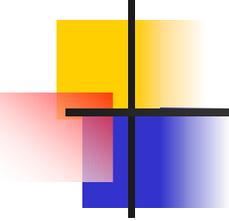


FIRE Cost Estimate

Methodology and Summary

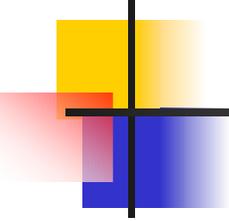
Bob Simmons, Phil Heitzenroeder, and Joel Schultz



Methodology for Costing the 2.0 m FIRE Design

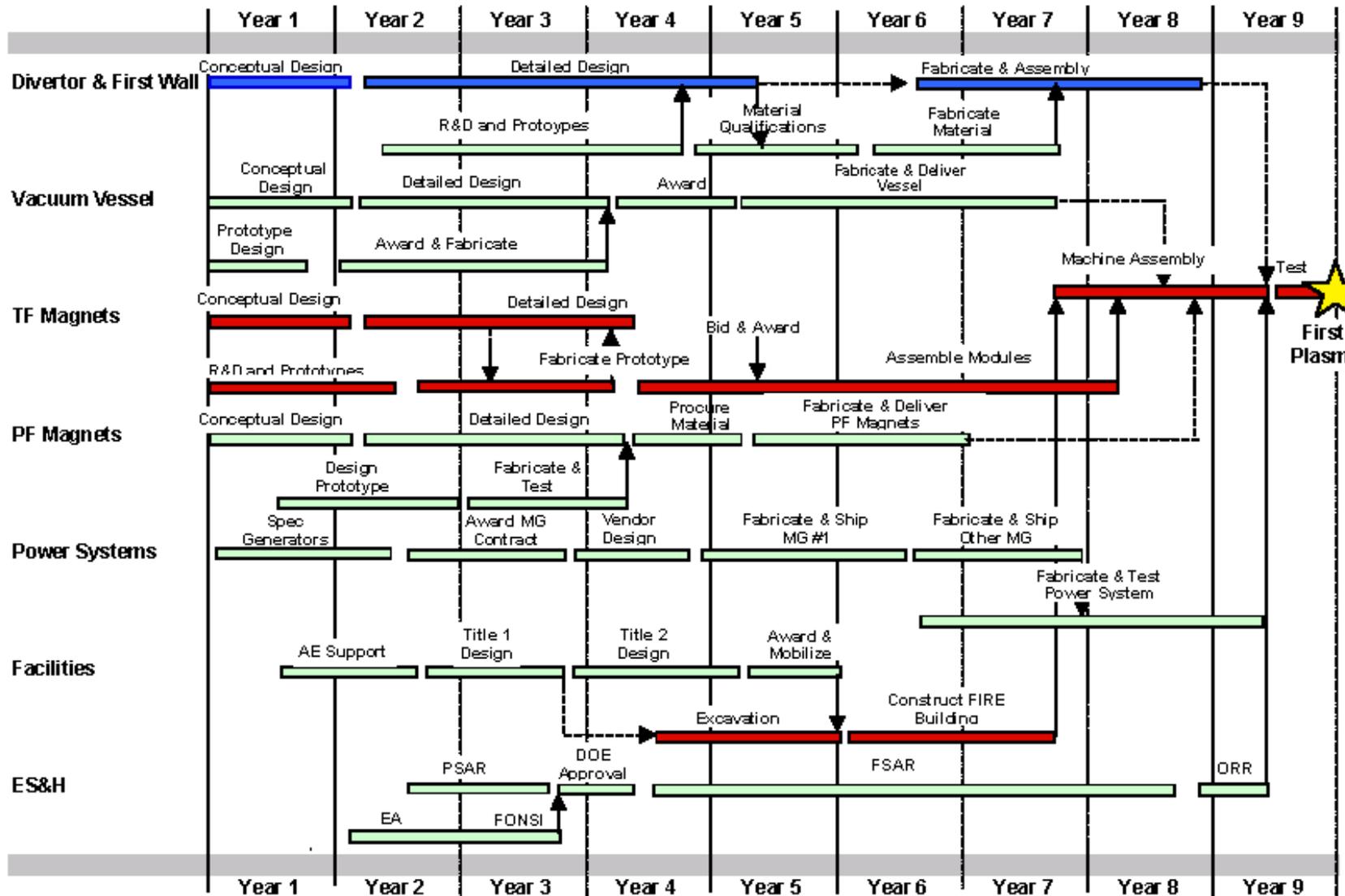
- FIRE assumed to be built on a “green field” site
- Estimate expressed in manhours and a “standard” fusion lab rate applied to cost
- Travel, Material, and Subcontracts fully loaded with all markups included
- Contingency estimated at the WBS 4 (3-digit) level based on standard guidelines as a starting point

General – Costing of the 2.0 m Design



- Costs expressed in FY1999 \$
- Estimates developed for labor, M&S, and contingency
- Rely heavily on previous experiments and similar design

FIRE Overview Schedule



8 year Construction Schedule based on BPX

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Cost Summary: 2 m. FIRE Design Direct

Costs (estimates developed as described)

| WBS Element | Cost (FY99M\$) | Contingency (FY99M\$) | Total (FY99M\$) |
|--------------------------------------|---------------------------|----------------------------------|----------------------------|
| 1 – Fusion Core Systems | \$266.3M | \$78.5M | \$343.8M |
| 2 – Auxiliary Systems | \$135.6M | \$42.5M | \$178.1M |
| 3 – Diagnostic Systems | \$22.0M | \$4.9M | \$26.9M |
| 4 – Power Systems | \$177.3M | \$42.0M | \$219.3M |
| 5 – Central I&C Systems | \$18.9M | \$2.5M | \$21.4M |
| 6 – Site & Facilities | \$151.4M | \$33.8M | \$185.2M |
| 7 – Assembly & Remote Maintenance | \$77.0M | \$18.0M | \$95.0M |
| Total | \$ 848.5 M | \$222.5 M | \$1069.7 M |

Note: R&D costs are included in the individual WBS elements.

Cost Summary: FIRE 2.0 M. Design; Indirect Costs; Commissioning Costs

Indirect Costs (FY 99\$)

| | Cost | Contingency | Total |
|---------------------------------|---------|----------------------|-----------|
| 8 – Project Support & Oversight | \$88.8M | \$13.3M | \$102.2 M |
| | | Total Indirect Cost: | \$102.2 M |

| | | | |
|-------------------------|---------|--------|----------|
| 9 – Commissioning Costs | \$16.2M | \$2.4M | \$18.6 M |
|-------------------------|---------|--------|----------|

Cost Summary for the 2.0 m FIRE Design

Cost, FY 99 \$

| | |
|---|-------------------|
| Subtotal, direct costs(incl. Contingency and labor): | \$ 1069.7 M |
| Subtotal, indirect costs (incl. Contingency and labor): | \$102.2 M |
| Total Direct + Indirect Costs (incl. Contingency and labor) | \$1171.9 M |
| Commissioning costs | \$18.6 M |
| Total, direct, indirect, & commissioning costs: | \$1190.5 M |

Direct Cost Summary: 2.14 m. FIRE Design

(Using revised WBS. Costs extrapolated using "FIRESALE" and do not include lab labor or contingency)

| WBS Element | Cost (FY 02 \$) |
|---------------------------------------|----------------------------|
| 1 – Fusion Core Systems | \$232.0 M |
| 2 – Auxiliary Systems | \$74.8 M |
| 3 – Diagnostic Systems | \$17.9 M |
| 4 – Power Systems | \$127.9 M |
| 5 – Central I&C Systems | \$15.3 M |
| 6 – Site & Facilities | \$119.9 M |
| 7 – Assembly & Remote Maintenance | \$42.6 M |
| <u>Subtotal, direct costs:</u> | <u>\$630.3 M</u> |

Indirect Costs for the 2.14 m. FIRE Design

| | Cost, FY 02 \$ |
|---|-------------------------|
| R&D | \$40.9M |
| Project Support & Oversight | \$98.6 M |
| <u>Subtotal, indirect costs:</u> | <u>\$139.2 M</u> |

R&D Summary for the 2.14 m. design– Fusion Core Systems (not including contingency and lab labor)

| WBS | FY02 \$ |
|-------------------------------------|----------|
| WBS 11 - PFCs | \$8.0M |
| WBS 12 – Vacuum Vessel | \$0.0M |
| WBS 13 – TF Coils | \$2.9M |
| WBS 14 – PF Coils | \$1.0M |
| WBS 15 - Cryostat | \$0.0M |
| WBS 1.6 – Tokamak Support Structure | \$0.7M |
| Subtotal Fusion Core Systems | ~\$12.6M |

R&D Costs For Other Systems of the 2.14 m. Design

| WBS | FY02 \$ (w/o Contingency) |
|--------------------------------|--------------------------------------|
| WBS 2.4 - ICRF | \$3.6 M |
| WBS 3.5 – Remote Handling | \$21.0 M |
| WBS 3.6 - Hot cell | \$3.4 M |
| Subtotal R&D for Other Systems | \$28.0M |

Commissioning Costs for the 2.14 m. FIRE Design and Cost Summary

| | |
|---------------------|----------|
| Commissioning costs | \$16.8 M |
|---------------------|----------|

Cost Summary

Cost, FY 02 \$

| | |
|--|------------------|
| Subtotal, direct costs: | \$630.3 M |
| Subtotal, indirect costs: | \$139.2 M |
| Total Direct + Indirect Costs | \$769.5 M |
| Commissioning costs | \$16.8 M |
| Total, direct, indirect, & commissioning costs: | \$786.3 M |
| 20% Lab Labor Costs (US costing) | 157.3 M |
| 25.5% contingency on total + lab labor (US costing) | 235.6 M |
| Total Direct, Indirect, & Commissioning Costs with Labor and Contingency: | \$ 1179 M |