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A Reactor Development Scenario for the FuZE Sheared-Flow Stabilized Z-pinch[1] HARRY S. MCLEAN, D.P HIGGINSON, A. SCHMIDT, K.K. TUMMEL, Lawrence Livermore National Laboratory, U. SHUMLAK, B.A. NELSON, E.L. CLAVEAU, E.G. FORBES, R.P. GOLINGO, A.D. STEPANOV, T.R WEBER, Y. ZHANG, University of Washington — We present a conceptual design, scaling calculations, and development path for a pulsed fusion reactor based on a flow-stabilized Z-pinch. Experiments performed on the ZaP [1] and ZaP-HD [2] devices have largely demonstrated the basic physics of sheared-flow stabilization at pinch currents up to 100 kA. Initial experiments on the FuZE device [3], a high-power upgrade of ZaP, have achieved ∼20 usec of stability at pinch current 100-200 kA and pinch diameter ∼few mm for a pinch length of 50 cm. Scaling calculations based on a quasi-steady-state power balance show that extending stable duration to ∼100 usec at a pinch current of ∼1.5 MA and pinch length of 50 cm, results in a reactor plant Q∼5. Future performance milestones are proposed for pinch currents of: 300 kA, where Te and Ti are calculated to exceed 1-2 keV; 700 kA, where DT fusion power would be expected to exceed pinch input power; and 1 MA, where fusion energy per pulse exceeds input energy per pulse. [1]U. Shumlak, et. al., Nucl. Fusion 49 (2009) 075039. [2]U. Shumlak, et. al., Phys. Plasmas 24 (2017) 055702. [3]B.A. Nelson, et. al., this meeting.

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