

A Credible Pathway for Heavy Ion Driven Target Fabrication and Injection*

D.T. Goodin,¹ A. Nobile,² N.B. Alexander,¹ L.C. Brown,¹ J.L. Maxwell,² J. Pulsifer,³
A.M. Schwendt,² and M. Tillack³

¹General Atomics, P.O. Box 85608, San Diego, California 92186-5608 USA

²Los Alamos National Laboratory, Los Alamos, New Mexico USA

³University of California, San Diego, California USA

The target for an Inertial Fusion Energy (IFE) power plant introduces the fusion fuel to the chamber, where it is compressed and heated to fusion conditions by the driver beams. The “Target Fabrication Facility” of an IFE power plant must supply about 500,000 targets per day. The target is then injected into the target chamber at a rate of 5–10 Hz and tracked precisely so the driver beams can be directed to the target. The feasibility of developing successful fabrication and injection methodologies at the low cost required for energy production (about \$0.25/target, about 10^4 less than current costs) is a critical issue for inertial fusion. A significant program is underway to develop the high-volume methods to supply economical IFE targets. Details, including equipment sizing and process times, of a “credible pathway” for supplying targets is taking shape. Spherical capsules can be formed by direct microencapsulation of polystyrene, capsules can be filled by permeating DT through the walls, and then cooled to ~20 K to reduce the capsule internal pressure and to allow removal of excess DT. Layering of the DT can be accomplished by placing the filled cryogenic capsule into a highly uniform temperature environment, either in a fluidized bed (bare capsules) or in a cryogenic layering tube (within a hohlraum). Production of the hohlraum and its internal components can be accomplished by casting and injection molding, doping of CH foams, and laser-assisted chemical vapor deposition. Injection of the target into the chamber can be done with a gas-gun or an electromagnetic based accelerator. This paper summarizes the requirements for heavy-ion driven IFE target fabrication and injection, and presents the current status of and results from that program.

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Subject Topic: Fusion Targets
