07-SC-06, National Synchrotron Light Source II (NSLS-II)
Brookhaven National Laboratory, Upton, New York
Project Data Sheet is for PED/Construction

1. Significant Changes

The most recent DOE O 413.3A approved Critical Decision (CD) is CD-3, Start of Construction, which was approved on January 9, 2009, with a Total Project Cost (TPC) of $912,000,000.

A Federal Project Director has been assigned to this project. The Federal Project Director is pursuing the appropriate certification level.

This PDS is an update of the FY 2009 PDS.

2. Design, Construction, and D&D Schedule

	CD-0	CD-1	(Design/PED Complete)	CD-2	CD-3	CD-4
FY 2007	08/25/2005	1Q FY 2007	4Q FY 2008	TBD	TBD	TBD
FY 2008	08/25/2005	2Q FY 2007	2Q FY 2009	TBD	TBD	TBD
FY 2009	08/25/2005	07/12/2007	2Q FY 2009	2Q FY 2008	2Q FY 2009	3Q FY 2015
FY 2010	08/25/2005	07/12/2007	2Q FY 2009	01/18/2008	01/09/2009	3Q FY 2015

CD-0 – Approve Mission Need
CD-1 – Approve Alternative Selection and Cost Range
CD-2 – Approve Performance Baseline
CD-3 – Approved Start of Construction
CD-4 – Approve Project Completion

	D&D Start	D&D Complete	Performance Baseline Validation
FY 2007	N/A	N/A	—
FY 2008	N/A	N/A	—
FY 2009	N/A	N/A	12/11/2007
FY 2010	N/A	N/A	12/11/2007

D&D Start – Not Applicable to this project
D&D Complete – Not Applicable to this project

3. Baseline and Validation Status

(dollars in thousands)

	TEC, PED	TEC, Construction	TEC, Total	OPC Except D&D	OPC D&D	OPC, Total	TPC
FY 2007	75,000	TBD	TBD	TBD	TBD	TBD	TBD
FY 2008	75,000	TBD	TBD	TBD	TBD	TBD	TBD
FY 2009	60,000	731,200	791,200	120,800	—	120,800	912,000
FY 2010	60,000	731,200	791,200	120,800	—	120,800	912,000

4. Project Description, Justification, and Scope

The National Synchrotron Light Source II (NSLS-II) will be a new synchrotron light source, highly optimized to deliver ultra-high brightness and flux and exceptional beam stability. It will also provide advanced insertion devices, optics, detectors, robotics, and an initial suite of scientific instruments. Together, these will enable the study of material properties and functions with a spatial resolution of about 1 nm, an energy resolution of about 0.1 meV, and the ultra-high sensitivity required to perform spectroscopy on a single atom.

The NSLS-II project will design, build, and install the accelerator hardware, experimental apparatus, civil construction, and central facilities including offices and laboratories required to produce a new synchrotron light source. It includes a third generation storage ring, full energy injector, experimental areas, an initial suite of scientific instruments, and appropriate support equipment, all housed in a new building.

Major advances in energy technologies will require scientific breakthroughs in developing new materials with advanced properties. A broad discussion is given in several recent reports, including the Basic Energy Sciences (BES) Advisory Committee reports entitled *Opportunities for Catalysis in the 21st Century, Basic Research Needs to Assure a Secure Energy Future, Basic Research Needs for the Hydrogen Economy*, and *Basic Research Needs for Solar Energy Utilization*, in addition to the report of the Nanoscale Science, Engineering, and Technology Subcommittee of the National Science and Technology Committee entitled *Nanoscience Research for Energy Needs*.

Collectively, these reports underscore the need to develop new tools that will allow the characterization of the atomic and electronic structure, the chemical composition, and the magnetic properties of materials with nanoscale resolution. Needed are non-destructive tools to image and characterize structures and interfaces below the surface, and these tools must operate in a wide range of temperature and harsh environments. The absence of any tool possessing these combined capabilities was identified as a key barrier to progress in the 1999 BES report *Nanoscale Science, Engineering and Technology Research Directions*.

In order to fill this capability gap, the Office of Science has determined that its mission requires a synchrotron light source that will enable the study of material properties and functions, particularly materials at the nanoscale, at a level of detail and precision never before possible. NSLS-II will provide these capabilities. Only x-ray methods have the potential of satisfying all of these requirements, but advances both in x-ray optics and in x-ray brightness and flux are required to achieve a spatial resolution of 1 nm and an energy resolution of 0.1 meV.

There are no alternative tools with a spatial resolution of 1 nm and energy resolution of 0.1 meV that also have the required capabilities of being non-destructive and able to image and characterize buried structures and interfaces in a wide range of temperatures and harsh environments. An analysis found that upgrading existing light sources was either impossible or not cost effective. In the case of NSLS-I, it was found that it would be impossible to upgrade this light source due to numerous technical difficulties, including accelerator physics and infrastructure constraints, such as its small circumference, which limit the feasible in-place upgrade options.

The key performance parameters are defined in the project execution plan. The NSLS-II project is expected to: deliver an electron energy of 3.0 giga-electron volts with a stored current of 25 milliamps; build a third generation storage ring of approximately one half mile in circumference and experimental and operations facilities with a total conventional construction of approximately 400 thousand gross square feet; and include an initial suite of six beamlines ready for commissioning.

Research and development activities funded under Other Project Costs will address technical risk in several key areas including energy resolution, spatial resolution, and storage ring magnets.

Project Engineering and Design funds were used to complete the detailed design, including detailed estimates of construction based on the approved design, final working drawings and specifications, and schedules for construction and procurements.

FY 2009 construction funds will be used to start the civil construction activities and continue progress on the NSLS-II systems components (e.g. magnet development, storage ring vacuum chambers, and radio frequency systems).

The American Recovery and Reinvestment Act of 2009 (Recovery Act) funds will be used to accelerate the civil construction activity as well as advance some major procurements in the project timeline. In FY 2009, the Recovery Act funds will be used to accelerate the ring building civil construction contract activities and several major infrastructure improvements that support the NSLS-II project.

In FY 2010, funds will be used to continue civil construction and advancing experimental and accelerator systems.

The project will be conducted in accordance with the project management requirements in DOE Order 413.3A, Program and Project Management for the Acquisition of Capital Assets.

5. Financial Schedule[a]

(dollars in thousands)

	Appropriations	Obligations	Recovery Act Costs	Costs
Total Estimated Cost (TEC)				
PED				
FY 2007	3,000	3,000	—	2,292
FY 2008	29,727	29,727	—	28,205
FY 2009	27,273	27,273	—	27,508
FY 2010	—	—	—	1,995
Total, PED	60,000	60,000	—	60,000
Construction				
FY 2009	66,000	66,000	—	52,211
FY 2009 Recovery Act	150,000	150,000	8,740	—
FY 2010	139,000	139,000	114,198	49,000
FY 2011	151,600	151,600	27,062	218,934
FY 2012	151,400	151,400	—	166,343
FY 2013	46,900	46,900	—	61,969
FY 2014	26,300	26,300	—	27,255
FY 2015	—	—	—	5,488
Total, Construction	731,200	731,200	150,000	581,200

[a] The costing profile is based on the current execution plan which does not reflect the impact of accelerated funding under the Recovery Act. The execution plan will be reevaluated during the upcoming year and the cost profile will be updated.

(dollars in thousands)

	Appropriations	Obligations	Recovery Act Costs	Costs
TEC				
FY 2007	3,000	3,000	—	2,292
FY 2008	29,727	29,727	—	28,205
FY 2009	93,273	93,273	—	79,719
FY 2009 Recovery Act	150,000	150,000	8,740	—
FY 2010	139,000	139,000	114,198	50,995
FY 2011	151,600	151,600	27,062	218,934
FY 2012	151,400	151,400	—	166,343
FY 2013	46,900	46,900	—	61,969
FY 2014	26,300	26,300	—	27,255
FY 2015	—	—	—	5,488
Total, TEC	791,200	791,200	150,000	641,200
Other Project Cost (OPC)				
OPC except D&D				
FY 2005	1,000	1,000	—	—
FY 2006	4,800	4,800	—	4,958
FY 2007	22,000	22,000	—	20,461
FY 2008	20,000	20,000	—	15,508
FY 2009	10,000	10,000	—	10,773
FY 2010	2,000	2,000	—	5,500
FY 2011	1,500	1,500	—	4,100
FY 2012	7,700	7,700	—	7,600
FY 2013	24,400	24,400	—	24,500
FY 2014	22,400	22,400	—	22,400
FY 2015	5,000	5,000	—	5,000
Total, OPC except D&D	120,800	120,800		120,800
Total Project Cost (TPC)				
FY 2005	1,000	1,000	—	—
FY 2006	4,800	4,800	—	4,958
FY 2007	25,000	25,000	—	22,753
FY 2008	49,727	49,727	—	43,713
FY 2009	103,273	103,273	—	90,492
FY 2009 Recovery Act	150,000	150,000	8,740	—
FY 2010	141,000	141,000	114,198	56,495
FY 2011	153,100	153,100	27,062	223,034
FY 2012	159,100	159,100	—	173,943

(dollars in thousands)

	Appropriations	Obligations	Recovery Act Costs	Costs
FY 2013	71,300	71,300	—	86,469
FY 2014	48,700	48,700	—	49,655
FY 2015	5,000	5,000	—	10,488
Total, TPC	912,000	912,000	150,000	762,000

6. Details of Project Cost Estimate

(dollars in thousands)

	Current Total Estimate	Previous Total Estimate	Original Validated Baseline
Total Estimated Cost (TEC)			
Design (PED)			
Design	60,000	49,000	49,000
Contingency	—	11,000	11,000
Total, PED	60,000	60,000	60,000
Construction			
Site Preparation	9,243	9,243	9,243
Equipment	32,078	31,579	31,579
Other Construction	518,635	518,381	518,381
Contingency	171,244	171,997	171,997
Total, Construction	731,200	731,200	731,200
Total, TEC	791,200	791,200	791,200
Contingency, TEC	171,244	182,997	182,997
Other Project Cost (OPC)			
Conceptual Planning	24,800	24,800	24,800
Research and Development	35,800	35,800	35,800
Start-Up	50,200	50,200	50,200
Contingency	10,000	10,000	10,000
Total, OPC	120,800	120,800	120,800
Contingency, OPC	10,000	10,000	10,000
Total, TPC	912,000	912,000	912,000
Total, Contingency	181,244	192,997	192,997

7. Schedule of Project Costs

For Schedule of project costs, see Section 5, “Financial Schedule.”

8. Related Operations and Maintenance Funding Requirements

Beneficial Occupancy of the Experimental Floor	4Q FY 2012
Expected Useful Life (number of years)	25
Expected Future start of D&D of this capital asset (fiscal quarter)	N/A

(Related Funding Requirements)

(dollars in thousands)

	Annual Costs		Life cycle costs	
	Current Estimate	Prior Estimate	Current Estimate	Prior Estimate
Operations	119,400	119,400	4,470,000	4,470,000
Maintenance	21,100	21,100	789,000	789,000
Total Operations and Maintenance	140,500	140,500	5,259,000	5,259,000

9. Required D&D Information

	Square Feet
Area of new construction	~ 400,000
Area of existing facilities being replaced	N/A
Area of any additional space that will require D&D to meet the "one-for-one" requirement	NA (see below)

The existing facility (NSLS) will be converted to another use. The one-for-one replacement has been met through completed and planned elimination of space at Brookhaven National Laboratory (BNL) along with "banked" space at the Massachusetts Institute of Technology (MIT) in Middleton, MA, and at the East Tennessee Technology Park (ETTP) in Oak Ridge, TN. A waiver from the one-for-one requirement to eliminate excess space at Brookhaven to offset the NSLS-II project was approved by Secretary Bodman on April 20, 2007. The waiver identified approximately 460,000 square feet of banked excess facilities space that were eliminated in FY 2006 at MIT and ETTP.

10. Acquisition Approach (formerly Method of Performance)

The acquisition strategy selected relies on the BNL management and operating (M&O) contractor to directly manage the NSLS-II acquisition. The acquisition of large research facilities is within the scope of the DOE contract for the management and operation of BNL and consistent with the general expectation of the responsibilities of DOE M&O contractors.

The design, fabrication, assembly, installation, testing, and commissioning of the NSLS-II project will largely be performed by the BNL NSLS-II scientific and technical staff. Much of the subcontracted work to be performed for NSLS-II consists of hardware fabrication and conventional facilities construction. Each system or component will be procured using fixed price contracts, unless there is a compelling reason to employ another contract type. Best-value competitive procurements will be employed to the maximum extent possible.

Many major procurements will be either build-to-print, following BNL/NSLS-II drawings and specifications, or readily available off-the-shelf. Source selection will be carried out in accordance with

DOE-approved policies and procedures. Acquisition strategies will be chosen to obtain the best value based on the assessment of technical and cost risks on a case-by-case basis. For standard, build-to-print fabrications and the purchase of off-the-shelf equipment for routine applications, available purchasing techniques include price competition among technically qualified suppliers and use of competitively awarded blanket purchase agreements.

The architect-engineer (A-E) contract was placed on a firm-fixed-price basis for the Final (Title II) Design and (Title III) construction support services. The general construction contract will be placed on a firm-fixed-price basis. The design specifications are sufficiently detailed to allow prospective constructors to formulate firm-fixed-price offers without excessive contingency and allowances.

NSLS-II project management has identified major procurements that represent significant complexity or cost and schedule risk. Advance procurement plans (APPs) are being prepared for each major procurement. The APPs include discussion of contract type, special contracting methods, special clauses or deviations required, and lease or purchase decisions. These final APPs will identify critical procurement activities and help to mitigate or avoid schedule conflicts and other procurement-related problems. At appropriate dollar levels, the APPs are approved by the responsible Division Director, the NSLS-II Procurement Manager, the NSLS-II Deputy Director, and the NSLS-II Project Director.