

FACILITIES MAINTENANCE AND ENGINEERING PROCEDURE		
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1.0 PURPOSE

To define and standardize the requirements for implementing a Performance Measurement and Reporting system. This is also known as an Earned Value System.

2.0 GENERAL

Earned Value System (EVS) – A method for integrating the scope, cost, and schedule into a common format (dollars) in order to provide the ability to measure the performance of the project throughout the life of the project. This information can be represented in both graphical and tabular formats to support the evaluation of the project status. Three essential components are required in order to develop an EVS;

- a) the plan (see BCWS) of the work in terms of dollars is required to be stored over time when that work is originally expected to be performed.
- b) the performance (see BCWP) of the work in terms of dollars is determined by multiplying the percent complete of the work to the current approved budget and is tracked on a monthly basis.
- c) the current cumulative actuals (see ACWP) costs is required to be stored and tracked on a monthly basis. When these three components and captured on a monthly basis they can be compared against each other to determine the full status of the project.

Additionally, the cost and schedule performance data can be used to support evaluations of the estimate at completion.

2.1 Definitions

Accrual – An advance cost (Accrual) may be added to the Monthly Status report for actual costs. This is to allow for reporting work performed (typically by subcontractors) when the invoice for that work is delayed and not reflected in the cost system for more than a month from when the work was completed. Accruals will be reversed or zeroed out every month, therefore if the amount needs to be accrued for more than one month it will need to be re-entered each month.

Budget at Completion (BAC) -[also known as the Current Baseline] the approved project scope, cost, and schedule recognized by the Directorate/Division customer. It includes all project costs, schedule, and technical requirements that have been identified in the approved Conceptual Estimate (CE) plus any approved scope change trends. The current baseline is the basis for the identification of variances and deviations as the project progresses. The current baseline will not be updated or revised at Fiscal Approval unless a Scope Change Trend is the basis for change at Fiscal Approval.

Estimate at Completion (EAC) - the projected forecast of the future final cost of the work order. This is a reflection of the initial budget (CE) plus all scope and non-scope change trends. It can also reflect anticipated cost underruns or overruns to resource budgets.

Budgeted Cost of Work Scheduled (BCWS) – PLAN – The monthly spread of the work order budget over the time that it will be performed. This information is developed by resource loading the work order budgets onto the

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time-phased activities in Primavera. A Primavera generated spread of the budget for each month the work is to be performed will be stored in a database (Budget Control Database) for monthly reporting.

Budgeted Cost of Work Performed (BCWP) – PERFORMANCE – The performance of the job represented in dollars. This amount is determined by multiplying the percent complete for any given task in a work order times the budget associated with that task. Example: for a task that is worth \$100K and is 25% complete, the BCWP (Performance) is equal to \$25K.

Actual Cost of Work Performed (ACWP) – ACTUALS – The monthly total of actual costs incurred for that work activity. This can be represented as either a cumulative amount or the current month’s cost.

Schedule Variance (SV): $[SV = BCWP (Performance) - BCWS (Plan)]$ – The schedule variance can be determined by comparing the plan to date (BCWS) to the amount of work performed (BCWP). Since the percent complete has been converted to an equivalent dollar amount it can be compared to the budget plan. Note: when the performance (BCWP) is greater than the plan (BCWS) a positive variance will result and means that the work is ahead of schedule.

Cost Variance (CV): $[CV = BCWP (Performance) - ACWP (Actuals)]$ – The cost variance can be determined by comparing the current cumulative costs (ACWP) to the amount performed (BCWP). Note: when the performance (BCWP) is greater than the actuals (ACWP) a positive variance will result and means that the project is reflecting a cost underrun. Example: for a task that is worth \$100K and is 25% complete, the BCWP (Performance) is equal to \$25K. If the Actual costs to date equal \$50K then the project has currently overrun the cost by: $BCWP - ACWP = \$25K - \$50K = (\$25K) = CV$.

Schedule Performance Index (SPI): $[SPI = BCWS (Plan) / BCWP (Performance)]$ – The SPI is a variation of the Schedule Variance (SV) representing it in terms of a ratio rather than as a dollar amount. In this case when the performance (BCWP) is greater than the plan (BCWS) the ratio will be less than 1.00 and means that the work is ahead of schedule.

Cost Performance Index (CPI): $[CPI = ACWP (Actuals) / BCWP (Performance)]$ – The CPI is a variation of the Cost Variance (CV) representing it in terms of a ratio rather than as a dollar amount. In this case when the performance (BCWP) is greater than the actuals (ACWP) the ratio will be less than 1.00 and means that the work is reflecting a cost underrun.

2.2 Responsibilities

The Manager, Project Controls (PC) is responsible for establishing a cost and schedule performance monitoring system. Tracking the cost, budget, funding, and schedule for FME Work Orders and maintaining that information in the “Computerized Maintenance System (CMS)”, Primavera, and the “Budget Control Database (BCD)” systems. As well as maintaining the change control process and supporting the earned value performance reporting.

The Directorate Support Team Project Manager (DST PM) is responsible for the management of the projects including coordinating of the design and construction activities, providing current status of work, interfacing with the customer and the NCI and assuring that the project is completed on time and with in budget. The DST PM in

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concert with the Project Controls planner has the responsibility for analyzing cost and schedule variances when applicable. This analysis includes identifying the cause of the variance, determining its impact on the project milestones, the effect on the work order EAC, and determining corrective action. The general rule of thumb or threshold to evaluate variances are when they exceed either \$50K or 10% of the current approved budget (BAC).

The Manager of Engineering is responsible for understanding the scope of work for the design and construction for all facility changes on the NCI-Frederick facilities.

The Manager, Operations and Maintenance (M&O) is responsible for oversight of all in house shop work orders, assisting with the coordination with the project controls scheduler for shop work, coordinating work orders with multiple craft support and with other shop work orders when applicable.

FME Director or designee is responsible to review the Directorate status and performance reports to ensure adequate response and/or resolution plans are identified for projects reflecting cost or schedule overruns.

The Project Controls Planner is responsible for understanding the project budget and scope, monitoring project development, supporting the DST PM and project team in maintaining the Directorate and Work Order cost, schedule, and baseline status.

Responsibilities for the planner

- Setup the initial project schedule
- Enter and maintain cost and trend information in both the cost databases and Primavera
- Ensure that the latest project status form the DST PM and project team is incorporated in reports and schedules
- Work with the DST PM to track, monitor, and maintain the earned value information and reports.

3.0 PROCEDURE

3.1 General Requirements

All Performance data shall be consistent with this procedure and be provided in the formats identified by Project Controls.

All costs shall be extracted from Smart Stream to the PME database. The cost data information will be transferred from the PME database into Primavera on a monthly basis. It will then stored in a budget control database to support the earned value reports.

All FME direct labor shall be in hours.

Schedule information; start and finish dates, percent complete status, durations, and interaction with other project activities shall be provided by the Project Manager and Project Team.

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3.2 Budget Requirements

The budget will be measured in US dollars and may also include job hours. The budgets should at least be established at the same level that actual costs would be collected. However, budgets may be planned at lower or more detailed levels to assist with cost and resource planning and performance efforts.

The project shall track and report the Budget at Completion (BAC) and the Estimate at Completion (EAC). Changes are made to future work only through the trend process.

The Total Cost To-date shall include the actual costs through the Performance Month End Date.

The current percent complete should be determined for each work task in the work order. The amount of work can be measured in job-hours, costs, and quantities or by percents assigned to specific points in the completion of the task. The percent complete multiplied by the approved budget for each task is equal to the cost performance (BCWP). The summation of the BCWP from individual work tasks equals the total BCWP for the group of tasks or work orders being evaluated.

The monthly cost and schedule performance data is to be statused through the Performance Month End date.

3.3 Budget Data Control

Initial budget is established with the NCI Conceptual Approval, including the Rough Order of Magnitude estimate. The NCI Fiscal Approval based on the detailed design redefines the project Baseline Budget. Any changes between the Conceptual and Fiscal Approvals and after the Fiscal Approval will be tracked using the trend program.

3.4 Data and Reporting Requirements

All information is to be updated in the PME Database, Primavera Schedule, and Budget Control Database on the dates shown in the reporting schedule, see Attachment A – FPSR Schedule (Sample).

3.5 Monthly Facility Progress Status Report (FPSR)

Data to be provided and included:

- Requested Funding as supported by Fiscal Approval Package
- Fiscal Approval Estimated Costs
- Baseline Budget including the Awarded Subcontract value
- Trends for project changes
- Current Baseline Budget
- Summation of Causes for the Change Requests or Contract Modifications
- Key Milestones and Activities from the Monthly statused P3 Current schedule
- Monthly Total to date Costs
- Earned Value Performance compared to the current budget and actuals
- Cost and Schedule Variance Analysis
- Updated Status and Descriptive Narrative

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- Current Approved Funding and Funding Issues

Monthly Progress Report will be prepared and issued per the Report Schedule.

The Monthly Facility Project Status Report will be issued by FME and reviewed with NCI management at the monthly progress review meeting.

Each project manager will assure that the information for his or her projects in the FPSR is complete and accurate.

Unless directed differently by FME Project Controls, the monthly report will include:

- Scope description of the task/renovation to be performed. This should include a general explanation of the work, identify any major equipment that is to be added or changed out, and any special conditions affecting the work. Where there have been changes in scope from that provided in the Conceptual Approval package, they are to be stated together with the date the scope change was approved by NCI.
- Current Status & Significant issues are to be provided and updated monthly to present the overall status of the project and the issues impacting the project.
- Authorized Funding by year and Center Number
- Identification of funding issues and actions to deal with them
- Cost Data by Work Order including the Fiscal Authorization, the current Budget at Completion (BAC), the approved and pending scope change trends, Budget to date (BCWS), Earned Value Performance to date (BCWP), the Total to date Costs (ACWP), the Projected to go Costs (PTG), and Estimate at Completion (EAC).
- Cost Completion Variance Analysis
 - a. Detailed analysis is required for each Work Order where the Cost Variance exceeds \$50,000 or 10% of the Current Approved Baseline (BAC)
 - b. The Cost Variance analysis shall include the cause, impact, corrective action and status
- Schedule Variance Analysis
 - a. Detailed analysis is required for each Work Order where the Schedule Variance exceeds -21 calendar days or when the Schedule Variance (SV) in terms of dollars Variance exceeds \$50,000 or 10% of the Current Approved Baseline (BAC).
 - b. The evaluation shall address cause of the schedule slip and the alternative solutions for recovering the milestone or for minimizing the impact to later milestones.
 - c. Significant changes (+/-2 weeks) to project end dates from the previous report shall be explained.

3.6 Performance Measurement

The project shall track and report the BAC and EAC. The Total Cost To-date shall include the actual costs plus any accruals through the Performance Month End Date.

The performance period percent complete is based on the percent complete multiplied by the current approved budget (BAC). The amount of work can be measured in job-hours, costs, and quantities or by percents assigned to specific points in the completion of the task.

The monthly cost performance is to be stated through the Performance Month End date.

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Schedule dates shall come from the Primavera work order schedules.

3.6.1 Baseline and Performance Measurement Process

The baselines generated during the planning and budgeting phase are statused for progress and technical accomplishment and then compared to actual costs. Projected to Go (PTG) costs are updated and corrective actions are initiated where problems exist.

A. Performance Measurement Process- The performance measurement process begins with evaluating the amount of work accomplished in terms of percent complete. Earned value is then calculated against the baseline. Earned value represents in budget dollars the value of work actually accomplished. It is determined by multiplying the current budget by the percent complete of the work order. The statusing of and calculation of earned value occurs monthly. Results are incorporated into management reports for review and analysis of cost and schedule performance and for implementation of corrective actions.

B. Performance Analysis and Forecasting- Early detection and correction of performance-related problems are benefits of a properly implemented Change Management System also called the Trend Program. It is important to recognize potential problems while time and resources are available to correct the problem and to minimize the impact on other work elements. Performance analysis focuses management's attention on critical project issues. The Project Manager provides management with an explanation of the problem, evaluation of the impact of the variance, and suggested corrective actions.

In addition to evaluating progress to date, a monthly assessment is made of cost and schedule resources required to complete a project. This assessment results in a current estimate to complete for each work scope. Each month Project Managers review the estimate to complete for each work order. Analysis of current forecasts provides the Project Manager a vision of where the project may be headed early enough to implement necessary corrective action.

FMEP-G-0170 Exhibits

Exhibit A – Sample Monthly Reporting Schedule (1 Page)

Exhibit B - Cost performance Graph (1 page)

Exhibit C - Cost performance Table (1 Page)

Exhibit D - Directorate Summary Sheet (Red/Yellow/Green Status) (1 Page)