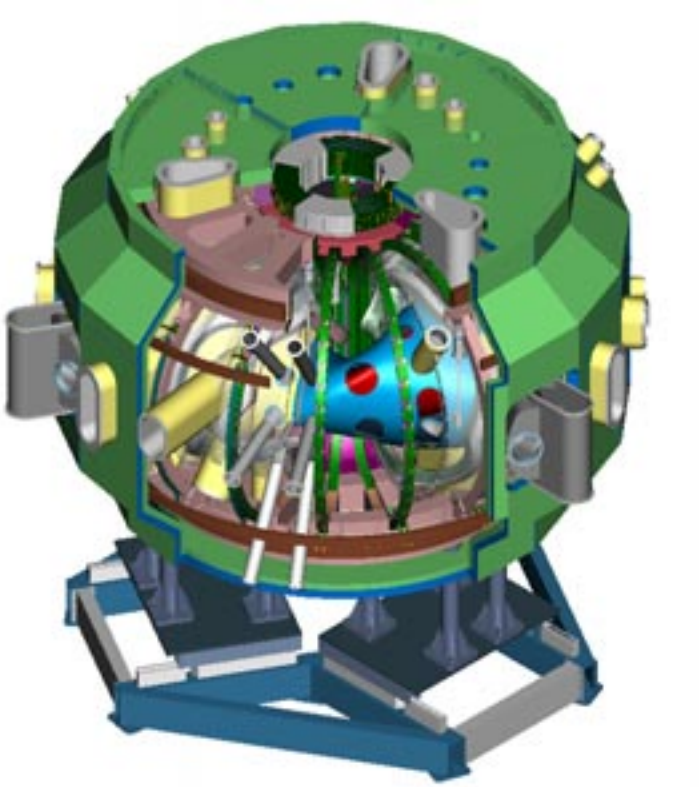

National Compact Stellarator Experiment

NCSX

ACQUISITION EXECUTION PLAN

(NCSX-PLAN-AEP)

Revision 0, Draft K

May 1, 2002

NCSX Acquisition Execution Plan

Approvals:

Project	Laboratory
R.D. Templon PPPL Procurement Manager	J. A. Schmidt Advanced Projects Department Head
J.F. Lyon NCSX Deputy Project Manager	R.J. Goldston PPPL Director
G. H. Neilson NCSX Project Manager	S. Milora ORNL Fusion Energy Division Director

DOE

G. Pitonak DOE NCSX Project Manager	Warren Marton DOE OFES Program Manager
Anne Davies Associate Director for Fusion Energy Sciences	James Decker Acting Director Office of Science

Robert G. Card
Under Secretary for Energy, Science and Environment

NCSX Acquisition Execution Plan

Revision	Date	Description of Changes
Draft G1	3/21/02	Revised Sections I.A, II.F6, and II.I as well as minor text revisions.
Draft H	3/22/02	Revised to incorporate PPPL management comments and type corrections
Draft I	4/16/02	Revised to reflect latest format guidance contained in the latest (Feb 2002) DOE Program and Project Management Manual and DOE comments.
Draft I-1	4/22/02	Revised to incorporate GHN & OFES comments.
Draft J	4/29/02	Completed milestone schedule and clarified mission
Draft K	5/1/02	Clarified plasma performance requirements and NCSX MIE Project Scope

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NCSX Acquisition Execution Plan

I REQUIREMENT

A. Summary Project Description

A.1 Overview

The National Compact Stellarator Experiment (NCSX) is an experimental research facility that is to be designed and constructed at the Department of Energy's Princeton Plasma Physics Laboratory (PPPL). Its mission is to acquire the physics knowledge needed to evaluate compact stellarators as a fusion concept, and to advance the understanding of 3D plasma physics for fusion and basic science. The facility will include the stellarator device and ancillary support systems. The Princeton Plasma Physics Laboratory will have lead responsibility for execution of the NCSX project. The Oak Ridge National Laboratory, as a partner to PPPL, will provide major support, including leadership in specific areas. Combining the PPPL and ORNL team is advantageous as both laboratories have extensive experience in the design and fabrication of stellarators and other fusion confinement experiments.

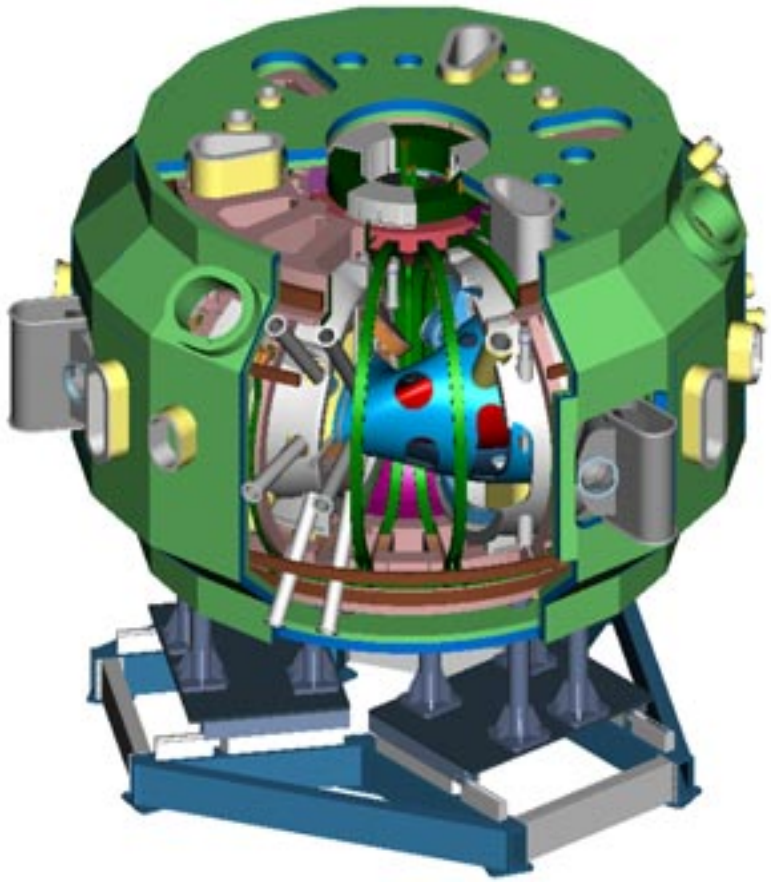
Within the DOE Office of Science (SC), the responsibility for the NCSX Program resides in the Office of Fusion Energy Science (OFES) and an OFES NCSX Program Manager has been assigned. The management responsibility, authority, and accountability for the day-to-day execution of the NCSX Project within the DOE are the responsibility of the Manager of the Chicago Operations Office (CH). CH has delegated major authorities and responsibilities for the NCSX Project to the Manager of the Princeton Area Office (PAO), who has designated a DOE NCSX Project Manager.

The DOE NCSX Project Manager shall be responsible for organizing and directing the efforts of the Integrated Project Team (IPT) to oversee the management of the NCSX Project. The IPT will be a dynamic team whose composition shall consist of both DOE and contractor personnel as appropriate to meet changing project needs. While the makeup of the team will evolve with the project phase and life cycle, the team should consist of both DOE and contractor personnel having appropriate background and experience. This team will be augmented by personnel with contracting, fiscal, legal, and

technical backgrounds and expertise as needed. Specific details of the current composition of the IPT are contained in the NCSX Project Execution Plan (PEP).

A.2 Project Description

The NCSX facility will be designed, fabricated, installed, and made ready for operation. At the heart of the facility is the plasma confinement device, or stellarator core, an assembly of several magnet systems and structures that surround a highly shaped plasma. Coils will produce the magnetic field for plasma shape control, inductive current drive, and field error correction. A vacuum vessel and plasma facing components will produce a high vacuum plasma environment with access for heating, pumping, diagnostics, and maintenance. The core will be enclosed in a cryostat to permit cooling of the magnets at cryogenic temperature. Figure I.A.2-1 shows a cutaway view of the stellarator core assembly.



NCSX Stellarator Core

Figure I.A.2-1

The NCSX core will be installed in the C-site test cell (formerly occupied by the Princeton Large Torus (PLT) and Princeton Beta Experiment (PBX) facilities) at the Princeton Plasma Physics Laboratory. It will be equipped with neutral-beam heating systems, pumps, fueling systems, diagnostics, control systems, and data acquisition systems. Site infrastructure and utility services will be used. The PBX/PLT computer and control rooms, which are contiguous to the test cell, will be refurbished and utilized. Power supplies located at D-site, originally used on TFTR, will be re-used on NCSX.

The key technical objective of the NCSX project is the fabrication and assembly of the NCSX experimental facility. The facility will be capable of producing magnetized plasmas with a well defined set of configuration properties, such as size, shape, magnetic field strength, and pressure, which in turn determine its physics properties. The NCSX will provide the capability to vary the configuration parameters over a range of flexibility. The plasmas to be studied are three-dimensional toroids, that is, doughnut-shaped plasmas whose cross sectional shape varies depending on where it is sliced. The magnetic field coils, which control the plasma shape, must be accurately constructed to precise shape specifications. The NCSX will provide plasma control, heating, diagnostic, and power and particle handling systems sufficient for the first few phases of experimental operation and will be able to accommodate later upgrades, depending on research needs. The NCSX PEP contains details of the system-by-system scope definition. The specific parameter objectives are as follows:

- Major radius R = 1.4 m;
- Toroidal field strength B_0 = 1.7 T for 0.2 second flattop;
- Neutral beam heating power P_{NB} = 3 MW

Plasma performance requirements for each phase of the research program will evolve during the NCSX fabrication phase as the research program plans, including its hardware and plasma performance requirements as a function of time, are defined in more detail.

As part of the Project conceptual design review, the NCSX project developed an acquisition strategy covering the procurement of all major systems components.

The NCSX Project is scheduled to achieve first plasma in mid-FY2007 and begin its operation phase thereafter. The DOE-level schedule objectives for the NCSX project are summarized by the sequence of milestones tabulated in Figure I.A.2-2 as follows:

NCSX DOE Milestones

Figure I.A.2-2

Milestone	Schedule	DOE Level 0	DOE Level 1	DOE Level 2
Physics Validation Review Completed	**March 2001A**		**X**	
CD-0 Milestone Completed	**May 2001A**	**X**		
Conceptual Design Configuration Selected	**December 2001A**			**X**
NEPA Preliminary Hazards Analyses Submitted	**April 2002A**			**X**
Conceptual Design Review Completed	May 2002		**X**	
CD-1 and CD-3a Milestones Completed	August 2002	**X**		
Start Preliminary Design (Title I)	October 2002		**X**	
Award Prototype Contract(s) for Modular Coils Winding Forms	December 2002			**X**
Award Prototype Contract(s) for Vacuum Vessel	February 2003			**X**
DOE Preliminary Design Review Completed	May 200*3*			**X**
CD-2 Milestone Completed	June 2003	**X**		
Complete Final Design Review for Modular Coils Winding Forms	August 2003			**X**
Award Production Contract for Modular Coils Winding Forms	December 2003			**X**
Complete Final Design Review for Vacuum Vessel	December 2003			**X**
CD-3 Milestone Completed	April 2004	**X**		
Award Production Contract for Vacuum Vessel	April 2004			**X**
Award Conductor Procurement for Production Modular Coils	July 2004			**X**

NCSX DOE Milestones

Figure I.A.2-2

Milestone	Schedule	DOE Level 0	DOE Level 1	DOE Level 2
First Modular Coil Winding Forms Delivered	January 2005		**X**	
Complete First Modular Coil Fabrication	March 2005			**X**
Complete Delivery of TF Coils	August 2005			**X**
Vacuum Vessel Shell Delivered	October 2005		**X**	
Begin Assembly of First Field Period	November 2005			**X**
Last Modular Coil Winding Form Delivered	January 2006		**X**	
Last Field Period Assembled	June 2006			**X**
Pump Down of Vacuum Vessel	September 2006		**X**	
CD-4 Milestone Completed	February 2007	**X**		
First Plasma and Complete MIE Project	March 2007	**X**		

Note: **DOE Level 0 milestone – DOE Acquisition Executive, DOE Level 1 milestone - DOE Program Manager, and DOE Level 2 – DOE Project Manager approval authority**.

"A" = Achieved.

B. Identification of Authoritative Source Documents

The National Compact Stellarator Experiment (NCSX) is an integral part of the Department's Office of Fusion Energy Sciences program. The mission of the NCSX supports two of the program's goals (Report of the Integrated Program Planning Activity, December, 2000), namely to:

- Resolve outstanding scientific issues and establish reduced-cost paths to more attractive fusion energy systems by investigating a broad range of innovative magnetic confinement configurations; and

- Advance understanding of plasma, the fourth state of matter, and enhance predictive capabilities through comparison of well-diagnosed experiments, theory, and simulation.

More complete details of how the NCSX mission supports these goals are contained in the NCSX PEP.

The NCSX and the stellarator proof-of-principle program were proposed to DOE in May, 1998. A DOE peer review panel and later the Fusion Energy Sciences Advisory Committee (FESAC) recommended development of the physics basis and pre-conceptual design of NCSX, which was done over the next three years. As the pre-conceptual design evolved, several implementation approaches for the core device were considered, ranging from a modest reconfiguration of the existing PBX-M device to fabrication of a new device. Trade studies examining a range of plasma configurations and coil topologies were conducted to support the decision process. The main design features were established in a series of decisions in late 2000 and early 2001: the reference plasma configuration and its associated physics properties, modular coils for the main helical field magnets, and the size and performance parameters. The results of these trade studies supported the conclusion that the best design approach for the mission was chosen. A second DOE peer review, a physics validation review in March, 2001, confirmed the soundness of the NCSX physics design basis and the appropriateness of the implementation approach based on the pre-conceptual design. On that basis, the compact stellarator was endorsed as a proof-of-principle concept by the FESAC and mission need (CD-0) was approved by the DOE Office of Fusion Energy Sciences (OFES).

As stated in the NCSX Mission Need Statement approved in September 2001, the DOE decided to site the NCSX device at PPPL to maximize the use of existing fusion energy program infrastructure, facilities, and resources. Use of the PPPL site takes advantage of the lab's decades of experience in designing and operating fusion experiments like NCSX. This long history of fusion experience has produced a knowledgeable

organization, procedures, and the human resources well suited to carry out the NCSX Project.

C. Status of Requirements Definition

The NCSX Project is currently completing the Conceptual Design phase and will undergo a DOE review of the Conceptual Design Report in May, 2002. At this time, the technical requirements will be documented in the Project's General Requirements Document (GRD). The requirements will have been defined to the extent necessary to support start of Title I (Preliminary) design at the beginning of FY2003. Initial project cost and schedule baselines will also be developed as part of the conceptual design process. Once these baselines are established, the configuration, cost, and schedule targets will be defined for Title I planning. However, in accordance with the DOE's baseline management policies, the cost and schedule baseline will not be formally established until the completion of Title I design.

D. Key Supporting Project Management Plans

In addition to this Acquisition Execution Plan (AEP), the NCSX Project has developed and implemented management plans that expand on the programs and policies outlined in this AEP. The key preliminary project management plans include the:

- NCSX Project Execution Plan (PEP);
- NCSX Project Quality Assurance Plan (QAP); and
- NCSX Systems Engineering Management Plan (SEMP).

II. PROGRAM STRUCTURE

A. Summary Description

The Office of Fusion Energy Sciences has identified the NCSX Project as a Major Item of Equipment (MIE) project because the scope of work consists almost entirely of hardware design, fabrication, and installation in an existing facility. The same overall management concepts applicable to line item project will be applied under a graded approach philosophy. For the fabrication of NCSX, DOE will provide funds directly to the major participants (PPPL and ORNL) via separate Budget and Reporting lines. All

major procurements will be accomplished through PPPL using PPPL's DOE-approved procurement system. The NCSX preliminary Total Estimated Cost (TEC) is $69M in year-of-expenditure dollars, based on the conceptual design and project execution schedule given in Table I.A.2-2 and Figure IV.A.1-1. The cost objective will be fully established at the completion of the Title I phase, and may increase prior to that time as the design is further defined..

B. Acquisition Steps

B.1 Overview

The key feature of the NCSX acquisition strategy and planning is the procurement of the components that comprise the stellarator core. The stellarator core includes the modular coils, vacuum vessel, supplementary coil systems (e.g., TF and PF), and plasma facing components (PFCs). The procured components will be assembled by Laboratory labor into the completed stellarator core assembly.

Since the majority of the other systems will primarily be upgrades and/or modifications to existing PPPL systems and structures, it is anticipated that simple build-to-print, fixed price procurements based on firm specifications are feasible.

B.2 Acquisition Steps

The procurement of the stellarator core components, especially the modular coil winding forms and vacuum vessel that are on or close the Project's critical path, is planned to proceed in a phased approach. This phased approach included the completion, during the conceptual design phase, of ten fixed-price manufacturing studies by qualified industrial suppliers that provided several benefits to the project:

- Independent value engineering assessments of the Project's planned design and manufacturing concepts and the cost and schedule impacts of these proposed approaches;
- Involvement of industrial manufacturing engineers at an early stage (i.e., conceptual design), thereby enabling the Project to incorporate their input into the design and future plans; and

- Establishment of lines of communication with suppliers.

With the start of Title I design in FY2003, the Project will solicit and award manufacturing development contracts to industrial suppliers to proceed with the design and fabrication of small scale manufacturing prototypes for both the vacuum vessel and the modular coil winding forms. These will be followed by development of full-scale prototypes in the Title II design phase. It is anticipated that these contracts will be cost reimbursable. Manufacturing development of the coil winding and vacuum pressure impregnation (VPI) processes will be done at PPPL.

Contract(s) for the production units would be fixed-price. The contracts for the vacuum vessel and modular coil winding form production units would be awarded competitively to industry. The winding and VPI of the modular coils and machine assembly will be done at PPPL using laboratory labor.

The fabrication of the toroidal field (TF) and poloidal field (PF) coils will also be through fixed price contracts. The PFC's, cryostat, and structure are not expected to offer significant challenges and will not require a significant amount of manufacturing development. The plan is to procure each of these under a fixed price contract. Other non-stellarator core system components are also anticipated to be relatively simple, off-the-shelf procurements that purchased under fixed-price contracts.

III. RISK ASSESSMENT

A. Overall Risk Mitigation Strategies

Although technically challenging, the risks associated with this project and acquisition strategy are judged to be manageable. From an environmental perspective, there are no significant ES&H risks. Previous projects with scopes similar to NCSX such as the National Spherical Torus Experiment (NSTX) have been determined to offer no significant ES&H risk. As a result, NCSX is following an Environmental Assessment model similar to the one successfully implemented for NSTX. The main risk of NCSX is in the cost and schedule uncertainties associated with manufacturing major components

with unique shapes and precise tolerance requirements. To mitigate these risks, the project opted for early involvement of suppliers in manufacturing studies as part of a value engineering activity during the conceptual design process. The project further plans to mitigate the risks by conducting periodic design reviews as the design evolves, to pursue manufacturing development activities during the Title I and II design, to utilize both sub-scale and full scale prototypes, and to implement a phased procurement strategy. Additionally, the Project plans on using two industrial suppliers for developing prototypes for the major procured components (e.g., the vacuum vessel and modular coil winding forms) to maintain competition.

The PEP outlines the Project's approach to risk management. These processes and the development of a fully integrated and resource-loaded schedule has resulted in the identification of the modular coils and the vacuum vessel as the critical components. As mentioned in the previous section and above, the Project is taking steps, to mitigate risk. The acquisition methodology for these items has been reviewed by the NCSX IPT and will be revisited at key decision points in their acquisition. In addition, the IPT will review proposed procurement strategies for other stellarator core and auxiliary systems.

PPPL has a DOE-approved procurement system that will be used to procure manufacturing development studies, prototypes, and final component fabrication. The capability and experience to handle all types of procurement activity, including equipment purchases and any necessary design and fabrication work is in place. For example, many of the procurement risks for fabrication services and supply contracts will be mitigated by allowing NCSX to enjoy the savings earned on industrial contracts already in place at PPPL. Finally, the existing Integrated Safety Management Program in place at PPPL will reduce risk and ensure that compatible standards exist for NCSX work in relation to other projects located at PPPL.

B. Value Engineering as Risk Mitigation

The Project has taken a proactive approach to technical, cost, and schedule risk mitigation by applying value engineering early in the conceptual design phase. The ten manufacturing studies included the review of potential fabrication techniques for the

highest risk items in the Stellarator core, namely the modular coils and the vacuum vessel. Valuable fabrication and costing information has been developed through these efforts and this data is being factored into the Project's plans. It is expected that these efforts will result in further mitigation of risk and refinement of design and fabrication details.

IV. APPROACH TO MANAGING PROJECT COST AND PERFORMANCE

A. Cost Objectives and Strategies

A.1 Overall Cost Objective

The NCSX Project cost objective is $72M in year-of-expenditure dollars, assuming project execution on the schedule given in Figure IV.A.1-1 that follows. The project cost objective will be fully defined at the completion of the Title I phase, and may change prior to that time as the design evolves.

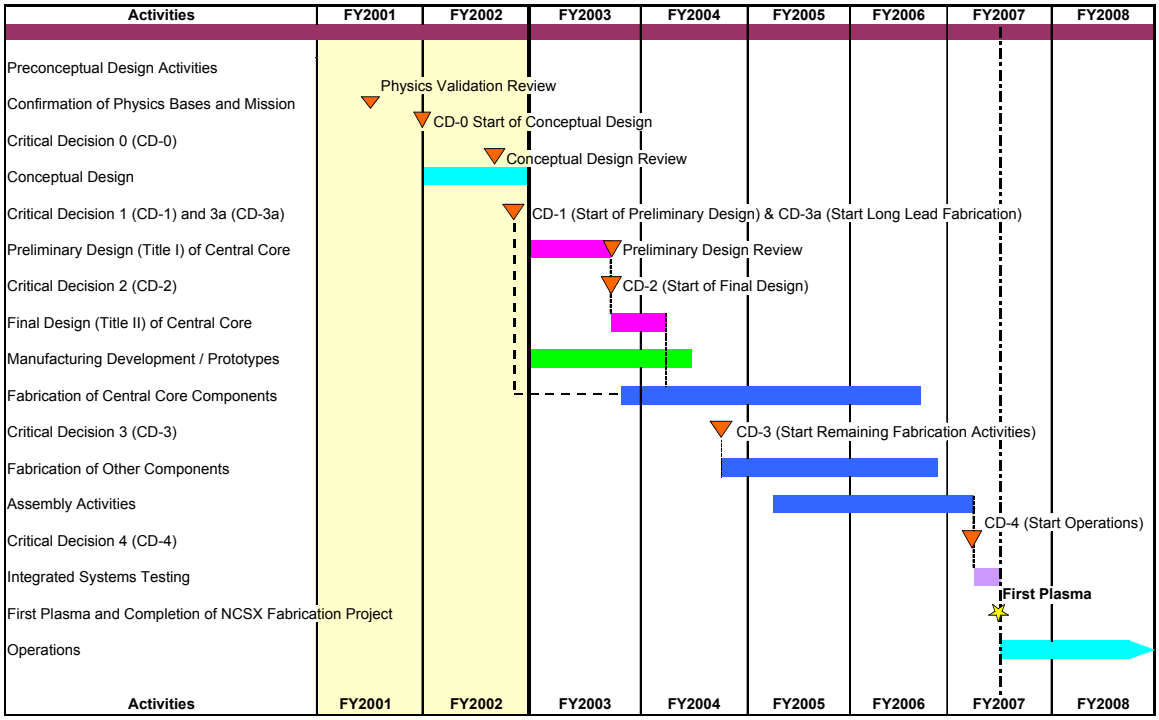


Figure IV.A.1-1

NCSX Project Schedule

A.2 Life Cycle Cost

Although the total life-cycle cost has yet to be determined, it is possible to identify the components. Fusion facilities like NCSX typically operate for about 10 years or more, and the major stellarator core components are expected to have operating lifetimes equal to that of the entire experiment. As is typical of fusion experiments, it is anticipated that additional upgrades to enhance the performance will be procured during the project's lifetime. At this stage of the project the annual facility operating and upgrade expenses are not yet estimated. At the end of the project's life, it is anticipated that the facility will be decommissioned and dismantled with much of the equipment likely to be re-used by other projects. The remaining equipment would be removed and it is expected that these activities should be routine and relatively inexpensive, although a small amount of radioactive activation and/or contamination of the structures is expected.

B. Managing Trade-Offs Between Cost and Performance

B.1. Tradeoffs

Certain tradeoffs were analyzed in arriving at the acquisition strategy described in this plan. They are based on the assumption that the NCSX Project will be built at PPPL and that the PPPL and ORNL M&O contractors would function as the prime contractors for the NCSX Project. Even though both PPPL and ORNL have key design responsibilities, it was deemed advantageous to flow all the procurement through the host (PPPL) institution's procurement organization rather than splitting them between two institutions.

The NCSX IPT will be involved in all major acquisition-related trade-offs.

B.2 Application of Should Cost Methodologies

The NCSX Project does not utilize the special forms or analyses associated with a formal should-cost methodology. The cost and schedule performance measurement baselines break out the estimated program costs for the design, fabrication, and manufacturing development budgets. The starting point for the NCSX estimate data will be the Conceptual Design Review currently scheduled for May, 2002. This review will rely on

a bottoms-up methodology where each individual function will be estimated and costed using either direct industrial estimates or composite industry labor rates and material costs (including fees and expenses). Where feasible, the basis for these estimates will be conceptual and/or preliminary performance specifications and drawings. Additionally, each procurement will use some form of price or cost analysis to compare with the TEC estimates for validation. As a result, as the project evolves, the TEC will serve as the should-cost benchmark. Cost estimates in design, fabrication, and manufacturing development are based on budgetary quotations from vendors or actual experiences from recent similar fusion energy sciences projects and contracts.

V. PROGRAM AND PROJECT MANAGEMENT

A. General Philosophy and Approach

The NCSX Project has been designated as a Major Item of Equipment (MIE) by OFES and will be built using Capital Equipment Funds. The NCSX Project will follow the recent DOE guidelines on program and project management using a graded approach that is appropriate for a MIE project the cost and duration of NCSX. The NCSX IPT will be closely involved in the day-to-day oversight of the NCSX Project and will participate in concurring with key project decisions.

B. Responsibilities

B.1 DOE Organization and Responsibilities

Within the DOE, the responsibility for the NCSX Program resides in the Office of Fusion Energy Science (OFES) and an OFES NCSX Program Manager has been assigned. The management responsibility, authority, and accountability for the day-to-day execution of the NCSX Project within the DOE are the responsibility of the Manager of the Chicago Operations Office (CH). CH has delegated major authorities and responsibilities for the NCSX Project to the Manager of the Princeton Area Office (PAO), who has designated a DOE NCSX Project Manager. The DOE NCSX Project Manager will lead the NCSX IPT.

B.2 Project Organization and Responsibilities

The NCSX project will be led by the Princeton Plasma Physics Laboratory (PPPL) with the Oak Ridge National Laboratory (ORNL) providing major leadership and support as a partner. The partners have formed an integrated team to carry out the NCSX project, where engineers and scientists from PPPL and ORNL work together to bring the necessary expertise to the project. This means that PPPL engineers and scientists will support areas in which ORNL has the lead and similarly, ORNL engineers and scientists will support areas in which PPPL has the lead. Management responsibilities are clearly assigned to one partner or the other, and PPPL has overall responsibility for the project. PPPL and ORNL will carry out project management responsibilities in accordance with the provisions of the approved NCSX Project Execution Plan (PEP).

All work associated with the NCSX will be performed by either laboratory personnel or by subcontractors to the laboratories. Plans are for PPPL and ORNL to provide overall programmatic and project leadership. PPPL, as the host site, will provide all procurement, quality assurance and logistics support for the Project.

Figure V.B.2-1 depicts the NCSX project organization structure and the key management responsibilities of the partner institutions.

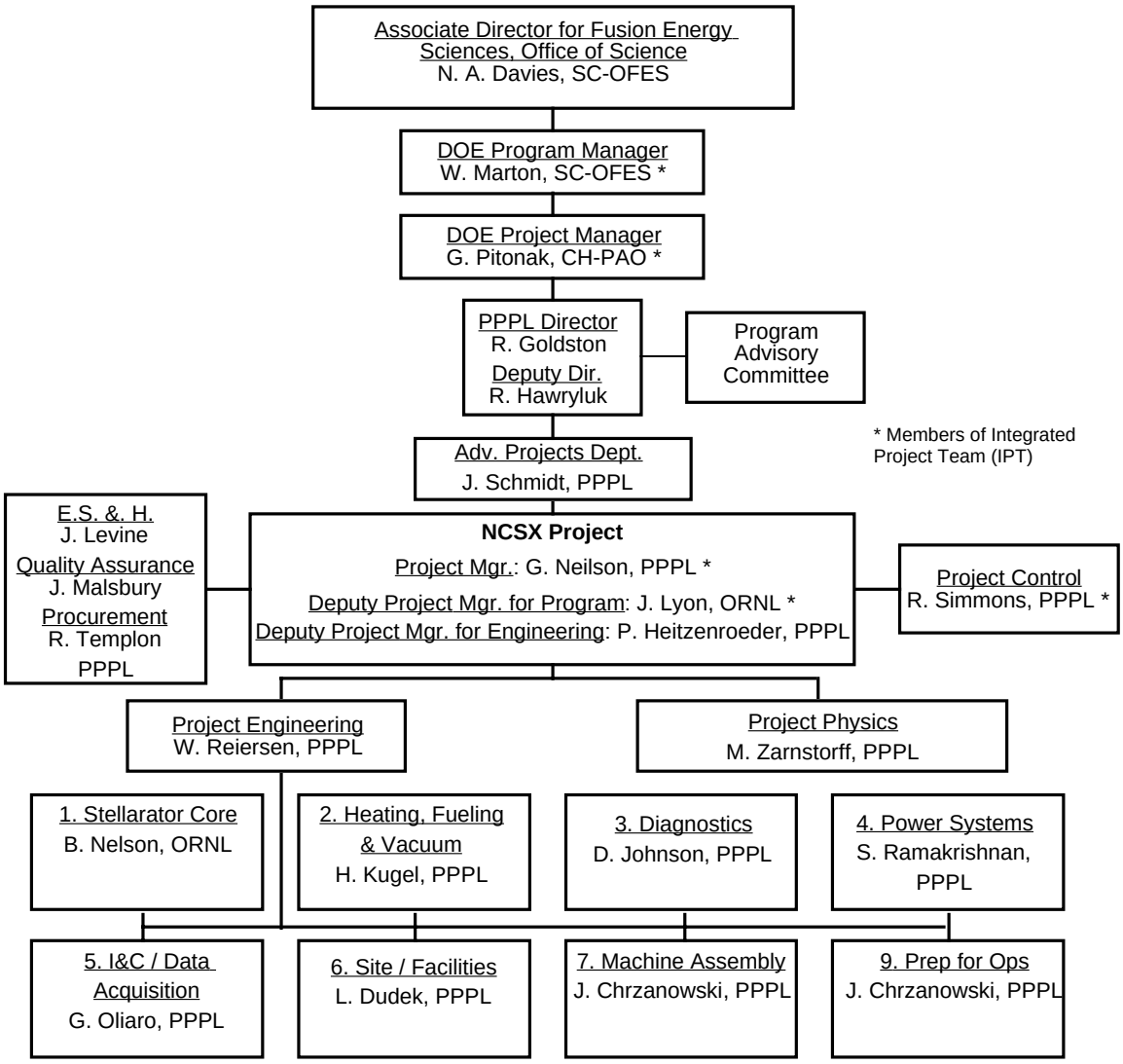


Figure V.B.2-1

NCSX Project Organization Structure

C. Resources

C.1 Funding

As a Major Item of Equipment (MIE) the NCSX project will be funded with Capital Equipment Funds. The cost objective is measured by the Total Estimated Cost (TEC) – this cost encompasses all project work scope, as defined in Section I.A.2 previously and in the NCSX PEP. These TEC cost activities will be used to measure the performance of the NCSX Project against its technical, cost, and schedule baselines. Section IV.A.1 previously identified the cost objective for this project.

In accordance with DOE guidance, the historical costs for pre-conceptual and conceptual design of NCSX through FY-2002 were funded via Operating (OPEX) funds and are not part of the TPC costs to design and fabricate NCSX.

Research planning and preparations activities in support of the operations program and upgrades to the basic machine capabilities are not included in the NCSX Project scope and will be funded with OPEX funds. Of necessity, this work will proceed in parallel with the design and fabrication of the NCSX device in order to be fully prepared to conduct a research program.

Figure V.C.1-1 below provides the preliminary DOE NCSX funding guidance profiles for the project execution phase. This profile is based on current DOE project planning guidance (October 2001). It should be noted that the current project's TEC and the DOE guidance is slightly in variance (~$3M) and this will be reconciled by OFES as part of the normal budgeting process. The cost of research planning and preparation activities and upgrades are still in the process of being estimated.

	FY2003	FY2004	FY2005	FY2006	FY2007	Totals
	◄				►	
NCSX Fabrication Project (TEC)	$11.0M	$16.0M	$17.0M	$17.0M	$8.0M	$69.0M*
Research Planning & Preparations	$0.8M	$0.8M	$1.2M	$1.6M	**	
TOTALS	**$11.9M**	**$16.8M**	**$18.2M**	**$18.6M**		**$75.0M**

*** Current Project TEC is $72M**
**** Operations will start during FY-2007**

Figure V.C.1-1

Preliminary NCSX Funding Guidance for the Project Execution Phase

C.2 Staffing

The DOE has committed the necessary resources both at OFES and DOE-PAO to properly manage and oversee the NCSX Project. A dedicated NCSX Program Manager has been assigned at OFES and a NCSX DOE Project Manager assigned at the Princeton Area Office. Additionally, OFES has committed to provide additional resources to augment the core DOE team.

Both PPPL and ORNL management consider the NCSX Project to be high priority and have committed to provide the necessary staffing support to meet the technical, cost, and schedule requirements. As indicated in Section V.B.2 previously, the NCSX Project team in fully integrated with personnel from either lab providing key support to their counterparts in the other laboratory.

As necessary, the core project team will be augmented by personnel from their laboratories or by other contractor personnel obtained by arrangements with other fusion laboratories or industrial participants. Procurement of the major components for NCSX will be obtained from industrial participants. When outside participants are involved in the NCSX Project, specific scopes of work will be defined and implemented using the PPPL or ORNL approved procurement systems.

D. Internal Controls

Both PPPL and ORNL will have project management responsibilities, with PPPL taking responsibility for all procurement activity, and conducting such activity in accordance with its DOE-approved purchasing system. All suppliers of NCSX components will be subcontractors to PPPL. All work associated with the NCSX Project will be performed by contractor vs. DOE personnel. All major procurements will be handled by the PPPL DOE-approved procurement system. In some instances, it might be advantageous to utilize the ORNL DOE-approved procurement system for some minor components in the R&D phase. There does not appear to be any advantage in DOE directly handling NCSX procurements, including design, fabrication, and manufacturing development.

Both PPPL and ORNL will utilize earned value reporting, including tracking and reporting costs by Work Breakdown Structure, and provide progress schedules to measure performance. This requirement will be passed down as appropriate to lower tier subcontractors providing the components for NCSX. As required by the Prime Contract between DOE and Princeton University(DE-AC02-76CH03073), PPPL and the NCSX Project will comply with the Contractor Requirement section of DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets,* at the frequency and intervals required by the order and the Federal Project Manager. Also, as also required by the prime contract, Project Assessment and Reporting System (PARS) requirements will be met.

The NCSX Project Manager will work to ensure early detection of technical, schedule or cost problems through the systems engineering approach described in the Systems Engineering Management Plan (SEMP).

E. Tailoring and Streamlining Plans

The NCSX Project is a MIE Project and will follow the DOE program and project management policies, taking a graded approach appropriate to a project of the magnitude, scope, and duration of NCSX.

The procurement systems and processes to streamline the NCSX Project are already in place. While the NCSX Project consists of an integrated team of both PPPL and ORNL personnel, imposing a single point of contact for major procurements offers significant advantages. Assigning the major procurements to PPPL will streamline the procurement process by utilizing the same procurement personnel to conduct all procurements regardless of whether designed by PPPL or ORNL.

PPPL has standard receipt inspection and acceptance testing for all delivered components. These receipt inspections and acceptance testing criteria closely mirror established industry practices.

Finally, commercial and best business practices will be used to accomplish all procurements. Many of the equipment procurements will use commercial or best value source selection concepts allowing cost and technical tradeoffs to ensure the best value is obtained in acquiring components. Fixed price contracts are contemplated for all production procurements. As part of the phased acquisition strategy described in Section II.B.2, early involvement of industry in developing viable manufacturing solutions should facilitate the wide use of fixed price contracts. In addition, consideration will be given to a wide dissemination of draft solicitations prior to formal solicitation as well as the use of pre-proposal and pre-award conferences.

VI. SUPPORT CONCEPTS AND STRATEGY FOR IMPLEMENTING INFORMATION TECHNOLOGY

A. Contractor Support

PPPL will provide all logistical support to the NCSX Project, including warehousing, shipping and traffic control of NCSX components received from suppliers. Unique logistical considerations are not currently foreseen for the NCSX Project. Delivery of the highly technical critical stellarator core components may require close scrutiny to ensure that Project's cost and schedule commitments are met.

The NCSX General Requirements Document, Project Execution Plan, and Conceptual Design Report will be provided to potential bidders via access to the NCSX Manufacturing web page at < http://www.pppl.gov/me/NCSX_MFG/ > to ensure an understanding of the requirements for the NCSX Project. This documentation contains the desired design estimates and fabrication project cost objectives for NCSX, as well as the estimated amounts budgeted for the major items of equipment.

B. DOE Support

At this time, it does not appear that any DOE logistical support is required.

C. Computer-Aided Acquisition Systems

PPPL is currently in the process of implementing the Business Information Systems Upgrade (BISU), an enterprise resource planning (ERP) software system that will integrate all project planning, budgeting, accounting, procurement and receiving functions. BISU will enable electronic requisitioning and data interchange with suppliers. It is currently expected to be fully operational on October 1, 2002 (FY 2003). Commencing in FY 2003 the NCSX procurements will be placed via the BISU system

VII BUSINESS AND CONTRACTING STRATEGY

A. Industry Involvement to Date

As was indicated previously, the NCSX Project has been proactive in obtaining early involvement of industrial participants. Even before the numerous manufacturing studies assigned to industrial participants in support of the conceptual design, the project involved industrial participants in assisting in developing the pre-conceptual design concepts.

B. Government's Role

DOE will provide scientific and administrative oversight of the NCSX Project. Scientific oversight will be provided by The Office of Fusion Energy Sciences (OFES). Administrative oversight -- including review and approval of PPPL contractual activities in support of NCSX -- will be provided by the DOE Princeton Area Office in accordance with the provisions of PPPL's DOE-approved purchasing system.

C. Competition and/or Make or Buy Analysis

C.1 General Approach

The PPPL purchasing system provides a variety of source selection procedures geared to the cost and technical complexity of the product to be purchased. For actions with an estimated value in excess of $1 million, or for lower dollar value actions when determined appropriate, a formal Subcontractor Proposal Evaluation Board (SPEB) will be convened by the PPPL Director. The SPEB includes cognizant technical, procurement, quality assurance and safety representatives. The SPEB is charged with

developing a source selection plan for best value procurement. The SPEB, which includes representation from the Procurement Division, develops the solicitation package, evaluates all proposals received, and prepares a report documenting its evaluation and recommendation to the Source Selection Official (SSO), who makes the ultimate selection decision. Once the selection is made, the SPEB chair and technical members work with the Procurement representative to debrief unsuccessful offerors.

For lower dollar value procurements that have some technical or administrative complexity, the PPPL purchasing system provides a graded approach to the implementation of best value procurement techniques. The core requirement of these less-formal methods is the development of a clear, coherent set of evaluation factors that are consistently applied to all proposals.

For standard, build-to-print fabrications and the purchase of off-the-shelf equipment for routine applications, available purchasing techniques include price competition among technically-qualified suppliers and use of competitively-awarded blanket purchase agreements.

C.2 Sources

The NCSX Project has committed to a high degree of supplier input and participation in the development of requirements for major systems, while at the same time maintaining appropriate in-house control and responsibility for definition, design and integration of these items. The Project will continue to encourage supplier participation through publication of preliminary design information on its public web site. To date, the Project's efforts to identify interested industrial suppliers has generated a list of more than 20 firms from the United States, Europe and Japan that are now actively participating in NCSX manufacturing studies or tracking the Project with the object of participation in its later phases.

C.3 Methods of Competition

The Project will attempt to promote and maintain the cost-leveraging effects of competition throughout all phases of acquisition, including the acquisition of major

components. As described above, the designs of those components that pose the highest degree of manufacturing risk will be developed through a series of manufacturing studies, a prototype fabrication and finally, a production fabrication subcontract. As a matter of policy, the Project will strive make project technical information available to the widest range of interested suppliers and to obtain multiple suppliers for prototype and manufacturing development in order to encourage the submittal of competitive proposals. . Off-the-shelf hardware will be purchased through the PPPL procurement system, using a variety of appropriate, competitively-awarded purchasing vehicles, including subcontracts, purchase orders and blanket purchase agreements.

C.4 Justification for Non-Competitive Procurements

At the present time, the project acquisition philosophy is to encourage full competition to the maximum extent feasible. Should unavoidable sole source requirements be identified during the course of the project, these will be documented on a case-by-case basis in accordance with PPPL's approved procurement procedures.

C.5 Make-or-Buy Considerations

Both PPPL and ORNL have resources and capabilities to design and fabricate/assemble selected equipment (e.g., modular coil windings). PPPL anticipates buying the majority of components for the NCSX Project. It will consider in-house fabrication of certain items, including the modular coils windings, where appropriate. The guiding principal will be that in-house fabrication will be used when it can significantly reduce cost, schedule, and risk.

A specific example of the Project's make or buy assessment is the decision to wind the modular coils on procured winding forms on site at PPPL vs. contracting the entire fabrication of the modular coil winding forms and coil winding to an industrial participant. PPPL has a demonstrated history and experience in winding coils based on previous devices sited at PPPL. The management of PPPL has committed to assuring that the necessary resources are made available to support this effort. The Project believes that this approach will result in cost and schedule savings and improved control of the entire process.

C.6 Government Furnished Property Considerations

As part of the development of the overall acquisition strategy for the NCSX Project, the use of government furnished equipment will be considered when there are clear cost, schedule, or technical advantages demonstrated.

D. Contracting Strategy

D.1 Major Contracts Planned

The stellarator core components will be the major procurements for this project as the ancillary systems will make extensive use of existing systems and components with only relatively minor modifications and refurbishment anticipated. Within the Stellarator core systems, the two major contracts will be the modular coil winding forms and vacuum vessel. As discussed in Section II.B.2, a phased approach of manufacturing studies, followed by sub-scale manufacturing development prototypes, followed by full scale prototype sectors, will lead to a fixed price award of the modular coils winding forms and vacuum vessel. Other procurements, while not of the dollar magnitude of the modular coil castings or vacuum vessel, are also critical to the timely success of NCSX. These include the remaining stellarator core systems procurements, the modular coil conductor, and assembly and installation fixtures.

D.2 Contract Type

Whenever feasible, the Project intends to utilize firm fixed price contracts for production units. However the project anticipates that cost reimbursement contracts may prove more appropriate for the manufacturing development procurements for the subscale and full scale prototypes. The key factor that governs the type of contract selected will be the relative risk, uncertainty, and complexity of the design.

E. Incentives

The majority of the subcontracted work to be performed for NCSX consists of hardware fabrication. The major stellarator core components to be specially fabricated for NCSX will be the subject of a multi-stage development program that will yield designs that

permit fabrication under fixed-price "build-to-print" subcontracts. Depending on schedule considerations, it may be appropriate to use one or more fixed-price incentive subcontracts, with negotiated targets based on delivery or cost. These performance based subcontractor incentives will be considered by the Project if such incentives appear necessary or appear to offer appropriate cost, schedule, or technical advantages to the Project. For the remaining ancillary systems components, it is anticipated that the majority will be readily available off-the-shelf.

F. Warranty and Licensing Considerations

F.1 Warranty Considerations

Suppliers of off-the-shelf components and commercial services will be required to provide PPPL with their standard commercial warranty. Specially designed components will be warranted for one year from date of delivery and/or acceptance in accordance with standard PPPL practice, unless such coverage is determined by the Project not to be cost-effective.

F.2 Licensing Considerations

At this time there are no known intellectual property licensing issues associated with the NCSX Project.

G. Quality and Safety

G.1 Quality Considerations

The NCSX Project QA Plan will demonstrate how the existing PPPL and ORNL-Fusion Energy Division Quality Assurance Plans and implementing policies and procedures, in conjunction with additional NCSX specific plans, policies, and procedures will satisfy the requirements of the DOE Order on Quality Assurance, 414.1A, and provide an appropriate level of quality on the project.

G.2 Safety Considerations

PPPL, as the host site for the NCSX Project, maintains a vigorous Integrated Safety Management (ISM) program, and will extend the provisions of the ISM program to all

subcontractors and suppliers working on the PPPL site. PPPL complies with all Federal and State regulations governing safety in the work place, including the submittal of Material Safety Data Sheets (MSDSs) for all substances brought onto the PPPL site. PPPL also requires that all subcontractor personnel working more than 40 hours on the PPPL site undergo General Employee Training, which includes both industrial hygiene and radiological awareness training. Further, PPPL requires special training and/or certification for work in confined spaces, operation of hoisting and rigging equipment and work with open flames.

VIII. OTHER IMPORTANT CONSIDERATIONS

A. Security

Normal site access security requirements will exist for NCSX activity in accordance with PPPL site security procedures. None of the work on NCSX is classified.

B. International Cooperation and Considerations

Several foreign suppliers from Japan and Europe are currently participating in the NCSX manufacturing studies, and it is possible that one or more foreign suppliers will provide major components for the NCSX device. As the host site, PPPL is well-versed in contracting with foreign suppliers, including suppliers located in countries comprising the former Soviet Union. PPPL is also very familiar with the requirements for coordination of work and visits by foreign nationals, as set forth in DOE Notice 142.1, Unclassified Foreign Visits and Assignments; DOE Notice 205.1, Foreign National Access to DOE Cyber Space; and DOE Order 551.1A, Official Foreign Travel.

C. Environmental and Energy Conservation Considerations

All work done on NCSX will be in accordance with applicable Federal, state and local guidelines for environmental objectives. Informal discussions with the responsible DOE Field Office (CH) have determined that an Environmental Assessment (EA), similar to one prepared for a recent fusion project constructed at PPPL – the National Spherical Torus Experiment (NSTX) – is the appropriate NEPA documentation. At the time of the

Conceptual Design Review, the NCSX Project will have submitted the necessary input NEPA documentation to DOE to permit the EA to proceed.

Additionally, energy conservation objectives are outlined in specifications and drawing requirements, and comply with 10 CFR 45 (Energy Conservation Requirements)

D. Participants in Preparing this Acquisition Execution Plan

The following DOE, NCSX Project, and PPPL and ORNL staff participated in developing this NCSX Acquisition Execution Plan:

Gregory Pitonak, DOE NCSX Project Manager
Warren Marton, DOE-OFES Program Manager
Robert Goldston, PPPL Laboratory Director
Stan Milora, ORNL Fusion Energy Division Director
John Schmidt, PPPL Advanced Projects Department Head
George H. Neilson, NCSX Project Director
Jim Lyon, NCSX Deputy Project Director
Phil Heitzenroeder, NCSX Deputy Project Director for Engineering
Rodney Templon, PPPL Procurement Division Manager
Judy Malsbury, PPPL Quality Assurance Manager
Jerry Levine, PPPL ES&H Division Manager
Wayne Reiersen, NCSX Engineering Manager
Robert Simmons, NCSX Project Controls Manager