RISK-WEIGHTED COST ESTIMATES - PRINCIPLES AND PRACTICAL APPLICATIONS

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Presentation Outline

- Company Overview
- Impacts of Deregulation (Capital Stewardship)
- Overview of Risk-Weighted Cost Estimating Process
- Use of Contingency to Support Continuous Risk Management
- Integration of Project Risk Management with Financial Risk Management
- Questions and Answers
The Entergy Corporation

- Headquartered in New Orleans, LA
- More than $10 Billion in Annual Revenues
- More than $25 Billion in Assets
- Major Functions
  - Generation Company
  - Transmission Company
  - Distribution Company
  - Retail Company
- More than 2.7 Million customers
- More than 25,000 megawatts capacity
Entergy Transmission

- More than 15,000 miles of Transmission lines (69 KV to 500 KV)
- Approximately 1000 substations
- Annual Capital Expenditure ($250 MM to $300 MM)
- Transmission Project Challenges = High Risk
- Aggressively pursuing Best Practices
## Electricity Utility Market Changes

<table>
<thead>
<tr>
<th>Regulated Market Pre 1990’s</th>
<th>Deregulated Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>➢ Capital Investment</td>
<td>➢ Performance Based</td>
</tr>
<tr>
<td>Recovered Through Rate</td>
<td>Rates Higher Risk,</td>
</tr>
<tr>
<td>Base</td>
<td>Higher Return</td>
</tr>
<tr>
<td>➢ Lack of Competitive</td>
<td>➢ Effective Capital</td>
</tr>
<tr>
<td>Pressures</td>
<td>Deployment is Key</td>
</tr>
<tr>
<td>➢ Service Area Well Defined</td>
<td>➢ Influx of Independent</td>
</tr>
<tr>
<td>➢ PSC Approved Rate</td>
<td>Power Producers (IPPs)</td>
</tr>
<tr>
<td>Increases</td>
<td></td>
</tr>
<tr>
<td>➢ Vertically Integrated</td>
<td>➢ <strong>Increased Project</strong></td>
</tr>
<tr>
<td>Utilities</td>
<td><strong>Management Involvement</strong></td>
</tr>
</tbody>
</table>

Regulated Market Pre 1990’s Deregulated Market
Why Risk Weighted Cost Estimates?

Single Value (Deterministic) Estimates
- Bid Evaluation
- Setting Budgets

There is Uncertainty in Cost Estimates

1 MM  1.75 MM  3 MM
Risk-Weighted Cost Estimating

- Prepare Cost Estimate
- BOE Documentation

- Review Estimate and Baseline

- Conduct Risk Ranging Session

- Determine Contingency & Contingency Drawdown
Base Cost Estimate

- Represents “Most Likely” Costs (Quotes, Historic Data, Manuals)
- Approaches “Best in Class”
- Lean with No Hidden Allowances
- Miscellaneous Costs or Allowances Justified
- Basis of Cost Estimate
Peer Review of Base Cost Estimate

- Peers are SME’s (15+ yrs experience)
- Able to apply “sanity” check
- Participate in Estimate Reconciliation
- Share Lessons Learned with Project Team
- Cost Estimate data should be circulated ahead of Review

End Result is a baseline cost estimate
Risk Ranging Session Participants

- Project Manager
- Business Rep
- Discipline Leads
- Project Controls
- Contractor/Vendor
- Facilitator
- Scribe

Group Size Should Be Restricted To
No More Than Ten
# Completed Cost-Influence Factor Matrix

## DESIGN

<table>
<thead>
<tr>
<th>Description</th>
<th>Base Cost X1000 In US$</th>
<th>1 Design Risks</th>
<th>2 Testing Risks</th>
<th>3 Schedule Risks</th>
<th>4 Contract Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>545</td>
<td>- 65</td>
<td>0</td>
<td>75% (0)</td>
<td></td>
</tr>
<tr>
<td>Investigations</td>
<td>+ 150</td>
<td></td>
<td>1,500</td>
<td>25% (1300)</td>
<td></td>
</tr>
<tr>
<td>Electrical</td>
<td>500</td>
<td>- 150</td>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td>+ 200</td>
<td></td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay Design</td>
<td>500</td>
<td>- 100</td>
<td>600</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 495</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relay Settings</td>
<td>1,355</td>
<td>- 110</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 380</td>
<td></td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## CONSTRUCTION

<table>
<thead>
<tr>
<th>Description</th>
<th>Base Cost X1000 In US$</th>
<th>1 Design Risks</th>
<th>2 Testing Risks</th>
<th>3 Schedule Risks</th>
<th>4 Contract Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Work</td>
<td>1,540</td>
<td>- 85</td>
<td>175</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 390</td>
<td></td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equipment Installation</td>
<td>275</td>
<td>- 500</td>
<td>275</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commissioning</td>
<td>285</td>
<td>- 200</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 142</td>
<td></td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effect on Total Estimate</td>
<td>5,000</td>
<td>- 625</td>
<td>785</td>
<td>1,030</td>
<td>75% (0)</td>
</tr>
<tr>
<td></td>
<td>+ 1,267</td>
<td></td>
<td>865</td>
<td>2,270</td>
<td>25% (1300)</td>
</tr>
</tbody>
</table>
Risk Analysis Models

Simple Monte Carlo Model

Risk-Weighted Cost Estimate = Base Cost + I1 + I2 + I3 + I4 + I5

Considerations

- Correlation
- Number of Iterations

For Factored estimates, correlation between Influence Factors must be considered.
Risk Analysis Results

- Probabilistic Distribution of Costs
- Minutes of Ranging Session (Scribe Output)
- Sensitivity Data (Tornado Diagram)

Risk Analysis results are reviewed before release
Using Results to Set Contingency

Contingency = Budget - Base

Base
Mean
Budget

Cost ($x1000)

Probability
Using Results to Set Project Budgets

- Budget is usually set at P50 value
- Other probability values may be used
- Use the mean of the simulated costs

From a corporate portfolio viewpoint, the expected cost of a portfolio of projects is of more interest than the costs of the individual projects considered separately. Thus individual projects are considered at the mean of the simulated cost distributions.
Tornado Diagram

Sensitivity Chart

-100.0% -50.0% 0.0% 50.0% 100.0%

- Schedule Conflicts
- Contract Uncertainties
- Design Uncertainties
- Testing Uncertainties
- Labor Uncertainty
Contingency funds are not tied-up for the duration of the project. As predefined milestone dates are safely met, the appropriate sums are drawn out from the Contingency fund.
Results - Capacitor Bank Project

<table>
<thead>
<tr>
<th>Base Cost Estimate</th>
<th>Post Peer Review Cost Estimate</th>
<th>Risk-Weighted Cost Estimate</th>
<th>Actual Final Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$408,000</td>
<td>$470,000</td>
<td>$529,000</td>
<td>$525,000</td>
</tr>
</tbody>
</table>

Major Risk Factors:

- Fault Current
- Mobile Transformer
- Cost of Additional Property
- Traps on Capacitor Bank to Block Carrier Signal
- Grounding Grid Additions
Results - City of Jonesboro, AR

Contingency Drawdown

Month Ending

<table>
<thead>
<tr>
<th>Month Ending</th>
<th>Contingency ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 03</td>
<td>$629,701</td>
</tr>
<tr>
<td>Jan 04</td>
<td>$619,947</td>
</tr>
<tr>
<td>Mar 04</td>
<td>$608,955</td>
</tr>
<tr>
<td>Apr 04</td>
<td>$504,350</td>
</tr>
<tr>
<td>May 04</td>
<td>$497,227</td>
</tr>
<tr>
<td>Jun 04</td>
<td>$453,286</td>
</tr>
<tr>
<td>Oct 04</td>
<td>$277,976</td>
</tr>
<tr>
<td>Nov 04</td>
<td>$92,355</td>
</tr>
<tr>
<td>Dec 04</td>
<td>$49,614</td>
</tr>
<tr>
<td>Jan 05</td>
<td>$14,117</td>
</tr>
<tr>
<td>Feb 05</td>
<td>$9,674</td>
</tr>
</tbody>
</table>

Managing Contingency through DrawnDown Plots
Contingency Funds are used to support Mitigation Tasks.
Integrating Financial Risk Management with Project Risk Management

**Business Decision Model**

\[
\text{IRR} = \text{CAPEX} + \text{Revenue} + \text{O&M Costs} + \text{Other}
\]

**Output from Risk-Weighted Cost Estimate Process**

**The Transmission Capital Process**

- Initiate
- Define
- Design
- Construct
- Close Out
Conclusions

- The Deregulated Electric Utility Marketplace has accentuated the need for effective Capital Stewardship.
- The Risk-Weighted Cost Estimating technique has been effectively used to determine project budgets and contingency funds.
- The continuous management of issues and risks is supported by the contingency funds.
- Risk-Weighted cost estimates for projects provide an essential link between Project Risk Management and Financial Risk Management.