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K. J. Kramer, M. Fratoni, J. F. Latkowski, R. P. Abbott, M. A. Havstad, T. M. Anklam, A. J. Bayramian, J. A. DeMuth, R. J. Deri, A. M. Dunne, B. El-dasher, J. C. Farmer, A. Lafuente, W. R. Meier, R. W. Moir, K. L. Morris, E. I. Moses, J. J. Powers, S. Reyes, J. E. Seifried, E. Storm

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Kevin J. Kramer, Massimiliano Fratoni[1], Jeffery F. Latkowski[1], Ryan P. Abbott[1], Mark A. Havstad[1], Thomas M. Anklam[1], Andy J. Bayramian[1], James A. DeMuth[1], Robert J. Deri[1], A. Mike Dunne[1], Bassem S. El-dasher[1], Joseph C. Farmer[1], Antonio Lafuente[1], Wayne R. Meier[1], Ralph W. Moir[1], Kevin L. Morris[1], Edward I. Moses[1], Jeffrey J. Powers[1,2], Susana Reyes[1], Jeffrey E. Seifried[1,2] and Erik Storm[1]

[1]Lawrence Livermore National Laboratory, Livermore, CA, USA
[2]Univeristy of California, Berkeley, Berkeley, CA, USA
E-mail: kramer12@llnl.gov

The Laser Inertial Fusion Energy (LIFE) concept is a fusion system for energy production that can also employ hybrid fusion-fission blankets [1]. The present work details designs for various hybrid blanket options and associated missions. Hybrid systems have been designed to generate power, incinerate waste and burn both fertile and fissile nuclear fuel. The blanket designs are modular allowing for periodic replacement of life-limited components and high plant availability. Each module contains moderating and multiplying materials in between the neutron source and the fuel to optimize the neutron spectrum. The fuel blanket is composed of TRISO fuel particles encapsulated in graphite pebbles cooled by a molten salt. In a typical design, low-yield (~25-40 MJ) targets and a repetition rate of ~10-15 Hz produce a 300-500 MW fusion source in the form of neutrons, high-energy photons and ions. Allowing for target injection and laser penetration, the blanket modules form a compact (2-4 m diameter) target chamber surrounding this fusion source. The resulting high neutron flux drives fissile material production and destruction providing a blanket energy gain (total thermal power-to-fusion power ratio) of 4-8, depending on the fuel and mission objective.

We employ a methodology using ^{6}Li as a neutron absorber to generate self-sustaining tritium production for fusion and to control power over the lifetime of the engine. This enables deeply subcritical operation while achieving high fuel burnup. In a single pass, fertile uranium and thorium blankets achieve fuel utilization beyond 80% without chemical reprocessing or isotopic enrichment. Fissile blankets can destroy more than 90% of the initial load of weapons grade plutonium or highly enriched uranium while producing 2-4 GW of thermal power.

1. Moses, E. et al., "A Sustainable Nuclear Fuel Cycle Based On Laser Inertial Fusion Energy (LIFE)," *Fusion Science and Technology*, **56**, 2, 566-572 (2009).

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