Maintenance Scheme for Post-ITER Power Reactors

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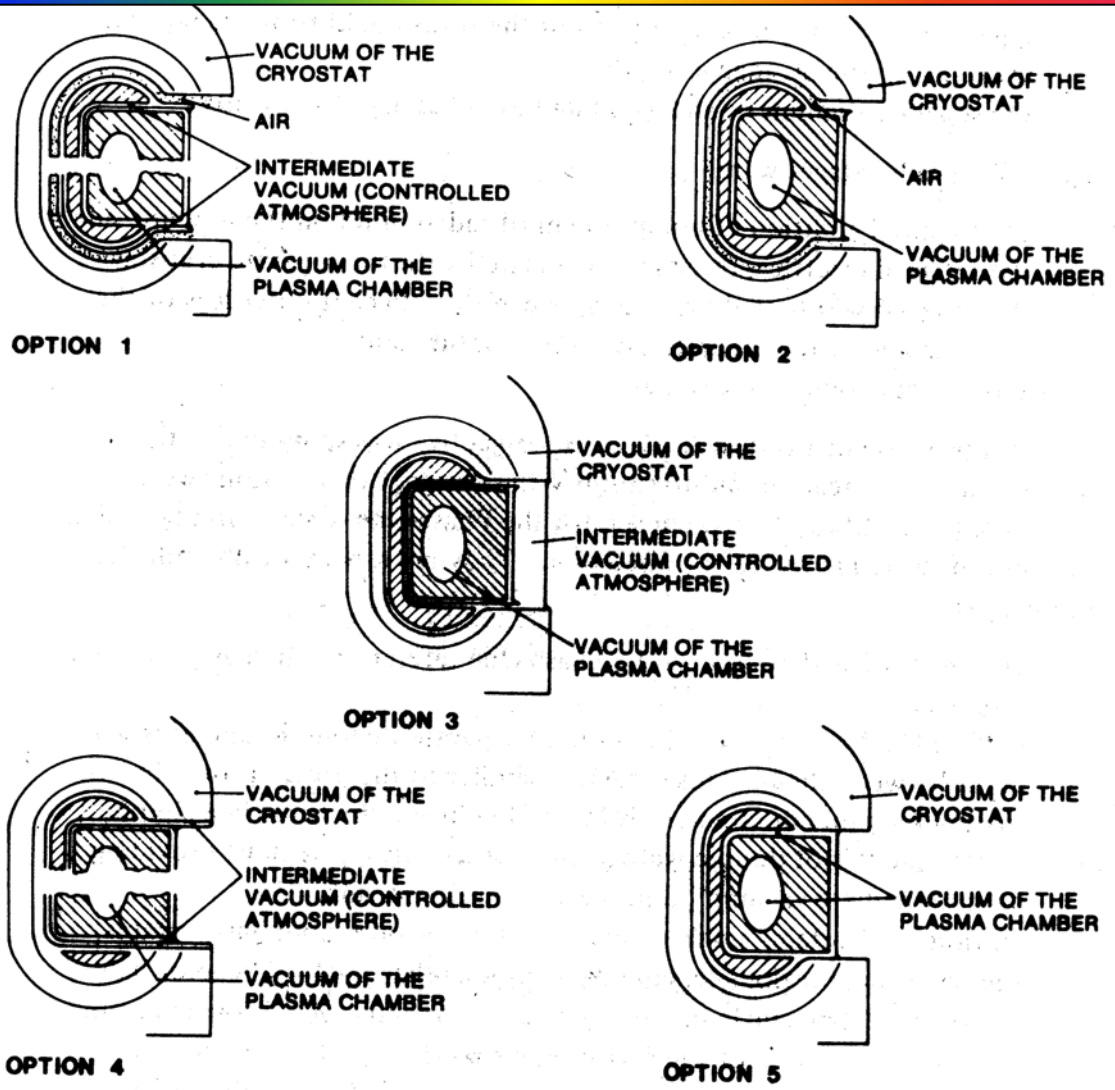
Maintenance Related Issues

A maintenance issue inevitably includes a vacuum boundary topology issue and a PF coils positioning issue.

Segmentation of Replaceable Components

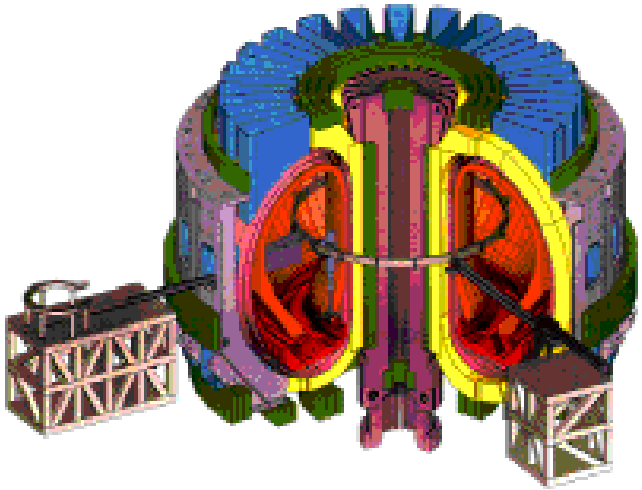
Vacuum Boundary Topology

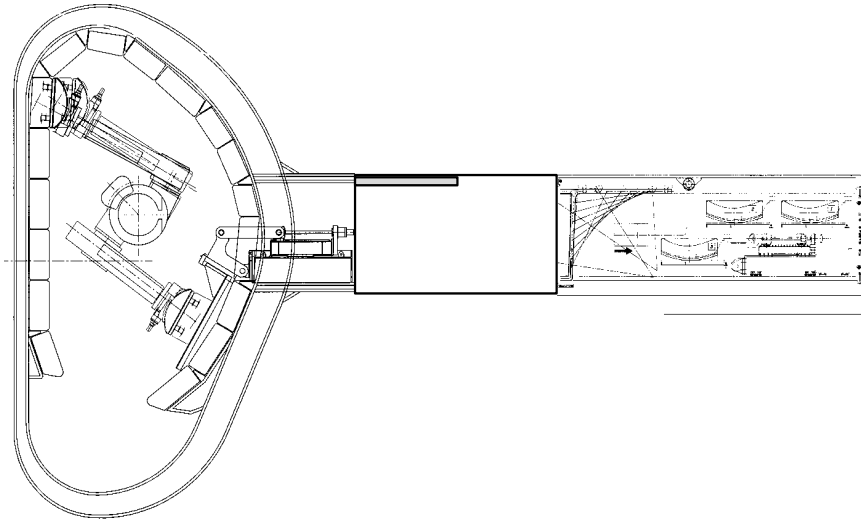


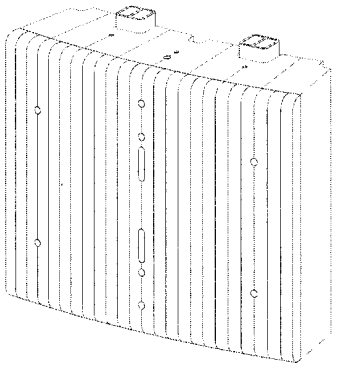
Supporting System of Power Core Components

Segmentation for In-Situ Maintenance (1)

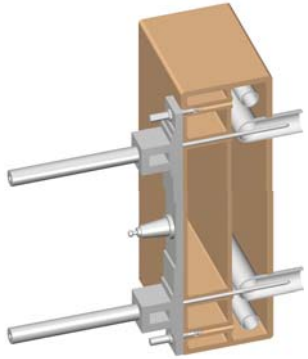
Small Module (Ship-in-bottle)





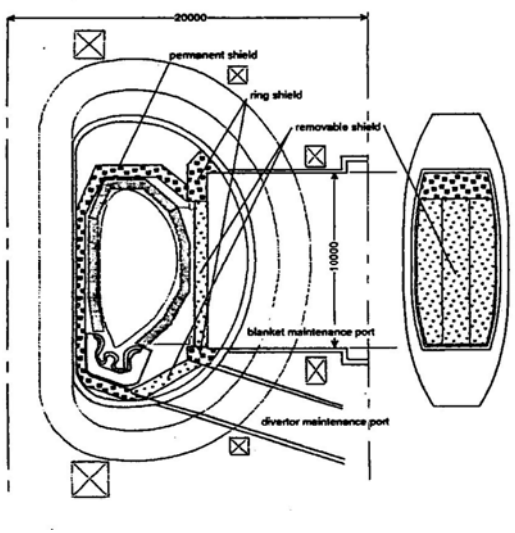


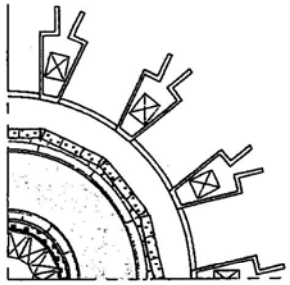
4~5 tons



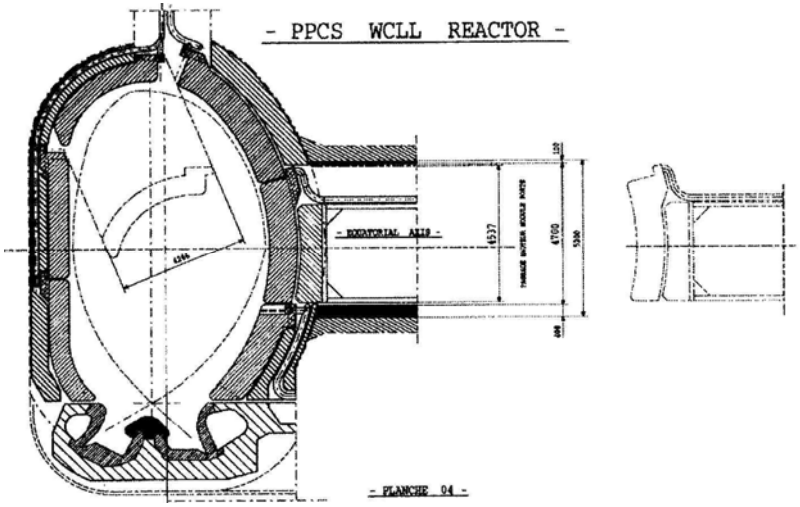
Segmentation for In-Situ Maintenance (2)

Large Module





●負荷の分布に応じたブランケット交換が可能。
●壁負荷の大きいアウトボードブランケットのみの交換が可能であり、かつ最も容易に交換できる。

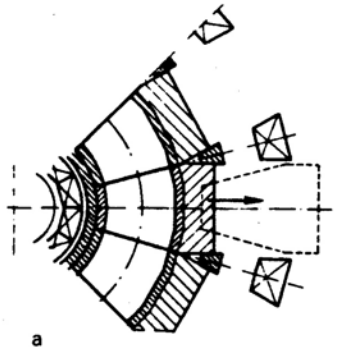


40~50 tons

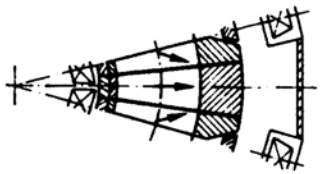
Reasonably moderate or Unsatisfactory half measures ?

Segmentation for Hot Cell Maintenance

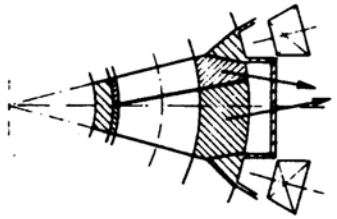
Hot Cell Maintenance



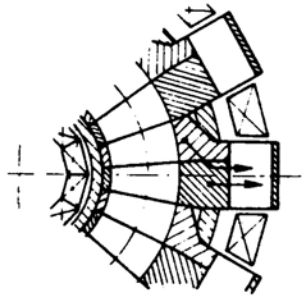
a
INTOR ph.1



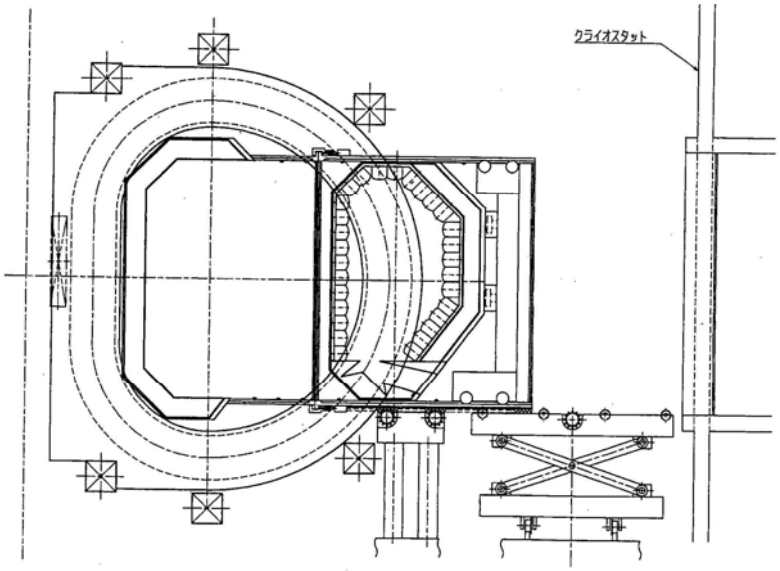
b
MULTISEGMENTED SCHEME WITH 3 SECTORS PER PORT



c
MULTISEGMENTED SCHEME WITH 2 SECTORS PER PORT (REMOVABLE BY CRISS-CROSSING) AND SEPARATE VACUUM CLOSURE



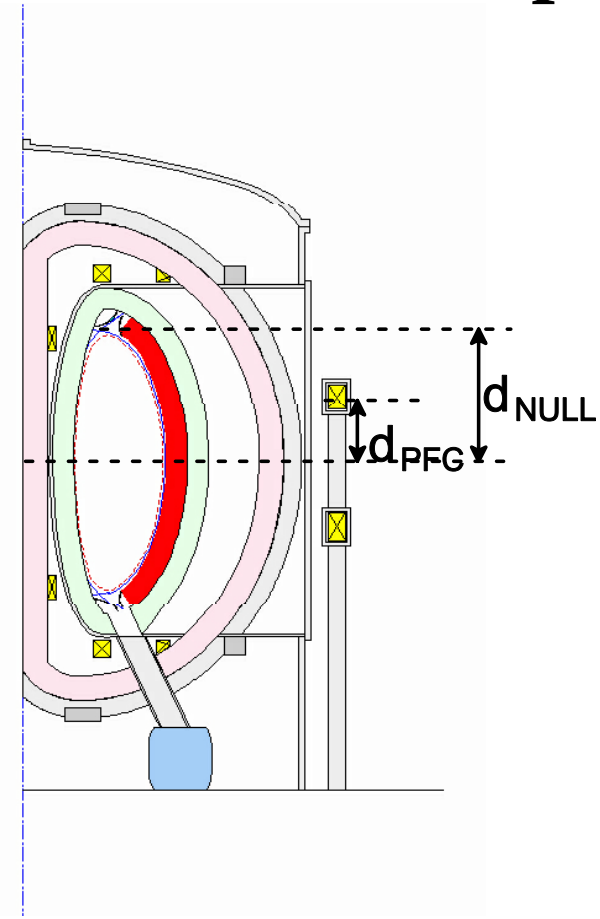
d
MULTISEGMENTED SCHEME WITH 2 SECTORS PER PORT (WITH COMPOUND MOTION OF 1 SECTOR) AND SEPARATE VACUUM CLOSURE

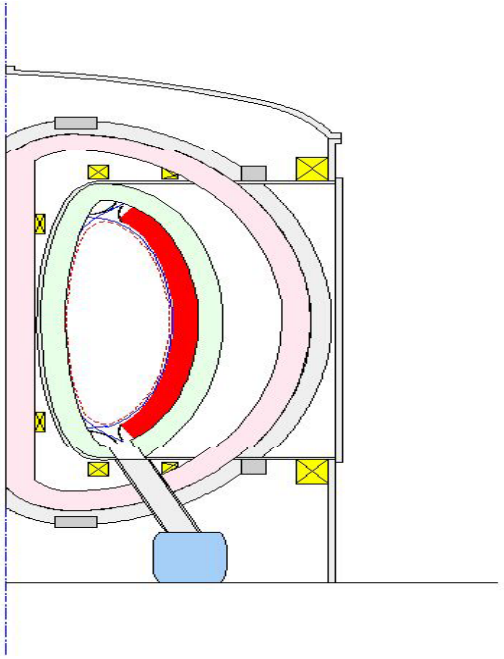


~300 tons

PF Coils Positioning

Plasma Shaping Control (Ellipticity)





$K_{95} < \sim 2.0$

Maintainability vs. Plasma Performance

Three Possible Concepts

(1) In-Situ Maintenance & Higher Elliptic Plasma

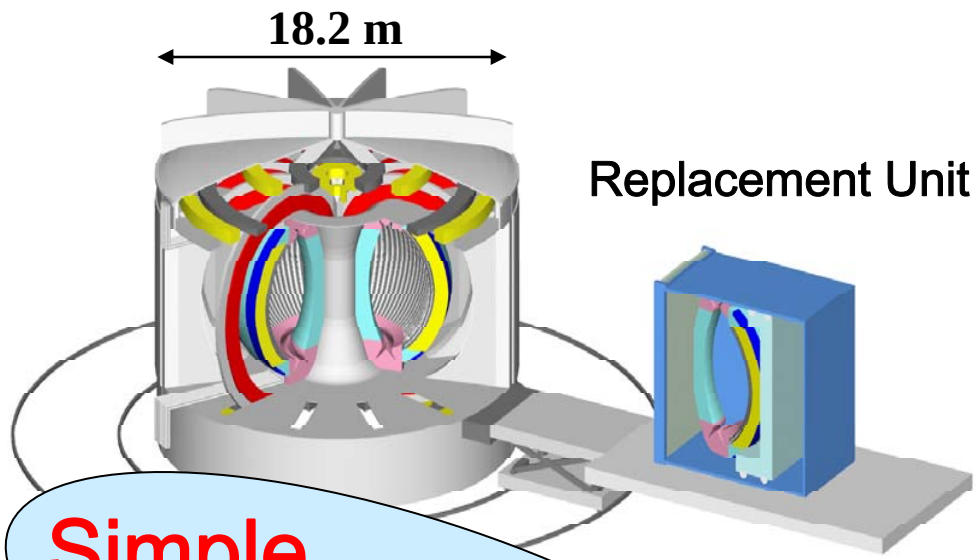
(2) Hot Cell Maintenance & Lower Elliptic Plasma

(3) Hot Cell Maintenance & Higher Elliptic Plasma (but Replaceable PFCs)

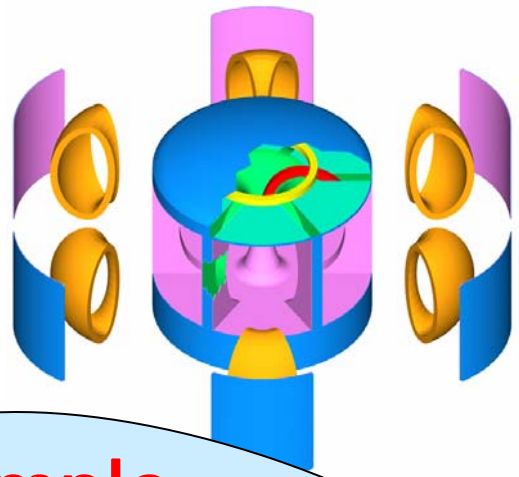
Qualitative Comparison of Maintenance Approaches (by L.M.Waganer)

Criteria (Importance)		In-Situ Maintenance	Hot Cell Maintenance
Maintenance Time	4	1 (4)	4 (16)
Replacement Sector Reliability	4	1 (4)	4 (16)
Building Cost	2	4 (8)	3 (6)
Maintenance Equipment Cost	1	4 (4)	3 (3)
Spare Equipment Cost	1	4 (4)	2 (2)
Waste Volume	3	4 (12)	2 (6)
Contamination Control	2	0 (0)	4 (8)
Applicability to Scheduled and Unscheduled Maintenance	3	1 (3)	4 (12)
	20	39/80	69/80

Hot Cell Maintenance Approach



Simple Maintenance Scheme



Simple Vacuum Boundary

Conclusion

What can we do?

Go back to the starting point.

Try to find a guide into tomorrow by taking lesson from the past.

温故知新