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FTP/P7-01: Feasibility of a Fusion Hybrid Reactor Based on the Gasdynamic Mirror

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A Comprehensive analysis of the feasibility of a fusion hybrid reactor whose fusion component is the gas-dynamic mirror (GDM) is presented. Since the primary role of the fusion component is to supply neutrons to a blanket laden with fertile material, it can operate at or near "breakeven"condition which is a much less stringent condition than that required for a pure fusion reactor. As a high beta device, with demonstrated MHD and kinetic stability, the GDM is chosen for utilization in such a reactor because it can also operate in steady state. Using extensive multigroup neutronic analysis, we show that such a reactor is capable of breeding fissile material and burning it to produce tens to hundreds of megawatts of thermal power per centimeter of length "safely"since it will be "subcritical,"and "securely"because of the use of a thorium fuel cycle which is known to be resistant to "proliferation"and clandestine operations. Moreover, we demonstrate that D-D fusion reactions are more suitable for use in a hybrid reactor since the energy of the neutrons produced by these reactions is closer to "thermalization"than those produced by D-T leading to a much more manageable waste disposal problem. Finally, since the reactor in question is "self-fueling"it can be designed to operate for an extensive period of time without refueling.

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