

EVMS Training Snippet Library: PARSII Analysis: Variance Reports



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Achieving Management and Operational Excellence

This EVMS Training Snippet, sponsored by the Office of Acquisition and Project Management (OAPM) is one in a series regarding PARS II Analysis reports. PARS II offers direct insight into EVM project data from the contractor's internal systems. The reports were developed with the users in mind, organized and presented in an easy to follow manner, with analysis results and key information to determine the status and health of the project. Snippets will help users understand the specific information provided by each report and what it tells them about project health and/or EVM system health.

This particular snippet focuses on the purpose and use of reports to assist in determining variances at both the Performance Measurement Baseline level and at the Work Breakdown Structure levels.

Analysis Reports – Project Analysis SOP



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The screenshot displays the PARS II web application interface. On the left, a navigation menu lists several categories: **OVERSIGHT & ASSESSMENT**, **PROJECT PERFORMANCE**, **ALL REPORTS**, and **SSS Reports** (which is currently selected). The main content area is titled **SSS Reports** and features a sub-header **All monetary values at**. Below this, there are **Add** and **Paste** buttons. A **Shared Reports** section is visible, containing a tree view of folders: **Analysis Reports**, **Data Validity Check**, **Schedule Health Assessment**, **Variance Analysis**, **Trend Analysis**, **EAC Reasonableness**, **Predictive Analysis**, and **APM DepSec Monthly Reports**.

In PARS II under the SSS Reports selection on the left, there are folders to the right. The reports being discussed are in the Analysis Reports folder. That folder is broken down into various subfolders pertaining to OAPM's EVMS Project Analysis Standard Operating Procedure (EPASOP). This Snippet covers the subfolder named Variance Analysis.



- **Analysis Reports**

- Report uses further explained in OAPM's EVMS Project Analysis Standard Operating Procedure (EPASOP)
- Variance Analysis Subfolder
 - EV Project Summary (6-Mo; PMB Level)
 - Performance Analysis (WBS Level)
 - Variance Analysis Cumulative (WBS Level)

These reports are useful for anyone responsible for project management. There are three reports that will be discussed: The EV Project Summary (6-Months; PMB Level), the Performance Analysis (WBS Level), and the Variance Analysis Cumulative (WBS Level).

Analyze Variances



- **After checking the data validity:**
 - Identify and investigate variances
 - Review cumulative variances, sorting by size
 - Also review current period variances to help spot growing concerns



Variance analysis begins with identification and investigation. This is the point where all the effort put in to developing an approved baseline plan and determining the status against that plan serves its purpose, i.e. to identify significant variances and analyze causes so corrective actions can be determined and implemented. Variance Analysis is the identification and explanation of the top cost and schedule drivers and typically involves cumulative information. Variance analysis employing current data may also be useful in identifying emerging trends that may signal concern. The WBS elements that significantly contribute to the project cost and schedule variance should be considered in the monthly assessment.

EV Project Summary (6-Mo. PMB Level)



| | 06/30/2013 | 07/31/2013 | 08/31/2013 | 09/30/2013 | 10/31/2013 | 11/30/2013 |
|---------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Cumulative to Date | | | | | | |
| BCWS | \$308,711,525.47 | \$314,762,727.42 | \$319,214,046.64 | \$322,729,551.45 | \$326,163,634.34 | \$329,090,236.94 |
| BCWP | \$295,442,525.22 | \$299,853,203.16 | \$304,262,053.33 | \$307,420,381.95 | \$310,880,829.64 | \$313,276,777.34 |
| ACWP | \$289,597,741.89 | \$293,502,964.41 | \$297,439,927.32 | \$301,673,613.99 | \$304,527,645.07 | \$307,749,156.89 |
| SV | (\$13,269,000.25) | (\$14,909,524.26) | (\$14,951,993.31) | (\$15,309,169.50) | (\$15,282,804.70) | (\$15,813,459.60) |
| SV% | -4.30% | -4.74% | -4.68% | -4.74% | -4.69% | -4.81% |
| SPI | | | | | | |
| CV | | | | | | |
| CV% | | | | | | |
| CPI | | | | | | |
| Current Period | | | | | | |
| BCWS | | | | | | |
| BCWP | | | | | | |
| ACWP | | | | | | |
| SV | | | | | | |
| SV% | | | | | | |
| SPI | | | | | | |
| CV | | | | | | |
| CV% | | | | | | |
| CPI | | | | | | |
| At Complete | | | | | | |
| BAC | | | | | | |
| EAC | | | | | | |
| VAC | | | | | | |
| VAC% | | | | | | |
| ACI | | | | | | |
| TCPI (To EAC) | | | | | | |
| TCPI (To BAC) | | | | | | |
| % Scheduled | | | | | | |
| % Complete | | | | | | |
| % Spent | 84.95% | 86.04% | 87.18% | 88.41% | 89.14% | 90.07% |
| IEAC | | | | | | |
| Cum CPI | \$334,157,360.29 | \$333,900,635.11 | \$333,511,945.90 | \$334,842,338.15 | \$334,630,299.02 | \$335,659,968.16 |
| Cum SPI X Cum CPI | \$336,158,634.77 | \$335,909,318.18 | \$335,284,590.81 | \$336,494,101.18 | \$336,110,136.10 | \$337,068,838.91 |
| 3 Period Moving Average | \$331,685,736.08 | \$331,975,705.17 | \$331,135,067.59 | \$335,750,781.49 | \$335,250,104.21 | \$340,241,240.72 |

- Shows Cumulative, Current, At Complete, and IEAC information at PMB Level for past 6 months
- Provides overall Project performance
- Provides helpful information at Variance Analysis Phase:
 - Schedule and Cost Variances
 - Schedule and Cost Variance Percentages
 - Schedule and Cost Performance Indices
 - Variance at Completion Percentage

The purpose of the EV Project Summary (6-Month PMB Level) report is to provide the user with key Earned Value data elements and project performance metrics at the project level over the last 6 performance periods. For variance analysis, focus on the cumulative and current period schedule and cost variances, schedule and cost variance percentages, schedule and cost performance indices, and the variance at completion percentage. Again, these are at the project level. They provide basic information as to how the project is performing. But to fully understand what is driving the variances, the next step is to drill down to the lower level WBS elements. It is also important to understand that although the project level variances may look reasonable, there could be variances at the WBS level that are warning signs of future problems. To drill down, we need to view other PARS II reports.

Performance Analysis (WBS Level)



| DESCRIPTION | Current | | | | | Cumulative | | | | | At Complete | | |
|--|-----------|-----------|-----------|------------|------------|--------------|--------------|--------------|------------|-------------|--------------|--------------|---------------|
| | BCWS | BCWP | ACWP | SV | CV | BCWS | BCWP | ACWP | SV | CV | BAC | EAC | VAC |
| DA - DESIGN AUTHORITY & TECH SUPPORT | \$324,713 | \$324,713 | \$344,745 | | (\$20,032) | \$19,408,879 | \$19,408,879 | \$17,501,379 | | \$1,907,497 | \$21,605,095 | \$23,119,989 | (\$1,514,894) |
| PR - PERMITTING | \$84,314 | \$57,355 | \$116,952 | (\$26,959) | (\$59,597) | \$7,692,473 | \$7,674,481 | \$7,235,594 | (\$17,992) | \$438,887 | \$8,039,240 | \$7,677,082 | \$362,157 |
| OP - OPERATIONS | | | | | | | | | | | | | |

- Shows Current, Cumulative, and At Complete information at all WBS reporting levels
- Click on WBS Description blue hyperlink to see information presented in Chart format
- Advantage of this report is Excel Sort feature to view variances from largest to smallest, positive to negative
- Note: This is a partial view of the full report

One of the drill down reports is the PARS II Performance Analysis (WBS Level) Report. This report provides information for drill down analysis of cost and schedule variances by identifying WBS elements that contribute and/or offset overall project level variances.

The data is shown at the lowest level reported (at least to the Control Account level). Because all PARS II reports export into Excel, the user can easily sort on the variance columns to see which WBS elements have the largest variances, positive or negative.

Variance Analysis Cumulative (WBS Level)



| THRESHOLD | | CHANGE | | COMMENTS |
|-----------|------|-----------|-------|----------|
| STATUS | MAX | STATUS | ARROW | |
| Red | 0.80 | Better | ▲ | |
| Yellow | 0.90 | No Change | - | |
| Green | 1.00 | Worse | ▼ | |

| WBS Number | DESCRIPTION | SV | CV | VAC | SPI | CPI |
|---------------------|----------------------------|----|----|-----|------|------|
| 01.25.60.01.02.01.0 | LAB EQUIP & CAP SPARES | ▲ | ▼ | ▼ | 0.73 | 1.02 |
| 01.25.60.01.02.01.0 | CONST PHASE PROJECT SU | ▼ | ▼ | ▲ | 0.99 | 0.95 |
| 01.25.60.01.02.01.0 | T3 - TITLE III ENGINEERING | - | ▼ | ▼ | 1.00 | 0.98 |
| 01.25.60.01.02.01.0 | CX - CONSTRUCTION MAN | - | ▼ | ▲ | 1.00 | 1.01 |
| 01.25.60.01.02.01.0 | PS - PROJECT MANAGEME | - | ▼ | ▲ | 1.00 | 0.87 |
| 01.25.60.01.02.01.0 | P&CS ENGINEERING | - | ▼ | - | 1.00 | 1.06 |
| 01.25.60.01.02.01.0 | QA & QC | - | ▼ | ▲ | 1.00 | 0.78 |
| 01.25.60.01.02.01.0 | STARTUP SUPPORT | - | ▼ | ▲ | 1.00 | 0.99 |
| 01.25.60.01.02.01.0 | ENGINEERING SUPPORT (D | - | ▼ | ▲ | 0.57 | 0.96 |

| WBS Number | DESCRIPTION | LEVEL | SV | CV | VAC | SPI | CPI | |
|------------|----------------|-------------------|----|-----------|-------------|--------------|------|------|
| 56 | 01.25.60.01.02 | LAB EQUIP & CAP | 8 | (302,545) | 17,474 | 20,837 | 0.73 | 1.02 |
| 57 | 01.25.60.01.02 | LAB EQUIP & CA | 9 | (302,545) | 17,474 | 20,837 | 0.73 | 1.02 |
| 58 | 01.25.60.01.02 | CONST PHASE P | 8 | (351,503) | (2,281,860) | (13,341,105) | 0.99 | 0.95 |
| 59 | 01.25.60.01.02 | T3 - TITLE III EN | 8 | | (514,424) | (4,291,325) | 1.00 | 0.98 |
| 60 | 01.25.60.01.02 | CX - CONSTRUC | 9 | | 118,987 | (3,530,672) | 1.00 | 1.01 |
| 61 | 01.25.60.01.02 | PS - PROJECT M | 9 | | (1,281,335) | (3,768,269) | 1.00 | 0.87 |
| 62 | 01.25.60.01.02 | P&CS ENGINEE | 9 | | 76,754 | 53,202 | 1.00 | 1.06 |
| 63 | 01.25.60.01.02 | QA & QC | 9 | (0) | (660,009) | (1,698,369) | 1.00 | 0.78 |

The PARS II Variance Analysis Cumulative (WBS Level) Report consists of two tabs with the Report tab serving as a summary tab that contains information about variance change and performance against preset thresholds, while the Detail tab provides a more detailed view of the variance data and numbers that support direction and color identifiers on the Report tab. The Report tab, shown on the top portion of the slide, is primarily used to see how the SV or CV has changed since the past month.

The SV% and CV% fields are available on the Detail tab (located on the lower portion of the slide). In conducting analysis, sort the WBS elements by CV% from smallest to largest. If there are WBS elements with negative (unfavorable) CV% they will be displayed at the top of the list. If there are WBS elements with positive (favorable) CV% they will be displayed at the bottom of the list. Select the largest favorable and unfavorable cost drivers and investigate to determine if the contractor has taken steps to identify and correct the root cause behind the unfavorable cost drivers. Likewise, sort the list by SV% and select the largest favorable and unfavorable schedule drivers.

Once the top schedule drivers have been identified, identify any resulting impacts to the key milestones in the schedule. In order to do this, the WBS elements in PARS II must be correlated to activities in the schedule. Typically, contractors include a WBS reference column in the schedule for this purpose. Obtain a copy of the schedule for the same month as the data being analyzed. Filter for the WBS elements identified as top schedule drivers. A list of activities will be displayed with logic links. Follow the successors of these tasks until you find the first major milestone in the logic chain. This will be the key milestone impacted by the schedule variance.



- **Analyze variances**
 - Determine the root cause
 - Determine if recurring or non-recurring (price of one-time purchase)
 - Isolate the non-recurring data when performing trend analysis
 - Target problem areas

Once the larger variances are identified, review the contractor's Variance Analysis Reports to determine if the root cause has been identified, if the issue is recurring or non-recurring (e.g. price of a one-time purchase), isolate the non-recurring data when performing trend analysis (next step of the Analysis Plan), and if the contractor's corrective action plan seems feasible to control the causes of the variances. This is done by looking at the contractor's narrative analysis.

In Search of the Root Cause



| | Schedule Variance | Cost Variance |
|-------------|---|--|
| Unfavorable | <ul style="list-style-type: none"> • Lack of resources due to . . . • Late vendor deliveries because . . . • Rework required due to . . . • Work more complex than expected because . . . • Unclear requirements in the areas of . . . | <ul style="list-style-type: none"> • Work is more complex than anticipated because . . . • Extensive design review comments have resulted in . . . • Material price escalation because of . . . • The estimate was understated because . . . |
| Favorable | <ul style="list-style-type: none"> • Increased efficiency due to . . . • Work less complex than anticipated in the areas of . . . • Fewer revisions and rework because . . . • Subcontractor ahead of schedule because . . . | <ul style="list-style-type: none"> • Efficiencies being realized because . . . • We used less expensive resources to accomplish the work and . . . • We negotiated a lower price with the supplier due to . . . |

The “5 Whys” technique is an effective tool used in determining if the true root cause is identified instead of the symptoms. “5 Whys” is a question-asking method used to explore the cause/effect relationships underlying a particular problem, with the goal of determining a root cause of a defect or problem. Typically by the fifth question, the root cause is identified and can then be fixed rather than focusing efforts on the symptoms of the true root cause.

Using this thought process with variance analysis helps the FPD and project team understand the true root cause or causes and then focus on ensuring a corrective action plan is in place that will prevent this process failure from happening again. In certain cases, the process analysis may warrant a Six Sigma approach.



- **Variance Analysis**
 - Identify WBS elements
 - Determine the root cause
 - Determine impact
 - Identify corrective actions to prevent reoccurrence and mitigate impact
 - Monitor effectiveness of corrective actions
 - Does the data reflect reality?

Variance analysis assists the Project management team in drilling down to identify the performance issues. Once identified, the next step is to determine the root cause. A clear understanding of the root cause helps to determine the full impact of the performance issues and how to mitigate them. Another key to variance analysis is not only mitigation of the current performance issue but also how to keep it from reoccurring. The FPD should expect updates on the effectiveness of the corrective actions taken in order to determine if the performance issues are having a greater or lesser than anticipated impact to the project.

The FPD should have a clear understanding of what the true issues are, what the data says the issues are, and does the data reflect reality. If the data reflects reality, the FPD can focus his or her efforts on what really matters – that is, performance improvement measures to complete the project successfully. If not, there may be underlying compliance issues within the contractor's EVM and scheduling systems.

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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>

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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.