National Spherical Torus eXperiment Upgrade

Accelerator Readiness Reviews

Physics Meeting – June 16, 2025

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Operational Readiness Assessments are Central to ASO

Accelerator Readiness Review (ARR): "A structured method for verifying that hardware, personnel, and procedures associated with commissioning or routine operations are ready to permit the activity to be undertaken safely." (<u>link</u>)

- Report, and PPPL response, are primary inputs to PSO granting commissioning or operations permission
- Taken the approach of calling an ARR when asking permission to introduce or significantly change our Accelerator Specific Hazards

We conduct Internal Readiness Reviews (IRRs) as "dry runs".

• Similar or identical charge questions, used to determine readiness for an ARR.

NSTX-U Planning a Two-Phase ARR Sequence

Review	Date	Supports PSO request to:
NB IRR	May 2023	High Voltage Conditioning
Neutral Beam ARR	June 2025	Stand alone operate neutral beam system
Plasma IRR	Q4FY2025	Plasma Commissioning Form plasmas and heat them with neutral beams
Plasma ARR	Q2FY2026	

Recent Successful NB ARR

Are the NSTX-U implementation of the PPPL Safety Management Programs (SMPs), the **NSTX-U Hazard Assessments**, and the **Safety Assessment Document (SAD)** appropriate to support commissioning and operations of NSTX-U Neutral Beams (NBs)?

Is the **Accelerator Safety Envelope (ASE)** appropriate and ready to support commissioning and operations of NSTX-U Neutral Beams following PSO approval?

Are the **Credited Controls** appropriate, in place, configuration managed, and ready to support safe commissioning and operations of NSTX-U Neutral Beams?

Is the **Unreviewed Safety Issue (USI)** program appropriate and ready to support commissioning and operations of NSTX-U Neutral Beams?

Are the NSTX-U Neutral Beam **procedures** and **Con-Ops programs** appropriate to initiate NSTX-U Neutral Beam Operations?

Is the NSTX-U **training** program established and ready to support the onboarding of operators for NB commissioning?

Is the **Contractor Assurance System** effectively evaluating issues and supporting the NSTX-U?

Have recommendations from the NB IRR been appropriately closed for this point relative to operations?

- Scope: startup of the NB system, injecting into calorimeters
- Accelerator Hazards introduced:
 - Cryogenic Oxygen Deficiency Risk
 - Direct Radiation
- 6 reviewers from ORNL, BNL, FNAL, JLab, LANL
- Committee answered "yes" or "yes following completion of recommendations" for all questions
- Recommendations were modest in scope; value-added.
- Prepares us to restart elements of the cryo-plant in late summer.

Plasma IRR/ARR Cycle is Next

- Plasma IRR/ARR will support a request to commission the facility
 - From first plasma to the 1 MA H-Mode level
- Late summer through winter
- Successful responses to NB ARR charge questions allows the next IRR/ARR to focus what is incremental
- Likely lines of inquiry include
 - Hazard analysis for plasma ops & shielding validation
 - Facility commissioning plans
 - Conduct of Operations for full facility operations
 - User onboarding and safety

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PPPL Safety Engineering Operations