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Scaling of the Sheared-flow-stabilized Z Pinch toward Reactor Conditions[1] BA NELSON, U SHUMLAK, JR BARHYDT, ZT DRAPER, H MEEK, ET MEIER, M QUINLEY, Y ZHANG, Zap Energy Inc., TR WEBER, EL CLAVEAU, EG FORBES, A KHAIRI, AD STEPANOV, University of Washington (UW), HS MCLEAN, Lawrence Livermore National Laboratory (LLNL) — Zap Energy Inc. (ZEI) is scaling the sheared-flow-stabilized (SFS) Z pinch toward fusion reactor conditions. The UW and LLNL collaborated on the Fusion Z-Pinch Experiment (FuZE) at the UW. FuZE has demonstrated long-duration D-D fusion production periods of 5-10 microseconds [Zhang *et al.*, PRL 2019], thousands of times longer than the 1 ns MHD m=0 (sausage) and m=1 (kink) instability growth times. FuZE has reached up to 400 kA pinch currents, 1-2 keV ion temperatures, 1-2x10^{23} m^{-3} densities, and neutron yields up to Y_n ~10^7 neutrons / pulse. An adiabatic model, 2-temperature MHD calculations, and experimental results all indicate a strong dependence of neutron yield with pinch current, Y_n ~I^{11}. A new device, FuZE-Q, is being built at ZEI with the goal of reaching equivalent scientific breakeven (scaling D-D operating conditions to "equivalent" Q if it were operated instead with D-T) at approximately 600 kA pinch currents. Status, plans, and reactor embodiment designs will be presented.

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