

U.S. DEPARTMENT OF ENERGY  
FINDING OF NO SIGNIFICANT IMPACT FOR THE  
BERKELEY LAB LASER ACCELERATOR (BELLA)  
LASER ACQUISITION, INSTALLATION,  
AND USE FOR RESEARCH AND DEVELOPMENT

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

**ACTION:** Finding of No Significant Impact

**SUMMARY:** The U.S. Department of Energy (DOE) has completed an Environmental Assessment (EA) (DOE/EA-1655) for the *Berkeley Lab Laser Accelerator (BELLA) Laser Acquisition, Installation, and Use for Research and Development at the Lawrence Berkeley National Laboratory*.

The ultimate goal of this undertaking is to support DOE's need to substantially reduce the size, cost, energy usage, and environmental impacts associated with future electron or positron accelerators.

Based on the results of the analysis reported in the EA, DOE has determined that the Proposed Action is not a major federal action that would significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement (EIS) is not necessary, and DOE is issuing this Finding of No Significant Impact (FONSI).

**PUBLIC AVAILABILITY:** The EA and FONSI may be reviewed, and copies of the documents obtained, at the following website and/or location:

<http://www.lbl.gov/Community/BELLA/>

U. S. Department of Energy  
Berkeley Site Office  
Lawrence Berkeley National Laboratory  
1 Cyclotron Road, MS 90-1023  
Berkeley, CA 94720  
Phone (510) 486-7909

The EA and FONSI may also be reviewed at the City of Berkeley Public Library

Berkeley Public Library  
Central Branch

2090 Kittredge  
Berkeley, CA 94704

**FURTHER INFORMATION ON NEPA PROCESS:** For further information on the NEPA process, please contact:

Gary Hartman  
NEPA Compliance Officer  
U. S. Department of Energy  
P.O. Box 2001, SE-32  
Oak Ridge, Tennessee 37831  
Phone (865) 576-0273

**DESCRIPTION OF PROPOSED ACTION:** The Proposed Action would create and operate an experimental facility for further advancing the development of laser-driven, plasma-based, particle beam accelerators. An existing, approximately 7,000 square-foot accelerator laboratory area inside Building 71 at Lawrence Berkeley National Laboratory (LBNL) would be modified to accommodate the new facility. A utility room and stairwell would be placed in an approximately 2,000 square-foot area of the Building 71 roof. The Berkeley Laboratory Laser Accelerator (BELLA) laser, laser plasma accelerator, ancillary equipment, and radiation shielding would be installed. The laser and laser plasma accelerator would be operated for research and development that would focus the laser system's laser beam pulses on the entry to a meter-long plasma channel (inside the laser plasma accelerator) to produce and accelerate an electron beam pulse to an energy level on the order of 10 giga electron-volts (GeV) within the meter length of the channel. The Proposed Action's unique attribute would be the comparatively short distance over which the laser plasma accelerator generates a 10 GeV electron beam.

**ALTERNATIVES:** The EA considered a No-Action Alternative, as well as several location and design alternatives. Assessment of the No-Action Alternative was used as a baseline to compare the impacts of the proposed action.

Other alternatives were considered but were rejected early in the process and were not assessed in the EA. These included four alternative BELLA locations in existing LBNL accelerator buildings that were considered but rejected because the buildings would need substantial upgrades, did not have available space, or were in the process of being demolished. The option of constructing a new building at LBNL for BELLA was rejected on grounds of larger cost and greater environmental impacts. Offsite

locations were rejected for the preceding reasons and because suitable accelerator facilities in the area are uncommon.

Three design alternatives were rejected due to higher cost, greater space requirements, and /or loss of existing research capabilities.

**ENVIRONMENTAL IMPACTS:** Installation of BELLA is essentially limited to modification of the internal structure of an existing building, with the exception of two small additions. Construction staging would take place on an existing paved area. As such, there would be no substantial effect on biological resources, aesthetics, noise, or air quality due either to BELLA construction, or operation. The reconstruction work would further enhance the seismic durability of the building structure. Operationally, BELLA would add an additional five to ten employees at the lab; this would cause minimal impacts to public services, utilities and traffic.

Potential environmental effects from radiation release generated by the operating laser accelerator system were addressed in the EA. DOE determines that project controls proposed for BELLA and analyzed in the EA are more than adequate to prevent exposure to the public or LBNL employees of radiation above the regulatory limits. The system and infrastructure would be designed to absorb the electron beam radiation to a level where 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. Safe operation would be achieved through limited access, engineered interlocks and safety controls preventing operation of the accelerator while the experimental cave was occupied. The west concrete cave wall would be three feet thick behind the electron beam termination and there would be an additional 16 inches of lead, 36 inches of steel, and another six feet of concrete to absorb the radiation and reduce exposure levels outside the experimental cave. The north and south walls and the roof would be 18 inches thick concrete. 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 also monitor radiation levels outside the building.

Contamination from past activities inside Building 71 has been investigated and the contamination in the areas affect by this action would be cleaned up as part of the Proposed Action. Contamination in the building includes asbestos in the structure, lead from lead paint, polychlorinated biphenyls (PCBs) from old electrical equipment, traces of

chemicals used in past experiments (such as beryllium) and low-level radioactivity resulting from past accelerator operations. Only 10 percent of the demolition waste would be expected to have some hazardous characteristics.

BELLA construction would involve excavation of soil, beneath building 71, up to 16 feet below floor level for installation of piers to support the experimental cave walls. Soil, and any groundwater that maybe encountered, would be tested for hazardous substances such as volatile organic compounds (VOCs), toxic metals, PCBs, gross alpha/beta radiation, and other specific radionuclides found inside the building. Existing contamination in groundwater and soil surrounding Building 71 is largely restricted to a plume of volatile organic solvents that is downgradient of the proposed BELLA construction site and under active remediation. This existing contamination and its remediation would not be affected by the BELLA project.

Laser safety at LBNL is governed by existing protocols developed from many past years of successful operations. The BELLA system would present no change in the risk of fire or explosion to the building or surrounding areas.

Other issues discussed in the EA included energy use (and consequent greenhouse gas emissions) for BELLA which would result in an increase of approximately one percent over the LBNL's annual electricity consumption, and less than one percent increase over the LBNL's annual natural gas consumption. This was not considered a significant impact.

**DETERMINATION:** Based on the findings of this FONSI, and after careful consideration of all public and agency comments, DOE has determined that the proposed development of BELLA does not constitute a major federal action that would significantly affect the quality of the human environment with the context of NEPA. Therefore, preparation of an EIS is not required.

Issued at Berkeley, California, this 4<sup>th</sup> day of September 2009.



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Berkeley Site Office