NASA SBIR 2009 Phase I Solicitation

S3.05 Power Management and Storage

Lead Center: GRC

Participating Center(s): JPL

Future NASA science objectives will include missions such as Earth Orbiting, Venus, Europa, Titan and Lunar Quest. Under this subtopic, proposals are solicited to develop energy storage and power electronics to enable or enhance the capabilities of future science missions. The unique requirements for the power systems for these missions can vary greatly, with advancements in components needed above the current State of the Art (SOA) for long life, high reliability, low mass/volume, radiation tolerance, and wide temperature operation. Other subtopics which could potentially benefit from these technology developments include X1.03 Radiation Hardened/Tolerant and Low Temperature Electronics and Processors. Battery development could also be beneficial to X7.01 Advanced Space-rated Batteries which is investigating similar, but different technologies.

Energy Storage

Future science missions will require advanced primary and secondary battery systems capable of operating at temperature extremes from -100Â°C for Titan missions to 400Â°C to 500Â°C for Venus missions, and a span of -230Â°C to +120Â°C for Lunar Quest. In addition, rechargeable electrochemical battery systems that offer greater than 50,000 charge/discharge cycles (10 year operating life) for low-earth-orbiting spacecraft, 20 year life for geosynchronous (GEO) spacecraft, are desired. Advancements to battery energy storage capabilities that address one or more of the above requirements for the stated missions combined with very high specific energy (>200 Wh/kg for secondary battery systems) and energy density, along with radiation tolerance are of interest.

Power Management and Distribution (PMAD)

Advanced electrical power technologies are required for the electrical components and systems on future platforms to address the size, mass, efficiency, capacity, durability, and reliability requirements. Of importance are expected improvements in energy density, speed, efficiency, or wide-temperature operation (-125Â°C to over 450Â°C) with a number of thermal cycles. Advancements are sought for power electronic devices, components and packaging for Venus type missions with power ranges of a few watts for minimum missions up to a few hundred watts for large missions. In addition, advancements in components or architectures for application to Radioisotope Electric Propulsion (REP) PMAD systems are considered beneficial. Technologies of interest include:

- High temperature devices and components (up to 450Â°C);
- Advanced electronic packaging for thermal control and electromagnetic shielding.

Research should be conducted to demonstrate technical feasibility during Phase 1 and show a path toward a Phase 2, and when possible, deliver a demonstration unit for NASA testing at the completion of the Phase 2 contract. Phase 2 emphasis should be placed on developing and demonstrating the technology under relevant test conditions. Additionally, a path should be outlined that shows how the technology could be commercialized or further developed into science-worthy systems.

Proposals should show an understanding of one or more relevant science needs, and present a feasible plan to fully develop a technology and infuse it into a NASA program.