

**Measurement Information Specification**  
 Earned Value Management  
 Version 2.1

<b>Information Need Description</b>	
<b>Information Need</b>	Correlate the actual performance of work on a project to the original plan, and track actual costs and schedule progress for the work accomplished.
<b>Information Category</b>	Schedule and Progress Resources and Cost

<b>Measurable Concept</b>	
<b>Measurable Concept</b>	Financial Performance Earned Value Management (EVM)

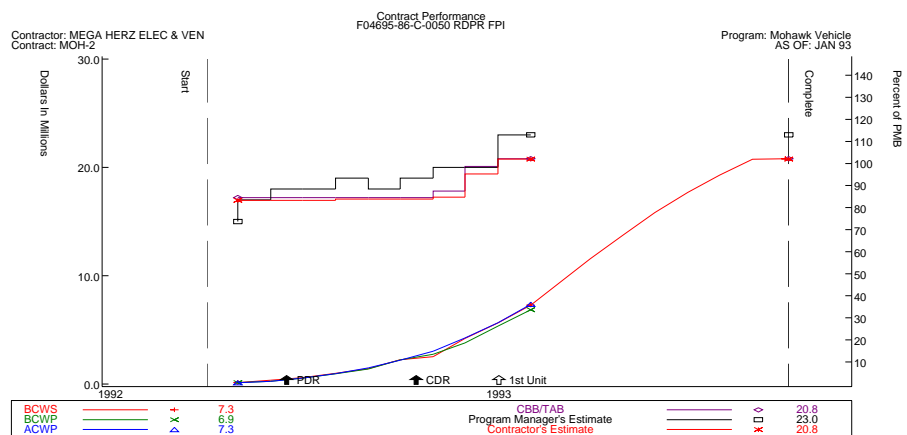
<b>Entities and Attributes</b>	
<b>Relevant Entities</b>	<ul style="list-style-type: none"> <li>• Project Plan</li> <li>• Actual Costs</li> <li>• Schedule Progress</li> </ul>
<b>Attributes</b>	<ul style="list-style-type: none"> <li>• The project plan provides the information necessary to establish the baseline that the project will be measured against. This includes the planned work, planned schedule, resources that will be used, and costs of those resources. These are normally broken down by either a Work Breakdown Structure (WBS) and/or an organization breakdown structure (OBS).</li> <li>• The actual costs will represent the total costs that have been charged to the project at any point in time, allocated to the applicable WBS or OBS element.</li> <li>• The status of planned activities in total duration and start and stop dates.</li> </ul>

<b>Base Measure Specification</b>	
<b>Base Measures</b>	<ol style="list-style-type: none"> <li>1. Budgeted Cost of Work Scheduled (BCWS) or Planned Value (PV)</li> <li>2. Budgeted Cost of Work Performed (BCWP) or Earned Value (EV)</li> <li>3. Actual Cost of Work Performed (ACWP) or Actual Costs (AC)</li> <li>4. Budget at Completion (BAC)</li> <li>5. Estimate at Completion (EAC)</li> </ol>
<b>Measurement Methods</b>	<ol style="list-style-type: none"> <li>1. The overall time phased/resource loaded plan for accomplishing the defined effort. This plan is established at the beginning of the project and is updated as necessary through formal replans to account for changes in the planned effort.</li> <li>2. The budgeted cost of the planned work that has been accomplished at a specific point in time.</li> <li>3. The actual cost of the resources that have been expended to accomplish the work that has been performed.</li> <li>4. The total cost of the project based on the initial plan (total BCWS) and any authorized changes that have been added.</li> <li>5. The performing agency's estimate of the final cost for the completed project at any point in time.</li> </ol>
<b>Type of Method</b>	<ol style="list-style-type: none"> <li>1. Objective</li> <li>2. Objective. However, the methods that are used to arrive at the value may at times be of a subjective nature.</li> <li>3. &amp; 4. Objective</li> <li>5. The EAC is a subjective number derived from an evaluation of the costs to date (ACWP) and the estimate of the future costs for the work that remains to be performed.</li> </ol>
<b>Scale</b>	<ol style="list-style-type: none"> <li>1. - 3. Integer values equal to or greater than zero</li> <li>4. &amp; 5. Integer values greater than zero</li> </ol>
<b>Type of Scale</b>	<ol style="list-style-type: none"> <li>1. - 3. Ratio</li> <li>4. &amp; 5. Interval</li> </ol>
<b>Unit of Measurement</b>	Dollars

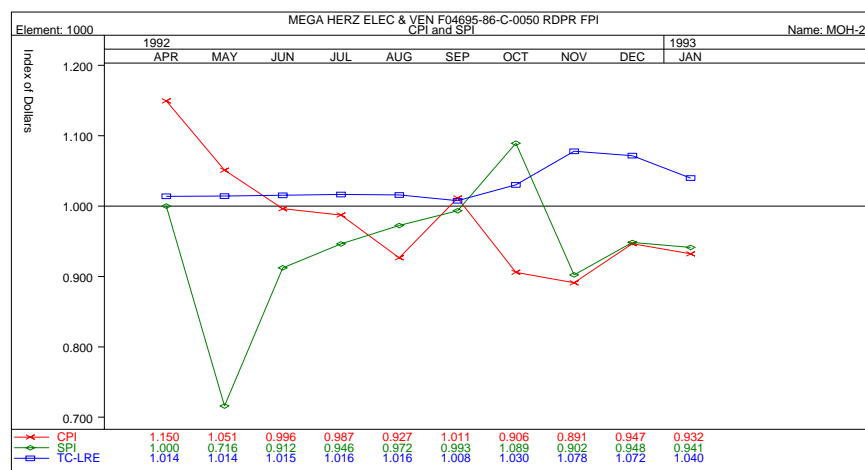
<b>Derived Measure Specification</b>	
<b>Derived Measure</b>	<ol style="list-style-type: none"> <li>1. Cost Performance Index (CPI)</li> <li>2. Schedule Performance Index (SPI)</li> <li>3. Cost Variance (CV)</li> <li>4. Schedule Variance (SV)</li> <li>5. Variance at Completion (VAC)</li> </ol>
<b>Measurement Function</b>	<ol style="list-style-type: none"> <li>1. <math>CPI = BCWP / ACWP</math></li> <li>2. <math>SPI = BCWP / BCWS</math></li> <li>3. <math>CV = BCWP - ACWP</math></li> <li>4. <math>SV = BCWP - BCWS</math></li> <li>5. <math>VAC = BAC - EAC</math></li> </ol>

## Indicator Specification

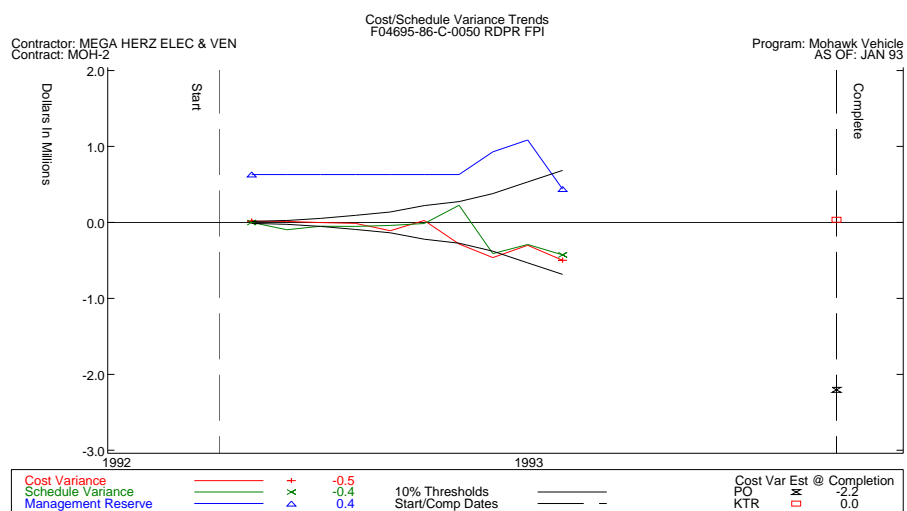
1. BCWS, BCWP, ACWP, and EAC are normally represented in a chart that provides a graphic method of visualizing the project progress.



2. The CPI and SPI are presented graphically to show trends.



3. The CV, SV, and VAC are also presented graphically to show trends.



Indicator Description and Sample

<p><b>Analysis Model</b></p>	<ol style="list-style-type: none"> <li>1. BCWS, BCWP, ACWP, and EAC are plotted on a timeline chart that will show project progress and cost against the baseline. Ideally, the BCWS, BCWP, and ACWP would fall on top of each other indicating that the project was proceeding on plan and actual costs are equal to the planned cost. Any deviation from this concurrence would be an indication of either over cost (ACWP above BCWP) or under cost (ACWP below BCWP) and either behind schedule (BCWS above BCWP) or ahead of schedule (BCWS below BCWP).</li> <li>2. CPI and SPI are plotted over time to show trends. Indices greater than 1.0 indicate under cost (CPI) and ahead of schedule (SPI), while indices below 1.0 indicate over cost (CPI) and behind schedule (SPI).</li> <li>3. CV, SV, and VAC are plotted over time to show trends and predicted completion costs. Positive variances reflect either under cost or ahead of schedule, while negative variances reflect over cost or behind schedule.</li> </ol>
<p><b>Decision Criteria</b></p>	<ol style="list-style-type: none"> <li>1. BCWS, BCWP, ACWP, and EAC provide a top-level view of the project status and at completion estimates. Increasing variances over three months require further analysis.</li> <li>2. CPI and SPI at the cumulative level are a general indication of the health of the program. Normally, values less than 0.9 are an indication that there are some problems that should be addressed. Additionally, the overall trends should be reviewed; several months of declining values are another indicator that there are issues that should be addressed.</li> <li>3. CV, SV, and VAC provide a dollarized presentation of the information that is represented in the CPI/SPI chart. It shows the current cost and schedule variances in dollar amounts. This allows a determination if the variances are significant. Nominal plus and minus 10% lines that indicate where this threshold is assists in the analysis.</li> </ol>
<p><b>Indicator Interpretation</b></p>	<ol style="list-style-type: none"> <li>1. BCWS, BCWP, ACWP, and EAC. The project in the sample chart shows that the effort is approximately 1/3 complete. Current performance shows that the performing organization is somewhat behind schedule and over cost, but not by a significant amount. Of potential concern is the fact that the performing organization has failed to meet the first unit milestone. This could lead to future schedule perturbations and the potential for additional cost overruns. Also indicated in the chart is the fact that while the performing organization is still estimating that the effort will be completed on cost, the government program manager is estimating that there will be an overrun of \$2.2M. This difference should be investigated.</li> <li>2. CPI and SPI. The performing organization started out significantly under cost (CPI &gt; 1.0); however, there was less effort than planned being accomplished (SPI &lt; 1.0). Since these initial perturbations, that were not unexpected, there has been a relatively steady decline in cost performance. While schedule performance initially improved, it has now started to decline again. Program details should be reviewed at lower WBS or OBS levels to determine those areas that are causing this situation, and potential corrective actions must be reviewed and acted upon.</li> <li>3. CV, SV, and VAC. This chart is essentially a dollarized presentation of the same information that is contained in the CPI/SPI chart. At the present time, the performing organization is \$0.5M over cost for the work that has been accomplished, and there is \$0.4M of work that had been planned that has not been accomplished. In most cases, schedule variances will later become additional cost variances as dollars are spent to recover schedule. While the cost overrun and behind schedule conditions are less than the 10% thresholds, the trends are indicating that there are still some issues that must be addressed if the project is to get back on schedule and within cost.</li> </ol>

<b>Data Collection Procedure (for each Base Measure)</b>	
<i>Complete this section for each base measure listed on the previous page.</i>	
<b>Frequency of Data Collection</b>	<ol style="list-style-type: none"> <li>1. BCWS is established at the beginning of the project and is updated as necessary through formal replans to maintain a proper representation of the planned effort.</li> <li>2. BCWP is collected and reported on a monthly basis.</li> <li>3. ACWP is collected and reported on a monthly basis.</li> </ol> <p>For numbers 2 &amp; 3: Sometimes, for critical items, increased visibility, or internal monitoring, the provider will collect a limited set of EVM data on a weekly basis. This is normally limited to man-hour data and not material or overhead information.</p> <ol style="list-style-type: none"> <li>4. The initial EAC is a function of the original plan that will generate a cost at completion. The EAC should then be updated monthly to reflect performance to date as well as changes to the project.</li> </ol>
<b>Responsible Individual</b>	<ul style="list-style-type: none"> <li>• The program business office collects this information.</li> <li>• All project members should review the data for validity and also to evaluate any variances.</li> </ul>
<b>Phase or Activity in which Collected</b>	All phases
<b>Tools Used in Data Collection</b>	<ol style="list-style-type: none"> <li>1. Project scheduling and resource planning system</li> <li>2. Project accounting system</li> </ol>
<b>Verification and Validation</b>	<ol style="list-style-type: none"> <li>1. The data should be verified by the performing organization prior to each submission.</li> <li>2. The receiving organization should also review each data submission to ensure that accurate/reasonable information has been provided.</li> <li>3. There also should be periodic surveillance of the data-generating process to ensure that data are being generated in accordance with the performing organization's defined processes.</li> </ol>
<b>Repository for Collected Data</b>	<ol style="list-style-type: none"> <li>1. The primary repository of the total collection of data should be in the performing organization.</li> <li>2. The customer should also maintain a copy of submitted data products as part of the standard project files.</li> </ol>

<b>Data Analysis Procedure (for each Indicator)</b>	
<b>Frequency of Data Reporting</b>	In most situations, EVM data is collected and reported on a monthly basis.
<b>Responsible Individual</b>	<ul style="list-style-type: none"> <li>• A trained analyst within the project team accomplishes data analysis.</li> <li>• All project team members must review the data for their specific areas of responsibility and be able to address the issues that are causing the variances.</li> </ul>
<b>Phase or Activity in which Analyzed</b>	All phases
<b>Source of Data for Analysis</b>	The performing organization's submission of EVM data is accomplished through either a Cost Performance Report (CPR) or a Cost/Schedule Status Report (C/SSR).
<b>Tools Used in Analysis</b>	There are a number of tools that are available for EVM data analysis. One of the more common tools in use within the government is wInsight.
<b>Review, Report, or User</b>	Data is provided to the program manager to allow the PM to identify areas of concern. EVM data analysis results are also provided to the entire project team to address the specific issues in their areas of responsibility.

<b>Additional Information</b>	
<b>Additional Analysis Guidance</b>	While use of a validated EVM system to generate the appropriate data provides significant insight into project performance, the EVM information should not be used in a vacuum. Analysts and all other project team members should be able to relate the EVM data to actual progress on the project as indicated by technical performance measures determined to be appropriate, actual hands on evaluation of the project status, and other methods/terms that are appropriate to the individual project.
<b>Implementation Considerations</b>	<p>The guidelines for implementing an EVM process within any organization are provided through an industry standard. The current version of the standard is EIA-748-A, Earned Value Management Systems, dated January 2002.</p> <p>Normally, there is an Integrated Baseline Review (IBR) conducted early in the project. The purpose of this IBR is to provide program managers with a mutual understanding of the project baseline (BCWS) and to attain agreement on a plan of action to handle the identified risks.</p>