

EVMS Training Snippet Library: High-level EVM Expectations



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Achieving Management and Operational Excellence

This EVMS Training Snippet, sponsored by the Office of Acquisition and Project Management (OAPM) focuses on the DOE Federal Project Director's expectations of the contractor's earned value management system and the resultant EVM data.



- **EVM Concepts and Objectives**
- **Scheduling and Budgeting**
- **Work Authorization**
- **Level of Effort Concerns**
- **Variance Analysis and Reporting**
- **Estimate at Completion**
- **Baseline Control and Revisions**
- **Synopsis**



The high-level EVM expectations presented in this Snippet will cover these areas:

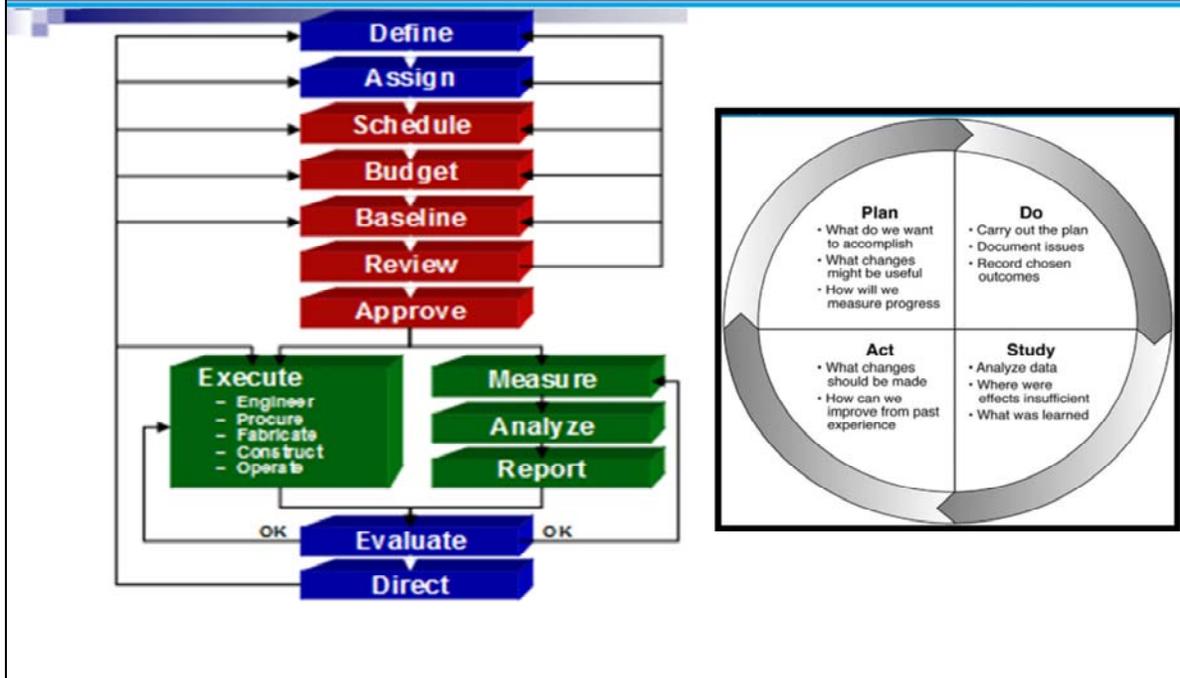
EVM concepts and objectives, the scheduling and budgeting process, work authorization, level of effort concerns, variance analysis and reporting, evaluation of the contractor's estimate at completion, baseline control and revisions, and a synopsis of expectations.



- **Objective:**
 - Provide Department of Energy (DOE) including the National Nuclear Security Administration with program and project management direction for the acquisition of capital assets with the goal of delivering projects within the original performance baseline (PB), on schedule, within budget and fully capable of meeting mission performance, safeguards and security, and environmental, safety, and health requirements
- **Earned Value Management System.**
 - An EVMS is required for all projects with a TPC greater than or equal to \$20M. In accordance with FAR Subpart 52.234-4, a contractor's EVMS will be reviewed for compliance with ANSI/EIA-748B, or as required by the contract.

The requirement for the application of EVM on the project is in Department of Energy Order 413.3B. An important facet of the Order is that it references ANSI/EIA-748 as the standard that must be met to satisfy DOE requirements for use of EVMS by contractors.

EVMS Process Flow vs. Plan, Do, Study, Act



To lay the foundation for this Snippet, EVM is composed of a number of individual processes. All of these are interrelated and must be integrated to produce an effective EVM System.

The first two processes at the top in blue address the definition and assignment of work by answering the questions of: What is being done and who will be responsible for getting it done? The Define and Assign process steps contains the elements of: the contract or project work scope, the Work Breakdown Structure (WBS); and assignment of portions of the work scope by the contractor's Project Manager (PM) to Control Account Manager's (CAMs) to manage.

Once the work has been defined and assigned, the planning process is focused on building the baseline and is shown by the process steps in red. Consider this the roadmap to follow from the beginning of the project to the end of project. The PM will lead the effort to develop further detailed work elements, which are then scheduled. In developing the schedule, the designation of the appropriate resources is performed. These resource requirements are then translated to the time-phased budget for the work. The objective in this phase is to integrate the cost and schedule based on the scope and to develop a time-phased resource plan for effectively accomplishing the work scope.

Once the integrated plan is reviewed and approved, it becomes the Performance Measurement Baseline against which performance will be measured. This authorization step establishes a formal agreement between the PM and the CAMs relating to the technical work scope and the schedule and the budget/resources for accomplishing the assigned effort.

After the PMB is approved, execution of the effort can begin. Charge numbers are opened, as appropriate, and work commences. The effort will be measured, analyzed, and reported. Please refer to the green process blocks. As the CAM and their team members execute and status the work, accomplishments and forecasts are compared to the planned baseline efforts. If actions are occurring in line with the planned efforts or there are no significant deviations from those plans then no further action is required. However, as actual accomplishments begin to deviate from the baseline plan, and as variances become significant as defined by thresholds in the contractor's EVMS system procedures and in the contract, the CAM must investigate to provide insight as to the root cause(s) for the deviation, any impact it may have, and any corrective action that might be appropriate. Another key element of the analysis element of monitoring performance is the development of revised Estimates at Completion (EAC).

Reporting is also a part of the monitoring process. These reports are both for internal and external reporting. It is important to note that while reporting is important, it is not the most important part of EVM. If all the preceding efforts are not properly accomplished, the data contained in the reports may not provide accurate visibility into project performance.

The last two process steps at the bottom in blue are Evaluate and Direct. This relates to both corrective actions and to baseline revisions. The results of the analysis element of the measurement process will likely lead to the implementation of some corrective action plan and sometimes may lead to a request to change the baseline. The EVMS has to have procedures for both of these elements of the Control process. As external and internal changes to the baseline are authorized, the direct process will flow to earlier process steps.

It is apparent that the EVMS process flow follows the basic "Plan, Do, Study, Act" process flow developed by Dr. W. Edwards Deming in the 1950s after realizing that the earlier 'Plan Do, Check, Act' flow did not place enough emphasis on "Analysis" – thus he replaced the word 'check' with 'study'.

Objectives of EVM



- **Relate time-phased budgets to specific contract tasks and/or statements of work**
- **Indicate work progress**
- **Relate technical, schedule, and cost performance**
- **Conduct detailed analysis so appropriate corrective actions can be implemented and monitored to completion to avoid reoccurrence and minimize impacts**
- **Provide valid, timely, and auditable data/information**
- **One project management system used by both Contractor and DOE**

The objectives of requiring an earned value management system on a project are very straight forward. The DOE wants to be assured that the contractor uses an earned value management system that incorporates time-phased resource plans related to contract or project work scope that can be accurately measured to identify technical, schedule, and cost performance against a well-developed baseline plan.

The performance data must then be analyzed to identify problems, root causes, and impacts in order to develop meaningful corrective action plans to avoid problem reoccurrence and minimize the impacts to the entire project. The data must be valid, timely, and auditable so that managers can make meaningful and timely decisions. Consistent and reliable data are the key.

The DOE wants the contractor's EVM system to be the same management system that the contractor uses. The DOE does not want duplicate systems, one for the DOE FPD and another for internal management. If there are two systems, the contractor has failed to incorporate the performance measurement concepts properly.

Benefits of Good Planning



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- **Improves communications both internally and externally**
- **Fosters a team approach**
- **Provides direction and purpose to activities**
- **Instills a clear understanding of work to be accomplished**
- **Engenders power to complete the project**
- **Forecast of when the project will complete and for how much**
 - No surprises – trends indicate problems in advance



The contractor's initial task is to schedule and budget the project. Initial or interim work authorizations must be issued to the CAM planning the work. These authorizations usually only authorize the control account planning and any near term work that must be performed. These authorizations can be issued from the project manager via a project directive.

Planning a project properly has many benefits. It improves communication on both sides and fosters a team approach to clearly understand the work to be accomplished. Basically, a well-planned project provides the contractor with direction and an execution strategy. From the DOE perspective, the primary benefit is a meaningful schedule forecast of when the project will complete and a realistic assessment of how much it will cost, or the EAC. Stated differently, surprises should be minimized and cost and schedule trends should indicate problems long before they occur.



- **Formally authorize scope and associated budget and schedule**
- **Establish and maintain a WBS Dictionary**
- **Each scheduled work segment has a budgeted value**
- **Identify measurement techniques for detailed tasks**
- **Schedule Baseline**
 - The original approved project plan (resource-leveled) for accomplishing the project objectives, plus any changes to that plan
- **Performance Measurement Baseline**
 - In a fully integrated EVM system, the resource-leveled schedule baseline is the basis for the PMB

The Guidelines require that the scope, schedule, and budget for all work be formally authorized to those responsible for performing the work. What that means is that there needs to be a process whereby control account managers are formally charged with executing their scope of work, the scheduled start and completion dates for that work, and the budget by cost element for their control accounts. This formal work authorization is not to be issued until the technical scope of work and its associated schedule and budget have been planned. After planning is complete and work authorizations approved, the initial authorization is replaced with a project manager and CAM approved WAD.

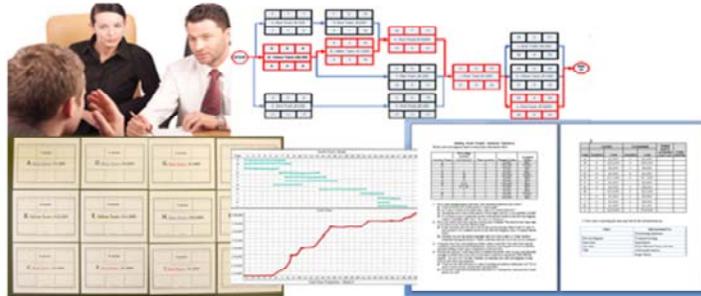
There should be a written definition of what work is going to be accomplished in each control account. The work breakdown structure dictionary should contain definitions of all the project work, by WBS element, which is contractually required. Using these definitions provides boundaries for, and the basis of, the scope of work for each control account.

Each scheduled work segment has a budgeted value. Once that value has been resource loaded in the schedule, the monthly value of work to be performed can be determined.

Each of the control account's work packages must have an earned value technique, or EVT, identified that is appropriate to measure the work scope.

The project schedule, once resource loaded, will result in a schedule baseline that is the basis for the PMB. A Performance Measurement Baseline (PMB) must be established and maintained. The PMB must always represent the total amount of the DOE authorized work to be accomplished.

- It is an iterative process
- It must be developed by the individual responsible for the work
- Use standard logic and minimal constraints
- Check logic very carefully
- Avoid excessive detail
- Assign responsibility for each activity

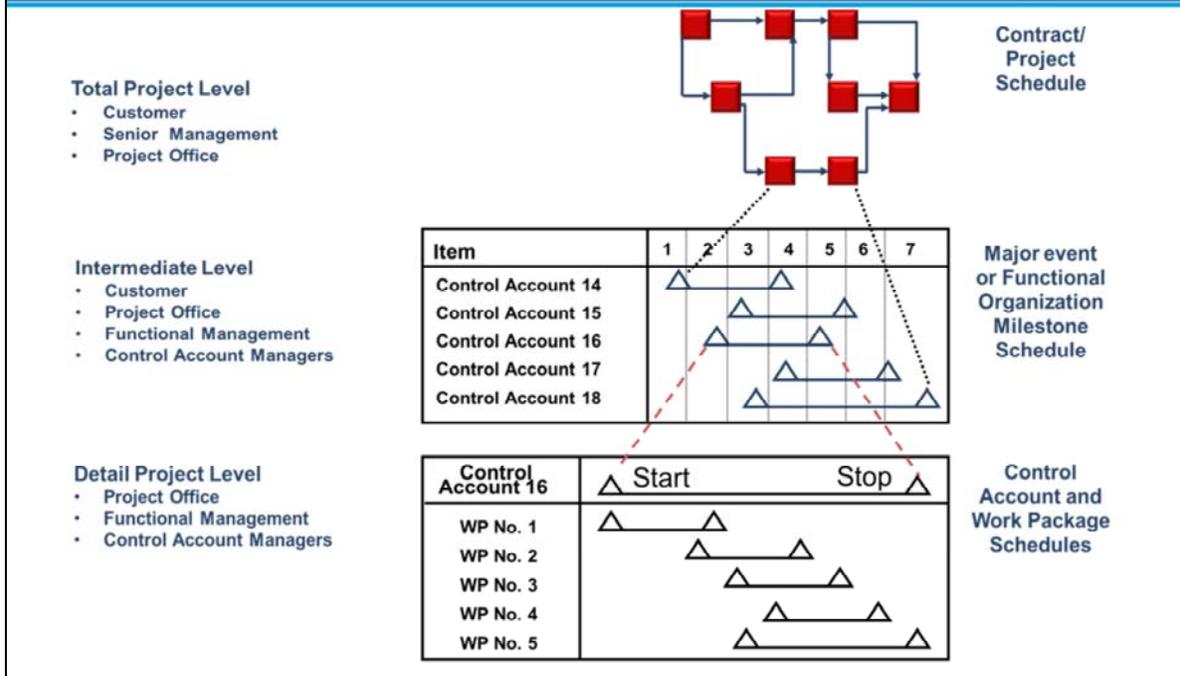


These are some of the basic considerations for the FPD to understand about the development of the project's schedule.

Scheduling is an iterative process and should be developed by those individuals responsible for the work as they best understand the scope and can articulate the performance sequence and resource requirements.

Logic and constraints are very important considerations when developing the schedule. Logic refers to how the schedule is horizontally constructed with the identification of predecessors and successors. Constraints refer to overrides of the schedule logic. Except for scheduled deliveries or completion to the DOE, constraints should be minimized. Logic and constraints should be carefully reviewed and verified as technically required. Responsibility for each activity in the schedule should be clearly identified.

Hierarchy of Schedules



Traceability is an essential feature of the contractor’s scheduling subsystem. The start and finish of the control account must be traceable to, and support higher level schedules.

For example, work package schedules are planned within the control account’s start and complete dates. At no time should work package performance periods be outside the performance period of the control account. Key events and activities should be identified in the control account schedule and tie to higher-level schedules.

These activity charts represent the planned start and completion of the work packages in this particular control account. All of these activities will be included in the same schedule data base. The information can then be summarized to the control account, higher WBS elements, and the total project level. Any activities that are slipping schedule and impacting successors or key events are shown in the schedule.



- **Excessive High Float**
 - Indicates that the task is planned incorrectly in time OR that accurate successors have not been identified
- **Excessive Constraints**
 - Distort the critical path algorithms
- **Excess Lags**
 - Creates unknown gaps in the Gantt view of the schedules
- **LOE on the Critical Path**
 - LOE cannot have a schedule variance (days or dollars) by definition

High level expectations are facilitated by a quick review of common EVM surveillance findings. The typical schedule issues include:

Excessive High Float: Total Float is the amount of time a task can slip without impacting the critical path. For example, float of 60 days means a task can move out 60 days without an impact. So the question is why is the task planned to occur so early if so much float exists? Often the CAM explanation is a missing successor task. Float management is a key expectation in EVM.

Excessive Constraints: Constraints impact either or both of the forward and backward passes and overrides the schedule logic with an imposed date.

Excessive use of Lags: Lags create unknown gaps in the Gantt view of the schedule.

Level of Effort activities on the critical path: Since LOE, by definition, does not involve the production of a measurable product; therefore it cannot be a driving factor in the critical path.

Benefits of a Work Authorization System



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- **Line management commitment**
- **Clear understanding of responsibility levels**
- **Forces review and SOW /PEP cross-matching**
- **Minimizes potential for added scope without budget**
- **Serves as an in-house contract**

Once the scheduling and budgeting process has been completed, the contractor's work authorization subsystem comes into play. Formally authorizing the control account managers before work begins is not only good management practice, but also produces benefits such as obtaining line management commitment to provide staffing, and facilitating the CAM's clear understanding of the scope of work, schedule and budget.

The work authorization process forces a review and cross-matching of the contract's statement of work (SOW) and project execution plan (PEP), which also minimizes the potential for performing work without associated budget. The contractor's work authorization document also serves as an in-house contract between the CAM and the company's Project Manager.

Primary Elements of a Work Authorization Document



- Budget
- Schedule
- Statement of Work
- Unique identifying number
- Person Responsible

| Control Account Work Authorization | | | | | Page 1 of 1 |
|------------------------------------|--|-------------------------|----------------|--------------|-------------|
| Project | Energy Project | | Contract No. | 20117856 | |
| Customer | TACOM | | Project No. | 86-2120 | |
| | CCN No. | N/A | | Revision No. | 0 |
| Contract Cost | | References | | Dates | |
| Current | \$0 | Schedule | EEL-LVL1-01-R0 | Original | 3/2/Yr01 |
| This Release | \$54,980,000 | CLIN | Attachment A | Revision | |
| Total | \$54,980,000 | | | | |
| Fee (10%) | \$5,498,000 | Contract Type | CPIF | | |
| Price | \$60,478,000 | Share Ratio | 80/20 | | |
| Contract Requirements | | | | | |
| Description | Z-Best is to provide the TACOM with modified generators in accordance with the contract statement of work, revision 1, dated February 15, Yr01. | | | | |
| Deliverables/Quantity | 220 custom all generators | | | | |
| Schedule | The generators must be received at TACOM in Warren, MI on these dates: Lot 1 of 150 generators: October 1, Yr03 Lot 2 of 70 generators: January 10, Yr04 | | | | |
| Special Instructions | Jim Levins is delegated the Project Manager responsibilities and authority for the management of this contract. | | | | |
| Approvals | | | | | |
| Contract Administrator | Date | Vice President, Finance | Date | | |
| Mary Steele | 3/2/Yr01 | Betty Washington | 3/8/Yr01 | | |
| Project Controls Manager | Date | Division Vice President | Date | | |
| Steve Garcia | 3/2/Yr01 | Donald Smith | 3/8/Yr01 | | |
| Project Manager | Date | Division President | Date | | |
| Jim Levins | 3/2/Yr01 | Nancy Harris | 3/10/Yr01 | | |

Here is an example of a typical control account work authorization document. The document includes the authorized budget by element of cost, the start and completion dates, and the statement of work.

It contains the control account number, the CAM's name, signature and date, the Project Manager's name, signature and date; and any other approvals required by the company.



- **Work Authorization scope inadequately defined**
 - Key assumptions and requirements not documented
 - Basis for later scope changes (MR, change control)
 - Linked to existing budget and schedule as basis for change
- **Work Authorization not updated with changes**
 - Extensions of schedule for variances
 - Scope changes

Here are some typical Work Authorization surveillance findings. First is inadequate work scope. Because scope is used as a basis for change, the CAM should ensure the scope adequately represents the work that will be performed. Another typical finding is when the Work Authorization is not integrated with change control. The Work Authorization is much more than an original baseline document. When scope, schedule, and or budget are changed at the control account level, the work authorization must be updated to include that change.



- **Use of LOE**
 - Limited to management type tasks that cannot slip
 - Should never be used for discrete design, test, verify, assess, complete, or other engineering tasks as these are typical construction performance aspects which can slip
- **Question to ask for appropriate LOE use:**

“What is the impact to the critical path if this task slips three years?”

If the answer is none, then LOE may be appropriate.

There is one earned value technique that is a common concern. That is Level of Effort (LOE). Basically LOE is limited to tasks that cannot slip by themselves. They do not produce technical products. These are generally support type tasks.

The basic test is if the task is slipped 3 years, then what is the impact to technical performance? An example is for project controls which produces the CPR/IPMR EVM report. If the report is not submitted for three years, the technical performance is not impacted. Think of this from the schedule perspective. Obviously the contractor would be non-complaint with a project requirement if it did not deliver the CPR/IPMR; however, the project schedule is not impacted so this is a typical LOE type task. Likewise tasks that do affect the project schedule cannot be planned as LOE.



- **Schedule Variance (current/cumulative), $SV = BCWP - BCWS$ (negative answer means unfavorable; i.e., behind schedule)**
- **Cost Variance (current/cumulative), $CV = BCWP - ACWP$ (negative means unfavorable, i.e., overrunning)**
- **Variance at Complete, $VAC = BAC - EAC$ (negative answer means unfavorable; i.e., overrunning at completion)**

The process of variance analysis and reporting is an important aspect of the contractor's EVM Control Phase processes.

The Variance Analysis process begins with three calculated variances -- Schedule Variance (SV), Cost Variance (CV), and Variance at Completion (VAC). A negative number means the variance is unfavorable -- behind for schedule and overrunning for cost and the Variance at Completion.

10 Steps in the Variance Analysis Process



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1. Review internal performance reports to quantify the variances and to isolate them by work package
2. Review the work packages driving the variances by element of cost
3. Review the labor charging report
4. Identify the root causes for the variances
5. Quantify the reasons for each identified cause
6. Discuss the impact these variances will have on the project and the rationale to support a new EAC and ECD, as applicable
7. Formulate a plan for corrective action (who, what, where, when, and how)
8. Write the Variance Analysis Report
9. Implement the Corrective Action Plan
10. Monitor the corrective action taken for solutions and resolutions

Typically a contractor's Variance Analysis process involves ten steps.

The first two are usually done in concert. The CAM reviews the internal performance reports and the respective work package variances that are driving the control account variances. Cost variances are analyzed at the element of cost level. To better understand the composition of the cost variances, the CAM reviews the company's labor reports to provide back-up for any required labor rate and efficiency analysis.

Basically, the CAM reviews the control account's performance reports and the IMS to identify the root causes and the variance value to identify with the specific cause.

Following identification of the cause, the next step is to review and discuss the associated impact including a rationale to support a new Estimate at Completion (EAC) and new Estimated Completion Date (ECD), as applicable.

Next is an important step in the analysis process, the Corrective Action Plan.

Since a schedule variance eventually goes to zero, *when* that is predicted to happen and the plan to get there, should be discussed.

If a cost variance cannot be recovered -- and often on cost plus type contracts it cannot -- a new EAC and its rationale should be included.

The completed Variance Analysis Report, or VAR, should be signed by both the CAM and the contractor's Project Manager. The CAMs' VARs are used by the PM and the Project

Control team to provide analyses details for the CPR or the IPMR Format 5.

The last two steps are common project management follow-up steps to the CAMs' analysis reports. The Corrective Action Plans, as identified in the VARs are implemented and closely monitored to ascertain if they are having the desired effect.

Example Variance Analysis Report



Project: CTAS Workstations

WBS: 6EGG.420 - Internal Build Qual Test (BQT)

As of: 09/30/XX

| | BCWS | BCWP | ACWP | SV | SV% | CV | CV% | SPI | CPI |
|--------------|---------|-----------|-----------|---------|------|----------|--------|-------|-------|
| Current: | 29,500 | 58,900 | 165,700 | 29,400 | 99.7 | -106,800 | -181.3 | 1.997 | 0.355 |
| Cumulative: | 686,500 | 657,900 | 1,014,000 | -28,600 | -4.2 | -356,100 | -54.1 | 0.958 | 0.649 |
| At Complete: | BAC | EAC | | | | VAC | VAC% | TCPI | |
| | 718,500 | 1,149,100 | | | | -430,600 | -59.9 | 0.449 | |

Cause of Variance: The Cumulative Negative Cost Variance is a result of additional resources (6 persons) being applied to the BQT-3 effort due to lower than planned productivity on the BQT-1 and BQT testing activities. The productivity problem was primarily because of the experience level of the testing organization during BQT-1 and BQT-2 testing which resulted from the late staffing activities for the ITG. The key variance drivers are the additional testing activities associated with CHI and the special testing initiated to ensure testing of the Baseline functions using the new V&V live data app.

Impact on Cost and Schedule: The continuing use of additional resources will result in a cost overrun of approximately \$430K for this task. However, the effort will be completed on the schedule developed for the test re-plan. The \$1,149,100 is based upon the cumulative ACWP of \$10,014,000 and an estimated \$85,000 for October and \$25,000 for both November and December. The \$85,000 estimate for October includes test conduct for BQT-3 continuing through the 11th of October and V&V testing continuing through the end of the month. Work in November and December will be limited to generation of the BQT-3 Final Test Report. Phase 2 and 3 of the V&V activity will be included as part of the System Testing activity.

Corrective Action Plan: A re-plan of the entire Spiral 1 Build 2 testing activity occurred during the June and July specified tests, schedule, and resources required to ensure adequate testing of the Baseline and New Functions associated with Spiral 1 Build 2 CTAS. This re-plan has been implemented since the first of July and has testing on schedule to complete BQT-3 on October 11th and System Testing November 22nd. The re-plan activity will continue to use the same WBS structure for Build Qualification Testing and will therefore continue to show a cost overrun but maintain the baseline schedule for completion of all testing associated with Spiral 1 Build 2 CTAS.

| Approvals: | Control Account Manager | Project Control | Project Manager |
|------------|-------------------------|--------------------------|-----------------------|
| | George Jones, 10/26/XX | Jake Bollinger, 10/27/XX | Brett Tisop, 10/27/XX |

This is an example of an actual Variance Analysis Report discussing an unfavorable cumulative cost variance of \$356,100 or 54.1%. This cumulative variance is expected to worsen to a Variance at Completion of \$430,600. Cost efficiency is indicated to decrease from a Cost Performance index (CPI) of .649 to a To Complete Cost Performance Index (TCPI) of .449.

The cause, impact, and corrective action plan sections of the VAR contain specific details regarding the cost variance, which the Project Manager has confirmed by signing the report.

Estimate at Completion (EAC)



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- **Actual cost of work to date plus the estimated cost of remaining work, or
EAC = ACWP + ETC (Estimate to Complete)**
- **Must be generated in a rational, consistent manner**
- **Consider:**
 - Performance to date (current and cumulative variances and efficiency)
 - Impact of approved corrective action plans
 - Known/anticipated downstream problems
 - Best estimate of the cost to complete the remaining work

The contractor's analysis process moves us to the next process -- updating the Estimate at Completion, the EAC. The contractor's Estimate at Completion involves much more than just the mathematical process of adding the Estimate to Complete to the cumulative actual cost of work performed.

The Estimate to Complete development should be done considering performance to date, the remaining work to be performed, effect of approved Corrective Action Plans, and knowledge of things "yet-to-happen", or risk. The ETC is important; it is the best estimate to complete the remaining work.



- **Include Schedule Risk Assessment (SRA) and other remaining risks**
- **Include rate/efficiencies and price/usage impacts**
- **Consider CPI vs. TCPI analysis**
- **Anticipate downstream problems**
- **Document rationale and assumptions**
- **Contractor PM sets proper ETC atmosphere**
 - Encourages surfacing of real and potential problems
 - Does not “absolve overruns” with Management Reserve (MR) misuse
 - Makes honest assessments to avoid problems being masked
 - Does not borrow budget from future SOW to cover current cost problems

Development of the Estimate to Complete is important and can be more time-consuming than the original control account’s estimate. Accordingly, it also should be more accurate than the original, as knowledge has been gained from the work that has been performed.

The development of the ETC includes Schedule Risk Assessment (SRA) results, other remaining risks, labor rate and efficiency variances and material price and usage variances.

The CPI and TCPI, which we just saw in the Variance Analysis Report, should be considered to test the validity of the ETC. Schedule analysis and the schedule performance index should be included in the ETC development -- it usually costs more to recover a schedule variance than initially estimated.

Any and all anticipated downstream problems; such as personnel shortages, equipment non-availability, delay in the Critical Design Review, even weather factors like the possibility of a hurricane effecting project progress should be considered. The rationale and assumptions supporting the Estimate to Complete need to be documented.

Given that the contractor’s Estimate to Complete establishes the funding curve for completion of the project, it is important that it is accurate. The contractor’s Project Manager plays a vital role in setting the proper atmosphere for the ETC development by encouraging real and potential problems to be surfaced that may have an impact on the ETC.

The contractor’s Project Manager should not use Management Reserve to cover overruns. Management Reserve is a budget to address possible risk items or the realization of previously unknown in-scope work; it is not funds to pay for overruns.

Other important points involving the contractor Project Manager's role in the Estimate to Complete include an honest assessment -- not just telling the DOE what it wants to hear, and not transferring budget from future contract work to cover current overruns.



- **CAM updates the EAC whenever they know of a significant change or they exceed a threshold**
- **The PM has overall authority for the EAC. If the PM does not concur this should be reported in the EAC analysis section of the CPR**
- **The EAC needs to address assessment of FFP impacts (REAs or schedule extensions)**

The EAC reliability is one of the key expectations in EVM. The CAMs should be updating the EAC for PM approval whenever they are aware of a significant trend. Additional updates are made when requested by the PM based on project status or metrics such as the TCPI, or annually as required for a comprehensive EAC.

The contractor PM has the ability to approve or reject the CAMs EAC. However, if the CAM does not concur with the PM's assessment, then this should be reported in the monthly EVM report Format 5. This should also be considered in the PM's worst case EAC.

All reasonably probable impacts need to be addressed in the EAC. This includes Firm Fixed Price (FFP) subcontract requests for equitable adjustment.



- **Importance of Baseline Maintenance**
 - Performance can only be measured successfully against a baseline that is stable
 - Changes are expected, but must be incorporated in a logical and consistent manner
 - Contractors should not do work they are not authorized to do
- **Elements**
 - CBB - Contract Budget Base: The budget against which overall contract performance is assessed, and is the summation of the PMB, UB, and MR
 - MR - Management Reserve: Budget without scope set aside by the contractor's Project Manager to accommodate risk and uncertainty
 - UB - Undistributed Budget: A temporary holding account for authorized scope of work and its budget that has not been assigned to a control account or summary level planning package.
 - PMB - Performance Measurement Baseline: The baseline against which project performance is measured

The importance of Baseline Maintenance on today's risky projects is an important factor in controlling costs and completing the project. Measuring performance can only be successfully done on a project that has a stable Performance Measurement Baseline.

While changes are normal and expected, the contractor should have a disciplined Change Control process. The baseline should comprise all of the authorized work. Consequently, the contractor should not be working, and charging, for work not authorized by the DOE Contracting Officer.

Earned Value Management, Change Control, and the terminology at the project level involves these four abbreviations: CBB, MR, UB, and PMB.

The CBB is essentially the entire project's authorized budget, while the Management Reserve (MR) is that amount of budget the contractor has set aside for the internal known unknowns. The topics of Management Reserve and Undistributed Budget are covered in other DOE Snippets.

The contractor's Performance Measurement Baseline (PMB) is composed of distributed budget and undistributed budget (UB). The UB is a temporary holding account for authorized scope of work and its budget that has not been assigned to a control account or summary level planning package.



- **Changes to the CBB**
 - Contractor owns the allocated CBB
 - Changes are expected, but can only be made with Government approval
 - All changes to the CBB must be documented
- **Changes to the PMB**
 - The contractor's PM "owns" the PMB
 - Changes are expected, but can only be made with contractor PM approval
 - Changes need to be documented and approved
- Refer to Snippet 4.6, Baseline Control Methods, for more information

One of the reasons for this quick overview of the budget terms slide is that any changes to the CBB can only be made with prior Government approval. Accordingly, any changes to the CBB must be documented and reported in the monthly CPR or IPMR.

The contractor's Project Manager "owns" the Performance Measurement Baseline and must approve changes to the PMB. Changes are logged and reported in the monthly CPR or IPMR.

Contract Budget Base Log



| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|--------------------|--------------|-------------------------------|----------------------|--------------------------|----------------------------|-------------------------|----------------------------------|---------------------------|--------------------------------|--|
| Transaction Number | Date | Description | Contract Target Cost | Authorized Unpriced Work | Contract Budget Base (CBB) | Management Reserve (MR) | Performance Measurement Baseline | Undistributed Budget (UB) | Allocated (Distributed) Budget | Remarks/Notes |
| 1 | 14 Jan Yr01 | Contract Award | 100,000 | | 100,000 | 9,000 | 91,000 | 91,000 | | Establish contract budget and BBL |
| | 31 Jan Yr01 | January CPR | 100,000 | | 100,000 | 9,000 | 91,000 | 91,000 | | |
| 2 | 28 Feb Yr01 | Establish Baseline | | | | (2,500) | 2,500 | (91,000) | 91,000 | Issue WADs for all authorized work and establish MTR |
| | 28 Feb Yr01 | February CPR | 100,000 | | 100,000 | 8,500 | 93,500 | | 93,500 | |
| 3 | 23 Apr Yr01 | P0001 | 1,000 | | 1,000 | | 1,000 | 1,000 | | Log Modification P0001 into Contract |
| | 01 May Yr01 | April CPR | 101,000 | | 101,000 | 8,500 | 94,500 | 1,000 | 93,500 | |
| 4 | 18 May Yr01 | Establish P0001 CAs | | | | 75 | (75) | (75) | (925) | PM could not attain 10% MTR - had to settle for 7.5% |
| 5 | 22 May Yr01 | SWO (AM/PM Con Fr) | | | | | | | 925 | Transfer remaining budget from CA to UB (SOW still exists) |
| | 29 May Yr01 | May CPR | 101,000 | | 101,000 | 8,575 | 94,425 | 800 | (800) | |
| | | | | | | | | 10,000 | 93,625 | Only a portion of work planned since change not yet negotiated |
| 6 | 10 June Yr01 | PSM Design | | 10,000 | 10,000 | | 10,000 | (3,000) | 3,000 | |
| | 03 Jul Yr01 | June CPR | 101,000 | 10,000 | 111,000 | 8,575 | 104,425 | 7,800 | 96,625 | |
| 7 | 20 Aug Yr01 | Continue with PSM Design | | | | | | (3,000) | 3,000 | 3 months additional CAADs authorized |
| | 28 Aug Yr01 | August CPR | 101,000 | 10,000 | 111,000 | 8,575 | 104,425 | 4,800 | 99,625 | |
| | | | | (8,500) | | | (500) | (500) | | 600 negotiation loss; 400 Management Reserve established |
| 8 | 22 Oct Yr01 | P0002 Definitized | 9,500 | (10,000) | (500) | 400 | (500) | (400) | (900) | |
| | 30 Oct Yr01 | October CPR | 110,500 | | 110,500 | 8,975 | 103,525 | 3,900 | 99,625 | |
| 9 | 25 Nov Yr01 | Establish remaining P0002 CAs | | | | | | (3,100) | 3,100 | Issue CAADs for remaining P0002 work |
| | | | | | | | | | | Remaining SOW |

A CBB Log is used by contractors to trace all changes to the CBB, such as scope modifications, authorized unpriced work, management reserve, and distribution of undistributed budget. Here is an example of a typical Contract Budget Base Log spanning the initial contract award date, at the beginning of the calendar year, on 14 January through 25 November, the end of the reporting period.

During the eleven months, various CBB and baseline changes were made. The project was baselined, received additional negotiated work on 23 April, a Stop Work Order on 22 May, and authorized unpriced work on 10 June for PSM design that was negotiated on 22 October. The balance of the P0002 budget was distributed to the CAMs on 25 November.



- **WBS results in clear picture of who and what**
- **Detailed planning reinforces communications with other managers involving interfaces and need dates**
- **Objective contract status information**
- **Performance data measurement and analysis identifies and quantifies cost and schedule problems, allowing for prompt course correction actions**
- **Improved communications internally and with the DOE FPD**
- **Project is definitely better controlled**

To wrap up discussion of the high-level EVM expectations, here is a brief synopsis of the benefits to both the contractor and the Department of Energy.

The development of a complete work breakdown structure down to the control account level facilitates the definition of the control account statement of work -- and the responsible control account manager. The detailed planning of the project not only supports the IMS and schedule interfaces, but also reinforces communications within the project and with the DOE.

Objective determination of the work performed not only results in a clear picture of project status and schedule deviations, but also provides clear cost and schedule variances.

Analysis of the cost and schedule variances provides insight into project problems at their inception, allowing for early root cause analysis and swift course corrections.

A major benefit to the DOE FPD, who has EVM expectations about the contractor's system and its data, is improved communications. Over fifty years of EVMS applications have also proven its value on high risk projects.

A project is definitely better controlled when the contractor implements, uses, and practices the principles of Earned Value Management.



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EARNED VALUE MANAGEMENT

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Earned Value Management (EVM) is a systematic approach to the integration and measurement of cost, schedule, and technical (scope) accomplishments on a project or task. It provides both the government and contractors the ability to examine detailed schedule information, critical program and technical milestones, and cost data.

- EVMS Surveillance Standard Operating Procedure (ESSOP) - 26 Sep 2011 (pdf)
- EV Guideline Assessment Templates - (MS Word)
- DOE EVMS Cross Reference Checklist - (pdf)
- DOE EVMS Risk Assessment Matrix - (MS Word)
- Formulas and Terminology "Gold Card" - Sep 2011 (pdf)
- Slides from the OECM Road Show: Earned Value (EV) Analysis and Project Assessment & Reporting System (PARS II) - May 2012 (pdf)
- DOE EVM Guidance

EVM TUTORIALS

Module 1 - Introduction to Earned Value (pdf 446.86 kb) July 17, 2003

This module is the introduction to a series of online tutorials designed to enhance your understanding of Earned Value Management. This module's objective is to introduce you to Earned Value and outline the blueprint for the succeeding modules. This module defines Earned Value management. It looks at the differences between Traditional management and Earned Value management, examines how Earned Value management fits into a program and project environment, and defines the framework necessary for proper Earned Value management implementation.

<http://energy.gov/management/office-management/operational-management/project-management/earned-value-management>

- Career Development
- Program
- Real Estate
- History

For information relative to EVMS procedures, templates, helpful references, and training materials, please refer to OAPM's EVM Home page. Check back periodically for updated or new information.

Thank you