Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Multiple Choice Tokamak Reactor Design: (a) Steady state (b) Pulsed (c) None of the above J FREIDBERG, D SEGAL, MIT, A CERFON, CIMS — The work presented here re-examines the long held US consensus that a tokamak reactor must operate as a steady state, rather than a pulsed, device. There are two reasons motivating this re-examination. First, current drive has proven to be more difficult to achieve than originally believed. The efficiency of the most favorable method, lower hybrid current drive, is just too low. Second, in order for pulsed devices to be able to survive cyclical stresses, earlier designs resulted in relatively large, economically unattractive reactors. Our analysis attempts to reassess these issues by making use of the game changing development of new high temperature superconductors (HTS). The ideas are as follows. Make the reactor pulsed in order to resolve the current drive problem. Make the OH transformer and toroidal field coils out of HTS, achieving maximum B = 22 T. A high toroidal field is expected to improve performance leading to a smaller reactor. Similarly, a high field OH transformer should substantially reduce the reactor size, since the same flux swing is now possible with a smaller coil radius. In addition, advanced technologies involving demountable joints and liquid blankets reduce the major component replacement down time. This allows high average power production even with shorter pulses in compact reactors limited to the same number of stress cycles as larger low field pulsed reactors. Do these ideas make pulsed reactors competitive with steady state reactors? Results will be presented at the meeting.

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Date submitted: 10 Jul 2019 Electronic form version 1.4