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FISSION SURFACE POWER SYSTEM TECHNOLOGY DEVELOPMENT ACTIVITIES AT THE NASA MARSHALL SPACE FLIGHT CENTER

Abstract

Fission surface power (FSP) systems could be used to provide power anytime, anywhere on the surface of the Moon or Mars. FSP systems could be used at polar locations, at locations away from the poles, or in permanently shaded regions, with excellent performance at all sites. A potential reference 40 kWe option has been devised that is cost-competitive with alternatives while providing more power for less mass anywhere on the lunar surface. The reference FSP system (FSPS) is also readily extensible for use on Mars. At Mars the system would be capable of operating through global dust storms and providing year-round power at any Martian latitude.

To be mass efficient, FSP systems must operate at higher coolant temperatures and use different types of power conversion than typical terrestrial systems. The primary reason is the difficulty in rejecting excess heat to space. Although many options exist, NASA's current reference FSP system uses a fast spectrum, pumped-NaK cooled reactor coupled to a Stirling power conversion subsystem. The reference system uses technology with significant terrestrial heritage while still providing excellent performance on the surface of the moon or Mars.

Under the NASA Exploration Technology Development Program (ETDP), NASA and the Department of Energy (DOE) have begun long-lead technology development for integrated Fission Surface Power (FSP) systems. Recent non-nuclear testing at NASA's Early Flight Fission Test Facility (EFF-TF) has helped assess the viability of the reference FSP system, and has helped evaluate methods for system integration. Results of this testing will be discussed.