Public Reports and Studies in the Minerals Industry

Applications to Deep Seabed Mineral Development

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Workshop on Polymetallic Nodules Resource Classification
International Seabed Authority/
Ministry of Earth Sciences, India
Goa, India
October 13-17, 2014

Mining Studies and Assessments

- History
  - Half a Millenium of Mineral Studies
  - 35th Anniversary of UNCLOS application of a seabed minerals scoping study
- Categories of Studies
  - Technical Reports
  - Integrated Economic Evaluations

Factors in Economic Studies

- Property Information
- Geology and Resources
- Mining
- Processing
- Infrastructure
- Management and Labor
- Products, Markets and Sales
- Environmental and Permitting
- Financial Issues
- Development Costs and Schedule
- Political and Social considerations
- Project Economics

Integrated Studies

- Scoping Study: Uses technical reports and industry studies as well as general assumptions about mineral resources. Reports Internal Rate of Return (IRR).
- Pre-feasibility Study: Evaluates a workable design with substantial resource and environmental data and contrasts design options. Reports IRR.
- Feasibility Study: Evaluates a near final design with increased resource and environmental data. Reports IRR.
- Engineering Study: Detailed Study of Potential Final Design

Scoping Studies/Preliminary Economic Assessments

Order of magnitude technical and economic study of the potential viability of Mineral Resources that includes appropriate assessments of realistically assumed Modifying Factors together with any other relevant operational factors that are necessary to demonstrate at the time of reporting that progress to a Pre-Feasibility Study can be reasonably justified.

- Factored Estimation
- Assumed Ore Values
- Not Used for Reporting Reserves or Resources
- Cost Estimation Range: ±45%
- Engineering Cost, Percent of CapEx: 0.1%-0.3%

Pre-Feasibility Study

A comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method is established and an effective method of mineral processing is determined. It includes a financial analysis based on reasonable assumptions on the Modifying Factors and the evaluation of any other relevant factors which are sufficient for a Competent Person, acting reasonably, to determine if all or part of the Mineral Resource may be converted to a Mineral Reserve at the time of reporting.

- Costs from Engineering Manuals
- May justify reports of Mineral Resources and Reserves
- Cost Estimation Range: ± 30%
- Engineering Cost, Percent of CapEx: 0.2%-0.8%

Feasibility Study

A Feasibility Study is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate at the time of reporting that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project.

- Costs from, for example, Vendor Quotes
- Cost Estimation Range: ± 15%
- Engineering Cost, Percent of CapEx: 0.5%-1.5%
- (Subsequent Basic Engineering Analysis: about 1.6 X Feasibility Cost)

Case Study

- MIT Model of Deep Ocean Mining
- Developed to Evaluate Effects of Design Changes and Policy Requirements on Economic Attractiveness and Social Impact
- Costs from Factored Estimation Approach and Engineering Designs from Dames & Moore and MIT Ocean Engineering Department
- Used Assumed Ore Values

Case Study, Part 2
10 Sectors of the Model

- Preparatory Costs
- Mining
- Marine Transport
- Ore Discharge Terminal
- On-Shore Transport
- Processing
- Waste Disposal
- Marine Support
- General Administration
- Continuing Preparations

Case Study, Part 3

- Three iterations of Study of Increasing Detail
- Established schedule of development and operation and Reported Results in Internal Rate of Return and NPV
- Provided Sensitivity Analyses for Design Parameters and Assumptions
- Final Iteration Indicated that Depressed Metal Prices Would Make Deep Seabed Mining Unattractive Until Market Prices Recovered

Increasing Study Details

Moving to a Pre-Feasibility Study:

- Use Actual Exploration Results for Mineral Data
- Test Prototype System in Laboratory Conditions
- Compare and Contrast Major Design Alternatives
- Itemize Equipment, Personnel and Material Requirements
- Itemize Direct Infrastructure Development Schedule

Moving to a Feasibility Study:

- Specify Specific Design and Increase Detail of Study in Each Area
- Increase Level of Detail of Exploration Results to Design a Mine Plan

Closing Points

- Economic measures are the common language of scoping and feasibility studies.
- Scoping and feasibility studies serve both design and decision functions.
- Sensitivity analyses should address uncertainties of input data in scoping and feasibility Studies.
- Scoping and feasibility studies may become public documents to inform investors and regulators and be governed by national reporting codes.

Thank You