Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Parameter exploration for a Compact Advanced Tokamak DEMO[1] D.B. WEISBERG, R.J. BUTTERY, J.R. FERRON, A.M. GAROFALO, P.B. SNYDER, A.D. TURNBULL, GA, C.T. HOLCOMB, LLNL, J. MCCLENAGHAN, ORAU, J. CANIK, J-M PARK, ORNL — A new parameter study has explored a range of design points to assess the physics feasibility for a compact 200MWe advanced tokamak DEMO that combines high beta ($\beta_N < 4$) and high toroidal field ($B_T = 6-7$T). A unique aspect of this study is the use of a FASTRAN modeling suite that combines integrated transport, pedestal, stability, and heating current drive calculations to predict steady-state solutions with neutral beam and helicon powered current drive. This study has identified a range of design solutions in a compact ($R_0 = 4$m), high-field ($B_T = 6-7$T), strongly-shaped ($\kappa = 2$, $\delta = 0.6$) device. Unlike previous proposals, C-AT DEMO takes advantage of high-beta operation as well as emerging advances in magnet technology to demonstrate net electric production in a moderately sized machine. We present results showing that the large bootstrap fraction and low recirculating power enabled by high normalized beta can achieve tolerable heat and neutron load with good H-mode access. The prediction of operating points with simultaneously achieved high-confinement ($H_{98} < 1.3$), high-density ($f_{GW} < 1.3$), and high-beta warrants additional assessment of this approach towards a cost-attractive DEMO device.

[1]Work supported by the US DOE under DE-FC02-04ER54698.

David Weisberg
GA

Date submitted: 13 Jul 2017 Electronic form version 1.4