

DEUTERIUM FUELED POWER PLANTS WITH TRITIUM SUPPRESSION

John Sheffield

Joint Institute for Energy and Environment, 314 Conference Center Bldg,
Knoxville, TN 37996-4609.

jsheff1@utk.edu

Catalysed D-D is the ultimate fusion cycle, because deuterium is essentially unlimited on earth. In this approach, the helium-3 and tritium fusion products are recycled to increase the charged particle fusion power. The difficulties with the cycle are twofold: much higher pressure, temperature and confinement are required than for D-T; and the tritium, if left in the plasma produces 14 MeV neutrons leading to wall damage comparable to that of the D-T cycle. On the plus side, the deuterium fuel has a negligible cost and no tritium breeding blanket is required. Fortunately, the charged particle fusion power from burning the tritium is small compared to that from the helium-3 and removing it from the plasma makes only a small difference to the plasma power balance. The tritium may be removed using ion cyclotron waves. As shown previously [1], with removal of 50% or more of the tritium, the neutron damage would be reduced significantly: at 90% removal, the wall damage would be comparable to that in a fission breeder reactor. In addition, the tritium will decay to helium-3 and may be recycled to improve the power balance. An earlier study was made of a tokamak [2]. In this paper, the conditions required for a stellarator to use the approach are analyzed.