NASA SBIR 2018 Phase I Solicitation

S3.01 Power Generation and Conversion

Lead Center: GRC

Participating Center(s): ARC, JPL, JSC

Technology Area: TA3 Space Power and Energy Storage

Photovoltaic Energy Conversion: advances in, but not limited to, the following:

- Photovoltaic cell and blanket technologies capable of low intensity, low-temperature operation applicable to outer planetary (low solar intensity) missions.
- Photovoltaic cell, blanket and array technologies capable of enhancing solar array operation in a low-intensity, high-temperature environment (such as the Venus surface).
- Solar arrays to support Extreme Environments Solar Power type missions, including long-lived, radiation tolerant, cell and blanket technologies applicable to Jupiter missions.
- Lightweight solar array technologies applicable to science missions using solar electric propulsion.

Current missions being studied require solar arrays that provide 1 to 20 kilowatts of power at 1 AU, greater than 300 watts/kilogram specific power, operation in the range of 0.7 to 3 AU, low stowed volume, and the ability to provide operational array voltages up to 300 volts to enable direct drive electric propulsion systems for science missions.

Dynamic Power Conversion: advances in, but not limited to, the following:

- Novel Stirling, Brayton or Rankine convertors that can be integrated with one or more 250 watt-thermal General Purpose Heat Source modules to provide high thermal-to-electric efficiency (>25%), low mass, long life (>10 years), and high reliability for planetary spacecraft, landers, and rovers.
- Micro-miniature dynamic power convertors that can be integrated with one or more 1 watt-thermal Radioisotope Heater Units to provide long duration electric power for planetary smallsats and distributed instruments.
- Advanced dynamic conversion components including hot-end heat exchangers, cold-end heat exchangers, regenerators/recuperators, alternators, engine controllers, heat pipes and radiators that improve system performance, reliability and fault tolerance.

Direct Energy Conversion; advances in, but not limited to, the following: Recent advancements in alpha/beta-voltaic energy conversion devices have the potential to increase the power level, improve reliability, and increase the lifetime of this power technology.Â The development of continuous, low-power generation technology for autonomous remote sensors and other specialized applications would support NASA Science Mission goals and enhance/enable new mission capabilities.Â The area of Direct Energy Conversion seeks technology

advancements that address, but are not limited to experimental demonstration of long life (years) alpha-voltaic, beta-voltaic, and other non-solar conversion concepts with device-level conversion efficiencies in excess of 10% and the ability to scale up to 1-10 W of electrical power output with system-level specific power of 5 W/kg or higher.