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DEVELOPMENT AND TESTING OF A EUROPEAN RADIOISOTOPE THERMOELECTRIC GENERATOR SYSTEM

Abstract

Space nuclear power systems are under development in the UK in collaboration with European part-

ners as part of a European Space Agency (ESA) programme. Radioisotope thermoelectric generators (RTG) are an important element of this new capability in Europe. RTG systems being developed in Europe are targeting the 10 W electric to 50 W electric power generation range adopting a modular scalable approach to the design. Radiogenic decay heat from radioisotopes can be converted to electrical power by using appropriate semiconductor based thermoelectric materials. The plan for Europe is to develop radioisotope space nuclear power systems based on both thermoelectric and Stirling power conversion systems. Although primarily focused on delivering up to 50 W of electrical power, the European radioisotope thermoelectric system development programme is targeting americium-241 as a fuel source and is maximizing the use of commercially available thermoelectric manufacturing processes in order to accelerate the development of power conversion systems. The use of americium provides an economic solution at high isotopic purity and is product of a separation process from stored plutonium produced during the reprocessing of civil nuclear fuel. A laboratory prototype that uses electrical heating as a substitute for the radioisotope was developed to validate the designs. This prototype has now been tested. This paper outlines the requirements for a European 241Am fuelled Radioisotope Thermoelectric Generator (RTG), describes the most recent updates in system design and provides further insight into recent laboratory prototype test campaigns.