AUGUR

Show Me the (Schedule) Metrics

How to manage to more realistic schedule projections when the baseline slips, yet milestones must be met

2025-05-01

Wendy Cassidy, Michelle Chau

Speaker Bios

Wendy Cassidy, CCEA®

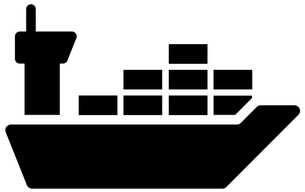
- **Augur:** Portfolio Manager
- 5 Years of Experience
  - Cost/IMS/EVM
  - AoA, IBR, Contract TAR
  - EOD, Robotics, UUV, Lasers
- BS Finance
- Junior Analyst of the Year 2024

Michelle Chau

- **Augur:** Technical Advisor
- 4 years of Experience
  - DoD: IMS, LCCE, IGCE
  - DoE/NNSA: RCA, BCP ICR, BCA
  - Hypersonics, UUV, Lasers
- BS Economics

Stage Setting

You are a program analyst

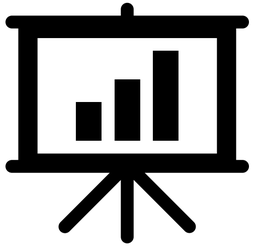


Supporting a dynamic program

The next major milestone has gained higher level visibility

The team is skeptical whether the date being communicated is achievable

The program manager is determined to meet the date and will not track differently without factual metrics



Agenda

- Scheduling Considerations
  - Key Terms
  - Program Nuances
- PM Conversations on Program Schedule
- How to Manage the Schedule Moving Forward

Scheduling Considerations

What is a “baseline”?

- Performance Management Baseline (PMB) vs. “Baseline”

- PMB is a plan that integrates baselines (scope, schedule, & cost)
  - Foundation to measure project performance against the initial plan
  - Enables PMs to identify variances and take corrective actions

- “Baseline” can refer to any of the individual baselines or even a more general concept of a reference point for comparison
  - Schedule baseline defines project timeline with key milestones / deadlines

Critical Path vs Driving Path

- Critical path: sequence of tasks that directly impacts the project's overall completion date
  - Any delays to a task on this path → delays project's finish date
  - Total float = 0

- Driving path: sequence of tasks that impacts the finish date for any key milestone or activity

Critical path evaluates critical tasks for *whole* program while driving path focuses on task completion for specific milestones

Program Nuances

- **Some metrics are dependent on data availability**
  - IPMDAR requirements can differ based on contract thresholds
  - Some programs might not have the maturity to pull sufficient data points
- **Status of schedule products**
  - How developed is your schedule? Does it have vertical and horizontal traceability? Is it up-to-date?
- **Stakeholder obligations and expectations**
  - Government vs vendor: who has more leverage and who drives the schedule?
- **Document findings and feedback for deliverables**
  - Use as reference point if there is a go back to prior decision points or data sources

PM Conversations on Program Schedule

Why the PM Believes We Can Maintain Schedule

1. Schedule changes are closely monitored and communicated.

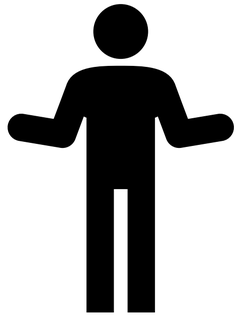
2. SPI is 1 or close to 1.

3. Critical Path is stable and well documented.

Point 1: Schedule Change Communications

"Schedule changes have been clearly monitored and communicated to me. I have confidence that the program is reacting appropriately, and we are all marching towards the common end goal."

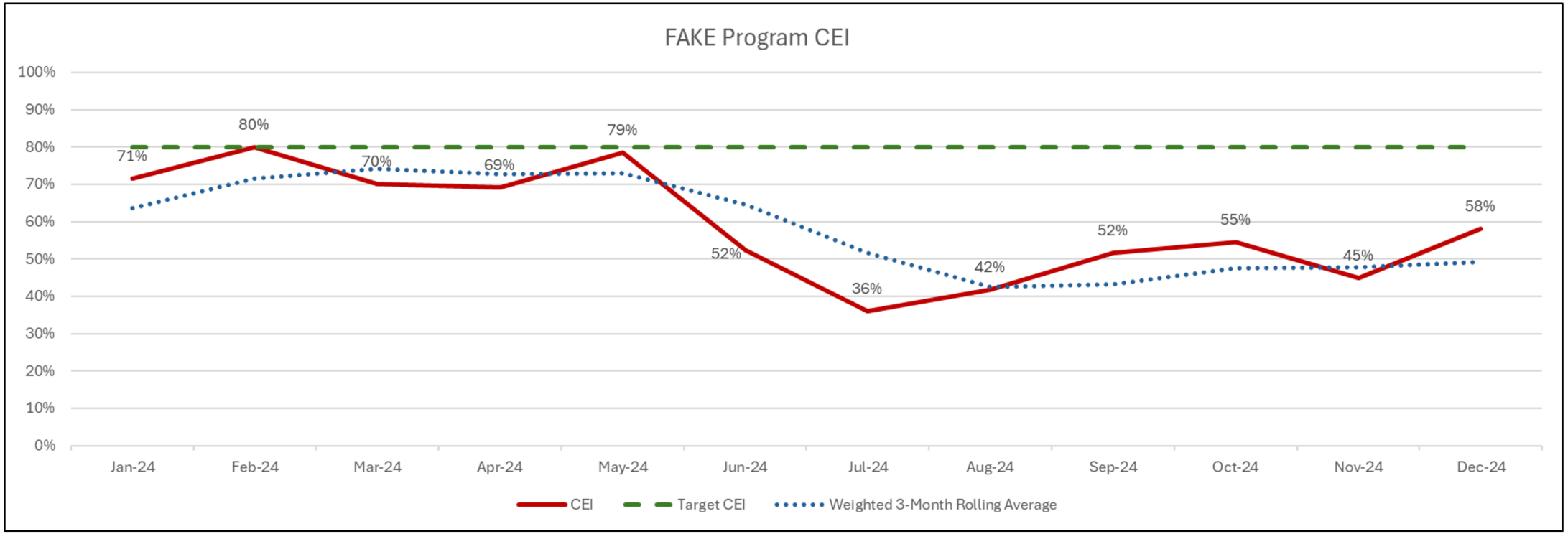
How can you evaluate how well the program replans for change?



Current Execution Index (CEI):

Measures how well the program / vendor forecasts and executes replans

Point 1: CEI Evaluation



$$\text{CEI} = \frac{\#\ of\ tasks\ that\ finished\ in\ the\ window\ (of\ the\ tasks\ forecasted\ to\ finish)}{\#\ of\ tasks\ forecasted\ to\ finish\ in\ the\ defined\ window}$$

Target CEI is 80% (PASEG, pg. 178)

Transparency is a key element to program success.
The ability to execute and accurately replan is crucial.

Point 2: SPI Looks Great!

"SPI for the program is close 1; we must be executing on schedule"

What is does the schedule performance index (SPI) tell us?

$$\text{SPI} = \frac{Earned\ Value}{Planned\ Value}$$

- Management tool to measure schedule adherence
- SPI converges to 1 as the program becomes closer to finishing the baselined tasking.

Point 2: Validating SPI

What else should we look at to provide additional SPI context?

- Task percent complete

- <u>Duration to Complete (DTC):</u>
  - Earned schedule concept that projects remaining task duration based on actual time used to complete work to date compared to planned duration

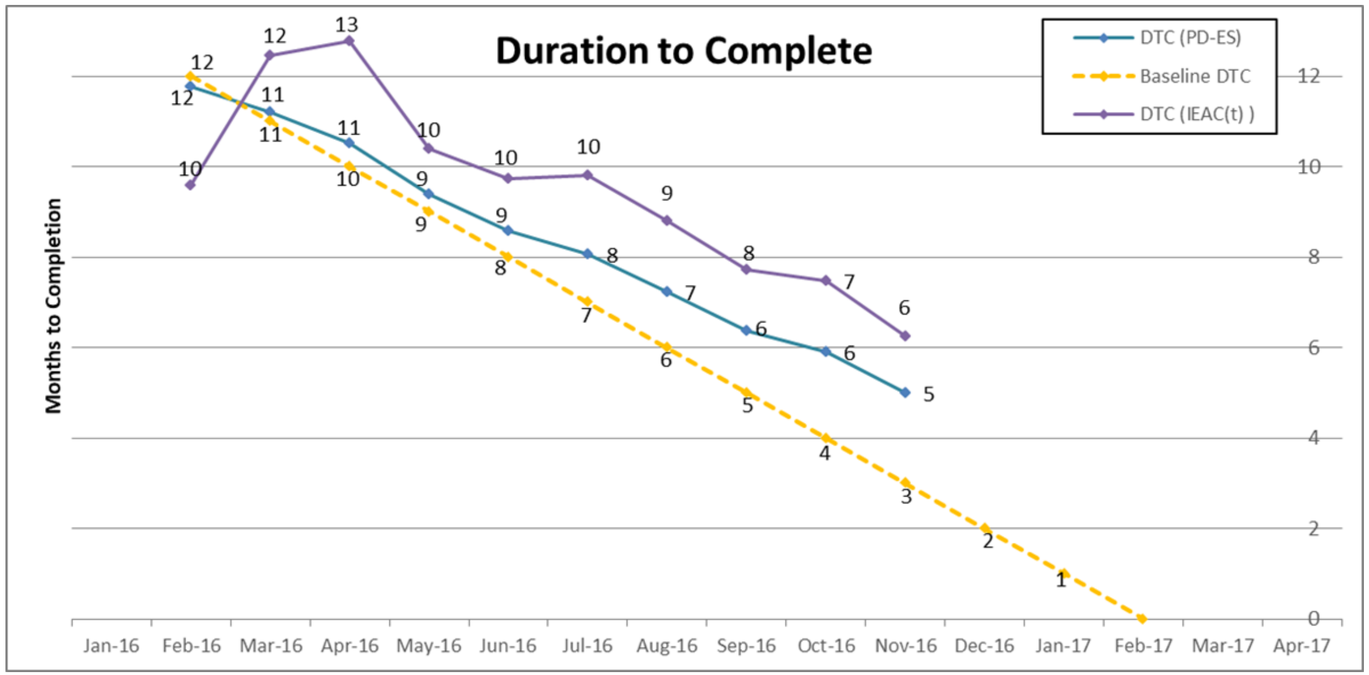
$$\text{EAC(t)} = Time\ Now + \frac{Remaining\ Work\ (as\ time)}{Schedule\ Performance\ Factor} = AT + \frac{PD - ES}{SPI(t)}$$

$$\text{DTC} = Estimated\ Finish\ Time - Time\ Now$$

$$\text{DTC} = EAC(t) - AT$$

Point 2: Duration to Complete (DTC)

Metric	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Definition
Actual Time (AT)	6	7	8	9	10	Months since start of Project
Earned Schedule (ES)	5	6	7	7	8	Months of work accomplished
SV (t)	-1.1	-1.2	-1.4	-1.9	-2.0	Months behind Baseline Plan
CUM SPI (t)	0.82	0.82	0.83	0.79	0.80	CUM efficiency factor
CUM Projection	15.8	14.8	15.7	16.5	16.3	Completion Month if CUM SPI(t) continues at current rate
Baseline DTC	7.0	6.0	5.0	4.0	3.0	Months until planned finish date
DTC (PD - ES)	8.1	7.2	6.4	5.9	5	Assumes SPI(t) = 1
EDTC (IEAC(t) - AT)	9.8	8.8	7.7	7.5	6.3	Assumes SPI(t) continues at current rate



Program success does not hinge upon a single metric like SPI;
Additional metrics validate the assumption & conveys actual performance

Point 3: Critical Path is Stable

"Critical path is well documented and infrequently changes. We all must have a mutual understanding of the crucial events and when they need to happen."

Critical path is not the only way to tell the story of the program.
It can mask issues of schedule performance / construction.

Point 3: Looking Beyond the Critical Path

What else can help us to better understand critical tasks, the impact of their completion date, and overall schedule construction?

- Total and Free Float

- Critical Path Length Index (CPLI):
  - Measures efficiency needed to meet milestone date & critical path "realism"
  - CPLI = $\frac{CPL+TF}{CPL}$
    - Critical Path Length (CPL) - remaining duration of critical path
    - Total Float (TF) - time a task can be delayed before it impacts project completion

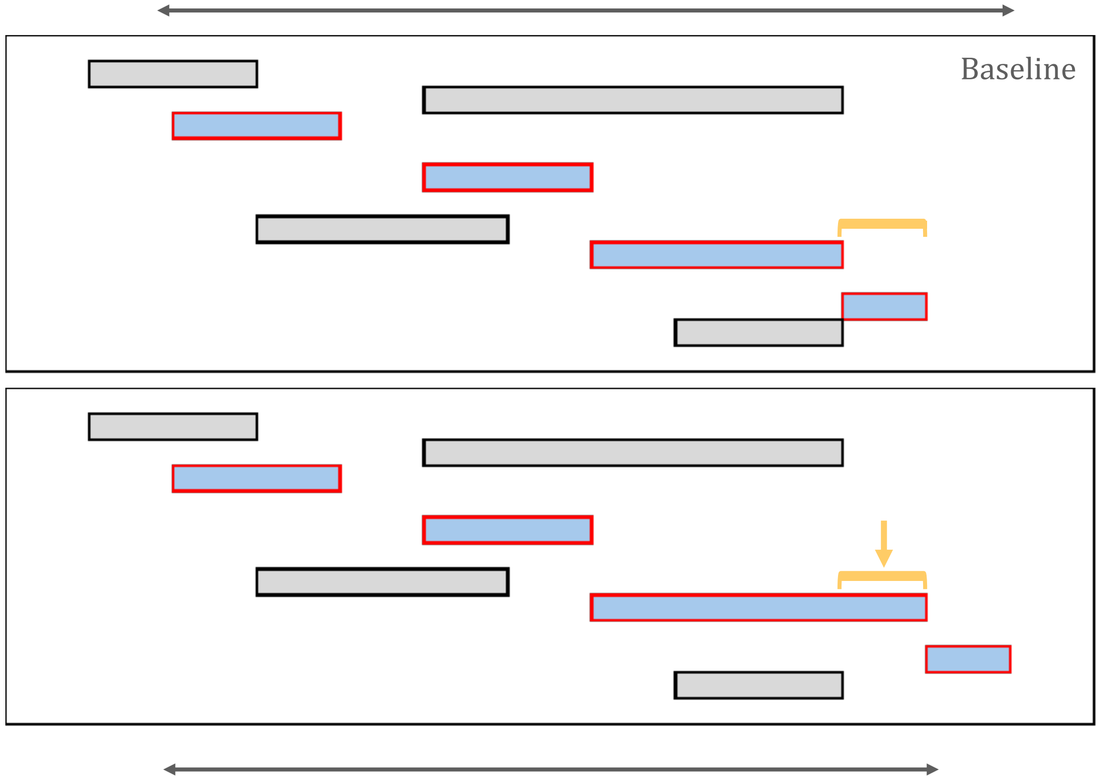
Point 3: Critical Path Realism

- CPLI to assess schedule efficiency needed to complete baseline plan

$$\text{CPLI} = \frac{CPL+TF}{CPL}$$

CPLI Value	Interpretation
= 1	On-track with baseline plan
> 1	More efficient and ahead of schedule
< 1	Inefficient and likely to finish late
CPLI < 0.95 should be flagged for CP realism	

$$\text{CPLI} = \frac{35\ days + 0\ days}{35\ days} = 1.00$$



$$\text{CPLI} = \frac{40\ days - 1.5\ days}{40\ days} = 0.9625$$

Understanding critical tasks for program success is smart program management, however critical path can mask other issues.

Conversations with the PM

Point 1: Schedule changes are closely monitored and communicated

- Transparency is important; Accurately executing replans is also crucial for success and should be monitored

Point 2: SPI is 1 or close to 1

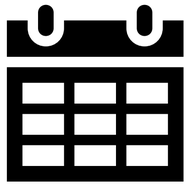
- Understand the purpose and context of metrics; use others to validate/provide additional context to program status

Point 3: Critical Path is Stable

- Understanding critical tasks is smart management; Be sure to focus on more than just those tasks for successful program completion

How to Manage the Schedule Moving Forward

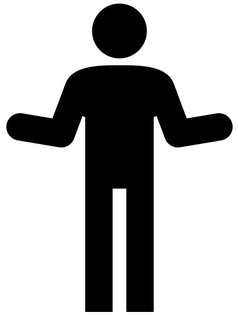
What to do when the PM wants to keep the schedule?



"This is the program schedule, and I have an obligation to keep it on track. We are keeping the current plan."

Okay, let's reassess schedule management processes so that we can better plan to the program. We can:

- Track to the Interim
- Communicate and Track Risk Events

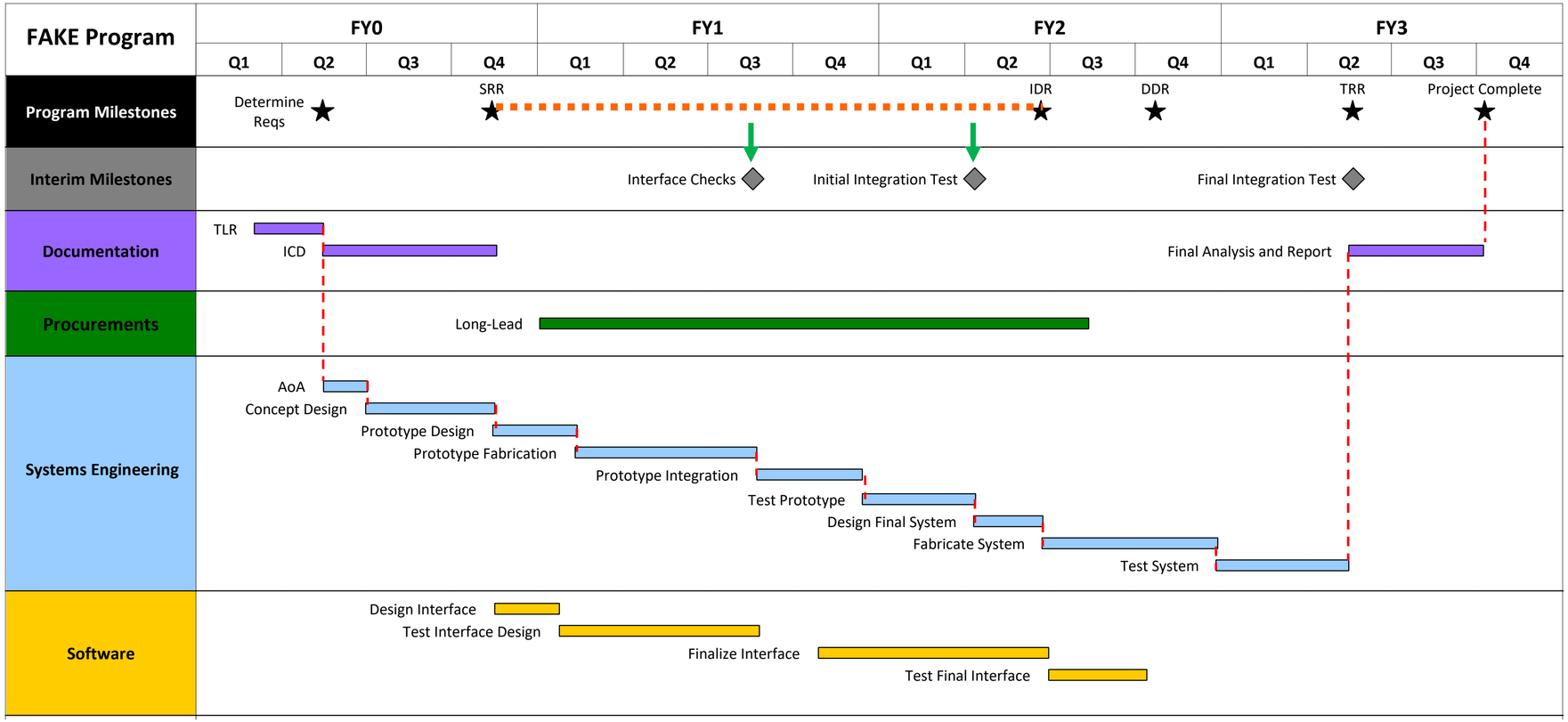


Tracking to the Interim

- Project baseline and critical path are not the only ways to communicate schedule execution or performance
- Make use of multiple baselines
  - Baseline 0 = original program baseline
  - Baseline 1 = baseline reflecting “new” program plan
  - Can compare forecast to different snapshots in time
- Rolling-wave planning technique to find schedule savings
  - Interim Baseline and Milestones
  - Driving Paths

Interim Milestones and Driving Paths

- Track progress between milestones with a long gap between them
- Establish checkpoints to keep on schedule



Interim Milestones and Driving Paths

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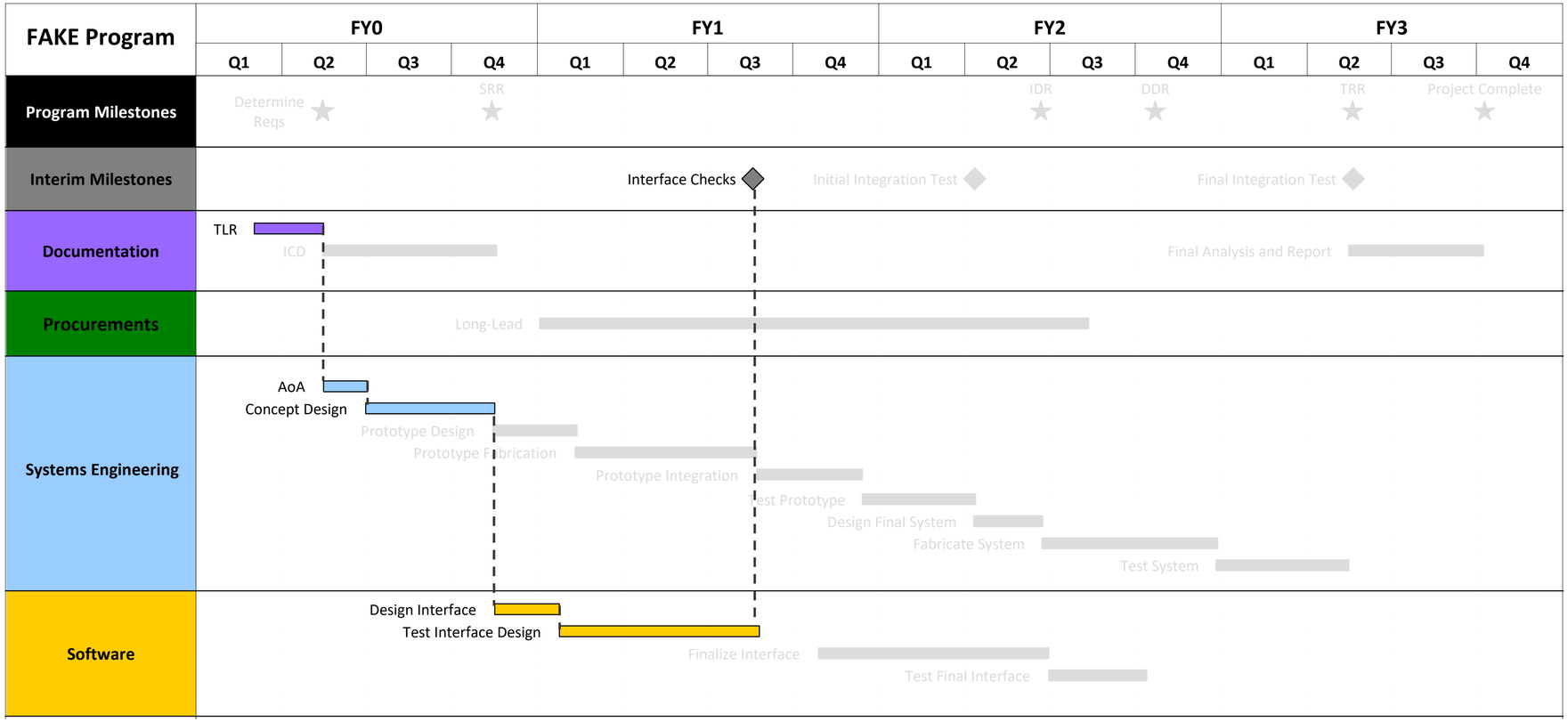
- Establish checkpoints to keep on schedule



Tracking to the Interim

- Keep the overall forecast but plan to interim milestones
  - Identify trade spaces and potential schedule savings
- Need to have a good baseline to start
  - Good schedule construction and consistent update cycle
- Use deadlines instead of constraints to quantify negative slack and paths that delay the schedule

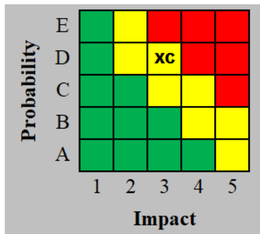
Instead of tracking to end of program, plan to next key milestone.
Can create a dynamic schedule that matures step-by-step and stays on time.

Communicating and Tracking Risk Events

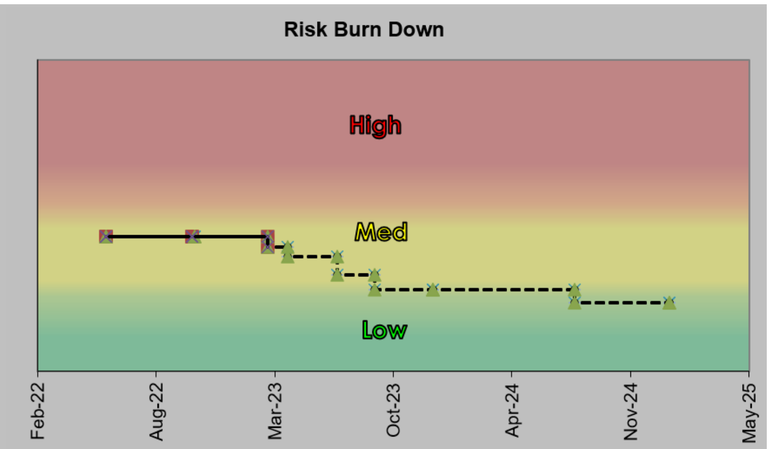
- What is the point where X is no longer achievable, and risk will have to be accepted?
- <u>Schedule Risk Analysis (SRA):</u>
  - Used to assess the likelihood of a project schedule being completed on time with consideration of potential uncertainties and risks
  - Can estimate optimistic, pessimistic, and most likely task durations / dates
- How does the program track risk?
  - Risk matrix and risk mitigation
  - Stoplight charts and chevron risk path

Risk Matrix and Risk Mitigation

- Add Risk Mitigation tasks in IMS connected to direct tasking and milestones → keeps configuration management but ties to a customer's tracker



CURRENT RISK ASSESSMENT SUMMARY
Medium

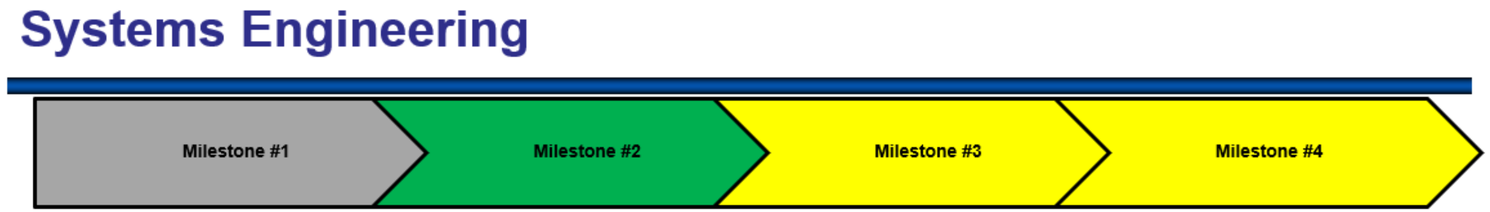


	Action / Event	Date: Scheduled	Date: Actual	Success Criteria	POC
1	Generate Reqs for Electrical Power System	12/5/24	12/5/24	Reqs that can be flowed to the subsystem design teams to begin the design process.	John Doe
2	Trade Study on Power Arch Design Options	1/9/25	1/20/25	Establishment of trade-space available to the design team.	John Doe
3	Design Review to Establish Electrical Power Architecture Baseline	5/15/25		Baseline design that meets requirements for integration into the platform.	John Doe
4	Finalize Power Design	8/7/25		Complete design of the system.	John Doe
5	Fabrication and Test Power System	1/22/26		Build & test for verification.	John Doe

WBS	Task Name	Duration	%	Start	Finish
1	**FAKE Project**	**524 days**	**0%**	**10/1/2024**	**10/2/2026**
1.1	**Project Milestones**	**524 days**	**33%**	**10/1/2024**	**10/2/2026**
1.1.1	Kickoff Meeting	1 day	100%	10/1/2024	10/1/2024
1.1.2	Initial Design Review (IDR)	1 day	0%	5/16/2025	5/16/2025
1.1.3	Detailed Design Review (DDR)	1 day	0%	8/8/2025	8/8/2025
1.2	**Program Management (LOE)**	**523 days**	**6%**	**10/2/2024**	**10/2/2026**
1.2.1	**Risks**	**400 days**	**10%**	**10/2/2024**	**4/14/2026**
1.2.1.3	Power Management	0 days	0%	8/10/2025	1/22/2026
1.2.2	**Risk Mitigation**	**342 days**	**0%**	**10/2/2024**	**1/22/2027**
1.2.2.1	**Power Management**	**342 days**	**0%**	**10/2/2024**	**1/22/2027**
1.2.2.1.1	Generate Reqs for Electrical Power System	47 days	0%	10/2/2024	12/5/2024
1.2.2.1.2	Trade Study on Power Design Options	25 days	0%	12/8/2024	1/9/2025
1.2.2.1.3	Design Review to Establish Power Architecture	90 days	0%	1/12/2025	5/15/2025
1.2.2.1.4	Finalize Power Design	60 days	0%	5/16/2025	8/7/2025
1.2.2.1.5	Fabrication and Test Power System	120 days	0%	8/8/2025	1/22/2026

Tracking Risks Visually: Stoplight Charts and Chevron Bands

- Determine the proper threshold for delays/risks
  - PMI EVM guidance: variances 0-5% = green, 5-10% = yellow and >10% = red
  - Smaller projects will have different parameters than more complex programs



- **Key Updates**
  - Major accomplishments or takeaways
- **Action Items**
  - Status/closure on action items
  - Reference by number/title with short status

On plan or delay has no impact	Late and/or risk to Execution	Off Track	Complete

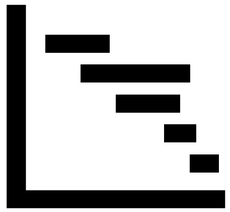
Actions	Team	Plan	Forecast	Notes
Item 1	Team 1	Date or Event	Date or Event	
Item 2	Team 2	Date or Event	Date or Event	
Item 3	Team 1	Date or Event	Date or Event	
Item 4	Team 1	Date or Event	Date or Event	
Item 5	Team 2	Date or Event	Date or Event	

Context is Important: A 5% delay on a small task might be negligible, while a 5% delay on a critical path activity could have significant implications.

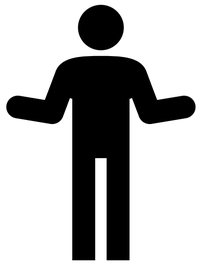
Summary

Conclusion

The PM says: "Let's talk schedule, show me the metrics."

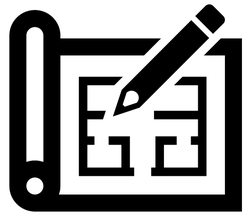


Review schedule execution and performance, as well as critical path-based metrics



We're still tracking to the same date, what else should I be doing?

Track to the interim, document risks, and tailor your visualizations



Communication, documentation, and messaging is key

AUGUR

Questions?

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Backup

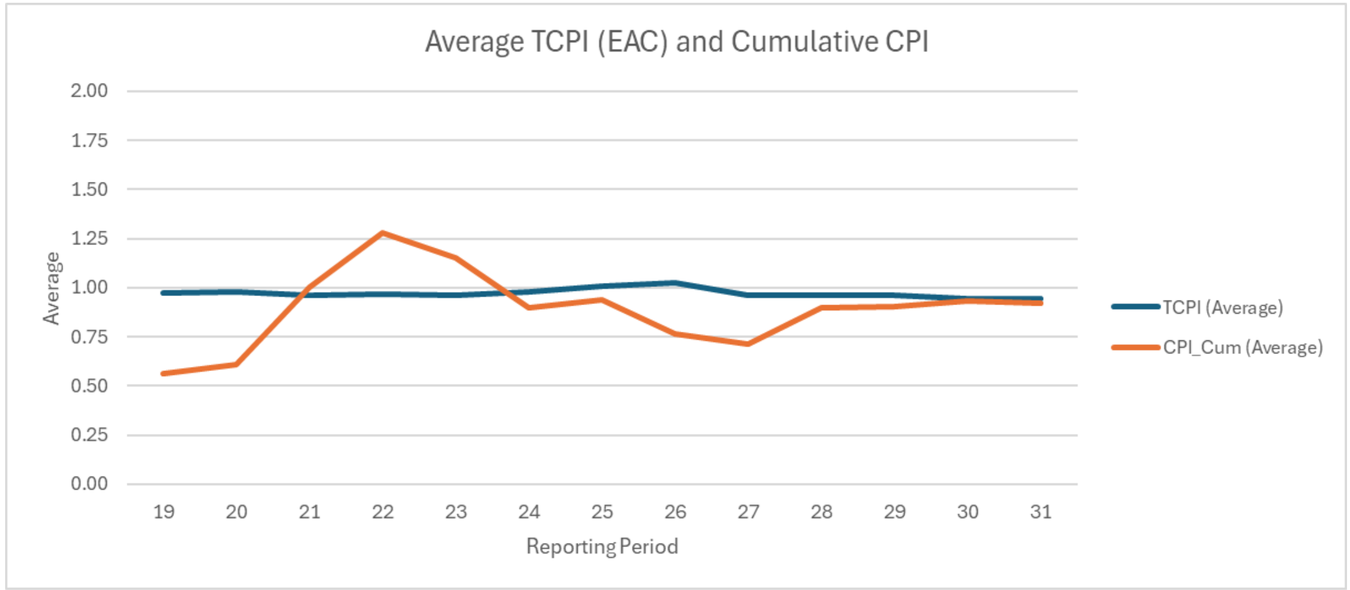
Point 1: Current Execution Index (CEI)

"Current Execution Index (CEI) is a schedule execution metric that measures how accurately the program is forecasting and executing to its forecast from one period to the next" (PASEG, pg. 168)

"The real benefit of implementing CEI is an increased program emphasis on ensuring the accuracy of the forecast schedule. This results in a more accurate predictive model and increases the program's ability to meet its contractual obligations on schedule" (PASEG, pg. 168)

$$\text{CEI} = \frac{\#\ of\ tasks\ that\ finished\ in\ the\ window\ (of\ the\ tasks\ forecasted\ to\ finish)}{\#\ of\ tasks\ forecasted\ to\ finish\ in\ the\ defined\ window}$$

Point 2: To-Complete Performance Index (TCPI)



	Calculated Metrics					
Task	% Comp	CPI	SPI	TCPI-E	TCPI Spread	Interpretation
A	10.7%	1.31	1.11	1.00	0.31	SPI>1 TCPI<CPI Efficient and savings
B	89.9%	0.92	1.00	0.48	0.44	SPI>1 TCPI<CPI Efficient and % complete not masking performance
C	81.2%	0.33	0.97	1.24	-0.91	SPI ~1 TCPI>1 Needs to be more efficient and SPI not reflective

<u>TCPI:</u> Indicates level of performance required to complete remaining work on time

Point 3: Free and Total Float

Critical path can mask issues of schedule performance/construction

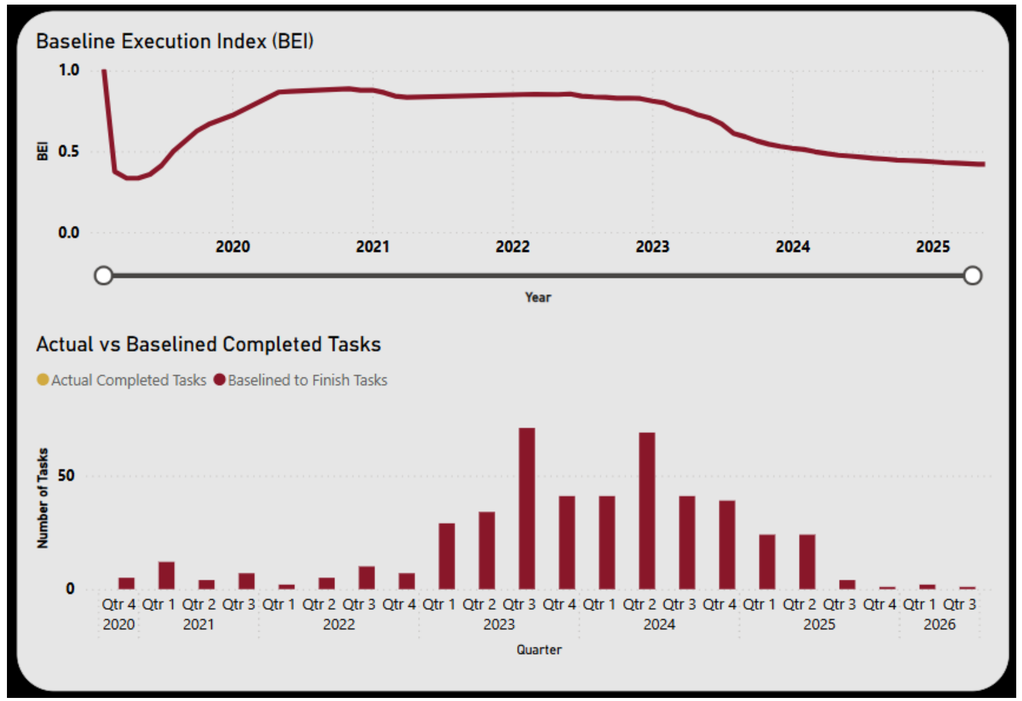
- Check the total float in the schedule, if it is high there's likely logic missing
- Free float could be a better indicator of how quickly slips will impact tasking

- Free Float
  - The amount of time a task can be delayed before it impacts a successor task

- Total Float
  - The amount of time a task can be delayed before it impacts project completion

Leveraging Dashboards & Visualizations

- Integrates other program elements with schedule (cost, EVM, etc.)
- Converts large datasets for analysis → better data management
- Graphics and tables can be updated by user in real time

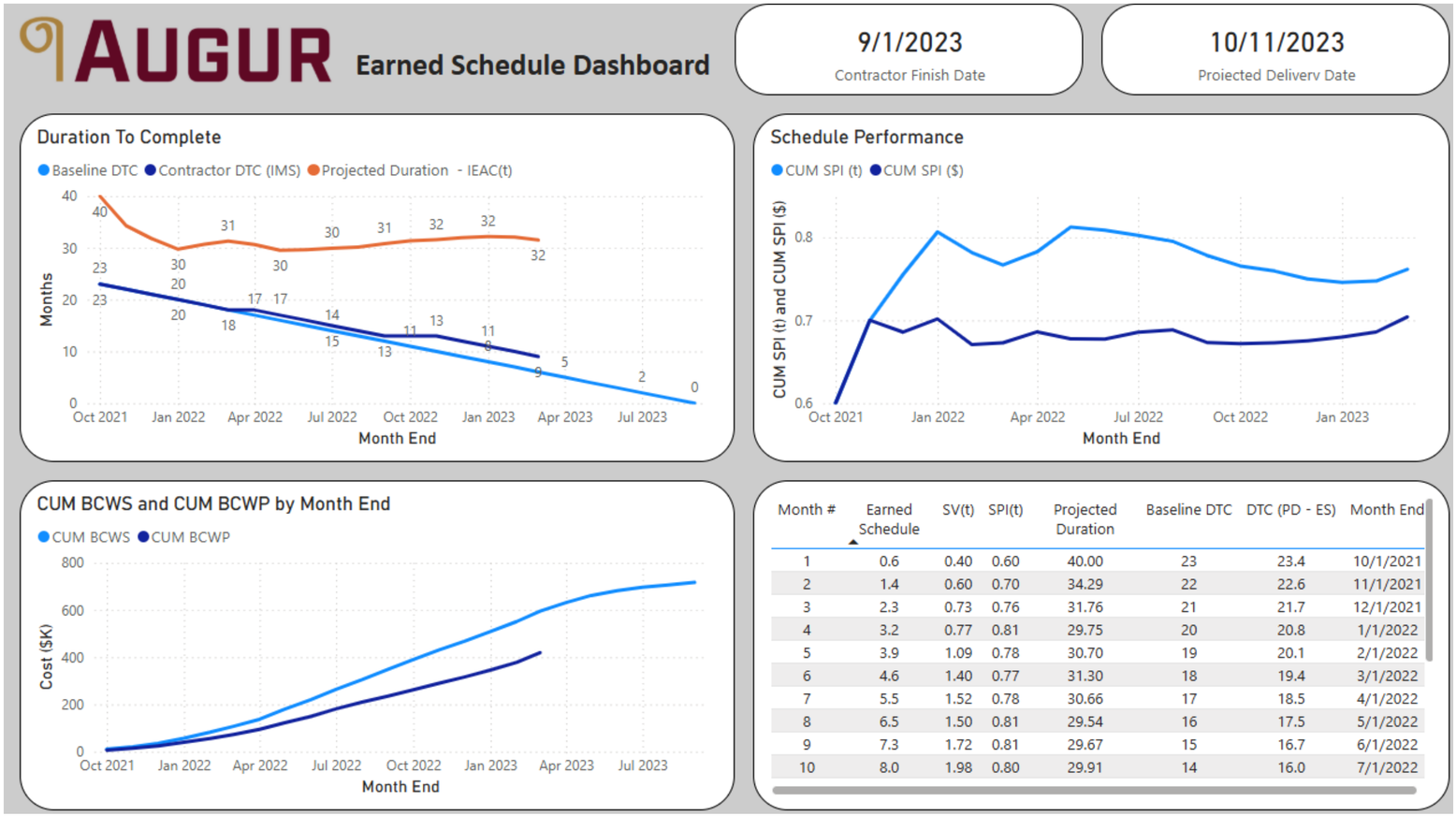


Back to report | MTA DOCUMENT TRACKER

Document	Status	Baseline Finish	Projected Finish	Finish Variance
Program Milestones		**10/1/27**	**11/1/27**	
Prototyping Phase	On Time	12/31/25	12/31/25	0 days
Fielding Phase	On Time	9/30/27	9/30/27	0 days
MS-B	Delayed	1/2/26	1/12/26	6 days
MS-C	Delayed	10/1/27	11/1/27	22 days
Test & Evaluation Master Plan (TEMP)		**2/28/25**	**2/28/25**	
TEMP - Development	Delivered - On Time	10/16/24	10/16/24	0 days
TEMP - Review & Adjudication	Delivered - On Time	11/14/24	11/14/24	0 days
TEMP - PO Review & Approval	Delivered - Late	11/1/24	11/15/24	9 days
TEMP - ASN(RDA) Approval	On Time	2/7/25	2/7/25	0 days
TEMP - DOT&E Approval	On Time	2/28/25	2/28/25	0 days
Capabilities Development Document (CDD)		**12/31/24**	**12/31/24**	
CDD - Development	Delivered - On Time	10/23/24	10/23/24	0 days
CDD - Review & Adjudication	Delivered - Late	11/1/24	11/15/24	9 days
CDD - PO Review & Approval	Delayed	12/9/24	12/13/24	4 days
CDD - CAPT Review & Approval	On Time	12/31/24	12/31/24	0 days

Leveraging Dashboards & Visualizations

- Earned Schedule Dashboard
  - Visualize metrics
  - How long should the project have taken to achieve the current level of work completed?



Month #	Earned Schedule	SV(t)	SPI(t)	Projected Duration	Baseline DTC	DTC (PD - ES)	Month End
1	0.6	0.40	0.60	40.00	23	23.4	10/1/2021
2	1.4	0.60	0.70	34.29	22	22.6	11/1/2021
3	2.3	0.73	0.76	31.76	21	21.7	12/1/2021
4	3.2	0.77	0.81	29.75	20	20.8	1/1/2022
5	3.9	1.09	0.78	30.70	19	20.1	2/1/2022
6	4.6	1.40	0.77	31.30	18	19.4	3/1/2022
7	5.5	1.52	0.78	30.66	17	18.5	4/1/2022
8	6.5	1.50	0.81	29.54	16	17.5	5/1/2022
9	7.3	1.72	0.81	29.67	15	16.7	6/1/2022
10	8.0	1.98	0.80	29.91	14	16.0	7/1/2022

Not all deliverables have to be the same.
Consider your customer's needs and customize/tailor to your products.