The Department of Energy's Project Reporting and Assessment System (PARS)

PARS Empower Trending Analysis, Module 5
PARS User Advanced Training

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Welcome to the fifth of eight session of the Department of Energy's Project Reporting and Assessment System advanced user training. This session is approximately 50 minutes in length. In this course the focus will be on the user, which include the contractor managing the project, the federal project director, the DOE program oversight, and DOE headquarters independent project analysis, using the tools in Empower to better look at projects performance data. The analysis and reporting capabilities of PARS provide decisions makers at all levels with knowledge to best manage these projects over their lifecycle. In this course we will look at how to do Trending Analysis in the Empower tool, *this is* easy to do in Empower and aligns with the Project Analyst Standard Operating Procedure (EPASOP). In the last session we identified the major variances, now we can ask the question, are those Variance trending or just "one off".

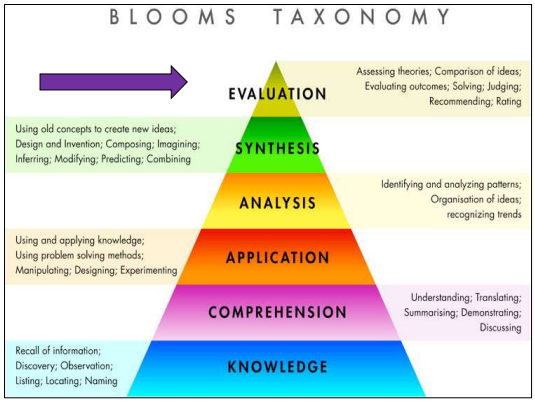
Training Objectives

Encore Analytics

- **Assess which Empower and PARS tools and capabilities to use in analyzing projects.**
- **Apply DOE EVMS and Project Analysis Standard Operation Procedure to projects**
- **Evaluate Projects using appropriate dashboards, views, charts, and reports information**
- Assess data provided to DOE through the use of EVMS metric tests and data quality reports
- **Building advanced pre-filters in Empower**

AT COMPLETION - EARN 8 CEU/PDUS

- Federal Employees – Will be added to CHRIS
- Contractor Employees – Certificate will be emailed MZW3



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This Fifth session will focus on the top three training objectives with focus on conducting Trending Analysis in Empower. We will use the advanced capabilities within Empower to provided ANALYSIS capabilities to support synthesis of by combining the many tools in PARS to allow the analyst to evaluate the status of the project, now and in the future.

We will cover the basic concepts outlined in the EPASOP, as well as additional capabilities. Keep in mind, some of this additional capabilities is data dependent, meaning, if the data exists in prior periods then trending analysis can be achieved. Let's get started…

Slide 2

MZW3 How to provide credit? - Sig

Matthew Z West, 8/25/2020

Trend Analysis Dashboard

Encore Analytics

- To analyze and identify reoccurrence of the same variance
- Identify trending to see if corrective actions have been effective
- Trending capabilities to identify emerging problems by observing:
  - Improving Trends or trending up
  - No change or “flat” trends
  - Trending conditions are deteriorating or trending down
- Some questions to ask as you analyze trending data:
  - What do the trends indicate over time?
  - Is this trending going to continue and why?
  - What future performance are expected?
  - MR and contingency burn rates and use acceptable

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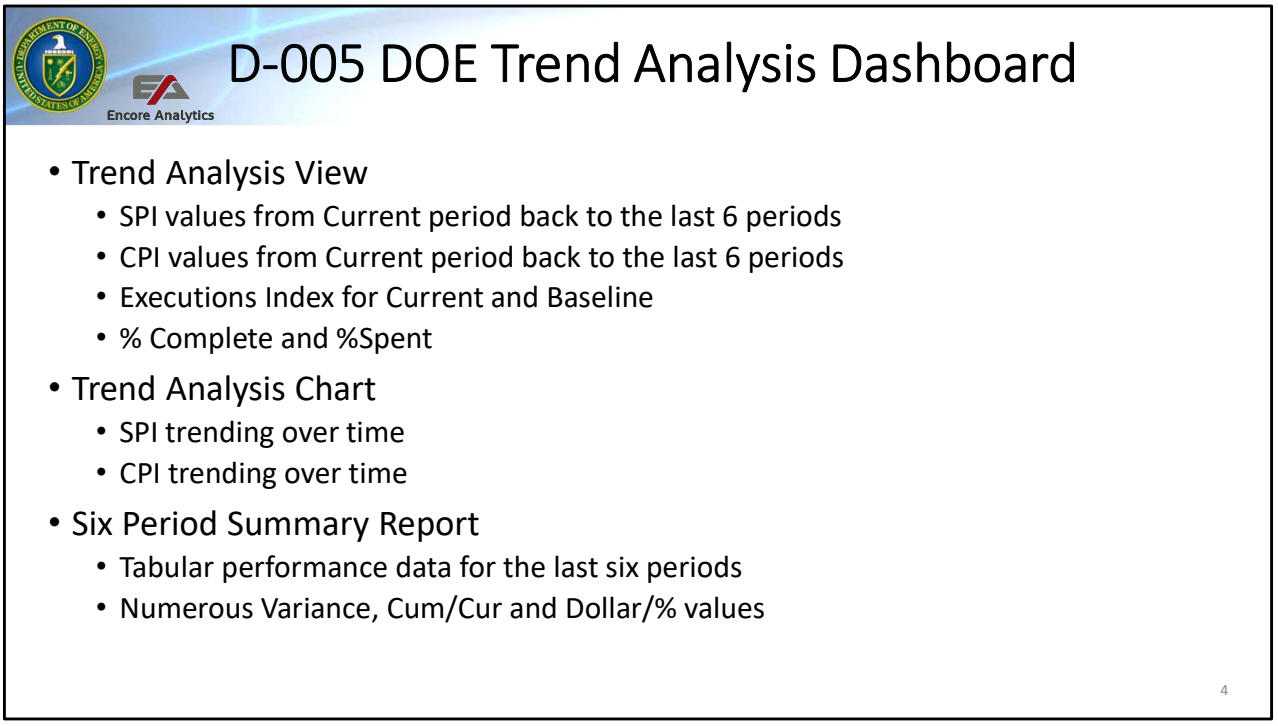
Trending by definition is to analyze and identify the reoccurrence of the same variance over a give time. It is not a single point but multiple points that provide insight into trending directions, how are they handling reoccurrence and if any corrective actions are effective. Trending highlights emerging problems that can only be seen given multiple periods of data, and not a just a since period report.
There are three types of trends to note: Improving, deteriorating and no change. As you look at multiple periods of data ask:

- What do the trend data indicate over time, i.e Improving, no change or deteriorating
- Is that trend going to continue and how would we know that, why??
- Is this the performance we are to expect in the future?
- What is the MR and contingency burn rates, are their use acceptable



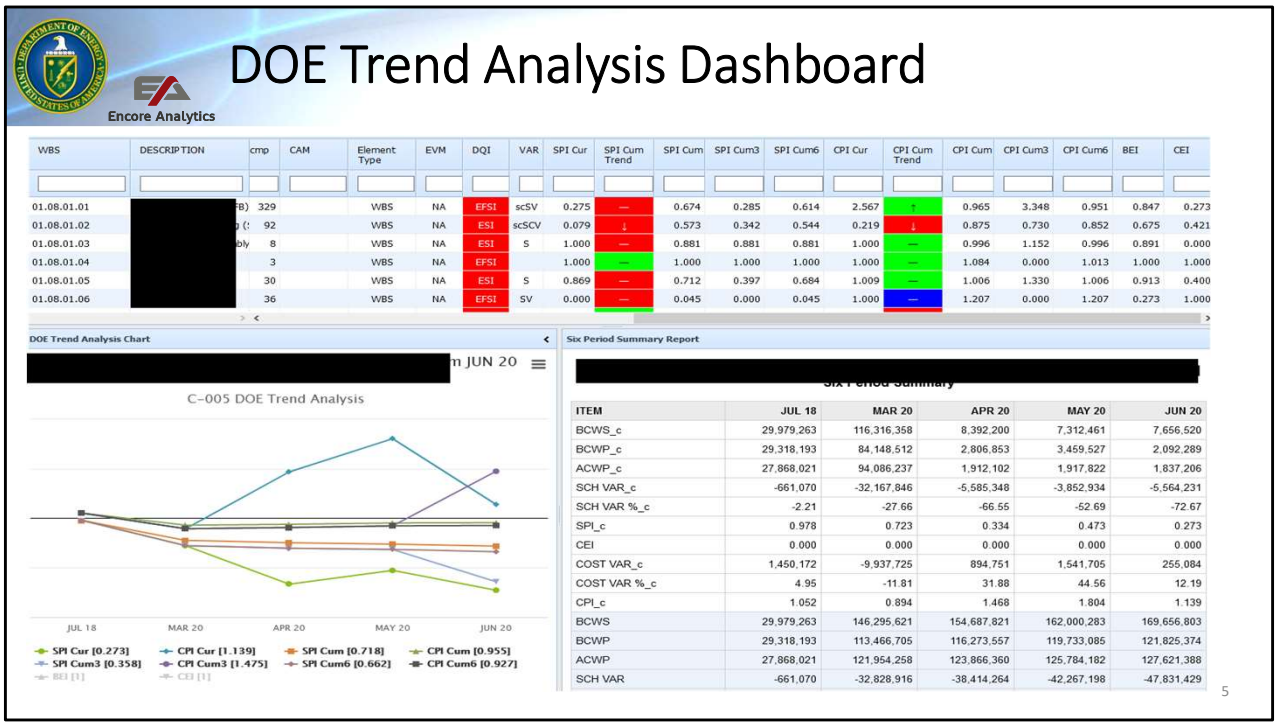
We have provided various Dashboard in the PARS Empower environment that you can select and use to conduct analysis. One of them is the D-005 DOE Trend Analysis Dashboard. This dashboard can be used as your initial launching point to conduct Trend Analysis.

Let's start with the Trend Analysis View, it is the top part of the Tri Pane of Empower. A wealth of information is provided starting with trending data for SPI and CPI. If the period data is available Empower will calculate performance indices from up to 6 periods back. Baseline Execution and Current Execution index will be provided as well.
There are other numerous data point, but one to draw your attention is the % Complete and Spent. One is based on BCWP the latter is based on ACWP.

Trend analysis charts provides SPI and CPI values over time, here is very easy to see how the trends are dynamic, up, down or flat. We will discuss this more in detail shortly.

Just like in prior session, the Six Period provides a lot of information, in this case, it shows tabular data for the past six period. It will have trending numbers over time so

you can the value changes. More on that in future slides.



The Trend Analysis Dashboard will display the selected project from the Dataset and open with the All Elements (all levels) on. You will need to select Dashboard > Global > and Select DOE Trend Analysis Dashboard and the following screen will open. Once you have done this, you can still use the interactive filters, sorting in the Sort window. Keep in mind a Dashboard will provide a preselected Views, Chart, Report and filters and sorting. Consider this your 'starting' point for analysis. So for example, if you want your starting point to be Level 3, go to type in LvL = 3 in the Interactive Filter. If you wish to do a sort, you may do that at this time by sorting for any field that is displayed.

You may at this time select a different Element and will notice the chart and reports changed based on the element (row) you selected. This is called an "active element" in Empower, it drives chart and report. You will also see each chart and report has the name of the "active element" within the display data. This is also another way to let you know that a chart or report is rendering that data based on the active element.

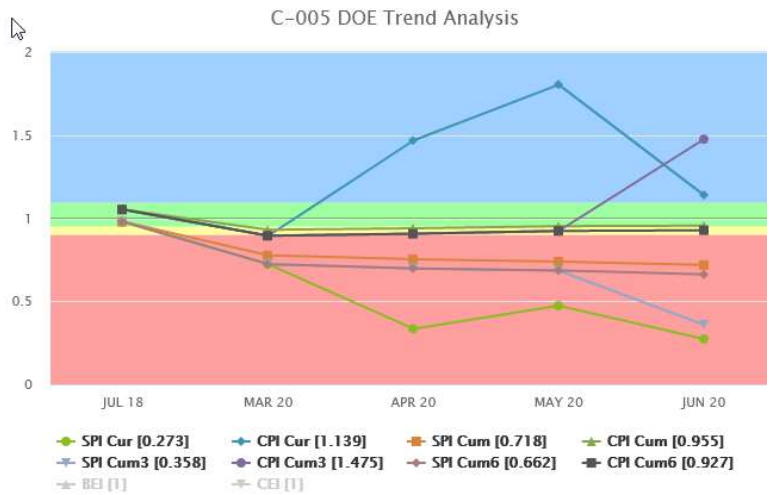
You will notice the bottom left has a chart with Color. We will go in detail soon on what the colors represent. But take some time to familiarize your self with the chart,

You will go in greater detail of each of the tri panes. Also note, you can change the Chart and Report to provide greater visibility into other variances such as EOC and Activities.

Trend Analysis Chart

Encore Analytics

- Shows performance over time
- Left axis shows 1 as the desired reference
- Any below 1 or red is underachieving
- SPI (Cur, Cum, Cum3, and Cum6) Period data
- CPI (Cur, Cum, Cum3, and Cum6) Period data
- Baseline Execution Index
- Current Execution Index



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The Trend analysis Chart provides a quick look at many of the indicies over the past 6 months. Easy way to resolve what is going up, down or staying flat. We will look at specific aspects of this chart again below.

Six Period Summary – Trend Analysis

Encore Analytics

- Up to Six Period of past data represented by period (column)
- Each calculation (SPI, CPI) is shown for each period
- CEI is shown in the Current
- BEI is shown in the Cumulative
- Current period and cumulative values are show for past 6 periods

ITEM	JUL 18	MAR 20	APR 20	MAY 20	JUN 20
BCWS_c	29,979,263	116,316,358	8,392,200	7,312,461	7,656,520
BCWP_c	29,318,193	84,148,512	2,806,853	3,459,527	2,092,289
ACWP_c	27,868,021	94,086,237	1,912,102	1,917,822	1,837,206
SCH VAR_c	-661,070	-32,167,846	-5,585,348	-3,852,934	-5,564,231
SCH VAR %_c	-2.21	-27.66	-66.55	-52.69	-72.67
SPI_c	0.978	0.723	0.334	0.473	0.273
CEI	0.000	0.000	0.000	0.000	0.000
COST VAR_c	1,450,172	-9,937,725	894,751	1,541,705	255,084
COST VAR %_c	4.95	-11.81	31.88	44.56	12.19
CPI_c	1.052	0.894	1.468	1.804	1.139
BCWS	29,979,263	146,295,621	154,687,821	162,000,283	169,656,803
BCWP	29,318,193	113,466,705	116,273,557	119,733,085	121,825,374
ACWP	27,868,021	121,954,258	123,866,360	125,784,182	127,621,388
SCH VAR	-661,070	-32,828,916	-38,414,264	-42,267,198	-47,831,429
SCH VAR %	-2.21	-22.44	-24.83	-26.09	-28.19
SPI	0.978	0.776	0.752	0.739	0.718
BEI	0.000	0.000	0.000	0.000	0.000

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The Six Period Summary Reports represents up to six periods (if available) in a tabular report. Each period is represented in a calendar description at the top of the header. The first column represent what value is being represented in the rows.

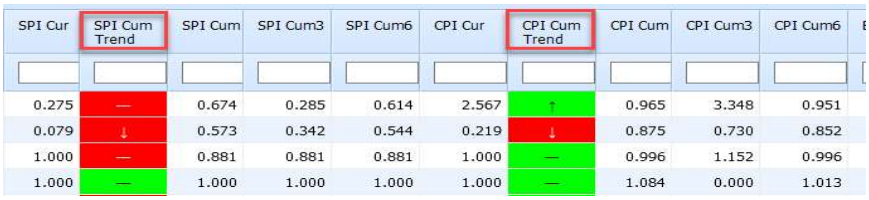
Highlighted are the rows or fields for Variance: The upper sections in clear (or white) is the Current period section of the report. Below that section in the 'darken' section is the cumulative section of the report.

The values we want to focus are highlighted in red. Look at the top header information, this provides the column of data for the appropriate period. It will provide up to the latest six periods of data. Next look at the rows that highlighted in red. In this case, SPI and CPI along with other indices are calculated by period. You will notice there are calculations for current and cumulative period data. This values will show in the View window but in the reports, it shows tabular in order to gain insight into the value of the changes of time. More on this report later.

Color and Trending Fields

Encore Analytics

- Color coded field – identifies how favorable or unfavorable the Variance is:
  - R - Red – Unsatisfactory
  - Y - Yellow – Marginal
  - G - Green – Satisfactory
  - B - Blue – Exceptional
  - No Color – No data
- Trend Arrows – identifies if the trend from the previous month is:
  - ↓ - D - Down arrow - Worse than last Month
  - – - F - Horizontal line – No change
  - ↑ - U - Up arrow - Better than last month
  - No Arrow – Need two periods
- Is NOT case sensitive
- Labeled in Empower as "Trend"



SPI Cur	SPI Cum Trend	SPI Cum	SPI Cum3	SPI Cum6	CPI Cur	CPI Cum Trend	CPI Cum	CPI Cum3	CPI Cum6
0.275	—	0.674	0.285	0.614	2.567	↑	0.965	3.348	0.951
0.079	↓	0.573	0.342	0.544	0.219	↓	0.875	0.730	0.852
1.000	—	0.881	0.881	0.881	1.000	—	0.996	1.152	0.996
1.000	—	1.000	1.000	1.000	1.000	—	1.084	0.000	1.013

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Let's take a look closely at the Color and Trending fields in the Variance Analysis Dashboard. I have highlighted them red to help identify the fields below have to pieces of information: Color and Trend

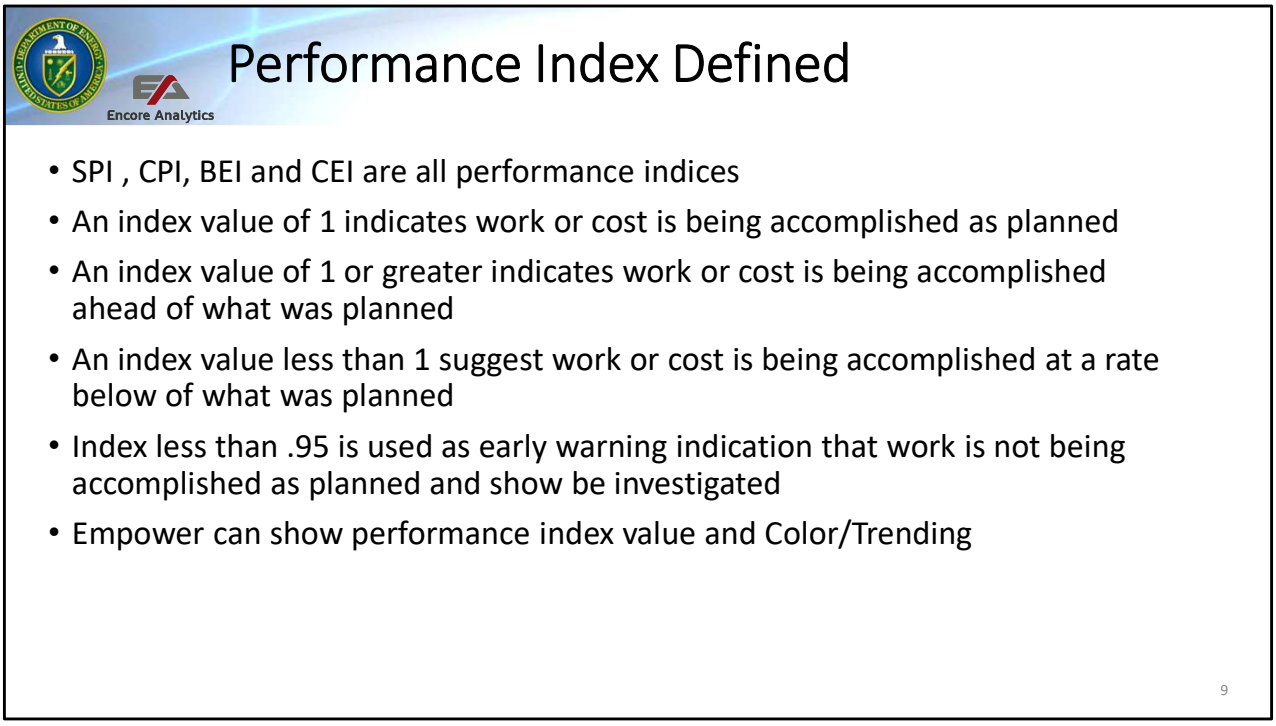
Notice the description will let you know if the field contains SV, CV, Current or Cum. However, the header description shows the word "Trend" to notify you this field is a color trend field. The field will only have to letters to describe the contents: color first and then trend. They are always in that order. I want to repeat that, you put the color first then the trend, reversing that will results in no data being displayed.

Let's start with the Color: The first letter of the color can input into the interactive filter to filter on that color. For example, an "R" will represent Red and Empower will filter for all Red color regardless of the Trend condition. You may only filter for one color at time, this field does not have the "|" (Pipe) option like other text fields.

The second letter represents the trend; down, up or flat. If all you want to see all elements that have worsen from last period, all you need to type is "D" and Empower will display all downward trending elements in the Sort window.
This is one of the few fields that are not case sensitive, but still a good practice to

capitalize.

You can create multiple interactive filters by inputting conditions in multiple fields.



Performance index measure efficiency relative to the task/element/total project level. Normally used as an early warning corrections are required in order to meet the objectives of the project and minimize the impact of risk. As we have shown, Empower provides numerous performance indices via views, charts and reports.

The indices are 'rearward-looking', derived entirely from historical data. However, CPI is used as predictive manner as a quick and easy gauge of future cost, as historical basis to compare forecasted cost (IEAC) and to make projections based on observed trends.

Typically, an index > 1.00 is considered favorable, another words, the effort on average is being accomplished more efficiently than planned
An index = 1.00 is considered on track and the effort on average is being accomplished as the planned efficiency.
An index < 1.00 is considered unfavorable, another words, the effort on average is being accomplished less efficiently than planned

Furthermore, an index < .95 is an early warning (red) indicating poor efficiency and/or poor planning (overly challenged budgets).

Empower will show performance index value and color/trending for most of these indices.

Checks on Learning – Trending Dashboard

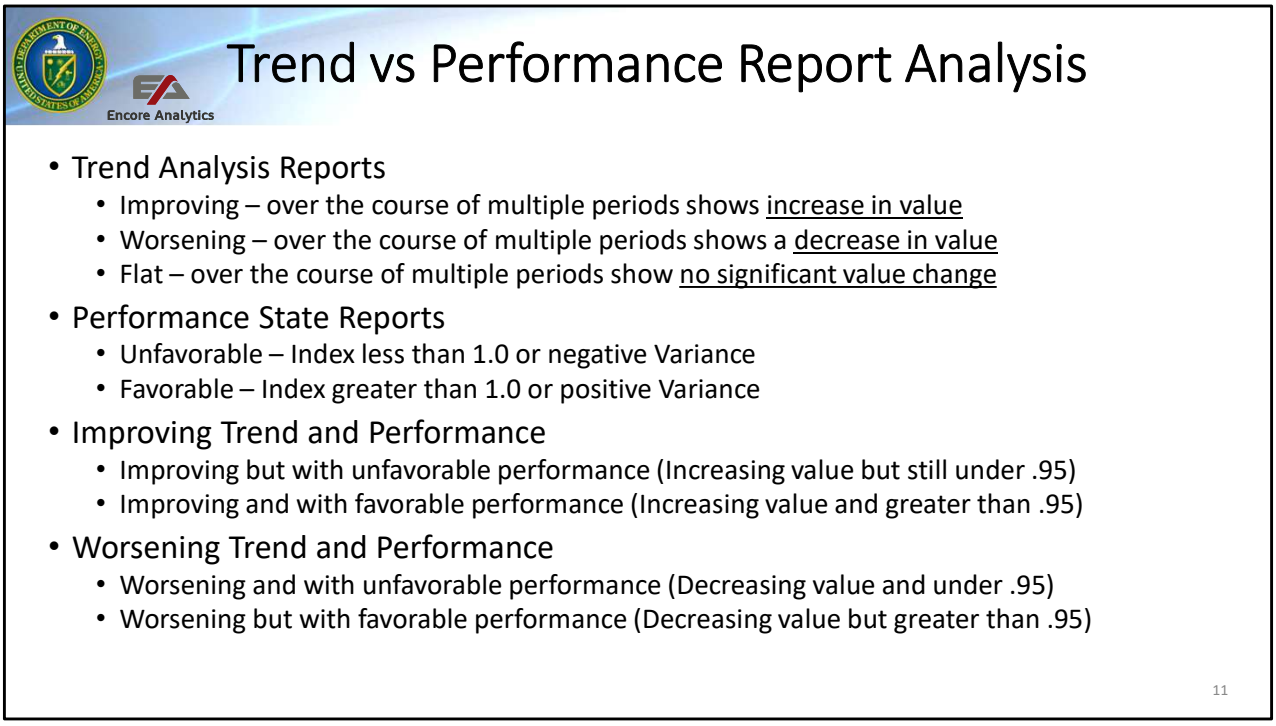
Encore Analytics

1. What does Performance Index measure?
   A. CPI Cur
   B. CPI cum6
   C. BEI
   D. SPI Cum
   E. All the above
   F. Answer A and B are correct

2. Empower has the following Indices?
   A. Air Conditioning
   B. Performance Condition
   C. Physical Condition
   D. Trending Condition
   E. Answer A and D are correct
   F. Answer B and D are correct

3. What is true about BEI and CEI?
   A. CEI has index for Current tasks only
   B. BEI is cumulative Task actual and plan values
   C. Both count activity completions
   D. All are correct

4. What is true about Trending data.
   A. Upward movement shows improving condition
   B. Flat movement shows it is getting worse
   C. Indices can show Trend and Color
   D. You need at least two period to show Trends
   E. Answers A, C and D are correct
   F. Answers A and D are correct



When looking at trending data there are two conditions to consider:

1. What is the current trending condition: Improving, Worsening or flat. They can only be observed if multiple periods are available
2. The current state of performance, is it on track, unfavorable and favorable. Those are performance conditions are measured based on negative variance or indices less than 1.0 values.

Keep in mind the you may have a combination of multiple conditions happening in any given time. For example, you have an improving trend condition, but still have poor performance condition <1 or Red state. You can also have improving condition and the performance is favorable >1 or Green/Blue

The other condition is the worsening trend and have unfavorable conditions. This is the worst of all the conditions, meaning performance is poor and things are worsening, sort of the double negative. You can also have worsening trend but the performance condition is still favorable.

Regardless of the performance condition, trending condition is important to note since it provides early warning of other issues that need to be investigated:

Why is the trend worsening? Let attempt to look at that in coming slides.

Schedule Performance Index Fields Defined

Encore Analytics

- SPI Cur - SPI for the current period
- SPI Cum – SPI Cumulative since the beginning for the selected Element
- SPI Cum3 - SPI Cumulative (avg) for the last three (3) periods
- SPI Cum6 – SPI Cumulative (avg) for the last six (6) periods

SPI Cur	SPI Cum Trend	SPI Cum	SPI Cum3	SPI Cum6
0.275	—	0.674	0.285	0.614
0.079	↓	0.573	0.342	0.544
1.000	—	0.881	0.881	0.881
1.000	—	1.000	1.000	1.000

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Before we start to do the trend analysis, let look at some defining some field that we will use. We will start with Schedule Performance Index (SPI)

SPI Cur – provides current period performance indices. This one is probably the most volatile of the indices since we are using a single period to make our calculations, it may and usually have large swing, we call them peaks and valleys in the chart.

SPI CUM – this is probably the most stable of them all, specially if you have more than 6 periods of data. It will provide an average from the beginning to the current period.

SPI Cum3 – this performance index provides and average performance over the last three months. It provide more stable than the Cur performance since it provide two additional data points than the Current period performance.

SPI Cum6 – provides the average performance over the last six months. More stable than the Cum3 because it gives us more data points to calculate.

Cost Performance Index Fields Defined

Encore Analytics

- CPI Cur - CPI for the current period
- CPI Cum – CPI Cumulative since the beginning for the selected Element
- CPI Cum3 - CPI Cumulative for the last three (3) periods
- CPI Cum6 – CPI Cumulative for the last six (6) periods

CPI Cur	CPI Cum Trend	CPI Cum	CPI Cum3	CPI Cum6
2.567	↑	0.965	3.348	0.951
0.219	↓	0.875	0.730	0.852
1.000	—	0.996	1.152	0.996
1.000	—	1.084	0.000	1.013

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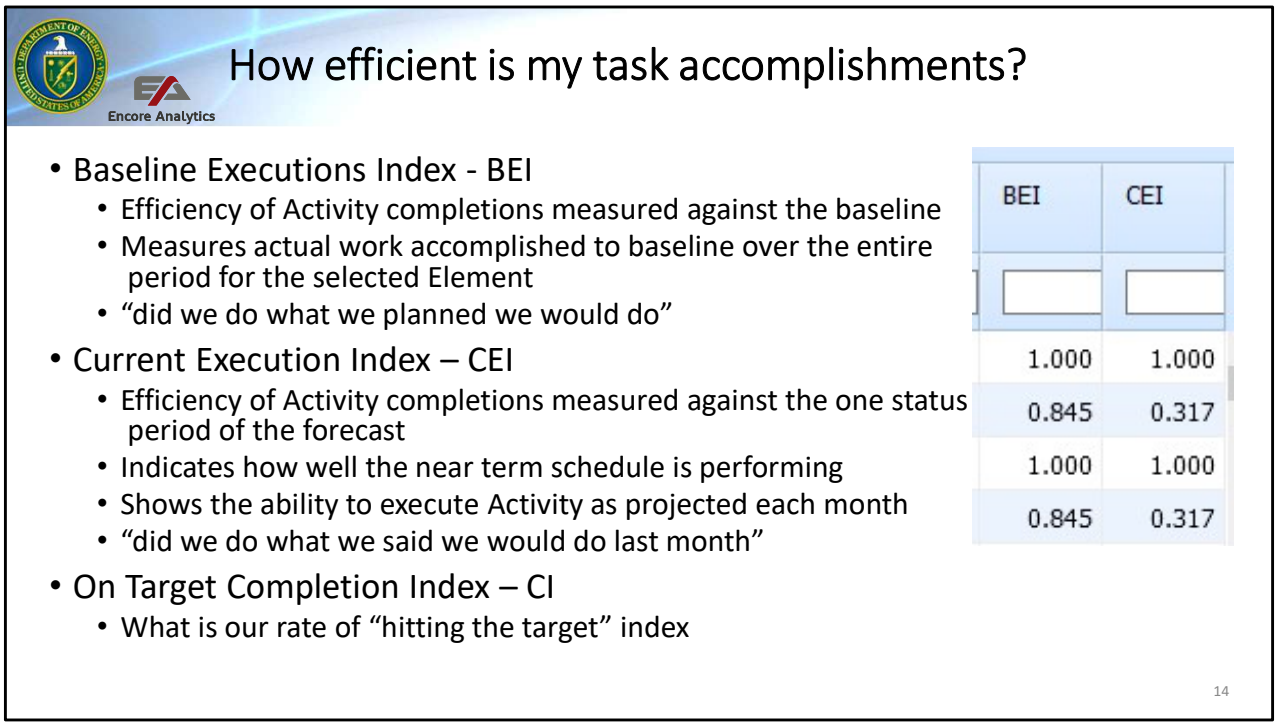
Continuing our conversation from the SPI field explanation, we will now talk about the Cost Performance Index (CPI)

CPI Cur – provides current period performance indices. This one is probably the most volatile of the indices since we are using a single period to make our calculations, it may and usually have large swing, we call them peaks and valleys in the chart.

CPI CUM – this is probably the most stable of them all, specially if you have more than 6 periods of data. It will provide an average from the beginning to the current period.

CPI Cum3 – this performance index provides and average performance over the last three months. It provide more stable than the Cur performance since it provide two additional data points than the Current period performance.

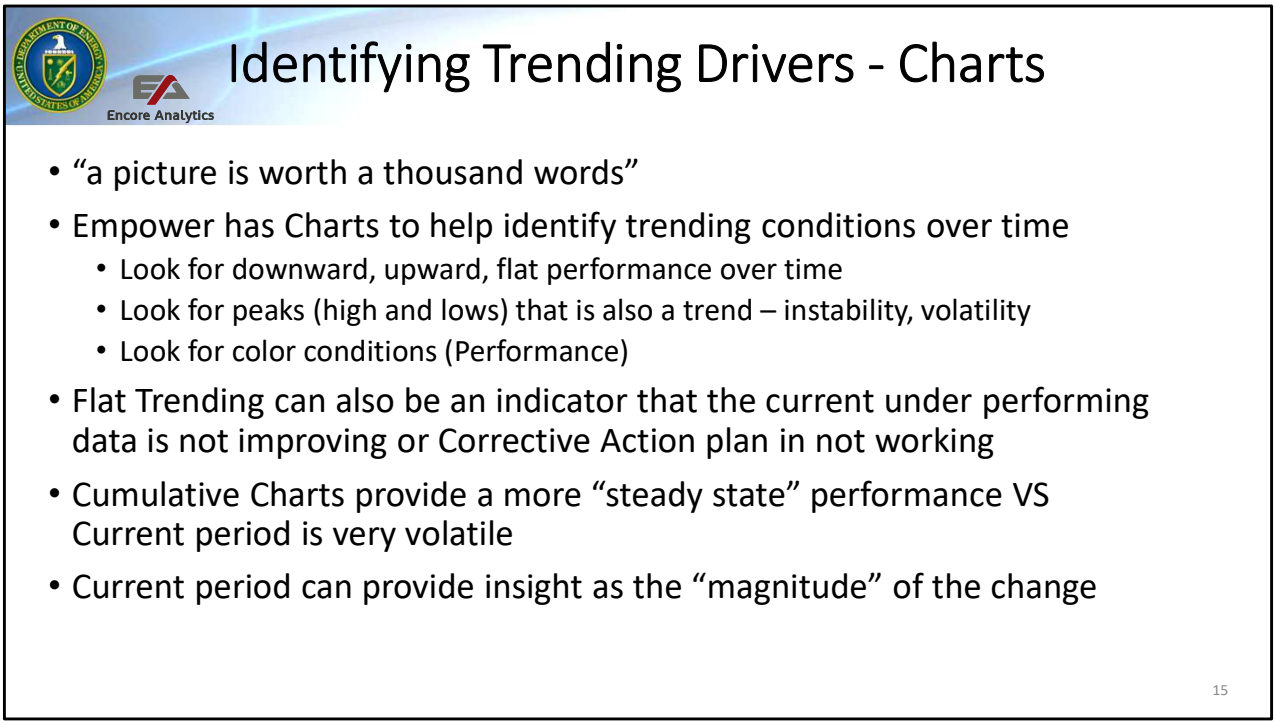
CPI Cum6 – provides the average performance over the last six months. More stable than the Cum3 because it gives us more data points to calculate. Aligns more with NRO schedule analysis.



Lets focus to the schedule and activity accomplishing rates.
Baseline Execution Index (BEI) measures the efficiency of activity completions measured against the baseline. It is a ratio of completed activities (or started) task to the tasks planned to be complete (or started). Useful metric to manage schedule progress towards the baseline plan. " Did we do what we planned we would do".

Current Execution Index (CEI) measure the efficiency of activity completions measured again the current period forecast plan. Great indicator on how well the near term schedule is performing. This is a good metrics to see if the plan is properly being updated or are they "kicking the can" another month or riding the status line month after month.

Completion Index is the rate of "hitting the target", another words how well are they doing in completing timely what they said they will do. Low values here is another indictor that schedule still have some volatility.



Now that we understand the various Views, Fields, Charts and Reports in the Trend Analysis Dashboard, lets focus on identifying the Trending drivers.
Earlier we addressed the various field that we will be using to identify trending drivers.
The chart is a great starting point, it provides a picture, and “a picture is worth a thousand words”. Charts show downward, upwards and not change conditions visibly over multiple periods of time. When looking at charts consider the following trending indicators:

- Direction of the trend, what is the over performance over time: down, up or flat
- If you can not tell the trend direction, look for lots of peaks, both positive and negative, that will also indicate a “trend”, meaning instability and volatility in the data.
- Look for the color, is the trend to stay in the ‘red’ for the entire time. That trend can say volumes like, CAR is not working or no improvement actions are working

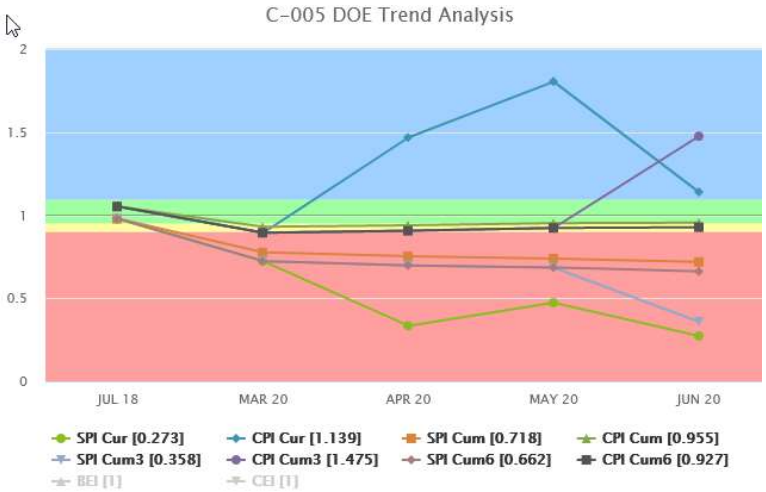
We are trained to look at downward trending but flat trends when an element is in the red or green says a lot. In one instance the current efficiency is poor the other provides a good plan and execution.

Are you looking at sprint or long run. When looking at sprint (current period) data there will be lots of volatility (high and lows) that may provide a clue as to stability. There was a study that after 20% complete that the CUM index reached about 95% probability of staying within CPI Cum. So based on the study what is the data trending for the remaining work effort?

Trend Analysis Chart – SPI & CPI

Encore Analytics

- Shows performance over time
- Left axis shows 1 as the desired reference
- Any below 1 or red is underachieving
- SPI (Cur, Cum, Cum3, and Cum6) Period data
- CPI (Cur, Cum, Cum3, and Cum6) Period data
- Baseline Execution Index
- Current Execution Index



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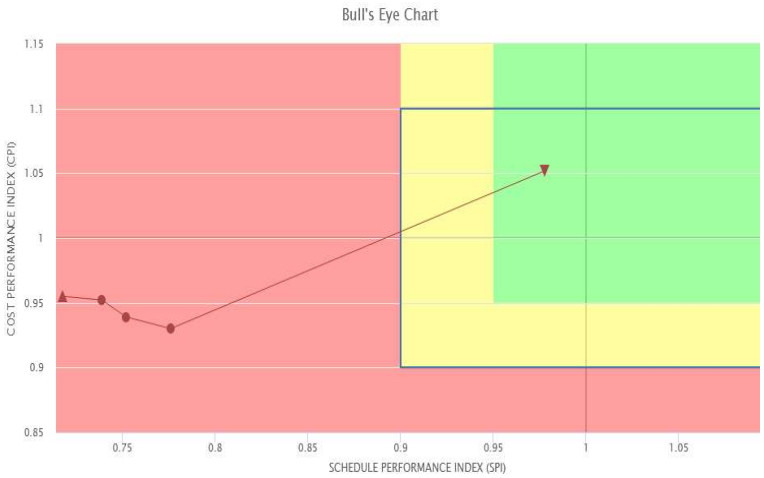
This charts shows SPI and CPI over several periods. You will noticed the trend direction in addition to the current performance status. When you see lines trending downward or 'dropping' over time, it indicates a negative trend that needs investigating. Previously we showed how you can drill down, in this case use the trending item to drill down to the primary variance driver.

As negative trends continue, you may want to ask: Why and what are they doing about it? Is there indications in the VAR narrative as to the performance or any corrective actions plans?

Trend Analysis Chart – Bull's Eye

- Shows performance over time based on CPI vs SPI
- Four quadrants show where the period data are plotted
- Any data point in the lower left quadrant is behind schedule and overrunning.
- The above trend shows a constant lower left quadrant condition



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The Bull's Eye is useful in seeing trending with regards to SPI vs CPI over time. The purpose is to hit the 'bull's eye' in the middle, that will be in the green area. It has four quadrants:

1. Upper right is over performing in cost and underrunning schedule
2. Lower left is under performing schedule and overrunning cost
3. Upper left is under performing schedule and underrunning cost
4. Lower right is over performing schedule and overrunning cost

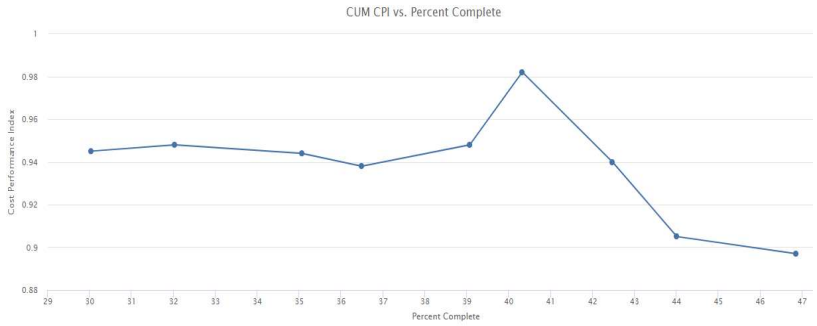
The plotted points show in time where this element/project has been performing in relationship to this quadrant. It also shows the direction if of improving or worsening. The line ending with an "up" arrow is the last period data. We can see this particular project/element is staying in the lower left quadrant (poor efficiency) and worsening over time.

Investigate as why the corrective action plans are not correcting the performance. Look at the VAR Narrative for clues as why this is the case.

Trend Analysis Chart – CPI vs % Complete

Encore Analytics

- Chart shows CPIcum vs % Complete
- Investigate why the peaks over certain % complete
- Downward trend over later % complete tells you more volatility instead of stability



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Are they learning as they go along or planned work becoming more volatile. This charts provides some very valuable insight into how well the planning/forecasting is taking place. Typically you would see an upward trend as you progress towards completion. In this case, the more % complete is achieved, the worst the CPI is trending. Sign if poor planning or certain risk were not taken into effect, another sign of future volatility that will be expected.

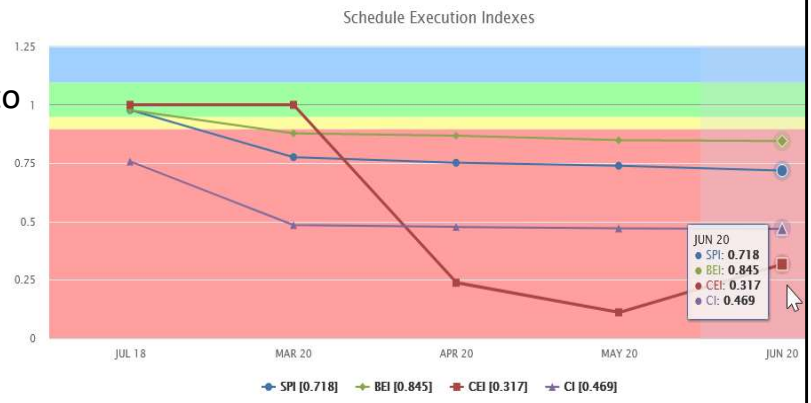
This is an emerging issue: is scope not properly defined, corrective actions not working? What additional risk are in front that would need to be addressed?

This is a good candidate to do some drilling down in Empower to find the root control account and conduct some further investigations.

Schedule Trending Chart – BEI, CEI, CI

Encore Analytics

- BEI reveals the 'execution pace' and provide early warning of increased risk to on time completion
- Look for divergence in the SPI and BEI lines:
  - High BEI Low SPI may be working "easy" tasks first
  - Cross check BEI completed activities with schedule to see if 'critical' activities are being complete
- CI is 'on target hits'



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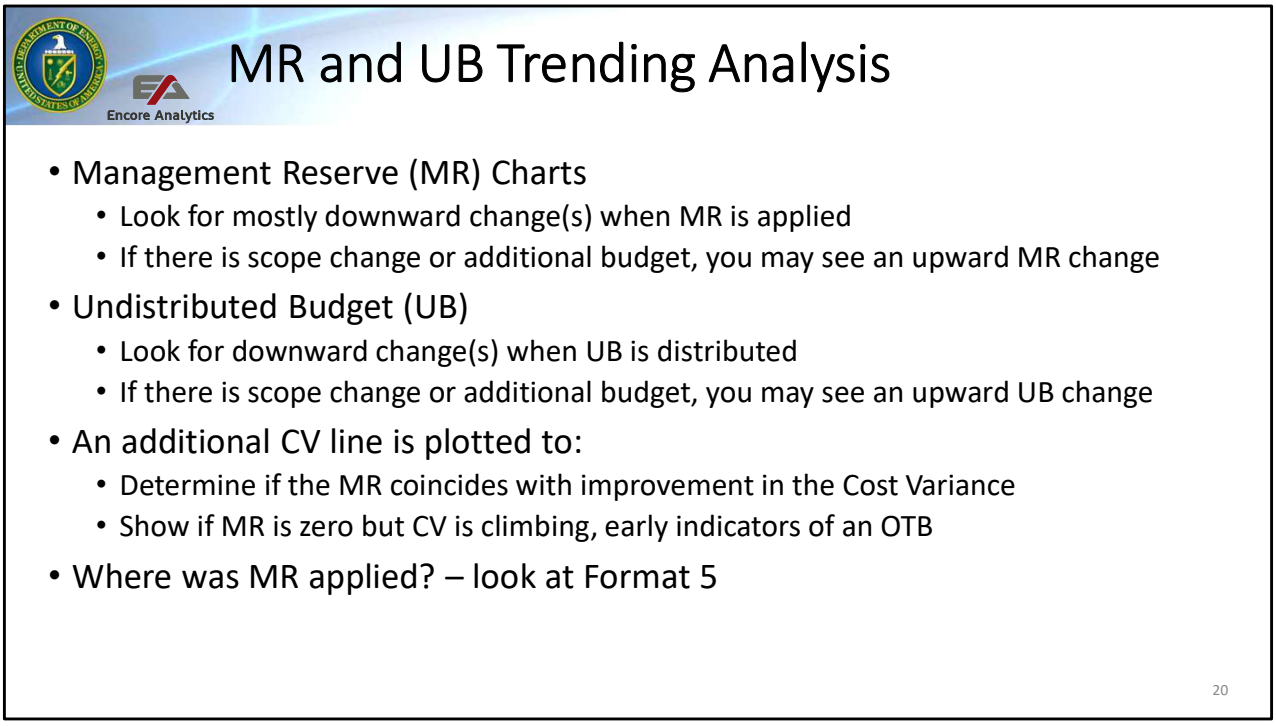
SPI is more sensitive than BEI. BEI places equal weight on all activities, while the SPI weights activities by their planned resource loading Therefore, activities that require more effort will have greater effect on the SPI calculation.

BEI is more objective metric than SPI. BEI is objective assessment since it is based on the planned and actual completion of activities. SPI may be more 'water down' index than BEI. LOE tasks skew BEI and SPI towards 1.0 and mask true state of program. Generally LOE is included in SPI calculations while it is excluded from BEI. Keep in mind that each activity is counted as '1' regardless of complexity or duration. So BEI can be skewed by completing future 'easy' and short based activities. If the BEI is high and SPI performance is low, consider looking into:

- Delinquent activities – Empower can show finish slips in the schedule, look for new forecasted finish/start dates and their corresponding float. This delinquent task are causing the negative schedule variance
- Early finishes should also be reviewed to see what work was completed earlier than baselined. While on the surface this may sound positive, early finishes are often used to offset negative schedule performance by masking the delinquent tasks.

While BEI is typically measured from the start of the project/element, the CEI is calculated using the count planned and completions during the recent current period. CI or Completion Index is value of the on target hits



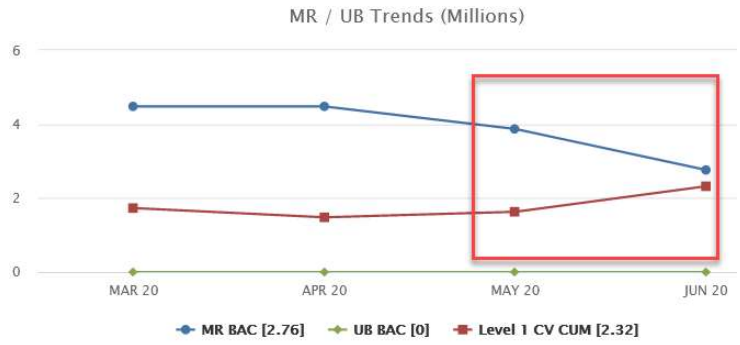
Empower has an MR/UB chart to show graphically how both of those item balances are being used. MR is established to provided budget for internal known and unknown project risks. When realized properly, it can be accomplished without the need to increase Contract Budget Base (CBB). It is not to be used to 'improve' or hide variances at the price of reducing the budget for future risk with possible much greater severity.

Downward trend implies that MR was applied during that period. It provides the opportunity review transactions such as logs, baseline changes and VAR Narrative reports. Not all contractors are required to provide MR logs, but if available the MR balance should traceable and reconcilable to the MR budget shown in the chart.

One item to note, look for 'coincides' of applied MR to improved CV. MR should only be applied for risk and unknown risk not to improve CV metrics.
Another item to look for is if the value of VAC + MR <0. If this is the case, the contract is forecasting to exceed the currently approved budget and DOE Contingency plans may be required to cover overruns.

MR/UB Charts

- MR/UB changes over time
- This contract has a constant decrease of MR, but CV is trending positive performance
- Look at the MR Log to analyze the usage and affected Control Accounts
- Also look for increasing MR with increasing performance of CVcum



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Continual decrease in the MR balance coupled with a steady or improving CV may be an indicator that MR is being applied to mask cost performance issues. You may need to look at the BAC Change report (next slide) will show if usage of MR is affecting the Control Account. That is the case happening with the contract and probably needs addition investigation

An increase in MR balance coupled with improving CV may be an indicator of MR 'harvesting'. Another words, budget for the account is being replenished without scope increase of for the purposes of "robbing Peter to pay Paul" effect. This is a technique of removing budget from well performing CA in order to have available to apply to poor performing CA. The result is negating the purpose of performance measurement.

Identifying Trending Drivers - Reports

- "pack a lot of data into a single report"
- Most Reports are tabular to help identify trending conditions over time
  - Reports will show Date columns as headers
  - Reports show numeric value changes
  - Most reports show Cumulative and Current period changes
- Some reports will provide "Delta" from prior periods
- Reports will show the value changes over time

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Now that we understand the various Views, Fields, Charts and Reports in the Variance Analysis Dashboard, lets focus on identifying the variance drivers.
Earlier we addressed the VAR field, it may or may not identify a required VAR Narrative, it is based on a default Thresholds. This can be used a 'guide' to VAR drivers

As we mentioned earlier, the 'drivers' can be favorable and unfavorable, most organizations are required to report based on both. Empower can help in this process, although not shown in this view, Empower has an "ABS" or absolute field for each of the variance condition that will help sort out top drivers regardless of negative or positive.

BAC Changes Trending Report

Encore Analytics

- BAC Change reports is perfect report to cross check MR/UB Chart
- It will show increase in BAC (Green) and decrease (Red)
- This report can drill down to any level you desire, in this case to level 4

WBS	DESCRIPTION	LL	LVL	MAR 20	APR 20	MAY 20	JUN 20
01.08.02.01	[redacted]		4	0	0	0	0
01.08			4	-345,172	235,380	-80,679	-133,942
01.08	RB)		4	-340,795	50,080	-71,818	34,236
01.08			4	-221,104	-55,946	279,674	37
01.08			4	898	-306,774	6,774	307,330
01.08			4	0	0	0	212
01.08			4	0	0	-0	0
01.08			4	-100,543	959	-866	1,583
01.08			4	12	-12	0	-0
01.08	Closeout		4	0	0	0	0
01.08			4	-1,661,181	-194,118	-246,657	-104,120
01.08			4	783,708	-502,844	111,667	98,868

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A technique to remove budget from well-performing Control Account and in order to have it available to poor-performing Control Accounts is call ‘MR harvesting’. This effectively negates the purpose of performance measurement. In this example you can cross check the MR/UB Chart to the detail BAC changes and you can see that more budget has been applied (MR reduction) and most likely will need to be cross checked with CV trending performance.

Empower allows you to look at Level 1 BAC changes and drill down to the desire CA to make and informed decision on the masking cost.

Checks on Learning – Trending Drivers

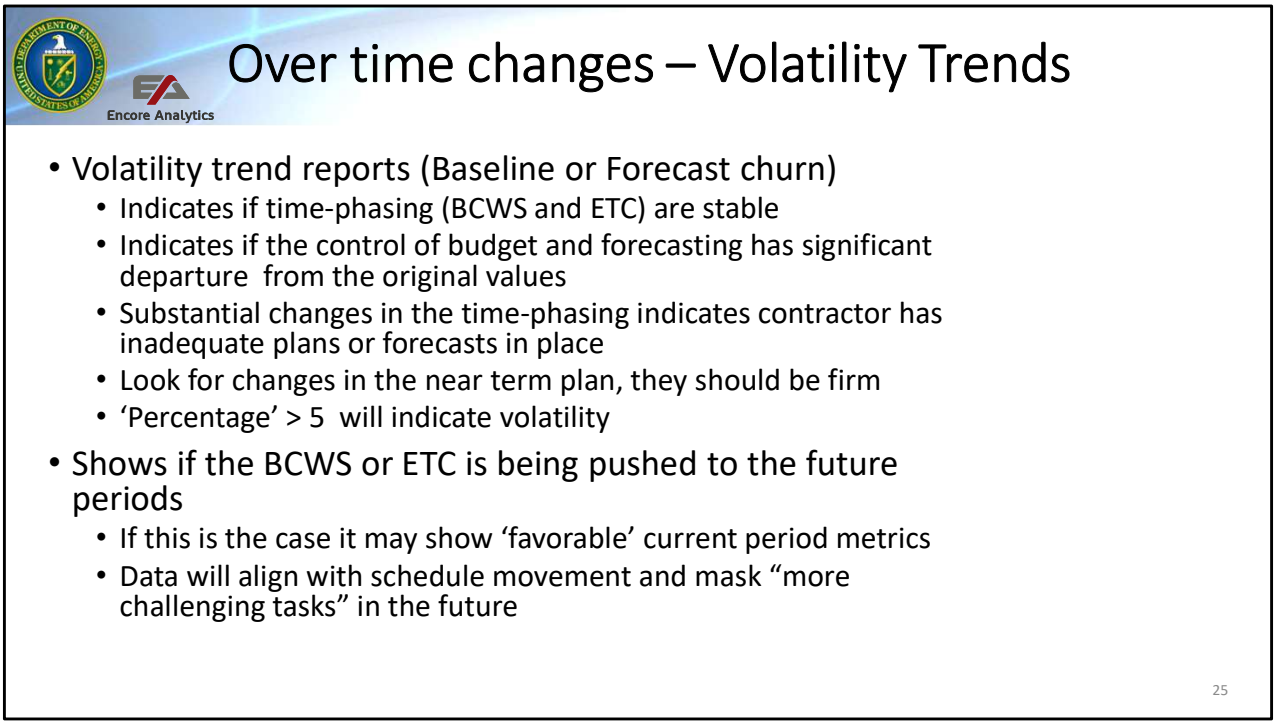
Encore Analytics

1. When looking at trending data what are two conditions to consider?
   A. Current trending condition
   B. Air conditioning
   C. Current state of performance condition
   D. Answer A & C are correct
   E. Answer B and D are correct

2. What does the BEI and CEI indicate?
   A. Efficiency of task completion
   B. BEI place the same weight on all task
   C. CEI provides Critical Task efficiency
   D. Measurement for BEI is from the start of the element
   E. Answer A and D are correct
   F. Answer A, B and D are correct

3. Current period chart have more volatility and cumulative charts have more "steady state" calculations?
   A. False, they all have the same data
   B. True, Cumulative have more data point to calculate averages

4. What should we look for in the MR/UB Charts?
   A. Applied use of MR and UB
   B. Check if CV increases due to MR being applied
   C. Cross check if MR = 0 and CV is continuing to worsen
   D. Look for MR Harvesting
   E. All answers are correct



Baseline Volatility can also be referred to as baseline churn. It provides some early warning indication that the element time phasing and control of the budget is volatile and that a significant departure from the original plan or estimate has occurred. When you notice significant changes to the baseline time phasing it may indicate that this element (contract) may have inadequate plans in place and the performance metrics may be unreliable. Sometimes, the churn may be in intent to manipulate the metrics to improve the appearance of poor performance.

I look for changes in the near term periods, mostly in the freeze period. By this time, the plan should be firm to allow sufficient resource planning and schedule planning. There may be some rolling way planning being done beyond the freeze period for the next 6 periods, so some flux in he near term is expected there.

How stable is the Baseline?

Encore Analytics

ITEM	JUL 19	AUG 19	SEP 19	OCT 19	NOV 19	DEC 19	JAN 20	FEB 20	MAR 20	APR 20	MAY 20	JUN 20	JUL 20
Future BCWS JUL 19		10,548,366	22,963,899	13,134,701	12,934,934	15,652,859	12,160,268	13,437,438	17,776,584	14,199,617	14,178,000	17,037,127	13,468,623
AUG 19			22,963,899	13,134,701	12,934,934	15,652,859	12,160,268	13,437,438	17,776,584	14,199,617	14,178,000	17,037,127	13,468,623
SEP 19				4,812,917	6,640,807	8,036,262	6,244,351	6,892,057	9,116,368	7,282,269	7,271,461	8,737,516	6,907,649
OCT 19					13,073,490	6,074,392	12,240,676	5,475,501	6,995,433	5,516,436	5,438,726	6,720,561	5,283,626
NOV 19						6,073,527	12,239,816	5,474,629	6,994,558	5,515,559	5,437,849	6,719,685	5,282,749
DEC 19							12,172,360	5,194,308	6,592,750	5,975,057	5,437,642	6,721,189	5,284,304
JAN 20								5,223,078	6,688,306	6,124,041	5,477,466	6,768,978	5,322,137
Current BCWS	11,993,375	10,548,366	-133,377,695	1,484,944	13,060,509	6,095,923	12,172,361						
Maximum	11,993,375	10,548,366	22,963,899	13,134,701	13,073,490	15,652,859	12,240,676	13,437,438	17,776,584	14,199,617	14,178,000	17,037,127	13,468,623
Minimum	11,993,375	10,548,366	-133,377,695	1,484,944	6,640,807	6,073,527	6,244,351	5,194,308	6,592,750	5,515,559	5,437,642	6,719,685	5,282,749
Difference	0	0	156,341,594	11,649,756	6,432,683	9,579,332	5,996,325	8,243,129	11,183,834	8,684,058	8,740,358	10,317,441	8,185,874
Percentage	0.00	0.00	-117.22	784.52	96.87	157.72	96.03	158.70	169.64	157.45	160.74	153.54	154.95
Average							151.76%						
Prior Average							153.65%						
Future Average							159.17%						
Delta to Prior								28,770	95,555	148,984	39,824	47,789	37,833
% Delta to Prior								0.55%	1.45%	2.49%	0.73%	0.71%	0.72%

This report indicates internal issues and investigate why it seems the baseline continues to be replanned each month

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The Baseline Volatility Report shows past 6 period and the near term 6 periods for the active element. 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. It may also contribute to 'favorable' current period metrics. Select an active element, it can be the Level 1 or any level of the WBS in Empower. It shows the Current BCWS value (Past period + Current) and the next future period BCWS value.

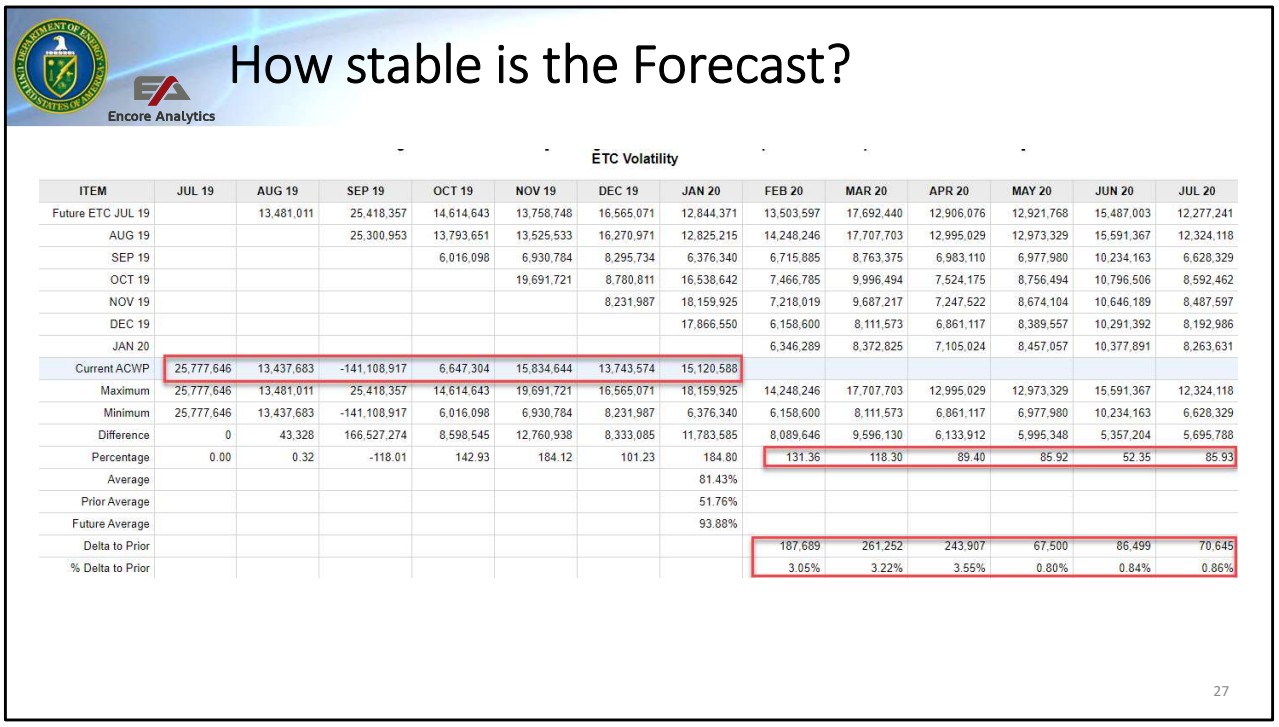
Let's start with the upper portion of the report and the left column, this report shows the past period time phase data from when it was reported. In the example above, it shows that Jul 19 through Jan 20 time phased BCWS future period data. Those data points are seen as Columns starting the Period + 1 future period. Another words, if I'm looking at Sep 19, the future period data would start in Oct 19 on forward.

Now lets focus on the middle section that is highlighted in light blue. This small section shows the Current BCWS values by period, this are "actual' BCWS values.

On the lower portion of the report are the key calculations. The first row compares the Maximum and Minimum BCWS values for the report period, for Past and future periods. Keep in mind, the Max or Min can also be the Current period value (light

blue) row. The next row will provide the Delta or Difference between Max and Min values. The next row is probably one of the first key calculations: Percentage. If the absolute values is greater than 5%, then there is high volatility present.
The Average takes into account the Current period as an average over the span of entire 12 period, anything greater than 5% will indicate high volatility. Prior Average shows volatility for past performance and Future Average shows next six months volatility.

The last two rows shows the Delta to prior and % Change to prior period. It will provide further insight into volatility in the future period.



ITEM	JUL 19	AUG 19	SEP 19	OCT 19	NOV 19	DEC 19	JAN 20	FEB 20	MAR 20	APR 20	MAY 20	JUN 20	JUL 20
Future ETC JUL 19		13,481,011	25,418,357	14,614,643	13,758,748	16,565,071	12,844,371	13,503,597	17,692,440	12,906,076	12,921,768	15,487,003	12,277,241
AUG 19			25,300,953	13,793,651	13,525,533	16,270,971	12,825,215	14,248,246	17,707,703	12,995,029	12,973,329	15,591,367	12,324,118
SEP 19				6,016,098	6,930,784	8,295,734	6,376,340	6,715,885	8,763,375	6,983,110	6,977,980	10,234,163	6,628,329
OCT 19					19,691,721	8,780,811	16,538,642	7,466,785	9,996,494	7,524,175	8,756,494	10,796,506	8,592,462
NOV 19						8,231,987	18,159,925	7,218,019	9,687,217	7,247,522	8,674,104	10,646,189	8,487,597
DEC 19							17,866,550	6,158,600	8,111,573	6,861,117	8,389,557	10,291,392	8,192,986
JAN 20								6,346,289	8,372,825	7,105,024	8,457,057	10,377,891	8,263,631
Current ACWP	25,777,646	13,437,683	-141,108,917	6,647,304	15,834,644	13,743,574	15,120,588						
Maximum	25,777,646	13,481,011	25,418,357	14,614,643	19,691,721	16,565,071	18,159,925	14,248,246	17,707,703	12,995,029	12,973,329	15,591,367	12,324,118
Minimum	25,777,646	13,437,683	-141,108,917	6,016,098	6,930,784	8,231,987	6,376,340	6,158,600	8,111,573	6,861,117	6,977,980	10,234,163	6,628,329
Difference	0	43,328	166,527,274	8,598,545	12,760,938	8,333,085	11,783,585	8,089,646	9,596,130	6,133,912	5,995,348	5,357,204	5,695,788
Percentage	0.00	0.32	-118.01	142.93	184.12	101.23	184.80	131.36	118.30	89.40	85.92	52.35	85.93
Average							81.43%						
Prior Average							51.76%						
Future Average							93.88%						
Delta to Prior								187,689	261,252	243,907	67,500	86,499	70,645
% Delta to Prior								3.05%	3.22%	3.55%	0.80%	0.84%	0.86%

The ETC Volatility Report shows past 6 period and the near term 6 periods for the active element. 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. It may also contribute to 'favorable' current period metrics. Select an active element, it can be the Level 1 or any level of the WBS in Empower. It shows the Current ACWP value (Past period + Current) and the next future period ETC value.

Let's start with the upper portion of the report and the left column, this report shows the past period time phase data from when it was reported. In the example above, it shows that Jul 19 through Jan 20 time phased ETC future period data. Those data points are seen as Columns starting the Period + 1 future period. Another words, if I'm looking at Sep 19, the future period data would start in Oct 19 on forward.

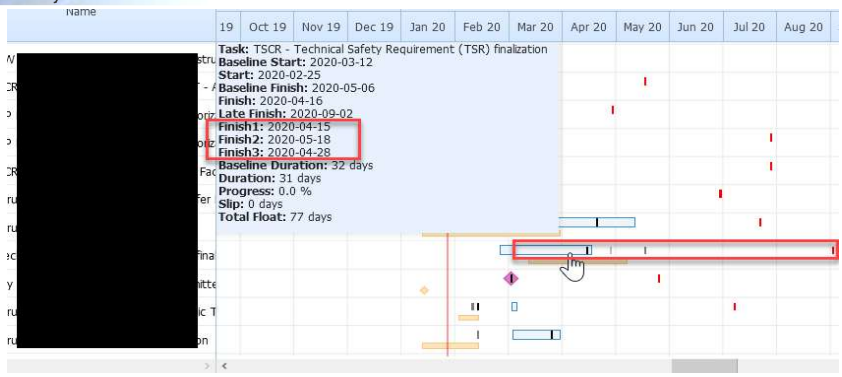
Now lets focus on the middle section that is highlighted in light blue. This small section shows the Current ACWP values by period.

On the lower portion of the report are the key calculations. The first row compares the Maximum and Minimum ACWP values for the report period, for Past and future periods. Keep in mind, the Max or Min can also be the Current period value (light

blue) row. The next row will provide the Delta or Difference between Max and Min values. The next row is probably one of the first key calculations: Percentage. If the absolute values is greater than 5%, then there is high volatility present.
The Average takes into account the Current period as an average over the span of entire 12 period, anything greater than 5% will indicate high volatility. Prior Average shows volatility for past performance and Future Average shows next six months volatility.

Schedule Movement Analysis?

Encore Analytics



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From Session 3 – relates to schedule volatility

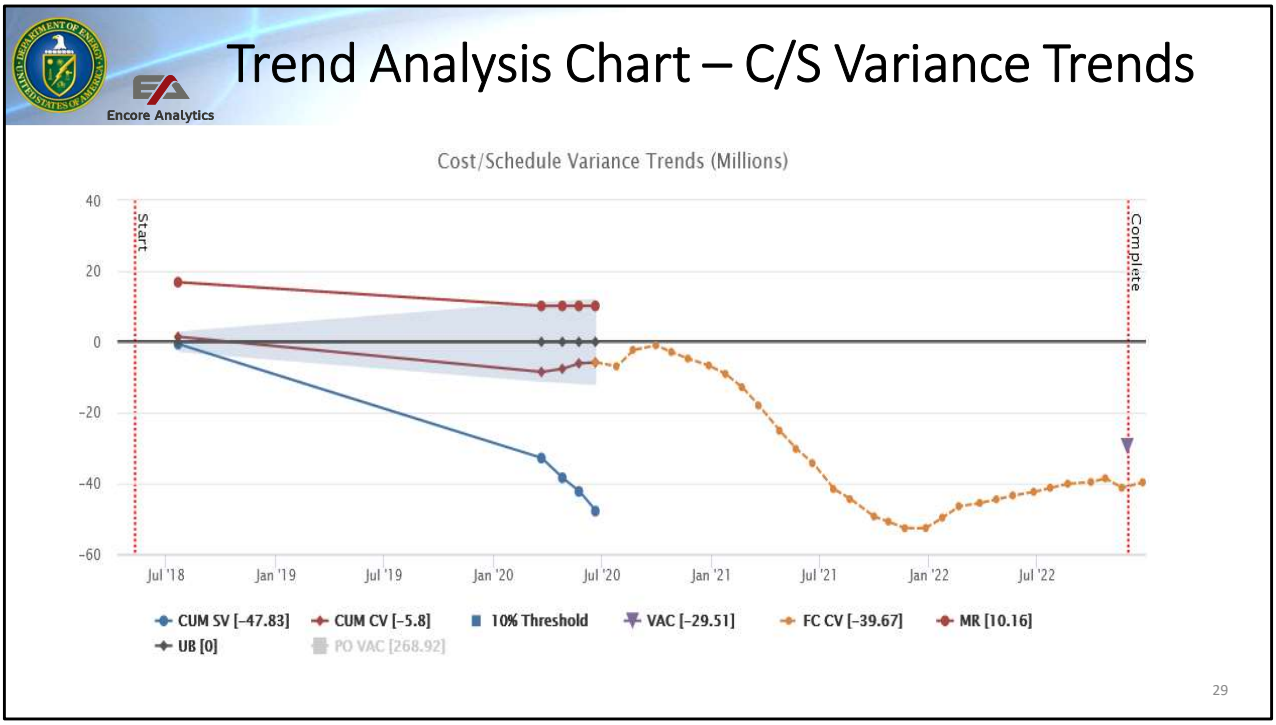
Another indicator of Baseline Volatility is the constant movement of schedule activities. In this case Empower can provide drill down Baseline Volatility Report to see the BCWS changes or ETC changes down to the lowest level data. If the schedule is present, that can be show by going to the Gantt chart and select the desire element for analysis.

When looking at the Gantt Chart, you must have the Gantt Options set to show slips and they will be shown in Gantt as vertical pipe symbols '|' . A Black pipe will represent the Finish1 which is last months, dark grey will represent Finish2, two months ago and light grey is Finish3, three months ago. If your Gantt has all three showing that means Empower detected that during the last quarter of data, there are changes in the Finish data provided for each month. The Volatility report should correspond to the changes in the schedule. In this case, you can identify the Activities that change and inquire as to:

- Are they moving right, left or all over the place? Why?
- What cause this Finish slip; What constraint or issue was encountered.
- During your assessment , what can be learned to provide more stability to future planned events?

- Was this a rolling wave event or poor planning causing a slip?
- Is this systemic?

Trend Analysis Chart – C/S Variance Trends



This final chart put the conclusion of the trending analysis in a single graph. It shows at Contract level the Cost and Schedule Variance Trends and also projected future trend based on ETC data being provided. This charts provides a bird's eye view of the total contract performance from inception to complete. Trending data can be seen by looking at SV (blue line), CV (red line) to the current period. Empower has include a shaded area that represents a 10% +/- to show where performance Variance has become unfavorable. MR (thick red) and UB (black linke) are also shown. A new future line is plot from the CV line called FC CV, meaning Forecast Cost Variance. This is derived by taking the future plan effort (BCWS) to represent BCWP and the future ETC to represent the ACWP by period. This line will represent to estimated/projected future CV based on future period data provided and plot it to completion. The FC CV intersects the complete line just below (negative variance) of the projected VAC value.

This chart indicates trending negative SV, reflected in the schedule analysis and future negative CV that is greater than the VAC.

Checks on Learning – Volatility Trends

Encore Analytics

1.What you tell me about the Volatility Reports?
- A. Current period changes > 5% may show volatility
- B. CPI must first be . 1.0 before it can go volatile
- C. Volatility can be positive or negative changes
- D. Volatility changes will be reflected in Schedule Activity slips
- E. Answer A and C are correct
- F. Answer A, C and D are correct
- G.

2. What you tell me about the ETC Volatility Report?
- A. Near term planning is volatile
- B. Need at least six period of data to determine volatility
- C. Apr 20 to Sep 20 has lots of volatility
- D. Future volatility is estimated to be greater than 5%
- E. Answer A, C and D are correct
- F. All are correct

3. What can you tell me about the C/S report?
- A. Contract is behind schedule and overrunning
- B. CV is within the 10 % Variance threshold
- C. Expect to overrun at completion
- D. Yellow line represent future estimate CV
- E. All are correct

ETC Volatility

ITEM	MAR 20	APR 20	MAY 20	JUN 20	JUL 20	AUG 20	SEP 20	OCT 20
Future ETC MAR 20		3,329,058	1,272,415	579,765	26,317			
APR 20			1,861,883	684,880	879,372	162,816	42,948	
MAY 20				1,238,711	896,183	716,322	166,259	4,595
JUN 20					2,116,571	643,103	21,439	
Current ACWP	12,815,185	1,340,276	690,507	374,899				
Maximum	12,815,185	3,329,058	1,861,883	1,238,711	2,116,571	716,322	166,259	4,595
Minimum	12,815,185	1,340,276	690,507	374,899	26,317	162,816	21,439	4,595
Difference	0	1,988,782	1,171,376	863,812	2,090,254	553,506	144,820	0
Percentage	0.00	148.39	169.64	230.41	7,942.69	339.96	675.49	0.00
Average				950.66%				
Prior Average				106.01%				
Future Average				1,493.02%				
Delta to Prior					1,220,388	-73,220	-144,820	-4,595
% Delta to Prior					136.18%	-10.22%	-87.10%	-100.00%

Cost/Schedule Variance Trends (Millions)