RESTRUCTURING OF ELECTRICITY SECTOR

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ABSTRCT

Traditionally Electricity Generation, Transmission and Distribution activities were considered as one vertically integrated business in the past. But, by restructuring the system these three areas can be unbundled to three separate units. This will help to introduce increased competition of the supply and choice for the customers. In general, by introducing restructuring, it is expected to bring about lower energy price and lower capital expenditure for governments. Some countries have already achieved successful results by restructuring the electricity sector but some have come across various problems and difficulties. The aim this project is to study the restructuring process of the electricity sector in detail and to suggest a suitable model for Sri Lanka. In order to achieve this different industry structures have been analysed to study the different alternatives of restructuring. Also, legal and economic framework of restructuring, experiences in different countries and various other factors to be considered in restructuring have been discussed. By critically analysing the preset position in the electricity industry in Sri Lanka, important factors to be considered in the process of restructuring the electricity sector have been identified. Finally a suitable model for Sri Lanka has been suggested. This project has been conducted mainly using the published material and information accessible in the environment.

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CHAPTER 1

INTRODUCTION

1.1 Background

Traditionally electricity industry was considered as a natural monopoly where all the functions of generation, transmission and distribution of electricity interconnected together and vertically integrated into one single system. In most of the cases it was belonged to the government or to one single firm.

First it was realised that generation was no longer a natural monopoly. This in turn was due to the changes in generating costs in the 1980s. The generating portion of the industry had been thought of as a natural monopoly because of the economies of scale that could be obtained by purchasing large and more efficient plants. These plants were large with respect to the size of the market. Even as markets got larger, and the use of electricity increased, so did the optimal size of plant. The optimal size of generating unit rose through the period 1970 to 1980, as it had for the previous 50 years. Then things began to turn around. Technology imported from materials science and the space programme made turbines much more efficient than they had ever been. At the same time, the price of natural gas declined, and the prohibitions on gas burning which the western countries had imposed were repealed. The way was then clear for smaller and cheaper generating units to be built economically; they were the cheapest form of new construction but, more important, in many cases the all-in cost of a new plant was lower than the customers were paying for the sunk costs of old plant. Customers began to think about building their own plant, and wanted to know why they could not change suppliers to get cheaper products.

Also people started to think why they can not have competition and choice in purchasing electricity as any other product. The idea which underlies the new world of competition and choice in electricity is that it is possible and desirable to separate the transportation from the thing transported. That is, electric energy as a product can be separated commercially from transmission as a service. In more simple terms, we have been used to think of electricity as a product that we only use at the point of delivery, and pay for in a single delivered tariff. The question now is, could the bill be "unbundled" into an electricity and a delivery charge? Even if the delivery service remained a monopoly, could the customer choose who would supply the electricity over the wires? Could the wires be "common carriers" even though the physics of the system dictate that the product is fully intermingled and indistinguishable? This seemingly simple question is central to understanding what is going on in the electric industry today. But if it is possible to define and separate the transport service, so that it can be provided separately from the electricity itself, electricity becomes a product that can be bought and sold and transported from place to place, much as any other product.

Electricity markets are opened to alternative producers and alternative purchasers. The economic analysis required for this type of world is the analysis of transactions. What is the product being bought and sold, at what time, in what place, who is the buyer, who is the seller, what is the price, how is it determined, what are the conditions of sale have to be clearly identified. It is certainly true that transporting electricity is physically more complicated than transporting most other goods. Transmission requires split-second timing of electricity flows from producers, or the system will go out of control with disastrous consequences. In physical terms, transport and production are inevitably closely related. Transmission company must have access to electric energy (beyond that transported) to be able to run a transmission system. In the past, the need for central control of production and transportation resulted automatically in "vertical integration": generation and transmission and local distribution were integrated within the same firm. Distribution might be provided by a separate company, but with each distribution company tied to only one generating company by contract. Some have argued that this is necessary because of the physical relationships, as the eggs and cake analogy suggests. However, the more subtle argument is an analysis of the costs and benefits of separating them.

1.2 Transaction costs

It is theoretically possible to replace command-and-control relationships (within a firm) with "contractual" relationships (between firms). "Contractual" relationships in this context may mean any agreement about the terms on which transactions take place between the separate firms. However, the difficulty of fully specifying all the necessary terms of the contract so that all possible situations are covered may be so great, and so expensive to negotiate, execute and litigate, that it is not worth attempting; it is more efficient to keep the activities with a single firm where one manager manages both activities. The technical term for the costs of negotiating, executing and litigating the required contracting mechanisms are transaction costs. Transactions costs are the costs associated with making contracts to replace command and control. The following important aspects in the institutional and technical context of the electric industry have to be noted carefully in contractual relationships:

- a regional transmission-coordination system with interconnected generating plants;
- a mechanism for dispatching generating plant that recognises the need for physical control second by second, but permits and encourages economic (least cost) dispatch;
- some method for coordinating unit commitment and maintenance;
- some method for ensuring that adequate generating capacity is built;
- some method for ensuring minimum cost investment, system wide;
- some method for dealing with emergencies.

Then it was widely agreed that these requirements were correct, but that the difficulties were insuperable because the transactions costs of separating transmission from generation and distribution were simply too great. Vertical integration from production to consumption was the natural condition of the industry, because of the transactions costs of separating them.

1.3 Movement to competition

However, this did not necessarily rule out competition entirely. Although the utility needed to maintain control over plant construction decisions and the operation of the transmission system, there could be some competition to build and operate plant. In the US, the Public Utilities Regulatory Policy Act (1978), known as PURPA, introduced the idea of competition in generation. Established utilities were required to purchase power from independent generators at prices that equalled their "avoided costs". After initial skirmishes in the courts, the independent generators (called Independent Power Producers or IPPs) flourished. However, they were not allowed to sell to end consumers but had to sell all their output to the local monopoly utility. Some states overestimated avoided costs so badly that they induced excessive amounts of new independent capacity; as a corrective measure, during the 1980s, competitive bidding to build and operate capacity, and contracts for the output of the plants, became standard procedure for new plants in many states. The growth of the IPPs demonstrated forcefully that economies of scale in generation were no longer a sufficient consideration to dictate that generation was a natural monopoly. By 1993, some 50% of new capacity in the US was being constructed by IPPs. Competition in generation was now possible. Even if the utility had become a sort of purchasing agency for generation, there was still no question of giving the US electricity customers a choice of who would supply them.

By the mid 1980s there was near-universal agreement that the industry was naturally vertically integrated (although some competition at the generation level was possible if a purchasing agency coordinated everything). Into this conventional wisdom stumbled the British government in early 1988. They published a White Paper proposing that the electricity privatisation should include breaking up the Central Electricity Generating Board (CEGB), the nationalised industry that owned all the generating plants and the transmission system. (The distribution system was also government-owned as twelve separate companies, each with a local monopoly over customers, and each able to purchase electricity from only the CEGB.) Existing plant would be divided between two generating companies; new entry of competing independent generators would be encouraged; a separate transmission company would be established; the distribution companies would provide local transport, and customers would choose their suppliers, to encourage competition. The previous privatisations of the telephone and gas industries as private sector monopolies had apparently not convinced the government that they were reaping all the benefits that private sector disciplines were supposed to provide. So electricity would be made competitive. At that time there was a clear understanding of the conceptual problems of transactions costs and the problems of replacing a command structure with a system of contracts. However, most people thought it impossible at the time.

After two years of negotiations, false starts, massive computer programs commissioned and abandoned, the current market structure took form, and was implemented in March 1990. The new structure, which separates the product from the transportation at all levels, consists of competing generators, regulated transport companies at two levels (transmission and distribution) and competing retailers. The UK system is a highly organised market with more rules than a normal market, to ensure system stability. This central commercial structure has worked remarkably well. The complaints about the UK system, of which there have been many, relate to the winners and losers during the changes, and to the small number of competitors. None of the complaints relate to the feasibility of setting up a disaggregated commercial system. It was shown to be feasible to arrange contracts that allowed open access to transmission and distribution wires, at least in a single island with a single transmission company.

However, the fact that something is technically feasible does not make it necessarily desirable, the transaction costs may still be too high. At the beginning many countries strongly opposed the move to open access. The European Community Council turned down such a proposal although it was considering opening generation to competitive bidding, believing competition in generation to capture most of the benefits and few of the costs of open access. The European Union also offered some access to large customers. The US has been moving gradually towards choice for at least some customers: particularly for independent distribution companies, known as wholesale customers, who have previously been tied to a single supplier. The US Energy Policy Act of 1992 (EPAct) permitted wholesale customers a choice of supplier, and obligated utilities to transmit ("wheel") power across their territory to accomplish this (this is known as "wholesale wheeling"). However, the same Act prohibited the federal authorities from mandating choice for retail customers ("retail wheeling"), although individual states may permit it, and some are now considering doing so. California announced that it intended to go to "direct access" or competitive markets for all consumers, in April 1994.

Restructuring the electric industry is conceptually different from privatising it, which is a change from public to private ownership. In the UK, the restructuring of the commercial relationships was done with the privatisation. Elsewhere (and in other industries in the UK) privatisation has taken place without restructuring. In other countries, notably the US, where the sector has been largely private for many years, restructuring is taking place without changes of ownership. China is considering restructuring without relinquishing government ownership. It is not therefore surprising that confusion reigns in this area. The number of options seems limitless. The tools for addressing them are being developed in a fairly unsystematic way, in response to particular concerns in particular countries.

1.4 Restructuring and Privatisation

All over the world, governments and regulators are considering whether to restructure and/or privatise their electric industries. Mostly their aim is to increase efficiency through better investment decisions, better use of existing plant, better management and better choices for customers. Sometimes they are driven to it by customers who feel that they can purchase more cheaply elsewhere, sometimes shortages force a search for new sources of capital, sometimes the incumbent utility has become inefficient and the problem is to introduce incentives, sometimes the utilities themselves want to be freed from inhibiting intervention. Whatever the reason, they need to know their alternatives, and the implications of a change.

Restructuring and privatisation are different dimensions of change.

- Restructuring is about commercial arrangements for selling energy: separating or "unbundling" integrated industry structures and introducing competition and choice.
- Privatisation is a change from government to private ownership, and is the end-point of a continuum of changes in ownership / management.

In the UK. when the electric industry was privatised, it was also restructured. The two need not go together. They are two almost separate dimensions of change. However, there is a practical logic linking the two decisions.

If a government decides it wants to privatise its electric industry (or any industry) it needs to place a value on the assets. The value of the assets will depend upon the revenues the assets can earn. To provide investors with sufficient information to decide what the assets are worth, the government must itself decide what system will be adopted to determine the flow of revenues. In the case of electric industry the sources and certainty of revenues will be crucial. Regulatory systems are put in place to control costs and prices and to make investment decisions in the absence of competition. Regulation is a surrogate for competition, to be used when competition is unworkable. However, once it has been shown that competition is feasible the question must arise as to whether it would make sense to introduce it and how much to introduce. Hence, the question of restructuring inevitably arises in conjunction with considerations of privatization.

1.5 Basic models of industry structure

The structure of the electric industry of any country can vary according to two dimensions. Those two dimensions are degree of competition and the ownership.

Under the degree of competition we can identify four basic models to structure an electric industry, but there can be a lot of other models which are combinations and extensions of these four basic models. These four basic models can be defined as follows:

- Model I has no competition at all.
- Model 2 allows or requires a single buyer or purchasing agency to choose from a number of different producers. to encourage competition in generation.
- Model 3 allows Distribution companies to choose their supplier, which brings competition into generation and wholesale supply.
- Model 4 allows all customers to choose their supplier, which implies full retail competition.

Also the ownership dimension can conveniently be divided into three basic levels:

- In some countries, the electric industry is a government department, with no separate accounts, and often with responsibilities that are only remotely connected to electricity production.
- The next level is a distinct government-owned company or nationalised industry.
- The third level is a privately owned industry.

A useful way to look at these two dimensions is as a matrix which a country might be anywhere on the matrix.

1.6 The forms of ownership and management

Many of the global changes in the electric industry are changes in ownership and management. These changes are concerned with putting pressures on enterprises to behave more commercially, but without necessarily changing the structure of the industry.

Owners are defined as those "who are entitled to the profits of the industry"; owners appoint managers to ensure that the enterprise is run efficiently, give them authority to do so, and hold them accountable for the results.

The three most common forms of ownership / management are:

1. **Direct government ownership:** The government both owns and has direct managerial control over the industry, as in China at present (and as was formerly the case in many countries). The same people are owners, regulators and managers, although sometimes they have different "nameplates" in their different roles. Investment is done with government appropriations, prices are set by the government and revenues are remitted to the government accounts. The government focuses on central planning, perhaps in conjunction with other industries; it should be concerned with investment appraisal and efficiency, but that is not its primary focus. The industry is viewed as "infrastructure". The government may impose other tasks on the electric industry, such as responsibility for schools and hospitals in a region.

2. **A government-owned corporation:** The government owns a corporation which manages the industry so that government is one step removed from day to day control. The board of the corporation sets the goals and appoints different people to the management, to achieve those goals. The corporation may still be required to carry out other government policies such as support of supplying industries, but it is under some

obligation to show a profit in its activities. There may be an independent regulatory agency, or the government department may approve prices and investment policy. This is the case with Electricité de France (EDF) in France, and used to be the case in the UK under the Central Electricity Generating Board (CEGB).

3. **A privately owned corporation:** A third form of ownership is private ownership of the corporation and its assets, as in the US and now the UK. These companies (joint stock companies) may be listed on the stock exchanges, and are expected to make profits for their shareholders (who may be the employees of the company). The managers are accountable to the Board, which represents the shareholders. These companies are generally regulated by an independent regulator.

These distinctions are never rigid in practice, the government may in effect have total control even over private companies. The level of government control may depend more on the intentions and behaviour of the government than on the organisation of the sector.

The three most common forms of different levels of government control are:

1. **Commercialisation** happens when the government relinquishes detailed control, in favour of autonomy for the enterprise and a focus on profitability. This is a change in behaviour rather than organization. It normally involves adoption of commercial accounting practices, economic tariffs, and an effort to separate the core business from other activities.

2. **Corporatisation** is the formal and legal move from direct government control to a legal corporation with separate management. This may be a government-owned corporation. The ownership of assets and the capital structure need to be determined before this step is taken. The government also needs to set out the objectives for the corporation, and the process by which public policy objectives are taken into account.

Economic regulation may be introduced at this stage to oversee pricing and investment policies.

3. **Privatisation** is the move from a government corporation to a privately held corporation. Incentives for efficiency are considered even greater if management is subject to the disciplines of stock market valuation of the company, which happens when the enterprise is privatised. Privatisation may also be undertaken to increase the company's access to capital markets. Privatisation is accomplished by a flotation on the stock market or a trade sale. This requires a valuation, a prospectus and registration on a stock exchange. It is accompanied by an increase in external regulation of the monopoly elements of the industry.

1.7 The scope of the study

The following areas involved in the restructuring of electricity industry have been concentrated in this study:

- Regulatory and Legislative framework.
- Different industry structures and alternatives of restructuring.
- Different situations to be considered in restructuring.
- Experience in different countries.
- Comments and suggestions on the Sri Lankan system.

CHAPTER 2

REGULATORY AND LEGISLATIVE FRAMEWORKS

2.1 Introduction

During last two decades many countries around the world restructured their electricity industries in order to achieve economic efficiency and social objectives. This transformation from a natural monopoly to a competitive industry is associated with transformation in the industry regulatory and legislative frameworks. This chapter examines the objectives, institutional framework, and processes of regulation in the restructured electricity industry. Functions, responsibilities and key characteristics of a regulatory commission are also discussed. Further, the existing legislative framework is identified as an important factor in electricity industry restructuring.

2.2 Economic Regulation

The economic regulation of a market can be defined as "explicit public or governmental intervention into a market to achieve a public policy or social objective that the market fails to accomplishes on its own." The fundamental justifications for governments to intervene in electricity industry oversight are universal even though the mode of implementation differs from country to country. The main justification is that electricity is a strategic sector and essential to the well being of society. Secondly, considering the physical interconnectivity of the system, a single firm may be able to provide electricity at a cheaper rate than a combination of firms. On the other hand a single firm can keep prices higher than economically justifiable. Thus there may be a "natural monopoly"

2.3 Objectives of Economic Regulation

The main objectives of economic regulation can be classified as follows:

- **Efficiency**

Both allocative and productive efficiencies should be considered. Since traditional electric utilities generally do not operate in competitive markets that would impose cost disciplines upon them, regulation must fulfill that function. This objective is promoted by setting rates that reflect, to the greatest extent possible, the marginal costs of production.

- **Fair prices**

Prices should be fair for both consumers and investors. This means price regulation is intended to restrict economically unjustifiable profits to the investors but still provide them with a reasonable return on their investments.

- **Non-discriminatory access to services**

This refers to providing access to services such as transmission for all market participants.

- **Adequate quality and reliability**

Quality and reliability in electricity is critically important in modern day society since electricity has become an "essential service".

- **Other stated public policy objectives**

Eg. Environmental protection, low income support etc.

As an essential and important component in national infrastructure, the electricity sector should support public policy programs. However, a natural monopoly may not be in favor of such programs. Therefore, regulation is an essential mechanism to achieve public goals such as:

- Policies on low income customers and rural areas,
- Investments in energy efficiency programs to minimize social cost,

- Investments in environmentally friendly technologies and minimization of environmental impact from existing system,
- Consumer protection and education programs,
- Research and development on electricity generation, delivery, use and impacts.

Therefore, regulation is important when the strategic nature, monopolistic characteristics and public policy roles of the electricity industry are considered.

2.4 Functions & Responsibilities of Regulatory Commission

In poor countries, the traditional monopoly electricity industry may experience low levels of reliability, an inability to meet customer demand and a lack of capital for expansion. In rich countries, electricity prices may be higher than necessary. Therefore, many countries are presently focussing attention on reforming the sector in order to achieve short and long term economic benefits. Electricity industry reforms generally involve two main steps:

- Utility operations are transformed into an enterprise format from the traditional vertically integrated government utility.
- A regulating mechanism/commission is established to regulate the transformed industry.

A regulatory commission can impose a variety of economic regulations on the sector in order to improve economic efficiency and address associated issues. The Federal Electricity Regulatory Commission (FERC) in the USA and the Office of gas and Electricity Markets (OFGEM) in the UK are examples of regulatory commissions.

The main functions and responsibilities of a regulatory commission include:

- Rate setting (tariff setting),
- General regulatory rule making,
- Utility system resource planning,
- Environmental impacts of resource utilization,

- Conservation and efficient use of utility and societal resources,
- Consumer protection,
- Maintenance of the utility's financial integrity,
- Assuring high system reliability,
- Utilization of appropriate tools to assure that utility management is given the proper set of incentives.

For example, Office of Gas and Electricity Markets (OFGEM) states its main tasks as;

- Promote competition in all parts of the gas and electricity industries by creating the conditions which allow companies to compete fairly and which enable customers to make an informed choice between suppliers;
- Regulate areas of the gas and electricity industries where competition is not effective by setting price controls and standards to ensure customers get value for money and a reliable service.

Federal Energy Regulatory Commission (FERC) of the United States describes its functions on electric power regulation as "The Commission approves rates for wholesale electric sales of electricity and transmission in interstate commerce for private utilities, power marketers, power pools, power exchanges and independent system operators. The Commission oversees the issuance of certain stock and debt securities, assumption of obligations and liabilities, and mergers. The Commission reviews the holding of officer and director positions between top officials in utilities and certain other firms they do business with. Finally, the Commission reviews rates set by the federal power marketing administrations, such as the Bonneville Power Administration, confers exempt wholesale generator status under the EPAct, and certifies qualifying small power production and cogeneration facilities".

These functions and responsibilities often compete with each other. Therefore, a regulatory commission has to set up a balanced and a workable regulatory framework.

2.5 Key Characteristics of a Regulatory Commission

The structure, scope and powers of a regulatory commission is key to the success of restructured electricity industry. The key characteristics of a good regulatory commission include;

- Independence from the political process,
- Independence from the regulated enterprise,
- A broad mandate to protect the public interest,
- Technical expertise in the functions and business of the regulated enterprise,
- Continuing monitoring and enforcement of rules and orders.

Independence is the most important factor for a successful regulatory commission. The strategic and essential nature of the electricity industry attracts a lot of political attention. Political influence of the regulatory commission may increase the risk of investment in the sector, resulting in higher financing costs. Being a capital-intensive industry, higher financing costs greatly influence electricity prices. Further, decisions of the commission such as pricing may be viewed by the public as political decisions. Therefore, keeping public confidence is also an important factor.

The FERC is composed of five members who are appointed by the President of the United States, with the advice and consent of the Senate. Commissioners serve five-year terms, and have an equal vote on regulatory matters. No more than three members may belong to the same political party. One member is designated by the President to serve as Chair and administrative head. Therefore, FERC is not entirely independent from political influence. But restriction of political party affiliation reduces political influence upon FERC.

The National Electricity Code Administrator Limited (NECA) and National Electricity Market Management Company (NEMMCO) are bodies set up under National Electricity Law (NEL) in Australia that have some regulatory functions. The governments of states participating in the National Electricity Market (NEM) appoint directors for these two bodies. Therefore, no state government has control over the affairs of these organizations.

The regulatory framework may vary from country to country, depending on the existing electricity industry structure, existing legal structure and the national culture of that country. Therefore, decision on the most suitable regulatory framework for a country should address relevant country specific issues.

2.6 Legislative Framework

A restructured electricity industry contains both competitive processes and regulated monopolies where competition is impossible. The following fundamental properties of electricity should be considered in designing a competitive electricity industry;

- Ephemerality: electricity cannot be stored in a cost effective way and therefore only exists for a brief instant between its production and conversion into an end use energy form.
- Fungibility: electricity flows through a network accpording to physical laws. Hence electricity cannot be directed from a particular power station to a particular end user.
- Quality of supply attributes: maintaining quality of supply is a shared responsibility of generators, network operators and consumers.

These fundamental properties distinguish electricity from other market commodities. Therefore, there are many issues, ranging from generator market power to end user equipment, to be addressed in a competitive electricity industry. These issues may not necessarily arise in conventional commodity markets. Hence, either the existing legal framework should be able to address these specific issues or new laws should be introduced to fill the gap.

All countries with restructured electricity markets have legal frameworks covering general business practice as well as specific legal structures in the industry. In Australia National Electricity Market Management Company and The Trade Practices Act of Australia covers general business practice and the National

Electricity Law governs the specific issues in electricity industry restructuring in participating states. In the United Kingdom, the Fair Trading Act of 1973 and the Competition Act of 1998 cover general business practices. The Electricity Act of 1989 governs the electricity industry. The Utilities Act of 2000 also is a part of the legislation that governs the electricity industry.

This analysis confirms that the legal framework is an essential part of successful implementation of electricity industry restructuring. A combination of general business practice laws as well as electricity sector specific laws is desirable for a restructured electricity industry.

2.7 Conclusion

Electricity industry restructuring is an important economic decision for all countries. One of the most critical decisions of electricity industry restructuring is the regulatory framework of the industry. The success or failure of the restructuring process is largely rests on the regulatory structure.

Countries have adopted different regulatory frameworks. The most common mode of regulation is through an independent regulatory commission such as the Federal Energy Regulatory Commission (FERC) in the United States or the Office of Gas and Electricity Markets (OFGEM) in the United Kingdom. The regulatory mechanism is dependent on country's existing electricity industry, legal structure, culture etc. Therefore, the most suitable regulatory structures are country specific and should be carefully designed and implemented. Blind adaptation from other countries may cause more problems than answers.

A suitable legal framework is an essential part of electricity industry restructuring. A combination of general business practice laws and electricity industry specific laws are required for a successful restructuring process.

CHAPTER 3

INDUSTRY STRUCTURES

3.1 The four models

The four models were chosen because they correspond to varying degrees monopoly, competition and choice in the industry. The models are abstractions and do not describe particular systems. They correspond broadly real electric systems and nature of the structures can be described as follows:

- **Model 1-** Monopoly at all levels. Generation is not subject to competition and no one has any choice of supplier, a single monopoly company handles the production of electricity and its delivery over the transmission network to distribution companies and/or to final consumers.

- **Model 2** – Purchasing agency. This allows a single buyer, the purchasing agency, to choose from a number of different generators to encourage competition in generation. Access to the transmission wires is not permitted for sales to final consumers. The purchasing agency has a monopoly on transmission networks and over sales to final consumer.

- **Model 3** – Wholesale competition. This allows Distcos to buy direct from a producer and deliver over a transmission network. Distcos still have a monopoly over final consumers. There is open access to transmission wires.

- **Model 4** – Retail competition. This allows all customers to choose their supplier. There is open access to transmission and distribution wires. The distribution (delivery) is separate from the retail activity, and the latter is competitive.

The models have quite different types of trading arrangements. They require different sorts of contracting arrangements and have different regulatory requirements. They may require different ownership arrangements for the companies operating in the sector. They also have different implications for stranded assets. These dimensions do not define the models. The defining characteristic which distinguishes the models from each other is competition and choice.

In a Model 1 system, no one may buy from an independent generator, so none exists. All final consumers are supplied by the incumbent utility. The first step away from Model 1 is to introduce competing generators or IPPs (Independent Power Producers). In Model 2, only the purchasing agency is allowed to buy from IPPs, which is why it is sometimes called the "single buyer" model. The design of the power purchase agreements (PPAs) is a major feature of Model 2. In Model 3, Distos (companies which both own the low voltage wires and retail, i.e. traditional distribution companies) are given the right to buy direct from IPPs, but they retain a local franchise over retail customers. The IPP will therefore need access to the transmission network, and there will need to be trading arrangements for the network. The design of trading systems is the main feature in Model 3. In Model 4, retail customers are given the right to buy from an IPP. They can select their suppliers. In this case the trading arrangements and the access provisions may become more complex in practice. Access to distribution networks is required as well as access to transmission.

Alternatively, if we look at it from the customer's point of view: In Model 1, there is no choice at any level. In Model 2, the purchasing agency chooses which generator it will buy from. The purchasing agency is the wholesaler for any area. The choice may only be exercised when new plant is built if the purchasing agency works by signing long-term contracts with generators. However, it could also purchase spot energy from other generators or from other jurisdictions. In Model 3, Distcos choose whom they will buy from. They can choose to buy from generators or aggregators or utilities or purchasing agencies outside their own area. To do this the Distco needs some form of contract with the transmission company and the generator needs connection to the system. These contacts are commonly called "access to transmission wires". In Model 4, the choice filters down to the final consumer, who may choose to purchase from generators acting as retailers, or from independent retailers, or from other utilities. To do this, "access to distribution wires" is also required.

3.2 Implications for the Structure of Companies

Many of the models will have implications for the structure of existing companies. Some functions will need to be separated to avoid conflict of interest. Large companies do not often willingly break themselves up into smaller ones, but reorganising the industry along the lines of the models described in this study often requires changes to the structure of companies. The restructuring decision involves consideration of the economies of scale and scope that originally led to the creation of integrated companies and which may still be important. However, conflicts of interest, self-dealing, cross-subsidies and market power create problems that offset or overcome the benefits of integration. Increased regulation or breaking up existing companies are common solutions to these problems.

Economies of scale mean that larger scale is cheaper than smaller. This used to be the case for generating plant and, as we noted earlier, this was a major reason for the historic monopolisation of generation. Economies of scope mean that different functions can be most efficiently performed by the same organisation. They often occur because of the transactions costs of setting up contracts for the tasks to be done separately.

Conflicts of interest and self-dealing problems arise when competitors find themselves in competition with the incumbent utility in situations where the incumbent can benefit itself at the competitor's expense, even if the competitor's product is better or cheaper. Cross-subsidisation is possible if a company has a subsidiary in the competitive sector and one in the regulated monopoly sector, particularly if there is cost-plus regulation. The company will have an incentive to load costs on to the regulated accounts. The solutions which have been tried in these situations are: separate accounts, policed by regulators, prohibitions on the incumbent engaging in the problematic activity or divestiture.

Market power is the ability of a producer with a large share of the relevant market to raise the price and keep it there or alternatively to keep competitors out of the market by barriers to entry, including predatory pricing. The remedies for market power include structural remedies, such as breaking up the company. Behavioural remedies such as requiring advance contracting or outcome remedies such as price regulation or profit regulation.

3.3 Economic Efficiency

Economic efficiency, the traditional concern of economists, is about giving the right incentives to use resources in the way that gives the "biggest bang for the buck" and that avoids waste. The concerns are usually divided into three types of efficiency:

- production and investment (efficient investment maintenance and closure decisions, the best choice of fuel, the right choice of investment type, location and timing, etc.),
- usage (consumers get the right signals to use electricity when their value exceeds the cost of production),
- allocation (prices should reflect the marginal cost of the resources at different times and locations to ensure that the correct amount is produced, that the most economic producers generate and that production is allocated to the consumers that value it most).

"Competitive markets" are generally assumed to have the advantage in that these types of efficiency are achieved simultaneously.

For regulated activities, incentives should be carefully structured so that the outcome is similar to the competitive outcome. Regulation must foster contracts, tariffs and trading arrangements that encourage efficient operation of the generators, network operators and customers. Ideally, these incentives would be provided with the absolute minimum of regulatory intervention. As the structure of the industry is unbundled into its separate components, more commercial agreements between companies are required to allow them to function as an integrated network industry. These commercial agreements must be designed to encourage companies to collaborate efficiently.

3.4 Social Policy Obligations

Social policy obligations are such things as demand side management (DSM) and conservation programmes, low-income assistance, fuel diversity (which may include subsidies to supplying industries), environmental issues, high local taxes and economic development. These can be categorised as above-market costs which can be divided into two sets: those that are connected with generation (DSM, fuel diversity and environmental issues) and those that are not (low-income assistance, economic development).

Whatever the market model under which the industry operates, the ability to impose and collect above-market costs depends upon the ease with which the customers can choose alternatives that do not have such costs attached. It will therefore be difficult to force the competitive functions to absorb above-market costs. However, since the regulated sector is a monopoly these above-market costs can more easily be collected as distribution charges, for customers normally cannot bypass the delivery system. In each of the successive models, the regulated sector gets smaller and the competitive sector gets larger, reducing the scope for social policy obligations.

Economic development activities are local functions, and can be paid for locally, through a charge on the delivery of electricity. The same applies to low-income assistance, If the legislature wants, it can mandate the distribution business to pick up the costs. However, the costs of fuel diversity (windmills, nuclear, etc.) have usually been seen as simply high-cost generation. It is unlikely that these will be built under a competitive regime unless they are subsidised. There are non-distorting ways to subsidise these activities, but in a more competitive world it will need to be made explicit.

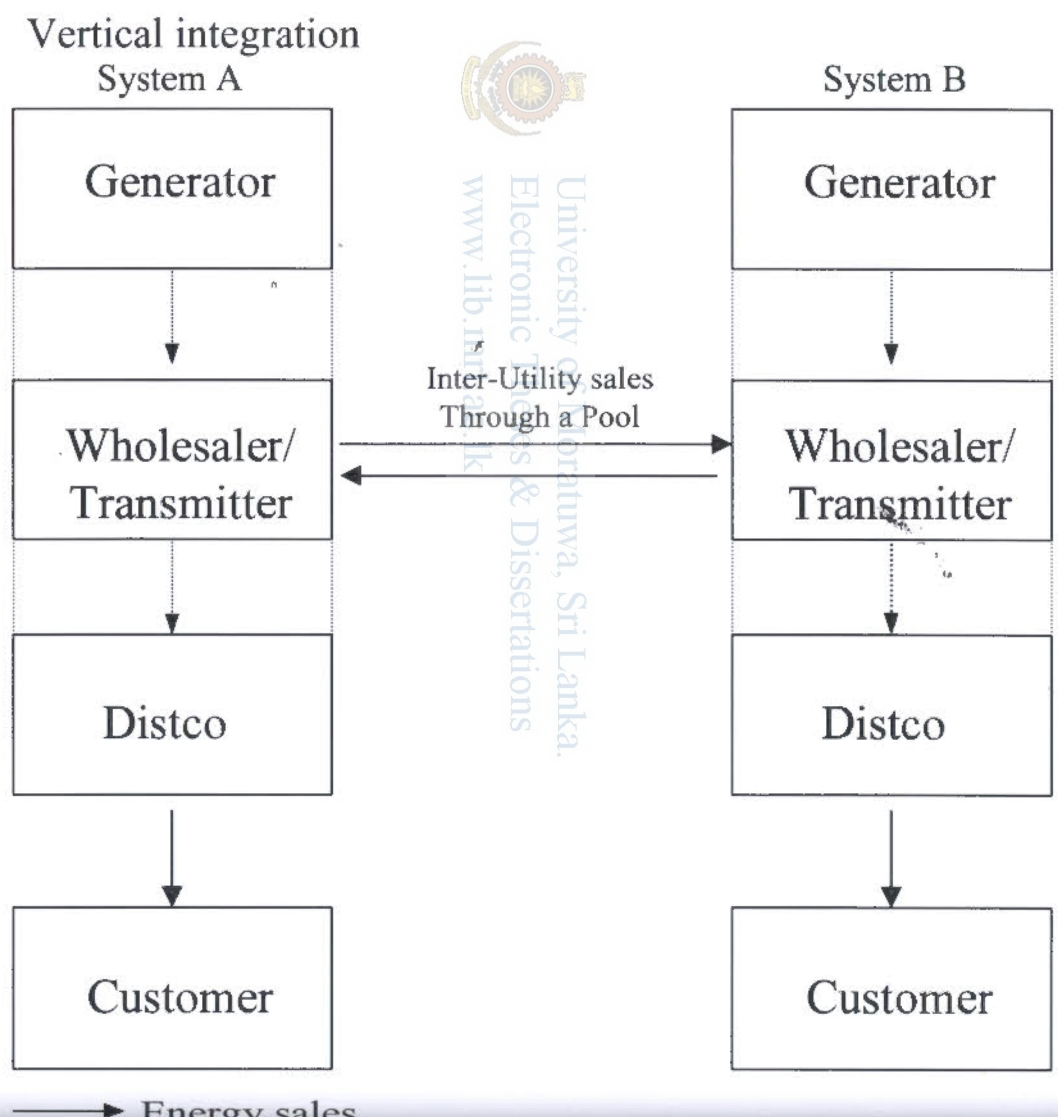
3.5 Treatment of "Stranded Costs"

Stranded costs are above-market costs, usually of generation, but also potentially of transmission and distribution, which cannot be recouped in a fully competitive market. They are usually costs which the customer is already paying, these become most apparent in Model 4.

3.6 Pressures for Change

Each model has its own forces for stability and its own internal pressures for change.

MODEL 1 - MONOPOLY



CHAPTER 4

MODEL 1 - MONOPOLY

4.1 Description of the model

Model 1 is a monopoly model, typically characterised by a vertically integrated system. In any area, one utility owns and operates all of the generating plants and the transmission and distribution wires used to transport the electricity, and is responsible for retailing the electricity to the final customer. The utility has a monopoly over production and over retailing in its service area. These service areas may cover a whole country, as in France, a single region or even a town. The model is shown diagramatically in Figure 1.

Optional features are separately owned "distribution companies" that own the low voltage wires and have a monopoly in retailing in their service territory, but which can only purchase from a single generating/transmission company. The UK was like this before 1990. This is sometimes called "vertical integration by contract". In the case of monopoly the utility generally has an obligation to serve customers, i.e. to provide energy to everyone in the service area, at a tariff price which is regulated to the cost of service, somehow defined. The monopoly over generation may be enforced rigorously, so that literally no one else may generate, or it may permit self-generation, with very limited sales of excess energy to the utility at regulated "buy-back rates".

4.2 Trading arrangements

Model 1 does permit trading between similar vertically integrated utilities across an interconnecter, and Model 1 utilities often coordinate their dispatch through pooling arrangements. This can provide back-up, increased security and help reduce costs by dispatching cheaper plant first. However, these Model 1 pools are generally short-term trading arrangements, based on comparisons of very short-run marginal cost. Model 1 utilities typically buy and sell to each other at prices which split the gains from trade. The prices reflect the presumption that trading will be reciprocal, and are not intended to cover the full cost. The utilities own franchise customers pay for the rest of the costs of generation. There is no competition to generate or to build plant, each utility is expected to meet its own load needs. The agreements set up under a Model 1 system include elaborate arrangements to prevent free riding. This is the most usual type of arrangement found in current systems.

4.3 Transmission access

In Model 1 the question of transmission access only arises as the question of access for traders to cross the network to get to the other side. For example, if France, Spain and Portugal all have Model 1 systems, but France wishes to sell to Portugal across Spain, then the conditions and price for access must be agreed. In the US, this would be called "wheeling across" a utility's transmission system, in Europe it is called "transit". (In Model I there is no wheeling or transit into a service area, since customers have no choice but the local utility, and no wheeling out, since there are no independent producers.) The issues here are about the traders' responsibility for the overhead costs and whether the transporting utility can capture the rents of the transactions (by charging a price equal to the difference between the cost of the power and its value in the receiving zone).

4.4 Should the Distcos be seperate?

In a Model 1 structure, the most usual arrangement is the vertically integrated company. This company owns and controls the generating plant and the transmission and distribution systems, and reaps economies of scale by building bigger plant and covering the territory efficiently. It also can take important advantage of the economies of coordination, especially the coordination of the dispatch of the generating plant. The transmission system operator can command and control the operation of the plant. This ensures not only that the transmission system remains stable, but that the plants are dispatched economically, i.e. they are run in "merit order", from lowest to highest marginal costs. This is the most economic method of dispatching plant since it minimises cost.

The structural question which most often arises in Model I is whether distribution should he separated from generation and transmission, and if so, what is the optimal area for the Distco to cover. These questions arise, even in the absence of restructuring, as questions of internal organization, and many companies go through cycles of de-centralisation and re-centralisation as they evaluate these issues. The answer to these questions usually lies in consideration of "economies of scale and scope". Economies of scale and scope are reasons for having a single firm rather than several firms which contract with each other. Their presence would suggest consolidation, but lack of these economies does not necessarily require separating companies, or even creating separate businesses within an existing company. There is no universal answer to the question of separate distribution companies in Model 1, although the economies of scale in distribution seem to run out at a relatively small size. Electricité de France, a Model 1 company which has evaluated this issue more than most, runs its distribution business in a highly decentralised fashion, which would confirm this impression.

If a later move to Model 3 is contemplated (where Distcos compete as purchasers of electricity), distribution companies may be separated from generation as a transition mechanism. Several smaller sized distribution companies might also be created from large ones.

4.5 Achieving efficiency

In Model 1, minimum-cost construction of generation is achieved through a planning process carried out by the utility, the outcome of which generally needs to be approved by the regulatory body or the government. The utility owns and operates the plant, although it may contract out the building construction. The costs of approved plant are passed to the franchise customers through the retail tariffs. Incentives for efficiency mainly arise from the regulatory lag between price settings.

In Model 1, most risk is usually passed through to customers under cost-of-service regulation. The customer pays for mistakes in investment, changes in demand, unanticipated technological obsolescence, and indeed virtually everything. This reduces the risk borne by the investors in the integrated company, which in turn may lead to a reduced cost of capital for investments by the company. However, this can also induce errors into the Construction decision, since the cost of capital for investments as a whole is seen as low when the risk of any given project, and therefore the cost of capital appropriate for that project, may be high.

Passing on all costs, so that prices rise when costs rise, gives bad incentives to reduce costs. Various steps, generically known as "incentive regulation", can improve the incentives by shifting some risk to the owners or operators of the assets. The general notion is that prices should be, at least partially, unhooked from costs, so that there is an incentive to reduce costs. Even in cost-based forms of regulation, slowness of the regulatory process to adjust prices to costs (regulatory lag) can unhook prices sufficiently from costs. Other methods include explicit limits on the ability to pass increased costs on to customers, indexing prices to an independent measure of costs (for example an index of retail prices) or setting a price path in advance.

The cost of putting the plant in the ground is a large element in final cost. The decision to build, and its accomplishment on time and to budget, has therefore been the area where there has been most pressure to substitute market mechanisms for the "planning process". This has led to bidding systems under Model 2, and a competitive market under Models 3 and 4.

4.6 Social policy obligations

One attraction of Model 1, which is carried over into Model 2, but is greatly reduced in Models 3 and 4, is the ability to accommodate social policy obligations. These are outcomes wanted by the government that would not appear in fully competitive markets. These can be divided into two groups. Those related to generation, and those that are not. The former group includes "ohligations to supply", environmental regulation of emissions, diversity of fuel sources and subsidies to the coal industry and to nuclear power. Social policy obligations not related to generation include uniform pricing across areas with unequal costs, rural electrification, discounts for customers who use a large amount of electricity, "lifeline rates" for poor people, conservation programmes and high local taxes. In Model I all can he achieved, but in the later models the generation-related policies come under serious threat.

The ability to achieve these objectives is made possible by the monopoly of the utility over its customers, which enables the utility to charge them the excess costs. High input costs and excess capacity can only be sustained if the customers have no other choice. Discrimination among customers is also feasible, since the tariff can be structured to sell to large users at a different price from small users.

Model I utilities are often the agents of so many social policies that they become effectively a tax collector. These policies are supported by above-market prices that the industry can charge because of its monopoly and because demand is so strong for a product which is close to a necessity.

4.7 Implications for asset values and stranded costs

Revenues and asset values in a Model I system hear a close relation to accounting concepts of cost-of-service rather than market valuations. In Model I, tariffs determine the utility's revenue. The regulatory body or the government will regulate tariffs to provide a return on assets and to keep prices in line with costs. Provided the tariffs are set at an adequate level, and provided the revenues are collected, the generators will be adequately remunerated. Model I relies upon the franchise customers to pay the capital costs of the plants and ensure an adequate level of profits. Certainly, regulators do not always ensure adequate returns: sometimes they may permit too generous a return. "Regulatory lag" (slowness to adjust prices to costs) provides some deviation from full cost recovery. However, the regulatory bargain is that the utility gets reimbursed for prudent expenditures.

Customers in a Model 1 system not only pay all the costs of the utility, they also take the risk of changes in technology which render existing plant obsolete. The customer takes the risk for mistakes made by the utility, if made in good faith. Often the customer also pays for social policy objectives that regulators or the governments deem wise, but that have little to do with provision of low-cost electricity. In return, regulators give the utility an obligation to supply that guarantees customers a supply of power.

In a well-regulated and well-run Model I utility, the prices are set to deliver an adequate rate of return to stockholders, whether stockholders are private individuals or governments. The asset values (as measured in the stock market - if the company is privately owned) will approximate to the asset values recorded in the books of the company. This will he true even with past mistakes or government imposed social objectives. As long as the form of price control permits the company to recoup an adequate return from customers, it can maintain the value of its assets.

4.8 Pressure for change

Model I (monopoly and monopoly service) begins to break down most spectacularly when the marginal cost of competitive generation, or the price that new entrants could charge, is less than the price charged by the utility.

This price may be higher than under competition because:

• the depreciation policies of the regulatory regime do not adequately capture technical progress;

• past capacity acquisitions have been poor (nuclear plants have often been excessively expensive);

• the incumbent's choice of plant must meet social policy objectives but similar requirements do not apply to competitors;

• large quantities of a fuel (such as gas) may become available at low prices, making a different technology a cheaper option. (This appears to have been a major factor in many cases.)

Model 1 utilities also create dissatisfaction by refusing to offer reasonable terms when customers install their own equipment and need back-up provisions. Utilities have sometimes refused to purchase excess energy from self-generators, and have refused access to their wires. The UK had a law requiring open transmission access for independent generators for six years before it implemented a radical restructuring. There were no takers because of the terms offered for transmission by the incumbent Model I utility, the CEGB. In the US litigation over access has been extensive and costly.

4.9 Examples of Model 1

Most countries start with monopolies covering their entire electricity supply industry. Sometimes there is one monopoly for the whole country, sometimes local monopolies. Almost all countries had this form of organisation up to 1980, and most still do. Electricité de France (EDF) owns the entire industry in France. The UK was an example of Model 1 until 1990; the CEGB owned all generation and transmission and there were separate monopoly distribution companies. Italy, Malaya and Japan all follow Model 1.

The US had almost complete monopoly until PURPA was passed in 1978. Investor-owned utilities served most of the country and had a monopoly from generation to the final customer. (There were also some publicly owned power companies eligible for tax-free financing, and some separate retail / distribution-only companies that bought from a single supplier.)

Despite having multiple generating and distribution companies, some privately owned and some publicly owned. Venezuela also has a Model I system. Only utilities may generate, and no one has any choice over whom they buy from and sell to. The list of Model 1 countries is almost as long as the list of countries, since the movement to competition is quite recent, and other models are the exception.

4.10 Conclusions

Model 1 has been the paradigm for a century, for good reason. This form of vertically integrated organisation has enabled the development of large-scale transmission systems and has enabled introduction of larger plants. These "economies of scale" arguments that were persuasive for many years, and still apply in some developing countries, justified monopoly arrangements.

The total monopoly has also allowed subsidies for poor areas, rural electrification, development of indigenous fuels, and other government policy objectives. These objectives may continue to require a monopoly in electric production and retailing.

MODEL 2 - COMPETITION IN GENERATION

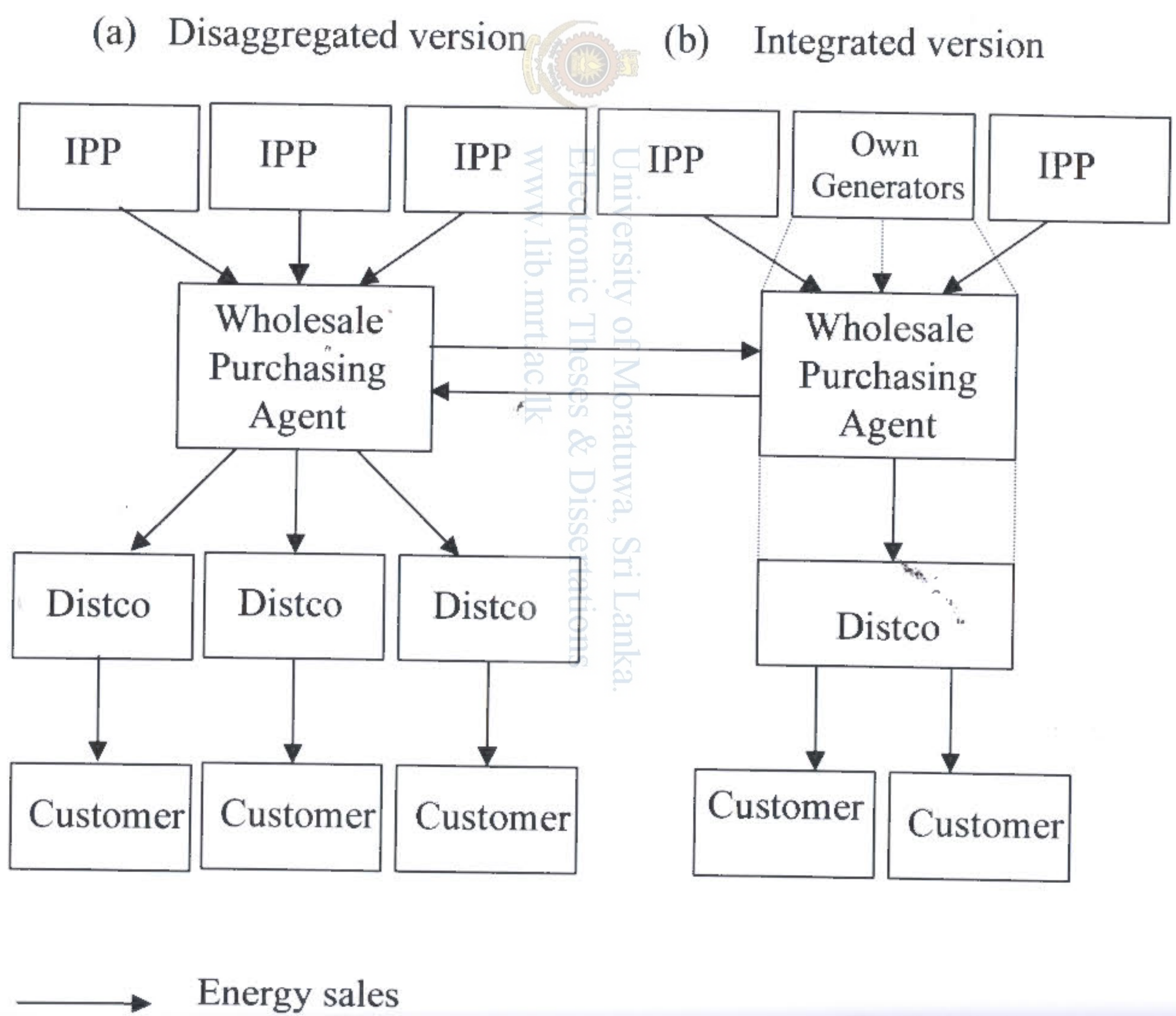


FIGURE 2

CHAPTER 5

MODEL 2 - PURCHASING AGENCY.

5.1 Description of the model

In Model 2, shown diagramatically in Figure 2, Independent Power Producers (IPPs) are allowed. These may be created from existing utilities by divestiture, or they may be new producers who enter the market when new plant is needed. The IPPs compete to construct and operate plant and carry the construction and operating risk. (This distinguishes this model from a Model I utility that may contract for new plant if it does not have a construction division to construct its own plant.) IPPs sell their output to a purchasing agency. In turn, the agency sells the output on to Distcos that have a monopoly over their customers.

While Model 2 allows competition in generation, all power must be sold to a purchasing agency, so the purchasing agency is a monopoly, buying the output from the generators. Generators compete to sell to the purchasing agency. This introduces competition at the level of new construction and for generation operation. Generators will typically compete for contracts to supply the purchasing agency.

The purchasing agency can in principle discriminate between generators. Either bidding procedures or some other provision will be needed to prevent this. Lower prices will be offered to low cost generators so that they will not get windfall gains. By this way the purchasing agency can pay appropriate "economic rents" for low cost sources or sources for which consumers have already paid.

5.2 Transition mechanisms

When a government-owned industry moves to Model 2, existing plant may be sold by tender to private buyers, complete with contracts for power sales to the purchasing agency. Alternatively, a regulator could order a Model 1 utility to purchase new power requirements by competitive bid from IPPs. This method is fraught with potential conflicts. In the US a Model 2 system was introduced by PURPA, which required utilities to purchase at "avoided cost".

5.3 Trading arrangements

In Model 2, the purchasing agency model, generators typically have contracts with the purchasing agency, known as power purchase agreements or PPAs. Normally, these contracts have an availahility payment, designed to cover fixed costs, and an energy payment, set to cover the variahle costs of generation in order to dispatch the plant. The contracts are called in order of their variahle costs of generation to achieve short-term efficiency in dispatch.

Economic dispatch requires that the energy payment he designed to match, as accurately as possible, the marginal cost of running the plant. However, setting energy payments to actual costs incurred gives the generators poor incentives to reduce those costs. One solution to this is to track costs closely, but independently of actual costs, by linking the energy payment to an index of costs. In practice there are many PPAs with clauses that link energy payments to fuel price indices.

Full payment of costs requires that the overheads also are paid, and this is usually done through an availability payment (usually paid for each kilowatt of generating capacity). If the plant is to have an incentive to he available to generate, this payment needs to be linked to the actual availability of the plant. However, the availability of a plant is difficult to monitor directly if the plant is not actually running. As a result, we usually see availability payments together with "penalties" for not being available. Plants incur these penalties if the dispatcher calls them to generate, but they are unable to do so. Ideally, these penalties would relate to the market value of energy, so that there are incentives to be available at the times of highest value. Design of the availability penalty is a major consideration in IPP contracts.

In Model 2, sales from the purchasing agency to Distcos often take place at preset wholesale tariff prices. Efficiency considerations suggest that this tariff should follow the marginal costs of the system. Also, the tariff should cover the total costs to the purchasing agency of purchasing power. Multi-part tariffs, with fixed and variable charge elements are often used to meet these objectives. Variable elements of the tariff can be set to mirror system marginal costs. Fixed components can then be set to recover any remaining costs. The tariffs should then be differentiated appropriately by time of day or season. Retail tariffs would inevitably reflect the cost of purchasing at the purchasing agency's wholesale tariff.

Such a wholesale tariff allows the introduction of interruptible rates, allowing the purchasing agency to cut off demand, usually from large industrial customers, at times of system stress. These customers usually provide this service in return for lower rates. Interruptible rates offer more opportunity to adjust the system to demand and supply conditions. It is possible to calculate a spot price for this system at the wholesale level, broadly similar to that in the England and Wales Pool price, to provide spot incentives for load management and plant availability.

5.4 Transmission access

The question of crossing the system discussed in Model 1 is still an issue here, and continues to be in all the models. The additional issue in transmission access in Model 2 is the question of how to reflect transmission costs in the location of generation and the dispatch of plant. The bidding process for obtaining new plant must allow for the actual and potential transmission constraints and losses and handicap the bids accordingly.

Clear terms and prices for transmission access must also be laid down. These terms of access will determine how independent generators are treated if they cannot run because of transmission constraints. For instance, the purchasing agency may guarantee a generator access to the system. If the generator was then unable to deliver power because of a transmission constraint, the purchasing agency would have to compensate the generator.

5.5 Should the purchasing agency be separate?

A structural question in Model 2 is the identity of the purchasing agency. The purchasing agency has to make long-term contracts with generators, so it needs to be credit-worthy. The government or a well-established utility is therefore a primary candidate, but either of these creates other conflicts.

The purchasing agency should in principle be independent of the owners of the generation, or conflicts will inevitably arise. The agency needs to be seen not to discriminate in favour of its own resources, either in procurement or in operation. In procurement, it might seem a simple matter to devise bidding procedures that make it clear which is the lowest cost producer, but in practice it is often difficult to compare plants with different cost structures providing power at different times and at different locations. The fact that the purchasing agency takes the market risk means that IPPs can be financed with high proportions of debt, "leaning" on the purchaser's equity. If the purchaser is also a generator, its "costs" are bound to be higher than the competition, if evaluated at the overall company cost of capital including the larger equity requirements.

In the US, there has been constant tension during the Model 2 phase about the utilities acting as the purchasing agency. There have been calls for the utilities to divest themselves of generation, and pledges by utilities not to build any more plant on their own account. As with all structural issues, the benefits of independent operation need to be weighed against the costs of reduced coordination and increased transactions costs.

A further conflict arises if the utility is also the system operator, responsible for dispatch of the contracts. In a mixed system, where running the operator's own plant may be more profitable than running a competitor's, the conflicts are likely to be substantial. One solution would be carefully-drawn contracts that give the system operator the right incentives to dispatch the least cost plant, irrespective of ownership. In the US, these potential conflicts were often resolved by permitting self-dispatch of small generators under PURPA, so that they could not accuse the dispatcher of discrimination. This has resulted in some cases in high-cost IPP plant being dispatched while low-cost plant belonging to the utility was backed off, in complete disregard of merit order.

The purchasing agency in Model 2 could in principle be a completely separate stand-alone company, but it could also be part of a separated transmission company. It makes no substantive difference whether there is a separate transmission company, or whether the purchasing agency and the wires are in common ownership.

5.6 Achieving efficiency

A crucial aspect of Model 2 is that generating plant procurement, which is the most important area to control costs, has been opened to competition. The capital costs of generating plant are a large fraction of total industry costs. Alone, this makes it important to induce efficiency in investment. The investment decision also dictates fuel type, which affects running costs for years to come.

The decision to build, and its accomplishment on time and to budget, has therefore been the area where there has been most pressure to substitute market mechanisms for the "planning process". This has led to bidding systems, under Model 2, and to competitive markets, under Models 3 and 4. Minimum cost generation in Model 2 is achieved through competitive bidding for construction and operation of plants, on long-term contracts.

An asserted advantage of Model 2 over Models 3 and 4 is that the long-term contracts reduce the risk that new technology will cause the generators to lose their market. This means that the cost of capital for generation projects, a substantial component of the final price of electricity, is likely to be lower here than in Models 3 and 4. which can lead to overly capital-intensive production. Both the IPPs and the purchasing agency are insulated from the technology and other risks associated with the market. (Model 2 has this in common with Model I and cost-based regulation generally.) Insulation from these risks undermines the superior incentives to innovation inherent in a more market-driven situation. The Model 2 generator does not compete with new entrants whereas the Model 3 generator does. The Model 2 generator does not take the market risk and decide when new plant is necessary but the Model 3 generator does.

Efficient dispatch in Model 2 is achieved by careful design of the IPP contracts so that the marginal cost to the dispatcher (the energy payment) is the marginal cost of running the plant. The marginal revenue to the generator, the availability payment plus the energy payment, is higher than marginal cost and this gives the plant the incentive to run. Efficient location decisions require some pricing of transmission at the bidding stage, while efficient dispatch of the contracts needs some adjustment for marginal losses.

Finally, efficient consumption decisions depend on how well the purchasing agency's wholesale tariff reflects marginal costs, and in turn on how well retail tariffs reflect wholesale tariffs.

5.7 Social policy obligations

Like in Model 1 this model too has the ability to accommodate social policy objectives. Discrimination among new plant can occur if the government (or regulator) instructs the purchasing agency to diversify fuel sources. The purchasing agency can ask for bids for a particular type of fuel, or for plants in a particular location. It can also ask for windmills or other non-conventional types of plant for environmental purposes, and roll the cost into the tariff.

In this structure, the purchasing agency will have an obligation to ensure there is sufficient generation, because it has either a direct or an indirect monopoly over customers. To meet this obligation, it must ensure sufficient power is available from IPPs under contract or from IPPs bidding for dispatch.

The utility's monopoly over the Distcos makes it possible to achieve these objectives, since it enables the purchasing agency to charge the excess costs to them. The purchasing agency can sustain high input costs and excess capacity if its customers have no other choice.

5.8 Implications for asset values and stranded costs

In Model 2, the existing plant can continue to be remunerated at historic cost and the feature of the customer absorbing all the costs can be maintained, thus obviating the problems of stranded costs. The purchasing agency has a monopoly over all Distcos, and can therefore pass on costs to customers. Regulation is necessary to give it incentives to purchase prudently, and to allow it to pass on some approximation of its purchasing costs to consumers.

A contract, however, does not guarantee payment. Some countries have tried to introduce IPPs as a solution to capital inadequacies of their existing utilities. However, they have foundered on the lack of a suitably credit-worthy purchaser of the power. In Model 2, revenue adequacy for the independent generator (the IPP) has three steps: the customer must pay the Distco: the Distco must pay the purchasing agency; and the purchasing agency must pay the generator. The PPA is the last step in the chain. The first is to ensure that the tariffs are set at an adequate level. This can be a substantial problem in poorer countries where the provision of electricity is viewed as a social service, and where theft is tolerated as a fact of life. The retail tariffs must be set to cover the payments under the IPP contracts.

Given adequate tariffs, Model 2 provides substantial assurance to new generators Moreover, changes in asset values (stranded costs) consequent on the move to a more competitive system can be minimised. For example, low-cost generators can be given contracts entitling them to fixed payments, while high-cost generators get higher fixed payments. Thus, the incentive properties of the contracts can be maintained, while reducing total costs to the purchasing agency. Or, if the government sells a plant that it owns, it can ensure that it recoups its investment by providing above-market contracts.

In a Model 2 structure, therefore, the asset value can be maintained, for the purchasing agency has a monopoly on Distcos in its territory.

5.9 Pressure for change

Pressures to move on from Model 2 (competition in generation) to Model 3 (wholesale competition) come from various places. One source is wholesale customers, Distcos or large industrial customers who feel they could do better elsewhere in systems where there are multiple purchasing agencies, as in the US. In some cases, this needs to be resisted, since it is not a pressure derived from more efficient production or lower marginal costs. It often has more to do with tariff differentials created by cost-of-service regulation. For example, two utilities may be facing similar marginal costs, but one company has older or more depreciated assets, and therefore lower tariffs. Customers of the high-priced utility may wish they could get hold of lower prices. However, allowing them to do so would not reduce total costs, they may even increase. This is simply a problem of wishing to avoid carrying a share of the historic investment obligations.

Pressures for freeing "access to the wires" will also come from IPP generators or utilities earning less than the market value of power under their contracts or under regulation. It may also come from generators who could produce from new plants at a total cost below the sunk costs reflected in the tariffs of the purchasing agency. These generators may be able to bypass the system by selling to nearby purchasers using their own wires. (Model 2 may allow some generators this option, but usually only in restricted circumstances.) On site generation is also a pressure on Model 2.

By contrast, in some countries where the growth of demand is enormous, a central purchasing agency can act as a bottleneck. Some localities would be prepared to pay for independent power production, even at market prices that are above cost, rather than ration demand and lose productive opportunities.

5.10 Examples of Model 2

Northern Ireland introduced an example of a Model 2 system in 1992, with an independent purchasing agency combined with the transmission.

The US has been using a variant of this model since 1978, with the incumbent utilities acting as purchasing agents for IPPs.

The Spanish system, although it is complicated by financial compensations between separate companies, is in essence a Model 2 system.

China has many regional and provincial companies, and some separate distribution companies. Monopoly relationships were continuous throughout the system, at least until 1985. Since then, there has been some experimentation with alternative ownership of generation, and this has been very successful in getting new plant built.

5.11 Conclusions

This model introduces competition in generation, which is arguably the place where the pressures of competition can do most good in reducing costs. It can also be a useful model in tapping new sources of capital. At the same time, this model avoids some of the costs of later models, the transactions costs of spot markets and transmission access and an increased cost of capital that arises when generators bear technology risk. The model may also make it easier for governments to achieve social policy objectives such as rural electrification, subsidies to producers and diversity of generating plant.

In small systems where there are very few generating plants, each plant may effectively have a monopoly at some point in the load curve, and Model 2 may be chosen as an effective form of regulation by contract.

On the whole, Model 2 is a good transition model in places where the more sophisticated arrangements needed for a more complete market structure are not in place and would be hard to establish. For example, in countries where there are as yet no reasonable accounting systems in the industry, proposing the type of settlement system required for Model 3 and the metering required for Model 4 might strain credulity. There are some housekeeping chores that must take precedence, such as corporatisation and commercialisation. Procurement of new plant from competitive sources under a PPA is a step that can mesh well with tariff reform and other requirements of commercialisation.

However, Model 2 also provides insurance to the independent generators against market risk and makes it easier for them to raise capital. Since the IPPs are not dependent on market prices for their revenues and do not have to compete against later entrants, they can finance with a very high proportion of debt, which reduces the prices they have to charge. The risk is passed via the purchasing agency to the captive customers.

By insulating the owners of the plant from the effects of technical change and market forces, Model 2 does blunt the dynamic benefits of competition, leaving many aspects of the choice of when to build and what to build in the hands of central planners rather than entrepreneurs. Moreover, the cleansing effect of competition is sometimes overlooked. Market prices make it difficult for participants to hide excess costs in payments for power. Market prices also make self-dealing and even plain old corruption less likely. There are millions of dollars at stake in each new IPP contract, and the opportunities for corruption are large and cannot be adequately counteracted by incentives and regulation. This of course is also true under Model 1, where the procurement of fuel and plant can also be corrupted in a way that is much more difficult under a competitive model, where the test is the market price.

MODEL 3 - WHOLESALE COMPETITION

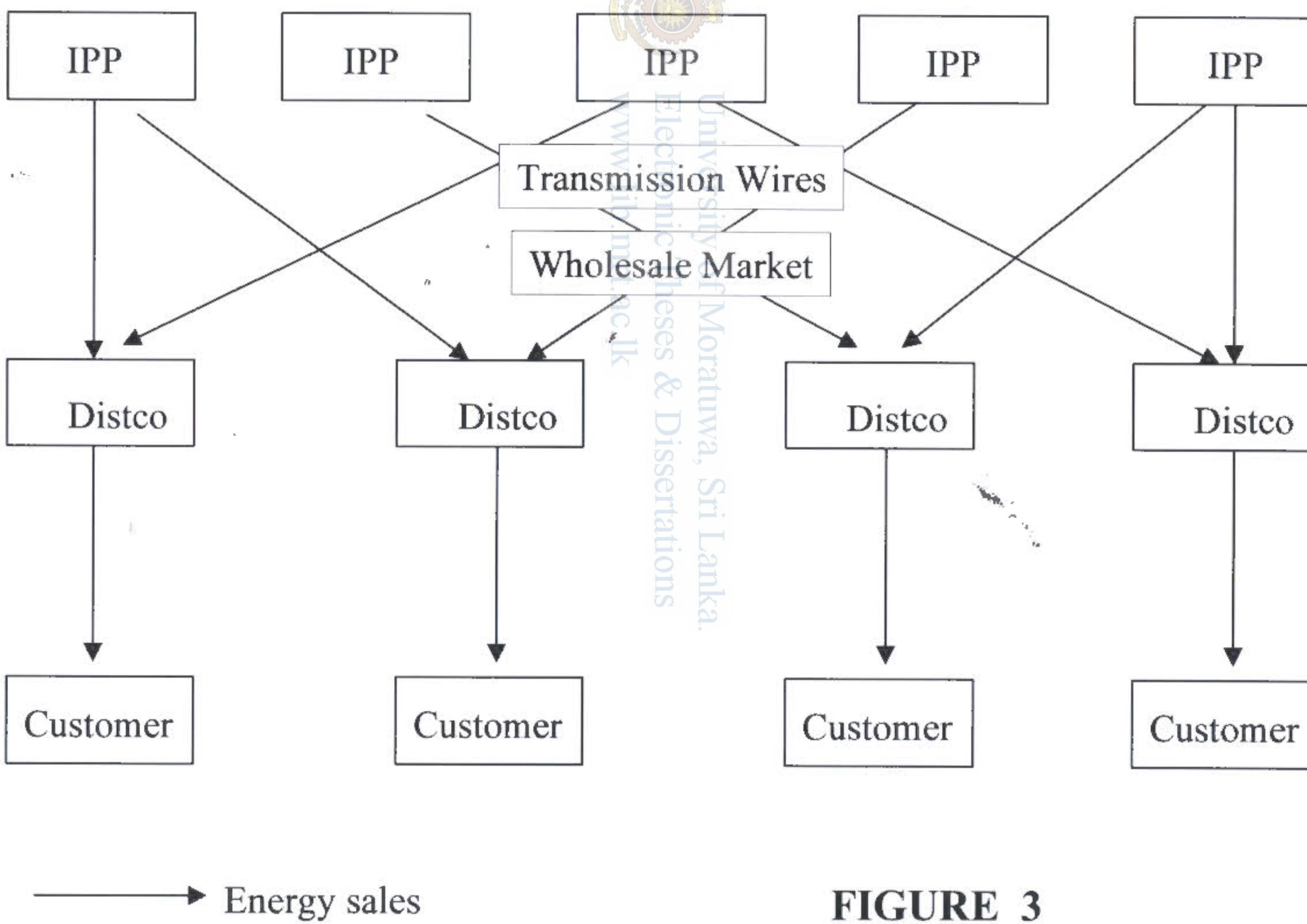


FIGURE 3

CHAPTER 6

MODEL 3 - WHOLESALE COMPETITION

6.1 Description of the model

Model 3 which is shown in Figure 3 is characterised by choice of supplier for Distcos together with competition in generation. This is sometimes called wholesale competition to distinguish it from retail competition (Model 4) where final consumers rather than Distcos have a choice of supplier. In Model 3 there are separate Distcos. These can purchase energy for their customers from any competing IPP generator. The Distcos maintain a monopoly over energy sales to the final customers (they each have a franchise to serve a given set of customers).

In one sense Model 3 moves the purchasing agency down to the low-voltage level, rather than keeping it at the high-voltage level, but it is no longer a "single buyer" model. Since Model 3 permits open access to the transmission wires, it gives the IPP alternative buyers. It is not therefore necessary for the buyer to take all the market risk, and the form of contract for power can change from the Model 2 contract to a contract which simply hedges price risk. With free entry to the market, a Model 3 generator competes against entrants. However, final customers within a service area still have no choice of supplier. With this structure the "obligation to supply" moves to the retail company, which still has a monopoly over final customers.

The arrival of wider competition does not eliminate the role of regulation.The monopoly providers of the wires must still be regulated, and the structure of the competitive parts of the market still need to be overseen.

6.2 Trading arrangements

We can lay out the main requirements of trading arrangements as follows;

- A dispatch function, which should be independent of the traders. The job of the "system operator" is to keep the frequency and voltage of the transmission system stable. To do this the operator requires access to wires voltage support, frequency support and reserve energy.

- A spot market or power exchange for electricity into which buyers and sellers of electricity bid to establish a spot price for electricity (on an hourly or half-hourly basis).

- Transmission prices which reflect the marginal costs of transmission, and which prioritise and manage the use of congested paths in an economically rational manner.

- A forward market in which the parties can contract bilaterally with each other. (This will develop naturally if not inhibited by bad regulation or protocols.)

- Last, and often overlooked, is the requirement that there be freedom of entry and exit from the market, i.e. the freedom to open and close plant in response to market forces. The market must be left free to provide the necessary reserves. This may require changes in legislation and custom.

The trading mechanism that we prefer, is a form of spot market or power exchange which we have called "full-cost pooling". Full-cost pooling is so called because all generators' costs could, at least in theory, be recovered at the pool's spot market prices. The generators' costs include "capacity costs", and the market price will be allowed to rise to quite high levels to signal the need for new capacity. This differs from partial-cost pooling where native load customers bear the fixed costs, a specific level of reserve is required to be held by all customers, and trades are made at avoided cost only. Prices in full-cost pools should be allowed to vary freely to the market levels. This ensures that sufficient generation is constructed, made available and operated at any time. In practice, full-cost pools are supplemented by bilateral contracting arrangements between customers and generators to hedge the price risks of operating in the spot market alone. Traders settle the imbalances between these contracts and actual flows at market prices. The market for energy trading therefore consists of a spot market organised by the Market Operator, and bilateral contracts.

It is possible to get by in Model 3, where there are relatively few traders, with a system known as "wheeling". In this customers and generators make bilateral contracts, an existing utility opens its wires to competitors to deliver contracted power (usually under compulsion) and sets regulated prices for imbalances on contracts. The utility therefore acts as the Dispatcher, the Transmission Provider and the Market Operator. This form of operation requires extensive regulation because of the intrinsic conflicts of interest in a transmission owner opening his wires for his competition to steal his customers. "Full cost pools" can enhance efficiency in Model 3, and provide a platform for the move to Model 4, because of the greater number of players in Model 4 markets, a workable "full-cost pool" or spot market becomes essential.

6.3 Transmission access

Competing generators in Model 3 may sell directly to Distcos. These still have a franchise over their customers and may be associated with the distribution function, owning the low-voltage wires. However, they are not required to provide open access to the low-voltage wires. This model therefore only requires transmission prices for the high-voltage wires. These prices must provide the right economic incentives for plant location and dispatch, and sufficient revenue for the transmission owners.

6.4 Implications for the structure of companies

In Model 3, a set of conflict, self-dealing and market power issues arises. Many of these issues have already arisen in the UK. It is worth looking at these problems and the solutions, or non-solutions, adopted in the UK and elsewhere.

(a) Transmission

In Model 3 the functions surrounding transmission need to be redefined. First, consolidation of transmission networks (if there are many of them) may be called for, since there are economies to be had. In Model 3, contractual agreements between networks become vastly more complicated. The more networks there are, the more agreements have to be negotiated and enforced to deal with the operation and settlement of flows at the interfaces between networks. The costs of doing this may indicate network consolidation as the most effective alternative.

Second, the question of whether the transmission functions need to be separated into separate companies, because of potential conflicts, becomes acute. New functions related to trading over networks need to be identified and assigned to someone. It has been identified at least three functions, those of: Dispatcher, Transmission Provider and Market Operator.

A Dispatcher is required to keep the transmission system stable and act as traffic controller. To avoid self-dealing concerns, it is best if the Dispatcher is independent of the buyers and sellers of electricity. Systems where an integrated utility acts as Dispatcher are also feasible, but they may require extensive regulation to avoid the reality and perception of self-dealing.

A transmission provider (TP) must be identified to set the terms of users' access to transmission and to collect revenues to pay for the use of the transmission assets. This provider is often the owner of the transmission assets, but this is not necessarily the case.

A Market Operator (MO) must also be identified to police an arrangement to settle imbalances between contracted amounts of energy and actual flows. Although most trades will be made by contract, it is inevitable that the contract amounts will not match the amounts actually generated and consumed. This will be true even if the seller and buyer try to match load to supply. (In practice, there is no reason to try to do this anyway, since it is much more economic to dispatch plants in merit order and settle the imbalances later.) An MO needs to be identified to run the market for spot imbalances.

These functions should often be performed independently of the traders in the market, or they will have to be heavily regulated. It may also be necessary for these functions to be performed independently of each other, due to potential conflicts of interest. In many industry models the company that acts as TP also acts as Dispatcher and MO. These functions need not be integrated and sometimes integration of these functions creates self-dealing concerns. Provision of transmission services often involves some financial risk to the provider, which may be conditional on the market prices for energy. As a result, there may be conflicts between the functions of TP and Dispatcher and MO. The Dispatcher's decisions set energy prices and the MO's actions calculate and settle the payments due for energy and transmission. Both functions could affect the transmission provider's revenues.

In the UK, the Dispatcher and TP functions are performed by the National Grid Company, while the pool is the MO. The separation has produced difficulties of coordination, some of which have been solved by changing the rules. In this model the TP lacks suitable incentives to maintain and expand the grid in an efficient manner. A more radical restructuring would have vested the three functions in entirely separate companies.

A further option is to combine the MO and the Dispatcher in a single body since there are no obvious conflicts between them. However, this is not necessarily a desirable pairing. The two functions are often thought to go well together because of the benefits of sharing information between dispatch and settlement of the system. However, the skills involved in dispatching a transmission system are very different from those required for settling a large number of transactions. The latter skills are abundant in industries such as banking and commodity trading. As a result, the benefits of employing a separate MO may exceed the cost of separating the functions.

(b) Generation and Retailing

The role of Distco, the purchaser of power in Model 3, involves retailing and may conflict with generation ownership. The conflict is caused by potential self-dealing. A Distco affiliated with a generator might prefer to purchase from the affiliate, even if the price is higher than other sources in the market. The fact that the Distco has a monopoly over the final consumer in Model 3, means that the excess costs can be passed on to customers (subject of course to regulation). An existing integrated utility may therefore find itself under pressure to sever the retail business from the generation business, either through accounting separation, or by divestiture.

In the UK, this conflict was recognised early, and not fully dealt with. The Distcos, Regional Electricity Companies or RECs were granted a monopoly over smaller final customers for eight years after the 1990 restructuring. Immediately after privatisation they entered the generating market and took equity positions in new gas-fired plant. The regulator was obliged by his charter to review the purchasing policies of the RECs. It proved almost impossible to make relevant price comparisons (due to differences in load mix, duration, index provisions, etc.) but at the end they managed to give the RECs a clean bill of health. However, there are those who have argued that the incentives to self-deal in these circumstances are irresistible and impossible to police, and that the conflict should be resolved by divestiture.

(c) Market Power in Generation

Questions of appropriate market share and potential market power in generation also arise in Model 3. Obviously enough, a generator who has had a legal monopoly is likely to have a large market share of an unregulated market. Market power can be limited by structural remedies, including breaking up existing companies and removing barriers to entry, by limiting the results of exercising market power. For example by instituting revenue or profit caps, or by regulating conduct, or by limiting prices which can be charged.

In the UK, the market power problem was initially resolved by breaking the existing company into three smaller generating companies and encouraging entry, a structural remedy. Although there were eight competitors in the spot market on the first day, there were two large fossil generators who between them had most of the power to set the market price. Since the price never dropped to the level that the excess capacity would have suggested, it is generally assumed that they exercised their market power to raise the price. There are those who argue that three companies are insufficient for competition, and feel that there should have been at least five fossil generators created.

The market power of the generators was limited in the first three years of operation by the existence of "vesting" contracts, which constrained results. These contracts virtually fixed the revenues of the fossil generators over this period. However, they still allowed the spot market to give price signals at the margin for efficient operation of plant, and for closing and opening plant. When the contracts expired, generators started to make real revenues directly in the spot market. When the spot market price subsequently rose, the regulator stepped in and forced an agreement with the generators that they would set caps on the pool price, a conduct remedy. He also told them to take steps to divest themselves of some generating plant.

6.5 Achieving efficiency

In Model 3 the choice of generation assets, both in quantity and fuel type, left to the market. A generator will construct a plant if the market price expected to cover the cost of construction and operation, as in any other market. In Models I and 2, the generator had no access to wider markets. As a result, it needs a contract (either implicit as in Model 1 or explicit as in Model 2) before constructing a plant. Model 3 generators are also likely to seek contracts. However, the existence of an organised spot market, in which they can sell their power, means that the contract is not essential. A Model 3 contract is used to share price risk, whereas a Model 2 contract is necessary to ensure performance on both sides.

In a pool type arrangement there is a real incentive to generate efficiency, even with a limited number of buyers, and even if all the market is covered with forward contracts. A low-cost generator can sell power at spot and, in effect, sell its power to a higher-cost generator to enable it to fleet its contracts. The high-cost generator can even decide to close its plant and meet its obligation through the spot market. This is a powerful tool for achieving generating efficiency.

The spot market price is also a strong incentive to efficiency in usage. A true spot market always clears, there can be no "shortage" because the market price will always rise sufficiently to match demand and supply. Since short-term supply is limited, demand response to short-term pressure on the system offers a major improvement of efficiency over tariff rates, or even interruptible rates. Access to the spot market for purchasers can therefore enhance efficiency. In England and Wales, there is already evidence that large firms can respond to the pool price by rescheduling operations. At least one firm has calculated its marginal value of electricity in order to cease consumption when the price exceeds this value.

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6.6 Social policy obligations

The ability of generators to accommodate social policy obligations connected with generation virtually disappears in Model 3. The purchase of uneconomic inputs (high-cost coal, excessive environmental standards, technologies favoured for national security reasons) cannot be sustained in a competitive market. The generation market in Model 3 has become competitive, and high-cost sources will not have a place unless specifically subsidised. Specific subsidies can of course be designed to encourage windmills or coal-burning plant, or whatever the favoured technology is, but the market will not provide the funds by itself.

However, non-generation related social policies can be continued, if regulators decide they are appropriate for the retail monopoly. For example, discrimination in favour of large consumers can continue so long as there is no mechanism for the customers to resell their low-cost power. The same is true of sales to poor people at below cost. The markets required in Model 4 will effectively permit resale. But in Model 3, the final customer cannot resell.

Subsidies require someone to bear the costs. Customers who have been monopolised and who are highly inelastic usually fit the bill. Although taxpayers could bear the costs directly. In Model 3, the customers are still monopolised and can bear the weight of higher local taxes, or of subsidies to the poor citizens.

6.7 Implications for asset values and stranded costs

The introduction of wholesale competition is the beginning of the potential erosion of the asset values of generating assets in systems where accounting costs result in prices above market value. Market prices could not be expected to cover the cost of past mistakes and social objectives. Furthermore, they will only by the merest chance be equal to the "accounting costs" of existing capacity. If the accounting costs are higher than the market prices, the introduction of competition will encourage movement to low-price sources. This of course is what competition is intended to do.

The problem of stranded costs is discussed more fully under Model 4, retail competition, in the next chapter.

6.8 Pressure for change

In Model 3, wholesale competition, Distcos may purchase directly from competing IPP generators or from a utility of their choice. It requires "access to the transmission system". Once Model 3 is in place, and generators are allowed to compete for sales to Distco, definitional problems creep in: what exactly is a Distco?

If a Distco is defined as being a wires company, purchasing for resale, does a large industrial company with its own network count? How about an industrial park? Can a group of large customers declare themselves a Distco? Can a town become a Distco? Can a shopping centre become a Distco?

Model 3 simply limits customer choice by defining the customers who can exercise it. This definition will inevitably be ragged. If customer choice is limited to consumers with an aggregate load larger than a certain level, are they allowed to aggregate loads over several buildings? Can they form a joint purchasing company to aggregate loads over several firms? Must the loads even be in the same location, or supplied from the same network?

These definitional problems cause Model 3 to turn into Model 4. If some customers are able to make their own arrangements they will be able to purchase market-price electricity. The rest of the utility's costs will then be left to others. This is the 'stranded cost" problem. However, since large consumers very often face tariffs which are close to marginal cost anyway, the cream skimming, and the consequent problems of stranded assets, may not be too extensive. Model 3 may survive for some years on its own or as a mixture with Model 4. Some retail customers may get Model 4 style "direct access" while others do not.

6.9 Examples of Model 3

Model 3 is close to the UK system as it operated immediately after it was Privatised in 1990. The transmission system was separated and provided open access. However, the Regional Electricity Companies (RECs), who owned the low-voltage wires, had a monopoly over all but the largest consumers (over 1 MW). In the UK, this structure was viewed as a temporary situation, in transition to Model 4. Open access was provided to large customers from the beginning, so the UK is a mixture of Models 3 and 4.

In the US, "wholesale wheeling" was permitted by the 1992 Energy Policy Act (EPAct). This allows separate Distcos to choose their suppliers, and requires open access for these customers to the transmission. In the US, however, separate "distribution companies" do not account for a high proportion of demand. Those that existed at the time of the EPAct were mainly municipally owned. There are also a few suppliers who are not already contracted to a utility. The EPAct specifically prohihited the federal authorities from ordering a move to retail competition, or Model 4. However, some states have subsequently taken steps to introduce it.

6.10 Conclusions

Model 3 expands competition by providing more customers for IPPs. More buyers make the market more competitive and more dynamic than the single buyer in Model 2.

The benefits of competition in generation are enhanced by pushing the market risk and the technology risk back to the generators. Generators are usually in a better position to judge the benefits of new technology than a regulator. When their own cash is at risk, they are also likely to give new investments more careful thought. In Model 3, an existing company has to compete against new entrants; in Model 2 it does not.

However, Model 3 increases the transactions costs by requiring markets and network agreements. Allocating new technology risk (the risk of stranded capacity) to the generators also increases their cost of capital. It removes the ability of governments to direct the choice of new generation technology, other than by direct subsidies or directives. However, it leaves some monopoly in the industry, since customers have no choice of supplier. This allows some subsidies and public service obligations to be maintained, although it limits the form in which they can be imposed. It does introduce the problem of stranded generation costs, but by keeping all customers monopolised as franchise customers, it provides at least a potential solution.

Model 3 certainly appears to have all the virtues. Yet we believe that this is an unstable model, mainly a way-station to Model 4. Way-stations can be useful, if they provide platforms for testing new market institutions such as pooling and transmission access. Model 3 could therefore be thought of as a testing stage. Reason for doubting that Model 3 can survive is that we observe that both in the UK and in the US, when some types of customers are granted choice, while others were excluded, the definitional problems become acute. In the UK, there was a phased transition, in which customers were granted access to competitive markets in order of their size. In the US, the large consumers threatened to persuade friendly municipalities to declare themselves independent retailers so that they were eligible to buy and resell (to the large industrial customers, of course) and by implication avoid paying for the sunk costs of their suppliers. We believe that once the markets are opened, it becomes very difficult to limit who may purchase from them and that trying too hard to limit choice only invites uneconomic bypass, and uneconomic self-generation.

MODEL 4 - RETAIL COMPETITION

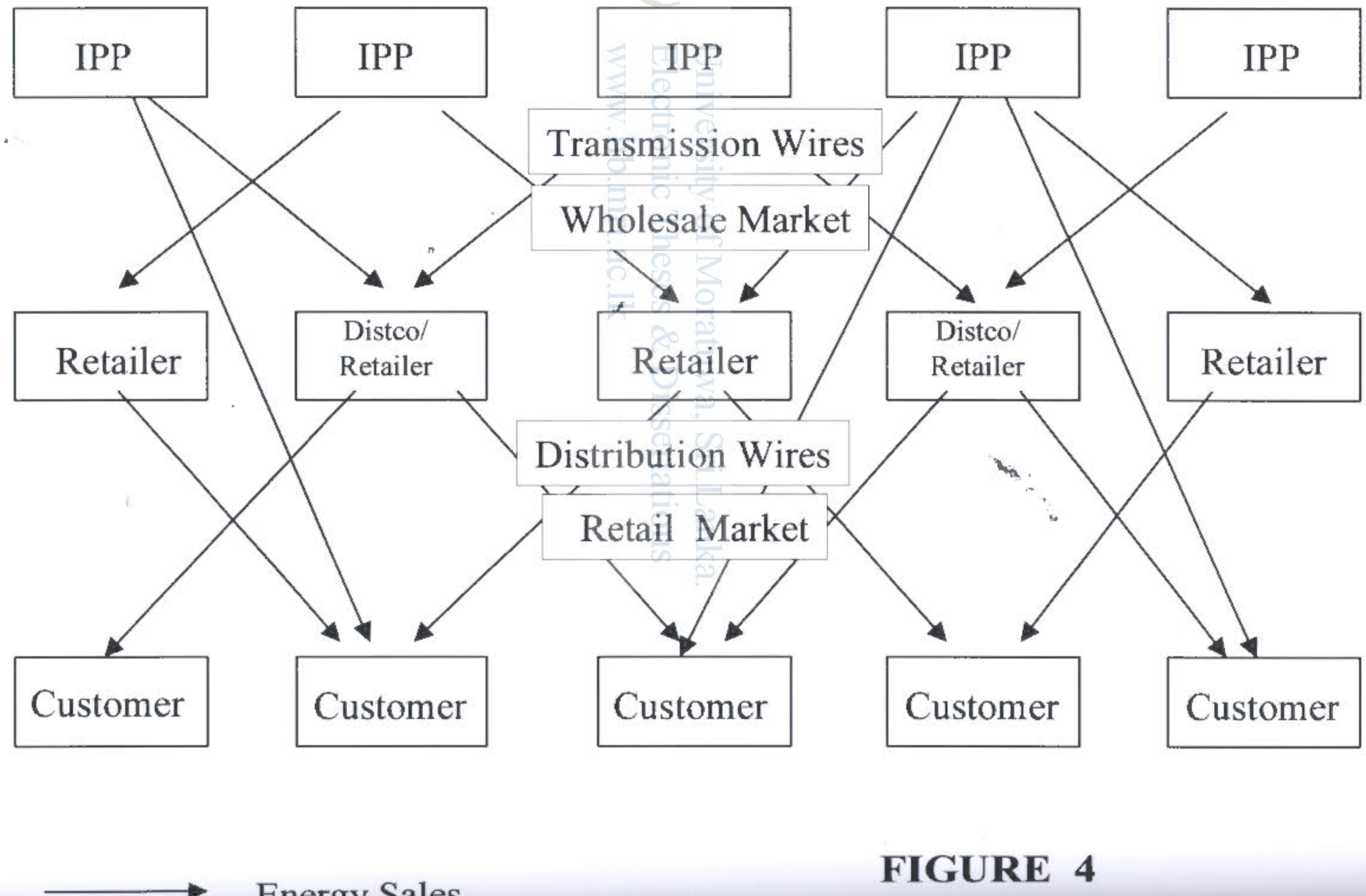

FIGURE 4

CHAPTER 7

MODEL 4 - RETAIL COMPETITION

7.1 Description of the model

Model 4 is called retail competition or direct access. It is shown diagramatically in Figure 4. In Model 4 all customers have access to competing generators either directly or through their choice of retailer. Model 4 differs from Model 3 in that it is characterised by choice for all customers, not just distcos who have a monopoly over their final consumers. The basic case of Model 4 would have complete separation of both generation and retailing from the transport business at both transmission and distribution levels. There is no monopoly over retailing, and competing retailers can perform the same roles as they do in other markets. The distribution wires provide open access or common carriage, just as the transmission wires do in Model 3.

With this structure there would also be free entry to generation markets and free exit. This means there should be no regulation over "need for new plants" and no requirement to maintain capacity in production when it has passed its economic life. There would also be free entry for retailers. Retailing is a new function in Model 4. It is a merchant function which does not require ownership of the distribution wires, although in many cases the owner of the wires will also compete as a retailer.

It needs to be emphasized that Model 4 is not a "single buyer" model. Model 4 pools are not purchasing agencies, they are auctioneers. They never own the power, they do not take the market risk, they cannot price-discriminate. Model 4 is of necessity a single transporter model, moving power to facilitate bilateral trading. The trading arrangements we discuss for Model 4 involve a method for the physical delivery of power. Inevitably this means that all trading has to he done over an integrated network of wires. The operator of the wires has to measure and account for the trades. In the pooling arrangements, there is provision for bidding into a spot market to facilitate merit order dispatch (calling of plants in the order of their short-run costs). The pool acts as auctioneer, matching supply and demand and determining the spot price in each half hour. It collects money from purchasers and distributes it to producers. Model 4 trading arrangements are completely different from Model 2.

7.2 Trading arrangements

Model 4 needs open access to all wires, both high voltage (transmission) and low voltage (distribution). A mechanism needs to he introduced to permit extensive hilateral trading across the network. This will be similar to the pooling mechanism we described briefly under Model 3. Model 4 requires prices for access to both high-voltage and low-voltage wires. These prices must, of course, provide the right economic incentives for location of plants and dispatch of plants. They must also provide sufficient revenues to the owners of the wires.

In Model 3, with relatively few customers, all of them regulated retailers, we noted that a spot market was preferable but not essential. It might be possible to get by with some form of regulated open access across a utility's system, with imbalances settled at a tariffed rate.

However, in Model 4 a spot market becomes essential. A spot market, is always required when contractual arrangements between customers and producers are carried out over a network owned by a third party. The network owner must ensure that there are commercial arrangements that allow for the settlement of imhalances hetween contracted amounts and actual flows. If different parts of a network are operated separately, inter-area payment schemes will also have to be devised.

In Model 4, metering becomes a major problem. Metering by time of use is no longer merely a useful way of promoting efficient usage, it is a commercial necessity. Each customer needs to be metered half-hourly, if this is the settlement period. Since the price changes every half hour, it is necessary to know how much the customers of each competing retailer used in each settlement period in order to be able to bill the right customers and to settle accounts properly. Problems have emerged in the UK with the metering necessary to extend choice to smaller customers. Initially, only 400 customers (over 1 MW) had direct access, and since these customers had adequate metering there were no problems. When choice of supplier was extended to 40,000 customers over 100 kW in 1994, there was a great deal of confusion. The full extension to 22 million customers in 1998 was a major logistical problem. In the absence of metering capability for all customers, some profiling of demand will be needed, but this will always provoke disputes.

7.3 Implications for the structure of companies

(a) Generation and Retail

In Model 3, there was a conflict between being a generator and being a Distco, because of the potential self-dealing. However, in Model 4 there is no longer a self-dealing issue. In Model 3, if the retailer purchases from his own generation, it is hard to persuade the retailer to minimize costs since they could be passed on to captive customers. In Model 4, the customers can choose other generators, so self-dealing is no longer a problem. In fact, there is reason to suppose that there is a natural integration of generation and sales to final customers. The reason is that there appears to be very little value added in retailing. The retailer in other industries performs various functions such as displaying goods in a store, making preliminary choices among different manufacturers as to the style and quality its customers will want, taking the risk on purchasing unsold amounts, quality control of manufacturers and unbundling large shipments for sale as smaller bundles. These are all value-added activities that earn the retailer return. In electricity, the retailer takes risks and unbundles services; the retailer buys bulk electricity and repackages it in tariffs or other forms of contract. These are useful functions, but ones which generators can as easily perform. Retailing as a stand-alone business appears to be a high-risk and low-return business. The potential existence of independent retailers who can hit and run if the profits are too high, introduces a useful discipline in the market.

(b) Distribution and Retail

The integration of distribution with retailing is another optional feature. The basic model assumes that the distribution wires are operated separately from the retailing function. The retailer may make arrangements with the distribution company for them to send customers in their region a bill covering all costs including transmission, distribution and the product itself. Alternatively, the customer could be sent separate bills for transport and for product.

There is a real trade-off between the potential for self-dealing and the potential benefits of allowing the owner of the distribution wires also to retail. The conflict problem is evident; for the same reasons as the Dispatcher needs to be independent in Models 3 and 4, the distribution system operator should arguably be independent in Model 4. For instance, if bad weather damages the wires, Distco has great incentives to fix its own customers first, and so on. It will require regulatory policing to avoid problems. On the other hand, in all cases we are aware that the companies being restructured own the wires and retail the electricity. Customers are used to going to that company for service and most customers are likely to prefer not to have to bother with changing their ways, in particular they do not want to have to call several different places to get service if things go wrong. For such an essential commodity as electricity, there may need to be a local entity that has some obligation to offer a tariff even to customers who, because of their load characteristics or payment record, are not sought after by the entrant competitors. This is a complex issue, in the UK the RECs in each area have a license that gives them responsibilities different from those of the competing retailers who do not own the wires in that area.

(c) Transmission and Distribution

There is no obvious reason of conflict or self-dealing why the distribution and transmission should not be in the same company. They are in the same business at different voltage levels, and all the wire functions are likely to remain monopolies. Whether there are economies of scale in running them jointly may depend partly on the institutional history of the systems, for instance, whether the systems have been jointly operated in the past and on how much congestion there is on the low-voltage systems. In most of the systems we are familiar with, distribution is operated separately from transmission. One reason for keeping it separate would be to provide some sort of "yardstick competition" for the distribution companies, a notion which has proved easier in principle than in practice. However, whichever body regulates the distribution function would have better data if several distribution companies "compete" for regulatory treatment based on service to customers, innovation and price.

7.4 Achieving efficiency

Why bother to go to all the trouble of introducing direct access and retail competition? The transactions costs of negotiating all the required contracts are not negligible. In addition, as we have pointed out, many monopoly companies have had fine records in supplying reliable service at low cost. What additional efficiency does competition bring? One big bonus is on the supply side, as prices of new technologies fall, the urgent demands of independent entrants become more difficult to resist. Competitors only want to compete when they can supply at prices below the prices of the incumbent. The march of technical progress, combined with the load of social obligations borne by the utilities, means that entrants can often beat the prices of existing service. Entry would not necessarily be efficient. Many systems with high prices have excess capacity and low marginal costs, so entry would be inefficient. The cheapest way to increase output would be by running existing plant more intensively. Some pressure for competition comes from customers who (obviously enough) want lower prices, even if this means avoiding whatever obligations they have to pay the sunk costs of the franchised utility. Utilities counter by making access to the transmission wires as difficult as possible. Regulation becomes more contorted as it tries to square the circle of fair allocation of sunk costs with the pressures of suppressed competition.

If the entrants cannot get through the regulatory maze, they will find physical ways to bypass the system, even at higher cost than the marginal costs of the producers they seek to supplant. Thus, there are examples of on-site generation, physical bypass by means of new physical connections, superfluous transmission wires built to meet badly drawn criteria for access, and so on. Making a clean break for competition, and solving the stranded cost issue by making it explicit, is itself an antidote to these inefficient investments.

The general arguments for competition (i.e. efficiency in production, investment and consumption) favour Model 4, although as we have pointed out, some of them can be achieved in Models 2 and 3 or even under Model I with good regulation. Competition should improve both short-term and long-term incentives for efficient production and consumption. On the supply side, the market price signals which plants to close and which to leave open. Plants should be closed if the market price cannot cover all the avoidable costs, including maintenance and staffing. If misguided regulation does not offset the economic decision with hold-over rules from the old regime, uneconomic plant will close, and there will be savings. When the price in the market rises high enough, then new plant will enter, again provided that entry is not hampered by hold-over rules from central planning.

Also, because of the visible spot market, the value of availability becomes explicit. It is the spot price of electricity less the short-run operating cost of the plant. Managers can make decisions about how much it is worth investing to make the plant available, and many decisions can be decentralised. It also offers the right marginal incentives to build, to maintain, to run and to close plant.

These supply-side incentives also operate under Model 3. It is on the customer side that Model 4 produces additional competitive pressure. Many customers make a more competitive market than few customers. They will search out new suppliers and put pressure on incumbents. The Model 3 retailer with a monopoly over customers does not face the same incentives to purchase at minimum cost. Furthermore, if customers are free to respond to a real-time price, they will make changes in consumption. For example, the UK pool price has varied within a single day by as much as 28: 1 between peak and off-peak. Even utilities with time-of-use tariffs must set them based on expected costs, and will have to average over the peak period; typical tariff ratios would be up to 5:1 within a day. When the peak actually occurs, it is under-priced, while the rest of the time it is over-priced. This is what induces "needle peaks," periods of 20 - 40 hours per year in which load exceeds normal levels by 5 - 10%.

These peaks require capacity that cannot possibly cover its cost. In the competitive situation, with consumers able to respond to real market prices, these peaks disappear. In England and Wales, there is already evidence that large firms can respond to the pool price by rescheduling operations. Firms have calculated their own Value of Lost Load in order to cease consumption when the price exceeds this value.

A third virtue of introducing full competition is that it can be the pivot to get rid on many inefficiencies of the previous system. Among these may be procurement policies that favoured certain national or local industries, social policy obligations or just an old bureaucracy used to doing things a certain way. A radical change may do this better than an evolutionary change since, in moving to competition, a re-think of nearly all the existing institutions is necessary and desirable. In the UK, the biggest saving to consumers was one they never had to pay for, the plans for four new nuclear plants and three new fossil plants were dropped when the move to competition was announced.

7.5 Social policy obligations

There can be no obligation to supply in this model since there is no monopoly franchise. Social policy programmes connected to generation can only be imposed by specific subsidy mechanisms or by an overall sales tax. Subsidies should be tailored so as not to impede efficient operation of the markets. For example, governments can encourage "renewable technology" by arranging to purchase such power on a contract similar to the IPP contracts discussed under Model 2. They would then sell it back into the market at market price, taking the loss.

Model 3 still permitted discrimination between customers, for example by providing special deals for large customers or lifeline rates for poor people. This can no longer be accomplished indirectly in the tariffs. Since the market will obey the law of one price, retailers cannot offer special deals and stay solvent. As a result, explicit provision by other means will need to be made for these programmes. This usually requires legislation to charge a non-avoidable levy on all retail sales and/or a charge via a monopolised sector of the industry, the distribution or transmission wires.

Other social programmes such as conservation, high local taxes, some sorts of research and development, could still be collected by the monopoly Wires Company at least up to the point where they induce self-generation. By the time pressure for Model 4 has built up, and especially if it is new technologies that have created the pressure, the ability to collect above-market rates may be severely strained by the economics of the potential by-pass. Explicit (legislated) levies designed to be non-bypassable are potential solutions to this problem.

7.6 Implications for asset values and stranded costs

Under Model 4, the stranded asset problem if it exists becomes much more acute. This is not a minor issue; in the UK, when the generating industry was privatised, generating plant that had been carried on the books for £25 billion was sold at an implied value of £5 billion. This redistribution of asset values (or obliteration of asset values) consequent on introducing open access to a Model 1 system, has been alluded to in previous models.

In a competitive market with many competitors the price of energy may fall to "avoidable costs". This does not mean simply the very short-run avoidable cost of fuel. Generators will close plant if the expected prices for the coming years do not cover all the costs they can avoid by closing. Avoidable costs have a time dimension. Costs are avoidable day-ahead, month-ahead, year-ahead or many years ahead. The market price must sustain all the costs the generators will incur, or the generators will close plant. If there are big players with some market power, even with excess capacity the price will not drop as low as the avoidable cost. Large players can keep the price up by relinquishing some market share. The price, however, may remain below entry level, as indeed it should if new entry is not to be induced in the face of excess capacity.

Introduction of competition will change the revenue of virtually every plant and company in the industry. Even if there is no excess capacity, the market price will only cover the costs of new entrants, there is no guarantee of a remunerative price (covering costs already sunk) for existing plant. Some plants will earn much less than their book costs, some plants may earn much more than their book costs.

In a move to Model 4 this issue must be analysed and assessed. When the owner is the government (as in the UK), and the government decides to open the sector and suffer the hit on generation asset values, it is the government that takes the loss. If the sector is already private, and has been operating in a legal framework which was thought to guarantee revenues, opening the markets can involve major windfall gains to some owners of generating plant. For other owners there may be serious losses to stockholders and costly litigation. As we have pointed out, Model 2 avoids these problems, and for that reason is often preferred.

Although incumbents are understandably more worried about stranded costs than a windfall gain, there are occasions and countries where the problem presents itself in the opposite guise, as follows: much of the generating plant has a book value which is well below the market price. This may be hydro plant that was cheap to construct or depreciated old plant, but is still economic. A move to market prices for generation would give big windfall gains to the owners of these assets, and raise prices to consumers who may in some sense have "already paid for" the assets. Conceptually, these opposite problems could be similarly resolved.

It has been suggested that investors faced with stranded costs are bleating too much, they are wimps. The wimp argument goes as follows; investors have been buying utility stock for years. Each time the regulator allows a rate of return, he/she looks at the price of the stock, and estimates the rate of return investors require to invest in the industry. This is the basis for the allowed rate of return. The investors cannot have been blind to the coming of competition. Industry analysts have been writing about it for years. The rates of return investors have been getting included the risk premium for increased competition and its consequences, and they should not bleat now that it has happened.

This argument, of course, weakens the basis for all regulatory agreements, since it implies that no investor can rely on any regulatory guarantees that might be overturned by the introduction of competition. When windfall gains rather than windfall losses occur from restructuring, the concepts adopted should be applicable in both cases; just as it seems hard to argue that the customer should pay twice if the plant is already depreciated, so it becomes hard to argue that they should not pay once if it is not. Normally, regulators are keen to provide some continued support to the shareholders of existing companies, if only to maintain their reputation for providing a stable commercial environment in the future. However, while regulators may grant permission for existing companies to recover stranded costs, they sometimes underestimate the difficulty of doing so in a competitive market. Design of appropriate cost recovery mechanisms and the appropriate regulatory support is therefore an issue worthy of detailed discussion.

7.7 Netback Pricing

Netback pricing (also known as efficient component pricing, or top-down pricing) must also be mentioned as a way of recovering stranded costs. Netback pricing takes the existing bundled price and subtracts out the monopoly provider's avoided cost of providing the competitive service. If the competitor can provide power more cheaply than the avoided cost of the incumbent, then they should do so. If they can only beat the bundled price, including the stranded costs, then entry is uneconomic. Netback pricing is conceived of as a way to ensure only efficient entry. There are many objections to it, on a dynamic basis, it is proposed as a way to recover stranded costs. Virtual direct access is a form of net back pricing.

The UK government found many ingenious ways to limit the hit on the Treasury implied by the initial sale price of the generator companies. First, it imposed a levy that amounted to a sales tax of 10% on all final sales: this raised £1 billion per year for eight years, which went mainly to Nuclear Electric to pay off sunk costs. It kept the small consumers captive long enough to dismantle the coal industry subsidy and to pay for the excess generating capacity on the system: the small consumers paid much more than the "pool price" for their electricity for the first eight years. Third, the prices set for the distribution wires were very generous. This enabled the government to sell those companies for a tidy profit to offset the losses to the Treasury on the generation side. Finally, the government itself kept 40% of the stock in the generator companies. When it sold this stock after five years, the value was three times as high as the original sale price. This was in all probability due to the market power of the original generators. By closing inefficient plant they kept the market price from sinking to very low levels.

If the potentially stranded costs are to be reclaimed by the owners, it requires careful design of the mechanisms of recovery so as not to interfere with the emerging market prices. The UK mechanisms were not without their problems. However, they proved that the owner could avoid taking too much of a drop in profits, while still introducing a competitive market with positive results for efficiency.

7.8 Examples of Model 4

The UK, Norway, Chile, Argentina and Victoria, Australia have systems that approximate to this model, or are in a phased transition. In each of these countries, the transmission system is owned separately. In none of them have the low-voltage wires been separated from the retailing function, although separate accounting is always required. In the UK, the question of separation of retailing and distribution has been raised as the introduction of retail competition for all customers (a full Model 4) approaches.

7.9 Conclusions

Model 4 expands competitive pressures by making final consumers part of the equation. It also greatly increases transactions costs by requiring more complex trade arrangements and metering.

For the large users, the transaction costs are relatively small per unit of electricity, and meters are already in place. For small users, the costs may easily outweigh the benefits. Not only are metering costs comparatively higher for small customers but, the benefits of "one-stop shopping" are lost. Precise responsibility for poor service may be difficult to pinpoint when the local distribution company is not also the retailer.

The world of electricity has changed radically in ten years. Our overall view is that Model 4 is the world of the future. However, the institutional questions are as important as the technical ones. In some countries the major problem is to get accounting systems in place, to get adequate tariffs and to get people trained to run control rooms, not open access to networks. Open access may be a frill. In other countries, the use of the electric industry as a vehicle for social policy will be hard to replicate if the policies have to be reenacted as specific legislation or subsidies. That is why they were hidden in the electric industry in the first place. Direct access may in practice be limited to only a few large consumers who threaten to leave the system, while the bulk of consumers stay effectively monopolised.

CHAPTER 8

WHICH MODEL TO BE SELECTED?

8.1 Final thoughts on the structure questions

On the whole, we tend to the view that competition, absent specific indications to the contrary, is the preferable form of organization for efficient production, since market prices give the right signals for both consumption and production, and (if the rest of the economy is competitive) give the right allocation of resources to electricity production. The most obvious contra-indications are scale economies, which might lead to unregulated monopoly power or destructive competition; or substantial transactions costs, whicb would render competition inefficient.

In small systems there may still be scale economies to be reaped, which would indicate continuation of monopoly. or at most a Model 2 system where the potential monopoly power of generators is restrained by contracts. Even in large systems, it has been argued that the benefits of standardization and a centralized nuclear program constitute scale economies of sufficient significance to outweigh the benefits of competition.

In many developing countries the transactions costs of competition are a significant problem. Countries where the electricity system is not yet on a sound Commercial footing may reasonably choose first to get the tariffs in order, persuade people to pay their bills, and get the accounting system in place, before introducing the further complications of spot markets and open access. Countries where the entire legal framework of commercial activity is lacking may reasonably choose to enact company law, property law and bankruptcy law before moving to any form of non monopoly organization.

If there is to be a Model 1 monopoly should it be government owned or should it be privately owned and regulated? The US experience from the 1940s to the 1970s of regulated monopoly is often adduced as an example of independent regulation of private monopolies which worked to bring low-cost plentiful power to the whole population. Yet in the same period, the government owned monopolies in Europe were able to perform much the same feat; demand was growing and mistakes were swamped by the continual improvement in technology. After the technology stopped improving, and fuel prices rose, demand growth fell off and both systems were slow to react; they all continued to overbuild plant; governments in both places prohibited gas burning long after it was reasonable to do so, slowing the advance of technology, and unleashing an avalanche of low-cost generation when the prohibitions were removed. The effect of the monopoly was to insulate the producers from the advance of technology and the risks of the market place. Private producers fully exposed to the demand risk might well have chosen a different path; in fact, the first casualties of impending competition, both in the UK and in California were the additions to capacity planned by the government on the one hand, and the regulators on the other.

Model 2 does not solve these problems, although continual bidding for new plant might uncover lower-cost sources, provided the purchasing agency does not limit bids to specific technologies or fuel sources. Model 2 can be used to invite alternative sources of capital into government-owned systems, without forcing the entrants to take the market risk, and may therefore be more successful in inducing investment in emerging economies. However, some emerging economies are so starved of power that the purchasing agency, with its bidding procedures and standard tariffs (and rationing procedures in many cases) can become a bottleneck. China, where in the early 1990s some provinces were on a reduced work-week because of power shortages, has had some success with Model 2, but the shortages persist. Some limited form of open access would allow new entrants to compete to sell directly to hungry manufacturers or townships at what the market would bear, without waiting for the cumbersome procedures of the purchasing agency.

Are any of the alternative models more amenable to maintaining an existing system of vertically integrated companies? Conflicts are not simply theoretical problems: they can result in prolonged litigations, or wasteful and sub optimal palliatives being adopted. Model 2 was instituted in the US with the built-in conflict of the incumbent utilities acting as purchasing agents while also owning competing generation and the transmission system. Perhaps as a result, many of the IPP contracts are non-dispatchable, resulting in seriously sub optimal dispatch. A Dispatcher independent of the competing generators would have been preferable. Again in the US, where limited versions of Model 3 exist in the form of municipalities which could exercise choice over suppliers, the utility which owns the transmission is also the competing supplier, and operates under different rules as far as risk and obligations. This has resulted in a decade of litigation over open access. Model 2 really required separation of the purchasing agency and the transmission from the incumbent utility for it to work well. In theory, properly structured PPAs (power purchase agreements) and bidding systems could resolve the potential conflicts, but this seems seldom to happen. Setting up a Model 2 system with independent transmission would be a step towards full competition at a later date. This is a major step requiring substantial reorganization.

Problems of conflict of interest, self-dealing and market power in Models 3 and 4 may require more extensive breaking up of existing companies. This is not a pleasant thought for existing vertically integrated companies; it is complicated and expensive to do, and absorbs much management time. Alternative methods for avoiding conflict, such as creating different business units with separate accounting, may be tried. Not all conflict and self-dealing situations are lethal; there may be offsetting advantages in terms of economies of scale and scope which should be balanced against the potential problems. Furthermore, the conflicts which exist in one model may disappear in the next. This implies that careful thought should be given before making large and dislocating changes.

The most obvious example of the problem changing with the model is the question of divestiture of generation. In Model 2, the purchasing agent should not be a competing generator, nor should one of the competing generators control the transmission. Therefore in a Model 2 system there will be pressure to divest generation to avoid conflict of interest problems. In Model 3, there will be pressure to divest generation from the Distco, because of perceived self-dealing problems. A Distco who has a monopoly over captive customers will prefer to purchase from an affiliated company so long as he can pass the costs on to the captive customers. Controlling this tendency may require such intrusive regulation that divestiture, to ensure arms-length dealing, is a better ideal. However, in Model 4, the self-dealing conflict disappears. If the retailer is facing competition, he would be foolish to favour his own subsidiary if cheaper power is to be found. In fact, in Model 4 there seems to be a natural vertical integration of generating and retailing, and the problem becomes horizontal market power, the ability to raise prices because a single entity has substantial control over a local market, and there is insufficient transmission to permit competitors from outside. This problem may indeed required divestiture if other remedies cannot be found, but it did not exist in Model 3 because the Distco had a 100% monopoly over the customers and was therefore regulated.

In Models 3 and 4, the operation of the transmission system needs to be independent of the traders. We have discussed the different functions and possible conflicts. Model 3 in any event seems to us to be unstable, although it may persist for some years, because of the difficulty of defining who is entitled to choose their supplier once some entities may do so, and because of people's ingenuity in redefining themselves into the favoured category.

The experience of the pioneer countries has shown that Model 4 is feasible, and that trading arrangements can be introduced which allow customers to choose their suppliers. While Model 2 is preferable in some instances, particularly where the institutions are immature, or the systems so small that competition is inherently limited because of too few generating units and consequent market power problems, we believe that Model 4 is likely to be the model of choice for developed countries with sophisticated systems. However, the case is still undecided. The UK system not yet completed the transition to full retail competition, and there may still be pitfalls in enlarging the numbers of customers eligible for competitive supply so dramatically, and in maintaining adequate capacity.

CHAPTER 9

EXPERIENCE IN DIFFERENT COUNTRIES

9.1 Introduction

In the chapters 1 to 8 of this study, the problems and difficulties the electricity sectors of different countries faced in the past and, how those countries used restructuring of their electricity sectors as a remedy for those problems have been discussed in general. The idea of this chapter is to discuss in detail the specific experiences gathered by countries like England & Wales, India, Chile, Argentina, Philippines and Malaysia in restructuring their electricity sectors.

9.2 England and Wales

The centrally planned and operated mainly state owned electricity industry in England and Wales was restructured by separating generation, transmission, distribution and supply businesses in early 1990. Generation and distribution/supply sectors were further separated horizontally to allow competition in these sectors while transmission business remained as a single entity. Within one year of restructuring all these businesses except the nuclear generation business were privatised. Even the nuclear Generation Company went private few years after.

Since the vesting day in 1990, England and Wales electricity industry has been operated on the hasis of a wholesale market where generators bid into a pool every day and the suppliers buy power from the pool or through direct contracts with the generators. Even the direct contract financial settlements needed to go through the pool arrangement. The pool electricity prices (both purchase and selling) are determined by the system marginal generation cost for every half an hour during the day. Originally consumers above 100kW were allowed to have direct involvement in the electricity market and later in 1998 even this lower limit was relaxed so that every single consumer in the country can select his supplier. Third party accesses to transmission and distribution networks have been allowed in order to maximise competition at generation and supply businesses.

Natural monopoly business within the electricity industry, transmission and distribution network services, have been regulated through an independent regulatory framework set up for the purpose while generation and supply business have been left to the market forces for self regulation. One of the major problems in the generation sector in the England and Wales electricity industry has been market domination by two large generating companies which had the ability to control the pool prices to a large extent at the initial period after vesting. Regulatory pressures have improved this situation over the years to a great extend.

After the restructuring of the E&W electricity industry the real average fuel costs per unit of electricity generated fell by approximately 50% due to improved generation efficiencies and fuel switching while the final electricity prices fell by 20%. The difference in the two figures reflects lack of competition in the generation sector.

Presently the pool arrangements are being reviewed to improve competition with proposals to introduce three markets, forward and futures market, a short-term bilateral market and a balancing market. These proposed arrangements are expected to offer lower prices and more competitive trading, a greater choice of markets and increased transparency.

9.3 India

The power industry in India has been state owned from 1956 and regulated by federal and state agencies. The state electricity boards (SEBs) were created to allow functioning of the power sector on better commercial and financial bases with operational autonomies from the state governments embedded in them. However over the years these arrangements deteriorated to such an extent that the financial footing of the SEBs became extremely weak requiring major reforms in all sub sectors of the electricity industry in India.

By mid 1990s the federal government decided that the SEBs need to be replaced by new entities for generation, transmission and distribution with progressive privatisation of the assets. It was also decided that tariff setting would be handled by an independent regulatory body which would be set up to regulate the industry as a whole. A national action plan for power evolved by December 1996 with maximum autonomy given to SEBs to operate on commercial lines.

The first state to introduce sector reforms was Orissa, which progressively implemented reforms since April 1996. Initially SEB in Orissa was unbundled into generation and transmission & distribution companies with responsibilities transferred to public utilities, Orissa Power Generation Corp (OPGC), Orissa Hydro Power Corp (OHPC) and Grid Corp of Orissa (Gridco). Additionally, an independent regulatory commission has started functioning for tariff setting and licensing. These newly formed companies failed to improve performance due to continued political interference and therefore privatisation of distribution through asset sale (51% of the equity) and sale of one of the generating companies (49% of the equity) was undertaken and completed in late 1999.

In the northern state of Haryana reforms legislation has provided for an independent regulatory commission, a new utility to take over existing state-owned generation projects and privatisation of distribution while transmission business remained with the government. The same pattern lies in the statutes passed by the southern state of Andra Pradesh while similar steps have been taken by other states such as Maharashtra, Kerala and Karnataka. State like Rajastan, Madya Pradesh and West Bengal are also at different stages in the process of proceeding towards reforms in the electricity sector. As early as early 1998, a federal ordinance was issued providing for creation of independent regulatory commissions at federal and state levels mainly for tariff setting and licensing.

9.4 Chile

The first experiment in transforming a government owned and operated power industry began in Chile in 1980. Utilities were privatised between 1986 and 1989 after financial and corporate restructuring. At the time of restructuring the sector had been operating reasonably well but was reformed as part of implementing broader economic policies at the time. By 1990 less than 10% of the electricity sector where hydropower contribution amounted to approximately 75% of generation, was owned by the state.

The "Southern Cone" model, which includes Argentina, divides the industry into five functions; generation, transmission, dispatch, distribution "wires" and distribution "supply". The utilities are deregulated at both wholesale and retail levels. The wholesale market is completely unregulated and heavily relies on the market forces for its proper functioning, introducing competition in electricity generation. The retail portion of the model allows medium and large-scale consumers to directly access generation on freely negotiated contracts for supply of electricity while the prices for small - scale consumers are regulated. The regulated price has been linked to the market price allowing the benefits of competition to be passed onto all the consumers. Unregulated prices were used as a signal for system expansion.

The experiences in Chile have shown that large efficiency gains can be achieved through restructuring and deregulation. By any standard these systems have improved. Active entrance of new generators has occurred with improved quality of supply while the prices have fallen in real terms. But as in the case of England and Wales system, there were transitional problems in the Chilean electricity industry when converting into a competitive market structure. A major problem was the absence of restrictions on cross-ownership of different business in the market leading to one investment group owning the bulk of the generation assets, the transmission system and the largest distribution company. This has hindered the development of a more competitive generation market at the initial stages of reforms.

One of the main achievements of the Chilean electricity sector restructuring is its handling of rural electrification. A special fund set up for this purpose is competitively allocated to private distribution companies to cover part of their investment costs in rural electrification projects. The state (Both federal and regional administrations), private investors and consumers, all contribute to funding of this programme. This programme has been able to stimulate a faster growth in the rural electrification levels beyond the expected targets.

9.5 Argentina

Argentina restructured and privatised the electricity industry more than ten years after Chile and benefited greatly from the lessons of its neighbouring country. It adopted the basic market mechanisms worked in Chile such as open access to the wholesale capacity and energy pool of generation facilities and least cost centralised dispatch. But it replaced or modified other less successful aspects of restructuring.

Mandatory separation of transmission and dispatch functions from generation and distribution and establishment of an independent dispatch agency are some of those measures which were not present in the Chilean system. No generator is permitted to own more than 10% of the system capacity and restrictions have been imposed on cross-ownership and reintegration. In 1997 the governments of Argentina and Brazil agreed to integrate their electricity markets with guaranteed free competition among generators banning all state subsidies and requiring cost based pricing.

The Argentine privatisation has been a clear success story with noticeable improvements in generation plant performances, decline in retail prices in real terms and increased supply reliability experiencing lower outage levels.

This "southern Corn" model is now being applied elsewhere in Latin America including Peru, Bolivia and Colombia. All these countries started their restructuring and deregulation processes in mid 1990s.

9.6 Philippines

Philippines is an example in Asia of a number of best practices in encouraging private sector investment more than other developing countries in the region. By and measure, Philippines has been successful in attracting private investment into electricity generation sector with IPPs accounting for 27% of its installed power generation capacity at present. But nearly all the IPP contracts guarantee the price and the sale of power from a single seller to a single buyer over a long period of time. Though these projects constitute real private investment with efficient generation technologies this form of contracts cannot be considered competitive. The investors compete for projects but not yet for the market.

The Omnibus Power Bill that contains key provisions determining the organisational and transitory provisions of the restructured power industry have been approved by the Philippine House of Representatives.

The restructured power industry will consist of five segments; generation, transmission, distribution, supply and end-users. The generation component will be composed of IPPs and spine-off generation companies of the National Power Corporation (NPC), cogeneration facilities and self-generators. High voltage electricity transport will be undertaken by the National Transmission Corporation (NTC) which will own and operate the transmission system. Low voltage transport and electricity retail will be carried out by franchised distributors who will own and operate the distribution systems. Retail competition and open access is to be implemented within a period of three years. As stipulated in the Omnibus Bill, NPC will be reorganised and its successor companies will be privatised through public bidding.

9.7 Malaysia

Malaysia though a relatively small country in terms its population (less than 20 million) has significant investments in the power sector. There have been a number of IPPs financed and constructed in Malaysia in the 1990s totalling over 4000 MW. Most of these projects have been funded through Malaysian financing which has resulted them being insulated from foreign exchange crisis afflicted the IPP payments in other countries in the region. Also, this has stimulated the growth of domestic capital markets.

Almost all the load in the country is served by Tenaga National Berhad (TNB) expect the area under eleven distribution licenses issued to serve over 600MW of consumers. These licensees are permitted to offer a full range of services such as water, district cooling, Internet access, and telecom in addition to electricity. The prices of the services are regulated. As a result of the ability of these licensees to provide integrated services, they have managed to obtain greater efficiencies and offer better service reliability levels. It appears that there has been very little competition in awarding these contracts thereby resulting in relatively higher prices and higher profits for the companies. But on the other hand, this approach has fostered the development of several Malaysian companies, which are now able to pursue project development in other countries in the region.

As discussed above, there is very little effective wholesale or retail competition in the Malaysian power sector at this point, expect benchmark competition in certain parts of the distribution sector. There are no specific commitments to putting real competition in place as at present.

9.8 General Discussion

As discussed above the reforms in the power sector has taken many forms in different countries and continue to evolve into various different structures.

"Southern cone" model in South America shows that several conditions can play an important role in creating efficient and competitive energy markets. They are,

- Mandatory separating of functions and clear restrictions on cross-ownership and vertical integration.
- Restrictions on the size of the generators to preserve competition.
- Open access to transmission facilities with transparent and incremental cost based transmission charges.
- Establishment of a centrally dispatched bulk supply market with prices based on marginal costs while a parallel bilateral market based on long term contracts.
- Access by generators to at least part of the retail market.

Many Asian and African countries are liberalising their energy markets while preserving and artificial monopoly over the whole sale trading of electricity even after vertical unbundling of national power companies. This is evident with the single buyer model being adopted in most of these countries as a transitional arrangement before conditions for wholesale market are satisfied. But the experience in countries with weak governments and low payment discipline suggests that it is better to skip this stage of the reforms and directly adopt a market model with multiple buyers immediately after unbundling. Allowing the generators to sell electricity directly to distributors and large consumers eliminates most of the disadvantages of the single buyer model. Though this bilateral contract model can pose some difficult short term challenges it is still worth finding solutions to them due to long-term benefits which follow.

There is no doubt that the England and Wales model provides the ultimate target for reform programmes in developing countries moving towards competition and private sector participation. But for most developing countries a policy selecting only the features that can be adapted to local conditions is advisable due to many constraints exist in terms of financial and other resource requirements in implementing this model entirely. Particularly this is important in the case of small power systems where economies of scope outweigh the gains from unbundling. This factor is further discussed in chapter 10 of this study. In fact, it is greater private sector participation in the electricity industry with competitive markets and a well-defined independent regulatory environment, which would bring in real gains from electricity sector reforms.

CHAPTER 10

DIFFERENT SITUATIONS TO BE CONSIDERED

10.1 Introduction

It was observed that the factors to be considered in restructuring the electricity sector varies with different situations like; challenges in the market, policies of the governments, attitudes of the people and the size of the market etc. For successful restructuring all these factors have to be considered. The size of the market has a special relevance to small countries like Sri Lanka. In this chapter the different factors those have to be considered for successful restructuring are discussed.

10.2 Relevance to small systems

The recent worldwide interest in power sector privatization and restructuring has focused on a few high-profile cases, such as Argentina, Chile, and the United Kingdom. As a result, the pattern of restructuring now taking shape in many power systems largely reflects the experience in these few countries. Consultants working in locations as diverse as Jamaica, Kenya, and Poland are applying a privatization model in which generation is separated from transmission, which in turn may be separated from distribution. The generation sector is then split into several competing firms. This model of restructuring, based on capturing the benefits of competition in the generation sector, is accompanies by regulation for those parts of the new system that cannot be competitive and that may therefore open up possibilities of monopoly exploitation.

In small power systems, however, the balance of advantages and disadvantages from these changes may be quite different from that of system in larger economies. When there is only a single generator, it can be more efficient to leave it joined to the transmission system. But that is not the advice some countries are getting. For example, a consultant report for Kenya, which had net installed public capacity of 706 megawatts (MW) in 1990, said that there was no scope for competition between the existing generating plants. Yet consultants have still advised separating the single private generator from the transmission and distribution company.

The arguments for this vertical separation are quite different from those for horizontal separation and need to be individually addressed. Indeed, even when it is possible to introduce limited competition in generation and hence achieve some benefits, the costs of vertical separation may be so large as to offset the gains from competition. Therefore, any restructuring plan for a small system must take into account that it may be harder to achieve real competition in the generation sector.

This issue is relevant to many small countries contemplating power sector reform. In 1990, there were sixty countries with capacity of less than 150 MW, thirty with a total net public capacity of between 150 and 500 MW, and seventeen with between 500 and 1,000 MW. The experience of countries that have already restructured their power sectors (United Kingdom, system size 70,000 MW; Argentina, 15,000 MW; and Chile, 3,000 MW) may be of very limited relevance to systems of, say, 1,000 MW or less.

The most efficient structure for a small system may be quite different from the fully disaggregated model. Reform proposals thus need to be flexible, and alternative systems under consideration need to be closely evaluated. The sources of the kinds of gains and losses from privatization and restructuring that need to be considered in any proposed power sector reform strategy. The preconditions for effective competition (one of the main sources of gains) in the generation sector also have to be carefully looked at. Each of the issues raised relates to system size.

10.3 Costs and benefits of privatisation

Comparing the performance of a vertically integrated public monopoly with that of a vertically integrated private monopoly exposes the gains and losses due to privatization alone. The key change that privatization introduces is the profit motive. The impact of this change should not be fused with the effect of restructuring. In fact, the benefits to society as a whole from ending state control of the power sector can be so large that the additional gains due to restructuring may be relatively unimportant.

Performance assessments of publicly owned entities should make a distinction between entities that have been corporatised and commercialised and those that have not been. Commercialization is possible only if the government removes itself from day-to-day interference in such issues as tariff setting and employment. Some countries that have not been ready to privatize their power sector have introduced commercialization (New Zealand, Portugal), an important intermediate step between the most interventionist form of state ownership and privatization. Commercialization may allow many of the potential gains in efficiency to be captured, especially where there is little scope for competition. Small systems may thus find it of little incremental benefit to privatize, provided that the government maintains an "arm's length" relationship with the company. Where this is more difficult, because of the political situation or because of the traditional approach to state companies, privatization may bring permanent benefits that would not be sustainable with a commercialized state entity.

The allocative gain or loss from a change in pricing due to a shift from a state monopoly to a private monopoly depends on the extent to which prices were being held below costs in the first case and the extent to which prices are limited by regulation in the second. With no subsidization, a move to unregulated pricing by a private monopoly produces a "deadweight" loss of consumer surplus as well as a transfer of consumer surplus to producer surplus. If the public sector were pricing below cost, the removal of this implicit subsidy would produce a "deadweight" gain, and a transfer back to taxpayers and away from power consumers. Because subsidies have been very large in many countries and the state has financed new investment, moving from public ownership to regulated private ownership (even if monopolistic) can produce large allocative net benefits for the economy.

This shift involves a potential gain in productive efficiency if private industry can cut costs. Public ownership tends to result in productive inefficiency, both because managers have little incentive to reduce costs and because politicians often are willing to increase costs to serve other purposes (for example, providing secure employment). The political incentive to collect revenues or prevent theft of power can also be low.

Whether a private monopoly will be productively efficient (that is, produce a given output at minimum cost) is uncertain. The few well-established private monopolies (Barbados, Bermuda) appear to work well. The poor performance of many state companies is more likely to be attributable to the nature of their ownership than to their structure.

10.4 Costs and benefits of vertical separation

Vertical separation (the separation of distribution, transmission, and generation into private monopolies) has two important implications for private capital. It can increase monopoly power, but it can also lead to the loss of economies of coordination. When each stage is monopolistic and the technology is relatively fixed, a classic result is for an unregulated chain of vertical monopolies to sell at a higher price than an unregulated integrated monopoly. Regulation becomes more important in this case. But the fact that many private industries, even in competitive markets, show evidence of vertical integration indicates that there are gains to be made from unified ownership, as in the U.S. power sector.

The first general reason for the success of vertical integration is the existence of economies of scope. Certain activities need to be undertaken by both parts of the industry, but there is the possibility of sharing some inputs. A typical example would be the need to have an accounting department in each company. The activities of these departments would include handling the transactions between the two companies. Integration would not do away with such transactions, although they become internalized, but they would be accounted for just once rather than twice.

Related to this would be an economy of scale. An accounting department would not need to be twice as large to deal with a company double the size. Some basic setup costs (computers) could be shared. A very important aspect of this argument is the existence of economies of scale to top management. Good mangers often are scarce (especially in small economies), and integration will likely save on this resource. There can also be financial economies of scale, which can be achieved when the component firms combine their borrowing needs, reducing the cost of borrowing money.

A separate argument concerning vertical separation, or de-integration, relates to the decision making process itself and economies of coordination. This issue affects both day-to-day working of the system (dispatch) and its longer-term size (investment). In an integrated company, coordination takes place through physical commands and, to be effective, required complete information about all parts of the system. In a de-integrated structure, the coordinating mechanisms are the prices and contracts agreed between the two parties. Since each firm is trying to gain more of the profit for itself, there is a strong incentive in bargaining not to divulge information to the other, leading to contracts that are suboptimal for the system as a whole. In addition, there are transactions costs in negotiating and contracting.

A key argument in favor of separation is that it increases transparency and allows the responsibilities of managers to become more focused. The larger the firm, the more difficult it is for a managers to become more focused. The larger the firm, the more difficult it is for a manager to have oversight of all its component parts and their interrelationships.

10.5 Costs and benefits of horizontal separation in generation

The possibility of introducing competition into generation is critical to a power restructuring strategy. The key issue is the mechanism by which competition takes place. If it is not possible to introduce effective competition through vertical separation, on balance it may be better to leave the industry integrated even though it has been privatized. Nor does the existence of several generating companies by itself necessarily introduce competition. So, breaking up the state company into several private generators could lead to the loss of some benefits of scale or scope, yet without producing any benefits through competitive downward pressure on prices.

In large privatized power systems (Argentina, Chile, England, and Wales), repeated bidding, in which the generators bid to supply power on a daily or even half-hourly basis, allows competition to be effective. If costs can be cut, then prices can immediately reflect this, forcing a higher-priced rival out of the way. This bidding system is too complex for most smaller power systems and for economies at lower levels of development, which instead use a contract system. With a long-run contract system, opportunities for generators to use cost reductions to gain market share are much more infrequent.

A second condition for effective competition is that there be a sufficient number of firms to avoid implicit collusion and gaming in the system. A two-generator industry, for example, may be susceptible to each firm's tacitly allowing its rival to behave in their mutual interest. The arrangement in England and Wales, with two large private generators (plus a smaller, subsidized public nuclear company), has already demonstrated that a larger number of companies is required to induce truly competitive behaviour. In small systems, the market can be too small to support enough firms to achieve competitive conditions, unless the firms are so small that they lose economies of scale.

A third condition for effective competition is that the size and cost structure of the generating firms must be fairly similar. If they are not, there would be no possibility of using cost saving to increase market share (by altering the "merit order" with respect to a rival). A related issue in determining the competitiveness of rival generators is the "strength" of the transmission system. A system with very high transmission costs per unit of distance can allow some generators to be virtual monopolies, since the extra costs of delivering supply across the transmission system to meet demand at a given node effectively prevents competition from more "remote" sites.

In an existing industry, there must be excess capacity for competition to be successful in the short run. If all plants are needed on a regular basis, there is no incentive to cut costs. The force of competition must come from new entry (such as independent power producers). If entry is easy and rapid, the threat of entry may be sufficient to induce existing firms to become cost-efficient. But were entry is difficult (because of problems in obtaining licenses and constructing the plants, for example), the threat of entry may be too small to affect the behavior of established firms. Where existing firms have some cost advantage not available to new entrants, there is an "intrinsic margin" that may not be competed away. Common intrinsic advantages are privileged access to local fuel supplies (especially hydro) that cannot be bid away by higher contract prices for the fuel, proximity to fuel source or to market, and environmental suitability of existing sites or even the non-availability of new sites.

In existing systems, de-integration may bring about some losses of economies of scale. One factor in such losses is the need to maintain a "reserve margin" against uncertainties. The experience of U.S. power pools has shown that pooling has enabled individual firms to reduce reserve margins, and thus to reduce costs. In developing countries, it is unlikely that such sophisticated devices can be made to work, so a de-integrated system will incur the extra cost of maintaining reserve margins. Similarly, separation will increase the demand for managers, who may be in scarce supply in many small and less developed economies.

10.6 Current situation in the world

As is now painfully obvious, California managed to implement deregulation without some essential requirements for a successfully deregulated market. The main problems they had were the inability of utilities to pass price rises onto consumers, the inability of utilities to set up forward contracts direct with consumers, the lack of capacity in the region (both generating and transmission), there was no "peak pricing" encouraging consumers to use less power during high demand period and there were no consumer protection and education programmes. (even on the hottest day of the year in 2000, clothes dryers used 5% of the total electricity consumed, a major contribution to rolling blackouts.)

Many countries throughout the world are worried their electricity markets would suffer California-style crises if they deregulated. Everybody feared power cuts and the abolition of the socially important security of supply. The chances of similar crises in Europe in the near future are minimal. There is excess supply for the coming years, there is more than sufficient interconnections between the different states, and all kind of derivatives products are widely available on the exchanges and bilateral markets and are widely sued by all electricity market participants.

An Asia, countries that were front runners in power market deregulation have put their activities on hold or at the very least slowed them down. They are reappraising the situation. But, Singapore has launched its restructured electricity market in end of 2001.

In the Middle East, there are still very few countries where deregulation has got further than a gleam in a businessman's eye. But many countries there are following closely the results of other's deregulation measures. Success or failure will influence whether the Middle East proceeds further.

To be protected against energy crises and from resulting losses, utilities will have to change their attitude. They will have to learn about the ins and outs of deregulation, electricity trading and the use of derivatives in a way that controls risk. Regulated markets offer fixed costs, guaranteed turnover and profit and a secure client base, so utilities will have to become competitive and will get exposed to constant market changes if deregulation is to succeed.

Market structures will change; there will be mergers and acquisitions of existing participants, and new participants will undoubtedly enter. Deregulated markets will mean competition with other players; price volatility and increased risk. Electricity prices are very volatile in deregulated markets. Changes of 400% are not uncommon, so it is necessary for market participants to be prepared for a fierce battle for customers.

All incumbent utilities will, sooner or later, have to transform from being monopolists to being competing market players with active sales and marketing departments and solid systems of risk control and portfolio management.

There is also a question over the future of the power pool, a concept implemented by the UK when it deregulated its electricity market. The UK was one of the first countries to deregulate and at the time a power pool was a good solution. It did not, whoever, promote the desired fair competition and so revised trading arrangements in electricity were implemented in march this year. Now the UK has decided that a power pool does not work, and has abolished it, other countries which use similar devices are expected to reassess them.

Deregulation in general is expected to bring about lower energy prices, better prices for end users, more efficient energy companies and lower capital expenditure for governments. When deregulation started in Europe, prices came crashing down. Energy companies started fighting for market share and therefore offered very low prices to maintain their large customer base and win new customers. The prices were lower sometimes even than production costs. German market incumbents suffered selling prices for power that were below the costs of production. These companies are willing to apply such a price scheme because they believe they can make up for their present losses once they have captured or maintained a significant share of the market.

Prices tend to rise towards more "normal" levels once the initial storm let loose by deregulation has abated. In the end, the consumers will tend to pay lower prices for their electricity but should get better service and have more choice as to who supplies their electricity.

Deregulation has large benefits not just for end-users but also for energy companies. Energy companies get the opportunity to grow outside their own regions and to invest in other countries. Many US-based energy companies have taken advantage of deregulation by entering the electricity trading business. These companies have large trading organizations in place, that are competing globally in every deregulated electricity market.

At present leading European companies such as Electricite de France are copying the successes of their US competitors. These European companies are mainly focussing still on the deregulated electricity markets of western, and increasingly of central and eastern, Europe but are starting to expand their activities further afield.

Even if these kinds of electricity trading activities were not top priority for Middle East utilities and suppliers, it would be foolish for them to ignore the market totally. That is because the big US and European energy giants will gladly supply the highly profitable electricity trading market even if local firms will not do so. And they will supply not just physical electricity. They can also supply all kinds of derivatives products, such as forwards and options, and they will bring with them valuable assets and experience of trade and deregulation.

In this market it is eat or be eaten. When incumbents are not securing their client base and therefore not competing on equal terms with news and other existing participants, somebody else will take their market share.

The trading markets in the US and Europe have proved to be a high profit earning business. Many Meddle East incumbents have identified the threats and opportunities and have started to research the different possibilities.

They are being educated in, or are implementing, trading desks and risk management organizations. In Asia there are many highly skilled engineers who have proved to be valuable employees for the utilities business. However in a deregulated market other skills are becoming more important. These skills include financial engineering, sales and marketing.

As an analyst in Hong Kong put it; "Deregulation doesn't change the way the electrons flow, only the way the money flows." For many engineers the shift to financial engineering, which implies a different business approach, can be very difficult. But is should not be seen as impossible.

Another way to acquire the necessary knowledge is by employing traders who have experience in competitive trading environments. But while this can be a good way to acquire the needed knowledge very quickly it will not prove ideal. A well-known factor in this is the culture clashes that can occur between western and Middle East people. The trading culture is something special and therefore mixing these two elements might not have the desired effect.

An important point needs to be noted. There is a shortage of skilled traders in the European market, so traders in Europe who are free, willing and able to be employed in Asia might not necessarily be the best traders on the market. It can take a long time and a lot of effort to find the right person for this kind of job.

Competitive markets are all about liquidity. Without liquidity a deregulated market will fail. Liquidity is a large number of buyers and sellers who are willing and able to trade in electricity and derivatives products. Without this liquidity, the transaction costs in fees and in the time to find trading partners will be high and trading will be difficult. For example a supplier with a fixed price contract who cannot find the right trading counter-party in time to cover the electricity need, can end up with large losses on their business. A liquid market will decide what products will be traded and will give market participants several opportunities to sell their production or to cover their supply needs. It will also provide instruments to control and manage risk.

Middle East fuel markets are characterized by fixed price, long term, contracts. Fuel suppliers will need to develop more sophisticated products to suit the needs of the power market there. A liquid electricity market would therefore stimulate those fuel markets. Physical and artificial barriers are a hindrance to competition. To create a truly competitive market every participant must have the same level playing field which means no discriminatory regulation or physical obstacles.

An important factor of deregulation is that every participant has access to the end consumer, which means transmission grids must be open to all participants at no extra cost. This is similar to the oil market where suppliers can distribute oil to their clients via public roads and waterways.

Even though electricity supplies depend on complicated laws of physics, that does not mean they should not be open to access by other suppliers. When open access is created, a system of fair pricing monitored by a regulator must be adopted. In Europe many lawsuits have been lost by companies that tried to discourage their competitors, both foreign and domestic, from using their networks. But also in Japan, new entrants to the market have complained that transmission charges are too high and are obstacles to fair competition.

Another artificial barrier in California's deregulation was the cap that was placed on the prices that electricity suppliers could charge consumers for power. This has held back the market from operating in its most efficient way. Equally the subsidising of local companies will also create unfair competition and will discourage investors from entering the market.

Middle East countries are unlikely to keep deregulation on hold forever, despite the problems in California. Reforms have been delayed but in the future some Middle East markets are expected to become truly free and competitive.

Governments must make a commitment to deregulation to create confidence in the market and therefore speed up deregulation. When governments tend to change policies over time, market participants will translate this insecurity into their activities and will not be committed to a competitive market either. If governments create regulatory certainty and stay focussed on their deregulation goals then investors will invest and participants will stimulate a fair and competitive market. Even before deregulation is really implemented, local incumbents must take their first steps towards being competitive.

They should do this by learning about deregulation and its implications of trading in power and using derivative products by designing a strategy for the new market; by setting up trading desks; by identifying risks, setting up risk policies and risk management organizations.

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