

Abstract Submitted  
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**Scoping studies for a sustained high power density next-step tokamak facility**<sup>1</sup> JONATHAN MENARD, TOM BROWN, WALTER GUTTENFELDER, PETER TITUS, YUHU ZHAI, Princeton Plasma Physics Laboratory — A sustained high power density (SHPD) facility may be an important bridge to a Compact Pilot Plant in the U.S. fusion energy development program. A SHPD facility would integrate: (1) sustainment – for very long pulses from high to full non-inductive operation, (2) high power density – high core and edge plasma pressure without transients, and (3) an exhaust solution compatible with sustainment and high pressure. Lower aspect ratio ( $A = 1.8-2.5$ ) tokamaks are considered potentially advantageous for SHPD by maximizing plasma performance per unit magnet cost. In this work, SHPD performance characteristics are studied as a function of device size, aspect ratio, and stability and confinement assumptions. Realistic shaping poloidal field coils based on free-boundary equilibrium calculations and superconducting magnet/conductor layout and stress analysis are also investigated. The impacts of incorporating liquid metal divertor and first-wall components are also considered. Physics and engineering design progress for a lower-A tokamak SHPD facility are described.

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