



2016 Department of Energy
Project Management Workshop
"Enhancing Project Management"

National Synchrotron Light Source II (NSLS-II) Project



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Office of Science - Brookhaven Site Office**



NSLS-II Project

- Synchrotron Radiation Facility (SRF)
- 10,000 times brighter than NSLS with ultra-low emittance and exceptional beam stability
- Delivers world leading capability to image single atoms
- Total Project Cost (TPC) = \$912M, TEC= \$791.2M; OPC=\$120.8M
- \$150M ARRA accelerated funding profile (did not increase TPC)
- LINAC, 3.0 GeV Booster, 500mA Storage Ring 791.5m circumference
- 7 Insertion Device Beamlines (ultimate capability for over 60 beamlines)
- Various buildings totaling 628,000 gross square feet
- Completed 6 months early, added \$68M scope from CD-2 baseline



Injector & Storage Ring



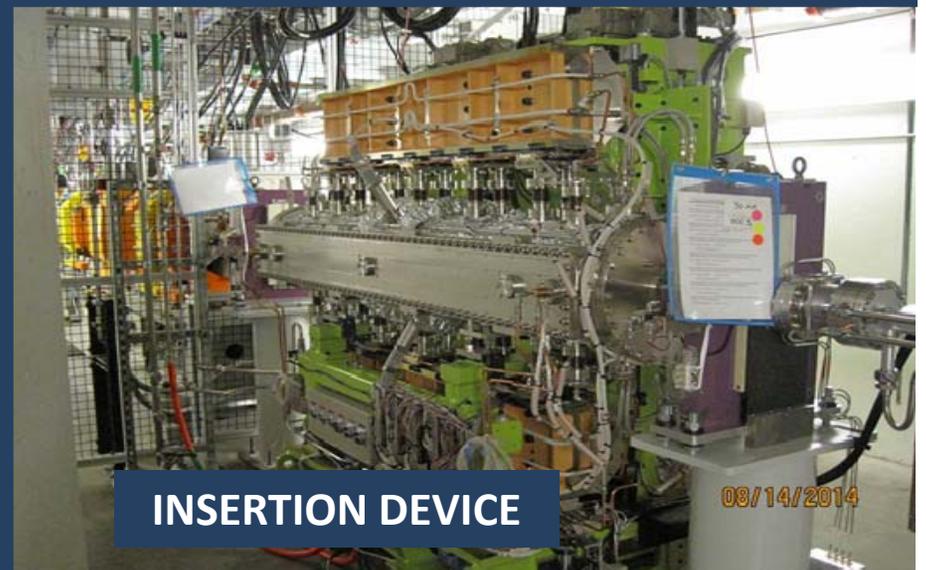
LINAC



BOOSTER



STORAGE RING



INSERTION DEVICE

08/14/2014

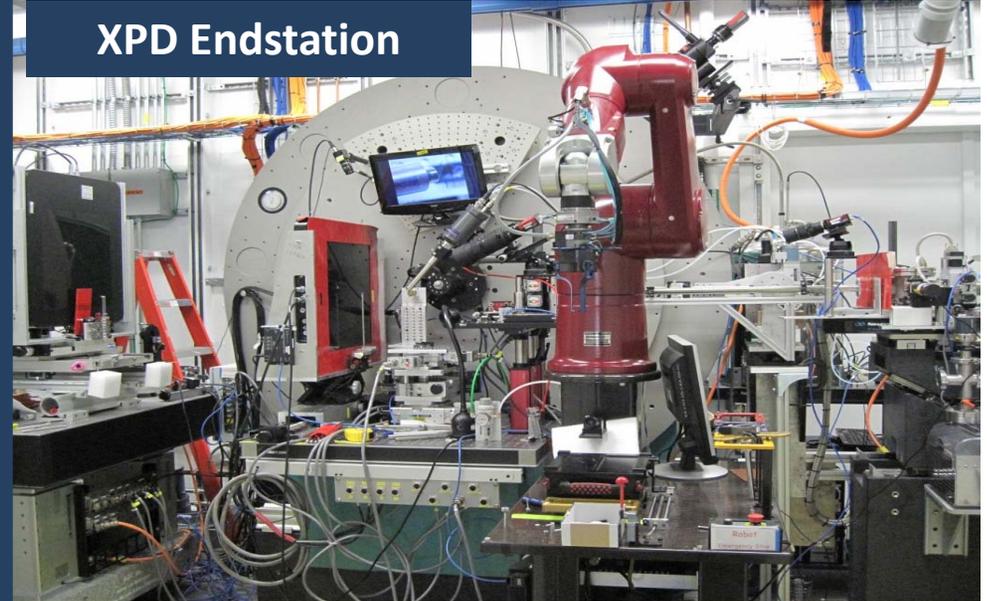


Beamlines & Endstations

CSX Beamline



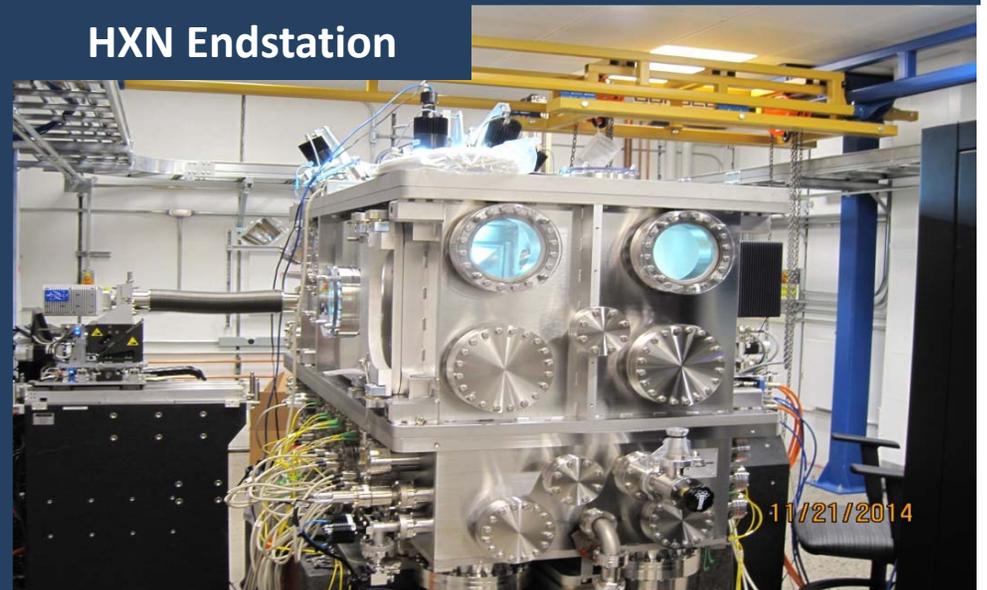
XPD Endstation



CHX Endstation



HXN Endstation

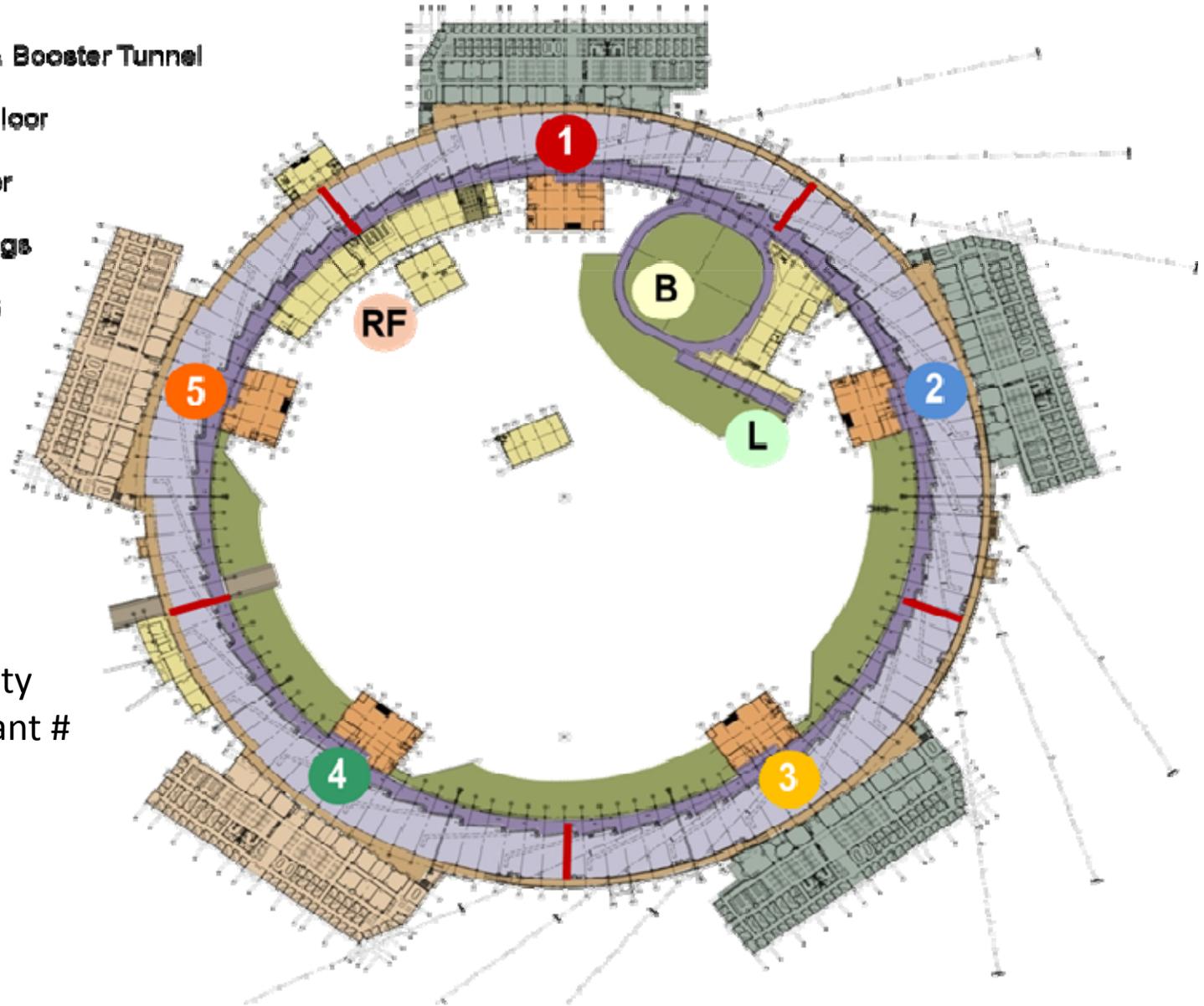




NSLS-II Floor Plan

- Storage Ring & Booster Tunnel
- Experimental Floor
- Access Corridor
- Service Buildings
- LOB's 1, 2, & 3
- LOB's 4 & 5
- Earth Berm

L- LINAC
B- Booster
RF- RF facility
1-5 – Pendant #





Why Was This Project Successful?

- Basic Energy Science's (project sponsor) commitment to project success
- Laboratory commitment to project success
- Excellent Integrated Project Team
- Project team's technical capabilities



Thanks!

Steven Dierker
Laboratory Project Director

Aesook Byon
Laboratory Deputy Project Director

Robert Caradonna
Deputy Federal Project Director

Phillip Kraushaar
Program Manager, SC-BES



Back-up Slides



National Synchrotron Light Source II (NSLS-II) Project



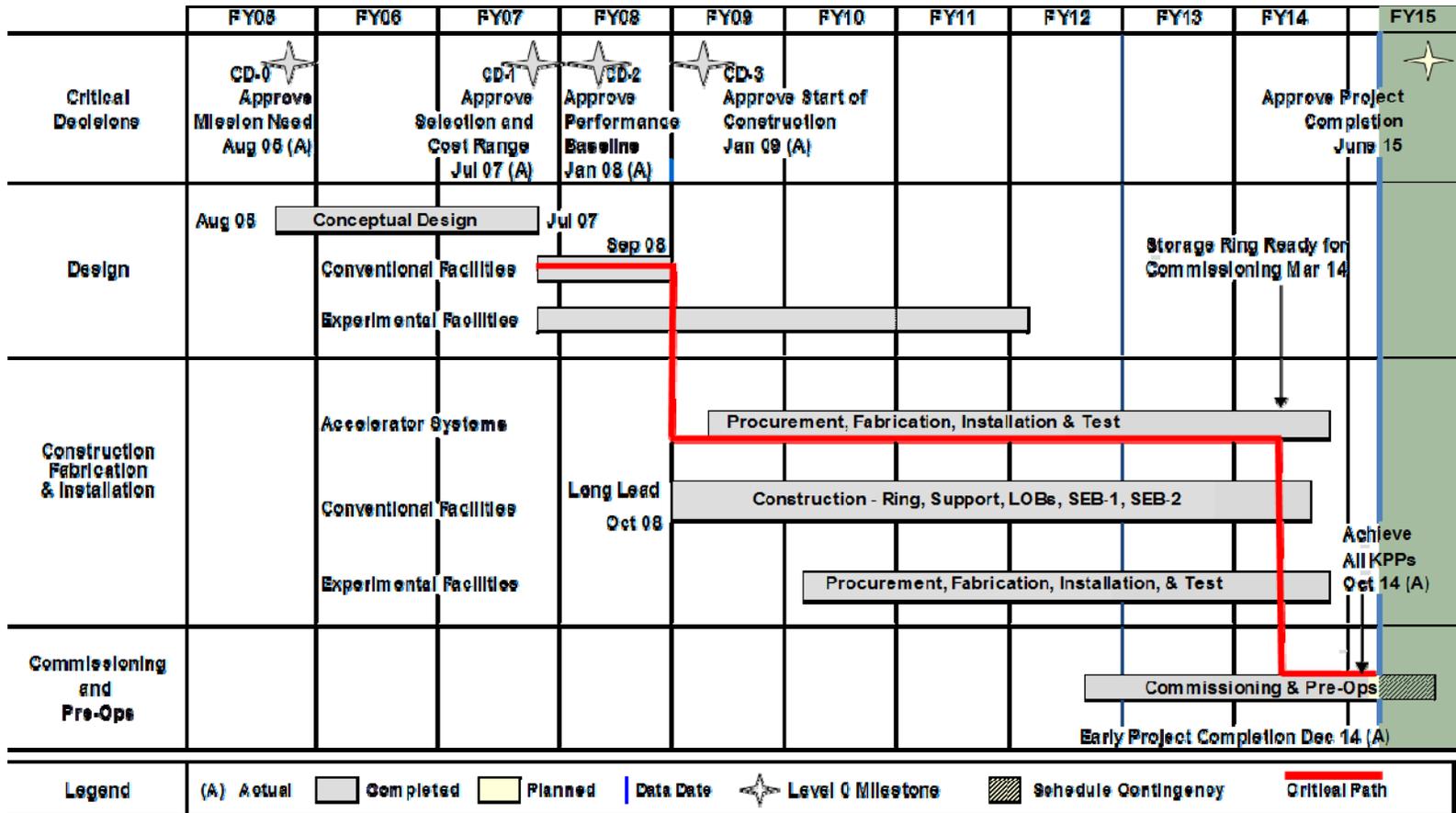
CD-4 Achieved March 19, 2015

Frank Crescenzo – FPD
Brookhaven Site Office (BHSO)



Schedule

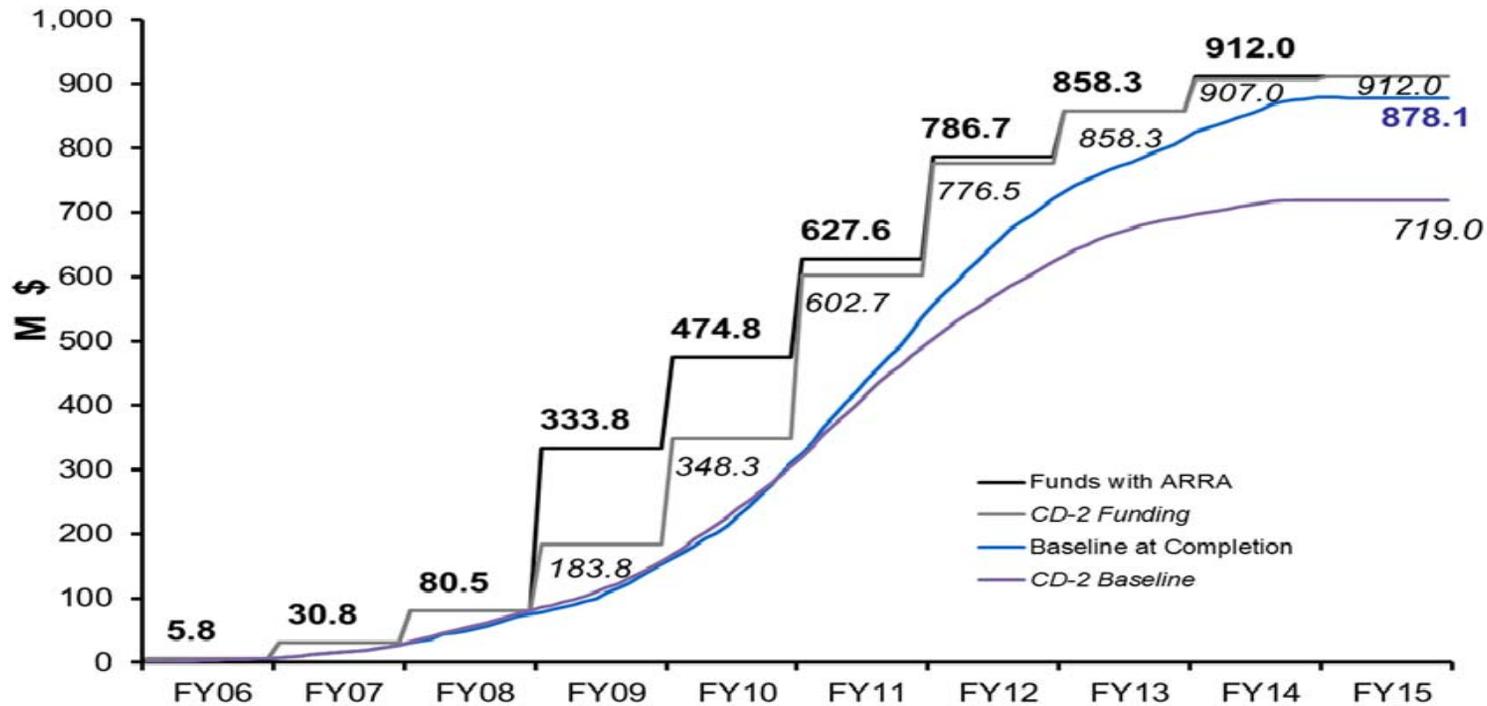
Level 1 Milestone	Schedule at CD-2	Actual
CD-0, Approve Mission Need	8/25/05	8/25/05
CD-1, Approve Alternative Selection and Cost Range	7/12/07	7/12/07
CD-2, Approve Performance Baseline	1 st Quarter FY2008	1/18/08
CD-3, Approve Start of Construction	2 nd Quarter, FY,2009	1/9/09
CD-4, Approve Start of Operations	3 rd Quarter, FY2015	3/19/15





Funding Profile

Funding Type	NSLS-II Funding Profile (\$M)											
	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	27.4		60.2
Total NSLS-II Project	1.0	4.8	25.0	49.7	253.3	141.0	152.8	159.1	71.6	53.7		912.0





Project Costs

WBS	WBS Name	At CD-2	Added Scope	Final	Contingency Utilization
1.01	PROJECT MANAGEMENT	\$52,506	\$4,743	\$69,752	Contingency was used primarily for project support which was underestimated and augmented to execute scope additions. ES&H was also augmented during construction and for support of the transition to operations.
1.03	ACCELERATOR SYSTEMS	\$242,181	\$8,159	\$314,500	Additional scope was provided (RF transmitter and insertion devices), Mitigation of production issues in magnets and power supplies, as well as underestimated labor particularly in installation and in the accelerator safety systems.
1.04	EXPERIMENTAL FACILITIES	\$72,751	\$10,473	\$95,256	Provided scope enhancements for project beamlines and provided affordances for future beamlines (hutches, and common systems)
1.05	CONVENTIONAL FACILITIES	\$240,782	\$38,445	\$311,501	Contingency was utilized for scope additions including expanding the experimental floor, providing additional LOB shells and an additional end station building.
TEC Direct		\$608,220	\$61,820	\$791,009	
TEC Contingency (31% ETC at CD-2)		\$182,980		\$191	
TOTAL ESTIMATED COST		\$791,200		\$791,200	
1.02	R&D and CONCEPTUAL DESIGN	\$60,588	\$0	\$60,595	No contingency utilization as scope of R&D was managed to cost
1.06	PRE-OPERATIONS	\$50,202	\$6,310	\$59,018	Additional pre-ops labor, and spares for future beamlines
OPC Direct		\$110,790	\$6,310	\$119,613	
OPC Contingency (12% ETC at CD-2)		\$10,010		\$1,187	
OTHER PROJECT COST		\$110,790		\$120,800	
Total Project Cost (TPC)		\$912,000		\$912,000	



Key Performance Parameters (KPPs)

<i>KPP at CD-2</i>	<i>Attained</i>	<i>Current Status</i>
<i>Deliver 340,000 GSF conventional construction</i>	<i>25-Jun-14</i>	<i>Delivered 627,834 GSF, KPP Exceeded</i>
<i>Achieve 3.0 GeV and 25 mA</i>	<i>29-Apr-14 with Warm RF cavity, 2-Jul-14 with SCRF Cavity</i>	<i>50 mA with SC Cavity KPP Exceeded</i>
<i>6 beamlines installed and ready for commissioning w/ x-ray beam</i>	<i>31-Oct-14</i>	<i>7 with provisions for 8th KPP Exceeded</i>



Scope Additions

Item	Cost [\$k]	Date
Widen Ring Bldg 10'	6,429	Mar-08
Enlarged LOBs	10,970	Aug-10
Add Data & Communication scope	695	Aug-10
2nd SR RF Transmitter	2,215	Aug-10
Site Utility Revisions for Larger LOBs	167	Mar-11
Lead Shielding for all Beam Openings	897	Mar-11
Additional HXN Near-Hutch Enclosure	157	Jul-11
Added LOB 4 & 5 Core and Shell	14,798	Aug-11
Procurement of AEDs for the Ring Building	29	Sep-11
HXN Secondary Source Aperture	338	May-12
Addition of Temperature Regulation for HXN	730	May-12
CSX Fast XPCS CCD Detector	438	Jun-12
Labor and Space for Scope Additions	3,891	Jul-12
Additional Insertion Devices	3,383	Feb-13
Additional Racks for Future Beamlines	277	Mar-13
Additional Frontends in Cells (2,4,6,8,12)	5,207	Apr-13
Project Support for Scope Additions	822	Apr-13
Satellite Endstation Building #2 Construction	4,087	May-13

Item	Cost [\$k]	Date
Future Beamline Common Systems	1,876	Jun-13
Additional Insertion Device Engineering	153	Jul-13
Additional Hutches for Future Beamlines	5,152	Aug-13
Utility Components for Future Beamlines	664	Aug-13
WAXS/SAXS Detector for CHX	920	Sep-13
CSX Beamline in-chamber slits and shutter	264	Dec-13
Additional ID Infrastructure	1,879	Feb-14
Power-actuated Hutch Door	440	Apr-14
Top Off Safety System	326	May-14
ACMI System	301	Jun-14
Bake-out System for Future Beamlines	138	Jun-14
Hot Cathode Thyratrons for Booster Kickers	85	Jun-14



Environment, Safety and Health

	Hours Worked	Recordable Cases	Recordable Rate	DART Cases	DART Rate
NSLS II Staff Cumulative	2,928,807	6	0.41 (Target: 0.65)	1	0.07 (Target: 0.25)
Total Project Cumulative	4,247,735	14	0.66 (Target: 1.0)	6	0.28 (Target: 0.36)



NSLS-II Success Lessons

Lessons	Description, Impacts, and Solutions
<p>Front loaded funding provided by DOE</p>	<ul style="list-style-type: none"> • Project CD-2 baseline plan had a very aggressive ramp-up of the assumed funding profile which was one of the highest project risks, if not the highest risk. With \$150M ARRA fund provided in FY2009, this risk was completely retired in a very early phase of the project. • Reduced other schedule risks by being able to pull-forward high schedule risk activities and increased built-in schedule float.
<p>Successfully recruited and retained key staff</p>	<ul style="list-style-type: none"> • DOE approved the NSLS-II Project to use an HR Toolkit that included enhanced sign-on capabilities and performance-based incentive pay options for key project personnel. • This incentive program allowed the project to quickly attract and recruit key personnel and gave the project the tools to use when key retention issues arose.
<p>Strong Laboratory support</p>	<ul style="list-style-type: none"> • Brookhaven National Laboratory delivered strong support to the NSLS-II Project in all areas, including ESH, Procurement, Human Resources and the other science departments and directorates. • NSLS-II was the Laboratory's highest priority during the life of the NSLS-II Project and that was communicated and known across the BNL campus. • Whenever the project reached a critical squeeze on resources, Brookhaven came through with support from around the Laboratory.



NSLS-II Lessons for Potential Improvement

Lessons	Description, Impacts, and Solutions
Proactive staffing plan	<ul style="list-style-type: none"> • Staffing plan and hiring process were often lagging behind need dates • Delays significantly impacted meeting schedule in some areas of project. • Setting up proactive staffing plan process in early phase of the project will help preventing these challenges.
Insufficient schedule allocation for procurement process	<ul style="list-style-type: none"> • Resource loaded schedule initially formulated did not include sufficient resources or schedule durations for the procurement process. • This shortfall was mitigated by consuming cost and schedule contingency throughout the project duration. • Adequate resource and schedule durations from previous experiences should be incorporated in project planning. • Procurement schedule profiles should be adjusted to appropriately reflect the anticipated and then the final contractual milestones. • Plan for obligations in the schedule with either one day activities or a separate resource for obligations which is planned for the first day of the procurement lead times. (This allocates all the funds on day 1 to cover the obligation.)
Readiness Preparations	<ul style="list-style-type: none"> • Accelerator Readiness Review Process needs to be robust, including: • the use of a performance-based approach when preparing for operations • establishment of clear roles & responsibilities for the operating organization • See BNL Lessons Learned # 2014-BNL-Linac-0002