

**Cost, Schedule, Status Review**  
**of the**  
**Building 1008 Infrastructure and Facility**  
**Upgrade**

**Charge Date:** March 18, 2021

**Review Dates:** April 7-8, 2021

**Final Report Date:** April 19, 2021

## Executive Summary

The Building 1008 Infrastructure and Facility (I&F) Upgrade will be a major upgrade to the facilities of the 1008 building. It is being upgraded to be a site that can host future experiments. The Infrastructure and Facility Upgrade includes the upgrade of the infrastructure in building 1008 to support detector operations, the superconducting magnet, the cryogenic system, the magnet flux return steel, the cradle carriage and mechanical structures necessary to support the scientific equipment, and installation and integration.

The I&F effort uses a tailored EVMS strategy and is managed according to BNL project management best practices and guidance.

A review of the 1008 Infrastructure and Facility Upgrade was held on April 7 & 8, 2021, which was meant to establish the readiness of the plans and documentation, progress to date, cost and schedule credibility, technical maturity of the components/systems included in the upgrade's WBS, completeness of interface identification/management and to determine whether risk identification is being properly addressed. This report documents the findings of the committee, as required by the charge shown in Appendix A.

The I&F Upgrade team is commended for the progress they have made to date and for the good work that was done in preparation for this review. The committee appreciates the information that was made available in advance of the review, which afforded time for detailed review. Information that was not made available in advance was presented upon request, which was also appreciated. The committee's overall assessment of the I&F effort is positive and we are encouraged by the knowledge and experience possessed by the I&F team that has been assembled. The presenters were able to speak to their scope with confidence. The committee appreciates the detailed responses that were offered during the Q&A sessions and especially the detailed responses that were offered for the homework assignments, which were answered to the committee's satisfaction.

Although the committee feels confident that the I&F team is on track for success, the committee is offering a fair amount of recommendations, which are outlined throughout the report below. One of the most notable observations is the likely reduction of schedule contingency between early completion and the start of the FY23 RHIC run (currently 3.5 months float, which will likely be reduced by 1 month after a PCR is submitted for approval). In addition, the committee has determined that some of the planning efforts for the Infrastructure WBS element (2.4) are insufficiently defined for this stage of the upgrade effort. The need for greater detail and defined resources is noteworthy and should be reflected as such in terms of cost & schedule uncertainty. In fact, the committee encourages the I&F Upgrade team to include this as a risk in the risk register as appropriate. The committee has determined that five of the fifteen active risks in the Risk Registry do not have mitigation strategies defined and one of those five risks are marked as high and could result in six months delay. The committee encourages the I&F team to develop a mitigation approach for all risks that are captured in the Risk Register. The committee has determined that there is schedule risk associated with successfully executing plans for magnet measurements due to COVID travel restrictions. The committee encourages the team to perform early planning, including seeking early approval from DOE for travel by BNL staff and/or on-site access for personnel traveling from CERN.

# Responses to the Charge

## Scope

Has the I&F Upgrade effort made sufficient progress to date against the proposed baseline plan? **YES**

- o The I&F Upgrade team has made significant progress since the last review.

## Interfaces

Are the interfaces and external dependencies properly understood? **MOSTLY**

- Although best practices appear to have been adopted, further work/effort should be directed to the Infrastructure L2 area (see comments and recommendations in the Infrastructure section below)

## Management

Is there a capable team in place and are the required resources identified to effectively manage risks, interfaces, and to successfully execute the proposed baseline? **YES**

- The team appears to be well-formed. Attention should be directed to the infrastructure L2 area in this regard.

Have the recommendations for the 1008 Infrastructure and Facility Upgrade from past reviews been appropriately addressed? **MOSTLY**

- The SAD still needs to be updated (see comments in the ES&H section below).

## Cost and Schedule

Are the cost and schedule estimates credible and reasonable considering the maturity of each component of the I&F Upgrade effort? **YES**

Has the impact of RHIC runs in FY21/FY22 been properly evaluated, including the impact on schedule and resources? **YES**

- See comments in the Infrastructure section below

Are the plans for an early finish of the I&F Upgrade effort, including available resources, credible? **YES**

- Although there is risk to further drawing on the remaining schedule contingency relative to the start of RHIC Ops, it appears appropriate planning efforts are underway in terms of maintaining the early finish completion date, which now leaves 2.5 months of schedule float.

Is the impact of COVID-19 on cost and schedule properly estimated? **MOSTLY**

- It appears significant attention has been directed to mitigating risks associated with COVID-19. Planning efforts and coordination of resources in a COVID

environment have been effective and Limited Operations at BNL has not impacted the schedule thus far. The committee is particularly concerned about the availability of CERN personnel for magnet measurements as well as specific controls for COVID Work Planning, especially when there is work in close proximity. See recommendation in Cost & Schedule section below.

## **Risks**

Are the risks properly understood and mitigation plans developed? **YES**

- Although a solid Risk Register is in place that uses best practices, further attention should be directed to any remaining risk exposure to ensure cost and schedule objectives are met (see comments in the Management section below).

Does the I&F Upgrade include adequate scope, cost, and schedule contingency?

**PARTIALLY**

- Scope and Cost: **YES**
  - Based on the remaining risks and uncertainty level, it is likely that the remaining 22% cost contingency is adequate to carry the I&F effort to completion.
- Schedule: **NO**
  - Schedule contingency to the start of RHIC Ops is low. Further effort should be directed to hold or further increase the contingency above the current estimate of 2.5 months.

Is the planned workforce likely to be available? **YES (qualified)**

- Resource planning efforts used to establish resource requirements are commendable and closely coordinated with other BNL organizations by way of MOU/MOA(s), which is best practice. With that in mind, the committee recommends I&F management review all MOUs to ensure resource needs are met and the appropriate draw-down plans are in place to ensure future opportunity for deployed resources.

## **ES&H**

Is ES&H properly addressed given the I&F Upgrade effort's current stage of development? **YES**

- Updates to the RHIC SAD remain an open action from the 2019 review. Time to prepare these documents and get approvals have been taking longer than anticipated. The I&F effort must ensure that CA-D has all information needed to move forward with these documents.
- The I&F effort is following standard BNL COVID prevention methods. Consideration should be given for work specific protective measures especially when staff need to work in close proximity for extended periods.
- ODH needs to be included into the RHIC Access Control System (ACS - credited controls)

# Sub-Committee Findings, Comments, and Recommendations

## Cost and Schedule

### Findings

- The Building 1008 Infrastructure and Facility Upgrade effort is being executed using a tailored approach to the BNL Earned Value Management System (EVMS).
- The I&F effort has a Total Cost of \$33.4M with a planned completion in January 2023. As of February 2021, the planned percent complete is 63.7% with an actual (earned) percent complete of 56.1%. The I&F Upgrade effort cumulative Schedule and Cost Performance Indices are 0.88 and 1.06, respectively.
- The I&F effort continues to maintain a logically driven, resource loaded schedule with a Budget at Completion of \$30.4M. The remaining duration is approximately 23 months with 3.5 months of schedule contingency to the 2023 RHIC run (15.2%).
- The I&F critical path is the carriage cradle assembly and installation.
- Original contingency at the baseline was \$4.2M. \$1.2M has been spent with \$3.0M remaining. 22.46% based on work remaining and 22.35% based on the \$13.4M ETC. The current Estimate at Completion is \$29.4M (see Appendix E for EAC contingency profile).
- Three of the five WBS elements have SPI<.85, which puts them in the red category as shown in Appendix D.
- Although not marked as such, two of the five WBS elements have a CPI>1.16 to 1.25 (Yellow) and one with CPI=1.38 (red).
- Variance reporting is being executed properly for CPI/SPI values that trip thresholds <1.0 but not for CPI/SPI that trips thresholds >1.0.

### Comments

- The Integration and Commissioning (I&C) schedule contingency is reduced by 20 working days due to Shield Wall Choreography, which leaves 2.5 months contingency to early finish.
  - Notes:
    - The rigging effort assumes one shift per day.
    - Early finish was mid October 2022. It is now mid-November. Start of RHIC Ops is February 2023.
    - The remaining 2.5-month float to the start of RHIC Ops spans the 2022 holiday season, which will likely come with some schedule inefficiencies.
- The beam pipe bakeout is anticipated to result in an additional reduction of 10 days of schedule contingency.
- Based on past performance, it is likely the Estimate to Complete (ETC) is adequate to complete the I&F effort scope within budget.
- Variance analysis has not been completed for cost under-runs that have tripped the variance thresholds.

## Recommendations

- Within three months after receipt of this report, identify methods to minimize the schedule impacts to early completion ahead of RHIC Run 2023 and present to NPP management for consideration.
- Consider developing plans for a second shift to address activities that need to be executed in the final days of construction (i.e. rigging and beam pipe bake-out).
- Perform appropriate variance reporting for all CPI/SPI values that trip thresholds set by the I&F effort (including values >1.0).
- Consider correcting any known misdirected labor charges to ensure proper EV reporting, which would correct the positive cost performance reported for WBS 2.05 that exceeded the threshold. Alternatively, consider methods that avoid masking future cost variances for WBS 2.05.
- Execute a PCR to ensure recent schedule slippage relative to early finish is reflected in P6 (i.e. float to late finish should reflect 2.5 months not 3.5 months).

## Management

### Findings

- The Risk Register that was shared reflects a total of 8 risks that have been closed to date and 15 that are still active. Two of the active risks are marked as High and four are marked as Moderate.
- Five of the 15 active risks do not have a mitigation strategy identified in the Risk Register (one of those 5 are scored as High).
- The total expected cost exposure for risks is \$94k.
- Risk ID: sPH\_Integration\_Installation\_07 is marked as a High risk with a likely schedule exposure of 6 months and does not have a mitigation strategy identified.

### Comments

- It is evident that a very capable team is in place to effectively execute the remaining I&F scope.
- Going forward, it would be beneficial to future review committees if each L2 presented the remaining reviews and/or gates that are planned. The format that was presented in the WBS 2.3 talk on slide 10 is a good example of what should be shown.
- The format that was used to convey potential schedule threats in the Installation & Integration talk (WBS 2.5) was well done. The I&F team should consider adopting that format for all L2 talks during future status reviews.
- Special attention should be directed to Risk ID: sPH\_Integration\_Installation\_07 to ensure proper planning is in place in the event the risk is realized.
- Although it is evident that Risk Management best practices have been adopted by the I&F team, the committee encourages continued review of risk exposure throughout the remainder of the I&F Upgrade effort.

- Ensure a mitigation strategy is articulated for all risks identified in the Risk Register. This is not the case in the current Risk Register that was provided.

## Recommendations

- Consider changing the management structure depicted in the Org Chart to reflect E. O'Brien or G. Young being the L2/CAM for 2.01 (Management).
- Going forward, maintain all past risks (closed/retired/accepted) in the risk register, which will maintain a historical record for future reference during status reviews.
- For future reviews, consider developing a common approach to presenting information at the L2 level, including risks, cost/schedule threats, remaining reviews, float to critical path, resource needs, notable requirements, etc.

## Environment, Safety & Health (ESH)

### Findings

- An ESH liaison coordinates the I&F activities between ESH staff from the CA-D and Physics Department.
- Standard BNL processes and practices are followed including ISM, ISO14000, and SBMS (ESR, WP&C etc.)
- A HAR is available, and all post mitigated risks are low or negligible.
- WP&C will include a combination of Experimental Safety Reviews for activities performed by Physics and Worker-planned, Prescribed, and permitted work for activities performed by CA-D.
- While there are several collaborations identified for the I&F Upgrade effort (University of Illinois and SBU), no work will be performed by BNL staff at these institutions.
- COVID has been added to the risk registry and COVID protective measures have been implemented at BNL to mitigate the risk.
- COVID risk mitigations appear effective and there has been no spread of COVID infection attributed to work at BNL.
- The hazards and risks associated with the I&F effort are well understood and are well known at BNL and within the DOE accelerator community.
- The prior recommendation related to updates to the SAD and ASE (if needed) remains open but will be addressed before cryogenics are introduced to the 1008 facility (new hazard).
- The prior recommendation regarding the need for an ARR has been addressed and it has been determined that an ORR will be performed. (Note this should be an ORE as ORRs are performed for Nuclear facilities)
- Several ORRs are on the schedule for bringing I&F effort subsystems online.

## Comments

- The I&F Upgrade effort has not reviewed specific activities for COVID protective measures. Work activities should be reviewed and additional COVID protective measures identified if close proximity is required. Recently, OSHA established a risk assessment process for determination if respiratory protection (i.e., respirator) is warranted. Work within close proximity for extended periods is deemed a medium risk. A Risk Assessment template is available from the ESH Directorate to help identify and document additional protective measures.
- Recent changes to the Accelerator Safety subject area identify an Internal Readiness Review as an appropriate review mechanism for new installations such as the I&F effort
  - *An IRR process may also be used in lieu of an ARR. It has been useful when multiple repetitive ARRs are required (e.g., multiple beam lines that will be commissioned over several months or years) and for large detector upgrades (e.g., PHENIX or STAR) where an ARR has been performed in the distant past.*
- While the I&F Team recognizes the need to update the SAD and possibly the ASE, if a new credited control is needed, work has not been started on these documents. These documents will require LESH and BHSO (ASE only) approvals. The time necessary to get these reviews completed may take several months.

## Recommendations

- If work in close proximity is expected, prepare the Hazard Assessment for COVID Respirator Use and consider additional protective measures.
- Determine if an IRR would be a better avenue for determination of readiness, instead of an ORR.
- Ensure CA-D has all information needed to proceed with SAD revisions as appropriate.
- ODH needs to be included into the RHIC Access Control System (ACS - credited controls)

## Cryogenics and Magnets

### Findings

- Several cryogenic system major components are awarded to the same vendor and two components are under fabrication by the same vendor (AET).
- The repurposed Babar magnet coil for I&F Upgrade was successfully tested in a temporary yoke at low and high current (105% of the design value) and awaits transport from 912 to the 1008 experimental hall. Actual commissioning of the assembled magnet will take place in the IR hall (on beamline) after hookup and checkout of the cryogenic supply, power, quench diagnostic and energy extraction systems. Magnetic measurements of the magnet field are planned to take advantage of experienced CERN personnel and existing magnet measurement equipment under a contract to be placed with CERN. Most other IR hall work is paused while magnetic measurements are in progress so any delay here would directly impact installation of the experimental equipment.



## Comments

- It is suggested to have close collaboration with the cryogenic vendor to get the process updated and ensure that the key items can be delivered on time to prevent the delay of the installation.
- The I&F effort is commended for providing new, redundant voltage taps where old vendor installed taps failed; however, there are locations inside the cold mass and current leads where there are taps that still could fail in inaccessible areas. We also strongly support plans to use a soft air ride transport system (on a good day) to minimize stress to the magnet during final transport to 1008.
- Contracting with CERN to use an existing magnetic measurement field mapping system (with minimal needs for installation fixturing) is commendable. There was however concern expressed whether travel from CERN to BNL might still be impacted by COVID-19 pandemic travel restrictions. The backup plan as presented for dealing with this COVID-19 related risk was that BNL staff (some combination of SMD, CA-D and physics staff) could be trained by CERN to do the magnetic measurements.
- Since the last review I&F Upgrade team has made good progress in quantifying the external field in the IR hall environment with a few areas reaching 100 gauss near the “corners” of the detector yoke. The safety analysis for static magnetic hazards is expected to continue and result in application of standard magnetic hazard mitigation (e.g. identifying areas not suitable for pacemakers).

## Recommendations

- The risk of losing additional voltage taps in inaccessible areas, while admittedly unlikely, should be kept in mind and the I&F team should evaluate how to monitor the health of the main superconducting coil if any other voltage taps, temperature, or strain sensors fail. Also, before hooking up the magnet power, the team should hipot the warm supply cables and dump resistor system.
- Since any delay in performing magnetic field measurements directly impacts the timeline for other activities, the team should flesh out the backup plan for training BNL staff to use the CERN measurement system in a report submitted to NPP management.

## Integration and Installation

### Findings

- The review team would like to recognize the teamwork demonstrated by the I&F engineering team, particularly the Facility and Detector Support systems engineers. Their transparency and willingness to participate in discussion Q&A demonstrated their knowledge and enthusiasm and assisted the review committee with their assessment.
- Much progress has been made since the last review – especially regarding development of an Office of System Integration and obtaining additional resources. It is excellent news that track reinforcement is underway and the cradle-carriage assemblies are awaiting delivery. Careful coordination will be required to orchestrate delivery and assembly of cradle carriage and subsequent large assemblies.

- This review team understands the complexity and significance of the track reinforcement work and would like to compliment the I&F team on working towards successfully integrating this effort into the schedule and I&F effort cost. It was a pleasure to see such a dynamic and enthusiastic team at work.

## Comments

- As stated during the discussion, the review team would like to point out that the transition between design and procurement and the assembly and installation phases require a different focus. The I&F team has the experience required to succeed and will need to be aware of this shift.
- Be careful not to overlook details of rigging and technician efforts during the installation and assembly work as well as the training required to support it. For example, make sure that it is known who the scaffold inspector(s) are and that they will be available for the daily inspections.
- Consider having spares available to either replace or repair special tooling required for the assemblies.
- Have WCCs maintain good communication with LE and CAD ES&F to ensure resources are available when needed.
- The review team understands that the team is working towards compliance with all electrical requirements, including arc-flash studies. Continue to focus on this and take care not to overlook specific grounding requirements and Short Circuit Current Ratings (SCCR). The NEC SCCR requirement is more detailed than circuit breaker coordination and requires that the available fault current at the “customer” facility be determined.
- It is recognized that evaluation of existing HVAC systems is important to reliability and economy, however the review team is concerned that the sub-optimal design of the prior DAQ room rack layout and cooling system distribution may carry over if a more specific design is not developed.
- The Detector Infrastructure presentation and backup documents were well prepared and addressed the requirements of the detector. The design clearly addresses requirements from NFPA 70 Electrical Code for equipment placement and cable tray loading. The use of PLCs for the protection systems for the detector is also well thought out.
- The 1008B Infrastructure presentation addressed the existing legacy systems needed to support the Detector. The HVAC and Water-Cooling systems are old systems, and some have known deficiencies that should be addressed. The presentation stated options for upgrading several systems to increase the reliability of these systems. It was not clear if these upgrades are going to be part of the I&F effort. The committee could not find evidence that the detector ICDs have the requirements for the HVAC and cooling water systems in terms of reliability and serviceability.

## Recommendations

- Further develop the design of the cooling water system. A system requirements document, preliminary P&ID and heat and flow balance should be developed soon. Define the redundancy (2N, N+1, etc) philosophy and design to this.

- Further design and develop the concept shown for the DAQ room HVAC and cooling water systems. Consider the use of water-cooled racks (precedent at NSLS-II) if analysis shows a benefit to heat load and removal.
- Identify activities that can be shifted if the start of RHIC Run 22 is delayed. There is precedent for this, and it may represent an opportunity to continue or begin work in the IR.
- Review and update MoU's and MoAs, if needed; several are more than a year old, and the understanding of staffing needs and other departments' commitments may have changed.
- Develop a plan for infrastructure systems commissioning, i.e. startup and testing of cooling water and HVAC systems and controls and safety interlocks.
- Develop a detailed plan for beam pipe installation and bake out.

## **Appendices**

### **Appendix A – Review Committee**

#### **Management, Cost & Schedule**

Bill Wahl (BNL – Review Chair)

Kelly Krug (BNL)

#### **Infrastructure**

Angelika Drees (BNL)

Charlie Folz (BNL)

George Ganetis (BNL)

#### **Cryo**

Yuenian Huang (FNAL)

#### **Cryo/Magnet**

Brett Parker (BNL)

#### **ES&H**

Bob Lee (BNL)

## Appendix B – Charge to Committee

**Cost, Schedule, and Status Review  
of the 1008 Infrastructure and Facility Upgrade  
April 7 & 8, 2021  
Virtual Review  
Charge to the Review Committee**

The 1008 Infrastructure and Facility (I&F) Upgrade will be a major upgrade to the facilities that had previously hosted the PHENIX experiment and will eventually host the sPHENIX upgrade to the PHENIX experiment. The upgrade to the 1008 Building complex will allow any future experiment to be resident in a facility that provides modern support and services to large scientific instruments and detectors. While sPHENIX is using the 1008 Building complex, the experiment will enable the precision characterization of jets produced in nucleus+nucleus (AA), proton+nucleus (pA) and proton+proton (pp) collisions at the Relativistic Heavy Ion Collider (RHIC) located at Brookhaven National Laboratory prior to the construction of the Electron Ion Collider.

The Infrastructure and Facility Upgrade scope includes the upgrade of Building 1008 infrastructure and facilities, support services for the super conducting magnet, the magnet, flux return steel, and cryogenics plant, as well as the installation of scientific equipment into the 1008 complex and the initial commissioning of the experimental equipment. The Building 1008 Infrastructure and Facility Upgrade has a total cost estimate of \$33.4M including contingency.

The review will take place remotely and the committee is charged to assess the status of the Infrastructure and Facility Upgrade of building 1008 including scope, cost, schedule and risks. In carrying out its charge, the review panel is requested to answer the following questions:

1. Scope: Has the I&F Upgrade made sufficient progress to date against the proposed baseline plan?
2. Cost and Schedule: Are the cost and schedule estimates credible and reasonable considering the maturity of each component ? Has the impact of RHIC runs in FY21/FY22 been properly evaluated, including the impact on schedule and resources? Are the plans for an early finish, including available resources, credible?
3. Management: Is there a capable team in place and are the required resources identified to effectively manage risks, interfaces, and to successfully execute the proposed baseline?
4. Risks: Are the risks properly understood and mitigation plans developed? Does the I&F Upgrade include adequate scope, cost, and schedule contingency? Is the planned workforce likely to be available?
5. Interfaces: Are the interfaces and external dependencies properly understood?
6. Recommendations: Have the recommendations for the 1008 I&F Upgrade from past reviews been appropriately addressed?

7. COVID-19: Is the impact of COVID-19 on cost and schedule properly estimated?
8. ES&H: Is ES&H properly addressed given the I&F Upgrade current stage of development?

The review will take place virtually from Wednesday, April 7 to Thursday, April 8, 2021. A closeout will be presented to the sPHENIX team, and the Laboratory prior to adjourning, and a report should be submitted to my office by closeout of business on April 22, 2021.

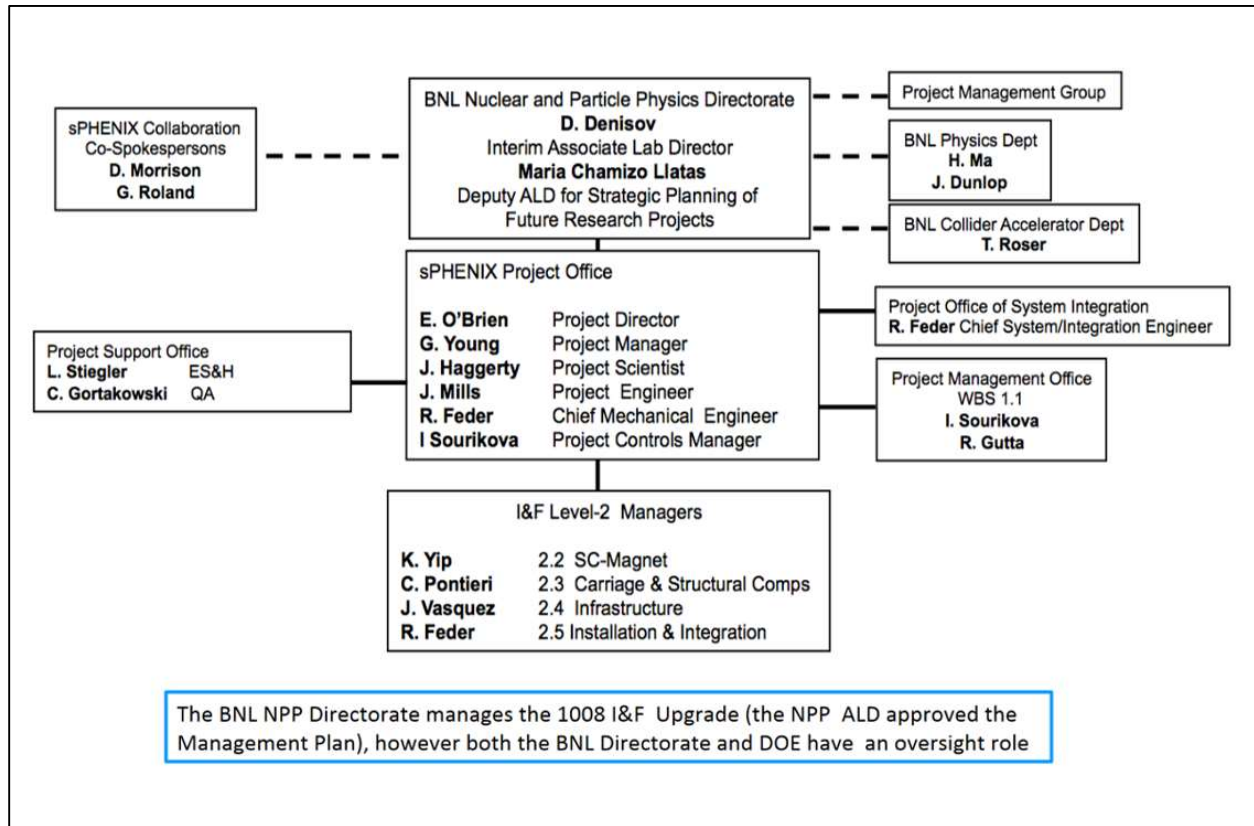
I very much appreciate your willingness to lend your time and expertise to this highly significant step in the sPHENIX review process and look forward to receiving your assessment.

Sincerely,



Maria Chamizo-Llatas  
Deputy Associate Laboratory Director for Strategic Planning of Future Research Programs  
Nuclear and Particle Physics Directorate  
Brookhaven National Laboratory

# Appendix C – I&F Org Chart



# Appendix D – Cost Performance Report

8. PERFORMANCE DATA												
CA (3)												
ITEM (1)	BUDGETED COST			ACTUAL COST WORK PERFORMED		VARIANCE		AT COMPLETION			SPI	CPI
	WORK SCHEDULED (7)	WORK PERFORMED (8)	WORK PERFORMED (9)	SCHEDULE (10)	COST (11)	BUDGETED (14)	ESTIMATED (15)	VARIANCE (16)				
2.01 Infrastructure/Facility Me	2,292,170	2,292,170	1,873,904	0	418,266	3,618,708	3,200,442	418,266			1.00	1.22
2.02 SC Magnet	3,224,852	2,648,265	2,274,381	-576,588	373,884	5,702,272	5,347,727	354,546			0.82	1.16
2.03 Carriage and Structural C	10,807,986	9,936,364	9,725,398	-871,622	210,966	12,421,829	12,241,844	179,986			0.92	1.02
2.04 Infrastructure	1,928,954	1,327,631	1,541,099	-601,322	-213,468	3,525,645	3,746,818	-221,172			0.69	0.86
2.05 Integration and Installati	1,102,619	841,938	610,954	-260,681	230,984	5,132,698	4,909,284	223,414			0.76	1.38
b. COST OF MONEY	0	0	0	0	0	0	0	0				
c. GENERAL AND ADMINISTRATIV	0	0	0	0	0	0	0	0				
d. UNDISTRIBUTED BUDGET												
e. SUBTOTAL	19,356,581	17,046,368	16,025,736	-2,310,213	1,020,632	30,401,153	29,446,114	955,039			0.88	1.06
f. Contingency							2,998,847					
g. TOTAL	19,356,581	17,046,368	16,025,736	-2,310,213	1,020,632	33,400,000						
9. RECONCILIATION TO CONTRACT BUDGET BASELINE												
a. VARIANCE ADJUSTMENT				0	0							
b. TOTAL CONTRACT VARIANCE				-2,310,213	1,020,632	33,400,000	0	33,400,000				
CLASSIFICATION (When Filled In)												
										\$13,420,378	ETC	
										\$13,354,785	BCWR	
										22.35 %	% Contingency on ETC	
										22.46 %	% Contingency on Remaining Work	
										63.67 %	% Planned	
										56.07 %	% Complete	
										52.71 %	% Spent	
										DOE SPI or CPI Value Thresholds		
										● 0.90 to 1.15		
										● 0.85 to 0.89 or 1.16 to 1.25		
										● <0.85 or >1.25		
										*Highlights in table above takes variance \$ into consideration, not just indices		

# Appendix E – EAC & Contingency Profile

