

incorporating uncertainties.

Presently after the least cost plan is obtained, a production simulation run is performed to look at impact of fuel cost, operations and maintenance cost. This method is fruitful in highlighting long term results for the nation. However it is proposed that an in depth study is necessary to produce current results for decision makers.

impact assessment, social impact and even obtain good publicity and media coverage to indicate public acceptance on a particular project undertaken.

Hence it can be concluded that TNB can adequately assess this aspect when making decision.

Demand for high capital - Capital intensiveness

For TNB to be prepared on this challenge, it will depend on two factors, firstly the attractiveness or un-attractiveness of the project undertaken, in terms of financial return and secondly the input for analysis and most likely the data used are realistic. As mentioned above even a good operations practice may not save the situation on a bad decision on investment largely because the capital cost is a high fraction of the total cost. Because of this TNB have to avoid cases of cost overruns in projects, projects completed on schedule to ensure revenue generating as soon as possible and most of all the financial viability studies data have a high level of confidence. Malaysia is lucky at the moment for not having a nuclear plant as an option. This is because nuclear plants requires a higher order of capital as compared to thermal plants. However today, Malaysia is facing the impact of Bakun hydro project where TNB is closely involved. In this case, to protect the interest of TNB input on the technical feasibility and viability must match the financial viability. Because of the high degree of the capital the success factor of Bakun

project is important to meet the target cost, i.e. cost overruns will have tremendous additional cost from the point of view of an investor and power purchaser. TNB who is also a customer to this project must realise the price of purchasing power from this project is retrievable from the ultimate customers who are the consumers and nation as a whole. Because of the capital intensiveness also, TNB have to ensure that the amount invested will in fact meet the technical criteria of the project. There is no use putting a billion ringgit or ten billion on a project if it has high degree of technical uncertainty, such as using a prototype turbines or rate of environment emissions.

Another conclusion from capital intensive is the affordability of the technology. What is the threshold that consumer can accept? Quality, reliability, clean technology and clean environment are all subjected to cost.

Public scrutiny

Because of the regulated nature of this industry in Malaysia and elsewhere the decision has to be logical and universally accepted. An example is when TNB proposes a coal fired power plant. This decision will be subjected to approval from many authorities before it obtains the green light largely because of the environment factors, perception of the public on fuel type used, queries on alternative fuels and is the cheapest cost to the utility a cheapest cost for the public. Controversials have to be avoided or else it will be reviewed

over again and open up chances of reversed decision. Hence TNB have to consider mostly moral and ethical issues in the decision making.

Difficulty to Change decisions made

Because of the difficulty to change a decision made, TNB have to defend and clear itself for unfavourable eventualities. For example if the coal plant in Kapar power station is ordered to close by regulators because of the investigation on emissions. Hence the energy generated by this cheaper operating cost plant has to be replaced by a more expensive unit in the system. TNB have to firstly, when deciding on the project have taken this event in consideration and would have prepared having unquestionable emission control measures to meet the regulators standard. Secondly to continuously be aware and sensitive to the changes made by the regulators. This can be achieved by having adequate representation in the decision making process of the regulators. Hence rules three and four on long term consequences and public review have to be fully addressed by the planners.

Public service obligation

With this obligation TNB have a dual role as mentioned earlier. To meet the nation interest and also shareholders interest. Because the capacity

addition is a competitive market today, TNB can play the role of meeting the shareholders interest as much as the public. Hence if TNB can make a capacity addition project attractive to the company, then it should make the best of the opportunity of realising the project. However in terms of delivery of power to the public, TNB today is maintaining the monopoly and therefore have obligations of providing the services to the public.

It would be of interest that there is a limit to cost in meeting obligations. Anything above the obligation will be added service to the customers. TNB and the regulators in this respect have to agree and provide guidelines in differentiating the obligated service and added service if there is none yet. The customer charter launched not long ago is a start on the service promised to the customers. TNB could also consider segmentation of the customers and the corresponding obligations to go with. This would certainly provide clear guidelines and categorisation to serve the customers at best.

Unequal risk-reward

This can be demonstrated in cost increase for a project. The risk then lies with the investors of the project, but the customers will not know this because customers do not have to bear the additional cost. Another example is the under performance of machineries. Malaysians may be so happy to have a large reserve margin on the generating end. This is considered as a reward to the customers but at the risk of TNB having to keep idle capacity. To

understand risk-reward and investigate the degree of these to TNB, the impact of uncertainties to the stakeholder have to be reviewed when deciding the capacity plan. For example if there is excess capacity when adding a certain capacity, are there chances of selling the capacity across the national borders of the country. All stakeholder may be rewarded by this business decision but the mechanism must be emplaced to support this transaction. It is a win-win situation because on top of the nation having adequate reserve margin, the utility (TNB) can also extend sales to neighbouring countries at an agreed level. On the other hand TNB can choose to provide only a certain percentage of the imposed reserve margin based on TNB's installed capacity since the capacity to the nation is an open market.

From the above discussions it can be concluded that to meet the challenges in capacity planning, a rational decision between business interest and ethics have their own role to meet the stockholders and stakeholder requirement. Although this challenges are well realised a long time ago, but efforts towards handling this situations were not explicitly discussed. One suggestion for further study is the framework of focusing the issues and determining the role, responsibilities of the various stakeholder and relationship with the Government/Regulator.

In addition the least cost plan model is adequate to meet regulators requirement on capacity planning for the country in the medium to long term, defined from 5 to 15 years ahead. However, for a company as TNB, decision

on capacity planning have to conform to business objectives of investing in a project which is worth more in the future than what it cost today. Hence the net present value of each project is one of the indicators in deciding whether to undertake a project or otherwise. Naturally this is dependent on Government policy and regulation. An example of this is the selection of a peaking plant¹, is influenced by the commitment of the Government to have a hydro power station which is capital intensive but low operating cost, and a gas turbine which is low in capital but high in operating cost. Although the project is capital intensive with associated risks, but because of Government four fuel policy and to develop hydro units as an alternative to other power station, than the project is implemented.

The static analysis on benefit-cost ratio and internal rate of return showed that any variation in discount rate and capacity factor of the unit have impact to the economic viability of the project. The analysis can also be performed with variation of fuel cost. In this case coal prices are relatively stable. However oil and gas projects may indicate fluctuation in fuel prices. This form of analysis can indicate quickly to the decision makers impact of some changes to the parameters in the project. However, there are shortfalls. One of it is that financial charges to loans are not fully represented. The method of financing, impact of local and foreign currencies contribution and taxes are not incorporated. This can be reflected in a financial model

¹ Peaking plants are plants with capacity factor of about 25%.

CHAPTER 5

CONCLUSIONS

From the analysis of the challenges in utility planning the significant to TNB will be discussed and concluded.

Long term decision

Because of the long term decision, TNB can process this information through the least cost planning model or other available dynamic programming model to indicate the long term impact of the expansion plan. This is possible because solutions from this simulation can provide information on the cost incurred by the nation and elaborate cost analysis is possible for TNB planners to appreciate the economics of implementing the expansion plans or otherwise. In addition this economic analysis can be further investigated for financial viability even if not proven economically viable in the simulation.

Looking at the four rules for the decision making, TNB can evaluate the effect of the decision on the nation as a whole who are the customers, the investors and owners. The benefit or penalty of the long lived decision can also be simulated by sensitivity case as long term consequences. However for public review TNB have to perform an external check such as the environmental