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Below is a summary of reactions to the 2011 International Academy of Astronautics (IAA) study “The First International Assessment of Space Solar Power: Opportunities, Issues and Potential Pathways Forward” from environmentalists, scientists, aerospace engineers, and advocates in the space and clean energy movements:

Contrary to the Department of Energy's bleak forecast that solar energy, in 2035, will provide only 0.6% of our energy needs; Our God-given nuclear fusion reactor, our Sun, can do far more with no fuel and no maintenance. To gain a much larger fraction, we must simply place our solar arrays where the sun shines brighter and much longer each day - in space.

Hubert Davis, NASA Vehicle Manager of three successful lunar landing vehicles (Lunar Modules) for the Apollo Program, including LM-5, Eagle, the first to land, and former manager of future programs at the NASA Johnson Space Center in Houston

The long view for Space-Based Solar Power is to develop it into a global wireless power transfer system using the concepts Nikola Tesla demonstrated even before the turn of the 20th Century. With investments made now, at the turn of the 22nd Century a system of SBSP Satellites on orbit will broadcast safe, clean, electrical energy directly to all devices, vehicles, homes, and businesses on the planet--wirelessly. No wars for energy, plenty of power for desalination, a cleaner environment, fair resource sharing on the planet, and a thriving space economic sector. Isn't this what government and industry should be working for?

M.V. "Coyote" SMITH, Colonel, USAF (PhD)

- Director, Center for Strategy and Technology (Project Blue Horizons)***
- Director, Air Force Space and Cyber Strategy Center (Spartans and Cyberians)***
- Professor of Strategic Space Studies, School of Advanced Air and Space Studies (SAASS)***



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I agree strongly with the conclusion of this report that energy from space is a major, solid source of future energy, which should receive just as much attention and support as solar farms and wind power (the other two technologies well proven to be able to meet all our electricity needs in principle). I am especially excited by the hope that energy from space and solar farms could both provide electricity at 10 cents per kWh, at different times of day, fitting the time profile of when we need electricity, and making it possible for the whole world to meet all its electricity needs from renewable energy without paying much more and without making wrenching changes in the power grid. We will need many new directions, international collaboration, and focused low-risk research to make this real."

Dr. Paul J. Werbos, Program Director for Energy, Power and Adaptive Systems at National Science Foundation (Personal views, not an official agency position." Search on "JIETSSP" at www.nsf.gov for the last official NFS position on this issue.)

This study by the International Academy of Astronautics finally removes all doubt that space-based solar power (SBSP) will be a mainstream energy source in coming decades, but the report is too conservative. Estimates by the US Department of Energy indicate that meeting global demand for electricity will require more than 2,700 GWe in new generating capacity by 2035. We must meet 10%, 20% or more of this need with SBSP, since it is the only known renewable technology that can make a contribution on this scale.

Philip K. Chapman, Sc.D., the first Australian-born American astronaut; member, Citizens' Advisory Council on National Space Policy; Chairman, Solar High Study Group



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Without any doubt the components technology for space solar power as well as various system concepts have been developed and tested successfully. The next logical steps are the validation of power transmission from space to ground, and power storage at a continuously increasing level to validate the economical analysis and create financial, technical, social, environmental, and political support across the globe. The industrial countries of the world cannot and should not miss this opportunity to meet their energy demand safely while creating financial and job growth.

Dr. Neville I. Marzwell, NASA-JPL Advanced Concepts and Technology Innovation Manager (retired), CEO Marzwell Strategic Technology Consulting

Clean energy is the future, and solar photovoltaics is a mature technology and industry. However, the US is badly lagging in this nationally vital energy industry. The US is finding it very hard to supercede the century-old, highly entrenched fossil fuel industry that is wreaking havoc both to the global economy as well as adversely contributing to our primary biosphere mechanics.

The ISS has been the demonstration platform for solar photovoltaics for over a decade and could now become the pioneer testbed for SBSP. We must do this ASAP and bring the world in along with us using the ISS model. A concept for such a demonstration employing both government and private enterprise is in Part 2 section 8 of this USC Astronautical Engineering team project.

http://denecs.usc.edu/hosted/ASTE/527_20111/thangavelu-girardey@cox.net

Space Based Solar Power is certainly an idea that deserves a serious evaluation. This may seem like a wild idea but no wilder than the thought of a Boeing 707 in the 1920s.

Bruce Pittman, Chairman, American Institute of Aeronautics and Astronautics Commercial Space Group



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We at Jantrix, a new project by Xyanni India, are truly impressed by the hope being crystallised by the new IAA report. To convert this hope into clearer expectation, every support should be provided by all stakeholders to carry the momentum forward. Here at Jantrix we think we have the best solutions to bring together the Indian strengths in shaping the expectations and enabling deliverence on technological and commercial levels, from India.

Tarun Kumar, Chief Executive, Xyanni India

Without producing GHGs or nuclear waste, SPS can supply the world's electricity needs forever, eventually manage base load electricity on a global basis, and increase the prospects for peace.

Jerome C. Glenn, CEO, The Millennium Project

Like food, water, and shelter, we now need to civilize our energy supplies by making them reliable and sustainable. Space solar power, along with algae biofuel, provide the only two civilized solutions now ready for engineering development and demonstration that would not require excessive land use.

Mike Snead, Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA), President, Spacefaring Institute LLC.



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The findings that a demonstration project could begin now with existing launch vehicles, and that SBSP could be commercially viable within 20 years, are extremely encouraging. This scientific assessment puts SBSP deeper into the realm of "Why not?" The scholars of Kepler Space Institute who study this important energy source recommend serious U.S. Administration and NASA attention to this report. It has long-term positive benefits for the United States and for Earth's global energy needs.

Walter Putnam, Director of Media Communications, Kepler Space Institute

The IAA study shows that SBSP has huge rectennas, huge beamed power transmission distances and huge GEO spacecraft requiring huge boosters, but the huge system promises huge payoffs in jobs, technology advances and energy independence, and this technology pointed away from the Earth can pave the way to beamed power propulsion to the other stars.

More Power TO Us,

***Richard M. Dickinson, President OFF EARTH-WPT, Wireless Power Transmission
2613 Seapine Lane, La Crescenta, CA 91214***

SBSP is not desirable, it is essential. No other source of safe energy can supply the increased demand for energy which the modernization of China and India guarantees. No other new source of energy of any kind can meet the world's increasing energy demand without adding to the disaster of climate change. We owe it to the future of our planet to make SBSP a reality sooner, rather than later.

Mark I. Wallach, Attorney At Law



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The IAA paper has it right. SBSP could be a strategic tool to focus the world, in a truly international project, that would boost the whole economy. SBSP could be a vehicle for avoiding international energy and water conflicts. SBSP could provide world energy requirements forever. However I believe that PowerSat has a different approach to the structure of the orbiting elements. We propose a constellation of satellites which can be added to as required to increase power output. PowerSat will use the eMdrive to keep individual satellites on station and synchronised with each other. This means that heavy lift launch vehicles will not be required nor will assembly in in space be needed.

Paul Young, PowerSat www.powersat.com

The countries and companies that follow the IAA space solar power (SSP) study's lead and successfully develop SSP will be in a position to dominate not only terrestrial energy markets but also the vast untapped resources of space. Why? Because the energy market is huge, so the first profitable SSP satellite will be followed by hundreds, if not thousands, more. This vast in-space infrastructure will confer enormous advantage to those who create it.

*Al Globus, Senior Research Associate
San Jose State University*

Space based Solar Power has the potential to solve our long-term energy needs and to do it with a non-polluting source. The high cost of lifting all material directly from Earth to space might make this approach too costly, at least for the near future. However, using material from the moons of Mars as an in-situ source of propellant and material to make structures and solar cells, could potentially cut the cost considerably and make the process practical.

Leonard Weinstein, ScD, National Institute of Aerospace



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Humans have been capable of profound achievements as huge as the Manhattan and Apollo projects. We can certainly succeed in taming the mighty power of our star, whether harnessing the Sun from the earth's surface or from space, humans must achieve our next leap forward to elevate our species from a combustion world economy into a permanently sustainable solar-electric civilization. Together we can make it happen (by achieving key technologies such as RLVs as well as safe and highly efficient WPT approaches etc.). But it won't happen if we fail to educate and mobilize the politicians and decision-makers around the globe!

***Dr. Feng Hsu, Sr. VP, Systems Engineering & Risk Management
The Space Energy Group, Former Sr. Engineer & Head of Risk Management, NASA GSFC***

As the IAA study indicates, power satellites are not conceptually difficult. They would have been in place decades ago and supplying much of earth's energy needs except that the cost to lift parts to GEO is around 200 times too high. Fortunately, ways to reduce the lift cost by this amount have recently become possible due to the unrelated development of industrial lasers and gyrotrons. This is being taken seriously. NASA Ames has purchased a \$2 M gyrotron able to test beamed energy propulsion hydrogen heaters to 10 MW/m².

Keith Henson, Founder, L5 Society

Spaced-Based Solar Power has widely been acknowledged by governments, futurists and industry experts to be an inevitable technology. As demonstrated in recent reports, the key requirement is simply a decisive will and coordination to mobilise the resources necessary to make SBSP a reality and make the game-changing leap to a sustainable energy future. The alarming fact is that we are now at a tipping point where we no longer have the luxury of time to debate when that happens.

***Peter Sage, Principal & Co Founder, Director of Global Marketing and Communications
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I found the recommendations of the IAA Study to be absolutely on the dot. There is a lot of interest around the world in space-based solar power (SBSP). The cost of developing SBSP has been often cited as an issue, but the cost-benefit analysis needs to be done on a different scale, including the direct and indirect cost of global warming and climate change. While technological feasibility studies are important aspects of recognizing the SBSP dream, it is also important to kick-start a debate among the larger public as well as among the political leadership. In Delhi, ORF is engaged with the Washington-based National Space Society (NSS) in this regard and has plans to conduct a workshop sometime in 2012, precisely with this objective in mind.

Dr. Rajeswari Pillai Rajagopalan, Senior Fellow, Observer Research Foundation, New Delhi

We run on energy like Rome ran on slavery. But we've hit an economic, energy and environmental wall. Space-based solar power is a technologically ready path over the wall to sustainable high tech civilization on Earth; an ideologically cross-cutting approach encompassing the military-industrial complex and Occupy Wall Street. It can create real jobs, both near- and long-term in orbital light and power industries of the 21st century much as the NASA's Apollo Program industrialized the South to produce high tech cars and aircraft today. And of course SBSP offers a unique challenge to the US in the spirit of Steve Jobs and Silicon Valley: "Don't tell us the sky's the limit when our footprints are on the Moon."

Marty Hoffert, Professor Emeritus of Physics, New York University



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Humanity faces an increasingly severe energy shortfall over the coming decades. We note continued worldwide hesitancy in uptake of nuclear power, especially following the Fukushima Dai-ichi accident. There are constraints on further development of oil output. Coal-fired power cannot expand indefinitely due to pollution control requirements. Nuclear fusion remains a distant dream. But satellite solar power stations (SSPS), or space-based solar power (SBSP) is increasingly seen as potentially a truly limitless power source for the indefinite future, capable in principle of supplying energy at first-world levels for the entire planet. This concept is so staggering, such a paradigm shift, that it behooves us to test its feasibility, by means of flying a test or demonstration article. I commend the recent IAA technical evaluation of SBSP for your detailed attention.

Humanity is running short of energy; space solar power has been judged highly promising; therefore flight trials should be funded (urgently).

Mark Sonter, Radiation Advice & Solutions Pty Ltd, Asteroid Enterprises Pty Ltd

Now that the technical feasibility, commercial potential and environmental acceptability of solar power satellites are better understood, every country on Earth will be looking to space for its next-generation electrical power. If you want to know more, click on National Space Society's Space Solar Power Library; Space Journal's Issue No.16: Solar Power Satellites, Issue No.17: Visualizing Space Solar Power and Issue No.18: SunSat Design Competition.

Don Flournoy, Prof. of Telecommunications; Editor, Online Journal of Space Communication; Scripps College of Communication, Ohio Center of Excellence; Ohio University, Athens Ohio 45701, spacejournal.org.

Don Flournoy's Layman's Guide To Solar Power Satellites is being released by Springer Science and Business Media, Nov. 30, 2011.



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We have the technology today to do substantial technical demonstrations of the viability of space solar power. The implementation of technical solutions that exist today toward the goal of a space solar power system would do much to empower the continuing dominance of the American aerospace enterprise. The actual demonstration of the systems required to do such demonstrations would also have a positive impact on public morale and help to dispel the idea of a nation in decline.

Dennis Wingo, CEO Skycorp Incorporated

I was the Boeing Solar Power Satellite Program Manager under contract to DOE/NASA for the Solar Power Satellite Definition Studies 1977-1980. The study clearly indicated the system was technically feasible and had the potential to provide clean, economical energy to all the nations on earth. I wrote two advocacy books on the subject, SUN POWER (1995) and ENERGY CRISIS (Apogee Books 2009). Subsequent studies have shown that SBSP is the only system that can meet future world energy needs.

Mr. Ralph H. Nansen, President of Solar Space Industries

Excellent reference on the need for synergy between nations and between terrestrial and space power industries. The roadmap with near-term small pilot plants and the crucial role of RLVs in the scale-up phase fit very well with our Space Power Grid plans to progressively reduce size, increase specific power and integrate with retail power delivery.

Narayanan Komerath Professor, Daniel Guggenheim School of Aerospace Engineering, Georgia Institute of Technology



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I wholeheartedly endorse the AIAA Study on Space Based Solar Power. SBSP offers the best opportunity for producing the Canadian Oil Sands in an environmentally sensitive fashion.

Joe Burris, Chairman, Heliosat, Inc.

I have reviewed the International Academy of Astronautics Position Paper "Space Solar Power -- The First International Assessment of Space Solar Power: Opportunities, Issues and Potential Pathways Forward". This position paper is a marvelous summary of the technical, economic, and political issues associated with Space Based Solar Power. I fully endorse the results, findings and recommendations offered in this position paper. In particular, I agree with the conclusion that Space Based Solar Power is technically feasible and could be ready for large scale implementation within 20 years, and I enthusiastically support the recommendation that international governments and commercial organizations should collaborate on a series of ground and flight demonstrations to reduce the technical and financial risks that currently hinder this game changing technology.

Bill Rothschild

The IAA report lays out the case quite clearly. Space Solar Power is one of the potential key elements in meeting the growing and evolving electrical energy demand of the United States and the world. Space Solar Power is not a panacea, nor is it engineering fantasy. Space Solar Power is a complex systems engineering and economics problem that entails learning how to build the most valuable system(s) and when to do so in order to best meet electrical energy needs. Space Solar Power is an option we can make real and in doing so help provide for a positive future for humanity.

Gary P. Barnhard, President & lead Robotic/Space/Computer Systems Engineer Barnhard Associates, LLC



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The Texas Space Alliance (TXA) endorses the Space-Based Solar Power concept as a potential source of clean, renewable energy in the quantities demanded by a growing technological civilization, and as a potential new industry for the state of Texas to produce the hardware and launch vehicles required.

Inevitably and sooner than many might think we will have to reach out into space to collect the energy of the sun. It is essentially infinite, it is clean, and it is easy to convert into electricity using methods we know and understand. It is neither magical nor mythical and is simply waiting for us to go out and get it. One does not have to believe in climate change or the greenhouse effect to understand that capturing the light of the sun and converting it to usable power is a better solution to our energy needs than ripping giant holes in the ground and filling the skies with smoke.

Continued study, experimentation, and orbital demonstration projects as recommended by the IAA study on Space Solar Power, as well as the Solar High Study Group and the National Security Space Office Interim Report on SBSP are all vital to determine the true viability of this concept, which would also serve as a driving force for new reusable heavy-lift launch capabilities.

Bob Lancaster, Executive Director, Texas Space Alliance, texasspacealliance.org



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Space Energy's mission and core focus is to provide our planet with clean renewable energy, in harnessing the limitless power of the sun - the most sustainable provider of the earth's required energy. This can and will be achieved well within the next 20 years through the commercial application of Space-Based Solar Power, as suggested by the International Academy of Astronautics (IAA) 3-Year, 10 Nation technical evaluation report of Space-Based Solar Power. World Leaders, both from government and private enterprise, are in desperate need of this solution - base-load, regional, captive, and emergency electrical power from Space will act as an equalizer between nations, minimizing the increasingly devastating effects of resource-based conflict on global economy and society. Global energy consumers require Space Based Solar Power as a critical component of a sustainable future; it is the foundation of an abundant supply of clean and renewable kilowatt-hours (kWh) of electricity efficiently captured with cutting edge PV technology, sent through wireless power transmission to ground based receivers. As the IAA study suggests, the demonstration of this technology is within the world's grasp with existing launch vehicles.

For the first time in history Space Base Solar Power is possible at affordable market prices, and the world is taking notice – it will reduce carbon emissions connected to power generation, will allow rural and poverty stricken areas to safely receive electricity for the first time, and will allow millions of people to benefit from clean water through SBSP based desalinations.

Stephan Tennsel, CEO & Chairman of Space Energy AG



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Look, let's get serious. America needs a future. Solar energy from space *is* the future. We've been harvesting solar energy in space and radio-waving it to earth since 1962. It's the basis of a quarter of a trillion dollar industry—the commercial satellite business. Solar energy harvested in space not only pays for itself, it makes a profit. Now it's time to scale it up. Big time.

Harvesting solar power in space is more than an answer to an energy crisis. It is more than the economic thrust that will end our debts and bring us a balance of payments surplus. It is more than a source of net exports and of next generation technologies. It is more than a source of new jobs. And it is more than an ender of energy wars.

Solar power from space is an answer to a civilization crisis. It is a confidence booster and a lifter of eyes to the skies. It is the economic base that will take America's values—tolerance, liberty, and freedom of speech—into the 22nd century.

Solar power from space is even more than what China sees it to be. Says China, the nation that harvests solar power in space will lead the next century. What is solar power from space in the big picture? The really big picture? Life thrives by finding new horizons. It is the human obligation to take life beyond the skies. To give life new niches in which to thrive. Harvesting solar energy in space is just step one of Nature's destiny—to green the universe. To garden the cosmos. To give Nature the new horizons toward which it strives.

Howard Bloom, Founder, Space Development Steering Committee; author of *The Lucifer Principle: A Scientific Expedition Into the Forces of History*, *Global Brain: The Evolution of Mass Mind From The Big Bang to the 21st Century* and *The Genius of the Beast: A Radical Re-Vision of Capitalism*.