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### A review on Project Investment and Financial Analysis

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#### Abstract

This paper contains the various components of cost and analysis required for a structured financial calculations of an engineering project including various risk associated. Author tried to give a brief overview of Capital cost estimation, Operating cost estimation, Economic analysis and possible Risk portfolio associated with a project. Each project is different in nature. So every project contains risk according to its location, project profile, product characteristics, economic considerations and respective Governmental regulations.

#### 1. Introduction

The estimate of Capital Cost has to be worked out based on some consideration. Typical considerations include Concept of implementation (EPC/ Turnkey/ Discreet Turnkey etc.) for major plant and equipment, Process operation period (No. of years). The cost estimates for main plant and equipment should be based on the information provided by Technology suppliers. The civil & structural cost for facilities other than Main Plant should be based on layout for the project and the prevailing rates at nearby location. The civil and structural cost for Main Plant should be based on the information provided by the technology suppliers or available in-house information. Cost towards Land, Site Development, Project Insurance, Project Management & Owners Cost and Environmental compensation has to be considered. Contingency provision has to be made as per guidelines. Escalation / Inflation have also to be accounted. The total capital investment includes cost of Design & Engineering, Enabling Work, Supply of Equipment, Civil and Structural work, Equipment Erection, Expenses towards Project Administration and Project Management during construction, Infrastructure Facilities, and Pre-Operative Expenses. The capital cost estimates shall be broadly classified into Land, Site Development, Raw Material Handling System, Main Process Unit, Electrical Substation, Power Plant, Instrumentation and Control, Water and Utility, Civil & Structural work, Spares and Other Miscellaneous Expenditure like Project Insurance, Owners Cost, Environmental & Safety Cost, Pre-Operational Expenses, Interest during Construction (IDC). Interest during construction has been computed based on the interest rate of Debt (Term Loan) and consideration of years of construction period for the project.

#### 2. Equipment Supply

The costs related to Equipment Supply are broadly classified into two categories mainly due to implication of different taxes and duties, they are Foreign Supply and Domestic Supply.

If the supplied equipment is from foreign territory then their cost calculation should be as per their basis of delivery. This delivery basis is clearly mentioned in their supply document which governs by INCOTERMS. As per INCOTERMS 2010, the basis of delivery has been categorized as follows:

EXW - Ex Works: Seller delivers (without loading) the goods at disposal of buyer at seller's premises. Long held as the most preferable term for those new-to-exports because it represents the minimum liability to the seller. On these routed transactions, the buyer has limited obligation to provide export information to the seller.

FCA - Free Carrier: Seller delivers the goods to the carrier and may be responsible for clearing the goods for export (filing the EEI). More realistic than EXW because it includes loading at pick-up, which is commonly expected, and sellers are more concerned about export violations.  $FCA = EXW + \text{Loading at pick-up}$

FAS - Free Alongside Ship: Risk passes to buyer, including payment of all transportation and insurance costs, once delivered alongside the ship (realistically at named port terminal) by the seller. The export clearance obligation rests with the seller.  $FAS = FCA + \text{All transportation and insurance costs upto named port terminal}$

FOB - Free On Board: Risk passes to buyer, including payment of all transportation and insurance costs, once delivered on board the ship by the seller. A step further than FAS.  $FOB = FAS + \text{Port charges at Seller's territory}$

CFR - Cost and Freight: Seller delivers goods and risk passes to buyer when on board the vessel. Seller arranges and pays cost and freight to the named destination port. A step further than FOB.  $CFR = FOB + \text{Ocean Freight}$

CIF - Cost, Insurance and Freight: Risk passes to buyer when delivered on board the ship. Seller arranges and pays cost, freight and insurance to destination port. Adds insurance costs to CFR.  $CIF = CFR + \text{Insurance cost}$

CPT - Carriage Paid To: Seller delivers goods to the carrier at an agreed place, shifting risk to the buyer, but seller must pay cost of carriage to the named place of destination.  $CPT = CIF + \text{Cost of carriage to the named place of destination}$

CIP - Carriage and Insurance Paid To: Seller delivers goods to the carrier at an agreed place, shifting risk to the buyer, but seller pays carriage and insurance to the named place of destination.  $CIP = CPT + \text{Insurance of carriage to the place of destination}$

DAT - Delivered at Terminal: Seller bears cost, risk and responsibility until goods are unloaded (delivered) at named quay, warehouse, yard, or terminal at destination. Demurrage or detention charges may apply to seller. Seller clears goods for export, not import.  $DAT = CIP + \text{unloading charges at named quay, warehouse, yard, or terminal at destination}$ .

DAP - Delivered at Place: Seller bears cost, risk and responsibility for goods until made available to buyer at named place of destination. Seller clears goods for export, not import.  $DAP = DAT + \text{cost except taxes and duties for goods until made available to buyer}$

DDP - Delivered Duty Paid: Seller bears cost, risk and responsibility for cleared goods at named place of destination at buyer's disposal. Buyer is responsible for unloading. Seller is responsible for import clearance, duties and taxes so buyer is not "importer of record".  $DDP = DAP + \text{All cost including taxes and duties for goods until made available to buyer}$ .

Supply within a territory is governed by the rules of that state. Transportation/ Logistic cost, taxes and duties as applicable by the respective state or country shall have to be accounted.

### 3. Operating Cost Estimation

The year-wise production cost/operating cost for a proposed project has to be estimated under the following indicative heads: a) Fixed Expenditure (Manpower, Annual Repair & Maintenance Cost, Other Overheads includes Plant insurance, annual Sales expense and annual environmental cost) b) Variable Expenditure (Power Consumption, Water & Utility and Consumables)

### 4. Economic Analysis

The projected financial performances over the future operation/production period have to be worked out on the basis of capital and production cost estimates indicated in previous section and income from sales and others.

The build-up of production has to be the pillar of financial analysis. A typical Production Build-Up shall be as follows:

| Product (Silicon metal for example)                              | Production Quantity (in tons) |
|--|-------------------------------|
| 1 <sup>st</sup> Year of Production (90% of rated capacity)       | 9,700                         |
| 2 <sup>nd</sup> Year onwards Production (100% of rated capacity) | 10,780                        |

The year-wise requirement of funds for the project shall be based on implementation schedule of the project. The following table indicates the Year-Wise Requirement of Fund (typical example)

| CAPEX<br>(70% Debt, 30% Equity) | Equity<br>(\$ Million) | Debt<br>(\$ Million) | Total Amount<br>(\$ Million) |
|---------------------------------|------------------------|----------------------|------------------------------|
| 1 <sup>st</sup> Year            | 40                     | 90                   | 130                          |
| 2 <sup>nd</sup> Year            | 57                     | 137                  | 194                          |
| <b>Total</b>                    | <b>97</b>              | <b>227</b>           | <b>324</b>                   |

Envisaged saleable quantities of product with rated capacity level and corresponding Net Sales Realization shall have to be considered. The following table indicates the Revenue from Sales

| Product (Silicon metal for example)                              | Total Amount (\$ Million) |
|--|---------------------------|
| 1 <sup>st</sup> Year of Production (90% of rated capacity)       | 145                       |
| 2 <sup>nd</sup> Year onwards Production (100% of rated capacity) | 162                       |

### 5. Financial Analysis

Financial analysis consists of Depreciation, Repayment of Borrowings, Working Capital, Interest charges and Corporate Tax. Depreciation for plant and equipment including other facilities has to be calculated on the basis operation. Depreciation may be calculated on Straight Line Method (SLM) or on Written down Value principle (WRDV). Many countries in the world follow Written down Value principal (WRDV) for tax applicability. Following table shows year-wise Net Asset Value as per SLM & WRDV method:

|        | Straight Line Method (SLM) |                    |                 | Written down Value principal (WRDV) |                    |                 |
|--------|----------------------------|--------------------|-----------------|-------------------------------------|--------------------|-----------------|
|        | Gross Asset Value          | Depreciation @ 20% | Net Asset Value | Gross Asset Value                   | Depreciation @ 20% | Net Asset Value |
| Year 1 | 1,000,000                  | 200,000            | 800,000         | 1,000,000                           | 200,000            | 800,000         |
| Year 2 | 800,000                    | 200,000            | 600,000         | 800,000                             | 160,000            | 640,000         |
| Year 3 | 600,000                    | 200,000            | 400,000         | 640,000                             | 128,000            | 512,000         |

It can be noticed that with same depreciation rate, there are differences in Net Asset Value as per different depreciation principle. The borrowed fund shall normally be sourced both from foreign as well as local financial institutions/banks. The term of repayment, Period of Moratorium thereon shall have to be accounted for calculations. The working capital required for the first year of operation and during subsequent years, may be fulfilled from bank borrowings. Fund requirement for regular operational activity has to be considered for calculating working capital requirement. A typical estimated year-wise working capital requirement is shown below.

### Year-Wise Funding of Working Capital

|  | 1 <sup>st</sup> Year (\$ Million) | 2 <sup>nd</sup> Year (\$ Million) |
|--|-----------------------------------|-----------------------------------|
| Working Capital Borrowing (75%)          | 15                                | 17                                |
| Margin Money (25%)                       | 5                                 | 6                                 |
| <b>Total Working Capital Requirement</b> | <b>20</b>                         | <b>23</b>                         |

Annual interest charges on long term loan and on bank borrowings for working capital requirement have to be calculated for future cash outflow calculations. In some countries, for promotion of Industrial activities and employment generation, Government used to waive or give relaxation on corporate tax applicability (mainly for Greenfield projects). However, this tax applicability widely followed.

### 6. Financial Statements

Taking into account the total income, the annual manufacturing expenses as well as depreciation charges, income statement and cash-flow statement have to be prepared. The calculations for internal rate of return (IRR), Net present value (NPV) and Payback period are the main indicators of economic viability of the project.

Internal rate of return (IRR) is the interest rate at which the net present value of all the cash flows (both positive and negative) from a project or investment equal zero. Internal rate of return is used to evaluate the attractiveness of a project or investment. In theory, any project with an IRR greater than its cost of capital is a profitable one, and thus it is in a company's interest to undertake such projects. In planning investment projects, firms will often establish a required rate of return (RRR) to determine the minimum acceptable return percentage that the investment in question must earn in order to be worthwhile. Any project with an IRR that exceeds the RRR will likely be deemed a profitable one, although companies will not necessarily pursue a project on this basis alone. Rather, they will likely pursue projects with the highest difference between IRR and RRR, as chances are these will be the most profitable.

Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyze the profitability of a projected investment or project.

The following is the formula for calculating NPV:

$$NPV = \sum_{n=0}^N \frac{C_n}{(1+r)^n}$$

Where

C<sub>n</sub> = net cash inflow during the period t

r = discount rate, and

n = number of time periods

The payback period is the length of time required to recover the cost of an investment. The payback period of a given investment or project is an important determinant of whether to undertake the position or project, as longer payback periods are typically not desirable for investment positions. The payback period ignores the time value of money, unlike other methods of capital budgeting, such as net present value, internal rate of return or discounted cash flow.

Sensitivity analysis on the proposed project has to be carried out based on variation in the capital cost, operating cost, sales prices as well as combination where the above three parameters influence the project at a time.

The summarized sensitivity analysis (illustrative) shall be as per following Table:

|                          | IRR (%) | NPV @ 12% WACC (\$ Million) |
|--------------------------|---------|-----------------------------|
| Base Case                | 16      | 79                          |
| Capex +10%               | 14      | 50                          |
| Capex - 10%              | 18      | 107                         |
| Opex +10%                | 14      | 35                          |
| Opex -10%                | 18      | 122                         |
| Sales +10%               | 19      | 153                         |
| Sales -10%               | 12      | 4                           |
| Capex +10%               |         |                             |
| Opex +10%                | 9       | (68)                        |
| Sales -10%               |         |                             |
| Capex +10%,<br>Opex +10% | 16      | 82                          |
| Sales 10%                |         |                             |

Note: Figures in bracket represents negative value

### 7. Risk Assessment and Management

The efficiency of financial analysis rests primarily on proper risk assessment and management. Despite the fact that the participation of SMEs in industry is growing, many of them are still facing problems in allocating limited resources, assessing risk and strategic planning - financially or non-financially. It is important to emphasize risk assessment in managerial activities. Firms manage risks for various reasons. Risks may be due to Higher input cost for production in the future, Falling short of earnings, Market volatility with respect to demand, Increase in competition and Other macro and

micro economic conditions. Identification of risks for a particular investment decision has to be carried out. Risk of operational hazard, Input and output risk (the raw material cost and revenue), Technical risk (due to obsolesce of technology with regard to process and production), Financial risks in terms of debt and borrowing cost, interest rates and currency exchange and Legal, taxation, environmental and other government regulations are the Main risks identified in a project. Based on the above risks identified, several precautionary steps to overcome risks have been identified and established. The options are

- a) Option to defer: The projected net cash flows will remain static but the cost of investment will increase. Purpose of Deferral is to deal with extreme fluctuation price in input and output prices and wait until uncertainty becomes plain in view, to hold investment so that information on latest environmental concerns/issues is evident, to plan for better tax planning so that able to benefit from tax incentives or to reduce tax rate imposed on heavy/hazardous activities and to provide an opportunity by performing stage-investment strategy.
- b) Option to cancel during construction: With this option, construction can be cancelled at any time without any penalty. The firm might earn any invested amount, being discounted at the adjusted-risk rate. Once cancelled, the project cannot be deferred, expanded or abandoned. Purpose of Cancellation is to obtain financial flexibility in the case that investment cost increase higher than perceived, to avoid extra legal and taxation cost if hazardous accidents happen during construction and to avoid further losses if demand is not competitive.
- c) Option to expand: The firm has the opportunity to increase without being penalized. The expansion activity includes improvement in process innovation, up-to-date hazard prevention equipment and upkeep with technical advancement. Purpose of Expansion is to equipped plant with better technology to prevent hazardous risk and technical risk of obsolesces, resulting in better production process and quality and To keep up with increase in demand without violating environmental law and avoid penalty.
- d) Option to abandon: At any time the project can be abandoned for alternative use and enjoy a salvage value. Purpose of Abandonment is to stop production and enjoy salvage value if output prices fall beyond profitable rate and to cease operation if legal suit leads to further losses or bankruptcy.

The next step is to value risks which have been incorporated into options and integrate it into evaluation of project investment. The options are valued individually and collectively. The results of valuation are then compared.

### 8. Conclusion

With the capability of real options valuing investment, evaluating it with all captured uncertainty complete with providing flexibility, it is possible to integrate risk management in strategic investment. Risk and flexibility are translated by providing opportunity for managers to defer, cancel, expand and abandon investment. It is important to for managers to understand that by deferring commitment under uncertainty can help firms to avoid losses and enhance firms' value.

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