



CR-1402/1

**Fermi Research Alliance LLC (FRA)
Earned Value Management System (EVMS)
Compliance Review**

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**SUBMITTED TO:
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U.S. Department of Energy
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1: EXECUTIVE SUMMARY

Under Contract # GS-23F-0105K, the Department of Energy (DOE) requested Tecolote to direct, lead and perform an Earned Value Management System (EVMS) compliance review of Fermi Research Alliance's (FRA) EVMS and its application to the NUMI Off-axis electron neutrino (ν_e) Appearance (NO ν A) Project. The compliance review took place during the week of May 11, 2009 in Batavia, Illinois.

The EVMS certification process is a clinical examination of the described system, its processes, and its outputs and is not intended to assess the health of the program/projects examined during the review. Those outputs (documents and artifacts produced on the programs/projects) are used solely as evidence to validate FRA's EVMS compliance with the American National Standards Institute/Electronic Industries Alliance (ANSI/EIA)-748 Standard for Earned Value Management Systems.

The certification review is conducted to determine if FRA's EVMS meets the requirements and intent of the 32 EVMS guidelines (GLs) embodied in the ANSI/EIA-748 Standard for Earned Value Management Systems and is not intended as a project, site, or corporate certification.

After a detailed assessment and evaluation of the FRA EVMS and its application to the NO ν A project, the review team found that the FRA EVMS is not in compliance with the ANSI/EIA-748 standard as indicated by the three Corrective Action Requests (CARs) identified in the tables below. In addition the team issued six Continuous Improvement Opportunity (CIO) recommendations.

Table 1: Certification Review Findings

In numerical order

CAR#	Title	GL#	Functional Area
1	Accounting for Scientist Labor	9, 22, 23	PBS/Accounting
2	No Process/Provision for UB as Holding Account	14	PBS
3	Direct Cost for Exempt Labor	16	Accounting
CIO#	Title		
1	Work Authorization Form	9, 29	PBS/Revisions
2	EVMS Training	All	All
3	Contingency/Mgt Reserve	14	PBS
4	Authorization Process for Invoice Payment	16	Accounting
5	Current Variance Thresholds	22	Management Analysis
6	Policy Regarding Work Authorization Form	28, 32	Revisions & Data Maintenance

Table 2: Certification Review Findings

By Functional Area

CAR#	Title	GL#	Functional Area
1	Accounting for Scientist Labor	9, 22, 23	PBS/Accounting
2	No Process/Provision for UB as Holding Account	14	PBS
3	Direct Cost for Exempt Labor	16	Accounting
CIO#	Title		
4	Authorization Process for Invoice Payment	16	Accounting
3	Contingency/Mgt Reserve	14	PBS
1	Work Authorization Form	9, 29	PBS/Revisions
2	EVMS Training	All	All
5	Current Variance Thresholds	22	Management Analysis
6	Policy Regarding Work Authorization Form	28, 32	Revisions & Data Maintenance

2: INTRODUCTION

Fermi National Accelerator Laboratory (Fermilab) builds and operates the particle accelerators, detectors and other facilities that physicists need to carry out forefront research in high-energy physics (HEP). Fermilab, located 40 miles west of Chicago, IL, is owned by the U.S. Department of Energy (DOE) and managed and operated by Fermi Research Alliance, LLC (FRA) under the DOE Contract No. DE-AC02-07CH11359. FRA is a Universities Research Association/University of Chicago limited liability corporation created specifically to manage and operate Fermilab. The DOE Office of High Energy Physics (OHEP) within the DOE Office of Science (SC) operates the Fermilab complex of accelerators, which includes the Neutrinos at the Main Injector (NUMI) facility. The NUMI facility uses protons from a Main Injector accelerator complex to produce an intense beam of neutrinos for use in long-baseline neutrino experiments designed to observe the phenomena of neutrino oscillations and study the nature of neutrino mass. The NUMI Off-axis electron neutrino (ν_e) Appearance (NOvA) experiment is such an experiment, and is to be realized through the NOvA Project.

The purpose of the NOvA project is:

- to fabricate the NOvA near (on the Fermilab site) and far (on the Ash River, MN site) detectors in a state ready to take data.
- to provide a detector hall at the Ash River, MN site to house the far detector.
- to upgrade the Fermilab Main Injector and Recycler accelerator facilities and the NuMI beamline facility to support NOvA.

The DOE Office of Science Director Raymond L. Orbach approved Critical Decision-Zero (CD-0), Mission Need, in November 2005 and CD-1, Alternative Selection and Cost Range, in May 2007. The project completed DOE Independent and External Independent Reviews in fall of 2007, in support of CD-2 validation and approval of the project baseline. In December 2007 Congress passed the FY08 Omnibus budget, which reduced DOE Office of Science and High Energy Physics budgets, resulting in a zeroed FY08 funding allocation for some specific DOE Science project work, including NOvA.

The CD-2 process was postponed, and the project adjusted the baseline plan within a subsequently revised funding profile and schedule to support project continuation in FY09. These revisions were subject to further DOE independent and external follow-up review. Under the revised plan, construction is planned to start in FY 2009 and Project Completion, CD-4, will be achieved in early FY 2015.

The DOE Office of Science is responsible for the NOvA Project, and its Office of High Energy Physics provides funding for the project via approved financial plans and, in part, through a DOE Cooperative Agreement (CA) with the University of Minnesota, that includes work at the Ash River, MN site. As Managing & Operating (M&O) contractor for Fermilab, FRA is responsible to DOE for carrying out the NOvA Project and providing for coordination as needed with the University of Minnesota. FRA and Fermilab, in coordination with the University of Minnesota, have responsibility for NOvA Project research and development, design, construction and transition to operations activities. The project team will coordinate project activities as needed with on-going Fermilab operations as well as other potential projects and efforts also located on the Fermilab site. FRA was awarded the \$278 million Department of Energy contract. The contract performance period is through November 2014.

3: PURPOSE

As part of the implementation of OMB Circular A-11, Part 7, the DOE under Order 413.3, Program and Project Management for the Acquisition of Capital Assets, requires Earned Value Management application for its contracts/projects.

Through Contract # GS-23F-0105K DOE has directed Tecolote Research Inc. to direct, lead and perform an EVMS compliance review of the FRA EVMS and its application to the NOvA project, leading to certification of FRA' EVMS.

The purpose of the EVMS certification review was to determine if FRA's EVMS meets the requirements and intent of the 32 EVMS Guidelines embodied in the American

National Standards Institute/Electronic Industries Alliance (ANSI/EIA-748); Standard for Earned Value Management Systems by assessing:

- a. The system, as described, is fully implemented on the selected programs.
- b. The implementation is successful and complies with the requirements of the system description/organization's EVMS procedures, and
- c. The system implemented provides timely, accurate, and auditable management information for both the organization's project management and the customer.

The EVMS certification process is a clinical examination of the described system, its processes, and its outputs and is not intended to assess the health of the program/projects examined during the review. Those outputs (documents and artifacts produced on the programs/projects) are used solely as evidence to validate the EVM System's compliance with the ANSI/EIA-748 Standard for Earned Value Management Systems.

4: TEAM FORMULATION

This effort was led by a review director from Tecolote Research, Inc. Table 3 identifies the team composition that includes Tecolote and members from multiple DOE organizations.

Table 3: Compliance Review Team

Name	Organization	Phone Number	E-mail
Jim Fountain	MA-50	202-586-4342	jim.fountain@hq.doe.gov
Kurt Fisher	NA-54	301-903-7412	kurt.fisher@hq.doe.gov
Tom Jaeger	Tecolote Research	(703)414-3290	tjaeger@tecolote.com
Greg Higdon	Tecolote Research	(703)414-3290	ghigdon@tecolote.com
Mark Andersen	Tecolote Research	(703)414-3290	mandersen@tecolote.com
Lee Waymire	Tecolote Research	(703)414-3290	lwaymire@tecolote.com
Kurt Wasileski	Tecolote Research	(703)414-3290	kwasileski@tecolote.com
Frank Gines	SC/ASO	630-252-4182	frank.gines@ch.doe.gov
Kurt Deshayes	LBNL	510-486-7866	kdeshayes@lbl.gov
Thomas Altemus	SC/CH	630-252-2217	thomas.altemus@ch.doe.gov

Team members were distributed into three sub-teams covering the five functional areas addressed by the ANSI/EIA-748 standard. In order to cover the 32 guidelines during each of the interviews, team members formed three interview teams composed of members from each of the responsible functional area teams. There was also a separate sub-team that interviewed senior management in order to assess their commitment to, and use of, the EVMS. Table 4 depicts the interview team composition. The Functional Area/Interview leads are identified in bolded text.

Table 4: Interview Team
FRA EVMS Certification Review, Batavia, IL
EVMS Review Team
May 11 – 15, 2009
OECM Representative: Jim Fountain
HQ Representative: Kurt Fisher
Review Director: Tom Jaeger

Functional Team			Interview Team				
No.	Area(s)	Members	2	3		ACTG	1
A	Organization	Greg Higdon Frank Gines	X	x			
	Analysis & Mgt Reports	Same as above					
B	Planning Budgeting & Scheduling	Mark Andersen Kurt Deshayes	x	X			
C	Accounting	Lee Waymire Thomas Altemus				X x	
D	Revisions	Kurt Wasileski		x			
	Management	Jim Fountain Kurt Fisher Tom Jaeger					X X X

5: FINDINGS AND OBSERVATIONS

The FRA EVMS Certification Review resulted in three Corrective Action Requests (CAR) and six Continuous Improvement Opportunity (CIO) suggestions. Copies of the CARs and CIOs have been sent under separate cover. This is being done to comply with the DOE email server protocols.

By definition, a CAR requires a Corrective Action Plan (CAP) and its implementation by the supplier prior to the acceptance of their EVMS. CIOs, on the other hand, are suggestions originated as a result of direct observations during the review. CIOs do not require any action, but if implemented could result in the expansion of good practices for a wider application or improvements beneficial to the overall management system.

The EVMS Compliance Review is conducted to determine if the system, as described, is fully implemented on the selected project(s) and if the implementation is successful and complies with the requirements of the system description/organization's EVMS procedures.

EVMS DOCUMENTATION:

FRA provided the following documentation prior to the certification review:

- EVM System Description dated March 27, 2009 Version 3
- FRA Procedure 12.PM-001 WBS, OBS, RAM, Rev 2
- FRA Procedure 12.PM-002 Control Accounts, Work Packages, Rev 2
- FRA Procedure 12.PM-003 Work Authorization, Rev 2
- FRA Procedure 12.PM-004 Project Scheduling, Rev 2
- FRA Procedure 12.PM-005 Cost Estimating, Rev 2
- FRA Procedure 12.PM-006 Monthly Status Reporting, Rev 3
- FRA Procedure 12.PM-007 Change Control, Rev 2
- FRA Procedure 12.PM-008 EVMS Surveillance & Maint, Rev 1

The team read these documents and provided FRA with a list of comments and questions for clarification prior to the team's arrival. The overall thrust of the comments addressed the need for clarification regarding intent of statements in the documents. However, the documents generally provided the specifics regarding the processes and guidance needed to ensure that disciplined and repeatable EVMS processes are

institutionalized. However, procedural specifics are needed in such areas as accounting for all hours worked by exempt employees, budgeting and accounting for scientists' work in supporting the program, timekeeping policy, change request processing, work authorization, and processes for undistributed budget. These issues were addressed in the three CARs and six CIOs issued.

GENERAL:

An EVM system description, its related processes and procedures, and well-trained Control Account Managers (CAMs) provide the foundation for a successful EVMS implementation and accurate, reliable performance data. CAMs are responsible for ensuring the accomplishment of work in their control account(s) and are the focal points for management control. Project Control Analysts (PCAs) provide the checks and balances and quality assurance/review of much of the planning and statusing performed by the CAMs. For this reason, it is important that CAMs and PCAs are well versed in the principles of EVM and the specific EVMS policies and procedures established by FRA. The team found that some NOvA CAMs were not fully conversant with their responsibilities or the processes related to statusing their accounts. Specifically, some CAMs were unable to demonstrate their understanding of EVM in the following areas:

1. Work Authorization Process
2. Estimates at Completion (unable to discuss bottoms-up ETCs/EACs; frequency of such)
3. Variance Analysis Reporting/Writing
4. Baseline Change Control

It was also noted that CAMs at remote locations were not as knowledgeable of their CAM responsibilities as CAMs at the Fermilab site. The above were addressed by the team in CIO#2, which suggested that additional training was needed to ensure all CAMs are aware of their EVM responsibilities and the processes/procedures for carrying them out.

Neither FRA's EVMS Description nor the related procedures address how a budget or schedule overrun would be handled. Specifically, there were no provisions for an over target schedule or budget. If the project requires rebaselining because it will overrun its schedule and/or budget, there are no procedures to accomplishing the rebaseline nor is there reference to an industry approach for accomplishing such action (e.g. Over Target Schedule and Over Target Budget Handbook, May 7, 2003). The industry has provisions for such, but this is not addressed in the FRA EVMS Description.

Paragraph 4.3 of the FRA's EVMS Description addresses ANSI/EIA-748 Guidelines 20 and 21 by stating "Most projects do not bulk order material for project work, and therefore do not need to implement procedures for residual inventory tracking. Each project will determine whether either of these principles apply and, if so, will address them in the Project Management Plan." First, the NOvA project requires bulk order materials (e.g. mineral oil, PVC, fiber cable, glue) to complete the project but does not address accounting for residual inventory in its Project Management Plan. Second, FRA's EVMS, once approved, will apply to all projects in which the certified EVMS will be used. Therefore, FRA's EVMS Description and/or its related procedures must address applicable guidelines, including accounting for residual inventory. It is inappropriate to address accounting for residual inventory in project management plans, as this an EVMS issue, rather than a project management issue.

Eighteen percent (i.e. 166K of 883K hrs) of the labor hours budgeted for the NOvA project are provided by scientists and post-graduate students at no cost to the project and are not included in the Total Project Costs. These hours are provided in-kind through Memorandums of Understanding (MoUs) between Fermilab and universities and labs in the U.S. and elsewhere. The team was informed that the hours are budgeted in the performance measurement baseline (PMB). However, scientists' hours are not captured and reported in the FRA's EVMS. As a result, there are no actual hours or costs recorded and no actual cost of work performed (ACWP) reported. While it is understood that this

labor is donated by labs and universities for the furtherance of science research, it is not captured by the NOvA project for use in measuring schedule and cost performance or to predict project completion schedule or costs. The NDIA Intent Guide regarding guideline nine states that “Budgets may be stated in dollars, hours, or other measureable units”. This provision would allow the FRA EVMS to measure schedule variance using the scientists’ hours budgeted (i.e. BCWS) and the budgeted cost of work performed (BCWP) to compute schedule performance. However, this is not done because both BCWS and BCWP are computed in dollars rather than hours. Further, FRA does not load scientists’ labor rates into its EVMS nor does it capture the scientists labor hours used to complete the work. This unreported and uncOSTed labor exists across all level 3 work breakdown structure (WBS) elements. This issue was recorded as CAR#1.

5.1 Organization

The scope of the team’s review consisted of verifying the ANSI/EIA-748 organization guidelines (GL) 1 through 5 are represented in the FRA EVMS Description Version 3, dated March 2009 and implemented in the execution of the NOvA Project.

The organizing process is concerned principally with: ensuring that each part of the EVMS is properly established; defining the work required to be performed; assigning the tasks to organizations responsible for performing the work, including major subcontractors; facilitating the collection and development of information for management purposes; and identifying organizational resources that facilitate the preparation of accurate and timely estimates of project cost and schedule completion. The sub-team assessed whether the work required to be performed was identified and assigned to organizations responsible for performing the work, including major subcontractors. Within guidelines 1-5, the organizational team reviewed the following documents:

- FRA EVM System Description, March 2009, Ver 3
- NOvA Project Execution Plan (PEP)
- NOvA Project Management Plan (PMP)

- NOvA Technical Design Report (TDR)
- WBS Dictionary for the NOvA Project, NOVA-doc-253, Version 1.6, dated 5/12/09
- NOvA Dollarized RAM, dated 4/29/09
- FRA Procedure 12.PM-001, Revision 2, dated 3/27/09, “Project WBS, OBS, RAM”
- FRA Procedure 12.PM-002, Revision 2, dated 3/27/09, Control Accounts, Work Packages, Planning Packages
- Control Account Plans, by CA, as of change revision and date (e.g. CAP-RAM-1.6-AFTER-CR062.xls, dated 4/28/09)
- Work Authorization Document (WADs)
- Open Plan Schedules, Gantt Charts, etc., dated 5/7/09
- Contract Performance Reports, NOvA Program, 3/31/09
- Contract Performance Report, Format 5 – Explanations and Problem Analysis, NOvA Program, 3/31/09

Interviews were conducted with the following CAMs: Ken Heller, Steve Dixon, Pat Lukens, Paul Derwent, Rich Talaga, Mike Martens, Carl Bromberg, and Leon Mualem.

DISCUSSION

GLI: Define the authorized work elements for the program. A work break down structure (WBS) tailored for effective internal management control is commonly used in this process.

The WBS is a product-oriented division of project tasks depicting the breakdown of work scope for work authorization, tracking, and reporting purposes that facilitates traceability and provides a control framework for management. The statement of work (SOW) for the project should reflect all work to be performed. A critical aspect is to establish the organizational responsibility for segments of the work and to define in-house effort versus subcontracted effort. The WBS also facilitates communications as it establishes a common frame of reference for customers, management and integrated product teams (IPT). A WBS dictionary provides the mechanism for capturing the correlation between the SOW and the WBS. When effort is to be subcontracted out, the applicable subcontractor is identified and related to the appropriate WBS element and/or organization charged with acquiring the subcontracted item.

The development and maintenance of the WBS for the project is described in Section 2.1 and 2.2 of the FRA EVMS Description and EVMS Procedure 12.PM-001. The lowest level in the NOVA WBS is level four. Level three is the control account level and the reporting level.

Only one WBS is used for the NOVA project. It contains all project work including revisions for authorized changes and modifications. The WBS for NOVA is initially defined for the construction phase in the Project Execution Plan (PEP) which represents the SOW between DOE and FRA. The PEP references the Technical Design Report (TDR) which provides extensive definition of the project and its products. The PEP also includes a CD-4, Project Closeout Definition which describes exit criteria for completion in terms of final end items. The Project Management Plan (PMP) authored by the Project Manager which is consistent with this document series. The team reviewed and found that a single control account was assigned to each WBS. The WBS is extended at a minimum to the control account level, and below to the work package/planning package level. The work authorization documents (WADs) reference the WBS Dictionary. The WBS dictionary defines the work scope for each element in the WBS at the control account level. Additional levels were observed in the Open Plan schedule for detailed Work Packages.

GL2: 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.

The organizational breakdown structure (OBS) reflects the way the project is functionally organized. To assign work responsibility to appropriate organizational elements, any WBS and OBS must be interrelated with each other. The OBS identifies the organization responsible for each segment of work, including subcontracted and intra-organizational effort.

When effort is to be subcontracted out, the applicable subcontractor is identified and related to the appropriate WBS element and/or organization charged with acquiring the subcontracted item. When designating the internal organization responsible for managing subcontracted efforts, the prime contractor must assign a manager with sufficient authority and responsibility to be able to ensure the subcontractor will perform to the terms and conditions of the project. This person should have all the same responsibilities as other control account managers within the program organization.

The FRA organization, as described in the NOvA PMP, organization charts, and Responsibility Assignment Matrix (RAM) is an organizational framework that is used for identification of accountability, management, and approvals of all authorized scope.

The team observed that the EVM documentation and explanation had an excellent flow of material connecting the PEP, WBS, OBS, WAD, Control Account Plan, dollarized RAM, and WBS Dictionary. The OBS is a projectized organization set up for management of the NOvA project that reports to the Particle Physics Division of FRA. This creates an unambiguous link between WBS and OBS to include the collaborating institutions (universities and/or laboratories). This is clearly observed in the dollarized RAM and consistently flows through planning, authorization, etc. to reporting. The CAMs consist of FRA employees as well as scientists from collaborating organizations.

GL3: 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.

The control account is the main action point for planning and control of effort. All aspects of the system come together at this point including budgets, schedules, work assignments, cost collection, progress assessment, problem identification, and corrective actions. Most management actions taken occur as a result of significant problems identified at this level. The control account levels should be determined by the scope of

the management tasks. The proper levels should not simply be an arbitrary determination or the result of one "across-the-board" level for control accounts.

The integration of the technical, schedule, and cost elements of the project through detailed, intermediate and summary project plans includes schedules, budgets, authorization of work, and accumulation of costs, all consistent with the budget plan. The integration of planning, scheduling, budgeting, work authorization, and cost accumulation management processes provides the capability for establishing the PMB, identifying work progress, and collection of actual costs facilitating management analysis and corrective actions. The WBS and OBS allow summarization of cost data from the detail level through both the WBS and the OBS to the appropriate project level needed for management insight and control.

The work tasks are assigned to a WBS and OBS and are traceable to the scheduling system and the cost collection system. Establishment of control accounts at the various intersections of the WBS and OBS facilitates the linkage between the planning, scheduling, budgeting, work authorization, cost accumulation, and performance measurement processes. The control accounts should be determined by the scope of the management tasks.

All items trace to the WBS and OBS for the various management processes of interest. Control accounts form the link between the work to be accomplished and the organization/staff. WADs are tied to the WBS dictionary and updates, which are the means of defining and maintaining the WBS. The WBS is used in the Open Plan program management system for scheduling. The resource loaded schedules are used to form preliminary estimates for budgeting and identification of performance measurement techniques. Output from Open Plan flows to the Cobra system for budgeting, cost accumulation, and performance measurement. FRA schedules integrate several of these items such as start and finish dates, percent complete, baseline start and finish dates for activity IDs and activity names. Schedules developed in Open Plan can be traced

between the levels and to the start/finish dates with the control account plans (CAPs) and WADs. Costs are accumulated and earned value calculated at the control account level for the R&D WBS 1.0 items and at a lower level for Construction WBS 2.0 items.

GL4: Identify the company organization or function responsible for controlling overhead (indirect costs).

The supplier establishes an indirect budgeting process which includes the formal assignment of duties and limits of responsibility, a description of the indirect system, and policies and procedures applicable to the establishment and control of indirect costs. Assignment and control of indirect resources must be clearly defined and should be commensurate with the authority to approve or avoid the expenditure of resources.

The “Planning and Controlling Indirect Costs” document (dated 3/31/09) identifies the Senior Management Team, (i.e., Deputy Director, Associate Directors, CFO, and Lab Financial Planning Manager) as responsible for controlling, determining and approving the indirect budgets/rates. However, the FRA Director is the final decision maker. The process begins two years prior to the year of execution and is finalized by August/September prior to the beginning of the year of execution, i.e., October 1. The overhead pools are treated as distinct DOE Budget and Reporting categories and are monitored and controlled as FRA B&R funding categories. The FRA accounting system tracks indirect costs and obligations throughout the year. Budget (overhead pools) is considered to have been used as soon as a legal obligation for goods and services has been made, rather than when goods and services are delivered. The Budget Office monitors and produces reports on a monthly basis comparing budgeted indirect costs to actual indirect costs at the organizational, project, and funding category (indirect pool) levels to actual obligations and provides this information to the Senior Management Team. If analysis shows that any organization or project is not following their budget plan, the member of the Senior Management Team responsible for that organization or project is responsible for resolution

GL5: 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.

The control account is the lowest level in the structure at which the comparison of actual costs to planned budgets and earned value are required. The cost collection point must be at a level which will identify the cost elements and factors contributing to cost and/or schedule variances. Managerial authority and responsibility for corrective action should exist at the control account level making it the key management control point in the system.

The team observed that the NOvA Dollarized RAM, dated 4/29/09, which identified the CAMs, tracked directly to the WBS, CAPs, and WADs. Control account planning, scheduling, statusing, reporting, and variance analysis is being accomplished at the control account level. The team observed that CAMs were able to demonstrate that their control accounts were the point where their WBS tasks and OBS responsibilities intersected. The control account plans and WADs identified the time-phased plan for work accomplishment, elements of cost, resources planned to execute the tasks, and the earned value methods planned to status the effort. CAMs presented Contract Performance Reports (CPRs) Format 1 showing the performance data by WBS. There is also a CAM summary that provides a roll-up of the performance, equivalent to performance data by OBS since there is one CAM per OBS element.

Conclusions and Recommendations

FRA is compliant with the Organization guidelines of the ANSI/EIA-748 as described above.

5.2 Planning, Budgeting and Scheduling (PBS)

The scope of the team's review consisted of verifying that the ANSI/EIA-748 Planning, Budgeting and Scheduling guidelines 6 through 15 are represented in the FRA

EVMS Description dated March 2009 and implemented in the execution of the NOVA project.

The scheduling process defines the schedule hierarchy that must be established to ensure proper, effective planning, and statusing of all effort on the project. The work/budget authorization process addresses the requirements for the project organization to integrate budget and work planning requirements with the program schedules to ensure completion of contractual efforts.

The sub-team focused its attention on assessing if the work required to be performed was identified and assigned to organizations responsible for performing the work, including major subcontractors.

In the assessment of GL 6-15, the PBS team reviewed and used the following documentation:

- Open Plan Project Master Schedule, Intermediate Schedule, Detailed Schedule, Critical Path, and Constraints List
- Work Authorization Documents (WADs)
- Cobra Control Account Plans (CAPs) and breakdowns
- Control Account Manager (CAM) documentation
- Performance Measurement Baseline (PMB)
- Responsibility Assignment Matrix (RAM) - dollarized
- Variance Analysis Reports (VARs)
- Work breakdown structure (WBS).
- WBS Dictionary
- FRA EVMS Description
- EVMS Procedures

DISCUSSION

GL6: 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.

The scheduling process defines the schedule hierarchy that must be established to ensure proper, effective planning and statusing of all effort on the program. Successful

management requires the integration of the technical, schedule, and cost aspects of the program. Schedules that result from this integration show the planned time required accomplishing the technical scope of the contract. When projects experience problems in technical performance, either schedule delays, cost problems, or both may follow. An adequate scheduling system will facilitate the depiction of the plan to accomplish the technical scope, the actual technical progress against that plan, and estimates of the time required completing the remaining technical scope. The schedule baseline, progress, and estimated time to complete all should readily integrate with the financial depiction (budgets, earned value, and estimate cost to complete) of the technical scope.

The scheduling system should contain a master schedule and related subordinate schedules that provide a logical sequence from the detail to the summary level. Intermediate schedules should be established, if needed, to provide a logical sequence from the detail level schedule to the master program schedule. The scheduling system must also provide for the interdependencies between organizations and/or WBS elements at the level appropriate for efficient program management. Detailed schedules should support control account and work package start and finish dates.

One aspect of schedule integration that provides unique problems is the integration of subcontractor schedule information into the prime contract schedule. This integration should be accomplished in a manner that provides an accurate depiction of the impact of subcontractor performance on the project schedules.

The intent of GL#6 is to ensure the scheduling process documents and the resulting project schedule provide a logical sequence of work leading to a milestone, event, and/or decision point needed to ensure that the schedule supports the project objectives. Team members working to the same project schedule is essential for monitoring progress, analyzing variances, and tracking corrective actions. Schedules contain timelines to the project plan to accomplish the technical scope, allow managers to

evaluate actual progress against the established baseline, and forecast completion dates for remaining work.

In reviewing the CAMs' WBS and associated detailed schedules there was evidence of clear definition of what constitutes commencement and completion of each control account (or lower level task/activity). All authorized work had been planned in control account plans and work packages and all tasks interdependencies (i.e. predecessors and successors) identified. Open Plan used critical path scheduling to support project objectives. The master schedule agreed with the project objectives, included all key events, and reflected a logical sequence of events. Evidence showed that team members are working to the same project schedule and using it to monitor progress, analyze variances, and track corrective actions. CAM schedules included a timeline to the project plan that identifies the technical scope, allowing managers to evaluate actual progress against the established baseline, and to forecast completion dates for remaining work. There was evidence that there was horizontal and vertical integration to the project objectives and milestones.

GL7: Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.

The intent of GL#7 is to ensure that objective interim performance measures within control accounts (or lower level tasks/activities) have been identified to enable accurate performance assessment each month. The scheduling system should cover all specified work and incorporate program milestones that are meaningful in terms of the technical requirements of the contract. The schedule should provide for significant events, constraints, and interfaces to be clearly identified. It should provide schedules such that actual progress can be related to the plan and contain forecasts of expected future progress. Such schedules should identify key milestones and activities that recognize significant constraints and relationships. A key feature of the scheduling system is that it establishes and maintains the relationship between technical achievement and progress status.

The team verified that the master schedule included key program and contractual requirements and reflected the milestones, events, deliverables and program decision points required by the PEP. Lower tier schedules reflected task/activity start and finish dates that were compliant with the project milestones and tasks based on physical accomplishment. These control accounts (or lower level tasks/activities) align with the objective interim performance measures to enable accurate performance assessment. The schedules and turnaround reports show evidence of the performance measures including ground rules and assumptions. Schedules reflect the appropriate use of earned value methods such as 0-100, 50-50, percent complete, and units to ensure performance is measured as objectively. Interim measures were based on the completion criteria developed and identified in the ground rules & assumptions column in the turnaround report. The schedule and updating process showed evidence that it establishes and maintains the relationship between technical achievement and progress statusing. Physical products appear to be well defined in the schedule, including peg points for percent complete activities.

GL8: 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.

The baseline establishment process addresses the requirements for the project organization to integrate budget and work planning requirements with the program schedules to ensure completion of contractual efforts. The assignment of budgets to scheduled segments of work produces a plan against which actual performance can be compared. This is called the performance measurement baseline (PMB). The PMB

should be in place as early as possible after authorization to proceed. The relationship of individual work tasks with the time-phased resources necessary to accomplish them is established at the control account level.

The PMB should include indirect budgets. Budgets should be included in the time-phased control account budgets, summary level planning packages, or undistributed budget. Irrespective of the level at which indirect budgets are allocated or assigned to the project, average indirect rates for the life of the contract or control account may cause too much distortion in cost performance.

The intent of GL#8 is to verify that the assignment of budgets to scheduled segments of work produces a plan against which actual performance can be compared and ensure that budgets are established for all authorized work. At no time should a control account manager have scope defined without a corresponding budget. The PMB is a vehicle for comparing work accomplished to work scheduled, and comparing actual costs to the value of work performed. The PMB represents the formal plan of each control account manager to accomplish all the work assigned in the amount of time allotted and within the amount of budget authorized.

It was observed that the performance measurement baseline documentation, which included a WADs, WBS Dictionary, Basis of Estimates (BOE), CPRs Format 1, Control Account/Chargeable Task Code / Work Package Summary, and CAPs, provided evidence of a complete PMB.

The schedule was resource-loaded appropriately. The time-phased man-hour budget for each control account was imported from the Open Plan schedule to Cobra and the budgets were developed in Cobra using appropriate labor and burden rates.

The team noted that control account WADs contain little meaningful information, but instead provided links to supporting documents, such as the CAP, WBS Dictionary, Control Account/Chargeable Task Code, and schedule. WADs contained electronic

signatures, but the date of approval was not evident. The team submitted CIO # 1 suggesting that the WAD be revised to include additional data that would provide the CAM more useable information and provide better traceability of changes to the document.

GL9: Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.

The intent of GL#9 is to ensure that budgets are established for all authorized work and the work to be done by the responsible organizational elements is identified through a work process. This guideline encompasses several processes: Authorize Responsible Organization to Proceed with Work, Authorize Work and Budgets to the Responsible Organization, Establish Work Packages for Budgeted Material Items, Schedule for the Authorized Subcontracted Effort, and Budget for the Authorized Subcontracted Effort.

All budgets were observed to be established and documented in CAPs and WADs. The budgets in the CAPs were estimated using appropriate resource types (labor, material, etc.) and the schedule was resource-loaded. Rates were properly burdened for all institutions. Control account budgets identified component cost elements as evidenced in CAPs. CA budgets appeared appropriate for the work being performed.

The team noted that the labor of scientists and post-graduate students supporting the NOvA project was budgeted but is not being captured and/or reported in the FRA EVMS. This is not in compliance with the GL#9 and, as a result, the team wrote CAR#1.

GL10: 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.

The intent of GL#10 is to ensure that the effort contained within a control account is distributed into either work packages or planning packages. This guideline also encompasses several processes: Assigning of Performing Organizations, Distributing the Control Account Effort into Work Packages and Planning Packages, Tying Work Package Budgets to Information in Supporting Systems, and Establishing Work Packages for Budgeted Material Items and Work Packages for Subcontracted Effort.

Work packages are natural subdivisions of control accounts and constitute the basic building blocks used in planning, controlling, and measuring project performance. A work package is simply a low-level task or job assignment. It describes the work managed by a specific performing organization and serves as a vehicle for monitoring and reporting work progress. Effective control and completion of the work requires that each work package be assigned to only one performing organization. Establishing and maintaining control at the Control Account level permits flexibility in the management of resources at the lower detail levels through work package re-planning.

When effort at the control account level cannot be adequately defined into work packages, the contractor may retain budget and scope in a planning package. Work for a given cost account which cannot be planned in detail at the outset should be divided into larger segments and placed into planning packages within the cost account. This package must be assigned to an organization for maintenance and for detail planning into work packages at the earliest possible time.

Effort contained within a cost account is distributed into either work packages or planning packages. Work packages are single tasks assigned to a performing organization for completion. Work packages should be natural subdivision of cost account effort. Each work package should result in a definable end product or event. When work packages are relatively short, little or no assessment of work-in-process is required. As work package length increases, work-in-process measurement becomes more subjective, unless work packages are subdivided by objective indicators such as discrete milestones with pre-

assigned budget values or completion percentages. When progress will be measured through the use of a standards-based performance measurement system, a direct relationship between the standards planned and the budget for the associated effort must be established.

It was observed that budget was broken down into work packages only. No planning packages were used in this project. Work packages were tasks assigned to a performing organization for completion, and were shown to be natural subdivisions of control account effort resulting in a definable end product or event. Work package descriptions clearly distinguished one work package effort from another. When work packages were relatively short, the 0-100 or 50-50 EV method was usually used. The longer work packages used either percent complete with peg points or the unit method. Control accounts were well defined and identified work as measurable when appropriate.

GL11: Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.

All control accounts must contain a budget, schedule, and scope of work and should realistically represent the manner in which work is assigned and budgeted to the organizational units. In all cases, the value of the budget assigned to individual work packages and planning packages within the control account must sum to the total value authorized for the control account. At no time should a control account manager have a budget with no assigned scope of work. Conversely, at no time should a control account manager have scope defined without a corresponding budget.

Work was detailed planned into work packages using time phased budgets within control accounts without the use of planning packages. Budgets were identified in CAPs summed to the control accounts. Work packages summed to the control account budgets, which were consistent with the control account budgets identified in the WADs and RAM.

GL12: 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.

Each task on the project needs to be assessed using the best method to budget and measure its progress toward completion. Level of effort is defined as having no measurable output or product at the work package level. LOE should be held to the lowest practical level.

For discrete work packages, accomplishment can be measured based on the completed pieces of work but level-of-effort (LOE) is "measured" through the passage of time. LOE activity should be separately identified from discrete work packaged effort to avoid distorting that which is measurable.

Budgets for level of effort activity must have a sound basis of estimate and be time-phased to properly reflect when work will be accomplished. LOE budgets should be separately substantiated and planned as direct labor, material/subcontract, or other direct costs. LOE activity should be budgeted on a time-phased basis for control and reporting purposes. Small amounts of LOE and discrete effort may be mixed within the same control account; however, the control account manager must ensure visibility into the performance of the discrete effort.

While there appeared to be a lot of level of effort (LOE) work packages, review of the work being done verified that the work packages were not measurable or impractical to be measured. CAMs were aware of the requirement to keep the use of LOE to a minimum, and appeared to do so in their planning of control accounts. Where LOE was used, it was time phased and was separated from measurable work packages.

GL13: 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.

Realistic time-phased budgets and forecasts for indirect costs must be established by the organization. The supplier should apply the most appropriate indirect rates so that a valid PMB can be established. Indirect budgets should be reviewed at least annually or when major changes are identified in factors affecting indirect costs.

FRA's divisions/sections establish the indirect (overhead, burden, and G&A expense) budgets at the appropriate organizational level for each pool and cost sub-element. There is an indirect budgeting/forecasting process. As the FRA contract is covered under the Cost Accounting Standard, there is an approved disclosure statement. The overhead budgeting process is addressed in FRA accounting policies and procedures. Overhead pools are tracked monthly and variances are managed by the pool owners. Monthly indirect activity reports were reviewed with the responsible management and rates were found to be appropriate. Indirect rates are kept current and tend to be more stable at the Fermilab location. Forecasted rates extend out one year. FRA uses consistent practices for managing and monitoring indirects. Project managers are notified of changes on a timely basis. The team performed some verification of the indirect costs being applied to the NOvA program and the amounts were supported.

GL14: Identify management reserves (MR) and undistributed budget (UB).

In most projects, there is considerable uncertainty regarding the timing or magnitude of future difficulties. The use of MR provides the project manager with a capability to adjust for these uncertainties. Adequate identification and control of MR is necessary. MR budget and its use should always be accounted for at the total project level. Normally, it is retained and controlled at this level, although in some cases it might be distributed to and controlled at lower management levels. In any event, MR is maintained separately from undistributed budget. There is no such thing as "negative management reserve".

Management reserve is not a contingency that can be eliminated from contract price during subsequent negotiations or used to absorb the cost of contract changes. The contractor should not be required to use existing MR to provide budgets for authorized, but undefinitized, work or other modifications to authorized contractual efforts.

Budgets applicable to contract effort which cannot be specifically identified to a WBS or organizational elements in a timely manner are referred to as UB. The establishment of UB may be necessary when project changes are authorized too late in an accounting month to be distributed in that month. The budget should be distributed to an appropriate WBS or organizational elements and control accounts as quickly as possible.

For authorized work, which has not been negotiated, the project may maintain budgets in the UB account until negotiations have been concluded, allocating budget only to that work which will start in the interim. After negotiations, the remaining budget should be allocated appropriately.

The team observed that FRA's use of management reserve/contingency, which is not in agreement with DOE G 413.3-10 or the EVMS standard. In CIO #3 the team recommended modifying the FRA EVMS to reflect a single DOE-compliant use of the terms Management Reserve and Contingency and incorporating the proper definitions across FRA EVMS documents. It was also recommended to remove any references to MR/Contingency that are outside compliance with DOE, ANSI or NDIA terminology or processes relating to MR and Contingency.

FRA does not provide for or have a process for use and management of undistributed budget. Specifically, paragraph 3.5.2 of the FRA EVM system description states "At the present time, Fermilab projects do not employ undistributed budget as described in the NDIA Intent Guide." The team could find no process that addresses the tracking, use, distribution, and accounting for undistributed budget. While there is a UB log that shows funds in a UB status, that status is instantaneous, as it is negated in the next line by a debit or credit to management reserve. Undistributed budget is a temporary

holding account and is a means for accounting for budget that has not yet been distributed to or has been removed from control accounts. The team wrote CAR # 2 describing this non-compliance issue.

GL15: Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.

A project baseline reflects the common agreement between the two parties and a reference point for progress assessment. It provides recognition of contractual requirements and precludes unauthorized changes to the performance measurement baseline. The project target cost must be reconciled with the performance measurement baseline and management reserve for clarity. The supporting baseline documentation must also be reconcilable.

FRA uses Open Plan and COBRA to track and manage the performance management baseline. The team compared the NOvA contract value with the performance measurement baseline (PMB) and management reserve and found them in agreement. Control account budgets summed to the PMB and WADs for control accounts were in agreement with the control account CAPs. Control account budgets were in agreement with the RAM and the month CPRs.

Conclusions and Recommendations

FRA is not compliant with the Planning, Budgeting and Scheduling guidelines of the ANSI/EIA-748 due to GL 9 (CAR #1) and GL #14 (CAR #2) not being in compliance with the EVMS standard.

5.3 Accounting

The scope of the team's review consisted of verifying that the ANSI/EIA-748 accounting guidelines and indirect management guidelines #4, 13, 16 through 21, 24, and 30 as represented in the FRA EVMS Description dated March 2009 and implemented in the execution of the NOVA project.

The accounting system structure supports the accurate accumulation of costs according to the FRA Cost Accounting Standards Disclosure Statement. The intent is to ensure there is a timely and accurate transfer of actual cost information from the accounting system into the EVMS. Also, it is important that management of indirect costs includes a structured and defined process for establishing, implementing, controlling, and evaluating indirect budgets and costs that are incurred and allocated to the individual projects. Since indirect costs are normally handled in organizations that are not project peculiar, there should be some method for assigning the appropriate values for indirect cost (budgets and actual) to all affected projects.

The sub-team focused its attention assessing whether the work required to be performed was identified, assigned and charged in a manner consistent with the budgets in FRA's formal system controlled by the general books of account to organizations responsible for performing the work, including major subcontractors. Specifically, the sub-team assessed FRA policies and practices in organizing, budgeting, managing, monitoring, and correcting direct (labor and material) and indirect (fringe, overhead, general and administrative (G&A)) accounts. The sub-team also evaluated the FRA process of reviewing and controlling direct and indirect accounts to the organizational structure, control accounts, contract, schedule, reports, and adjustments. Lastly, the sub-team attempted a series of traces to ensure reliability within the data. Documents reviewed included the following:

- FRA EVMS Description
- NOVA Work Breakdown Structure (WBS)
- NOVA WBS Dictionary
- Cost Accounting Disclosure Statement, Revision 3
- FRA Expenditure Accounts and Applied Burdens
- NOVA Chargeable Task Codes
- FRA Fringe Budget vs. Actual Variance Report
- NOVA Budget vs. Actual Report
- FRA Organization Chart
- FRA Finance Section Organization Chart

- FRA Financial Statements and Schedule September 30, 2008 (with independent auditors' report)
- NOvA's Implementation of FRA's Earned Value Management System, December 2008
- FRA Accounting Policy and Procedures
- FRA Labor Capture and Distribution Policy and Procedures
- FRA Indirect Burden Allocation Policy and Methodology
- FRA Indirect Summary (Budgeted vs. Actual, Monthly Report, March 2009)
- FRA Cost Budget Report, March 2009
- FRA Overhead Report, Quarterly
- FRA FY08 Actual Indirect Rates & FY09 Estimated Rates
- FRA FY09 Budget Guidance, August 2008
- FRA Planning and Controlling Indirect Costs
- NOvA Dollarized RAM
- NOvA Key Assumptions, May 2008
- FRA Invoices (plus backup)
- Traces of Invoices to the Accounting System to the Chargeable Task Number
- Example of Apportionment of Total Hours Worked
- Allocation Uncompensated OT
- UM Invoice – low level detail trace to transaction in the accounting system
- UM Invoice (issued to FRA traced to the EVMS)
- Trace of subcontract and material purchases accrual from the accounting system to the EVMS
- Trace recording labor from timekeeping system to accounting system to EVMS
- Trace recording of direct labor for exempt and non-exempt
- FRA General Ledger Entry Support (Excel Spreadsheet)
- FRA Oracle General Ledger
- Monthly Status Reports - including Cost Performance Reports (CPR)

The team interviewed the following individuals: Cindy Conger (CFO), Michael Rhodes (Chief Accounting Manager), Connie Trimby (Budget Manager), Suzanne Saxer (Project Controls)

DISCUSSION

GL16: Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.

The accounting system must be capable of accounting for all resource expenditures on an "applied" basis (i.e., on an "as-used" or "as-consumed" basis). This requirement creates few difficulties in the categories of direct labor where time cards are used or other direct charges where services are rendered on some type of dollars per-unit basis. In the area of material accountability, there is considerable variation among the respective processes of accounting for material usage. Recognizing the absence of uniformity in material methodologies, the CAS provides relaxed interpretations as to what constitutes an "applied" basis of material accounting, as well as alternatives for acceptance on an "other-than-applied" basis.

The accounting system should ensure that actual costs for effort identified as apportioned effort are collected properly so that valid comparisons to the budgets for the apportioned effort may be made.

The team determined through interviews with Finance Department Managers, NOvA FFM, and CAMs and traces that the cost charging structure in the accounting system ensures costs collected can be directly compared with associated budget for that work. Also, costs reported in the accounting system agree (based on sample traces) with the EVMS and accruals are accomplished to support proper matching of period costs to EV taken.

FRA indirect burden rates are determined by the Budget Office and the Accounting Department jointly. Normally provisional rates are based upon the Laboratory's current year budget of direct and indirect costs. However, in the case where the approved budget for the upcoming year has not been finalized, or in the case of a new methodology with which the Lab has little or no experience, the rates may be based on prior year(s) actual rates. Indirect costs are monitored throughout the year by comparing budgeted to actual costs on a monthly basis. The monthly reports are distributed to the responsible managers, who must respond to unusual variances. As a result of this review

process, FRA has made adjustments prior to the end of a fiscal year (e.g., January 2009 due to impacts from DOE funding).

The team observed that costs are captured at the same level as budgeted, i.e., at the control account level or lower. FRA's EVMS Description states on page 24, section 4.1.2, that "actual costs are collected so that direct comparison with associated budgets can be made at the appropriate WBS level(s)." The team traced a sample of transactions for direct labor, material, and subcontracts from the accounting system (Oracle Project Accounting (PA)) to the EVMS (COBRA) and verified that the costs were collected at the level budgets were being created.

During interviews with the FFM and CAMs, the team discovered that not all CAM's were involved in the invoice approval process. It was not a FRA defined process that the CAMs be part of the invoice approval process but it was identified by the team as a best practice recommendation. This recommendation is documented in more detail in CIO #4.

Lastly, the team determined there is not an auditable trail beyond submitted employee time records that would validate whether exempt employees' efforts are allocated to multiple projects proportionate to their actual effort. Hours recorded may or may not represent total hours actually worked. Through review of FRA policy and procedures documentation and interviews with both accounting department and project personnel it was determined that the FRA timekeeping system/process does not capture total hours worked. Also, there are no detailed procedures providing guidance on recording time worked that ensures consistent/accurate recording of time when charging to more than one project/task.

The timekeeping systems/processes (for exempt employees working more than one project or charging time to more than one task within a project) as defined creates an internal control weakness allowing for unnecessary inaccuracies in how exempt

employees record their time in relation to work assignments. This finding is documented in CAR#3.

GL17: 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.

The team observed that a charge number structure exists for each unique work activity (Control Account). There is no control account that is charged to two or more WBSs. Costs at the control account level can be summarized directly into its associated WBS. The team also verified that the accounting system records costs below the control account level consistent with the chargeable task structure.

GL18: 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.

The same requirement for accurate cost summarization (Guideline #17 above) applies to the project organization as well. The integrity of the data summarization begins at the control account level through the project structure to the highest-level organizational element without costs being allocated to two or more higher-level elements. Again, a carefully developed project structure and cost collection structure will assure accurate data summarization for management use.

The RAM clearly demonstrated that activities are only assigned to one responsible organization. The project RAM and WBS tie control accounts to the contractor's organizational elements without allocation of a single control account to two or more organizational elements.

GL19: Record all indirect costs which will be allocated to the project.

Overhead costs represent expenses, which benefit more than a single contract. The accounting process should record all allocable indirect costs consistent with the

provisions of the supplier's disclosure statement. The supplier's procedures and/or EVMS description should specify the level at which indirect cost information will be allocated to individual contracts.

FRA's indirect planning and control, budgeting and accounting procedures demonstrate that the responsible organization for incurring indirect cost corresponds to the level of management control. Their organization structure is consistent with the management responsibility for controlling indirect staff and ability to influence indirect costs.

The FRA policy is to allocate indirect expenses (Material/Service Acquisition, Common Site Support, Program Support and General and Administrative Expenses) to all final cost objectives. All costs incurred are subject to the indirect burden allocation including the total cost of goods and services procured through FRA. This policy is consistent with the requirements of the prime contract with DOE and complies with their CAS Disclosure Statement.

The team interviewed the FRA financial department managers, NOvA Field Financial Manager and worked through multiple traces to determine that FRA's pooled costs are allocated in accordance with the CAS Disclosure Statement and FRA FY09 Provisional Labor, Indirect and Shop Rates (Revised January 2009).

GL20: Identify unit costs, equivalent unit costs, or lot costs when needed.

The supplier may be required to account for the production of material items in a manner that facilitates development of unit costs, equivalent unit costs, or lot costs. This is normally a requirement of contracts where multiple units are being produced in a production or production-like environment.

This GL is meant for a manufacturing environment and requires an accounting system capable of isolating unit and lot costs in a production environment. This

requirement does not apply to FRA projects as they do not involve manufacturing of units or lots.

GL21: for EVMS, the material accounting system will provide for:

1) Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques.

2) 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.

3) Full accountability of all material purchased for the project including the residual inventory.

Acceptable costing techniques should be used to fully account for all material purchased for the project. To ensure effective performance measurement of material takes place, the supplier's accounting system should have the following characteristics:

1. An accurate cost accumulation system, which assigns material cost to appropriate control accounts in a manner consistent with the budget. Actual costs for material items should be reported in the same accounting period that earned value is taken for the material to facilitate management analysis.
2. Where actual costs are not available in a timely manner, assign estimated costs to the material item and make adjustments when actuals are recorded in the accounting system. This may be done outside of the accounting system as long as the project is able to reconcile this value to the accounting system actuals.
3. Account for all material and purchased parts in a manner appropriate to their value and significance.

FRA's policy and procedures for material is to accrue the cost when received. It is accomplished through an automated process in Oracle (accounting system). Every month a system generated entry accrues received items not yet processed in Accounts Payable (AP). The item looks for goods that have been received and entered by the Receiving Department, but not yet matched to an invoice in AP. If a Purchase Order (PO)

and a receipt are in the system, an amount is automatically accrued via a system generated entry. There are two situations of goods received that require special attention. The first is when an item is received at an off-site location, and the second is when an item is shipped FOB shipping point. For these situations it is the responsibility of the Procurement Department and/or requisitioner to provide the appropriate documentation sufficient to confirm delivery to the Receiving Department for the receipt to be entered. The team determined through interviews with the NOvA FFM, CAMs, and multiple traces that the material accrual process was working as defined in the accrual procedures.

Conclusions and Recommendations

FRA is not compliant with the accounting guidelines of the ANSI/EIA-748 as described above and documented in CAR #3.

5.4 Analysis and Management Reports

The scope of the team's review consisted of verifying the ANSI/EIA-748 Analysis and Management Reports Guidelines 22 through 27 are represented in the FRA EVMS Description dated March 2009 and are implemented in the execution of the NOvA project. This process is the evaluation and feedback loop of the EVMS. Management actions are determined based on lower level analysis of problems, the corrective actions are implemented, and their effect on cost and schedule performance is projected.

The sub-team focused on assessing if the EVMS performance data reconciled to the general books of account and provided for overall management control. The sub-team also focused its attention in assessing whether significant cost and schedule variances are identified, reasons for the variances are provided, and whether corrective actions are taken and tracked. Another area of focus was to determine if revised estimates of cost at completion were developed on a regular basis.

Within guidelines 22 - 27, the sub-team reviewed the following:

- Project Management Plan (PMP)
- NOvA Dollarized RAM, dated 4/29/09

- Contract Performance Reports (CPR) Format 1
- Contract Performance Report, Format 5 – Explanations and Problem Analysis, NOvA Program, 3/31/09
- FRA Procedure 12.PM-006 , Revision 3, dated 3/27/09, “Monthly Status Reporting”

Interviews were conducted with the following CAMs: Ken Heller, Steve Dixon, Pat Lukens, Paul Derwent, Rich Talaga, Mike Martens, Carl Bromberg, and Leon Mualem.

DISCUSSION

GL22: a) 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:

1) Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.

2) 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.

It is essential that all actual costs used for variance analysis come directly from, or be reconcilable with, the accounting system. In some cases, it may be necessary to use "estimated costs" to avoid artificial variances that might be created by the time lag costs being recognized by the accounting system. The EVMS will use actual cost data from the supplier accounting system as appropriate for accurate reporting of program performance.

To ensure valid comparisons of scheduled effort and actual costs to earned value, it is important that an appropriate technique for assessing progress be established for each segment of work. Objective methods should be used where practicable.

The FRA system produced monthly reports on the amount of planned budget and the amount of budget earned for work completed (schedule variance). Also, the CAM compares the amount of budget earned with the actual direct costs (cost variance). These

are calculated in COBRA using the specified performance measurement technique. Procedure 12.PM-006 identifies thresholds which are the basis of color-coded variance reports at the control account level. Examples were shown where the variance analysis was performed at a lower level to explain the cause and determine action.

GL23: 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.

Scheduling should interface with other elements of the EVMS to the extent necessary for measurement and evaluation of project status. The scheduling system should provide current status and forecasts of completion dates for all authorized work. The summary and detailed schedules should enable a comparison of planned and actual status of project accomplishment based on milestones or other indicators used for control purposes. Analysis of deviations from planned activities provide management with visibility into needed actions to either return the project to plan or compensate for these deviations in cost, schedule, or technical areas.

Unfavorable cost or schedule conditions are usually caused by technical difficulties. Quantitative information as to technical status is desirable and should be supplemented by narrative reports. As work progresses, determine the adequacy and quality of the work performed by making inspections, tests, or other types of technical measurements. If the results are satisfactory and no corrective action is required, the work proceeds. If, on the other hand, deficiencies are found, consider alternatives for corrective action; for example, redesign, scrap and remake, rework, etc. When considering these alternatives, the impact on cost and schedule must be weighed in addition to the technical considerations. After an alternative is selected, it may become necessary to plan the additional work in terms of new work packages or additions to existing unopened work packages and to change the schedules affected. In some cases the project manager may choose to provide additional budget to the responsible organization. Thus, there is a close relationship between technical achievement and its impact on cost and schedule.

Budgets should be scheduled in accordance with a project event and earned when the event occurs. To avoid distortion, actuals should be recorded when the budget is earned. Analysis of variances for material accounts should focus on significant concerns. This may include usage incurred above or below the normal or exact quantities plus normal attrition amounts, as well as variances in the expected price of the material.

Procedures established by the prime supplier for measuring the performance of the subcontractor must consider the following:

1. The establishment of a process whereby the prime supplier evaluates the management processes established by the subcontractor to perform the cost, schedule, and technical requirements of the subcontract when earned value reporting is required.
2. The requirement to review the subcontractor's performance report for accuracy and adequacy. This includes an independent analysis of the performance measurement information contained in the data formats of the report, an evaluation of the variance analysis information contained in the report, and an evaluation of management reserve usage, baseline changes, and manpower changes.
3. The capability to incorporate the subcontractor's management information, including analysis of significant variances, into the information submitted to the customer.

During the time period between subcontract authorization to proceed and definitization, the prime supplier must make provisions to perform the above actions based on best available information.

Variance analyses are performed at control account level to determine the cause, impacts, and necessary corrective action. Notable cost and schedule variances are accompanied by revised EAC/VACs. The CAMS were able to explain the performance

analysis process and how the Variance Analysis Report (VAR) is completed. VARs are reviewed in the PM's Technical Board Meetings monthly

The team found that FRA Procedure 12.PM-006 "Monthly Status Reporting", Section 4.4 establishes the same dollar threshold for variance analysis for both current month and cumulative variance. Variance analysis thresholds are established to avoid unnecessary attention and analysis of insignificant problems and to cause analysis to be performed on those that are significant and in need of management attention. Although the NOvA dollar variance threshold established may be appropriate for cumulative variances, it may be high for current variances given that many cost accounts may not ever plan over \$50K per month. It is more common to see higher variance thresholds established for cumulative variances than current period thresholds. CIO #5 addressed this issue and suggested that the variance thresholds be reconsidered.

GL24: 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.

The supplier establishes controls to ensure actual indirect costs are compared to indirect budgets and this information should be shared with all affected programs. Specific control procedures should be implemented to ensure variances are identified, reported, and addressed by the appropriate level of management. Such controls increase the likelihood that potentially significant variances are communicated and considered in the development of the project EAC.

FRA indirect budgets are established annually by the Director and applied to the project budget prior to the beginning of the fiscal year. Indirects are allocated based on direct labor dollars budgeted and expended on the projects. Actual indirect charges to projects are made monthly. Indirect costs are monitored monthly by the Budget Manager. An analysis of indirect costs is performed by the directors responsible for the indirect pools. A detailed monthly review is performed to assess variances and their causes.

GL25: 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 contract.

Performance measurement information should be summarized directly from the appropriate level (control account or below) to provide both project status and organizational performance at all levels of management. This process provides supports an overall capability for managers to analyze available information and identify problem areas in sufficient time to take action. Because favorable variances in some areas are offset by unfavorable variances in other areas, higher level managers will normally see only the most significant variances at their level. The accumulation of many small variances that may add up to a large overall cost problem that is not attributable to any single major difficulty will also be evident.

CAMs are able to explain the monthly project statusing process. The CAM uses the same data for internal management needs and for reporting to the DOE. The WBS and the OBS provide the framework for a comprehensive roll-up of data elements and are used for summarizing data from the control account level to the management reporting level. The exception is that FRA uses stricter thresholds to control variances internally than for customer reporting. This appears to be a good practice to resolve problems before they become a customer issue.

GL26: Implement managerial actions taken as the result of earned value information.

The control account in an EVMS is the lowest levels in the structure at which the comparison of actual costs to planned budgets and earned value are required. The cost collection point must be at a level, which will identify the cost elements and factors contributing to cost and/or schedule variances. Managerial authority and responsibility for corrective action should exist at the control account level making it the key management control point in the system.

Performance measurement information should be summarized directly from the appropriate level (control account or below) to provide both project status and organizational performance at all levels of management. This process provides support and overall capability for managers to analyze available information and identify problem areas in sufficient time to take action. Because favorable variances in some areas are offset by unfavorable variances in other areas, higher level managers will normally see only the most significant variances at their level. The accumulation of many small variances that may add up to a large overall cost problem that is not attributable to any single major difficulty will also be evident.

VARs are prepared for cost and schedule variances that exceed thresholds. These describe the cause and the impact (to the task and other CAMs). Corrective actions for variances are developed and CAM management is assigned responsibility. Corrective actions are identified and tracked to resolution and closure. The CAM addresses the status of corrective actions at the PM's bi-weekly Technical Review Boards. Based on feedback, the CAM modifies actions as required to achieve project objectives. Reports from Cobra are generated monthly. The project's internal reports and the reports forwarded to DOE indicate the cost and schedule variances. The EVM system is capable of producing CPR data at any WBS level required for internal and external reporting.

GL27: 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.

Organizations, engaged in the performance contract effort, must periodically perform a comprehensive estimate of costs for the effort remaining. Project Management must periodically assess the sufficiency of resources versus the amount of work remaining. Responsibility for resource assignment to support program objectives must be clearly identified. The EAC process focuses on the control account manager (CAM).

Periodic is defined by ANSI/EIA-748 in Section 3.9., Frequency: “The schedule for establishment and maintenance of EAC data depends on program management needs and overall organization financial review requirements. An organization may elect to conduct periodic (at least annual) EAC reassessments.”

Comparison of this estimate to budgets for the associated effort must be made frequently enough for management to ensure project performance and resource availability will not be adversely impacted. Monthly maintenance of the control account level EAC by the control account manager ensures that the EAC continuously reflects a valid projection of project costs. Information relative to price and usage variance should be used to support an update to the EAC. This provides timely notification to management of expected/incurred price changes which may affect future costs on the current project as well as future procurements. On production contracts, the evaluation of excess usage can lead to identification of increased material requirements necessary to maintain the production line at optimum capacity and to meet the contractual requirements.

The most current information should be used in preparing indirect rates, including historic experience, contemplated management improvements, projected economic escalation, and anticipated business volume. The use of these rates to generate indirect cost estimates will ensure a valid projection of project costs. Comparing indirect budgets to estimates of final indirect costs will reveal where significant differences occur. These variances must be analyzed to determine the cause and appropriate corrective actions.

The EAC procedures relative to subcontract EACs should focus on two aspects:

1. The requirements that the subcontractor will generate an EAC as necessary to support program requirements and reporting to the customer.
2. The responsibility of the prime supplier to evaluate the subcontractor's EAC for adequacy and accuracy.

EACs are updated by CAMs, as needed, to reflect significant changes to the planned budget. CAMs consider past trends, complexity of future tasks, changes in resource costs and/or rates, the introduction of risks, and realization of under/over budgeted work to adjust their EACs. CAMs use a turnaround document produced by Project Controls to project changes to the schedule, which may also cause changes in the CAM's estimate to complete (ETC). Cumulative ACWP plus ETC is used by the CAM to compute their latest EAC. Comprehensive EACs are performed annually, as directed by Project Controls. The Project Manager produces his EAC based on all known factors, estimates of CAMs, and envisioned risks.

Conclusions and Recommendations

FRA is compliant with the Analysis & Management Reports guidelines of the ANSI/EIA-748 as described above.

5.5 Revisions

The scope of the team's review consisted of verifying that the ANSI/EIA-748 Revisions and Data Maintenance Guidelines 28 through 32 are represented in the FRA EVMS Description and procedures and implemented in the execution of the NOVA project.

The sub-team focused its attention on ensuring revisions to project plans are carefully controlled. Changes in projects are inevitable. The revisions process addresses the controlled and disciplined manner by which projects incorporate formal changes, conduct internal replanning, and adjust past, present, and future information to accommodate changes. The PMB should reflect the current project management plans for accomplishment of project objectives. It must be up to date and should include all authorized changes. It is equally important that unauthorized changes are not introduced. If the maintenance of baseline plans is compromised, the information on management reports will be degraded. The keys are timeliness and control.

The following documents were reviewed:

- NOvA Change control logs (management reserve, undistributed budget, performance measurement baseline, and contract budget base).
- NOvA Control account/work package/planning package plans.
- NOvA schedules, intermediate schedules, and detailed schedules.
- WBS and WBS dictionary.
- Work Authorization Documents.
- NOvA Management reports / contract performance reports
- Monthly management reports).
- FRA Procedure 12.PM-003, Work Authorization, dated 3-27-09.
- FRA Procedure 12.PM-007, Change Control, dated 3-27-09.

FRA's EVMS Description states "Full control and accountability must be maintained over the Performance Measurement Baseline. A detailed change log is maintained to record all changes to authorized work and to reconcile original budgets and schedules with all changes for the WBS elements." FRA's OPMO Procedure 12PM-007, Change Control, addresses the change control process.

DISCUSSION

GL28: 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.

Incorporation of the work scope for authorized changes into the performance measurement baseline must be in a documented, disciplined, and timely manner. Adherence to this guideline helps to ensure that budget, schedule, and work remain coupled. For unpriced change orders, the contractor will develop its best estimate for planning and budgeting purposes for incorporation into the performance measurement baseline. Incorporating changes must not arbitrarily eliminate existing cost and schedule variances.

Customer-directed changes to the project can impact virtually all aspects of the internal planning and control system, such as organization structures, work authorizations, budgets, schedules, and EACs. The incorporation of authorized changes should be made in a timely manner and strictly controlled. This will ensure the PMB can be accurately maintained.

A data trace was performed on the NOvA project CR numbers 55 and 56 within the control account WBS 1.5., PVC Module R&D. These CRs created four new tasks and modified one existing task within WBS 1.5. These CRs were initiated by the CAM in late January, 2009 and approved by the FRA project manager on February 24, 2009 and included in the PMB in April, 2009. During an interview with the CAM and the project controls engineer the explanation and details provided of the process used was consistent with the FRA system description and procedures and is implemented in a timely manner.

The CR form provided by the project control engineer does not allow or identify a new total budget. The only cost reflected is the “final cost impact”. When the team asked for traceability it was provided documents with hand written notes telling us what the “before” and “after” budget was/is, the current CR form also doesn’t allow the decision makers to have a clear understanding of the schedule impact before they sign the request.

CIO #6 addresses the current CR implementation process and finds it is inconsistent with the FRA procedure for change control, 12.PM-007, which states “when reissue of a revised document is accomplished by posting to an approved project web site, participants will be informed of the change.” That notice was not being provided. CIO #6 suggests the CR record be amended to allow for before and after state tracking, as well as adding a field for historical records.

GL29: 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.

The original budget established for the project should constitute a traceable basis against which project growth can be measured. The starting point or base on which these original budgets are built is the project target cost. This value increases or decreases only as a result of authorized changes. For definitized changes, the project target cost changes by the negotiated amount. For authorized work which has not been negotiated, the project target cost increases by the amount of the cost estimated for that effort. Where a specified Not-to-Exceed (NTE) amount has been established, the project target cost will only increase by this amount unless both parties mutually agree to a different amount for performance measurement purposes. After negotiations, the project target cost is adjusted to reflect the negotiation results. Adequate records of all changes should be maintained to provide the basis for reconciliation back to the original budgets assigned during the baseline process.

The integrity of the current performance measurement baseline can be maintained by reconciling budget revisions. Adequate records of all changes should be maintained to provide the basis for reconciliation with the original budgets assigned during the baselining process. The original budget established for the project constitutes a traceable base against which project growth can be measured. Provide visibility for management reserve allocations.

It was observed that the CR records and the WADs do not contain or identify previous changes or historical data that have been recognized and implemented. Instead the current convention is to use the “before WAD” and the “after WAD” state, which creates an unnecessary burden to the CAMs or other project participants and presents a risk to ensuring traceability. An opportunity exists to improve the content of the CR records and the WADs by including recent changes to budget in chronological order, effective dates, BCP numbers, as reflected in CIO # 1.

GL30: 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.

Retroactive adjustments to costs should only be made for routine accounting adjustments or for correction of errors. Any direct or indirect cost adjustments must be made in a timely manner in accordance with Generally Accepted Accounting Principles (GAAP). This is necessary to ensure baseline integrity and accuracy of performance measurement data. Retroactive budget and/or performance adjustments may delay visibility of overall project variance from plan, thus reducing the alternatives available to managers for project redirection or termination.

It was observed that retroactive changes are not allowed, other than to address accounting errors and adjustments. This is consistent with the FRA EVMS Description and related procedures. CAMs are aware that they cannot retroactively change their ACWP or BCWP with the exception of the correction of errors and routine accounting adjustments. The CAMs were able to trace changes made from previous accounting adjustments.

GL31: Prevent revisions to the program budget except for authorized changes.

To maintain the validity of the Performance Measurement Baseline (PMB), discipline is mandatory throughout the organization, particularly in regard to budgetary control. Internal procedures should clearly delineate acceptable and unacceptable budget practices.

Any changes to the project must be approved and implemented following the baseline management control process. This control precludes the inadvertent implementation of a budget baseline greater than the project budget. When the performance budget or schedule objectives exceed the project plan and are recognized in the performance measurement baseline, it is identified as an over-target baseline.

The NOvA project maintains detailed change logs to record all changes to authorized work and to reconcile original budgets and schedules with all changes for the WBS elements. The change control logs provide status for all change requests on the project and the details related to proposed and approved changes.

GL32: Document changes to the performance measurement baseline.

The baseline, established based on the agreed-to value of authorized work, must be strictly controlled to maintain a valid basis for project performance. Changes to the PMB may only be made as a result of contractual changes. Procedures should ensure controls are in place to prevent inadvertent implementation of a baseline in excess of contract value.

The PMB should always reflect the most current plan for accomplishing the effort. Authorized changes must be promptly recorded in the system and incorporated into all relevant planning. Planning and authorization documents must be updated accordingly, prior to the commencement of new work.

A review of the CR log and interviews with the CAMs regarding process for changes to the baseline schedule and budget revealed that CAMs were knowledgeable of the CR process and actions needed to process and document changes. The team's review of CR records and logs found them consistent with the CR process and that records were maintained current.

Conclusions and Recommendations

FRA was found to be compliant with the revisions guidelines of the ANSI/EIA-748 as described above.

6: CONCLUSION

After a detailed assessment of the evaluation of the FRA EVMS and its application to the NOvA Project, the team finds that the FRA EVMS is not in compliance with the ANSI-EIA-748 guidelines as required by DOE and the OMB.

Accordingly, Tecolote recommends that OECM not accept the FRA EVMS as compliant with ANSI/EIA-748 at this time until an acceptable corrective action plan is provided and its implementation is verified at a follow-up visit.

7: EXHIBITS AND APPENDIXES

Corrective Action Requests And Continuous Improvement Opportunities

Have been sent under separate cover.

