# National Spherical Torus eXperiment Upgrade

# Accelerator Safety and NSTX-U

Physics Meeting – May 12, 2025

S. Gerhardt





# Why "Accelerator"?

- The DOE has extensive and rigorous regulatory system for Nuclear Facilities
- DOE + accelerator operators created Accelerator
  Safety Order (ASO) to give operators more flexibility.
  - Relaxed configuration management
  - Fewer federal approvals than for a Nuclear Facility
  - Accelerator: A device ... employing electrostatic or electromagnetic fields to impart kinetic energy to molecular, atomic, or sub-atomic particles and capable of creating a radiological area
- ASO was added to the PPPL contract, NSTX-U was reclassified

# **Key Definitions**

### Accelerator Specific Hazard (ASH) (<u>ESH-027</u>)

Any hazard to workers, the environment, or public, whose nature is uniquely defined by the configuration of NSTX-U systems and not fully mitigated by PPPL standard safety management programs (ESHD 5008, etc)

### Credited Control (ESH-027)

A system or control, either engineered or administrative in nature, that reduces the risk of an accelerator specific hazard from unacceptable to the acceptable range.



## **Accelerator Hazards and Controls**

### Accelerator Specific Hazard (ASH) (<u>ESH-027</u>)

Any hazard to workers, the environment, or public, whose nature is uniquely defined by the configuration of NSTX-U systems and not fully mitigated by PPPL standard safety management programs (ESHD 5008, etc)

**ASH #1**: Direct Radiation from Fusion Reactions **ASH #2**: Cryogenic Oxygen Deficiency

#### Credited Control (ESH-027)

A system or control, either engineered or administrative in nature, that reduces the risk of an accelerator specific hazard from unacceptable to the acceptable range.

**ASH #1**: Shielding, Access Control Systems **ASH #2**: Cryogenic Oxygen Deficiency Alarms

# **Key Deliverables**

- Safety Assessment Document <u>link</u>\* to Rev. 1
- Accelerator Safety Envelope <u>link</u>\* to Rev. 1
  - Specifies the credited controls
  - Will be DOE approved
- Accelerator Readiness Review(s)
  - Performance based readiness reviews
  - One coming on June 3-6 this year
- USI Process
- Site Office approvals for Commissioning and Operations

\* these are links to the specific revisions; always check for updates

### **Identifying Credited Controls**

- D-NSTXU-OP-AD-134 Configuration Management of NSTX-U Credited Controls (<u>link</u>)
- Defines controls such as:
  - Stamps for drawings
  - Field labeling typically purple
  - Tamper resistant fasteners
- Any modifications done to credited controls uses:
  - Approved procedure(s)
  - Qualified individuals
  - Work authorization



E-Stop Button





ODH Monitor Labels

CONTACT THE NSTX-U RESPONSIBLE ENGINEER RF. DRAWING: E -AE2021

Shielding Labels