UNIVERSITY OF CALIFORNIA **ENVIRONMENTAL IMPACT CLASSIFICATION**

Campus or Field Station Ernest Orlando Lawrence Berkeley National Laboratory **Project Account No.** _____

PROJECT TITLE: ***Berkeley Lab Laser Accelerator (BELLA) Laser Acquisition, Installation, and Use for Research and Development***

For purposes of compliance with the California Environmental Quality Act of 1970 (CEQA), and Amended University of California Procedures for Implementation of the CEQA, this project has been reviewed and initially classified as indicated below. Please check (X) as appropriate. Include project description and appropriate local map.

_____ **I. EXEMPT FROM THE CALIFORNIA ENVIRONMENTAL QUALITY ACT OF 1970**

When it can be seen with certainty that there is no possibility the action will result in physical change to the environment or the action is specifically exempted by statute, the project is classified as exempt from CEQA.

__X__ **II. CATEGORICALLY EXEMPT**

This project falls under the indicated Class of Exemption and there is no significant effect on the environment:

__X__ Class 1: Existing Facilities
__X__ Class 2: Replacement or Reconstruction
___ Class 3: New Construction of Small Structures
___ Class 4: Minor Alterations to Land
___ Class 5: Minor Alterations in Land Use Limitations
___ Class 6: Information Collection
___ Class 7 : Regulatory Protection of Natural Resources
___ Class 8: Regulatory Protection of the Environment
___ Class 9: Inspection
___ Class 10: Loans
___ Class 11: Accessory Structures
___ Class 12: Surplus Government Property Sales
___ Class 13: Acquisition for Conservation
___ Class 14: Minor Additions to Schools
___ Class 15: Minor Land Divisions
___ Class 16: Transfer of Ownership of Land in Order to Create Park
___ Class 17: Open Space Contracts
___ Class 18: Designation of Wilderness Areas
___ Class 19: Annexation of Existing Facilities and Lots
___ Class 20: Changes in Organization of Local Agencies
___ Class 21: Regulatory Enforcement Actions
___ Class 22: Educational Programs
___ Class 23: Normal Operation
___ Class 24: Regulations of Working Conditions
___ Class 25: Transfer of Ownership of Land to Preserve Open Space
___ Class 26: Acquisition of Housing for Housing Assistance
___ Class 27: Leasing New Facilities
___ Class 28: Small Hydroelectric Projects
___ Class 29: Cogeneration Projects

_____ **III. INITIAL STUDY**

This project is not Exempt from CEQA or Categorically Exempt; an Initial Study is to be prepared to determine if the project may have significant effect on the environment that has not been substantially and adequately analyzed in a certified program EIR. **Checklist** _____ **Narrative** _____

_____ **IV. ENVIRONMENTAL IMPACT REPORT (EIR)**

It is known that the project will have a significant effect on the environment and has not been adequately and substantially analyzed in a certified program EIR.

PROJECT DESCRIPTION

See attached Project Description.

V. Does this project conform to the approved LRDP? __X__ YES _____ NO

VI. Prepared by: Jeff Phillibar 10-16-09 Date — Local Approved by: Laura Chen 10/16/09 Date

VII. OFFICE OF THE PRESIDENT

__X__ Concur with Classification

_____ Do not concur;

Signed Charlotte Ahern 10/16/09 Date

COMMENTS

5/14/91

PM112.1

PROJECT DESCRIPTION
Berkeley Lab Laser Accelerator (BELLA) Laser Acquisition, Installation, and Use for Research and Development, Lawrence Berkeley National Laboratory

The University of California, as management and operating contractor for the Lawrence Berkeley National Laboratory (LBNL), proposes to modify a portion of an existing accelerator laboratory building to accommodate further development of small laser-driven particle accelerators at LBNL, Berkeley, California. The research program taking place in this modified space would be called "BELLA" (Berkeley Lab Laser Accelerator).

Overview

Particle beam accelerators are devices that can focus and direct charged subatomic particles to high energy levels and speeds. Dental X-ray machines, television picture tubes, and the new Large Hadron Collider in Switzerland are all examples of accelerators of vastly different sizes and energy levels. Typical accelerators use radiofrequency emitters and other similar devices to accelerate subatomic particles.

In accelerator physics, high speeds are often measured in terms of the kinetic energy levels induced in accelerated particles. In general, the size of the accelerator device must be larger to attain higher particle speeds and energy levels. To achieve the highest energies, today's accelerators often reach lengths of several kilometers. These longer accelerators require construction of very large facilities with massive amounts of shielding to cover the length of their beam lines.

BELLA would employ a novel approach – using laser pulses through a small channel filled with hydrogen gas – to create relatively high particle beam energies in short distances. In this manner, it is hoped that particle energies on the order of 10 billion electron volts (10 GeV) can be achieved within an approximately one meter-long device, whereas conventional acceleration would call for a device of approximately 300 meters or more. It should be noted here that the "high energies" that are the goal of the BELLA project are high in the context of accelerator physics. On a more conventional scale, each 10 GeV electron pulse that may be achieved with BELLA contains kinetic energy equivalent to the energy needed to power a one-watt LED light bulb for one second.

The ultimate goal of the BELLA program would be to develop technology that reduces the size, cost, energy usage, and environmental impacts associated with particle accelerators.

Construction

The proposed modifications would take place in Building 71, which is a 54,000 gross square foot (gsf) accelerator laboratory facility at LBNL, and which houses the Lab's current on-going laser-driven, particle accelerator research (see Figure 1). An existing, approximately 7,000 square-foot (SF) accelerator laboratory area inside Building 71 would be reconfigured and otherwise modified to accommodate the new BELLA facility. Reconfiguration of space would include removal of existing walls and laboratory rooms and replacement with an accelerator room, a laser room, a control room, and ancillary areas. Shielding – including a "beam dump" that would absorb the accelerated electrons at their termination – would be constructed at one end of the accelerator room. An enclosed utility shed and an access stairwell would be placed among existing utility systems on the Building 71 roof. The BELLA laser, laser plasma accelerator, and ancillary equipment would be installed inside the reconfigured laboratory area.

BELLA construction would include excavation of soil up to 16 feet below floor level (within the footprint of Building 71) for installation of piers to support the new walls and shielding in the reconfigured laboratory space. Soil and any groundwater that may be encountered would be tested for hazardous substances such as volatile organic compounds, toxic metals, PCBs, gross alpha/beta radiation, and other specific radionuclides associated with past uses inside the building (although no known soil or groundwater contamination currently exists within the area to be disturbed). Soil would then be disposed at an appropriate, permitted facility. Clean groundwater would be discharged as permitted to the storm drain system; groundwater with contaminants would be treated on-site and discharged to the sanitary sewer as permitted, or shipped to a permitted facility for treatment and disposal. Although a plume containing volatile organic solvents is down-gradient of the proposed BELLA construction site and under active remediation, this is not expected to be affected by proposed project activities.

Construction staging would take place adjacent to Building 71 on an existing paved area. Truck traffic during construction would average less than one truck per week and would fall within LBNL's construction coordination program, which ensures that cumulative truck traffic at LBNL stays below significance thresholds. Construction would begin around mid-2010 and end around the end of 2011. Installation of equipment and laboratories would take an additional year. At maximum, approximately 30 workers related to construction and installation would be on site at any one time.

Building 71 was constructed in phases from 1957 to 1974. In 2006, DOE determined that certain elements within the building – remnants of a long retired linear accelerator – had historic merit and could make the building eligible for the National Register of Historic Places. With concurrence of the State Historic Preservation Officer (SHPO), a Historic American Engineering Record was prepared in 2007 which documented the history and remaining contents of the building. LBNL was then permitted to remove the final historical accelerator remnants from the building without impact. Pursuant to the agreement with SHPO, Building 71 no longer has eligibility for listing and may now be renovated or modified without impact to historic resources.

Contamination from past activities inside Building 71 has been investigated and the majority of the hazardous substances are being cleaned up as a separate action. This is largely restricted to asbestos in the flooring and insulation, lead in paint, poly-chlorinated biphenyls (PCBs) in old electrical equipment, traces of materials used in past experiments (such as beryllium), and low-level radioactivity resulting from past accelerator operations. Contamination remaining in the architectural and structural elements to be demolished during construction would be collected and disposed of in accordance with LBNL standard policies and procedures.

Operation

Operation of accelerators at LBNL is anticipated and analyzed in the 2006 Long Range Development Plan EIR. Building 71 was constructed to house high-energy accelerators and has been used as such for the past 50 years. Nevertheless, an Environmental Assessment (EA) was prepared by the Department of Energy under the National Environmental Policy Act (NEPA) for the proposed BELLA project, in accordance with DOE's policy for all accelerators exceeding 100 million electron-volts of energy. The DOE made a Finding of No Significant Impact (FONSI) for the BELLA project on September 4, 2009.

When fully operational, the BELLA accelerator would be run on average only once per week for a six-to-eight hour period. The laser and accelerator would operate in very short pulses of about once per second. The accelerated electrons would be directed into a terminal "beam dump," which is designed to stop and contain the electrons. Although none of the laser or accelerator components, nor the accelerated electrons themselves, would be radioactive, the action of the electrons colliding into the beam dump is expected to create very low levels of ionizing radiation. This is fully accounted for in the design of the beam dump and associated shielding.

The potential environmental effects from radiation generated by the operating laser accelerator system have been analyzed by DOE and LBNL. As documented in its FONSI, DOE determined that the BELLA design and project controls proposed are more than adequate to prevent radiation exposure to humans above regulatory safety limits. For example, a full-time worker positioned outside the experimental cave at the point of highest exposure would receive less than 20 percent of the radiation allowed by the regulatory limit over the course of the year. This would be achieved through limited access, engineered interlocks, and safety controls preventing operation of the accelerator while the experimental cave was occupied. The concrete walls behind the electron beam terminus would be three feet thick, and there would be an additional 16 inches of lead, 36 inches of steel, and another 6 feet of concrete to absorb the radiation and reduce exposure levels outside the experimental "cave." Active radiation monitors outside the shielding in the wall and roof would be installed to confirm the performance of the shielding. An existing radiation monitor outside Building 71 would further monitor radiation levels outside the building.

Laser safety at LBNL is governed by regulations and also protocols developed from many past years of successful Lab laser operations. The BELLA system would present no additional risk of fire to the building or surrounding areas. The potential for effects from electro-magnetic frequency, extremely low frequency, and chemical hazards have all been considered and found to negligible.

Operationally, BELLA would add an additional five to ten employees to the Lab site (the Building 71 complex is currently occupied by 120 workers). BELLA would result in an increase of approximately one percent over the Laboratory's annual electricity consumption, and less than a one percent increase in natural gas consumption. This would be less than that consumed by historic high energy accelerators in Building 71. Greenhouse gas emissions from project construction and operations would be minimal and far less than from constructing and operating an accelerator of similar power level using conventional technology.

Conclusion

Because the proposed project would take place almost entirely within Building 71, no impacts to aesthetics, biological resources, geology, or noise are expected. A HAER report and SHPO concurrence provide that no significant cultural resources impacts would occur. Hazards, Air Quality, and Water Quality are addressed through careful analysis and design by environment, health & safety specialists, and through shielding, controls, monitoring, and adherence to regulatory requirements and protocols. The proposed project would take place in a dedicated accelerator building, and it would be consistent with LBNL's 2006 Long Range Development Plan (LRDP) and land use designation (Research and Academic Zone) for the site, as well as with LRDP population and space projections. Energy use increase would be marginal and somewhat less than historical levels in Building 71. Traffic would be limited both in terms of construction trucks (less than one per week) and operation (fewer than five to ten new employee trips per day).

The proposed project is not connected to other projects with potentially significant impacts and is not part of a proposed project that is or may be the subject of an Environmental Impact Report. There are no extraordinary circumstances related to this project.

It has been determined that this project is categorically exempt under **Class 1, Existing Facilities**, and **Class 2, Replacement or Reconstruction**. Class 1 applies because the project would create interior and some exterior "alterations involving such things as interior partitions, plumbing, and electrical conveyances" and would involve operational uses consistent with past and current uses of the building (and that are analyzed and covered under the 2006 LRDP EIR). There would be a negligible expansion of existing accelerator research uses within the building, but this would represent a decrease from historic use levels for which the building was originally designed. Class 2 applies

because existing structures, facilities, and utility systems would be replaced or reconstructed on the same site, and these would have substantially the same purpose and capacity as the structures replaced.

CEQA exceptions to Categorical Exemptions (CEQA Section 15300.2) would not apply, and there is not a reasonable possibility that the proposed project would have a significant effect on the environment due to unusual circumstances. Project activities would not be located in an environmentally sensitive area. Shielding and safety design for both lasers and accelerators are well understood, and LBNL has world-class expertise in both of these areas.