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Critical need for MFE: the Alcator DX advanced divertor test facility R. VIEIRA, B. LABOMBARD, E. MARMAR, J. IRBY, S. WOLF, P. BONOLI, C. FIORE, R. GRANETZ, M. GREENWALD, I. HUTCHINSON, A. HUBBARD, J. HUGHES, Y. LIN, B. LIPSCHULTZ, R. PARKER, M. PORKOLAB, M. REINKE, J. RICE, S. SHIRAIWA, J. TERRY, C. THEILER, G. WALLACE, A. WHITE, D. WHYTE, S. WUKITCH, Alcator DX Team — Three critical challenges must be met before a steady-state, power-producing fusion reactor can be realized: how to (1) safely handle extreme plasma exhaust power, (2) completely suppress material erosion at divertor targets and (3) do this while maintaining a burning plasma core. Advanced divertors such as “Super X” and “X-point target” may allow a fully detached, low temperature plasma to be produced in the divertor while maintaining a hot boundary layer around a clean plasma core – a potential game-changer for magnetic fusion. No facility currently exists to test these ideas at the required parallel heat flux densities. Alcator DX will be a national facility, employing the high magnetic field technology of Alcator combined with high-power ICRH and LHCD to test advanced divertor concepts at FNSF/DEMO power exhaust densities and plasma pressures. Its extended vacuum vessel contains divertor cassettes with poloidal field coils for conventional, snowflake, super-X and X-point target geometries. Divertor and core plasma performance will be explored in regimes inaccessible in conventional devices. Reactor relevant ICRF and LH drivers will be developed, utilizing high-field side launch platforms for low PMI. Alcator DX will inform the conceptual development and accelerate the readiness-for-deployment of next-step fusion facilities.

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