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Conceptual design study for heat exhaust management in the ARC fusion pilot plant C.A. DENNETT, N.M. CAO, A.J. CREELY, J. HECLA, H. HOFFMAN, A.Q. KUANG, M. MAJOR, J. RUIZ RUIZ, R.A. TINGUELY, E.A. TOLMAN, D. BRUNNER, B. LABOMBARD, B.N. SORBOM, D.G. WHYTE, MIT, P. GROVER, C. LAUGHMAN, MERL — The ARC pilot plant conceptual design study [1] has been extended to explore solutions for managing heat exhaust resulting from ˜525 MW of fusion power in a compact (R˜3.3 m) tokamak. Superconducting poloidal field coils are configured to produce double-null equilibria that support X-point target divertors while maintaining the original core plasma shape and toroidal field coil size. Long outer divertor legs are appended to the original vacuum vessel, providing both large surface areas for surface dissipation of radiative heat and significantly reduced neutron damage for divertor components. A molten salt FLiBe blanket adequately shields all superconductors and functions as a tritium breeder, with advanced neutronics calculations indicating a tritium breeding ratio of ˜1.08. In addition, FLiBe is used as the active coolant for the entire vessel. A tungsten swirl-tube cooling channel is implemented in the divertor, capable of exhausting 12 MW/m^2, heat flux while keeping total FliBe pumping power below 1% of fusion power. Finally, three novel diagnostics are explored: Cherenkov radiation emitted in FLiBe to measure fusion reaction rate, microwave interferometry to measure divertor detachment front location, and IR imaging through the FLiBe blanket to monitor selected divertor "hotspots." [1] Sorbom, B. N., et al. *Fusion Engineering and Design* 100 (2015): 378-405.

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