NSTX-U

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NSTX U CD-4
Presentation to the ES&H Executive Board

C. A. Gentile
Presented on behalf of the NSTX-U ACC Committee

August 3, 2015

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Charge to the NSTX-U ACC from Chair of the PPPL ES&H Executive Board

May 20th, 2015

To: Charlie Gentile, Stefan Gerhardt, John Lacenere, Al von Halle, Jerry Levine, Leif Dietrich, Anthony Indelicato

- From Adam Cohen, Deputy Director of Operations / Chief Operating Officer

1. Confirm that the reassembly of the NSTX-U has been completed appropriately and has not impacted your recommendation for the Safety Certificate
2. Evaluate the new items designed and installed and confirm they do not impact your recommendation for the Safety Certificate
3. Confirm that the appropriate actions have been taken to establish and install electrical grounding prior to energizing the coils
4. Assess the start-up process to confirm that we have needed checks-and-balances to ensure proper conduct of operations

Charge Question #1

- Confirm that the reassembly of the NSTX-U has been completed appropriately and has not impacted your (April 10, 2015) recommendation for the Safety Certificate

Upon physical inspection / walk-down of the re-worked and reassembled center stack (design and reassembly), including collateral areas, it is the finding of the ACC that the basis for recommending a Safety Certificate for NSTX-U operations on April 10, 2015 remains the same. The ACC conducted a formal walk-down of the CS on July 30, 2015. The ACC chair physically reviewed work-package folders (yellow and blue) associated with the re-work activity. A robust documentation package for the CS is in place and confirms the parameters of the Safety Certificate

Charge Question #2

- Evaluate the new items designed and installed and confirm they do not impact your recommendation for the Safety Certificate

Newly designed components of the center stack (design and installation) provide a well engineered and analyzed sub-system. The original evaluated parameters for issuance of a Safety Certificate on April 10, 2015 remain the same. Safety Certificate boundaries remain the same. A robust and well documented sub-system has been provided for the re-worked Center Stack

Charge Question #3

- Confirm that the appropriate actions have been taken to establish and install electrical grounding prior to energizing the coils

The project has established, documented, and implemented a grounding strategy and has identified a well qualified system engineer for the CS and collateral (FCPC) areas. Appropriate documentation / analysis is in place to support NSTX-U operations in accordance with the boundaries of approved operating procedures and the Safety Certificate

Charge Question #4

- Assess the start-up process to confirm that we have needed checks-and-balances to ensure proper conduct of operations

The project has strengthened (by revision) procedure OP-AD-56 “ Chain of Command” and re-affirmed OP-AD-39 “ Conduct of Operations” (by training) those elements required for robust conduct of operations. The project has / is conducting staff training to ensure that personnel are aware of their “Stop Work Authority “ and responsibility, including stopping work during activities that could impact machine / equipment safety

Safety Certificate

PPPL PRINCETON PLASMA PHYSICS LABORATORY	**SAFETY CERTIFICATE**

LOCATION (Site, Area, Bldg., Room, etc.)
D-Site Bldgs and C-Site NSTX Control Room

ACTIVITY (Brief Description)
Operate NSTX-Upgrade (NSTX-U)

LIMITATIONS:

1. Maximum neutron generation rate from plasma operations is 4 x 10^{18} DD neutrons/year per the running total required by OP-NSTX-015, "NSTX-U HPP Daily Operations."
2. Operation of the Bakeout Systems may be performed to heat the plasma facing components (PFCs) to temperatures up to 350°C and the torus vacuum vessel to temperatures up to 150°C per OP-G-156, "NSTX Integrated Machine Bake-out Operations."
3. Boronization with deuterated Trimethylboron (dTMB) may be performed with no more than 50 grams of TMB at risk in the NSTX-U Test Cell at any time per OP-G-155, "NSTX Boronization using TMB."
4. The total maximum active elemental lithium inventory in the NSTX-U Test Cell during an experimental campaign will not exceed 2,000g per OP-VAC-762, "NSTX LITER Operating Procedure."
5. No access into the NSTX Test Cell is permitted during plasma operations or when the NSTX-U toroidal or poloidal magnetic field coils are energized by high-power supplies. Complete OP-NSTX-014, "NSTX Machine Operation Guide for Startup and Shutdown" each run day.

CONDITIONS FOR OPERATIONS:

1. Controls are implemented per Chapter 5 of the NSTX-U Safety Assessment Document (SAD).
2. COEs are trained in the requirements of the NSTX-U Safety Assessment Document (SAD) per OP-NSTX-012, "NSTX-U Operations Training."
3. The criteria of procedure OP-NSTX-02, "Startup of NSTX-U" must be satisfied.
4. The machine operating parameters will be bound by the most recent completion of ISTP-NSTX-001, NSTX Coil Energization Tests.

RESPONSIBLE LINE MANAGER:

Print Name	Signature	Date

APPROVED BY (ES&H/EB Chairperson):

Print Name	Signature	Date

ACTIVITY COMPLETED (Dated and Signed by Responsible Line Manager)

Print Name	Signature	Date

NSTX-U ACC Findings & Recommendation

- ACC confirms that the Safety Certificate for NSTX-U issued on April 10, 2015 remains valid and still represents appropriate limitations and conditions for the safe operation of NSTX-U

- Conduct of Operations and Chain of Command requirements have been re-confirmed with the CD-4 operating staff. Targeted training has occurred has been documented

- Center Stack (engineering and analysis) documentation has been well documented. A robust package for the CS sub-system is in place

- NSTX-U is prepared to proceed to CD-4

Backup Slides

NSTX-U
Activity Certification Committee Membership

Members

- Stefan Gerhardt
- Irving Zatz
- John Lacenere
- Leif Dietrich*
- Anthony Indelicato
- Al von Halle*
- Jerry Levine*
- Charles Gentile*

Resource Members

- Ron Strykowsky
- Jon Menard
- Tracy Estes
- Tim Stevenson
- George Ascione
- Larry Dudek

* members of the NSTX ACC since 1997

NSTX-U ACC Process

- NSTX-U ACC reviews commenced on June 7, 2013
- The committee has met over forty times to discuss, examine, walk-down, sub-systems associated with machine start up & FY 15 operations, including safety documentation (SAD, FMEA, procedures). Evaluate readiness of mechanical, electrical, chemical, safety, radiological protection systems for start-up.
- Reviews are mainly linked to NSTX-U sub-systems, including diagnostics, HIS, compliance
- Ancillary items include training, conduct of operations, industrial safety, fire safety, etc.

Activity Certification Committee Has Reviewed & Performed:

- NSTX–U Safety Assessment Document (SAD)
- Failure Modes Effects Analysis (FMEA's)
- Pre-Operational Test Procedures (PTP's), Integrated System Test Procedure (ISTP), Operating Procedures, other applicable documents
- NSTX-U physical plant and sub-system walk-downs

Key NSTX-U ACC Document Control Items

- NSTX-U conforms with the procedural requirements for Writing, Reviewing, and Approving D-Site Procedures (ENG-30) -complete
- ATI & RLM for all procedures -complete
- Documents conforms with chain of command (OP-AD-56), and conduct of operations (OP-AD-39) -complete

Administrative Procedures ACC has Monitored

- Administrative Control of D-Site Procedures (OP-AD-97)
- D-Site Conduct of Operations (OP-AD-39)
- Control of Equipment and System Status (chain of command) (OP-AD-56)
- D-Site Work Permit System (OP-AD-09)
- Control of Workplace Cleanliness Around D-Site Experimental Areas (OP-AD-24)
- D-Site Fire Watch Requirements (OP-AD-31)
- Rollover Procedure (OP-AD-44)
- Preparation, Review, & Approval of D-Site Design Changes (ENG-32 & 33)
- Control of Temporary Modifications (ENG-36)
- Experimental Proposals for NSTX (OP-ADX-03)
- Operation of the NSTX Access System (OP-AD-117)

Training Matrix

The NSTX Training Matrix (OP-NSTX-12)

- Three categories of training for operators
  - General Accessor (unescorted access to work in NSTX-U machine areas)
    - Trained in worker safety (Lockout/Tag out, Confined Space, Basic Electrical Safety, Radiation Safety, etc.
    - Trained on administrative procedures governing NSTX-U configuration control
  - Subsystem Operators
    - Trained in worker safety
    - Trained on administrative procedures governing NSTX-U configuration control
    - Trained on specific operating procedures relevant to subsystems
    - Instructional discussion with appropriate cognizant engineers
    - "Qualified to operate" checklist reviewed and approved by NSTX Head of Operations
  - Chief Operating Engineers
    - Trained in worker safety
    - Trained on all administrative procedures associated with NSTX operations
    - Trained on all NSTX-U operating procedures
    - Instructional discussion with appropriate cognizant engineers
    - "Qualified to operate" checklist reviewed and approved by NSTX Head of Operations
    - Trained on SAD & Safety envelope, Safety certificate

Safety Interlock Systems – ACC Has Reviewed

- Testing of the E-Stop System (OP-NSTX-08)
  - FCPC / ECS, TCB, Cable Spread Room Area
  - Test Cell Installations (NBI-2)
- Safety Lockout Device Testing (OP-NSTX-09)
  - SLD pressurized to test line/ground switches
  - NSTX-U SLD Kirk Key Test procedure (OP-KK-28) Testing NSTX HIS with Areas safe for Access (OP-NSTX-05)
  - ECS Critical Interlock Testing
- Operation of the NSTX-U Access System

DOE Items

PPPL will need to address/close the following action items:

1. PPPL will assure the NSTX-U safety certificate information will be specific to the safety envelope**. Complete**

2. PPPL will assure the NSTX-U safety certificate will be posted in a conspicuous location in the NSTX-U Control Room. **Complete**

3. PPPL will assure the dTMB and Lithium systems will be functional when placed on-line, which will occur following NSTX-U restart. **Complete**

4. PPPL will assure Chief Operations Engineers and key personnel training requirements will include specifics related to the safety envelope/safety certificate. **Complete**

5. PPPL will assure OP-NSTX-02 will include the requirement for NSTX-U Chief Operations Engineers and key personnel are trained to the safety envelope/safety certificate. **Complete**

6. PPPL will assure references concerning “Hot Access to NSTX-U Test Cell” are removed from NSTX-U procedures. **Complete**

7. PPPL will assure the run copy of the ISTP is signed off and located in the NSTX-U control room. **Complete**

8. PPPL will assure emergency stops, within the NSTX-U Test Cell, will meet PPPL ESH 5008 requirements. **Complete**

9. PPPL will be in communication with PSO concerning the timeframe to achieve PSO concurrence for NSTX-U restart. **Complete**

10. Post NSTX-U start-up action item – PPPL will arrange with the DOE National Training Center to present “Conduct of Operations” training at PPPL. **Planned**