CRITICAL ISSUES -- CONFINEMENT

1 How can the US retain access to (and ability to manipulate) the various confinement databases assembled hy the ITER Expert Groups? (Uckan, Perkins) (These have been the basis for almost all FIRE performance predictions to date.)

- as more data-points are added, it should increasingly be possible to look at narrower subsets of data limited to FIRE ranges of :

    - n/n_{Gr} (> 0.6), T_i/T_e (< 1.5), DN divertor, ELM type, $q_{95} < 3.2$ (especially at $\beta_\theta > 0.5$ −− Coppi)

2. Is there an experimental database on the scaling of sawtooth amplitude and repetition time and what does it predict for FIRE? (Perkins)

3. Are the (cost-constrained) parameters of FIRE optimum? Should I/aB be larger (and R/a smaller)? (Mazzucato, Petty)

4. Why has an unfavorable β-dependence reappeared in the new confinement scaling:

$$B\tau_E \qquad \beta^{-0.9}\, \nu^{-0.1}\, \rho^{-2.7} \text{ ..... ?}$$

(Uckan) At fixed ν and ρ, JET found $B\tau_E$ roughly independent of β ? Is the reappearance of an adverse β dependence a reflection of the onset of NTMs?

5. How can we reconcile the predictions for FIRE from 0-D scalings with those from 1-D modelling? (Kritz) Specifically, the Multi-Mode Model generally predicted more favorable performance of ITER than 0-D scalings, but its predictions are uniformly more pessimistic for FIRE.

- Benchmark the MMM for high field/density with C-MOD results?

6. What is the physics of the L-H transition and threshold power?

7. What power P should be used in experimental data-points used to develop empirical scalings for the L-H transition power threshold?

- In applying such scalings to ITER-FEAT and FIRE, the power transported across the separatrix, P_{sep}, is used, which is defined as $P_{sep} = P_{absorbed\ htng} + P_{alpha} - P_{brems} - P_{synchr} - P_{line}$, where P_{line} means all other radiation which originates from within the separatrix.

8. What is the experimental scaling of the edge pedestal width? Is there a regime in which the edge pedestal width does not decrease with ρ_i ? (Hammett)

9. How can transient regimes in FIRE be exploited?

- "PEP-like" modes in which reversed shear and high bootstrap current arise in the ramp-up phase and survive for periods of several seconds (Houlberg)

- Transient very-high-Q regimes before helium build-up in high-purity plasmas in FIRE (Sugiyama).

10. What n(r) and T(r) profiles should be assumed for the reference mode in FIRE?

- 0-D predictions have generally assumed $n(0)/\langle n\rangle \approx 1.5$ and $T(0)/\langle T\rangle \approx 2.0$, whereas 1-D modelling generally gives $n(0)/\langle n\rangle \approx 1.0$ and $T(0)/\langle T\rangle \approx 3.0$. (Kritz, Sugiyama, Houlberg)