, if we can't get the world economy back on track, we may still have to fight.

**.**

**Contention : Solvency**

## SBSP Cheap

### **The projected costs of SBSP would be about 5 billion dollars, or about the same as that of a nuclear power plant; technological advances will make them cheaper.**

Mardon 12 June 2011- Austin Mardon received an honourary doctorate of laws from the University of Alberta on Friday. He is a member of the Order of Canada and is a full member of the International Academy of Astronautics (Austin Mardon, “Solar Satellites Key to Green Energy”, Edmonton Journal, http://www.edmontonjournal.com/technology/Solar+satellites+green+energy/4933251/story.html)

With gas prices on the rise, the race is on for cheap alternative fuel sources, including solar power, but amid a wash of criticism, the solar industry may not even be in the running. The major criticisms against solarpower facilities, such as wind farms, are unreliability and inefficiency. Solar power depends on environmental factors beyond human control and that makes investors anxious. These facilities also require areas with high amounts of sunlight, usually hundreds if not thousands of acres of valuable farmland and all for relatively little power production. This is why, in the 1960s, scientists proposed solar-powered satellites (SPSs). SPSs have about the most favourable conditions imaginable for solar energy production, short of a platform on the sun. Earth's orbit sees 144 per cent of the maximum solar energy found on the planet's surface and takes up next to no space in comparison to land-based facilities. Satellites would be able to gather energy 24 hours a day, rather than the tenuous 12-hour maximum that land-based plants have, and direct the transmitted energy to different locations, depending on where power was needed most. So, with so many points in its favour, why hasn't anyone built one yet? Obviously, putting anything into outer space takes a lot of money. Many governments claim there simply isn't any money in the budget for launching satellites into space, but in 2010, amid an economic crisis, the United States managed to find $426 million for nuclear fusion research and $18.7 billion for NASA, a five-per-cent increase from 2009. The most recent projections, made in the 1980s, put the cost of launching an SPS at $4 billion, or around 8-10 cents/ kWh. Nuclear power plants cost a minimum of $3 billion to $6 billion, not including cost overruns, which can make a plant cost as much as $15 billion. In the U.S., nuclear power costs about 4.9 cents/kWh, making SPS power supply only slightly more expensive. But these estimates are over two decades old and the numbers likely need to be re-examined. The idea for space-based solar energy has been around since the '60s; given the technological advancements since then, surely governments would have invested in making an SPS power supply more budget-friendly. That is not the case. Governments and investors are rarely willing to devote funding to something that doesn't have quick cash returns. The projected cost of launching these satellites once ranged from $11 billion to $320 billion. These figures have been adjusted for inflation, but the original estimates were made back in the 1970s, when solar technology was in its infancy, and may have since become grossly inaccurate. How long an SPS would survive in orbit is anybody's guess, given the maintenance due to possible damage to solar panels from solar winds and radiation. As for adding to the ever-expanding satellite graveyard in Earth's orbit, most solutions to satellite pollution remain theoretical. Still, these satellites should not be so largely dismissed. There is a significant design flaw keeping these satellites from production. One of the major shortfalls in the design of SPSs is simply in getting the power from point A to point B. This remains the most controversial aspect of SPSs: the use of microwaves to transmit power from high orbit to the ground. Critics often cite the dangers of microwave radiation to humans and wildlife, however, the strength of the radiation from these beams would be equal to the leakage from a standard microwave oven, which is only slightly more than a cellphone. A NASA report from 1980 reveals that the major concern with solarpowered satellites was problems with the amplifier on the satellite itself. Several workable solutions were proposed in that same report. The report also recommended that NASA develop and invest in SPS technology, so that by the 2000s, these satellites would be a viable alternative fuel source. This recommendation was ignored. We should already have the technology and the infrastructure in place for green energy, but we don't. Instead, we are engaged in a mad dash for the quickest, cheapest alternative to oil and that may be the source of our downfall. For the sake of the future, expediency must take a back seat to longevity and longevity may just be found in outer space.

**The technology does exists now - similar to communication satellites just needs more investment**

**Goldenberg, US environment correspondent, 09**

(Suzanne Goldenberg, April 16, 2009, <http://www.guardian.co.uk/environment/2009/apr/16/solar-energy-farms-space>, JP)

<Solaren has released relatively few details about the project. But Solaren's CEO, Gary Spirnak, said the company, a group of about 10 former satellite and aerospace engineers, was confident in the technology and timing behind the venture. He argued that the science behind the orbiting solar farms was little different to that of communications satellites. "This is the exact same thing that satellites do every day. The basic technology is there," said Spirnak. "The bottom line is that this is not really a technology issue.">

**Solvency: Solar energy is the most efficient energy source**

**Hsu, Systems Engineering & Risk Management, 10**

(Dr. Feng Hsu, “Harnessing the Sun”, Winter 2010, <http://spacejournal.ohio.edu/issue16/hsu.html>, KJ)

<Learning how to harness our sun for solutions to our energy problems will not be unlike our ancestors harnessing the wild fire. I believe it will lead to an inevitable leapfrog in the process of human evolution. Bill Michael, a University of Chicago professor, wrote "Use of fire illustrates that human evolution is a gradual process; modern humans did not emerge overnight in a 'big bang' of development, but rather slowly adapted from their primitive origins. The use of fire by humans throughout time to overcome environmental forces is a fundamental and defining aspect of human nature."[3]

Before we reach that tipping point of negative sustainability, there is still time for humankind to tame the natural forces of the sun and harness it for the well-being and survival of our species. The best place, of course, for a nuclear fusion reactor is about 149E6 km (149 x 106 km) away. This one happens to be free of charge and we can count on it being around for a long time. The sun's energy only takes 8 minutes to arrive on earth and leaves no radioactive waste (and it is terrorist proof). Our sun puts out about 3.8E11TWh of energy per hour. Our planet receives about 174,000 terawatt each second. Every minute, earth's surface gets more solar power than we human beings can use in a whole year.

We must learn how to bypass the solar-to-fossil inefficiency. About 4.6 billion years ago, the earth was just formed, and it was 3.5 billion years ago that there was the first sign of life. Not until 1.5 billion years ago was there multicell biology; real life started just about 500 million years ago. The dinosaur lived about 150 million years ago and went extinct. Human beings have lived maybe a few hundred thousand years. You can see that it took about 3.5 billion years and rare geologic events to sequester hydrocarbons and build up hydrogen in the atmosphere. If you do a little calculation, you will find that using direct solar energy is about 1,200,000,000,000 times more efficient than using a secondary solar energy, such as oil. Why not go directly to the well of the sun?>

**SSP efficient sustainable energy source solves for energy demands and greenhouse gas emissions**

**National Space Society**, 20**07** (“Space Solar Power: An Investment for Today – An Energy Solution for Tomorrow”, October 2007. Accessed on June 22, 2011. NP)

The United States and the rest of the world need to find alternative sources of energy besides fossil fuels. The National Space Society believes that one of the most important long-term solutions for meeting those energy needs is Space Solar Power (SSP), which gathers energy from sunlight in space and sends it to Earth. We believe that SSP can solve our energy and greenhouse gas emissions problems. Not just help, not just take a step in the right direction; solve. SSP can provide large quantities of energy to each and every person on Earth with very little environmental impact. The NSS recommends that SSP be considered along with ground-based solar collectors and wind turbines as a safe, renewable, and clean energy option. Solar energy is routinely used on spacecraft today, and the solar energy available in space is literally billions of times greater than we use today. The lifetime of the sun is an estimated 4 to 5 billion years, making SSP a truly long-term energy solution. Space solar power can have an extremely small environmental footprint, perhaps competitive with ground-solar and wind, because with sufficient investments in space infrastructure, the SSP can be built from materials from space with *zero* terrestrial environmental impact. Only energy receivers need be built on Earth. As Earth receives only one part in 2.3 billion of the sun's output, SSP is by far the largest potential energy source available, dwarfing all others combined. Development cost and time, of course, are considerable. This makes SSP a long-term solution rather than a short-term stop-gap, although there are some intriguing near-term possibilities. In any case, SSP can potentially supply all the electrical needs of our planet.