

Finalizing ARIES-CS Power Core Engineering

Presented by
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Choose a Set of Machine Parameters to Perform Final Design and Analysis of Power Core Components

- From Jim's and Laila's presentations, the case with $R=7.5$ m would probably be the one with the lowest COE satisfying all our constraints
- However, we are using 90% ${}^6\text{Li}$ enrichment and have no active knob for increasing TBR if required during operation.
- We might have some margin with the 15% divertor coverage assumption.
- Should we choose the case with $R=7.75$ m with a somewhat lower ${}^6\text{Li}$ enrichment and slightly higher margin with respect to our constraints and requirements?
-and the winner is: $R=7.5$ m? **NO, it is $R = 7.75$ m**



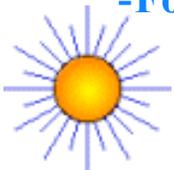
We Have Made Good Progress on the Design and Analysis of Power Core Components, but There are Still a Few Areas Where We Need To Fill the Gap

- **Divertor and Prompt Alpha Accommodation**
 - **Difficulty in obtaining results to define location and heat flux on divertor and regions that would need to accommodate the alpha loss. Continue our effort there (T.K. Mau)**
 - **In the mean time, we need to define zero-order parameters for our analysis**
 - **Suggestion: scale roughly from W7X divertor work and from our work to-date to locate divertor plates (for Laila's analysis and also to provide a better estimate of the coverage fraction) (T. K. Mau)**
 - **For now, maintain the assumption of 15% coverage for divertor + alpha accommodation?**
 - **Need to agree on a core radiation fraction, a local divertor edge radiation fraction for a reasonable anticipated peaking factor on divertor (and for alpha deposition) and for a max. heat flux of 10 MW/m² (J. Lyon would need this also)**
 - **But we need some physics basis for the assumed numbers (T.K. Mau, J. Lyon)**



We Have Made Good Progress on the Design and Analysis of Power Core Components, but There are Still a Few Areas Where We Need To Fill the Gap (cont.)

- **Coil and Structure Analysis**
 - Great that we can compare 2-D shell model results with 3-D solid model results for example case so that we can apply them to scale other shell model results
 - Need to analyze effect of penetration and rib requirement (X. Wang)
 - Zero-order estimate of structure thickness variation based on stress profile (X. Wang)
 - Need to choose between Incoloy and Japanese material (L. Bromberg)
- **CAD Drawing**
 - Need to update CAD drawings for our final design choices (no bucking cylinder) (X. Wang)
 - Do we need control coils and if so where are they located; need to show them on our CAD drawings (L-P. Ku)
- **Blanket**
 - Perform stress analysis on final design
 - First wall heat flux distribution (J. Lyon, L-P Ku)
- **System runs**
 - For both blanket designs (reference and advanced) (J. Lyon)
 - Availability assessment to back up our number (L. Waganer)
- **Safety analysis**
 - For both blanket designs? (B. Merrill)



Example List of Papers to be Submitted to 17th TOFE, Albuquerque, Nov 13-15, 2006 (abstracts due by June 9, 2006)

- **Overall paper (Farrokh)**
- **Engineering paper (Rene)**
- **Physics configuration (Long-Poe)**
- **System (Jim)**

- **Neutronics analysis (Laila, UW)**
 - **Neutronics performance**
 - **Waste management**
 - **Radial build**

- **Maintenance (Xueren/Siegfried)**
- **Hot core design (Xueren/Siegfried)**
- **Coil design and analysis (Xueren/Rene)**

- **Coil material choice (Leslie)**

- **Out of reactor layout and maintenance considerations (Les)**

- **Safety analysis (Brad)**

- **Divertor heat loads (T.K)**

Currently an ARIES-CS session is scheduled at the 17th TOFE (need to check with C. Olson about this)

17th TOFE Technical Program

Tuesday, November 14, 2006

Tuesday Morning - 8:00 to 10:00 (3 ll sessions, 6 talks per session, 20 min each)

Power Plant Studies

ITER Test Blanket Modules

Non-Electric Applications

Coffee Break - 10:00 to 10:30 AM

Tuesday Morning - 10:30-12 AM (3 ll sessions, 5 talks per session, 18 min each)

ARIES Compact Stellarator

Target Development and IFE Technology

Latest Technology and Tritium System

Lunch - 12-1:30 PM

