



Risk Based BOE Analysis – PMAG Approach

Mr Imran Ahmed

Dr David L Wang

Dr Mun Kw'on

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Agenda

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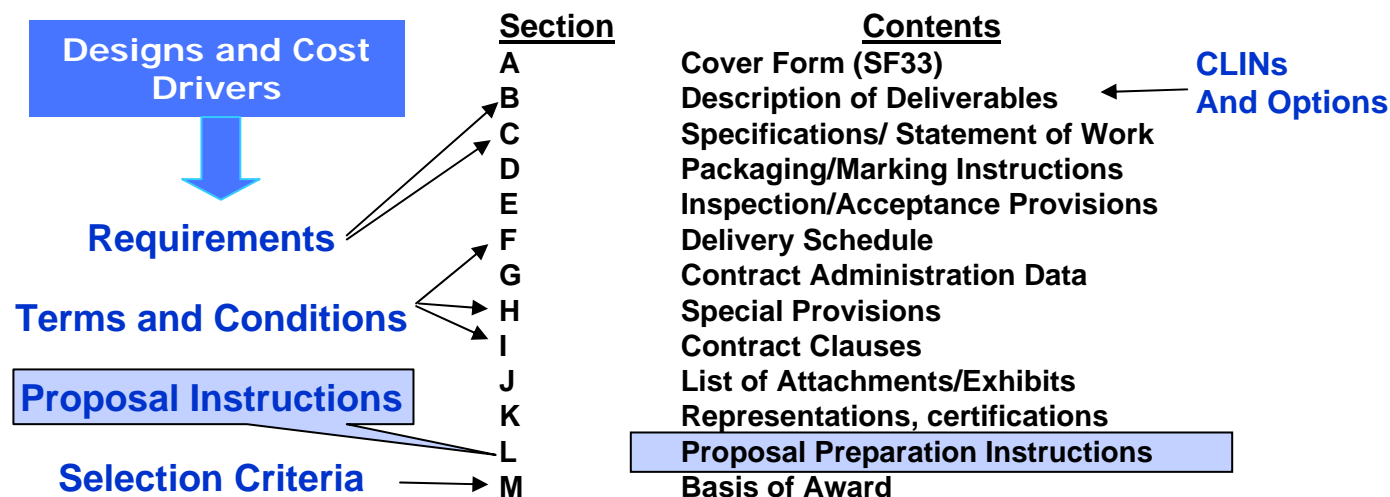
- **Introduction**
- **Common Challenges and Findings**
- **PMAG Approach to BOE Evaluation**
- **BOE Evaluation Examples**
- **Recommendations**



Introduction



Requests for Proposals (RFPs)



- Requests for proposals (RFPs) are used to communicate the Government requirements to prospective contractors and to solicit proposals. RFPs for competitive acquisitions shall, at a minimum, describe the --
 - Customer's requirement
 - Anticipated terms and conditions that will apply to the contract
 - Information required, format and limitations for the proposal (RFP Section L)
 - Factors and significant sub-factors that will be used to evaluate the proposal and their relative importance (RFP Sec. M where applicable)



RFP Cost Volume Evaluation Criteria



- The RFP (Request for Proposal) typically states that demonstration of Cost Realism, Reasonableness, and Completeness will be the evaluation criteria for the Cost Volume
 - **REALISM:** Is the answer accurate? Does it pass the sanity check? What verification methods and analyses have been used to validate the estimate? Are the costs and scope of the estimates compatible?
 - **REASONABLENESS:** Is the estimating methodology sound and acceptable? Is the estimating process clearly explained in the Cost Volume?
 - **COMPLETENESS:** Are all elements accounted for in, and consistent throughout the cost estimate? Have all the Statement of Work (SOW) tasks been addressed in the proposal? Have all RFP requirements been addressed and are easily traceable?



Basis of Estimate (BOE)

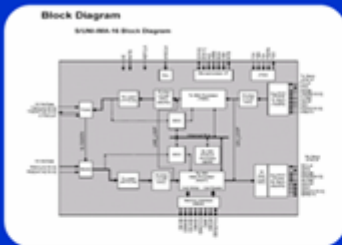


- **BOEs document the thought process and calculations used to arrive at the proposed estimate**
- **BOEs provide the estimate and associated estimating rationale for the labor and other costs required to complete the effort described in the Task Description**
- **BOEs provide a written record of:**
 - Scope or task description
 - Ground rules and assumptions
 - Period of performance
 - Cost estimate technique and justification
 - Labor skill mix
 - Explanation describing the thought process used to prepare the cost estimate

The BOE should be documented and organized such that anyone can understand and re-create the estimate with the information given



The Basis of a Good BOE



Technical Content

- Provide brief technical and programmatic summary of Task Description
- Identify WBS, Control Account, Period of Performance, and scope of current estimate



Program Schedule

- List the key Program Events (PE's), Significant Accomplishments (SA's), and Accomplishment Criteria (AC's)
- Provide logical linkage between technical content and program schedule



Cost

- Describes methods and sources for material and labor pricing
- Identify pricing sources for all major equipment, vendor quotes, and historical data
- Identify pricing sources for all labor hours and productivity adjustments
- Provide logical linkage between labor profile, labor categories, and program schedule



Common Challenges and Findings



Common Challenges and Findings



- Overall, quantitative data was difficult to extract and work with from individual BOEs
 - Relevant quantitative data is embedded in the text of BOEs and requires data “hunting”
 - Data did not lend itself to easy manipulation (e.g., not in Excel file)
 - Inconsistent references to the same data
- BOE-relevant schedule materials were not consistently available
- Detail of data provided was insufficient
 - Recurring labor activities did not explicitly incorporate historical labor hours into estimates
 - References to actual labor hours did not logically match the activities described in Task Description
 - Authors’ true bases were not revealed (e.g., arbitrary and illogical ties to actual labor hours)
 - Underlying data to support rationale for NRE and newly-proposed recurring activities were not consistently available
- Proposed labor hours were based on individuals' engineering estimates that do not sufficiently consider estimation standards, e.g.:
 - Hours per drawing update
 - Standard times for tests



PMAG Approach to BOE Evaluation



PMAG Top Down BOE Analysis



- Apply integrated technical, cost, and schedule focus to BOE evaluation
- Evaluate labor hours and labor profile at different level of WBS to assess logical consistencies and reasonableness
- Isolate key drivers of labor hours and perform “deep dive” analysis
- Develop questions for contractor to clarify and improve Program Office’s understanding of contractor’s BOE
- Create and document labor estimation issues as BOE risks



PMAG Bottom Up Integrated BOE Analysis



- Detailed review of WBS, IMS, and Control Account scope definition, and rationale for hour estimates
 - Logical consistencies, assumptions and reasonableness
 - Accounting and mathematical consistencies
 - Staffing profile and metrics
 - Labor mix
- Review duration estimate for IMS tasks including critical path and near critical path activities (e.g. AI&T)
- Review Staffing and resource assumptions for reasonableness
- Formulate integrated program risks based on BOE evaluation
 - Technical, Cost, Schedule, Management Process, Resources
- Develop questions for contractor to clarify and improve Program Office's understanding of contractor's BOE
- Create and document labor estimation issues as BOE risks



Top Down BOE Evaluation Example



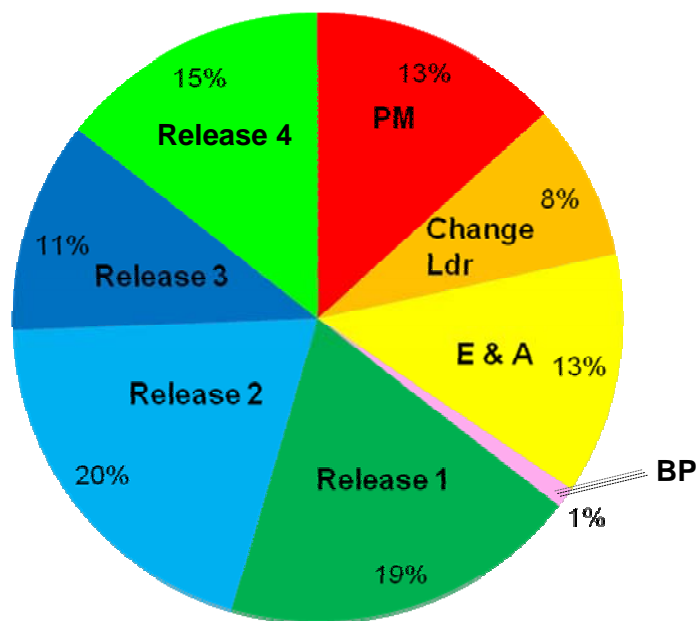
PMAG BOE Evaluation Methodology



- Analysis of Labor Hours Distribution
 - By WBS
 - Over Time
 - By Releases 1, 2, 3 and 4
 - Non-Technical vs Technical
 - Non-Technical Hours as Percent of Total Labor Hours
 - PM Hours as Percent of Total Labor Hours
 - Change Leadership Hours as Percent of Total Labor Hours
 - Relationships of Labor Hours at lower levels of WBS

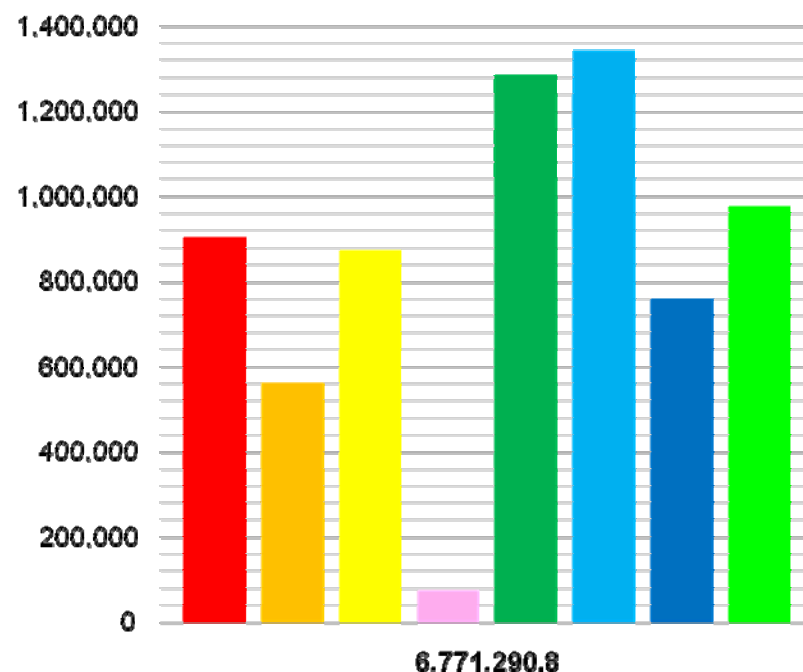


Program Level Summary



- 2.01 (PM)
- 2.02 (Change Ldr)
- 2.03 (E&A)
- 2.04 (Blueprinting)
- 2.05 (Release 1)
- 2.06 (Release 2)
- 2.07 (Release 3)
- 2.08 (Release 4)

Hour Breakdown by WBS Element



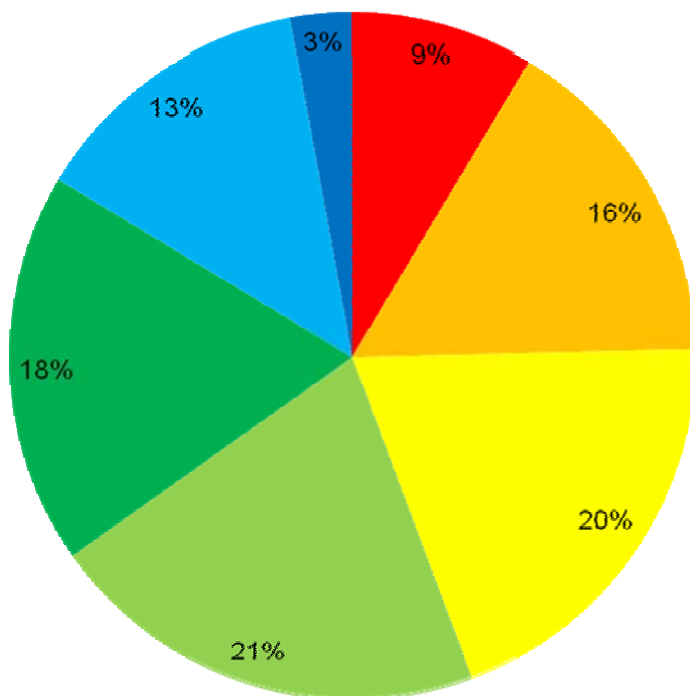
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Labor Hours Distribution by CY

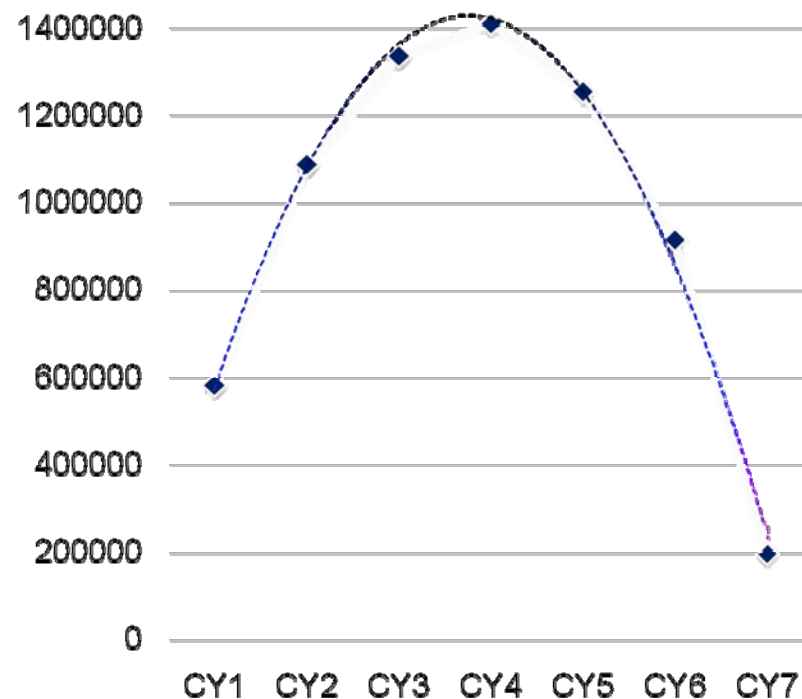
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Total Sum of Hours by CY



■ CY1 ■ CY2 ■ CY3 ■ CY4 ■ CY5 ■ CY6 ■ CY7

Total Sum of Hours by CY



◆ Total Sum of Hours by CY = 6,771,291

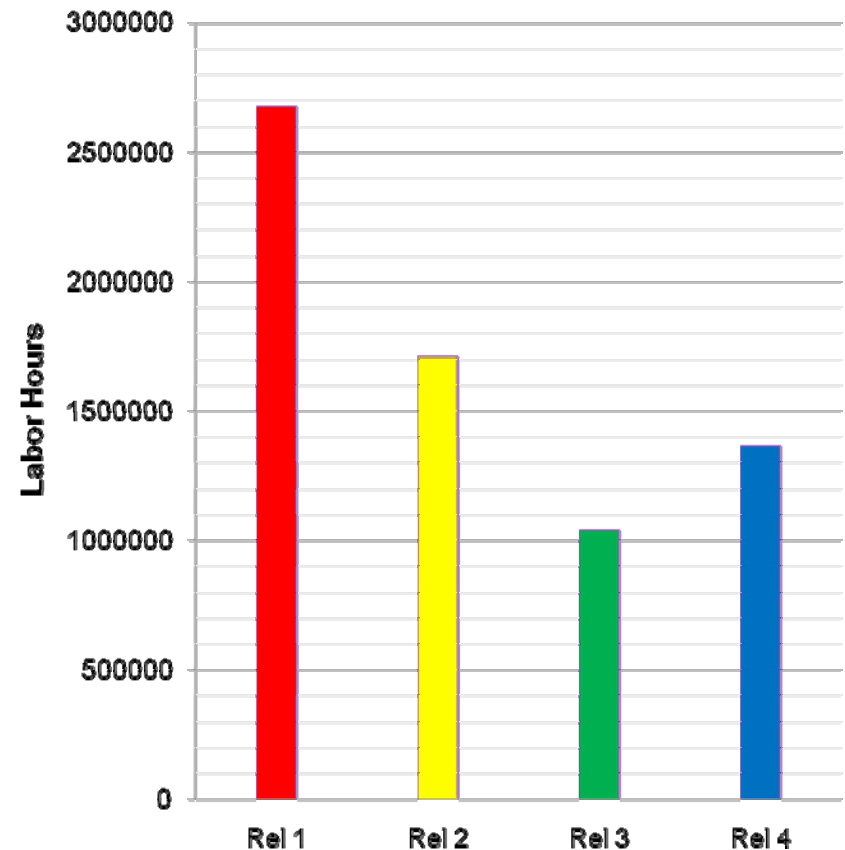
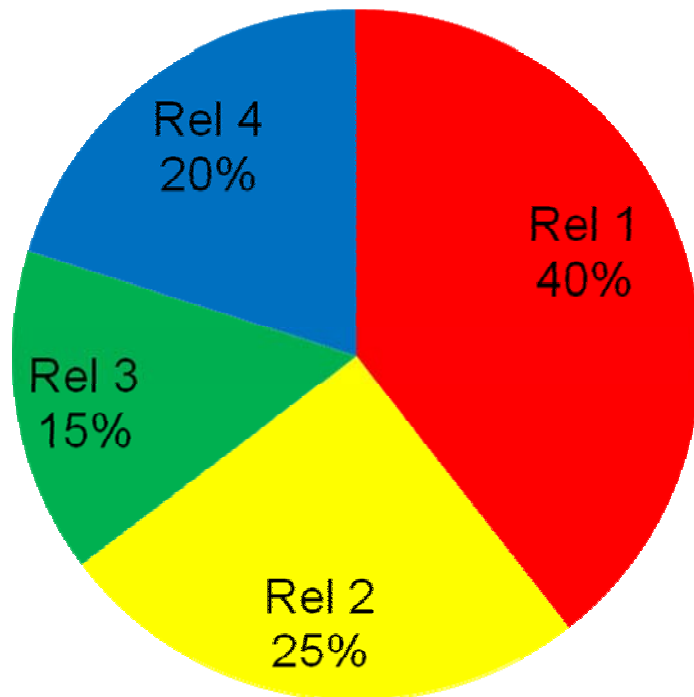
----- Poly. (Total Sum of Hours by CY = 6,771,291)

***Near Perfect Fit to Parabolic Curve Suggests
Top Down Cost Estimating Approach***



Labor Hours Distribution by Release

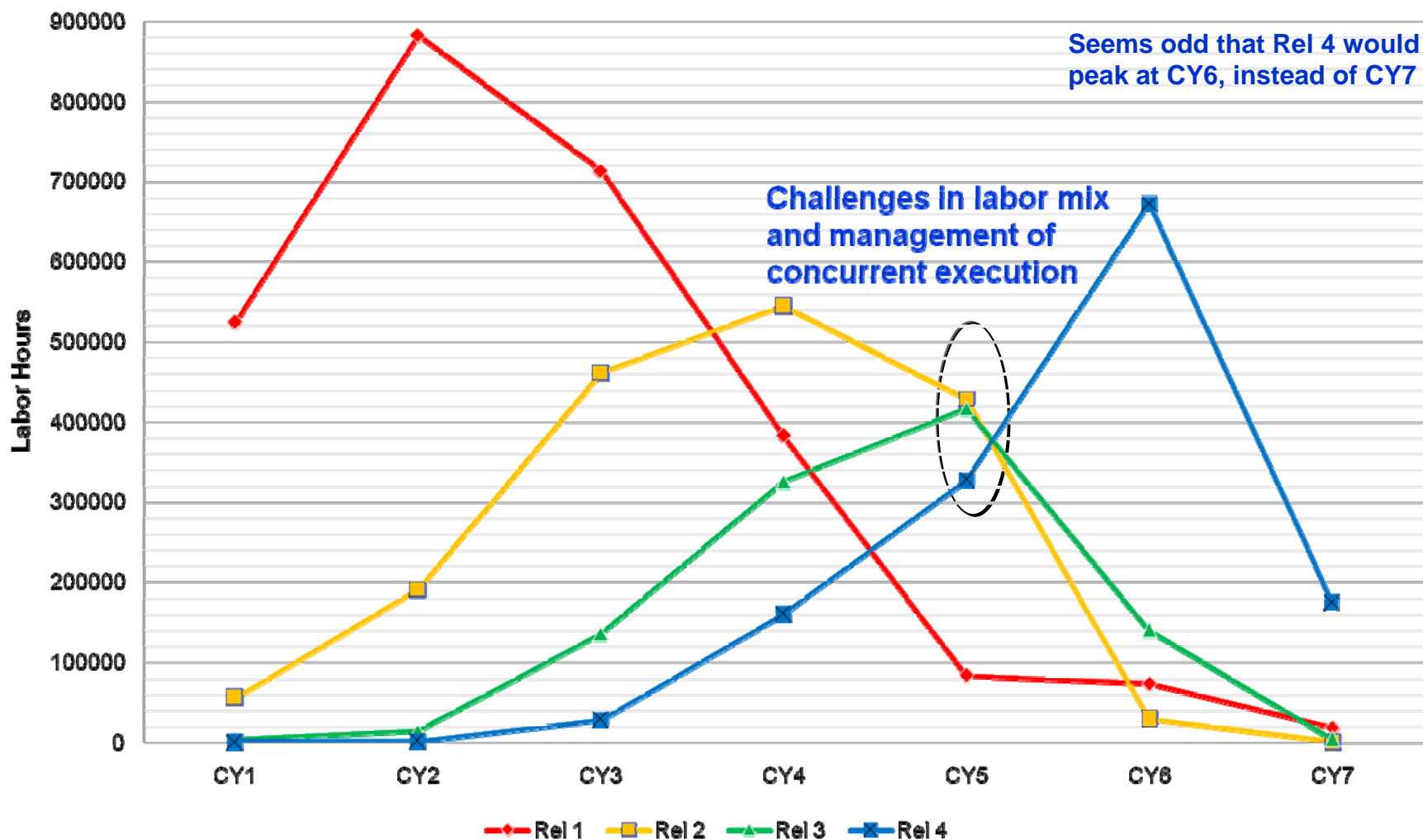
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***Perfect Increments at Multiples of 5% Suggest
Top Down Cost Estimating Approach***



Total Labor Hours Profile by Release





Non-Technical Hours Analysis



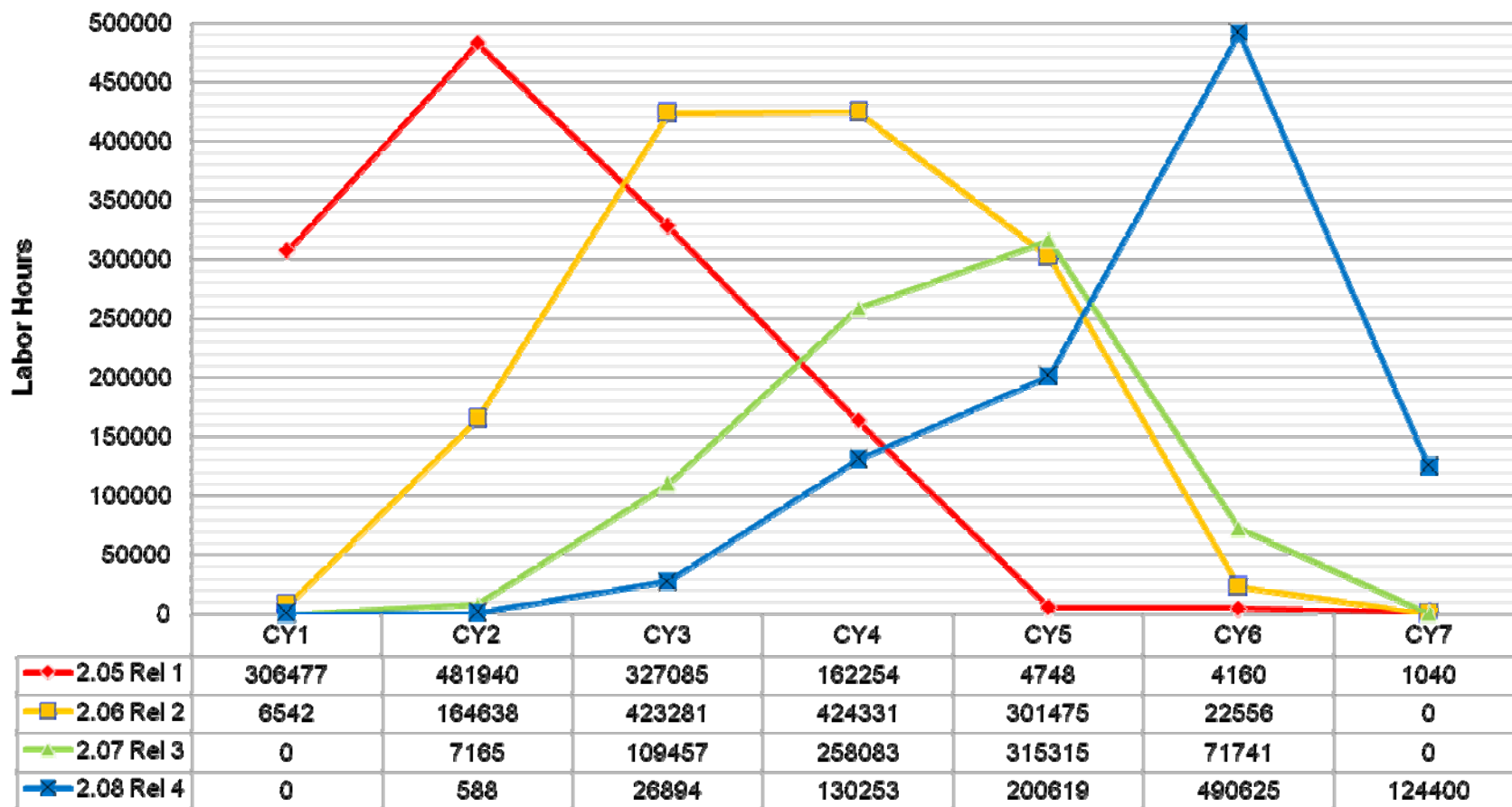
- Non-Technical Hours as a Percent of Total Labor Hours by Release
- Decompose Non-Technical Hours into its 2 components – PM and Change Leadership
- Compare phasing of Non-Technical Hours vs Technical Hours



Engineering/Technical Hours by Release

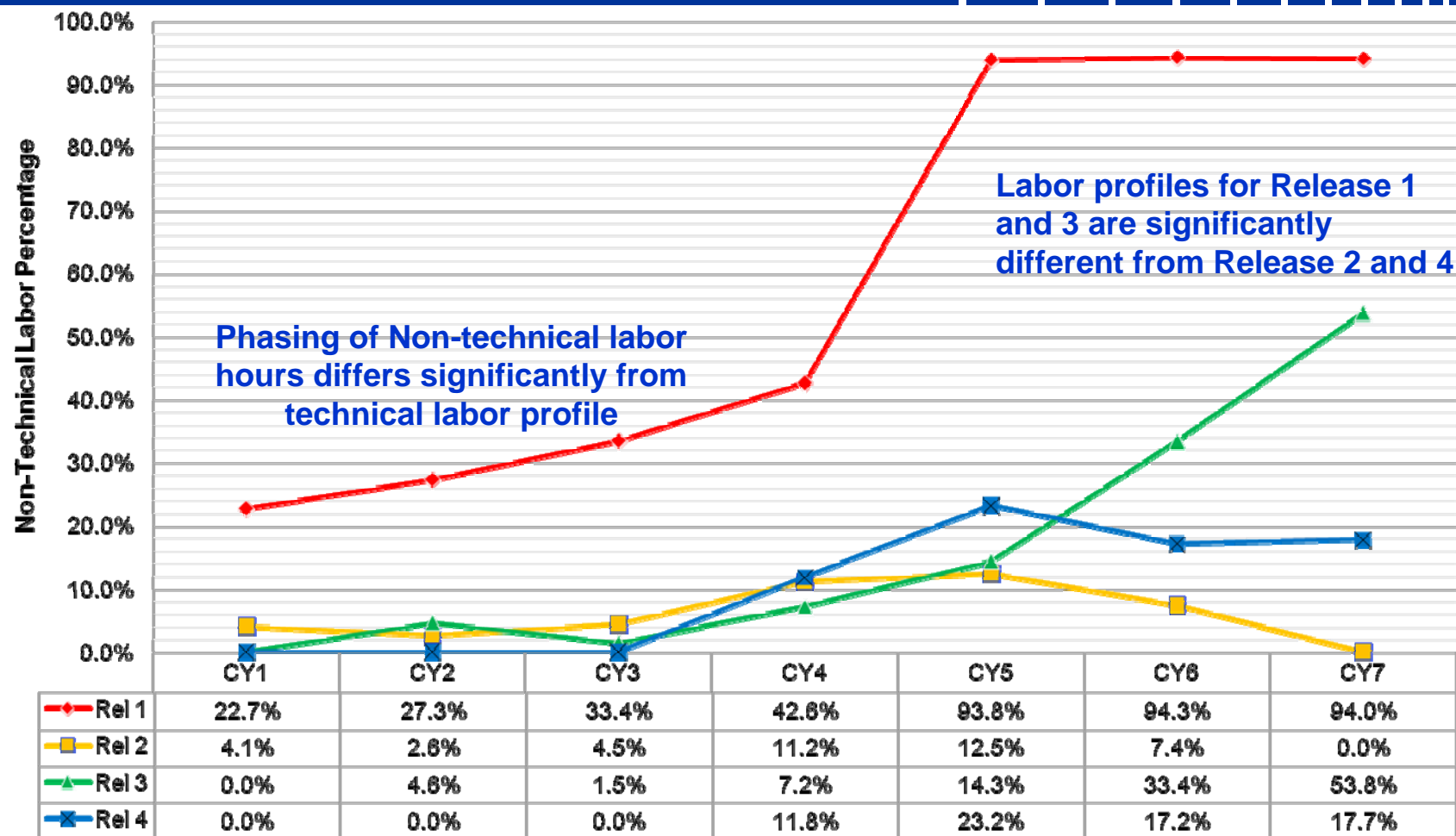


Engineering / Technical (w/o Change Ldr, E&A, Blueprinting)





Non-Technical Labor Hours Percentage



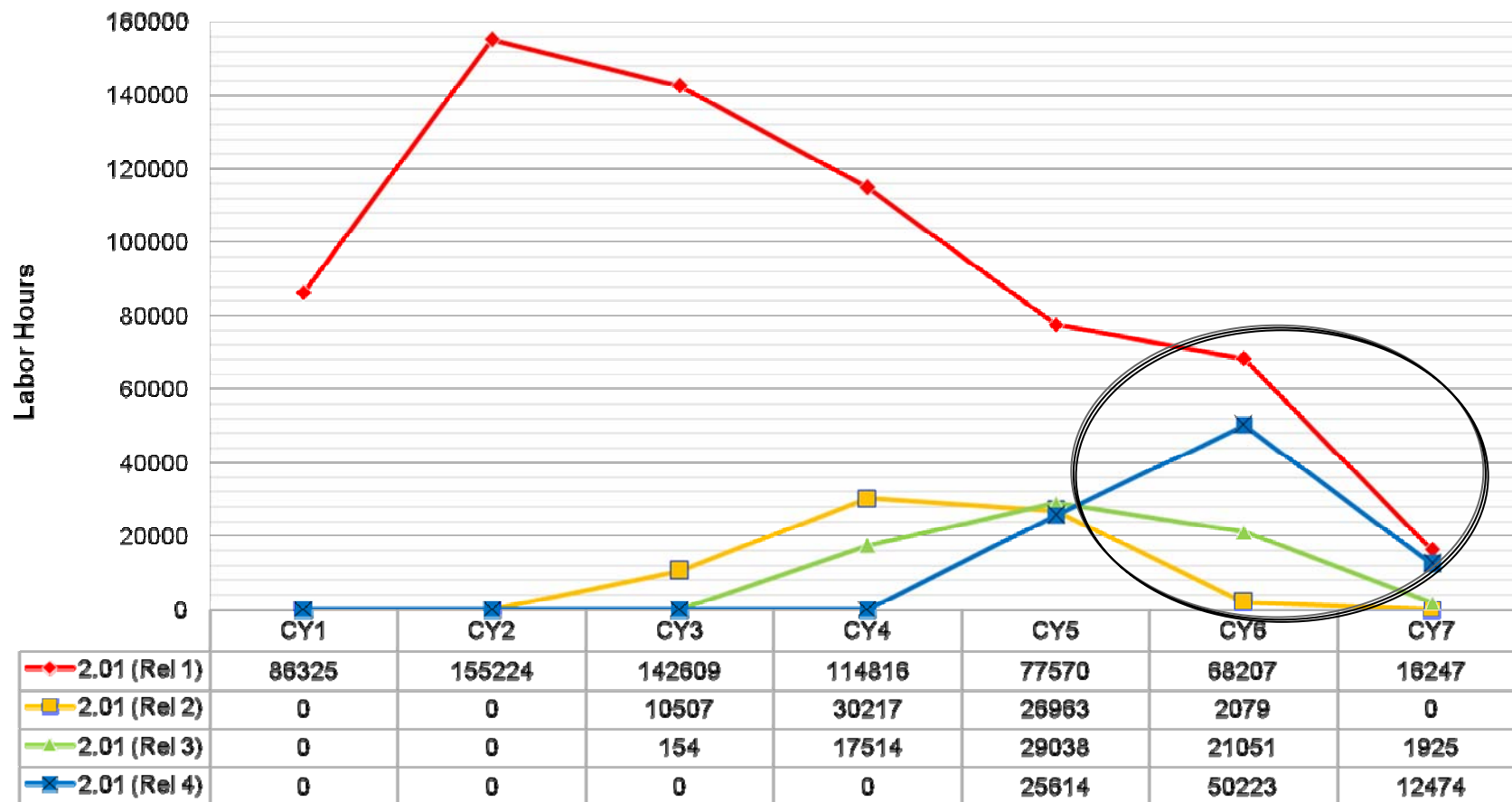
94%+ Non-Technical Labor Hours for Release 1 when there are virtually no technical activities in CY5-CY7



2.01 PM Labor Hours by Release



2.01 PM labor hours by Release



Disconnects in PM Hours for Release 1, 2, 3, 4 in CY5-CY7



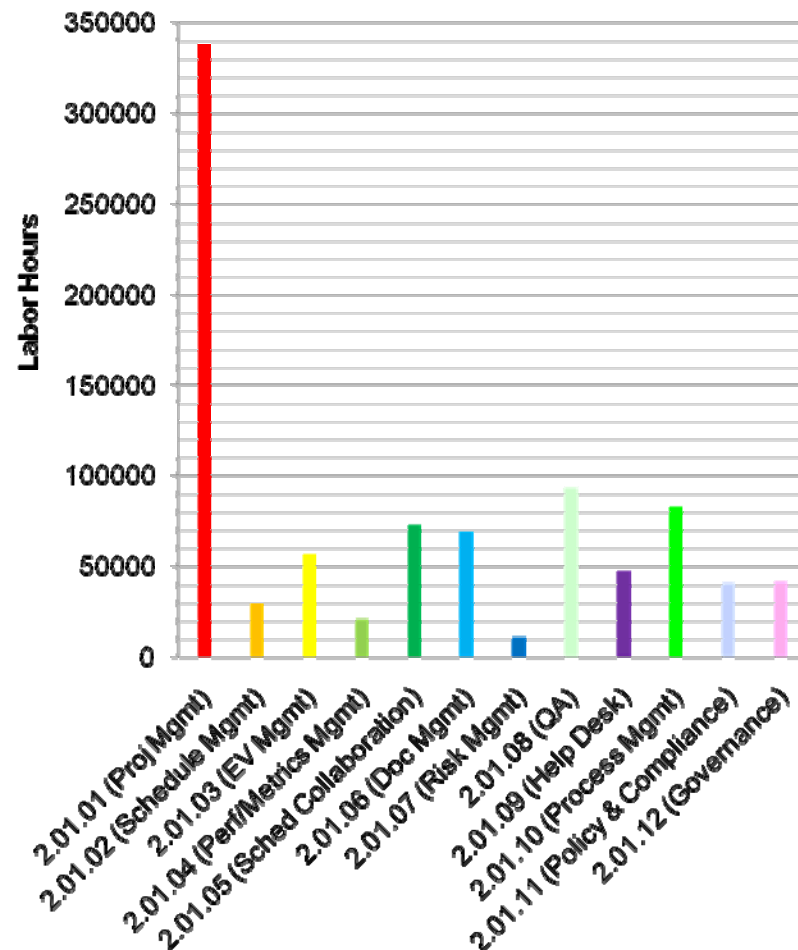
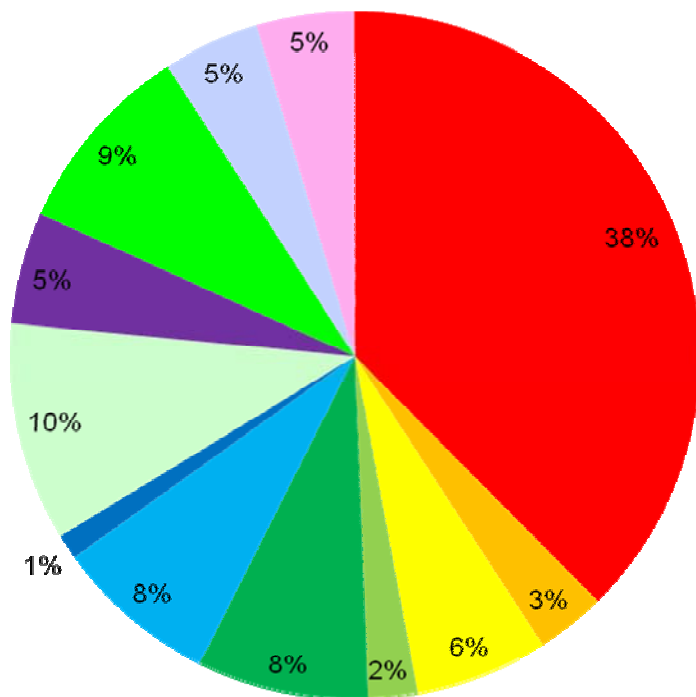
More Detailed Analysis of PM Hours

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- **Analyze distribution of PM hours by 3rd level WBS**



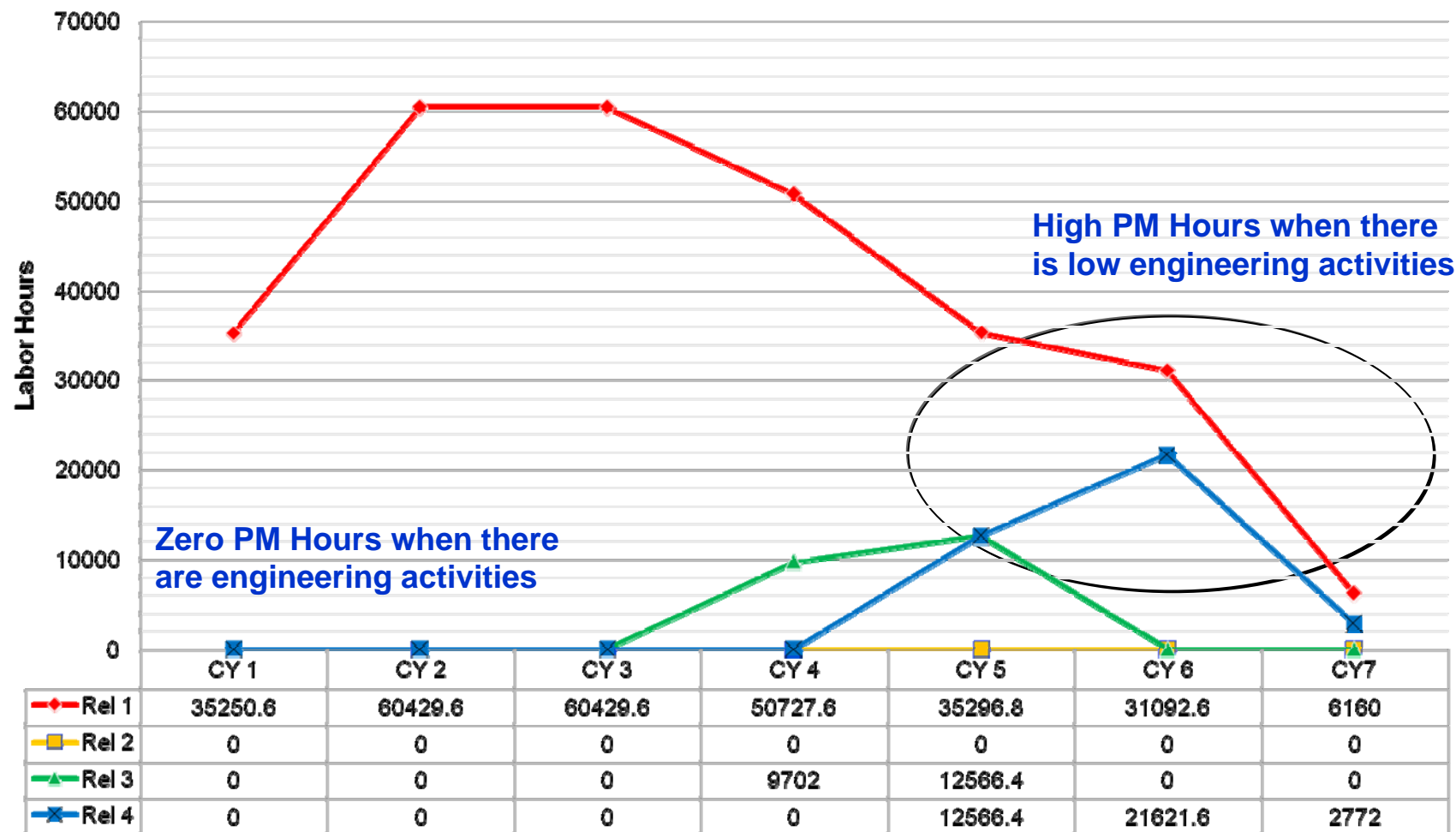
WBS 2.01 PM by Sub-Element



**Risk Management Labor Hours Appear to be Too Low
PM Hours Appear to be Too High**



WBS 2.01.01 Project Management

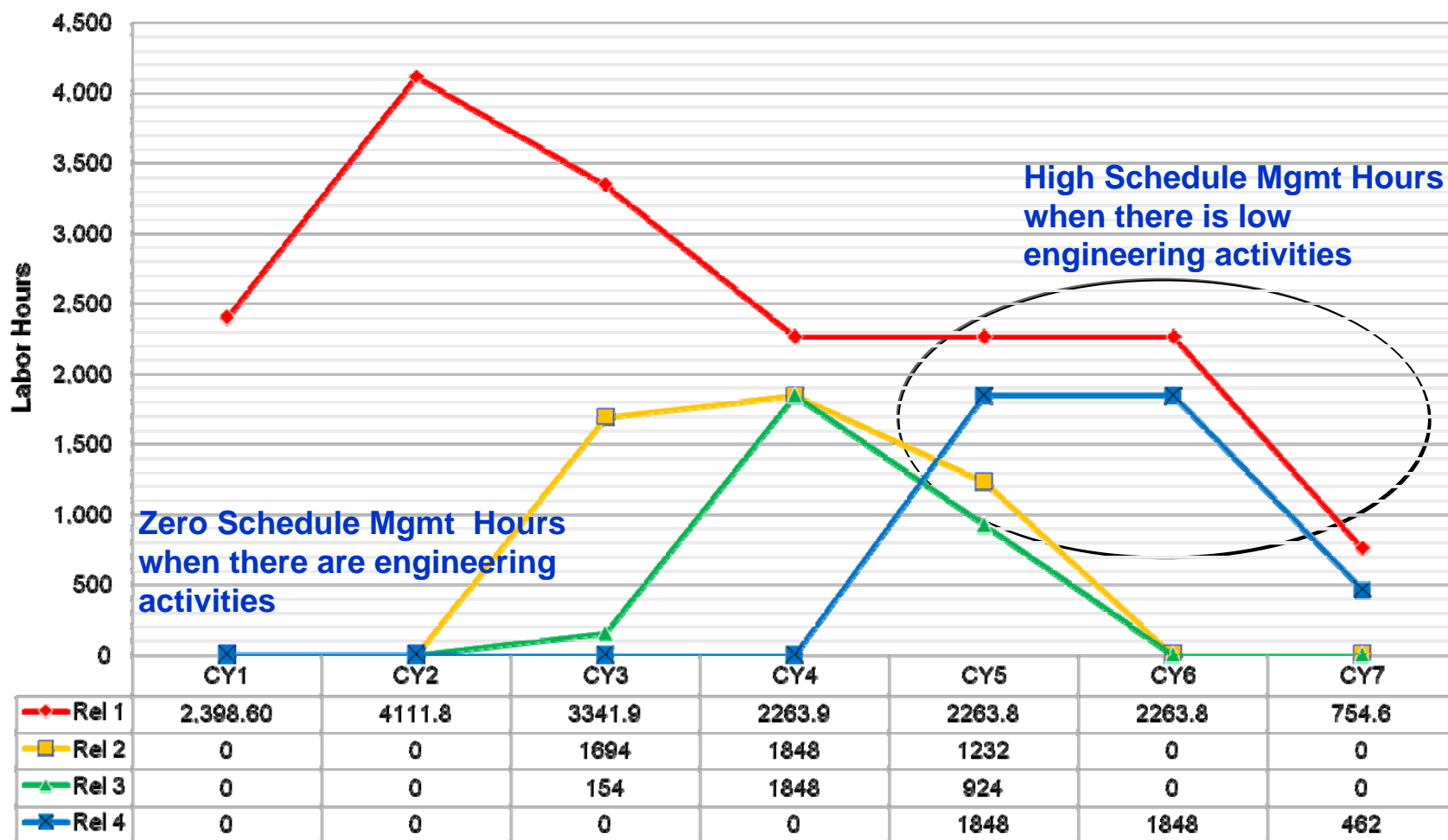


PM Labor Hours appear to be disconnected with engineering activities



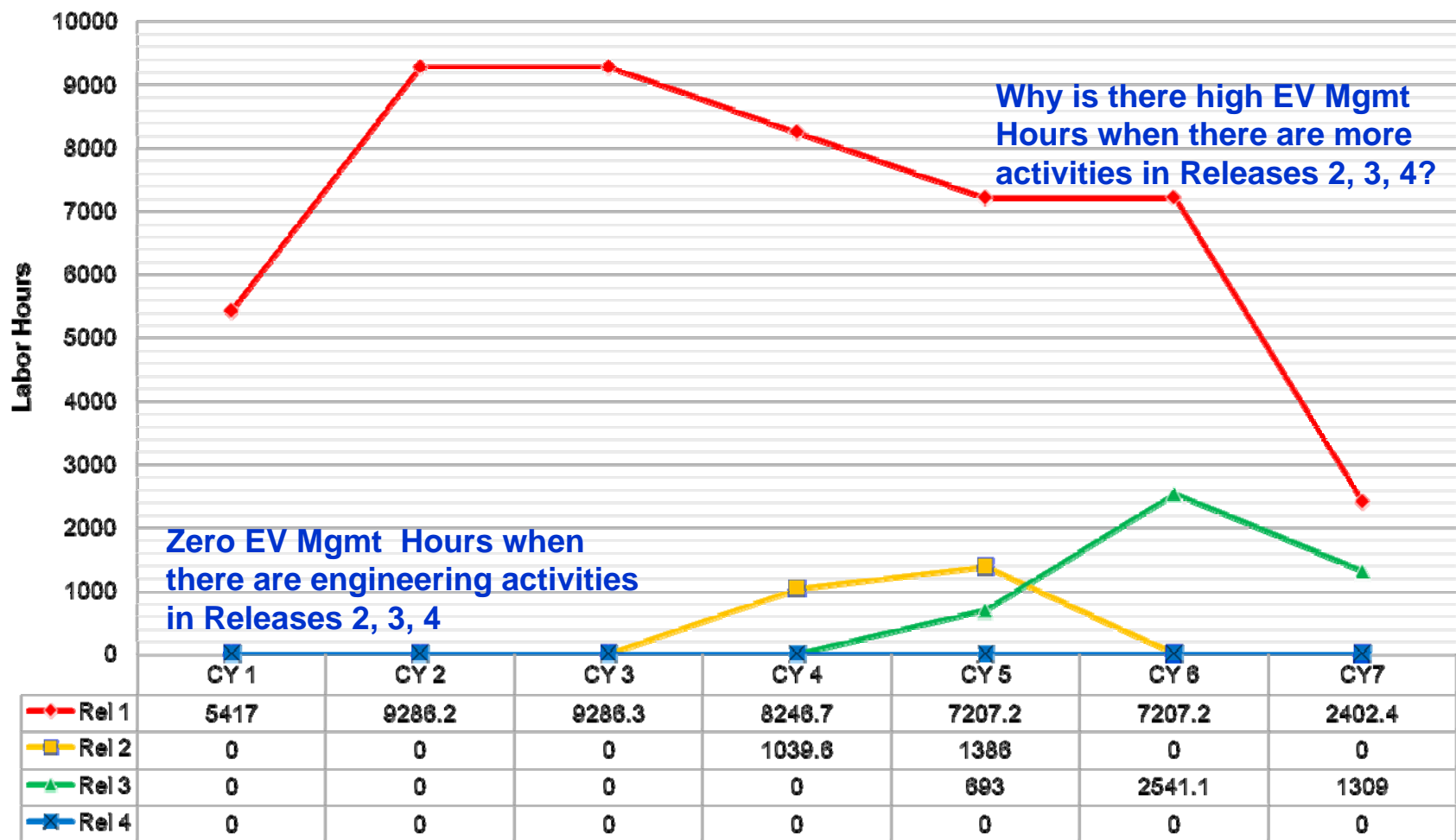
WBS 2.01.02

Schedule Management





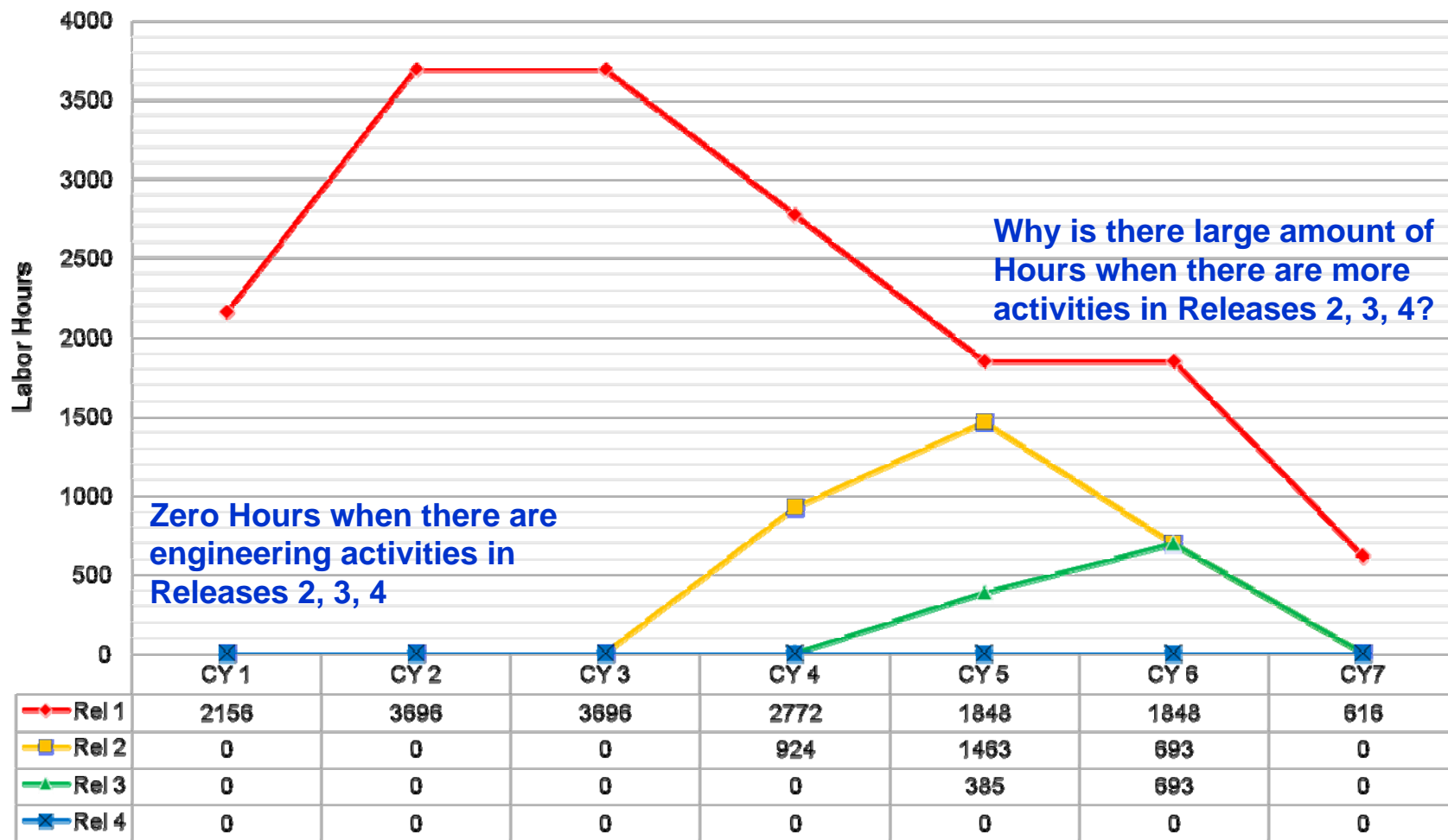
WBS 2.01.03 EV Management



Labor Hours Appear to be Allocated to Rel. 1 Disproportionately



WBS 2.01.04 Performance/Metrics Mgmt



Labor Hours Appear to be Allocated to Rel. 1 Disproportionately



Bottom Up BOE Evaluation Example



PMAG Bottom Up BOE Evaluation Methodology



- **Focus on details in every BOE**

- Review Description of Technical Scope for specificity
- Evaluate BOE Rationale according to the following criteria:
 - **Realism:** Is the answer accurate? Does it pass the sanity check? What verification methods and analyses have been used to validate the estimate? Are the costs and scope of the estimates compatible?
 - **Reasonableness:** Is the estimating methodology sound and acceptable? Is the estimating process clearly explained in the Cost Volume?
 - **Completeness:** Are all elements accounted for in, and consistent throughout the cost estimate? Have all the Statement of Work (SOW) tasks been addressed in the proposal? Have all RFP requirements been addressed and are easily traceable?



Findings Across Multiple Programs



- **“Cut-and-paste” identical description of work scope for multiple WBS BOE**
 - Different BOE estimates for identical scope of work
- **Inconsistent BOE cost estimation methodologies and assumptions**
 - Inadequate estimate for front end system engineering and system performance analysis
 - Optimistic software reuse percentages
 - Optimistic estimates for SLOC that are inconsistent with historical performance
 - Inadequate estimate for peer reviews and design documentation
 - Inadequate estimate for unit test, integration, and system test
 - Inadequate estimate for ICD development and cross-IPT integration and test
- **Inadequate BOE rationale with insufficient specific details**



Findings Across Multiple Programs



- **Logical disconnects**
 - Some follow-on production activities cost more than previous systems
 - Significantly longer test set-up duration in follow-on production
- **Inconsistent application of historical data**
 - Applying peak loads from previous contracts to new BOE
- **Unreasonable staffing profiles**
 - High management to engineering ratio
 - Inappropriate staffing experience or expertise
 - Senior management and HR included in direct costs
 - No ramp-up and no-ramp-down
 - Unexplained staffing profile dips/humps



Benefits of PMAG Approach



- **Enhance government negotiation position with contractors by**
 - Identify key disconnects in contractors' BOE
 - Highlight key opportunities for government to implement resource leveling
 - Areas of "overbid"
 - Areas of "underbid"
 - Identify risks in contractors' BOE assumptions
 - Identify deficiencies in contractors' BOE rationale
- **Enhance robustness of government's source selection by using systematic risk-based BOE analysis**
- **Enhance quality and accountability of BOE submitted by contractors by setting appropriate expectations**
- **Enhance scope traceability and connectivity from BOE to Technical content Baseline to IMS to Control Account Plans**
 - Strengthen program baseline executability and performance assessment and root cause analysis
- **Enhance government's organic BOE analysis and assessment capabilities**



PMAG Recommendations



PMAG Recommendations



- **Contractor to provide detailed and comprehensive BOE for each Control Account according to standardized format to be specified by Government**
 - Government to specify BOE formats to facilitate Government analysis of Contractor BOE data
 - Technical scope for each BOE must be specific and complete
 - CDRL deliverables associated with BOE must be clearly identified
 - BOE hours estimation methodologies must be clearly specified to allow the reviewers to reconstruct the labor estimates
 - Rationale for historical period of comparison must be compatible with the BOE technical scope specification
 - Government to document all identified BOE risks
 - Contractor to resolve BOE risks identified by Government
- **Enhance Section L in RFP to reflect this requirement**
- **Enhance evaluation factors in Section M of RFP for risk based source selection evaluation**
 - Completeness and reasonableness of BOE provided at the control account level by contractors