NASA SBIR 2005 Phase I Solicitation

S8.05 Energy Conversion and Storage for Space Applications

Lead Center: GRC

Participating Center(s): GSFC, JPL

Earth science observation missions will employ spacecraft, balloons, sounding rockets, surface assets, aircraft, and marine craft. Advanced power technologies are required for each of these platforms that address issues of size, mass, capacity, reliability, and operational costs. A vigorous effort is needed to develop energy conversion technologies that will enable the revolutionary Earth science missions. Exploiting innovative technological opportunities, developing power systems for adverse environments, and implementing system-wide techniques that promote scalability, adaptability, flexibility, and affordability are characteristics of the technological challenges to be faced and are representative of the type of developments required beyond the state-of-the-art.

The energy conversion technologies solicited include photovoltaics and thermophotovoltaic as well as related technologies such as array, concentrator, and thermal technologies. Specific areas of interest include:

- Photovoltaic cell and array technologies with significant improvements in efficiency, mass specific power, stowed volume, cost, radiation resistance, and wide operating conditions are solicited. Photovoltaic cell technologies for wide temperature operation and radiation environments are solicited;

- Potential array technologies of interest include rigid and deployable arrays, concentrators (rigid or inflatable, primary or secondary), ultra-lightweight arrays for lightweight, flexible, thin-film photovoltaic cells, and electrostatically clean spacecraft solar arrays;

- Proposals are sought addressing structural and microbatteries and rechargeable lithium-based batteries with advanced anode and cathode materials and advanced liquid and polymer electrolytes;

- Primary fuel cell systems that can function in high altitude platforms are solicited. These include primary H₂:Air systems that operate at low air pressure and H₂:O₂ systems;

- Future micro-spacecraft require distributed power sources that integrate energy conversion and storage into a hybrid structure with microelectronics devices/instruments; and

- Thermal technology areas include heat rejection, composite materials, heat pipes, pumped loop systems, packaging and deployment, including integration with the power conversion technology. Highly integrated systems are sought that combine elements of the above subsystems to show system level benefits.