

Python Tool Development to Support Alternative EVM Reporting

Dan Hearn


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Program History

Program stopped buying new production lots

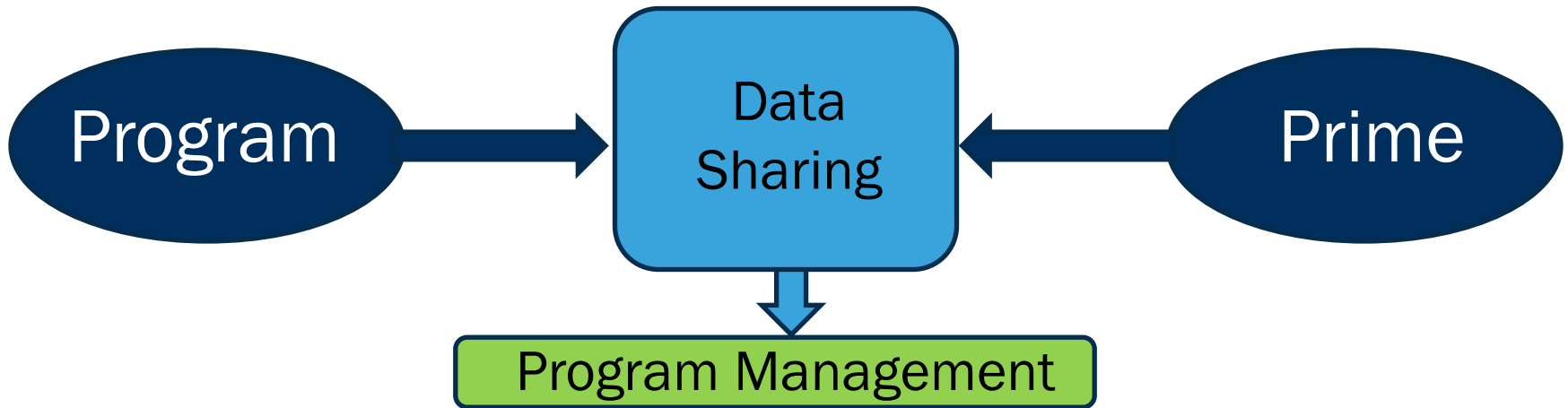
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- Began discussions for new lots with upgraded capability
 - High risk for Prime, contract type changed to fixed price incentive
 - Paid one time cost for factory reboot
 - Triggers a government requirement for EVM



20+ FTEs proposed to fulfill EVM requirements

- Nearly doubles estimated SEPM hours
- Significant increase to program cost
- Negotiated three FTEs (1 gov, 2 contractor)

Program History Pt. 2



Collaborated with Prime to create a cost model

- Basis for negotiations using agreed upon data

Alternative EVM Approach

- Began using material data to track supply chain issues
- Informs schedule and future contract negotiations

Python Code Development

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Initial Tasking

- Material Lead was utilizing Material Requirements Planning (MRP) data to track factory progress in high level assemblies
- Required manual updates biweekly
- Tasked with learning the data set and automating this process

Demand Update
No Progress
Progress
Constraint

Part Number	Part Description	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22
001	Complete Assembly	35	35	35	35	63	70	70	70
002	Subassembly 1	31	31	31	31	66	66	66	66
003	Subassembly 2	29	29	29	29	60	64	62	59
004	Subassembly 3					70	70	70	57
005	Subassembly 4	35	30	30	30	60	65	59	58
006	Subassembly 5	28	28	28	28	46	46	46	46

Line of Balance

- Line of balance is a material planning tool that the Prime uses to track inventory and plan orders on an as-needed basis based on schedule
- MRP Qty Demand describes how many assemblies/parts need to be consumed to satisfy lot(s) on contract
- The “Next Higher Assembly” column can be used to identify which parts are limiting the build of assemblies

Next higher Assembly	Part Site	Part	Description	MRP Qty Demand	On Hand	PR	PO	Past	1/1/2025	1/8/2025	1/15/2025	1/22/2025	1/29/2025
Top Level	2	001	Complete Assembly	55	1		54	-27	-33	-37	-43	-43	-42
001	2	0011	Part 1	150	35		102	32	26	30	29	29	27
001	2	0012	Part 2 - GFM	50				0	0	0	0	0	0
001	2	0013	Part 3 - GFM	43				0	0	0	0	0	0
001	1	002	Subassembly 1	53				-25	-30	-32	-40	-40	-39
002	1	0030	Part 4	232	115		117	110	102	97	105	90	87
002	1	0031	Part 5	49	12		30	10	7	8	5	5	4
001	1	003	Subassembly 2	51			51	-42	-42	-42	-42	-42	-42

Coding Brainstorm

With an understanding of the data and the task required, how do get started on automating this product? I prefer to write out the steps I plan to take without any coding language.

- 1) Read in data set
- 2) Filter data set down to the chosen assemblies
- 3) Filter columns down to the part number, description, and demand
- 4) Scrape date of data from file name
- 5) Rename demand column to month/year of line of balance date
- 6) Repeat steps 1-4 for each line of balance file, merging in demand
- 7) Read through each row, coloring cells based on the previous month's demand

LoB Burndown Heatmap

After hours of coding, googling solutions to problems, and troubleshooting, we have a script to automates the task. Now what?

Issues with current deliverable:

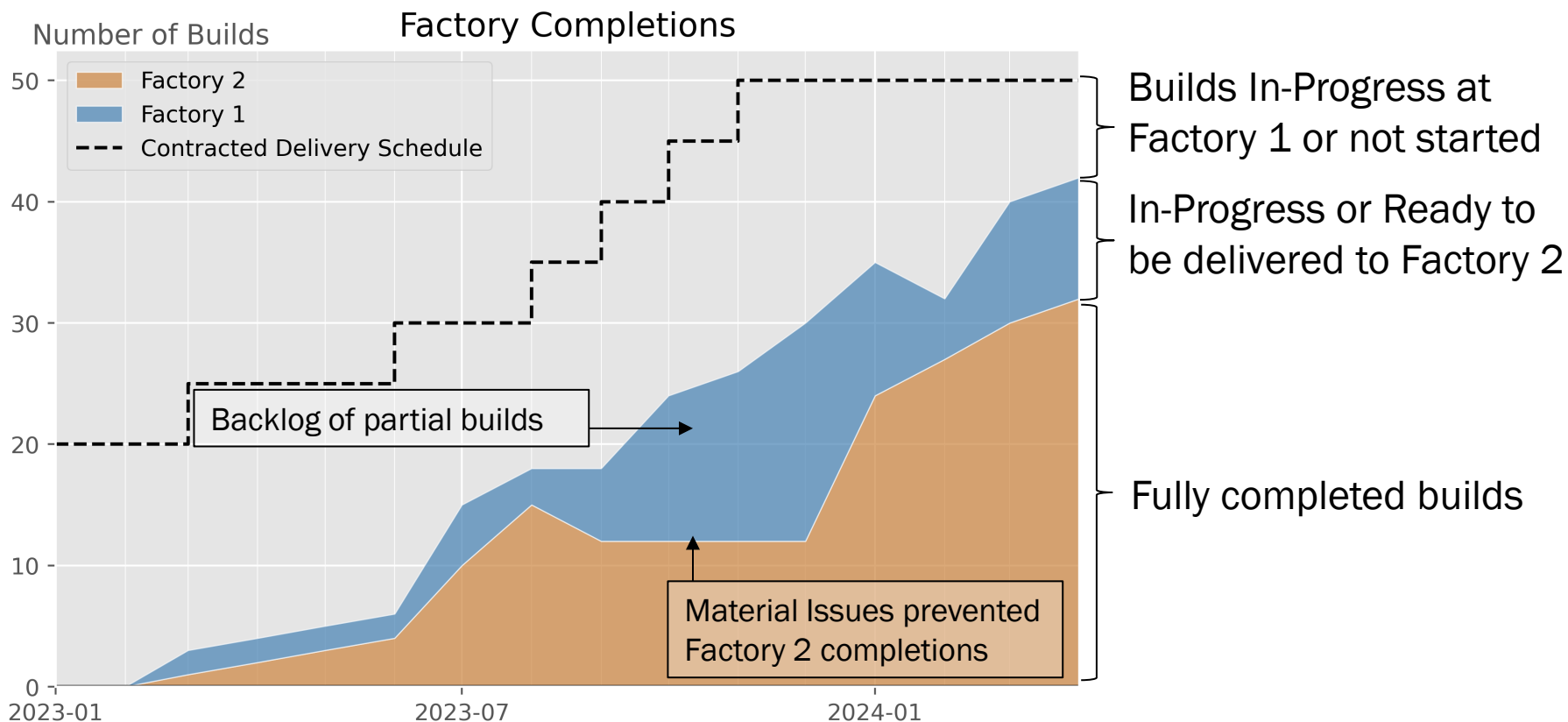
- Nothing visually that differentiates a change of 1 or 100
- Great for our monitoring, but hard to brief upwards

Factory	Part Number	Part Description	1-Aug-23	1-Sep-23	1-Oct-23	1-Nov-23	1-Dec-23	1-Jan-24	1-Feb-24	1-Mar-24	1-Apr-24	1-May-24
2	001	Complete Assembly	55	54	52	52	45	43	43	43	37	32
2	002	Subassembly 1	54	54	54	49	42	40	40	39	24	20
2	003	Subassembly 2	70	54	54	50	40	39	38	29	15	13
2	004	Subassembly 3	49	48	46	30	14	13	12	11	6	4
1	005	Subassembly 4	55	54	52	52	45	43	43	43	37	32
1	006	Subassembly 5	54	54	54	49	42	40	40	39	24	20
1	007	Subassembly 6	70	70	70	50	40	39	38	29	15	13
1	008	Subassembly 7	49	48	46	29	14	13	13	11	7	4
1	009	Subassembly 8	49	48	44	30	14	11	11	9	7	4

Factory Sand Chart

The Heatmap, once again while useful for monitoring, is difficult to brief to senior leadership.

This approach isn't working, lets try looking at the data differently.

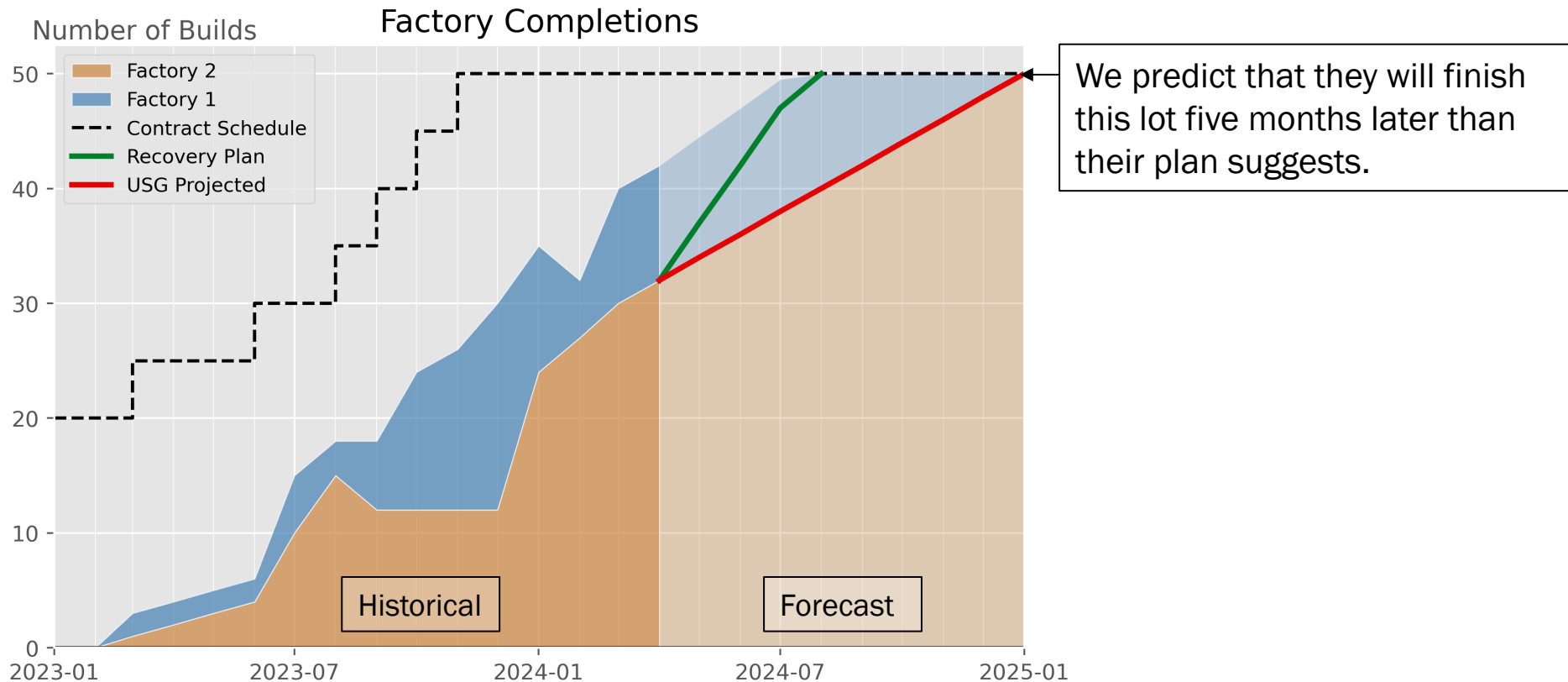


Forecasting

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Factory Forecast Sand Chart

- Began predicting lot completion dates based on historical performance and comparing it to their Recovery Plan.
- Found significant discrepancies in timeline between current lots, even larger for future ones on contract.

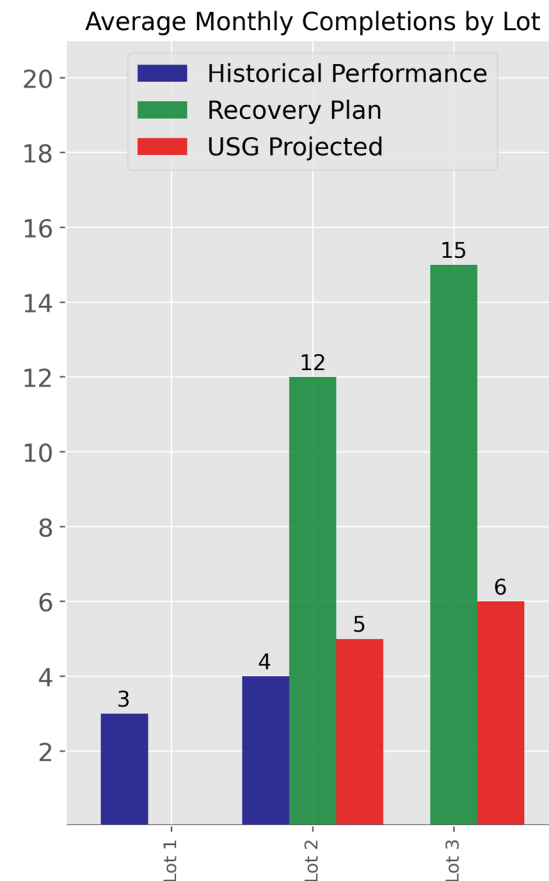
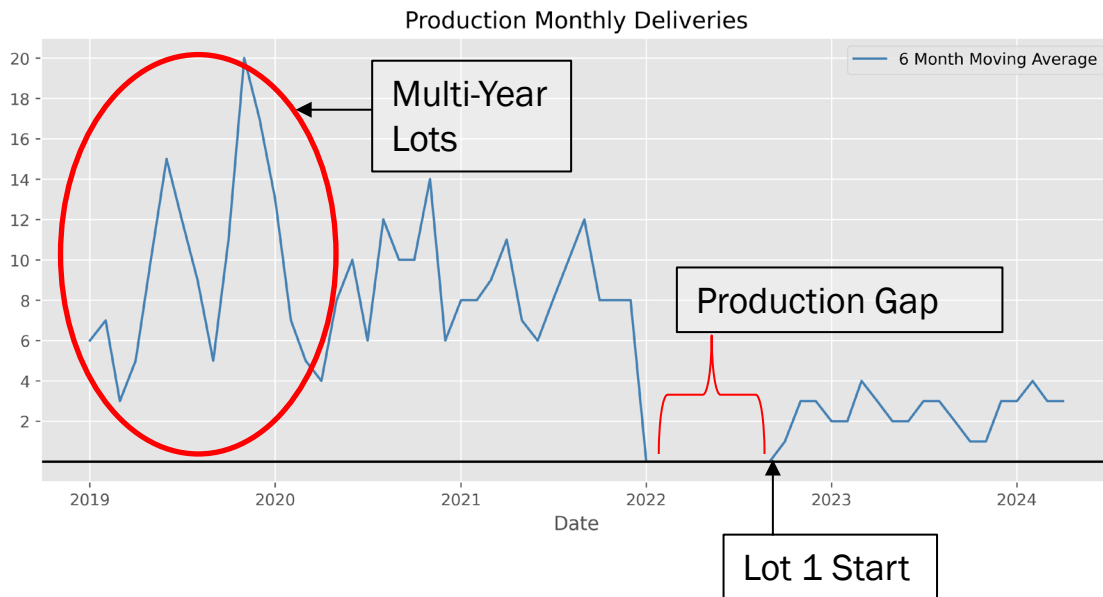


Historical Performance

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Historical Performance

- Predicted completion dates showed a larger discrepancy than expected
- Began investigating long-term historical performance to look for reasons why deliveries are behind schedule



Automation

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Streamlit App Development

Method 1: Hosting python tool online with restricted permissions

The screenshot shows a web browser at localhost:8501 displaying a Streamlit application. The application has a title 'Line of Balance Burndown' and two tabs: 'Variant 1' (selected) and 'Variant 2'. Below the tabs are three buttons: 'Generate Variant 1 Sand Charts', 'Display Variant 1 Sand Charts', and 'Display Interactable Variant 1 Chart'. At the bottom, there is a file upload section with a cloud icon and the text 'Drag and drop file here' and 'Limit 200MB per file • CSV, XLSX'. Callouts on the right side of the image point to these elements: 'Web based-tool hosted locally' points to the browser address bar; 'Switch between two Variants' points to the tabs; 'Generate/Display Charts' points to the three buttons; and 'Process new data sets' points to the file upload area.

Html Reports

Functionality

- Downloadable file that opens in web browser
- Supports interactable charts
- Can be generated automatically through python script

Limitations

- Recipients can't make changes
- Formatting options are limited
- Unfamiliar format to most
- Few python plotting packages support it

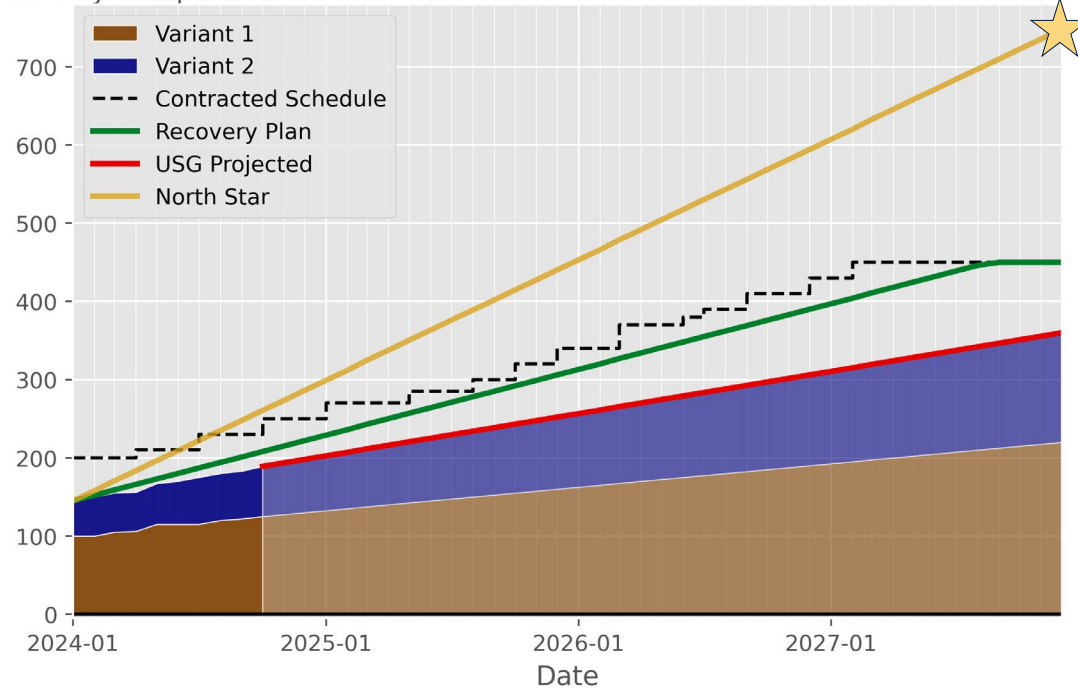
North Star Announcement

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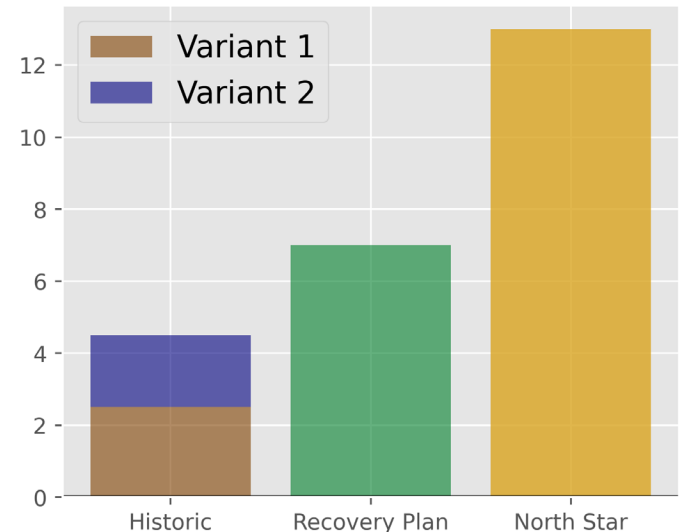
North Star Planning

- North Star goal significantly exceeded the Prime's Recovery plan
- To meet it, throughput needs to more than double
- Each month that rate is not met, required monthly rate increases

Factory Completions



Avg. Monthly Factory Completions Rates

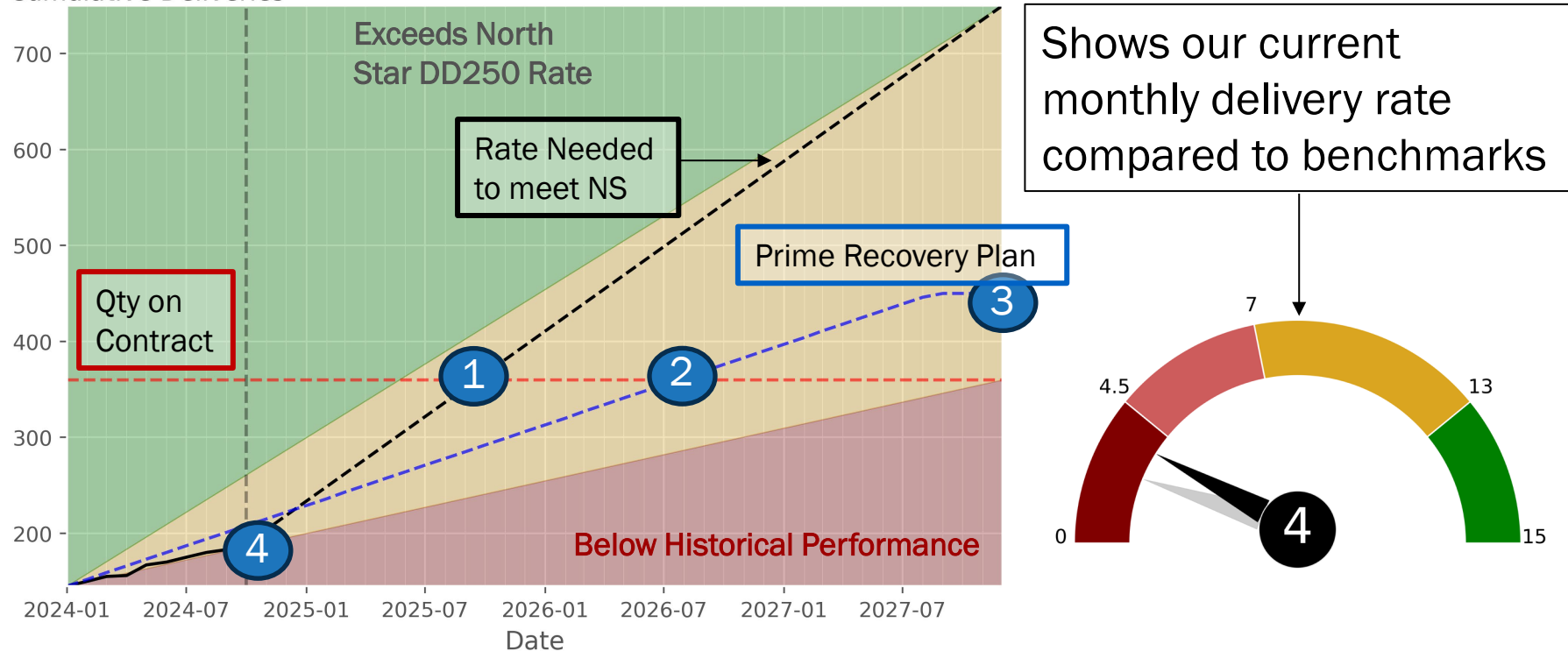


IPT Lead Request

IPT Lead requested we build a few slides to be briefed with the Prime and later to the Admiral

- Needs to clearly show how we are on track to miss our goal
- Kickstart conversation on decisions needed to improve outlook

Cumulative Deliveries



Material Limitations

We need to workshop a plan to get us closer to the North Star

- Additional contracts are needed ASAP

Without available material, contracts are irrelevant

- Began investing material availability on parts already identified as “sensitive”

		2025										2026						Potential New DD250s
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun		
Prime Plan - Variant 1		4	4	3	3	5	2	4	4	5	5	3	2	4	5	5	58	
Supplier Best Case - Limited by Part 1		27	26	26	26	24	25	24	23	21	19	19	20	19	17	15	73	
Supplier Current Rate - Limited by Part 2		18	16	15	14	11	11	9	7	4	1	0	0	-2	-5	-8	50	
	Qty On Hand*																Cumulative Part Availability	
Part 1 - Current Rate	20	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	50	
Part 1 - Best Case Rate		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	95	
Part 2 - Current Rate	28	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	58	
Part 2 - Best Case Rate		3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	73	

Next Steps

Sustainment

- Produce analysis with each new data set
- Update older charts when we get improved assumptions

Development

- Expand material analysis to Variant 2
- Gather supplier information for additional parts
- Start utilizing material availability in forecast

Takeaways

Material data can be extremely valuable to us as cost estimators

- Part availability – Second Source Requirement
- Inventory on hand – Sustainment costs

A simple task can snowball into a valuable product to our program office

- This is where our creativity and out-of-the-box thinking adds value

It can take time for people to see the value your analysis provides

- Sometimes it feels like you're yelling at the sky
- Be patient. If you are confident in your analysis and what it conveys, keep going

Automation is key

- By automating products at each step, we can keep producing updates effortlessly while we continue developing

Q&A



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