

Position Statement #40

Space Nuclear Power and Propulsion Systems



The American Nuclear Society supports and advocates the research, development, and use of nuclear based systems for space exploration. Nuclear-based systems can provide electricity, heat, and propulsion for missions that are well beyond the capabilities of solar power, fuel cells, and conventional chemical means. Nuclear-based systems include, but are not limited to, radioisotope thermoelectric generators (RTGs), fission-based nuclear reactor power systems, nuclear thermal propulsion (NTP), nuclear electric propulsion (NEP), and propulsion systems based on nuclear fusion and on other advanced nuclear technologies.

The United States has designed and launched RTGs for more than thirty years. These systems are being used safely and effectively in robotic missions and science experiments now reaching beyond Pluto's orbit. Without these valuable power sources, the missions would not have been possible.

While RTGs are proven sources of power up to a few hundred watts, these power generator systems are not large enough to sustain human life or enable the most ambitious robotic missions to other worlds. Nuclear fission reactors can safely supply the power needs required for long-duration human missions to the moon and Mars and for advanced robotic missions to explore the outer planets and beyond the solar system. Nuclear fission reactors, referred to as

nuclear surface power in these applications, can be used to power everything from small landing craft to large manned or unmanned bases. Nuclear fission reactors can ensure the ultimate safety of our astronauts by generating safe, reliable, long-term electric power for use on planetary surfaces and for in-space spacecraft operations.

Fission-based nuclear reactor systems can also provide more effective and efficient means of space travel for manned and unmanned missions. The environment of space is hostile to humans and requires short transit times. NTP systems can provide the fastest method to propel vehicles to their destinations. Both the United States and Russia conducted extensive development programs related to NTP in the past. For advanced robotic missions to the outer planets, NEP provides the most efficient means for spacecraft to travel farther with less propellant.

Nuclear technologies—both radioisotope and fission-based systems—are enabling a variety of ambitious space missions, providing a safer, more rapid means of transit and operations than possible with conventional chemical power and propulsion systems. The American Nuclear Society supports programs to develop, bridge, and leverage these enabling capabilities.



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