

NASA's Radioisotope Power Systems Program – A 3 Year Status Assessment

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Introduction: NASA's Radioisotope Power Systems (RPS) Program began formal implementation in December 2010. The Program's goal is to make available RPS for the exploration of the solar system in environments where conventional solar or chemical power generation is impractical or impossible to meet mission needs. To meet this goal, the RPS Program manages investments in RPS system development and RPS technologies. There have been many changes to the RPS Program since inception. This paper provides the status of the RPS Program and its related projects. Opportunities for RPS generator development and targeted research into RPS component performance enhancements, as well as constraints dealing with the supply of radioisotope fuel, are also discussed in the context of the next ten years of planetary science mission plans.

Program Content: The RPS Program consists of NASA-funded work conducted both at NASA and the Department of Energy (DOE). The RPS Program's goal is to make available RPS for the exploration of the solar system in environments where conventional solar or chemical power generation is impractical or impossible to meet mission needs. As such, the customers of RPS products seek a capability to conduct scientific and exploration missions to the far reaches of the solar system and to areas where sunlight is intermittent or non-existent, such as permanently shadowed crater floors.

Products of the RPS Program include

- Basic and applied research in energy conversion technologies, where the heat of decay of a radioisotope is converted to electrical power usable by a spacecraft or other system.
- Technology transfer of newly developed energy conversion approaches to enable development of prototypic systems for system demonstration purposes.
- Initiation of flight systems development, via partnership with DOE.
- Mission support to enable missions to integrate RPS into their spacecraft design.
- Awareness of ongoing mission RPS performance.

- Leading edge studies to determine investment strategies for future systems and their potential mission benefit.
- Development or acquisition of generic multi-mission products in advance of mission approval. Products have included launch vehicle data books in support of future National Environmental Policy Act (NEPA) actions and unfueled RPS in support of future mission needs.

Status: In September 2013, the RPS Program began an orderly termination of the Advanced Stirling Radioisotope Generator

As of late 2013, the RPS Program has begun to assess an increased emphasis towards Nuclear Power System (NPS) beyond just those that are radioisotope-based. Use of RPS energy conversion technologies are being applied in studies of using reactor-based heat sources in lieu of radioisotopic material.

The RPS Program is also providing NASA support in maintaining insight to the resumption of U.S. isotope production by the Pu-238 Supply Project.

Additionally, program scope may be increased if funding responsibility and associated management of DOE facilities in support of NASA RPS usage is transferred from DOE to NASA.

Conclusion: The RPS Program continues to be a vibrant and viable single-point resource for NASA to continue its long-term investments in space nuclear power in partnership with DOE and in support of space science missions. Recent changes to RPS scope provide further evidence to the breadth and depth of relevance the RPS Program provides to NASA.