

CS Power Core Materials and Fabrication Unit Cost Estimation

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Assumptions

- 10th unit recurring cost
- First wall, blanket, vacuum vessel, power core structure, and some building costs are provided
- Development and tooling costs assumed previously amortized
- Power supplies, magnets, electrical, instrumentation, and controller costs are not included
- Power core assembly and installation costs are not included

Logic

- Materials and fabrication procedures used are considered fully developed and commercially available
- Larger quantities of identical, or very similar, components reduce cost
- Costs compared with current “similar” structures for reasonableness

Rationale

- Cost is projected on a \$/kg basis and therefore should be applicable to any similar component made from that material.
 - A judgment must be made concerning the size, complexity, and requirements of the component

Pricing Information

- Material costs are for 2004
- Cost compared with estimates for previous conceptual reactors (Starfire, EBTR, Prometheus, ARIES-RS, ARIES-ST, ARIES-AT)
- Cost compared with other industry applications
 - Fusion Experiments (FIRE, TPX, ITER)
 - Aerospace
 - Commercial

Cost Estimations

	Compact Stellarator	Prior Estimates	Comments
Material			
B4C, Granules		48.92	
B4C, Cast		244.61	
Be, wall coating sprayed		492.33	
Be, Cast, pellets	500.00	649.88	Brush Wellman
C (graphite)	30.00	23.63	UCAR ATJ
Li, liquid, natural		61.14	
LiAlO2, Natural, Pellets		256.84 - 78.77	
LiAlO2 Pellets, 60%Enrch		157.55	
Pb, cast	9.00	2.69	
PbLi, liquid (natural Li)		16.89	
FLiBe			
SiC Powdered, Bulk		24.46	
SiC Solid, Bulk		86.16	
SiC Composite structure	107 - 1075	492.75	Material Costs 50% of current
TiH2 powder	40.00	3.94	Web Price
TiB2/TiH2 powder		3.94	
W, Cast		99.95	
WC	18.00	80.22	Web Price

Cost Estimations

	Compact Stellarator	Prior Estimates	Comments
Material			
FS, RA, Large, Complex, Curved Structures		79.87	
Ferritic Steel, RA, Blanket structures		76.30	
Ferritic Steel, Borated, filler		30.49	
HT-9, Modified (shield structure)		82.78	
Nonmage 30, structural		39.39	
Nonmage 30, bulk		17.72	
PCA, bulk		17.72	
PCA-SS, Simple Fab		53.17	
PCA-SS, Complex Fab		68.93	
TenelonF (filler)		30.11	
TenelonS (shield)		82.78	
Tenelon, Borated (filler)		30.30	
304 SS, structure		39.39	
304 SS, auto fab, near bulk	12.10	11.22	
304 SS, simple machining, med size	23.10	21.82	
304 SS large welded structure	45.10	42.98	
304 SS very large, simple, accurate	45.10	66.84	
304 SS lg, welded, accurate struct	67.10	65.42	
304 SS plt wlded/mchnd, lg, accur		88.37	
Stainless Steel (Cryostat)		82.78	
Inconel 625 welded, accurate struct		78.79	
Concrete, simple structure or pier	400/m3		
Concrete, large complex structure	1050/m3		

Issues

- Power core assembly and installation costs have not been included
- Other materials that need to be considered, or not considered?