Abstract Submitted
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NSTX-U research supporting the development of a steady-state Compact Fusion Power Plant[1] D.J. BATTAGLIA, S.M. KAYE, W. GUTTENFELDER, R. MAINGI, PPPL, THE NSTX-U TEAM — Steady-state tokamak Compact Fusion Power Plant (CFPP) designs target enhanced thermal confinement ($H_{98y,2}$>1.5) and large bootstrap current fraction ($f_{BS} \geq 0.5$) concurrently with low disruptivity and suitable divertor power handling and exhaust. NSTX-U will advance the physics basis and technology solutions required for an Advanced Tokamak CFPP by producing scenarios at large non-inductive current fraction (f_{NI} = 60 – 100%) with strong boundary shaping (κ>2.5, δ>0.7), f_{BS} = 60 – 90%, β_N = 4 – 6 and β_T = 5 – 25% uniquely accessed at small aspect ratio (A<2). The technical capabilities of NSTX-U are directed at exploring the unique transport and stability properties at high β and the lowest collisionality (ν_e*<0.1) of any spherical tokamak. This includes investigating if the strong favorable scaling of confinement with collisionality in regimes dominated by electron thermal transport persists at lower ν_e*. The compact nature of NSTX-U, coupled with high heating power leads to high power exhaust levels that enable the evaluation of integrated tests of reactor-relevant divertor solutions, such as liquid lithium PFCs, in order to qualify these potentially transformative solutions for a CFPP.

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