White Paper on Magnetic Fusion Research submitted to FESAC

In my opinion, the two highest priorities in the US Magnetic Fusion research program are i) to insure the successful operation of ITER and ii) to perform research which will enable the USA to take advantage of the successful operation of ITER to move forward towards the application of magnetic fusion to help meet the nation’s energy requirements. More specifically, I suggest the following priorities:

1. Experiments in US tokamak facilities (DIII-D, C-Mod and NSTX) that can define and explore certain aspects of ITER operating conditions and the theoretical interpretation of these experiments which will enable extrapolation to ITER conditions.
2. Development of fusion nuclear science (tritium breeding and recovery) in support of ITER test module utilization.
3. Experiments in US tokamak facilities (DIII-D, C-Mod and NSTX) that can define ways to reliably achieve high availability plasma operation, with very long pulse (or steady-state) and disruption-free operation, and the theoretical interpretation of these experiments that will enable their extrapolation to future tokamaks.
4. Development of a radiation damage resistant (to >150 dpa) structural material.
5. Examination of pathways for introducing magnetic fusion to contribute to the nation’s energy needs at the earliest possible time.
6. Experiments in US tokamak facilities (DIII-D, C-Mod and NSTX, ??) that can investigate achievement of advanced confinement and stability performance parameters, and the theoretical interpretation that will enable future fusion reactors to be more economical.

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