Stability and non-inductive current drive in NBI-heated long-pulse NSTX discharges.

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Lower single null NBI-heated H-mode discharges with I_P=800kA optimized to avoid sawteeth and tearing modes through elevated q(0) and large ELMs through shaping have achieved poloidal beta =1.2-1.4, normalized beta = 5-6, toroidal beta=12-16%, and H(89P)=2-2.5 all sustained for up to 8 energy confinement times. Many of these discharges operate at or above the ideal non-rotating no-wall stability limit yet appear to suffer from predominantly internal disruptions which lead to only a partial loss of core stored energy. In addition, the surface voltage of these discharges is reduced to 100-200mV for durations approaching 0.5s with non-inductive current drive fractions of approximately 50% computed by TRANSP. Details of the stability and current drive physics of these discharges as a function of boundary shape, internal inductance, toroidal field strength, and NBI source power and voltage will be described. The impact of the H-mode density rise and associated decrease in rotation will also be discussed.