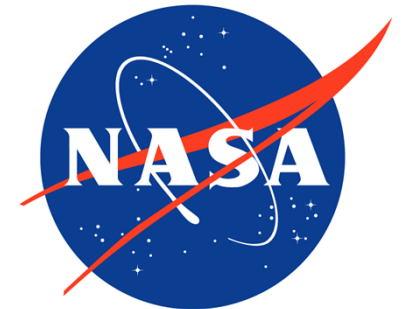


Turning Schedule Metrics Into Management Insight

NASA Cost and Schedule Symposium
Glenn Research Center, Cleveland, OH

August 25-27, 2026



Introduction



Ryan Witters, PMP, LEED AP

Managing Director | Washington, DC

Education

BS – Civil Engineering, University of Evansville
MEng – Civil Engineering, University of Maryland, College Park
Graduate Certificate – Engineering, Project Management,
University of Maryland, College Park

Industry Certifications

Project Management Professional (PMP)
LEED Accredited Professional (LEED AP)

Professional Experience

Field Engineer and Project Manager
Construction Delay Disputes & Advisory
Schedule Advisory



Javier Arniella, PE, PSP

Senior Director | Washington, DC

Education

BS – Civil Engineering & Land Surveying and Topography,
University of Puerto Rico-Mayaguez
MEng – Civil Engineering, University of Puerto Rico-Mayaguez

Industry Certifications

Professional Engineer (PE)
Planning & Scheduling Professional (PSP)

Professional Experience

Land Surveyor and Field Engineer
Construction Delay Disputes & Advisory
Schedule Advisory



Natasha Dahl, CCP, PSP, PMP

Senior Director | Washington, DC

Education

BA – Political Science & Government, Western WA University
MS – Construction Management, Louisiana State University

Industry Certifications

Certified Cost Professional (CCP)
Planning & Scheduling Professional (PSP)
Project Management Professional (PMP)

Professional Experience

Builder's Risk Claims Consulting
Construction Claims and Disputes – Damages / Delay
Schedule Advisory
Faculty Specialist – Planning and Scheduling

Agenda

1. Management Challenges

- Cost growth, schedule delay, integration, visibility, and complexity.

2. Why Metrics Fail To Communicate Urgency

- Explain chain-of-command dilution and how forensic communication can change outcomes.

3. Schedule Metric Tool Kit

- CEI, BEI, SPI, Bow-Wave Analysis, and Trend Interpretation.

4. Executive Reporting Framework

- Translate data into easily digestible management reports

5. Takeaways

- A practical, repeatable framework for active project management.

Abstract

Turning Schedule Metrics Into Management Insight: Practical Early-Warning And Forecasting Techniques And How to Overcome the Chain-of-Command Communication Barrier

Persistent challenges in managing major programs/projects (“P/p”), including **cost growth and schedule delays**, **optimistic planning assumptions**, **limited integration** between cost, schedule, and risk, **late visibility** into emerging execution issues, and **increasing complexity** across interdependent mission portfolios plague daily management operations. Despite improvements in overall P/p performance, **these issues can remain as primary drivers of risk** and are often exacerbated by delayed identification of deteriorating schedule conditions, limiting management’s ability to take timely corrective action. Often data-driven schedule and cost metrics fail to clearly and concisely communicate the appropriate urgency for potential risks. The authors provide practical actions to communicate schedule risks based on their experience as forensic schedule analysts where clear and concise communication is often a primary driver of the resulting dispute outcome.

This presentation introduces a practical framework for **converting routine schedule data into actionable management** insight through the use of recurring schedule metrics, trend analysis, and structured reporting, using metrics already developed in the NASA Schedule Management Handbook. Building on NASA’s emphasis on continuous assessment and performance monitoring, the approach demonstrates how indicators such as the Current Execution Index (CEI), Baseline Execution Index (BEI), Schedule Performance Index (SPI), and bow-wave analysis can be used to evaluate execution quality, detect schedule pressure, and assess the achievability of near-term plans.

The framework is specifically designed to provide support for executive decision-making by providing reliable forecasting, earlier visibility into emerging risks, objective validation of performance against the plan, and improved communication across projects and program leadership. By translating detailed schedule data into concise, repeatable reporting products, the approach enhances situational awareness and **supports a more proactive, repeatable, and data-driven decision-making process.**

Attendees will gain a scalable methodology for improving early-warning capability, strengthening forecasting confidence, and reducing the likelihood of downstream cost and schedule impacts across complex projects.



Learning Objectives

Turning Schedule Metrics Into Management Insight



Recognize and identify cost and schedule risk early



Utilize historical data to forecast with confidence



Translate unstructured or structured data and metrics into effective risk communication and actionable insights



Apply lessons learned from examples to support communication for better management decisions

The Chain-of-Command Communication Barrier

P/p challenges represent communication problems of a timing and technical nature

Cost + Schedule Growth

Performance degradation is often discovered after recovery options narrow.

Optimistic Assumptions

Plans may remain credible on paper longer than execution behavior supports.

Late Visibility

Formal milestones may lag the operational indicators that first show deterioration.

Portfolio Complexity

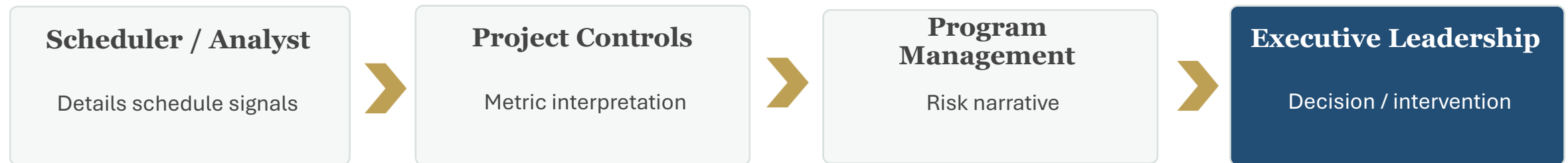
Interdependence can convert local schedule pressure into broader program risk.

Integration Gaps

Schedule, cost, and risk can be analyzed in parallel rather than as cause-and-effect signals.

Why This Matters

P/p challenges represent communication problems of a timing and technical nature



Where urgency is often lost

- Risk is visible in data before it is clear in the management narrative – **what's the big picture?**
- Metrics are reported without an explicit management consequence – **what are the numbers really saying?**
- Forecast changes are described technically, not as decision triggers – **what are the explicit recommended actions?**
- Escalation language is inconsistent across reporting cycles – **how impactful is the risk?**

Practical Framework

A chain of effective communication steps

- | | | |
|---|-------------------|--|
| 1 | Schedule Data | IMS updates, progress, critical path shifts, completion behavior |
| 2 | Metric Logic | CEI, BEI, SPI, bow-wave analysis, trend movement |
| 3 | Risk Narrative | What changed, why it matters, near-term implication |
| 4 | Decision Product | Concise dashboard, escalation trigger, action options or recommendations |
| 5 | Management Action | Earlier intervention, resource alignment, plan reasonability check |

Takeaway: The framework is built to be repeatable - same data view, same interpretation logic, same escalation language.

Metric Tool-Kit

Use established metrics to answer management questions, not just produce a status update.

BEI

Is execution keeping pace with the baseline?

CEI

Are current-period activities being completed as planned?

SPI

Is earned progress aligned with planned value?

Bow-wave

Is unfinished work being pushed into future periods?

Executive translation template

What changed? → Why does it matter? → What decision or intervention is needed?

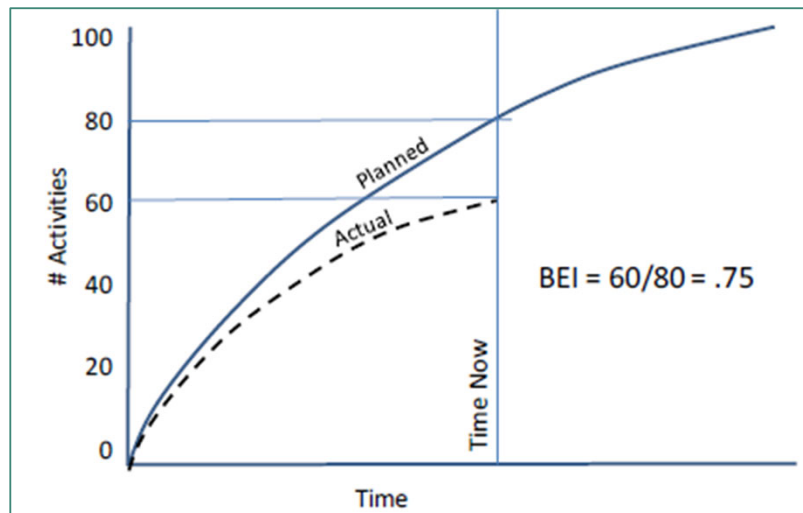
The disciplined communication of metric outputs helps to preserve urgency and knowledge through the chain of command.

Metric Tool-Kit: Execution In

Execution Indices

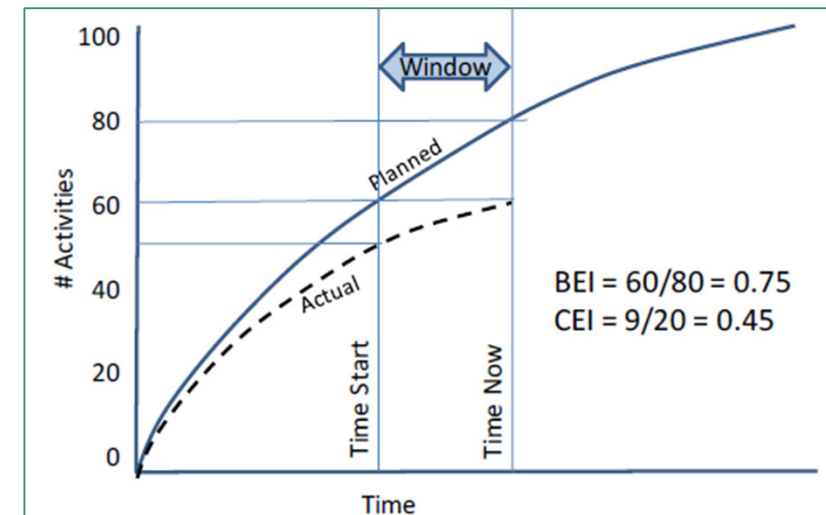
$$BEI = \frac{\text{Activities Actually Completed}}{\text{Activities Planned to be Completed}}$$

- Cumulative actual-to-baseline comparison
- Answers: “Is work getting done compared to the Baseline?”
- Plotted over time to determine trend
- Useful for showing actual pace of progress compared to planned



$$CEI = \frac{\text{Activities Actually Completed (in the window)}}{\text{Activities Planned to be Completed (in the window)}}$$

- Period-by-period actual-to-forecast comparison
- Answers: “Is work getting done this period compared to the forecast?”
- Snapshot of current execution’s reliability
- Useful for evaluating whether the current schedule update is realistic



Metric Tool-Kit: Current/Baseline Execution Index

Why BEI and CEI Matter in a Dispute or Claims Setting

BEI Declining over Time

- Was the project actually completing the activities it planned to complete
- Supports a baseline-vs-actual execution narrative

Low CEI in repeated windows

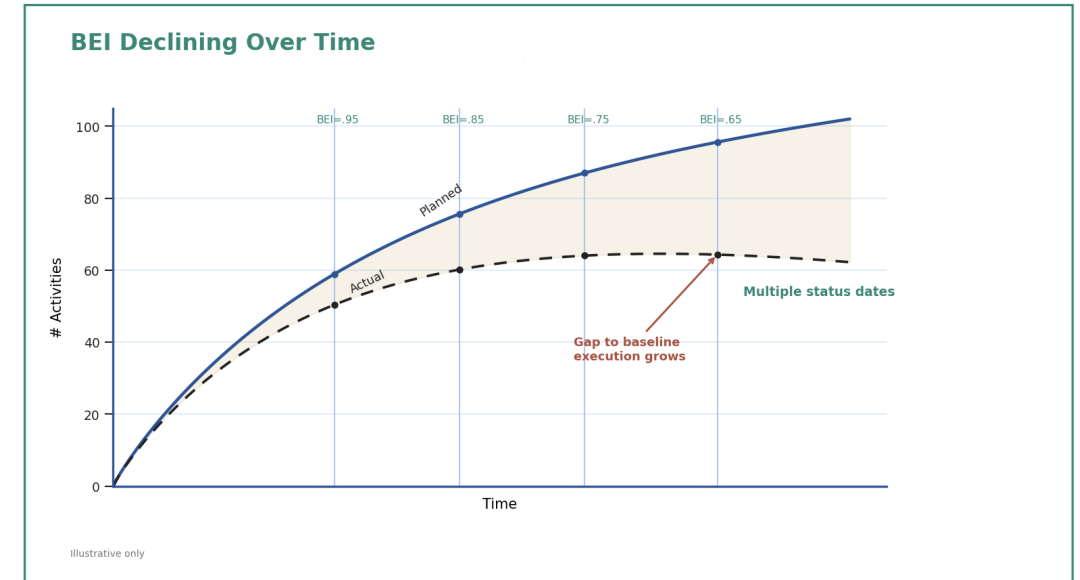
- Were current forecasts reliable, or were updates consistently aggressive?
- Tests contemporaneous schedule credibility

BEI stable, CEI deteriorating

- Is the issue *recent forecast reliability* rather than *long-term baseline execution*?
- Helps isolate when performance changed

BEI and CEI both weak

- Are missed completions accumulating into measurable delay pressure
- Helps trigger deeper causation and responsibility analysis



Metric Tool-Kit: Current/Baseline Execution Index

Why BEI and CEI Matter in a Dispute or Claims Setting

BEI Declining over Time

- Was the project actually completing the activities it planned to complete
- Supports a baseline-vs-actual execution narrative

Low CEI in repeated windows

- Were current forecasts reliable, or were updates consistently aggressive?
- Tests contemporaneous schedule credibility

BEI stable, CEI deteriorating

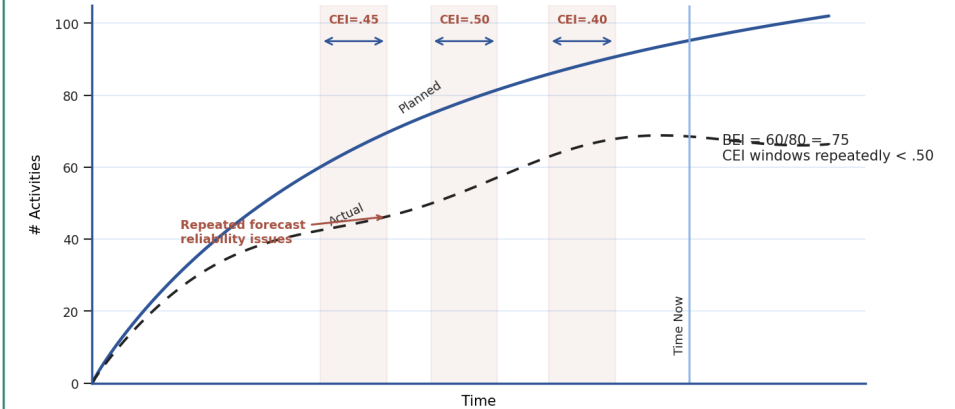
- Is the issue *recent forecast reliability* rather than *long-term baseline execution*?
- Helps isolate when performance changed

BEI and CEI both weak

- Are missed completions accumulating into measurable delay pressure
- Helps trigger deeper causation and responsibility analysis

BEI Declining Over Time

Low CEI in Repeated Windows



Metric Tool-Kit: Current/Baseline Execution Index

Why BEI and CEI Matter in a Dispute or Claims Setting

BEI Declining over Time

- Was the project actually completing the activities it planned to complete
- Supports a baseline-vs-actual execution narrative

Low CEI in repeated windows

- Were current forecasts reliable, or were updates consistently aggressive?
- Tests contemporaneous schedule credibility

BEI stable, CEI deteriorating

- Is the issue *recent forecast reliability* rather than *long-term baseline execution*?
- Helps isolate when performance changed

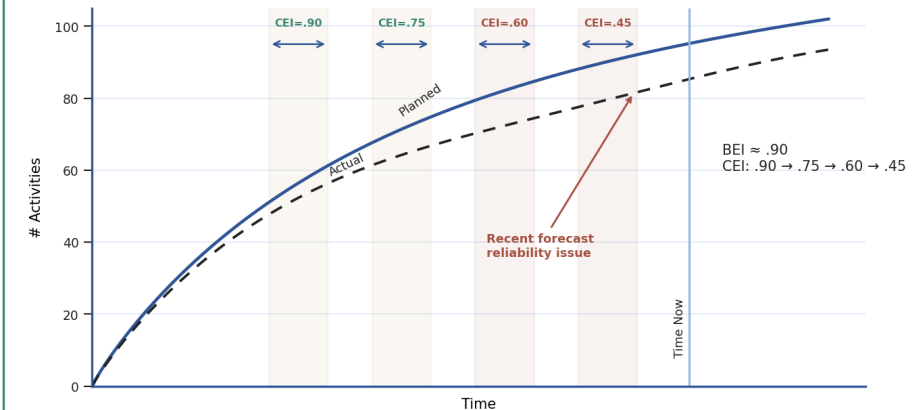
BEI and CEI both weak

- Are missed completions accumulating into measurable delay pressure
- Helps trigger deeper causation and responsibility analysis

BEI Declining Over Time

Low CEI in Repeated Windows

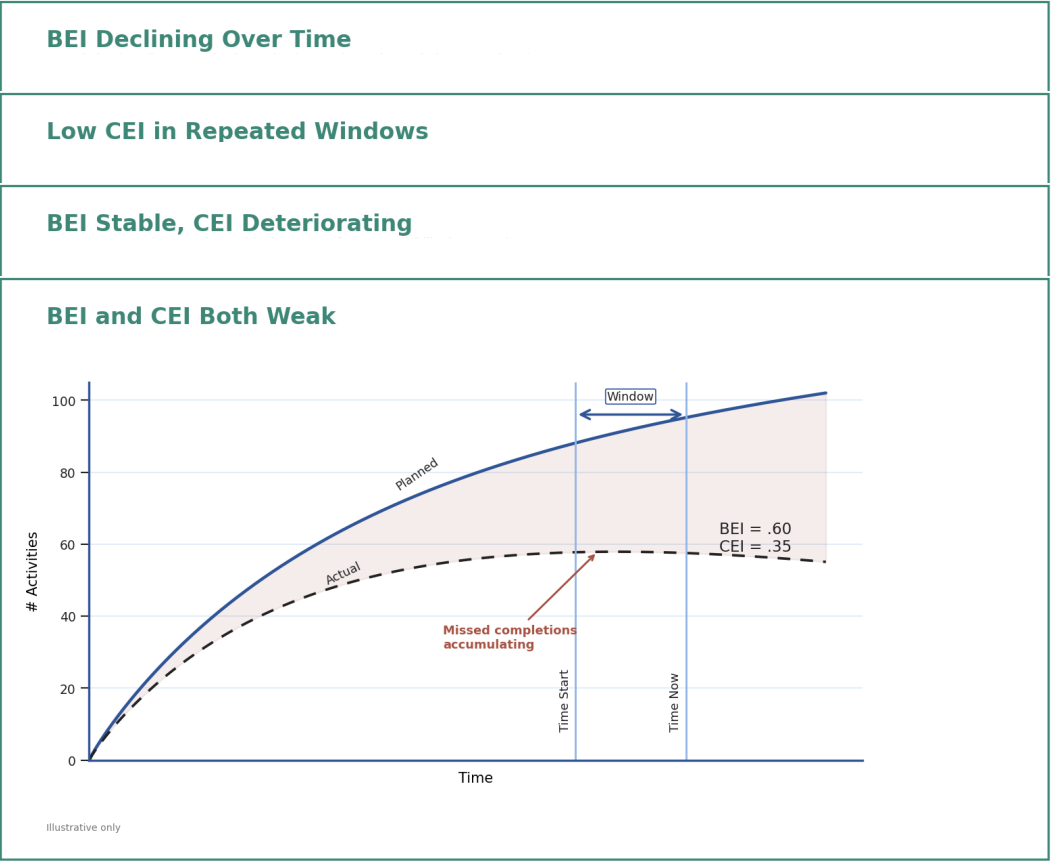
BEI Stable, CEI Deteriorating



Metric Tool-Kit: Current/Baseline Execution Index

Why BEI and CEI Matter in a Dispute or Claims Setting

BEI Declining over Time	<ul style="list-style-type: none">Was the project actually completing the activities it planned to completeSupports a baseline-vs-actual execution narrative
Low CEI in repeated windows	<ul style="list-style-type: none">Were current forecasts reliable, or were updates consistently aggressive?Tests contemporaneous schedule credibility
BEI stable, CEI deteriorating	<ul style="list-style-type: none">Is the issue <i>recent forecast reliability</i> rather than <i>long-term baseline execution</i>?Helps isolate when performance changed
BEI and CEI both weak	<ul style="list-style-type: none">Are missed completions accumulating into measurable delay pressureHelps trigger deeper causation and responsibility analysis

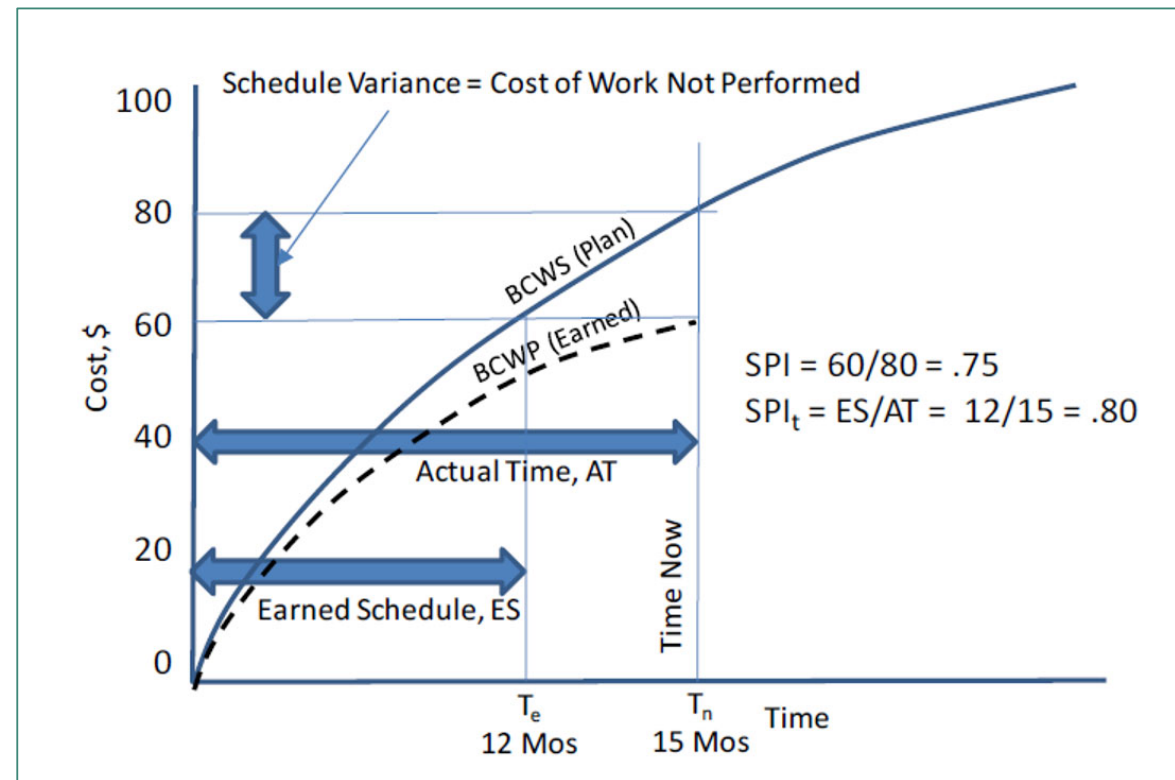


Metric Tool-Kit: Schedule Performance Index

Execution Indices

$$SPI = \frac{BCWP}{BCWS}$$

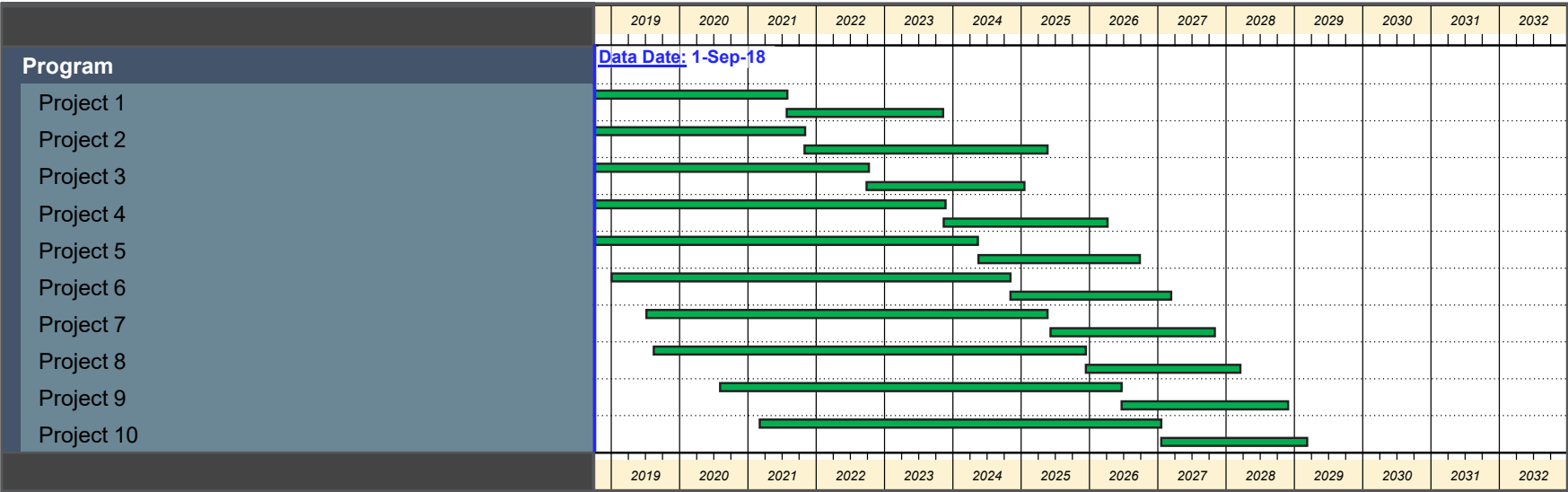
$$SPI_t = \frac{\text{Earned Schedule}}{\text{Actual Duration}}$$



Source: NASA Schedule Management Handbook, pgs. 304-305

Metric Tool-Kit: Bow-Wave

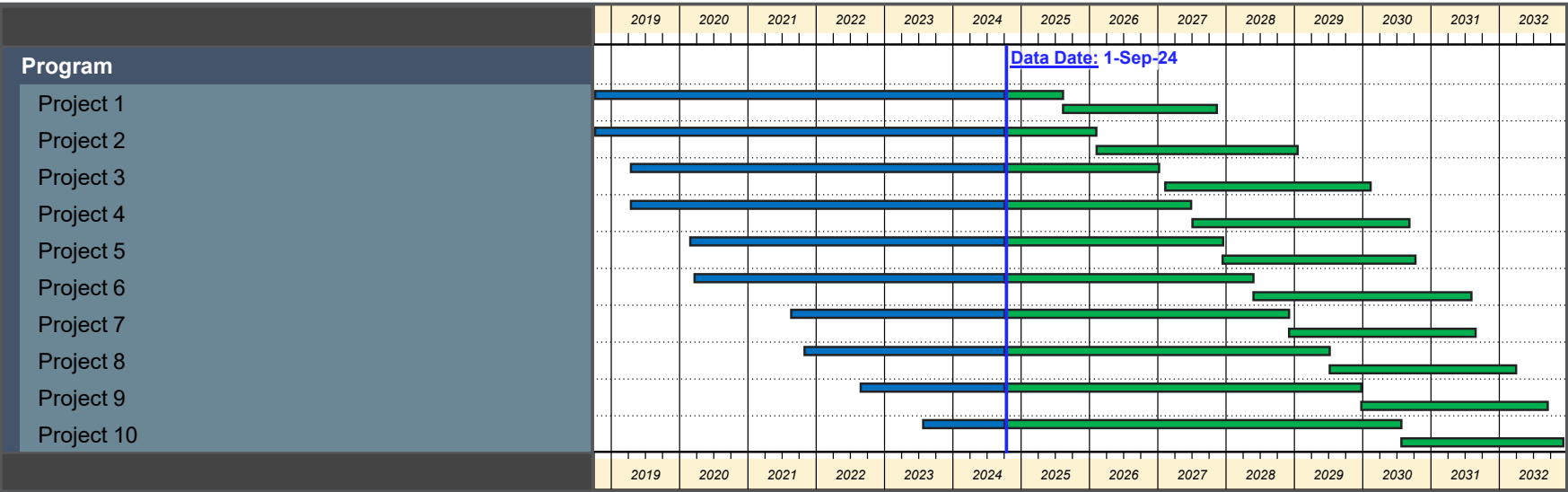
Planned vs Actual



Large Program



Planned Finish in 2029



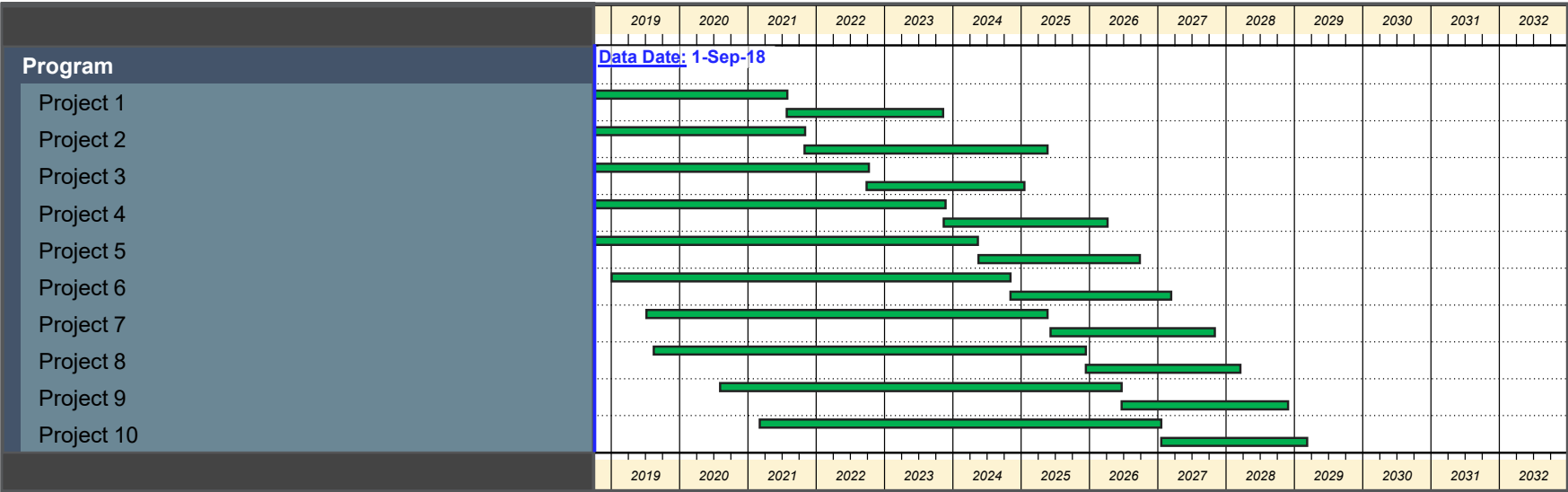
The Program Slipped



Schedule does not tell full story

Metric Tool-Kit: Bow-Wave

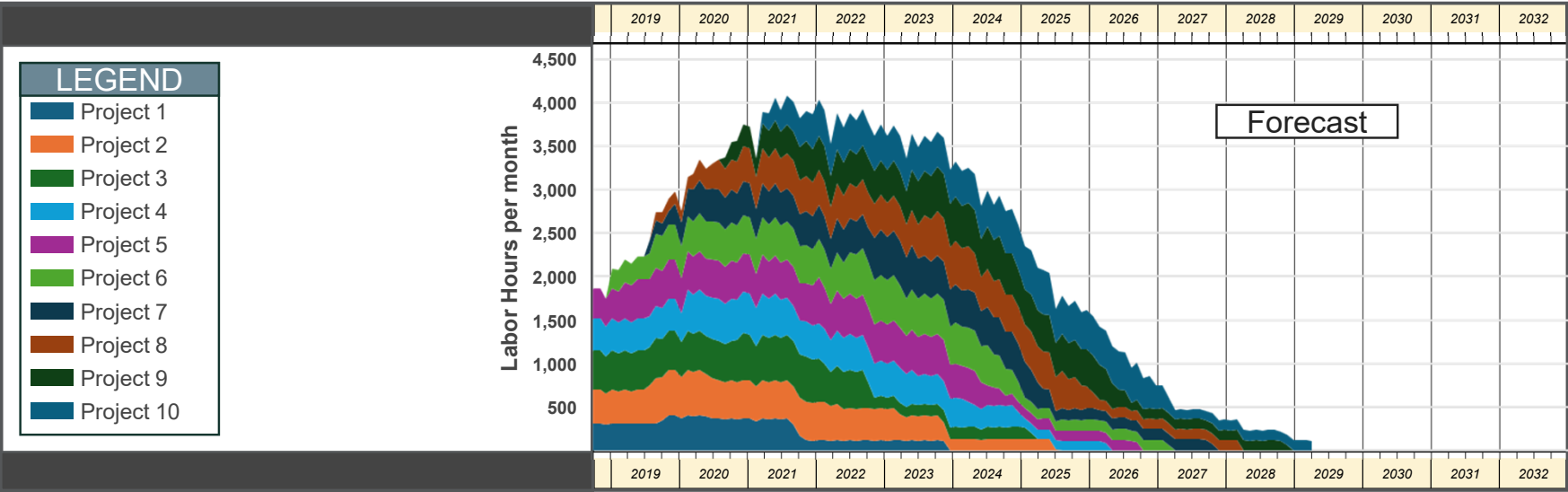
Planned vs Actual



Resource Loaded
Schedule Provides
Planned Bow-Wave



Planned labor ramps
up to a peak in 2021
then tapers down



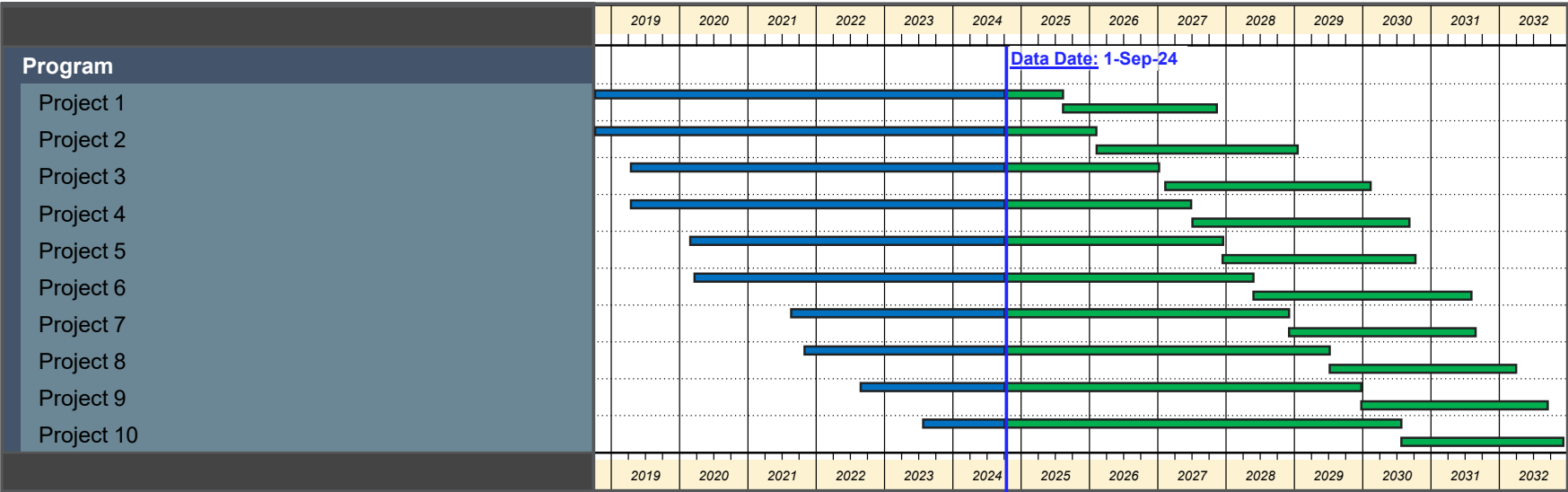
Planned Labor 1,800
LH/mo
Ramping up to 4,100
LH/mo



The peak is the most
labor the program can
staff

Metric Tool-Kit: Bow-Wave

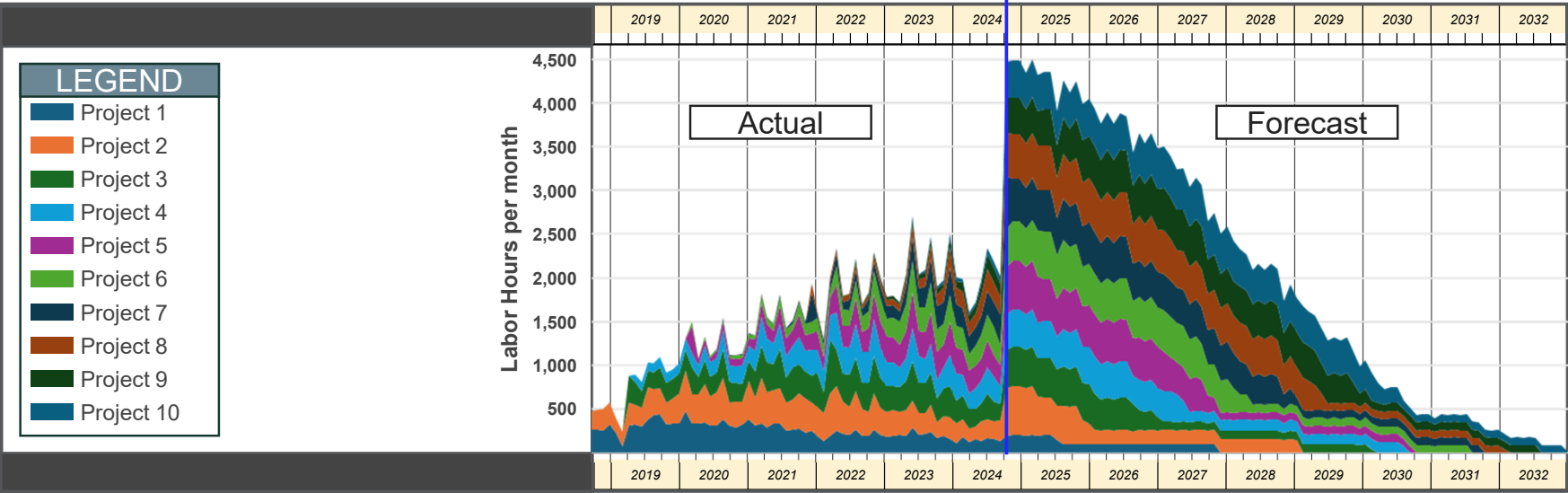
Planned vs Actual



Actuals ran below plan



The bow wave reveals why



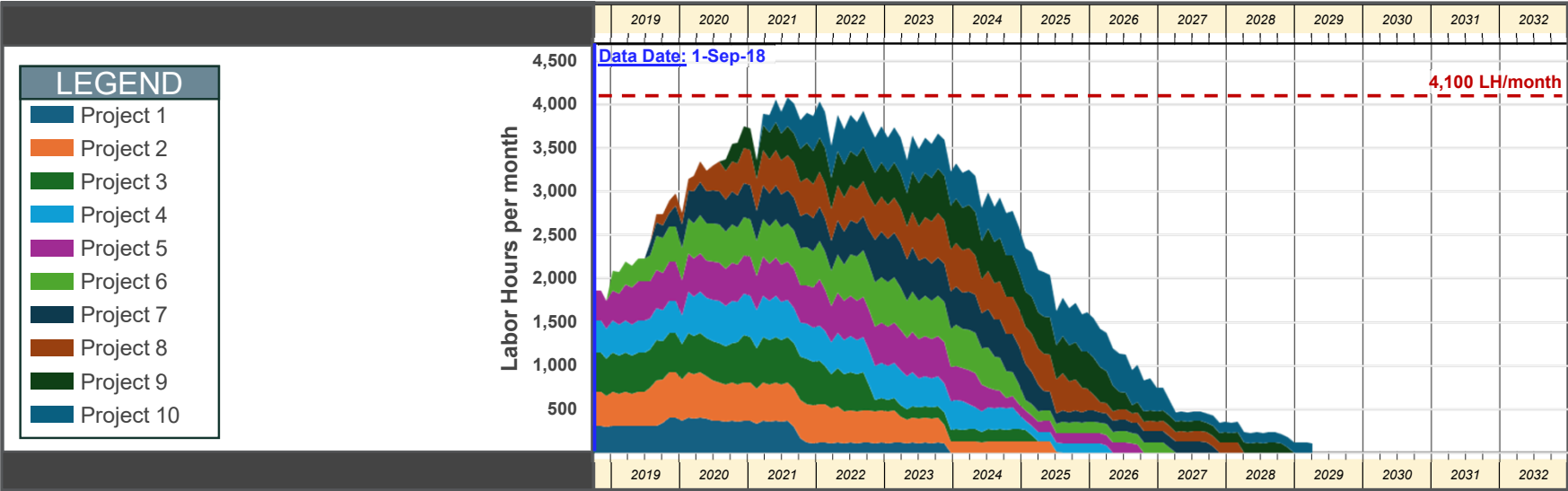
Unbuilt work piled into the future forecasts



Increase labor required to meet forecast

Metric Tool-Kit: Bow-Wave

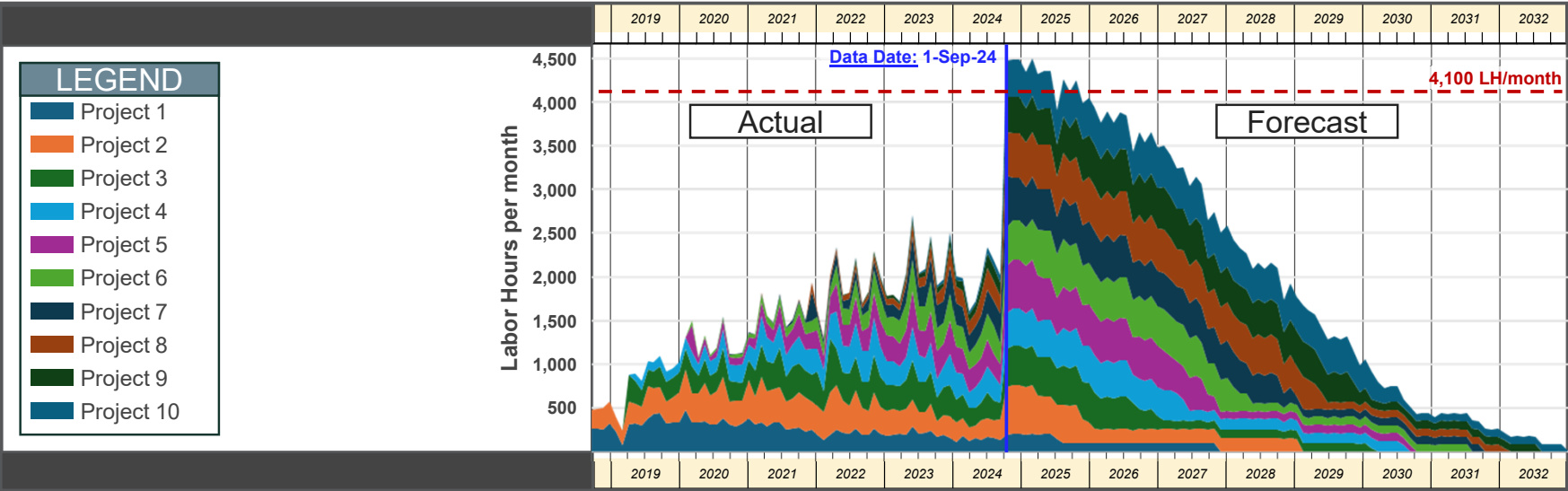
Planned vs Actual



Peak planned labor allocation of 4,100 LH/month



Peak labor was never achieved



Forecast breaks the labor ceiling



3 years late
Forecast Unreasonable

Visualizations for Effective Communication

Bad Practices: What NOT to do



Source data is fine



Too much data is the problem



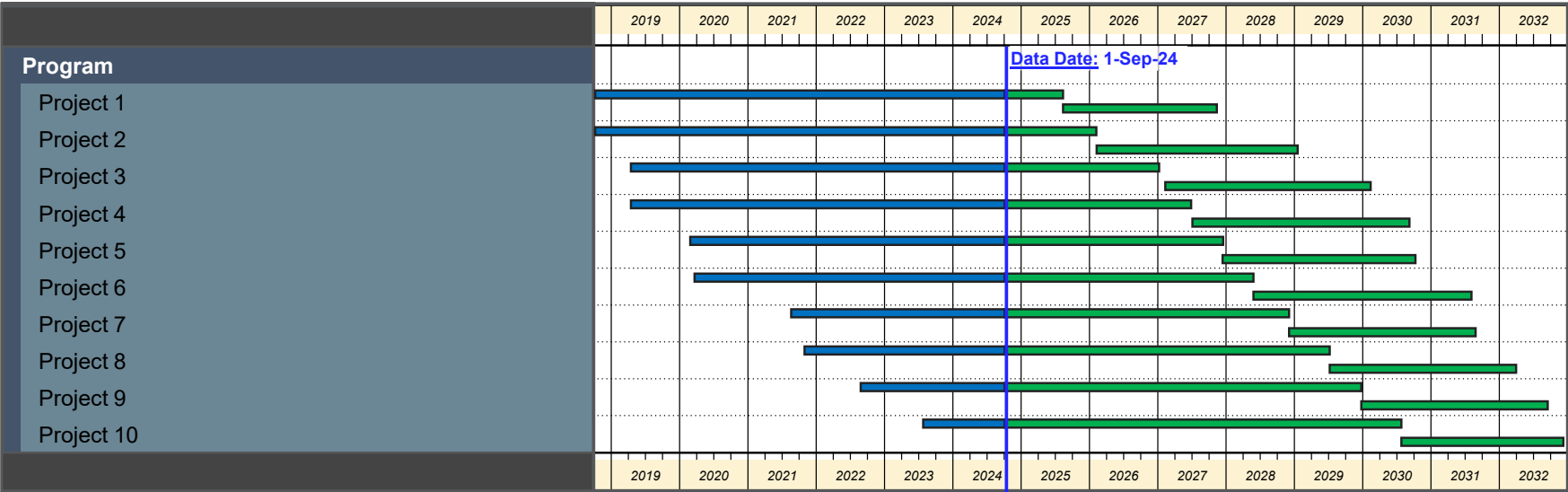
Hard to read



Punchline gets lost
Ineffective communication

Visualizations for Effective Communication

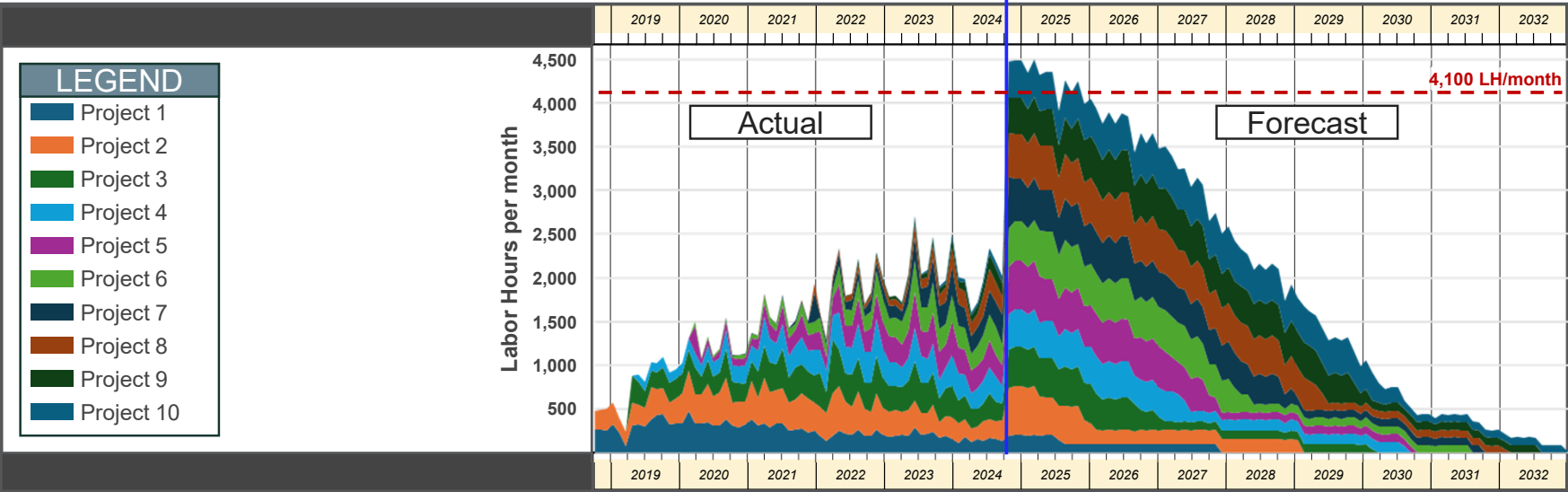
Good Practices



Visual separation of data



Same timescale



Visuals steps through the narrative



Punchline is clear
Effective communication

Forecasting Confidence + Reporting Discipline

Earlier signals become more valuable when leaders can see direction, magnitude, and consequence.

Forecasting Confidence

- Use observed execution behavior to stress-test near-term plans
- Compare planned completion pace against actual task completion trends
- Identify schedule pressure before milestone movement becomes unavoidable
- Surface key assumptions and uncertainty in leadership-ready language

Reporting Discipline

- One-page “quick look” dashboard
- Was/now milestone movement view
- Bow-wave summary
- Plain-language escalation statement
- Decision options and timing

Goal: more proactive, repeatable, and data-driven decision-making.

Audience Takeaways

A scalable framework for early-warning capability and executive decision support.

Improve Early-Warning Capability

Detect deteriorating schedule conditions sooner.

Strengthen Forecasting Confidence

Use repeatable, trend-based interpretation logic.

Integration Gaps

Turn technical metrics into plain-language risk narratives.

Support Better Decisions

Clarify escalation, options, and timing for leadership action.

Reduce Downstream Impacts

Enable earlier corrective actions across complex projects.

Takeaway: the best schedule metrics do not merely describe risk – they accelerate the right management decision.

Thank you

Questions and Discussion

Ryan Witters | ryan.witters@ankura.com
Javier Arniella | javier.arniella@ankura.com
Natasha Dahl | natasha.dahl@ankura.com



ankura.com