

System Analysis and Technical Assurance

A. W. Brooks

NCSX WBS 824

System Analysis and Technical Assurance

System Analysis Overview



- Responsibilities
- Job Status
- Staffing Requirements – Manpower Loading

Responsibilities



- Analyzing field errors and managing field error budgets for as-designed conditions, out-of-tolerance conditions, eddy currents, and magnetic materials with Trim Coil correction. Includes disposition nonconformance reports (NCRs).
- “Back Office Support” - Providing analysis support to the metrology and dimensional control efforts for troubleshooting problems as well as production activities
- Analyzing options for optimally aligning modular coils based on as-built measurements to mitigate resultant field errors
- Performing global analyses which are outside the scope of individual subsystems. Analyses include electromagnetic analyses to determine coil inductances, fields, forces; global structural modeling to determine overall structural behavior, mechanical interface loads, and operating limits. (Global seismic analyses will be performed as part of the base support structure design in WBS 15.)
- Technical Assurance - Providing independent assessments of the design adequacy and risks for *critical* systems and design features. Facilitate resolution of critical issues. (Does not include general calculation checking which is handled within each WBS)

**WBS provides System Analysis LOE As Needed
To Support Project Integration and Systems Engineering**



Status



Task	Personnel	Status
Field error analysis and management	Brooks Zhang	Ongoing in support of machine assembly. Computational tools have been developed to aid analyses and evaluations.
Analysis and troubleshooting support for metrology and dimensional control	Brooks Zhang	Ongoing in support of machine assembly. Initial computational tools to aid assembly and alignment have been developed but need to be tailored for each assembly. Some uncertainties exist for future demands as dimensional control plans and metrology procedures have not been fully exercised.
Modular coil alignment calculations and implementation	Brooks Zhang	Initial Phase based on Winding 16 of 18 coils Completed. Will be revisited following completion of 18 coils and as HP and FP subassemblies are completed.
Global modeling and analysis	Fan	Much of this work has already been completed. Global structural models need to be updated as the design of the coil structures (WBS 15) and base support structure (WBS 17) and Trim Coils are completed. This effort is expected to continue until the completion of the design of stellarator core components.
Technical assurance	Fan	Future tasks authorized by the Engineering Manager to resolve critical issues when they arise. Past tasks included MCWF bolted joint and shim evaluations.

Han Zhang recently joined PPPL and NCSX to provide needed backup for personnel to mitigate schedule risk as recommended in prior reviews



Manpower Loading



Task	Manpower Loading, FTE					TOTALS
	FY2008	FY2009	FY2010	FY2011	FY2012	
Field error analysis and management	0.28	0.23	0.23	0.10	0.05	0.875
Analysis and troubleshooting support for metrology and dimensional control	0.55	0.45	0.45	0.20	0.10	1.75
Modular coil alignment calculations and implementation	0.28	0.23	0.23	0.10	0.05	0.875
Global modeling and analysis	0.55					0.55
Technical assurance		0.31	0.31	0.10	0.10	0.82
All	1.65	1.21	1.21	0.50	0.30	4.87

LOE activities provide Ongoing Project Support which is expected to be front loaded and tail off as machine assembly matures. A bottoms up estimate was done to support these LOE's



Summary

- System Analysis a key part of Project Integration and System Engineering
- We have responded to past recommendations to mitigate schedule risk by adding personnel to provide backup in critical areas
- LOE tasks anticipated to provide support for project at a diminishing level until project completion.
 - Job estimate risk tied to project schedule performance