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POWER SECTOR COMPONENTS, DEVELOPMENT, AND REFORMS: AN OVERVIEW

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ABSTRACT

The modern day-to-day activities are solely dependent on electricity. Economic development and electricity are interlinked. Besides playing a crucial role in enhancing the agricultural production, its contribution to social sector is immense. It also covers both the domestic and productive uses. It is an important ingredient for technological advancement and for modernisation of peasant society. Electricity was discovered in the process of unveiling many other experiments including dynamo and theory of electric magnetic force. From generation to distribution it has several components. Management of these components defines the efficiency of a state in providing electricity to the population. In the process tariff setting, pricing policy plays an important role. The management of the electricity system also different and varies as per the policies of the state. This entire set up is called power sector. The success or failure or efficiency of the state in providing electricity to all the population at reasonable prices necessitates reform or restructuring of the sector. The paper provides an over view of the power sector, it's evolution, components, pricing policies, markets and reforms, restructuring of the sector.

INTRODUCTION

Electricity is one of the greatest discoveries of mankind (Malcolm Slesser, 1982:85). The use of electricity increases the production of small scale and house hold industries and also can increase the profit of individual personal businesses by using minimum electric power (Broadman, 1982:33). This profit increases the access to capital that could be re-invested. In the socio-economic area, the electrification can lead to the increase in study hours at night for school going children, better access to health facilities and can fasten day-to-day activities of rural people leading to drastic changes in the socio-economic relations of the people (Sinha, *et al*., 1983:157). It is observed that even the basic electric appliances have an important role in the social and economic development in the low income countries (IEA, 1997:30).

History

Electricity was discovered in the process of unveiling many other experiments including dynamo and theory of electric magnetic force. When discovered it was a luxury but slowly it became a part of human life.

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In application the level of usage varies from one country to another depending upon economic development and social structure. Since 1880 its use has grown rapidly with the invention of electric light (Nye, 2004: 177). The experiments discovered the use of electricity in many functions such as lightning, cooking, transporting, commercial activities and industrial purpose. Gradually people started finding easier to work with the use of electricity which led to increasing consumption of electricity. As demand increased many new techniques of generating electricity were discovered. Improved generating efficiencies did much to meet increasing demand while lowering the cost of production (Ibid:178). Consumers have been an active force behind the expansion of electricity use. Human activity in modern era can be broadly divided into four major sectors. They are agricultural, industrial, commercial and residential sectors. Electricity became an integral part of these sectors.

Components of Electricity

Electricity involves four components (Capel, 1990:4): Generation, which is the production of electricity, transmission (transfer of electricity in bulk), distribution (delivery of electricity in bulk over local networks) and supply (acquisition of electricity and its sale to customers). Electric generation is a source of electricity, especially one that transforms mechanical or heat energy into electrical energy. (Hunt, 1979:137)

Electricity is a high quality form of energy, produced by batteries or generators from a variety of primary sources (Milton, 1983:7). The main sources of electric generation are coal, water, wind and sun. With each component it is named differently. Transmission of energy through conductors is a flow of electrons under pressure. The flow is measured in 'Ampere' and the pressure of electrical potential is measured in 'Volts'. The amount of energy transmitted is proportional to the product of the flow and the pressure (Ibid). Transmission is through transmission lines separately formed to facilitate the distribution function. Power distribution systems are a very important part of electrical power systems.

It is an order that transfers electrical power from an Alternating Current (AC) or a Direct Current (DC) source to the place where it will be used. This transfer of electrical power from the power plant to industries, homes and commercial buildings and other distribution systems usually employs some equipment as transformers, circuit breakers and protective devices. The distribution of electrical power involves a very complex system of inter connected power transmission lines. The heart of a power distribution system is an electrical device known as a transformer which is capable of controlling massive amounts of power for efficient distribution (Fardo *et al.,* 1997:195). The ultimate purpose of these transmission and distribution systems are to supply the electrical power necessary for industrial, residential and commercial uses (Ibid:187). From the point of view of the systems, we may say that the overall electrical power system delivers power from the source to the load that is connected to it to the ultimate receiver. This is the end point of the purpose of which the electricity is generated.

Characteristics of Electricity

The most important special characteristics of electric energy are that it is not a primary energy source but is derived by transforming a range of sources such as coal, wood, petroleum, bio-gas, water pressure, fissile elements, wind and the sun. It cannot be stored in large quantities and therefore the supply of energy has broadly to match its demand at any given time. It can be transmitted over long distances. Therefore, the implications for scale economies and regional benefit spill over. Its generation, transmission and distribution requires technologically advanced and capital-intensive infrastructure. The power that is generated by coal is called thermal power, petroleum and bio-gas based power generator is called gas based power, and power generated through water pressure is called hydro electricity, and power based on wind and sun are called as non-conventional energy or wind/solar energy.Management of electricity is crucial as it involves the use of a selected set of policy instruments to achieve desirable energy, and socio-economic objectives. The most important among them are tariff setting and pricing policy.

Tariff Setting

The cost of operating any electrical power system can be split into two parts, namely 'capital cost' and 'running cost' or 'energy cost'. These costs are passed on to the users in the form of mixture of a 'two part' tariff one part of which is a fixed charges proportional to the capital cost and variable charges proportional to the energy cost. (Tripathy, 1991:207). The cost of power available to the consumer is a core issue. In fact the whole system is based on the pricing policy which in turn is largely based on consumers of power. All the four categories of electricity consumers, viz. domestic, agricultural, commercial and industrial have got different characteristics in their use of electricity. Pricing policy is based on nature of supply, the purpose of which it (electricity) is used, the requirements of co-ordinated development between supply and distribution of electricity for its use in most efficient and economic manner (HDCCI, 1978:59). This pricing policy also called as tariff structure and utility charges should at least earn the revenue for required generation and if need be future supply (Komonoff, 1981:270). The utility charges or tariff consist of two internal components (HDCCI, 1978:59) viz., tariff related to the energy consumption, and tariff related to the installation or connected load. Apart from this the governments impose duties or taxes for using the electricity. Comprehensively the tariff or utility charges consist of (Orlando, 1991:152):

Customer charge is a fixed monthly charge applicable to all customers. It is intended to recover the fixed overhead costs like meter reading, billing and other ingredients associated with each account. Demand charge is the amount charged by the utility for the capacity to deliver power. A ratchet refers to a demand billing which is based on some historic peak demand rather than the peak incurred in the current month. The billing demand as contrasted to the actual or measured demand consists of some fraction of the peak demand incurred during ratchet period. Energy charge is the amount charged by the utility for actual energy delivered. It is based on the variable costs of power production including fuels. Taxes are the amount charged by the utility on behalf of government body. These taxes also include sales tax. All these charges are again to a large extent based on various practices of tariff fixation (HDCCI, 1978:59). Under the cost of service, the total revenue requirement is apportioned between the different categories of consumers. This is based firstly on separately identifiable costs each category of consumer imposes on the utility, and secondly, on an allocation of common costs and overheads incurred by the electricity board. The total revenue requirements are computed on the basis of operating expenses for generation, transmission and distribution of power, accounting, administration, including depreciation costs, debts and other liabilities. On the other hand, allocation of costs between various classes of consumers is decided on the basis of costs incurred in making the services possible to a particular class of consumer regardless of level of usage or demand. The price of electricity in this case varies, according to the consumer classes. Peak and off-peak level tariff is another kind of tariff setting, where the tariff fixation would be based on the 'Time'. Usually the demand for power increases in particular hours of a day, where consumers of all classes use extensive power for their concerned needs resulting in over burden in power supply. In this situation, to avoid unnecessary use during these hours, a different setting of tariff could be set up which makes the power consumption only by who really need it. As there is peak demand for power, this is also called 'peak hours' and 'non peak hours' where demand is low. This kind of tariff is based solely on demand rather than supply to avoid the wastage and over load on transmission. Quality

based tariff under which industries demand uninterrupted power supply to reduce production charges. Any interruption could be disastrous for them. Domestic consumers can generally withstand the interruptions in the power supply, under such circumstance some utilities impose tariff based on supply quality of uninterrupted power. This quality based power supply tariff to industries and domestic consumers could also satisfy both the users as their demand is accordingly to their need.

Pricing Policy

The theory of electricity pricing has three approaches viz., (i) recovery in tariffs, (ii) marginal costs both long run and short run, and (iii) spot pricing based on the real time costs of generation of electricity. In the past, electric pricing policy in most countries was determined mainly on the basis of financial or accounting criteria, such as raising sufficient sales revenues to meet operating expenses and debt service requirements, while providing a reasonable contribution towards capital needed for future power system expansion. In recent times several new considerations are made which include rapid growth of demand, increase in generating costs, low availability of resources and the expansion of power systems into areas of lower consumer density at relatively high unit costs (Munasinghe, 1990:6).

The main considerations in the pricing policy include (Ibid:7)

- National economic resources, which are allocated among different sectors of the economy including electric power sector. This implies that costs reflecting prices in theory should indicate to the electricity consumers the true economic cots of supplying electricity to their specific needs, so that supply and demand can be matched efficiently
- Principles of fairness and quality supply. This includes allocation of costs among consumers according to their type of usage i.e. agriculture, industrial and domestic, assurance of a reasonable degree of price stability from year to year, and provision of a minimum level of service to persons who may not be able to afford the full cost.
- Raising sufficient revenues to meet financial requirements.
- Facilitating simple metering and billing to customers.
- Other economic and political requirements such as subsidised electricity supply to certain sectors to enhance growth or to certain geographical areas of development or a certain categories of social groups.

Electricity Markets

Although the electricity markets are characterised by either monopoly or competition, there is a continuum of market types that depend on the number of sellers and buyers. Traditionally the electricity industry has been dominated by national or local monopolies (government) under price regulation. Under price regulation, the regulator (government) sets the prices. In the post-restructured process, the role of regulator becomes one of setting market guidelines to yield competitive conditions under which prices and quantities are similar to what they might be under the ideal of perfect competition. Under perfect competition the interaction of many buyers and sellers yields a market price equal to the cost of producing the last unit. The users or consumers of electricity actually define the markets. They could be divided into residential, commercial, industrial and agricultural sectors.

Residential: Electricity in the modern time became an integral part of state policies which emphasise on the supply to all sectors which include residential use. Though electricity is supplied to and purchased by the house holds even belonging to a relatively low income group (Broadman, 1982), one can argue that increase in cost of production as well as end availability cost of per unit earned exclude the poorest people from electricity (Cecelaski, *et al,* 1982). The share of electricity use by the residential category is in fact steadily growing. This is a result of increasing household income and increasing access to electricity (Vogt, et.al., 1997:25). This expansion in the use of residential is generally mere consistent than the industrial consumption (Kim, 1983:21). Within the households also major use of electricity are for lighting, kitchen appliances, cooking, water heating, air conditioning, communication and electronic devices. The purchase of domestic electric items increases with the increase of the income. The choice of appliances depends very much on life style patterns of consumers and policies of a Government.

Commercial Use: A substantial part of this is made up of government activities which include non-residential uses like office buildings, universities, hotels, hospitals, street lighting, that grow rapidly with urbanisation (EIA, 1992:12). The commercial sectors use more electricity than other sectors and grow more rapidly with the rise of middle income groups (Meyers *et al.,* 1984:21).

Industrial Use: The industrialisation in the modern era has a direct relationship with electricity. Industrial sector engages in activities such as manufacturing, construction and mining. With in manufacturing sub-industries like petroleum refining, chemical production, primary metal production, paper, food, and mineral production demands huge electricity supply. Industrial consumption of electricity is two types. One is high voltage and low voltage depending on the production activity. Industrialisation also demands uninterrupted quality and quantity of power supply.

Agricultural Sector: It demands power supply for irrigation. The use of the electricity varies from country to country depending upon the various types of irrigation systems. Generally the share of agricultural sector in power consumption stands comparatively lower than other sectors. The substantial demands for electricity are from residential, commercial and industrial sectors and partly in transportation sector (EPRI, 1983:1). The increase in the demand for electricity increases the services of the electricity but not the amount of electricity to perform each service. This raises a question, given the supply situation in different developing countries which electrical demands should have priority? Since use of electricity is equally critical for all sectors. Then electrical use can be divided into three categories of quality: those uses for electricity necessary items; those uses for works

for which substitutes are adequate but lack the convenience; and those uses for which other forms of energy easily available and perform the same function. The category can be termed as necessary, electricity convenient and electricity expansive (Munasinghe, 1990:33). A country with high cost electricity will only satisfy those users that fall mainly within the category of essential electricity consumers. In contrast, a country that can expand electrical supply at moderate cost can satisfy the demands of electricity convenient category. If a country has a low cost power, it could provide electricity for expansive uses.

Types of Ownership

Traditionally, a single utility vertically integrated was the only electricity provider in its service territory. It had the obligation to supply electricity to all customers in its territory. The providers could be described as owners. These owners are defined as proprietors who are entitled to the profits of the owned (Oxford Dictionary, 2002). Owners appoint managers to ensure that the enterprise is run efficiently, give them authority and hold them accountable for the results. There are three different types of owners in the electric supply industry. They are (Hunt *et al,* 1996:15):

Direct Government Ownership: The Government both owns and has direct managerial control over the industry, as in China and other communist countries. The same people are owners, regulators and managers. Investment is done with Government appropriations, prices are decided by it and revenues are collected by it. The Government views it as 'infrastructure'.

A Government owned corporation: A Government owns a corporation, which manages the industry according to Government policies, norms and procedures. There may be an independent regulatory authority to approve prices and investment policies. Electricite de France (EDF), France and Central Electricity Generating Board (CEGB), U.K are the examples of these kinds of Corporations.

Privately Owned Corporations: These are of two types. The company may own the Corporation and its assets or it may be a joint stock company. In both cases the shares are registered in stock exchanges[1] and managers are accountable to board members who are representatives of shareholders. These companies are regulated by independent regulators. Because of the monopoly status of the provider the owner periodically sets the tariff to earn a fair rate of return on investments and to recover operational expenses. Under this regulated frame work firms maximise profit subject to many regulatory constraints. Because utilities have been allowed to pass costs on to customers through regulated tariffs, there has been little incentives to reduce costs or to make investments with due consideration of risk. As a whole in the electric sector four models of structures exist (Hunt *et al,* 1996:22):

- ***Monopoly at all levels*:** In this type, 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 final consumers.
- ***Purchasing Agency*:** This allows a single buyer the purchasing agency. It chooses from a number of different generators to encourage competition in generation. Access to the transmission wires is not permitted for sales to the final consumers. The purchasing agency has a monopoly on transmission networks and over sales to final consumers.
- ***Whole Sale Competition*:** This allows distribution companies to buy direct from a producer and delivers over a transmission network. Distribution companies still have a monopoly over final consumers. There is open access to consumer wires.
- ***Retail Competition*:** This allows all customers to choose their supplier. There is open access to transmission and distribution wires. The distribution is separate from the retail activity, and the latter is competitive.

Power Sector

After World War-II, in many countries for strategic reasons, the electricity industry was gathered in a single, nationalised company. The Government generally controlled the sector. It formulates the policies and appoints administrative boards. Also the criteria underlying government policy in the power sector rarely have been spelled out explicitly. Several of them nevertheless are discernible (Munasinghe, 1990:7). Most developing countries feel that power is an engine for growth and modernization that should be sustained through centrally directed investments and activity. Traditionally electric utilities are considered a tool for addressing social equity and employment issues and improving the quality of life. The sector is also sometimes perceived as a vehicle for raising resources and taxing away surpluses although significant problems are acknowledged. This state regulation created a stable legal and economic structure that assured the rapid growth of vertically integrated utilities that ran everything from power plants to high-voltage transmission to distribution wires in their exclusive service areas (Smeloff *et al*. 1997:11). At the same time there are other reasons for government to control electric utilities particularly in developing countries. They are economies of planning and operations, improvement in coordination and efficiency, reduced reserve margins and reliability gains, the need to undertake larger and longer term investment, nationalisation and elimination of foreign ownership. Although much of this rationale is still valid, there is a growing awareness in third world countries, as well as in the development community, of the urgent need for greater efficiency and reform in the power sector. Another factor forcing developing countries to think of reform is that public ownership has been in crisis during the last few decades for various reasons resulting in insufficient electricity.

For instance, in Latin America, countries which had high rates of electricity demand growth, with a significant external debt, were unable to carry out the needed generation investments. The need for greater productivity efficiency in the power sector arises from the investment burden, especially in the case of countries with serious debt problems. As the world

economy expands, there is likely to be increasing economic growth in end demand for, exports from the developing countries which will in turn entail greater industrial activity. This factor taken together with the existing unsatisfied demand for electricity in developing countries indicates the need for further investments in supply. But the performance of utility companies in many developing countries has deteriorated drastically in terms of technical efficiency and economic efficiency. A number of problems have plagued these institutions including, the inability to raise prices or to meet revenue requirements, weak planning, inefficient operations and inadequate maintenance, high technical and non technical losses, low quality of supply and frequent power failures, poor management, excessive staffing and low salaries, poor staff morale and performance, excessive government interference and so on.

Restructuring: Related Justifications

The above reasons which prompted countries to go for restructuring process could be broadly classified as follows:

Power Sector reforms must be viewed against the background of the failures of the government owned enterprises in-terms of incentives for efficiency and tariff levels that did not reflect actual costs and led to poor performances, which accumulated huge financial deficits (Millan, 2005:5291). This led to generalised and poorly targeted subsidies, inefficient and insufficient expansion of distribution, and the power sector acting as an employment agency vulnerable to corruption (Ibid). The tendency towards centralisation and government control of the power sector may have achieved some gains though economies of scale and improved coordination in planning and operations, they have also been characterised in many cases by a marked deterioration in performance. Although many difficulties have plagued developing country power utilities, it may be argued that the most pervasive have been undue government interference in organisational and operational matters, such interference has adversely affected least cost procurement and investment decisions, hampered attempts to raise prices to efficient levels, mandated low salaries tied to civil service levels, and prompted excessive staffing. This in turn has resulted in inadequate management, the loss of experienced staff due to uncompetitive employment condition and poor job satisfaction, weak planning and demand forecasting, inefficient operation and maintenance high losses, and poor financial monitoring, controls and revenue collection. The natural monopoly characteristics of some power enterprise functions as well as the perceived national interest to use these enterprises as a general policy tool are in many countries accepted as sufficient reasons for maintaining large public sector monopoly organisations. This affected the technological choices considering the government political requirements, pressure favouring the indigenous fuels, domestic manufacturers, environment performance and the provision of jobs (IEA, 1999:13). The pressures for power sector reform are driven by the urgent need for increased productive efficiency in the power sector. In particular the efficiency of investment and resource mobilisation are key issues, given the weak economic situation of many of these countries, and high levels of uncertainty with regard to energy prices, future demand interest rates and technological change. In this process the enterprise efficiency is becoming increasingly recognised as one of the key factors in resolving the major problems of most developing country power utilities. In some countries, where the electricity rates are high, the global competition prompted by international firms is emphasising international price comparisons and consequently, inducing nations to reduce electricity costs to be globally competitive. Restructuring and deregulation process are carried out by governments, through the introduction of electricity markets to increase efficiency and reduce prices. Markets also promote participation of external agents and neighbouring countries with lower production costs as a way to achieve lower prices (Rothwell, *et al*. 2003:2).

Also the increase in oil prices called many countries to review their subsidies. Many developing countries generally give many subsidies to many developing sectors in their countries. Metering, billing, quality control, and load management option based on new information technologies and communication systems are being offered and restructured and deregulation. According to the observation, the retail competition and customer choices based on new technologies, encourages entry of new electricity service providers with new commercial relationships, offering attractive prices, high quality and other integrated services. Another problem arises out of energy waste, which governments or electric industries cannot help much except generating conscious of energy waste among the consumers. This energy waste may be attributed to lifestyles. Industrial production schedules determine the basic load pattern of a plant. Typically, load peaks are generated in the morning and evening. Quick start up and shut down operations may reduce the load burden factor. Bulk load burden depending the peak consuming pattern impose difficulties to the economical supply of power (Vogt, *et al.* 1997:70).

System efficiency occupies important position in reducing the production costs. But this declines with filters become dirty and drive belts become worn. The lack of regular maintenance results both in additional energy costs and in the reduced life of equipment. Often maintenance work is not authorised until a problem exits (Ibid:71). Historically there is no problem for consumption but in fact there is very less supply of electricity than consumption. According to the World Bank report the electricity consumption in the world has grown at an about nine percent per year where as its supply stood at much lower level (IBRD, 1983:51). This is because electricity is almost every where in the form of energy. Consumers do not always pay the full costs of the production. It also requires huge capital for production. The developing countries generally use traditional ways of production which requires large investments. Developing countries generally use coal and water resources for electricity production. These plants requires capital which developing countries lacks and borrow from other countries resulting in debt and balance of payments problems ultimately resulting in increase in costs of production and the production and supply (SERD, 1981:2). The constructions of these plants also have to satisfy the environmental and social benefits but the developing countries can not afford to satisfy these needs with their low financial resources. The most difficult problems are faced by utilities that have no prospects for increasing capacity without incurring substantially higher costs or increasing long-run

marginal costs (World Bank, 1984:20).[2]Such utilities are inevitably faced with the temptation to expand markets to improve their financial position, yet may not be able to satisfy the demands the future without increases in the price for electricity. This leaves the utilities with an option to restrict their sights mainly to necessary uses by restrict market expansion to high priority uses or to those uses that could pay the higher tariffs (Ramsay, 1979:105). Power system exists in order to provide, as economically and as reliably as possible, electrical energy to the customer (Billington *et al*., 1984:34). It is implicit in this philosophy that it is not justifiable to increase reliability for its own sake but by increased investment. Some part of this investment comes from consumers in terms of charges and taxes. The electricity available or supplied to the consumers includes the production costs, which include transmission, distribution costs and operational costs. It also includes the losses. In theory to determine the optimum tariff, or rate for a customer, it is often necessary to determine the value of transformer losses (Seevers, 1983:83). Many consumers are paying less than the production costs because of the subsidised policies by the national and regional governments. This production costs generally ignore a collection of environmental and social costs resulting gap in production costs and income.

All these problems affected the electricity supply industry in terms of investment as the industry requires huge capital for providing adequate generation further needed for the growing demand. In theory as capital needed for the generation becomes scarce, the marginal value of capital rises rapidly because processes with high operating costs and low capital costs are substituted for processes with low operating costs and high capital costs then the capital availability may significantly affect the structure of the electric industry (Russel *et al.,* 1977:84). As a whole, structure of the industry affected by factors includes the fixed change rate-depreciation at the international level, no interest on capital and return of equity. This situation, plus the recommendation of international financial institutions, such as the World Bank and the Inter-American Development Bank to go for Structural Adjustment led governments to initiate privatisation and restructuring. Structural adjustment according to these international financial agencies, refers to reform of policies and institutions-microeconomic (e.g. taxes), macro economic (e.g. fiscal imbalances) and institutional problems. In their view, the intended structural changes improve resource allocation, increase economic efficiency, expand growth potential and increase resilience to further shock. As part of structural adjustment electricity restructuring and deregulation involve a transformation in the structure and organisation of electricity companies. Many believe that if the political influences can be removed, improved utility performance can be achieved with little capital only. But privatising developing country utility operations is extraordinarily difficult because the central governments are reluctant to relinquish control of what is frequently the most capital intensive segment in the economy and also needs huge capital to reform the industry (The World Bank, 1998:10). To help the countries which want to adopt the restructuring process in the power sector the World Bank created Multilateral Investment Guarantee Agency (MIGA). It seeks to promote the flow of international capital to developing countries, by providing guarantees (on a fee basis) against the non-commercial forms of risks like:

- Transfer risk, arising from host government restrictions against convertibility and transfer of foreign exchange,
- Loss risk, resulting from legislative or administrative action (or omission) of the host government that leads to loss of ownership, control or benefits,
- Contract repudiation risk, when the outside investor has no recourse to an adequate forum, faces undue delays or is unable to enforce a favourable judgement and war and civil disturbance risk.

The interest for restructuring of the sector including more decentralisation and greater private participation, as one means of improving power utility performance and relieving developing country governments of the clipping economic burden of financing the chronic deficit of these state owned enterprises. This situation has arisen mainly because of the serious shortcomings in the overall macroeconomic and energy position of the countries concerned. The power sector reform and restructuring which involves the participation of private sector is based on three roles, mobilisation of private capital for power development, development of new sources of power generation and improved economic efficiency (Glen, 1992:9). The mobilisation of private capital for power development is helpful where some power projects may be considered too small to be developed effectively by a large public utility, some industries and agricultural sectors may be able to employ cogeneration technologies that are not available for traditional power plants, in both these cases private sector involvement can bring additional capacity into production from sources which are economically efficient but not readily available to public owned generation companies (Ibid:10).

Another argument in favour of private participation in the power sector is that of improved economic efficiencies. The profit motive induces the private sector to improve efficiency and the economic benefits results in the form of improved maintenance of plants and over head costs (Ibid). In a study by the World Bank to evaluate the efficiency of small diesel fired electric power plants, which compared the total cost of all variable inputs to total electricity output in order to arrive at an estimate of the overall efficiency of a plant compared to the other plant in the public sector the out come suggests that private involvement is more efficient (Ibid). The finding is that the cost of per unit of output (kWh) is 38 percent less in the private sector than in the public sector, which shows that a similar amount of electricity can be produced in the private sector with substantially less capital than the public sector uses (Ibid:11). In Latin American and Caribbean countries after the introduction of private participation in the sector the generation capacity has expanded, and the region expanded largest share of private electricity projects in developing countries with over $77 billion out of $193 billion took place by 2005 (Millan, 2005:5291). Most privatised distribution companies increased their efficiency by cutting losses and reducing staff while providing better quality of service. Chile improved its efficiency of its privatised companies and helped

with its experience as it participated in the privatisation of distribution companies in Argentina, Brazil, Peru and Columbia. The wholesale prices have also been reduced where privatisation has been introduced (Ibid: 5292). In England the most notable results of power sector reforms is the reduction in prices (Thomas, 2005:5265) this is because of major cost reductions for generators after privatisation, real fossil fuel prices paid by the British generators have fallen by 50 percent for coal and 30 percent for gas during the reform process, 1990-2001 and the introduction of more efficient generating plant, the combined cycle gas turbine (CCGT) became available (Ibid:5266). In Philippines power sector reforms brought economic growth by introducing private participation in the sector which resulted in reduction of government investment in the power sector so that the much investments could be made on social services such as water and sanitation (Toba, 2003:29). The other benefit was the gains in generation, arising from additional competitive pressures on National Power Corporation (NPC) from presence of Independent Power Producers (IPPs), the IPP's efficient operation and technology transfer to NPC and the envisioned privatisation of the NPC. The presence of additional investments in the sector allowed the government to go for extra spending on social welfare activities and economic development (Ibid:26).

Conclusion

Restructuring Challenges and Problems

The intellectual principle behind electricity restructuring is that competition should be introduced wherever possible in the power sector. The main components of this restructuring are corporatisation, privatisation and unbundling the sector. The rise of the neo-liberal economic policies in the 1980s shrunk the scope of the state and opened the markets for the private sector. These ideas were sharpened by international financial institutions and spread to the developing world largely through the policy based lending, over the time the restructuring model became part of this neo-liberal economic reform (Dubash *et al.,* 5244). In the neo-liberal developed world, the restructuring took place in the context of well functioning electricity systems providing reliable power to all on a financially viable basis where as the developing world faced problems like public debt, capacity shortfalls, low levels of electricity access, insufficient infrastructure and mismanagement (Ibid). In developed world the electricity restructuring was not aimed at solving these problems and blindly following this model could lead to serious setbacks to the developing world (Ibid). The basic idea behind the electricity restructuring is increasing efficiency driven by competition (Dubash *et al.*, 2005:5250). If it has to be politically sustainable, the gains have to be realised and passed on to the population. Given the problems in the developing countries the restructuring and price benefits to the population is difficult because of several factors (Ibid) like government subsidies to the consumers. As the provision of electricity to the consumers has been the responsibility of governments for a long time, the restructuring may seek a shift of ownership to the private sector and regulation to an independent authority, the role of government will go down and the public perception of providing electricity by the governments at lower cost will not go down so easily (Ibid:5255). Moreover, the success of privatisation in the power sector will depend to a very large extent on whole hearted support in all fields by government (Mishra, 2002:29). The politicians will come forward in support of the restructuring when they feel that it will enhance their political support, not meet with overwhelming opposition and provide opportunities to increase the resources they control through increased economic benefits (Lal:649). The success of reforms not only includes technological advantages and investment in the form of private participants but also a positive role of these politicians (Ibid:655).

Endnotes

- The movement of electric charge results in an electric current. Magnetic forces arise from these movements and can be utilized in electric motors and generators. Lighting and electronic effects can also be produced by an electric current. Electrical energy can be dissipated as head. The factor stimulating the movement of electric charge is the electromotive force, which is measure in Volts. This current can be direct (DC), or alternating (AC) and is measured in Ampere. For further details see, Malcolm Slesser (ed), Dictionary of Energy, (London: The Mac Millian Press Ltd., 1982), p. 85.
- A joint stock company is a combination of private and Government share. One way of gradually privatizing an enterprise to form a joint stock company with only a minority of shares held privately, and then gradually sell the Government shares.
- Stock exchange is a place where all the companies get registered before opening for public issues. These shareholders buy and sell the shares of the company in the stock exchange.
- If a company becomes Public limited company it generates investments by selling of sum of value in the total assets by selling out certain percentage. The people or companies who ever buy these shares are called share holders. The total profit or losses will be distributed among the share holders based on the volume of their shares. However the maximum limit of public (outsiders) public shares will be 49 percent.
- The Long Run Marginal Cost (LMRC) may be defined as "the present value of the economic cost of supplying an incremental unit of demand on the power system. Further purposes of valuing the technical losses in the electrical network, the LMRC are estimated as a two part cost an incremental capacity related cost and an incremental energy cost at generation level and at the distribution level". Joint UNDP/ World Bank Energy Sector Management Assistance Programme, Activity Completion Report, No. 0818/84, June 1984, p. 20.

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