OPA (SC-28) Mini-Review Report

Department of Energy/Office of Science Review of the National Spherical Torus Experiment Upgrade (NSTX-U) Project

Review Date: **February 4, 2014**
Project Location: **Princeton Plasma Physics Laboratory**
Program Manager: **Barry Sullivan, FES**
Federal Project Director: **Tony Indelicato, PSO**
Acquisition Executive: **Ed Synakowski, FES**
Current Critical Decision: **Post-CD-3 Status Review**

Table 1—Project Status

Project Status as of December 31, 2013		
Project Type	MIE	
CD-1	Planned: Dec 2009	Actual: Apr 2010
CD-2	Planned: Dec 2010	Actual: Jan 2011
CD-3	Planned: Jan 2012	Actual: Dec 2011
CD-4	Planned: Sep 2015	Actual: on schedule
TPC Percent Complete	Planned: 84.5%	Actual: 80%
TPC Cost to Date	$71.2M	
TPC Committed to Date	$71.2M	
TPC	$94.3M	
TEC	$83.5M	
Contingency Cost (no Mgmt Reserve)	$5.4M	30 % to go
Contingency Schedule on CD-4	10 months	101%
CPI Cumulative	0.98	
SPI Cumulative	0.94	

Table 2—Funding Profile

FY09	**FY 10**	**FY 11**	**FY 12**	**FY 13**	**FY 14**	**FY 15**	**Total ($M)**
$5.2	$9.0	$9.9	$20.5	$22.8	$23.7	$3.2	$94.3

SUMMARY

A Department of Energy Office of Science (DOE/SC) review of the National Spherical Tokomak Experiment (NSTX) Upgrade project was conducted at Princeton Plasma Physics Laboratory (PPPL) on February 4, 2014. The review was conducted by the Office of Project Assessment (OPA) at the request of Dr. Edmund Synakowski, Associate Director of Science for the Office of Fusion Energy Sciences and chaired by Kin Chao. The purpose of the review was to evaluate the technical progress of the project.

The NSTX Upgrade project team has a realistic, executable schedule for remaining Center Stack (CS) efforts and has adequate resources with appropriate skills mix to execute the remainder of the project as planned. The project forecasts a November 2014 CD-4 date. However, the Committee assessed that this schedule appears aggressive.

The cost and schedule projections are consistent with the approved baseline and the contingency remaining adequate for the remaining risks. The project is actively managing risks and management is capable of delivering the scope within budget and schedule.

Good progress has been made since the October 2013 DOE/SC review and the project is progressing as planned. The project continues to demonstrate a high attention to quality, especially in the ohmic heating (OH) coils. The Committee applauded the project for proactively assessing and evaluating potential issues that may be encountered for all remaining work.

1. FINDINGS

The status of the project and the funding profile are shown in Tables 1 and 2 on page 1. Since the October review, the toroidal field coil has been completed and electrical tests successfully performed. This was a major risk and has been retired.

The first OH layer has been wound on the Aquapour base and the radial build is within the tolerance requirements. The first layer of the OH winding consisted of 240 turns versus the 226 that were planned. In addition, the production in-line braze joints have been successfully performed and the completion of the first layer-to-layer transition is in process.

The learning curve for the OH coil winding is as expected and has resulted in two-shift operation with four-man teams completing this work.

Both Poloidal Field (PF) 1B coils have been fabricated and one has been delivered. The tooling for PF1A and PF1C are complete and winding of PF1A has started.

The setup and commissioning of winding station took 14 weeks longer than scheduled and became a critical path activity. Overall, the project has used 26 working days on the critical path, but there are plans to recover 24 days by using second shift operations on non-winding tasks.

2. COMMENTS

The project has satisfactorily responded to all recommendations of the previous review. In addition, the risk registry is being updated and actively used to manage the project risks. The Committee applauded the project for proactively assessing and evaluating future risks and the project should continue this planning for all remaining work.

Technically, the OH winding is proceeding faster than scheduled. The project has not taken credit for this efficiency but will use this additional schedule gains to absorb potential future slippages in the OH assembly. The Committee agreed that this is the correct approach.

The project continues to demonstrate a high attention to quality, especially in the OH work and the focus on quality should continue.

It is of some concern that there is no firm understanding of why there are 240 (14 extra) turns in the first layer of OH coil versus the 226 planned turns. While the higher number of windings is

not a problem for the physics program, it is concerning that this may be pointing to a potential design or fabrication issue and is worth resolving.

Note: On February 7, 2014, the project provided a response to this issue. The 240 turns the project previously advertised was a miscount. The actual recount showed that there were 232 turns, which is within the predicted range.

The difference between planned versus actual was due to the compression of fiberglass not accounted for in the plan build. Additionally, the copper conductor has a tolerance of +/- 0.015 inches. This adds to the discrepancy with the number of turns that have been counted along with the compression of the glass. The net is a 2.7% increase (6 to be exact) in additional turns.

3. RECOMMENDATIONS

None.

Department of Energy
Washington, DC 20585

January 15, 2014

MEMORANDUM FOR: STEPHEN W. MEADOR
ACTING DIRECTOR
OFFICE OF PROJECT ASSESSMENT
OFFICE OF SCIENCE

FROM: EDMUND J. SYNAKOWSKI
ASSOCIATE DIRECTOR OF THE
OFFICE OF SCIENCE
FOR THE OFFICE OF FUSION ENERGY SCIENCES

SUBJECT: OFFICE OF SCIENCE PROJECT REVIEW FOR THE NATIONAL SPHERICAL TORUS EXPERIMENT (NSTX) UPGRADE PROJECT

I request that your office organize and lead an Office of Science (SC) project review of the NSTX Upgrade Project at PPPL on February 4, 2014. The purpose of this review will be to assess the current status of the Project's performance.

The NSTX Upgrade Project received Critical Decision (CD-0) approval in February 2009, CD-1 approval in April 2010, CD-2 approval in October 2010, and CD-3 approval in December 2011. The project is currently in the construction/execution phase, with significant field construction, fabrication and procurement activities underway.

In carrying out its charge, the review committee is requested to consider the following questions:

1. Critical Path Construction Efforts: Does the Project team have a realistic, executable schedule for Center Stack (CS) remaining construction efforts? Does the project have adequate resources and the appropriate skills mix to execute the remainder of the project per the plan?
2. Baseline Cost and Schedule: Are the current project cost and schedule projections consistent with the approved baseline cost and schedule? Is the contingency remaining adequate for the risks that remain?
3. Management: Evaluate the management structure as to its adequacy to deliver the scope within budget and schedule. Are risks being actively managed? Has the project responded satisfactorily to the recommendations from the previous project reviews?

Barry Sullivan is the program manager for this project and will serve as the contact person for this review. He can be reached at 301-903-8438. I would appreciate receiving your committee's report within 60 days of the review's conclusion.

cc: M. Dikeakos, SC-PSO
J. Makiel, SC-PSO
A. Indelicato, SC-PSO
E. Synakowski SC-FES
J. May SC-FES
G. Nardella, SC-FES
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M. Ono, PPPL
J. Menard, PPPL

Appendix B:
Review Committee

Department of Energy/Office of Science Review of the
National Spherical Torus Experiment (NSTX) Upgrade Project
February 4, 2014

REVIEW COMMITTEE PARTICIPANTS

Department of Energy

Kin Chao, SC, Chairperson

Review Committee

Arnie Kellman, General Atomics
Will Oren, TJNAF

Observers

Barry Sullivan, DOE/SC
Tony Indelicato, DOE/PSO
Maria Dikeakos, DOE/PSO

Appendix C:
Agenda

Department of Energy/Office of Science Review of the
National Spherical Torus Experiment (NSTX) Upgrade Project
February 4, 2014

AGENDA

Tuesday, February 4, 2014—Site-C Lyman Spitzer Building (LSB), Room B318

8:30 am	Executive Session	Kin Chao
8:50 am	Project Overview	Ron Strykowsky
9:20 am	NSTX Centerstack Fabrication	Jim Chrzanowski
10:05 am	Break	
10:20 am	Tour Centerstack Fabrication Area	Jim Chrzanowski
11:20 am	Follow-up and Report Writing	
2:15 pm	Executive Session Dry Run	
2:45 pm	Closeout Presentation	
3:00 pm	Adjourn	

All times listed are EST.