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Managing Risk for Global Energy Projects

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Managing risk for global Oil and Gas Development Projects is crucial in the capital intensive Energy Industry. A Company that consistently selects the right projects and executes them with excellence can improve Return on Capital Employed (ROCE) and ultimately Total Shareholder Return (TSR). In today's competitive business environment this can mean a difference between a profitable company versus the one that becomes a takeover target.

Effective project management improves ROCE by increasing revenues, decreasing expenses and reducing capital employed. ROCE is a common metric in the industry to measure capital efficiency. A structured Project Management Process facilitates selection of the best projects from the portfolio of opportunities and executing them with excellence.

Projects are the vehicle by which we turn business opportunities into valued business assets. Successful projects are defined as the ones that are delivered on time, within budget and meet established business objectives. If a company selects and builds good projects, it can increase its revenues, decrease life cycle costs (operating and maintenance costs) and use less capital to achieve its business goals.

This practical paper focuses on how risk is managed on complex and mega Oil and Gas Development Projects worldwide. Decision and Risk Analysis tools are used to identify, quantify, mitigate and manage major project risks such as:

- Oil and Gas Reserves Estimates
- Oil and Gas Price Forecasts
- Capital Project Cost and Schedule Estimates
- Operating Factor of the Facility

RISK AND UNCERTAINTY

Webster defines risk as the chance of injury, damage or loss. Risk obviously involves uncertainty. Uncertainty is the set of all outcomes, both favorable and unfavorable. Those outcomes which are unfavorable represent risk, whereas those which are favorable represent opportunity. Thus, uncertainty can give birth to either, or both, risk and opportunity.

Risk is also defined as the probability that an unfavorable outcome will occur. Similarly, opportunity is defined as the probability that a favorable outcome will occur.

There are several types of risks inherent in global energy projects such as technical, cost, schedule, price, operating factor, political, etc. Accepting risk and providing contingency to cover it is one form of risk control. Other forms of risk control include risk avoidance, risk sharing, risk reduction, risk transfer, insurance and risk containment.

DECISION AND RISK ANALYSIS

The Decision and Risk Analysis (D&RA) Process is a set of tools to improve decision quality for all types of decisions. It is used to compare alternatives, quantify risks and uncertainties and compare financial outcomes. The key elements of this process include problem definition, critical factor identification and economic evaluation of alternative courses of action using probabilities and uncertainty ranges. The D&RA process facilitates understanding of project uncertainties and risks and improves the quality of difficult decisions.

The D&RA tools are especially useful when we have to make difficult decisions because:

- There is risk or uncertainty about the outcome.
- Multiple alternatives exist and it is not clear which one is best.
- We need to consider multiple value measures and trade-off between them.
- We have multiple stakeholders and we need to incorporate their perspectives to reach a shared decision.

Issue Raising—An issue raising session helps share information and expose major concerns about the opportunity. An issue is anything that is important to the decision and an issue raising session early in the project can:

- Provide common understanding of the opportunity.
- Uncover issues that need to be addressed in the alternatives and the analysis.
- Expose multifunctional project team members to each other's perspective.

After brainstorming the issues, these issues are sorted into four categories:

- Decisions: The available choices or actions that can be controlled by the decision-maker. Examples include building a

new plant, building an expansion to an existing plant, acquiring a competitor's plant or selling the plant.
- Values: Metrics that are used to compare and rank alternatives. Examples include Net Present Value (NPV), Rate of Return (ROR), earnings, zero incidents, customer satisfaction, etc.
- Uncertainties: Factors that cannot be controlled. Examples include oil and gas prices, margins, etc.
- Other: Facts or process issues such as historical spending, organizational challenges, etc.

Separating decisions, uncertainties and values adds clarity and sets up subsequent steps.

Decision Hierarchy—The primary purpose of the Decision Hierarchy tool is to identify what issues will be included and excluded from the study to manage the scope of work. This tool is particularly important in solving complex problems.

Strategy Table—The Strategy Table helps to set and select doable but varied alternatives for a given opportunity. This tool provides a map of different strategic paths that can be taken in moving an opportunity forward.

Influence— Influence Diagram establishes the relationship between inputs and outputs of the study. This tool graphically forms the basis for an economic model to determine expected value of strategic alternatives.

Tornado Diagram—The primary purpose of this tool is to clarify the sensitivity of the decision value measure to the uncertainty of the input values. All variables are important to the bottom line, but attention must be focused on the critical few variables that have an impact on the decision. The Tornado Diagram can save significant amount of time by allowing the project team to focus on few critical variables.

Figure 1 shows a Tornado Diagram for a typical Oil and Gas Development Project. All the variables on this chart are shown at their 10 % probability (P10), 50 % probability (P50) and 90 % probability (P90) of possible outcomes. This captures 80 % confidence interval for all the variables in the analysis. Items at the top of the Tornado Diagram have highest risk as well as possible opportunity for the project.

Decision Tree and S-curve—The Decision Tree incorporates the most critical uncertainties from the Tornado Diagram and graphically summarizes calculated output in a format relating it to the decisions at hand. Development of a Decision Tree also clarifies time relationship and any dependencies between decisions.

The output from a Monte Carlo simulation program based on this Decision Tree is presented in the form of an S-curve in Figure 2. The NPV shown in Figure 2 can range from P10 outcome of $ 100 million to P90 outcome of $ 1.75 billion. There is also an 8 % probability that the project may result in a negative NPV. The final project outcome could be any place along this curve. Management needs to make a decision based on how much risk they are willing to take.

Risk and uncertainty are inherent in all projects. They carry with them the potential for time, resource and monetary loss. Identification and measurement of risks must be an integral part of any project development and execution process. A probabilistic approach using D&RA tools and commercially available computer software can facilitate this analysis.

Managing risk for mega global energy projects in critical in today's competitive business environment. The D&RA tools can help management make good decisions prior to approving these complex and mega projects for execution.

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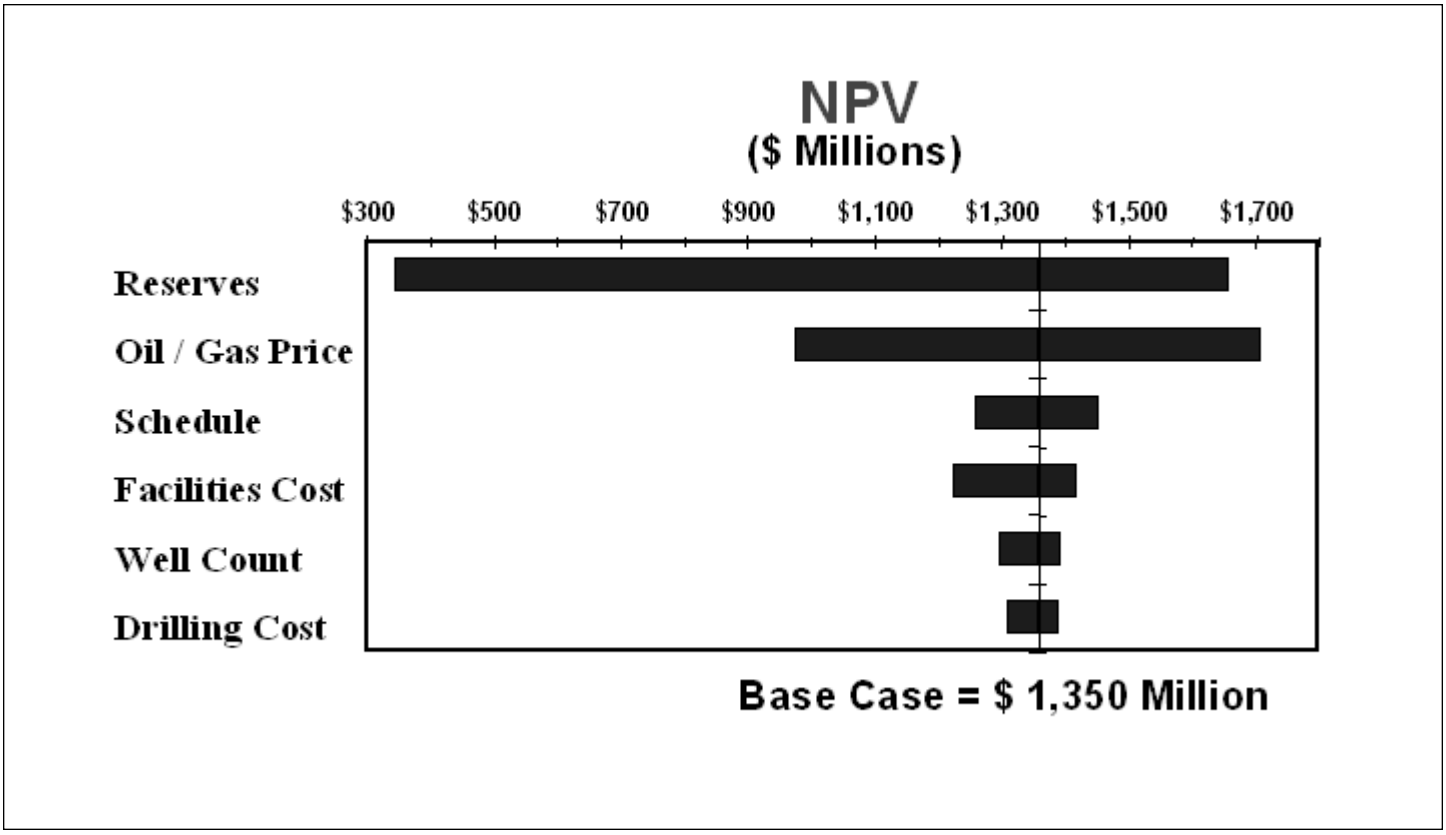

Figure 1 — Tornado Diagram

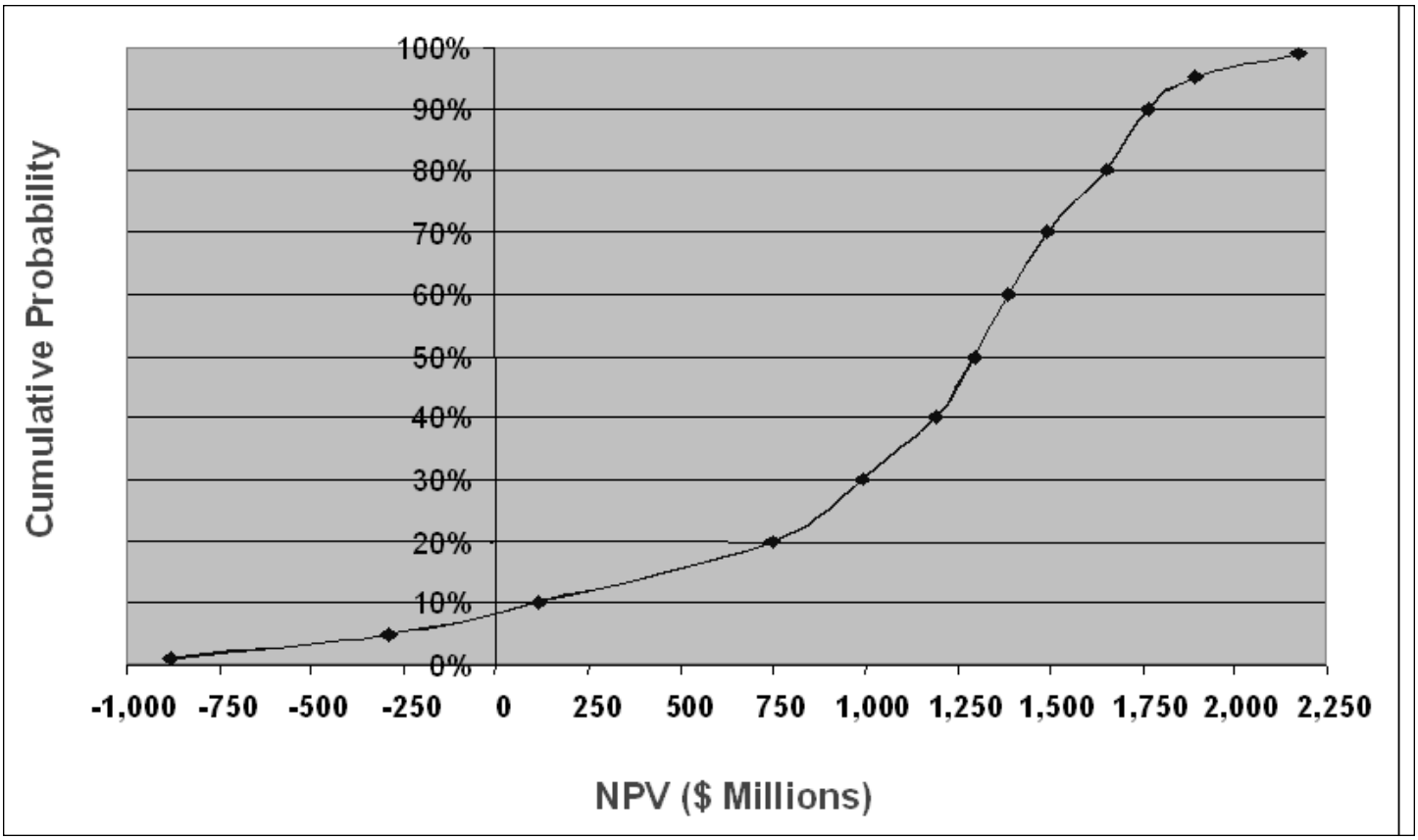

Figure 2 — S- Curve: Cumulative Probability of NPV