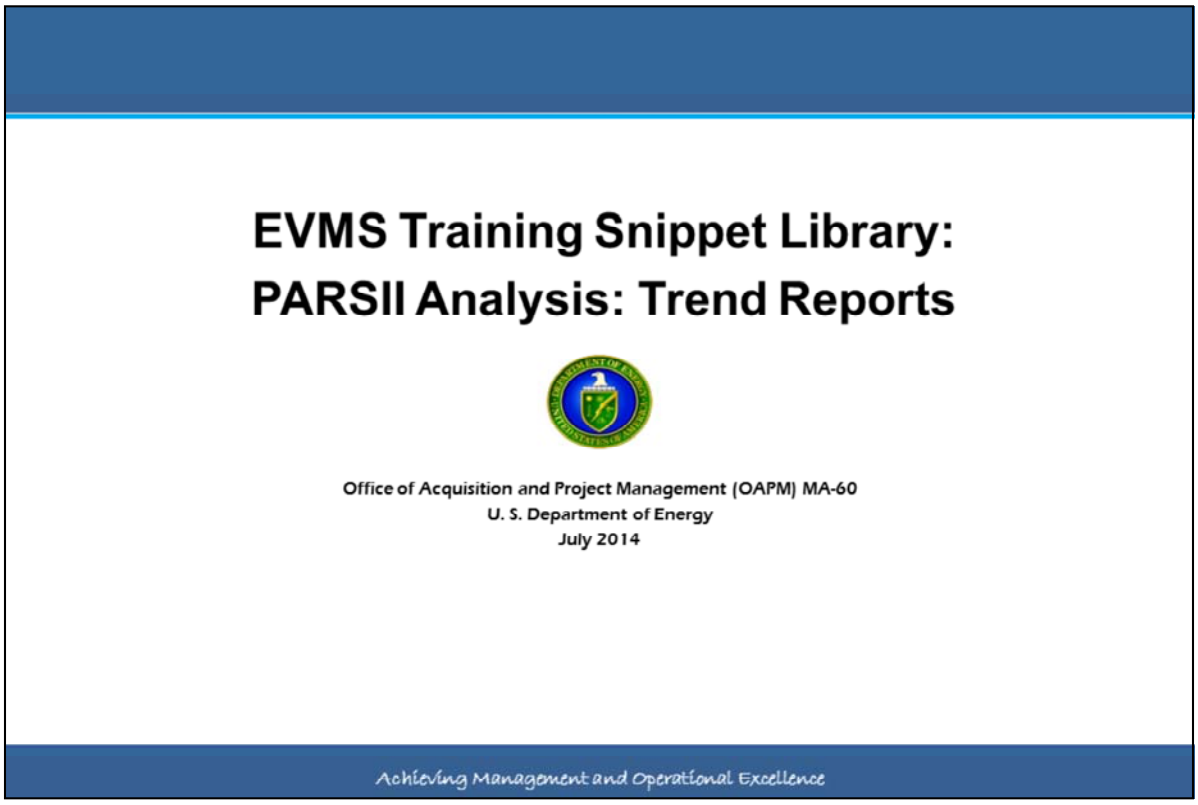
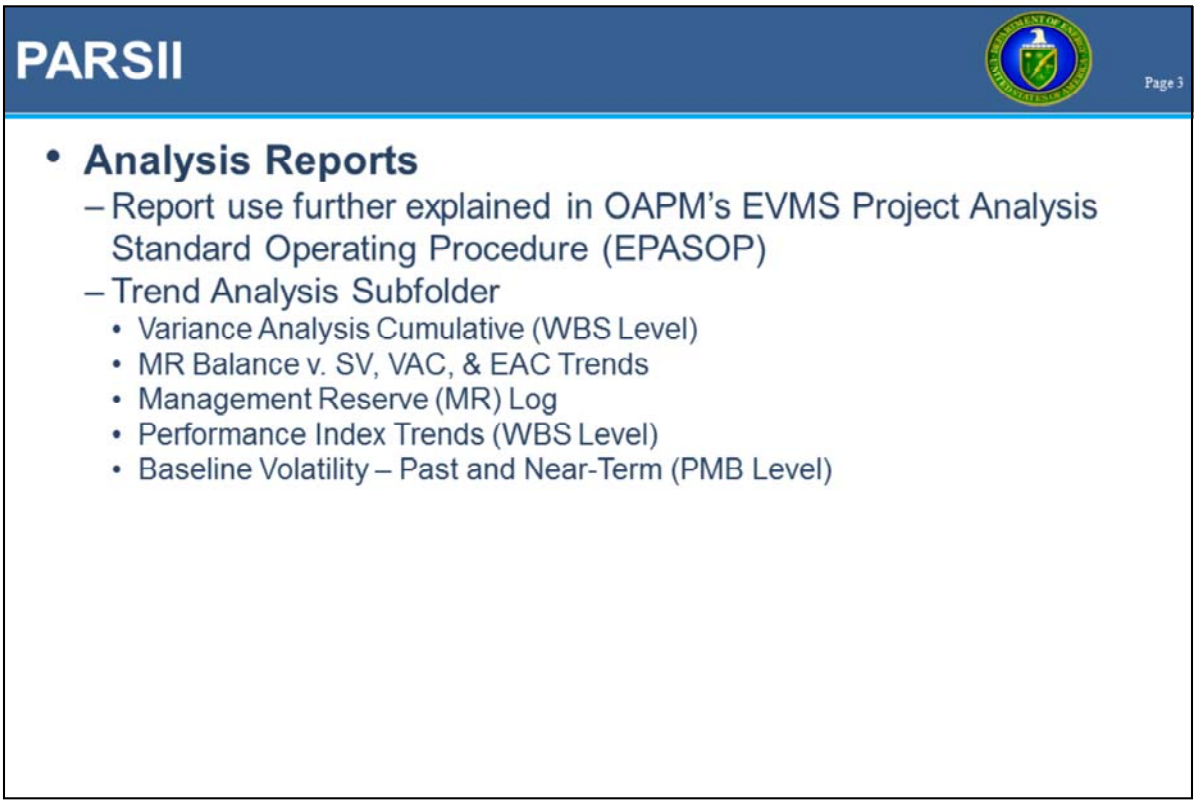


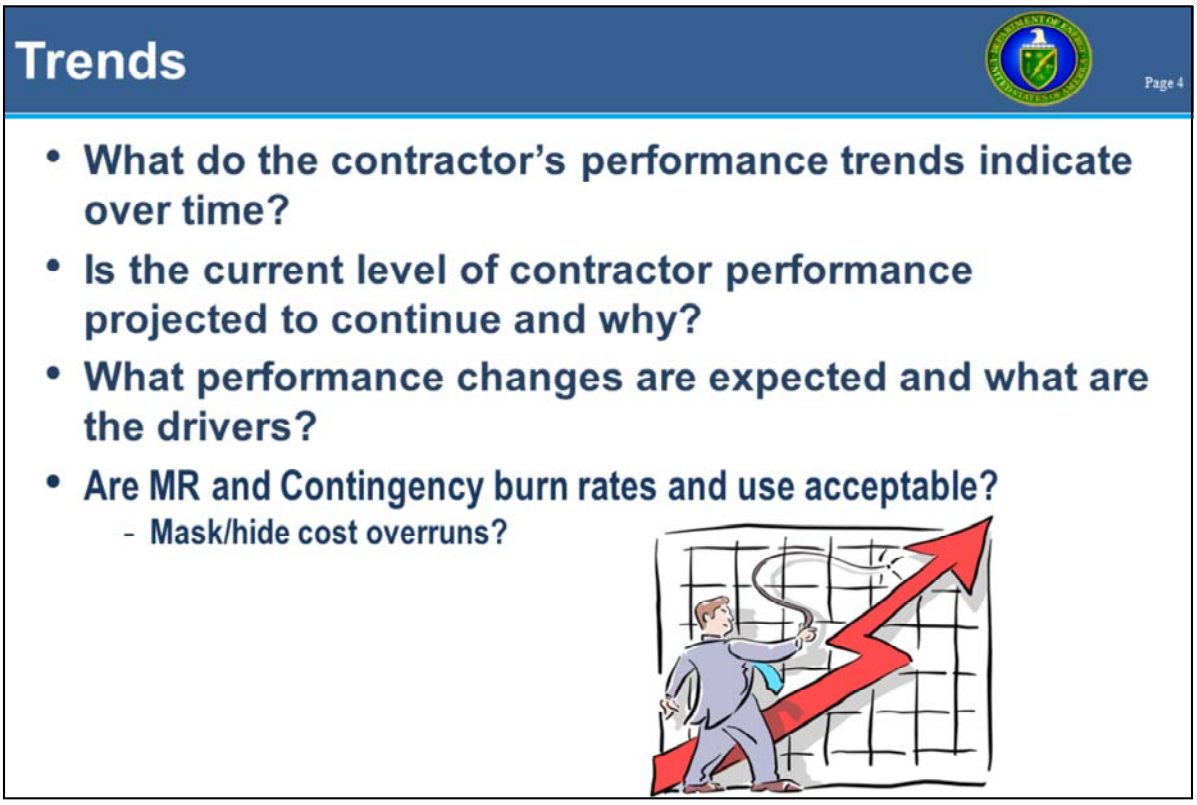
This EVMS Training Snippet, sponsored by the Office of Acquisition and Project Management (OAPM) is one in a series regarding PARS II Analysis reports. PARS 2 offers direct insight into EVM project data from the contractor's internal systems. The reports were developed with the users in mind, organized 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 trends at both the Performance Measurement Baseline level and at the Work Breakdown Structure levels.

In PARS 2 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 Trend Analysis.



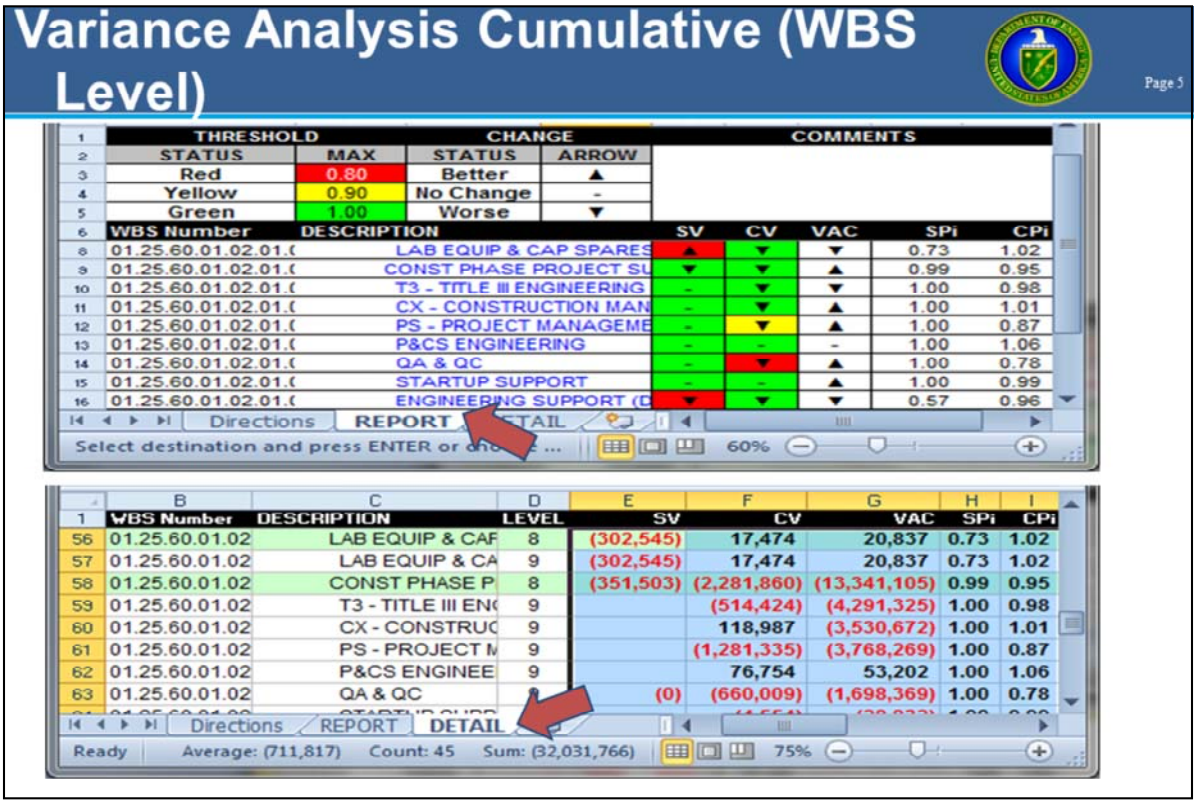
These reports are useful for anyone responsible for project management. There are five reports that will be discussed: the Variance Analysis Cumulative (WBS Level) report, the MR Balance vs. SV, VAC, & EAC Trends report, the Management Reserve (MR) Log, the Performance Index Trends (WBS Level) report, and the Baseline Volatility – Past and Near-Term (PMB Level) report. The EV Project Summary (6-Months; PMB Level) was discussed in Snippet 5.4.



After analyzing major variances to ensure corrective actions have been identified to prevent reoccurrence, trend identification helps to see not only if corrective action has been effective (e.g. improvement trends), but also provides visibility into emerging problem areas where variances may not yet be significant.

The types of questions to consider once trends have been identified may include:

- What do the contractor's performance trends indicate over time?
- Is the current level of contractor performance projected to continue and why?
- What performance changes are expected and what are the drivers?
- Are MR and Contingency burn rates and use acceptable or are they used to mask/hide cost overruns?



In Snippet 5.4 we discussed the PARS II Variance Analysis Cumulative (WBS Level) Report as it relates to identifying variances. In this Snippet, we will cover how information on this report provides trend information. The Report tab (top portion of slide), serves as a summary tab that contains information about variance change and performance against preset thresholds by using directional arrowheads and color identifiers. These features prove helpful in identifying trends. The Detail tab (lower portion of the slide) provides the SV, CV, VAC, CV%, SV%, VAC%, CPI, and the SPI, all of which are explained in detail below.

The schedule variance trend compares the metric for a specific reporting period (usually monthly) to the same metric in prior reporting periods. An SV trend is considered favorable if the SV improves in value over the course of multiple reporting periods (i.e., three months). The actual SV itself may still be negative (unfavorable) but if the SV trend is improving, the trend is said to be favorable. Conversely, the SV trend is unfavorable when the SV worsens over time. Again, the SV could be positive (favorable) but the trend is degrading.

The Schedule Performance Index (SPI) is an efficiency factor representing the relationship between the performance achieved and the initial planned schedule. An index of 1.0 or greater indicates that work is being accomplished at a rate on or ahead of what was planned. An index of less than 1.0 indicates work is being accomplished at a rate below the planned schedule. An index of less than 0.95 is used as an early warning indication of schedule slippage and should be investigated.

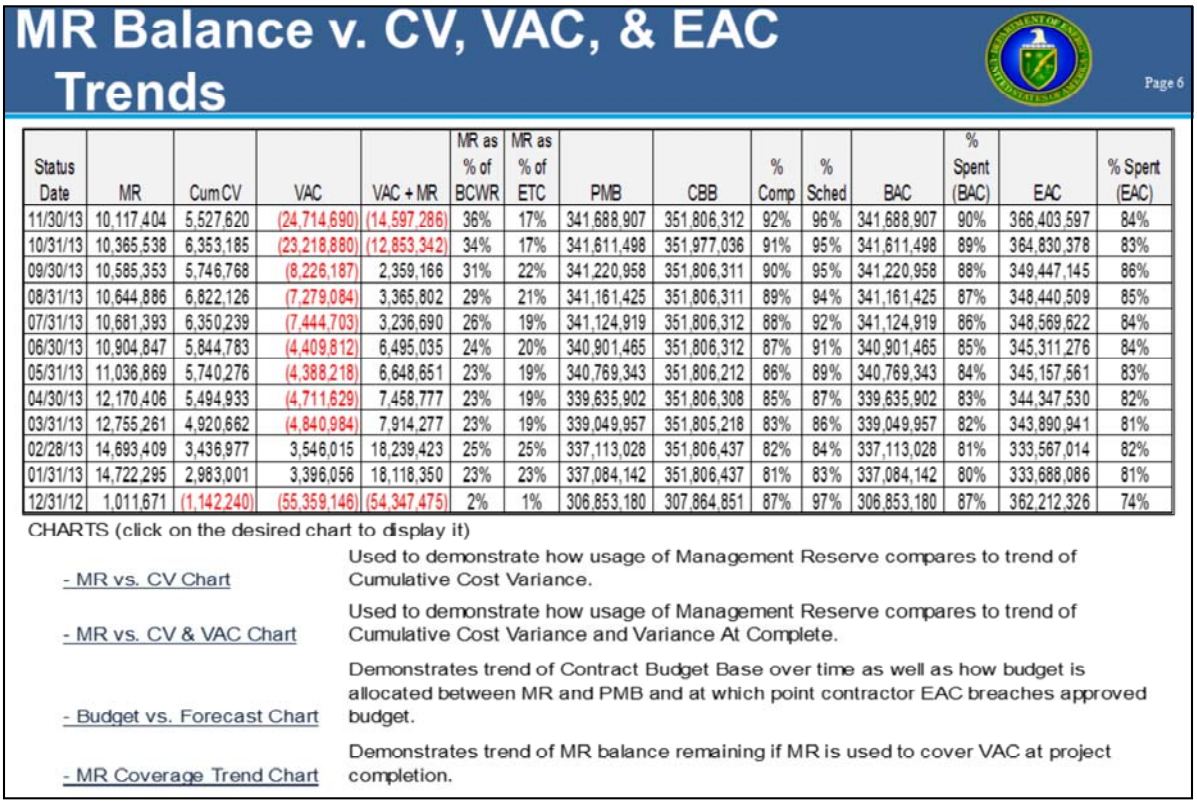
The SPI trend is a comparison of the metric for this reporting period (usually monthly) to the same metric in prior reporting periods. An SPI trend is favorable if the SPI increases in

value over the course of multiple reporting periods. Conversely, the SPI trend is unfavorable if it decreases in value.

The Cost Performance Index (CPI) is an efficiency factor representing the relationship between the performance accomplished (BCWP) and the actual cost expended (ACWP).

An index of 1.00 or greater indicates that work is being accomplished at a cost equal to or less than what was planned. An index of less than 1.00 indicates work is being accomplished at a cost greater than planned. A cumulative index of less than 0.95 is used as an early warning indicator of cost increase and should be investigated.

The CPI Trend is a comparison of the metric for a specific reporting period (usually monthly) to the same metric in prior reporting periods. A CPI trend is favorable if the CPI increases in value over the course of multiple reporting periods. Conversely, the CPI trend is unfavorable if it decreases.



MR Balance v. CV, VAC, & EAC Trends

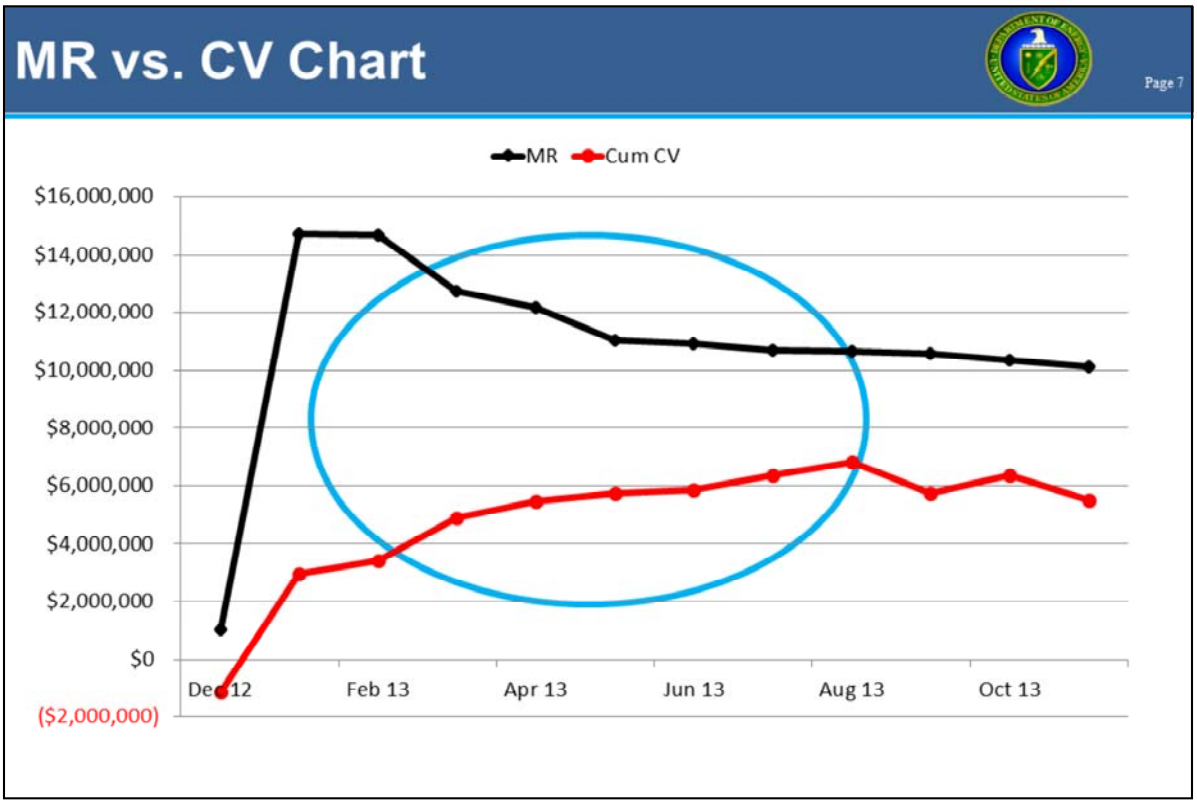
Page 6

Status Date	MR	Cum CV	VAC	VAC + MR	MR as % of BCWR	MR as % of ETC	PMB	CBB	% Comp	% Sched	BAC	% Spent (BAC)	EAC	% Spent (EAC)
11/30/13	10,117,404	5,527,620	(24,714,690)	(14,597,286)	36%	17%	341,688,907	351,806,312	92%	96%	341,688,907	90%	366,403,597	84%
10/31/13	10,365,538	6,353,185	(23,218,880)	(12,853,342)	34%	17%	341,611,498	351,977,036	91%	95%	341,611,498	89%	364,830,378	83%
09/30/13	10,585,353	5,746,768	(8,226,187)	2,359,166	31%	22%	341,220,958	351,806,311	90%	95%	341,220,958	88%	349,447,145	86%
08/31/13	10,644,886	6,822,126	(7,279,084)	3,365,802	29%	21%	341,161,425	351,806,311	89%	94%	341,161,425	87%	348,440,509	85%
07/31/13	10,681,393	6,350,239	(7,444,703)	3,236,690	26%	19%	341,124,919	351,806,312	88%	92%	341,124,919	86%	348,569,622	84%
06/30/13	10,904,847	5,844,783	(4,409,812)	6,495,035	24%	20%	340,901,465	351,806,312	87%	91%	340,901,465	85%	345,311,276	84%
05/31/13	11,036,869	5,740,276	(4,388,218)	6,648,651	23%	19%	340,769,343	351,806,212	86%	89%	340,769,343	84%	345,157,561	83%
04/30/13	12,170,406	5,494,933	(4,711,629)	7,458,777	23%	19%	339,635,902	351,806,308	85%	87%	339,635,902	83%	344,347,530	82%
03/31/13	12,755,261	4,920,662	(4,840,984)	7,914,277	23%	19%	339,049,957	351,805,218	83%	86%	339,049,957	82%	343,890,941	81%
02/28/13	14,693,409	3,436,977	3,546,015	18,239,423	25%	25%	337,113,028	351,806,437	82%	84%	337,113,028	81%	333,567,014	82%
01/31/13	14,722,295	2,983,001	3,396,056	18,118,350	23%	23%	337,084,142	351,806,437	81%	83%	337,084,142	80%	333,688,086	81%
12/31/12	1,011,671	(1,142,240)	(55,359,146)	(54,347,475)	2%	1%	306,853,180	307,864,851	87%	97%	306,853,180	87%	362,212,326	74%

CHARTS (click on the desired chart to display it)

- MR vs. CV Chart	Used to demonstrate how usage of Management Reserve compares to trend of Cumulative Cost Variance.
- MR vs. CV & VAC Chart	Used to demonstrate how usage of Management Reserve compares to trend of Cumulative Cost Variance and Variance At Complete.
- Budget vs. Forecast Chart	Demonstrates trend of Contract Budget Base over time as well as how budget is allocated between MR and PMB and at which point contractor EAC breaches approved budget.
- MR Coverage Trend Chart	Demonstrates trend of MR balance remaining if MR is used to cover VAC at project completion.

MR trends are identified on the PARS II MR Balance vs. CV, VAC, & EAC Trends Report. The purpose of this report is to provide the FPD and Analyst with a range of tools to complete the analysis of Management Reserve. The first page of the report presents the set of data used in the analysis. Individual charts shown in subsequent slides provide graphical representation to identify trends. The report is intended to provide data for the purposes of determining if best practices for Management Reserve use are being followed and whether sufficient Management Reserve is available to the project. In the event report data suggests that there are problems with usage or availability of MR, further trend analysis of the data and a conversation with the performing contractor should be initiated in order to understand the issues presented by the data. *The trend charts referenced at the bottom are discussed on the following slides. Note that concerns with MR usage not only apply to Project performance but also to systemic concerns with the contractor's EVMS.*

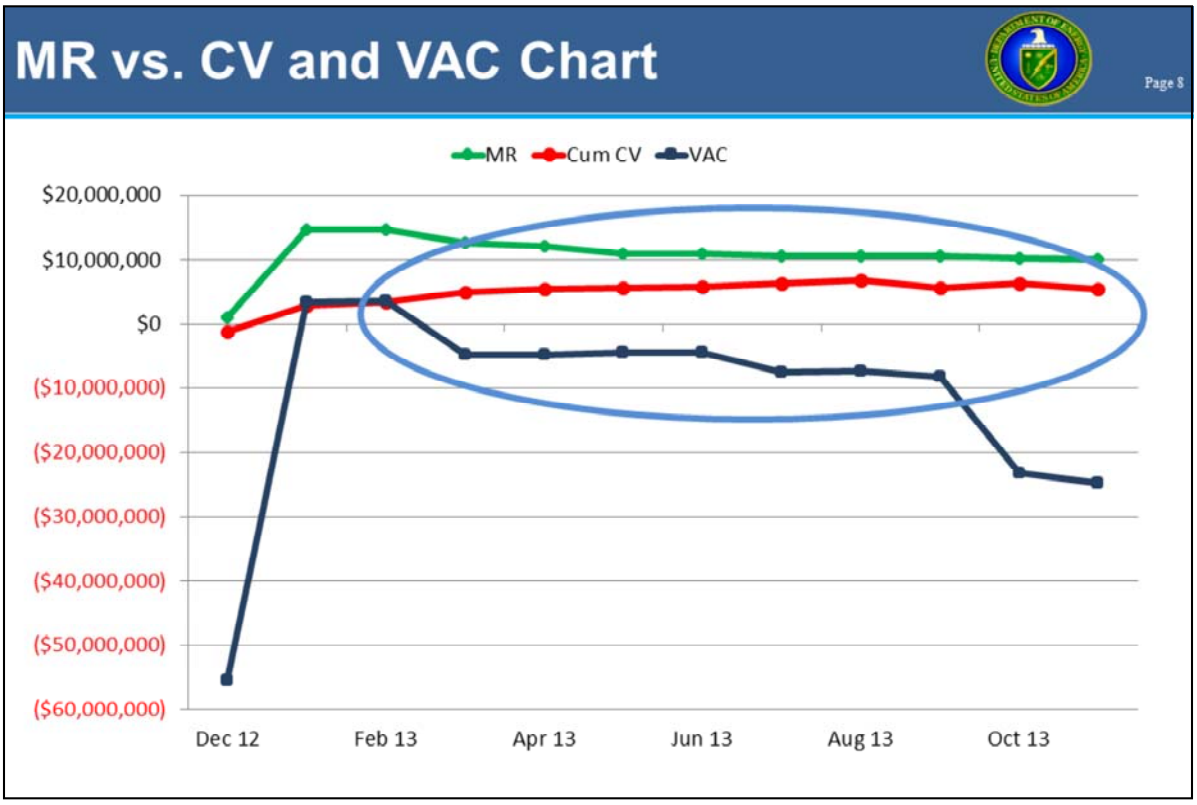


This trend shows the MR balance compared to the cumulative cost variance over a 12 month period. It provides a visual representation of the use of MR. It provides insight into whether Management Reserve is being used to mask cost variances which may lead to an inability to identify issues early.

The Management Reserve Account is established on a project to provide budget for internal known and unknown project risks, that if realized, can be accomplished without the need to increase the Contract Budget Base (CBB). As such, the budget allocated to Management Reserve may be needed to cover future project risks. By using Management Reserve to increase the budget on Control Accounts that are experiencing performance issues, the contractor is reducing the risk reserve budget meant to budget future risks while effectively hiding performance issues that will surface later in the project with possibly much greater severity.

Continual decrease in the Management Reserve balance coupled with a steady or improving cumulative cost variance may be an indicator that MR is being applied to mask cost performance issues. The FPD should access the MR Log to analyze the usage of MR and affected Control Accounts. In this particular example, notice how the area inside the blue circle shows that the cost variance improved as MR was applied.

Increases in the Management Reserve balance coupled with steady or improving cost variances may be an indicator of MR Harvesting - a technique of removing budget from well-performing Control Accounts in order to have it available to apply to poor-performing Control Accounts, thus effectively negating the purpose of performance measurement.

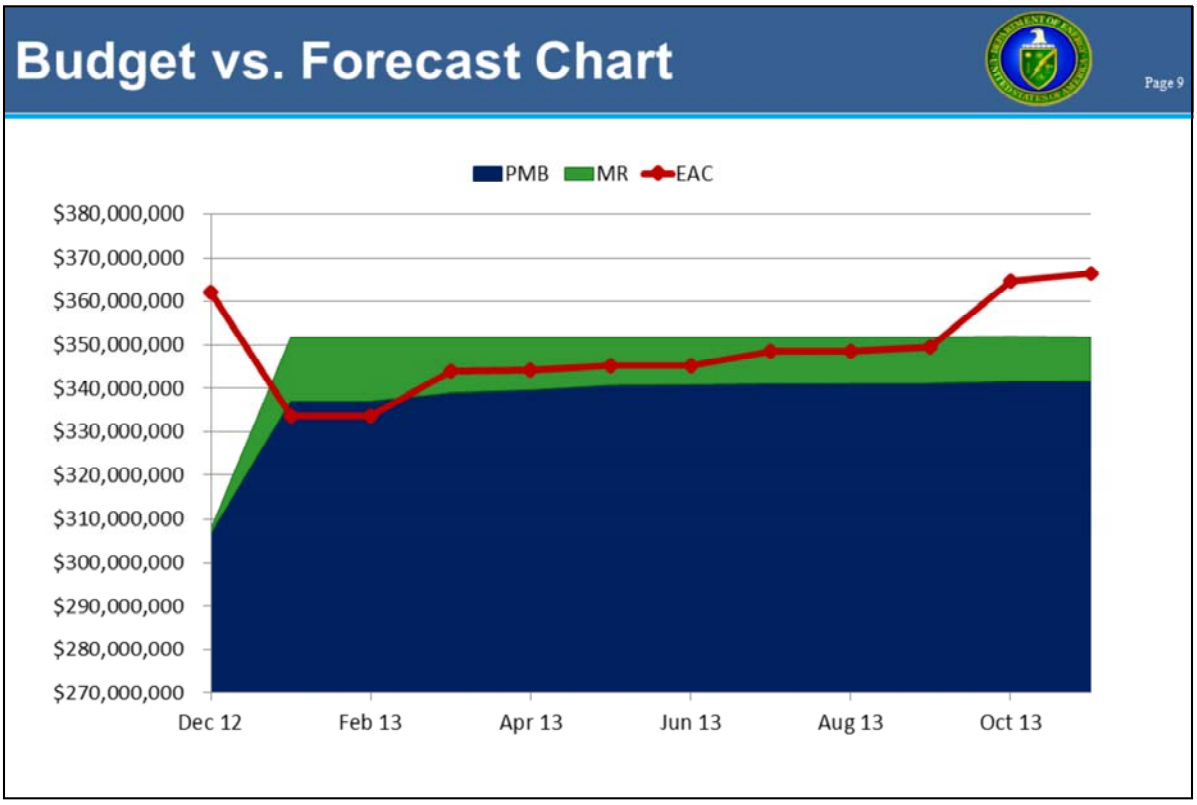


This trend chart provides a similar analysis tool to that available in the MR vs. CV Chart, but adds another dimension to the analysis by introducing Variance At Complete as another data element. Similarly, the tool is intended to highlight potential misuse of Management Reserve by the contractor in order to maintain favorable to-date performance while masking potential issues in hopes of potential future savings opportunities.

The addition of the VAC trend that is steadily decreasing along with MR, while the cost variance remains fairly constant, presents the possibility that MR is being used to cover current cost variances.

A VAC trend line that is plotted below the zero X-axis while being above the CV trend line is an indicator that the contractor-reported EAC may not be up-to-date or significant cost savings are expected in the future that will reverse the cost variance trend.

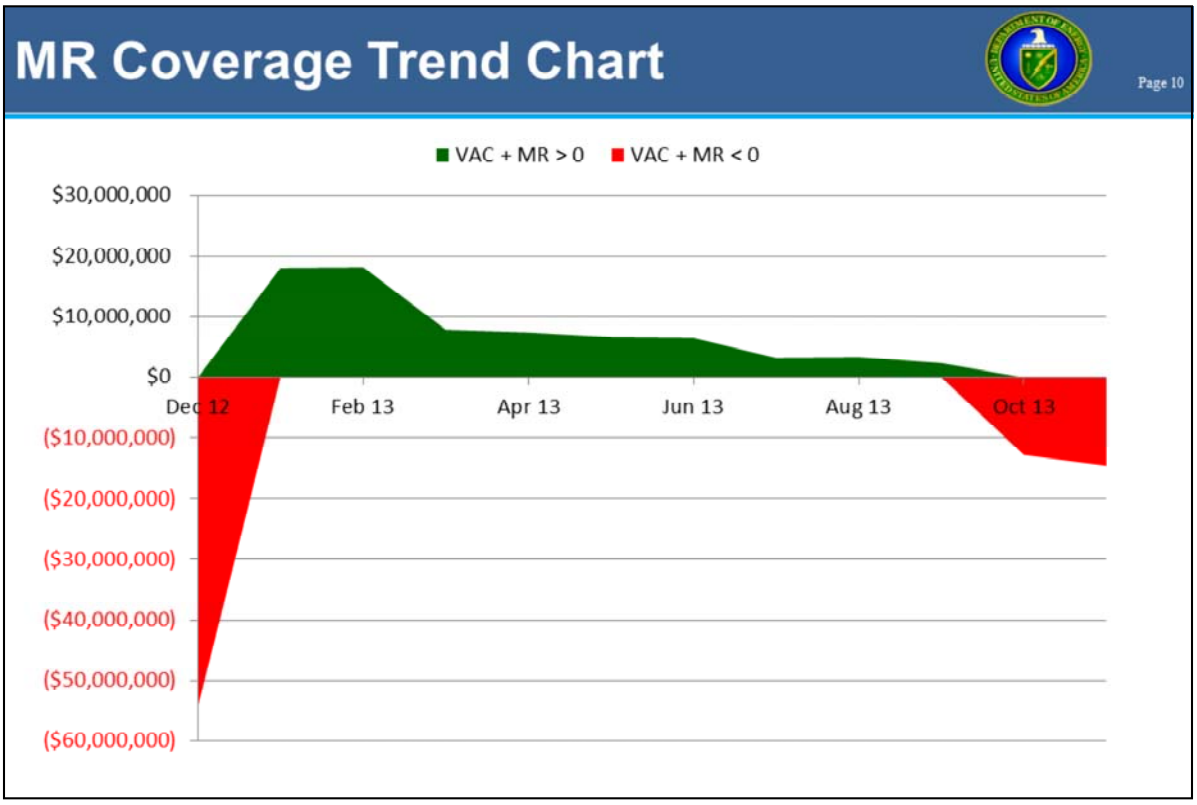
Significant increases in the MR trend line may be an indicator of MR Harvesting practices or the MR Account is being replenished without scope increase from other sources, such as from DOE Contingency.



The chart provides a 12-month trend of the contractor-reported EAC plotted over the contractor-reported approved contract budget base, which consists of PMB and MR components. If the contractor-reported EAC is plotted above the combined PMB and MR area, the user of the report should conduct EAC analysis to determine if a) the EAC is reasonable and accurate, and b) if sufficient contingency is available to cover cost overruns at project completion if the contractor-reported EAC does materialize into actual cost at completion. The Project Funding Status report can also be used to view this information.

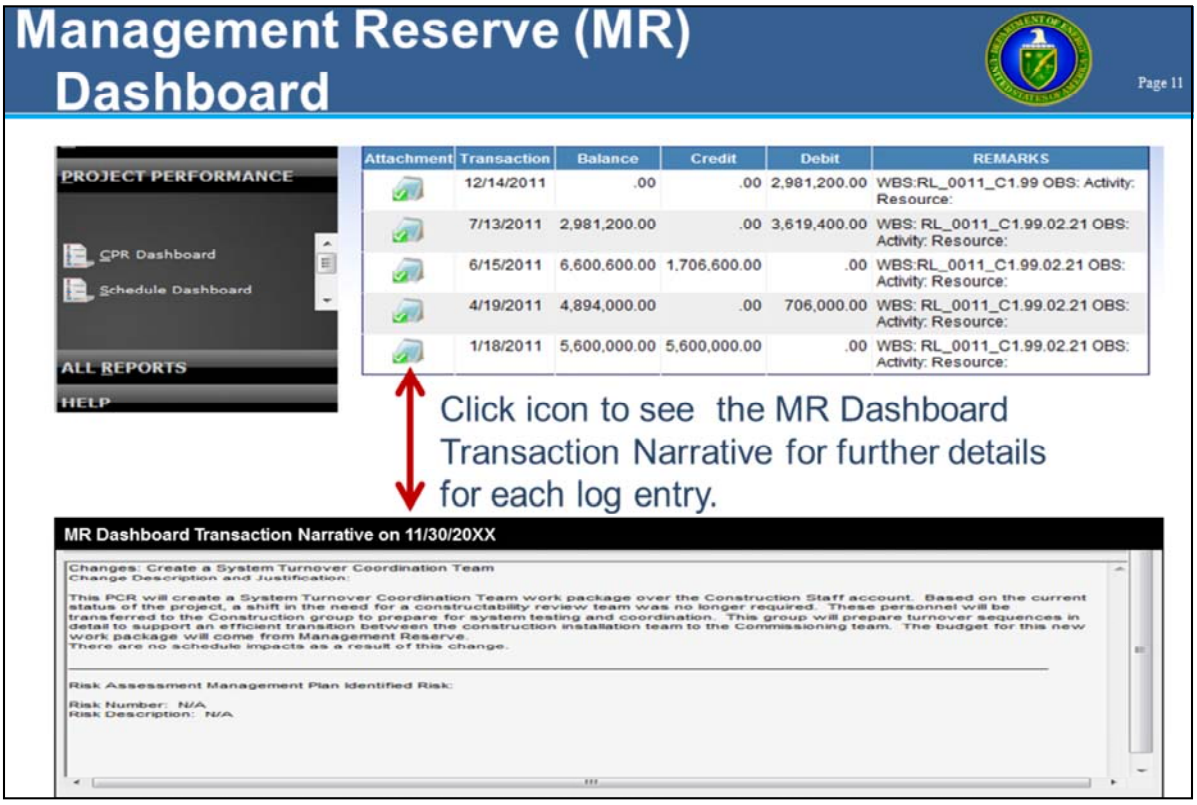
An upward-trending EAC line should be investigated to identify and understand underlying cost drivers and be in a better position to implement corrective actions to prevent further overruns. An unchanging EAC over time should be investigated to ensure that updates to the EAC are both reasonable and accurate and made in a timely fashion.

If the CBB line changes, either increases or decreases, such changes should be properly documented and communicated in monthly assessments, so that the FPD and other management officials clearly understand the reasons.



This is a Visual representation of potential problems with expected overruns. It demonstrates if MR will be sufficient to cover the current forecasted overrun (if MR will not be used for any other purpose until the project completion). If the sum of the MR Balance and Variance At Complete (VAC) becomes negative (red on the chart), that means that the contractor is forecasting the project will exceed the currently approved budget on the contract (the CBB) and DOE Contingency may be required to cover overruns at completion.

The assumption of the metric is that the contractor-reported EAC will materialize into actual cost at completion. Ongoing assessment of contractor owned project risks is important to understand future MR needs.



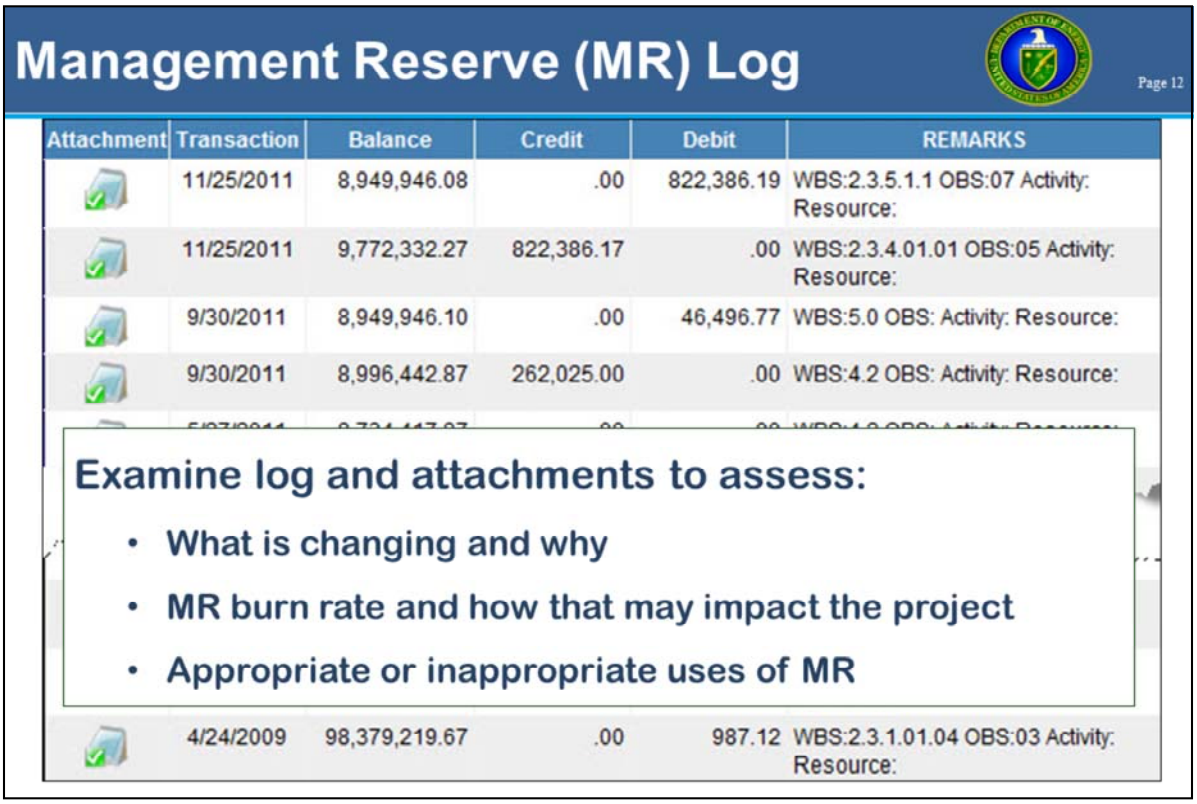
To obtain some of the details to assist in analyzing MR trends previously covered, first check the MR Dashboard. The PARS 2 MR Dashboard provides a checkbook-like view of the contractor Management Reserve (MR) account. It contains information on MR Usage and gives the user an opportunity to review transactions posted against the MR account. It also provides the WBS and/or OBS elements affected by the transactions in the Remarks column. If it is not populated, the contractor is not uploading this data via the CPP process in which case they should be attaching a separate MR transaction log file every month when they upload CPP data.

Descriptions of the transaction are available by clicking the Notepad icon in the Attachment column when available.

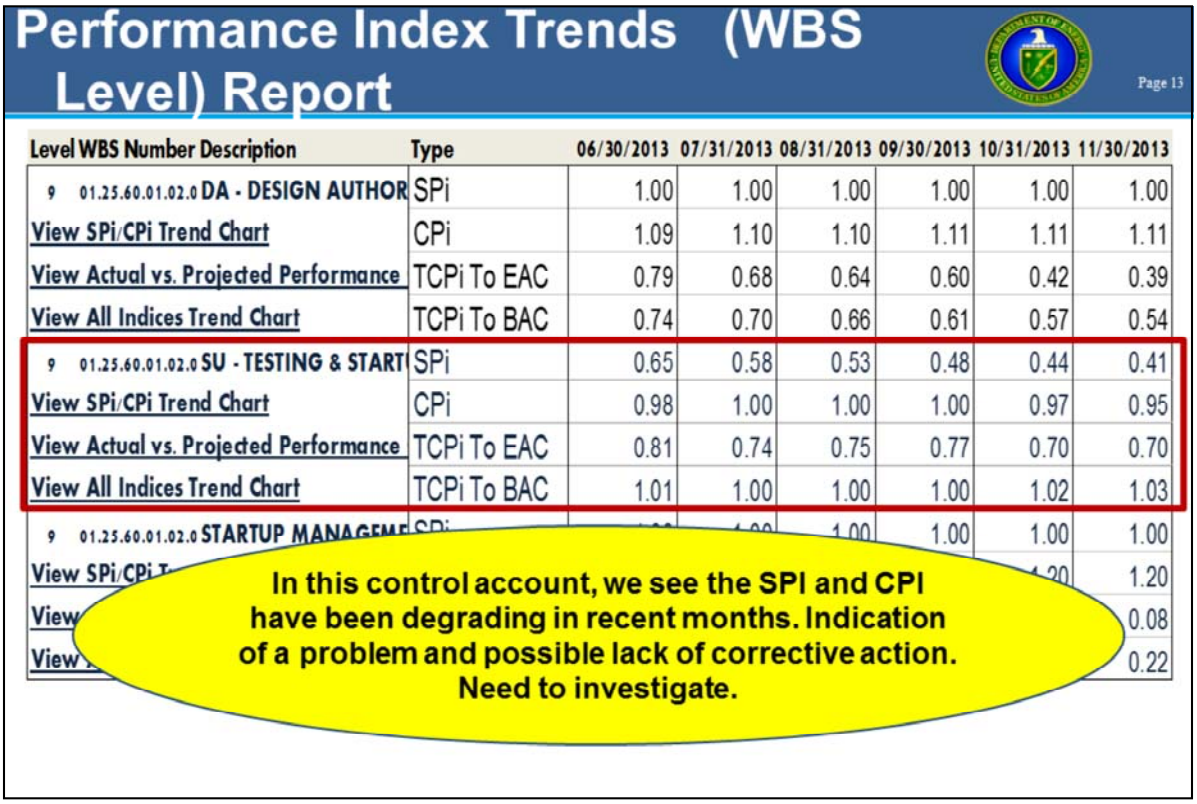
IMPORTANT: Only projects that provide a detailed MR Transaction Log as part of their CPP Upload, will have data populated in the dashboard. Because some contractors were given a temporary waiver for reporting MR Log data into PARS 2 via CPP Upload, those projects will not have this dashboard populated with valid data. Instead, those contractors attach their MR Transaction Logs in the “All Attachments” screen of PARS 2. The FPD should ensure the contractor complies with the requirement to upload their transaction log either as part of the CPP upload or as an attachment, since access to this data is needed for monthly analysis.

Transactions are listed in descending order from newest to oldest. The value in the Balance column for the first listed transaction should be equal to a contractor’s current MR account balance. Values in the Credit column are additions that increase the MR account balance; values in the Debit column are subtractions that reduce the MR account balance. The first

MR transaction (the last record in the MR Dashboard) should be the original deposit that established the MR account. When the Performance Baseline is established at either Critical Decision 2 (CD-2) or when a Baseline Change Proposal (BCP) is approved, the MR balance in the MR transaction log should be traceable and reconcilable with the MR budget noted in the Performance Baseline approval documentation.



The value of this report is to see how MR is being used. The log will show the WBS and/or OBS element affected by the Management Reserve usage and will identify specific details associated with changes in the Management Reserve account balance. The FPD should examine the log to understand what is changing and why, consider burn rate and how that may impact the project, and identify if any transactions are not an appropriate use of MR.



Another way to track trends on a total project or WBS element level is by viewing graphs in the PARS 2 Performance Index Trends (WBS Level) Report. Click on the graph you want on the Report tab, and the selected graph will appear on the Chart Tab. When you see trends of SPI or CPI dropping over time, it indicates a negative trend that needs investigating. Remember that all PARS 2 reports that have “WBS Level” in the name can provide information at the lowest level of the WBS. With proper analysis it can be determined which WBS elements are causing the negative trend.

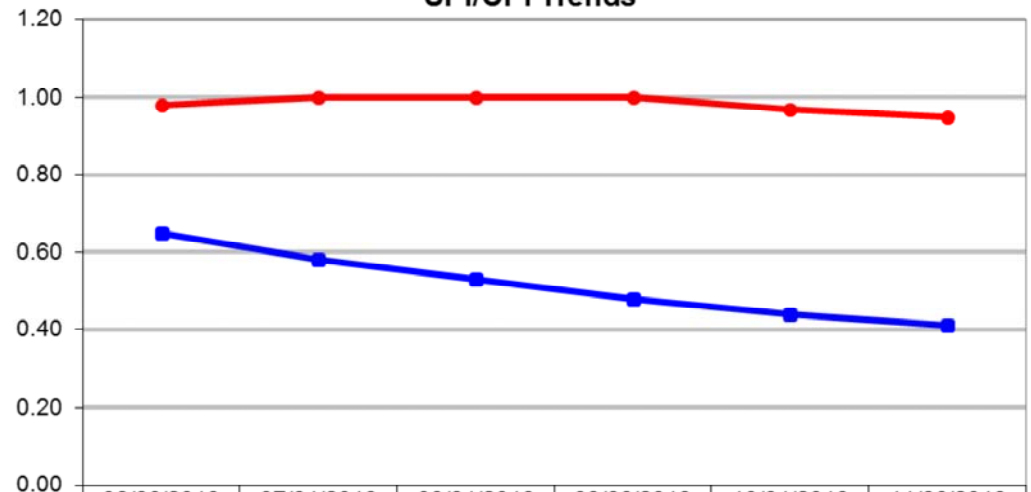
Performance Index Trends (WBS Level) Report

- First select the control account that is showing signs of trouble.
- Next select the charts for more trend information.

	Level	WBS Number	Description	Type	06/30/2013	07/31/2013	08/31/2013	09/30/2013	10/31/2013	11/30/2013
340	9	01.25.60.01.	SU - TESTING & STARTUP	SPi	0.65	0.58	0.53	0.48	0.44	0.41
341	View SPi/CPi Trend Chart			CPi	0.98	1.00	1.00	1.00	0.97	0.95
342	View Actual vs. Projected Performance Chart			TCPi To EAC	0.81	0.74	0.75	0.77	0.70	0.70
343	View All Indices Trend Chart			TCPi To BAC	1.01	1.00	1.00	1.00	1.02	1.03

For lower level WBS element charts, click on the chart you want on the Report tab, and the selected graph will appear on the Chart Tab. Next we will look at the trend curve of SPI versus CPI. The Actual vs. Projected Performance Trends and the Performance Index Trends will be covered in Snippet 5.6 PARS 2 EAC Reasonableness.

SPI / CPI Trends Chart



	06/30/2013	07/31/2013	08/31/2013	09/30/2013	10/31/2013	11/30/2013
SPi	0.65	0.58	0.53	0.48	0.44	0.41
CPi	0.98	1.00	1.00	1.00	0.97	0.95

This slide shows the SPI and CPI Trends Chart. When you see trends of SPI or CPI dropping over time, it indicates a negative trend that needs investigating. The FPD should drill down to the WBS levels identified as primary variance drivers and then select this report to monitor the trends. As negative trends continue, ask the contractor questions as to why and what they are doing about them. On the trend shown we see the SPI has dropped steadily for the past six months, and the CPI has dropped over the last two months.

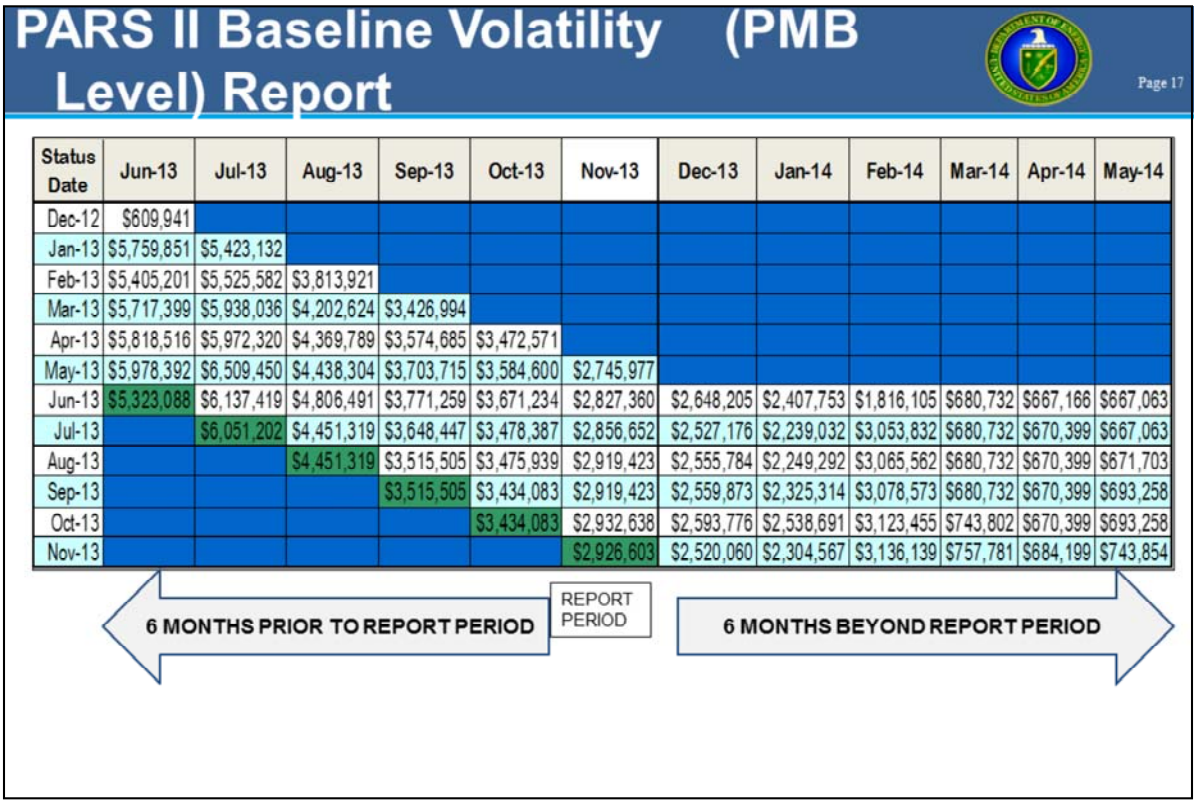
Baseline Volatility

- **Baseline Volatility may equal Baseline Churn**
- **Provides early warning indication of project's time-phasing and control of budget volatility**
- **Churn may indicate**
  - The significance of departure from the original plan
  - Contractor has inadequate plans in place
  - The performance metrics may be unreliable
  - Metric manipulation may be intentional
  - Concerns with
    - Project performance
    - EVMS compliance

Baseline Volatility is sometimes referred to as baseline churn. The report provides an early warning indication that the project's time-phasing and control of the budget is volatile and that a significant departure from the original plan has occurred.

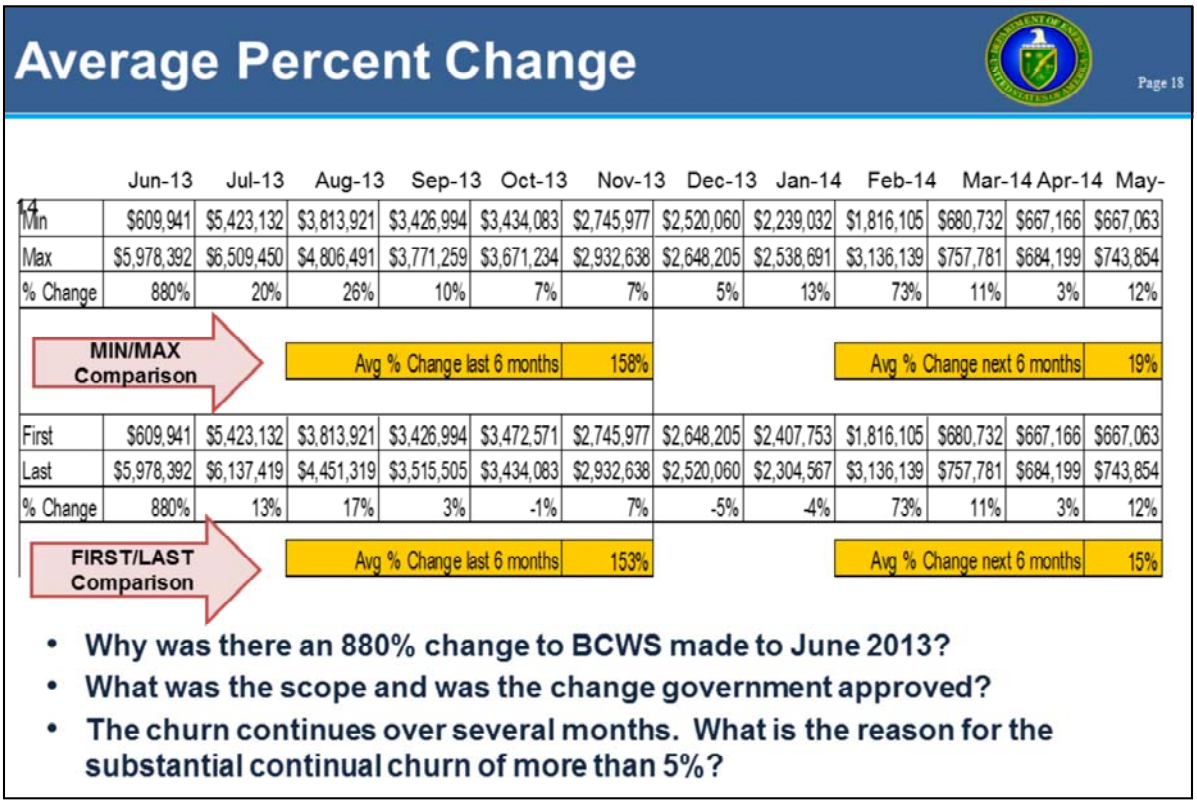
Substantial changes to the baseline time phasing indicate the contractor has inadequate plans in place and the performance metrics may be unreliable. In fact the churn may be an indicator of intent to manipulate the metrics to improve the appearance of poor performance. Change is inevitable but the contractor is expected to be able to establish a firm near term plan (at least 6 months) so that sufficient resource planning and network scheduling can be done.

Rolling wave planning is when the BCWS is only detail planned for the near term (say the next six months) as opposed to detail planning the entire project. Since EV best practices encourage rolling wave planning in six month increments, one would expect to see little flux in the near term except for unpredictable events or real-time realized risks. *Concerns in this area not only apply to Project performance but also to systemic concerns with the contractor's EVMS.*



The PARS II Baseline Volatility – Past and Near-Term (PMB Level) report is split into two sections - past 6 months and near-term 6 months with a visible divider between the two that indicates the Current Performance Period. The significance of this report is that it highlights if the near term baseline is constantly churning in the near term or being pushed to future periods, possibly in order to achieve seemingly favorable current period metrics. This practice can cause misleading results and potentially mask future schedule issues.

There are three calculations on this report, two related to average percent change, and one related to percentage of current period changes. These will be explained on the following slides.



On the lower portion of the report are the calculations. The two Baseline % Change metrics highlight changes made to the time-phased Performance Measurement Baseline (or BCWS) over the past 6 periods. A change of five or more percent is used as an early warning indicator that the project's time-phasing and control of the budget is volatile in the near term and that a significant departure from the original plan has occurred.

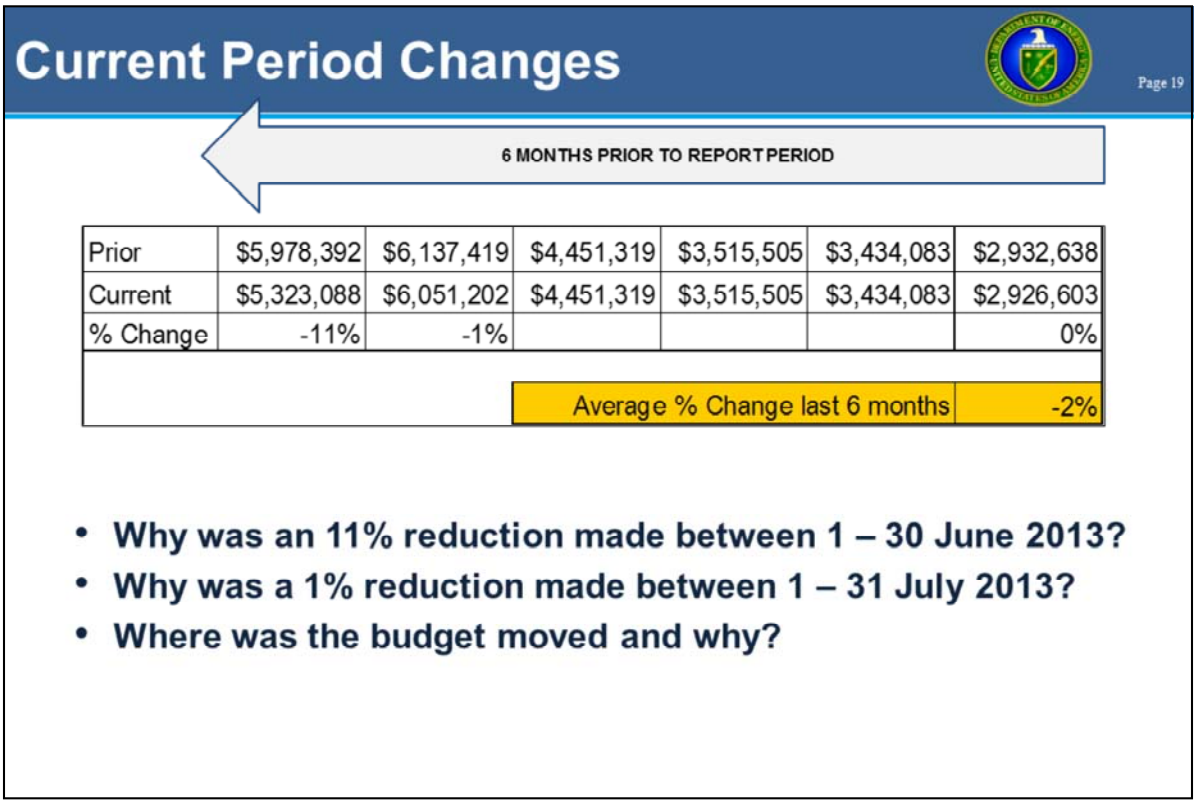
The first compares the Minimum and Maximum BCWS values for the report period within the past six months and then for the next six months.

The second compares the First (earliest) and Last (most recent) BCWS values for the report period within the past six months and then for the next six months. If the First/Last value is negative, then BCWS was moved forward (later in the project). If BCWS is positive, then work is being moved to be accomplished earlier than planned. This can be a concern as well since it could mean that 'cherry picking' could be occurring, that is, easy future tasks brought forward while more important critical activities are not being accomplished.

The individual calculations for the past six months are added to determine (a) the average percent change based on minimum and maximum reported values, and (b) the average percent change for the first and last reported values. If either of the absolute values for the six month average percent change calculations exceeds 5%, there is high volatility in the near term plan. If the re-plan is not government-directed, it should be investigated and potentially documented in the monthly assessment as an indicator of baseline churn.

On this particular example, there was a significant influx of BCWS added to the baseline in June 2013 which may be a discrete replan vice a continual rolling replan (or baseline

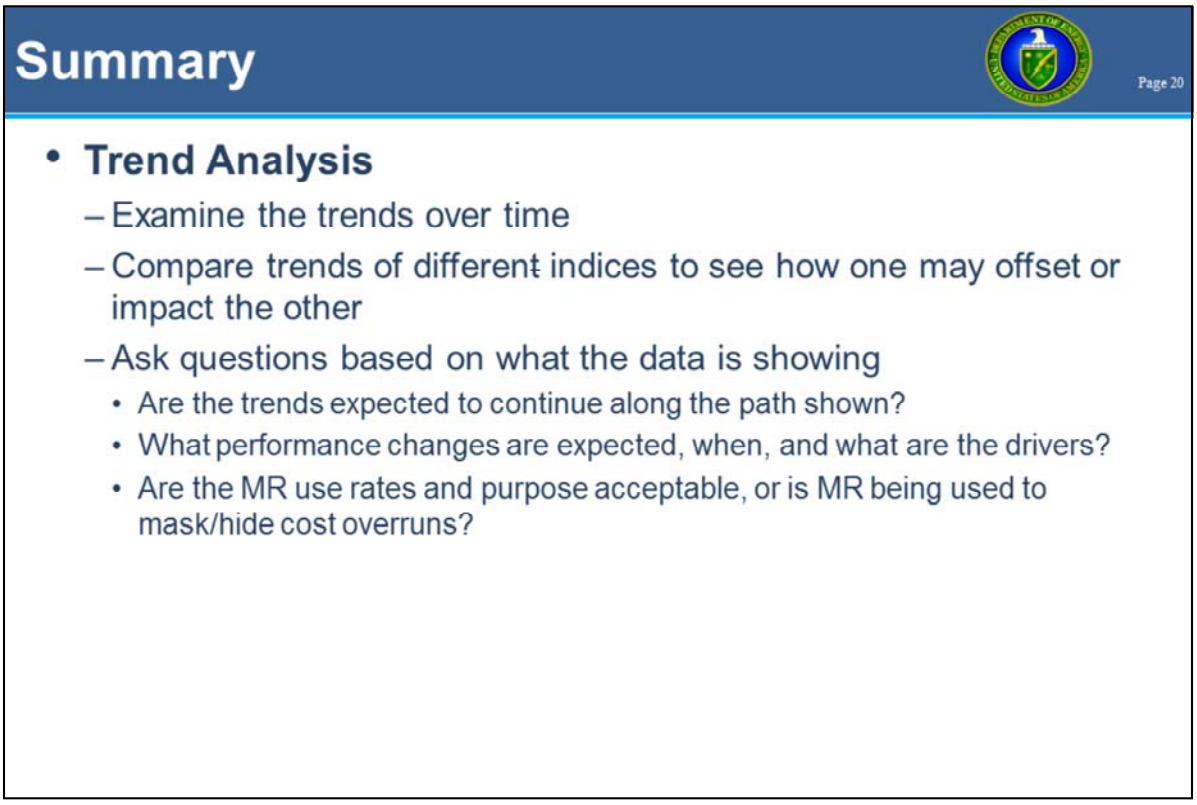
churn). In this situation, the FPD may be aware of the authorization for the influx. When a significant replan is conducted, it is important for the contractor to complete that replanning activity in a timely manner as required by the ANSI/EIA-748 guidelines. When baseline churn continues above 5%, it indicates internal issues with being able to plan properly. Consequently the FPD should be concerned and investigate why it seems the baseline continues to be replanned each month.



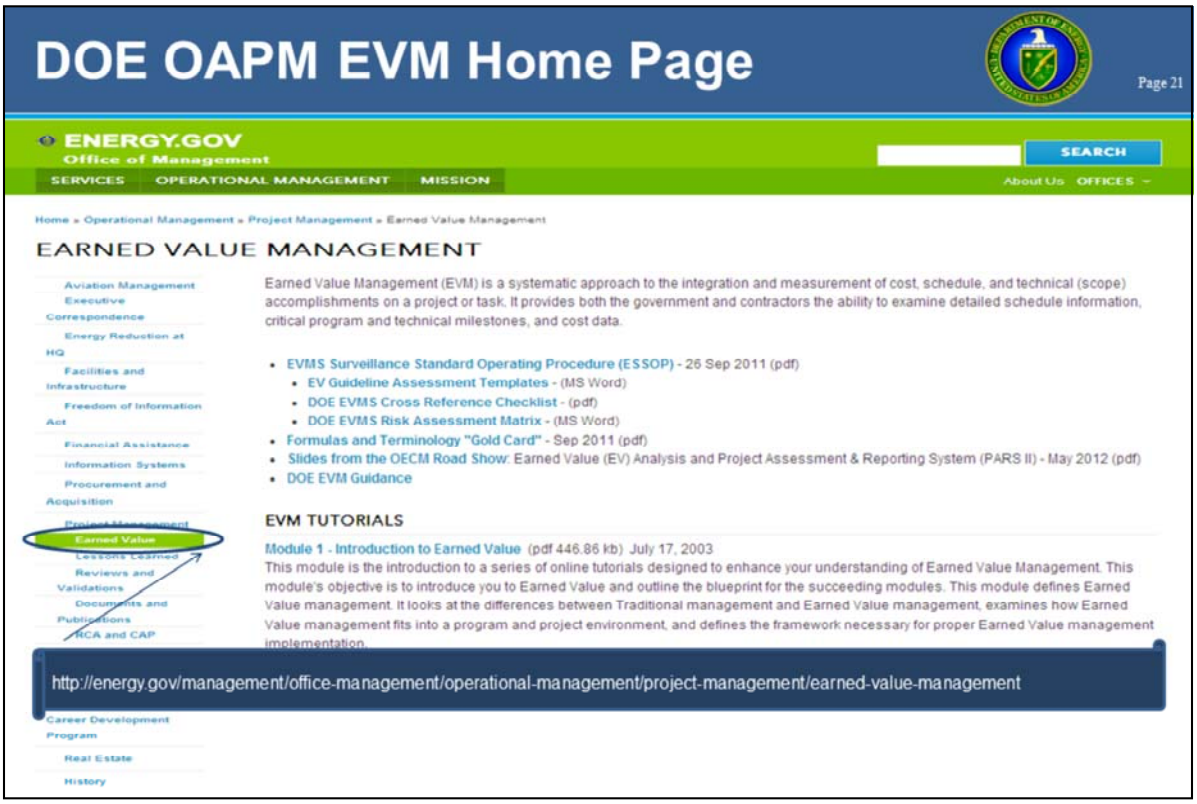
The last calculation identifies changes made during the current reporting period. Changes made to the BCWS during the current period are considered retroactive changes once the period begins and should not happen. The current period should be a freeze period for baseline changes and changes within a current period can be an indicator of problems with the cycle time of the contractor's revisions processes or baseline discipline issues.

This report is designed not to display zero (0) values in the % Change cells. Therefore, blank cells indicate a true zero (0) percent (no change in values), while 0% indicates there is insignificant difference (< 0.5%) between compared values. Anything greater than 0% is of concern for the current period changes calculation.

Substantial changes to the baseline time phasing may indicate the contractor has inadequate plans in place and the performance metrics may be unreliable. Change is inevitable, but the near term plan should be firm and change control should be exercised. In this example, the change in the current periods for each month, June and July, would need to be questioned. Why was it that 11% of the BCWS was removed during the current period (1 June – 30 June 2013) and then again in July another 1% was removed? And where was it moved to?



In summary, the trend analysis assists the Project management team in determining both emerging trends and recoveries. The steps and supporting reports discussed include examining the trends over time for those WBS elements that variance analysis uncovered as the leading causes. Compare trends of different indices to see how one may offset or impact the other, such as MR use versus the cumulative cost variance. These are tactics that could be masking true performance and impact the FPD's ability to make accurate forecasts. The FPD should ask questions based on what the data is showing, such as are the trends expected to continue along the path shown? What performance changes are expected, when, and what are the drivers? Are the MR usage rates and applications acceptable or, is MR being used to mask/hide cost overruns?



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.