

## **Cost Engineering and Economic Analysis Services**

MSE Technology Applications, Inc. (MSE) offers a wide variety of cost engineering and economic analysis services. Cost estimating, life-cycle cost modeling, and various other analyses including sensitivity, risk, cost benefit, and decision are fundamental to this process. A simple example of this is depicted in Figure 1, which indicates the point at which two competing technologies become cost equivalent. Different forms of cost analyses have been performed for a number of customers including the U.S. Department of Energy (DOE), the U.S. Department of Defense (DoD), the U.S. Environmental Protection Agency, and private businesses.

### **LIFE-CYCLE COST MODELING**

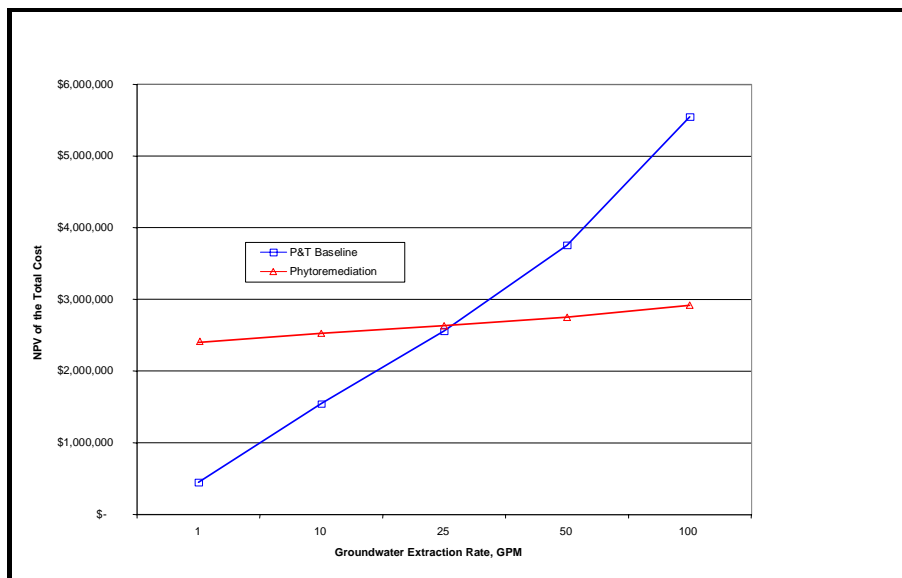
MSE has completed scaleable life-cycle cost models for numerous environmental technologies. These spreadsheet-based models consider costs beginning with research and development, through engineering and fabrication, to operations and final decommissioning and disposal. Net present values of costs, unit cost, and percent cost savings (or loss) are calculated using discounted cash flow methods. These models are used for project-level cost estimation using site-specific data for inputs. Upon completion of a scaleable life-cycle model, other studies such as cost-benefit analysis, sensitivity analysis, risk analysis, and decision analysis, can be undertaken.

### **COST ESTIMATING**

Developing cost estimates is the starting point for a suite of cost engineering services at MSE, and cost estimates can be provided for a wide range of projects. These estimates often range from order of magnitude (ballpark) to definitive (bid). Depending on the level of accuracy required, the estimates can be prepared using quantity take-offs, factor methods, historical data, internal models, estimating references, supplier information, or other sources. In addition, each estimate is properly adjusted to include indirect costs, contingency, and profit.

### **SENSITIVITY ANALYSIS**

Sensitivity analysis (also called "what if" analysis) is designed to allow rapid comparison of project alternatives that can be readily interpreted and manipulated by the decisionmaker. This analysis is completed by changing a variable while holding all else constant to determine what impact that variable has on the overall outcome of total cost. Whenever possible, the sensitivity analysis is supported by graphical representations available through commercial software packages, as illustrated in Figure 1.



*Figure 1. Cost comparison, pump and treat versus phytoremediation.*

## FORECASTING AND RISK ANALYSIS

Risk analysis can be a key factor in the evaluation of engineering projects and technologies. Financial risks, engineering and development risks, and implementation risks are often underestimated or ignored in the evaluation process. Forecasting and risk analysis provides the decisionmaker with a useful method for integrating the project risk profile into the decision process. An example of a forecasting and risk analysis is shown in Figure 2.

### PROJECT EXAMPLES

#### *Individual Technology Cost Analysis*

This project completed scaleable life-cycle cost models, with reports, for 22 innovative remediation technologies under development by the DOE Office of Science and Technology. These analyses examined the cost and performance of innovative technologies and compared these technologies to their appropriate baseline technologies.

#### *Project Cost Estimating*

Order of magnitude cost estimates were completed for environmental remediation projects for various innovative technologies for the DOE. Also, comparative costs for vehicle maintenance facilities replacement versus upgrade feasibility studies were completed for the DoD. Budget level estimates were used to decide whether to refurbish existing facilities or construct new ones.

MSE has also undertaken cost estimating projects for private industry. Some of these projects included the economic feasibility of building electrical generating plants and water treatment facilities.

### MSE COST ENGINEERING GROUP

Members of the MSE Cost Engineering Group have combined cost and economic analysis experience of over 15 years; have active memberships in the American Association of Cost Engineers and the Society of Cost Estimating and Analysis; and have access to up-to-date references such as *Richardson's Rapid Cost Estimating Data*, R.S. Means/ECHOS *Environmental Remediation Cost Data*, and Western Mine Engineering, Inc.'s, *Mining Cost Service Mine and Mill Equipment Costs*.

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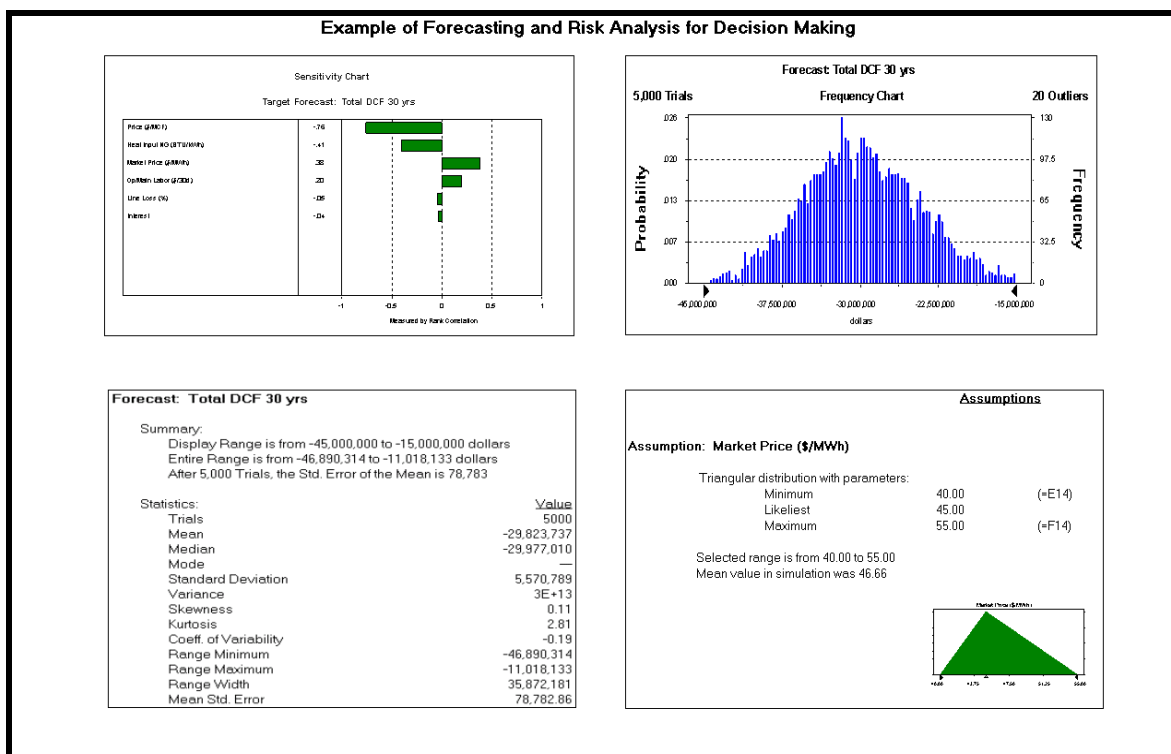


Figure 2. An example of a Monte Carlo simulation used for decision making.