Project Risk

Unscrambling Risk Ownership, Management Reserve, and Contingency

OECM Cost Estimating Symposium

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New Orleans, LA

Unscrambling Risk Ownership

- Project cost overruns have kept DOE on GAO's High Risk List for years
- Pre-symposium survey identified these systemic issues:
  - poor risk assessment and analysis
  - inadequate Contingency and Management Reserve
  - unknown unknowns
- Who owns Contingency and Management Reserve?
  - **Contractor is responsible** for risks within its ability to estimate or control, e.g., variance in the cost of steel or labor, meeting NQA-1 requirements, site safety
  - **DOE is responsible** for risks outside contractor's control, e.g., scope/schedule changes, funding, economic conditions, legal and regulatory changes
  - Line between contractor and DOE control should be drawn in the contract. Acquisition Strategy and contract terms need to address risks and clarify responsibilities and expectations.

# Risk Elements in Cost Estimating

- **Key cost estimate objectives**:
  - **CD-1 Range Estimate** – high probability TPC will be within broad range. Requirement to redo CD-1 if top end of original CD-1 cost range grows more than 50% as proceed toward CD-2.
  - Projects will be delivered within original CD-2 Performance Baseline (cost and schedule) and be fully capable of meeting mission and key performance parameters. Baselines to be established with 70-90% confidence in cost and schedule.
- **Perform Uncertainty Analysis to Measure Risk**
  - **Uncertainty**: quantifiable variance of a <u>cost method or input</u>
  - **Risk Register**: list of events that, if they occur, result in a cost <u>consequence or opportunity</u>
  - **Risk**: the chance of loss or injury. In the context of cost analysis, risk is the probability a selected budget will be exceeded
- Usually, the contractor faces more uncertainty and DOE faces more risk; but the contract can be used to change the distribution (use of fixed prices, incentives, etc.)

Risk Estimating Process

- Clearly define "what" is being estimated (WBS)
  - Define assumptions, cost methods and the input variables that drive the cost methods
  - Validate input data, assess uncertainty, add a risk register
  - Do not add risk register items that are already addressed in the uncertainty model
- The cost uncertainty model grows as the project definition is refined
  - Uncertainty models grossly underestimate the project variance if correlation is not properly addressed, a problem that gets worse as the model gets bigger
  - Any good uncertainty model can be used to identify cost and uncertainty drivers: candidates for risk mitigation plans
- Develop standard, effective cost risk reports and metrics that provide management actionable info

Effective Cost Risk Reports

1. **Pareto Chart**: identifies WBS elements that contribute most to the target row _total_

2. **Tornado/Spider Chart**: identifies the uncertain variables that most influence the target row _total_

3. **Variance Analysis (Rollup)**: identifies _WBS elements_ that contribute most to the target row _uncertainty_

4. **Variance Analysis (Driver**- not shown but similar in appearance to RollUp): identifies the defined distributions that contribute most to the target row _uncertainty_

5. **Cost/Schedule Joint Uncertainty**: Find the joint probability to meet both cost and schedule targets
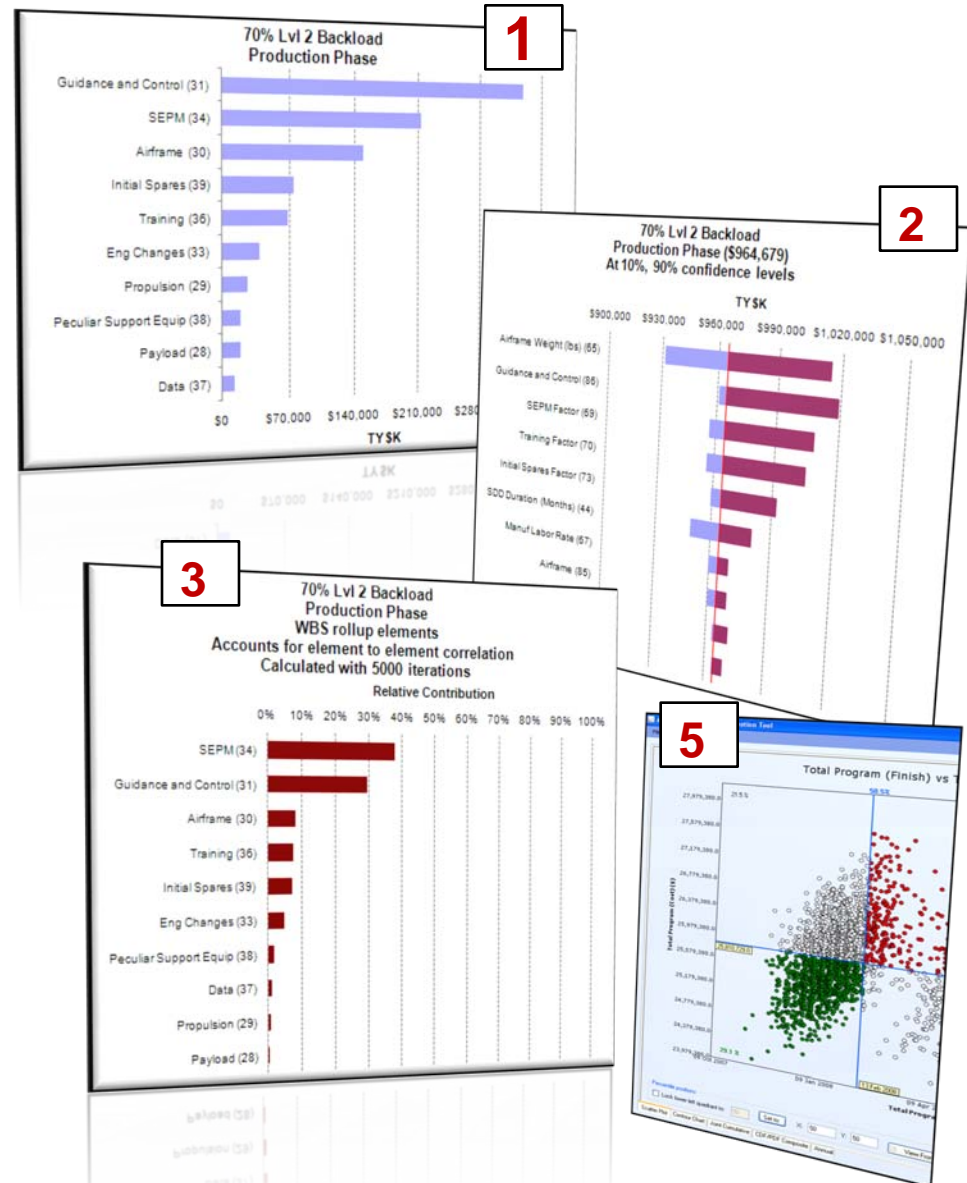
New DOE Resources Available

- As mentioned in yesterday's talks, the quality of your estimate <u>will be measured against</u> the GAO Cost Estimating and Assessment Guide Checklists

- To help, DOE created new tools based on the GAO Guide
  - DOE O 413.3B established new, clear, robust project management requirements
  - New Cost Estimating Guide - DOE G 413.3-21
  - New Risk Management Guide - DOE G 413.3-7A
 - PMCDP Training Courses

Thoughts for Discussion

- What happens to "bounding assumptions" excluded from project analysis/contingency?

  – Involves portfolio management issues and available funding/contingency at either Program or DOE level.

- A key DOE risk for all projects is contractor performance (either better or worse than planned).

  – Evaluation should consider type of contract, incentives in place, contractor history, etc.

- Experience shows not all risks identified – what about "unknown unknowns"?

Backup

Key Elements of a
# Meaningful Cost Risk Analysis Process

- Clear definitions and goals:
  - Define what a Point Estimate is, its role and its content
  - Clarify the difference between uncertainty and risk
  - Agree on a standard process and reporting
  - Develop metrics to measure quality and completeness
- Point Estimate
  - Describe the effort (detailed work breakdown structure)
  - Populate the WBS with the best method to estimate each elem...
  - Overall, total result is NEVER the most likely cost
  - The point estimate is the anchor for the uncertainty analysis
- Uncertainty vs Risk
  - **Uncertainty**: the indefiniteness (range) of a specific element in the estimate
  - **Risk**: a chance of loss or injury. In the context of cost analysis, risk is the probability a selected budget will be exceeded.
  - Perform **Uncertainty** analysis in order to measure **Risk**
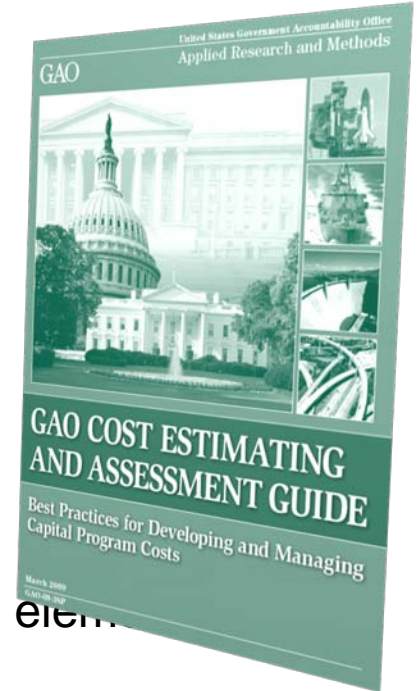
Standard Processes and Metrics

- **Standard processes**
  - Build a <u>functional</u> cost model
  - Assess uncertainty at the "Input" or the "Output" level
  - Define uncertainty distribution shapes/dispersions standards
    - Based on objective (historical) rather than subjective (expert) data
  - Build in functional correlation and also apply it where necessary
  - Add a risk register (discrete risks to the project)
  - Use simulation techniques to combine uncertainties
  - Map statistical results (do not sum) to inflated, phased results that do sum
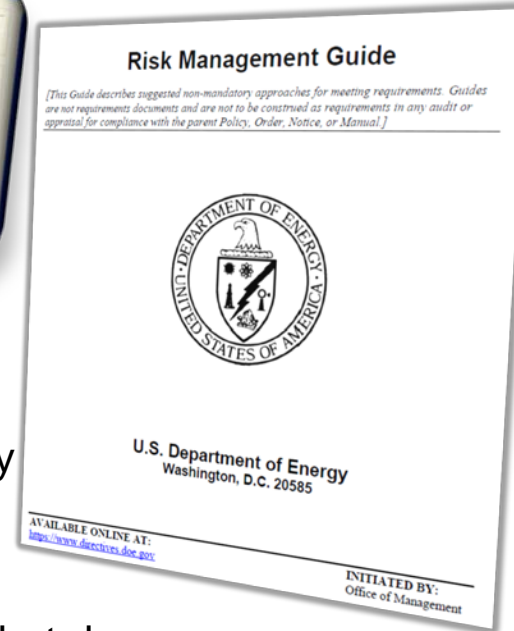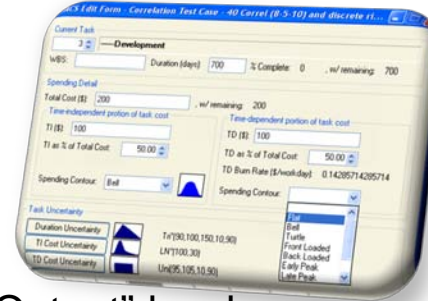
- **Metrics to Assess Uncertainty Result Quality and Completeness**
  - **Coefficient of Variation (CV)**: (StdDev/Mean) a unitless measure of uncertainty that can be used to assess and compare model results
    - For some commodities, CV is generally between 0.15 and 0.35 at the total level
  - **Probability of the Point Estimate**: Extreme high or low result should be questioned
    - For some commodities, the point estimate is generally between 20-35%