

HEX Contingency Analysis Report

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Summary

There is no Project level contingency for HEX Beamline project as the current estimates at FDR is equal to \$30M of which \$25M is funded by NYSERDA and \$5M is funded by NSLS-II. Any significant cost overruns will have to be dealt with through a reduction in scope. This contrasts with DOE projects which are normally expected to carry a 30-40% contingency at the start of a project. The project team used several ways to determine the risk value which will help identify the scope contingency items. The risk values calculated using different approach are summarized below:

Risk Register - \$430K

Top down risk assessment at WBS level - \$2.33M

Bottom-up Estimate uncertainty - \$2.60M

Different Approaches

Risk Register-

A detailed risk registry was created in MS Excel at L2 WBS level with inputs from Control Account Managers, Project Engineer, Project Controls, Beamline Lead Scientist, Program Manager and Portfolio Manager. The up to date Risk Register will be maintained in the HEX SharePoint site and the project intends to update it periodically (at least quarterly). Each risk carries a unique identifier which will be maintained throughout the project. The cost of Risk event (impact/mitigation) is multiplied with the probability of the risk event happening to arrive at a risk value. All these risk values are summed up to arrive at a total risk value captured in the risk register. At the time of writing this document, the risk value identified in the risk register equals \$430K.

Top down Risk Assessment-

Top down risk assessment is done in CEB. Risks at the WBS level are identified by the Core Project Team using factors and multipliers by schedule, cost and Technical sources as defined in the Assumptions document. The sum product of these gets us an overall risk value. The excel sheet that was used to perform this exercise is posted in SharePoint (PMP reference document "Risk Assessment"). At the time of writing this document, the risk value identified using this approach equals \$2.33M.

Bottom-up Estimate uncertainty-

The bottom-up estimate uncertainty is also done in CEB. The uncertainty of the estimates at resource level within each activity is determined from the Basis of Estimate (BOE), (for example CP, VQ, AC etc.). The uncertainty percentages for the BOE types were determined by the HEX Management team as defined in the Assumptions document, but the CAMs are able to override these percentages with a valid explanation. Estimate costs multiplied with the uncertainty percentages gives us the uncertainty value which are all summed up to arrive at the total value of Estimate uncertainty. At the time of writing this document, the risk value identified using this approach equals \$2.60M.

Scope Contingency at FDR / Baselineing

The project team compared the values calculated using the above three approaches and selected a Risk value. At the time of writing this document, the plan to determine the scope contingency value *at the time of baselineing the project* (before the end of April 2019) is as below:

Required Scope Contingency value =

(Top down risk assessment value + 4 times risk register value + Bottom-up uncertainty estimate)/6

= (\$2,333,730 + 4*\$429,900 + \$2,596,358) / 6

= **\$1,108,281**

The above formula is chosen to give more weightage to the risk register, but at the same time take other two approaches into consideration.

After determining the above value, the project team developed below list of scope contingency items.

Scope Contingency Already Exercised

It should be noted that the B-hutch has already been descoped in order to allow the hutches and satellite building to fit within the original budget for these items. This was done in accordance with advice from the BNL Project Oversight Board.

Furthermore, the local storage drive and a GPU for fast image processing have been descoped recently from the plans in order to meet the overall \$30M budget. Since these items are critical for the beamline operation, we hope to reinstate these items if project funds allow.

Scope Contingency at the time of the beamline FDR

Item	WBS	Value	Decision date	Mitigation or consequence
End station fit-out	7.05.03.03	\$1,61M	Jan-2020	Use existing equipment from NSLS
Controls (DAMA) descoping	7.05.06.02	\$100k	Aug-2020	Less software functionality
Total		\$1.7M		
Very radical solution (last resort, and would need NYSERDA concurrence)				
Delay procurement of SCW, install borrowed PM wiggler (from Australian synchrotron, would need agreement)	7.05.05.02	>\$1M	Sept-2018	PM wiggler would have a significantly low critical energy which would impact the beamline performance.

Table 1: Scope Contingency