NATIONAL COMPACT STELLARATOR PROJECT
Engineering Change Proposal (ECP)

COVER PAGE
(TO BE COMPLETED BY SYSTEMS ENGINEERING SUPPORT MANAGER)

Originator: R.Strykowsky	**Date:** September 12, 2008
ECP No: 060	**ECP Title:** NCSX MIE Project Closeout

Required Reviewers

Required Reviewers for this ECP: D.Rej, H.Neilson, R.Simmons, P.Heitzenroeder, L.Dudek, J.Harris

ECP Approval Level

Expedited ECP? ☐ Yes ☒ No
Change Level: 0 - Deputy Secretary of Energy
Approving Official: Deputy Secretary of Energy

Actions

1. Accept proposed closeout plan as proposed (DOE)
2. Execute closeout plan (PPPL/ORNL)

APPROVALS
(TO BE COMPLETED BY APPROVING OFFICIALS)

Change Level	Approving Official	Approval?	Signature
3	NCSX Project Manager	☒ Yes ☐ No	Don Rej
3a (Expedited ECP)	NCSX Engineering Manager	☐ Yes ☒ No	
2	NCSX Federal Project Director	☒ Yes ☐ No	Jeffrey Makiel
1	Associate Director OFES	☒ Yes ☐ No	Gerald Navratil
0	Deputy Secretary of Energy*	☒ Yes ☐ No	NA

* S-2, S-4, DOECM ALL CONCURRED/APPROVED THE DECISION TO CANCEL

NATIONAL COMPACT STELLARATOR PROJECT
Engineering Change Proposal (ECP)

PART I
(TO BE COMPLETED BY ORIGINATOR)
ECP-60

Originator: R.Strykowsky	**Date: September 12, 2008**

Overview of Change

Type of ECP: ☐ **EXPEDITED** ☒ **STANDARD**

Type of Change: ☒ **TECHNICAL** ☒ **COST** ☒ **SCHEDULE** ☐ **EDITORIAL**

(Check all that Apply)

Reason for Change: Project Cancellation

Impacted WBS Elements: All

Impacts of Change (Briefly Describe):
NCSX MIE Project cancelled as directed by DOE. Remaining work (as defined in attached) required to bring work efforts to an orderly conclusion, which includes new scope of safeguarding acquired project assets and documentation closeout.

Project TEC reduced from $92.4M to $92.0M
Project OPC increased from $9.6M to $10.0M
Project TPC unchanged at $102.0M
CD-4 date unchanged at July, 2009. Scope changed as described herein.

Does this Change Impact Material Already Procured or Parts/Assemblies Already Assembled/Manufactured using this Material: ☒ **Yes** ☐ **No**

If "Yes", what is the recommended disposition of this material/part/assembly? Fabricated and procured parts and hardware will be inventoried, collected and stored in a protected defined area.

Assessment of Other Options: Parts and fabricated hardware to be stored for future disposition and not sold for scrap value at this time.

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Engineering Change Proposal (ECP)

PART I
(TO BE COMPLETED BY ORIGINATOR)

Originator: R.Strykowsky	**Date: September 12, 2008**

Detailed Description of the Change:
(Use Continuation Sheets and/or Attach Information/Sketches, As Needed)

List Attachments, Impacted Documents, etc.

1) WBS Element Description & Status at Closeout
2) CD4 Deliverables
3) WBS financial comparison chart between previous baseline (ECP-53) and this Closeout ECP
4) Closeout plan resource loaded schedule
5) Revised list of milestones
6) Decision memo from SC-1 to S-2 announcing project cancellation

Description of Change:

1. Scope:
   – Document work performed relative to the ECP-53 baseline
   – Inventory and store all materiel and fabricated components
   – Complete fabrication of 18 modular coils
   – Complete fabrication of 18 toroidal field coils
   – Complete coil structures final design review
   – Complete the LN2 distribution system PDR, trim coil , and base structure FDR
   – Complete subassembly of two half field period assemblies (HFPAs) & one HFPA trial fit-up test over vacuum vessel subassembly
   - Document final status of CAD models, finite-element analyses, and all work packages, including open issues needing to be resolved in order to complete construction.
   – Archive key project documents for long-term storage electronically, and make those documents readily accessible to the research community
   – Prepare journal manuscripts on physics, engineering design, integration, R&D, fabrication, assembly, management, and lessons learned (OPC)
   – Closeout costs, e.g., subcontract claims, indirect changes
   – Organizational restructuring

2. Costs & Budgets:
   – TEC
      Costs through 5/31/08 ……...…...$82.7M
      Estimate to Complete…..……$9.3M
      Current Baseline …….…..……...$92.4M
      Revised Baseline……$92.0M
   – OPC
      Current Baseline: …….……$9.6M
      Revised ……..……$10.0M

3. Schedule: See attached resource-loaded schedule for early finish dates

ATTACHMENT 1 page 1/12

WBS ELEMENT DESCRIPTION & STATUS AT CLOSEOUT

1 Stellarator Core

Vacuum Vessel System (WBS 12)

The vacuum vessel was to have provided the vacuum boundary around the plasma suitable for high vacuum conditions; structural support for all internal hardware and access for auxiliary systems such as neutral beam injection and plasma diagnostics. The vacuum vessel was a highly shaped, three-period Inconel structure which approximately conforms to the plasma. Work included engineering design, R&D in support of design and fabrication, component procurement, and fabrication. Project scope and construction status at the end of the project are listed in Table 1.

Table 1: Vacuum Vessel System Scope

MIE Project Scope	Status at Closeout
Three vacuum vessel sub-assemblies, each consisting of a 120-degree shell sector, spacer, and associated ports	**Complete.**
Heating and cooling hoses, with attachment hardware	**Complete, except for following exceptions due to replacement of 11 reworked hoses. (NCR3758) and connections loosened to correct instrumentation which needed troubleshooting. The following activities were cancelled, and would need to be done if the Project were to be restarted.** **VVSA-1: 2 connections (1hose) will need brazing + leak check; 5 lines will need leak check only.** **VVSA-2: 14 connections (7 hoses) will need brazing + leak check; 12 lines will need leak check only.** **VVSA-3: 8 connections (4 hoses) will need brazing + leak check; 13 lines will need leak check only.**
Heating and cooling manifolds	**Complete.**
Cryostat interface flanges	**Preliminary design complete. Detail drawings not started. Scope cancelled.**
Heater tapes	**Complete.**
Supports	**Design: 100% complete.** **100% of parts delivered.** **Not installed; scope cancelled.**
Thermocouples and other instrumentation	**Complete.**
Thermal insulation	**Title-I & II design complete.** **100% of materials delivered.** **Some further design changes likely needed; scope cancelled.**

Conventional Coils (WBS 13)

The conventional coil systems scope included the fabrication of eighteen toroidal field (TF) coils, six poloidal field (PF) coils, forty-eight trim coils for control of low-order helical field harmonics, local instrumentation, and certain support structures. The TF coils are identical, and were to be installed equally spaced, providing flexibility in the magnetic configuration. TF coils were wound from copper conductor, assembled to steel support wedges, and vacuum impregnated with epoxy. They were designed to operate at the liquid nitrogen (LN2) cryogenic temperatures. The PF magnets produce the poloidal magnetic field within the NCSX device. These coils were to provide inductive current drive and plasma shape and position control. The coils were to be wound from copper conductor and vacuum impregnated with epoxy, and also designed to operate at the LN2 temperatures. Existing PF solenoids from the National Spherical Torus Experiment (NSTX) were to be utilized as the initial central solenoid for NCSX. Project scope and construction status at the end of the project are listed in Table 2.

Table 2: Conventional Coils Scope

MIE Project Scope	Status at Closeout
Design and fabrication of eighteen TF coil assemblies consisting of D-shaped coils assembled to wedge support pieces	**Complete.**
Design and fabrication of three pairs of PF ring coils. Central Solenoid will utilize existing PF-1a solenoid from NSTX	**Final design complete; fabrication contract award was pending at time of Project cancellation.**
Design and fabrication or procurement of trim coils required for MIE project.	**Final design complete.**
Fabrication and installation of local instrumentation for the conventional coils, e.g., thermocouples, strain gauges, RTDs, and voltage taps	**Scope cancelled. Not started.**
Fabrication and installation of the support structure for existing central solenoid coils, and procurement and installation of I&C for those coils	**Final design of structure complete. Design of PF 1 interconnecting bus not done; scope cancelled.**

Modular Coils (WBS 14)

The modular coils consisted of eighteen complex-shaped coils supported on the interior surface of a toroidal shell structure. The coils were fabricated on 2700 kg castings made from a specially developed modified CF8M alloy named Stellalloy. There were three types of coils differing primarily in their shapes. The coils were fabricated from flexible copper cable conductor wound on the inner diameter of a support structure called a modular coil winding form (MCWF), and vacuum impregnated with epoxy. In the finished assembly, the modular coils were arranged in three identical field periods, each containing six coils, two of each type. The winding forms were joined together at their mating flanges to form a stiff toroidal structure when completed. The flange interfaces between the modular coils utilize a combination of electrically insulated custom-fitted friction shims, insulated bolts, and specially designed low distortion welded connections in some regions to provide strong, stable structural connections

between the winding forms along with accurate coil positioning and an adequate electrical time constant to facilitate magnetic field penetration. The coils were designed to operate at LN2 cryogenic temperatures. Work included engineering design, R&D in support of design and fabrication, component procurement, tooling and fixtures, fabrication, and sub-assembly. Project scope and construction status at the end of the project are listed in Table 3. There were many challenges that were overcome during the coil winding process, one of the most significant was the metrology. In order to minimize islands in the toroidal flux to less than 10%, a tolerance in the positioning of the modular coil winding pack ± < 0.5 mm was required. Through careful assembly and after-winding shaping techniques the tolerance was achieved on almost all points on the winding path.

Table 3: Modular Coils Scope

MIE Project Scope	Status at Closeout
Delivery of eighteen winding forms to modular coil fabrication operations	**Complete.**
Delivery of eighteen instrumented coils and assembly hardware to assembly operations	**Coil winding, VPI, post-VPI work complete.** **Thermocouple installation: 50% Complete.** **Strain gage installation: 0% Complete; Remaining scope cancelled.**
Delivery of drawings, specifications, and models to fabrication and assembly operations; and documentation of coil protection limits.	**All models, drawings, and specifications for the modular coil assemblies (SE104-10X) issued for fabrication/assembly.** **Station-3 models, drawings, and spec issued for comment.** **Station-5 assembly drawings issued for comment.** **Coil protection limits guidance complete.**
Delivery and installation (as appropriate) of tooling for the modular coil fabrication facility.	**Complete.**
Delivery of modular coil interface parts to assembly operations	**Detailed fabrication, assembly, and some as-built drawings issued.**

Conventional Coil Structures (WBS 15)

The coil support structures were to have provided the mechanical supports connecting TF, PF ring coils (PF 4, 5, and 6) to the modular coil toroidal shell and the base support structure. Work included engineering design, procurement, and fabrication of structures and associated instruments and controls. The coil supports interfaced with the MCWF shell which provided the load path to react all coil electromagnetic and gravity loads. It also interfaced with mounting hardware for supporting coil buswork, cryogen lines & cryostat. Project scope and construction status at the end of the project are listed in Table 4.

Table 4: Conventional Coil Structures Scope

MIE Project Scope	Status at Closeout
Design, fabrication, and delivery of coil support structure components to machine assembly operations.	**Final design complete. FDR judged successful pending resolution of open chits. 2 chits from the FDR and 4 remaining from PDR will be left open, pending re-start of NCSX since their resolution is dependent on work stopped due to NCSX closeout.**

Coil Services (WBS 16)

The coil services consisted of the LN2 distribution system and electrical leads inside the cryostat, serving all of the coils. It also included the specification of requirements for the coil protection system. Project scope and construction status at the end of the project are listed in Table 5.

Table 5: Coil Services Scope

MIE Project Scope	Status at Closeout
Engineering design, procurement, and fabrication of manifolds, cooling pipes, and associated supports and I&C, and delivery of components to machine assembly operations.	**Preliminary design for LN2 System (WBS1601) complete.** **R&D, procurement, fabrication & assembly work had not started; scope cancelled.**
Engineering design, procurement, and fabrication of leads and associated supports, and delivery of components to machine assembly operations.	**Preliminary design on lead system (WBS1602) approximately 75% complete; remaining scope cancelled.**
Design, fabrication, and delivery of delivery of coil protection requirements to the coil protection system design activity	**Scope cancelled. Not started.**

Cryostat & Base Structure (WBS 17)

A cryostat was to have enclosed the NCSX device to provide a suitable thermal environment for the magnets, and provides thermal insulation and a tight seal to isolate the cold gaseous nitrogen atmosphere surrounding the coils and cold structure from the ambient atmosphere. It would also provide a means for circulating dry nitrogen inside the cold volume to cool down and maintain the temperature of the interior structures. The base support system would have provided the gravity support for the core device (vacuum vessel and coils) and also thermal isolation of the cold structure from the floor. Project scope and construction status at the end of the project are listed in Table 6.

Table 6: Cryostat & Base Structure Scope

MIE Project Scope	Status at Closeout
Engineering design, procurement, and fabrication of the cryostat shell and structure components, insulation, attachments for the structural support of internal components, and penetrations for electrical, cooling, and mechanical support services. Delivery of components to machine assembly operations.	**A Peer Review of the cryostat involving experts from other laboratories and industry was held on April 23, 2008. A cryostat and cryosystem development plan was formulated based on input from the review. The targeted completion dates for Final Designs were in the 2nd quarter of CY 09. At the time of closeout, a cryostat shell design compatible with the structures, internal components, and penetrations was well underway. A subcontract that was being negotiated for expert support to guide the completion of the shell design, insulation, and integration was terminated. Remaining scope cancelled.**
Engineering design, procurement, and fabrication of the permanent base support structure for the machine. Delivery of components to machine assembly operations.	**Final design complete.** **Only the spherical bearings were procured; no fabrication was begun; scope cancelled.**

Field Period Assembly (WBS 18)

This activity included the assembly of the vacuum vessel, modular coils, and toroidal field coils and trim coils into three identical modules known as field periods. Each field period would contain one vacuum vessel sub-assembly (120-degree shell sector, toroidal spacer, and ports), six modular coils (two each of the three types), six toroidal field coils, sixteen trim coils, and associated coil support structures. Work included engineering design, R&D in support of design and fabrication, component procurement, tooling and fixtures, and assembly. The three different modular coils were aligned, bolted and welded together to form a half period assembly. Alignments were measured to a precision of 0.08 mm and maintained to position requirements of 0.50 mm or less. Project scope and construction status at the end of the project are listed in Table 7.

Table 7: Field Period Assembly Scope

MIE Project Scope	Status at Closeout
Delivery of drawings, specifications, and models to field period assembly and machine operations.	**Station 2: 100% complete.** **Station 3: 100% complete.** **Station 5: 50% complete (drawings 90% complete; specifications not started) ; remaining scope cancelled.** **Station 6: 40% complete (drawings 60% complete; specifications not started); remaining scope cancelled.**
Delivery and receiving inspections of 3 vacuum vessel assemblies (plus port extensions), to Station 1	**Complete.**
Delivery of three field period modules to machine assembly operations.	**Two half periods assembled.**
Delivery and installation (as appropriate) of tooling for field period assembly	**Station 1: 80% complete; remaining scope cancelled.** **Station 2: 50% complete; remaining scope cancelled.** **Station 3: Complete.** **Station 5: Complete.** **Station 6: Complete.**
Design, procure and fabricate additional metrology equipment needed for field period assembly.	**Complete.**

2 Auxiliary Systems (WBS 2)

MIE Project scope included gas fueling, vacuum pumping, and an evaluation of an existing PPPL neutral beam system for potential future use after the planned completion of the Project. Work included design, R&D to support the design effort, component fabrication, assembly, installation, system level commissioning and testing. Project scope and construction status at the end of the project are listed in Table 8.

Table 8: Vacuum Vessel System Scope

MIE Project Scope	Status at Closeout
Design, fabrication, refurbishment, installation, and system testing of gas fueling equipment capable of injecting H_2, D_2, or He gas into the plasma. Components include a gas delivery line, and pulse valve control.	**Design ~25% complete; remaining scope cancelled..** **No parts were procured, fabricated or refurbished; remaining scope cancelled.** **Neither installation nor testing of the system had been started; scope cancelled.**
Design, fabrication, installation, and system testing of turbomolecular pumps backed by existing mechanical vacuum pump systems.	**Design ~30% complete; remaining scope cancelled.** **No parts were procured, or fabricated; remaining scope cancelled.** **Installation of the system had not been started; remaining scope cancelled.** **System testing ~30% complete (offline tests of legacy TMPs and mechanical pumps) ; remaining scope cancelled.**
Evaluate, for future use, a neutral beam injection including one beamline, power systems, ac power, & controls system, based on existing C-site NBI system.	**Complete.**

3 Diagnostics (WBS 3)

Diagnostic systems would have provided measurements of first plasma parameters. The NCSX MIE Project included the following diagnostics: (1) magnetic field probes and flux loops; (2) an existing fast visible TV camera to measure edge and divertor plasma; (3) an electron beam mapping apparatus to measure properties of the magnetic surfaces including shape and topology. Project scope and construction status at the end of the project are listed in Table 9.

Table 9: Diagnostics Scope

MIE Project Scope	Status at Closeout
Co-wound magnetic flux loops installed on the modular coils, TF coils, and PF coils. Saddle loops installed on the vacuum vessel. Rogowski loops. Integrator, digitizer, and data acquisition for one Rogowski loop.	**Design: 95% complete.** **95% of parts delivered.** **Loops installed on vacuum vessel, modular & TF coils.** **Remaining scope cancelled.**
Delivery of one Fast visible TV camera system (based on existing equipment).	**Design: Scope cancelled. Not started.** **No components delivered.**
Installation of electron-beam mapping equipment including probe drive with an electron gun at its tip, fluorescent detector which intercepts the electron beam, and a high-resolution CCD camera to detect the light from the detector. Existing components will be used to the extent possible.	**Design: Scope cancelled. Not started.** **No components delivered or installed.** **Remaining scope cancelled.**

4 Electrical Power Systems (WBS 4)

This system consisted of the supply and delivery of AC and DC electrical power to NCSX equipment, and equipment control and protection systems. The MIE scope dealt with all electrical power system capabilities required for initial operation, including design, component fabrication, assembly, and installation activities, system level commissioning, and testing.

Table 10: Electric Power System Scope

MIE Project & GPP Scope	Status at Closeout
Provide auxiliary AC power systems and experimental AC Power Systems.	**Design 80% complete.** **Fabrication 45% complete (GPP work).** **Installation 45% complete (GPP work).** **Remaining scope cancelled.**
Provide refurbished AC/DC Convertors required for initial operation.	**Design 70% complete.** **Procurement 0% complete.** **Refurbishment 0% complete.** **Remaining scope cancelled.**
Provide, refurbishing as needed, cabling and other DC components required to feed the NCSX machine from the existing C-Site rectifiers.	**Design 35% complete.** **Fabrication 0% complete.** **Installation 0% complete.** **Remaining scope cancelled.**
Provide control and protection systems including electrical interlocks, Kirk key interlocks; real time Control systems, instrumentation systems	**Design 15% complete.** **Fabrication 0% complete.** **Installation 0% complete.** **Remaining scope cancelled.**

5 Central Instrumentation, Controls, & Data Acquisition (WBS 5)

This system consisted of equipment and software that would have provided central computing, control, and synchronization for NCSX. Components interfaced with the subsystem's local instrumentation and controls (I&C) systems and allowed for control and monitoring of NCSX experiments from the control room and includes analysis and display of the data. Subsystems included: network & fiber infrastructure; central I&C; data acquisition and facility computing; facility timing and synchronization; real time control; central safety & interlocks; and control room. Project scope and construction status at the end of the project are listed in Table 11.

Table 11 Central Instrumentation, Controls, and Data Acquisition Scope

MIE Project Scope	Status at Closeout
Provide and install network & fiber infrastructure systems with common backbone for all data acquisition, and I&C communications.	**Design 10% complete. Fabrication 0% complete. Installation 0% complete. Remaining scope cancelled.**
Provide and install integrated control of NCSX through supervisory control and a common user interface to selected engineering subsystems and diagnostics instruments. It will provide process control and monitoring functions, inter-process synchronization, operator displays, alarm management, and historical trending. It will be designed using the Experimental Physics and Industrial Control System (EPICS).	**Design 5% complete. Fabrication 0% complete. Installation 0% complete. Remaining scope cancelled.**
Provide and install a software structure to collect, catalog, and manage experimental results for analysis and subsequent retrieval. The design will use the MIT-developed MDSplus software for data acquisition, data archiving and display.	**Design 5% complete. Fabrication 0% complete. Installation 0% complete. Remaining scope cancelled.**
Provide and install a timing & synchronization system sufficient to synchronize the equipment and computers used for achieving the MIE Project requirements.	**Design 10% complete. Fabrication 0% complete. Installation 0% complete. Remaining scope cancelled.**
Provide and install a PC-oriented, LabVIEW-like system to produce synchronized, open-loop power supply commands and gas injection commands. The system will also control a few gas delivery valves.	**Design 5% complete. Fabrication 0% complete. Installation 0% complete. Remaining scope cancelled.**
Provide and install a central safety and interlock system Provide a limited CSIS, sufficient to achieve safe operation of the NCSX device.	**Design 3% complete. Fabrication 0% complete. Installation 0% complete. Remaining scope cancelled.**

6 Facility Systems (WBS 6)

Facility Systems consisted of the following subsystems which support operation: water cooling; cryogens; air system utilities; vacuum vessel heating and cooling. Project scope and construction status at the end of the project are listed in Table 12.

Table 12: Facility Systems Scope

MIE Project Scope	Status at Closeout
Provide required cooling water for vacuum pumping system	**Design 5% complete.** **Fabrication 0% complete.** **Remaining scope cancelled.**
Provide liquid nitrogen supply for coil and cryostat cooling consistent with CD-4 requirements	**Design 10% complete.** **Fabrication 0% complete.** **Contract with Bagley Assoc for LN2 delivery system (WBS-621) and cooling of structures within cryostat (WBS-623) was underway in May 2008. Contract was terminated prior to completion of any design reviews.** **Remaining scope cancelled.**
Establish requirements and system architecture for entire LN2 feed system including in-cryostat LN2 distribution system (WBS 161).	**Design 70% complete.** **Fabrication 0% complete.** **Design of the in-cryostat LN2 distribution (WBS-161) for cooling of coils was well under way (successful PDR on 6/5/08).** **Remaining scope cancelled.**
Provide LN2 cooling system based on that constructed for the coil test facility (CTF).	**Design 5% complete.** **Fabrication 0% complete.** **Engineering studies of the LN2 cooling system (WBS 622) was underway by ORNL and Bagley Associates. Contract was terminated prior to completion of any design reviews.** **Remaining scope cancelled.**
Provide a vent for the vacuum vessel pumping system.	**Design 5% complete.** **Fabrication 0% complete.** **Remaining scope cancelled.**
Provide a system to force 150-deg-C heated air through the vacuum vessel heating and cooling tubes.	**Design 5% complete.** **Fabrication 0% complete.** **Remaining scope cancelled.**

7 Test Cell Preparation & Machine Assembly (WBS 7)

This work consisted of engineering and field labor to prepare the test cell and install the stellarator core systems, including trial machine assembly in which the three field period assemblies would be joined together to form the torus, followed by installation of PF coils, remaining trim coils, coil services, and cryostat. Design and fabrication of special machine assembly tools and equipment were included in this work. Project scope and construction status at the end of the project are listed in Table 13.

Table 13: Test Cell Preparation and Machine Assembly Scope

MIE Project Scope	Status at Closeout
Design and fabricate a platform around the NCSX device, in support of various diagnostics and systems required for operation.	**Design: 80% complete.** **Materials: 50% ordered & received.** **Fabrication: 10% complete.** **Remaining scope cancelled.**
Perform final assembly of the stellarator core, specifically: installation and leveling of machine base plate; installation and leveling of the machine support columns; installation of the machine platform; installation of lighting and fire detection/suppression systems under the platform; installation of the lower cryostat floor; installation of the lower PF-3 & 4 coils in preliminary positions; installation of the three field periods; support pump down and vacuum leak testing; placement of the lower PF-3 & 4 into their final position; installation of the upper PF-3 & 4 coils; installation of the PF-1 & PF-2 solenoid; installation of external cryostat walls and ceiling; and cold power test PTP.	**Scope cancelled. Not started.**
Design and fabricate tooling and fixtures for machine assembly including the base support structure used during assembly and constructability analyses.	**Design: Models 75% complete; Drawings not started. Remaining scope cancelled.** **Analyses : Scope cancelled. Not started.** **Fabrication: Scope cancelled. Not started.**

8 Technical Management & Support

81-Project Management & Integration\

This work included of all the activities necessary to manage the NCSX Project and carry out system-level engineering tasks such as project management, project control, systems engineering, design integration, technical assurance, and project physics. It also includes planning and performing Project closeout.

84- Project Physics

This work included the definition of the project physics requirements and documenting them in the NCSX Project General Requirements Document (GRD)**.**

82-Project Engineering

This work included risk management, project planning, including implementing the PPPL work planning program, safety, including implementing the PPPL Integrated Safety Management (ISM) program. Responsible Line Managers (RLMs) were responsible for managing on-site fabrication and assembly work and the design, fabrication, and assembly of ancillary, facility, and electrical systems.

8202-System Engineering

This work included requirements management, design verification, including a program for systematic design reviews, configuration management and change control, including processing of Requests for Deviations (RFDs), Engineering Change Proposals (ECPs), Risk registry maintenance, Risk management, and Engineering Change Notices (ECNs), and interface control, document control, and training project personnel in project plans, procedures, and practices.

8203-Design Integration

This work included configuration development and integration support for all design and construction activities, design reviews, the computer aided design (CAD) database of project models and drawings, reviewing and promoting CAD models and drawings, establishing Intralink procedures and privileges, and providing support to the metrology and dimensional control efforts by analyzing metrology data in conjunction with CAD models of the parts and assemblies.

8204-System analysis / Technical Assurance

This work included establishing structural and cryogenic design criteria, establishing dimensional accuracy requirements for coil systems based on field error considerations, analyzing field errors and managing field error budgets for as-designed conditions, out-of-tolerance conditions, eddy currents, and magnetic materials. It also included the disposition of nonconformance reports (NCRs), 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 physical and magnetic measurements, performing global analyses which are outside the scope of individual subsystems, and independently assessing design adequacy and risks for critical systems and design feature. Analyses included electromagnetic analyses to determine coil inductances, fields, forces; global structural modeling to determine overall structural behavior, mechanical interface loads, and operating limits.

8205-Dimensional Control Coordination

This work included support of design and construction activities in the realization of dimensional accuracy requirements by developing strategies and procedures for dimensional control and supporting their implementation.

8215-Plant Design

This work included allocating space within the NCSX Test Cell and adjacent areas, and developing models and drawings to define the routing and location of equipment in the Test Cell.

8501-Integrated System Testing

This work covered the planning, document preparation, and execution of the NCSX integrated system testing and startup activities, through the generation of the first plasma. Program was documented in a draft *NCSX Safe Startup & Control Plan.* Costs for the development and completion of the sub-system preoperational tests procedures were the responsibility of the individual (sub-system) WBS managers and were detailed in the specific WBS work elements.

8221-Closeout Documentation

This task includes documentation of all work, both performed and remaining at the time of termination. This information will be of critical value if NCSX construction is restarted, or if another device of this type is undertaken in the future. A Closeout Note will be prepared for each job that was in process at the time of NCSX cancellation or was completed as part of the Project closeout. Closeout Notes for jobs already completed and/or closed prior to cancellation, will be generated on a case-by-case basis to document information that was not captured in other Project documents, *e.g.,* lessons learned and engineering solutions to problems that were encountered. Each closeout note includes the following elements: job scope; status of work completed at the time of closeout; definition of key interfaces and any changes anticipated at time of closeout; specifications, schematics, process & instrumentation diagrams, models, drawings, analyses; testing summaries; costs; narratives of remaining work; lessons learned; and a conclusion. Manuscripts for archival journal publication are also being prepared.

8220-Equipment Disposition

This job includes the safe and orderly disassembly of NCSX construction facilities at PPPL and the disposition of equipment. The major components of the NCSX – the vacuum vessel, modular coils, TF coils, diagnostics, and their associated ancillary components, assembly fixtures, rigging, and tooling – will stored in and under the test cell that had been prepared for NCSX. The modular coil autoclave will also be stored at PPPL. The modular coil winding rooms and test cryostat will be salvaged.

Project Termination

This includes additional costs incurred from cancellation of the Project. These costs include claims resulting from contract termination, and severance associated with workforce restructuring.

ATTACHMENT 2

CD-4 Deliverables

Design

WBS	Scope	Job Mgr.	CDR	PDR	FDR
Inner Core (Stellarator Core out to MC Shell & VV port flanges)					
12	Vacuum Vessel	Goranson	X	X	X
14	Modular Coil Assemblies	Williamson	X	X	X
14	MC AA, AB, BC Interface	Williamson / Cole	X	X	X
14	MC CC Interface	Williamson / Cole	X	X	X
18	FPA Tooling: Station 2 stands and lift fixtures	Brown	X	X	X
18	FPA Tooling: Station 3 stands and lift fixtures	Brown	X	X	X
18	FPA Tooling: Station 3 module alignment system	Brown	X	X	X
82	Assembly Sequence Plan: Station 2	Brown	X	X	X
82	Assembly Sequence Plan : Station 3	Brown	X	X	X
Outer Core (Stellarator Core Beyond MC Shell & VV port flanges)					
12	NB Transition Ducts	Goranson	X		
13	TF Coils	Kalish	X	X	X
13	PF Coils	Chrzanowski	X	X	X
13	Trim Coils	Kalish	X	X	X
15	TF/PF Coil Structures	Dahlgren	X	X	X
15	Central Solenoid Structure	Dahlgren	X	X	X
16	LN2 Manifolds	Goranson	X	X	
16	Electrical Leads	Goranson	X	X	
17	Base Structure	Dahlgren	X	X	X
17	Cryostat	Raftopoulos			
18	Assembly Tooling: Station 5	Brown	X	X	
18	Assembly Tooling: Station 6 module supports ("sleds")	Brown	X		
18	Assembly Tooling: Station 6 spool piece support	Brown	X		
82	Assembly Sequence Plan: Station 5	Brown	X		
82	Assembly Sequence Plan: Station 6	Brown	X		
Ancillary Systems (Facility Beyond Stellarator Core)					
12	Heater control sys	Gernhardt	X		
2	Fueling	Blanchard	X		
2	Vacuum Pumping System	Blanchard	X		
3	Diagnostics:		X		
3	VV spacer flux loops	Stratton	X		
3	Visible camera system	Stratton	X		
3	Electron beam mapping sys.	Stratton	X		
4	Coil Protection System	Ramakrishnan	X		
4	Power Systems	Ramakrishnan	X		
5	Central I&C	Sichta	X		
62	Cryogenic Systems (LN2)	Raftopoulos			
62	Cryogenic Systems (GN2/Cryostat)	Raftopoulos			
63	Utility Systems	Dudek	X		
64	VV heating and cooling system	Kalish	X		

Hardware

WBS	Component	Job Mgr.
Inner Core (Stellarator Core out to MC Shell & VV port flanges)		
12	Three vacuum vessel sub-assemblies, each consisting of a 120-degree shell sector, spacer, associated ports including magnetic diagnostics and cooling tubes installed	Viola
14	Eighteen modular coils, wound and vacuum-pressure impregnated on eighteen modular coil winding forms	Chrzanowski
14	Tooling for modular coil fabrication including winding stations and autoclave.	Chrzanowski
18	Two half field period assemblies, each consisting of three modular coils	Viola
18	Tooling for field period assembly Statiosn 2 and 3	Dudek
Outer Core (Stellarator Core Beyond MC Shell & VV port flanges)		
13	Eighteen toroidal field coil assemblies consisting of D-shaped coils assembled to wedge support pieces	Kalish

ATTACHMENT 3

Comparison ECP-53 vs ECP-60

TEC

WBS	WBS Element	Previous Baseline (ECP-53)	Actual Costs thru 5/31/08	Estimate to Complete	New Baseline (ECP-60)	Change
12	Vacuum Vessel Systems	9,909	9,838	0	9,838	-71
13	Conventional Coils	5,317	4,419	362	4,781	-536
14	Modular Coils	36,722	39,880	553	40,433	3,711
15	Coil Support Structures	1,078	656	74	730	-348
16	Coil Services	1,153	69	30	99	-1,054
17	Cryostat & Base Support Structure	1,229	670	12	682	-547
18	Field Period Assembly	6,400	7,362	1,287	8,649	2,249
19	Stellarator Core Management & Integration	2,625	2,509	127	2,636	11
1	**Stellarator Core**	**64,433**	**65,403**	**2,445**	**67,848**	**3,415**
2	**Auxiliary Systems**	**484**	**349**	**-**	**349**	**-135**
3	**Diagnostic Systems**	**935**	**1,262**	**28**	**1,290**	**355**
4	**Electrical Power Systems**	**2,845**	**646**	**0**	**646**	**-2,199**
5	**Central Controls and Computing**	**787**	**48**	**0**	**48**	**-739**
6	**Facility Systems**	**758**	**24**	**0**	**24**	**-734**
7	**Test Cell Prep & Machine Assembly**	**3,741**	**774**	**0**	**774**	**-2,967**
81	Project Management	4,173	4,487	770	5257	1,084
82	Project Engineering	5,823	7,206	453	7659	1,836
84	Project Physics	470	470	0	470	0
85	Integrated Systems Testing	777	3	0	3	-774
86	Closeout Documentation	-	-	1134	1134	1,134
87	Equipt Disposition & Facility Restoration	-	-	530	530	530
89	Allocations	1,067	1,939	202	2141	1,074
8	**Project Oversight & Support**	**12,310**	**14,105**	**3,089**	**17,194**	**4,884**
	DCMA	**75**	**75**	**0**	**75**	**0**
	Contingency	**6,033**	-	**1,112**	**1,112**	**-4,921**
	Project Termination Costs	**-**	**-**	**2,653**	**2,653**	**2,653**
	Subtotal TEC	**92,401**	**82,686**	**9,327**	**92,013**	**-388**

OPC

	Conceptual Design	**9,570**	**9,570**		**9,570**	**0**
	Manuscripts and Journals			**323**	**323**	**323**
	Contingency			**65**	**65**	**65**
	Subtotal OPC	**9,570**	**9,570**	**388**	**9,958**	**388**
	TOTAL TPC	**101,971**	**92,256**	**9,715**	**101,971**	**0**

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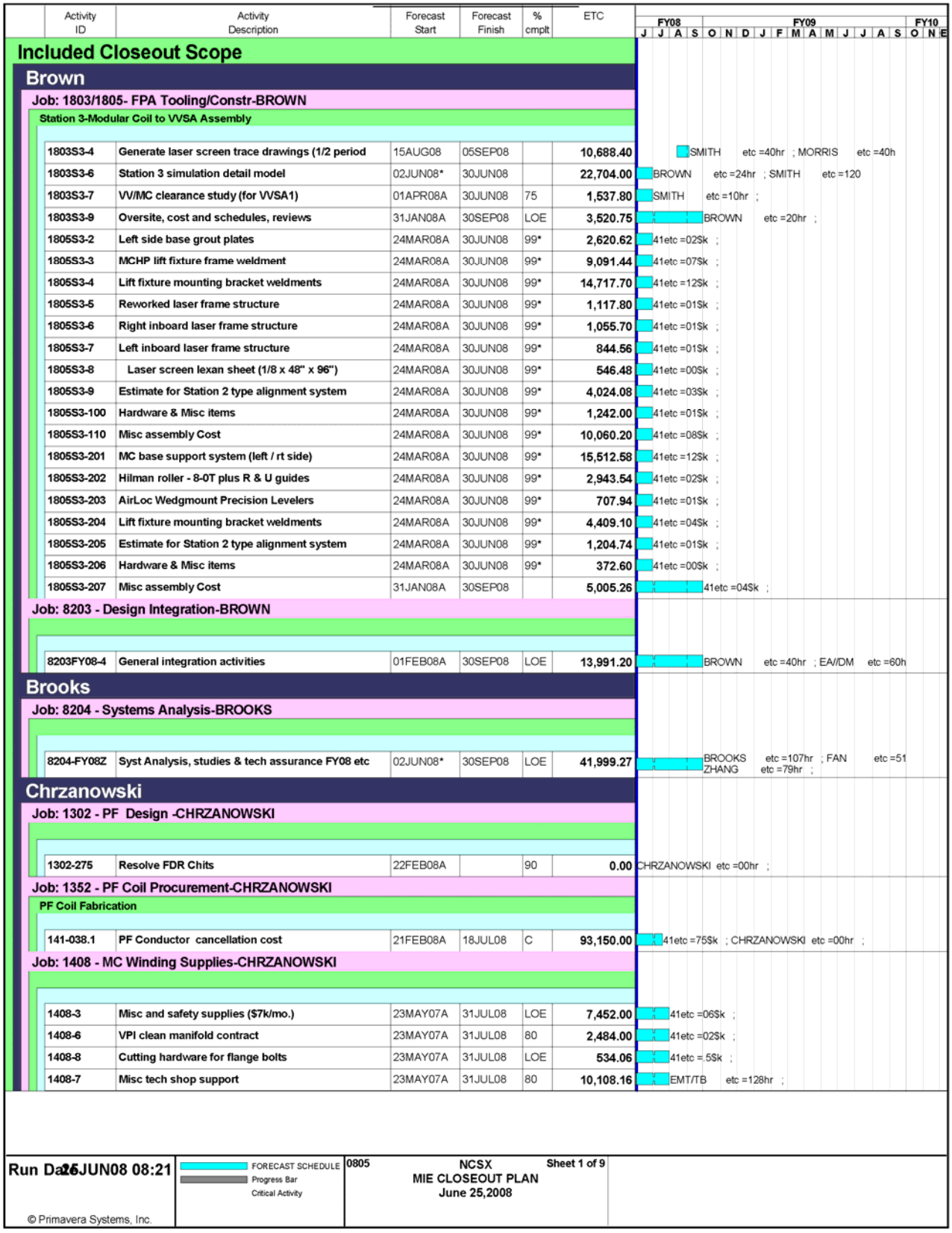

Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
Included Closeout Scope					
Brown					
Job: 1803/1805- FPA Tooling/Constr-BROWN					
Station 3-Modular Coil to VVSA Assembly					
1803S3-4	Generate laser screen trace drawings (1/2 period	15AUG08	05SEP08		10,688.40
1803S3-6	Station 3 simulation detail model	02JUN08*	30JUN08		22,704.00
1803S3-7	VV/MC clearance study (for VVSA1)	01APR08A	30JUN08	75	1,537.80
1803S3-9	Oversite, cost and schedules, reviews	31JAN08A	30SEP08	LOE	3,520.75
1805S3-2	Left side base grout plates	24MAR08A	30JUN08	99*	2,620.62
1805S3-3	MCHP lift fixture frame weldment	24MAR08A	30JUN08	99*	9,091.44
1805S3-4	Lift fixture mounting bracket weldments	24MAR08A	30JUN08	99*	14,717.70
1805S3-5	Reworked laser frame structure	24MAR08A	30JUN08	99*	1,117.80
1805S3-6	Right inboard laser frame structure	24MAR08A	30JUN08	99*	1,055.70
1805S3-7	Left inboard laser frame structure	24MAR08A	30JUN08	99*	844.56
1805S3-8	Laser screen lexan sheet (1/8 x 48" x 96")	24MAR08A	30JUN08	99*	546.48
1805S3-9	Estimate for Station 2 type alignment system	24MAR08A	30JUN08	99*	4,024.08
1805S3-100	Hardware & Misc items	24MAR08A	30JUN08	99*	1,242.00
1805S3-110	Misc assembly Cost	24MAR08A	30JUN08	99*	10,060.20
1805S3-201	MC base support system (left / rt side)	24MAR08A	30JUN08	99*	15,512.58
1805S3-202	Hilman roller - 8-0T plus R & U guides	24MAR08A	30JUN08	99*	2,943.54
1805S3-203	AirLoc Wedgmount Precision Levelers	24MAR08A	30JUN08	99*	707.94
1805S3-204	Lift fixture mounting bracket weldments	24MAR08A	30JUN08	99*	4,409.10
1805S3-205	Estimate for Station 2 type alignment system	24MAR08A	30JUN08	99*	1,204.74
1805S3-206	Hardware & Misc items	24MAR08A	30JUN08	99*	372.60
1805S3-207	Misc assembly Cost	31JAN08A	30SEP08		5,005.26
Job: 8203 - Design Integration-BROWN					
8203FY08-4	General integration activities	01FEB08A	30SEP08	LOE	13,991.20
Brooks					
Job: 8204 - Systems Analysis-BROOKS					
8204-FY08Z	Syst Analysis, studies & tech assurance FY08 etc	02JUN08*	30SEP08	LOE	41,999.27
Chrzanowski					
Job: 1302 - PF Design -CHRZANOWSKI					
1302-275	Resolve FDR Chits	22FEB08A		90	0.00
Job: 1352 - PF Coil Procurement-CHRZANOWSKI					
PF Coil Fabrication					
141-038.1	PF Conductor cancellation cost	21FEB08A	18JUL08	C	93,150.00
Job: 1408 - MC Winding Supplies-CHRZANOWSKI					
1408-3	Misc and safety supplies ($7k/mo.)	23MAY07A	31JUL08	LOE	7,452.00
1408-6	VPI clean manifold contract	23MAY07A	31JUL08	80	2,484.00
1408-8	Cutting hardware for flange bolts	23MAY07A	31JUL08	LOE	534.06
1408-7	Misc tech shop support	23MAY07A	31JUL08	80	10,108.16

Run Date 26JUN08 08:21

FORECAST SCHEDULE
Progress Bar
Critical Activity

0805 NCSX Sheet 1 of 9
MIE CLOSEOUT PLAN
June 25,2008

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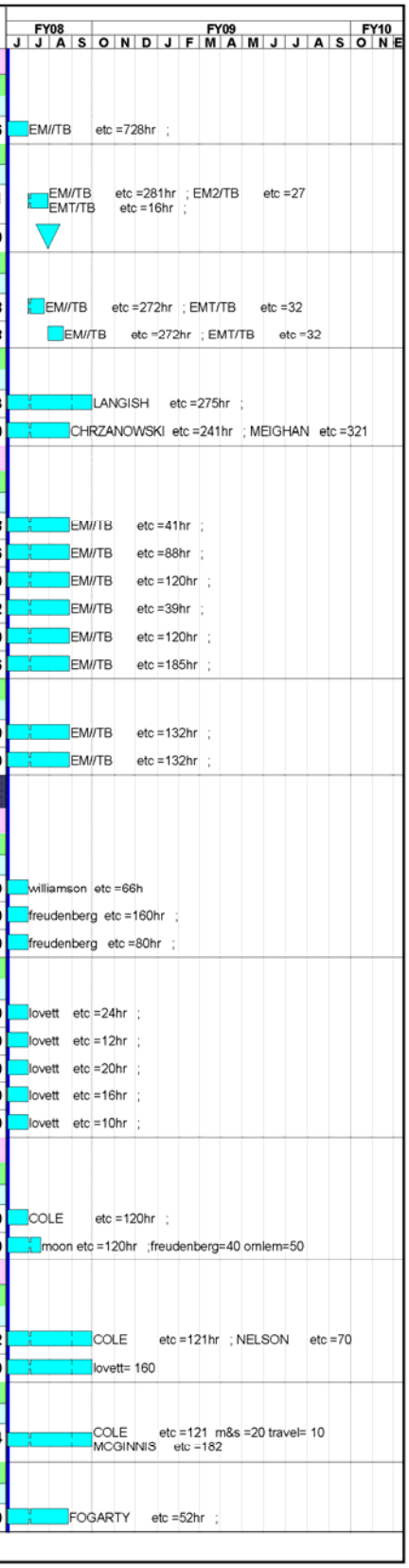
Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
Job: 1451 - Mod Coil Winding-CHRZANOWSKI					
Station 3-Casting Prep & Winding					
P1-170	Instl Chill Plates,Tubing,Bag A6	02JUN08	01JUL08		57,490.16
Station 5-VPI					
P1-171V	VPI (Station 5) A6	02JUL08	29JUL08		47,514.31
P3-171VM	COMPLETE VPI OF 18th MOD COIL		29JUL08		0.00
Station 1 Post VPI					
P2-171C	Final Clamps & Warm Test (Station1) B6	01JUL08*	23JUL08		24,006.88
P1-171C	Final Clamps & Warm Test (Station1) A6	30JUL08	20AUG08		24,006.88
LOE Oversight & Supervision					
145XSPRV-3	Winding Engineering oversight and supervision	01MAY07A	30SEP08	LOE	42,266.43
145XSPRV-A	Winding Engineering oversight and supervision	01NOV07A	29AUG08	LOE	84,677.10
Job: 1459 - Mod Coil Fabr.Punch List-CHRZANOWSKI					
Punchlist Tech shop/RESA					
PLTS-C5	Grinding & Drill Holes -C5	01MAY08A	29AUG08	83	3,221.98
PLTS-A5	Grinding -A5	01MAY08A	29AUG08	0	6,949.36
PLTS-B5	Grinding -B5	01MAY08A	29AUG08	0	9,476.40
PLTS-A6	Grinding -A6	01MAY08A	29AUG08	20	3,095.62
PLTS-B6	Grinding -B6	01MAY08A	29AUG08	0	9,476.40
PLTS-C6	Grinding & Drill Holes -C6	01MAY08A	29AUG08	23	14,593.66
Punchlist- Coil Technicians					
PLCT-A6	Insul,measure,TC,SG other punch list-A6	01OCT07A	29AUG08	36	10,411.40
PLCT-B6	Insul,measure,TC,SG other punch list-B6	01OCT07A	29AUG08	36	10,411.40
Cole					
Job: 1416 - Mod Coil Type AB Fnl Dsn-COLE					
Analysis and closeout documentation					
1416-601	Prepare EM and structural analysis of leads	31JAN08A	30JUN08	70	9,966.00
1416-650	Prepare cooling analysis of lead area	02JUN08*	30JUN08		3,020.00
1416-651	2D cooling analysis for mod colis	02JUN08*	30JUN08		12,080.00
ECN Modifications					
1416-801	ECN Mods-Resize vertical port boot	02JUN08	30JUN08	80	3,624.00
1416-802	ECN Mods-Revise Type B cooling lines	01MAY08A	30JUN08	80	1,812.00
1416-803	ECN Mods-Issue DXF shim files for fab	02JUN08*	30JUN08	80	3,020.00
1416-805	ECN Mods-Add TC's at bottom of 101,102,103 dwgs	01MAY08A	30JUN08	80	2,416.00
1416-806	ECN Mods-Revise dwg 123-151	02JUN08*	30JUN08	80	1,510.00
Job: 1421 - Mod Coil Interface Design-COLE					
Inboard Interface-CC					
1421-3155	Resolve C-C shim FDR comments	02JUN08*	30JUN08		18,120.00
1421-9000	Perform shear test	02JUN08*	18JUL08	60	31,710.00
Job: 1901 - Stellarator Core Mngtt&Integr-COLE					
191 - Stellarator Core Management & Oversight					
1901-08	WBS 191 FY08	01OCT07A	29SEP08	LOE	28,889.32
1901-9000	Update drawing tree	01OCT07A	29SEP08	LOE	24,160.00
192 - Stellarator Core Integr & Global Analysis					
1902-08	WBS 192 FY08	01OCT07A	29SEP08	LOE	66,445.34
193 - Risk Mitigation Tasks					
RISK-43	Bolt preload could relax with time.	03MAR08A	26AUG08		7,852.00



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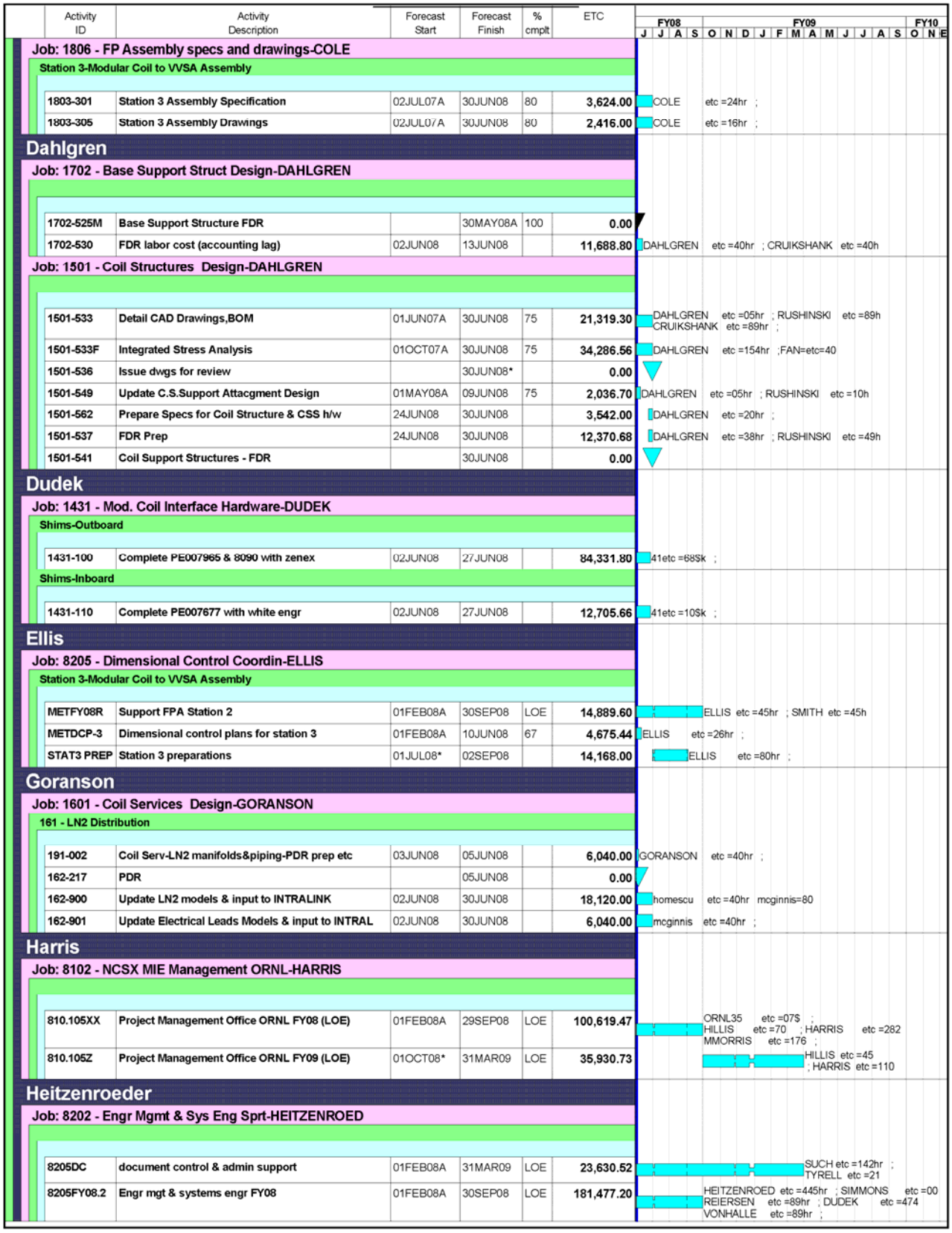

Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
Job: 1806 - FP Assembly specs and drawings-COLE					
Station 3-Modular Coil to VVSA Assembly					
1803-301	Station 3 Assembly Specification	02JUL07A	30JUN08	80	3,624.00
1803-305	Station 3 Assembly Drawings	02JUL07A	30JUN08	80	2,416.00
Dahlgren					
Job: 1702 - Base Support Struct Design-DAHLGREN					
1702-525M	Base Support Structure FDR		30MAY08A	100	0.00
1702-530	FDR labor cost (accounting lag)	02JUN08	13JUN08		11,688.80
Job: 1501 - Coil Structures Design-DAHLGREN					
1501-533	Detail CAD Drawings,BOM	01JUN07A	30JUN08	75	21,319.30
1501-533F	Integrated Stress Analysis	01OCT07A	30JUN08	75	34,286.56
1501-536	Issue dwgs for review		30JUN08*		0.00
1501-549	Update C.S.Support Attacgment Design	01MAY08A	09JUN08	75	2,036.70
1501-562	Prepare Specs for Coil Structure & CSS h/w	24JUN08	30JUN08		3,542.00
1501-537	FDR Prep	24JUN08	30JUN08		12,370.68
1501-541	Coil Support Structures - FDR		30JUN08		0.00
Dudek					
Job: 1431 - Mod. Coil Interface Hardware-DUDEK					
Shims-Outboard					
1431-100	Complete PE007965 & 8090 with zenex	02JUN08	27JUN08		84,331.80
Shims-Inboard					
1431-110	Complete PE007677 with white engr	02JUN08	27JUN08		12,705.66
Ellis					
Job: 8205 - Dimensional Control Coordin-ELLIS					
Station 3-Modular Coil to VVSA Assembly					
METFY08R	Support FPA Station 2	01FEB08A	30SEP08	LOE	14,889.60
METDCP-3	Dimensional control plans for station 3	01FEB08A	10JUN08	67	4,675.44
STAT3 PREP	Station 3 preparations	01JUL08*	02SEP08		14,168.00
Goranson					
Job: 1601 - Coil Services Design-GORANSON					
161 - LN2 Distribution					
191-002	Coil Serv-LN2 manifolds&piping-PDR prep etc	03JUN08	05JUN08		6,040.00
162-217	PDR		05JUN08		0.00
162-900	Update LN2 models & input to INTRALINK	02JUN08	30JUN08		18,120.00
162-901	Update Electrical Leads Models & input to INTRAL	02JUN08	30JUN08		6,040.00
Harris					
Job: 8102 - NCSX MIE Management ORNL-HARRIS					
810.105XX	Project Management Office ORNL FY08 (LOE)	01FEB08A	29SEP08	LOE	100,619.47
810.105Z	Project Management Office ORNL FY09 (LOE)	01OCT08*	31MAR09	LOE	35,930.73
Heitzenroeder					
Job: 8202 - Engr Mgmt & Sys Eng Sprt-HEITZENROED					
8205DC	document control & admin support	01FEB08A	31MAR09	LOE	23,630.52
8205FY08.2	Engr mgt & systems engr FY08	01FEB08A	30SEP08	LOE	181,477.20

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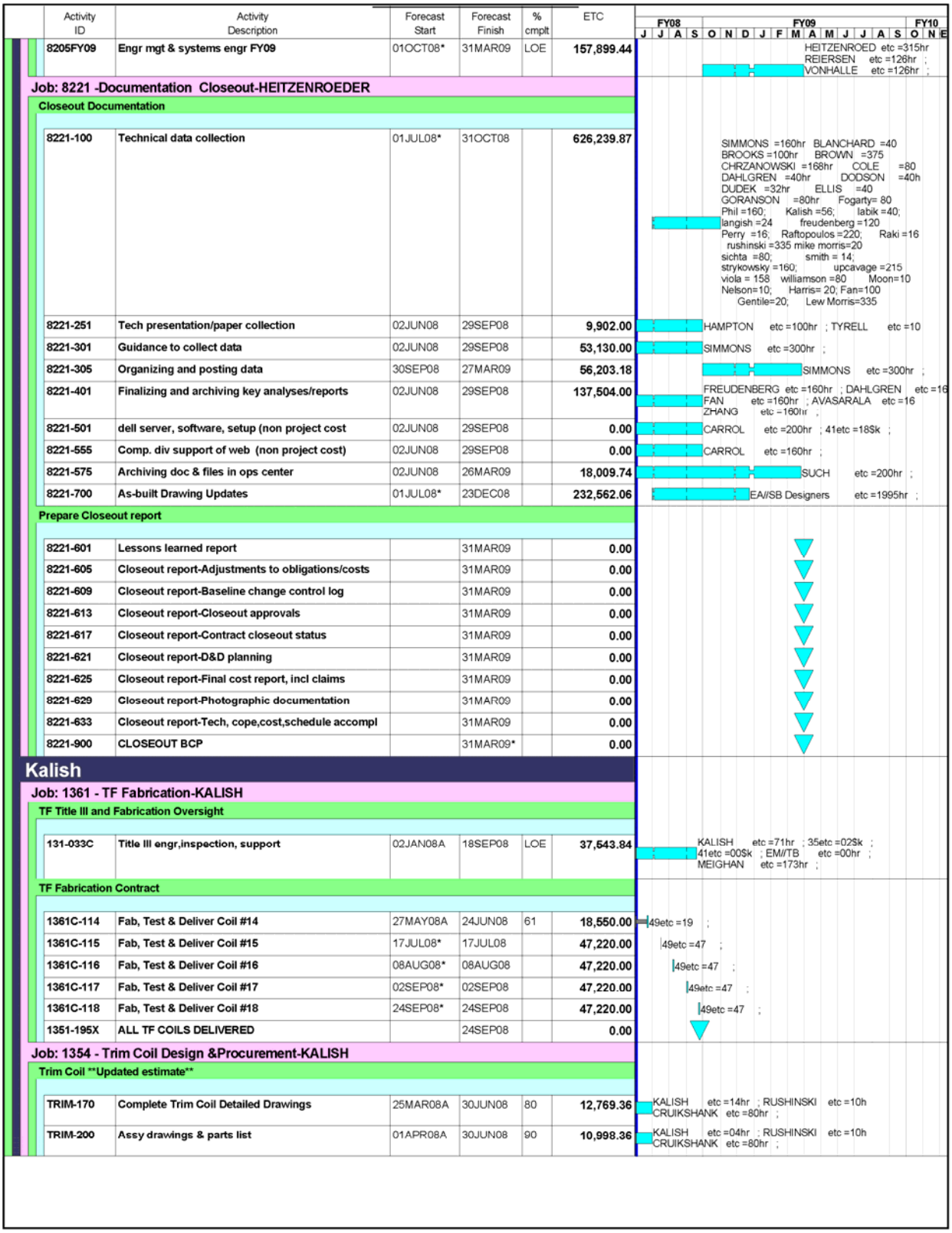

Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
8205FY09	Engr mgt & systems engr FY09	01OCT08*	31MAR09	LOE	157,899.44
Job: 8221 -Documentation Closeout-HEITZENROEDER					
Closeout Documentation					
8221-100	Technical data collection	01JUL08*	31OCT08		626,239.87
8221-251	Tech presentation/paper collection	02JUN08	29SEP08		9,902.00
8221-301	Guidance to collect data	02JUN08	29SEP08		53,130.00
8221-305	Organizing and posting data	30SEP08	27MAR09		56,203.18
8221-401	Finalizing and archiving key analyses/reports	02JUN08	29SEP08		137,504.00
8221-501	dell server, software, setup (non project cost	02JUN08	29SEP08		0.00
8221-555	Comp. div support of web (non project cost)	02JUN08	29SEP08		0.00
8221-575	Archiving doc & files in ops center	02JUN08	26MAR09		18,009.74
8221-700	As-built Drawing Updates	01JUL08*	23DEC08		232,562.06
Prepare Closeout report					
8221-601	Lessons learned report		31MAR09		0.00
8221-605	Closeout report-Adjustments to obligations/costs		31MAR09		0.00
8221-609	Closeout report-Baseline change control log		31MAR09		0.00
8221-613	Closeout report-Closeout approvals		31MAR09		0.00
8221-617	Closeout report-Contract closeout status		31MAR09		0.00
8221-621	Closeout report-D&D planning		31MAR09		0.00
8221-625	Closeout report-Final cost report, incl claims		31MAR09		0.00
8221-629	Closeout report-Photographic documentation		31MAR09		0.00
8221-633	Closeout report-Tech, cope,cost,schedule accompl		31MAR09		0.00
8221-900	CLOSEOUT BCP		31MAR09*		0.00
Kalish					
Job: 1361 - TF Fabrication-KALISH					
TF Title III and Fabrication Oversight					
131-033C	Title III engr,inspection, support	02JAN08A	18SEP08	LOE	37,643.84
TF Fabrication Contract					
1361C-114	Fab, Test & Deliver Coil #14	27MAY08A	24JUN08	61	18,550.00
1361C-115	Fab, Test & Deliver Coil #15	17JUL08*	17JUL08		47,220.00
1361C-116	Fab, Test & Deliver Coil #16	08AUG08*	08AUG08		47,220.00
1361C-117	Fab, Test & Deliver Coil #17	02SEP08*	02SEP08		47,220.00
1361C-118	Fab, Test & Deliver Coil #18	24SEP08*	24SEP08		47,220.00
1351-195X	ALL TF COILS DELIVERED		24SEP08		0.00
Job: 1354 - Trim Coil Design &Procurement-KALISH					
Trim Coil **Updated estimate**					
TRIM-170	Complete Trim Coil Detailed Drawings	25MAR08A	30JUN08	80	12,769.36
TRIM-200	Assy drawings & parts list	01APR08A	30JUN08	90	10,998.36

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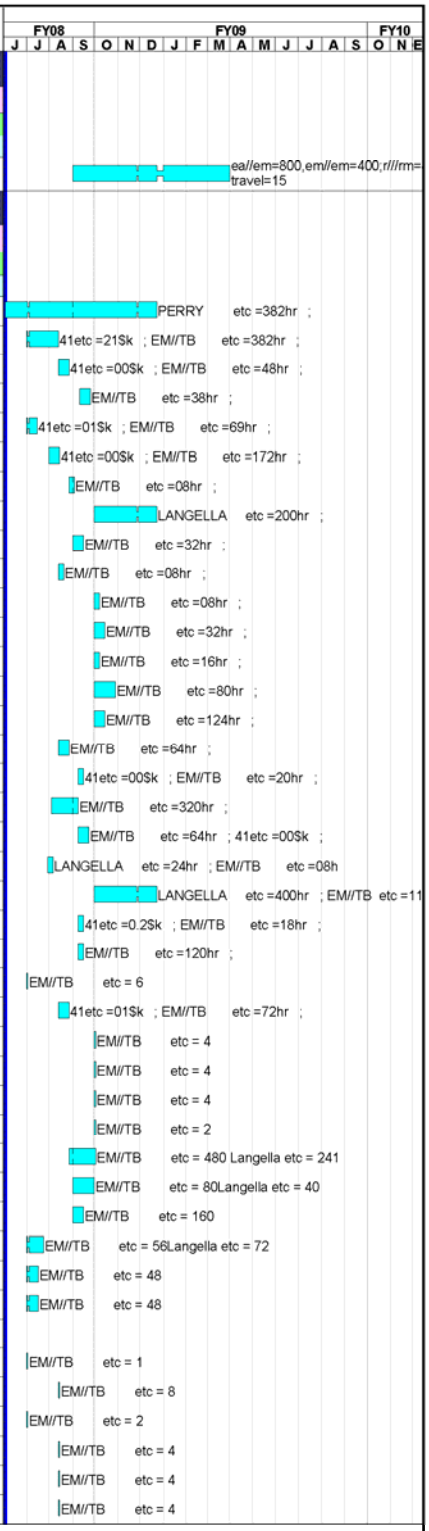
Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
Neilson					
Job: 8222 - Manuscripts and Papers - NEILSON					
Prepare Closeout report					
8222-900	Manuscripts, journal & papers (40 papers@40hrs)	02SEP08*	31MAR09		299,600.15
Perry					
Job: 8220 - Equipt Save & Facility Restora-PERRY					
Safe and store NCSX hardware assets					
8220-201	Coordination and oversight	02JUN08	23DEC08		60,133.75
8220-205	NCTC floor penetrations & PLT water htr removal	01JUL08*	12AUG08		56,248.54
8220-209	Secure platform parts from CAS Bldg to NCTC	13AUG08	26AUG08		4,163.16
8220-215	Secure TF Coils from Dsite MG to NCTC	11SEP08	24SEP08		3,000.86
8220-219	Electr trays & hw from D-site yard to dsite pad	01JUL08*	15JUL08		6,194.13
8220-223	Items f/TFTR bsmnt (incl spare MC cond) to NCTCB	01AUG08*	14AUG08		13,831.24
8220-227	Portable AC units to Csite crib	27AUG08	03SEP08		631.76
8220-231	Drawing closeouts and field follow-up	01OCT08*	23DEC08		27,614.00
8220-235	Large and Small shield block to Dsite pad	02SEP08*	15SEP08		2,527.04
8220-239	Machine mock-up to NCTC	13AUG08	19AUG08		631.76
8220-243	Welding machines to RESA	01OCT08*	07OCT08		668.56
8220-247	Tools to Csite crib	01OCT08*	14OCT08		2,674.24
8220-251	Measuring Equipment to MU Shop	01OCT08*	07OCT08		1,337.12
8220-255	Inventory parts,material, tools to new location	01OCT08*	28OCT08		6,685.60
8220-409	Crates,cabinets,parts shelves f/TFTRTC to NCTCB	01OCT08*	14OCT08		10,362.68
8220-415	Coil winding station to NCTC	13AUG08	26AUG08		5,054.08
8220-419	MC bolts (incl crate) to NCTCB	09SEP08	15SEP08		2,076.20
8220-427	Assemble 4 remaining MC 3 packs	04AUG08	08SEP08		25,270.40
8220-431	Transport MC 3 packs (6) to NCTC	09SEP08	22SEP08		5,302.48
8220-501	Autocalve- Safe all AC power	30JUL08	05AUG08		3,762.80
8220-505	Autoclave-Removal and store Dsite pad & NCTCB	01OCT08*	23DEC08		154,843.44
8220-901	VV Diagnostic parts incl fab crates to NCTCB	09SEP08*	15SEP08		1,669.86
8220-903	Move tool crib from C-site back to D-Site	09SEP08*	15SEP08		9,476.40
8220-605	VV Spool piece crates to NCTCB	01JUL08*	02JUL08		473.82
8220-423	VVSA's (incl port extension crates) to NCTC	13AUG08	26AUG08		7,176.24
8220-609	Yellow wedge stands to NCTC	01OCT08*	02OCT08		334.28
8220-613	Wedge cover plates to NCTC	01OCT08*	02OCT08		334.28
8220-617	5 ton lift beam to RESA	01OCT08*	02OCT08		334.28
8220-621	14 ton lift beam to RESA	01OCT08*	02OCT08		167.14
8220-625	Remove coil winding rooms & dispose	27AUG08	01OCT08		69,377.38
8220-633	Equipment in MU machine shop-Electrical to RESA	02SEP08*	29SEP08		11,536.00
8220-641	Equipment in MU machine shop-Mechanical to RESA	02SEP08*	15SEP08		12,635.20
8220-645	Cryo pump skid- Electrical to NCTCB	02JUL08*	23JUL08		13,815.44
8220-653	Cryo pump skid- Mechanical to NCTCB	02JUL08*	16JUL08		3,790.56
8220-657	Cryostat-dispose	02JUL08*	16JUL08		3,790.56
8220-661	Interlocked cryo room-leave in place	02JUN08*	02JUN08		0.00
8220-665	Spherical bearings (Dahlgren) to NCTCB	02JUL08*	03JUL08		78.97
8220-669	Prototype castings to NCTC	13AUG08	14AUG08		631.76
8220-673	Prototype VV cross sections-Scrap	02JUL08*	03JUL08		157.94
8220-677	TF coil fabrication fixtures to NCTC-VPI fixture	13AUG08	14AUG08		315.88
8220-681	TF coil fabrication fixtures to NCTC-Mandrel	13AUG08	14AUG08		315.88
8220-685	TF coil fabrication fixtures to NCTC-Misc fixtur	13AUG08	14AUG08		315.88



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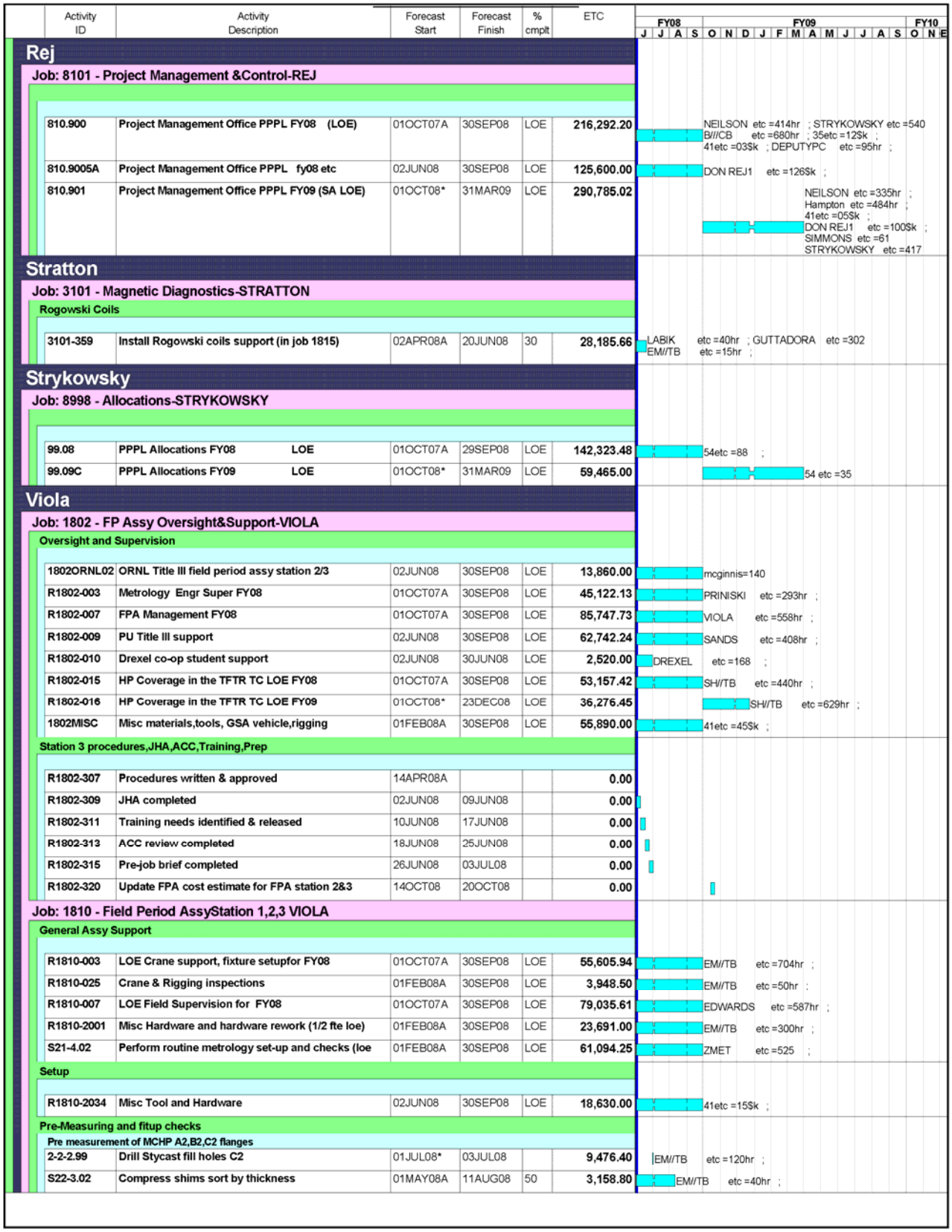

Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
Rej					
Job: 8101 - Project Management &Control-REJ					
810.900	Project Management Office PPPL FY08 (LOE)	01OCT07A	30SEP08	LOE	216,292.20
810.9005A	Project Management Office PPPL fy08 etc	02JUN08	30SEP08	LOE	125,600.00
810.901	Project Management Office PPPL FY09 (SA LOE)	01OCT08*	31MAR09	LOE	290,785.02
Stratton					
Job: 3101 - Magnetic Diagnostics-STRATTON					
Rogowski Coils					
3101-359	Install Rogowski coils support (in job 1815)	02APR08A	20JUN08	30	28,185.66
Strykowsky					
Job: 8998 - Allocations-STRYKOWSKY					
99.08	PPPL Allocations FY08 LOE	01OCT07A	29SEP08	LOE	142,323.48
99.09C	PPPL Allocations FY09 LOE	01OCT08*	31MAR09	LOE	59,465.00
Viola					
Job: 1802 - FP Assy Oversight&Support-VIOLA					
Oversight and Supervision					
1802ORNL02	ORNL Title III field period assy station 2/3	02JUN08	30SEP08	LOE	13,860.00
R1802-003	Metrology Engr Super FY08	01OCT07A	30SEP08	LOE	45,122.13
R1802-007	FPA Management FY08	01OCT07A	30SEP08	LOE	85,747.73
R1802-009	PU Title III support	02JUN08	30SEP08	LOE	62,742.24
R1802-010	Drexel co-op student support	02JUN08	30JUN08	LOE	2,520.00
R1802-015	HP Coverage in the TFTR TC LOE FY08	01OCT07A	30SEP08	LOE	53,157.42
R1802-016	HP Coverage in the TFTR TC LOE FY09	01OCT08*	23DEC08	LOE	36,276.45
1802MISC	Misc materials,tools, GSA vehicle,rigging	01FEB08A	30SEP08	LOE	55,890.00
Station 3 procedures,JHA,ACC,Training,Prep					
R1802-307	Procedures written & approved	14APR08A			0.00
R1802-309	JHA completed	02JUN08	09JUN08		0.00
R1802-311	Training needs identified & released	10JUN08	17JUN08		0.00
R1802-313	ACC review completed	18JUN08	25JUN08		0.00
R1802-315	Pre-job brief completed	26JUN08	03JUL08		0.00
R1802-320	Update FPA cost estimate for FPA station 2&3	14OCT08	20OCT08		0.00
Job: 1810 - Field Period AssyStation 1,2,3 VIOLA					
General Assy Support					
R1810-003	LOE Crane support, fixture setupfor FY08	01OCT07A	30SEP08	LOE	55,605.94
R1810-025	Crane & Rigging inspections	01FEB08A	30SEP08	LOE	3,948.50
R1810-007	LOE Field Supervision for FY08	01OCT07A	30SEP08	LOE	79,035.61
R1810-2001	Misc Hardware and hardware rework (1/2 fte loe)	01FEB08A	30SEP08	LOE	23,691.00
S21-4.02	Perform routine metrology set-up and checks (loe	01FEB08A	30SEP08	LOE	61,094.25
Setup					
R1810-2034	Misc Tool and Hardware	02JUN08	30SEP08	LOE	18,630.00
Pre-Measuring and fitup checks					
Pre measurement of MCHP A2,B2,C2 flanges					
2-2-2.99	Drill Stycast fill holes C2	01JUL08*	03JUL08		9,476.40
S22-3.02	Compress shims sort by thickness	01MAY08A	11AUG08	50	3,158.80

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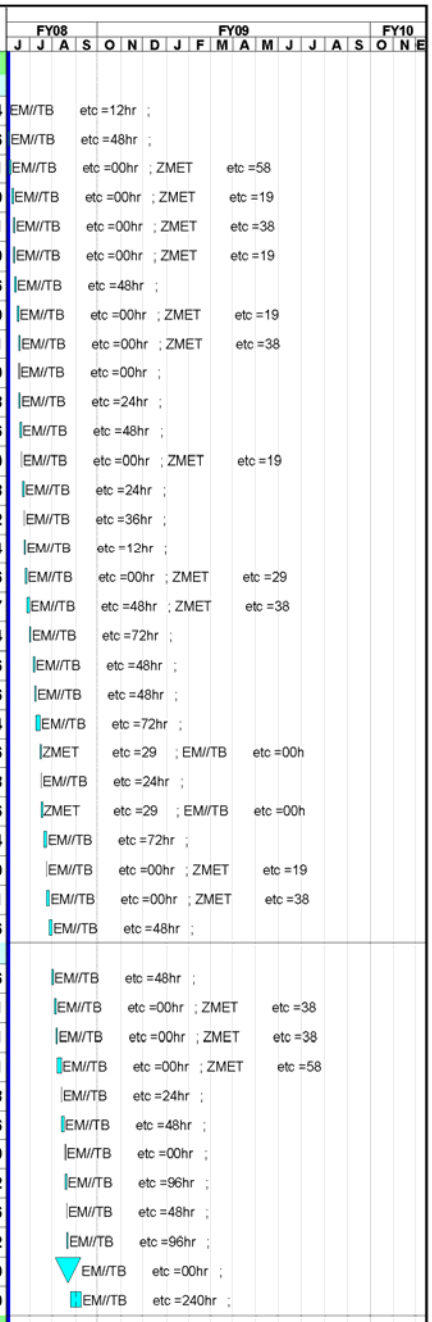
Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
Station 2 MC subassy A1B1C1					
AB-C MC Assembly					
2-1-7.16	"Lightly" tack weld nose flex shims	02JUN08*	02JUN08		947.64
2-1-7.17	remove "C" coil & place it on a separate fixtur	03JUN08	03JUN08		3,790.56
2-1-7.18	Recheck part alignment & weld all Type-B flex s	04JUN08	06JUN08		6,702.91
2-1-7.19	After welding "B" coil nose shims recheck align	09JUN08	09JUN08		2,234.30
2-1-7.20	Back office assessment of part after weld	10JUN08	11JUN08		4,468.61
2-1-7.21	Measure "C" fiducials	10JUN08	10JUN08		2,234.30
2-1-7.22	Weld all Type-C (A-flange) flex shims plasma sid	12JUN08	13JUN08		3,790.56
2-1-7.23	After welding determine metrology acceptance	16JUN08	16JUN08		2,234.30
2-1-7.24	Back office assessment	17JUN08	18JUN08		4,468.61
2-1-7.25	Remove shims for alignment mating coil	17JUN08	16JUN08		0.00
2-1-7.07	Place unfilled shim bags in wing areas	17JUN08	17JUN08		1,895.28
2-1-7.26	Lower mating "C" coil into position.	19JUN08	19JUN08		3,790.56
2-1-7.261	alignment "C" coil tooling balls	20JUN08	20JUN08		2,234.30
2-1-7.27	position coil accurately in x, y, & z directio	23JUN08	23JUN08		1,895.28
2-1-7.28	Install shims;studs,, & "wiggle"	24JUN08	24JUN08		2,842.92
2-1-7.29	Torque50% of final value.	25JUN08	25JUN08		947.64
2-1-7.30	Measure position of all monuments	26JUN08	26JUN08		3,351.46
2-1-7.301	Fuji paper, & examine load sharing. back office	27JUN08	30JUN08		8,259.17
2-1-7.302	Install new shims & Fuji paper. Lower & reposit	01JUL08	03JUL08		5,685.84
2-1-7.303	Install shims without Fuji paper, studs & torqu	07JUL08	08JUL08		3,790.56
2-1-7.31	Adjust shims locally. Re-torque all studs50%.	09JUL08	10JUL08		3,790.56
2-1-7.32	Install bushing. Replace nut & tighten back50%	11JUL08	15JUL08		5,685.84
2-1-7.33	After super bolt tightening, measure position	16JUL08	17JUL08		3,351.46
2-1-7.34	Tighten all boltsir final torque.	17JUL08	17JUL08		1,895.28
2-1-7.35	After tightening hardware, meas position of monu	18JUL08	18JUL08		3,351.46
2-1-7.36	Weld B / C nose region solenoid side	21JUL08	23JUL08		5,685.84
2-1-7.37	Measure positions of all monuments	24JUL08	24JUL08		2,234.30
2-1-7.38	Back office of above results & INSTALL wing supp	25JUL08	28JUL08		4,468.61
2-1-7.39	Fill all lose bushings with Stycast 2850FT	29JUL08	30JUL08		3,790.56
Stycast shim bags & final measurements					
2-1-8.01	Fill all wing bladders & cure	31JUL08	01AUG08		3,790.56
2-1-11.01	Measure tooling balls on all coils.	04AUG08	05AUG08		4,468.61
2-1-11.02	Install or identify three primary fiducials	06AUG08	07AUG08		4,468.61
2-1-11.03	Scan "B" flange Type-C coil & interfacing base	08AUG08	12AUG08		6,702.91
2-1-11.04	Measure bolt length on all tension fasteners	13AUG08	13AUG08		1,895.28
2-1-11.05	Perform Electrical Megger test on each coil	14AUG08	15AUG08		3,790.56
2-1-11.06	Mark part for identification	18AUG08	15AUG08		0.00
2-1-11.07	Install lift support beams	18AUG08	19AUG08		7,581.12
2-1-11.08	Remove from stand & measure weight of completed	20AUG08	20AUG08		3,790.56
2-1-11.09	Move to holding area.	21AUG08	22AUG08		7,581.12
S21-11.07M	Complete 1st MCHP Assy (Sta 2)		22AUG08		0.00
2-1-11.10	Lift upper wedge & reinstall & grout at Assembly	25AUG08	08SEP08		18,952.80
Station 2 MC subassy A2B2C2					
A-B MC Assembly					
2-2-6.26	Torque50% of final value.	02JUN08	02JUN08		789.70
2-2-6.27	Measure position of all monuments	03JUN08	03JUN08		2,792.88
2-2-6.28	Adjust shims locally. Re-torque all studs50%.	04JUN08	04JUN08		10,323.96
2-2-6.29	Install bushing. Replace nut & tighten back 50%	05JUN08	05JUN08		4,738.20
2-2-6.30	After super bolt tightening, measure position	06JUN08	06JUN08		2,792.88
2-2-6.31	Tighten all boltsir final torque.	09JUN08	09JUN08		1,579.40
2-2-6.32	After tightening hardware, measure position	10JUN08	10JUN08		2,792.88
2-2-6.33	Weld A / B nose region solenoid side	11JUN08	11JUN08		10,323.96
2-2-6.34	Measure positions of all monuments	12JUN08	12JUN08		1,861.92



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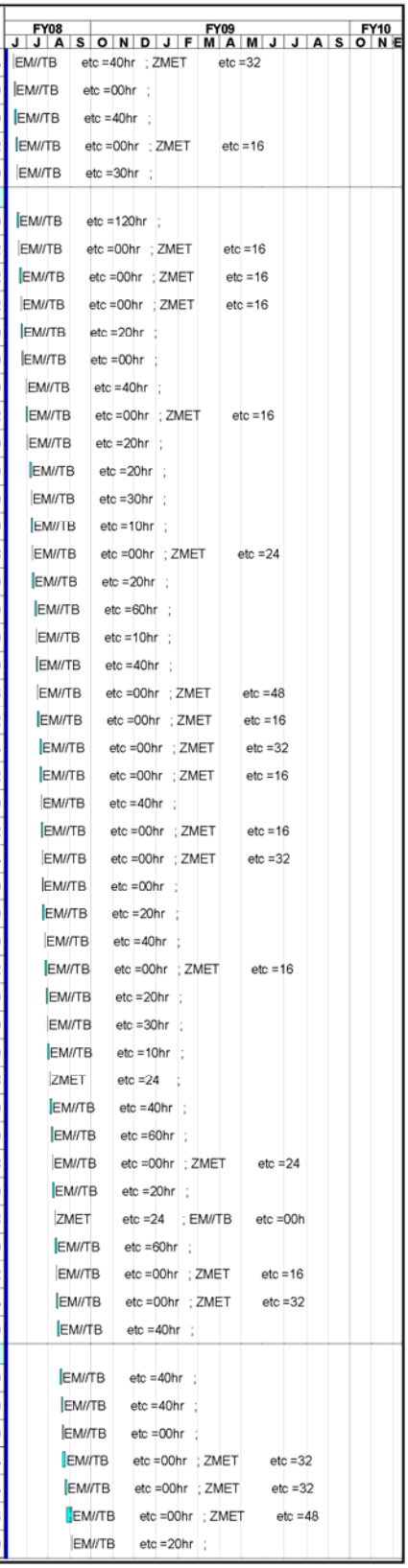
Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
2-2-6.35	Review with Back Office. INSTALL wing supports	13JUN08	13JUN08		6,882.64
2-2-6.36	Identify, a set of monuments moved	16JUN08	13JUN08		0.00
2-2-6.37	Fill all loose bushings with Stycast 2850FT	16JUN08	16JUN08		3,158.80
2-2-6.38	Scan "B" flange (datum "E") of "B" coil,	17JUN08	17JUN08		1,861.92
2-2-6.39	define all B/C flange shim thickness.	18JUN08	18JUN08		2,369.10
AB-C MC Assembly					
2-2-7.01	lift (A-B) coil, along with fixture, onto anot	19JUN08	19JUN08		9,476.40
2-2-7.02	Select a subset of monuments for initial alignm	20JUN08	20JUN08		1,861.92
2-2-7.03	Align set of monuments selected in 7.02.	23JUN08	23JUN08		1,861.92
2-2-7.04	Establish a set of global monuments	24JUN08	24JUN08		1,861.92
2-2-7.05	Mark nose shim locations & puck locations.	25JUN08	25JUN08		1,579.40
2-2-7.06	Place initial set shims (4-8) on Type-B	26JUN08	25JUN08		0.00
2-2-7.08	Lower mating "C" coil into position.	01JUL08	01JUL08		3,158.80
2-2-7.081	Perform alignment "C" coil tooling balls	02JUL08	02JUL08		1,861.92
2-2-7.09	Install jack screws & dial indicators	03JUL08	03JUL08		1,579.40
2-2-7.10	Position coil within ±.002"	07JUL08	07JUL08		1,579.40
2-2-7.11	Install shims studs, & "wiggle"	08JUL08	08JUL08		2,369.10
2-2-7.12	Torque50% of final value.	09JUL08	09JUL08		789.70
2-2-7.13	Measure position of all monuments	10JUL08	10JUL08		2,792.88
2-2-7.14	Measure shim puck height	11JUL08	11JUL08		1,579.40
2-2-7.15	remove puck locating rings & install all nose s	14JUL08	14JUL08		4,738.20
2-2-7.16	"Lightly" tack weld nose flex shims	15JUL08	15JUL08		789.70
2-2-7.17	remove "C" coil & place it on a separate fixtur	16JUL08	16JUL08		3,158.80
2-2-7.18	Recheck part alignment & weld all Type-B flex s	17JUL08	17JUL08		5,585.76
2-2-7.19	After welding "B" coil nose shims recheck align	18JUL08	18JUL08		1,861.92
2-2-7.20	Back office assessment of part after weld	21JUL08	21JUL08		3,723.84
2-2-7.21	Measure "C" fiducials	21JUL08	21JUL08		1,861.92
2-2-7.22	Weld all Type-C (A-flange) flex shims plasma sid	22JUL08	22JUL08		3,158.80
2-2-7.23	After welding determine metrology acceptance	23JUL08	23JUL08		1,861.92
2-2-7.24	Back office assessment	24JUL08	24JUL08		3,723.84
2-2-7.25	Remove shims for alignment mating coil	25JUL08	24JUL08		0.00
2-2-7.07	Place unfilled shim bags in wing areas	25JUL08	25JUL08		1,579.40
2-2-7.26	Lower mating "C" coil into position.	28JUL08	28JUL08		3,158.80
2-2-7.261	alignment "C" coil tooling balls	29JUL08	29JUL08		1,861.92
2-2-7.27	position coil accurately in x, y, & z directio	30JUL08	30JUL08		1,579.40
2-2-7.28	Install shims;studs,, & "wiggle"	31JUL08	31JUL08		2,369.10
2-2-7.29	Torque50% of final value.	01AUG08	01AUG08		789.70
2-2-7.30	Measure position of all monuments	04AUG08	04AUG08		2,792.88
2-2-7.31	Adjust shims locally. Re-torque all studs50%.	05AUG08	05AUG08		3,158.80
2-2-7.32	Install bushing. Replace nut & tighten back50%	06AUG08	06AUG08		4,738.20
2-2-7.33	After super bolt tightening, measure position	07AUG08	07AUG08		2,792.88
2-2-7.34	Tighten all bolts to final torque.	08AUG08	08AUG08		1,579.40
2-2-7.35	After tightening hardware, meas position of monu	11AUG08	11AUG08		2,792.88
2-2-7.36	Weld B / C nose region solenoid side	12AUG08	12AUG08		4,738.20
2-2-7.37	Measure positions of all monuments	13AUG08	13AUG08		1,861.92
2-2-7.38	Back office of above results & INSTALL wing supp	14AUG08	14AUG08		3,723.84
2-2-7.39	Fill all lose bushings with Stycast 2850FT	15AUG08	15AUG08		3,158.80
Stycast shim bags & final measurements					
2-2-8.01	Fill all wing bladders & cure	18AUG08	19AUG08		3,158.80
2-2-8.02	Inject stycast in all shim spaces	20AUG08	21AUG08		3,158.80
2-2-10.0	Complete local service & interface details	22AUG08	21AUG08		0.00
2-2-11.01	Measure tooling balls on all coils.	22AUG08	25AUG08		3,723.84
2-2-11.02	Install or identify three primary fiducials	26AUG08	27AUG08		3,723.84
2-2-11.03	Scan "B" flange Type-C coil & interfacing base	28AUG08	02SEP08		5,585.76
2-2-11.04	Measure bolt length on all tension fasteners	03SEP08	03SEP08		1,579.40



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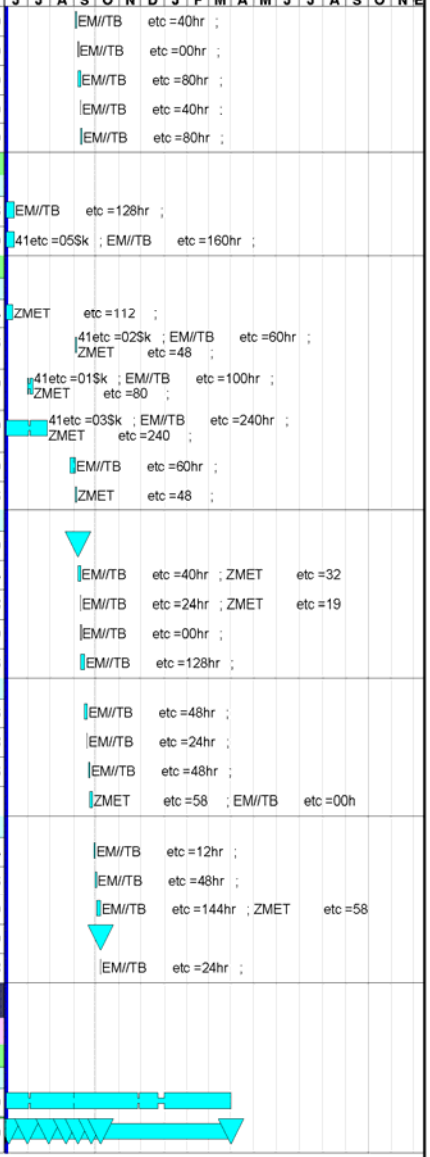
Activity ID	Activity Description	Forecast Start	Forecast Finish	% cmplt	ETC
2-2-11.05	Perform Electrical Megger test on each coil	04SEP08	05SEP08		3,158.80
2-2-11.06	Mark part for identification	08SEP08	05SEP08		0.00
2-2-11.07	Install lift support beams	08SEP08	09SEP08		6,317.60
2-2-11.08	Remove from stand & measure weight of completed	10SEP08	10SEP08		3,158.80
2-2-11.09	Move to holding area.	11SEP08	12SEP08		6,317.60
Station 3 Setup/Preparations/General					
Misc Prep activities					
R1810-3112	Load Test 3 legged actuator lift fixtur	03JUN08*	12JUN08		10,108.16
R1810-3113	Procure wire rope slings & 6 17ton shackles	03JUN08*	12JUN08		18,845.20
Station 3-Assemble Mod Coils and VVSA-FP#1					
Set-up and Prep					
3-1-1.01	transfer CAD models	02JUN08*	10JUN08		13,033.44
3-1-1.02	Install Station 3 site monuments	03SEP08	05SEP08		12,807.96
3-1-1.03	Install floor mounted tracks and the VV base sup	01JUL08	08JUL08		18,448.60
3-1-1.021	Design, fabricate and calibrate photogrammetry	02JUN08	28JUL08		50,607.60
3-1-1.05	Install the MCHP right support stand;	28AUG08	02SEP08		4,738.20
3-1-1.07	Reconfirm Leica position	03SEP08	05SEP08		5,585.76
Install Laser Screen					
R1810-2109	Begin Station 3	08SEP08			0.00
3-1-6.02	Place all laser screens	08SEP08	09SEP08		6,882.64
3-1-6.03	Turn each lasers on & measure each laser source	10SEP08	10SEP08		4,129.58
3-1-6.04	Print path on milar paper	11SEP08	10SEP08		0.00
3-1-6NEW	Dry-run MCHP thru laser screen path without VVSA	11SEP08	16SEP08		10,108.16
Install Vacuum Vessel					
3-1-7.02	Install VV NBI port support stand.	17SEP08	18SEP08		3,790.56
3-1-7.03	Install VVSA to base support and make connection	19SEP08	19SEP08		1,895.28
3-1-7.04	take tooling ball readings and secure VVSA	22SEP08	23SEP08		3,790.56
3-1-7.05	Scan VV surface and compare data	24SEP08	26SEP08		6,702.91
Trial fit MCHP over VV					
3-1-8.01	Install any bumper protection components on the	29SEP08	29SEP08		947.64
3-1-8.03	Install MCHP lift fixture, disengage leveler	30SEP08	01OCT08		3,900.96
3-1-8.05	Move right MCHP over the VV	02OCT08	06OCT08		19,130.40
3-1-8.05M	MCHP test fit over VVSA Complete		06OCT08		0.00
3-1-6.05	Disengage the right MCHP & position on floor	07OCT08	07OCT08		2,005.68
Contingency-Project					
CC	Closeout contingency @ 20%	02JUN08*	31MAR09		1,172,000.00
Subtotal		01MAY07A	31MAR09		7,031,867.09



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ATTACHMENT 5

Milestones

	Baseline ECP-53	Actual		New Baseline ECP-60	
Level I					
CD-1	May-2003	***May-2003***			
CD-2	Feb-2004	***Feb-2004***			
CD-3	Sep-2004	***Sep-2004***			
CD-4	Jul-2009			***Jul-2009***	
Level II					
Vacuum Vessel & Modular Coil Prel Dsn Rvw	Oct-2003	***Oct-2003***			
Performance Baseline Review	Nov-2003	***Nov-2003***			
Conduct VVSA FDR	Jul-2004	***May-2004***			
Mod Coil Winding Form Final Design Review	Jul-2004	***May-2004***			
Award MC Conductor Contract	Dec-2004	***Oct-2004***			
Award VV Production Vendor	Oct-2004	***Sep-2004***			
Award MCWF Mfg Contract	Oct-2004	***Sep-2004***			
First MCWF Delivered	Jul-2005	***Sep-2005***			
Begin TF Coil fabrication activities	Sep-2005	***Jun-2005***			
Complete First Mod Coil Fabrication	Mar-2006	***Mar-2006***			
Vacuum Vessel Sectors Delivered	Sep-2006	***Sep-2006***			
Last MCWF Delivered	Sep-2007	***Sep-2007***			
PF Coils Awarded	Mar-2008	***May-2008***	*		***Contract negotiated and ready to award.***
Begin Assembly of First Field Period	Jul-2007	***Jul-2007***			
All TF Coils Delivered	Aug-2008			***Oct-2008***	
Last Field Period Assembled	Nov-2008			***n/a***	***Project terminated***
Begin Vac Vsl Pumpdown	Feb-2009			***n/a***	***Project terminated***
Begin Cryostat Installation	Apr-2009			***n/a***	***Project terminated***
Operational Readiness	Jun-2009			***n/a***	***Project terminated***
Begin Start-up Testing	Jun-2009			***n/a***	***Project terminated***
Modular Coil Fabrication Complete (last VPI)				***Aug-2008***	
3 modular coils assembled				***Oct-2008***	
Modular Coil Half Period test fit over VVSA				***Nov-2008***	
Modular coils and TF coils in safe storage				***Mar-2009***	
Techincal Data Collection complete				***May-2009***	

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Department of Energy
Washington, DC 20585

JUL 09 2008

MEMORANDUM FOR JEFFREY F. KUPFER
ACTING DEPUTY SECRETARY

THROUGH: INGRID KOLB
DIRECTOR, OFFICE OF MANAGEMENT

FROM: RAYMOND L. ORBACH
UNDER SECRETARY FOR SCIENCE

SUBJECT: Attached is the memorandum canceling the National Compact Stellarator Experiment (NCSX) Major Item of Equipment (MIE) project at Princeton Plasma Physics Laboratory (PPPL).

BACKGROUND: The Office of Engineering and Construction Management (OECM) supported and concurs with the Office of Science decision to cancel the NCSX MIE.

cc: Patricia Dehmer, SC-2
Steve Isakowitz, CF-1

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Department of Energy
Washington, DC 20585

MEMORANDUM FOR UNDER SECRETARY FOR SCIENCE

FROM: Stephen Eckstrand for RAYMOND J. FONCK, ASSOCIATE DIRECTOR
OFFICE OF FUSION ENERGY SCIENCES

SUBJECT: ACTION: Rebaseline or cancel the National Compact Stellarator Experiment (NCSX) Major Item of Equipment (MIE) project at Princeton Plasma Physics Laboratory (PPPL)

ISSUE: The NCSX project Performance Baseline was initially approved at Critical Decision (CD)-2 with a Total Project Cost (TPC), including conceptual design, of $96 Million (M) and completion in May 2008. The current NCSX project has an established baseline with a TPC of $102M with a CD-4 completion date of July 2009. After PPPL, with support from Oak Ridge National Laboratory (ORNL), evaluated the project performance to date and performed a "bottoms up" estimate to complete, a new baseline was proposed with a TPC of **$170.2M** and a completion date of **August 2013**.

RECOMMENDATION: After extensive evaluation of the past performance and future expectations of the NCSX MIE fabrication, which is documented in the attached Appendix, I recommend that the Under Secretary cancel the NCSX MIE for the following reasons:

1) the NCSX initial pre-CD-0 costs have increased from the $50-60M range first considered by the Fusion Energy Sciences Advisory Committee (FESAC) to the current estimated cost of $170.2M and the date for finishing the project has been delayed from 2007 to 2013;
2) the NCSX will need an additional $30-40M and 1-2 years after 2013 to achieve useful physics operation;
3) there is a significant possibility that the NCSX TPC could increase further due to the inadequate, preliminary stage of some of the design work, and the lack of machine assembly experience;
4) cancellation will clarify PPPL's future, allow significant upgrades to the National Spherical Torus Experiment (NSTX), if NCSX funds are redirected, and eliminate the "standing army" problem; and
5) there is a need to avoid further damage as we move the program into the era of support of burning plasma physics.

APPROVE: Raymond L. Orbach

DISAPPROVE: _____

DATE: July 9, 2008