



NASA SBIR 2009 Phase I Solicitation

X7.02 Surface Nuclear Power Systems

Lead Center: GRC

Participating Center(s): MSFC

NASA is interested in the development of highly advanced systems, subsystems and components for use with fission and isotopic systems to power habitats, resource production, and mobility systems on the Moon and Mars. Nuclear systems are anticipated to enable the long duration stay over the lunar night and for "global access" Mars missions. Initial planetary outpost power levels are anticipated to be between 30-50 kWe with anticipated growth to 100's kWe. Isotopic technologies that improve the utilization of a limited fuel supply and have extensibility to fission systems are sought. Performance goals include reducing overall system mass, volume and cost, and increasing safety and reliability.

Specific technology topics of interest are:

- High efficiency (>20%) power conversion at 900 K;
- Electrical power management, control and distribution (1-5 kV);
- High temperature, low mass (2) radiators, liquid metal/liquid metal and liquid metal/gas heat exchangers (>90% effectiveness) and electromagnetic pumps (>20% efficiency);
- Deployment systems/mechanisms for large radiators (~3m x 15m);
- High temperature (>900 K) materials or coatings compatible with local soil and atmospheric environments;
- Systems/technologies to mitigate planetary surface environments including dust accumulation, wind, planetary atmospheres, corrosive soils, etc.;
- System designs to provide autonomous control for 10-year operation, including sensor and control technologies;
- Radiation tolerant systems and materials enabling robust, long life operation.

Research should be conducted to demonstrate technical feasibility during Phase 1 and show a path toward a Phase 2 hardware demonstration, and when possible, deliver a demonstration unit for functional and environmental testing at the completion of the Phase 2 contract.