

Final Report

Surveillance Review Report

of the

Fermi Research Alliance, LLC

Earned Value Management System (EVMS)

December 10-11, 2014

Submitted by:
Robert Wunderlich, Surveillance Team Leader
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Fermi Research Alliance, LLC.
Earned Value Management Report (EVMS)
Surveillance Review Report
Executive Summary
December 10-11, 2014

Executive Summary

An independent Surveillance Review, chartered by the Fermilab Directorate, was conducted on the certified Fermi Research Alliance (FRA) LLC Earned Value Management System (EVMS) on December 10-11, 2014. The Surveillance Review was based on an examination of the previously certified FRA EVMS System Description and procedures, previous surveillance reviews, as well as the Fermilab EVMS application on the Mu2e Project and the Compact Muon Solenoid (CMS) Detector Upgrade Project. These two projects were selected based on their size and timing. The CMS Project, at a TPC of \$42.9M, was baselined (approved CD-2/3) in November 2014 while the Mu2e Project, at a TPC of \$271M, is scheduled to be baselined (CD-2/3b) in March 2015. The Surveillance Review included Fermilab projects that are required (or will soon be required) to fully implement the full FRA EVMS. The NOvA Project which was the basis for the August 2013 Fermilab EVMS Surveillance Review was successfully completed in 2014 (received a CD-4 approval), so any previously identified NOvA Project EVMS issues were considered only to the extent that they were overall Fermilab EVMS systems issues or if they applied directly to the CMS or Mu2e Projects.

The two day December 2014 EVMS Surveillance Review took place at the Fermilab site in Batavia, Illinois. An exit briefing was held with Fermilab Management on December 11, 2014 to provide the Surveillance Review Team's preliminary conclusions. Due to the holidays, an additional four weeks, after the December 10-11, 2014 on-site Surveillance Review, was taken by the Surveillance Review Team to continue to examine submitted documents and to complete the final report. The Surveillance Review determined that the FRA EVMS continues to meet the ANSI/EIA-748 standard, however, with regard to implementation; the Surveillance Review Team identified two corrective action requests (CARs) and nine continuous improvement opportunities (CIOs). In addition, the Surveillance Review Team identified noteworthy practices.

The EVMS Surveillance Team examined the identified CARs and CIOs to determine if there were relationships among these issues that could be broadly characterized as a "root and/or contributing cause" that, if corrected, should minimize the re-occurrence of the identified CARs and CIOs as well as limit the identification of new CARs and CIOs. For the December 2014 Surveillance Review, the Review Team identified a single root and contributing cause. The Fermilab EVMS Corrective Action Plan should address this root and contributing cause:

- There is a continuing need to develop standardized Fermilab EVMS processes and procedures (that allow tailoring) to ensure that consistent direction/guidance is provided to all of the project staffs, regardless of the project.

Section 8 of this report discusses the root and contributing causes in more detail.

For the December 2014 review, the Surveillance Review Team identified the following CARs and CIOs:

CARs (with appropriate Guidelines identified)

- **CAR-01 Traceability** -The information provided to the reviewers lacked key elements to allow for a cradle-to-grave traceability to confirm that Baseline Change Requests were implemented in accordance with the EVMS System Description. (GL-28-29-31)
- **CAR-02 Properly identify and track MR, UB and contingency** - Tracking for MR, UB, and contingency for CMS Project not in compliance with EVMS Change Control Procedure (GL-14-15)

CIOs (with appropriate Guidelines identified)

With an asterisk:

- CIO-01* Continue to improve the variance analyses to remove quality variability. (GL-23)
- CIO-02* Continue to examine the use of LOE tasks to ensure that they are being appropriately used. (GL-12)
- CIO-03* Continue to refine the calculation of Estimate at Completion (EAC) to be standardized across the projects and better reflect CAM/PM assessments. (GL-27)
- CIO-04* The Corrective Action Logs, that reflect corrective actions identified during the variance analysis process, require standardization of the methodology so they can be tracked to completion by the PMs/CAMs and provide a single source of issues for Fermilab Management. (criteria, process, and timely updates) (GL-26)
- CIO-05* Recommend options for PARS II reporting to the FPD and obtain FPD approval or further direction. (GL-25)
- CIO-06* Review and validate the accuracy of the schedule logic. Perform schedule clean-up (including integrity checks) on a regular basis. CAMs should be trained to better understand how their sub-projects roll up into the master project schedule and which high level project milestones they impact. (GL-6)
- CIO-07* Continue CAM training to include accruals and information on Lab indirect expense. (GL-4, GL-16, GL-19)
- CIO-08* Continue to ensure that there are no retroactive changes to the BCRs. (GL-30)

Without an asterisk:

- CIO-01 The number of cost and schedule reports supporting the BCRs varied across the projects. A Fermilab Change Control Process/Procedure should be standardized for consistent implementation across the projects. (GL-9, GL-32)

**Surveillance Review Report of the
Fermi Research Alliance, LLC
Earned Value Management System (EVMS)
December 10-11, 2014**

1.0 FRA Surveillance Review Objective

According to DOE Guide 413.3-10A, an EVMS is an integrated set of policies, procedures, and practices necessary to provide reliable and accurate project and program information to support project management as a decision making tool and a critical component of risk management. DOE Guide 413.3-10a defines a surveillance review as:

A review conducted to demonstrate continued compliance of a certified system to the ANSI/EIA-748-B, or as required by the contract, and in accordance with FAR clause 52.234-4, *EVMS*, to ensure company processes are being followed, verify the EVM data is useful, timely, and effective, and assess whether the data is used to make informed decisions. A surveillance is not intended to assess the health of the program/projects examined during the review.

The Guide states that the surveillance is to be conducted in a manner that answers the following questions:

- 1) Does the system comply with ANSI/EIA-748-B?
- 2) Is the system being used to manage the project?
- 3) Is the data accurate, timely, and reliable?
- 4) Does the data represent the entire scope?

The objective of the December 10-11, 2014 independent Surveillance Review is to ensure that the FRA EVMS continues to meet the ANSI/EIA-748 Standard and that implementation of the FRA EVMS system remains effective.

2.0 Prior FRA EVMS Certification and Reviews

In January 2010, the FRA EVMS was certified by DOE-HQ OECM. This means that the FRA EVMS:

- 1) meets the requirements and intent of the ANSI/EIA-748 Standard.
- 2) as described, is fully implemented on the selected projects.
- 3) provides timely, accurate, and auditable management information for both the organization's project management and the customer.

Since the January 2010 certification, three additional internal FRA EVMS surveillance reviews were conducted. One was conducted in March 2011. The second review was conducted in

March 2012 while the third review was conducted in August 2013. The August 2013 review focused on the NOvA Project and identified six CARs and five CIOs.

3.0 Independent EVMS Surveillance Review Team Members

- Bob Wunderlich, (Team Leader) Consultant (DOE Retired)
- Jenn O'Connor, (Deputy Team Leader) BNL, Project Management Specialist
- Betsy O'Connor, ANL, Financial Project Manager
- Kelly Krug, JLAB Project Management Office Manager
- Rick Larson, LBNL, Project Controls Analyst
- Katie Martin, ANL, Project Controls Scheduler
- Sherese Humphrey, ANL, Project Controls Analyst
- Bob O'Sullivan, FNAL, LBNE Project Controls Manager

Surveillance Review Team members consisted of participants from other Office of Science National Laboratories, a retired DOE Manager, and one participant from a separate Project at Fermilab that was not being reviewed. The objective was to include knowledgeable participants while ensuring the independence of the surveillance process. Observers were permitted to attend all of the sessions.

4.0 EVMS Surveillance Review Plan

A formal FRA EVMS Surveillance Review Plan was prepared prior to the start of the surveillance review, based on input from the Fermilab EVMS Surveillance Review Team Leader. The surveillance plan includes a clear definition of the scope of surveillance, the participants' responsibilities, methods for conducting the surveillance, and the Surveillance Review schedule. The Surveillance Review Plan was based on the FRA EVMS Surveillance and Maintenance procedure (12-PM-008) which establishes the methodology for the FRA EVMS surveillances. This procedure summarizes the approach to be used to complete the annual surveillance of the certified FRA EVMS. The DOE Fermi Site Office was notified of the planned Surveillance Review and participated in the review as observers. Responsibility for conducting the FRA EVMS surveillance program lies with the Fermilab Office of Project Support Services (OPSS) which is an organization separate from the CMS and Mu2e Project Managers' line management.

A Fermilab EVMS surveillance website was made available prior to the review to provide access to the review materials. This website was populated with the FRA EVMS policy and procedures, as well as CMS and Mu2e Project specific data and prior certification and surveillance reports.

5.0 EVMS Surveillance Review Scope

The December 10-11, 2014 FRA EVMS Surveillance Review evaluated the formal, previously certified FRA EVMS system, its processes, and its outputs. The Surveillance Review Team also examined the results of the previous surveillance conducted on August 19-20, 2013. The December 2014 FRA EVMS Surveillance Review departed from a clinical analysis of the FRA EVMS for those projects that were beyond CD-2. This expanded set of topics was intended to provide Fermilab Management with constructive information with respect to their EVMS that

could assist in the effective management (planning and/or implementing) of their projects. This expanded set of topics included the following elements:

- 1) While the Mu2e Project has not yet been formally baselined, it was included in the Surveillance Review. The intent was to identify issues that Fermilab would have the opportunity to correct prior to baselining, as well as to provide information to the Acquisition Executive as input for the CD-2 approval process.
- 2) The EVMS Surveillance Team examined the list of identified CARs and CIOs to determine if there were relationships among these issues that could be characterized as a “root and/or contributing cause” that, if corrected, should minimize the re-occurrence of the identified CARs and CIOs as well as limit the identification of new CARs and CIOs.
- 3) The EVMS Surveillance Team examined the progress against the “root and contributing causes” identified during the August 2013 Surveillance Review to determine what progress was made to resolve these issues and if additional action is needed.
- 4) The EVMS Surveillance Team examined Fermilab plans for their existing EVMS (e.g. system description changes, procedural changes, implementation changes). This provides a perspective concerning what Fermilab believes was not working or not working as effectively as it could/should.

The purpose of including this information in the Surveillance Review was to assess if the FRA EVMS is operating effectively (achieving its intended purpose) and, just as important to the Surveillance Team, if the EVMS would be effective in the future.

An objective of the Surveillance Review Team Leader was to ensure that the review focused on the effective operation of the FRA EVMS while at the same time, did not result in a project review. Further, the Surveillance Review Team Leader considered that Fermilab may not be in violation of a particular EVMS guideline but the combined implementation of several guidelines may result in a deficiency that needs to be corrected. To the extent that these issues directly impact the effective implementation of the FRA EVMS, they were included in the report. In addition, during the review, it was noted that some of the CARs and CIOs may impact more than one guideline.

6.0 Surveillance Review Observations

Five formal presentations were given by Fermilab to the Surveillance Team to provide a perspective on the Fermilab mission and management structure; the overall Fermilab EVMS Program; background information on the Mu2e Project and the CMS Project as well as the implementation of the Fermilab EVMS on the CMS and Mu2e Projects.

Processes (System Description and Procedures)

- 1) Fermilab presented a description of their EVMS System including details of the individual elements (processes, procedures, tools). A website was made available for the review to provide accessibility to the required EVMS documentation.
- 2) Fermilab is using the P6/Deltek Cobra project controls system which is common throughout the DOE Office of Science Laboratories.

- 3) Fermilab presented a table that cross-walked the FRA EVMS System/Processes to the ANSI/EIA-748B Standard confirming continued compliance.
- 4) Fermilab presented the approved updates to the FRA EVMS System Description and Procedures since the last surveillance review. These changes clarify and/or respond to previous CARs and CIOs and do not represent “significant changes” to their EVMS System Description.
- 5) Fermilab provided a corrective action plan, based on the results of the August 2013 review and explained actions taken to resolve the CARs, CIOs, and the root and/or contributing causes.
- 6) Fermilab uses a Project Execution Plan and a Project Management Plan for each of its projects to provide additional details on how the project is to be managed.

Implementation (CMS Project)

- 1) The CMS Project was baselined in November 2014 (CD-2/3 approved). The CMS is a detector upgrade project where the detector will be installed in the LHC Facility near Geneva, Switzerland. Fermilab built the original CMS detector. Funding for the CMS is provided by both DOE and the NSF. This resulted in a need to track and account for funds from two separate sources.
- 2) The CMS Project Manager provided a presentation on the Fermilab EVMS implementation by the CMS Project.
- 3) Fermilab implementation of the FRA EVMS to the CMS Project included performance data collection and analysis for the three months prior to baselining (August, September, and October 2014).
- 4) Two Control Account Managers (CAMs) were selected by the Surveillance Team for interviews. Both CAMs were very knowledgeable about the EVMS System and how it was being implemented by them on the CMS Project. The CAMs explained the excellent support that they were receiving from the Project Controls staff.

Implementation (Mu2e Project)

- 1) The Mu2e Project is scheduled to be baselined in March 2015. This project allows an experimental program at Fermilab to proceed. While a March 2015 baseline approval would not make this project eligible for the Surveillance Review, any issues identified by this Surveillance Review can be corrected early, generating additional confidence in the project. In addition, the input from the Surveillance Review will be available to the Acquisition Executive as part of the CD review and approval process.
- 2) The Mu2e Project Manager provided a presentation on the Fermilab EVMS implementation by the Mu2e Project. There were differences between the Mu2e and CMS in how they apply the FRA EVMS.
- 3) While all elements of the Mu2e EVMS implementation were examined, less performance data was available and it was based on an internal (preliminary) baseline.
- 4) Three Control Account Managers (CAMs) were selected by the Surveillance Team for interviews. All three CAMs were very knowledgeable about the EVMS System and how it was being implemented by them on the Mu2e Project. They also mentioned the excellent support that they were receiving from the Project Controls group.

Implementation for Other Fermilab Projects

- 1) Fermilab took advantage of this Surveillance Review to increase integration among the Fermilab Project Managers concerning their EVMS implementation. The Project Manager for the Muon g-2 Project (scheduled for a CD-2 approval in the summer of 2015) attended the Surveillance Review as an observer. Discussions with Fermilab Management during the review specified that a tailored form of the Fermilab EVMS was being used even on the smaller infrastructure projects that were not subject to the ANSI/EIA-748B Standard. Many of these smaller projects, such as utility upgrades, have important interfaces with the larger projects. A member of the Fermilab Long Baseline Neutrino Experiment (LBNE) Project Controls Group was a member of the Surveillance Review Team. There is no formal schedule for the baselining of the LBNE Project.
- 2) Fermilab explained that the EVMS monthly performance results for all projects are included in their formal Project Oversight Group (POG) which meets monthly. The POG consists of senior Fermilab Management including the Fermilab Director. Performance is discussed, and where appropriate, actions are assigned and later statused at the POG.

7.0 EVMS Surveillance Review Conclusions

The Surveillance Team reached some general conclusions concerning the FRA EVMS implementation:

- The FRA EVMS continues to meet the requirements and intent of ANSI/EIA-748 Standard.
- There is a Lab-wide emphasis on project performance, in general, and EVMS in particular.
- Since the August 2013 Surveillance Review, Fermilab appointed a Chief Project Officer and an Office of Project Support Services (OPSS) Manager. The Project Controls Group hired an experienced manager and several additional project controls staff were hired.
- There are noticeable improvements in the implementation of the FRA EVMS since the August 2013 surveillance review. Both the CMS and Mu2e Projects are using the FRA EVMS to manage their respective projects. The FRA EVMS is integrated into the Project Management structure and not an appendage.
- Additional EVMS training was conducted. This included tailored (to the FRA EVMS) training. In addition, the training focused on individual topics, which reflects feedback from the Project staff.
- The CAMs interviewed during the surveillance were knowledgeable and engaged. Ownership is clear.
- During the surveillance, the Surveillance Team members identified several positive actions taken by Fermilab with identifiable results to correct EVMS issues. However, these actions are continuing. The CIO* category was used to give Fermilab credit for successful actions taken to resolve these EVMS issues. To ensure that these actions fully resolve identified issues, they were placed in the CIO* category and the CIO* description uses the word “continue” in the title.

- Having said the above, the FRA EVMS continues to mature but some elements still need further refinement. These refinements are discussed further as part of the Continuous Improvement Opportunities as well as the root and contributing causes sections of this report.

A summary of the CARs, CIO*s and CIOs are listed below with detailed supporting documentation included in the appendix of this report. Some of the CARs/CIO*s/CIOs may affect more than one guideline. If this is the case, the CAR/CIO*/CIO will appear in more than one guideline and will address the specific violation/corrective action for that particular Guideline. A cross reference of affected Guidelines is also listed.

7.1 CARs (with appropriate Guidelines (GL) identified)

A Corrective Action is defined as: 1) non-compliance with the accepted EVMS description or procedures and 2) non-compliance with the ANSI/EIA 748B EVMS guidelines. Failure to resolve Corrective Actions reduces confidence in the ability of project management to effectively use the EVMS process to achieve project goals and objectives of the stakeholders.

While there are no CARs that directly impact the certification of the FRA EVMS SD or procedures, there were two CARs which indicates that the FRA EVMS is not fully implemented on the CMS and/or Mu2e Projects and therefore do not always provide timely, accurate, and auditable management information for the organization’s project management and the customer. Corrective Action Plan is required for each finding.

- CAR-01 Traceability -The information provided to the reviewers lacked key elements to allow for a cradle-to-grave traceability to confirm that Baseline Change Requests were implemented in accordance with the EVMS System Description. (GL-28-29-31)
- CAR-02 Properly identify and track MR, UB and contingency - Tracking for MR, UB, and contingency for CMS Project is not in compliance with EVMS Change Control Procedure (GL-14-15)

7.2 CIOs (with appropriate Guidelines (GL) identified)

Continuous Improvement Opportunities are defined as recommendations to EVMS implementation. This includes enhancements such as sharing of successful practices, tools, or other items that come to their attention. Continuous Improvements are not the same as Corrective Actions and, therefore, need not be tracked for closure. However, should a recommendation have an asterisk (*), the team members have elected that this practice is critical enough to require tracking to closure.

With an asterisk:

- CIO-01* Continue to improve the variance analyses to remove quality variability. (GL-23)
- CIO-02* Continue to examine the use of LOE tasks to ensure that they are being appropriately used. (GL-12)

- CIO-03* Continue to refine the calculation of Estimate at Completion (EAC) to be standardized across the projects and better reflect CAM/PM assessments. (GL-27)
- CIO-04* The Corrective Action Logs, that reflect variance analyses, need to be standardized so they can be tracked by the PMs and provide a single source of issues for Fermilab Management. (criteria, process, and timely updates) (GL-26)
- CIO-05* Recommend options for PARS II reporting to the FPD and obtain FPD approval or further direction. (GL-25)
- CIO-06* Review and validate the accuracy of the schedule logic. Perform schedule clean-up (including integrity checks) on a regular basis. CAMs should be trained to better understand how their sub-projects roll up into the master project schedule and which high level project milestones they impact. (GL-6)
- CIO-07* Continue CAM training to include accruals and information on Lab indirect expense. (GL-4, GL-16, GL-19)
- CIO-08* Continue to ensure that there are no retroactive changes to the BCRs. (GL-30)

Without an asterisk:

- CIO-01 The number of cost and schedule reports supporting the BCRs varied across the projects. A Fermilab Change Control Process/Procedure should be standardized for consistent implementation across the projects. (GL-9, GL-32)

CIOs 01*, 02*, 03*, 07*, and 08* all involve Fermilab efforts that are underway to make continuing improvements in the implementation of the FRA EVMS. These needed improvements were recognized by Fermilab management and solutions are being implemented. Because of the considerable reliance on a matrixed management structure, there is a continuing need to ensure that there is a consistent application among the individual projects. The listing of these continuous improvement opportunities, with an asterisk, is to ensure that these efforts are tracked to their conclusion.

7.3 Noteworthy Practices

- Fermilab Laboratory Management engagement in projects (POG and PMG) continues as a very positive activity. These two organizations, which involve different levels of management, meet monthly to review project progress and issues. The POG involves senior management at Fermilab including the Laboratory Director. As Fermilab Project Management is heavily matrixed, these two organizations assist in ensuring that informed and timely management decisions can be made on Fermilab Projects. Fermilab is encouraged to keep this level of senior management engaged.
- Fermilab continues to develop Desktop Instructions to provide clarification and, where necessary additional guidance for CAMs.
- The EVMS training program has been helpful for CAMs in providing a foundation of knowledge. All interviewed CAMS recognized that applying their training (learning while doing) was just as important (or even more important) than the classroom training.
- The Project Teams demonstrated a thorough understanding of the Change Control Process, including the process flow and controlled documents.

8.0 Analysis of Surveillance Results

8.1 EVMS Process and Procedures

As there were no significant changes to the previously certified FRA EVMS, the Surveillance Review Team review did not uncover any new issues with the System Description. Fermilab had made some changes to the EVMS procedures but these changes were used to clarify statements or respond to issues from the previous EVMS Surveillances.

8.2 EVMS Root and Contributing Causes - Implementation

8.2.1 Previous Root and Contributing Causes

The Previous (August 2013) Root and Contributing Causes, as well as an assessment of how effective the corrective actions were, are described below:

#	Root or Contributing Cause	Action Taken	Future Actions
1	At least four of the six corrective actions involve the need for Fermilab management to establish clear expectations for the CAMs, providing the necessary training, and developing a process which regularly evaluates the CAM performance to ensure that project-wide implementation is occurring.	Based on the Surveillance Review, the R2A2s for CAMs are clear and understood by the CAMs. The EVMS training program has been enhanced and better focused on CAM needs. CAMs were knowledgeable and engaged. Ownership was evident.	Continue to standardize, refine, and update EVMS processes and procedures. Continue to prepare and update Desktop Instructions to enhance day-to-day task performance. Continue to conduct training on special topics (some specific topics are mentioned in the surveillance report).
2	Several corrective actions were previously identified in prior surveillances. Fermilab management needs to ensure that formal close-out of corrective actions will provide for the effective implementation of the FRA EVMS as well as ensure that the results are sustainable.	With some exceptions, repeat findings did not occur. Where they did occur (e.g. quality of variance analyses) there were efforts underway to resolve them but those efforts are not complete. These continuing actions appear as CIOs*. As reported, tracking and determining successful completion of corrective actions is the responsibility of OPSS and the Chief Project Officer.	Subsequent surveillance reviews will need to ensure that results are sustainable.
3	While the completion of the NOvA Project relies on the collection,	Early implementation is ongoing and Fermilab has taken steps to	Consider a procedure or some other document

	analysis, and reporting of the detailed detector manufacturing data, the early implementation of EVMS on the developing projects will have the more significant impact on the overall effectiveness of the FRA EVMS. The FRA EVMS Corrective Action Plan should address how the FRA EVMS will be implemented for new and developing projects.	ensure that new projects implement EVMS using a phased approach. The Surveillance Review participants are an expression of this early engagement. The inclusion of the Mu2e Project (not yet baselined) in the surveillance review is an excellent example of how Fermilab is phasing in the EVMS.	(possibly lessons learned) that describes how the EVMS processes can be phased into the project development in an effective and efficient manner.
4	As Fermilab moves to implement its mission through a large number of projects, the R2A2s for the Office of Project Support Services should be evaluated and then a gap analysis performed to compare with the size and make-up of this organization to ensure that the required project management functions, both line and support, can be effectively performed.	A knowledgeable consultant was hired to examine OPSS and provide recommendations. The report appears to be very detailed and complete. An OPSS Manager was selected, new staff were hired, and the organizational effectiveness is growing. CAMs remarked about the helpfulness of the OPSS Project Controls staff.	Continue to implement the plan for the OPSS Office.

8.2.2 New Root and Contributing Causes

Examining the issues identified during the December 2014 EVMS Surveillance Review, the Surveillance Review Team believes that there is one issue that involves several of the CARs and CIOs and, if resolved, would be an important contributor to ensure that Fermilab is implementing a fully effective EVMS. This root issue is:

- There is a continuing need to develop standardized Fermilab EVMS processes and procedures (that allow tailoring) to ensure that direction/guidance is provided to the project staffs, regardless of the projects.

Because of the heavy reliance on the matrixed organization at Fermilab, standardized EVMS processes and procedures are needed to ensure the effective use of the matrixed staff in contributing to the Project mission. A common set of processes and procedures and/or desktop instructions would provide a logical and consistent set of guidance/direction for the matrixed staff and would assist in reporting information to Fermilab management. Training to these Fermilab processes and procedures would also be needed. A common Fermilab-wide set of processes and procedures would also simplify training and allow a more efficient exchange of Fermilab staff, including the Project Controls staff. The eCAM Notebook, being developed by Fermilab, would represent a collection of the individual project data from the standard processes into a single source for the CAMs and would be helpful to the CAMs.

A proposed action (gap analysis) that could give the desired result is:

- 1) Determine where EVMS procedures (or processes or desktop instructions) are needed.
- 2) Determine which of the existing procedures (or processes or desktop instructions) are in place
- 3) Accept those that perform their function, as required
- 4) Develop a prioritized list of those procedures (or processes or desktop instructions) that are needed but do not exist or do not adequately perform their function
- 5) Work with the Project Managers to determine greatest need/value for those procedures that do not exist or need to be updated
- 6) Based on the priority of need, develop a schedule for developing/revising the procedures (processes or desktop instructions)
- 7) Identify lead people for developing/revising the procedures (or processes or desktop instructions)
- 8) Report progress against the plan.

While tailoring should be permitted and may be necessary, a procedure may be needed to determine how tailoring is approved. Other approaches may also provide an acceptable solution.

9.0 Further Discussion of FRA EVMS Issues

The Surveillance Review Team, based on progress made since the previous Surveillance Review and interviews with Fermilab management and project staff, believes that Fermilab is capable of resolving the FRA EVMS issues that were identified during this Surveillance Review in a timely manner. The two reviewed projects can implement an FRA EVMS that provides useful and accurate information that can be used to identify issues and provide the basis for management decisions.

10.0 Discussion of Special Topics or Other Related Issues

During the surveillance review two topics were raised and discussed that were not resolved during the review but they could have an impact on the effectiveness of the Fermilab EVMS. These topics could be included as surveillance review topics in the next EVMS surveillance review.

10.1 Use of Artificial Constraints in Scheduling

During the Surveillance Review the use of artificial constraints in the baseline schedule development received considerable discussion. It is understood that there are different methods to build a schedule where the intended plan (very aggressive schedule) can be included in the baseline while at the same time planning for an attainable BCWS profile. There does not seem to be an optimal solution to this issue concerning the use of artificial constraints. The practice of including artificial constraints in the Baseline schedule to slow-down the BCWS profile and then removing the constraints in the working schedule, results from a lessons learned from the NOvA Project, where significant variances occurred even though the project critical path remained on schedule. The practice of removing the artificial constraints after baselining may disconnect the current plan and the baseline plan. Removal of the constraints may also be subject to Baseline

Change Control. OPSS discussed the preferred practice with other labs. The Surveillance Review Team believes that this needs to be discussed at a higher level. The DOE Project of Office Assessment should examine this to determine best practices and/or acceptable practices.

10.2 Fermilab Project Management Reporting Structure

Fermilab made a number of significant changes in their organization/management structure over the past year or so to reflect the change to a project management emphasis/culture. The present organization includes both line and matrixed organizations. The establishment of the Chief Project Officer within the Directorate is a new senior level position. Projects report up through the matrixed managers to the Directorate. Based on discussions with the Fermilab project participants, the working relationships are still evolving. To obtain a sense of the issues, discussions were held with the respective participants. The DOE FPD and HQ Program Office, the Fermilab CMS and Mu2e Project Managers, the Chief Project Officer and OPSS Manager are all supportive of the organizational changes. As expected, the Fermilab Project Managers have strong personalities and understand the Fermilab culture. The Project CAMs know and understand their respective reporting relationships. While a bit unusual, there is no inherent reason for the Review Team to recommend changes to the Fermilab organizational structure for managing their projects.

Two issues that need to be considered as the working relationships continue to evolve is that the Chief Project Officer's authorities (he does not have supervisor authority over the project managers) are not consistent with his responsibilities (he is responsible for all the projects to succeed). In addition, specific line/matrixed managers, who the project managers report to, also have matrixed management responsibilities which may put them in a position to have undue influence on the project managers' abilities to obtain the type and number of resources needed to complete the projects. This latter issue could go either way (helping or hurting an individual project). The Surveillance Team Leader proposes that a possible resolution to these issues is through the performance appraisal system. Ensure that those responsible line/matrixed managers' performance appraisals include specific language with respect to the projects' performance for those projects that report through them. In addition, ensure that there is a formal mechanism in place where the Chief Project Officer has direct input into the performance appraisals for the Fermilab Project Managers. Other approaches may also provide an acceptable solution.

Appendix: Guideline Reviews

1.0 Individual Guideline Review, Analysis, and Comments

This section covers the review and analysis of the five major EVMS categories: 1) Organization; 2) Planning, Scheduling, and Budgeting; 3) Accounting Considerations; 4) Analysis and Management Reports; and 5) Revisions and Data Maintenance

2.0 ORGANIZATION

2.1 Guideline 1: Define the authorized work elements for the program. A work breakdown structure (WBS), tailored for effective internal management control, is commonly used in this process.

Reviewer Name(s): Bob Wunderlich
Compliant with ANSI/EAI-748: Yes

Observations and Findings:

From the FRA EVM System Description: “All projects operating under EVMS are required to develop a WBS Dictionary. The WBS Dictionary is a set of specific definitions that describe how work is carried out to develop, design, construct, equip, and manage the project. It defines each element to at least the control account (CA) level in terms of the content of the work to be performed.”

The CMS and Mu2e projects use a hierarchical Work Breakdown Structure (WBS) with an associated WBS Dictionary to define the complete project work scope. Control accounts are established at appropriate levels in the WBS with sub-element work/planning packages. The WBS is used throughout the project for organizing project documents such as the Responsibility Assignment Matrix, Work Authorization Document, and project schedule. Changes to the WBS are controlled via an established Change Control process.

A data trace conducted on several control accounts showed that the WBS was consistent across the WBS Dictionary/Responsibility Assignment Matrix/Work Authorization Document/Control Account Plan.

One area that would assist in ensuring the traceability of data is the inclusion of the specific impacted WBSs directly on the CMS contingency logs.

2.2 Guideline 2: Identify the program organizational structure including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.

Reviewer Name(s): Bob Wunderlich
Compliant with ANSI/EAI-748: Yes

Observations and Findings:

From the FRA EVM System Description: “The Organizational Breakdown Structure (OBS) is a project organization framework for identification of accountability, responsibility, management, and approvals of all authorized work scope. It is a direct representation and description of the hierarchy and organizations that will provide resources to plan and perform work identified in the WBS.”

The CMS and Mu2e Projects have an Organizational Breakdown Structure (OBS) that shows the assignment of responsibility for each segment of the project. Other institutions have been integrated into the appropriate organizational framework. Control Account Managers have been identified for all segments of the project and they understand their role within the project structure.

Both the CMS and Mu2e Projects have procurement plans. The management of the selected subcontractors was discussed during the Surveillance Review. Fermilab will be intimately engaged, even for fixed price contracts, to obtain data and ensure that the subcontractors meet project quality, cost, and milestones targets.

The CMS Project is funded by both DOE and the NSF. A formal agreement is in place that describes the responsibilities for the two funding agencies.

There is a formal Fermilab line management organizational structure that includes specific project reporting. The Fermilab structure also includes a POG and PMG organization that reviews and uses the monthly project performance data for decision-making. A recommendation is included in the Surveillance Report concerning the linkage between specific responsibilities, authorities, and performance appraisals but this recommendation does not impact the functioning of the EVMS.

2.3 Guideline 3: Provide for the integration of the company’s planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.

Reviewer Name(s): Bob Wunderlich

Compliant with ANSI/EAI-748: **Yes**

Observations and Findings:

From the FRA EVM System Description: “A control account is a natural management point for planning and control since it represents the work assigned to one responsible organizational element for one WBS element, which is the point at which the WBS and OBS intersect. The control accounts are determined by the scope of the management tasks. A single CAM is assigned to one or more of these control accounts and is responsible for the planning and control within their control account(s) and the identification, analysis, and reporting of significant variances that may occur during project execution.”

Using the WBS framework, the Mu2E and CMS Projects have appropriately integrated the organizational elements of planning, scheduling, budgeting, work authorization and cost accumulation. The control accounts have been formed by connecting a WBS element with its associated work scope with an identified responsible organization/control account manager. The project Responsibility Assignment Matrix exhibits all project control accounts with their associated budget. CAMs execute their assigned portion of the project by an approved Work Authorization Document. Schedule and cost performance is measured and managed at the control account level. Interviewed Control Account Managers were knowledgeable of the EVMS requirements and have a clear understanding of their responsibilities and authorities with regard to their assigned WBSs.

2.4 Guideline 4: Identify the company organization or function responsible for controlling overhead (indirect costs).

Reviewer Name(s): Betsy O’Connor

Compliant with ANSI/EAI-748: **Yes but with CIO*07**

CIO-07*

Subject (Issue): Laboratory Overhead

Reference Guideline 4

Observations and Findings:

From the FRA EVM System Description (4.2.1): “Fermilab maintains a cost accounting system that allocates indirect costs to projects and tasks. Indirect costs are collected in discrete cost pools and distributed to the individual project beneficiaries via published rates that are formally reviewed and approved by the CFO. The CAS Disclosure Statement identifies all indirect cost pools with a discrete and specific set of cost objectives or beneficiaries. “

Fermilab’s Chief Financial Officer is responsible for identifying and controlling overhead. Fermilab has a current Cost Accounting Standards Disclosure Statement approved by the DOE Fermi Site Office. The CFO maintains a document, “Indirect Cost Allocation Policy and Methodology”, that explains how the indirect pools and corresponding bases are determined and how the rates are applied. The document was last updated in March 2014.

Typically, the Lab indirect rates require an adjustment (to actual) at year end and new indirect rates are established at the beginning of the fiscal year, which may require an adjustment to the

baseline. Though some Control Account Managers were aware of the adjustments, others were not and could not explain how or why adjustments to indirect rates affect their projects.

Recommendation: Enhance the CAM training to include information on the indirect budget and rates and the impact on the projects.

2.5 Guideline 5: Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures as needed.

Reviewer Name(s): Bob Wunderlich

Compliant with ANSI/EAI-748: **Yes**

Observations and Findings:

From the FRA EVM System Description: “A control account is a management control point at which budgets (resource plans) and actual costs are accumulated and compared to an objective measurement of work performed for management control purposes. The control account is the minimum level in the WBS structure where project cost and schedule performance is compared.”

The Mu2e and CMS Projects have established control accounts at the appropriate WBS level for acceptable cost and schedule performance measurement and management control. Chargeable Task Codes have been established at certain sub-control account levels to provide greater detail to cost performance. Work/planning packages have been generated under the control accounts/chargeable task codes. Control accounts are only opened after a Work Authorization Document has been approved. The Mu2e and CMS Responsibility Assignment Matrix identifies all project control accounts cross-matched with the project Organizational Breakout Structure in a dollarized format.

3.0 PLANNING, SCHEDULING, AND BUDGETING

3.1 Guideline 6: Schedule the authorized work in a manner which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.

Reviewer Name(s): Jennifer O’Connor and Katie Martin

Compliant with ANSI/EAI-748: **Yes but with CIO-06***

Observations and Findings:

The CAMs interviewed for the CMS and Mu2e Projects were very knowledgeable. They appear to be very engaged in the schedule development process and status update process. The CMS and Mu2e Projects both had comprehensive resource loaded schedules which used a Work Breakdown Structure framework. The sequencing of work was identified in the schedule with logic ties and a critical path can be generated. However, both projects have some areas with very high float numbers shown below. Both projects utilize several sub-projects which roll up into a master project schedule. The CAMs were not always able to articulate whether they impacted the total project critical path, or high level project milestones. The Mu2e Project had several activities with open ends and constraints. The majority of these were on milestones but data traces also identified task dependent activities with missing logic. The Mu2e Project Scheduler was very informative, describing the process used to link and integrate all the sub-projects each month. The Project Scheduler utilizes a detailed critical path analysis which is manually performed to ensure the proper drivers exist for critical activities.

CIO-06*

Subject (Issue): Schedule Integrity

Referenced Guideline(s): Guideline 6

Referenced Data Trace: Several CMS and Mu2e activities – see below.

Mu2E High Float:

Activity Type	Activity ID	Activity Name	Budgeted Total Cost	Start	Finish	Original Duration	Total Float	Costs Pmt Code
Project Management - 12/2/14 Baseline after BCR010			\$0.00	03-Sep-13A	02-Jul-15	479	1929	
Project Office Preliminary & Final Design Phase to CD-2/3			\$0.00	03-Sep-13A	02-Jul-15	479	1929	
DOE CD-2/3b and other Reviews			\$0.00	03-Sep-13A	02-Jul-15	479	1929	
Finish Milestone	47501.3.2.001198	T2 - DOE CD-2/3b Approval	\$0.00		02-Jul-15*	0	1921	B
Finish Milestone	47501.3.2.001197	T3 - DOE CD-2/3b Approval	\$0.00		02-Apr-15*	0	1886	B
Finish Milestone	47501.3.2.001196	T4 - DOE CD-2/3b Approval	\$0.00		02-Mar-15*	0	2009	B
Task Dependent	47501.3.2.001018	Draft Project Management Technical Design Report Chapter	\$0.00	03-Sep-13A	29-Mar-14	186	2224	
Accelerator - 12/2/14 Baseline after BCR010			\$10,000.00	01-May-14	03-May-16	524	1143	
Instrumentation and Controls			\$10,000.00	01-May-14	03-May-16	524	1143	
Mu2e Accelerator Controls			\$10,000.00	01-May-14	03-May-16	524	1143	
Transport Controls and Delivery Ring Controls			\$10,000.00	01-May-14	03-May-16	524	1143	
Task Dependent	47502.03.01.1.00	About Link Implementation	\$0.00	09-Mar-16	03-May-16	40	1143	C
Task Dependent	47502.03.01.1.00	Purchase Network & Communication Hardware Implementation	\$5,000.00	08-Mar-16	08-Mar-16	1	1094	C
Task Dependent	47502.03.01.1.00	Purchase Network & Communication Hardware Implementation	\$0.00	29-Jan-16	07-Mar-16	28	1094	C
Task Dependent	47502.03.01.1.00	Purchase Network & Communication Hardware Implementation	\$5,000.00	27-Jan-16	27-Jan-16	1	1094	C
Task Dependent	47502.03.01.1.00	Coordinate Implementation Plan with Delivery Ring ASP	\$0.00	01-May-14	11-Jun-14	30	1518	C
Finish Milestone	47502.03.01.1.00	T5 - Transport and Delivery Ring Controls Complete	\$0.00		03-May-16	0	1143	B
Task Dependent	47502.03.01.1.00	Network Installation Implementation and Closeout	\$0.00	09-Mar-16	19-Apr-16	30	1094	C
Finish Milestone	47502.03.01.1.00	T5 - About Controls Complete	\$0.00		03-May-16	0	1143	B
Task Dependent	47502.03.01.1.00	Camac and Timing Links Implementation and Closeout	\$0.00	09-Mar-16	19-Apr-16	30	1153	C

CMS High Float:

Layout: Review		Filter: All: Total float >200d						
Activity Type	Activity ID	Activity Name	Budgeted Total Cost	Start	Finish	Original Duration	Total Float	Color P Code
CTP Infrastructure			\$120,046.00	01-Oct-14 A	01-Jan-16	328	1041	
Task Dependent	T107030	Commission pre-production CTP Infrastructure M&S	\$0.00	01-Oct-14 A	14-Nov-14	20	1216	C
Task Dependent	T107000	Install pre-production CTP Infrastructure	\$200.00	01-Oct-14 A	14-Nov-14	25	1336	C
Task Dependent	T107020	Commission pre-production CTP Infrastructure	\$20.00	01-Oct-14 A	14-Nov-14	20	1216	C
Task Dependent	T106990	Test pre-production CTP Infrastructure at CERN M&S	\$0.00	01-Oct-14 A	18-Nov-14	30	1334	C
Task Dependent	T107010	Install pre-production CTP Infrastructure M&S	\$0.00	01-Oct-14 A	18-Nov-14	25	1334	C
Task Dependent	T106980	Test pre-production CTP Infrastructure at CERN	\$120.00	01-Oct-14 A	18-Nov-14	30	1334	C
Task Dependent	T107050	Place production order for Vadatech crates	\$48,600.00	01-Oct-14 A	16-Dec-14	64	1049	C
Task Dependent	T107060	Place production order for AMC13	\$30,000.00	01-Oct-14 A	16-Dec-14	64	1049	C
Task Dependent	T107070	Place production order for optical splitters and patch-panel - UW	\$15,000.00	01-Oct-14 A	16-Dec-14	64	780	C
Task Dependent	T107075	Place production order for optical splitters and patch-panel - C...	\$25,000.00	01-Oct-14 A	16-Dec-14	64	780	C

Mu2e Constrained Critical Activities:

Activity Type	Activity ID	Activity Name	Budgeted Total Cost	Start	Finish	Original Duration	Total Float	Color P Code
Straws			\$0.00	28-Jul-17	28-Jul-17	0	0	
Straw Tubes			\$0.00	28-Jul-17	28-Jul-17	0	0	
Finish Mileston	47506.02.01.001057	T2 - PO issued for material for straws for full-backer	\$0.00	28-Jul-17	28-Jul-17	0	0	B
Straw Assemblies			\$0.00	01-May-19	01-May-19	0	0	
Panels			\$0.00	01-May-19	01-May-19	0	0	
Finish Mileston	47506.03.01.001263	T2 - All backer panels complete and tested	\$0.00	01-May-19	01-May-19	0	0	B
Detector Assembly & Installation			\$0.00	19-Oct-20	19-Oct-20	0	0	
Finish Mileston	47506.06.001050	T2 - Ready for Cosmic Ray Test	\$0.00	19-Oct-20	19-Oct-20	0	0	B
Calorimeter - 10/31/14 Baseline after BC R007 w 20141031 status			\$100,000.00	30-Sep-15	01-Oct-18	762	0	
Calorimeter Project Management			\$0.00	30-Sep-15	01-Oct-18	762	0	
Mechanical Support			\$100,000.00	30-Nov-17	30-Mar-19	67	0	
Mechanical Support (In-Kind contribution)			\$100,000.00	30-Nov-17	30-Mar-19	67	0	
Task Depend	47507.3.092230	INFN delivers in-kind Mechanical Support for Disk 1	\$50,000.00	30-Nov-17	30-Nov-17	1	0	C
Task Depend	47507.3.092240	INFN delivers in-kind Mechanical Support for Disk 2	\$50,000.00	30-Mar-18	30-Mar-18	1	0	C

Description of Issue: High float values were observed in the CMS and Mu2e Project schedules and at least some of these appear to be the result of incorrect logic ties. Several activities were constrained, both milestones and task dependent which resulted in zero float for these activities. Logic issues within a schedule can produce incorrect critical path calculations and can greatly reduce the accuracy and usefulness of the schedule. It is essential that the entire schedule logic is clear and correct, and that the logic is checked regularly/maintained often as the project progresses to ensure it remains accurate.

Recommendation: Review and validate the accuracy of the schedule logic. Continue to perform schedule clean up and integrity checks on a regular basis. A detailed critical path analysis as performed on Mu2e should be followed by other projects to ensure the integrity of the critical path. CMS Project utilizes one project scheduler who performs all data integrity checks. Project Management should evaluate the need for additional schedule support especially as the project ramps up and schedule maintenance needs increase. CAMs should be trained to better understand how their sub-projects roll up into the master project schedule and which high level project milestones they impact.

3.2 Guideline 7: Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

Reviewer Name(s): Jennifer O'Connor and Katie Martin
 Compliant with ANSI/EAI-748: **Yes**

Observations and Findings:

Both projects utilize a baseline schedule as well as a current status (working) schedule. Progress is assessed monthly by each Control Account Manager in the status schedule which is measured against the baseline schedule. The projects utilize a variety of objective earned value methods including percent complete with steps/milestones, 50-50 and 0-100. The CAMs interviewed were very knowledgeable. While a few of the CAMs were new to their roles, they all appear to be engaged with the monthly status process, were able to clearly articulate their plans, their own individual critical path, their progress to date and their future efforts.

3.3 Guideline 8: Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost including estimates for authorized but undefinitized work. Budget for far-term efforts may be held in higher level accounts until an appropriate time for allocation at the control account level. On government contracts, if an over-target baseline is used for performance measurement reporting purposes; prior notification must be provided to the customer.

Reviewer Name(s): Jennifer O'Connor & Katie Martin

Compliant with ANSI/EAI-748: **Yes**

Observations and Findings:

Both Projects presented a time-phased budget baseline at the control account level along with CAP reports and basis of estimate documents. Cost estimates were developed using a basis of estimate process that entailed the identification of resources needed to complete the scope of work. The estimates were then integrated into the scheduling tool resulting in a time-phased resource-loaded schedule appropriate for performance measurement. The overall baseline total was validated against the dollarized RAM and CPRs provided for this review.

3.4 Guideline 9: Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.

Reviewer Name(s): Jennifer O'Connor & Katie Martin

Compliant with ANSI/EAI-748: **Yes (but with an issue that ties back to CAR-01)**

CAR-01 reference

Subject (Issue) WAD updates consistent with CCB actions.

Reference Guideline 9

Observations and Findings:

The budgets for both projects were established using a basis of estimate (BOE) process. The projects identify significant cost elements such as labor, material etc. during the establishment of the BOE. The projects look at hours and actual cost of labor, materials, and contracts to manage and forecast ETC. Each control account has a detailed Work Authorization Document which includes budget for authorized work with identification of cost elements such as labor and materials. The CAMs interviewed stated the WADs are updated after each project change request. However, during a data trace the WADs for both projects were not always updated as required by the Change Control Procedure.

Recommendation: CAMs should ensure that the WADs are updated in a timely manner after a Change Control Action is approved.

3.5 Guideline 10: To the extent it is practicable to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.

Reviewer Name(s): Jennifer O'Connor & Katie Martin

Compliant with ANSI/EAI-748: **Yes**

Observations and Findings:

The projects utilize a control account structure which is further broken down to the activity level. CAMs interviewed were familiar with the work packages and planning packages within their control accounts. They were also able to explain how and when a planning package is converted to a work package and the authorizations required for that conversion. The activities roll up into defined control accounts as shown on the RAM and monthly CPRs. Budgets were established by resource in terms of units such as hours and dollars. A variety of earned value techniques are being used to track progress against the baseline which was validated with data traces on activities in progress.

3.6 Guideline 11: Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.

Reviewer Name(s): Jennifer O'Connor & Katie Martin

Compliant with ANSI/EAI-748: **Yes**

Observations and Findings (Justification for Compliance):

Traces were conducted on each project which confirmed the sum of the work packages and planning packages reconciled with the sum of the control account budgets.

3.7 Guideline 12: Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is unmeasurable or for which measurement is impracticable may be classified as level of effort.

Reviewer Name(s): Jennifer O'Connor and Katie Martin

Compliant with ANSI/EAI-748: **Yes but with CIO-02***

Observations and Findings:

Both Projects have work packages that contain a level of effort work scope. These are mainly project management and/or oversight activities separate from discrete work. The percentage of LOE budget at the control account level was included on the RAM and was found to be higher than what is typically an acceptable use of LOE. Best practice for LOE is about 15%. The CMS Project contains 27% of LOE budget. The Mu2e Project contains 21%.

CIO-02*

Subject (Issue): Refine the Use of LOE Budget

Referenced Guideline(s): Guideline 12

Referenced Data Trace: The CMS and Mu2e Project Dollarized RAMs and respective control accounts

Description of Issue: The CMS Project has a performance measurement baseline of \$34,313K with \$9,148K of LOE budget equating to 27%. The Mu2e Project has a performance measurement baseline of \$217,378K with \$45,212K of LOE budget equating to 21%. Higher LOE values can mask accurate project performance. LOE activities bias the project data toward an on-schedule condition and should be minimized to prevent distortions of the performance measurement data. One CAM interviewed stated some of the discrete work could actually be considered level of effort in his opinion, which would result in even higher percentages of LOE.

Recommendation: The Projects should review the LOE usage project-wide to reduce the percentage until it is closer to the recommended 15%. If this cannot be done, the Projects should sufficiently document why the LOE usage percentage is appropriate.

3.8 Guideline 13: Establish overhead budgets for each significant organizational component of the company for expenses which will become indirect costs. Reflect in

the program budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.

Reviewer Name(s): Betsy O'Connor, Jennifer O'Connor, and Katie Martin
 Compliant with ANSI/EAI-748 **Yes**

Observations and Findings:

The Fermilab CFO is responsible for leading the annual budget process and developing the Lab's indirect rate structure and the rates. The structure was changed recently to include special rates for large projects that more closely reflect the overheads required to support the projects. Typically, project support functions can be charged to the projects directly, resulting in less need for traditional Lab overhead resources. This structure change was communicated to and supported by DOE and documented in the Lab's Disclosure Statement and in the Lab's indirect policy document. The appropriate rates are applied to the Mu2e and CMS projects.

3.9 Guideline 14: Identify management reserves and undistributed budget.

Reviewer Name(s): Jennifer O'Connor and Katie Martin
 Compliant with ANSI/EAI-748: **Yes for Mu2e Project but issues remain for CMS**

Observations and Findings:

Risks are identified and being managed on both projects. The Mu2e Project utilizes management reserve and contingency which reconcile with the project logs. Formal change control procedures are in place to move and track the contingency and MR funds. For the CMS Project, the Project Change Request Log provided was missing pertinent details to assist in traceability and the log didn't conform to the procedure requirements with respect to required information (missing management reserve, undistributed budget and contingency tracking).

CAR-02

Subject (Issue): Properly Identify and Track Management Reserve, Undistributed Budget and Contingency
 Referenced Guideline(s): GL 14 and 15

Referenced Data Trace: CMS Project Change Request Log (below) and FRA Project Management Procedure 12.PM-007 Change Control

CR no	Creation date	Project	Short Title	Created by	DocID # with hyperlink	Estimated cost increase (\$)	Project Controls Assessment		Approvals					Status		Notes
							Status	Cost increase from NSFCOA (M)	L2 Manager	PI of NSFCOA	PM	ISOP Program Director	DOE Federal Project Director	PO SCR #	Work done in PCS?	
51	2014-11-19	All	FY15 Rate update - part 2	Suzanne Sawyer	12523	30	Done	30	Not required	Not required	2014-11-20	Not required	Not required	SCR051	Yes	Costs only for changes
52	2014-11-21	All	Correct inadvertent Recals to prior periods	Suzanne Sawyer	12519	17	Done	17	Not required	Not required	2014-11-23	Not required	Not required	SCR052	Yes	Costs only for changes
53	2014-11-21	All	Administrative change- CAM Assignment	Suzanne Sawyer	12524	0	Done	0	Not required	Not required	2014-11-20	Not required	Not required	SCR053	Yes	Completed in Cobra, and PB
54	2014-11-24	HCAL	Exchange of work scope with Turkey. In	Jeremiah Mann	12522	-5			Not required	Not required		Not required	Not required			
55	2014-12-03	All	Remove GA code assignments in PB file	Bill Freeman	12525	0	Done	0	Not required	Not required	2014-12-04	Not required	Not required	SCR055	Yes	only affects PB costing

Description of Issue:

The CMS Project Change Request Log does not identify the type of budget the change request impacts. While the Project explained the log represented contingency, it was not clearly identified on the log. The log also does not include a beginning balance or remaining totals of funds. Therefore, the committee was not able to trace the contingency usage to ensure reconciliation. According to FRA Project Management Change Control Procedure 12.PM-007, Appendix E, the Change Request Log at a minimum should contain MR value, MR change, MR remaining value, original contingency value, contingency change, and remaining contingency value.

Recommendation:

The CMS Project Change Request Log should be revised to include the minimum requirements as stated in their Change Control Procedure, Appendix E.

3.10 Guideline 15: Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.

Reviewer Name(s): Jennifer O'Connor and Katie Martin

Compliant with ANSI/EAI-748: **Yes for Mu2e but issues remain with CMS**

Observations and Findings:

For the Mu2e Project, the sum of all control account budgets plus MR and contingency reconciles to the total project cost. For the CMS Project, this could not be validated because the Project Change Request Log provided was missing pertinent details to assist in traceability and the log didn't conform to the procedure requirements with respect to required information (missing management reserve, undistributed budget and contingency tracking).

CAR-02

Subject (Issue): Properly Identify and Track Management Reserve, Undistributed Budget and Contingency

Referenced Guideline(s): GL 14 and 15

Referenced Data Trace: CMS Project Change Request Log (below) and FRA Project Management Procedure 12.PM-007 Change Control

CR no.	Creation date	Project	Short Title	Created by	DocID # with hyperlink	Estimated cost increase (\$)	Status	Project Controls Assessment				Approvals				Status	Notes
								Cost increase from PE/Cobra (d)	L2 Manager	PI of NSF, CA	PIU	NSF Program Director	DOE Federal Project Director	PE BCR #	Work done in PCS?		
31	2014-11-19	All	FY15 Rate update - part 2	Suzanne Sawyer	12523	30	Done	0	Not required	Not required	2014-11-20	Not required	Not required	SCR051	Yes	Cobra only for changes	
32	2014-11-21	All	Correct inadvertent Revoke to prior period	Suzanne Sawyer	12519	17	Done	17	Not required	Not required	2014-11-23	Not required	Not required	SCR053	Yes	Cobra only for changes	
33	2014-11-21	All	Administrative change- CAM Assignment	Suzanne Sawyer	12524	0	Done	0	Not required	Not required	2014-11-25	Not required	Not required	SCR051	Yes	Completed in Cobra, and PE	
34	2014-11-24	HCAL	Exchange of work scope with Turkey, in	Jeremiah Mann	12522	-5k			Not required			Not required	Not required				
35	2014-12-03	All	Remove CA code assignments in PE file	Bill Ptasman	12526	0	Done	0	Not required	Not required	2014-12-04	Not required	Not required	SCR055	Yes	only affects PE costing	

Description of Issue:

The CMS Project Change Request Log does not identify the type of cost change the change request incurs.

While the Project explained the log represented contingency, it was not clearly identified on the log. The log also does not include a beginning balance or remaining totals of funds. Therefore, the committee was not able to trace the contingency usage to ensure reconciliation. According to FRA Project Management Change Control Procedure 12.PM-007, Appendix E, the Change Request Log at a minimum should contain MR value, MR change, MR remaining value, original contingency value, contingency change, and remaining contingency value.

Recommendation:

The CMS Project Change Request Log should be revised to include the minimum requirements as stated in their Change Control Procedure, Appendix E.

4.0 ACCOUNTING CONSIDERATIONS

4.1 Guideline 16: Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.

Reviewer Name(s):

Betsy O'Connor

Compliant with ANSI/EAI-748

Yes but with CIO-07*

CIO-07*

Subject (Issue) CAM training to include accruals and information on Lab indirect expenditures

Reference Guideline 16

Observations and Findings:

Discussions were held with the Fermilab Chief Financial Officer, Chief Accounting Officer and Assistant Chief Accounting Officer. These financial experts along with Project Controls staff confirmed that the development of the project budgets in the EVMS is in accordance with the Lab's official financial system, as did observance of the budget information in the EVMS reports. Fermilab uses Oracle's electronic business suite and the project accounting module to record all costs in the general ledger whereby the actual Control Account (and lower level if applicable) is used as the chargeable task code.

There was a large variance on the CMS project that was the result of a missed accrual. In discussions with the CAM, apparently a requisition for approximately \$1M in materials was submitted and \$228K of performance was claimed simply with the submission of the requisition. The variance occurred because no corresponding cost was recorded. However, unless a prepayment was required by the vendor, typically, no cost is recorded on materials until the material is received, as documented in the Lab's Disclosure Statement. The CAM explained that \$138K was to be paid upon submission of the requisition but the vendor did not send an invoice. At a minimum, the \$138K in cost should have been accrued in July when the requisition was submitted but the cost was not recorded until November when the invoice was received.

In addition to this accrual error, there was one other missed accrual indicating that more CAM training is needed on recording actual cost and the accrual process. Though two errors were identified in the review, these errors are considered isolated events and are not indicative of system weaknesses.

4.2 Guideline 17: When a work breakdown structure is used, summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements.

Reviewer Name(s): Betsy O'Connor
Compliant with ANSI/EAI-748 Yes

Observations and Findings:

The chargeable task code in the Fermilab financial system is consistent with the WBS shown in the RAM and the EVMS reports, though the chargeable task codes established are not exactly the same at the WBS code. The project code is the same in the general ledger and the EVMS, but the chargeable task code is at a lower level than the WBS code in the financial system to assist with tracking cost and variance analysis. Project Controls maintains the crosswalk between the WBS used in EVMS and the chargeable task code used in the financial system. Also, the cost associated with the CMS NSF funding is not in the Fermilab financial system. That cost is reported to Fermilab by NSF and Project Controls imports the data into the EVMS to produce financial reports for the entire project including all funding sources. Although not readily evident when looking at the EVMS reports, the NSF funding is tracked in separate WBS codes.

4.3 Guideline 18: Summarize direct costs from the control accounts into the contractor's organizational elements without allocation of a single control account to two or more organizational elements.

Reviewer Name(s): Betsy O'Connor
Compliant with ANSI/EAI-748 Yes

Observations and Findings:

Each chargeable task code reviewed was traced and verified to the dollarized RAM using the WBS crosswalk from Project Controls. The financial statements produced were traced and tied to the information in the EVMS reports. The cost of the hours charged to a specific WBS was traced from the Kronos time card system, indicating the employee and number of hours charged to the WBS. The hours charged were priced out using actual pay rates as expected per the Lab's Disclosure Statement and the cost was entered into the Oracle general ledger. The cost was traced to the Lab's financial statement which also showed the appropriate allocation of indirect expense. Materials are recorded when received, in accordance with EVMS guidelines and Generally Accepted Accounting Principles.

4.4 Guideline 19: Record all indirect costs which will be allocated to the project.

Reviewer Name(s):	Betsy O'Connor
Compliant with ANSI/EAI-748	Yes but with CIO-07*

CIO-07*

Subject (Issue): CAM training on Lab indirect costs
Reference Guideline 19

Observations and Findings

Indirect costs were applied in accordance with the Lab's CAS Disclosure Statement. When questioned, one CAM did not know if the indirect rates were adjusted in September or if the rates were changed for FY15. Other CAMs were more aware of the rate changes and how they affected the project budgets and cost. The indirect rate structures, application of the rates, and the impact of adjustments to the indirect rates should be covered thoroughly in the CAM training so that CAMs are aware and understand the impact of the rates on their projects.

4.5 Guideline 20: Identify unit costs, equivalent unit costs, or lot costs when needed.

Reviewer Name(s):	Betsy O'Connor
Compliant with ANSI/EAI-748	Yes

Observations and Findings

This guideline applies to manufacturing processes. Fermilab is an R&D facility and does not need to implement procedures for this guideline.

4.6 Guideline 21: For EVMS, the material accounting system will provide for:

- **Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques.**
- **Cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material.**
- **Full accountability of all material purchased for the project including the residual inventory.**

Reviewer Name(s): Betsy O'Connor
 Compliant with ANSI/EAI-748 Yes

Observations and Findings

This guideline applies to manufacturing processes. Fermilab is an R&D facility and does not need to implement procedures for this guideline.

5.0 ANALYSIS AND MANAGEMENT REPORTS

5.1 Guideline 22: At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system:

- **Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.**
- **Comparison of the amount of the budget earned and the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.**

Reviewer Name(s): Rick Larson
 Compliant with ANSI/EAI-748: Yes

Observations and Findings (Justification for Compliance):

- This ANSI Guideline is facilitated at Fermilab by requirements in Sections 5.1, 5.2, 5.3 of the Fermilab EVM System Description (Version 8, 11/20/2014) and in the supporting procedure(s): Monthly Status Reporting (12.PM-006, Version 5, 8/18/2013).
- CAMs from CMS & Mu2e projects were interviewed. CAMs indicated that they have a process to status the schedule at the activity level using a turnaround document provided by the Project Controls staff to document status from progress meetings or other subsequent status documents. Fermilab's actual costs are reported from the Lab's financial system and actual costs from other institutions are reported to the Fermi Finance Manager.

The costs are validated by the Financial Manager and then imported into Cobra. Cost Performance Reports (CPRs) are generated on a monthly basis. The CAMs demonstrated an in-depth knowledge of their respective Control Account and current status reflected on the monthly CPR. The CAMs understood that monthly earned value, when compared to the plan, would provide a schedule variance and the monthly earned value, when compared to actual costs from the accounting system (which includes accrual data from the CAM), would generate the cost variance.

- CAMs review labor hour reports on a monthly basis and if there are any mischarges to their CAs, they can request an adjustment.

The project is producing a monthly Contract Performance Report at the Control Account level that includes BCWS, BCWP, ACWP for the current reporting period, cumulative to date, BAC and EAC. The Schedule Variance (SV), Cost Variances (CV), and Variance at Completion (VAC) are calculated and included in the report.

5.2 Guideline 23: Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.

Reviewer Name(s): Rick Larson

Compliant with ANSI/EAI-748: **Yes but with CIO-01***

Observations and Findings (Justification for Compliance):

- This ANSI Guideline is facilitated at Fermilab by requirements in Sections 5.1, 5.2, 5.3 of the Fermilab EVM System Description (Version 8, 11/20/2014) and in the supporting procedure(s): Monthly Status Reporting (12.PM-006, Version 5, 8/18/2013).
- CAMs from the CMS & Mu2e projects were interviewed. CAMs indicated that they have a process to status the schedule at the activity level using a turnaround document provided by the Project Controls staff to document status from progress meetings or other subsequent status documents. Fermilab's actual costs are reported from the Lab's financial system and actual costs from other institutions are reported to the Fermi Finance Manager. The costs are validated by the Financial Manager and then imported into Cobra. Cost Performance Reports (CPRs) are generated on a monthly basis. The CAMs demonstrated an in depth knowledge of their respective Control Account and current status reflected on the monthly CPR. The CAMs understood that monthly earned value, when compared to the plan, would provide a schedule variance and the monthly earned value, when compared to actual costs from the accounting system (which includes accrual data from the CAM), would generate the cost variance.
- CAMs review labor hour reports on a monthly basis and if there are any mischarges to their CAs they can request an adjustment.

The project is producing a monthly Contract Performance Report at the Control Account level

that includes BCWS, BCWP, ACWP for the current reporting period, cumulative to date, BAC and EAC. The Schedule Variance (SV), Cost Variances (CV), and Variance at Completion (VAC) are calculated and included in the report.

CIO-01*

Subject (Issue): Continue to improve the variance analyses to remove quality variability.

Referenced Guideline(s): ANSI/EIA-748-B Intent Guideline 23 Fermilab by requirements in Sections 5.1, 5.2, 5.3 of the Fermilab EVM System Description (Version 8, 11/20/2014) and in the supporting procedure(s): Monthly Status Reporting (12.PM-006, Version 5, 8/18/2013).

Referenced Data Trace:

Mu2e Earned Value Report – October 2014: 19 Control Accounts with current period or cumulative variances exceeded either the “Red” or “Yellow” Thresholds. (6 “Red” Threshold Variance Reports, 13 “Yellow” Threshold Variance Reports including 475.04.02-Production Solenoid which is missing from the EVMS Review website.)

CMS CPR for Reporting – October 2014: 6 Control Accounts with current period or cumulative variances exceeding the “Red” Threshold. (5 “Red” Threshold Variance Reports. The 401.04.04 Calorimeter Trigger Variance Report is missing from the EVMS Review website).

Description of Issue:

Mu2e Project

October 2014 is the only month for which variance reports were available, so no history of reporting is available. Of the 18 variances reviewed in this reporting period most were very well written. In some cases a more detailed explanation could be provided (in two cases a form was prepared but no analysis was provided). In other cases, reporting errors were identified (earned value or accrued/actual cost), but no action was identified to correct the error and the decision was made to carry the error until time naturally corrected the error. The following comments on specific variance analysis are provided as examples of suggested improvements.

475.02.09 – Correct the erroneously stated item identified in the explanation in the next reporting period.

475.04.02 (Production Solenoid) – Variance Report missing.

475.04.05 – Does the early completion of work enable other opportunities? If significant enough, should the action be to communicate the potential opportunity to accelerate other activities or make resources available for future work?

475.04.07 – If truly an error, transfer the actual mischarged effort to the correct account.

475.04.08 – It was noted there was no significant impact to project due to considerable float. Number of days of float might put impact in context. Any resource issues this might cause later?

475.06.02 – If truly an error, transfer the actual mischarged effort to the correct account.

475.06.04 – What impact does schedule delay have on rest of project? How much float? Any resource impact?

475.07.05 – No analysis provided.

475.07.06 – No analysis provided.

CMS Project

All variance reports provided for this review were well written. Only variance reports exceeding the “Red” Threshold are prepared. Variance reports for “Yellow” Threshold issues are not prepared and are not required by the Fermilab EVMS Procedures. The Monthly Status Reporting Procedure 12PM-006 states the following, “Yellow variances are considered a warning that in future reporting periods the variance could trend into the red threshold range. These variances shall be analyzed to determine if corrective actions are required.”

The October variance report for 401.03.03.01 refers to the earning of an engineering order in July 2014, but not accruing the cost until October 2014. This discrepancy makes the data reporting in EVMS inconsistent.

Recommendation:

1. The review team recommends the CAMs and Project Controls staff complete the incomplete variance reports and consider incorporating the suggestions made above in the next available reporting cycle.
2. The review team recommends the CAMs and Project Controls staff review the guidelines for correcting errors in the EVMS data so the reporting of BCWS, BCWP and ACWP is consistent.

5.3 Guideline 24: Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.

Reviewer Name(s): Rick Larson

Compliant with ANSI/EAI-748: Yes

Observations and Findings (Justification for Compliance):

- This ANSI Guideline is facilitated at Fermilab by requirements in Sections 4.2, 5.1, 5.2, 5.3 of the Fermilab EVM System Description (Version 8, 11/20/2014) and in the supporting procedure(s): Monthly Status Reporting (12.PM-006, Version 5, 8/18/2013).
- Revised indirect costs are applied at the beginning of each fiscal year as documented in BCR-048 (CMS) and BCR-008 (Mu2e).
- The application of the indirect rates was validated as part of Guideline19.

The ability to track indirect variances was not evaluated during this review due to the recent/upcoming CD-2 approval (baselining) of these projects.

5.4 Guideline 25: Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the project.

Reviewer Name(s): D. Sherese Humphrey

Compliant with ANSI/EAI-748: **Yes but with CIO*05**

Observations and Findings:

Consistent with the EVMS-SD monthly earned value status reports, including variance analyses, are prepared by the CMS and Mu2e projects. Fermilab has monthly PMG (project level) and POG (senior Fermilab management level) meetings that are used to report and assess project status and progress as well as to identify and track issues. The Federal Project Director is invited and attends these meetings. Regular (annual or semi-annual) reviews of the Mu2e and CMS projects are conducted by DOE-HQ Office of Science to assess progress and status and to identify issues. Because it is now baselined, the CMS Project is to provide additional data and information through PARS-II.

CIO-05*

Subject (Issue): Make a recommendation to the Federal Project Director or request direction on Project Assessment and Reporting System (PARS-II) Reporting

Referenced Guideline(s): ANSI/EIA-748-B Intent Guideline 25; Fermi Research Alliance Earned Value Management (EVM) System Description (EVM-SD) Section 5.3 Performance Reporting, 5.3.1 EVMS Reporting

Referenced Data Trace: Reviewer interviews with Mu2e CAMs, CMS CAMs, and discussions with the respective project controls representative. In addition, discussions with the Federal Project Director determined that he has received monthly status reporting through a variety of mechanisms including monthly reports and attending monthly PMG and POG meetings.

Description of Issue:

Recognizing that the CMS Project was baselined in November 2014 and the Mu2e Project has not yet been baselined, it is important to ensure that the PARS-II reporting requirements be clearly understood by Fermilab and then followed. Presently, the CMS Project stated that they are providing data to the PARS-II System but the Review Team questioned whether it was providing all of the required data to the PARS-II system.

According to FRA's EVM-SD, the projects are required to define the level, frequency and distributing of reporting in their Project Execution Plan (PEP). Upon review Mu2e and CMS documentation, the PEP refers to the Project Management Plan (PMP) for that definition. This is not consistent with the Fermilab EVMS System Description. In addition, when the CMS PMP was reviewed, references to level, frequency, and report distribution were not defined. During the CAM interviews, it was determined that the CAMs were unsure of the reporting expectation.

Based on discussions with the respective project controls representative concerning reporting requirements; additional coordination is still needed between the CMS project management and the Federal Project Director. The Federal Project Director agreed with this assessment.

Recommendation:

The review team recommends that each project work with their respective Federal Project Director to develop the reporting level, reporting thresholds, and documentation requirements (i.e., CPRs 1, 3, and/or 5 etc.). Additionally, once these requirements have been mutually determined and understood, these reporting requirements need to be documented in the PEP as required by FRA's System Description.

5.5 Guideline 26: Implement managerial action taken as the result of earned value information.

Reviewer Name(s): D. Sherese Humphrey

Compliant with ANSI/EAI-748: **Yes but with CIO-04***

Observations and Findings:

Consistent with the EVMS-SD monthly earned value status reports, including variance analyses, are prepared by the CMS and Mu2e projects. Fermilab has monthly PMG (project level) and POG (senior Fermilab management level) meetings that are used to report and assess project status and progress as well as to identify and track issues. The Federal Project Director is invited and attends these meetings. Regular (annual or semi-annual) reviews of the Mu2e and CMS projects are conducted by DOE-HQ Office of Science to assess progress and status and to identify issues.

CIO-04*

Subject (Issue): The Corrective Action Log, which reflect corrective actions identified during the variance analysis process, requires standardization of the methodology so that items can be effectively tracked to completion by the PMs/CAMs and provide a single source of issues for Fermilab Management. (criteria, process, and timely updates)

Referenced Guideline(s): ANSI/EIA-748-B Intent Guideline 26

Referenced Data Trace: Reviewer interviews with the CAMs and Review of Project Corrective Action Logs

Description of Issue:

The Mu2e and the CMS projects currently prepare corrective actions logs for each of their projects. The corrective actions included in these logs is derived from the variance analysis process. If corrective actions are identified, they are recorded on the variance analysis sheets and recorded in their

respective logs for follow-up and action. Both projects have logs with corrective actions. Some of those actions were identified from earlier periods, but did not reflect any progress/status (specifically the CMS project). The Mu2e Project includes the status in their log. While having a Corrective Action Log is an important first step, these logs need to reflect regular updates through completion to ensure that the projects are using this information to ensure that identified issues are corrected in a timely manner and that they do not jeopardize project success. The methodology for developing these logs and managing those actions through completion needs to be standardized across all projects to ensure effective management of corrective actions.

Recommendation:

The review team recommends that the FRA EVM-SD be updated to define the requirements and expectations for the management of corrective actions log to ensure uniform compliance across all projects. Using the Mu2e Log as a general example is a starting point to achieve this.

5.6 Guideline 27: Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.

Reviewer Name(s): D. Sherese Humphrey

Compliant with ANSI/EAI-748: **Yes but with CIO-03***

CIO-03*

Subject (Issue): Continue to refine the process for calculating Estimate-at-Complete (EAC)

Referenced Guideline(s): Fermi Research Alliance Earned Value Management (EVM) System Description (EVM-SD) Section 5.2.1 Variances and Section 5.2.6 Project Performance Analysis

Referenced Data Trace: CAM interview with Harry Cheung and Bill Freeman (project controls)

Description of Issue:

The CAMs stated that they “review” their Estimate-to-Complete (ETC) during the monthly reporting cycle. Mu2e and CMS projects are in the early stages of recording their EACs and have been using default formulas to calculate their ETC. Their review consists primarily of examining the output of that “generic” formula being applied by the cost tool. Some of the CAMs were unable to state which EAC formula was being used to compute their control account’s ETC. It is important that the CAMS/PMs be able to understand and explain the method being used to calculate ETC and EAC. The Mu2e Project has developed and begun using a more robust and uniform method of determining the ETC and Fermilab stated that the method is being exported to the CMS Project.

There was also a concern when it was determined that a generic formula was being used to calculate the ETC when the CAM had additional information concerning an increased financial impact. The

CAM included that impact in the variance analysis explanation, but did not reflect that specific information in the ETC (refer to 401.03.03.03 Components - Mechanical Structures & Cooling VAR for October 2014). The log stated that there was going to be an increase in cost due to underestimations of labor and the associated rate for that labor. The CAM was aware of this increase in cost, based on a bottom-up estimate, but did not modify the ETC to reflect this knowledge. It is important to reflect the latest available information that is available to most effectively monitor and manage the project's EAC and ETC. The system default does not provide the most accurate and useful information to understand the financial implications of previous or ongoing work

Recommendation:

The review team recommends that the EAC process continue to be refined so that projects will be proactive rather than reactive to financial impacts that can be most accurately assessed when information is readily available. To ensure that the most recent information is available, consider providing a "rough estimate" and reflect that in the ETC.

6.0 REVISIONS AND DATA MAINTENANCE

6.1 **Guideline 28: Incorporate authorized changes in a timely manner, recording the effects of such changes in the budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.**

Reviewer Name(s): Kelly Krug/ Bob O'Sullivan
Compliant with ANSI/EAI-748: **No**

Documents Reviewed:

FNAL Earned Value Management System Description, Rev 6 August 19, 2013
FNAL Earned Value Management Procedure Change Control, Rev 5 November 19, 2014
FNAL Earned Value Management Procedure Work Authorization, Rev 5 November 20, 2014
Mu2e BCR 007 and 010
CMS BCR 029 and 041
Mu2e Change Request Log: Dated 12/10/14
CMS Change Request Log: Dated 12/08/14
Mu2E WAD for Control Account 475.04.02 Solenoids Production – Signed 12/10/14
CMS WAD for Control Account 401.04.04 Calorimeter Trigger
Mu2E Project Management Plan: dated 12/25/14
CMS Project Management Plan: dated 10/15/14

Traces: CMS BCR 029 and 041 AND Mu2e BCR 007 and 010
CMS BCR 029 and 041

CAR-01

Subject (Issue): Traceability
Reference Guideline 28

Observations and Findings

Complete traces of the BCRs, through the project documentation, were not possible due to absence of requisite information to allow for traceability. Below lists missing information on various forms and logs that would be needed for complete traceability:

BCR Form:

FNAL Change Control Procedure requires “on the CR form, a breakdown of the budgeted impact by control account shall be listed”. This was not shown on the CR form nor was the WBS(s) affected listed on the form. In addition, CAM approval was missing although it was required per the responsibilities section of the Change Control Procedures. The procedures also state “The CAM shall include an impact assessment on the BCR form explaining the consequence of not approving the BCR.” This was not included.

The reviewers feel the form could be improved by providing the required approval level of the change and including separate sections for the BCR Reason and Justification. Supporting documents should be provided (budget and schedule) to allow for tracing the information to the subsequent reporting period by identifying impacts to all changed budget and schedule activities. The reviewers also believe that the Estimated Uncertainty Contingency should not be tracked as part of the BCR form as it causes confusion with DOE held contingency. All signatures should be auditable with time/date stamp.

BCR Log:

The log was missing pertinent details to assist in traceability and the log didn't conform to the procedure requirements with respect to required information (missing management reserve, contingency tracking and schedule impact). Traceability would be possible by identifying on the log when the change was implemented (reporting period) in order to reconcile the change with the PMB monthly reports.

Work Authorizations Documents:

The work authorization documents would require a revision history to be included on the form for traceability purposes. Although, this is not specifically called out in the Work Authorization procedure, it is a standard practice and necessary. There were no signatures included on the WAD even though there was a signature block included on the form and the schedule information was missing. Finally, it is recommended that Fermilab include the date the WAD update is complete on the BCR log.

Note: The required reconciliation of the updated control account value through the monthly reporting documentation could not be accomplished due to some of the challenges cited above.

Mu2e BCR 007 and 010

The Mu2e BCRs had some of the shortfalls outlined in the CMS BCR comments above,

however the documentation was much more comprehensive. The only additional comment was the absence of the scope of the Control Account on the Work Authorization Document, which is required by the Fermilab Work Authorization procedure.

In both projects, the CAMs stated they are usually notified of BCR approvals via meetings or e-mails. A standardized approach to CAM notification should be developed.

6.2 Guideline 29: Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal replanning in the detail needed by management for effective control.

Reviewer Name(s): Kelly Krug/ Bob O’Sullivan

Compliant with ANSI/EAI-748: **No**

CAR-02

Subject (Issue): Traceability

Reference Guideline 29

Observations and Findings

Reference comments provided in Guideline 28 above.

6.3 Guideline 30: Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.

Reviewer Name(s): Kelly Krug/ Bob O’Sullivan

Compliant with ANSI/EAI-748: **Yes but with CIO-08***

CIO-08*

Subject (Issue): Retroactive BCR Change

Reference Guideline 30

Observations and Findings

During the CMS data trace of CR-0041, it was noted that the Sept-14 BCR changed budget back to May-14. BCRs should limit historical changes for corrections only.

During the Mu2e data trace of CR-007, it was noted that the Nov-14 BCR changed the start date of MS TX3 – 2015 Accelerator Maintenance Shutdown Start to Sept-14, a date prior to the CR submittal date. This also occurred with BCR 10, with T5-Target Proton Beam milestone date moved from 8/25/14 to 1/15/15.

6.4 Guideline 31: Prevent revisions to the program budget except for authorized changes.

Reviewer Name(s): Kelly Krug/ Bob O’Sullivan

Compliant with ANSI/EAI-748: **No**

Documents Reviewed:

FNAL Earned Value Management System Description, Rev 6 August 19, 2013

FNAL Earned Value Management Procedure Change Control, Rev 5 November 19, 2014

Mu2e BCR 007 and 010

CMS BCR 029 and 041

CAR-01

Subject (Issue); Traceability

Reference Guideline 31

Observations and Findings

Reference Observation in Guideline 28, specifically the lack of traceability stated in criteria #28, prevented the reviewers from verifying this and the Change Control Procedure required CAM approval of BCRs, however CAMs are not signatory to the BCR forms.

6.5 Guideline 32: Document changes to the performance measurement baseline.

Reviewer Name(s): Kelly Krug/ Bob O’Sullivan

Compliant with ANSI/EAI-748: **Yes but with CIO-01**

Documents Reviewed:

FNAL Earned Value Management System Description, Rev 6 August 19, 2013

FNAL Earned Value Management Procedure Change Control, Rev 5 November 19, 2014

Mu2e BCR 007 and 010

CMS BCR 029 and 041

CIO-01

Subject (Issue): Variability in the number of BCR supporting reports among projects

Reference Guideline 30

Observations and Findings

There are several documents included in the change request backup, providing traceability of before and after changes. The reviewers felt it would be beneficial if Fermilab standardized the attachments to BCRs and WADs as one project had up to 16 attachments while the other project included only a couple of reports.