NSLS-II Experimental Tools (NEXT)

January 2017 Project Activity
Report due date: February 20, 2017

ISR Instrumented 6-Circle Diffractometer installed in Hutch 4-ID-C.

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OVERALL ASSESSMENT

During January, significant progress was made toward operational readiness of the SIX photon delivery system and significant endstation installation progress was made at ISR, SMI, and SIX.

The radiation shielding upgrade of the SIX photon delivery system was completed this month. Completion and approval of the documents required for IRR made good progress during January. All IRR documents were approved in the second week of February and the SIX IRR was held on February 15. Authorization to take beam was received from the NSLS-II Director on February 17 and first light was taken on February 21.

At ISR, the 6-Circle Diffractometer (cover figure) and the phase plates for the Dual Phase Plate Assembly were installed this month. Following installation of the cable guide for the 6-circle diffractometer in February, only receipt of commissioning reports for these two major procurements remain. More detail is provided in the ISR section of this report.

Endstation installation progress at SMI, for the SAXS beam chamber, and at SIX, for the sample chamber and emission spectrometer, is described in the corresponding sections of this report.

Two major procurements were completed in January (SIX Grating Rulings and ISR KB Mirror Optics) and 5 remain: 1 (M4 mirror optics) shared between ESM and SIX, 2 for ISR (Dual Phase Plate Assembly and 6-circle Diffractometer), and 2 for SIX (Sample Chamber and Emission Spectrometer). All materials for the 5 remaining contracts were received in January with the exception of the M4 mirrors and TRF portion of the SIX sample chamber contract.

As of January 31, 2017, the project is 99.0% complete on base scope performance earned to date. The cumulative EVMS schedule and cost indices both increased by 0.01, to 0.99 and 0.94, respectively. Post-January-deadline accruals will bring the cumulative CPI back to 0.93.

No PCRs were processed in January. A PCR to add Project Management and Support activities past January 2017 will be processed in February. BAC remained at $82.97M. Cost contingency is $7.03M, compared to $0.86M BAC work remaining.

The EAC, reported as the sum of actual cost to date (ACWP) plus the estimated cost to complete (ETC), is $89.17M, $0.22M greater than the December value. This increase is shared between increased Project Management and Support needed past January 31 and increases in SIX Beamline Systems, predominantly for effort and materials needed to upgrade the SIX PDS radiation shielding. As of the end of January, contingency on EAC is $0.83M, which represents 45.2% of $1.84M EAC work remaining, or 198.2% of $0.42M unobligated work to go ($1.42M of the remaining work is obligated to fixed-price equipment contracts).

COMMON SYSTEMS

All Common Systems work on ISS, ESM, SMI, and ISR has been completed.

Completion of the SIX Mechanical and Electrical utilities installation work in the SIX Satellite Building is expected this month, pending the delivery and installation of the endstation sample chamber and emission spectrometer. These components are expected to be ready for utilities integration in February and into March.

BEAMLINE CONTROLS

SIX endstation controls development continued to make good progress during January. The controls engineer assigned to SIX provided support for motion tuning and testing of the entire endstation (sample chamber, optics chamber, and detector arm) during supplier installation (Bestec). This engineer also continued to work closely with SIX beamline scientists to prepare for commissioning of the PDS with beam, expected to start in February.

ESM – ELECTRON SPECTRO-MICROSCOPY

Receipt and acceptance of the M4 mirror are the only remaining ESM activities. This mirror, a focusing ellipsoid with challenging figure error specifications, will provide beam to the photoemission microscope in the XPEEM branch. Weekly progress updates, which continue to be provided by the supplier (JTEC), indicate slow progress toward achievement of the specified figure error. Delivery is expected to extend to at least March.

ISR – IN-SITU AND RESONANT HARD X-RAY

The two sets of diamond phase plates and alignment tools were installed by Huber in the Dual Phase Plate Assembly vacuum chamber on January 26, as shown in Figure 1. This component is now ready for commissioning with beam, and science commissioning with polarization control is anticipated during the May-August cycle.

Five crates containing the Instrumented 6-Circle Diffractometer, except for the manual translation rails which were received and installed last fall, arrived on January 11. The diffractometer was installed by Huber in Hutch C during January 23-26 (cover figure). Installation of the cable guide system remains, and will be completed by the ISR team in early February. Commissioning of the instrument is underway, and is also anticipated to be completed in early February. Science commissioning using the diffractometer and the displex cryostat, which was transferred from NSLS beamline X21, is scheduled for April 7-14.

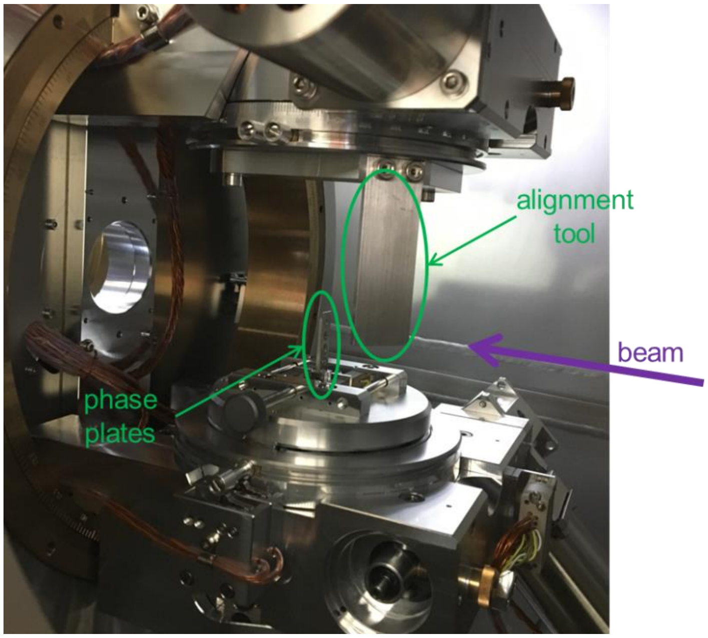


Figure 1. ISR: Diamond phase plates and alignment tool installed in the upstream stack of the ISR Dual Phase Plate Assembly.

ISS – INNER SHELL SPECTROSCOPY

Experimental Safety Review of the ISS endstation has been completed successfully, paving the way to general user operations expected to start in February.

SIX – SOFT INELASTIC X-RAY

Installation of the SIX sample chamber and emission spectrometer (Bestec) made steady progress during January. The flatness of the 15-m granite track was improved to meet the specified height deviation of ±50 μm. The optics tank and the spectrometer cable chain structure were installed on top of the 3-m granite track (Figure 2). The cable chain design (Bestec) straddles the optics tank in order to permit full access to the large top flange and is fully mechanically decoupled from the tank and its granite base in order to limit the propagation of vibrations to the optics. Pre-terminated cables were pulled (Bestec) from the patch panel that sits on top of the sample chamber down one of the two nested cable chains and then distributed to their respective components on the optics tank or down the spectrometer arm to the detector tank (Figure 3). In the meantime, pulling and termination of the NSLS-II motor and encoder tables between the Bestec patch panel and the controller racks was nearly completed during January.

Alignment of the optical components inside the optics tank has begun. The alignment of the beam clean-up masks upstream of M7 and downstream of the gratings is complete (setup shown in Figure 4). The 1250 l/mm grating was installed and surveyed in place in the grating cradle of the optics tank (Figure 5). Metrology and pre-survey of the M6 and M7 mirrors in their respective holders is underway.

Regarding the PDS, raytracing of the SR beam has been extended beyond the PGM for mis-steering cases where the pink beam reflected off the M2 mirror is not intercepted by the grating. The raytracing shows that when this beam is mis-steered through the aperture of the internal mask, it is blocked by the external mask located about half a meter downstream of the PGM vessel. This mask can now be taken as a credited safety component, following bench survey, survey into position, and connection and integration of its cooling water to the PPS DI water system.

Figure 2. SIX: Spectrometer optics tank and cable chain structure installed on the 3-m granite track.

Figure 3. SIX: Motor cables being pulled along the spectrometer arm (Bestec).

Figure 4. SIX: Alignment ongoing for the M7 masks, viewed from the inboard side of the sample chamber.

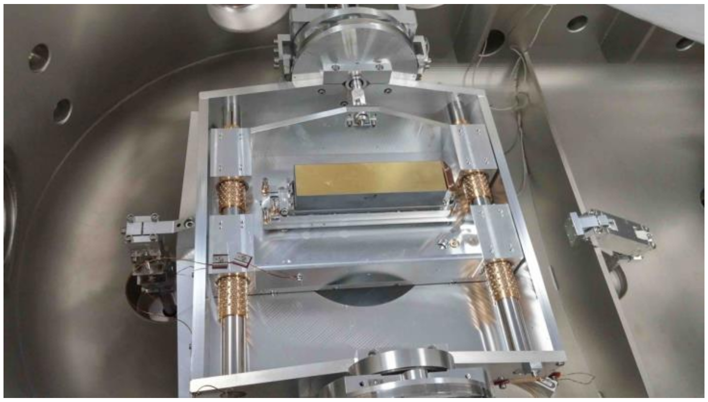


Figure 5. SIX: 1250 l/mm grating installed in the grating cradle of the spectrometer optics tank.

SMI – SOFT MATTER INTERFACES

Assembly, installation, and testing of the SAXS chamber, the only SMI activities remaining in NEXT, progressed well during January. All parts for this chamber have been received, with the exception of the segmented in-vacuum cable chain which is expected in March. Figures 6-8 illustrate some of the specific assembly steps currently underway.

The SAXS assembly incorporates a long Z translation for the Pilatus 1M area detector. Figure 6 (upper panel) shows some of the 22 feet that will support this translation assembly, along with their bellows and flanges. The mechanical design enables the long Z rail to be decoupled from the vacuum vessel for optimum stability. Figure 6 (lower panel) shows four of these feet installed on a stand in the process of being connected to the vacuum vessel. The Z rails will be installed in sections, which must be aligned true; any deviation could cause friction in the trolley that carries the heavy payload of the Pilatus 1M, the Z motor and drive mechanism, the detector XY motors and stages, and the air, water, and service cables. Each section needs to be installed inside the vacuum chamber modules, which are about 1m in diameter and 2m in length. The team is testing the installation procedure within the furthest upstream module first. Downstream rail sections are being placed on the feet, without the vacuum chamber sections, for an in-air motion test. After this test, the rail sections will be removed individually, preserving the relative alignment of key components, and then reinstalled in their vacuum chamber modules.

All parts for the rails, stages, and other mechanics have been received and cleaned for vacuum compatibility. These parts and associated hardware are collected on lab benches located near the 12-ID-C endstation hutch, ready for assembly (Figure 7).

Assembly of the cable sets began this month, using a 20' long cable assembly table constructed of left-over Uni-Strut (Figure 8). In the figure, wires for one motor cable are shown. The complete cable assembly consists of nine 9-lead motor cables (thermocouples to monitor stepper motor temperature included), two 13-lead encoder cables, four beam stop data signals, and several services associated with the detector including power, water, two CAT6 data channels, and certain logic signals. Cabling tasks other than those requiring the cable chain (which is expected to ship March 15) are planned to be completed in February.

Figure 6. SMI: Upper: Pre-assembled SAXS Z rail feet, with bellow and flange assemblies, that support the detector Z motion independently from the vacuum vessel. Lower: the first four feet installed on the SAXS support stands, ready for the vacuum vessel to be lowered over them, at which point the flanges can be connected.

Figure 7. SMI: SAXS assembly area near hutch 12-ID-C. On the cart in the foreground, long foil-wrapped packages are the drive rail segments for SAXS Z translation, the machined C-channel support rails, and other stages and plates associated with the XYZ mechanics.

Figure 8. SMI: 20'-long cable assembly table, constructed from Uni-Strut and lined with foil for assembly of in-vacuum cables for the SAXS beam chamber. The cables will be between 30' and 40' long. Cables for one motor channel harness are shown.

PROJECT MILESTONES

Milestone	Planned	Actual
CD-0 (Mission Need):	May 27, 2010	May 27, 2010
CD-1 (Alternative Selection):	Sept. 30, 2011	Dec. 19, 2011
CD-2 (Performance Baseline):	Dec. 31, 2013	Oct. 9, 2013
CD-3A (Long Lead Procurement):	Dec. 31, 2013	Oct. 9, 2013
CD-3 (Start Construction):	Mar. 31, 2014	Jul. 7, 2014
Early Project Completion:	May 19, 2017	
CD-4 (Project Completion):	Sept. 29, 2017	

RECENT AND UPCOMING EVENTS

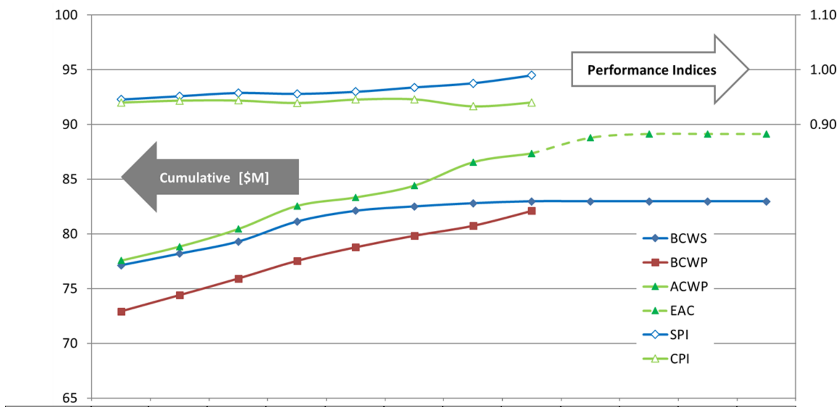
Scope Verification Review	February 27-28, 2017
DOE/SC OPA CD-4 Review of NEXT	TBD

Acronyms and Abbreviations

ACWP	Actual Cost of Work Performed
BAC	Budget at Completion
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
CAT6	Category 6 (Ethernet cable)
CD	Critical Decision
CPI	Cost Performance Index
CV	Cost Variance
DI	De-Ionized
DOE	Department of Energy
EAC	Estimate At Completion
EPS	Equipment Protection System
ESM	Electron Spectro-Microscopy beamline
ETC	Estimated Cost to Complete
EVMS	Earned Value Management System
FE	Front End
FTE	Full Time Equivalent
FXI	Full-field X-ray Imaging beamline
FY	Fiscal Year
ID	Insertion Device
IRR	Instrument Readiness Review
ISR	Integrated In-Situ and Resonant X-ray Studies
ISS	Inner Shell Spectroscopy beamline
KB	Kirkpatrick Baez
M&S	Material & Supplies
NEXT	NSLS-II Experimental Tools project
NSLS	National Synchrotron Light Source
NSLS-II	National Synchrotron Light Source II
OPA	Office of Project Assessment
OPC	Other Project Costs
PCR	Project Change Request
PDS	Photon Delivery System
PGM	Plane Grating Monochromator
PMB	Performance Management Baseline
PPS	Personnel Protection System
SAXS	Small Angle X-ray Scattering
SC	Office of Science
SIX	Soft Inelastic X-ray Scattering beamline
SMI	Soft Matter Interfaces beamline
SPI	Schedule Performance Index
SV	Schedule Variance
TEC	Total Estimated Cost
TPC	Total Project Cost
TRF	Triple Rotation Flange
UB	Undistributed Budget
VAC	Variance At Completion
WBS	Work Breakdown Structure
XPEEM	X-ray photoemission electron microscopy

COST AND SCHEDULE STATUS

Cost and schedule progress is being tracked using an Earned Value Management System (EVMS) against the cost and schedule baseline established on October 1, 2013. All baseline changes are being controlled through the NEXT Change Control Board. Cost and schedule revisions are being managed using Project Change Control procedures. From June 2015 forward, EAC is reported as the sum of actual cost to date (ACWP) plus the estimated cost to complete (ETC), at the individual activity and resource level, with account-level cost corrections applied as needed to account for the difference between the Earned Value and accrual schedules. ETC values are shown in the final row of the EVMS table below, and all EAC changes are captured in the monthly EAC log.



Cum $M	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17
BCWS	77.1	78.2	79.3	81.1	82.1	82.5	82.8	83.0	83.0	83.0	83.0	83.0
BCWP	72.9	74.4	75.9	77.5	78.8	79.8	80.7	82.1				
ACWP	77.6	78.8	80.4	82.5	83.3	84.4	86.5	87.3				
SPI	0.95	0.95	0.96	0.96	0.96	0.97	0.98	0.99				
CPI	0.94	0.94	0.94	0.94	0.95	0.95	0.93	0.94				
ETC									1.8	0.4	0.0	0.0

NEXT as of 1/31/2017	Current Period	Cum-to-Date
Plan (BCWS) $k	178	82,970
Earned (BCWP) $k	1,359	82,106
Actual (ACWP) $k	800	87,330
SV $k	1,181	-864
CV $k	560	-5,225
SPI	7.62	0.99
CPI	1.70	0.94
Budget at Completion $k (PMB [UB])		82,970
Planned % Complete (BCWS/BAC)		100.0%
Earned % Complete (BCWP/BAC)		99.0%
Contingency $k		7,030
Contingency / (BAC – BCWP)		813.3%
EAC $k		89,169
Contingency / (EAC – BCWP)		99.5%
(Contingency + VAC) / (EAC – ACWP)		45.2%
TPC = PMB + Contingency		90,000

The NEXT project Schedule Variance (SV) for January 2017 is +$1,181k, with an associated monthly Schedule Performance Index (SPI) of 7.62 (red status). The largest contributors to the current month schedule variance are provided in the table below. The cumulative SPI is 0.99 (green status), 0.01 higher than it was in December.

The NEXT project Cost Variance (CV) for January 2017 is +$560k, with an associated monthly Cost Performance Index (CPI) of 1.70 (red status). The significant contributors to the current month CV are provided in the table below. The cumulative CPI is 0.94 (green status), 0.01 higher than it was in December.

Leading Current Month Variances [$k], January 2017								
WBS	Title	PV	EV	AC	Schedule		Cost	
					SV	Issues	CV	Issues
2.01	Project Support	161	161	262	0	--	-102	Project Awards (planned linearly, paid this month)
2.03	Common Systems	5	28	31	24	--	-2	--
2.04	Controls	3	3	9	0	--	-6	--
2.05	ESM Beamline	0	12	0	12	--	12	--
2.07	ISR Beamline	2	238	226	236	6-Circle Diffractometer activities earned this month that were scheduled to be performed earlier: receipt and acceptance ($86k), installation ($84k), and commissioning and training ($30k).	12	--
2.08	ISS Beamline	2	2	0	0	--	2	--

Leading Current Month Variances [$k], January 2017

WBS	Title	PV	EV	AC	Schedule		Cost	
					SV	Issues	CV	Issues
2.09	SIX Beamline	2	827	192	825	Sum of earlier-scheduled activities performed in January: emission spectrometer (+$723k), grating rulings (+81k), and vacuum manifold (+22k).	636	Earned value (mostly on the Bestec contracts) that will be accrued next month.
2.10	SMI Beamline	2	53	77	51	Endstation component assembly and test activities earned this month that were scheduled to be performed earlier.	-23	--
2.11	Insertion Devices	2	35	3	33	--	32	--
	Total	**178**	**1359**	**800**	**1181**	**Total**	**560**	

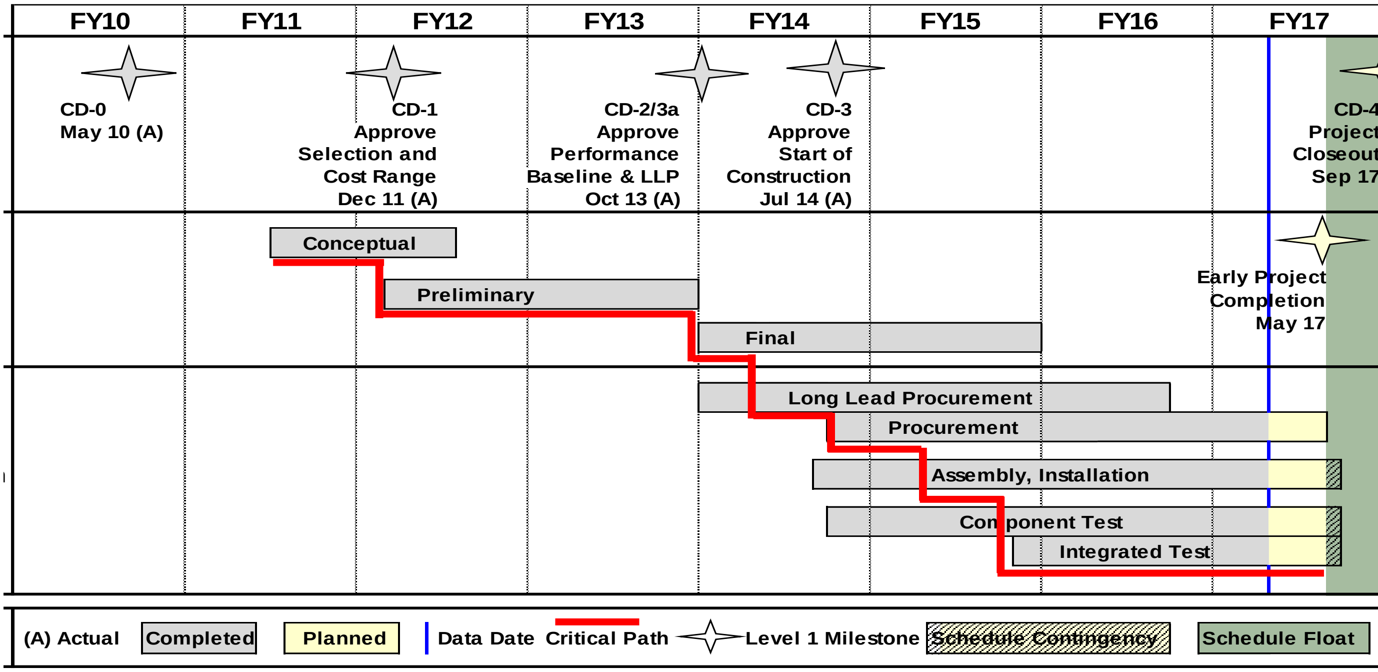
As of January 31, 2017, the project is 99.0% complete with 813.3% contingency ($7.03M) for $0.86M Budget At Completion (BAC) work remaining, based on PCRs processed and approved through January 2017. The project EAC for January is reported at $89,169k against a Performance Measurement Baseline (PMB)/Undistributed Budget (UB) of $82,970k. The Variance At Completion (VAC) is given by VAC = BAC – EAC, with EAC = ACWP + ETC. Through January 2017, the VAC (-$6,199k) is driven by the cumulative cost variance (-$5,225k), which is dominated by labor cost overage on work performed to date.

The January EAC ($89.17M) is $0.22M higher than the December value. This increase is broken down as follows: increased Project Management and Support needed past January 31 (+$95k), increases in SIX Beamline Systems (+$145k: labor cost in January ($65k), effort and materials needed to upgrade radiation shielding and IRR preparation as well as additional endstation work ($80k)), Common Systems management past January 31 (+$20k), and reduction in SMI Beamline Systems resulting from good labor performance (-$40k). As of the end of January, contingency on EAC is $0.83M, which represents 45.2% of $1.84M EAC work remaining. Outstanding commitments on fixed-price equipment contracts total $1.42M, so the $0.83M contingency on EAC represents 198.2% of $0.42M unobligated EAC work to go. ETC will continue to be assessed monthly through project completion to contain costs while maintaining the good schedule performance that the project has demonstrated to date.

No PCRs were approved or implemented in January. A PCR to add project management and support activities from 1-Feb-17 through project completion is planned for February 2017.

Milestones – Near Term		Planned	Actual	Projected
L3	ISR – Installation of Beamline Components Complete	29-Jun-16		8-Feb-2017
L3	WBS 2.04 – Beamline Control Systems Complete	14-Sep-16		March 2017
L3	SMI – Installation of Beamline Components Complete	16-Sep-16		March 2017
L3	ESM – Installation of Beamline Components Complete	29-Sep-16		March 2017
L3	SIX – Installation of Beamline Components Complete	30-Sep-16		May 2017
L3	Common Beamline Systems: EPS Installed	30-Sep-16		February 2017
L2, L3	Complete Installation of Common Beamline Systems PPS	30-Sep-16	19-Dec-16	
L2	Early Project Completion – incl. IRR	31-Jan-17		19-May-2017

PROJECT SCHEDULE



As of January 2017, the critical path runs through activities related to the Triple Rotating Flange, a component of the SIX endstation sample chamber (WBS 2.09.02.03, SIX Beamline Systems Endstation Equipment).

Staffing Report

Staffing as of 1/31/2017	Current Period		Cumulative-to-Date	
	Planned ** (FTE-yr)	Actual (FTE-yr)	Planned ** (FTE-yr)	Actual (FTE-yr)
WBS 2.01 Project Management and Support	0.29	0.30	41.55	37.00
WBS 2.02 Conceptual and Advanced Conceptual Design	0.00	0.00	8.74	8.74
WBS 2.03 Common Beamline Systems	0.21	0.16	33.16	19.57 *
WBS 2.04 Control System	0.19	0.17	22.10	21.00
WBS 2.05 ESM Beamline	0.00	0.00	15.75	18.52
WBS 2.06 FXI Beamline	0.00	0.00	4.77	4.60
WBS 2.07 ISR Beamline	0.03	0.05	17.70	16.16
WBS 2.08 ISS Beamline	0.00	0.00	14.96	14.92
WBS 2.09 SIX Beamline	0.74	0.77	22.04	25.98
WBS 2.10 SMI Beamline	0.19	0.13	17.59	16.40
WBS 2.11 Insertion Devices	0.00	0.00	7.74	7.20
WBS 2.12 ID & FE Installation	0.00	0.00	3.88	7.97
Total	**1.66**	**1.58**	**209.99**	**198.06**

** Based on the NEXT working schedule

* A large fraction of utilities installation has been performed by contractors (M&S) rather than staff as originally planned

Number of individuals who worked on NEXT during January 2017: 84

Funding Profile

Funding Type	NEXT Funding Profile ($M)						
	FY11	FY12	FY13	FY14	FY15	FY16	Total
OPC	3.0						3.0
TEC – Design		3.0	2.0				5.0
TEC – Fabrication		9.0	10.0	25.0	22.5	15.5	82.0
Total Project Cost	**3.0**	**12.0**	**12.0**	**25.0**	**22.5**	**15.5**	**90.0**

Key NEXT Personnel

Title	Name	Email	Phone
Federal Project Director	Robert Caradonna	rcaradonna@bnl.gov	631-344-2945
NEXT Project Manager	Steve Hulbert	hulbert@bnl.gov	631-344-7570

COST PERFORMANCE REPORT

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 National Laboratory	a. NAME NEXT	a. NAME NSLS-II Experimental Tools (NEXT) Project	a. FROM (YYYYMMDD) 2017 / 01 / 01
b. LOCATION (Address and ZIP Code)	b. NUMBER	b. PHASE	b. TO (YYYYMMDD) 2017 / 01 / 31
	c. TYPE / d. SHARE RATIO	c. EVMS ACCEPTANCE NO X YES (YYYYMMDD)	

8. PERFORMANCE DATA

WBS (2) WBS (3) 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)
2.01 Project Management and Support	160,632	160,632	262,435	0	(101,804)	9,918,232	9,918,232	10,825,702	0	(907,469)	9,918,232	10,934,635	(1,016,402)
2.01.01 Project Management	70,559	70,559	41,556	0	29,003	4,598,029	4,598,029	4,192,567	0	405,461	4,598,029	4,249,394	348,635
2.01.02 Project Support	90,073	90,073	220,880	0	(130,807)	5,320,204	5,320,204	6,633,135	0	(1,312,931)	5,320,204	6,685,241	(1,365,037)
2.02 Conceptual Design and Advanced Conceptual Design	0	0	0	0	0	1,807,316	1,807,316	1,807,316	0	0	1,807,316	1,807,316	0
2.02.02 Conceptual Design and Analysis of Photon Delivery Syst	0	0	0	0	0	849,881	849,881	849,881	0	0	849,881	849,881	0
2.02.04 ESM Advanced Conceptual Design	0	0	0	0	0	101,376	101,376	101,376	0	0	101,376	101,376	0
2.02.05 FXI Advanced Conceptual Design	0	0	0	0	0	120,634	120,634	120,634	0	0	120,634	120,634	0
2.02.06 ISR Advanced Conceptual Design	0	0	0	0	0	210,700	210,700	210,700	0	0	210,700	210,700	0
2.02.07 ISS Advanced Conceptual Design	0	0	0	0	0	163,508	163,508	163,508	0	0	163,508	163,508	0
2.02.08 SIX Advanced Conceptual Design	0	0	0	0	0	179,533	179,533	179,533	0	0	179,533	179,533	0
2.02.09 SMI Advanced Conceptual Design	0	0	0	0	0	181,684	181,684	181,684	0	0	181,684	181,684	0
2.03 Common Beamline Systems	4,579	28,337	30,655	23,758	(2,318)	7,340,417	7,303,939	8,495,370	(36,478)	(1,191,431)	7,340,417	8,552,490	(1,212,073)
2.03.01 Utilities	0	0	3,202	0	(3,202)	4,210,031	4,183,280	4,352,388	(26,751)	(169,108)	4,210,031	4,392,833	(182,802)
2.03.02 Personnel Protection System (PPS)	0	23,758	17,508	23,758	6,250	1,620,824	1,618,573	2,359,196	(2,251)	(740,623)	1,620,824	2,360,047	(739,223)
2.03.03 Equipment Protection System (EPS)	0	0	2,724	0	(2,724)	680,294	680,294	952,283	0	(271,989)	680,294	952,283	(271,989)
2.03.04 Control Station	0	0	2,844	0	(2,844)	306,744	299,269	219,013	(7,475)	80,255	306,744	226,313	80,431
2.03.05 Common Beamline Systems Management	4,579	4,579	4,378	0	201	522,524	522,524	612,490	0	(89,966)	522,524	621,014	(98,490)
2.04 Control System	2,594	2,594	8,887	0	(6,293)	4,648,844	4,643,237	4,940,889	(5,607)	(297,652)	4,648,844	4,972,497	(323,653)
2.04.01 Control System Management	2,594	2,594	1,961	0	633	294,427	294,427	257,275	0	37,152	294,427	257,275	37,152
2.04.02 Control System Design & Implementation	0	0	24,124	0	(24,124)	2,929,314	2,923,707	3,350,250	(5,607)	(426,543)	2,929,314	3,381,858	(452,545)
2.04.03 Control System Equipment	0	0	(17,199)	0	17,199	1,425,103	1,425,103	1,333,363	0	91,740	1,425,103	1,333,363	91,740
2.05 ESM Beamline	0	11,830	0	11,830	11,830	9,422,464	9,362,517	10,132,222	(59,947)	(769,704)	9,422,464	10,187,914	(765,450)
2.05.01 ESM Management	0	0	0	0	0	610,744	610,744	474,027	0	136,718	610,744	474,027	136,718
2.05.02 ESM Beamline Systems	0	11,830	0	11,830	11,830	8,811,720	8,751,773	9,658,195	(59,947)	(906,422)	8,811,720	9,713,888	(902,168)
2.06 FXI Beamline	0	0	0	0	0	1,818,324	1,818,324	1,793,425	0	24,899	1,818,324	1,793,425	24,899
2.06.01 FXI Management	0	0	0	0	0	409,359	409,359	470,908	0	(61,549)	409,359	470,908	(61,549)
2.06.02 FXI Beamline Systems	0	0	0	0	0	1,408,965	1,408,965	1,322,516	0	86,448	1,408,965	1,322,516	86,448
2.07 ISR Beamline	2,120	237,797	225,816	235,677	11,981	10,392,425	10,200,116	10,332,730	(192,309)	(132,614)	10,392,425	10,520,808	(128,383)
2.07.01 ISR Management	2,120	2,120	0	0	2,120	1,105,394	1,105,394	1,034,389	0	71,005	1,105,394	1,034,389	71,005
2.07.02 ISR Beamline Systems	0	235,677	225,816	235,677	9,861	9,287,031	9,094,722	9,298,341	(192,309)	(203,619)	9,287,031	9,486,419	(199,388)
2.08 ISS Beamline	2,120	2,120	0	0	2,120	10,472,212	10,472,212	11,236,443	0	(764,231)	10,472,212	11,236,443	(764,231)
2.08.01 ISS Management	2,120	2,120	0	0	2,120	838,199	838,199	681,035	0	157,164	838,199	681,035	157,164
2.08.02 ISS Beamline Systems	0	0	0	0	0	9,634,013	9,634,013	10,555,409	0	(921,395)	9,634,013	10,555,409	(921,395)
2.09 SIX Beamline	2,120	827,485	191,884	825,365	635,601	11,764,836	11,295,176	12,378,879	(469,660)	(1,083,703)	11,764,836	13,667,285	(1,902,450)
2.09.01 SIX Management	2,120	2,120	10,737	0	(8,617)	729,841	729,841	742,040	0	(12,199)	729,841	808,495	(78,654)
2.09.02 SIX Beamline Systems	0	825,365	181,147	825,365	644,219	11,034,995	10,565,335	11,636,838	(469,660)	(1,071,503)	11,034,995	12,858,790	(1,823,796)
2.10 SMI Beamline	2,120	53,427	76,898	51,308	(23,470)	9,126,837	9,026,496	9,368,230	(100,341)	(341,734)	9,126,837	9,477,366	(350,529)
2.10.01 SMI Management	2,120	2,120	0	0	2,120	805,656	805,656	706,837	0	98,819	805,656	706,837	98,819
2.10.02 SMI Beamline Systems	0	51,308	76,898	51,308	(25,590)	8,321,181	8,220,840	8,661,393	(100,341)	(440,553)	8,321,181	8,770,529	(449,348)
2.11 Insertion Devices	2,120	35,159	3,039	33,039	32,120	4,805,392	4,805,392	4,566,301	0	239,092	4,805,392	4,566,301	239,092
2.11.01 ESM EPU Insertion Device	0	33,039	3,039	33,039	30,000	4,587,795	4,587,795	4,401,645	0	186,150	4,587,795	4,401,645	186,150
2.11.02 SIX EPU Insertion Device	0	0	0	0	0	117,137	117,137	70,375	0	46,762	117,137	70,375	46,762
2.11.03 Insertion Devices Management	2,120	2,120	0	0	2,120	100,460	100,460	94,281	0	6,179	100,460	94,281	6,179
2.12 ID & FE Installation & Testing	0	0	0	0	0	1,452,816	1,452,816	1,452,960	0	(143)	1,452,816	1,452,960	(143)
2.12.01 ID & FE Installation & Testing Management	0	0	0	0	0	20,739	20,739	20,739	0	0	20,739	20,739	0
2.12.02 ID Installation & Testing	0	0	0	0	0	584,560	584,560	584,560	0	(0)	584,560	584,560	(0)
2.12.03 FE Installation & Testing	0	0	0	0	0	847,517	847,517	847,660	0	(143)	847,517	847,660	(143)
TOTAL	178,403	1,359,381	799,614	1,180,978	559,767	82,970,116	82,105,775	87,330,466	(864,341)	(5,224,691)	82,970,116	89,169,440	(6,199,324)