# NASA SBIR 2014 Phase I Solicitation

## Z1.03 Integrated Nuclear Power & Propulsion

**Lead Center: GRC**

**Participating Center(s): MSFC**

This subtopic seeks innovative solutions for integrating radioisotope and small fission power systems with electric propulsion devices for space science missions. The goal is to develop architectures that optimize the power delivery and overall propulsive capabilities. Separate subtopics are developing innovative power generation (S3.01), power management (S3.03), and electric thruster technologies (S3.02). Here, the objective is to take existing components and assemble them into testbeds to demonstrate functionality, robustness, and performance. Emphasis is on novel integration schemes that maximize efficiency and reliability while minimizing mass. Phase I activities would develop the power architecture and identify the key design elements. Phase II activities would assemble testbeds and perform experimental testing to validate design methods. The assumed building blocks are described below with additional information available from literature searches. However, the system should be evolvable to incorporate advanced components developed under S3.01, Power Generation & Conversion; S3.02, Propulsion Systems for Robotic Science Missions; and S3.03, Power Electronics and Management, and Energy Storage.

Power sources:

- Advanced Stirling Radioisotope Generator, 140 watts at 28 Vdc.
- Multi-Mission Radioisotope Thermoelectric Generator, 110 watts at 28 Vdc.
- Small Thermoelectric Fission Power System, 0.5 to 3 kW at 28 to 100 Vdc.
- Small Stirling Fission Power Systems, 1 to 10 kW at 15 to 300 Vac, 100 hz single-phase.

Representative Electric Propulsion Devices (Isp = specific impulse):

- 200 – 600 W Hall thrusters, at 200-250 Vdc and 1300-1600 sec Isp.
- 1.4 kW – 5 kW Hall thrusters, at 300-600 Vdc and 1600-2700 sec Isp.
- 10 kW Hall thrusters, at 300 Vdc and 2200 sec Isp.
- 100-600 W Ion thrusters, at 800-1500 Vdc and 2000-3800 sec Isp.
- 2.3-5 kW Ion thrusters, at 1200-1500 Vdc and 3300-3800 sec Isp.
- 7-10 kW Ion thrusters, at 1800-2000 Vdc, and 4100-5000 sec Isp.