



**Department of Energy**  
Thomas Jefferson Site Office  
12000 Jefferson Avenue  
Newport News, Virginia 23606

November 16, 2007

Dr. Christoph W. Leemann  
President and Laboratory Director  
Jefferson Science Associates, LLC  
Thomas Jefferson National Accelerator Facility  
12000 Jefferson Avenue  
Newport News, VA 23606

Dear Dr. Leemann:

### **12 GeV CEBAF UPGRADE PROJECT CRITICAL DECISION 2 APPROVAL**

Please accept my congratulations on the 12 GeV CEBAF Upgrade Project achieving the significant milestone of approval of Critical Decision 2, "*Approve Performance Baseline*" (CD-2). Enclosed is the CD-2 approval by Dr. Orbach. The 12 GeV CEBAF Upgrade project now has a formally approved performance baseline, with a Total Project Cost of \$310 million and a CD-4B completion date of June 2015.

I also want to extend my personal appreciation for the professionalism and dedication of the 12 GeV CEBAF Upgrade Project Team, as well as the many other JLab contributors, and project collaborators. Everyone should be extremely proud of their contribution to this significant accomplishment. I am confident that the Project can continue this success and will be well positioned for CD-3, "*Approve Start of Construction*," approval in September 2008.

Please also extend my sincere appreciation to Claus Rode and Allison Lung for their untiring dedication to the Project and for successfully leading the Project in addressing the numerous CD-2 requirements, as well as playing pivotal roles addressing the various opportunities from the various CD-2 reviews.

Sincerely,

A handwritten signature in black ink that reads "James A. Turi".

James A. Turi, Manager  
Thomas Jefferson Site Office

Enclosure

cc w/o encl:  
J. Simon-Gillo, SC-26.2  
J. Hawkins, SC-26.2  
C. Rode, TJNAF  
A. Lung, TNAF  
J. May, SC-TJSO  
S. Mallette, SC-TJSO

**Office of Nuclear Physics  
Office of Science**

**CD-2, Approve Performance Baseline  
for the  
12 GeV CEBAF Upgrade Project**

**A. Purpose**

The purpose of this paper is to document the review by the Office of Science Energy Systems Acquisition Advisory Board-equivalent for the Critical Decision “Approve Performance Baseline (CD-2)” for the 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) Upgrade Project at the Thomas Jefferson National Accelerator Facility (Jefferson Lab).

**B. Mission Need**

The CEBAF at Jefferson Lab is the world-leading facility in the experimental study of hadronic matter. The 12 GeV CEBAF Upgrade directly addresses a major scientific opportunity identified in both the 2002 and the forthcoming 2007 Long Range Plans in which the Nuclear Science Advisory Committee (NSAC) recommends the 12 GeV CEBAF Upgrade as one of its highest priorities for the Nuclear Physics program. The project was identified as a high priority initiative in the Office of Science’s plan, “Facilities for the Future of Science: A Twenty Year Plan”. Mission Need (Critical Decision – Zero (CD-0)) was approved in March 2004.

**C. Project Performance Scope Baseline**

The scope of this project is to upgrade the maximum electron energy of the main accelerator from 6 GeV to 12 GeV, build a new experimental area (Hall D) with instrumentation dedicated to the study of gluonic excitations, enhance the capabilities in the existing experimental halls (Hall A, B, & C) to support the most compelling nuclear physics research, and upgrade the infrastructure to support higher energy requirements including the Central Helium Liquefier. Hall D will be able to accommodate the 12 GeV beam generated in 5.5 passes of the machine. The existing halls will have the upgraded capability to receive up to an 11 GeV beam generated in five passes of the machine.

**D. Project Performance Cost and Schedule Baseline**

The Total Project Cost (TPC) and Total Estimated Cost (TEC) are \$310M and \$287.5M, respectively, with a scheduled completion by June 2015 based on the following funding profile.

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Fiscal Year	Planned Budget Authority Profile (\$ in Millions)		
	TEC	OPC	TPC
2004		0.7	0.7
2005		2.3	2.3
2006	0.5	4.0	4.5
2007	7.0	2.5	9.5
2008	13.5	1.0	14.5
2009	28.5		28.5
2010	59.0		59.0
2011	62.0		62.0
2012	66.0		66.0
2013	40.5	2.5	43.0
2014	10.5	7.5	18.0
2015		2.0	2.0
Total	\$287.5	\$22.5	\$310.0

The following list is the baseline Level 1 Milestone dates for the 12 GeV CEBAF Upgrade project.

Schedule

	<u>Completion</u>
CD-0 (Mission Need) Approval	March 2004 (A)
CD-1 (Alternative Selection & Cost Range) Approval	February 2006 (A)
CD-2 (Performance Baseline Total Project) Approval	December 2007
CD-3 (Start of Construction) Approval	September 2008
CD-4A <sup>1</sup> (Accelerator Project Completion) Approval	December 2014
CD-4B (Experimental Equipment Project Completion) Approval	June 2015

**E. Performance Baseline Reviews**

In June 2007, The Office of Project Assessment formed an Independent Project Review (IPR) panel and conducted a technical, cost, schedule, and management review. In September 2007, the Office of Engineering and Construction Management (OECM) conducted an External Independent Review (EIR). The performance baseline incorporates the project's response to review recommendations.

**F. Project Controls and Reporting Systems**

Cost, schedule and technical performance will be monitored using an earned-value process that is described in the Jefferson Lab Project Control System Manual. The Change Control process is documented in Section 6.0 of the Project Execution Plan. The Federal Project Director (FPD) will provide quarterly reports on the project to the Acquisition Executive, the Office of Project

<sup>1</sup> The Project Execution Plan delegates approval of CD-4A to the Associate Director of the Office of Science for Nuclear Physics. Final CD-4 (CD-4B) remains with the Acquisition Executive (Director, Office of Science).

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Assessment (OPA), the NP Program Office, and the Office of Engineering and Construction; and provide monthly updates to the Project Assessment and Reporting System (PARS). The core integrated project team (IPT) will meet weekly and hold monthly conference calls with executive leadership to assess progress. In addition, the Jefferson Lab 12 GeV Project Manager will hold monthly meetings with the FPD and provide formal monthly reports which will include the cause and corrective action for any variances. Monitoring of the 12 GeV CEBAF Upgrade project will occur through established mechanisms among project participants. Reviews of the project status are anticipated to be conducted by the SC Office of Nuclear Physics and OPA on an annual basis.

### **G. Acquisition Strategy**

The choice of the acquisition approach is mainly dictated by the nature of the project. With the exception of Hall D, the project is an integrally coupled upgrade of the existing CEBAF. Therefore, it cannot be easily decoupled from the operating contractor without introducing significant project interface requirements and associated additional project costs and inefficiencies. All acquisitions will be managed by Jefferson Science Associates, LLC (JSA) with appropriate DOE oversight. The procurement practice is to use firm fixed-price purchase orders and subcontracts for supplies, equipment and services, and to make awards through competitive solicitations. Additional details can be found in the 12 GeV CEBAF Upgrade Acquisition Strategy that was approved by the Acquisition Executive in February 2006. A Contractor Acquisition Plan will be developed in accordance with O 413.3A requirements and submitted to DOE for concurrence.

### **H. Environmental Strategy**

National Environmental Policy Act (NEPA) documentation is required to fully assess the impact to the environment, workers, and the public. With the exception of Hall D, construction will take place in existing developed areas. Impacts to the environment are anticipated to be minimal. Modification to other buildings will be minimal with respect to environmental impact. In compliance with NEPA, an Environmental Assessment (EA) was developed for this project. A Finding of No Significant Impact (FONSI) was approved on January 30, 2007 by the Thomas Jefferson Site Office Site Manager.

### **I. Safety & Health**

All phases of the 12 GeV CEBAF Upgrade project will be carried out in accordance with the Jefferson Lab Environment, Health and Safety (EH&S) policies and procedures as documented in the Jefferson Lab "EH&S Manual" including obeying all local, state and federal regulations. The laboratory has as one of its guiding principles, the protection of the health and safety of its employees, contractors and the public. With the exception of the Hall D complex, construction will take place in existing developed areas (e.g., accelerator tunnel, Halls A/B/C, Central Helium Liquefier (CHL), and North & South Access Buildings).

### **J. Hazard Assessments**

JLab is classified as an Unclassified, Non-Nuclear, Low-Hazard Accelerator Facility, and therefore is exempt from DOE nuclear order requirements; i.e., neither a Preliminary Hazard

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Analysis Report nor a Hazard Analysis Report is required. However, DOE O 420.2B, "Safety of Accelerator Facilities" requires accelerator facilities like Jefferson Lab to develop a Safety Assessment Document (SAD) and an Accelerator Safety Envelope (ASE). In support of developing the SAD and ASE, the 12 GeV CEBAF Upgrade Project developed a Preliminary Hazard Assessment for CD-1 and it has been revised to a Hazard Assessment for CD-2.

#### **K. Risk Management**

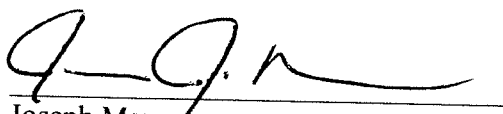
Overall the technical, cost, and schedule risks of the 12 GeV CEBAF Upgrade are categorized as low. Most of the technology for the accelerator, conventional construction, and experimental equipment is already in use at Jefferson Lab and based on proven technologies. This project is being designed to utilize the SRF expertise unique to Jefferson Lab which has been developed during the lifetime of the laboratory. A 12 GeV CEBAF Upgrade R&D Plan has been developed and is being carried out to mitigate any risk associated with remaining open technical issues and to achieve further cost optimization where possible.

#### **L. Sustainable Building Design**

The building design process will utilize sustainable building design principles and will involve maintenance and operations personnel during reviews. The design of buildings is being evaluated against the U.S. Green Building Council's LEED (Leadership in Energy & Environmental Design) design goals. Energy and water conservation, minimization of waste, and use of recycled and recyclable materials are the major areas of focus because most of the new space houses equipment versus personnel. Procurement documents will incorporate waste disposal and recycle requirements. Though the design is being evaluated against LEED, LEED certification will not be pursued. The LEED rating system is primarily designed to guide and distinguish high-performance commercial and institutional projects, with a focus on office buildings and not buildings of the nature being constructed as part of this project.

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Submitted by:



Joseph May  
DOE 12 GeV Federal Project Director  
Thomas Jefferson Site Office  
Office of Science

11/5/07  
Date



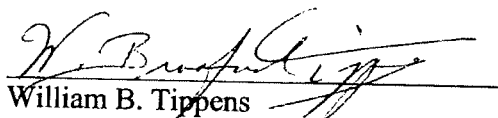
James Turi  
Manager  
Thomas Jefferson Site Office

11/5/07  
Date



James C. Hawkins  
DOE 12 GeV Program Manager (Acting)  
Office of Nuclear Physics

11/6/07  
Date



William B. Tippens  
Program Manager for  
Medium Energy Nuclear Physics  
Office of Nuclear Physics

11/6/07  
Date



Jehanne Simon-Gillo  
Acting Associate Director of the Office of Science  
for Nuclear Physics

11/8/07  
Date

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**Recommendations**

The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of CD-2, Approve Performance Baseline, for the 12 GeV CEBAF Upgrade at Thomas Jefferson National Accelerator Facility as noted below.

\_\_\_\_\_  
ESAAB Secretariat, Office of Project Assessment Date

Yes \_\_\_ No \_\_\_

\_\_\_\_\_  
Representative, Non-Proponent SC Program Office Date

Yes \_\_\_ No \_\_\_

*Kathleen Klausig* \_\_\_\_\_ *11/9/07*  
Representative, Office of Budget Date

Yes  No \_\_\_

\_\_\_\_\_  
Representative, Environmental, Safety and Health Division Date

Yes \_\_\_ No \_\_\_

\_\_\_\_\_  
Representative, Safeguards and Security Division Date

Yes \_\_\_ No \_\_\_

*[Signature]* \_\_\_\_\_ *11-9-07*  
Representative, Infrastructure Division Date

Yes  No \_\_\_

\_\_\_\_\_  
Representative, Office of Grants and Contracts Date

Yes \_\_\_ No \_\_\_

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**Recommendations**

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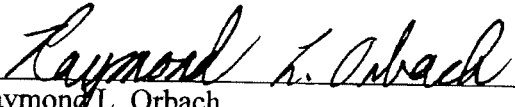
_____ ESAAB Secretariat, Office of Project Assessment	Date	Yes ___ No ___
<i>David Goodwin</i> _____ Representative, Non-Proponent SC Program Office	11/21/07 Date	Yes <input checked="" type="checkbox"/> No ___
_____ Representative, Office of Budget	Date	Yes ___ No ___
_____ Representative, Environmental, Safety and Health Division	Date	Yes ___ No ___
<i>David Goodwin</i> _____ Representative, Safeguards and Security Division	11/29/07 Date	Yes <input checked="" type="checkbox"/> No ___
_____ Representative, Infrastructure Division	Date	Yes ___ No ___
_____ Representative, Office of Grants and Contracts	Date	Yes ___ No ___

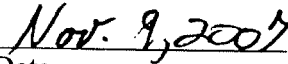


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**Approval**

Based on the information presented above and at this review, Critical Decision-2, Approve Performance Baseline, is approved. Therefore, the Thomas Jefferson Site Office is authorized to continue expenditure of funds for the design of the 12 GeV CEBAF Upgrade at Thomas Jefferson National Accelerator Facility.

  
\_\_\_\_\_  
Raymond L. Orbach  
Director  
Office of Science

  
\_\_\_\_\_  
Date