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THE BENEFITS OF ADVANCED STIRLING RADIOISOTOPE GENERATORS FOR DEEP SPACE MISSIONS

Abstract

Radioisotope power conversion provides enabling technology for National Aeronautical Space Administration (NASA) missions that are constrained for electrical power due to inadequate available solar energy. In 2000, a Stirling Radioisotope Generator program was awarded to Lockheed Martin (LM), sponsored by the Department of Energy (DOE) and funded by NASA, to develop a significantly more efficient radioisotope power generator than the existing thermoelectric generator technology, and to preserve a limited 238Pu supply. In August 2008, an Engineering Unit (EU) Advanced Stirling Radioisotope Generator (ASRG) was delivered to NASA Glenn Research Center (GRC) for extended operation testing. After the July 2012 Final Design Review (FDR), procurement of parts for the qualification unit ASRG proceeded. ASRG uses Stirling power conversion technology to convert radioactive-decay heat into electricity for use on spacecraft. The higher conversion efficiency of the Stirling cycle, compared with that of radioisotope thermoelectric generators (RTGs) used in previous missions (Viking, Pioneer, Voyager, Galileo, Ulysses, Cassini, New Horizons, and Mars Science Laboratory), offers an advantage of a four-fold reduction in PuO2 fuel, lower system mass, reduced mission cost, and significantly more power at mission end of life.