KNOWLEDGE IS POWER: RADIOISOTOPE POWER SYSTEMS EDUCATION AND PUBLIC OUTREACH AT NASA. Preston Dyches[1], Rachel Zimmerman-Brachman[1], Kristin Spear[2], Margaret Simon[3], and Ryan Bechtel[4], [1]Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109, Preston.Dyches@jpl.nasa.gov and Rachel.Zimmerman-Brachman@jpl.nasa.gov, [2]NASA Glenn Research Center, 21000 Brookpark Road, Cleveland, OH 44135, Kristin.M.Spear@nasa.gov, [3]Johns Hopkins University Applied Physics Laboratory, 11100 Johns Hopkins Road, Laurel, MD, Margaret.Simon@jhuapl.edu, [4]U.S. Department of Energy, 1000 Independence Ave., SW, Washington, DC 20585, ryan.bechtel@nuclear.energy.gov.

Introduction: NASA's Radioisotope Power Systems (RPS) Program includes an ongoing Education and Public Outreach (EPO) effort. The primary objectives of this effort are to raise awareness of the long and safe history of exploration that has been enabled by space nuclear technologies and to emphasize the importance and value of space nuclear power technologies for future exploration.

Relevance to the Space Science Community: 2011 marked the 50th anniversary of the first use of space nuclear power by the United States. The future of outer planets exploration is dependent on the availability of space nuclear power systems, which include the radioisotope thermoelectric generators employed by missions like Voyager, Cassini, and Mars Science Laboratory. Even the solar powered Mars Exploration Rovers used radioisotope heater units to prolong the length of their surface mission. It is important to educate the public about the enabling benefits of radioisotope power systems in addition to disspelling the misconceptions about their use and safety.

Scientists and engineers whose missions utilize radioisotope power should be aware of the outreach efforts in this area. They are part of the nationwide network of people who can help bring this information to students and to increase public awareness and understanding of this critical technology for exploration. The RPS EPO effort will work with the technical community to educate and inspire the next generation to explore and make historic science discoveries.

Educational Outreach: The RPS Program has developed a website (http://rps.nasa.gov) that highlights the NASA missions enabled by radioisotope power systems technology and their legacy of discovery across the solar system. The site provides a much needed online destination for public access to information about NASA's use of nuclear power for space exploration.

The RPS web presence is further enhanced by "Eyes on the Solar System," NASA's 3D visualization (http://solarsystem.nasa.gov/eyes) that allows visitors to travel to the planets alongside robotic spacecraft. This web browser-based interactive will soon include a module dedicated to radioisotope power.

Classroom resources are being developed to explain concepts such as radioactive half-life, planetary exploration, why radioisotope power systems are needed to explore extreme environments in the solar system, and how they work.

The RPS Program worked with the NASA Glenn Visualization Studio (GVIS) to develop a 3D interactive representation of its next-generation power system, the Advanced Stirling Radioisotope Generator. The "VR Stirling" gives viewers insight into the inner workings of what is otherwise a mysterious and complex piece of space technology. An educational mode explains the basic function of a Stirling engine based on true physics.

Cross-agency Collaboration. The RPS EPO effort coordinates all of its products with communications staff at the RPS program's key partner, the U.S. Department of Energy (DOE), which provides both the radioisotope power systems and their nuclear fuel to NASA. This coordination helps to ensure consistency of messaging on products like fact sheets, which are co-authored and co-released with DOE.

Connections to Formal Education: The National Science Education Standards include content related to transfer of energy for grades 5 to 8, and both conservation of energy and interactions of energy and matter for grades 9 to 12. Space power systems provide real-world examples for relating these concepts. Basic science principles aredemonstrated using straightforward, hands-on demos like thermoelectric generator kits, coffee-cup Stirling engines, and Faraday "shake" flashlights. These "physics toys" illustrate important principles of the science of energy conversion (such as the Seebeck and Peltier effects) that are the foundation for space power technology.

Next Steps: Over the past two years, the RPS EPO team has developed an initial portfolio of educational outreach products. Plans are underway to develop a set of educational products tailored to classroom and museum audiences.

Other products existing or in development include videos and animations, fact sheets, lithographs, and a museum exhibit.

In line with best practices, the RPS EPO effort will determine the effectiveness of programs for partici-

pants by engaging in formative evaluation during product development and summative evaluation following implementation.