

**Office of Basic Energy Sciences  
Office of Science**

**CD-3, Approve Start of Construction  
for the  
Center for Functional Nanomaterials (CFN)  
A Nanoscale Science Research Center  
at Brookhaven National Laboratory**

**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 Start of Construction (CD-3)” for the Center for Functional Nanomaterials (CFN), a Nanoscale Science Research Center (NSRC) at Brookhaven National Laboratory (BNL).

**B. Mission Need**

The Center for Functional Nanomaterials (CFN) will serve as the nucleus of an integrated BNL program in nanoscience. It will facilitate major new directions in BNL’s materials and chemical research programs, and greatly expand the capabilities available to a national user base, thereby increasing university and industrial interactions. The Center will enable the Nation to focus efforts in nanoscience and technology via promoting complementary, interdisciplinary work, including the Chemistry Department, the Materials Science Department, Condensed Matter Physics, the Instrumentation Division, the National Synchrotron Light Source Department, and the Biology Department. The Center will also integrate Nanoscale research with existing synchrotron capabilities in a broad range of techniques, including hard and soft x-ray scattering and spectroscopy, with new materials synthesis and nanofabrication capabilities including theory and modeling. The Center will serve as a focal point for collaborations, enabling studies of functional materials at the nanoscale involving academia and private industry. The CFN will be a highly collaborative unique National User facility for nanoscience.

The scientific goal of the CFN is to understand the chemical and physical response of nanomaterials, with the challenge being to attain the level of understanding needed to tailor or design new classes of functional materials. The CFN’s programs will exploit the unique electronic and optical properties of nanoparticles and molecular nanoarrays to design chemical systems with specific functionality for diverse, energy-related applications such as catalysis, photo-induced energy conversion and storage, and molecular conductors. Another science emphasis will be to examine the behavior and fundamental properties of functional nanocomposite materials including ferro-electrics, and magnetic and superconducting thin films to provide insights into their future applications. This capability and focus are complementary to the other planned NSRCs; it capitalizes on the National Synchrotron Light Source (NSLS) leadership in new materials probes; and it builds on the strengths of BNL’s BES programs in (1) strongly correlated electron systems, (2) catalysis, (3) molecular materials, (4) electrochemistry, and (5) nanostructure in complex functional materials.

**C. Project Performance Scope Baseline**

The CFN performance scope baseline consists of the CFN building, and procurement and installation of an initial set of specialized scientific equipment needed to support research activities in Nanoscience. The facility will be a new building of about 94,500 gross square feet (gsf) located across the street from the existing NSLS. The CFN facility will consist of a two-story building housing state-of-the-art clean rooms; wet and dry laboratories for sample preparation, fabrication, and analysis; office space for BNL staff and users; and conference rooms. The excess facility offset requirement will come from the “space bank” accumulated by BNL since FY2002 through the Excess Facility Disposal Program.

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

The performance baseline Total Estimated Cost (TEC) of \$79.7 million and performance baseline Total Project Cost (TPC) of \$81million are based on receiving the following funding levels (in thousands of dollars):

Fiscal Year	Total Estimated Cost		Other Project Costs	TPC
	Project Engineering & Design	Construction	Conceptual Design, NEPA, Hazard Analysis, Other, and Pre-Operations	Total
Prior			300	300
2003	988			988
2004	2,982			2,982
2005	1,996	18,317		20,313
2006		36,553		36,553
2007		18,864	500	19,364
2008			500	500
	5,966	73,734		
<b>Total</b>	<b>79,700</b>		<b>1,300</b>	<b>81,000</b>

The performance schedule baseline is as follows:

CD-0	Approve Mission Need	June 2002 (A)
CD-1	Approve Alternative Selection and Cost Range	July 2003 (A)
CD-2	Approve Performance Baseline	May 2004 (A)
CD-3	Approve Start of Construction	April 2005
CD-4a	Approve Start of Initial Operations	April 2007
CD-4b	Approve Start of Full Operations	April 2008

### **E. Final Design, Procurement Package, and Execution Readiness Independent Project Review**

The Center for Functional Nanomaterials final design drawings were completed in January, 2005 and the conventional facilities procurement bid package (IFB) was issued in March, 2005. A bid opening was held in April, 2005 and all bids were over the government estimate. A recovery plan was developed and approved by the BES Program Office. A re-bid was held on July 14, 2005. The qualified low bidder (below the government estimate) is awaiting contract award pending CD-3 approval. November, 2004, the Office of Science conducted an Execution Readiness Independent Project Review (IPR). The project team has adequately responded to the Independent Project Review action items and recommendations based on the draft closeout report from the review.

### **F. Safety Documentation**

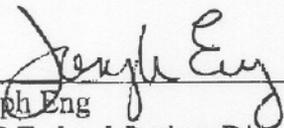
The CFN Preliminary Hazard Analysis Report identifies potential hazards associated with construction and operation of the Center for Functional Nanomaterials. Through an iterative process, the analysis leads to actions that ensure that the project is designed, constructed, and operated to protect the safety and health of the workers, the public, and the environment. The report is based on surveys, current chemical and gas inventory projections, and interviews with CFN scientific leadership and future users of the facility. Planning quantities of hazardous materials were developed and compared against regulatory thresholds. The hazards assessment addresses the broad range of hazards and a brief description of how such hazards are controlled (e.g., relevant procedures) at BNL. A Fire Hazards Analysis Report has also been prepared for the CFN. The documents reference BNL Integrated Safety Management (ISM) procedures and processes as well as regulatory requirements that govern CFN operations.

### **G. Risk Assessment/Plan**

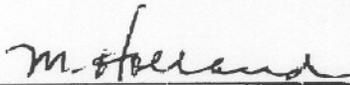
The Center for Functional Nanomaterials Risk Management Plan provides a comprehensive overview of how risk will be managed throughout the project such that there is acceptable, minimal impact on the project's cost and schedule as well as on the facility's operational performance. The plan defines the methodology used in building the risk mitigation assessments and describes roles and responsibilities for team members, including monitoring and reporting requirements of the process. Risks are reviewed regularly and at key points in the project, and probability and impact are reevaluated as appropriate. The Risk Management Plan provided valuable input to a modeling process that affirmed budget and schedule contingencies.

Center for Functional Nanomaterials at BNL  
CD-3 Review

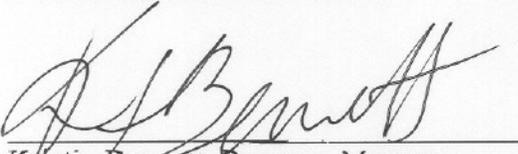
Submitted by:

  
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Aug 1, 2005  
Date

  
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Michael D. Holland, Manager  
DOE Brookhaven Site Office

8/1/05  
Date

  
\_\_\_\_\_  
Kristin Bennett, Program Manager  
Office of Basic Energy Sciences  
Office of Science

8/5/05  
Date

**Recommendations**

The undersigned "Do Recommend" (Yes) or "Do Not Recommend" (No) approval of CD-3, Approve Start of Construction, for the Center for Functional Nanomaterials at BNL as noted below.

8/2/05 Yes  No   
ESAAB/Secretariat, Construction Mgmt Support Division Date

8/2/05 Yes  No   
Representative, Non-Proponent SC Program Office Date

8/2/05 Yes  No   
Representative, Financial Mgmt. Division Date

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

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Representative, Security Mgmt. Team Date

8/2/05 Yes  No   
Representative, Laboratory Infrastructure Division Date

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Representative, Grants and Contracts Division Date

**Approval**

Based on the material presented above and at this review, Critical Decision-3, Approve Start of Construction, is approved. Therefore, the Brookhaven Site Office is authorized to expend construction funds when they are in a HQ approved funding program for the Center for Functional Nanomaterials, a Nanoscale Science Research Center.

8/5/2005  
Patricia M. Dehmer Date  
Associate Director of the Office of Science  
Director, Office of Basic Energy Sciences  
Office of Science