

TECH-2-4: Mission and Configuration Studies for a U.S. Sustained High-Power Density (SHPD) Tokamak Facility



- Present/planned devices do not access Fusion Pilot Plant (FPP) regime
- Need new facility (or FPP) to simultaneously explore:
 - High fraction of self-driven current
 - High core plasma pressure
 - High surface-average and divertor-parallel heat flux
- $R=1.4\pm 0.2\text{m}$, $B = 4\text{-}6\text{T}$, $A = 2\text{-}2.5$, $P_{\text{H\&CD}}=50\text{MW}$ attractive for SHPD
- Systems studies and initial integrated predictive modelling indicate FPP regime should be accessible with the SHPD parameters above
- Initial device configuration and physics design integrates:
 - High current density and high B_T toroidal field magnets
 - Lower aspect ratio / strong shaping to maximize f_{BS} and pressure
 - Liquid metal systems (divertor, first wall, blankets) to prototype FPP
- Engineering calculations show pre-conceptual design is feasible

