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RECENT PROGRESS ON NUCLEAR ROCKET FUEL TESTING CAPABILITIES IN THE MIT REACTOR FACILITY

Abstract

On April 13, 2022, Little Prairie Services, LLC (LPS) was awarded a Phase II STTR for development of the capability to test Nuclear Thermal Propulsion (NTP) rocket engine fuels in a university reactor setting. LPS is teamed with the Massachusetts Institute of Technology (MIT) to perform the nuclear fuel testing in the MIT Reactor Facility, (MITRF). The solicitation for this testing work was highly optimistic and success-oriented. The solicitation requested testing of a surrogate fuel component at the end of two years. The solicitation also requested that the testing concept design be able to test fuel to temperatures up to 2700 Kelvins at as high a power density as possible. Given the author's experience with the Timber Wind/Space Nuclear Thermal Propulsion program, which had tested particle fuel in Sandia National Laboratories' Annular Core Research Reactor, the request bordered on the impossible. LPS's task was to invent a fuel test capsule capable of achieving the solicitation goals while operating within the limits of the MITRF. The fuel test capsule also had to be sufficiently flexible to accommodate a wide range of possible fuel geometries, even some that are undefined. MIT's role is to analyze the fuel test capsule in order to ensure it meets the safety and environmental criteria of the MITRF while still being able to achieve the solicitation objectives. This paper will discuss the progress to date and plans for the completion of the Phase II STTR. After almost 2 years into the Phase-II STTR, and having been awarded a Phase-II enhancement the LPS team has generated a final design and has 3D printed the final capsule design. The LPS/MIT team plans to test a surrogate fuel element in the MIT Reactor Facility before the end of the year.