

United States Government

Department of Energy

Oak Ridge Office

memorandum

DATE: APR 26 2005

REPLY TO
ATTN OF: SC-TJSO:Morgan

SUBJECT: ENVIRONMENTAL ASSESSMENT DETERMINATION - PROPOSED UPGRADE AND OPERATION OF THE CEBAF AND FEL ACCELERATORS AND CONSTRUCTION AND USE OF BUILDINGS ASSOCIATED WITH THE 2004 TEN YEAR SITE PLAN

TO: Scott Mallette, Deputy Manager, Thomas Jefferson Site Office

Attached is the Environmental Assessment Determination for the proposed upgrade and operation of the Continuous Electron Beam Accelerator Facility (CEBAF), the Free Electron Laser (FEL) accelerators, and construction and use of buildings associated with the 2004 Ten Year Site Plan at the Thomas Jefferson National Accelerator Facility in Newport News, Virginia. The proposed action is considered a National Environmental Policy Act (NEPA) Non-Subpart D Determination.

Based on the analysis in the Environmental Assessment (EA), the Department of Energy will either prepare a Finding of No Significant Impact and proceed with the action or prepare an Environmental Impact Statement if the EA reveals the potential for significant environmental impacts. I am designating you as the NEPA Document Manager for this EA.

If you have any questions on NEPA compliance issues related to the proposed action, you may direct them to Gary S. Hartman, Oak Ridge Office NEPA Compliance Officer at (865) 576-0273.

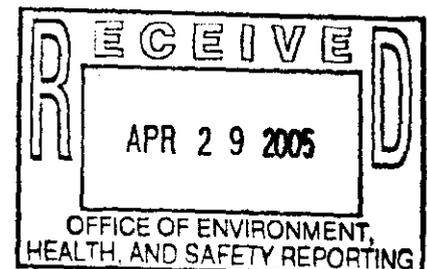

James A. Turi, Site Manager
Thomas Jefferson Site Office

Attachment

cc w/attachment:

C. Borgstrom, EH-42
C. Hickey, SC-31.1
D. Erbschloe, SC-3
D. Kovar, SC-26
J. Simon-Gillo, SC-26.2
L. Kelly, SE-30, OR
D. Allen, SE-32, OR
J. Murphy, SURA/TJNAF
G. Plummer, SURA

G. Hartman, SE-322, OR
J. Elmore, SE-322, OR
N. Carnes, CC-10, OR
B. Morgan, SC-TJSO
C. Leemann, SURA/TJNAF
C. Rode, SURA/TJNAF
A. Lang, SURA/TJNAF
✓ L. Even, SURA/TJNAF



**U.S. DEPARTMENT OF ENERGY (DOE)
ENVIRONMENTAL ASSESSMENT DETERMINATION**

**PROPOSED UPGRADE AND OPERATION OF THE CEBAF AND FEL
ACCELERATORS AND CONSTRUCTION AND USE OF BUILDINGS ASSOCIATED
WITH THE 2004 TEN YEAR SITE PLAN FOR THE THOMAS JEFFERSON
NATIONAL ACCELERATOR FACILITY, NEWPORT NEWS, VIRGINIA
(NON-SUBPART D)
TJNAF-001**

Proposed Action: Proposed upgrade and operation of the Continuous Electron Beam Accelerator Facility (CEBAF) and Free Electron Laser (FEL) accelerators and construction and use of buildings associated with the 2004 Ten Year Site Plan for the Thomas Jefferson National Accelerator Facility, (TJNAF or Jefferson Lab).

Location: The TJNAF is located in Newport News, Virginia. The site area of responsibility is approximately 171 (DOE owned and leased) acres in the coastal plain of the lower York-James Peninsula plus an estimated 6.5 acres that will be transferred by the Southeastern Universities Research Association (SURA) to DOE for construction of Hall D. The site is just south of Oyster Point Road, east of Jefferson Avenue and less than one mile to the west of Interstate 64.

Brief Description of the Proposed Action: The proposed action involves increasing the current beam energy range of the CEBAF Accelerator from a maximum energy of 8.0 GeV (billion-electron Volt) to between 12.0 and 16.0 GeV and building expansions to the North and South Access Buildings and Service Building 98; upgrading the FEL to provide between 100 kW (kilowatts) and 190 kW light power beyond the current 50 kW; construction of a second Central Helium Liquefier (CHL) facility that would be connected to the current CHL; the construction and use of a new experimental area, the Hall D complex; excavation/construction of two retention ponds; construction of two Technical Support Buildings; construction of lead and radioactive waste storage structure and several general site storage and mobile equipment storage structures; expansion of Accelerator site utilities including the construction of a 10 megawatt (MW) generator pad; and a North Connector Road extension. All of the actions summarized below are included in the Laboratory's 2004 Ten Year Site Plan.

- **Upgrading CEBAF from a maximum energy of 8.0 GeV to a range of energy from 12 to 16 GeV and expansions to the North and South Access Buildings and to Service Building 98**

The proposed action supports the design, fabrication, equipment installation, use and maintenance of an increased energy of CEBAF, an electron beam accelerator. Jefferson Lab intends to increase CEBAF's operating beam energy from the current range of 0.5 to 8.0 GeV to a maximum energy range of 12 to 16 GeV with a maximum beam power safety envelope of 2000 kW or 2 MW.

As well as Research and Development efforts, CEBAF operation at this increased energy will require machine modifications in the accelerator tunnel, its service buildings and experimental halls and will require accelerator site service building and major utility expansions. The total land disturbance for building construction would be about 16,000

square feet (sq. ft.) with the three areas to be disturbed adjacent to existing buildings. The majority of the area to be disturbed is existing asphalt pavement.

- **Upgrading the FEL from 50 kW to 190 kW light power**

The FEL, an existing laser light source, located on the lower level of the FEL Building will be upgraded to increase the power in the existing FEL accelerator from 1.6 MW to 22 MW and the infra-red (IR) laser beam power of 50 kW (operations) to a range of 100 kW to 190 kW. In addition, an ultraviolet light (UV) beam up to 20 kW (up from the current 3 kW maximum) may be produced by the FEL. The higher powers will improve the capability to perform fundamental biological measurement and material property studies of small quantities of pyrotechnic materials in the FEL User Labs.

- **Construction of a second Central Helium Liquefier (CHL #2) facility connected to the current CHL (CHL #1)**

The proposed action is the design, construction, use and maintenance of a new helium liquefaction facility (CHL #2) that includes a two-story high, single floor addition to the existing CHL facility (CHL #1), an expansion of the CHL's current industrial chilled water (ICW) system, the addition of more compressed gas storage tanks, and the extension of above ground piping systems, to expand the capability of CHL #1. CHL #2 will support CEBAF cryomodules located in the south linac and current planned FEL operations. It will have the same cooling capacity as CHL #1. CHL #2 will include new equipment, piping, and other support activities to complement the current CHL #1 facility equipment.

The actions under the CHL #2 will primarily involve pavement demolition, standard building construction, the installation of two electrical substations and a cooling tower network, storage tanks, transfer lines, and associated equipment. The action is needed to support the upgrades of CEBAF and the FEL and the new Hall D's cryogenic refrigeration needs.

This 4,800 sq. ft. building addition and new pavement would affect an estimated 10,000 sq. ft. of land. Almost all of the proposed CHL #2 activities would take place at or immediately adjacent to the existing building and transformers. The new storage tanks and cooling tower system will be further from the building but will remain within the already disturbed areas.

- **Construction and use of a new experimental area, Hall D Complex**

The proposed action of the design, construction and use of a new experimental area, Hall D would be required to make optimal use of the new CEBAF beam energy. The Hall D Complex will be composed of a tagger building, a photon hall (Hall D), a counting house, an extension of the existing accelerator tunnel (approximately 250 feet), and a few small support service buildings. This experimental area would be located eastward from the east end of the North Linac, and would maintain at least a 50 foot clearance to Canon Boulevard, a public road. The new beam line, buildings and experimental apparatus will be designed to make optimal use of the new CEBAF beam energy levels. A new

underground beam pipe would connect the CEBAF enclosure with the tagger and then the photon hall. Both one-story buildings will be shielded. The photon hall would contain the new detector and would support planned research activity that involves using a hydrogen target for studying exotic mesons and their decay products.

Construction of the new experimental area would proceed in concert with the CEBAF upgrade. The beam pipe and building construction is estimated to require approximately 17,000 sq. ft. of new facilities. A mix of already disturbed land and some undisturbed land will be affected. With access roads and parking area for about 10 vehicles, the total area to be affected is 2 to 2.5 acres.

- **East Retention Pond and West Retention Pond**

Jefferson Lab completed a site wide storm water management study in 2003. The site consists of two watershed areas. One pond in each watershed is proposed to manage the increased storm water runoff from planned construction documented in this EAD and a previous EA that will be implemented over the next 10 years. The East Retention Pond will be located east of Building 63. The West Retention Pond will be located east of Building 72. Each pond will disturb approximately 1.5 acres of grass and wooded area. Tree clearing will be required and existing storm drainage channels will need modifications.

- **Technical Support Building 1**

This project will provide for the construction of a new two-story 33,000 sq. ft. technical support facility for operations on the Accelerator site. This project was previously addressed in the 2002 NEPA DOE/EA-1384, but has been relocated and increased in size. The proposed site is at the southeast end of the Accelerator site. The facility will provide technical spaces, offices and a high bay area. This project will disturb about 2 to 2.5 acres of land, which includes parking and drive-through access to the high bay space. Utilities will be extended from an adjacent utility line, so no major utility upgrade is anticipated. The construction area is a grassed and wooded area that will be cleared as necessary. Storm drainage in the immediate area will need to be modified.

- **Technical Support Building 2**

This project will provide for the construction of a new two-story, 21,300 sq. ft. technical support facility for operations on the Accelerator site. The proposed site is at the northwest corner of the Accelerator site on the existing bulk lay-down area. The facility will provide technical spaces, offices, and a high bay area for equipment assembly. This project will disturb about 1 to 1.5 acres of land, which includes parking and drive-through access to the high bay space. Utilities will be extended from an adjacent utility line, so no major utility upgrade is anticipated. The majority of construction area is cleared and is a gravel yard. Some clearing may be necessary as required by the facility layout. Storm channels in the vicinity may need to be modified or rerouted.

- **Lead and Low-Level Radioactive Waste Handling Storage Building**

This project is for a lead and low-level radioactive waste (RAD) storage building(s) consisting of approximately 2400 sq. ft. The lead and RAD storage space will provide an enclosed space to meet both existing needs and future needs until the waste can be disposed of off site. A new access road will be constructed from an existing roadway to the new building. A continuous apron along the front of the building will allow loading and unloading access. The building will be placed on a concrete pad with perimeter grading to keep drainage moving away from the building. Required utilities will be extended from an adjacent utility line, so no major utility upgrade is anticipated. The project would disturb about 12,000 sq. ft of grassed area within the Accelerator site north of the North Linac.

- **General Site Storage Structures**

This project will provide for the construction of approximately 12,000 square feet of new general storage space consisting of a complex of five (5) – 40 ft. x 60 ft. pre-manufactured buildings to house storage of components. Two sites are being considered. The first is the existing bulk storage area near Canon Boulevard with the second behind the North Linac Service Building. The first site would not require any additional roads but has sufficient area for only three of the five buildings. The second site would require a new access road constructed along the rear of the North Linac Service Building, connecting to an existing road. A continuous apron along the front of the buildings will allow loading and unloading access to the front of each building. Each building will be placed on an individual concrete pad with perimeter grading to provide drainage away from the buildings. Required utilities will be extended from an adjacent utility line, so no major utility upgrade is anticipated for either site. The first site is currently a gravel yard. Construction of the project at the second site would disturb about 30,000 sq. ft of grassed area within the Accelerator site. A combination of the two sites may be utilized.

- **Mobile Equipment Storage Structures**

This project will provide for the construction of new equipment storage buildings in two locations. One of the proposed sites is on the Accelerator site near truck ramps for Halls A and C adjacent to the Physics Storage Building and the second site is behind the Test Lab. Each building will be a 30 ft. x 60 ft. pre-manufactured metal building, open on the front side. Each facility will include parking for up to six pieces of equipment to be housed inside each structure. Each location will provide tool storage and personnel lockers, a workbench area, and a hydraulic fluid/oil disposal and containment area. Required utilities will be extended from an adjacent utility line, so no major utility upgrade is anticipated. The project would disturb about 5,000 sq. ft of grassed area within the Accelerator site and about an additional 5,000 sq. ft. of paved area behind the Test Lab.

- **Expansion of Accelerator site utilities (including low conductivity water (LCW), industrial cooling water (ICW), tunnel air conditioning, and electrical utility systems)**

A variety of utilities will need to be upgraded to support the new operating levels at CEBAF and the FEL. This action also includes the additional resources that are needed to support the expanded CHL and the new Hall D Complex.

Accelerator Equipment Cooling: LCW and ICW: The capacity of the three CEBAF/FEL ICW cooling systems at Buildings 8 (CHL #1), 38, and 67, including the associated cooling towers and pumping systems will be expanded. The construction for these units will disturb a total of about 3,000 sq. ft of grassed and/or paved area. Fresh water used will be increased to meet the higher cooling needs resulting from the new operating levels at the accelerators.

The LCW supply and distribution system at Buildings 38 and 67 will require five additional radiofrequency (RF) zones at the North and South Linacs and ARC 10 Magnets to support the upgraded CEBAF and FEL operations, as well as the new Hall D transport line. No land area is affected, as existing equipment will be modified accordingly.

CEBAF Air Conditioning: The air conditioning of the CEBAF straight and arc tunnel environments will have to be enhanced to handle the new accelerator-generated heat loads. The air conditioning system will be optimized to handle the increased heat load and maintain acceptable conditions. Existing equipment will be augmented by providing more cooling capability as noted above and by possible use of a natural convection system. The cooling needs for the service buildings were addressed in 2003 through energy savings efforts.

Electrical: The accelerator area power grid is proposed to be expanded by adding six new substations and connecting ductwork. The construction of a 10 MW generator pad, approximately 100' x 100' in a grassed and wooded area will be included in this expansion. In addition, about 5,000 sq. ft. of land in the vicinity of existing buildings will be disturbed. Installed RF power is to be increased by 2 MW. Other changes to the accelerator's DC power supplies and spreader/recombiner magnets will be needed. The 40 MVA substation will require an expansion to accommodate the new substations for CHL #2.

- **North Connector Road Extension**

This project is to extend the North Connector Road (North of CEBAF Center) from Rutherford Road to Rattley Road. This would connect the west and east sides of the campus area together and improve access throughout Jefferson Lab. The project would disturb about 20,000 sq. ft. of wooded area.

Summary: The energy delivery capability of the accelerator has increased since 1987 when DOE issued an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for the facility. Another EA was completed by DOE in 1997 for a proposed increase in beam

energy from 4.0 GeV to 8.0 GeV, and a FONSI issued on November 5, 1997 that described the increase in operation of the CEBAF and operation of the Free Electron Laser (FEL). With this proposal, DOE intends to increase the beam energy of the CEBAF to a range of 12.0 GeV to 16.0 GeV, increase the IR beam power of the FEL to a range of 100 kW to 190 kW IR, construct and use a new experimental Hall D, and build additional buildings to support the operation of these facilities. DOE will prepare an EA analyzing these activities because of the potential for increased radiological concerns from CEBAF, FEL and Hall D operations, land disturbance, and expanded resource consumption.

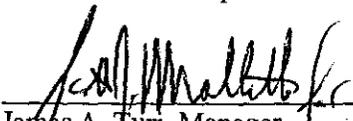
Class of Action to be applied: Non-Subpart D

Based on my review, I recommend that an EA be prepared to assess the impacts of the proposed action.



Gary S. Hartman Date
Oak Ridge Service Center NEPA Compliance Officer

Based on the recommendations of the Oak Ridge Service Center NEPA Compliance Officer, I have determined that an EA should be prepared to assess the impacts of the proposed action. Based on the analysis in the EA, DOE will either prepare a Finding of No Significant Impact (FONSI) and proceed with the action or will prepare an Environmental Impact Statement (EIS) if the EA reveals the potential for significant environmental impacts.



James A. Turi, Manager Date
TJNAF Site Office

