Space Solar Power Workshop Abstracts for WiSEE, Baltimore, November 8-9

Session 3 (Nov. 09 Morning): International, Education 8:30 am – 12:00 pm

1. Building SSP Expertise into the Next Generation of Engineers Through Competitive Projects

Gregory Durgin, Associate Professor, Georgia Tech, Atlanta, GA.
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Research areas include microwave energy harvesting and space systems. I chair the Microwave Power Transfer Workshop at Georgia Tech. I also teach numerous SSP-related courses at Georgia Tech including Microwave Design Lab, Antenna Engineering, and Satellite Communication Systems

ABSTRACT
This talk presents the results of a large, semester-long project at Georgia Tech requiring student teams to design original space solar power systems – a technology mostly associated with Japanese science and engineering. The project results are archived online and surveyed in this article. As a result of participation, over 68% of surveyed student participants developed increased interest in the fields of RF engineering and electromagnetics (notoriously difficult but necessary areas in which to foment student interest); over a third of the surveyed participants expressed a desire to study space solar power beyond the course.

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Martin Leitgab, Postdoctoral Researcher, Physics, University of Illinois at Urbana-Champaign, Martin.Leitgab@gmail.com

ABSTRACT
A new and innovative design for scaleable space solar power systems based on free-flying reflectors and module self-assembly is presented. Lower system cost of utility-scale space solar power is achieved by design independence of yet-to-be-built in-space assembly or transportation infrastructure. Using current and expected near-term technology, this contribution describes a design for mid-term utility-scale power plants in geosynchronous orbits. High-level economic considerations in the context of current and expected future launch costs are given as well.

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3. A Long-Term Vision for a Space Electric Utility Provider

Corey Bergsrud, Grad Student, Electrical Engineering, University of North Dakota, corey.bergsrud@my.und.edu

ABSTRACT
This paper discusses how several space solar power (SSP) design projects underway at the University of North Dakota synergistically combine to provide a robust power solution for remote locations on Earth, designated lunar areas and spacecraft in Earth orbit or Earth-Moon transfer. A flexible ‘smart space grid’ is proposed which will allow power to be delivered on-demand to spacecraft and Earth-based users. Based on customer needs, the SSP provider spacecraft could switch targets, servicing multiple craft in multiple orbital locations and multiple ground receiving sites during a single orbit. In a lunar environment, SSP can be used to supply power to lunar industry, explorers and craft in lunar orbit. Furthermore, SSP can be used in the Earth-Moon transportation systems to supply cargo and human carrying in-route. The combination of the three separate systems (Earth-orbiting, lunar-orbiting and Earth-Moon transfer) allows a seamless user experience with a constant (and pre-defined via a service level agreement) supply of power. The need for this type of system is considered, relative to other prospective solutions and proposed system benefits is discussed. The relationships between the divergent entities in the three markets (Earth-orbiting, lunar-orbiting and Earth-Moon transfer) are considered and synergies identified. A pathway to the development of the proposed system is presented.

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4. Interagency and International Collaboration for SSP Implementation

Chris Dessert, student, University of Texas at Austin, 26 Santa Monica Circle, Wylie, TX 75098  cdessert1995@gmail.com

In my senior year of high school, I wrote this paper on space solar power while working with two NASA employees, Mr. Damon Landau and Mr. Brent Sherwood.

ABSTRACT
This paper proposes a plan for space solar power (SSP) project governance by US and foreign agencies and participation by industry, universities, and other non-governmental organizations. SSP research has typically focused on the technical aspects, rather than others that are equally important. NASA alone could never
implement SSP, because it lacks the expertise required. This paper begins to bridge the gap between technical aspects and these other areas. I allocate SSP project governance among agencies with relevant experience and that are responsive to a successful clean power program, and I propose project management by an internationally-represented committee. A framework for interagency collaborations is outlined detailing the motivations for cooperation for each agency, company, university, or organization, and the issues associated with collaboration on interagency and international levels.

5. SSP and International Disaster

David Dunlop, Chair International Committee, National Space Society,
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ABSTRACT
The Earth presents an unending series of disasters to humanity which affect both advanced economies as well as economically undeveloped areas. SPS is a potential mechanism to provide power to areas in which a grid has been seriously compromised or where no grid exist. Building on the Foundation of the UN SPIDER Program this potential application may provide a transparent mode of pragmatic demonstration of the practical value of a solar power satellite and one consistent with the UN COPUOS as a mechanism.