U.S. Department of Energy
Finding of No Significant Impact
Construction and Operation of the National Synchrotron Light Source-II

Brookhaven National Laboratory
Upton, New York

AGENCY: U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The U.S. Department of Energy has prepared an Environmental Assessment (EA), DOE/EA-1558, evaluating the Proposed Action to construct and operate the National Synchrotron Light Source-II (NSLS-II) at Brookhaven National Laboratory (BNL).

Based on information and analyses in the EA, the DOE has determined that the proposed federal action does not significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act of 1969.

Description of the Proposed Action

DOE proposes to construct and operate NSLS-II, an advanced synchrotron light source designed to study the properties and functions of materials with nanoscale resolution, at BNL. The NSLS-II light source would generate the world's brightest x-rays at 10,000 times that of BNL's current light source, the National Synchrotron Light Source (NSLS), and 10 times its intensity. NSLS-II would also provide high brightness in the infrared spectral region that would further usher in new imaging techniques. NSLS-II would uniquely allow a broad range of scientific inquiry concentrating particularly on science at the "nanoscale," the length range from 1 to 100 nanometers or billionths of a meter. Working in the nanoscale, NSLS-II would incorporate state-of-the-art magnet insertion devices, optics, detectors, and non-destructive tools and instruments to image the structure and characterize the properties of materials under real physical and chemical conditions, to allow future progress in basic and applied research in biology and medicine, material and chemical sciences, geosciences, environmental sciences, energy security and technology, and nanoscience.

NSLS-II would replace the NSLS which has been operational and producing world-class science for more than 24 years. Operational experience gained at NSLS is translatable to the state-of-the-art NSLS-II.

Construction of NSLS-II is envisioned for a 10-12 acre (4.0-4.9 hectare) site immediately southeast of the NSLS and east of the Center for Functional Nanomaterials. NSLS-II would include a linear accelerator, a booster synchrotron ring, an electron storage ring, beamlines, offices, laboratories, support facilities and parking. Also proposed for the area would be a Joint Photon Sciences Institute (JPSI) that the State of New York has offered to fund if NSLS-II is constructed at BNL. The complex would create a nanotechnology research and development hub for the Northeastern United States. Construction is expected to begin in 2008 with operation beginning in 2013. Integrated Safety Management (ISM) would be fully incorporated into all phases of work at NSLS-II so that all workers and employees, the public and the environment are protected during construction and operations. In addition, worker health and safety requirements of 10 CFR 851 will be fully implemented at BNL by February 2007.

Summary of NSLS-II estimated parameters:

- Storage ring electron energy of 3.0 billion electron volts
- Stored current of at least 500 milliamps
- Top-off injection mode
- Circumference in the range of 2,560 feet (780 meters)
- Circular footprint of 400,000 square feet (37,000 square meters)
- Parking area of 100,000 square feet (9,300 square meters)

Alternatives

Two alternatives to the Proposed Action were considered.
No Action – Under the No Action Alternative, NSLS-II would not be constructed and operated. The existing NSLS would continue operating until the termination of its useful lifetime. As a consequence, the DOE mission need for an advanced, state-of-the-art 3.0 billion electron volt electron storage ring that produces the brightest x-rays in the world would not be fulfilled.

National and global competitiveness would be lost, and the U.S. would fall behind in the areas of basic and applied research. If NSLS-II were not built at BNL, another consequence of the No Action Alternative would be the loss in funding for the Joint Photon Sciences Institute (JPSI). Loss of JPSI would forfeit an intellectual center at BNL and in the Northeast.

In-place Upgrade – Under the In-place Upgrade of NSLS Alternative, performance and capability enhancements would be performed primarily within the existing NSLS building footprint. DOE Basic Energy Sciences concluded that this alternative would not be selected because the upgrade would not meet DOE's overall science mission requirements for a brighter, world-leading photon source with the research and development capabilities such as those proposed for NSLS-II.

Environmental Impacts of the Proposed Action

The EA analyzes the impacts to the following components of the environment as a result of NSLS-II construction and operation:

- Soil Resources
- Air Resources
- Cultural Resources
- Transportation
- Construction Hazards
- Nanoscience Hazards
- Waste Management
- Commitment of Resources
- Water Resources
- Ecological Resources
- Socioeconomic Factors
- Visual
- Industrial & Experimental Hazards
- Accidents & Natural Hazards
- Pollution Prevention
- Radiological

Construction

Impacts associated with the construction phase of NSLS-II would be typical of those experienced at a mid- to large-scale construction site. Contractor accident prevention and construction site environmental protection would be established through a BNL-required Health and Safety Plan. Construction would meet U.S. Green Building Council Leadership in Energy and Environmental Design (LEED) standards. Construction efficiencies may warrant establishing a temporary concrete mixing plant at BNL with sand obtained from the project site and water from existing BNL wells. Based on the current design and geotechnical data, the need for additional sand for use as compacted fill is not anticipated. If it is determined that additional sand is required beyond that available from the project site, the source(s) would be evaluated, along with applicable permits.

Storm water runoff from the construction site would be controlled using standard erosion control measures, including silt-fencing and hay-bales. Due to the potential for runoff to a regulated surface water, the need for a SPDES General Permit #GP-02-01 for Construction Activity would be evaluated and applied for, if necessary. Disturbed areas would be restored by means such as returning topsoil to promote regrowth of native vegetation. Water sampling wells within the footprint of the project site would be relocated, as needed, to areas meeting regulatory and groundwater monitoring program requirements.

No threatened or endangered species are known to be present in the immediate project area. However, the current footprint for the Proposed Action would overlap the outer portion of a

1,000 foot NYSDEC administrative buffer area surrounding a known tiger salamander habitat, by about 400 feet (122 meters). It is expected that any disturbance from construction would not increase the predisturbed area and there would be no net decrease in the amount of habitat available to the tiger salamander, a New York State designated endangered species. The potential for loss of migratory bird (killdeer) nesting areas would be mitigated by available alternative sites. The need for an archeological survey would be evaluated. Any existing structures that require demolition are not eligible for listing on the National Register of Historic Places.

Operation

Potential environmental impacts for many aspects of NSLS-II operation have been based on data amassed from BNL's 24-year operational experience of the existing NSLS and many of these impacts remain the same or are very similar. These would include aspects such as transportation, industrial and experimental hazards, accidents and natural hazards, waste management and pollution prevention.

Operation, as well as construction, of NSLS-II would result in economic benefits realized through industrial and manufacturing orders, materials and supplies, and personal expenditures. The two-story NSLS-II would be located 5,000 feet from the nearest public road and would not be expected to have an adverse visual impact either on or off the laboratory property. The estimated water usage of 0.3 million gallons per day would be within BNL's existing capacity. Chilled water demands would require a slight increase in BNL's Central Chilled Water Plant capacity. The estimated increase of 10,000 gallons per day in sanitary effluent volume and 58,000 gallons per day from cooling water blow down and other sources to the sanitary waste stream would be well within BNL's current capacity of 3 million gallons per day. LEED efficiencies would be applied to water usage, chilled water demands and effluent to reduce volumes. Increased stormwater discharges to recharge basins are anticipated due to the increased impermeable area of the building and the parking surfaces. Engineering and environmental evaluations would be conducted to determine whether these basins would have sufficient capacity to handle the estimated increased flow, or if additional water management means, such as redirecting to other recharge basins or constructing a landscape pond, need to be considered. No new water supply wells would be developed as a result of NSLS-II construction or operation.

Impacts to air resources would include slight increases in vehicle and construction equipment emissions, and dust particle generation. Because no new air emission sources, other than laboratory hoods, would be constructed as part of the Proposed Action's permanent facilities, no impact on the existing Clean Air Act Title V permit for the Laboratory is anticipated. When NSLS-II is fully operational, air emissions from the BNL Central Steam Facility (CSF) would be expected to increase by an estimated 5% as compared to current CSF emissions.

Work planning and control requirements, and cradle-to-grave management of hazardous materials for experimental work, in particular nanoscience, would be utilized to ensure the safety of workers, the public and the environment as well as ensure safe use of experimental materials and proper disposal of wastes. The overall risk to workers, the public and the environment from operational hazards and accidents is expected to be low based on similar experience with the existing NSLS, and would be fully analyzed during development of the NSLS-II Safety Assessment Document.

The demands for electricity and steam would increase within BNL's capacity.

Radiological impacts have been analyzed and monitoring would be carried out during the lifetime of the facility. Shielding provided by the accelerator enclosure and along the beamlines would reduce levels from scattered radiation at the site boundary to less than 0.1 millirem/year. The maximum annual dose at the site boundary from facility air releases would be less than 0.01 millirem/year. Soil and leachate activation have been calculated to be less than 5% of drinking water standards (<1000 pCi/l for H^3 and <20 pCi/l for Na^{22}). Radiological impacts to a worker have been calculated to result in an estimated lifetime risk of a one in a thousand chance of a cancer fatality. The normal U.S. lifetime risk is one in five. In the 24 years of accelerator and beamline operation at the existing NSLS, no injury to staff, members of the public, or the environment from a radiation accident has occurred.

Decontamination and Decommissioning

A plan would be developed to fully evaluate the hazards and risks posed by decommissioning the facility, and to identify the activities required to complete that decommissioning. Baseline conditions would be determined through calculations, design features, operating experience, and characterization analyses. Decommissioning methods would be chosen based on radiological conditions at NSLS-II at the time of decommissioning and on the effectiveness of the methods to achieve the desired end use of the buildings and the site. Additional criteria in choosing the methods would be the ability of the methods to keep personnel exposure As Low As Reasonably Achievable, and to protect the environment and worker.

The decommissioning plan would delineate the applicable New York State and Federal laws, consensus standards, DOE directives and other requirements applicable to the activities at the time of decommissioning, especially those required to meet the end-point criteria.

Cumulative Impacts

Cumulative environmental impacts from the construction phase of the Proposed Action are expected to be minor and short term. During the long term operation, the anticipated waste types and amounts would remain within historical ranges. Radiological impacts at the site boundary are calculated to be well below existing limits. Soil and water activation levels are calculated to be below 5% of the Drinking Water Standards, and these would be monitored. Electrical, steam, water and chilled water demand would increase. The increased chilled water demand would require additional BNL capacity by upgrading existing facilities; all other demands would be met by existing BNL capacity.

Once the identified chilled water infrastructure is completed, the cumulative utility and waste aspects identified above would be within available BNL capabilities, and would not create a significant burden to the site infrastructure or resources. Overall the cumulative impact of these aspects would have a minor effect on the environment.

Environmental Justice

The construction and the operation of the Proposed Action would not have environmental justice impacts because there would be no anticipated negative economic or health effects on any potentially affected population. Therefore, there would be no disproportionate impacts to either low-income or minority populations.

Determination

Based on the information and analysis in the EA, the DOE has determined that the proposal to construct and operate National Synchrotron Light Source-II (NSLS-II) at Brookhaven National Laboratory (BNL) does not constitute a federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969. Therefore, a FONSI is made and an Environmental Impact Statement is not required.

Public Availability

Copies of this EA are available from:

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On the DOE web site at:
http://www.eh.doe.gov/nepa/pub_ea_toc.html

or

For further information regarding the DOE National Environmental Policy Act (NEPA) process, contact:

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