ANNOUNCEMENTS AND COMMENTARY

FPS Discussion Board Opens for Business

The FPS recently announced the opening of the Forum on Physics and Society Discussion Board at www.fpsboard.org <http://www.fpsboard.org>. The Discussion Board's purpose is to support ongoing discussions of physics and society topics as raised by members of the physics community, and in doing so to facilitate active interactions among participants on issues of mutual interest. The board can even arrange private forms on particular topics, for registered users who wish that capability, although forums will ordinarily be available to all participants

A major activity of the Discussion Board will be to organize discussions on topics of special topical interest, and the Board has opened with forums on the APS study group report on "Boost-Phase Intercept Systems for National Missile Defense," released on July 15. The Board includes a subsite with extracts from the APS report and other information. For the fall, the Board plans to add summaries, and to support ensuing discussion, of the invited talks that took place at the April FPS Awards Session, whose abstracts should now be available via the site. Finally, note that one forum on the Discussion Board is devoted to a *continuation* of topics begun in *Physics and Society*.

Anthony Nero
avnero@lbl.gov

Forum Election Results

The Forum on Physics and Society election is completed. The winners are:

Vice-Chair: Joel Primack
Secretary-Treasurer: Andrew Post-Zwicker
Forum Councilor: Bo Hammer
Members at Large: Maureen Mellody and Rob Nelson

There were over 740 votes cast, which is much higher than our usual turnout (which is around 500). The closest election was Councilor, which was decided by about 4%. The various methods of dealing with duplicate votes (drop the first, drop the second, drop them both) would not have changed anything by more than 3 votes--but in case we have a Floridian election, this should be resolved by next year. A perl script could be written to check in real time if someone has voted, but I don't have the ability to that.
Best wishes to all.

Marc.Sher
SHER@PHYSICS.WM.EDU

Energy for Society from Space

A constant underlying theme in "Physics and Society" is our future energy supply - in the July issue both book reviews and a news item on US participation in ITER reflect this theme; the April issue's letters in favor of nuclear power, a January article on nuclear power and a review on climate change, and many more relevant articles going back over the years. Even the commentary concerning the Iraq war is arguably tied to US concerns about energy supply.

Fossil fuels, bio-fuels, hydroelectric power and wind energy all derive indirectly from the most powerful energy source in our solar system - the Sun. Even our fuel for fission derives from fusion in ancient stars, as does the radioactive heating that drives geo-thermal power. Tidal power has a rather separate, but also space-based origin. Only fusion itself, still not technically or commercially viable as a power source, is independent of the stars (and Moon) above us.

But all the discussion of energy supply in recent years seems completely blinded to what, to any physicist, should be the most obvious solution of all - capturing more of the Sun's energy directly. The energy from the Sun that passes just through the region between Earth and Moon is measured in ZettaWatts - billions of TeraWatts. In fact, this option has not been completely ignored; the Department of Energy and NASA funded some studies in the late 1970's on space solar power options; that ended abruptly with some cuts in President Carter's DOE budget. But a rather minimal level of funding ($5 to $10 million/year) returned for the space solar power program at NASA under President Clinton in the late 1990's. A review by the National Research Council in 2000/2001(1) indicated the program was underfunded relative to the research needs and should be strengthened. Rather than strengthen it, all funding for the program ceased under the new administration, and the concepts for solar power from space are back in limbo (there is some very minimal research continuing outside of NASA).

A frequently recognized pre-requisite for commercially viable space solar power is less expensive commercial launch capacity. Whether built directly from Earth components or using industrial capacity installed on the Moon, the cost to first power, and the capital investment required before profitable power production, depend heavily on costs for launch from Earth. However, there is a bit of a chicken-and-egg problem here: a frequently recognized pre-requisite for reducing the cost of launch from Earth is a bigger launch market. Several commercial reusable launch vehicles were under development in the late 1990s that could have greatly reduced launch costs if the expected market for communications satellites had materialized. The failure of the Iridium system and subsequent telecommunications company financial troubles has put all those projects at least on hold. Plans for large-scale space infrastructure to capture solar power would very likely bring these low cost launchers back into play; other low cost launch options will likely also appear as materials and aerospace technology continues to improve.

There are a number of myths about space solar power that seem hard to dispel. The intuition that solar power on Earth is a better prospect than in space is false - the day/night cycle, sun angle, weathering, cloud cover, long-distance transmission, and environmental impact from covering large parts of the Earth's surface with solar cells make collection from a space platform far more efficient and environmentally friendly. The most important question is how power would be returned to Earth -directed microwave power is a simple extension of communications satellite technology, the main downside of which is the need to reserve spectrum for power transmission applications. The other downside of microwave transmission is the need for relatively large platforms for reasonable efficiency - below a critical size (for a given microwave frequency and antenna geometry), received power levels vary as the third power of the construction cost.

Compared to fusion power, and even fission reactors, solar power from space presents few challenges for physicists: it is primarily an engineering and economic problem at this point. But to anybody interested in real solutions to our energy supply problems, it should seem strange that an energy technology so close to usability has received essentially no government funding for two decades, while the still-impractical fusion gets close to $1 billion/year (between the magnetic and inertial confinement programs). The ITER project is currently estimated at $5 billion for a research reactor that will produce only thermal power (500 MW) -in contrast the 1995 "Fresh look" (2) study for space solar power found some systems with an estimated cost of $6 to $8 billion, producing 250 MW electric available for commercial sale, readily expandable to several GW and a profitable return on investment. With some further research those numbers can likely be improved upon, but the funding has again dried up.

We already have an immense fusion reactor working for us in our solar system, and stellar fusion is responsible for all our current energy choices; all we really need to do is make better use of it by tapping into it more directly.

Arthur Smith
Selden, NY
apsmith@aps.org
631-591-4072 (work)

1. "Laying the Foundation for Space Solar Power: An Assessment of NASA's Space Solar Power Investment Strategy" (2001) - National Research Council; see http://www.nap.edu/execsumm/0309075971.html
2. ."A Fresh Look at Space Solar Power: New Architectures, Concepts and Technologies", John C. Mankins, 38th International Astronautical Federation conference (1997); see http://spacefuture.com/