Capital Efficiency – Keys to Success

Dan Morlang
Vice President Capital Projects – AP-Networks
Voting Device – The Connector

Practice Question: Have you used a voting device before?
1. Yes
2. No
How Your Responses Will Be Used

- Shape the presentation based on information you provide
- Capture your thoughts on projects at various points during session
- Provide you captured data after the session
**Survey Says!**
*Help Shape This Presentation*

<table>
<thead>
<tr>
<th>What type of company do you represent?</th>
<th>Which best describes your role?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Owner</td>
<td>1. Executive Team</td>
</tr>
<tr>
<td>2. Contractor</td>
<td>2. Project Management</td>
</tr>
<tr>
<td>3. Supplier</td>
<td>3. Engineering</td>
</tr>
<tr>
<td>5. Other</td>
<td>5. Health Safety Environmental</td>
</tr>
<tr>
<td></td>
<td>6. Project Services</td>
</tr>
<tr>
<td></td>
<td>7. Other</td>
</tr>
</tbody>
</table>

**Are most of your projects?**
1. Small/Medium ($<=$25 million)
2. Large ($>US$25 million)
3. Mega ($>US$1 billion)

**True or False:** The industry has seen improvement in capital efficiency in the past two decades.
1. True
2. False

---

*47th Annual ECC Conference*  
*Complexity, Ambiguity, and Volatility*  
*Leading Into the New Normal*
Energy industry invests hundreds of billions annually in new capital projects and technology.
Meeting project schedules and budgets is imperative to achieving capital efficiency.
Clearly defining and managing risks is essential.
Despite comprehensive governance and assurance, data shows capital efficiency has not improved over last two decades.
Governance and assurance process are not keeping pace with project complexities of today.
Key Areas Impacting Projects

- Project Definition
- Target Setting
- Risk Management Processes
- People, Leadership, Organization
- Partner, Commercial, Government
- Contracting Strategy / Management
- Schedule
- Project Performance Goals
- Quality
- Cost
Which area is the most challenging on your projects?
1. Project Definition
2. Target Setting
3. People, Leadership, Organization
4. Contracting Strategy / Management
5. Partner, Commercial, Government
6. Risk Management Processes
<table>
<thead>
<tr>
<th></th>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capital Efficiency Background</td>
</tr>
<tr>
<td>2</td>
<td>Current State of Projects</td>
</tr>
<tr>
<td>3</td>
<td>Addressing Three Industry Themes</td>
</tr>
<tr>
<td>4</td>
<td>Wrap-Up</td>
</tr>
</tbody>
</table>
Data: Major Projects (>US $25 Million)

- Industry has struggled to meet objectives
- Approximately 72%* of projects fail to satisfy all performance goals defined as
  - +10% of budget
  - +/- 10% of planned schedule
  - no major operability issues post startup
- Approximately 1 in 4 major projects grossly exceed 1 or more success criteria and can be labeled as a “Train Wreck”

* Based on AP-Network’s database of >800 major projects executed since 2002
Only 24% of megaprojects meet business objectives. Publically available data shows disappointing results for 8 recent US refining megaprojects. Half experienced a regulatory related delay or issue. 6 were delayed by more than a year. 6 exceeded initially announced costs by 30%. None achieved mechanical completion cost within 10% of initial announced costs. 3 of these projects had fatalities.

Source: Booz Allen
Why Don’t Projects Meet Performance Goals?

All 8 megaprojects used some type of assurance process and many used industry project benchmarking; however, overall performance was disappointing due to complexities inherent in megaprojects.

Consider your projects not meeting performance goals…
Common Quotes

Which quote do you hear most on failed projects?

1. “We followed our process, so everything should have been fine.”
2. “The project’s Front-End Loading (FEL) was best-in-class, but we did not follow our plan.”
3. “It was the contractor’s responsibility, but they did not ensure the quality of their deliverables.”
4. “We have a lump-sum EPC, so costs should not have increased.”
5. “The estimate was wrong.”
6. “We would have stopped the project, but it was too late to say no.”
The Industry Problem Today

Projects are often misreporting the true state of project definition (FEL) creating a **false sense of confidence** in decision makers.

<table>
<thead>
<tr>
<th>Checklist-Driven Approach</th>
<th>Quality and content of project development deliverables not accurately assessed by qualified assessors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Front-End Focus</td>
<td>Focus placed on front-end analysis and relatively minimal emphasis post-full-funds authorization activities (Execute).</td>
</tr>
<tr>
<td>Estimate Basis</td>
<td>Accuracy of estimate is overstated. Estimate is driven by approval dates rather than engineering progress.</td>
</tr>
<tr>
<td>Risk Management</td>
<td>Risk register is in place, but effective follow-through and mitigation plans are lacking.</td>
</tr>
<tr>
<td>Capability and Experience</td>
<td>Project Organization lacks relevant experience and/or resources, which leads to over-optimism regarding the state of planning and preparation. People don’t know what they don’t know.</td>
</tr>
<tr>
<td>Misalignment</td>
<td>Lack of input / alignment from all key stakeholders leads to late changes.</td>
</tr>
</tbody>
</table>
## Agenda

1. Capital Efficiency Background
2. Current State of Projects
3. Addressing Three Industry Themes
4. Wrap-Up
Three Themes of the Industry Problem

- Cost and Schedule
- Risk Management
- Governance and Assurance
Delivering Cost and Schedule Objectives

- Analysis builds understanding and ownership
- Transparency is created around project funding decisions
- Important to
  - Agree performance targets with stakeholders
  - Talk in terms of ranges (lower limit and not to exceed)
  - Clearly understand what makes up the estimate
What Makes Up the Estimate

- Estimate Components
  - Base Cost Estimate
  - Allowances
  - Contingency
  - Management Reserve

- Cost estimate tied to schedule

- Must be clear on what’s in and what’s out of the estimate

How do you know your estimate is a good estimate?
Three Themes of the Industry Problem

- Cost and Schedule
- Governance and Assurance
- Risk Management
Teams Like to Play Below the Line (Executive Reporting Threshold ⭐

- Looking across 1200+ Risk Registers
- Average Number of Risks per Register: 55
- Median Number of Risks per Register: 28
Teams Fail to Complete the Risk Process

- **Risk Identification**: 90% of projects identify risks
- **Risk Evaluation**: 75% do some type of periodic review
- **Risk Response Plan**: 30% actively develop risk response plans and monitor
- **Risk Closeout**: Only 15% actually implement response plans and close out the risks

**Where are you typically in the risk process?**
Three Themes of the Industry Problem

Cost and Schedule

Risk Management

Governance and Assurance
When have you said “no” to progressing a project?
Current Project Governance and Assurance

- Most governance framework today is targeted at funding, with little concern for execution
- Many front-end loading activities are
  - “Cut and paste” from similar projects
  - Rewarded for format and volume vs content
- Need ability to judge content in an industry very short on people to review content, especially in execute
- Data and information-based decision making is key
<table>
<thead>
<tr>
<th></th>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Capital Efficiency Background</td>
</tr>
<tr>
<td>2</td>
<td>Current State of Projects</td>
</tr>
<tr>
<td>3</td>
<td>Addressing Three Industry Themes</td>
</tr>
<tr>
<td>4</td>
<td>Wrap-Up</td>
</tr>
</tbody>
</table>
**Take Aways**

- Drive optimal Front-End Loading (FEL) based on engineering and produce a high-quality cost and schedule estimate.
- Ensure that risks are identified, scored, communicated, and mitigated.
- Ensure project objectives are in alignment with business needs.
- Provide a common framework for all project data so that the company can work consistently across its portfolio of opportunity.
BACKUP SLIDES
Recent US Megaproject Disappointments

Data from recent U.S. Refining Megaprojects (publicly available information)

<table>
<thead>
<tr>
<th>Project</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP Whiting Upgrade</td>
<td>6 of 8 authorized after 2006 suffered significant cash flow constraints; the six were delayed by more than a year</td>
</tr>
<tr>
<td>Chevron Pascagoula Base Oil Project</td>
<td>At least 4 experienced a regulatory related delay or issue</td>
</tr>
<tr>
<td>Marathon Garyville Major Expansion</td>
<td>Lack of megaproject experience was a consistent theme</td>
</tr>
<tr>
<td>Marathon Detroit Heavy Oil Upgrade</td>
<td>Many used modularization to address labor concerns</td>
</tr>
<tr>
<td>Motiva Port Arthur Refinery Expansion</td>
<td>There were fatalities on at least 3 of these projects</td>
</tr>
<tr>
<td>Wood River Refinery Expansion</td>
<td>Average overruns on 6 projects with publically available cost information exceeded 30 percent from initial announcements; none achieved a mechanical completion cost within 10% of the initially announced cost</td>
</tr>
<tr>
<td>Valero Port Arthur Hydrocracker</td>
<td></td>
</tr>
<tr>
<td>Valero St. Charles Hydrocracker</td>
<td></td>
</tr>
</tbody>
</table>

All 8 projects used some type of assurance process and many used industry project benchmarking; however, overall performance was disappointing due to the complexities inherent in megaprojects.
Monte Carlo Simulation Results

- **Not To Exceed** Sanction Value - P95 ($160.00)

- **Performance Target**
  - Expected Cost - P53.5 ($100.00)

- **Base Cost Estimate**
  - Unadjusted Cost - P26.5 ($80.00)

- **Lower Limit - P10** ($60.00)

- **Additional Contingency**
  - $50 MM

**aka** “Management Reserve”

- The Sanction Value is the “Not to Exceed” cost. This includes the Additional Contingency amount.

- The NTE cost may range from the Expected Cost to the P100 value. The NTE cost must recognize the uncertainty around the expected outcome.
The Base Cost Estimate, Allowance Allocation, Contingency & Additional Contingency (Management Reserve)

What's Included in the Base Cost Estimate?
- Pre-feasibility
- Design
- Scope
- Schedule
- Execution Strategy / Plan
- Norms / Rates / Historical Costs
- Present Market Assessment
- Project Management
- Current Legislation / Policy
- Equipment Specifications
- Material Take-offs
- HII Scope
- Drilling
- Offices
- Temporary Services
- General Services
- Indigenous Contractors
- Historical Spend
- Single concept & strategy
- Schedule Float

Required Alliances to Achieve Most Likely Outcome:
- Design Development
- Expected Market Conditions
- Weather
- Construction
- Known & Identified Uncertainties
- Identified Risks & Mitigations
- Weight Advantage
- Minor Scope Change

Understanding Contingency:

"Performance Target"
Contingency is an allowance for goods and services which at the current state of the project definition cannot be accurately quantified, due to uncertainty in the scope and estimating norms included in the estimate basis, but which history and experience show will be necessary to achieve the objective (cost, time and quality) of the project.

Contingency Will Typically Cover:
- Minimal Scope Change
- Schedule Extenuation
- Technical Development
- Market Change
- Exchange Rate Change
- Estimating Errors & Omissions
- Revisions
- Weather / Climate (No Damage)
- Delayed Clients (No Damage)
- Force Majeure
- Normal Growth
- Acceleration
- Rationing
- Labor Productivity
- Minor Location Change

What is Additional Contingency (aka Management Reserve)?

"Not to Exceed Value"
The sanction value of a Project will be set at a "not to be exceeded value". This value will be determined by executive judgment after taking into account the expected cost and the impact of the risks that have been assessed. The difference between the expected cost and the not to be exceeded cost is termed "Additional Contingency or Management Reserve".

Additional Contingency Will Not Cover:
- Force Majeure
- Major Changes
- Political Unrest
- Major Location Change
- Capacity Changes >10%
- Major / National Strikes
- Major Legislation Change
- Major Cost Inflation Change
- Major Industrial Disputes
- Bankruptcy Major Contractor
- Natural Disasters
- Terrorists Act / Wars