

ENVIRONMENTAL EVALUATION NOTIFICATION FORM

Grantee/Contractor Laboratory: Princeton University/Princeton Plasma Physics Laboratory (PPPL)  
 Project/Activity Title: National Spherical Torus Experiment (NSTX) Upgrade Project  
 NEPA Tracking No.: \_\_\_\_\_ Type of Funding SC  
 B&R Code: \_\_\_\_\_ Total Estimated Cost: \$95M

DOE Cognizant Secretarial Officer (CSO): Patricia M. Dehmer

Contractor Project Manager: \_\_\_\_\_ Signature: \_\_\_\_\_  
 Date: \_\_\_\_\_

Contractor NEPA Reviewer: Jerry D. Levine Signature: SIGNED BY JERRY D. LEVINE  
 Date: 3/26/09

I. **Description of Proposed Action:** The proposed action would replace the current NSTX center stack (CS) assembly with a new larger radius CS assembly, and would add a second neutral beamline (NBL) formerly used for the Tokamak Fusion Test Reactor (TFTR) Project onto the NSTX experiment. This action would contribute to understanding Spherical Torus (ST) configuration physics by allowing: (1) study of high beta (ratio of plasma pressure to magnetic field pressure) plasmas at reduced particle collisionality; (2) assessment of full non-inductive current drive operation; and (3) prototyping of heat and particle exhaust solutions for next-step facilities. Details of the proposed work are provided in the attachments.

Upgrades to the NSTX experiment were previously addressed in the NSTX Environmental Assessment (DOE/EA-1108; FONSI issued 12/8/95), including plasma currents up to 2 MegaAmperes (MA) and pulse lengths up to 60 seconds.

II. **Description of Affected Environment:** Work would take place in the TFTR Test Cell, the NSTX Test Cell, the D-Site Test Cell Basement, and at other D-Site locations (see Figures 1-3). No environmentally sensitive resources would be affected.

III. **Potential Environmental Effects:** (Attach explanation for each "yes" response, and "no" responses if additional information is available and could be significant in the decision making process.)

**A. Sensitive Resources: Will the proposed action result in changes and/or disturbances to any of the following resources?**

	<u>Yes/No</u>
1. Threatened/Endangered Species and/or Critical Habitats	1. No
2. Other Protected Species (e.g. Burros, Migratory Birds)	2. No
3. Wetlands	3. No
4. Archaeological/Historic Resources	4. No
5. Prime, Unique or Important Farmland	5. No
6. Non-Attainment Areas	6. No
7. Class I Air Quality Control Region	7. No
8. Special Sources of Groundwater (e.g. Sole Source Aquifer)	8. No
9. Navigable Air Space	9. No
10. Coastal Zones	10. No
11. Areas w/Special National Designation (e.g. National Forests, Parks, Trails)	11. No
12. Floodplain	12. No

**B. Regulated Substances/Activities: Will the proposed action involve any of the following regulated substances or activities?**

	<u>Yes/No</u>
13. Clearing or Excavation (indicate if greater than 5 acres)	13. No
14. Dredge or Fill (under Clean Water Act section 404; indicate if greater than 10 acres)	14. No
15. Noise (in excess of regulations)	15. No
16. Asbestos Removal	16. No
17. PCBs	17. No
18. Import, Manufacture or Processing of Toxic Substances	18. No
19. Chemical Storage/Use <i>Use of routine shop chemicals such as cutting fluids, solvents to clean oil from copper and stainless steel components, rust neutralizer, and paint.</i>	19. Yes
20. Pesticide Use	20. No
21. Hazardous, Toxic, or Criteria Pollutant Air Emissions	21. No
22. Liquid Effluent	22. No
23. Underground Injection	23. No
24. Hazardous Waste <i>Small quantities of solvent soaked rags would be generated and disposed of per regulatory requirements using existing PPPL procedures.</i>	24. Yes
25. Underground Storage Tanks	25. No
26. Radioactive (AEA) Mixed Waste	26. No
27. Radioactive Waste	27. No
28. Radiation Exposures	28. No

**C. Other Relevant Disclosures. Will the proposed action involve the following?**

	<u>Yes/No</u>
29. A threatened violation of ES&H regulations/permit requirements <i>The requirements of 10CFR851 (as implemented under the DOE approved PPPL Worker Safety and Health Program) would be applied to work at PPPL under this proposed action.</i>	29. No
30. Siting/Construction/Major Modification of Waste Recovery, or TSD Facilities	30. No
31. Disturbance of Pre-existing Contamination	31. No
32. New or Modified Federal/State Permits	32. No
33. Public controversy	33. No
34. Action/involvement of Another Federal Agency (e.g. license, funding, approval)	34. No
35. Action of a State Agency in a State with NEPA-type law. (Does the State Environmental Quality Review Act Apply?)	35. No
36. Public Utilities/Services	36. No
37. Depletion of a Non-Renewable Resource	37. No

IV. **Section D Determination:** Is the project/activity appropriate for a determination by the OM under Subpart D of the DOE NEPA Regulations for compliance with NEPA?

Yes

**DOE-PSO NEPA Compliance Officer Review:**

Concurrence with Proposed Class of Action Recommended

CX

EA

EIS

Category B3.13 Magnetic fusion experiments, no tritium fuel use

V. **DOE Recommendation Approval:**

SC GLD: Irene Atney Signature: SIGNED BY IRENE ATNEY

Date: 3/30/09

VI. **NEPA Compliance Officer (NCO) Subpart D CX Determination and Approval:**  
**The preceding pages are a record of documentation required under DOE Final NEPA Regulation, 10 CFR Part 1021.410, and SEN-15-90 to establish that an action may be categorically excluded from further NEPA review. I have determined that the proposed action meets the requirements for the Categorical Exclusion referenced above. Therefore, by my signature below, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.**

PSO NCO: H. Allen Wrigley Signature: SIGNED BY H. ALLEN WRIGLEY

Date: 3/27/09

## ADDITIONAL INFORMATION (see also attached slides)

### Center Stack (CS) Assembly

The new CS Assembly would provide higher toroidal magnetic fields (1 Tesla) and plasma currents (2 MegaAmperes) than presently attainable, and would allow these parameters to be maintained for longer time periods (5 seconds) than currently possible on NSTX. This would allow production of higher temperature plasmas to reduce collisionality of plasma particles (thereby providing hoped for enhanced confinement), as well as more efficient non-inductive current drive sources and better plasma performance.

Work would include installations of:

- New Toroidal Field (TF) Hub Assembly
- New TF Flag Assemblies
- New Ceramic Break
- New Inner TF Bundle
- New Ohmic Heating (OH) Coil
- New Inconel Casing and Insulation
- New Plasma Facing Component (PFC) Tiles
- New Poloidal Field (PF) 1a, b & c Coils

In addition, the following would be accomplished:

- Install reinforcements to existing coil structures (umbrella structure, outer TF coil legs, and possibly the vacuum vessel) to handle the increased magnetic loads
- Install new PF/TF/OH bus connections
- Repair leaks and improve the existing cooling water system to cool the outer TF coil legs separately from the inner legs
- Replace the Center Stack Diagnostics
- Upgrade the TF Coil power supply to support full field capability of 1 Tesla

### Second Neutral Beamline

The second neutral beamline (NBL), which was formerly used in the Tokamak Fusion Test Reactor (TFTR) experiments, would provide up to two times higher plasma current drive efficiency and current profile control than currently available with only the existing one NSTX NBL. This would enhance heating and current drive for plasma start-up, sustainment, heat flux, and transport studies.

Of the remaining former TFTR NBL's, the one selected for use as the second NSTX NBL is contaminated with tritium from its previous use and must be decontaminated and prepared for installation on NSTX. The potential impacts of decontamination and removal/disposal of NBL components were analyzed in DOE/EA-0813 (see Section 2.1.1 and Chapter 4), for which DOE issued a Finding of No Significant Impact (FONSI) on 12/5/94.

Many of the necessary activities involve duplicating the services and equipment already provided for the existing NSTX NBL to facilitate operation of the second NBL.

Work would include:

- Evaluation and refurbishment of internal NBL components, as needed (e.g., cryo-pumping panels, bending magnets, etc.)
- Relocation of one NBL from the former TFTR Test Cell to the NSTX Test Cell
- Provision of a second set of NBL services, i.e., power, water, vacuum and cryogenics, for operation
- Modification of the NSTX Bay K port and fabrication and installation of a duct assembly to connect the second NBL to the NSTX torus
- Refurbishment and installation of existing neutral beam ion sources onto the second NBL
- Installation of tiled water-cooled armor plating inside the NSTX torus to protect in-vessel impinged surfaces
- Routing high voltage power supplies and neutral beam controls to the NSTX Test Cell, and installing/re-commissioning existing High Voltage Enclosures and transmission lines
- Relocating the present NSTX torus vacuum pumping duct, vacuum control systems, gas injection systems, and diagnostic systems displaced by the addition of the second NBL
- Reworking of NSTX platforms and modification of the fire detection and suppression systems under the platforms