Objective Criteria for Assessing Safe NSTX-U Startup NSTX-U Readiness for Operation Review Lines Of Inquiry DRAFT

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1.0 Safety Documentation

1.1 Objective

Determine if the approved NSTX-U Safety Assessment Document (SAD) and pending Safety Certificate adequately define the safe operating envelope for NSTX-U operations.

1.2 Criteria

The PPPL Health and Safety Manual ESHD 5008 requires that the SAD:

- Identify hazards and associated onsite and offsite impacts to workers, the public, and the environment from the facility for both normal operation and credible accidents.
- Contain sufficient descriptive information and analytical results pertaining to specific hazards and risks identified during the safety analysis process to provide an understanding of risks of proposed operations.
- Provide detailed descriptions of engineered controls (e.g., interlocks and physical barriers) and administrative measures (e.g., procedures) put in place to eliminate, control, or mitigate hazards from operation.
- Include or reference a description of facility function, location, and management organization in addition to details of major facility components and their operation.

1.2 Approach

Safety Assessment Document (SAD) and Failure Modes and Effects Analysis (FMEA) reviews.

SAD/FMEA Author and Activity Certification Committee Chairman Interviews.

Lines of Inquiry	Assessment Methodology
1. Are the safety aspects of the NSTX-U	1. Review SAD Chapter 3 and associated
facility and systems adequately	FMEAs. Consider follow up interviews
described in the SAD?	with cognizant systems engineers.
2. Are the hazards of NSTX-U operations,	2. Review SAD Chapter 3 and associated
as described in the SAD reasonably	FMEAs, and review SAD Chapter 4.
complete, and adequately assessed?	Consider follow up interviews with
	cognizant systems engineers, SAD
	author, ACC chair.
3. Will the mitigating factors described	3. Review SAD Chapter 3 and associated
in the SAD adequately protect workers,	FMEAs, and review SAD Chapter 4.
the public and the environment from the	Consider follow up interviews with
potential consequences of NSTX-U	cognizant systems engineers, SAD

hazards?	author, ACC chair.
4. Does the Safety Envelope described in	4. Review SAD Chapters 2 and 5.
the SAD (from which the Safety	Consider follow up interviews with
Certificate will be derived) address the	cognizant systems engineers, SAD
key mitigating factors to protect against	author, ACC chair.
the potential consequences of NSTX-U	
hazards?	
5. Were the review and approval	5. Review ESHD 5008 Section 11.
processes for the SAD and pending	Interview SAD author and ACC Chair on
Safety Certificate robust?	processes. Examine SAD Review
	comments and resolutions.

2.0 Roles and responsibilities

2.1 Objective

Determine if there are there clearly defined roles, responsibilities and training for NSTX-U operations personnel.

2.2 Criteria

PPPL and NSTX-U Administrative Procedures define and document roles and responsibilities of operations personnel, and prescribe training requirements.

2.3 Approach

Reviews of the NSTX-U Administrative Procedures defining the roles, responsibilities, and training of operating personnel.

Management/Staff interviews.

Lines of Inquiry	Assessment Methodology
1. Is the NSTX-U operations organization	1. Review of the Administrative
clearly defined and documented?	Procedure on the NSTX-U Chain of
	Command (OP-AD-56)
2. Are the roles and responsibilities of	2. Interviews with the NSTX-U Head of
each member of the NSTX-U operations	Engineering Operations and a NSTX-U
organization unambiguously defined,	Chief Operating Engineer (COE).
documented and understood by the	Interviews of operating staff as
organization members and their	appropriate.
supervisors?	
3. Are the training requirements for each	3. Review the NSTX-U Operator Training
member of the NSTX-U operations	Matrix (OP-NSTX-12)
organization clearly defined, including	
required refresher frequencies if	
applicable?	
4. Have the members of the NSTX-U	4. Interview with the PPPL Office of
operations organization received their	Human Resources Training Manager.
required training, or are there plans to	
have this training completed as needed	
to support operations?	

3.0 Safe Operating Envelope

3.1 Objective

Determine if there are clearly defined operating procedures that ensure that NSTX-U is commissioned and operated within the safe operating envelope defined by the NSTX-U Safety Assessment Document (SAD) and Safety Certificate (including off-normal events).

3.2 Criteria

Operations Procedures prescribe the necessary steps and approvals for the commissioning and operations of NSTX-U.

3.3 Approach

Reviews of the NSTX-U Pre-Operational Test and Operations Procedures. Management/Staff interviews.

Lines of Inquiry	Assessment Methodology
1. Are there clearly defined NSTX-U	1. Review the NSTX-U Start-Up
operating procedures that address	Procedure (OP-NSTX-02), particularly
commissioning and operation of NSTX-	the matrix of subsystem pre-operational
U?	test and operations procedures.
2. Is the NSTX-U Safety Envelope that is	2. Review the "Hold Points" and
documented in Chapter 5 of the NSTX-U	approvals to proceed contained in OP-
SAD, which will constitute the	NSTX-02. Review the NSTX-U Integrated
Conditions/Limitations on the Safety	System Test Procedure (ISTP-001)
Certificate, adequately addressed in	which defines the protection system
NSTX-U operating procedures, where	settings and necessary test shots for any
appropriate?	changes to the NSTX electromagnetic
	configuration and/or operating
	envelope. Interviews with the NSTX-U
	Head of Engineering Operations and a
	NSTX-U Chief Operating Engineer (COE).
	Interviews with the NSTX-U Head of
	Engineering Operations, a NSTX-U Chief
	Operating Engineer (COE), the Head of
	PPPL ESH&S, and the Head of NSTX-U
	Experimental Operations.

4.0 Activity Certification

4.1 Objective

Determine if the PPPL Activity Certification Committee (ACC) process ensures that configuration changes are adequately reviewed and appropriately documented in the NSTX-U Safety Assessment Document (SAD) and Safety Certificate.

4.2 Criteria

ESHD 5008 and PPPL Engineering Procedures prescribe the necessary steps and requirements for NSTX-U Configuration Control.

4.3 Approach

Reviews the appropriate section(s) of ESHD 5008 and PPPL Engineering Procedures. Management/Staff interviews.

Lines of Inquiry	Assessment Methodology
1. How is it assured that a configuration	1. Review ESHD 5008 Section 11 & PPPL
change that may impact the NSTX-U	Work Planning Procedure (ENG-032).
Safety Envelope would be reviewed and	Consider, if necessary, reviews of the
approved by the ACC and relevant other	Design Verification Procedure (ENG-
management prior to implementation?	033), Drawing Control Procedure (ENG-
	010, and the Approval Matrix for
	Technical Procedures (ENG-030).
	Interview ACC Chair, Project
	Management Office Head, Head ESH&S,
	and the NSTX-U Construction Manager
	on the operation of the Work Control
	Center.
2. How does the ACC process regarding	2. Review ESHD 5008 Section 11 & Work
configuration changes ensure that	Planning Procedure (ENG-032).
approved changes to the NSTX-U Safety	Interview ACC Chair, Project
Envelope are documented in the SAD	Management Office Head, Head ESH&S,
and Safety Certificate prior to their	others as appropriate.
implementation?	

5.0 Operational Readiness

5.1 Objective

Determine if the PPPL Activity Certification Committee (ACC) process, including approval to proceed by the PPPL ES&H Executive Board Chairperson, ensure that PPPL is indeed ready to begin NSTX-U operations.

5.2 Criteria

ESHD 5008, the ACC, and the PPPL ES&H Executive Safety Board will be used to evaluate and approve NSTX-U's readiness for operation.

5.3 Approach

Reviews the appropriate section(s) of ESHD 5008. Interviews with the ACC and the ES&H Executive Board Chairmen.

Lines of Inquiry	Assessment Methodology
1. What is the ACC process, and how is it	1. Review ESHD 5008 Section 11.
designed to allow a defensible judgment	Interview ACC Chair, others as
to be made by the ACC and the ES&H	appropriate.
Executive Board Chair on NSTX-U	
readiness to operate?	
2. What specific actions were taken, and	2. Interview ACC Chair, review ACC
will be taken, as part of the ACC process	documentation.
to ensure that a defensible judgment on	
NSTX-U readiness to operate can be	
made?	

6.0 Project Objectives

6.1 Objective

At the time of project completion, determine if the NSTX Upgrade Project will have delivered the Project Objectives as defined in Section 2.2 of the NSTX-U Project Execution Plan.

6.2 Criteria

Project Objectives and Requirements are described in the NSTX-U Project Execution Plan.

6.3 Approach

Review of the NSTX-U Project Execution Plan and EVMS project data. Interviews with the NSTX-U Project Head, the appropriate section(s) of ESHD 5008. Interviews with

Lines of Inquiry	Assessment Methodology
1. Have NSTX-U PEP items for the	1. Review of the NSTX-U Project
centerstack upgrade and for the second	Execution Plan. Interviews with the
neutral beam been completed?	NSTX-U Project Head, the Engineering
	Managers of the Centerstack and Neutral
	Beam Groups, and appropriate CAM's.
2. How will the achievement of first	2. Interviews with appropriate CAM's
plasma, defined as an ohmically heated	and the Head of NSTX-U Experimental
discharge > 50 kA at a toroidal magnetic	Operations.
field of > 1 kG, be confirmed?	
3. How will the achievement of a 40,000	3. Interviews with appropriate CAM's
electron-volt neutral beam produced and	and the Head of the Neutral Beam
injected into the armor for .050 seconds	Engineering Group.
be confirmed?	