NEXT Project

(NEXT: NSLS-II EXperimental Tools)

Risk Registry Report

November 2016

Brookhaven National Laboratory
Upton, New York 11973

BROOKHAVEN
NATIONAL LABORATORY

This Risk Registry Report contains a collection of the risk documents which define the Risk Registry. In order to report, track and closeout risks, a risk entry form is used to capture each High, Medium or Low risk and is updated by the owners of the risk as the risk assessment, handling, and monitoring functions are executed.

The Risk Registry Report is a dynamic document throughout the life of the project and is maintained and updated by the NEXT Project Manager(s) as required based on the addition and update of high, medium and low risks.

Table 1. Risk Likelihood (Probability) Categories

Likelihood Category	Definition	Weighting
Very Likely (V)	Risk is likely to occur with a probability ≥ 90%	90%
Likely (L)	Risk is likely to occur with a probability ≥ 50% and < 90%	70%
Unlikely (U)	There is < 50% chance that this event will occur	50%

Table 2. Risk Consequence (Impact) Categories

Consequence Category	Definition		
	Cost: Impact on project contingency	**Schedule**: Impact on project schedule	**Technical**: Impact on performance
Marginal (M)	< $100K	None	Minor degradation, Performance falls below upper end of goal; CD-4 can still be met
Significant (S)	$100K-500K	Impacts Level 0, 1, or 2 milestones defined in PEP	Moderate performance shortfall, but workarounds available; Performance falls below mid-range goal
Critical (C)	> $500K	Impacts early finish milestones	CD-4 will not be met (essential performance parameter not met)

Table 3. Risk Categorization Matrix (Risk Rating)

Probability	Impact		
	Marginal	**Significant**	**Critical**
Very likely	Medium	High	High
Likely	Low	Medium	High
Unlikely	Low	Low	Medium

Additional low probability (less than 10% likelihood) risks are listed in the NEXT LOW Risk Registry and not included in the overall risk value assessment.

Further content in this report is organized into the following sections:

- Overall summary table, indicating risk values and update status
- NEXT Risk Registry Summary
- NEXT Risk Registry Entries Detail
- NEXT LOW Risk Registry Summary
- NEXT LOW Risk Registry Entries Detail
- Risk Registry Report Addendum (overall risk assessment and tables of values for risks by WBS)

NEXT Risk Registry Update Summary Nov. 30, 2016

Risk ID	Title	Record Date	Current Risk Value	Date to Complete	Value Retired*	Factors Affecting Update	Risk Rating
NEXT-01	Underestimated effort	Nov. 30, 2016	$0.178 M	Jan-17	$0.239 M	Completion of Scope	Medium
NEXT-02	Delay in appropriations occurring on October 1 of each year	July 10, 2012	$1.200 M	Jan-16	$0.000 M		High
NEXT-03	Directed Funding Profile Change	July 10, 2012	$4.800 M	Feb-16	$0.000 M		High
NEXT-04	Higher-than-expected worldwide demand for beamline components	Nov. 30, 2016	$0.135 M	Jan-17	$0.055 M	Schedule risk (mostly SIX)	Medium
NEXT-05	Higher-than-expected optic quality required	Mar. 27, 2015	$0.000 M	Mar-15	$0.000 M		Retired
NEXT-06	Required optic quality is closer to state-of-the-art than expected	Mar. 27, 2015	$0.000 M	Jan-15	$0.000 M		Retired
NEXT-07	Underperforming equipment brought from NSLS	Nov. 30, 2015	$0.000 M	Aug-15	$0.000 M		Retired
NEXT-08	Design Changes	Nov. 30, 2016	$0.025 M	Jan-17	$0.000 M		Low
NEXT-09	Changes to EESE requirements/designs	Jul. 16, 2014	$0.000 M	Feb-14	$0.000 M		Retired
NEXT-10	Higher-than-expected thermal deformation of optics	Mar. 27, 2015	$0.000 M	Dec-14	$0.000 M		Retired
NEXT-11	Underestimated endstation component costs	Nov. 30, 2016	$0.055 M	Jan-17	$0.090 M	Completion, EAC updates	Low
NEXT-12	Personnel recruitment delays	Nov. 30, 2015	$0.000 M	Oct-15	$0.000 M		Retired
NEXT-13	Higher-than-expected inflation rate	Mar. 23, 2016	$0.000 M	Jan-16	$0.000 M		Retired
NEXT-14	Accidents and injuries	Nov. 30, 2016	$0.174 M	Jan-17	$0.226 M	Completion, transition to operations	Low
NEXT-15	Limited availability of specialized effort	Nov. 30, 2016	$0.024 M	Jan-17	$0.048 M	Completion, updated plan	Low
NEXT-16	Market-driven price fluctuations	Jul. 23, 2015	$0.000 M	Jul-15	$0.000 M		Retired
NEXT-17	Late installation of EESEs	Nov. 12, 2014	$0.000 M	Nov-14	$0.000 M		Retired
NEXT-18	Insufficient mechanical stability of optical components	Nov. 30, 2016	$0.000 M	Oct-16	$0.015 M	Completion	Retired
NEXT-19	Late installation of Utilities, PPS, and EPS	Nov. 30, 2016	$0.060 M	Jan-17	$0.330 M	Completion for beamlines	Low
NEXT-20	Installation of beamlines during facility commissioning/studies	Jul. 16, 2014	$0.000 M	Oct-14	$0.000 M		Retired
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements	Nov. 30, 2016	$0.000 M	Oct-16	$0.125 M	Completion	Retired
NEXT-22	Insertion Device and Front End installation scope not funded by NSLS-II Operations as planned	Jul. 23, 2015	$0.000 M	Jul-15	$0.000 M		Retired

*Relative to July 2016 assessment

NEXT Risk Registry - Summary

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Risk ID	Title	Record Date	Owner title	Risk Rating	Approval Status
NEXT-01	Underestimated effort	Nov. 30, 2016	Project Manager	Medium	Approved
NEXT-02	Delay in appropriations occurring on October 1 of each year	July 10, 2012	Federal Project Director	High	Approved
NEXT-03	Directed Funding Profile Change	July 10, 2012	Federal Project Director	High	Approved
NEXT-04	Higher-than-expected worldwide demand for beamline components	Nov. 30, 2016	Level 2 Managers for Beamlines	Medium	Approved
NEXT-05	Higher-than-expected optic quality required	Mar. 27, 2015	Level 2 Managers for Beamlines	Retired	Approved
NEXT-06	Required optic quality is closer to state-of-the-art than expected	Mar. 27, 2015	Level 2 Managers for Beamlines	Retired	Approved
NEXT-07	Underperforming equipment brought from NSLS	Nov. 30, 2015	Level 2 Managers for impacted beamlines	Retired	Approved
NEXT-08	Design Changes	Nov. 30, 2016	Level 2 Managers	Low	Approved
NEXT-09	Changes to EESE requirements/designs	Jul. 16, 2014	Level 2 Managers	Retired	Approved
NEXT-10	Higher-than-expected thermal deformation of optics	Mar. 27, 2015	Level 2 Managers for Beamlines	Retired	Approved
NEXT-11	Underestimated endstation component costs	Nov. 30, 2016	Level 2 Managers for Beamlines	Low	Approved
NEXT-12	Personnel recruitment delays	Nov. 30, 2015	Project Manager	Retired	Approved
NEXT-13	Higher-than-expected inflation rate	Mar. 23, 2016	Project Manager	Retired	Approved
NEXT-14	Accidents and injuries	Nov. 30, 2016	ESH Manager	Low	Approved
NEXT-15	Limited availability of specialized effort	Nov. 30, 2016	Project Manager	Low	Approved
NEXT-16	Market-driven price fluctuations	Jul. 23, 2015	Level 2 Manager for Insertion Devices	Retired	Approved
NEXT-17	Late installation of EESEs	Nov. 12, 2014	Level 2 Manager for Common Systems	Retired	Approved
NEXT-18	Insufficient mechanical stability of optical components	Nov. 30, 2016	Level 2 Managers for Beamlines, Common Systems, and Controls	Retired	Approved
NEXT-19	Late installation of Utilities, PPS, and EPS	Nov. 30, 2016	Level 2 Managers for Beamlines	Low	Approved
NEXT-20	Installation of beamlines during facility commissioning/studies	Jul. 16, 2014	Level 2 Managers	Retired	Approved
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements	Nov. 30, 2016	Level 2 Manager for Insertion Devices	Retired	Approved
NEXT-22	Insertion Device and Front End installation scope not funded by NSLS-II Operations as planned	Jul. 23, 2015	Level 2 manager for ID and FE installation	Retired	Approved

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-01	Underestimated effort	2.0 NEXT Project	Nov. 30, 2016

Description:

Condition: Underestimated effort: technical engineering and design issues prove to be more challenging than anticipated; Level 2 management effort greater than estimated.

Consequence: Additional labor required, increasing cost.

July 2013 Breakdown by WBS
13% : Common Systems WBS 2.03.[01..04]
10% : Beamline Controls WBS 2.04.02
2% : FXI beamline design WBS 2.06.02.[01,03]
15% x 5 : 5 base scope beamlines PDS & endstation WBS 2.[05,07..10].02.[01,03]

October 2013 Breakdown by WBS
13% : Common Systems WBS 2.03.[01..04]
10% : Beamline Controls WBS 2.04.02
2% : FXI beamline design WBS 2.06.02.[01,03]
12% x 5 : 5 base scope beamlines PDS& endstation WBS 2.[05,07..10].02.[01,03]
2.5% x 6 : Beamline Management, WBS 2.[05-10].01

February 2014 Breakdown by WBS
Common Systems
 2.03.01: $222k (utilities)
 2.03.[02,03]: $111k each (PPS, EPS)
 2.03.04: $37k (control station)
Beamline Controls
 2.04.02: $370k (design & implement)
FXI beamline (design)
 2.06.02.[01,02]: $37k each
5 base scope beamlines PDS & endstation
 2.[05,07..10].02.01: $259k -> $130k each
 2.[05,07..10].02.03: $185k each
Beamline Management (6 beamlines)
 2.[05-10].01: $92.5k each

November 2014 Breakdown by WBS
Common Systems ->$0 (risk hit; significant labor added to EAC)
Beamline Controls (2.04.02): $100k
FXI beamline (design, 2.06.02.[01,02]): $0 (base scope complete)
5 base scope beamlines PDS, endstation, and management:
 ESM. 2.05.02.01: $65k, 2.05.02.03: $93k, 2.05.01: $0
 ISR. 2.07.02.01: $32k, 2.07.02.03: $45k, 2.07.01: $23k
 ISS. 2.08.02.01: $93k, 2.08.02.03: $132k, 2.08.01: $65k
 SIX. 2.09.02.01: $16k, 2.09.02.03: $23k, 2.09.01: $11k
 SMI. 2.10.02.01: $32k, 2.10.02.03: $45k, 2.10.01: $23k

March 2015 Breakdown by WBS
Reduction in PDS of ESM& ISS, ES of ISS, and increase in enclosures for ISS & ISR plus risk on new 2.12 scope.
Beamline Controls (2.04.02): $100k
 ESM. 2.05.02.01: $30k, 2.05.02.03: $93k
 ISR. 2.07.02.01: $32k, 2.07.02.03: $45k, 2.07.02.02: $10k, 2.07.01: $23k
 ISS. 2.08.02.01: $60k, 2.08.02.03: $100k, 2.08.02.02: $10k, 2.08.01: $65k
 SIX. 2.09.02.01: $16k, 2.09.02.03: $23k, 2.09.01: $11k
 SMI. 2.10.02.01: $32k, 2.10.02.03: $45k, 2.10.01: $23k
 ID/FE install. 2.12.01 $2k, 2.12.02 $74k, 2.12.03 $75k

July 2015 Breakdown by WBS
Beamline Controls (2.04.02): $100k->$250k (~1FTE additional need possible to complete endstations)
FXI. 2.06.02.02: $0 ->$20k (possible additional hutch test effort)
No change in other areas:
 Common Systems. 2.03 $0
 ESM. 2.05.02.01: $30k, 2.05.02.03: $93k
 ISR. 2.07.02.01: $32k, 2.07.02.03: $45k, 2.07.02.02: $10k, 2.07.01: $23k
 ISS. 2.08.02.01: $60k, 2.08.02.03: $100k, 2.08.02.02: $10k, 2.08.01: $65k

SIX. 2.09.02.01: $16k, 2.09.02.03: $23k, 2.09.01: $11k
SMI. 2.10.02.01: $32k, 2.10.02.03: $45k, 2.10.01: $23k
ID/FE install. 2.12.01 $2k, 2.12.02 $74k, 2.12.03 $75k

Nov 2015 Breakdown by WBS
Common Systems. 2.03.01 Utilities $0->$10k, 2.03.02 PPS $0->$175k ($35k/BL), all other 2.03: $0.
Beamline Controls (2.04.02): $250k->$150k (~1 FTE additional need possible)
ISR hutches (2.07.02.02): $10k->$0 (hutches complete)
ISS mgmt. (2.08.01): $65k-> $20k, ISS hutches (2.08.02.02): $10k->$0 (hutches complete)
SIX 2.09.02.01: $16k->$36k, 2.09.02.03: $23k->$43k
ID/FE install. 2.12 $151k->0 (scope removed)
No change in other areas:
ESM. 2.05.02.01: $30k, 2.05.02.03: $93k
FXI. 2.06.02.02: $20k
ISR. 2.07.02.01: $32k, 2.07.02.03: $45k, 2.07.01: $23k
ISS. 2.08.02.01: $60k, 2.08.02.03: $100k
SIX. 2.09.01: $11k
SMI. 2.10.02.01: $32k, 2.10.02.03: $45k, 2.10.01: $23k

Mar 2016 Breakdown by WBS
Common Systems. 2.03.01 Utilities $10k (no change), 2.03.02 PPS $175k->$140k (EAC added to reach $450k per beamline, but risk exists to reach up to 20% growth on remaining work), all other 2.03: $0.
Beamline Controls (2.04.02): $150k (no change)
ESM. 2.05.02.01: $30k->$50k (added potential cost of pylon reinforcement); 2.05.02.03: $93k->$69k (25% reduction based on work completed)
FXI. 2.06.02.02: $20k->0 (hutches scope complete)
ISR. 2.07.01: $23k (no change); 2.07.02.01: $32k->$42k (added potential cost of pylon reinforcement); 2.07.02.03: $45k->$22.5k (50% reduction based on clarified labor requirements)
ISS. 2.08.01: $20k->$5k (travel nearly complete); 2.08.02.01: $60k->$15k ($5k pylons, $10k focusing mirror); 2.08.02.03: $100k (no change)
SIX. 2.09.01: $11k (no change); 2.09.02.01: $36k (no change); 2.09.02.03: $43k (no change)
SMI. 2.10.01: $23k->0 (little travel remains, all costs captured in EAC); 2.10.02.01: $32k->$36.5k (pylons, IDT cables), 2.10.02.03: $45k (no change)

Jun 2016 Breakdown by WBS
Common Systems. 2.03.01 Utilities $10k->$20k, finishing work remaining on SMI and SIX which have not yet undergone IRR ($10k risk per beamline); 2.03.02 PPS $175k->$27k (10% of remaining work, adds to 10% unknown risk for total of 20% potential growth on remaining work); 2.03.03 EPS $10k potential underestimate for endstation work, if in scope (e.g. ISS), up from 0.
Beamline Controls (2.04.02): $150k->$75k (EAC growth in May)
ESM. 2.05.02.01: $50k->$15k (pylons done, PDS largely complete. This covers possible overage related to chiller work); 2.05.02.03: $69k->$20k (most work completed or now in EAC).
ISR. 2.07.01: $23k->$12k (50% reduction based on completion, IRR& travel risk remain); 2.07.02.01: $42k->$16k (pylons done, PDS largely complete); 2.07.02.03: $22.5k (no change)
ISS. 2.08.01: $5k (travel, keep); 2.08.02.01: $15k->$20k (in case of HRM xtal failure); 2.08.02.03: $100k->$20k (costs in EAC).
SIX. 2.09.01: $11k (no change); 2.09.02.01: $36k (no change); 2.09.02.03: $43k (no change)
SMI. 2.10.01: 0 (no change); 2.10.02.01: $36.5k->$20k (PDS/vacuum risk beyond EAC), 2.10.02.03: $45k (no change)

Nov 2016 Breakdown by WBS
CBS: 2.03.01 $20k->$5k, 2.03.02 $27k->$16k, 2.03.03 EPS $10k->$6k
Controls: 2.04.02 $75k->$30k
ESM: 2.05 ->0 (all work complete)
ISR: 2.07.01 $12k->0, 2.07.02.01 $16k->0, 2.07.02.03 ISR endstation $23k->$11k
ISS: 2.08 -> 0 (all work complete)
SIX: 2.09.01 $11k (no change), 2.09.02.01 $36k (no change), 2.09.02.03 $43k (no change)
SMI: 2.10.02.01 $20k->0 (complete), 2.10.02.03 $45k->$20

Probability:	Impact:	Risk Rating:
Likely	Significant Schedule: up to 8 months == $3.2M **10/10/2013** added: underestimated beamline management risk = $0.5M ->Total assessed risk = $3.7M **2/5/2014** retired 129k from each of 2.[05,07..10].02.01 (total retired: $645k) ->Total assessed risk = $3.055M **11/12/2014** retired total $2.26M per CAM input and comprehensive EAC -> Total assessed risk = $798k **3/27/2015** added net $71k per CAM input -> Total assessed risk = $869k **7/23/2015** added net $170k per CAM input -> Total assessed risk =	Medium

$1039k
11/30/2015 reduced net $91k per CAM input -> Total assessed risk = $948k
3/23/2016 reduced net $150k per CAM input -> Total assessed risk = $798k (EMV $559k)
7/9/2016 reduced net $381k per CAM input -> Total assessed risk = $417k (EMV $292k)
11/30/2016 reduced net $239k per CAM input -> Total assessed risk = $178k (EMV $125k)

Mitigation Approaches:

Provide additional labor.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-17	Project Manager S. Hulbert

Current Status:

2/27/2013 Update the schedule impact, reduced from 10 months to 8 months. Risk rating remains high.
10/10/2013 Added $0.5M schedule risk for possible underestimated beamline management effort, WBS 2.[05-10].01, for total assessed risk of $3.7M. Risk rating remains high. Renormalized WBS breakdown shown in Description text box above.
2/5/2014 Retired $0.645M risk based upon 50% completion of PDS design for 5 base scope beamlines (WBS 2.[05,07-10].02.01 (as given in Description field), for total assessed risk of $3.055M. Risk rating remains High.
7/16/14 No reduction. Identified refinement of PDS and endstation plans for beamlines as candidate retirement strategy.
11/12/14 Reductions based on revised risk estimates (all CAMs) as well as labor costs included in annual bottoms-up EAC.
3/27/15 Reductions and additions with net increase, dominated by risk on added 2.12 scope.
7/23/15 Additions in 2.04 and 2.06, no reductions elsewhere since March. Rating increased from Medium to High, completion date extended to September 2016.
11/30/15 Both additions and reductions as indicated in Description. Rating returned from High to Medium, largely due to removal of 2.12 scope.
3/23/16 Changes are mostly but not entirely reductions, as indicated in Description. Rating remains Medium.
7/9/16 Changes are largely reductions, as indicated in Description. Rating remains Medium.
11/30/16 Reductions indicated in Description. Rating remains Medium (impact remains Significant).

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-02	Delay in appropriations occurring on October 1 of each year	2.0 NEXT Project	July 10, 2012

Description:

Condition: Until project reaches its peak year funding, CR will impact the performance baseline both cost and schedule unless there is an intervention by DOE sponsor.

Consequence: Schedule delay(s), leaading to cost increase(s).

Probability:	Impact:	Risk Rating:
Very Likely	Critical Schedule: up to 5 months == $1.2M	High

Mitigation Approaches:

Perform impact analysis for various scenarios and inform DOE. Get direction from DOE as early as possible.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-16	Federal Project Director Robert Caradonna

Current Status:

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-03	Directed Funding Profile Change	2.0 NEXT Project	July 10, 2012

Description:

Condition: Revision to baseline scope/schedule and/or budget, resulting in potential increase in cost of project

Consequence: Schedule delay(s) and/or reduced funding.

Probability:	Impact:	Risk Rating:
Likely	Critical Schedule: up to 12 months == $4.8M	High

Mitigation Approaches:

Revise baseline to minimize cost and schedule impacts.

Date Started:	Date to Complete:	Owner:
Jan-12	Feb-16	Federal Project Director Robert Caradonna

Current Status:

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-04	Higher-than-expected worldwide demand for beamline components	2.05 - 2.10 Beamlines (Photon Delivery Systems and Endstation Optics)	Nov. 30, 2016

Description:

Condition: Increased worldwide demand for beamline and endstation components that are offered by a small number of vendors. Resulting procurement delays.

Consequence: Delays in installation and testing of photon delivery system components, possibly delaying beamline completion.

Initial Breakdown by WBS:
20% x 5 : 5 base scope beamlines PDS & endstation
2.[05,07..10].02.01: $156k each
2.[05,07..10].02.03: $84k each
(total optics scope: $240k each)

February 2014 Breakdown by WBS:
Retirement of $140k total from PDS based upon establishment of schedule upon contract award:
2.05.02.01 (ESM): 2 RFQ's awarded constituting ~11% of total optics scope (17% of PDS).
Proportional retirement of initial risk value ($27k) results in $156k -> $129k.
2.08.02.01 (ISS): 1 RFQ awarded constituting ~5% of total optics scope (8% of PDS).
Proportional retirement of initial risk value ($12k) results in $156k -> $144k.
2.09.02.01 (SIX): 2 RFQ's awarded constituting ~10% of total optics scope (15% of PDS).
Proportional retirement of initial risk value ($23k) results in $156k -> $133k.
2.10.02.01 (SMI): 1 RFP awarded constituting ~33% of total optics scope (50% of PDS).
Proportional retirement of initial risk value ($78k) results in $156k -> $78k.
2.07.02.01 (ISR): $156k remains
2.[05,07..10].02.03: $84k each remains

July 2014 Breakdown by WBS:
Retirement of $245k total from PDS based upon establishment of schedule upon contract award:
2.05.02.01 (ESM): mono and rulings awarded, raising awarded fraction to 47% of PDS.
Proportional retirement of initial risk value results in $156k -> $129k -> $83k.
2.07.02.01 (ISR): optics package awarded, raising awarded fraction to 70% of PDS.
Proportional retirement of initial risk value results in $156k -> $47k.
2.08.02.01 (ISS): mono awarded, raising awarded fraction to 37% of PDS.
Proportional retirement of initial risk value results in $156k -> $144k -> $98k.
2.09.02.01 (SIX): mono and spectrometer grating substrates awarded, raising awarded fraction to 43% of PDS.
Proportional retirement of initial risk value results in $156k -> $133k -> $89k.
2.10.02.01 (SMI): No change. Award-proportional risk value remains at $156k ->$78k (50% awarded includes white beam optics package only).
2.[05,07..10].02.03: $84k each remains (endstations)

November 2014 Breakdown by WBS:
Retirement of $132k total (in ISS), leaving:
2.05.02.01 (ESM): $83k, 2.05.02.03: $84k
2.07.02.01 (ISR): $47k, 2.07.02.03: $84k
2.08.02.01 (ISS): $25k, 2.08.02.03: $25k
2.09.02.01 (SIX): $89k, 2.09.02.03: $84k
2.10.02.01 (SMI): $78k, 2.10.02.03: $84k

March 2015 Breakdown by WBS:
Reductions in ESM, ISS, and SMI due to procurement progress, leaving:
2.05.02.01 (ESM): $50k, 2.05.02.03: $20k
2.07.02.01 (ISR): $47k, 2.07.02.03: $84k
2.08.02.01 (ISS): $25k, 2.08.02.03: $0
2.09.02.01 (SIX): $89k, 2.09.02.03: $84k
2.10.02.01 (SMI): $50k, 2.10.02.03: $84k

July 2015 Breakdown by WBS:
Reductions in ISR and SMI (endstations) due to procurement progress, leaving:
2.05.02.01 (ESM): $50k, 2.05.02.03: $20k
2.07.02.01 (ISR): $47k, 2.07.02.03: $50k
2.08.02.01 (ISS): $25k, 2.08.02.03: $0
2.09.02.01 (SIX): $89k, 2.09.02.03: $84k

2.10.02.01 (SMI): $50k, 2.10.02.03: $68k

Nov 2015 Breakdown by WBS:
Reductions in ISS PDS and SMI endstation (due to procurement progress), leaving:
2.05.02.01 (ESM): $50k, 2.05.02.03: $20k
2.07.02.01 (ISR): $47k, 2.07.02.03: $50k
2.08.02.01 (ISS): $0, 2.08.02.03: $0
2.09.02.01 (SIX): $89k, 2.09.02.03: $84k
2.10.02.01 (SMI): $50k, 2.10.02.03: $30k

Mar 2016 Breakdown by WBS:
Reductions in Most PDS and endstation areas (due to vendor progress):
2.05.02.01 (ESM): $50k->$10k (M1 masks remaining), 2.05.02.03: $20k (no change)
2.07.02.01 (ISR): $47k->$25k (DCM crystals remaining), 2.07.02.03: $50k (no change)
2.08.02 (ISS): $0
2.09.02.01 (SIX): $89k->$40k, 2.09.02.03: $84k->$299k (M4, M6, grating substrates and rulings, sample chamber and spectrometer)
2.10.02.01 (SMI): $50k->0, 2.10.02.03: $30k->0

Jun 2016 Breakdown by WBS:
Reductions in most PDS and endstation areas (due to vendor progress):
2.05.02.01 (ESM): $10k (M4 remaining), 2.05.02.03: $20k->0
2.07.02.01 (ISR): $25k->0 (PDS completion), 2.07.02.03: $50k->$40k (dominated by 6-circle diffractometer)
2.08.02 (ISS): 0
2.09.02.01 (SIX): $40k->$20k (M4, M3 cleaning), 2.09.02.03: $299k->$120k (grating substrates and rulings risk mitigated, but endstation delays for sample chamber / spectrometer / optics could have"standing army" impact of up to 2 months x 4 mFTE)
2.10.02 (SMI): 0

Nov 2016 Breakdown by WBS:
Reductions due to vendor progress:
ESM: 2.05.02.01 $10k->0 (no cost impact of M4 delay)
ISR: 2.07.02.03 $40k->0 (costs for 6-circle diffractometer captured in EAC)
SIX: 2.09.02.01 $20k->$15k (M4), 2.09.02.03: $120k (endstation delays for sample chamber / spectrometer / optics could have"standing army" impact of up to 2 months x 4 mFTE)

Probability:	Impact:	Risk Rating:
Very Likely	Marginal Initial Assessment: Schedule: up to 3 months == $1.2M **2/5/2014** retired $140k from 2.[05,08,09,10].02.01 ->Total assessed risk = $1.06M **7/16/2014** retired $245k from 2.[05,07,08,09].02.01 Updated Assessment: This risk may impact both schedule and cost ->Total assessed risk = $815k **11/12/2014** retired $132k from 2.08.02. Remaining risk captures ~ 3 mo. of possible schedule delay per beamline ->Total assessed risk = $683k **3/27/2015** Remaining risk captures ~ 2 mo. of possible schedule delay per beamline ->Total assessed risk = $533k **7/23/2015** Remaining risk captures ~ 1.5 mo. of possible schedule delay per beamline ->Total assessed risk = $483k **11/30/2015** Remaining risk captures ~ 1.4 mo. avg. possible schedule delay per beamline ->Total assessed risk = $420k **3/23/2016** Remaining risk captures ~ 1.5 mo. avg. possible schedule delay per beamline ->Total assessed risk = $444k **7/9/2016** Remaining risk captures ~ 1-2 mo. possible schedule delay per remaining beamline (mostly SIX) ->Total assessed risk = $190k **11/30/2016** Remaining risk captures ~ 1-2 mo. possible schedule delay per remaining beamline (mostly SIX) ->Total assessed risk = $135k	Medium

Mitigation Approaches:

NEXT Risk Registry - Risk Entries

Complete designs, arrive at specifications, and order these items as early as possible. Closely monitor supplier activities in support of contractual delivery.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-17	Level 2 Managers for Beamlines E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/5/2014 Retired $140k total risk based upon optics award completion described in Description text box above. Total assessed risk is now $1.06M. Risk rating remains High.
7/16/2014 Retired $245k total risk based upon optics award completion described in Description text box above. Total assessed risk is now $815k. Risk rating remains High. Further reduction anticipated upon award of endstation equipment.
11/12/2014 Retired $132k total risk from ISS PDS and ES based upon optics award completion. Total assessed risk is now $683k. Risk rating remains High. Completion date extended to Jan 2016 to coincide with latest optics delivery; some early reduction may be possible based on delivery and/or vendor fabrication and test status.
3/27/2015 Retired risk from ESM, ISS and SMI based upon optics award completion and vendor status. Total assessed risk is now $533k. Risk rating remains High.
7/23/2015 Retired risk from ISR and SMI based upon endstation award completion and vendor status. Total assessed risk is now $483k. Risk rating remains High. Completion expected by May 2016.
11/30/2015 Retired risk from ISS and SMI based upon contract and vendor status. Total assessed risk is now $420k. Risk rating remains High. Completion expected by May 2016.
3/23/2016 Remaining risk results from both cost to mitigate delay, and standing army estimate (~$60k/BL) for items extending beyond planned period. Reductions overall, except in SIX where several items represent bottlenecks (see description). Total assessed risk is now $444k (net increase of $24k since last estimate). Risk rating remains High, EMV is $400k. Completion expected by August 2016.
7/9/2016 Remaining risk results mainly from standing army estimate (~$60k/mo/BL) for items extending beyond planned period. Reductions are made overall due to progress, with SIX dominating the value. Total assessed risk is now $190k (net decrease of $254k since last estimate). With impact below $200k (marginal), risk rating moves from High to Medium, and EMV is $171k. Completion expected by October 2016 (SIX & ISR endstations are latest).
11/30/2016 SIX continues to dominate this risk value (SIX endstation is last to arrive). Total assessed risk is now $135k (net decrease of $55k since last estimate). With impact below $200k (marginal), risk rating remains Medium, and EMV is $122k. Completion expected by January 2017.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-05	Higher-than-expected optic quality required	2.05 - 2.10 Beamline Optics (Photon Delivery Systems and Endstations)	Mar. 27, 2015

Description:

Condition: Required figure and finish quality of mirrors might be more demanding than is captured in current design. That is, immature design analysis.
Consequence: Revisions to optical design and/or changes to the optical and/or mechanical specifications of the photon delivery system components.
July 2013 ($2.0M total) Breakdown by WBS:
13% x 5 : 5 base scope beamlines PDS WBS 2.[05,07..10].02.01 ($260k each, $1.3M total)
5% : ISR endstation optics WBS 2.07.02.03 ($100k)
25% : SIX endstation optics WBS 2.09.02.03 ($500k)
5% : SMI endstation optics WBS 2.10.02.03 ($100k)
October 2013 ($1.2M total) Breakdown by WBS:
~8.3% x 5 : 5 base scope beamlines PDS WBS 2.[05,07..10].02.01 ($100k each, $0.5M total)
~8.3% : ISR endstation optics WBS 2.07.02.03 ($100k)
~41.7% : SIX endstation optics WBS 2.09.02.03 ($500k)
~8.3% : SMI endstation optics WBS 2.10.02.03 ($100k)
July 2014 ($0.7M total) Breakdown by WBS:
Owing to maturity of optical design, all PDS and SIX endstation cost risks are reduced:
5 base scope beamlines PDS WBS 2.[05,07..10].02.01 ($100k ->$50k each, $0.25M total)
ISR endstation optics WBS 2.07.02.03 ($100k)
SIX endstation optics WBS 2.09.02.03 ($500k->$250k)
SMI endstation optics WBS 2.10.02.03 ($100k)

November 2014 ($70k total) Breakdown by WBS:
Owing to maturity of optical design, PDS and endstation optics risk is almost completely retired (quality requirements now largely known):
ESM: PDS risk fully retired.
ISS: PDS risk fully retired.
ISR: PDS& ES risk fully retired.
SMI: PDS& ES risk fully retired.
SIX: risk reduced to $12k PDS (2.09.02.01), $58k ES (2.09.02.03).

March 2015:
Owing to maturity of optical design, PDS and endstation optics risk is now completely retired (quality requirements known).

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $2.0M **10/15/2013** update (see Status for detail): Cost: up to $1.2M **7/16/2014** updated cost: up to $0.7M **11/12/2014** updated value: up to $0.07M **3/27/2015** retired ($0 value)	Retired

Mitigation Approaches:

Complete optical design and analysis, and revise specifications as needed, as early as possible.

Date Started:	Date to Complete:	Owner:
Jan-12	Mar-15	Level 2 Managers for Beamlines E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/27/2013 Update the cost impact, reduced from $3M to $2M due to much progress made in design over last few months. Risk rating remains high.

10/10/2013 Reduced photon delivery system cost impact from 65% of $2.0M = $1.3M to 25% of $2.0M = $0.5M, i.e. a reduction of $0.8M, owing to substantial progress having been made in the design of the optics for all NEXT beamline photon delivery systems, WBS 2.[05-10].02.01. Updated total assessed risk = $1.2M. Risk rating remains high. Renormalized WBS breakdown shown in Description text box above.

2/5/2014 Extended completion date from Oct 2013 to Oct 2014 to follow beamline and endstation final design milestones.

7/16/2014 Reduced impact based on optical design maturity (see Description field). Further reduction expected upon finalization of PDS and endstation designs.

11/12/2014 Reduced impact based on optical design maturity (see Description field). Retirement expected upon finalization of PDS and endstation designs in SIX (extend to Dec 2014).

3/27/2015 Retired risk based on optical design maturity. Finalization of PDS and endstation designs in SIX complete.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-06	Required optic quality is closer to state-of-the-art than expected	2.05 - 2.10 Beamline Optics (Photon Delivery Systems and Endstations)	Mar. 27, 2015

Description:

Condition: The required figure and finish quality of some photon delivery system optics is at the limit of what is possible to manufacture today, i.e. at the current state-of-the-art.

Consequence: Only a limited number of companies will be able to meet the specications for these optical elements, increasing cost and lengthening delivery time.

Initial Breakdown by WBS:
16% x 5 : 5 base scope beamlines PDS WBS 2.[05,07..10].02.01 ($160k each)
3% : ISR endstation optics WBS 2.07.02.03 ($30k)
14% : SIX endstation optics WBS 2.09.02.03 ($140k)
3% : SMI endstation optics WBS 2.10.02.03 ($30k)

February 2014 Breakdown by WBS:
Retirement of $144k total from PDS based upon establishment of feasibility from contract award:
2.05.02.01 (ESM): 2 RFQ's awarded constituting ~17% of PDS optics scope.
Proportional retirement of initial risk value ($28k) results in $160k -> $132k.
2.08.02.01 (ISS): 1 RFQ awarded constituting ~8% of PDS optics scope.
Proportional retirement of initial risk value ($12k) results in $160k -> $148k.
2.09.02.01 (SIX): 2 RFQ's awarded constituting ~15% of PDS optics scope.
Proportional retirement of initial risk value ($24k) results in $160k -> $136k.
2.10.02.01 (SMI): 1 RFP awarded constituting ~50% of PDS optics scope.
Proportional retirement of initial risk value ($80k) results in $160k -> $80k.
2.07.02.01 (ISR PDS): $160k remains
2.07.02.03 (ISR ES): $30k remains
2.09.02.03 (SIX ES): $140k remains
2.10.02.03 (SMI ES): $30k remains

July 2014 Breakdown by WBS:
Reduction by $251k total from PDS based upon establishment of feasibility from contract award:
2.05.02.01 (ESM): Total 47% PDS optics awarded.
Proportional retirement of initial risk value results in $160k -> $132k -> $85k.
2.07.02.01 (ISR): Total 70% PDS optics awarded.
Proportional retirement of initial risk value results in $160k -> $48k.
2.08.02.01 (ISS): Total 37% PDS optics awarded.
Proportional retirement of initial risk value results in $160k -> $148k -> $101k.
2.09.02.01 (SIX): Total 43% PDS optics awarded.
Proportional retirement of initial risk value results in $160k -> $136k -> $91k.
2.10.02.01 (SMI): Total 50% PDS optics awarded.
Proportional retirement of initial risk value results in $160k -> $80k (no change).
2.07.02.03 (ISR ES): $30k remains
2.09.02.03 (SIX ES): $140k remains
2.10.02.03 (SMI ES): $30k remains

November 2014 Breakdown by WBS:
Reduction by $417k to $188k total from PDS and ES based upon establishment of costs from contract awards:
2.05.02.01 (ESM) $85k ->$40k
2.07.02.01 (ISR): $48k (no change)
2.08.02.01 (ISS): $101k ->$50k
2.09.02.01 (SIX): $91k ->$8k
2.10.02.01 (SMI): $80k -> $0
2.07.02.03 (ISR ES): $30k remains
2.09.02.03 (SIX ES): $140k ->$12k
2.10.02.03 (SMI ES): $30k ->$0

March 2015:
Retired based upon establishment of costs from contract awards.

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $1.0M **2/5/2014** retired $144k from 2.[05,08,09,10].02.01	Retired

->Total assessed risk = $856k
7/16/2014 retired $251k from 2.[05,07,08,09].02.01
->Total assessed risk = $605k
11/12/2014 retired $417k from PDS, ES areas
->Total assessed risk (cost) = $188k
3/27/2015 retired completely
->Total assessed risk (cost) = $0

Mitigation Approaches:

Arrive at technical specifications early in the project, obtain long lead procurement approval early, and hold adequate cost contingency.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-15	Level 2 Managers for Beamlines E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/27/2013 Update the cost impact, reduced from $1.8M to $1M due to progress made in design and updated information on qualified vendors and market survey over last few months. Risk impact lowered to significant.

2/5/2014 Retired total of $144k based upon awards, as indicated in the Description text box above. Updated total assessed risk value is $856k; Risk impact remains significant.

7/16/2014 retired $251k based upon awards, as indicated in the Description text box above. Updated total assessed risk value is $605k; Risk impact remains significant. Further reduction forthcoming in endstation areas.

11/12/2014 retired $417k based upon awards, as indicated in the Description text box above. Updated total assessed risk value is $188k; Risk impact now marginal, update due Jan 2015.

3/27/2015 Retired.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-07	Underperforming equipment brought from NSLS	2.05 - 2.10 Beamline Endstation Equipment	Nov. 30, 2015

Description:

Condition: Equipment transferred from NSLS beamlines may not perform to required specifications.

Consequence: Need to upgrade or replace endstation equipment transferred from NSLS, requiring additional endstation design effort and increasing cost.

Initial Breakdown by WBS:
30% : ESM endstation WBS 2.05.02.03 ($450k)
40% : ISR endstation WBS 2.07.02.03 ($600k)
30% : SMI endstation optics WBS 2.10.02.03 ($450k)

November 2014 Breakdown by WBS:
ESM endstation WBS 2.05.02.03 $450k ->$0
SMI endstation optics WBS 2.10.02.03 $450k ->$0
100% : ISR endstation WBS 2.07.02.03 $600k -> $300k

March 2015 Breakdown by WBS:
ISR endstation WBS 2.07.02.03 $300k ->$50k

November 2015 Breakdown by WBS:
Retired.

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $1.5M Nov. 2014: cost impact revised downward, to $300k (ISR only) Mar. 2015: cost impact revised downward, to $50k (ISR only) Nov. 2015: cost impact revised downward, to $0 (fully retired)	Retired

Mitigation Approaches:

Upgrade NSLS equipment prior to transfer. Put high priority on replacement of these items in the contingency spend plan. Task available technical staff with test of transferred equipment.

Date Started:	Date to Complete:	Owner:
Jan-12	Aug-15	Level 2 Managers for impacted beamlines E. Vescovo, C. Nelson, E. DiMasi

Current Status:

7/16/14: Updated owners list. Retirement anticipated upon addition of upgrade scope to NEXT.

11/12/14: Reduced significant amount of risk due to addition of endstation upgrade scope to NEXT.

3/27/15: Further significant reduction due to successful transfer of equipment from NSLS. Extended completion to June 2015 for test of ISR items.

11/30/15: Retired due to recent successful transfer and testing of equipment from NSLS, including that for ISR.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-08	Design Changes	2.03 - 2.10 Utilities, PPS, EPS, Control Station, NEXT Beamline Photon Delivery Systems and Endstation Equipment, Beamline Controls Systems	Nov. 30, 2016

Description:

Condition: Design changes, resulting from: analysis not yet completed, special requirements, e.g. those yet to be received via user input

Consequence: Additional costs for material and/or labor, and resulting stretched schedules.

July 2013 Breakdown by WBS:
5% : Common Systems WBS 2.03.[01..04]
5% : Beamline Controls WBS 2.04.02
15% x 6 : All beamlines PDS& endstation WBS 2.[05..10].02.[01,03]

October 2013 Breakdown by WBS:
15% : Common Systems WBS 2.03.[01..04]
2.03.01: 6% ($66k)
2.03.02: 3% ($33k)
2.03.03: 4.5% ($49.5k)
2.03.04: 1.5% ($16.5k)
6% : Beamline Controls WBS 2.04.02 ($66k)
4% x 6 : All beamlines PDS, WBS 2.[05..10].02.01 ($44k each)
8% x 5 : All beamlines except SIX endstation, WBS 2.[05..08,10].02.03 ($88k each)
15% : SIX endstation, WBS 2.09.02.03 ($165k)

November 2014 Breakdown by WBS:
Common Systems WBS 2.03.[01..04]
2.03.01: $66k -> $33k
2.03.02: $33k (keep)
2.03.03: $49.5k (keep)
2.03.04: $16.5k (keep)
Beamline Controls WBS 2.04.02: $66k (keep)
Beamlines Photon Delivery and Endstation:
ESM PDS (2.5.2.1) $44k->$30k; ES (2.5.2.3) $88k->$70k
FXI PDS (2.6.2.1) $44k->$0; ES (2.6.2.3) $88k->$0
ISR PDS (2.7.2.1) $44k->$66k; ES (2.7.2.3) $88k->$66k
ISS PDS (2.8.2.1) $44k (keep); ES (2.8.2.3) $88k (keep)
SIX PDS (2.9.2.1) $44k->$0; ES (2.9.2.3) $165k->$70k
SMI PDS (2.10.2.1) $44k->$0; ES (2.10.2.3) $88k->$0

March 2015 Breakdown by WBS:
Common Systems WBS 2.03.[01..04]
2.03.01: $33k -> $99k
2.03.02: $33k -> $115k
2.03.03: $49.5k -> $150k
2.03.04: $16.5k (keep)
Beamline Controls WBS 2.04.02: $66k (keep)
Beamlines Photon Delivery and Endstation:
ESM PDS (2.5.2.1) $30k->$0; ES (2.5.2.3) $70k->$0
FXI PDS (2.6.2.1) $44k->$0; ES (2.6.2.3) $88k->$0
ISR PDS (2.7.2.1) $66k->$0; ES (2.7.2.3) $66k (keep)
ISS PDS (2.8.2.1) $44k (keep); ES (2.8.2.3) $88k (keep)
SIX PDS (2.9.2.1) $0 (keep); ES (2.9.2.3) $70k (keep)
SMI PDS (2.10.2.1) $0 (keep); ES (2.10.2.3) $0 (keep)

July 2015 Breakdown by WBS:
Common Systems WBS 2.03.[01..04]
2.03.01: $99k -> $0
2.03.02: $115k -> $0
2.03.03: $150k -> $0k
2.03.04: $16.5k (keep)
Beamline Controls WBS 2.04.02: $66k (keep)
Beamlines Photon Delivery and Endstation:

ISR PDS (2.7.2.1) $0; ES (2.7.2.3) $66k->$30k
ISS PDS (2.8.2.1) $44k (keep); ES (2.8.2.3) $88k->$50k
SIX PDS (2.9.2.1) $0; ES (2.9.2.3) $70k (keep)

November 2015 Breakdown by WBS:
Common Systems WBS 2.03.04: $16.5k
Beamline Controls WBS 2.04.02: $66k->$25k
Beamlines Photon Delivery and Endstation:
ISR ES (2.7.2.3) $30k
ISS PDS (2.8.2.1) $44k->$20k; ES (2.8.2.3) $50k
SIX ES (2.9.2.3) $70k->$50k
March 2016 Breakdown by WBS:
Common Systems WBS 2.03.04: $16.5k (no change)
Controls WBS 2.04.02: $25k->0 (EAC labor updated)
Controls WBS 2.04.03: 0->$94k (motor controllers)
ESM PDS (2.5.2.1): 0->$32k (additional pumps)
ISR ES (2.7.2.3): $30k->$10k (ES completion)
ISS PDS (2.8.2.1): $20k->$5k; ES (2.8.2.3) $50k->$25k
SIX PDS (2.5.2.1): 0->$55k (additional pumps); ES (2.9.2.3) $50k (no change)
June 2016 Breakdown by WBS:
Common Systems WBS 2.03.04: $16.5k->0 (no impact remains)
Controls WBS 2.04.03: $94k->0 (motor controllers in EAC)
ESM PDS (2.5.2.1): $32k->(additional pumps in EAC)
ISR ES (2.7.2.3): $10k->$5k (ES completion, EAC update)
ISS PDS (2.8.2.1): $5k->0 (completion); ES (2.8.2.3) $25k->0 (endstation design complete)
SIX PDS (2.5.2.1): $55k->0 (completion, EAC update); ES (2.9.2.3) $50k->$20k (design complete, EAC updates, risk on interfacing)

Probability:	Impact:	Risk Rating:
Likely	Marginal Schedule: up to 3 months == $1.2M Cost: up to $0.5M Total: up to $1.7M **10/15/2013** update (see Status for detail): Schedule: up to 2 months == $0.8M Cost: up to $0.3M Total: up to $1.1M **11/12/2014** update: up to $632k (cost) **3/27/2015** update: up to $715k (cost) **7/23/2015** update: up to $277k (cost) **11/30/2015** update: up to $192k (cost) **3/23/2016** update: up to $288k (cost) **7/9/2016** update: up to $25k (cost)	Low

Mitigation Approaches:

Complete beamline and endstation designs as soon as possible. Obtain external input (Users, Partners, BAT) as early as possible.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-17	Level 2 Managers C. Stebbins, Z. Yin, E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/27/2013 Update the cost impact, reduced from $1.5M to $0.5M due to much progress made in design over last few months. Likelihood assessed as Likely; Risk rating High (> $1M total impact).

October 2013 Owing to design maturity, reduce beamline portion of this risk from 15% x 6 x $1.7M = $1.53M by factor of 2, to $0.77M; owing to remaining design issues for Common Systems, increase its portion from 5% of $1.7M = $0.085M by factor of 2, to $0.17M. Net change is -$0.77M + $0.17M = -$0.6M, i.e. reduction by $0.6M, to a total assessed risk of $1.1M. Apportion this as:
Schedule: up to 2 months == $0.8M
Cost: up to $0.3M
Total: up to $1.1M
Risk rating High (> $1M total impact).
Renormalized WBS breakdown shown in Description text box above.

February 2014 Extended completion date from Oct 2013 to Jan 2016 to cover later changes, particularly in Common Systems, Controls, and Endstations.

July 2014 Updated owner name list to reflect 2.03 CAM assignment. Reductions anticipated upon design completion.

November 2014 Reductions made based upon design completion.

March 2015 Reductions made based upon design completion in beamlines are countered by increases in WBS2.3 (common systems), for a net increase of $83k. The WBS2.3 increases result from identification of new or revised requirements in the form of additional racks, exhaust equipment/installation, area radiation monitors, PPS-related hutch rework, and revised material requirements for EPS.

July 2015 Reductions in 2.03 made based on incorporation of estimated cost in EAC rather than risk, for items including sprinklers, smoke detectors, emergency power for exhaust, area radiation monitors, additional racks, PPS-related hutch modifications, and additional EPS material. Additional reductions in ISR and ISS endstations due to design maturity.

November 2015 Design maturity brings total exposure below $200 (now marginal); risk rating now Low.

March 2016 Impact increased from Marginal to Significant, raising rating from Low to Medium, as a result of identification of potential changes (controls, ESM, SIX). Date to complete extended from January 2016 to June 2016.

June 2016 Impact decreased from Significant to Marginal, lowering rating from Medium to Low, as a result of completion in many areas. Date to complete extended to October 2016 for endstations of SIX & ISR.

November 2016 Extended completion date to Jan 2017 (ISR and SIX endstations delayed, no change to risk value)

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-09	Changes to EESE requirements/designs	2.05 - 2.10 Beamline Shielded Enclosures	Jul. 16, 2014

Description:

Condition: Changes to enclosure requirements, due to changes in optical design and layout.

Consequence: Re-design of hutches to meet revised requirements.

Breakdown by WBS:
20% x 4 : FXI, ISR, ISS, SMI shielded enclosures WBS 2.[06,07,08,10].02.02 ($40k each)
10% x 2 : ESM, SIX shielded enclosures WBS 2.[05,09].02.02 ($20k each)

Probability:	Impact:	Risk Rating:
Unlikely	Marginal Cost: up to $200k	Retired

Mitigation Approaches:

Complete all optical design activities that affect optical layout and hutch dimensions as early as possible.

Date Started:	Date to Complete:	Owner:
Jan-12	Feb-14	Level 2 Managers C. Stebbins, E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/27/2013 Enclosure final design close to complete. The cost risk is reduced from $660K (significant) to $200K (marginal) and risk rating is reduced from Medium to Low (likelihood category changed from Likely to Unlikely).

2/5/2014 Vendor final designs are complete for all base scope enclosures. Cost risk is reduced to zero (risk is retired).

7/16/2014 Updated risk rating to "Retired", and owner name list to reflect 2.03 CAM assignment.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-10	Higher-than-expected thermal deformation of optics	2.05 - 2.10 Beamline Photon Delivery Systems	Mar. 27, 2015

Description:

Condition: Absorbed power distribution on beamline optical elements may degrade the calculated beamline performance to an unacceptable extent. Lack of design maturity compared to the eventual solution. For undulator beamlines, this effect is typically greatest at the lowest photon energies, where the undulator magnetic strength parameter K is greatest.

Consequence: Either a more complicated mechanical design, which increases cost and stretches schedule, or a requirement to add additional filters, which reduces flux and increases cost.

Initial Breakdown by WBS:
20% x 5 : 5 base scope beamlines PDS WBS 2.[05,07..10].02.01 ($280k each)

February 2014 Breakdown by WBS (several items retired):
2.05.02.01 (ESM) $280k->$0; (retirement based upon engineering analysis)
2.07.02.01 (ISR) $280k remains (retirement awaiting vendor FEA)
2.08.02.01 (ISS) $280k->$260k; ($20k retirement based upon value fraction of high-heatload optics contracts awarded)
2.09.02.01 (SIX) $280k->$0; (retirement based upon engineering analysis)
2.10.02.01 (SMI) $280k->$0; (retirement based upon engineering analysis and vendor selection)

July 2014 Breakdown by WBS:
2.07.02.01 (ISR) $280k remains (retirement awaiting vendor FEA)
2.08.02.01 (ISS) $280k->$260k->$118k; ($142k retirement based upon value fraction (58%) of high-heatload optics contracts awarded)

November 2014 Breakdown by WBS:
2.07.02.01 (ISR) $280k->$56k based on vendor FEA
2.08.02.01 (ISS) $118k->$50k based upon awards and design for high-heat-load optics (all but filters now complete)

March 2015:
Fully retired, based upon awards and design completion for high-heat-load optics

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $1.4M **2/5/2014** retired $860k total, for net Cost: up to $540k **7/16/2014** retired $142k total, for net Cost: up to $398k **11/12/2014** retired $292k total, for net Cost: up to $106k **3/27/2015** retired fully ($0 value)	Retired

Mitigation Approaches:

Perform the required iterative sequence of optical design/analysis and mechanical engineering, including thermal analysis, as early as possible.

Date Started:	Date to Complete:	Owner:
Jan-12	Dec-14	Level 2 Managers for Beamlines E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

7/10/2013 Likelihood changed to Likely, Overall rating increased to Significant.

2/5/2014 Retirement of $860k total risk based upon engineering analysis and awards as described in Description text box above. Total assessed risk is now $540k. Impact reduced from Critical to Significant; Risk Rating reduced to Medium. Extended completion date from Oct 2013 to July 2014 to follow anticipated schedule for awards, vendor optics analysis, and design reviews.

7/16/14 Reduction of ISS high heatload risk based on fraction of relevant procurement awards. Update of due date from July to August 2014 based on expected completion for ISR PDS (vendor PDR).

11/12/14 Reduction of ISR and ISS high heatload risk based on procurement awards and design completion. Update of due date from Aug. 2014 to Dec. 2014 based on expected completion for remaining items.

3/27/15 Retirement of remaining risk on ISR and ISS optics based on procurement awards and design completion. Now fully retired.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-11	Underestimated endstation component costs	2.05 - 2.10 Beamline Endstation Equipment	Nov. 30, 2016

Description:

Condition: Costs of certain endstation components, e.g. state-of-the-art pixel array detectors and diffractometers with sub-micron sphere of confusion, are not now known.

Consequence: State-of-the-art detectors and diffractometers are needed to achieve the planned world class performance of the NEXT beamlines.

Initial Breakdown by WBS:
20% x 5 : 5 base scope endstations WBS 2.[05,07..10].02.03 ($320k each)

November 2014 Breakdown by WBS:
ESM (2.5.2.3): $320k->$50k
ISR (2.7.2.3): $320k->$160k
ISS (2.8.2.3): $320k (keep)
SIX (2.9.2.3): $320k->$150k
SMI (2.10.2.3): $320k (keep)

March 2015 Breakdown by WBS:
ESM (2.5.2.3): $50k (keep)
ISR (2.7.2.3): $160k->$75k
ISS (2.8.2.3): $320k->$100k
SIX (2.9.2.3): $150k (keep)
SMI (2.10.2.3): $320k->$150k

July 2015 Breakdown by WBS:
ESM (2.5.2.3): $50k (keep)
ISR (2.7.2.3): $75k->$25k
ISS (2.8.2.3): $100k->$50k
SIX (2.9.2.3): $150k (keep)
SMI (2.10.2.3): $150k (keep)

November 2015 Breakdown by WBS:
ESM (2.5.2.3): $50k (keep)
ISR (2.7.2.3): $25k (keep)
ISS (2.8.2.3): $50k (keep)
SIX (2.9.2.3): $150k->$100k
SMI (2.10.2.3): $150k->$30k

March 2016 Breakdown by WBS:
ESM (2.5.2.3): $50k (keep)
ISR (2.7.2.3): $25k->$10k
ISS (2.8.2.3): $50k->$40k
SIX (2.9.2.3): $100k->$50k
SMI (2.10.2.3): $30k->$60k

June 2016 Breakdown by WBS:
ESM (2.5.2.3): $50k->$25k (completion/EAC), risk for pump repair
ISR (2.7.2.3): $10k->$5k (completion/EAC)
ISS (2.8.2.3): $40k->$20k (completion/EAC)
SIX (2.9.2.3): $50k->$35k (completion/EAC), risk for vac eqt
SMI (2.10.2.3): $60k (no change)

November 2016 Breakdown by WBS:
ESM (2.5.2.3): $25k ->0 (completion)
ISR (2.7.2.3): $5k (no change)
ISS (2.8.2.3): $20k ->0 (completion)
SIX (2.9.2.3): $35k->$20k (some completion/EAC)
SMI (2.10.2.3): $60k->$30k (some completion/EAC)

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $1.6M	Low

11/12/2014: Cost impact reduced to $1.0M
3/27/2015: Cost impact reduced to $525k
7/23/2015: Cost impact reduced to $425k
11/30/2015: Cost impact reduced to $255k
3/23/2016: Cost impact reduced to $210k
7/9/2016: Cost impact reduced to $145k
11/30/2016: Cost impact reduced to $55k

Mitigation Approaches:

Monitor price development of advanced commercial detectors and diffractometers. Extrapolate to likely procurement date. Identify cost-effective technical solutions.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-17	Level 2 Managers for Beamlines E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/27/2013 Likelihood category changed from Unlikely to Likely. Update the cost impact, slightly increased from $1.5M to $1.6M (critical). Risk rating **changed from medium to high**.

11/12/2014 Impact reduced based on endstation procurements completion. Risk rating changed from high to medium; completion date extended to May 2015.

3/27/2015 Impact reduced based on endstation procurements completion and inclusion of anticipated cost refinements in EAC. Risk rating remains medium.

7/23/2015 Impact reduced based on endstation procurements completion and inclusion of anticipated cost refinements in EAC. Risk rating remains medium. Completion expected by October 2015.

11/30/2015 Impact reduced based on endstation procurements completion and inclusion of anticipated cost refinements in EAC (SIX, SMI). Risk rating remains medium. Expected completion extended to March 2016 (covering in-house details).

3/23/2016 Impact reduced based on endstation procurement and installation completion (e.g. ISR GHS, SIX). Remaining specific items include SIX sample transfer, SMI XBPMs & beamstop). Risk rating remains medium. Expected completion extended to August 2016 to accompany latest endstation schedule.

7/9/2016 Impact reduced based on endstation procurement and installation completion, and updated information incorporated to project EAC. With impact reduced by $65k (from $210k to $145k), impact category is reduced from Significant to Marginal, and risk rating subsequently reduces from Medium to Low. Expected completion is extended to October 2016 to follow anticipated latest completion of materials scope for endstations.

11/30/2016 Impact reduced based on endstation completion and estimate updates to EAC. With impact reduced by $90k (from $145k to $55k), impact category remains Marginal, and risk rating remains Low. Expected completion is extended to January 2017 to follow anticipated latest completion of materials scope for endstations.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-12	Personnel recruitment delays	WBS 2.0 NEXT Project	Nov. 30, 2015

Description:

Condition: Schedule delay due to failure to recruit qualified personnel to key positions as planned in the baseline schedule

Consequence: Schedule delays within beamline schedules and/or to project schedule

Initial Breakdown by WBS:
100% : Project Management& Support WBS 2.01.[01,02]
2.01.01: $600k
2.01.02: $200k

February 2014 Breakdown by WBS:
Due to staffing maturity, reduce as follows:
2.01.01: $600k -> $100k
2.01.02: $200k -> $100k

November 2014 Breakdown by WBS:
2.01.01: $100k -> $50k
2.01.02: $100k ->$50k

November 2015 Breakdown by WBS:
Fully retired.

Probability:	Impact:	Risk Rating:
Unlikely	Marginal Schedule: up to 2 months == $0.8M **2/5/2014** reduced to $200k total **11/12/2014** reduced to $100k total (C&S) **11/30/2015** retired ($0)	Retired

Mitigation Approaches:

(1) Aggressively monitor planned versus actual staffing plan
(2) Conduct focused recruitment program with HR
(3) Exercise recruitment incentive plan

Date Started:	Date to Complete:	Owner:
Jan-12	Oct-15	Project Manager S. Hulbert

Current Status:

2/27/2013 Update the schedule impact, reduced from months to 2 months due to much progress made staffing ramp-up over last few months. Risk rating remains Low.

2/5/2014 Retired $600k as indicated in Description field, based on staffing maturity; extended completion date from Dec 2013 to Oct 2015 to reflect latest possible hiring need.

11/12/2014 Retired $100k, based on staffing maturity and revised impact of shortfall.

11/12/2015 Retired completely, based on staffing maturity. All future staffing shortfalls will be addressed by assignment within NSLS-II.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-13	Higher-than-expected inflation rate	WBS 2.0 NEXT Project	Mar. 23, 2016

Description:

Condition: Actual inflation rate could be much higher than standard DOE rates used in cost estimate

Consequence: Cost overruns, independent of estimate accuracy

Initial Breakdown by WBS:
Total $800k applies to all M&S, 4% each across 25 areas:
2.03.[01-04]
2.04.03
2.[05-10].02.[01,03,04]
2.11.[01,02]

February 2014 Breakdown by WBS:
All materials and labor.
Basis for uncertainty is use of 3.2% inflation rate, whereas Labor (40%) could rise to 4.5% (1.3% delta) and Materials (60%) could rise to 4.2% (1.0% delta). Combined uncertainty is thus estimated as 1.12% of work to go. Presently this is $650k, so $150k can be retired from earlier $800k risk value.
July 2014 update:
1.12% of current work to go is $600k, therefore $50k risk can be reduced.
November 2014 update:
Observed ~ 1.3% savings in material costs at EAC; This value ($422k) is taken to indicate cost uncertainty due to change in inflation rate.
March 2015 update:
1.12% of current unobligated work to go is $287k. Risk is reduced by $135k.
July 2015 update:
1.12% of current unobligated work to go is $236k. Risk is reduced by $51k.
November 2015 update:
1.12% of current unobligated work to go is $173k. Risk is reduced by $63k.
March 2016 update:
Rates are known for remainder of FY16. Risk is retired.

Probability:	Impact:	Risk Rating:
Unlikely	Marginal Cost: up to $800k **2/5/2014** (see Description field): 1.12% of work to go is $650k **7/16/2014** (see Description field): 1.12% of work to go is $600k **11/12/2014** (see Description field): Cost impact $422k **3/27/2015** (see Description field): Cost impact $287k **7/23/2015** (see Description field): Cost impact $236k **11/30/2015** (see Description field): Cost impact $173k (now marginal) **3/23/2016**: Cost impact $0k (now retired)	Retired

Mitigation Approaches:

Hold appropriate amount of cost contingency.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-16	Project Manager S. Hulbert

Current Status:

2/5/14 Retired $150k in risk for total cost risk value of $650k. Risk Rating remains Low.
7/16/14 Retired $50k in risk for total cost risk value of $600k. Risk Rating remains Low.
11/12/14 Reduced risk value by $178k for total cost risk value of $422k. Risk Rating remains Low.
3/27/15 Reduced risk value by $135k for total cost risk value of $287k. Risk Rating remains Low.
7/23/15 Reduced risk value by $51k for total cost risk value of $236k. Risk Rating remains Low.
11/30/15 Reduced risk value by $63k for total cost risk value of $173k. Risk Rating remains Low.
3/23/16 Retired risk (value 0).

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-14	Accidents and injuries	2.0 NEXT Project	Nov. 30, 2016

Description:

Condition: Accident/Incident causing injury/illness during construction, assembly, and testing. Multiple minor incidents and non-compliances can lead to a serious event.

Consequence: Minor injury or damage would result in potential work slowdown/schedule impact due to first aid treatment and incident investigation. Potential work stoppage if serious injury and corrective actions.

Breakdown by WBS:
Initial:
100% : Project Management & Support WBS 2.01.[01,02]
2.01.01: 75% ($300k)
2.01.02: 25% ($100k)
11/30/2016:
Distributed risk to areas of remaining impact (total $174k), where standing army costs are possible for remaining dedicated project staff:
2.01.01: $30k, 2.01.02: $50k
2.03.05: $4k
2.04.02: $15k
2.07.01: $10k
2.09.01: $30k
2.10.01: $20k
2.11.03: $15k

Probability:	Impact:	Risk Rating:
Unlikely	Significant Schedule: up to 1 months == $0.4M (initial assessment) Updated (11/30/16) assessment corresponds to 1 month at $80k for project management and support plus ~1.6 beamlines at $60k/mo/BL.	Low

Mitigation Approaches:

Vigorous ES&H program and adequate level of staffing for ES&H support and oversight.
Safe transition of dedicated staff to facility operations.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-17	ESH Manager Lori Stiegler

Current Status:

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-15	Limited availability of specialized effort	2.0 NEXT Project	Nov. 30, 2016

Description:

Condition: Limited availablity of scientific, engineering, and beamline controls specialists to perform necessary effort when required.

Consequence: Delays in finalizing design and in writing of specifications. Delays in assembly and integrated testing of photon delivery system and endstation equipment.

Breakdown by WBS:
13% : Common Systems WBS 2.03.[01..04]
2.03.01: 6% ($48k)
2.03.02: 3% ($24k)
2.03.03: 3% ($24k)
2.03.04: 1% ($8k)
10% : Beamline Controls WBS 2.04.02 ($80k)
2% : FXI beamline design WBS 2.06.02.[01,03,04]
2.06.02.01: 1% ($8k)
2.06.02.03: 0.5% ($4k)
2.06.02.04: 0.5% ($4k)
15% x 5 : 5 base scope beamlines PDS, endstation, and control station WBS 2.[05,07..10].02.[01,03,04]
2.[05,07..10].02.01: 8% ($64k)
2.[05,07..10].02.03: 5% ($40k)
2.[05,07..10].02.04: 2% ($16k)

July 2014 Breakdown by WBS:
Uniform reduction by 25% due to completion of PDS design
Common Systems WBS 2.03.[01..04]
2.03.01: $48k->$36k
2.03.02: $24k->$18k
2.03.03: $24k->$18k
2.03.04: $8k->$6k
Beamline Controls WBS 2.04.02 $80k->$60k
FXI beamline design WBS 2.06.02.[01,03,04]
2.06.02.01: $8k->$6k
2.06.02.03: $4k->$3k
2.06.02.04: $4k->$3k
5 base scope beamlines PDS, endstation, and control station WBS 2.[05,07..10].02.[01,03,04]
2.[05,07..10].02.01: $64k->$48k each
2.[05,07..10].02.03: $40k->$30k each
2.[05,07..10].02.04: $16k->$12k each

November 2014 Breakdown by WBS:
Reductions due to completion of design.
Common Systems WBS 2.03.[01..04]
2.03.01: $36k->$18k
2.03.02: $18k (keep)
2.03.03: $18k (keep)
2.03.04: $6k (keep)
Beamline Controls WBS 2.04.02 $60k (keep)
FXI beamline design WBS 2.06.02.[01,03,04]
2.06.02.01: $6k->$0k
2.06.02.03: $3k->$0k
2.06.02.04: $3k->$0k
5 base scope beamlines PDS, endstation, and DAQ:
ESM 2.5.2.1 $48k-> $24k, 2.5.2.3 $30k->$15k, 2.5.2.4 $12k->$6k
ISR 2.7.2.1 $48k (keep), 2.7.2.3 $30k (keep), 2.7.2.4 $12k (keep)
ISS 2.8.2.1 $48k-> $0, 2.8.2.3 $30k->$0, 2.8.2.4 $12k->$0 (included now in NEXT-01)
SIX 2.9.2.1 $48k-> $24k, 2.9.2.3 $30k->$15k, 2.9.2.4 $12k->$6k
ESM 2.10.2.1 $48k (keep), 2.10.2.3 $30k (keep), 2.10.2.4 $12k (keep)

March 2015 Breakdown by WBS:
Reductions due to completion of design.
Common Systems WBS 2.03.[01..04]
2.03.01: $18k (keep)

2.03.02: $18k (keep)
2.03.03: $18k (keep)
2.03.04: $6k (keep)
Beamline Controls WBS 2.04.02 $60k (keep)
ESM 2.5.2.1 $24k (keep), 2.5.2.3 $15k (keep), 2.5.2.4 $6k->$0
ISR 2.7.2.1 $48k (keep), 2.7.2.3 $30k (keep), 2.7.2.4 $12k (keep)
SIX 2.9.2.1 $24k (keep), 2.9.2.3 $15k (keep), 2.9.2.4 $6k (keep)
SMI 2.10.2.1 $48k->$24k, 2.10.2.3 $30k (keep), 2.10.2.4 $12k (keep)

July 2015 Breakdown by WBS:
Reductions due to completion of design and fab/install.
Common Systems WBS 2.03.[01..04]
2.03.01: $18k -> $0
2.03.02: $18k -> $12k
2.03.03: $18k -> $24k
2.03.04: $6k -> $0
Beamline Controls WBS 2.04.02 $60k
ESM 2.5.2.1 $24k, 2.5.2.3 $15k
ISR 2.7.2.1 $48k, 2.7.2.3 $30k, 2.7.2.4 $12k->$0
SIX 2.9.2.1 $24k, 2.9.2.3 $15k, 2.9.2.4 $6k->$0
SMI 2.10.2.1 $24k, 2.10.2.3 $30k, 2.10.2.4 $12k->$0

November 2015 Breakdown by WBS:
Reductions due to completion of design and fab/install.
Common Systems WBS 2.03.[01..04]
2.03.02: $12k
2.03.03: $24k
Beamline Controls WBS 2.04.02: $60k
ESM 2.5.2.1 $24k->$0, 2.5.2.3 $15k
ISR 2.7.2.1 $48k, 2.7.2.3 $30k->$15k
SIX 2.9.2.1 $24k, 2.9.2.3 $15k->$24k
SMI 2.10.2.1 $24k, 2.10.2.3 $30k

March 2016 Breakdown by WBS:
Reductions due to completion of design and fab/install.
Common Systems WBS 2.03.[01..04]
2.03.02: $12k
2.03.03: $24k
Beamline Controls WBS 2.04.02: $60k->0
ESM 2.5.2.3 $15k
ISR 2.7.2.1 $48k->$24k, 2.7.2.3 $15k->0
SIX 2.9.2.1 $24k->$12k, 2.9.2.3 $24k->$12k
SMI 2.10.2.1 $24k, 2.10.2.3 $30k->0

June 2016 Breakdown by WBS:
Reductions due to completion of design and fab/install.
Common Systems WBS 2.03.[01..04]
2.03.02 (PPS): $12k->0 (reqts in working schedule/EAC)
2.03.03 (EPS): $24k->$16k based on completion
ESM 2.5.2.3 $15k->$7.5k per completion (FEA maybe needed)
ISR 2.7.2.1 $24k->0 based on completion of PDS
SIX 2.9.2.1 $12k, 2.9.2.3 $12k (no change)
SMI 2.10.2.1 $24k (no change)

November 2016 Breakdown by WBS:
Reductions due to completion:
CBS (EPS) 2.03.03: $16k->$0
ESM 2.5.2.3: $7.5k->0
SIX 2.9.2.1: $12k, 2.9.2.3: $12k (no change)
SMI 2.10.2.1: $24k->0

Probability:	Impact:	Risk Rating:
Unlikely	Marginal Schedule: up to 2 months == $0.8M **7/16/14**: update to $0.6M **11/12/14**: update to $0.39M **3/27/15**: update to $0.36M **7/23/15**: update to $306k	Low

11/30/15: update to $277k
3/23/16: update to $123k
7/9/16: update to $72k
11/30/16: update (reduce) to $24k

Mitigation Approaches:

Adequate and timely hiring of scientific, engineering, and beamline controls specialists to meet schedule requirements; coordination of schedules for matrixed staff performing design, test, and installation activities.

Date Started:	Date to Complete:	Owner:
Jan-12	Jan-17	Project Manager S. Hulbert

Current Status:

2/27/2013 Update the schedule impact, increased from 1.5 months to 2 months based on latest analysis. Previously enlisted cost impact was corrected. Risk rating remains Low.

2/5/2014 Extended completion date from Jul 2014 to Jan 2016 to include needs for specialized staff throughout installation.

7/16/2014 Reduced risk value by 25% due to completion of PDS design. Further reduction will be possible upon completion of PDS assy/test, ES design, and ES assy/test.

11/12/2014 Reduced risk values due to completion of utilities and beamline / endstation design.

3/27/2015 Reduced risk values due to completion of beamline designs requiring expert guidance.

7/23/2015 Reduced risk values due to completion of beamline designs (e.g. data storage solutions) requiring expert guidance, and completion progress or revised plans for completion in common systems. Risk reduction completion expected by September 2016.

11/30/2015 Reduced risk values due to completion of beamline designs and installation progress in ESM and ISR requiring specialized labor. Increased allocation at SIX for endstation optics.

3/23/2016 Reduced risk values due to completion of beamline designs and planned effort involving specialized labor (e.g. endstation, data storage, survey). Impact reduced from Significant(>$200k) to Marginal (<=$200k). Risk rating remains Low.

7/9/2016 Reduced risk values due to completion of design and implementation, as well as planning for effort involving specialized labor. Impact remains Marginal; risk rating remains Low.

11/30/2016 Reduced risk values due to completion of implementation and planning for remaining work. Impact remains Marginal; risk rating remains Low.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-16	Market-driven price fluctuations	2.11 Insertion Devices	Jul. 23, 2015

Description:

Condition: Procurements cost significantly more than baseline due to unpredictable market-driven price fluctuations in materials used in manufacturing.

Consequence: Increase in material costs.

Breakdown by WBS:
100%: Insertion Devices (EPUs for ESM, SIX), WBS 2.11
2.11.01: 50% ($650k)
2.11.02: 50% ($650k)

July 2014 Breakdown by WBS:
After reduction due to 1st EPU award,
Insertion Devices (EPUs for ESM, SIX), WBS 2.11
2.11.01 (ESM): 50% ($430k)
2.11.02 (SIX): 50% ($430k)

November 2014 Breakdown by WBS:
Insertion Devices (EPUs for ESM, SIX), WBS 2.11 (total $600k):
ESM EPU57: $100k
SIX EPU57: $250k
ESM EPU105: $250k

March 2015 Breakdown by WBS:
Insertion Devices (EPUs for ESM, SIX), WBS 2.11 (total $200k):
ESM EPU105: $200k

July 2015 Breakdown by WBS:
Insertion Devices (EPUs for ESM, SIX), WBS 2.11 (total $0k)
fully retired (no risk remaining)

Probability:	Impact:	Risk Rating:
Unlikely	Marginal Cost: up to $1.3M **7/16/2014** => up to $860k **11/12/2014** => up to $600k **3/27/2015** => up to $200k **7/23/2015** => $0 (fully retired)	Retired

Mitigation Approaches:

Monitor exchange rate and price index trends and be ready to initiate procurements as soon as possible. Monitor subcontract of magnetic material.

Date Started:	Date to Complete:	Owner:
Jan-12	Jul-15	Level 2 Manager for Insertion Devices C. Kitegi

Current Status:

2/27/2013 Update the scope and owner for this risk from Shielded enclosures to Insertion Devices. Risk rating changed from Low to Medium owing to changing the likelihood category from Unlikely to Likely, since market forces could increase permanent magnet material costs relatively suddenly.

2/5/2014 Impact value >$1M is Critical; Risk Rating is High.

7/16/2014 Risk reduced due to award of 1st of 3 EPUs. Remaining cost risk is shared equally between remaining EPU procurements. Impact value $860k is now Significant; Risk Rating is reduced to Medium.

11/12/2014 Risk reduced due to awards all EPUs; remaining cost risk remains until magnetic materials subcontracts are in place. Impact value $600k is Significant; probability reduced to unlikely; Risk Rating is reduced to Low.

3/27/2015 Risk further reduced due to awards of magnetic materials subcontracts for 2 of the 3 EPUs; remaining cost risk remains until subcontract is in place for the EPU105 device for ESM. Anticipate retirement by May 2015. Risk Rating remains Low.

7/23/2015 Risk now fully retired due to receipt of all magnetic materials by EPU subcontractor (for 3 of 3 EPUs).

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-17	Late installation of EESEs	2.05 - 2.10 Beamline Shielded Enclosures	Nov. 12, 2014

Description:

Condition: Delay of Installation of the Photon Delivery System due to late installation and testing of the enclosures.

Consequence: Delays in beamline completion

Breakdown by WBS:
20% x 5 : 5 base scope shielded enclosures WBS 2.[05,07..10].02.02 ($160k each)

Probability:	Impact:	Risk Rating:
Likely	Significant Schedule: up to 2 months == $0.8M	Retired

Mitigation Approaches:

Timely procurement of the enclosures, followed by timely installation of utilities systems in those enclosures.

Date Started:	Date to Complete:	Owner:
Jan-12	Nov-14	Level 2 Manager for Common Systems C. Stebbins

Current Status:

Assessed likelihood is Likely, Impact is Significant. Risk Rating is Medium.

7/16/2014: updated Owner name to reflect CAM update. To retire upon enclosure test completion.

11/12/2014: Fully retired, due to completion of enclosure installation (Nov. 2014).

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-18	Insufficient mechanical stability of optical components	2.03 - 2.10 Common Systems, Controls, & all NEXT PDS	Nov. 30, 2016

Description:

Condition: Insufficient mechanical stability of components that interact with the beam, resulting from: (1) Incomplete design and analysis, (2) too large temperature fluctuations in the beamline environment, (3) too large vibrational motion in the beamline environment, and (4) manufacturing not meeting specifications.

Consequence: Design complication and added cost for vibration-damping elements.

Initial Breakdown by WBS:
13% : Common Systems WBS 2.03.[01,03] (utilities, EPS)
2.03.01 10% ($100k)
2.03.03 3% ($30k)
10% : Beamline Controls WBS 2.04.02 ($100k)
2% : FXI PDS (design) WBS 2.06.02.01 ($20k)
15% x 5 : 5 base scope beamlines PDS WBS 2.[05,07..10].02.01 ($150k each)

February 2014 Breakdown by WBS:
Retirement of all $150k from ISS PDS (2.08.02.01) based on determination of insensitivity to positioning error.
Other risk assignments retain their cost value.

November 2014 Breakdown by WBS:
Common Systems WBS 2.03.[01,03] (utilities, EPS)
2.03.01 $100k -> $50k
2.03.03 $30k -> $15k
Beamline Controls WBS 2.04.02 $100k (keep)
FXI PDS (design) WBS 2.06.02.01 $20k ->$0
5 base scope beamlines PDS WBS 2.[05,07..10].02.01
ESM 2.5.2.1 $150k (keep)
ISR 2.7.2.1 $150k -> $75k
ISS 2.8.2.1 $0k (no change)
SIX 2.9.2.1 $150k (keep)
SMI 2.10.2.1 $150k (keep)

March 2015 Breakdown by WBS:
Common Systems 2.03.[01,03] (utilities, EPS)
2.03.01 $50k -> $25k
2.03.03 $15k -> $0
Beamline Controls 2.04.02 $100k->$115k
ESM 2.5.2.1 $150k ->$140k
ISR 2.7.2.1 $75k ->$20k
ISS 2.8.2.1 ($0)
SIX 2.9.2.1 $150k ->$100k
SMI 2.10.2.1 $150k ->$30k

July 2015 Breakdown by WBS:
Common Systems 2.03.[01,03] (utilities, EPS)
2.03.01 $25k (keep)
Beamline Controls 2.04.02 $115k ->$25k
ESM 2.5.2.1 $140k (keep)
ISR 2.7.2.1 $20k (keep)
ISS 2.8.2.1 ($0)
SIX 2.9.2.1 $100k (keep)
SMI 2.10.2.1 $30k (keep)

November 2015 Breakdown by WBS:
Common Systems 2.03.01 $25k->$15k
Beamline Controls 2.04.02 $25k->$0
ESM 2.5.2.1 $140k ->$80k
ISR 2.7.2.1 $20k (keep)
ISS 2.8.2.1 $0
SIX 2.9.2.1 $100k->$40k
SMI 2.10.2.1 $30k->$0

March 2016 Breakdown by WBS:

Common Systems 2.03.01: $15k
ESM 2.5.2.1 $80k ->$20k
ISR 2.7.2.1: $20k
SIX 2.9.2.1 $40k->$35k

June 2016 Breakdown by WBS:
Common Systems 2.03.01: $15k->0 (impact distributed by BL)
ESM 2.5.2.1 $20k->0 (PDS scope complete)
ISR 2.7.2.1: $20k->$15k HFM cooling implementation risk
SIX 2.9.2.1: $35k->0 all mitigations now implemented in EAC

November 2016 Breakdown by WBS:
Reduction of all remaining value to zero; retired.
All known mechanical (thermal and vibrational) stability risks addressed by implementation & design.

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $1.0M **2/5/2014** Reduction by $150k leaves $850k **11/12/2014** Reduction by $160k leaves $690k **3/27/2015** Reduction by $260k leaves $430k **7/23/2015** Reduction by $90k leaves $340k **11/30/2015** Reduction by $185k leaves $155k (now marginal) **3/23/2016** Reduction by $65k leaves $90k **7/9/2016** Reduction by $75k leaves $15k **11/30/2016** Reduction of remaining $75k leaves 0	Retired

Mitigation Approaches:

Complete vibrational and thermal analysis early. Utilize long lead procurement for these items, to maximize testing and integrated testing of these components.

Date Started:	Date to Complete:	Owner:
Jan-12	Oct-16	Level 2 Managers for Beamlines, Common Systems, and Controls E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi, C. Stebbins, Z. Yin

Current Status:

2/27/2013 Update the cost impact, increase from $0.9M to $1M after latest analysis. Risk rating remains Low.

7/10/2013 Update likelihood to Likely, and therefore Risk Rating increased to Medium.

2/5/2014 Risk for ISS beamline is retired due to determination of relative insensitivity to vibration. Risk for other beamlines is to be retired upon vendor award (SMI) or design milestone (ISS, SIX, ISR). Total risk value reduced to $850k (Risk Rating remains Medium). Complete retirement of this risk is expected by Dec 2014 (extended from Oct 2013).

7/16/2014 Updated Owner name to reflect CAM change in WBS 2.03.

11/12/2014 Updated impact as described above. Further reduction will be possible upon completion of mechanical-optical systems designs.

3/27/2015 Completion of utilities installations and beamline designs to date limits remaining risk to beamline systems and, to a lesser extent, controls. Decisions in these areas are expected to complete by September 2015, concurrent with endstation implementation design.

7/23/2015 Minimal exposure expected in utilities as work is completed. Controls is not expected to have significant ownership of this risk (primarily held by beamlines), therefore controls risk value is reduced.

11/30/2015 Minimal exposure expected in utilities and controls as work is completed. Cost impact of mitigations to potentially be implemented are largely known, reducing risk values in beamlines. Marginal impact brings risk rating to Low. Completion expected by March 2016.

3/23/2016 Cost impact of mitigations to potentially be implemented are largely known, reducing risk values to representation of largely only specific possible mitigating implementations (e.g. cryo isolation, thermal enclosure). Completion now expected by August 2016.

7/9/2016 Virtually all mitigations now implemented or planned; only ISR HFM known risk remains.

11/30/2016 All mitigations now implemented or planned; no known risk remains.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-19	Late installation of Utilities, PPS, and EPS	2.03 NEXT Common Systems	Nov. 30, 2016

Description:

Condition: Delay of Installation of Utilities, PPS, and EPS systems owing to interference with NSLS-II facility operations.

Consequence: Delays in beamline completion

Initial Breakdown by WBS:
100% : Common Systems WBS 2.03.[01..03]
2.03.01: 50% ($400k)
2.03.02: 25% ($200k)
2.03.03: 25% ($200k)

November 2014 Breakdown by WBS:
Common Systems WBS 2.03.[01..03]
2.03.01 (utilities): $400k -> $200k
2.03.02 (PPS): $200k
2.03.03 (EPS): $200k

March 2015 Breakdown by WBS:
Common Systems WBS 2.03.[01..03]
2.03.01 (utilities): $200k -> $10k
2.03.02 (PPS): $200k -> $25k
2.03.03 (EPS): $200k -> $40k

July 2015 Breakdown by WBS:
Common Systems WBS 2.03.[01..03]
2.03.01 (utilities): $10k -> $0
2.03.02 (PPS): $25k (keep)
2.03.03 (EPS): $40k (keep)

November 2015:
Impact and Probability assessment same as for July 2015.
Date to complete updated.

March 2016 Breakdown by WBS:
Common Systems WBS 2.03.[01..03]
2.03.03 (EPS): $40k (no change)
2.03.02 (PPS): $25k->$360k
Owing to resource bottlenecks and competing projects, delays in PPS could impact project cost by standing army cost of 1-2 beamlines (SMI and SIX) over ~3 months (Nov-Jan). Assuming a core team for each beamline of 4 FTE and cost of $15k/mo for each, the cost exposure for 3 month possible delay is $360k. Although cost would be incurred on the beamline accounts, the 2.03.02 area is the driving factor, and the common systems CAM is the assigned risk owner.

June 2016 Breakdown by WBS:
Common Systems WBS 2.03.[01..03]
2.03.03 (EPS): $40k->0
2.03.02 (PPS): $360k->0
Beamlines:
2.05.02.03 (ESM ES): $30k (1 mo x 2 mFTE)
2.07.02.03 (ISR ES): $30k (1 mo x 2 mFTE)
2.08.02.03 (ISS ES): $30k (1 mo x 2 mFTE)
2.09.02.01 (SIX PDS): $120k (1 mo x 2 mFTE)
2.09.02.03 (SIX ES): $30k (2 mo x 4 mFTE)
2.10.02.01 (SMI PDS): $120k (1 mo x 2 mFTE)
2.10.02.03 (SMI ES): $30k (2 mo x 4 mFTE)
Owing to resource bottlenecks and competing projects, delays in PPS and/or EPS could create standing army cost impact in beamlines of 1-2 months for photon delivery and endstation systems. Impact is dominated in SMI and SIX since those PDS IRRs remain to be completed. Assuming a core team for each beamline of 4 FTE for PDS and 2 FTE for ES, and cost of $15k/mo for each FTE, the total cost exposure is estimated as $390k. Since cost would be incurred on the beamline accounts, the impact values are moved from 2.03 to the relevant beamline areas.

November 2016 Breakdown by WBS:
Remaining impact only to beamlines with significant remaining common systems work:
2.05.02.03 (ESM ES): $30k->0 (complete)

2.07.02.03 (ISR ES): $30k->0 (complete)
2.08.02.03 (ISS ES): $30k->0 (complete)
2.09.02.01 (SIX PDS): $120->30k (1 mo x 2 mFTE)
2.09.02.03 (SIX ES): $30k (1 mo x 2 mFTE, no change)
2.10.02.01 (SMI PDS): $120k->0 (complete)
2.10.02.03 (SMI ES): $30k->0 (complete)

Probability:	Impact:	Risk Rating:
Unlikely	Marginal Schedule: up to 2 months = $0.8M **11/12/2014** => $0.6M **3/27/2015** => $0.075M **7/23/2015** => $65k **3/23/2016** => $400k **7/9/2016** => $390k **11/30/2016** => $60k	Low

Mitigation Approaches:

Pulling forward, in the project schedule, the procurement, installation, and testing of utilities, PPS, and EPS systems.

Distributing resources as needed.

Date Started:	Date to Complete:	Owner:
Feb-13	Jan-17	Level 2 Managers for Beamlines E. Vescovo, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

7/10/2013 Impact rated Significant and Likelihood assessed Likely; Overall risk rating raised to Medium.

2/5/2014 Accelerated completion date from Jan 2016 to Jul 2015 to follow expected NSLS-II transition to operations.

7/16/2014 Updated Owner name to reflect CAM change in WBS 2.03.

11/12/2014 Reduced impact based on completion progress in 2.03.01 (utilities).

3/27/2015 Reduced impact based on completion progress in WBS2.03 (utilities, PPS, and EPS), supported by additional budget and resource availability. CAM is projecting nearly negligible impact on beamline installations resulting from late installation of common systems systems. Remaining risk of $75k is expected to retire by July 2015.

7/23/2015 Eliminated impact on 2.3.1 based on completion progress. Remaining risk of $65k (schedule impact of delays in PPS & EPS) is expected to retire by October 2015, as implementation plans mature.

11/30/2015 Retirement date extended to March 2016.

3/23/2016 Impact increased from Marginal to Significant (Rating remains Low). Completion extended to September 2016.

7/9/2016 Impact remains Significant (probability remains Unlikely); Rating remains Low.

11/30/2016 Impact reduced to Marginal (probability remains Unlikely); Rating remains Low.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-20	Installation of beamlines during facility commissioning/studies	2.03 - 2.10 Common Systems, Controls, & all NEXT PDS and Endstation Equipment	Jul. 16, 2014

Description:

Condition: Possibility of delays in installation of PDS and endstations owing to limited access to the NSLS-II experimental floor during accelerator commissioning or studies.

Consequence: Estimated 2 month overall schedule delay.

Initial Breakdown by WBS:
15% : Common Systems WBS 2.03.[01..04]
2.03.01: 6% ($48k)
2.03.02: 3% ($24k)
2.03.03: 4% ($32k)
2.03.04: 2% ($16k)
10% : Beamline Controls WBS 2.04.02 ($80k)
15% x 5 : 5 base scope beamlines PDS, shielded enclosures,& endstation WBS 2.[05,07..10].02.[01..04]
2.[05,07..10].02.01: 8% ($64k)
2.[05,07..10].02.02: 2% ($16k)
2.[05,07..10].02.03: 4% ($32k)
2.[05,07..10].02.04: 1% ($8k)

Probability:	Impact:	Risk Rating:
Unlikely	Significant Schedule: up to 2 months = $0.8M **7/16/2014** => retired ($0)	Retired

Mitigation Approaches:

Advanced planning of beamline installation activities, in coordination with accelerator commissioning or studies.

Date Started:	Date to Complete:	Owner:
Feb-13	Oct-14	Level 2 Managers C. Stebbins, Z. Yin, E. Vescovo, W.-K. Lee, C. Nelson, K. Attenkofer, I. Jarrige, E. DiMasi

Current Status:

2/5/2014 Accelerated completion date from Sep 2016 to Oct 2014 to follow expected NSLS-II completion of ring commissioning.

7/16/2014 Retired upon successful commissioning of NSLS-II ring to 25 mA with efficient injection.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements	2.11 Insertion Devices (EPUs)	Nov. 30, 2016

Description:

Condition: ID field quality, of the delivered IDs from suppliers, does not meet stringent NSLS-II accelerator requirements.

Consequence: Schedule delay for ID installation; these IDs cannot be installed without magnetic field correction.

Initial Breakdown by WBS:
100% : Insertion Devices (EPUs for ESM, SIX) WBS 2.11.[01,02]
50% ($500k) each

7/16/2014 Breakdown by WBS:
After reduction in risk estimate:
Insertion Devices (EPUs for ESM, SIX) WBS 2.11.[01,02]
50% ($250k) each

11/30/2015 Breakdown by WBS:
Insertion Devices (EPUs for ESM& SIX) WBS 2.11.01: $250k total
This cost represents 3 months of a measurement/shimming crew (scientist, engineer, technician) for each of the two in-house-shimmed devices.

7/9/2016 Breakdown by WBS:
Insertion Devices (EPUs for ESM& SIX) WBS 2.11.01: $125k total
This cost represents 1.5 months of a measurement/shimming crew for the remaining in-house shimming work. Development of processes, progress with shimming on the first (SIX) device, and EAC updates reflecting additional resource requirements drive the labor cost impact down from the prior assessment.

11/30/2016 Breakdown by WBS:
Completion of measurements for all NEXT EPUs confirms required field quality for use in NSLS-II. Risk now retired.

Probability:	Impact:	Risk Rating:
Likely	Marginal Cost: up to $1.0M **7/16/2014** => up to $0.5M **11/30/2015** => up to $0.25M **7/9/2016** => up to $125k **11/30/2016** => 0 (retired, no remaining impact)	Retired

Mitigation Approaches:

Perform magnetic shimming at NSLS-II magnetic measurement facility.

Follow efficient and proven shimming and sorting procedures.

Date Started:	Date to Complete:	Owner:
Feb-13	Oct-16	Level 2 Manager for Insertion Devices C. Kitegi

Current Status:

7/10/2013: Cost Impact increased to $1M owing to experience with EPUs at other SR facilities. Impact level remains Significant, and Overall Rating remains Medium.

7/16/2014: Cost impact decrease to $0.5M based on updated estimate of shimming effort, and revised procurement strategy.

3/27/2015: Anticipated completion date extended to May 2016 per schedule of first devices tested and ready for installation to NSLS-II.

11/30/2015: Reduced impact, considering possible resource allocation to maintain project schedule.

7/9/2016: Reduced impact, based on improved understanding of required effort and revised resource estimate (EAC). Impact now Marginal, Risk Rating now Low. Extended completion date from May 2016 to September 2016.

11/30/2016: Fully retired, based on completion of measurements through October 2016.

NEXT Risk Registry - Risk Entries

Risk ID:	Title:	WBS:	Record Date:
NEXT-22	Insertion Device and Front End installation scope not funded by NSLS-II Operations as planned	2.12 Installation of Insertion Devices and Front Ends	Jul. 23, 2015

Description:

Condition: NSLS-II facility operations does not fund installation of NEXT front ends and insertion devices as described in the NEXT Project Execution Plan

Dependencies of NEXT on NSLS-II Facility Operations for delivery of operational accelerator systems are described in the NEXT Project Execution Plan. These include testing, installation, and commissioning of NEXT insertion devices and chambers, front ends, and all other scope within the accelerator tunnel. Being outside of NEXT Project Scope, they are not budgeted within NEXT but are instead expected to be provided using NSLS-II facility operations funds. In case that these funds are inadequate, NEXT project holds contingency in order to complete this additional scope.

Consequence: NEXT may be forced to fund its own accelerator installations (IDs and FEs) in order to deliver beam on time for NEXT beamlines.

November 2014 Breakdown by WBS:
100% : Project management 2.01.01 ($1.0M)

March 2015 Breakdown by WBS:
FE/ID Install (WBS 2.12): (total $600k)
2.12.01 (Mgt): $70k
2.12.02 (ID install): $370k
2.12.03 (FE install): $160k

July 2015 Breakdown by WBS:
FE/ID Install (WBS 2.12): (total $0)
=>completely retired, upon addition to project baseline.

Probability:	Impact:	Risk Rating:
Unlikely	Marginal **11/12/14** => Cost: $1M estimated for ~6 FTE effort to complete installation of NEXT IDs and front ends. Work to occur in FY15-16. **3/27/15** => Cost: $600k estimated for FY16 work remaining beyond that added to NEXT via PCR-15-072 for NEXT insertion device and front end installation, possibly needed from NEXT depending on NSLS-II operations budget. **7/23/15** => Cost: $0 (retired), as estimate for NEXT insertion device and front end installation effort in FY16 and any work remaining beyond that already added to NEXT via PCR-15-072 is now implemented via PCR-15-094; NEXT funding need based on NSLS-II operations budget and group leader inputs.	Retired

Mitigation Approaches:

Maintain regular communication with NSLS-II operations management and accelerator systems groups for up to date funding forecasts and effort requirements; hold contingency.

Date Started:	Date to Complete:	Owner:
Oct-14	Jul-15	Level 2 manager for ID and FE installation G. Fries

Current Status:

11/12/2014: Established risk and initial assessment.
3/27/2015: Reduced risk estimate to $600k, based on estimate for remaining effort (beyond added scope for FY15). Remaining risk assigned to 2.12 (ID/FE install) WBS; retirement anticipated by September 2015.
7/23/2015: Retired risk completely, as estimated budget for completion is added to project baseline (now including all of FY15 and FY16 effort).

NEXT LOW Risk Registry

Tuesday, December 20, 2016
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LOW Risk ID	Title	Record Date	Risk Value	Risk Rating	Approval Status
NEXT-LOW-01	Mirror repolishing found to be needed after delivery to BNL	Mar 23, 2016	$200,000.00	Low	Approved
NEXT-LOW-02	Damage to equipment during transport	Mar. 23, 2016	$100,000.00	Low	Approved
NEXT-LOW-03	Incomplete NSLS-II project contributions	Nov. 12, 2014	$0.00	Retired	Approved
NEXT-LOW-04	ID and Front End installations not covered by NSLS-II operations	Jul. 9, 2016	$196,000.00	Low	Approved

NEXT LOW Risk Registry

LOW Risk ID:	Record Date:
NEXT-LOW-01	Mar 23, 2016

Description:

Risk of mirror repolishing found to be needed after delivery to BNL
Impact: $200k (1 beamline delay up to ~2 months)

Probability:	Impact:	Risk Value:	Risk Rating:
Very Unlikely	Marginal	$200,000.00	Low

Mitigation Approaches:

Involve PS metrology team in FAT

Date Started:	Owner:
July 16, 2014	Beamline CAMs

NEXT LOW Risk Registry

LOW Risk ID:	Record Date:
NEXT-LOW-02	Mar. 23, 2016

Description:

Risk of damage to equipment during transport
Impact: $200k (replacement/repair of equipment moved from NSLS to NSLS-II)

Probability:	Impact:	Risk Value:	Risk Rating:
Very Unlikely	Marginal	$100,000.00	Low

Mitigation Approaches:

Beamline CAMs and supporting staff ensure that equipment is packed adequately for safe transport.

Date Started:	Owner:
July 16, 2014	Beamline CAMs

NEXT LOW Risk Registry

LOW Risk ID:	Record Date:
NEXT-LOW-03	Nov. 12, 2014

Description:

Risk of incomplete NSLS-II project contributions
Impact: $200k for materials or labor not provided as agreed and stated in PEP

Probability:	Impact:	Risk Value:	Risk Rating:
Very Unlikely	Marginal	$0.00	Retired

Mitigation Approaches:

Stay in communication with NSLS-II / accelerator division staff and evaluate progress on behalf of NEXT regularly.

Date Started:	Owner:
July 16, 2014	Project Manager

NEXT LOW Risk Registry

LOW Risk ID:	Record Date:
NEXT-LOW-04	Jul. 9, 2016

Description:

Risk of incomplete NSLS-II operations contributions
Impact: $1.22M for labor not provided as agreed and stated in PEP
Revised ETC as of June 2016 (BDN Portfolio) is $196k (from $672k prior value).

Probability:	Impact:	Risk Value:	Risk Rating:
Very Unlikely	Marginal	$196,000.00	Low

Mitigation Approaches:

Stay in communication with NSLS-II operations and accelerator division staff, and evaluate progress for NEXT regularly.

Date Started:	Owner:
Nov. 30, 2015	Project Manager

NEXT Project

(NEXT: NSLS-II EXperimental Tools)

Risk Registry Report Addendum: Risk Breakdown by WBS

November 2016

As an addendum to the November 2016 NEXT Risk Registry Report, the following collection of tables summarizes the risk assessment by risk and by WBS.

Following the approach used since CD-2, total risk is assessed as a total of both known and unknown risks. For known risks, the probability-weighted impacts are summed to a value of $0.431M as of November 2016 (excluding risks NEXT-02 and NEXT-03 held by FPD). For unknown risks, 10% of unobligated work remaining is used ($0.171M as of October 2016). The total risk assessment for NEXT as of November 2016 therefore is $0.602M. Total projected contingency requirement including VAC ($5.926M in October) is therefore $6.528M on BAC of $82.970M (156% of $4.193M budgeted remaining work); the available $7.030M represents 168% of remaining work. The $1.104M available contingency on EAC represents 19.8% of $5.574M ETC, which compares favorably with the risk assessment of $0.602M (10.8% of ETC).

The raw risk and probability-weighted risk values are detailed in the tables to follow, per NEXT risk and per WBS. Individual and summed raw risk impact values in each level 2 WBS area as assigned per risk, as well as probability-weighted (“expected monetary value” or EMV) sums are given, which add to unknown risk to yield total risk and risk as a fraction of remaining work.

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BROOKHAVEN NATIONAL LABORATORY

			2.01 Project Management		EXCLUDING FUNDING CHANGES		
			2.01.01	2.01.02		2.01.01	2.01.02
Risk ID	Risk Name	Total Value ($M)	Project Management	Project Support	Total Value ($M)	Project Management	Project Support
NEXT-01	Underestimated effort						
NEXT-02	Delay in appropriations occurring on October 1 of each year	1.200	1.200				
NEXT-03	Directed Funding Profile Change	4.800	4.800				
NEXT-04	Higher-than-expected worldwide demand for beamline components						
NEXT-05	Higher-than-expected optic quality required						
NEXT-06	Required optic quality is closer to state-of-the-art than expected						
NEXT-07	Underperforming equipment brought from NSLS						
NEXT-08	Design Changes (beamlines, controls and common systems)						
NEXT-09	Changes to EESE requirements/designs						
NEXT-10	Higher-than-expected thermal deformation of optics						
NEXT-11	Underestimated endstation component costs						
NEXT-12	Personnel recruitment delays						
NEXT-13	Higher-than-expected inflation rate						
NEXT-14	Accidents and injuries	0.080	0.030	0.050	0.080	0.030	0.050
NEXT-15	Limited availability of specialized effort						
NEXT-16	Market-driven price fluctuations (IDs)						
NEXT-17	Late installation of EESEs						
NEXT-18	Insufficient mechanical stability of optical components						
NEXT-19	Late installation of Utilities, PPS, and EPS						
NEXT-20	Installation of beamlines during facility commissioning/studies						
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements						
NEXT-22	ID & FE installation scope not funded by NSLS-II Operations						
	TOTAL	6.080	6.030	0.050	0.080	0.030	0.050
	EMV TOTAL	4.480	4.455	0.025	0.040	0.015	0.025

			2.03 Common Beamline Systems				
			2.03.01	2.03.02	2.03.03	2.03.04	2.03.05
Risk ID	Risk Name	Total Value ($M)	utilities	PPS	EPS	Control Sta	MGT
NEXT-01	Underestimated effort	0.027	0.005	0.016	0.006		
NEXT-02	Delay in appropriations occurring on October 1 of each year						
NEXT-03	Directed Funding Profile Change						
NEXT-04	Higher-than-expected worldwide demand for beamline components						
NEXT-05	Higher-than-expected optic quality required						
NEXT-06	Required optic quality is closer to state-of-the-art than expected						
NEXT-07	Underperforming equipment brought from NSLS						
NEXT-08	Design Changes (beamlines, controls and common systems)						
NEXT-09	Changes to EESE requirements/designs						
NEXT-10	Higher-than-expected thermal deformation of optics						
NEXT-11	Underestimated endstation component costs						
NEXT-12	Personnel recruitment delays						
NEXT-13	Higher-than-expected inflation rate						
NEXT-14	Accidents and injuries	0.004					0.004
NEXT-15	Limited availability of specialized effort	0.000			0.000		
NEXT-16	Market-driven price fluctuations (IDs)						
NEXT-17	Late installation of EESEs						
NEXT-18	Insufficient mechanical stability of optical components						
NEXT-19	Late installation of Utilities, PPS, and EPS						
NEXT-20	Installation of beamlines during facility commissioning/studies						
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements						
	TOTAL	0.031	0.005	0.016	0.006	0.000	0.004
	EMV TOTAL	0.021	0.004	0.011	0.004	0.000	0.002

			2.04 Beamline Controls		
Risk ID	Risk Name	Total Value ($M)	2.04.01 MGT	2.04.02.[01-06] design & implement	2.04.03 equipment
NEXT-01	Underestimated effort	0.030		0.030	
NEXT-02	Delay in appropriations occurring on October 1 of each year				
NEXT-03	Directed Funding Profile Change				
NEXT-04	Higher-than-expected worldwide demand for beamline components				
NEXT-05	Higher-than-expected optic quality required				
NEXT-06	Required optic quality is closer to state-of-the-art than expected				
NEXT-07	Underperforming equipment brought from NSLS				
NEXT-08	Design Changes (beamlines, controls and common systems)				
NEXT-09	Changes to EESE requirements/designs				
NEXT-10	Higher-than-expected thermal deformation of optics				
NEXT-11	Underestimated endstation component costs				
NEXT-12	Personnel recruitment delays				
NEXT-13	Higher-than-expected inflation rate				
NEXT-14	Accidents and injuries	0.015		0.015	
NEXT-15	Limited availability of specialized effort				
NEXT-16	Market-driven price fluctuations (IDs)				
NEXT-17	Late installation of EESEs				
NEXT-18	Insufficient mechanical stability of optical components				
NEXT-19	Late installation of Utilities, PPS, and EPS				
NEXT-20	Installation of beamlines during facility commissioning/studies				
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements				
	TOTAL	0.045	0.000	0.045	0.000
	EMV TOTAL	0.029	0.000	0.029	0.000

			2.05 ESM Beamline					
			2.05.01	2.05.02	2.05.02.01	2.05.02.02	2.05.02.03	2.05.02.04
Risk ID	Risk Name	Total Value ($M)	MGT	BL Systems	PDS	enclosures	endstation	data acquisition
NEXT-01	Underestimated effort	0.000		0.000	0.000		0.000	
NEXT-02	Delay in appropriations occurring on October 1 of each year							
NEXT-03	Directed Funding Profile Change							
NEXT-04	Higher-than-expected worldwide demand for beamline components	0.000		0.000	0.000			
NEXT-05	Higher-than-expected optic quality required							
NEXT-06	Required optic quality is closer to state-of-the-art than expected							
NEXT-07	Underperforming equipment brought from NSLS							
NEXT-08	Design Changes (beamlines, controls and common systems)							
NEXT-09	Changes to EESE requirements/designs							
NEXT-10	Higher-than-expected thermal deformation of optics							
NEXT-11	Underestimated endstation component costs	0.000		0.000			0.000	
NEXT-12	Personnel recruitment delays							
NEXT-13	Higher-than-expected inflation rate							
NEXT-14	Accidents and injuries							
NEXT-15	Limited availability of specialized effort	0.000		0.000			0.000	
NEXT-16	Market-driven price fluctuations (IDs)							
NEXT-17	Late installation of EESEs							
NEXT-18	Insufficient mechanical stability of optical components							
NEXT-19	Late installation of Utilities, PPS, and EPS	0.000		0.000			0.000	
NEXT-20	Installation of beamlines during facility commissioning/studies							
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements							
	TOTAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	EMV TOTAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			2.07 ISR Beamline					
Risk ID	Risk Name	Total Value ($M)	2.07.01 MGT	2.07.02 BL Systems	2.07.02.01 PDS	2.07.02.02 enclosures	2.07.02.03 endstation	2.07.02.04 data acquisition
NEXT-01	Underestimated effort	0.011	0.000	0.011	0.000		0.011	
NEXT-02	Delay in appropriations occurring on October 1 of each year							
NEXT-03	Directed Funding Profile Change							
NEXT-04	Higher-than-expected worldwide demand for beamline components	0.000		0.000			0.000	
NEXT-05	Higher-than-expected optic quality required							
NEXT-06	Required optic quality is closer to state-of-the-art than expected							
NEXT-07	Underperforming equipment brought from NSLS							
NEXT-08	Design Changes (beamlines, controls and common systems)	0.005		0.005			0.005	
NEXT-09	Changes to EESE requirements/designs							
NEXT-10	Higher-than-expected thermal deformation of optics							
NEXT-11	Underestimated endstation component costs	0.005		0.005			0.005	
NEXT-12	Personnel recruitment delays							
NEXT-13	Higher-than-expected inflation rate							
NEXT-14	Accidents and injuries	0.010	0.010					
NEXT-15	Limited availability of specialized effort							
NEXT-16	Market-driven price fluctuations (IDs)							
NEXT-17	Late installation of EESEs							
NEXT-18	Insufficient mechanical stability of optical components	0.000		0.000	0.000			
NEXT-19	Late installation of Utilities, PPS, and EPS	0.000		0.000			0.000	
NEXT-20	Installation of beamlines during facility commissioning/studies							
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements							
	TOTAL	0.031	0.010	0.021	0.000	0.000	0.021	0.000
	EMV TOTAL	0.020	0.005	0.015	0.000	0.000	0.015	0.000

			2.08 ISS Beamline					
Risk ID	Risk Name	Total Value ($M)	2.08.01 MGT	2.08.02 BL Systems	2.08.02.01 PDS	2.08.02.02 enclosures	2.08.02.03 endstation	2.08.02.04 data acquisition
NEXT-01	Underestimated effort	0.000	0.000	0.000	0.000		0.000	
NEXT-02	Delay in appropriations occurring on October 1 of each year							
NEXT-03	Directed Funding Profile Change							
NEXT-04	Higher-than-expected worldwide demand for beamline components							
NEXT-05	Higher-than-expected optic quality required							
NEXT-06	Required optic quality is closer to state-of-the-art than expected							
NEXT-07	Underperforming equipment brought from NSLS							
NEXT-08	Design Changes (beamlines, controls and common systems)							
NEXT-09	Changes to EESE requirements/designs							
NEXT-10	Higher-than-expected thermal deformation of optics							
NEXT-11	Underestimated endstation component costs	0.000		0.000			0.000	
NEXT-12	Personnel recruitment delays							
NEXT-13	Higher-than-expected inflation rate							
NEXT-14	Accidents and injuries							
NEXT-15	Limited availability of specialized effort							
NEXT-16	Market-driven price fluctuations (IDs)							
NEXT-17	Late installation of EESEs							
NEXT-18	Insufficient mechanical stability of optical components							
NEXT-19	Late installation of Utilities, PPS, and EPS	0.000		0.000			0.000	
NEXT-20	Installation of beamlines during facility commissioning/studies							
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements							
	TOTAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	EMV TOTAL	0.000	0.000	0.000	0.000	0.000	0.000	0.000

			2.09 SIX Beamline					
Risk ID	Risk Name	Total Value ($M)	2.09.01 MGT	2.09.02 BL Systems	2.09.02.01 PDS	2.09.02.02 enclosures	2.09.02.03 endstation	2.09.02.04 data acquisition
NEXT-01	Underestimated effort	0.090	0.011	0.079	0.036		0.043	
NEXT-02	Delay in appropriations occurring on October 1 of each year							
NEXT-03	Directed Funding Profile Change							
NEXT-04	Higher-than-expected worldwide demand for beamline components	0.135		0.135	0.015		0.120	
NEXT-05	Higher-than-expected optic quality required							
NEXT-06	Required optic quality is closer to state-of-the-art than expected							
NEXT-07	Underperforming equipment brought from NSLS							
NEXT-08	Design Changes (beamlines, controls and common systems)	0.020		0.020			0.020	
NEXT-09	Changes to EESE requirements/designs							
NEXT-10	Higher-than-expected thermal deformation of optics							
NEXT-11	Underestimated endstation component costs	0.020		0.020			0.020	
NEXT-12	Personnel recruitment delays							
NEXT-13	Higher-than-expected inflation rate							
NEXT-14	Accidents and injuries	0.030	0.030					
NEXT-15	Limited availability of specialized effort	0.024		0.024	0.012		0.012	
NEXT-16	Market-driven price fluctuations (IDs)							
NEXT-17	Late installation of EESEs							
NEXT-18	Insufficient mechanical stability of optical components							
NEXT-19	Late installation of Utilities, PPS, and EPS	0.060		0.060	0.030		0.030	
NEXT-20	Installation of beamlines during facility commissioning/studies							
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements							
	TOTAL	0.379	0.041	0.338	0.093	0.000	0.245	0.000
	EMV TOTAL	0.270	0.023	0.247	0.060	0.000	0.187	0.000

			2.10 SMI Beamline					
			2.10.01	2.10.02	2.10.02.01	2.10.02.02	2.10.02.03	2.10.02.04
Risk ID	Risk Name	Total Value ($M)	MGT	BL Systems	PDS	enclosures	endstation	data acquisition
NEXT-01	Underestimated effort	0.020		0.020	0.000		0.020	
NEXT-02	Delay in appropriations occurring on October 1 of each year							
NEXT-03	Directed Funding Profile Change							
NEXT-04	Higher-than-expected worldwide demand for beamline components							
NEXT-05	Higher-than-expected optic quality required							
NEXT-06	Required optic quality is closer to state-of-the-art than expected							
NEXT-07	Underperforming equipment brought from NSLS							
NEXT-08	Design Changes (beamlines, controls and common systems)							
NEXT-09	Changes to EESE requirements/designs							
NEXT-10	Higher-than-expected thermal deformation of optics							
NEXT-11	Underestimated endstation component costs	0.030		0.030			0.030	
NEXT-12	Personnel recruitment delays							
NEXT-13	Higher-than-expected inflation rate							
NEXT-14	Accidents and injuries	0.020	0.020					
NEXT-15	Limited availability of specialized effort	0.000		0.000	0.000			
NEXT-16	Market-driven price fluctuations (IDs)							
NEXT-17	Late installation of EESEs							
NEXT-18	Insufficient mechanical stability of optical components							
NEXT-19	Late installation of Utilities, PPS, and EPS	0.000		0.000	0.000		0.000	
NEXT-20	Installation of beamlines during facility commissioning/studies							
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements							
	TOTAL	0.070	0.020	0.050	0.000	0.000	0.050	0.000
	EMV TOTAL	0.045	0.010	0.035	0.000	0.000	0.035	0.000

			2.11 Insertion Devices		
			2.11.01	2.11.02	2.11.03
Risk ID	Risk Name	Total Value ($M)	ESM EPU	SIX EPU	MGT
NEXT-01	Underestimated effort				
NEXT-02	Delay in appropriations occurring on October 1 of each year				
NEXT-03	Directed Funding Profile Change				
NEXT-04	Higher-than-expected worldwide demand for beamline components				
NEXT-05	Higher-than-expected optic quality required				
NEXT-06	Required optic quality is closer to state-of-the-art than expected				
NEXT-07	Underperforming equipment brought from NSLS				
NEXT-08	Design Changes (beamlines, controls and common systems)				
NEXT-09	Changes to EESE requirements/designs				
NEXT-10	Higher-than-expected thermal deformation of optics				
NEXT-11	Underestimated endstation component costs				
NEXT-12	Personnel recruitment delays				
NEXT-13	Higher-than-expected inflation rate				
NEXT-14	Accidents and injuries	0.015			0.015
NEXT-15	Limited availability of specialized effort				
NEXT-16	Market-driven price fluctuations (IDs)				
NEXT-17	Late installation of EESEs				
NEXT-18	Insufficient mechanical stability of optical components				
NEXT-19	Late installation of Utilities, PPS, and EPS				
NEXT-20	Installation of beamlines during facility commissioning/studies				
NEXT-21	Insertion Device Field Quality does not meet NSLS-II requirements	0.000	0.000		
	TOTAL	0.015	0.000	0.000	0.015
	EMV TOTAL	0.008	0.000	0.000	0.008