# Space Application of a Hybrid Fusion-Fission Reactor

[#]Lawrence P. Forsley, Pamela A. Mosier-Boss
Global Energy Corporation, USA
Email: Lawrence.p.forsley@nasa.gov

JWK Corporation and Global Energy Corporation have spent the past two decades understanding and developing Condensed Matter Nuclear Reactions with the US Navy and NASA. This has resulted in a US Patent, 8,419,919 "System and Method Generating Particles", that has been replicated and published in over 50 peer-reviewed papers. We have observed energetic particles during Pd/D co-deposition [1, 2] including ≥ 1.8 MeV protons (with 15 MeV protons), ≥ 7 MeV alphas, and 2.5 MeV and 14.1 MeV neutrons [3]. These neutrons are energetic enough to fission uranium as was reported in 2016 [4] with an average energy > 6 MeV.

Deep space missions are dependent upon $^{238}$Pu thermoelectric generators (RTG) providing less than 1 kW of electrical power. With the exception of the solar powered Juno probe, every spacecraft destined past Mars has been RTG dependent. Consequently, deep space missions are power deprived for both instrumentation and propulsion. Indeed, human travel beyond the Earth-Moon system requires nuclear electric propulsion if astronauts are to arrive healthy.

Global Energy Corporation (GEC) began developing a non-fissile reactor core suitable for deep-space power. GEC has a second Space Act Agreement with NASA Glenn Research Center to develop a launch-compatible design, operating at the Plum Brook Station facility. Plum Brook has vacuum, acoustic and shake table systems to certify space launch capability. Various electrical power needs range from tens of kilowatts for instruments to over 20 megawatts for human space craft electric propulsion and planetary power.

(Hermes Spacecraft, "The Martian", 20th Century Fox.)

(NASA Plum Brook Space Power Facility)

[1] P.A. Mosier-Boss, F.E. Gordon, L.P. Forsley, D. Zhou, "Detection of high energy particles using CR-39 detectors Part 1: results of microscopic examination, scanning, and LET analysis," *Int. J. Hydrogen Energy*, **42**, no. 1, pp. 416-428, (2017)

[2] A.S. Roussetski, A.G. Lipson, E.I. Saunin, F. Tanzella, M. McKubre, "Detection of high energy particles using CR-39 detectors Part 2: results of in-depth destructive etching analysis," *Int. J. Hydrogen Energy*, **42**, no. 1, pp. 429-436, (2017)

[3] P.A. Mosier-Boss, S. Szpak, F.E. Gordon, L.P.G. Forsley, "Triple tracks in CR-39 as the result of Pd/D co-deposition: evidence of energetic neutrons," *Naturwissenschaften*, **96**, no.1, pp. 135-142, (2009).

[4] P.A. Mosier-Boss, L. P. Forsley and P. McDaniel, "Investigation of Nano-Nuclear Reactions in Condensed Matter: Final Report", *Defense Threat Reduction Agency*, pp 41-49. (2016)