Abstract Submitted
for the TSF11 Meeting of
The American Physical Society

Accelerator-Driven Subcritical Fission in a Molten Salt Core: Green Nuclear Power for the New Millennium PETER MCINTYRE, Texas A&M University — Scientists at Texas A&M University, Brookhaven National Lab, and Idaho National Lab are developing a design for accelerator-drive subcritical fission in a molten salt core (ADSMS). Three high-power proton beams are delivered to spallation targets in a molten salt core, where they provide ∼3% of the fast neutrons required to sustain 600 MW of fission. The proton beams are produced by a flux-coupled stack of superconducting strong-focusing cyclotrons. The fuel consists of a eutectic of sodium chloride with either spent nuclear fuel from a conventional U power reactor (ADSMS-U) or thorium (ADSMS-Th). The subcritical core cannot go critical under any failure mode. The core cannot melt down even if all power is suddenly lost to the facility for a prolonged period. The ultra-fast neutronics of the core makes it possible to operate in an isobreeding mode, in which neutron capture breeds the fertile nuclide into a fissile nuclide at the same rate that fission burns the fissile nuclide, and consumes 90% of the fertile inventory instead of the 5% consumed in the original use in a conventional power plant. The ultra-fast neutronics produces a very low equilibrium inventory of the long-lived minor actinides, $\sim 10^4$ less than what is produced in conventional power plants. ADSMS offers a method to safely produce the energy needs for all mankind for the next 3000 years.

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Date submitted: 07 Sep 2011 Electronic form version 1.4