PPPL Quality Assurance Audit Report

To: Larry Dudek, NCSX Construction Manager
Phil Heitzenroeder, Stellerator Design and Procurement
From: Judy Malsbury
Subject: Audit #0802, NCSX Field Period Assembly – Station 1
Date: April 1, 2008

This report documents audit number 0802, NCSX Field Period Assembly – Station 1. For this audit there were five observations, one recommendation, and five findings. Corrective actions for the findings have already been specified and are contained on the findings forms.

Reference material pertaining to this audit is available in the audit file and may be obtained by contacting the Lead Auditor at x2415.

Responses to the audit will be followed up and corrective action status is reported on a monthly basis.

Should you have any questions, please contact the Lead Auditor.

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Jim Chrzanowski, Auditor/Engineering

Since the audit, Mr. Phelps has left PPPL.
Colin Phelps, Auditor/Quality Assurance

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Accepted by:

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Phil Heitzenroeder, Stellerator Design & Proc.

cc:
Don Rej, Head, NCSX Project
Hutch Neilson, NCSX Program Integration
Jeff Harris, Deputy Head, NCSX Project
Mike Viola, NCSX Assembly Manager
John Edwards, NCSX FPA Station 1 Field Supervisor
George Labik, NCSX FPA Station 1 Physics Representative
Steve Raftopoulos, PPPL Metrology Engineer (see finding #4)
John DeLooper, Associate Director for Best Practices and External Affairs
Mike Williams, Associate Director for Engineering and Infrastructure
Susan Murphy-LaMarche, Head, Human Resources (see observation #3 and findings #3 and 4)

AUDIT REPORT

Audit Number:	0802
Audit Name:	NCSX Field Period Assembly – Station 1
Date(s) of Audit:	December 3 – 7, 2007, though additional investigation occurred after December 7th to assure the thoroughness and accuracy of the report
Place of Audit:	PPPL
Auditors:	Judy Malsbury (Lead Auditor), QA Jim Chrzanowski, NCSX Colin Phelps, QA (QC inspector primarily focused on NCSX)
Organizations Audited:	NCSX
Individuals Contacted:	Art Brooks, Engineering, for analysis of metrology data Larry Dudek, Head, Fabrication, Operations, and Maintenance Division John Edwards, FPA Station 1 Field Supervisor Sue Hill, Human Resources, Training George Labik, FPA Station 1 Physics Representative Frank Malinowski, QA – Procurement Quality Assurance Steve Raftopoulos, Metrology Engineer
Exit Meeting:	1/14/08, 2 PM, Engineering Conference Room Jim Anderson, Jim Chrzanowski, Larry Dudek John Edwards, Phil Heitzenroeder, Judy Malsbury Hutch Neilsen, Colin Phelps, Steve Raftopoulos Mike Viola
References:	See Appendix C

Executive Summary

Field Period Assembly is the next critical step within the fabrication of NCSX. The field Supervisor did a commendable job on the work performed in station 1. Findings were identified that included changes being made in the field that impacted design without formal review, use of sketches in the field when approved drawings are required, inconsistency between requirements specified in high level documents and procurement documents, proper processing of field changes to procedures, establishing procedures and defining and implementing training requirements for metrology, and dispositioning of nonconformance reports in a timely fashion. In addition, the checking of calculations/analysis is a problem that, had it not been identified by the NCSX

Constructability Review, would have been a finding; instead it is an observation in this report. While it is not a finding in this procedure, the project should be certain that the processes in place to store and protect the analysis data and results are effective.

Some of these issues had been identified in earlier NCSX audits, specifically assuring training requirements are defined and given (audit #0314), assuring calculation checks are performed (audits #0314 and #0406), and the timely dispositioning of NCRs (audit #0609).

[Audit #0314, NCSX Management Systems, conducted in April and May of 2003.
Audit #0406, NCSX Design Control, conducted in August and September of 2004.
Audit #0609, NCSX Modular Coil Fabrication, conducted in August 2006]

Management Reaction

This audit came at a particularly busy time when NCSX was resolving technical issues with the interface shims along with preparing for Project reviews; consequently time required for us to formalize our responses to the report took longer than normal. We appreciate Judy Malsbury's patience in bearing with us during this critical period and the thorough and professional work of the audit committee. The audit identified several deficiencies and weaknesses at Station 1. Our plans are to present a summary of these issues and resolutions to the NCSX team so that these issues and deficiencies will be avoided in the downstream assembly stations.

This audit report for a single assembly station and 5 findings is 40 pgs. long. In the way of a suggestion, I believe the efficiency of the audit process could be much improved if a concise and focused format for the audit report is developed.

I. Audit Overview

A. General

This was an audit of the NCSX Field Period Assembly station 1 work activities and was performed by interviewing personnel and reviewing records.

B. Objectives of the Audit The performance objectives are listed below along with the status, in italics, as determined by this audit.

1. The station 1 work for the Field Period Assembly was performed according to the requirements defined in the referenced documents. Deviations from the procedures were appropriately documented and processed.

   Findings #1 and 2 document issues with the control of work in station 1 compared to PPPL and project requirements.

2. The drawings used for this work are accurate and updated, when necessary.

   No problems were identified with the drawings used for this work with the exception of a sketch used for field work. See finding #1 for details.

3. Data documenting the actual construction of the Field Period Assembly, including metrology data and photos, are properly archived and protected.

   No problems were identified in this area. The data and photos appear to be archived on the NCSX web system.

4. Personnel performing this work are appropriately trained.

   Problems were identified in this area. See finding #3.

5. ES&H concerns are identified and properly resolved.

   No problems were identified in this area.

   In addition to these POCs, other significant issues not directly related to a POC were identified during the performance of this audit. They concern establishing procedures and training requirements for metrology (finding #4) and the timely dispositioning of NCRs (finding #5).

C. Findings, Observations, and Recommendations

Findings This audit resulted in five findings. The summaries are given below. Details may be found on the findings forms contained in Appendix A.

1. The control of work for Station 1 of the Field Period Assembly does not consistently adhere to PPPL and project requirements.

   PPPL and project requirements are established to reduce risks. In the case of this finding, (1) test parameters were changed in the run copy of the procedure that result from the design but were not properly reviewed as either a revision to the procedure or a NCSX Request for Deviation and (2) field work was done with sketches that were not approved drawings.

2. Issues were identified with the flow of and changes to requirements from top level documents to procurement documentation to field instructions.

   The risks associated with this finding are that the final system may not satisfy project specified requirements.

3. The requirements of the NCSX Project Training Matrices for station 1 work have not been consistently met.

   The risks associated with this finding are that individuals not trained for the work being performed may perform the work improperly or not safely.

4. The requirements for procedures and training for Metrology have not been implemented.

   The risks associated with this finding are that metrology may be inconsistently performed, perhaps invalidating the data.

5. NCRs for FPA Station 1 work are not being dispositioned in a timely manner.

   The risks associated with this finding are that issues identified by an NCR are not properly reviewed and dispositioned in a timely manner. Without

timely review, work may be proceeding that may be costly or impossible to undo.

Observations

1. The NCSX Construction Feasibility Review, Oct. 31 – Nov. 1, 2007, recommended, in item 2007 10-3, that the calculations performed by a specific Dimension Control Coordinator (by name) be carefully reviewed and cross-checked. This is a requirement of ENG-033, which provides a form for doing such in Attachment 1 and associated requirements in Attachment 2. The project is reminded that the review and cross checks to be performed are required to follow the requirements of ENG-033. Note that this observation is applicable to any individual who performs dimension analysis work, not just the individual specified by name. At the time of this audit, two other individuals have been assigned this work.
2. Problems were identified with the NCSX Document Control System including:
    a. The Field Period Assembly Training Matrix, draft revision 0, was dated January 12, 2006 and, as of 9/4/07, did not have any approvals indicated on the copy posted on the NCSX website. Sometime during this audit, a copy with electronic signatures dated on January 17, 2006 was posted.
    b. The NCSX training requirements were identified in the NCSX Project Training Matrices, Revision 2, dated March 9, 2006. This document included the training for each station of the Field Period Assembly, replicating the information contained in the document of 2.a above. Having the same information in two separate documents increases the risks that inconsistencies can arise.
    c. The Record of Revisions contained in the front of NCSX documents is the means to identify the changes in each revision. However, this does not consistently list all changes. As an example, NCSX CSPEC-185-01-01 records that revision 1 incorporated changes in Sections 4.2.2.1.2 and 4.2.5.1. However, changes were also made in sections 3.2.1.3.2, 3.2.1.4.5, 4.2.1.1, and 4.2.1.3. It is recommended that from revision to revision, changes bars be used to highlight all paragraphs with changes. This is a feature built into Word and, therefore, easy to implement.
    d. NCSX field procedures are controlled under the PPPL Operations Center system. The PPPL Operations Center system has a requirement to void all procedures after two years, unless a different time period is specified, if they are not reviewed and a new sign-off sheet generated. However, the NCSX procedure system is not linked to the two year renewal requirement. As an example, D-NCSX-OP-EO-41, the Modular Coil Mfg. Facility – Emergency Response Procedure, Rev. 0, issued January 11, 2005, is posted on the NCSX webpage, but is considered to be void by

the Operations Center since it has exceeded the two year effective period. This procedure is referenced in both training matrices described in 2.b. above.

3. It was difficult to review the current training status of individuals working on the FPA Station 1 activities, when such training was taken. This is due to multiple reasons including:

    a. The Record of Training forms may not be consistently transmitted to Human Resources. The requirement is that these forms be delivered in person when the event that triggered the form is completed, such as the performance of a pre-job brief. However, pre-job briefs may be performed throughout the execution of a job, particularly as new individuals become involved in the job. Human Resources should consider the storage of the Record of Training form for pre-job briefs with the field run copy until the work specified by the procedure is completed.

    b. The Office of Human Resources Record of Training is used to document a variety of training types including Read Only, Small Group Meeting, Instructional Discussion, Practical/Hands On, Video, Pre-Job Brief, and Other. The actual check entered by the individual completing the form has an impact on the way the information is stored.

        (1) If “Small Group Meeting” is checked, the record of training is maintained on paper only in binders, one per each month. The information is not recorded in any of the training databases.

        (2) If “Pre-job Brief” is checked, then, usually, the training is associated with a procedure. The information is entered in the 4D database and the paper stored in a file associated with the procedure.

        (3) If “Read Only” is checked, then, for the majority of instances, the training involved a procedure. This information is entered into the 4D database and the paper form stored in a file associated with the procedure.

        (4) Other types of training are “Instructional Discussion” for a trainer lead class entered in the PeopleSoft database for PPPL employees and 4D for contractors and students, “Practical/Hands on” for on-the-job training such as fork lifts or cranes entered in the PeopleSoft database for PPPL employees and 4D for contractors and students, “Video” for watching a video, and “Other”.

    In all cases, the individual completing the form is unlikely to be aware of the implications for each check box. It is recommended that instructions for the completion of this form be posted on the Human Resources website next to the form itself.

Note that this observation was also contained in audit #0609, NCSX Modular Coil Fabrication (#4).

4. During the execution of D-NCSX-FPA-001, field personnel identified a problem with the specified parameters of the electrical isolation tests for the heater strips and the thermocouples. The test parameter, 10 Mohms at 5 kV, would destroy the heater strips and thermocouples. After experimentation, the parameter was set to 10 Mohms at 600 Volts. See finding #1 for further details. This change will have an impact when the machine as a whole is hi-potted, years from now. When this action occurs, the leads to the heater strips and the thermocouples will have to be disconnected to prevent their being destroyed. While this is standard practice for many PPPL experiments, there does not appear to be a process for NCSX to record this so that it is not forgotten.
5. The Station Log Book required by D-NCSX-FPA-01 has not been maintained.

Recommendations

1. FPA-001 does not indicate the names of the key individuals involved in the procedure. It is a good practice for procedures is to contain a place within the procedure to list these individuals, such as the Field Supervisor or the Physics Representative.

D. History

While this is the first audit of work performed on Field Period Assembly, it is not the first audit of the NCSX project. Audit #0314, NCSX Management Systems, contained observations concerning responsibilities to assure that training is completed and that reviews of analyses are performed and documented. These were not findings since the NCSX project level PDR had not yet occurred. Audit #0406, NCSX Design Control, contained, as part of finding #1, that NCSX calculations and analyses had not been verified and validated. Audit #0609, NCSX Modular Coil Fabrication, identified problems in change control for documents containing the information necessary for the fabrication of the modular coils. One of the problems concerned the timely dispositioning of NCRs. Details are available in appendix B of this report

Appendix A – Audit Finding Reports

Appendix B – Findings and Concerns from Earlier Audits and Appraisals

This is the fifth audit of the NCSX Project. Related issues are documented in Appendix B and include training, review of analyses, and the timely dispositioning of NCRs.

Appendix A

Audit Finding Reports

AUDIT FINDING REPORT

AUDIT NO.: 0802 FINDING NO.: 1

AUDIT NAME: NCSX Field Period Assembly Station 1 Work Activities

AUDITED ORGANIZATION: NCSX

DATE OF AUDIT: December 3 – 7, 2007

REFERENCES:

DOE O 414.1C, Quality Assurance

P-071, Inspection and Acceptance Testing, Rev. 0

ENG-010, Rev. 3, Control of Drawings, Software, and Firmware

NCSX-PLAN-QAP-01, NCSX Quality Assurance Plan, March 22, 2006

NCSX-MIT/QA-185-01-00, NCSX Field Period Assembly (FPA) Manufacturing/Assembly, Inspection, Test and Quality Assurance Plan, May 1, 2006, since issued as revision 1, effective November 14, 2007 though with the last signature dated December 10, 2007

NCSX-CSPEC-31-01-01, September 15, 2006, NCSX Diagnostics Specification External Saddle Loops

D-NCSX-FPA-001, Rev. 1, Field Period Assembly Station One

PROGRAM REQUIREMENTS:

INSPECTIONS AND ACCEPTANCE TESTING –

DOE O 414.1C, Attachment 2, Contractor's Requirements Document, Criterion 8 – Inspection and Acceptance Testing, states that the Contractor shall "(1) Inspect and test specified items, services, and processes using established acceptance and performance criteria."

P-071 requires that for inspection and acceptance testing, the process for performing the inspection or testing, the acceptance criteria, and the requirements for documentation of the inspection or test results be specified in addition to other considerations..

The NCSX QA Plan references QA-004, QA Site Inspection Program, which, in turn, reiterates that P-071 is applicable to inspections performed by anyone at PPPL.

NCSX-CSPEC-31-01-01 states in ¶ 3.2 under "Cable, Loops, Leads and Other Geometry Requirements", first bullet, that "the sheath to conductor isolation is to be 300 volts or greater." The last bullet in this area states "After completion, the flux loops are to be checked for continuity of the center conductor and for electrical isolation between the conductor and sheath."

D-NCSX-FPA-001 states in ¶ 6.10.8 “After each twisted pair is installed, it must be tested for continuity and resistance of the conductor and integrity of the MGO insulation. See: (NCSX CSPEC-31-A-01-01).” [Note that the CSPEC does not specify the acceptance criteria for these tests.]

USE OF DRAWINGS –

DOE O 414.1C requires, for criterion 4 – Documents and Records, that the Contractor “(1) Prepare, review, approve, issue, use, and revise document to prescribe processes, specify requirements, or establish design.”

ENG-010 states in Section C that “This procedure requires that … b) only drawings stamped “Approved for fabrication” can be used for installation or fabrication…” It goes on to further clarify when approved drawings are required. Two of the applicable requirements are “for in-house fabrication except where exempted by the RLM with the concurrence of the FOM Division Head” and “as required by the associated Work Planning form.”

WP-1224, the Work Planning form requires “Fabrication/Assembly Drawings.”

The NCSX-MIT/QA Plans for FPA work, both rev. 0 used for the work included in this audit and rev. 1 just issued, reiterates the requirement of ENG-010 in section 2.3, which states that “Drawings for each field period assembly and station will be provided by the NCSX project. Only signed and “Approved for Fabrication” stamped drawings may be used. A complete list of field period drawings are listed in the field period assembly specification. Procedures will identify applicable drawings.”

FINDING: The control of work for Station 1 of the Field Period Assembly does not consistently adhere to PPPL and project requirements. This finding is supported by the following:

The test of continuity and resistance as specified in D-NCSX-FPA-001, Rev. 1, ¶ 6.10.8, does not indicate how the test is conducted or the parameters or acceptance criteria for the test. While it references NCSX CSPEC-31-A-01-01, this referenced document does not contain this information. The acceptance was determined by the physics representative based on the data obtained during these tests. In fact, as a result of this review of the data, some flux loops were replaced; however, there is no document that defines the criteria by which this individual determined the acceptability.

A sketch is used in the field to document which leads were brought through which holes in the port 12 cryostat interface flange. This is the TBD of ¶ 6.11.1 in Rev. 1. [Note that Rev. 2 was modified to have the cognizant engineer make this determination at the time of the work. However, the purpose of the sketch is to document the lead/hole configurations, which appears to be missing in rev. 2.] The sketch contains a drawing of the flange and associated holes and many tables completed in the field indicating the leads associated with each hole. The goal indicated by the physics representative is to make this sketch into an official drawing (one per VVSA) after the work is completed. However, an exemption from the

requirements of ENG-010 had not been approved by the RLM/FOM Division Head (same person in this case.) Since the purpose of the sketch and the tables is for documentation purposes, it could have met Laboratory requirements by including the sketch in the procedure itself, which could, upon completion, be used to generate an official drawing. Note that prior to the issuance of this report, preliminary but not approved drawings for this work were issued.

Priority: low

RECOMMENDED CORRECTIVE ACTION:
Note: Recommendations are suggestions only. Specific action taken to resolve the finding is at the discretion of the audited organization.

For each test, the best guidance on acceptance should be specified, even if it states the range of acceptance with final acceptance determined by the diagnostic engineer for the project. If the acceptance criteria cannot be absolutely specified, e.g. >x and <y, then the final justification for acceptance should be written in the run copy.

The sketch contains important data required for the final assembly of the three VVSAs. Due to its importance, the data must be protected. Including it in the run copy of the procedure for work on the VVSAs would have reduced the likelihood of its being lost and would have been an appropriate approach. However, given the current situation, issue the drawing per ENG-010 with a note indicating the purpose of the drawing, the information that will be filled in, and the fact that the drawing will be revised when it is completed. Once all work is done, officially update the drawing.

CORRECTIVE ACTION (to be completed by audited organization):

Proposed by: _R. Simmons / P. Heitzenroeder On date: March 25, 2008

For future stations, the Project will better utilize the Run Procedure to document "best guidance of acceptance" or justification for accepting the final "as built" configurations. Where necessary, a timelier update of the requirements documentation or corrections to the Run Procedure will be considered. If the determination is made that no changes to requirements is necessary, the Run Procedure will be annotated to document the final acceptance criteria.

The best guidance on acceptance will be specified. Once acceptance tests are performed, reasonably achievable criteria will be reviewed with Engineering and the run copy and other supporting documentation such as specifications will be updated.

The sketch that was used in the field to document which leads were brought through which holes in the Port 12 cryostat interface flange were converted into official drawings (one per VVSA) so they can be included in the run copy of the procedure for work on the VVSAs.

CORRECTIVE ACTION TO RESOLVE THE FINDING:

Action: John Edwards is to attach the converted drawings (sent to him by Bob Simmons) to the run copy procedure for the VVSA.

Due Date: April 15, 2008.

CORRECTIVE ACTION TO PREVENT A RECURRENCE OF THE FINDING:

Will review the audit findings with the NCSX group by the end of April (i.e., after the Lehman review).

Completion date: 4/30/08 Assigned to: P. Heitzenroeder/ R. Simmons

Audit Finding Prioritization Form

Audit #0802 Finding # 1

Consideration	Yes (3 pts each)	Yes (2 pt each)	Yes (1 pt each)
1. Reportable under the Federal Noncompliance Tracking System	☐		
2. Noncompliance to a federal or state regulatory or legal requirement	☐		
3. Has credible potential for injury to workers or the public.	☐		
4. Consistent with current global problem areas identified in DOE or other government reports.[1]		☐	
5. Noncompliance to a contractual requirement, e.g., DOE Order or Notice		☒	
6. Programmatic concern with the potential to impact the Laboratory S&H program (worker and/or public)		☐	
7. Repeat of findings or significant observations found in earlier audits and, if a finding, declared to be corrected.		☐	
8. Potential to significantly impact the schedule, cost, operation, or functionality of a project or collaboration		☐	
9. Potential to impact the Laboratory security program			☐
10. Potential to impact the schedule, cost, operation, or functionality of a project or collaboration			☒
11. Potential to impact the Laboratory environmental program			☐
12. Impacts multiple groups, e.g., Departments, Projects, Division			☐
13. Violation to PPPL plans, policies, or procedures			☒

SCORE: 4 (<= 4 – Low, <=8 – Medium, >8 – High)

NOTES:

Item #	Justification
5	Violation of DOE O 414.1C
10	While these changes probably will not have an impact, not adequately defining acceptance tests and working using sketches in other instances might have an impact
13	Violates P-071 and ENG-010 as well NSCX Plans

[1] From the U. S. Department of Energy, Office of Inspector General, Office of Audit Services, Special Report, Management Challenges at the Department of Energy, DOE/IG-0712, December 2005. The list of management challenges identified by the IG includes environmental cleanup, national security, stockpile stewardship, contract administration, project management, information technology management, and financial management and reporting. The list of management challenges identified by DOE include environmental cleanup, nuclear waste disposal, security, stockpile stewardship, oversight of contractors, project management, information technology management, human capital management, and unclassified cyber security. [Note that Safety and Health was excluded from this list since it is already covered by #6.]

AUDIT FINDING REPORT

AUDIT NO.: 0802 FINDING NO.: 2

AUDIT NAME: NCSX Field Period Assembly Station 1 Work Activities

AUDITED ORGANIZATION: NCSX

DATE OF AUDIT: December 3 – 7, 2007

REFERENCES:

DOE O 414.1C, Quality Assurance

NCSX-CSPEC-185-01-00, Product Specification Station 1 Field Period Assemblies (S1-FPA)

D-NCSX-FPA-001, Rev. 1, Field Period Assembly Station One, effective 12/4/06

ENG-030, PPPL Technical Procedures for Experimental Facilities

PROGRAM REQUIREMENTS:

DOE O 414.1C, Quality, requires, for criterion 4, Documents and Records, that the contractor "(1) Prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design." Furthermore, criterion 5, Work Processes, requires that the contractor "(1) Perform work consistent with technical standards, administrative controls, and hazard controls adopted to meet regulatory or contract requirements using approved instructions, procedures, etc." Finally, criterion 6, Design, requires that the contractor "(2) Incorporate applicable requirements and design bases in design work and design changes."

NCSX-CSPEC-185-01-00, ¶ 4.2.2.1.2 states that "The resistance between the vacuum vessel and each of the heater elements shall be checked to assure that it is greater than 10 Mohms at 5kV."

NCSX-CSPEC-185-01-00, ¶ 4.2.5.1 states that "The resistance between the vacuum vessel and each of the thermocouple elements shall be checked to assure that it is greater than 10 Mohms at 5kV."

D-NCSX-FPA-001 states in ¶ 6.8.7.1 to "Perform electrical continuity shock and an electrical isolation test (10 Mohms at 5kV) on the heater strips. See (NCSX-CSPEC-01-00)" It also states in ¶ 6.12.2 to "Perform electrical isolation check (10 Mohms @ 5kV) and an operation check on the thermocouples. See (NCSX CSPEC-185-01-00)"

D-NCSX-FPA-001 states in ¶ 6 states that "This assembly procedure is to be used as guide to complete the station no. 1 activities. Deviation from this procedure for processes that DO NOT affect the design of the assembly can be made during the assembly process with the concurrence of the VVSA Field Supervisor. All deviations shall be documented in the procedure and initialed by the VVSA Field Supervisor

prior to implementing the deviations. Deviations that may affect the design of the assembly requires a Request for Deviation "RFD" approval. The RFD must be approved prior to proceeding. Procedure changes need to be incorporated into the document via "Minor Procedure Changes" or "Revisions".

ENG-030 defines the process for Minor Procedure Changes (MPC). The definition of an MPC is "An interim change to a procedure to allow deviation from the procedure or make minor corrections that do not alter the intent or scope of the procedure as determined appropriate by the RLM."

FINDING: Issues were identified with the flow of and changes to requirements from top level documents to procurement documentation to field instructions.

Incomplete Inclusion of requirements in procurement documents:

Two requisitions for the heater elements (tape) (#403838 – purchase order #PE006564-W; #405732 – purchase order #PE007788-W) were reviewed by the audit team. One did not contain any resistance requirements, while one specified >10.0 Mohms at a minimum of 600V.

Three procurements for thermocouples were reviewed by the audit team. These were:

- Requisition 404445, created on 9/1/06, referencing NCSX-PRL-12-003. The purchase order specified part numbers, e.g. Part #EI1106107/XCIB-E-4-2-3SHX-m XCIB T/C Assy/ungrounded. NCSX-PRL-12-003 did not specify the requirement of greater than 10 Mohms at 5kV. The only requirement relevant to the issue discussed by this finding is "TC shall have an isolated, electrically floating junction."
- Requisition 405376, created on 7/17/07, referenced the same PRL as requisition 404445. This purchase order did not reference part numbers but component types with a direct reference to NCSX-PRL-12-003, e.g. "Type E, Electrically Isolated Thermocouple with 190 inch leads per NCSX-PRL-12-003".
- Requisition 405733, created on 10/15/07, reference the items in the same way as 405376., except that the version of the PRL used in the requisition was NCSX-PRL-12-003-01. This version further clarified the required to be "TC shall have an isolated, electrically floating junction *(>1.5 MOhms at a minimum of 500V)"* (emphasis added by the audit team).

Note that both the PRL and the CSPEC were developed by the same individual. The audit team was told that earlier versions of the thermocouples met the requirement of resistance greater than 10 Mohms at 5kV, but that the manufacturer, however, changed the design of these thermocouples in such a way that this requirement was not met, though the same part number was retained.

Improper processing of changes identified during field work:

During the execution of the work performed under D-NCSX-FPA-001, the Field Supervisor recognized that the voltage levels specified for the two tests identified in ¶ 6.8.7.1 (heater tape) and 6.12.2 (thermocouples) were too high and would

damage the hardware. After discussing these issues with the Head, NCSX Construction, a decision was made by project management to proceed with the installation of these elements while further tests were performed to determine the appropriate resistance levels. These were later determined to be 10Mohms at 600V for the heater tape and 10Mohms at 500V for the thermocouples. These values were inked in by the Field Supervisor and initialed in ¶ 6.8.7.1 and 6.12.2. Both entries are undated. The signature of the Field Supervisor indicating that the work covered by ¶ 6.8.7.1 was completed is dated 2/9/07. As of 12/4/07, the Field Supervisor had not signed the run copy of the procedure indicating that the work covered by ¶ 6.12.2 had been completed.

However, neither the Field Supervisor nor Quality Control recognized that these changes were design changes and that the Field Supervisor is not authorized to make these changes without written authorization, typically a minor procedure change or NCR, though NCSX procedures include the use of an RFD. Note that the issue associated with ¶ 6.8.7.1 was later documented in NCR #3715, generated on 7/09/07, with the project agreeing to formally change the test requirement to 600 volts with readings of greater than 10 Mega Ohms as the acceptance criteria. The issue associated with ¶ 6.12.2 was later documented in NCR #3719, generated on 7/26/07, with the disposition to accept at 1.5 Mohms at 500 volts DC and to not revise the CSPEC "to preclude setting precedence for potentially reduced requirements for future experimental devices." However, these NCRs were generated significantly later than the issue was first identified.

Priority: low

RECOMMENDED CORRECTIVE ACTION:
Note: Recommendations are suggestions only. Specific action taken to resolve the finding is at the discretion of the audited organization.

Project personnel should be reminded of their responsibilities for assuring that requirements properly flow down to lower level documents or, if the requirements are determined to not be appropriate, resolved via the RFD mechanism or revisions to the documentation that defines the requirements.

When Field Supervisors are provided the authority to make field changes except those that impact the design, a discussion should take place on the decision for determining when a field change might impact a design. In this case, since the field change negated a requirement in a higher level document (the CSPEC), it did impact the design.

Quality Control personnel should be reminded of the need for further controls when a field change impacts the design.

The audit team has been told by NCSX personnel that neither deviation from the CSPEC requirements has a significant technical impact as long as these components are safed prior to hipots. However, the procedure for performing hipots will not be generated for a few years; it is not clear to the audit team that there is a mechanism to

assure that these safing requirements will be identified for inclusion in the hipot procedure.

CORRECTIVE ACTION (to be completed by audited organization):

Proposed by: _R. Simmons / P. Heitzenroeder On date: March 25, 2008

CORRECTIVE ACTION TO RESOLVE THE FINDING:

Additional megger testing of the thermocouples performed after the Audit indicates that the thermocouple test should specify >0.2 Mohms at 500 V. NCSX-PRL-12-003 and NCSX-CSPEC-185-01-00, para. 4.2.2.1.2 will be revised to be consistent with the new thermocouple test parameters.

Action: R. Simmons Due date: April 30, 2008

D-NCSX-FPA-001 has to be marked up with the corrected test parameters for the heater tapes (>10 Mohms at 600 V) and the thermocouples (0.2 Mohms at 500 V).

Action: John Edwards, Due date: April 30, 2008

Copies of NCSX-PRL-12-003 and NCSX-CSPEC-185-01-00 will be sent to C. Gentile to make him aware of the revised test parameters for the heater tapes and thermocouples as he prepares the Integrated Systems Test Procedures for NCSX.

Action: R. Simmons Due date: April 30, 2008

CORRECTIVE ACTION TO PREVENT A RECURRENCE OF THE FINDING:

In addition,, this finding will be reviewed with the NCSX group by the end of April (i.e., after the Lehman review).

Completion date: 4/30/08 Assigned to: P. Heitzenroeder/ R. Simmons

Audit Finding Prioritization Form

Audit # 0802 Finding # 2

Consideration	Yes (3 pts each)	Yes (2 pt each)	Yes (1 pt each)
1. Reportable under the Federal Noncompliance Tracking System	☐		
2. Noncompliance to a federal or state regulatory or legal requirement	☐		
3. Has credible potential for injury to workers or the public.	☐		
4. Consistent with current global problem areas identified in DOE or other government reports.[1]		☐	
5. Noncompliance to a contractual requirement, e.g., DOE Order or Notice		☐	
6. Programmatic concern with the potential to impact the Laboratory S&H program (worker and/or public)		☐	
7. Repeat of findings or significant observations found in earlier audits and, if a finding, declared to be corrected.		☐	
8. Potential to significantly impact the schedule, cost, operation, or functionality of a project or collaboration		☐	
9. Potential to impact the Laboratory security program			☐
10. Potential to impact the schedule, cost, operation, or functionality of a project or collaboration			☒
11. Potential to impact the Laboratory environmental program			☐
12. Impacts multiple groups, e.g., Departments, Projects, Division			☐
13. Violation to PPPL plans, policies, or procedures			☐

SCORE: 1 (<= 4 – Low, <=8 – Medium, >8 – High)

NOTES:

Item #	Justification
10	Components were procured and installed that did not meet the CSPEC requirements.

[1] From the U. S. Department of Energy, Office of Inspector General, Office of Audit Services, Special Report, Management Challenges at the Department of Energy, DOE/IG-0712, December 2005. The list of management challenges identified by the IG includes environmental cleanup, national security, stockpile stewardship, contract administration, project management, information technology management, and financial management and reporting. The list of management challenges identified by DOE include environmental cleanup, nuclear waste disposal, security, stockpile stewardship, oversight of contractors, project management, information technology management, human capital management, and unclassified cyber security. [Note that Safety and Health was excluded from this list since it is already covered by #6.]

AUDIT FINDING REPORT

AUDIT NO.: 0802 FINDING NO.: 3

AUDIT NAME: NCSX Field Period Assembly Station 1 Work Activities

AUDITED ORGANIZATION: NCSX

DATE OF AUDIT: December 3 – 7, 2007

REFERENCES:

DOE O 414.1C, Quality Assurance, June 17, 2005
P-008, Staff Training and Development, Rev. 4, September 8, 2005
TR-001, Laboratory Training Program, Rev. 3, January 5, 2006
NCSX Project Training Matrices, Rev. 2, March 9, 2006

PROGRAM REQUIREMENTS:

DOE O 414.1C, Attachment 2, Contractor Requirements Document, Criteria 2 – Personnel training and Qualification, requires in 1) that the contractor "Train and qualify personnel to be capable of performing assigned work."

P-008 states "Line management has the overall responsibility to ensure that all their personnel are trained, qualified or certified to perform their specific jobs. Line management is also responsible for ensuring that employees have completed required training in ES&H prior to performing affected work duties. In a case where a staff member from a Department is assigned ("matrixed") to a Project, the Project's management is responsible for including that individual in the Project organization and ensuring that any additional Project-specific training requirements are established and fulfilled."

TR-001 states in A. Development of Training, Certification, and Qualification Records, that the Department, Project, or Division Head "Establishes, with Human Resources, training required for a job function. Training requirements may be documented on a "training matrix." The training matrix cross-references training to the job function. "

TR further states in G. Training, Certification, and Qualification Records that:
The Department, Project, Division Head "2. Provides appropriate records to Human Resources for processing and maintenance."
The Head, Human Resources (or designee) "3. Maintains training records, qualification records, certification records, and other training documents."

The NCSX Project Training Matrices document defines in Table 5 the Field Period Assembly Training Requirements. For station 1, this includes General Employee Training, Radiation Safety, Hazard Communications, Hazard Awareness (JHA),

Manufacturing Facility Operations Plan, Lockout/Tagout, Basic Electrical, Ladder Safety, Welding (for those who do welding), Mechanical Arm training – Romer (operators only), Fire Extinguisher, and Emergency Response Procedure. Note that these requirements are, with one minor exception, also defined in the Field Period Assembly Training Matrix, dated January 17, 2006. The exception is that "Welding" is replaced with "Stud Welding." This matrix should have been voided with the issuance of the NCSX Project Training Matrices document.

FINDING: The requirements of the NCSX Project Training Matrices for station 1 work have not been consistently met.

The names of the individuals working on Station 1 were provided by the Station 1 Field Supervisor. With the addition of the names of the Quality Control inspectors, the team identified a total of thirteen names. The following discrepancies were identified:

- Of the 13 individuals, evidence of training on the Manufacturing Facility Operations Plan was provided for 6 individuals.
- Of the 13 individuals, evidence of training on the Emergency Response Procedure was provided for 2 individuals.
- Of the 13 individuals, evidence of training on Ladder Safety was provided to 11 individuals. Note that one of these individuals competed ladder safety on December 14, 2007, after being informed that he had not taken this training.

Priority: low

RECOMMENDED CORRECTIVE ACTION:
Note: Recommendations are suggestions only. Specific action taken to resolve the finding is at the discretion of the audited organization.

The training matrix required the same set of training for all who worked at station 1, independent of the type of work that they did. However, the training requirements for the field supervisor might differ from those performing welding. The project should review the specified training requirements and include further clarification, where appropriate.

Once training requirements are formally identified, it is up to line management to assure that individuals have completed the specified training prior to doing the work. The last individual in this line of command is the Field Supervisor. It is recommended that Field Supervisors review the training that individuals have completed against the requirements specified in training matrices or other work documents prior to their beginning work and assure that any incomplete training is taken.

CORRECTIVE ACTION (to be completed by audited organization):

Proposed by: _R. Simmons / P. Heitzenroeder On date: March 25, 2008

CORRECTIVE ACTION TO RESOLVE THE FINDING:

Table 5 of the NCSX Project Training Matrix will be removed and replace by a note that training requirements for Field Period Assembly are specified in the assembly station training procedures. The assembly station training procedures will be revised to add Welders and Metrologists as categories. The selections (X indications) will be removed from this table, and a note will be added saying that the training requirements are specified in the D-Site training matrices.

Action: R. Simmons for Project Training Matrix Due date: April 30, 2008
M. Viola for Field Period Assembly Training Matrix Due date: April 30, 2008

The D-Site training matrices will be redone to properly reflect the training required station by station and by specialist groups which serve in multiple stations (i.e., welders, metrologists, QC reps, Riggers & Crane Operators, and Field Supervisors).

Action: J. Edwards / M. Viola Due date: April 15, 2008

The Field Supervisor will be reminded of his responsibility to assure that individuals are trained per the matrix prior to beginning work on the project.

Completion date: By 4/06/08 Assigned to: P. Heitzenroeder/ R. Simmons

CORRECTIVE ACTION TO PREVENT A RECURRENCE OF THE FINDING:

In addition, this finding will be reviewed with the NCSX group by the end of April (i.e., after the Lehman review).

Completion date: 4/30/08 Assigned to: P. Heitzenroeder/ R. Simmons

Audit Finding Prioritization Form

Audit # 0802 Finding # 3

Consideration	Yes (3 pts each)	Yes (2 pt each)	Yes (1 pt each)
1. Reportable under the Federal Noncompliance Tracking System	☐		
2. Noncompliance to a federal or state regulatory or legal requirement	☐		
3. Has credible potential for injury to workers or the public.	☐		
4. Consistent with current global problem areas identified in DOE or other government reports.[1]		☐	
5. Noncompliance to a contractual requirement, e.g., DOE Order or Notice		☒	
6. Programmatic concern with the potential to impact the Laboratory S&H program (worker and/or public)		☐	
7. Repeat of findings or significant observations found in earlier audits and, if a finding, declared to be corrected.		☐	
8. Potential to significantly impact the schedule, cost, operation, or functionality of a project or collaboration		☐	
9. Potential to impact the Laboratory security program			☐
10. Potential to impact the schedule, cost, operation, or functionality of a project or collaboration			☐
11. Potential to impact the Laboratory environmental program			☐
12. Impacts multiple groups, e.g., Departments, Projects, Division			☐
13. Violation to PPPL plans, policies, or procedures			☒

SCORE: 3 (<= 4 – Low, <=8 – Medium, >8 – High)

NOTES:

Item #	Justification

[1] From the U. S. Department of Energy, Office of Inspector General, Office of Audit Services, Special Report, Management Challenges at the Department of Energy, DOE/IG-0712, December 2005. The list of management challenges identified by the IG includes environmental cleanup, national security, stockpile stewardship, contract administration, project management, information technology management, and financial management and reporting. The list of management challenges identified by DOE include environmental cleanup, nuclear waste disposal, security, stockpile stewardship, oversight of contractors, project management, information technology management, human capital management, and unclassified cyber security. [Note that Safety and Health was excluded from this list since it is already covered by #6.]

5	Violation of DOE O 414.1C
13	Violation of P-008, TR-001, and the NCSX Project Training Matrices

Note that training issues were identified in audit #0314, NCSX Management Systems, though these concerned project requirements and systems, not specific work activities. Therefore, item #7 in the scoring matrix was not checked.

AUDIT FINDING REPORT

AUDIT NO.: 0802 FINDING NO.: 4

AUDIT NAME: NCSX Field Period Assembly Station 1 Work Activities

AUDITED ORGANIZATION: NCSX

DATE OF AUDIT: December 3 – 7, 2007

REFERENCES:

DOE O 414.1C, Quality Assurance, June 17, 2005
ENG-030, Rev. 1, PPPL Technical Procedures for Experimental Facilities, Marcy 25, 2002
P-008, Staff Training and Development

PROGRAM REQUIREMENTS:

DOE O 414.1C, Attachment 2, Contractor Requirements Document, Criteria 2 – Personnel training and Qualification, requires in (1) that the contractor "Train and qualify personnel to be capable of performing assigned work."

DOE O 414.1C, Attachment 2, Contractor Requirements Document, Criteria 4 – Documents and Records, requires in (1) that the contractor "Prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design."

DOE O 414.1C, Attachment 2, Contractor Requirements Document, Criterion 5 – Work Processses, requires in (1) that the contractor "Perform work consistent with technical standards, administrative controls, and hazard controls adopted to meet regulatory or contract requirements using approved instructions, procedures, etc."

ENG-030, Rev. 1, PPPL Technical Procedures for Experimental Facilities, specifies the requirements for the creation, revision, approval, and implementation of procedures.

P-008 covers training for job specific tasks and specifically states that "Line management has the overall responsibility to ensure that all their personnel are trained, qualified or certified to perform their specific jobs."

FINDING: The requirements for procedures and training for Metrology, as indicated in the above documents, have not been implemented.

- There are no procedures for the metrology performed as part of the station 1 work.

- There are no formally documented training requirements. Of the five individuals who performed metrology work in station 2, training records for the Romer arm could only be found for one individual. No training records were found for the Leica arm. [Note that an email was sent by the Cognizant Engineer to Human Resources on 12/19/07 documenting the current status on the Romer and Leica training. However, the definition of what constitutes trained personnel for performing this work and documenting actual training with information to Human Resources is still an issue.]

Priority: medium

RECOMMENDED CORRECTIVE ACTION:
Note: Recommendations are suggestions only. Specific action taken to resolve the finding is at the discretion of the audited organization.

A specific procedure on metrology for the Field Period Assembly was sent out for review on 1/8/08.

The training requirements for the use of the metrology equipment should be explicitly defined and implemented.

After each metrology procedure is developed, train the operators on the specifics of the procedure.

Training sheets in project files are required to document completed training. It is recommended that the project maintain copies of these training sheets but send the original to Human Resources.

As the lab becomes more knowledgeable about metrology, the Laboratory should consider generating lab-wide ("ENG") procedures for metrology..

CORRECTIVE ACTION (to be completed by audited organization):

Proposed by: _R. Simmons / P. Heitzenroeder On date: March 25, 2008

CORRECTIVE ACTION TO RESOLVE THE FINDING:

Since this audit, the Station 2 Dimensional Control Plan (NCSX-Plan-FPA2DC) has been issued and approved. Additionally, a procedure specifically on Metrology for Field Period Assembly (D-NCSX-FPA-010) has been issued and approved that provides specific guidance on metrology – this now replaces the metrology section on the Field Period Assembly training matrix.

A recent Project reorganization has now identified two specific metrology leads – one for mechanical/laser metrology and one for photogrammetry. These two leads will serve as the primary point of contact for questions on performing metrology and for training personnel.

Steve Raftopoulos will be actioned to clearly specify criteria for qualification that a person has been properly trained. He should take credit for training provided by the equipment manufacturers, as appropriate.

Due Date: April 15. Assigned to: Steve Raftopoulos (as Metrology Manager) and his two leads: Craig Prinski(Romer/Faro arms and Faro/Leica laser trackers) and Tiana Dodson (Photogrammetry).

CORRECTIVE ACTION TO PREVENT A RECURRENCE OF THE FINDING:

Will review the audit findings with the NCSX group over the next few NCSX weekly meetings.

Completion date: By 4/30/08 Assigned to: P. Heitzenroeder/ R. Simmons

Audit Finding Prioritization Form

Audit # 0802 Finding # 4

Consideration	Yes (3 pts each)	Yes (2 pt each)	Yes (1 pt each)
1. Reportable under the Federal Noncompliance Tracking System	☐		
2. Noncompliance to a federal or state regulatory or legal requirement	☐		
3. Has credible potential for injury to workers or the public.	☐		
4. Consistent with current global problem areas identified in DOE or other government reports.[1]		☐	
5. Noncompliance to a contractual requirement, e.g., DOE Order or Notice		☒	
6. Programmatic concern with the potential to impact the Laboratory S&H program (worker and/or public)		☐	
7. Repeat of findings or significant observations found in earlier audits and, if a finding, declared to be corrected.		☐	
8. Potential to significantly impact the schedule, cost, operation, or functionality of a project or collaboration		☒	
9. Potential to impact the Laboratory security program			☐
10. Potential to impact the schedule, cost, operation, or functionality of a project or collaboration			☐
11. Potential to impact the Laboratory environmental program			☐
12. Impacts multiple groups, e.g., Departments, Projects, Division			☐
13. Violation to PPPL plans, policies, or procedures			☒

SCORE: 5 (<= 4 – Low, <=8 – Medium, >8 – High)

NOTES:

Item #	Justification
5	Violation to DOE O 414.1C
8	The metrology data from the modular coils and FPA Station 1 work is critical to the FPA Station 2 and later work.
13	Violation to P-052

[1] From the U. S. Department of Energy, Office of Inspector General, Office of Audit Services, Special Report, Management Challenges at the Department of Energy, DOE/IG-0712, December 2005. The list of management challenges identified by the IG includes environmental cleanup, national security, stockpile stewardship, contract administration, project management, information technology management, and financial management and reporting. The list of management challenges identified by DOE include environmental cleanup, nuclear waste disposal, security, stockpile stewardship, oversight of contractors, project management, information technology management, human capital management, and unclassified cyber security. [Note that Safety and Health was excluded from this list since it is already covered by #6.]

AUDIT FINDING REPORT

AUDIT NO.: 0802 FINDING NO.: 5

AUDIT NAME: NCSX Field Period Assembly Station 1 Work Activities

AUDITED ORGANIZATION: NCSX

DATE OF AUDIT: December 3 – 7, 2007

REFERENCES:

DOE O 414.1C, Quality Assurance, June 17, 2005
QA-005, Control of Nonconformances, Rev. 3

PROGRAM REQUIREMENTS:

DOE O 414.1C, Attachment 2, Contractor Requirements Document, Criteria 3 – Quality Improvement, requires in

- (1) that the contractor "Establish and implement processes to detect and prevent quality problems."
- (2) that the contractor "Identify, control and correct items, services, and processes that do not meet established requirements."
- And (3) that the contract "Identify the causes of problems, and include prevention of recurrence as a part of corrective action planning."

The Quality Assurance Nonconformance Reporting (NCR) System, documented in QA-005, is one of the processes that implement the requirements of DOE O 414.1C. Step 5 of this procedure requires the Cognizant Individual (i.e., the individual responsible for the work for which the NCR was generated) to "If an NCR related to internal work, provides a disposition within 10 working days. If a disposition cannot be provided within 10 working days, notifies QA and provides an estimated time to complete the disposition."

FINDING: NCRs for FPA Station 1 work are not being dispositioned in a timely manner.

As of 12/18/07, there were 12 NCRs generated for this work. Of these 12 NCRs, 11 have been dispositioned. The average time to disposition these 11 NCRs was 38 working days. The NCR that has not been dispositioned was generated on October 15, 2007.

The table below contains the data upon which this is based:

NCR #	Open Date	Eng Dept Hd Concur/dispositio n date	Work days to dispositon
3688	12/12/2006	1/9/2007	18
3689	12/12/2006	1/9/2007	18
3691	1/2/2007	1/9/2007	6
3703	3/14/2007	5/29/2007	54
3704	3/15/2007	5/29/2007	53
3710	4/13/2007	4/20/2007	6
3714	6/19/2007	8/22/2007	46
3715	7/9/2007	7/23/2007	11
3719	7/26/2007	11/16/2007	82
3729	10/15/2007		
3733	10/26/2007	11/7/2007	9
		average =	30

Priority: medium

RECOMMENDED CORRECTIVE ACTION:
Note: Recommendations are suggestions only. Specific action taken to resolve the finding is at the discretion of the audited organization.

Note that this was also identified as a problem in finding #1 of audit 0609. The response was that the project would be more diligent in the dispositioning of NCRs. However, diligence alone has not worked.

Establish systems within the NCSX process to assure that NCRs are dispositioned within the 10 working days time frame. If, for some reason, an NCR cannot be dispositioned within this time frame, inform QA of this condition with an explanation and a due date for the disposition. QA will be glad to work with the project to support this effort.

CORRECTIVE ACTION (to be completed by audited organization):

Proposed by: R. Simmons / P. Heitzenroeder On date: March 18, 2008

CORRECTIVE ACTION TO RESOLVE THE FINDING:

The Project has taken a much more proactive role in resolving NCRs. The Systems Engineering Support Manager is working with QA to ensure that he is notified of open NCRs and will work with the RLMs to follow-up with the responsible parties.

Completion date: Ongoing Assigned to: QA, Bob Simmons, and RLMs.

Note from QA: This will be entered as a finding in the audit database but will be closed immediately since this topic will be covered in the subsequent NCSX audit, #0806, currently scheduled for July 2008.

CORRECTIVE ACTION TO PREVENT A RECURRENCE OF THE FINDING:

Marianne Tyrrell was assigned Project responsibility for follow-up tracking and reminders on open NCRs. The Systems Engineering Support Manager (Simmons) will assist her in resolving technical questions.

Assigned to: M. Tyrrell by P. Heitzenroeder on 3/25/08

Audit Finding Prioritization Form

Audit # 0802 Finding # 5

Consideration	Yes (3 pts each)	Yes (2 pt each)	Yes (1 pt each)
1. Reportable under the Federal Noncompliance Tracking System	☐		
2. Noncompliance to a federal or state regulatory or legal requirement	☐		
3. Has credible potential for injury to workers or the public.	☐		
4. Consistent with current global problem areas identified in DOE or other government reports.[1]		☐	
5. Noncompliance to a contractual requirement, e.g., DOE Order or Notice		☒	
6. Programmatic concern with the potential to impact the Laboratory S&H program (worker and/or public)		☐	
7. Repeat of findings or significant observations found in earlier audits and, if a finding, declared to be corrected.		☒	
8. Potential to significantly impact the schedule, cost, operation, or functionality of a project or collaboration		☐	
9. Potential to impact the Laboratory security program			☐
10. Potential to impact the schedule, cost, operation, or functionality of a project or collaboration			☒
11. Potential to impact the Laboratory environmental program			☐
12. Impacts multiple groups, e.g., Departments, Projects, Division			☐
13. Violation to PPPL plans, policies, or procedures			☒

SCORE: 5 (<= 4 – Low, <=8 – Medium, >8 – High)

NOTES:

Item #	Justification
5	Violation of DOE O 414.1C
7	Problems with the timely dispositioning of NCRs were identified in audit #0609, NCSX Modular Coil Fabricatio
10	Problems identified by NCRs not being resolved in a timely fashion may be difficult or costly to correct as additional work on the hardware proceeds
13	Violation of QA-005

[1] From the U. S. Department of Energy, Office of Inspector General, Office of Audit Services, Special Report, Management Challenges at the Department of Energy, DOE/IG-0712, December 2005. The list of management challenges identified by the IG includes environmental cleanup, national security, stockpile stewardship, contract administration, project management, information technology management, and financial management and reporting. The list of management challenges identified by DOE include environmental cleanup, nuclear waste disposal, security, stockpile stewardship, oversight of contractors, project management, information technology management, human capital management, and unclassified cyber security. [Note that Safety and Health was excluded from this list since it is already covered by #6.]

Appendix B
Findings and Concerns from Earlier Audits and Appraisals

This is the fifth audit on the NCSX Project. Relevant information from earlier audits is reproduced below:

Audit #0314, NCSX Management Systems, conducted in April and May of 2003

This audit contained the following relevant observations:

From audit #0314	From audit #0802
Obs.1. The NCSX Training Matrix had not been developed nor had training on the project requirements and systems been given. The impact of this observation was that individuals were not aware of project requirements or systems. Note that. As a result of this observation, the NCSX Training Matrix was developed.	While an applicable training matrix existed for the work to be done, the Field Supervisor was not aware of his responsibility to assure that all who participated in this work were properly trained. Also, training for those who performed the special metrology processes was not properly documented. (see finding #3 and observation #3)
Obs. 3. The audit team was not provided with satisfactory answers that a method had been identified for the effective review of analyses. (see observation #1 of audit #0802) As a result of this observation, a commitment was made by the project to independently check all design-basis engineering analyses.	The project did not recognize that independent reviews of analysis of metrology data are required. (See observation #1). Since this had been identified by the Constructability Review Team, it was not a finding in audit #0802.

Audit #0406, NCSX Design Control, conducted in August and September 2004

This audit contained the following relevant finding:

From audit #0406	From audit #0802
Fdg 1. This finding, in part, documented that NCSX Calculations and Analyses were, in some cases, on the NCSX web in draft format. The response is that the Project will, with due diligence, assure that calculations and analyses are independently checked. In other cases, calculations were performed and checked but not posted on the NCSX web site.	The project did not recognize that independent reviews of analysis of metrology data are required. (See observation #1). Since this had been identified by the Constructability Review Team, it was not a finding in audit #0802.

Audit #0601, NCSX Procurements, conducted in December 2005

There were no findings or observations from audit #0601 applicable to audit #0802.

Audit #0609, NCSX Modular Coil Fabrication, conducted in August 2006

This audit contained the following relevant observations or findings:

From audit #0609	From audit #0802
Fdg 1: Item #4: "Another source of changes to the actual configuration of modular coils is QC Nonconformance Reports (NCRs). Some of the Modular Coil NCRs concern permeability issues and require dispositioning. The disposition is being held up until material testing can be performed. Two of the NCRs, #3649 and 3659, are for items that have since been covered up and could not be replaced should permeability of these items not be acceptable. Other NCRs have a disposition of "Use-as-is", which requires additional field work that is not consistently incorporated into the field documentation." A commitment was made by the project to disposition all NCRs within the 10 day limit of QA-005.	See finding #5 of audit 0802.

Appendix C – Referenced Documents

1. The NCSX Constructability Review of October 31 – November 1, 2007 final report.
2. The NCSX Project Training Matrices, Rev. 2, March 9, 2006
3. The NCSX Field Period Assembly Training Matrix, Rev. 0, January 12, 2006
4. NCSX CSPEC-185-01-01, Field Period Assembly Operations, Station 1
5. D-NCSX-OP-EO-41, The Modular Coil Manufacturing Facility Emergency Response Procedure, Rev. 0, issued January 11, 2005
6. D-NCSX-FPA-001, Field Period Assembly Station One, Rev. 1, 12/4/06
7. NCSX-CSPEC-31-01-01, NCSX Diagnostics Specification External Saddle Loops, September 15, 2006
8. P-071, Inspection and Acceptance Testing, Rev. 0
9. ENG-010, Control of Drawings, Software, and Firmware, Rev. 3
10. NCSX-PLAN-QAP-01, NCSX Quality Assurance Plan, March 22, 2006
11. NCSX-MIT/QA-185-01-00, NCSX Field Period Assembly (FPA) Manufacturing/Assembly, Inspection, Test and Quality Assurance Plan, May 1, 2006 and Rev. 1, November 14, 2007
12. Work Planning form #1224
13. DOE O 414.1C, Quality Assurance
14. P-008, Staff Training and Development, Rev. 4, September 8, 2005
15. TR-001, Laboratory Training Program, Rev. 3, January 5, 2006
16. P-052, Special Processes, Rev. 0, October 29, 1994
17. QA-005, Control of Nonconformances, Rev. 3