Chapter 9

RISK MANAGEMENT - NEW BUSINESS STRATEGIES FOR DEREGULATED ELECTRICITY MARKET

9.1 Overview

Deregulation process in Asia's power industry is taking place fast following the move towards more competitive electricity and gas markets. These competitive markets provide opportunities for further growth in the region, but also introduce new threats in the form of risk and competition from new entrants.

In a conventional regulated environment, risks are transferred to customers. But in the new deregulated market, the companies themselves have to take the risks. In order to survive and success in this changing market, Asian companies must develop new business strategies. To develop new strategies, good understanding in electricity trading, power exchanges and derivative products is vital.[58]

9.2 Derivative and Trading Products

The range of derivatives that can be constructed is very wide, but there are four main categories – futures, options, forwards and swaps.

In a deregulated energy market, the electricity is traded as commodity and therefore its prices are fluctuated in accordance with supply and demand or even in speculation. Energy providers and end users definitely wish to avoid the uncertainty, therefore the primary purpose of derivatives is to minimise buyers

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[58]Richard Mogg (2000), "Deregulated Market and Risk, in Need of Direction," Journal of Asian Power (August), pp17-18

and sellers' exposure to fluctuations in the electricity price. Or in another word, the derivatives provide these financial market participants with a tool to manage (i.e. hedge) the price risk.

Professional traders, known as speculators who endeavour make profits by correctly anticipating price changes may use derivatives. Their role is crucial to the operation of the market as they allow risk to be transferred from those seeking to avoid it, to those willing to accept it in the hope of making profit.[59] The objectives of derivative products are as follows:

- Create a better insight of deregulated and liberalised energy markets.
- Learn how to adapt to changing markets, eliminate problems and maximise opportunities
- Learn how to trade in electricity and derivatives
- Learn how to hedge with energy derivatives
- Identify the opportunities in a free market

Before we can discuss further about the risks that may be encountered in a competitive market, it is important to have general understanding of the capacity prices in a competitive market.[60]

9.3 Capacity Prices in a Competitive Market

In deregulated electricity supply market, one-part pricing will supersede the traditional practice of two-part pricing, which was based on long-term power supply contracts that distinguishes between capital and operating costs.

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[59] Gordon Gemmill (1993),"Options pricing an International Perspective," England, McGraw-Hill Book Company, pp220-236

[60] Reproduced from Frank C. Graves, James A Read, Jr.(1997), "Capacity Prices in a Competitive Power Market," London, The Brattle Group & Kluwer Academic Publishers

1. Price per unit of capacity (demand charge) is based on the interest, depreciation and other capital costs
2. Price per unit of energy (commodity charge) is based on the operating costs.

The capacity values of traditional two-part pricing model are determined administratively by the rules. So, it does not inherit the intrinsic characteristics of power supply technologies and economics in competitive aspects of the emerging electric supply industry. It is anticipated that the two-part pricing model will diminish in the electric power industry

For one part pricing, capacity price is based on the market price, not on the book value of investments in generating facilities. Power pool bid prices are real time pricing (RTP), with the rate of capacity depends on the output, efficiency, volatility, and correlation of energy and fuel prices.

When demands grows exceed the generating capacity, bidding for supply will cause the power price rises to a level, which high enough to justify the cost and risk of investments in new capacity. In this circumstance, utilities that enter into long-term supply contract with generators sometimes prove more economical for both parties, rather than rely on pool exchange. However, in a competitive commodity market, power prices volatility is the main factor of risk bearing. Volatility of peak load prices is greater than base load prices because base load prices are relatively predictable as to both demand and supply (marginal cost). Prices differences in different locations due to transmission costs has also to be considered.

9.3.1 Market Value of Capacity as per "Call" Option

Ownership of generating capacity is equivalent to holding a portfolio of call options on energy. A call option is a contract that gives the right to buy a specific asset for a fixed cash price on a predetermined date. The contract date is the "expiration" date and the fixed cash price is referred to the "exercise" or "strike" price. An option is a right, not an obligation, so the holder will exercise an option only of it is profitable to do so, example when the price of that asset exceeds the strike price.

In a competitive market, the generator will operate the plant as long as its marginal costs lower than the market energy price. Electric energy in this analogy is the "underlying asset" and the marginal cost of the plant is the "strike price" of the option. Because of this, capacity will fluctuate over time as expectation of energy prices evolves.

A unit of generating capacity consists of a bundle of call options with serial exercise dates. As an example, a unit of generating capacity, which extend for a period of one year can be partition into twelve periods, each represents one month duration. This is equivalent to a portfolio that consists of twelve call options, one with one month to expiration. The value of the capacity is the sum of option values in the portfolio.

There are three important characteristics of option price when the generating capacity is equivalent to call option of energy.

1. The higher the price of the underlying asset, the higher the value of a call options, other things being equal.
2. The higher the strikes price of the option, the lower the value of a call option, other things being equal.
3. The higher the volatility of the price of the underlying asset, the greater the value of an option, other things being equal. This is because the holder need not exercise an option. Thus, more volatility is always better than less from the perspective of an option holder. Option prices are non-decreasing in the volatility of the underlying asset.

Not only the price of energy volatile, but also the plant's operating costs. Fuel is the most volatile component and largest component of marginal costs. Of course, there are non-fuel components in marginal cost also.

- The value of capacity will increase when price for future delivery of energy increase;
- The value of capacity will decrease when price for future delivery of fuel increase;
- The value of capacity will increase when the volatilities of prices for future delivery of energy or fuel increase; and
- The value of capacity will decrease when the correlation of energy and fuel prices increases.

The value of capacity varies depending on the delivery period and the remaining time to delivery, whereas each delivery period is corresponding to each type of fuel and heat rate. With reference to the analogy for the underlying asset, it is clearly a "forward " value, not "spot" value. "Forward" is the price established in advance for delivery on a specific future date whereas the spot price is the price for immediate delivery, therefore the forward prices and it's volatility and correlation are relevant to the capacity pricing.

The market value of generating capacity with reference to a range of prices and price volatilities of energy and fuel is shown as the formula below:[61]

$$\mathbf{C_t = Max\ (\ 0,\ (\ P_t^E - hP_t^F\ ))}$$

Symbols:

C_t = cash flow of a unit of capacity return (eg. kilowatt)

P^E = spot price of energy

P^F = spot price of fuel

h = heat rate of generating capacity (constant)

[61] Extract from Black, Fischer (1976), "The Pricing of Commodity Contracts," Journal of Financial Economic 3 (January), pg 167-169

Note: The decision to operate or let it idle depends on the relationship between the prices of energy and fuel. The behaviour of energy and fuel prices is shown as below;

1. The underlying asset is log-normal random walks with constant trend and volatility parameters as assumption below:

- Prices is not zero
- Price changes are proportional
- Price increase is uncertain with the length of the time

2. Term structure of interest rate is flat.
3. Spot price and forward price for all relevant delivery dates are perfectly correlated.
4. Forward prices for delivery of energy at the relevant future dates are equal to current spot prices. The forward curve is flat.

The following figures shows the relationship between the market value of capacity and the level of volatility and correlation of the underlying forward commodity prices upon time horizon.[62]

[62] Extracted from Frank C. Graves, James A Read, Jr. (1997), "Capacity Prices in a Competitive Power Market," London, The Brattle Group and Kluwer Academic Publishers, Figure 2 –9.

Figure 9.1 shows the probability distribution of a log-normal price process with constant trend and volatility rates successive longer time horizons (1, 2 and 5 year horizon)

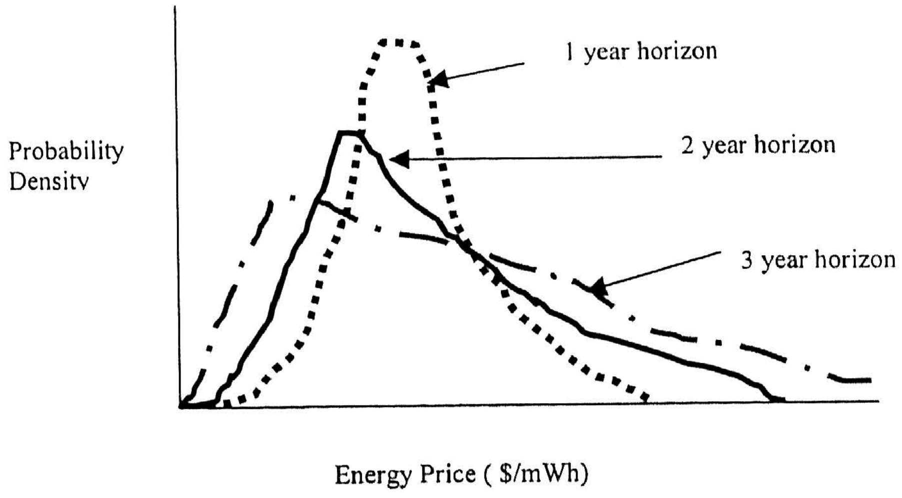

Figure 9.1: Price Distribution for 1, 2 and 5 years Horizon

Figure 9.2 shows the forecast energy value with a tolerance of one standard deviation confidence interval for the spot price over a period of delivery. Black-Scholes option pricing model can be used to compute capacity values, but in the reality, the behaviour of energy and fuel prices is much more complex.

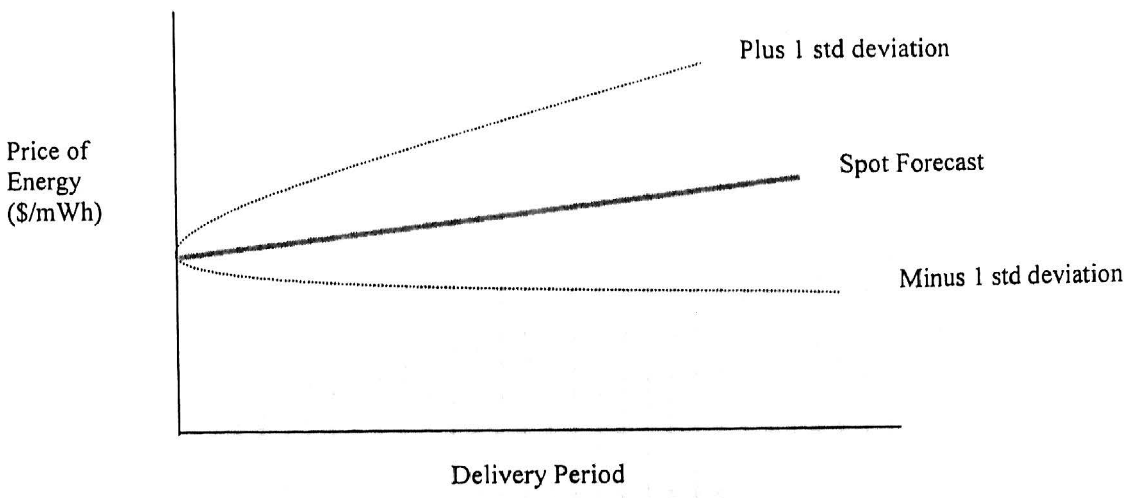

Figure 9.2: A Hypothetical Price Forecast

Figure 9.3 shows the value of capacity is an increasing function of the price of energy and the duration of the delivery period. (Price of fuel is in terms of megawatt-hour equivalents). Because the generator has the right to produce energy, not obligation, therefore even when the price of energy is less than the cost of fuel, the capacity still has value.

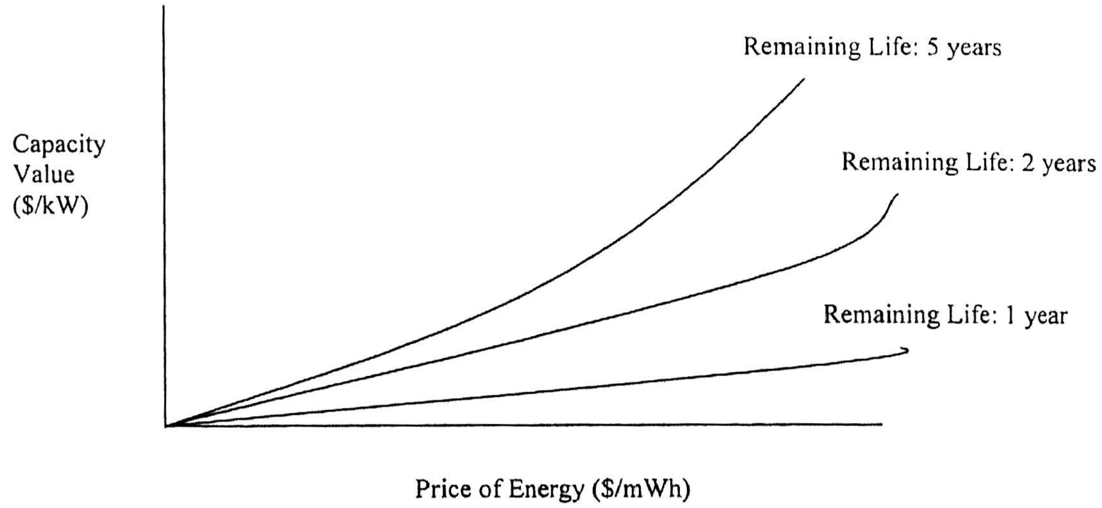

Figure 9.3: Capacity Value versus Remaining Life

Figure 4 shows the value of capacity with a remaining life of one year as a function of the price energy and several alternative fuel prices. The value of generating capacity and heat rate is different for the different type of resources used, such as natural gas or coal. The higher the fuel price, the lower the capacities value.

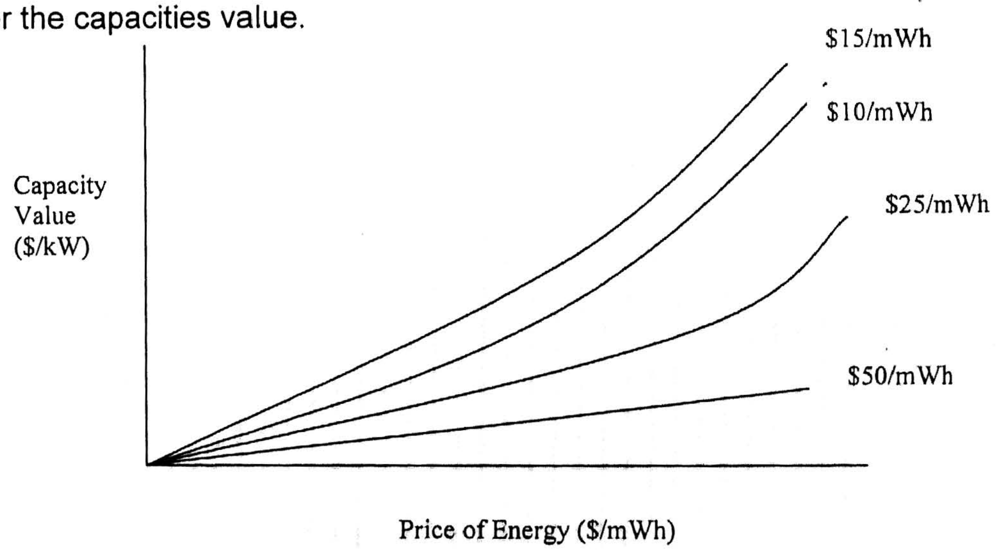

Figure 9.4: Capacity Value versus Fuel Price

Figure 9.5 shows the value of capacity is an increasing function of the volatility of both energy prices and fuel prices. The higher the volatility, the higher the capacity values. The volatility on capacity is least significant when energy price is far higher that the fuel prices.

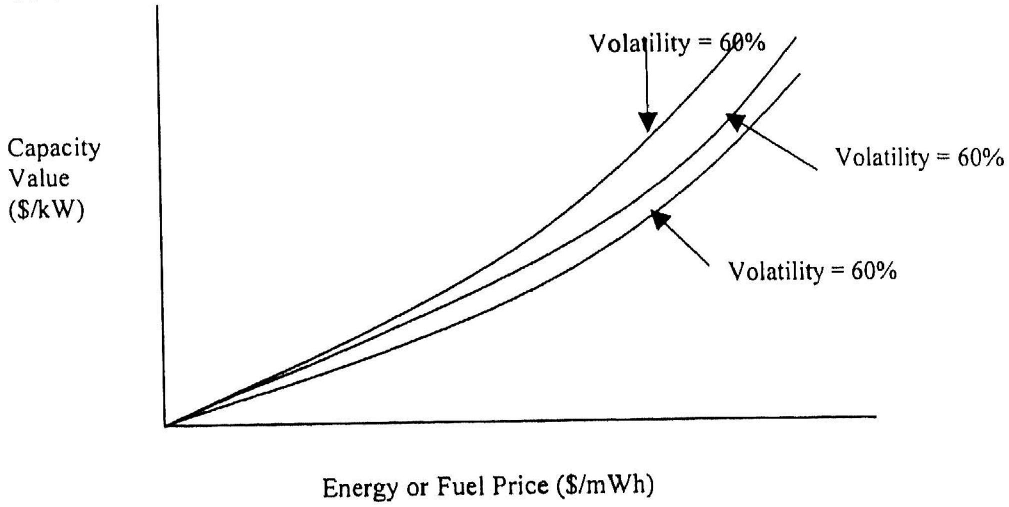

Figure 9.5: Capacity Value versus Energy or Fuel Price

Figure 9.6 shows the correlation of energy and fuel price has an important bearing on capacity value. The higher the correlation, the lower the capacities value. When energy prices are correlated with fuel prices, the changes in energy prices will offset the fuel prices and thus reduces the price volatility on capacity values.

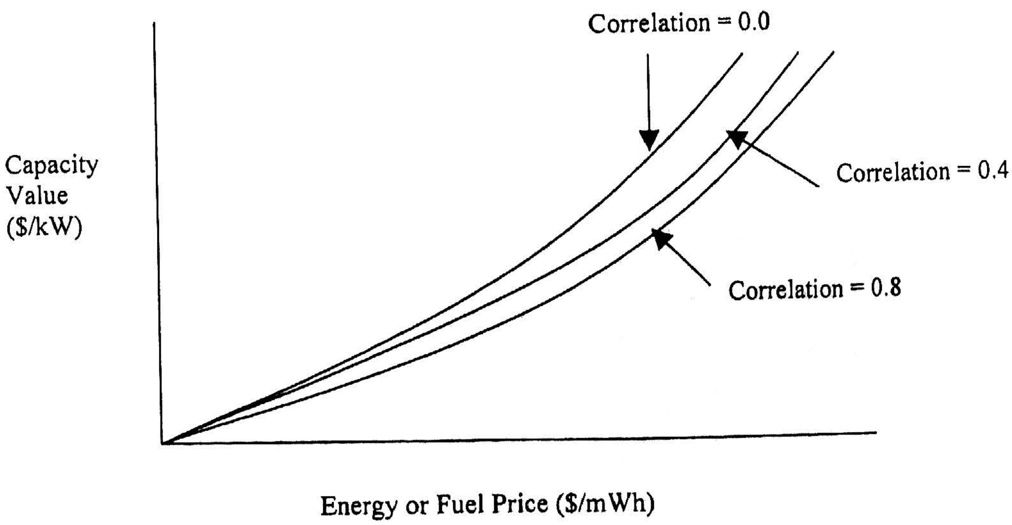

Figure 9.6 : Capacity Value versus Correlation of Energy and Fuel Prices

Figure 9.7 shows the volatility of capacity values as a function of the price of energy. Assume that both energy and fuel prices have volatility of 40% per annum and a correlation coefficient of 0.5, the volatility of capacity values will be much greater when energy prices are lower than energy prices. This indicates that generating capacity with higher fuel prices or higher generating cost results in greater volatility of capacity values.

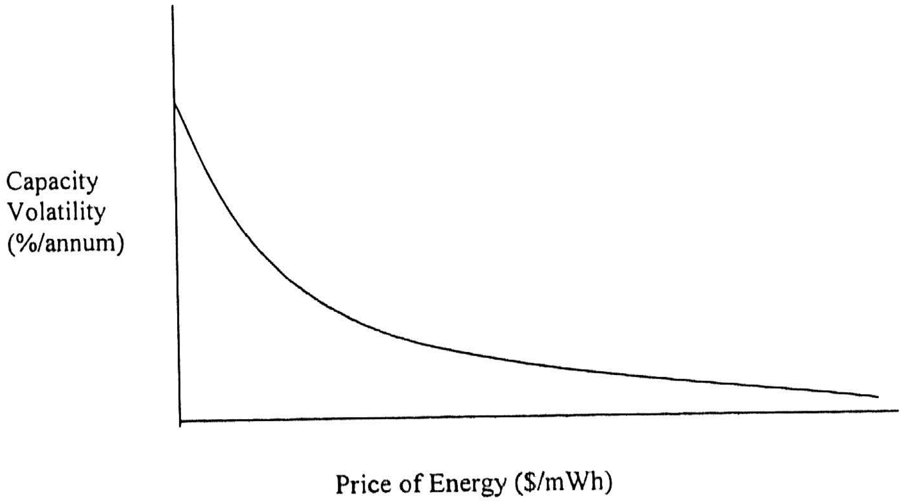

Figure 9.7 : Volatility of Capacity Values

9.3.2 Summary

Consumers of electric power wish to manage their risk exposure. For consumers with constant loads, they can manage their risks by entering into forward contracts at fixed or indexed prices. However, for consumers with random loads, can manage their risk by acquiring options on energy whereas the capacity price, is the premium that customers pay to acquire options on energy.

9.4 Risk Management and Competitive Advantage in Open Power Markets

9.4.1 Introduction

Competition has changed both generation and retail sales' traditional monopoly structures. In the past, the consumers bear the total costs of their utilities, but now suppliers or generators in open market compete fiercely for customers and eventually leads to decrease in electricity prices. In UK, Germany and Australia, large industry customers were managed to reduce their electricity prices up to 30% in the first 18 months after the market opened. However, in the nascent wholesale market that comprising generators, traders and distributors, are experiencing high price volatility such as the California power market has seen its wholesales electricity prices peaking up more than 10 times the normal average price.

Electricity utilities in deregulated and open power markets are facing two critical challenges. One is their profitability has been threatened in increasing competitive market, and another is to meet investors' expectation for higher return due to increased market risk in the perception of decreasing retail profitability and increased wholesale market risks. This has caused the investors to review their risk assessment and valuation of utilities. For the past three years, credit rating of many large utilities has been downgraded and also decreased of their market to book ratios by 25%.

Besides all risks and challenges as mentioned, utilities are still opened to many great opportunities in open power markets. Two modern risk management skills, "Risk Based Valuation" and "Risk Capital Management" if apply properly, it will significantly improves electricity utilities' performance. Risk based valuation helps to seize business opportunities through superior valuation while using risk capital management can actively optimise risk capital needs and returns.[63]

9.4.2 Risk Based Valuation

Risk based valuation (RBV) was derived from the insight that different methods used under stable conditions can be redesigned to value business opportunities in a highly volatile market. In an open market, it is not enough to determine the value of a power contract, power plant or electricity prices by just an expectation, however it shall be determined by the future prices, fluctuation around expected prices and volumes and the right or ability to adapt deliveries or withdrawals to such fluctuation.

RBV assigns a value for the ability to respond to unforeseen fluctuations, which is referred to the operational flexibility of power plants, the optionalities in contracts or the possibility of active load management of a customer base. Utilities such as PowerGen in UK and Reliant Energy in Texas, have used RBV to improve their generation strategy. PowerGen made a significant investment in its coal-fire power plants so that able to react flexibly to unexpected price fluctuations. Reliant Energy acquired flexible peak load generating capacity from Southern California Edison, and this made Reliant Energy able to identify a higher option value than the other bidders.

Competing in open market can easily results in price war. As an example, in offering pure bulk energy (fixed quantity, fixed forward prices), suppliers will compete on price. If in a market of over capacity, this leads to major price-cutting. From here, utilities can create value by using "value at risk" method to determine risk capital needs, then incorporate risk transfers in the contract structure and varying value attached to flexibility between suppliers and customers.

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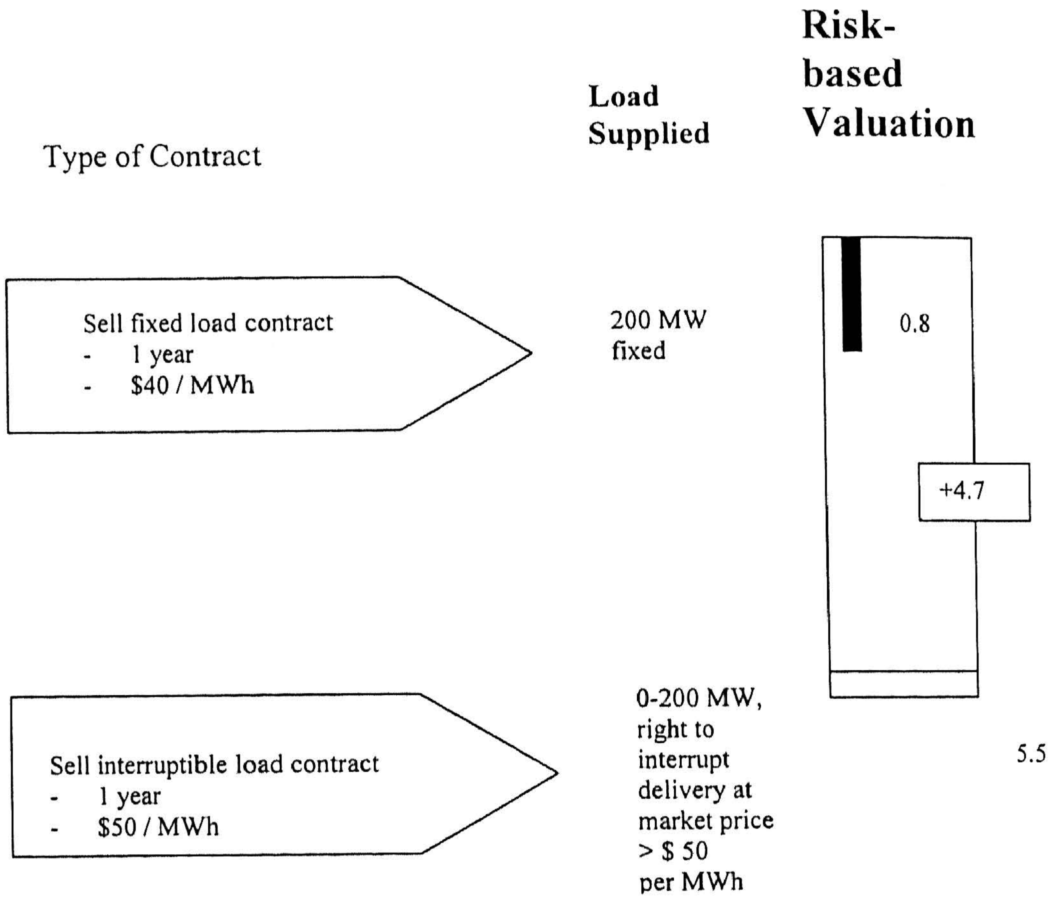
[63] Thomas Paulsen, Helga, Axel, Ueli, Carlos and Iosif (2001)," Competitive Advantage in Open Power Markets," Journal of Energy Power Risk Management (February), pp 35-38

Figure 9.8 shows how utilities could capture value by introducing the right to interrupt delivery at market price above $50/MWh compare to one year fixed load supply contract at $40/MWh.



Source: McKinsey Consultants

Figure 9.8: Capturing Value by Introducing the Right to Interrupt Delivery

Flexibility in supply will earn utility or supplier better profit. For instance, Southern Steel plant in Prai needs very high demand when its arc furnace starts its melting process. The utility needs to cover the rapid increase in load by starting its most high cost peaking plant. If flexibility is available in supply contract, then Southern Steel plant could inform utility of its melting operation earlier and utility could then start up its much cheaper coal-fired plants although it takes longer time, about 30 minutes notice to ramp up the plant.

If utility offers the steel plant a fixed fee in exchange for giving 60 minutes notice of igniting its furnace, this is a good opportunity and win-win situation for both parties as the utility reduces steel plant's energy costs while giving he utility enough flexibility to increase earnings. Utility increases earning by shifting production from natural gas-fired plant to a coal-fired plant to meet the load, which marginal cost of coal-fired plant is five times cheaper than natural gas-fired peaking plant. Although coal-fired plant is cheaper, but it is necessary to have natural gas-fired too in its portfolio as diversification, which will discuss later. The natural-gas plant can be available for some real option opportunities, such as taking advantage of fuel or power price spikes.

9.4.3 Risk Capital Management

The objective of risk capital management is to adjust the need for risk capital to the business strategy and also to monitor the availability risk capital of a utility. To meet investors' expectation in its economic viability, utilities' credit rating, that is total risk capital needs shall not exceed its availability risk capital. But it is not easy to estimate precisely the availability of risk capital as it is determined based on all on and off balance sheet positions valued at market values. But markets do not provide future values, so in order to determine the market value, the expected price development model is used and thus the estimated available risk capital may differ significantly from the book capital.

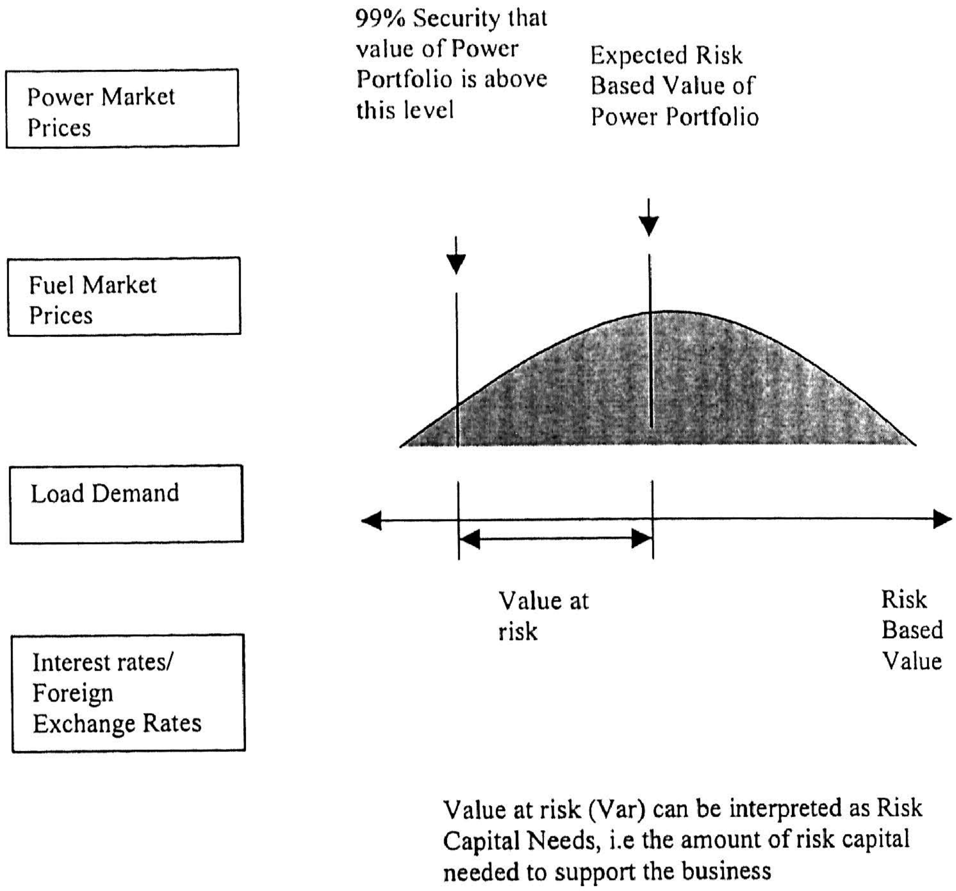
To minimise the market risks, utilities must understand and quantify their risk capital needs for all energy market activities and total energy portfolio. They must also take into account the risks of all positions, short and long-term, from generation, trading and sales.

As shown in Figure 9.8, a value-at-risk (Var) concept is used to quantify the risk capital needs. Var is the largest observed deviation of the power portfolio value below expected power portfolio value. The size of deviation depends on the utilities' credit rating ambition, the confidence level chosen, market liquidity and neutralisation period required to close any open position.

Utilities must understand the drivers of risk capital needs, then only can decide on the trade-off of a higher level of risk capital to achieve a better credit rating and lower corporate bond rate, or against a lower level of risk capital but a higher corporate bond rate.

Excessive over-capitalisation indicates inefficient use of the available capital resources and this may be achieved through higher risk active trading, thus brings higher return, or utilities buy back shares and increase the return on the remaining share capital. On the other hand, significant under-capitalisation poses direct threat to the survival of the utilities. The excess risk in this case may be reduced by portfolio restructuring such as sales of power plants because increase in capital by other means is unlikely to be a realistic option. If utilities experience serious imbalance between risk capital needs and available risk capital or lower liquidity, they have to fundamentally reorient their business strategy and adjust their capital base because lower liquidity increases capital costs for a given rating ambitions.

Distribution of Risk Based Values

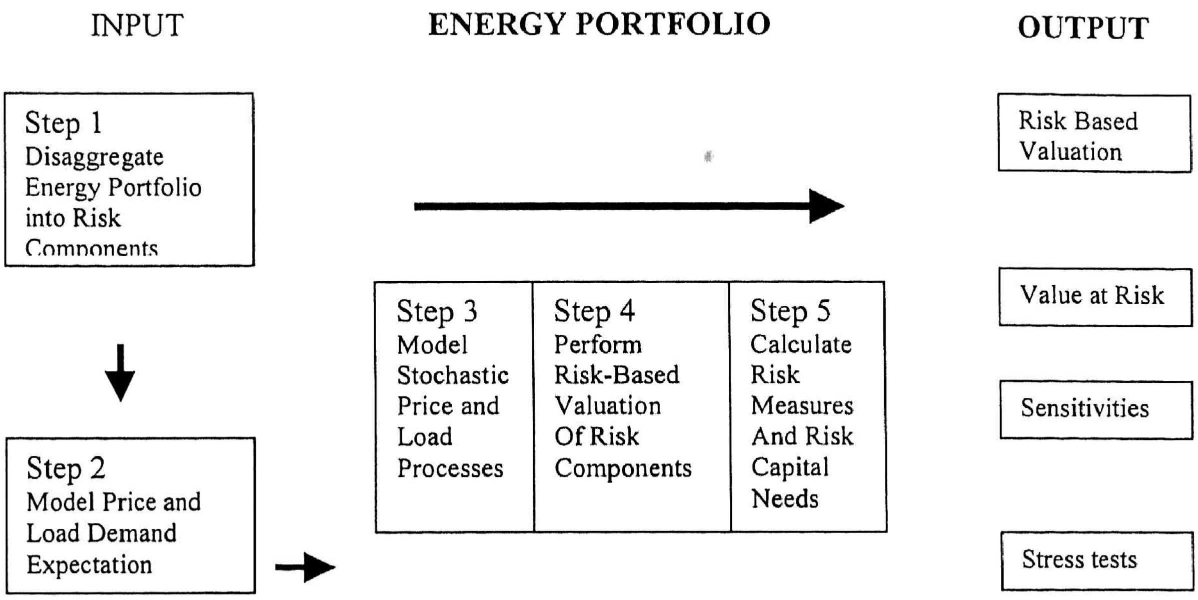


Source: McKinsey Consultants

Figure 9.9: Using Value at Risk to determine Risk Capital Needs

9.4.4 Modern Risk Management Approach

Utilities can also develop specific core risk management skills by using Modern risk management approach, which has been developed by International management consultants, McKinsey & Company.[64] There are five steps, but step three to five are supported by company's software system Energy Portfolio View as shown in Figure 10.



Source: McKinsey Consultants

Figure 9.10: Energy Portfolio View

[64] Helga Meier-reinhold and Axel Muller-Groeling (1999), "Software System Energy Portfolio View for Risk Management Approach," McKinsey and Company, Germany.

Step 1: Desegregate Energy Portfolio into Risk Components

Electricity contracts and power plants can be assumed as a combination of risk components. As discussed earlier, the gas generator can be seen as call option and this option will only be exercised when at determine time, the power market price is excess of the specific fuel cost.

Other instruments from financial markets can also be used to represent the characteristics of various types of power plant and contract. Few main types of risk components generally used are fixed- quantity forwards, variable quantity forwards, financial option with one underlying (European and American style), forward spreads and financial spread options, which are European and American style options with two underlying.

Step 2: Model Price and Load Demand Expectations

With reference to the composition of the utilities' energy portfolio, expectation of various commodity prices and load demands are required to determine the value of the positions. This approach is regard to the choice of price and volume forecasts.

Step 3: Model Stochastic Price and Load Process

This approach takes the characteristics of power prices into account, such as their tendency to revert to the expected or average level after an unexpected fluctuation. As stochastic deviation from the expected price and volume development play a key role in power markets, it is therefore the price stochasticties being described by the volatility curve and the mean reversion factor. This approach also includes price spikes.[65]

Step 4: Perform Risk Based Valuation of Risk Components

Risk based valuation determines the market to market value of the individual risk components. To determine the value of different risk components required different valuation techniques.

Forwards or simple European options are used for simple components, whereas Monte Carlo simulations are used for more complex strips of European options. When it is needed, one or more logic trees or forecasts are used for strips of American style options.[66]

Step 5: Calculate Risk Measures and Risk Capital Needs

The risk-based value of an energy portfolio depends on future price and load developments. A variation in the market parameters, which includes price forecasts, price volatility curves and mean reversion factors, changes the value of the portfolio. The uncertainty of these parameters represents the market risk. The uncertainty reflects its relation with future market conditions, depend on the assumed neutralisation period. Market parameters of a longer neutralisation period can change to a greater extent, resulting in a higher Var.

By using Monte Carlo simulations, a distribution of the portfolio values can be generated from the distribution of these market parameters. With a given confidence interval, the Var of the portfolio can be read from the distribution. In addition to Var calculations, the software allows for calculation of risk measures

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[65] Extract from Johnson, B, and Barz, G (1999), "Selecting Stochastic Processes for Modelling Electricity Prices, Energy Modelling and the Management of Uncertainty," Boston, Risk Boooks.
[66] Extract from Barbieri and Garman (1996), "Putting a Price on Swings, " Energy and Power Risk magazine, October, pp 16.

such as profit-at-risk, sensitivities and stress tests. This approach allows for energy portfolios with highly exotic options.

9.4.5 Summary

In respond to the increasing pressure from investors, utilities can use risk management skills and ready available software to explore superior risk based valuation for better determination of transaction prices for power plants, or to create value through risk transfer as discussed earlier. Risk capital management allows utilities to optimise the risk capital employed or deployed. With all these skills, utilities could better position themselves to successfully master the future challenges in the market and also to come up with answers to the key strategic questions of the future.

9.5 Risk Management Tools

9.5.1 Software

To develop the capability to create or identify the opportunities and then build a profit through volatility environment is solid enterprise risk management. As option spotting is crucial element, much energy risk management software can be used to build hedge portfolios secured around an expected profit position. Real-time key performance indicators (KPIs) are build in the software system, which will alert management to grab opportunities for exercising options at the right time.

For an instance, with the assistance of KPI, when the spark spread, perhaps the price of fuel used to generate it is much higher than the price of power, utility may make more money by selling its stored fuel to a local manufacturer, rather than by running its plant. If a day later, another KPI alaert, this time natural gas spot prices have eased, but things are moving in electricity futures. Then this is the time to get the plant back up and making profit from the volatility. Maintenance plans will be revised in alignment with the lowest prises in the latest forward curve.

To achieve all these, corporate culture, organisational structure and management attitudes are important or may have to be re-engineered around the profit through volatility concept.

9.5.2 Complete Matrix of Real Options

Creating a complete matrix of real options throughout its customer and supply base provides utilities maximum opportunity to exploit low cost power sources, but also the flexibility to profit from short-term supply and demand imbalances by selling capacity into the spot market. [67]

9.5.3 Diversification and Hedging of Real Options

The terminal value of the option can be significantly different from the initial value, therefore it is advisable to diversify real option into a large number of real options or to hedge the value of the real option with financial derivatives. Diversification is important because any individual real option may end up worthless. By diversification, at least some real options may remain valuable, whereas hedging will directly locking in the value of the option. With diversification or hedge, average value of the real option can be converted into a more stable cash flow.[68]

In reality, diversification is not as simple as it first appears. For instance, if a supplier owns one gas-fired power plant in Perlis, and builds additional one there,

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[67] Greg Keers (2001), "Risk Management and Volality Profit System," Journal of Energy Power Risk Management (June), pp 40-41.

[68] Brett Humphreys(2001), "A real Reflection of Value," Journal of Energy Power Risk Management (May), pp 39-40.

it has not so much diversified its portfolio as increased the size of the original option, the first plant.
If it builds another plant in other state, the diversification advantage again will depend on the correlation of electricity prices, because if two plants are gas-fired, then both would have the same cost basis again have little actual diversification.

Hedging real options with financial derivative can also be difficult. To hedge effectively, financial contracts that match the characteristics of the real options shall be used. However, it is normally no liquidity-traded asset at an identical pricing point, so some type of proxy may have to use. As real options are long-lived while liquidity in the financial market is many shorts live, these differences mean an imperfect hedge may be used or no hedging at all.

9.5.4 Credit Derivatives

Credit derivatives have been designed to mitigate energy companies' credit risk because of the tighter credit capacity constraints in the volatile US power markets. The objective of credit derivative is to make a market place where people can trade without giving traders the burden of counter-party credit risk, and transfer that risk into the capital market where it belongs. In this way, for a premium, can make insured trades that protect them against counter-party default.[69]

Figure 9.11 of shows how the credit derivatives work. Party A could use that premium paid by party B to acquire protection from a credit derivative provider, or simply keep the premium s consideration for extending the additional credit to party B.

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[69] Randy Baker (2001)), "Collateralisation – Ways to reduce Credit Risk," Journal of Energy Power Risk Management (May), pp 17-18.

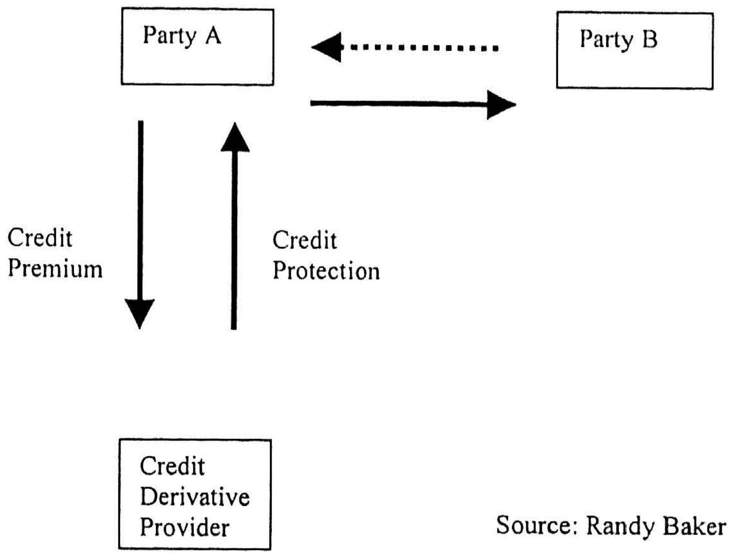

Figure 9.11: How Credit Derivatives Work

9.5.5 Credit Default Swaps and Bankruptcy Swaps

Credit default swaps (CDSs) are the most popular and liquid of the regularly traded credit derivatives in the finance industry. CDSs are linked to bonds issued by a company and in the event of default or another credit event, a counter-party can buy discounted bonds as well as receive a payout from the seller of the CDSs, but their suitability for the energy markets are still in studies.

The most suitable option seems to be the bankruptcy swap, as it fits better with energy players, especially at a time of high profile bankruptcy, such as Californian's Pacific Gas & Electric utility. There are six recognised credit events that could trigger payment in a credit derivative contract: Bankruptcy, obligation default, failure to pay, obligation acceleration, restructuring and repudiation. [70]

[70] Joe Hanley (2001), " Swaps – SuitableCredit Derivatives?" Journal of Energy Power Risk Management (May), pp6-7.

9.5.6 Insurance – alternative of Risk Management Tool

Some energy companies have been reluctant to use derivatives because afraid of new regulatory might clampdown their contracts. Financial Accounting Standard (Fas) 133 requires users of derivatives to qualify their hedges, and this have dramatic effects on a company's profit and loss if its derivatives deals have to be market to market. In this case, insurance-based solution may be used as an alternative risk management tool. Traditional hedge providers used techniques learned from the insurance industry to create actuarial type products, which will be sold as derivatives, physical hedges or insurance. According to William Anderson, global head of the utilities and power industry practice at New Your based insurance company, insurance is the market best equipped to deal with illiquid risk.[71]

Insurance based derivatives protect utilities or distribution companies and consumers from high volatile power prices, shock events or forced outage of electricity generating plant. Philadelphia insurance house has indemnified utilities, marketers and other power players for the additional cost of power over an agreed and insurance price up to a maximum payout of $150 million.

Another latest well known insurance-based product is Aquila's contigent plan, a demonstration of the firm's guaranteed generation product. When a generator is concerned about the possibility of a generating unit going down on a peak-demand summer day when spot market power prices are likely to be volatile. If one of its unit does go down , the generator has to purchase back-up power imediately, and could end up paying several hundred times higher than normal prices. However, by paying an up-front premium to Aguila, the generator can rest assured that in the event of a forced outage on the covered unit, Aquila will deliver 100 MW an hour at a certain price as agreed. The generator will set its

[71] Joel Hanley, Kim Johnson, Lynda Clemons, William Anderson (2001), " Insurance Derivatives – Double Indemnity," Journal of Energy Power Risk Management (July), pp 18-19.

own strike price, cover quantity, contract term and delivery location in order to structure an agreement that fits its budget and level of risk tolerance.[72]

These Aquila guaranteed generation structure could offer derate protection, next hour coverage and daily exercise options. They can also be structured for financial settlement rather physical power delivery.

9.5.7 Outsourcing

Traditional production cost models do not more match anymore with the real time energy trading, where information changes so rapidly and decision for more profitable, risk managed trades required fast analysis of how these changes affect market price movement. Predicting price movement, especially the occurrence of price spikes is no more an easy task, therefore it is important to have an tool that can access the rapidly changing data, turn it into the exact information that required for the efficient decisions. As a result, energy industries, as well as many industry companies have turned to outsourcing.

Deregulation of the power market is prompting many companies to consider outsourcing their energy purchasing and risk management. US energy majors such as Enron, Duke Energy and Dynegy have been starting to offer their services to companies who want to outsource all their energy procurement and risk management needs. This outsourcing is to take the headaches out of hedging for industrial companies. Although outsourcing is still a relatively new concept, but energy management agreements have brought profitable business for these energy companies. The deals are structured so that the two sides agree to split any savings by the program.[73]

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[72] Aquila Insurance (2001), " Guaranteed Generation Product," Journal of Energy Power Risk Management (July), pp 21.

[73] Randy begotka (2000), " The outsourcing challenges," Journal of Energy Power Risk Management (March), pp 39.

9.5.8 Summary

Volatility is a great opportunity to generate hidden profits, therefore making profit through volatility is no more an imagination, but can be achieved with the correct risk management skills, right management teams and tools. Energy companies' risk position is actually much stronger than it would be if they ignored the forwards markets altogether, because hedging and profit based risk management are part and parcel of profit through volatility and also the potential rewards are far greater.