National Synchrotron Light Source II

Project Progress Report

December 2011

At dusk on the last workday of 2011, newly installed outdoor lighting casts a festive glow.

report due date:
January 20, 2012

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BROOKHAVEN NATIONAL LABORATORY

OVERALL ASSESSMENT

The National Synchrotron Light Source II project continued to maintain satisfactory performance by completing over $211M of planned work during calendar year 2011. By the end of December the project was more than 69% complete, with about 35% of contingency and management reserve for the remaining Budget At Completion (BAC). The cumulative Schedule Performance Index (SPI) for the overall project is 0.96; the cumulative Cost Performance Index (CPI) is 1.00.

Construction of the ring building continues its excellent progress with beneficial occupancy for pentant 4 of the ring building occurring in December and rapid progress in construction of all five lab–office buildings (LOBs).

Excellent progress was made in the production, delivery, and installation of magnets, linac, booster, power supplies, vacuum, RF, and cryogenic systems. Installation of linac components was completed and all of the magnets for the linac-to-booster transfer line (LtBTL) have been delivered and are being installed. The first shipment of the booster components arrived at BNL and magnet production continued to make excellent progress, with over 66% of work being completed. Installation and acceptance testing of accelerator subsystems are making healthy progress in pentants 1, 2, 3, the RF building, the injector building, and the computer room. Nine magnet girders were installed in the storage ring and the installation team is gearing up to start double-shift girder integration work. Installation of mechanical and electrical utilities and support systems, including water, power supply, RF, shielding, and controls systems continued. The contract for one of the in-vacuum undulators (IVU) was awarded, and damping wiggler (DW) production is making excellent progress.

Good progress continued with many procurement packages for the six Project beamlines and preparation work for the utilities that are required before hutches and beamline components can be installed.

Activities funded by the American Recovery and Reinvestment Act (ARRA) continue on schedule and on budget.

UPCOMING EVENTS 2012

ALD's Conceptual Design Review for ABBIX Project	Jan 17–18
Final Design Review (FDR) of Hutches	Jan 24
Review of Incorporation of IDs into NSLS-II Lattice	Jan 26–27
Accelerator Systems Advisory Committee	Feb 1-2
DOE Mini-Reviews of NSLS-II Project	Feb 7
Accelerator Readiness Review (ARR)	Feb 27–29
Science Advisory Committee	Mar 15–16
Project Advisory Committee	Mar 29–30
ALD's Preliminary Design Review for NEXT Project	Apr 5–6
DOE Review of NSLS-II Project	Apr 17–19
DOE Review of NSLS-II Pre-Operations Budget	May 14–16
DOE CD-2 Review of NEXT Project	Jun 5–7

ACCELERATOR SYSTEMS

Injector. After the generation of long bunch trains was successfully demonstrated, the linac front end was uninstalled at Building 729 and moved to the NSLS-II linac tunnel. All linac components are now complete, delivered, and installed in the NSLS-II linac vault.

Production of components for the NSLS-II booster synchrotron at BINP went well. The first container with components has arrived at BNL. Many dipole magnets are complete or nearly complete. The second container with five complete girders left port in late November and should arrive in January. Other components such as vacuum chambers and small power supplies are well advanced. The first horizontally focusing combined-function dipoles are completed and will be delivered to BNL. In general, progress with the booster is quite satisfactory.

All magnets for the linac-to-booster transfer line have been received and are being installed on the girders (Fig. 1). Diagnostics and vacuum components for the LtBTL are ready for installation in the first week of January, with a survey to follow.

Figure 1. Magnets for the linac-to-booster transfer line being installed.

Orders for the ceramic beam pipes of the storage ring injection kicker magnets have been placed.

The Insulated-Gate Bipolar Transistor (IGBT)-based pulser for the first kicker magnet assembly was finished on Dec. 22. This device has 4-series IGBT stages and will be able to produce pulses of 3.2 to 4 KV. Testing is in progress for inter-stage timing jitter and long-term drift, pulse current stability, pulse shape, and the ability to produce pulses of the required voltage and currents.

Magnet production and girder integration. NSLS-II magnet production progressed well in December. All production lines are active. More than 400 magnets have been produced and shipped. Approximately 66% of all magnet work is complete, including partially finished magnets at the suppliers with coils and yokes completed. All magnets for the LtBTL inside the linac tunnel have been delivered (Fig. 2), and the first magnet was measured in Building 902.

Figure 2. Magnet girders being installed in the tunnel.

The magnet-girder integration has proceeded well. A total of nine girders have been integrated and transported to the tunnel. Storage ring cell 25 now has all five girders installed. Double-shift girder integration work is planned, based on a detailed schedule utilizing all available experience.

Vacuum. Four long-cell chambers were assembled, baked, and vacuum certified in December, bringing the total available chambers to 117. One dipole and three multipole girders were successfully assembled and baked this month. Preparation for C25 cable termination and pump-down continues. Vacuum chassis for pentant 2 vacuum racks were installed. All the beam pipes and supports for the LtBTL are available for installation. Vacuum chassis for LtBTL phase I were installed and cables terminated at the chassis end.

Four production RF gate valves were received and are being evaluated. The quotes for production orders of all photon absorbers were received from suppliers and from BNL Central Shops. More than 70% of vacuum gauge controllers, 50% of TSP controllers, and 50% of RGA systems were received. Orders for the balance of vacuum cables were placed. The LtBTL vacuum programmable logic controller (PLC) was received from Budker. The prototype storage ring vacuum PLC was also received and is being tested.

Power supplies. The main power supply entered the final design phase at the manufacturer. Approximately 70% of the power supply controller main boards and 79% of all power supply regulators that are integrated in their chassis have been received; testing is underway. The power supply interface modules are now 75% complete. The production of AC amplifiers has begun and first articles will be received in March. The fast corrector power supply underwent successful preproduction tests and production is being initiated. The fourth delivery of production power converters was received in December. The project has received 80% of all power converters. Last deliveries will be early in January. The procurement for the AC input power modules is completed. All shelves, hardware, and power modules for each component are at hand.

Insertion devices. The DW production has made progress. Components of the magnet assembly parts were machined. Structural frames and mechanical drive systems made good progress at Nortemecanica, Danfysik's subcontractor for the mechanical carriage. Danfysik has agreed to accommodate the project's design change to facilitate transport stabilizers mounted to the air caster outriggers. Design details between the DW and DW vacuum chamber are being addressed directly by the two manufacturers, Danfysik and FMB. On the 4 m-vacuum vessel seal test, the first tests of the aluminum wire seal have been completed successfully, confirming that aluminum seals are a reasonable approach to sealing the IVU in the ring. This is important for in-situ measurement on the IVU. The final contracts for IVU20 and IVU21 have been signed after a number of small modifications. The RFP for IVU22 has been published. Issues with the price of permanent magnets for the three-pole wiggler have been resolved by using spare material from the DW production.

Installation. To complete the linac for commissioning in March, efforts concentrated on the injector. Process chilled water systems have been made available for pentants 1 and 2 and the injector building. The electrical and mechanical utility infrastructure and cables in the linac and the klystron gallery have been installed. The linac personnel protection system installation is complete and testing is in progress. LtBTL installation is well advanced. Support systems, beam dumps, magnets, diagnostic elements, and radiation shielding were installed in the linac tunnel. All diagnostic cables have been installed and terminated. A large number of the power supplies for the LtBTL have been installed in their racks. Controls hardware was installed in the injector equipment room (Fig. 3). All linac hardware is in place. In the RF building, the deionized water system and the electrical infrastructure are complete. The two 500 MHz klystron transmitters are completely installed and are ready for testing. In the storage ring, electrical utilities are being installed in pentant 2 and equipment enclosures have been installed in pentant 3.

Figure 3. Nearly completed linac installation.

EXPERIMENTAL FACILITIES

Work continues on many procurement packages for the beamline optical components. Significant numbers of bids are either out with potential suppliers, in evaluation, or in contract negotiation. Hutch work continues with the manufacture of the first hutches, for CSX and HXN. The final design review for the second batch of hutches is planned for January. Delivery of the first hutches will occur in early March. The utilities required for the beamlines will be installed as soon as the hutches are completed. Staff are working on component specifications for the utilities, and a mock-up of a 6-ft section of wall is under construction.

IXS. Specifications and statements of work (SOWs) for the KB Mirror System have been approved and the RFP is scheduled for January release. The specifications for the first optical enclosure package are being finalized. The team completed the preliminary design of the base mechanism of the IXS spectrometer and drafted a specifications document.

In crystal optics R&D, the "trapezoid flexure mechanism" designed to achieve 10 nrad angular resolution for the 4B monochromator ("mono," Fig. 4) was tested using in-house metrology tools. Preliminary test data indicate that it meets specifications. In January, further tests will be carried out with x-rays at SPring-8.

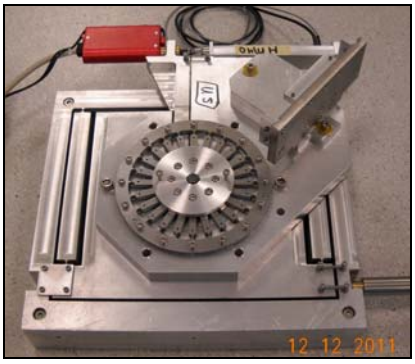


Figure 4. The 4B mono mechanism attached to the trapezoid flexure.

CHX. The CHX optics bids arrived in late November and are being evaluated. The diffractometer RFP was released December 2 with a due date of February 3. The CHX team has continued work on an in-house conceptual design for a 15 m-long, small-angle x-ray scattering (SAXS) table that will enable speckle detection with next generation CMOS pixel detectors (~80 μm pixel size). The table's unique capabilities include a wide accessible scattering wavevector range (up to ~1 $Å^{-1}$ at 15 m from the sample and up to ~3 $Å^{-1}$ at 5 m from the sample), as well as capabilities for simultaneous in-situ combined SAXS and wide angle scattering (WAXS).

CSX. Procurement packages for the toroidal mirrors, monochromators, and M3A mirror are being finalized. The next procurement packages will be for the remaining optics components and the beamline diagnostics.

HXN. The HXN team began holding biweekly conference calls with the contractor of the HXN Beamline Component Package after a kick-off meeting on December 8. The team approved the quality plan submitted by the contractor and discussed engineering details for the white beam mirror, which requires the longest fabrication time. For nanofocusing R&D, the HXN team completed construction of a prototype multilayer Laue lens (MLL) microscope, to be tested in experiments at beamline I13L of the Diamond Light Source.

XPD. The contract for the XPD double Laue monochromator (DLM) is in its pre-award negotiation phase. Bidding on the XPD beamline components, which include the high resolution monochromator but not the DLM nor the vertically focusing mirror (VFM), closed on December 6 with selection of the preferred source. The RFP for the XPD VFM will soon be released. Discussions are underway with the selected supplier regarding the baseline and options and their associated cost. The SOW and specification documents for the XPD diffractometer are being written.

SRX. Four companies submitted proposals in mid December for design, construction, and installation of the SRX optics package components; those bids are now under evaluation. Because adequate cooling of the first crystal of the double-crystal monochromator is absolutely crucial to beamline performance, FEA calculations have been undertaken to validate the data submitted by the suppliers. Endstation design is in progress. The KB mirror system RFP has been released to bidders.

Optical metrology. Fabrication of the gantry for the nano-radian surface profiler is progressing well; its delivery is expected to be on schedule at the end of January 2012. Most components for the first optical head have been ordered (penta-prism, polarizing beam splitter, and high resolution autocollimator). The mechanical design of the stitching platform using the 4-inch FIZEAU interferometer is finished, and mechanical parts are in fabrication.

Optics fabrication. Fabrication of two 4-bounce channel-cut monochromators was completed for use within the IXS group (Fig. 5). Pitch polishing will begin after procurement of a "pitch-pot" for pouring heated pitch.

MLL fabrication efforts continue to focus on sectioning, using a combination of reactive-ion etching and focused ion beam milling. An MLL grown with 10% nitrogen has been sectioned to a thickness of 43 μm and width of 3 to 5 microns; it contains 6,510 zones (Fig. 6). The sectioned MLL will be tested by the HXN group at the next available beamtime.

RIE-FIB MLL lens. Nitrogen reactive sputtering is used to reduce film stress, but resulting temperature fluctuations in the optics lab led to inconsistent growth rate of the crystals. The problem seems to have been solved by modifying the HVAC system's RTD feedback controller and ensuring proper local insulation.

Figure 5. 4-B mono pair for IXS.

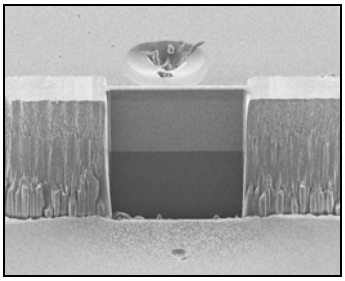


Figure 6. Sectioned MLL.

CONVENTIONAL FACILITIES

Conventional construction continued its excellent progress during December. Beneficial occupancy was taken for pentant 4 of the ring building on December 21, and the last area, pentant 5, will be ready for beneficial occupancy as scheduled. Construction of all five LOBs continues to progress rapidly, with erection of structural steel for the final LOB, 5, (Fig. 7) completed at the end of December. Contributing to the excellent progress has been unseasonably warm winter weather.

Figure 7. In LOB 5, steel erected; floor pour insulated for controlled curing.

The ring building contractor is nearing completion of all major work scope. Pentant 4 was substantially complete in mid December, and pentant 5 is nearing completion with start-up of electrical and mechanical systems in progress and finalization of architectural finishes underway. The lobby is essentially complete but is awaiting permanent power from pentant 5 so final testing of the elevator and HVAC can be done. With the likely substantial completion of pentant 5 in February 2012, all major contract work for the ring building will be completed. Remaining work will include resolution of all punchlist items, completion of system commissioning and operator training, delivery of remaining operations and as-built documents, and some final sitework that could not be completed during winter conditions. Following completion of all physical work at the site, demobilization and contract closeout will commence.

The LOBs continue to make excellent progress. Temporary enclosure of LOB 1 is complete, enabling the use of temporary heat to allow interior finish work to proceed (Fig. 8). The roof is complete, most glazing is installed, and exterior siding installation will begin in January. Mechanical, electrical, and architectural finish work is progressing well.

LOB 3 is the next most advanced, with most of the envelope complete (not including exterior siding) and interior partitions, mechanical, and electrical underway. The loading dock work is shown in Figure 9.

LOB 2 follows, with roofing underway and sheathing and glazing in progress (Fig. 10). LOB 4 steel and concrete are complete, and interior partition work will commence in January.

Figure 8. LOB 1 drywall installation is underway.

Figure 9. LOB 3 loading dock apron installation in progress.

Figure 10. LOB 2 exterior sheathing, roofing, and glazing underway.

LOB 5 structural steel erection is complete and concrete will be completed in January. The LOB workforce is at near-peak activity. The coordination of work between the ring building and LOB contractors with ongoing accelerator installation continues to progress well, with minimal interference or disruption. Any work performed by the contractors in occupied areas is managed by a work permit system, to ensure safety of the workers and minimize potential disruption of on-going accelerator installation work.

ENVIRONMENT, SAFETY, AND HEALTH

Beneficial occupancy readiness evaluations (BOREs) have been completed for pentants 1, 2, 3, and 4; RF compressor; injection buildings; and the cooling tower. The final BORE for pentant 5 (mid February) will complete the ring building turnover from construction to operations. A formal Lessons Learned report for the BORE process is being prepared.

The Booster Safety Assessment Document and Accelerator Safety Envelope underwent an internal Photon Sciences Directorate review and a Lab Safety Committee review. Approval by BHSO is expected in February, approximately one month ahead of schedule. Lessons learned during the development of linac documentation have streamlined this process. Authorization basis documentation for the storage ring is now underway. Progress continues on documentation needed for a successful commissioning Accelerator Readiness Review (ARR), including operational procedures, emergency procedures, and training and qualifications criteria. These tasks are on schedule to be completed in January. The linac ARR is now scheduled for February 27–29, 2012. A web site has been established for the ARR team to give them access to documentation necessary for the review. This web site is available through the NSLS-II project pages:

http://www.bnl.gov/nsls2/project/reviews/AccelReadinessRev2011/default.asp

While much of the high-risk construction activity for the ring building is complete, increased emphasis is being given to safety as the contractor demobilizes. Historically, this phase of a construction project results in increased injuries and claims. Enhanced communications and job planning are being implemented to minimize this risk.

ESH staff has been meeting with the contractors to discuss lessons learned from the ring-building project. These lessons learned will be documented and shared with the LOB contractor and the laboratory.

PROCUREMENT ACTIVITIES

The RFP for the IXS Beamline IVU was posted on FedBizOps in December, with proposals due in late January. Proposals for the CHX Beamline Optical Components Package were received in late November. Responses are in evaluation and award is expected by the end of January. The XPD Beamline Components and the SRX Beamline Optics Components proposal packages were received in December. Proposals are in evaluation and awards are expected to be made by the end of January or early February. Proposals for the Double Laue Monochromator were received the first week of November. The proposals are in evaluation and award is expected to be made in late January. The RFP due date for the CHX Beamline Diffractometer has been extended to early February. The following awards were made in December: Storage Ring In-Vacuum Undulator, HXN Beamline Components, and the SRX Beamline In-Vacuum Undulator.

COST/SCHEDULE BASELINE STATUS

The cumulative Cost Performance Index (CPI) for the overall project is 1.00 and cumulative Schedule Performance Index (SPI) remains at 0.96, both well within the acceptable range. The project is 69% complete, with 31% of contingency and management reserve, based on EAC work remaining.

The project current-period SPI is 0.87, due to continued positive schedule performance for Conventional Facilities (CF) construction, where work has been completed ahead of the baseline, and to an improvement in December's SPI for Accelerator Systems Division (ASD), now at 0.93 (-$530K). The injection systems and storage ring experienced positive schedule performance, offsetting negative monthly schedule performance in controls, safety systems, and insertion devices. Cumulative SPI for ASD remains at 0.85 (-$30.3M). The CF cumulative SPI continues ahead of schedule at 1.03 ($7M).

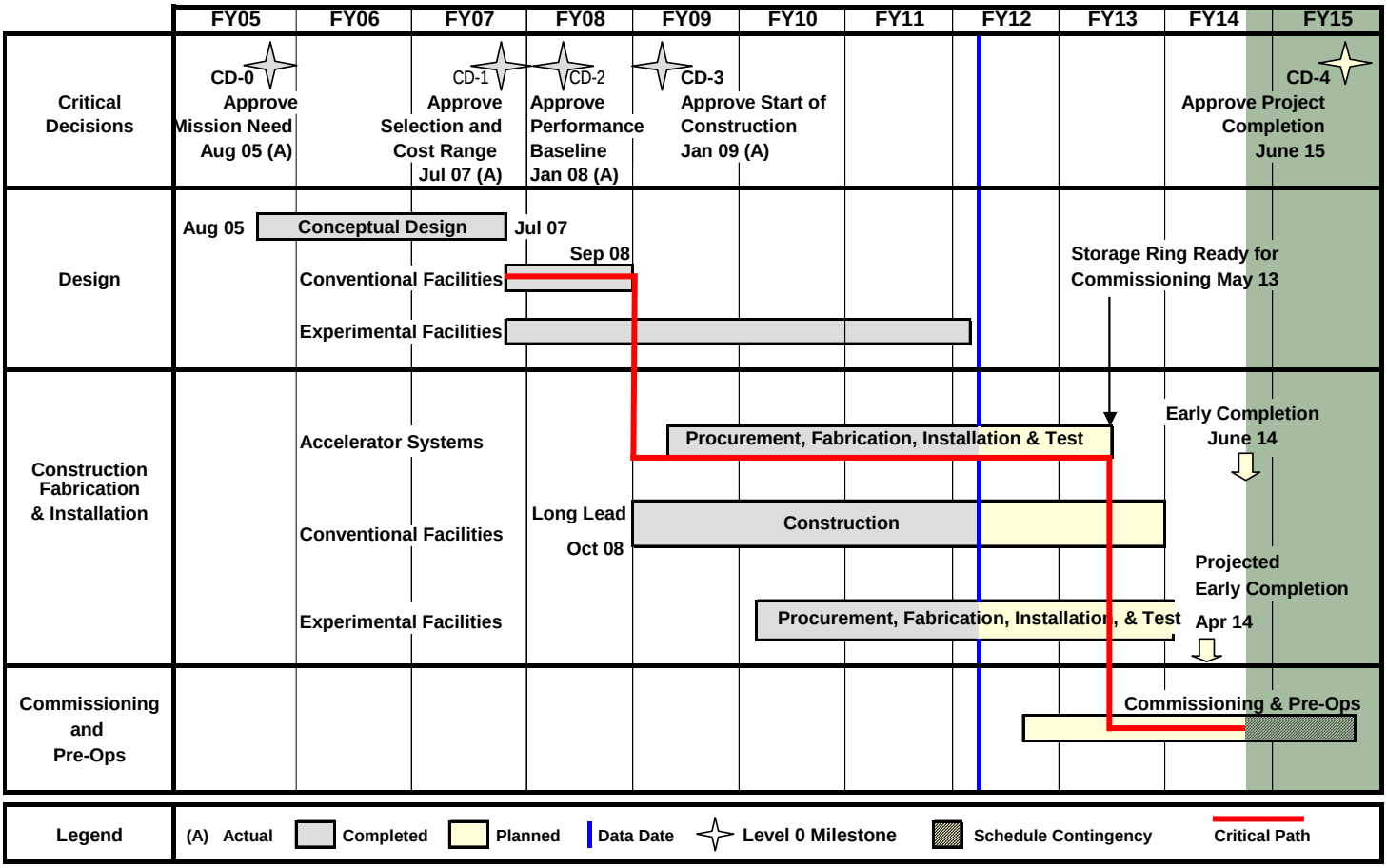
Experimental Systems (ES) variance for the month was negative for schedule performance, with a current-month SPI of 0.81 (-$202K), and positive for cost performance with a current-month CPI of 1.22 ($154K). This is due primarily to hutch fabrication being slightly behind schedule for two of the beamlines. However, the ES cumulative cost and schedule performance continues to be positive, with CPI 1.01 ($118K) and SPI 0.96 ($834K).

The critical path for the project has slightly changed since last month. Activities on the critical path include 35 mm dipole magnet deliveries; pentant 5 girder assembly, bakeout, and installation; P5 connect PS & instrumentation, cables survey, and alignment; subsystem test diagnostics; EPU installation; integrated tests; and commissioning of the storage ring. Due to late delivery of the first production run of the 35 mm dipole magnets, the projected early completion date for the project has been pushed out one month, to April 2014. There are 14 months of float between the project early completion milestone and CD-4, with approximately 33% schedule contingency.

Figure 11. LOB 1 curtain wall installation nears completion.

The NSLS-II project is being carried out to design and build a world-class user facility for scientific research using synchrotron radiation. The project scope includes the design, construction, and installation of the accelerator hardware, civil construction, and experimental facilities required to produce a new synchrotron light source. It will be highly optimized to deliver ultra-high brightness and flux and exceptional beam stability. These capabilities will enable the study of material properties and functions down to a spatial resolution of 1 nm, energy resolution of 0.1 meV, and with the ultra-high sensitivity necessary to perform spectroscopy on a single atom.

DOE Project Milestone Schedule



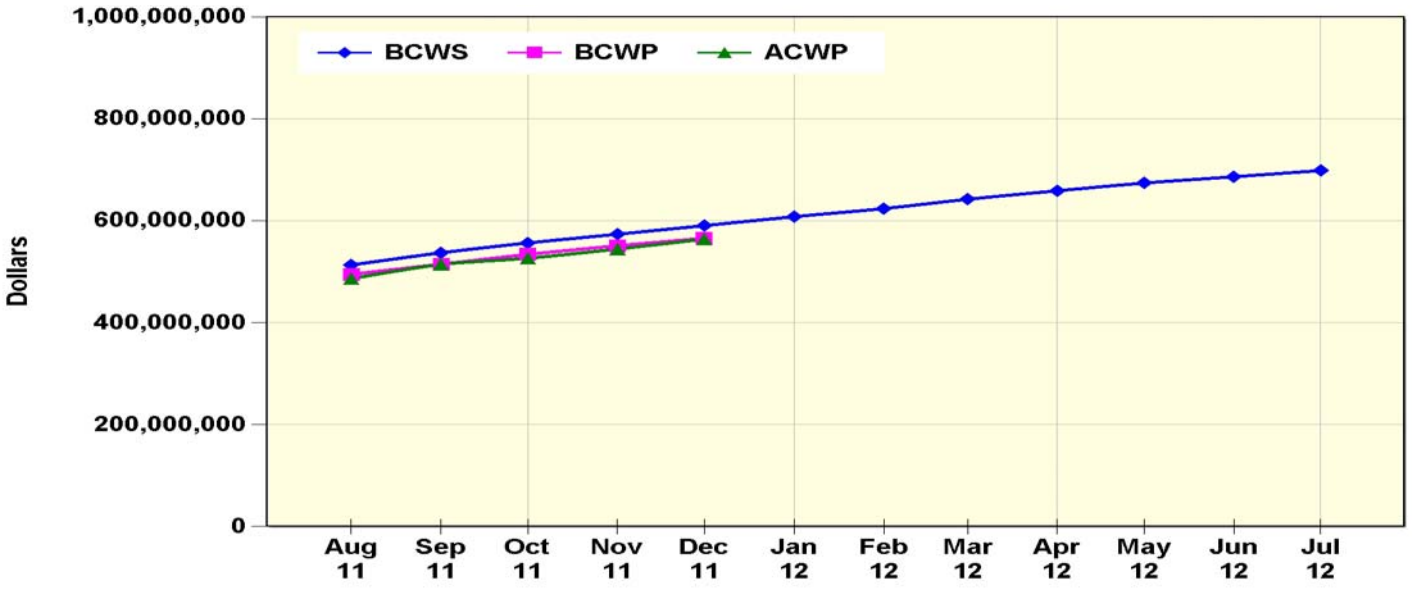
Funding Profile

	NSLS-II Funding Profile ($M)											
Funding Type	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	TOTAL
R&D			3.0	20.0	10.0	2.0	0.8					35.8
OPC	1.0	4.8	19.0									24.8
PED			3.0	29.7	27.3							60.0
Construction					216.0	139.0	151.3	151.4	47.2	26.3		731.2
Pre-Ops							0.7	7.7	24.4	22.4	5.0	60.2
Total NSLS-II Project	1.0	4.8	25.0	49.7	253.3	141.0	152.8	159.1	71.6	48.7	5.0	912.0

Key Personnel

Title	Name	Email	Phone
Federal Project Director	Frank Crescenzo	crescenzo@bnl.gov	631-344-3433
NSLS-II Project Director	Steve Dierker	dierker@bnl.gov	631-344-4966

EVMS for WBS 1 (NSLS-II Project) as of December 31, 2011



Cumulative to Date:	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
BCWS	513,275	537,171	556,466	573,700	590,501	608,084	624,004	642,262	658,886	674,064	686,395	698,603
BCWP	494,904	514,839	533,985	551,038	565,717							
ACWP	486,560	514,161	526,474	544,582	564,067							

Project as of 12/31/11	Current Period	Cum-to-date
Plan (BCWS) $K	$ 16,801	$ 590,501
Earned (BCWP) $K	$ 14,679	$ 565,717
Actual (ACWP) $K	$ 19,486	$ 564,067
SV $K	$ - 2,123	$ - 24,784
CV $K	$ - 4,807	$ 1,650
SPI	0 .87	0.96
CPI	0.75	1.00
Budget at Completion $K (PMB [UB])		$ 822,843
Management Reserve/Contingency		$ 89,157
Planned % Complete		71.8%
Earned % Complete		68.8%
Mgmt Reserve/Cont as % of BAC remaining		34.7%
Mgmt Reserve/Cont as % of EAC remaining		31.8%

Schedule Performance Index, Project to Date:

SPI **0.96**

Cause & Impact: No reportable variance.
Corrective Action: None Required.

Cost Performance Index, Project to Date:

CPI **1.00**

Cause & Impact: No reportable variance.
Corrective Action: None Required

Milestones – Near Term	Baseline	Done
L2-Ring Building Pentant 1 BOD	2/2011	✓
L3-Lobby BOD	2/2011	
L3-Accelerator Injector System Design Complete	2/2011	✓
L3-Accelerator SR Insertion Devices – Design Complete	5/2011	✓
L3-Accelerator SR Safety Systems – Design Complete	5/2011	
L2-RF Building BOD	5/2011	✓
L3-Ring Building Pentant #2 BOD	6/2011	✓
L3-Accelerator SR Beamline Front Ends – Design Complete	8/2011	
L3-Ring Building Pentant #3 BOD	9/2011	✓
L3-Accelerator SR Design Complete	11/2011	
L3-Start Linac commissioning	12/2011	
L2-Ring Building Pentant #4 BOD	2/2012	✓
L3-Ring Building Pentant #5 BOD	2/2012	
L2-Experimental Facility Beamlines Final Design Complete	2/2012	
L3-P2 Experimental Floor Handoff (XPD/HXN)	2/2012	
L3-P3 Experimental Floor Handoff (SRX)	6/2012	
L3-P4 Experimental Hutch Construction Start	7/2012	
L3-P4 Experimental Floor Handoff (IXS/CHX)	10/2012	

The IPT can find further details on NSLS-II cost / schedule data at:
http://www.bnl.gov/nsls2/project/IPT/default.asp.

Four PCRs were approved in December.

PCR #	Area	Δ cost	Title or Description	PCR #	Area	Δ cost	Title or Description
11-320	CF	$417k	LOB Miscllaneous Field Changes #2	12-330	AS	$-30k	DC Powered Amp contract award
11-313	AS	$0k	Integrated Testing Re-phasing	12-334	PM	$6M	Request for MR from contingency funds

ARRA DETAILS

The Recovery Act has provided advanced funding for NSLS-II construction, created jobs, and substantially reduced the cost and schedule risks for the project. The overall schedule for the ring building completion has not been accelerated; however, Recovery Act funds have allowed for re-ordering of the work sequence with a six-month acceleration of the injection building completion. Acceleration of the injection building allows for earlier installation and commissioning of the injector, which had been close to the critical path. This addition of schedule float significantly reduces the schedule risk for the accelerator. In addition, Recovery Act funds have allowed for accelerated completion of the Laboratory–Office Buildings by approximately 15 months, which has enabled the project to maximize the cost advantage of the depressed construction market.

ARRA$ as of 12/31/11	Current Period	Cum-to-date
Plan (BCWS) $K	$ 2,669	$ 130,032
Earned (BCWP) $K	$ 2,282	$ 133,143
Actual (ACWP) $K	$ 6,103	$ 133,472
SV $K	$ - 386	$ 3,112
CV $K	$ - 3,821	$ - 329

ARRA Milestones		
Description	Baseline Date	Status
Complete tunnel slab pentant 2.	1/15/10	Completed 1/15/10.
Pentant 2 tunnel walls complete.	3/16/10	Completed 3/11/10.
Begin steel erection pentant 1.	4/14/10	Completed 3/16/10.
Start metal decking for pentant 1 Service Building.	5/12/10	Completed 4/14/10.
Pentant 5 tunnel slab complete.	5/25/10	Completed 12/9/10.
Begin experimental floor concrete, pentant 1.	6/2010	Completed 6/7/10.
Begin experimental floor concrete, pentant 2.	7/2010	Completed 6/21/10.
Complete structural for steel pentant 3.	9/2010	Completed 8/13/10.
Complete chilled Water Plant enclosure.	9/2010	Completed 8/2010.
Pentant 1 building enclosure complete.	10/2010	Completed 10/2010.
RF building enclosure complete.	11/2010	Completed 11/2010.
Injection building enclosure complete	12/2010	Completed 8/2011.
Permanent power available, pentant 1	1/2011	Completed 1/2011.
Pentant 1 ready for beneficial occupancy	2/2011	Completed 3/2011.
RF Building ready for beneficial occupancy	3/2011	Completed 6/2011.
Chilled Water expansion complete	4/2011	Completed 3/2011.
Injection building ready for beneficial occupancy	5/2011	Completed 8/2011.
Pentant 2 ready for beneficial occupancy	6/2011	Completed 7/2011.
Permanent power available, pentant 3	8/2011	Completed 7/2011.
Pentant 3 ready for beneficial occupancy	9/2011	Completed 10/2011.
Concrete Roof complete HXN	10/2011	Completed 9/2011.
Pentant 4 Ready for Beneficial Occupancy	11/2011	BORE to be held in mid December.
Roof Complete LOB 1	12/2011	Completed 12/2011.
Roof Complete LOB 3	1/2012	
Pentant 5 ready for beneficial occupancy	2/2012	

Blue text is new.

8. PERFORMANCE DATA

ARRA vs. REGUL Cost Account ITEM (1)	CURRENT PERIOD BUDGETED COST WORK SCHEDULED (2)	BUDGETED COST WORK PERFORMED (3)	ACTUAL COST WORK PERFORMED (4)	VARIANCE SCHEDULE (5)	VARIANCE COST (6)	CUMULATIVE TO DATE BUDGETED COST WORK SCHEDULED (7)	BUDGETED COST WORK PERFORMED (8)	ACTUAL COST WORK PERFORMED (9)	VARIANCE SCHEDULE (10)	VARIANCE COST (11)	AT COMPLETION BUDGETED (14)	ESTIMATED (15)	VARIANCE (16)
A ARRA													
1.05.01.02.01 CF Project Office Construction Management	0	0	0	0	0	0	0	0	0	0	148,535		
1.05.02.02.01 CF Title II A/E Design	0	0	0	0	0	300,000	300,000	311,719	0	-11,719	300,000		
1.05.03.02.01 General Requirements	0	0	0	0	0	5,182,343	5,295,535	3,334,164	113,192	1,961,371	5,295,535		
1.05.03.02.02 Site Work	0	0	0	0	0	3,456,532	3,602,913	3,424,169	146,381	178,744	3,611,419		
1.05.03.02.03 Pentant 1 and Service Building	0	1,350	0	1,350	1,350	19,501,848	19,401,765	19,111,446	-100,083	290,319	19,446,336		
1.05.03.02.04 Pentant 2 and Service Building	0	1,350	0	1,350	1,350	15,414,127	15,428,496	15,523,582	14,369	-95,086	15,453,256		
1.05.03.02.05 Pentant 3 and Service Building	0	0	0	0	0	10,324,112	10,355,094	10,464,956	30,982	-109,862	10,363,240		
1.05.03.02.06 Pentant 4 and Service Building	0	0	0	0	0	2,733,490	2,726,777	2,791,902	-6,713	-65,125	2,749,735		
1.05.03.02.07 Pentant 5 and Service Building	25,641	5,923	5,922	-19,718	1	7,266,176	7,303,674	7,207,620	37,498	96,054	7,341,133		
1.05.03.02.08 Injection Building	0	82,721	83,381	82,721	-660	5,389,027	5,710,025	5,659,892	320,998	50,133	5,742,029		
1.05.03.02.09 RF and Compressor Building	0	4,750	0	4,750	4,750	4,952,780	4,941,280	4,957,622	-11,500	-16,342	4,950,780		
1.05.03.02.10 Lobby	0	0	325	0	-325	3,005,358	2,975,506	2,971,250	-29,852	4,256	2,986,150		
1.05.03.02.11 Cooling Tower and Process Water	0	3,500	3,500	3,500	0	4,466,519	4,449,630	4,424,161	-16,889	25,469	4,471,519		
1.05.03.02.12 Underground Mechanical Utilities	0	0	0	0	0	8,573,121	8,573,121	8,573,972	0	-851	8,573,121		
1.05.03.02.13 Site Electrical Utilities	900	0	0	-900	0	8,408,120	8,411,720	8,581,880	3,600	-170,160	8,411,720		
1.05.03.02.14 LN2 and GN2 Systems	0	0	0	0	0	0	0	0	0	0	0		
1.05.03.03 Electrical Substation and Feeder (Contract)	0	0	0	0	0	2,943,143	2,943,143	2,858,844	0	84,299	2,943,143		
1.05.03.04 Chilled Water Plant (Contract)	0	0	0	0	0	9,200,000	9,184,400	9,049,197	-15,600	135,203	9,200,000		
1.05.03.06.01 LOB 1	829,199	685,939	1,801,667	-143,260	-1,115,727	10,161,227	10,590,778	11,341,491	429,552	-750,713	16,344,170		
1.05.03.06.02 LOB 2	670,553	531,994	1,439,650	-138,558	-907,655	3,346,011	4,317,768	5,160,266	971,757	-842,499	6,887,759		
1.05.03.06.03 LOB 3	1,142,470	964,794	2,769,030	-177,676	-1,804,236	5,407,970	6,632,148	7,724,181	1,224,178	-1,092,033	13,227,430		
ARRA Totals:	2,668,763	2,282,321	6,103,474	-386,441	-3,821,153	130,031,903	133,143,774	133,472,316	3,111,871	-328,542	148,447,010		
ARRA Undist Budget											0		
ARRA Grand Total	2,668,763	2,282,321	6,103,474	-386,441	-3,821,153	130,031,903	133,143,774	133,472,316	3,111,871	-328,542	148,447,010		

CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE

FORM APPROVED
OMB No. 0704-0188

1. CONTRACTOR	2. CONTRACT	3. PROGRAM	4. REPORT PERIOD
a. NAME Brookhaven Science Associates	a. NAME National Synchrotron Light Source II (NSLS-II)	a. NAME December 2011 EV8	a. FROM (YYYYMMDD) 2011 / 12 / 01
b. LOCATION (Address and ZIP Code) Brookhaven National Laboratory, Upton,NY	b. NUMBER	b. PHASE	b. TO (YYYYMMDD) 2011 / 12 / 31
	c. TYPE / d. SHARE RATIO	c. EVMS ACCEPTANCE NO YES X (YYYYMMDD)	

5. CONTRACT DATA

a. QUANTITY	b. NEGOTIATED COST	c. ESTIMATED COST OF AUTHORIZED UNPRICED WORK	d. TARGET PROFIT/ FEE	e. TARGET PRICE	f. ESTIMATED PRICE	g. CONTRACT CEILING	i. DATE OF OTB/OTS (YYYYMMDD)
1	912,000,000	0	0	912,000,000	0	0	

8. PERFORMANCE DATA

WBS[2] / WBS[3] / Control Acct / ITEM (1)	CURRENT PERIOD: BUDGETED COST WORK SCHEDULED (2)	BUDGETED COST WORK PERFORMED (3)	ACTUAL COST WORK PERFORMED (4)	VARIANCE SCHEDULE (5)	VARIANCE COST (6)	CUMULATIVE TO DATE: BUDGETED COST WORK SCHEDULED (7)	BUDGETED COST WORK PERFORMED (8)	ACTUAL COST WORK PERFORMED (9)	VARIANCE SCHEDULE (10)	VARIANCE COST (11)	AT COMPLETION: BUDGETED (14)	ESTIMATED (15)	VARIANCE (16)
1.01 Project Management													
1.01.01 Project Management													
WBS[3]Totals:	98,801	98,801	74,500	0	24,301	6,522,514	6,522,514	6,405,848	0	116,666	7,962,806	7,673,244	289,562
1.01.02 Environmental, Safety & Health													
WBS[3]Totals:	122,081	122,081	131,308	0	-9,227	4,470,027	4,470,027	4,886,644	0	-416,617	6,507,532	6,751,598	-244,066
1.01.03 Project Support													
WBS[3]Totals:	510,205	510,205	907,272	0	-397,067	36,642,113	36,642,113	38,273,262	-0	-1,631,150	43,353,294	45,307,461	-1,954,167
1.01.04 Quality Assurance													
WBS[3]Totals:	61,941	61,941	63,363	0	-1,422	2,642,053	2,642,053	2,416,697	0	225,356	3,397,133	3,397,133	0
1.01.05 Configuration Management & Document Control													
WBS[3]Totals:	30,174	30,174	24,555	0	5,619	1,408,425	1,408,425	1,159,708	0	248,717	1,972,567	1,972,567	0
WBS[2]Totals:	**823,202**	**823,202**	**1,200,998**	**0**	**-377,796**	**51,685,133**	**51,685,133**	**53,142,160**	**-0**	**-1,457,027**	**63,193,331**	**65,102,002**	**-1,908,671**
1.02 R&D and Conceptual Design													
1.02.01 Accelerator Systems R&D													
WBS[3]Totals:	19,268	6,450	71,760	-12,818	-65,310	11,460,076	11,275,511	11,132,878	-184,565	142,633	11,460,076	11,890,274	-430,198
1.02.02 Experimental Systems R&D													
WBS[3]Totals:	110,656	143,919	108,146	33,264	35,773	18,107,948	17,926,976	17,548,196	-180,972	378,779	19,166,550	18,771,057	395,493
1.02.03 Conceptual Design - Accelerator Systems													
WBS[3]Totals:	0	0	0	0	0	12,998,214	12,998,214	12,960,504	0	37,709	12,998,214	12,960,504	37,709
1.02.04 Conceptual Design - Experimental Facilities													
WBS[3]Totals:	0	0	0	0	0	709,445	709,445	712,450	0	-3,005	709,445	712,450	-3,005
1.02.05 Conceptual Design - Conventional Facilities													
WBS[3]Totals:	0	0	0	0	0	3,886,952	3,886,952	3,872,878	0	14,074	3,886,952	3,886,952	0
1.02.06 Conceptual Design - Project Management & Support													
WBS[3]Totals:	0	0	0	0	0	7,086,188	7,086,188	7,326,180	0	-239,992	7,086,188	7,325,314	-239,126
1.02.07 Project Management - R&D													
WBS[3]Totals:	0	0	25	0	-25	5,305,339	5,305,339	5,034,327	0	271,012	5,305,339	5,066,213	239,126
WBS[2]Totals:	**129,924**	**150,370**	**179,931**	**20,446**	**-29,561**	**59,554,162**	**59,188,624**	**58,587,414**	**-365,537**	**601,211**	**60,612,763**	**60,612,763**	**-0**
1.03 Accelerator Systems													
1.03.01 Accelerator Systems Management													
WBS[3]Totals:	55,439	55,439	53,073	0	2,366	4,557,808	4,557,808	4,842,440	0	-284,632	6,127,100	6,343,100	-216,000
1.03.02 Accelerator Physics													
WBS[3]Totals:	71,658	71,658	131,167	0	-59,509	7,973,123	7,973,123	8,283,557	0	-310,434	10,071,767	10,202,612	-130,845
1.03.03 Injection System													
WBS[3]Totals:	1,140,534	1,394,457	1,052,707	253,923	341,750	35,999,469	32,571,803	30,233,702	-3,427,666	2,338,101	43,829,587	45,721,477	-1,891,890
1.03.04 Storage Ring													
WBS[3]Totals:	5,098,701	5,478,194	4,913,446	379,493	564,748	117,961,034	97,614,604	97,531,928	-20,346,430	82,677	158,695,670	164,106,021	-5,410,351
1.03.05 Controls Systems													
WBS[3]Totals:	481,697	255,427	337,647	-226,271	-82,220	14,126,568	13,026,581	12,799,178	-1,099,987	227,403	20,317,707	20,317,707	0
1.03.06 Accelerator Safety Systems													
WBS[3]Totals:	472,755	91,942	245,373	-380,813	-153,431	4,273,248	2,599,280	3,762,103	-1,673,969	-1,162,823	6,070,137	8,337,611	-2,267,474
1.03.07 Insertion Devices													
WBS[3]Totals:	725,770	113,216	108,704	-612,554	4,512	10,383,616	6,749,437	6,728,953	-3,634,178	20,485	24,227,823	27,107,617	-2,879,794
1.03.08 Accelerator Fabrication Facilities													
WBS[3]Totals:	0	55,740	70,975	55,740	-15,235	7,358,739	7,250,138	7,342,880	-108,601	-92,741	7,358,739	7,618,551	-259,811
WBS[2]Totals:	**8,046,555**	**7,516,073**	**6,913,092**	**-530,482**	**602,981**	**202,633,606**	**172,342,775**	**171,524,740**	**-30,290,831**	**818,035**	**276,698,530**	**289,754,695**	**-13,056,165**
1.04 Experimental Facilities													
1.04.01 Experimental Facilities Management													
WBS[3]Totals:	76,550	76,550	92,659	0	-16,109	4,198,840	4,149,827	5,083,737	-49,013	-933,910	4,877,349	5,347,386	-470,037
1.04.02 Standard Local Controls & Data Acquisition Systems													
WBS[3]Totals:	0	0	5,893	0	-5,893	69,585	60,366	14,112	-9,219	46,254	69,585	69,585	0
1.04.05 User Instruments													
WBS[3]Totals:	950,645	632,389	458,387	-318,256	174,002	13,554,013	12,861,936	11,920,987	-692,077	940,949	64,890,291	66,474,173	-1,583,882
1.04.06 Front End User Requirements Development													
WBS[3]Totals:	0	0	0	0	0	456	456	2,111	-0	-1,655	456	2,111	-1,655
1.04.07 Optics Labs													
WBS[3]Totals:	30,028	145,930	144,300	115,901	1,629	1,239,482	1,155,364	1,089,210	-84,117	66,155	1,660,300	1,660,300	0
WBS[2]Totals:	**1,057,224**	**854,869**	**701,239**	**-202,355**	**153,630**	**19,062,376**	**18,227,949**	**18,110,156**	**-834,427**	**117,793**	**71,497,981**	**73,553,555**	**-2,055,574**
1.05 Conventional Facilities													
1.05.01 Conventional Facilities Management													
WBS[3]Totals:	253,916	253,916	279,496	0	-25,580	12,120,474	12,120,474	11,892,630	0	227,845	15,867,710	15,904,297	-36,587
1.05.02 Conventional Facilities Engineering and Design													
WBS[3]Totals:	117,648	116,085	30,300	-1,563	85,785	21,917,145	21,917,145	20,908,687	0	1,008,459	23,181,410	22,891,642	289,768
1.05.03 Conventional Facilities Construction													
WBS[3]Totals:	5,467,183	4,497,395	9,676,407	-969,789	-5,179,012	219,528,112	227,015,836	227,831,587	7,487,723	-815,752	257,530,172	261,917,157	-4,386,986
1.05.04 Integrated Controls & Communications													
WBS[3]Totals:	60,812	28,000	263,265	-32,812	-235,265	1,092,314	926,001	900,459	-166,313	25,542	1,256,000	1,256,000	0
1.05.05 Standard Equipment													
WBS[3]Totals:	176,495	0	150	-176,495	-150	246,908	0	14,153	-246,908	-14,153	1,025,586	1,425,586	-400,000
1.05.06 Conventional Facilities Commissioning													
WBS[3]Totals:	21,156	16,701	6,488	-4,455	10,214	466,169	344,448	196,662	-121,721	147,786	578,000	578,000	-0
WBS[2]Totals:	**6,097,211**	**4,912,097**	**10,256,106**	**-1,185,114**	**-5,344,009**	**255,371,122**	**262,323,904**	**261,744,178**	**6,952,781**	**579,726**	**299,438,878**	**303,972,683**	**-4,533,805**
1.06 Pre-Operations													
1.06.01 Management - Pre Ops													
WBS[3]Totals:	239,613	239,613	21,005	0	218,609	707,949	707,949	21,005	0	686,944	20,170,700	20,170,700	0
1.06.02 Accelerator Systems - Pre Ops													
WBS[3]Totals:	407,575	182,450	213,167	-225,126	-30,717	1,486,913	1,240,593	937,579	-246,320	303,014	17,071,591	19,144,648	-2,073,057
1.06.03 Experimental Facilities - Pre Ops													
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	3,823,660	5,065,357	-1,241,697
1.06.04 Spares													
WBS[3]Totals:	0	0	0	0	0	0	0	0	0	0	9,134,454	9,134,454	-0
WBS[2]Totals:	**647,189**	**422,063**	**234,172**	**-225,126**	**187,891**	**2,194,862**	**1,948,542**	**958,584**	**-246,320**	**989,959**	**50,200,405**	**53,515,159**	**-3,314,754**
Total Project Baseline	16,801,305	14,678,675	19,485,538	-2,122,630	-4,806,864	590,501,261	565,716,927	564,067,231	-24,784,334	1,649,697	821,641,889	846,510,858	-24,868,970
Undistributed Budget											1,201,013	0	1,201,013
Performance Measurement Baseline (PMB)	16,801,305	14,678,675	19,485,538	-2,122,630	-4,806,864	590,501,261	565,716,927	564,067,231	-24,784,334	1,649,697	822,842,902	846,510,858	-23,667,957
Management Reserve											5,789,008		
Total PMB plus Management Reserve	16,801,305	14,678,675	19,485,538	-2,122,630	-4,806,864	590,501,261	565,716,927	564,067,231	-24,784,334	1,649,697	828,631,910		