Chapter 3 - Determining Project Feasibility

3.1 - Project Feasibility

From the lenders point of view, a project is feasible for financing if it is financially and technically viable, with all its risks sufficiently mitigated or at acceptable level. Therefore, during the evaluation process, lenders will assess all the risks involved in the project to determine whether they are in a position to assume the risks. This practice will be analysed in greater detail in the next section of this chapter. Financial viability, on the other hand, is determined on the basis of cash flow projections. The practice of financial analysis will be covered in Chapter 3.4 below.

Lenders' concern with technical feasibility is actually the concern with the project's *completion risk* (or sometimes called *construction risk*) and performance risk (or *technology risk*), which is basically, the risk of the project being completed successfully and in time so that it operates to full capacity and specifications originally envisaged. For example, in financing an IPP project lenders assume the risk of the power plant (whether it is diesel-fuelled, gas-fired or a hydroelectric-

dam) being completed in time and able to generate the required amount of electricity according to its capacity. Accordingly, for a project which involves more sophisticated technology, its completion risk is much greater. Suffice to say, lenders prefer tried and tested technology.

To determine technical feasibility, lenders rely on feasibility study made by independent expert such as civil engineers, electrical engineers, mining engineers or other consultants. These experts play an important role. For example, in the case of an IPP project, the experts will scrutinise the design and operating mechanism: a combined-cycled gas-turbine plant (e.g. YTL Power) obviously requires more attention compare to the simpler medium speed diesel generators (e.g. ARL Tenaga). They will also consider the availability of transmission infrastructure and grid capacity, as well as assess the fuel supply and consumption proposals. There will also be a review of the start-up test and completion criteria. In the case of a highway or a light rail transit project, the experts will focus on the design and construction schedules, review the feeder infrastructure and traffic flow forecasts. It is interesting to note that most banks hire in-house technical experts, usually engineers, as project analysts to protect the lenders' interests. Despite this however, lenders still want independent experts involved in the evaluation and monitoring of the project.

3.2 - Project risks analysis

When asked about project risks, the common reply from the bankers is that they do not want the project they financed failed. Thus, project risks is really concerning the possible causes that can brought about the failure of a project. Some of the causes which concern the bankers are:

- capital cost overrun
- technical failure
- raw materials price increase or shortages of supply
- poor management
- delay in completion
- financial failure on the part of contractor
- obsolescence of the project
- casualty losses
- loss of competitiveness or market, and many others

Therefore it is imperative that all risks be properly considered, monitored and avoided throughout the life of the project. Thus the objective of project risks analysis undertaken by lenders is to assess all risks involved in the project and

determine whether they are in a position to assume the risks before extending financing. The risks analysis process involves the following tasks:

- identifying all risks present in a project
- assessing the level of the risks
- determining whether there are any mitigating factors to reduce the risks
- determining whether the risks can be shifted or allocated to parties capable of assuming the risks (including the lenders themselves)

From the cases analysed in this study, it is observed that the risks of all projects are not assessed in a same manner. Some projects risks are analysed according to category while some are analysed according to the phases of the project, namely, risks at construction phase (or pre-completion phase); at operating phase (or post-completion phase) etc. Broadly speaking, the risks can be divided into six main categories outlined in figure 3.2A below.

It is also observed that lenders do not quantify the risks in numerical value. Rather the risks are assessed subjectively or descriptively using indicators such as "low", "medium" or "high" to denote the risks level. Even for financial risks (e.g. risk of inflation or foreign exchange), there is no quantification at this stage of analysis. If such risks are present in the project, usually they will be further treated in the financial analysis stage (e.g. sensitivity analysis).

Figure 3.2A

Risks Categories	Examples of risks
INDUSTRY RISKS	Competition
	Market / Product
	Supply
SPONSOR RISKS	
PROJECT SPECIFIC RISKS	Technology
	Construction
	Operation and management
FINANCIAL OR ECONOMIC RISKS	Inflation
	Foreign exchange
	Interest rate and Price
Environmental risks	
Force Majeure risks	

Analysis of the data collected concludes that lenders tend to place more emphasis on industry risks, project specific risks and financial risks, in their evaluation of the project risks. These three risk categories will be examined below.

However this does not mean that the other risk categories are ignored by the lenders. The financial strength and reputation of the sponsor or sponsors will be assessed to determine sponsor risk, for example, through a credit review (financial ratio analysis). With regards to environmental risk, lenders will consider the physical impact of the project on the environment and compliance by the project company with environmental regulations. Force majeure risks are risks from events beyond the control of all parties, so-called "act of God". Lenders

objective will be to shift the risks to other parties through contractual terms or insurance, if possible. Otherwise, lenders will have to assume such risks.

Industry risks

From the cases or projects analysed in this study, it is noted that lenders will review the industry risks relevant to the project as follows:

(1) Competition risk - the level of competitiveness in the industry is assessed by looking at the following forces: whether there is threat of new entrants, whether the product can be easily substituted, suppliers power and buyers power;

(2) Market risk - the marketability of the product, whether there is ample market or market is "guaranteed" viz. existence of offtake agreements such as take-or-pay / take-and-pay contracts e.g. Power Purchase Agreement;

(3) Supply risk - the supply of raw materials for the project in terms of availability, quantity and quality; whether there is any long term supply contracts.

Project specific risks

Assessment of the project specific risks is actually the analysis of the project technical feasibility as discussed in Chapter 3.1 above. The main project specific risks identified are technology risk, construction or completion risks, performance and operation risk. All the risks are related in the sense that the technology used will affect the construction or completion as well as the performance or operation of the project. As stated earlier, lenders prefer tried and tested technology. Appropriateness of the technology is also considered.

Construction risk is assessed by looking at the capability, track record and financial profile of the contractor. The existence of backlog contracts held by the contractor for other projects is also a factor to consider. Mitigating factor could be found, for example, in the form of contractual commitments such as payment of liquidated damages in the even of delay in completion. Better still if sponsors undertake to provide additional funds in the event of cost overrun due to delay in completion. Note that not only the project need to be completed in time, it is required to operate to the capacity and specifications originally envisaged. It is common that the contractor provide a contractual commitment to compensate the project company in the event the project constructed failed to perform to capacity expected (a performance guarantee essentially).

Once the project is completed, lenders become dependent on the continued and uninterrupted operation of the project and the sale of its products to provide revenues to repay the loan. Lenders need to assess capability, the proven track record or technical expertise of the operator appointed. Whether there is any contractual commitment on the part of the contractor to provide technical support and service after completion of construction is an important factor to consider.

Financial risks

Financial risks include risks associated with inflation, foreign exchange, interest rates and price (of product and raw materials). Most of the time inflation risk is present as projects financed are of considerable duration. Costs of construction and operations are affected by inflation. Therefore an appropriate inflation factor should be included in preparing the cash flow projections the basis of which the lenders will determine the financial viability of the project.

Foreign exchange risk will not be present if capital expenditures, operating expenses, revenues and borrowings are all in Malaysian Ringgit. Otherwise lenders may have to assume such risk or recommend some measures to hedge the risk.

By structuring a loan based on floating interest rates will protect the lenders in long term financing. However, the borrower may require some portion of fixed

rate loan so that interest rate risk can be partially managed. In any even realistic interest rates assumptions need to be included in projections forecast so as to ensure that future debt service requirements can be met.

Lenders are subjected to price risk of products and raw materials if there are no long term contracts entered into by the project company. They must appraise the future market for the products produced by the project and the raw materials required. The price(s) to be used in the financial projections must be appropriate and realistic. Even if there are long term contracts, the pricing mechanism in the contract must be scrutinised, for example, a fuel supply agreement for a power project usually peg the fuel price to a relative market spot rate, thus allowing price escalation. However, it is also common that such price increase be passed through to the power purchaser via the power purchase agreement.

3.3 - Risks analysis - a case example

As an illustration, the writer will present briefly the results of the risks analysis undertaken by the financial arranger in the 1303MW power project in Lumut. The parties and contractual structure of the project has been illustrated earlier (refer to Figure 2.3B of Chapter 2.3 above). Other relevant project details are summarised below:

Technology	Combined-cycle gas turbine
Configuration	2 blocks of 651.5MW
Transmission line	90 km of 275 kV to be built
Project cost	RM4.05 billion
Debt financing	RM3.0 billion
Completion period	Block 1 - 28 months
	Block 2 - 39 months
Plant location	80-acre site at Lumut, Perak overlooking the Straits of Melaka

The risk analysis undertaken includes tasks of identifying and assessing all risks present in the project, and determining whether there are mitigating factors. The sources of information to accomplish these tasks includes the various project contracts or documents, engineers' or other consultants' reports, financial statements and also (through several discussions held) direct information from parties involved in the project.

The results of the risks analysis undertaken is presented in a risk-responsibility matrix summarised below. The first column contains risks identified in the project. At this juncture no conclusion is made as to the amount of each risk. The fact that such risk is present warrants it to be mentioned. Each risk is then assessed by identifying who is responsible to assume it, i.e. represented by the second column. The third column contains the mitigating factors or the assessment for each risk. Having assessed all the risks, a conclusion will be made regarding the project overall risk profile (such conclusion may single out a particular risk as the overriding factor).

Risk-Responsibility Matrix

Risk	Party	Mitigation
Market risk		
Price risk	SEV and TNB	Tariff is fixed for 21 years.
Demand risk	SEV and TNB	The facility is despatchable and TNB must pay Capacity Payments based on Dependable Capacity declared by SEV.
Construction and completion risk		
Technical capacity	EPC Contractor	Mitigated by EPC Contract.
Financial capacity	ABB Switzerland	Acceptable to Lenders.
Construction capacity	EPC Contractor	Mitigated by EPC Contract and insurance.
Cost overruns, budget, variation orders	EPC Contractor SEV	EPC Contract at fixed price. Minimised by Technical Services Agreement.

Risk	Party	Mitigation
Construction delay	EPC Contractor	Mitigated by EPC Contract liquidated damages. Loss and damage covered by insurance.
275kV line wayleave	SEV and TNB	93% of wayleaves secured. TNB provide Letter of Undertaking.
Performance at completion	EPC Contractor	Mitigated by EPC Contract with regards to Heat Rate and Capacity Liquidated Damages.
Design risk	EPC Contractor	Mitigated be EPC Contract, detailed Technical Services Agreement and liquidated damages.
Technology risk	ABB Group	Using proven technology.
Quality of works	EPC Contractor	Mitigated by EPC Contract, Power Purchase Agreement (PPA) and detailed Technical Services Agreement.
Resources supply risk		
Gas supply risk	SEV and Petronas	Mitigated by Gas Supply Agreement (GSA). Petronas responsible for supply and quality. SEV use best endeavours to take gas.
Water supply risk	SEV	Low risk perceived. Letter of Comfort from water authority.
Auxiliary fuel supply risk	SEV	SEV responsible for sourcing.
Waste disposal risk	EPC Contractor, SEV and TJSB	Obligations under EIA and regulations.
Waste water disposal	EPC Contractor, SEV and TJSB	Obligations under EIA and regulations.
Environmental risk		
Power station site	EPC Contractor, SEV and TJSB	Obligations under EIA and regulations.

Risk	Party	Mitigation
Permits and licences	EPC Contractor, SEV and TJSB	Obligations under EIA and regulations.
Industrial relations risk		
Strikes risk	EPC Contractor and TJSB	EPC Contractor during construction, TJSB during operations.
Force Majeure risk		
EPC Contract PPA GSA	EPC Contractor, SEV, TJSB, TNB and Petronas	Force majeure events are managed by the project agreements and cross referencing between them.
Joint venture risk	The sponsors	Mitigated by Joint Venture Agreement and the project agreements.
Credit risk	Lenders	Mitigated by Financing Agreements and the project agreements.
Political risk	All parties	Minimal.
Change in law risk	EPC Contractor and SEV	SEV to bear cost of increases above RM800,000.
Operations and Maintenance risk		
Ability of operator	EPC Contractor TJSB and Black & Veatch Intern. (BVI)	Operation and Maintenance Agreement, technical competency of TJSB and MRCB performance guarantee of RM40 million.
Design for operations	EPC Contractor and SEV	EPC Contract, JBE and TNB's standards.
Ability to operate under TNB's standards	EPC Contractor, TJSB, SEV and BVI	O&M Agreement, PPA and EPC Contract.
Financial / Economic risk		
Interest rate risk	SEV	Partially managed by fixed rate loans.

Risk	Party	Mitigation
Inflation rate risk	SEV and TJSB	O&M costs allow for 4% increase. Fuel price is pass through to TNB.
Foreign exchange risk	SEV and TJSB	Hedging arrangements.
Taxation risk	SEV	SEV liable for increases in corporate rates (which is unlikely or minimal). Other tax increase are passed through to TNB under the PPA, subject to JBE approval.

Having assessed all the risks involved in the project, the financial arranger concludes that the project risks apportionment profile is robust and cohesive. Thus the project overall risks is at satisfactory or acceptable level. The conclusion was arrived at based on several factors including, among others:

(1) the use of proven technology for the project (i.e. the combine cycle gas turbine power plant to be built by Asea Brown Boveri group)

(2) the appointment of experienced organisations in the facilitation of project of this nature

(3) the use of a systematic approach to interface the project agreements with the financing plan to facilitate the allocation of risk between all parties involved in the project

3.4 - Financial analysis

The bankers' concern with financial viability of a project is basically whether sufficient cash will be generated by the project to pay for all operating expenses, taxes, other costs and of course, debt service. And in addition, whether there will be surplus cash to cater for contingencies such as fluctuation in exchange rates, interest rates, inflation and market demand as well as profit for the project company to meet its required return target.

Financial viability is determined on the basis of cash flow projections and using some basic financial analysis tools such as Financial Ratios (Debt Service CoverRatio, Loan Life Cover Ratio etc.), Net Present Value ("NPV") and Internal Rate of Return ("IRR").

There is a consensus of opinion among the bankers interviewed that NPV must be positive and IRR must exceed a certain benchmark before a project can be said to be financially viable. However, almost all bankers agreed that they do not go to the extent of actually calculating the project's required rate of return or cost of capital to be used as the discount rate or hurdle rate. The discount rate used by the bankers to calculate the NPV ranges from 8% to 15%. 53% of the bankers said they use 10% as a standard discount rate (the default rate provided by spreadsheet programmes) . Less than 30% of the bankers would use a flexible

rate between 8% to 15%, representing an estimate of the project's minimum or required return. Majority of the bankers said the IRR computed would be compared to the IRR of previously financed project of similar nature. And all bankers agreed that at the current market conditions IRR should exceed 10% (this rate is base on their own gut-feel).

Before analysis can be made, the project's cash flow must be forecasted or projected first. The project company will hire a financial advisor or rely on its in-house finance personnel to prepare the financial projections (also called financial model). The financial model is prepared based on information from various sources especially from the various project agreements or contracts already concluded or still under negotiation.

The forecast or financial model is constructed based on various assumptions made regarding the project operating variables that have a bearing on the cash inflow (derived from revenue) and cash outflow (i.e. expenses and costs). It is important that the assumptions are realistic to lend credibility to the model. For an IPP project, the existence of some long term contracts namely the power purchase agreement and fuel supply agreement allow for easier and more reliable projections of revenues and expenses. Forecast of revenue for example is based on the pricing formula provided by the power purchase agreement and the operating assumptions (see illustration in Figure 3.4A below). In contrast, the

credibility of a road or highway project's revenue projections relies heavily on the accuracy of the traffic flow forecasts. Forecast of revenue here is based on the toll pricing agreed in the concession agreement and the traffic volume forecast provide by the traffic consultant appointed. Less reliable, relatively, is the forecast of the number of subscribers to a mobile communication network to be launched, in view of various factors of uncertainties such as network quality, market competition, consumer behaviour etc. Forecast of revenue in this case will be based on the projected number of subscribers provided by the market survey or consultant's report.

Therefore, as part of financial analysis, bankers will critically examine the forecasts or more correctly, the assumptions made by the project company or its consultant and will likely to impose some assumptions of their own. Bankers may even make their own independent cash flow projections using a similar method as mentioned in the earlier paragraph. To illustrate, some of the common assumptions made in an IPP project are outlined in Figure 3.4A below :

Figure 3.4A

ASSUMPTIONS	COMMENTS / EXAMPLES
Capacity Factor (CF)	The financial model will not assume full capacity (e.g. 80%).
Dependable Capacity (DC)	A degradation factor will be assumed e.g. 3%. Therefore if power plant capacity is 1303MW, Dependable Capacity is 1264MW.

Net Electrical Output (NEO)	E.g. NEO is equal to the product of 8,760 (total number of hours in a year) the DC and CF.
Heat Rate (HR)	It is also assumed that the HR will degrade over the life of the project e.g. 4.5%.
Availability	Full availability will not be assumed, only a percentage e.g. 87%.
Fuel consumption and expenses	Corresponds to NEO and HR and fuel cost.
Fuel price	An appropriate price will be assumed throughout the project.
Inflation	E.g. 4% per year.
Energy Payment and Capacity Payment	These are payments payable by the purchaser under the PPA, for NEO generated and the availability of the generating capacity (i.e. DC factor) respectively. The PPA will provide the appropriate formulas for calculations.
Operating expenses	Various expenses variables such as staff, insurance, rates, taxes etc.
Financing assumptions	Such as debt/equity ratio, interest rates, term, amortisation, reserves accounts, debt service cover etc.

An example of the projected or forecasted operating cash flow of an IPP project is provided in Appendix D.

The financial model will also contain, among other things, the sources and application of funds for the project, drawdown schedule, amortisation of the loan

facility, and debt coverage. Figure 3.4B provide an example of the sources and application of funds schedule of an IPP project.

Figure 3.4B

Sources of funds	RM'000	% of the total
Senior debt or financing	2,960,000	74.0
Cash flow during construction	299,900	7.5
Subordinated debt	737,000	18.4
Equity	4,000	0.1
TOTAL	**4,000,900**	

Application of funds	RM'000	% of the total
EPC Contract	2,550,000	63.7
Transmission line, water pipe, gas line	181,100	4.5
Spare parts	108,100	2.7
Equipment	7,400	0.2
Engineering and consultants	59,850	1.5
Working capital	60,700	1.5
Insurance	99,200	2.5
Land rates and access road	19,300	0.5
Development expenses and fees	26,550	0.7
Financing fees	91,000	2.3
Legal fees	5,600	0.1
Contingency	170,800	4.3
Interest during construction	621,300	15.5
TOTAL	**4,000,900**	

It must be noted that the initial assumptions made presents the financial model in its base case. In the bankers view, however prudent the assumptions are, a forecast remains a forecast. Remember Murphy's law, "If anything can go wrong, it will". Therefore, a further analysis need to be made to "test the financial model" so to speak. The method widely used by bankers is the Sensitivity Analysis. In the analysis, key variables used in the base case assumptions are

identified and given a more pessimistic estimation to see its effect or consequence on the financial model, that is to say, whether the project financial viability would remain within acceptable margin (base on the same financial indicators used earlier i.e. NPV, IRR, DSCR, LLCR etc.). For illustration, the common key variables tested in IPP projects are as follows:

Figure 3.4C

VARIABLES	COMMENTS
Increase in interest rates	The loan interest rate used in the base case will be increase, say between 1%-3%.
Increase in inflation rate	E.g. increase from 4% to 6%.
Decrease in Availability	E.g. decrease base case Availability Factor of 87% to 84%.
Decrease in Output	Base case already assume degradation of e.g. 3%. Sensitivity may assume output further degrade an additional 2%.
Increase in non-fuel operating expenses	Note that the base case model may already provide for a contingency amount. Despite this, sensitivity may increase the expenses, say by 10%.
Increase in EPC contract price	The sensitivity may assume an increase in the price e.g. of 5% (in addition to the EPC contingency already budgeted)

One drawback to Sensitivity Analysis is that the effect of each variable or sensitivity on the financial model is taken in isolation, that is, they are mutually exclusive of each other despite the fact that they may be interrelated. This

drawback, however, could be resolved by performing a Scenario Analysis, i.e. by combining different set of sensitivities to form different scenarios. However, this method is rarely used by the bankers.

As stated earlier, if the results of the Sensitivity Analysis shows that the financial indicators are still within acceptable margin, the project would be deem to be financially feasible.

3.5 - Conclusion

The project finance skills of the local bankers are derived from the experience of concluding one project after another. There are intensive courses, but mostly conducted by foreign bodies and they are usually quite costly. Throughout the course of this study, it is observed that the majority of the project parties comprise foreign establishments from financial advisers, engineers and other independent consultants (such as traffic, insurance etc.) to lawyers. This is primarily due to the fact that project financing is a relatively recent phenomena in this country and therefore the technical expertise and knowledge of the foreign firms are required. It is hope that as the field of project finance matures further, local firms could have more participation. Local solicitors' firm are already very much in the picture having participated in many deals and learning from their foreign counterparts. Likewise, local financial institutions should move towards having more financial advisory positions rather than just being arrangers or lenders. Strategic alliances with foreign firms would benefit the local institutions, especially in view of the potential provided by the economic development in the Asian region.

Finally, as mentioned in the introductory chapter, the scope of this study is limited in view of the availability of data. It is recommended that future researches on this area of finance be extended to cover more aspects such as the financing

structures, project and security documentation etc. to provide a more comprehensive scope of project finance practice in Malaysia. Perhaps a comparative study could be made with other region (e.g. Asean countries) or a more established region e.g. the United States.