

U.S. Department of Energy  
Finding of No Significant Impact  
Proposed National Compact Stellarator Experiment  
Princeton Plasma Physics Laboratory, New Jersey

**AGENCY:** U.S. Department of Energy

**ACTION:** Finding of No Significant Impact

**SUMMARY:** The Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA-1437, evaluating the environmental effects of the proposed fabrication, assembly and operation of a National Compact Stellarator Experiment (NCSX) within the existing C-Stellarator (CS) Building at C-Site of the Princeton Plasma Physics Laboratory (PPPL), Princeton, New Jersey. The purpose of the NCSX is to provide an experimental device to investigate the attractiveness of a compact stellarator as the basis for a fusion power reactor. Fusion energy has the potential to help compensate for dwindling supplies of fossil fuels, the eventual depletion of fissionable uranium used in present-day nuclear reactors, and the limitations of solar, hydro and wind alternatives.

Based on the analyses in the EA, the DOE has determined that the proposed action does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. 4321, et seq.

The preparation of an Environmental Impact Statement is not required. Thus, the DOE is issuing a FONSI pursuant to the Council on Environmental Quality regulations implementing NEPA (40 CFR Parts 1500-1508) and the DOE NEPA implementing regulations (10 CFR Part 1021).

#### **DESCRIPTION OF THE PROPOSED ACTION:**

The proposed action consists of the proposed fabrication, assembly and operation of a National Compact Stellarator Experiment (NCSX) within the existing C-Stellarator (CS) Building at C-Site of PPPL. The NCSX would be installed in an existing building, formerly occupied by two other fusion devices, which would be refurbished to accommodate the new experiment. Existing equipment and systems would be re-used for NCSX, including cooling and other utilities; plasma heating, fueling and pumping equipment; and, power supplies. All existing parts that would be used to assemble the NCSX, as well as the resulting waste, would be non-radioactive.

The NCSX experimental program would be conducted at PPPL by a nationally-based research team. Key features of NCSX relative to determining the attractiveness of the compact stellarator concept would include maintaining plasma stability without active feedback control, the capability for testing features favorable for steady state operation, and provision of enhanced efficiency for plasma confinement compared with conventional stellarators. NCSX would be unique in its ability to investigate all of these aspects in a single experimental device.

Design, fabrication and assembly of NCSX would occur in fiscal years (FY) 2003-2007, with operations conducted over approximately a 10-year period beginning in June 2007. The total estimated cost for design, fabrication and assembly of NCSX is estimated at about \$70-75M. Fusion reactions that would occur in the NCSX device would involve various combinations of hydrogen, helium and deuterium gases. The NCSX mission would be pursued in a series of planned phases, beginning with initial modest operation and system checkout, and proceeding to increasingly greater plasma heating capabilities and longer pulse lengths.

## **ALTERNATIVES:**

Two alternatives were considered: (1) the proposed action, fabrication, assembly and operation of NCSX at PPPL, and (2) no action. The no action alternative would preclude efforts to investigate a potentially attractive fusion reactor solution that would also broaden understanding of magnetic fusion science. There would be no additional environmental impacts from the no action alternative, and activities at PPPL would proceed at about current levels with continued operations of existing fusion and plasma physics experiments.

## **ENVIRONMENTAL IMPACTS:**

The impacts of the fabrication, assembly and operation of the NCSX on the environment were analyzed in the Environmental Assessment. The Environmental Assessment considered impacts to wetlands, floodplains, air quality, noise, water quality and quantity, aquatic and terrestrial ecology (including threatened and endangered species), visual environment, land use, historical, cultural, and archaeological resources, socioeconomic environment, radiological conditions, workers, and impacts of potential accidents. No significant environmental impacts associated with the proposed action are anticipated.

The potential exists for one lost work case (work related injuries requiring time-off from work or restrictions from normal work activity) over the NCSX fabrication and assembly period. Non-radioactive waste material generated during this work would be sent to a local landfill, which would not be adversely impacted due to the small volume of waste compared to the capacity of the disposal facility.

Releases of non-radioactive plasma exhaust and liquid nitrogen boiloff gases to the environment during NCSX operation would be of similar nature to those that have occurred during operation of PPPL's past and current experimental devices. No adverse environmental impacts from this

operation are anticipated. Radiation exposures to workers during NCSX operation would not be expected to exceed 0.5 rem per year. This occupational dose would result in an increased probability of fatal cancers of less than 2 chances in 10,000. Less than 0.014 Curies per year of tritium may be produced and vented to the environment during NCSX D-D operation. The annual effective dose equivalent to a hypothetical maximally exposed individual at the site boundary from this released tritium plus direct and scattered radiation produced during NCSX D-D operations would be less than 0.002 rem per year, resulting in an increased probability of fatal cancers of less than 1 chance in 1,000,000 to a member of the public. No accident scenario has been identified that would cause a release of hazardous material from NCSX to the offsite environment. Wastes may include small amounts of hazardous wastes such as waste solvents and solvent soaked rags. The only anticipated radioactive waste would be tritium contaminated pump oil wastes (less than 0.001 Curies per year), which would be expected to qualify as low level radioactive waste and would be disposed of at an appropriate DOE waste disposal facility.

#### **CUMULATIVE AND LONG TERM IMPACTS:**

No adverse cumulative or long term impacts from the proposed action are anticipated based on operating experience of similar devices such as the National Spherical Torus Experiment (NSTX), the current absence of measurable cumulative impacts between PPPL and other facilities in the region, and the very low potential impacts from the proposed action.

**DETERMINATION:**

Based on the analyses in the Environmental Assessment, the DOE has determined that the proposed action at the PPPL is not a major Federal action significantly affecting the quality of the human environment within the meaning of the NEPA; consequently, an environmental impact statement is not required.

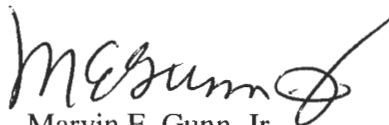
**PUBLIC AVAILABILITY:** Copies of this EA (DOE/EA-1437) are available from:

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