

**Critical Decision-3b, Approve Start of General Construction  
for the Technology and Engineering Development Facility  
at the Thomas Jefferson National Accelerator Facility**

**Office of Safety, Security and Infrastructure  
Office of Science**

**A. Purpose**

The purpose of this paper is to document the review by the Office of Science (SC) Energy Systems Acquisition Advisory Board-equivalent for the Critical Decision, “Approve Start of General Construction (CD-3b)” for the Technology and Engineering Development Facility (TEDF) Project at the Thomas Jefferson National Accelerator Facility (TJNAF).

**B. Mission Need**

The mission of the Science Laboratories Infrastructure Program within SC is to support the conduct of Departmental research missions at SC laboratories by funding line item construction to revitalize and repair the general-purpose infrastructure.

This project is needed to ensure TJNAF facilities can reliably support production of advanced cryomodules and develop enabling technologies with the quality required for the ongoing research programs and projects at TJNAF which include 6-GeV, 12-GeV, and Free Electron Laser as well as other DOE national and international projects such as the Spallation Neutron Source, the Relativistic Heavy Ion Collider, the Facility for Rare Isotope Beam, and the International Linear Collider, and sustain the current high demand for mounting numerous unique large scale particle detectors.

TJNAF occupies a position of world leadership in the field of nuclear physics. This leadership is built upon the unique properties of the Continuous Electron Beam Accelerator Facility (CEBAF), as well as an outstanding array of experimental facilities and strong theoretical support. It is essential for the continuation of this world leadership that core competencies be maintained and enhanced in:

- Nuclear physics, including experimental, theoretical, and computational physics.
- Accelerator science and technology, including radiofrequency superconductivity, high brightness, polarized electron beams, and cryogenics.

These core competencies enable TJNAF to deliver its mission, to perform a complementary role within the DOE laboratory system, and to attain its vision for scientific excellence and pre-eminence in the structure of nuclear building blocks, the structure of nuclei, and symmetry tests in nuclear physics. In addition to nuclear physics, TJNAF contributes to enabling technologies and emerging fields – photon science and electron-light ion colliders – including advanced radiofrequency superconductivity, 2K cryogenic engineering technology, photon science, advanced high power free electron lasers, energy recovering linacs, and electron-light ion collisions at ultra-high luminosity.

### C. Project Scope Baseline

The TEDF Project is located on the TJNAF site and will provide modern, 21<sup>st</sup> century technical work space, high-bay space, office space, and associated space for support functions. The design of the facility will emphasize more open, collaborative environments and flexibility to respond to future mission changes.

The scope of the project includes design, site work (including fence, parking, and gate relocation), construction of new facilities, renovation of the Test Lab building, commissioning, building demolition, and removal of trailers. The new facilities will consist of laboratories, equipment rooms, offices, and support space. In addition to the technical work space and high-bay space, the facilities will include offices for researchers, small group conference rooms, equipment areas, restrooms, circulation space, and needed supporting infrastructure. The key performance parameters for the project are:

- Construction of a new 65,000 to 80,000 gsf Technology and Engineering Development (TED) building.
- Construction of a new 25,000 to 40,000 gsf Test Lab building Addition.
- Renovation of the Test Lab building (approximately 90,000 gsf).
- Demolition of 7,000 to 10,000 gsf of inadequate and obsolete work space in and adjacent to the Test Lab building, and 2,000 to 12,000 gsf of dilapidated trailers.

The CD-3a scope included site preparation, structural steel purchase, Test Lab south wall preparation, replacement of the guardhouse, and construction of the process support building. The CD-3b scope includes all remaining work to complete the project and address the key performance parameters.

### D. Project Cost and Schedule

The Total Project Cost is \$73.2M. Table 1 shows the funding profile for this project.

**Table 1 – Funding Profile (\$000)**

FY	Total Estimated Cost		Other Project Costs	Total Project Cost
	Project Engineering and Design	Construction		
2008			300	300
2009	3,700		700	4,400
2010		27,687		27,687
2011		20,800		20,800
2012		20,013		20,013
<b>Total</b>	<b>3,700</b>	<b>68,500</b>	<b>1,000</b>	<b>73,200</b>

The schedule baseline is shown in Table 2.

**Table 2**

CD-0	Approve Mission Need	September 2007 (A)
CD-1	Approve Alternative Selection and Cost Range	September 2008 (A)
CD-2	Approve Performance Baseline	November 2009 (A)
CD-3a	Approve Start of Early Procurement Package	March 2010 (A)
CD-3b	Approve Start of General Construction	September 2010
CD-4a	Approve Start of Operations – New Construction	March 2012
CD-4b	Approve Start of Operations – Renovation	March 2014

CD-4b, “Approve Start of Operations - Renovation,” is scheduled for March 2014, which includes 15 months of schedule contingency.

The baseline cost estimate is shown in Table 3. A portion of the \$11.7M cost contingency will be used at award of the construction bid packages for critical upgrades to the Ultra Pure Water and acid handling systems and for award of high value bid alternates. This will leave an estimated \$9.0M of cost contingency (or 15.4 percent on cost to go). A baseline change proposal will be processed after CD-3b approval to incorporate the final Construction value.

**Table 3 - Cost Estimate (\$)**

<b>WBS</b>	<b>Description</b>	<b>Cost</b>	<b>Total Cost</b>
<b>1.1</b>	<b>Project Planning</b>		<b>\$ 1,000,000</b>
1.1.1	Conceptual Planning	\$ 800,000	
1.1.2	Planning	\$ 200,000	
<b>1.2</b>	<b>Engineering and Design</b>		<b>\$ 3,639,000</b>
1.2.1	Design Services	\$ 2,956,000	
1.2.2	Pre-Construction Services	\$ 537,000	
1.2.3	Pre-Construction Project Management	\$ 146,000	
<b>1.3</b>	<b>Construction</b>		<b>\$ 56,821,000</b>
1.3.1	Conventional Facilities Construction	\$ 52,659,000	
1.3.2	Furnished Furniture/Equipment	\$ 1,964,000	
1.3.3	Construction Management Services	\$ 1,491,000	
1.3.4	Project Management	\$ 707,000	
<b>Total Contingency (21.1% on costs to go)</b>			<b>\$11,740,000</b>
	Engineering and Design Contingency	\$ 61,000	
	Construction Contingency	\$ 11,680,000	
<b>Total Estimated Cost</b>			<b>\$ 72,200,000</b>
<b>Other Project Cost</b>			<b>\$ 1,000,000</b>
<b>Total Project Cost</b>			<b>\$ 73,200,000</b>

## **E. Acquisition Strategy**

The JLab Management and Operating (M&O) Contractor, Jefferson Science Associates, LLC (JSA), under the direction, guidance, and oversight of DOE Thomas Jefferson Site Office (TJSO), is managing a Fixed-Price Architectural-Engineering (A/E) Design subcontract, and a Fixed-Price Construction Management/General Contractor (CM/GC) subcontract that consists of two phases (described below). JSA will also manage any other service-type subcontracts required by JLab in the execution of this project.

The A/E was awarded as a fixed price subcontract that utilizes the design-to-cost clause. The A/E prepared all drawings, calculations, and specifications for the construction activity. The A/E coordinated with the CM/GC during the final design phase and will provide support during the construction phase.

The subcontract with the CM/GC is for two phases of fixed-price work. Phase 1 was for the CM/GC to provide support services to the A/E, including input regarding material selection, equipment, construction feasibility, and factors relating to construction, and cost estimates including cost estimates of alternative designs or materials. The CM/GC also provided cost validation and schedule validation services, and provided recommendations designed to minimize adverse effects of labor or material shortages; and time requirements for procurements, installation and construction completion to JLab. Phase 2 is to execute the construction project, including the management, ES&H oversight, and the administration of construction subcontracts. Phase 2 is inclusive of all material, labor, equipment, etc. necessary to perform the work in accordance with the contractual requirements in order to meet the defined scope and schedule.

All work performed by the CM/GC is monitored by JLab personnel, with support from the A/E. The TJSO provides oversight to ensure safety, quality, and baseline performance.

## **F. Environmental Strategy**

No environmental issues have been identified that would significantly impact this project. The environmental risk is low. The project will comply with all requirements of the NEPA and its implementing regulations. An Environmental Assessment (EA) including the elements of this project was completed in December of 2006 and a Finding of No Significant Impact (FONSI) was issued in January of 2007. A NEPA Analysis was completed in May of 2009 to address the evolution of the project since the FONSI was issued. The NEPA Compliance Officer made a determination that additional NEPA documentation is not required. Construction of the new facilities and renovation has been coordinated with JLab operations and will not impact ongoing research at TJNAF.

TJNAF has implemented an Environmental Management System (EMS). Requirements of the EMS flow down to construction subcontracts. Oversight of construction activities will be conducted by JLab to ensure subcontractors are in compliance with EMS requirements. Throughout construction, environmentally sensitive construction practices

will be followed to reduce site disturbance, minimize construction waste, and improve indoor air quality. As a LEED registered project, the Technology and Engineering Development Facility construction project will include erosion and sedimentation control plans. Waste management requirements will include recycling and waste minimization actions.

#### **G. Hazards Analysis**

A Hazard Analysis (HA) report has been issued for the TEDF project. It identifies construction hazards and operational hazards and mitigation plans for the hazards. The operational hazards are due to work activities and building design features associated with the usage of the new buildings. The HA report serves as the basis for planning physical and administrative controls to protect the health and safety of workers, contractors, and the environment. A project specific ES&H Plan per 10 CFR 851 has been prepared for the CD-3a phase of work.

#### **H. Energy Conservation and Sustainable Design**

Sustainable design features have been incorporated into the TEDF Project as required by the Energy Policy Act of 2005 and DOE Order 430.2B, Departmental Energy, Renewable Energy and Transportation Management including incorporation of the Guiding Principles of Executive Order 13423 to the extent practical and life cycle cost effective. The design will achieve energy savings of a least 30 percent below ASHRAE Standard 90.1-2004, if cost-effective. The highest possible LEED certification will be pursued consistent with the budget and performance goals of this project. A preliminary LEED Checklist for New Construction has been completed in conjunction with the design.

#### **I. Risk Management**

A Risk Management Plan (RMP) has been issued for the TEDF project that identifies the potential risks and provides a comprehensive strategy for management of these risks. The objective of the plan is to proactively identify and manage project related risks throughout the project's life cycle. The mitigation of risks minimizes their impact on the project's cost and schedule as well as on the facility's operational performance.

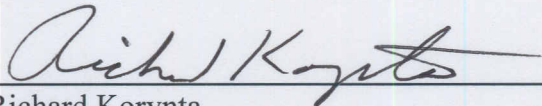
The RMP includes a risk registry that indicates assigned responsibilities of the project personnel in performing the risk management actions. The risk registry will be updated monthly to contain all comprehensive risk information as the project progresses. The RMP will be maintained to ensure that the project incorporates appropriate, efficient and cost-effective measures to handle project risk and to address and successfully manage any new risks that may surface during the execution of the project.

The risks anticipated during construction of the proposed facilities are typical of standard building design and construction. The risks associated with this project and acquisition strategy are judged to be manageable.

Quantitative risk analysis, including Monte Carlo simulation, was utilized to assess the impact of the identified risks on the project cost and schedule, and provide an evaluation of the level of confidence in achieving the project cost and schedule objectives. The probability of success of the TEDF project is considered high based on these analyses. The analysis indicated that adequate schedule and budget contingency exists for the successful completion of the project within the desired objectives.

Technology and Engineering Development Facility at the  
Thomas Jefferson National Accelerator Facility  
CD-3b Review

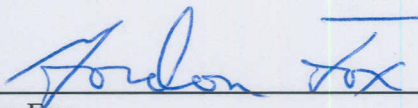
Submitted by:

  
Richard Korynta  
Federal Project Director  
Thomas Jefferson Site Office

7-29-10  
Date

  
Scott J. Mallette  
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7/29/10  
Date

  
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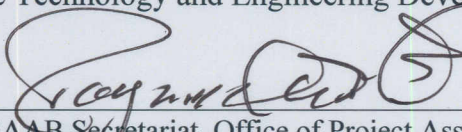
8/3/10  
Date



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**Recommendations:**

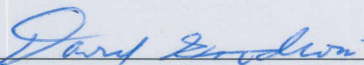
The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of CD-3b, for the Technology and Engineering Development Facility as noted below.

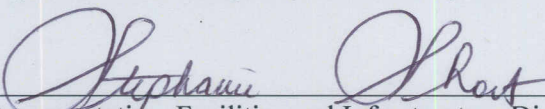
 8/4/10 Yes  No   
 ESAAB Secretariat, Office of Project Assessment Date

 8/4/10 Yes  No   
 Representative, Non-Proponent SC Program Office Date

\_\_\_\_\_  
 Representative, Office of Budget Date Yes  No

\_\_\_\_\_  
 Representative, Environmental, Safety and Health Division Date Yes  No

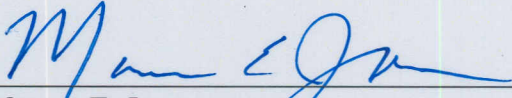
 8/4/10 Yes  No   
 Representative, Safeguards and Security Division Date

 8-4-10 Yes  No   
 Representative, Facilities and Infrastructure Division Date

\_\_\_\_\_  
 Representative, Grants and Contracts Division Date Yes  No

**Approval:**

Based on the information presented above and at this review, Critical Decision 3b, Approve Start of General Construction, is approved and authorization is provided to start General Construction.

 8/4/2010  
 Marcus E. Jones Date  
 Associate Director of Science for  
 Safety, Security and Infrastructure