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DEMOCRITOS: DEMONSTRATOR PROJECTS OF A MW CLASS NUCLEAR ELECTRIC SPACECRAFT.

Abstract

The DEMOCRITOS project aims at preparing demonstrators for a mega-watt class nuclear-electric spacecraft. It is funded by the European Community through the Research Technology program "Horizon 2020". The project involves the following partners: the Nuclear National Laboratory – NLL (U.K.), the German Aerospace Center – - DLR (Germany), the Keldysh Research Center – KeRK (Russia), Thales Alenia Space Italia – TAS (Italy), Airbus-Safran Launchers – ASL (France), the European Science Foundation – ESF, (France) and the Centre National d'Etudes Spatiales – CNES (France). The Instituto de Estudos Avançados – IEA (Brazil) has joined the project as an observer.

In this paper we will present key aspects of the three demonstrator concepts underpinning DEMOCRITOS: 1) The development logic for a ground demonstrator, whose target is to test end-to-end nuclear-electric propulsion, with the nuclear core replaced by a conventional heater. Our target is to test a 200 kWe conversion loop (closed Brayton cycle), linked to lower power heat-pipe radiator and electric thrusters. 2) Review of previous space reactor concepts and lessons learned applicable to the Democritos project 3) The assembly strategy for a MW class nuclear electric spacecraft.

We will conclude with a discussion on future steps towards the realisation of a MW class nuclear electric spacecraft, within the context of international cooperation.