4.1 International Experiences on Electricity Market Reforms

Today, in most of the European countries, US, Australia and some selected countries in Latin America, power sector reforms are already highly developed. On the other hand, counties in Africa and the Middle East have been late in implementing reforms and reforms have been gradually taking effect in East Europe and Asia. This section briefly reviews the country experiences so far. Due to limitations on the length of the report, we could not provide detailed account of the reform processes around the world, and therefore our focus will be on the counties that have introduced wide-ranging reform measures and on those novel characteristics that are important for explaining the reform process.

The entire process of reforms in most countries was initiated in the mid 1980s and early 1990s. Some have reformed fast and are at the consolidation stage (e.g. Chile, England, US, Argentina, Australia), others in the transition stage (e.g. Brazil, Scotland, Northern Ireland, Holland, Germany, India, Russia, South Africa.) The essential aspects of reforms in different countries are given below:

4.1.1 Chile

The restructuring of the power industry was the last phase of the economic reforms introduced in Chile. The, restructuring of the economy started in 1974, to reverse the Allende government’s determination to transform, through nationalization. Phase I of the reform (1974-75) consisted in returning nationalized companies to their original owners, phase II (1975-83) involved sale of about 100 nationalized companies for generation of revenues for the government. Phase III was a stabilization phase and Phase IV started the power sector reform.

Till 1980, the power sector was vertically integrated. In the early 1980s, the PSUs participating in the power sector began to be restructured as joint stock companies. The National Production Company held control of the PSUs in transition, acting as a holding company, in charge if reorganizing and privatizing the companies
under its supervision. Privatization began with the sale of stock to company employees at low prices, who were allowed to draw upon the payments in advance that were set aside as their pension funds. This was an attempt to show that the privatization prices was irreversible. With the start of restructuring, generation and distribution was separated and Economic Load Dispatch Centre (LDC) was created. Restructuring allowed open entry to participation in the generation area, but with no supply or purchase obligation. New generator had to rely in the market for the sale of its power. The LDC dispatches the system according the and economic merit order and determines SRMC if the system. During the initial years, transmission remained monopoly. Generators had right of access to the line if capacity was available, subject to payment of wheeling charge, to be determined by the regulator. Distribution required a license, which was granted under a competitive bidding system.

Pricing for different segments is determined as follows:

- Generators- SRMC. However, prices are negotiated for energy sales to deregulated energy users (large consumers). This leads to competition and market situation
- Transmission- SRMC or on the average incremental cost, or negotiated between parties.
- Consumers- Node price plus LMRC of the distribution enterprise plus margin. Regulator determines distribution margin for every hour.

Prior to reforms, there were heavy defaults in payments by consumers, distributors etc and the system was unreliable. There were heavy losses/inefficiencies. Prompt payments increased efficiency/competition and brought the tariff down for the consumers.

(Pollitt, 2004) assessed the progress in Chilean reforms and its lessons. He found that reform was very successful. He concluded that while the initial market structure and regulatory arrangements gave rise to certain problems, the overall experience argued strongly for the private ownership and operation of the electricity industry, with appropriate restructuring to create a competitive market.
4.1.2 England

The restructuring of the power sector in England was a part of the restructuring of the whole economy in the UK, a process that started in 1957, but which derived strength and character in the late 1970s, the famous Thatcherite years. Yet, the power sector’s reforms were delayed until the late 1980s, to put in place the reform structure widely debated and appropriated structured reform legislation of 1988. The success of England model is due to well structured and sequenced regulatory and unbundled system, and maturity of the restructured components which enhanced investor confidence in their potential profitability, thus increasing investment in the sector and consequently greater efficiency.

Before reforms Central Electricity Generating Board was a monopoly for generation/transmission and area boards for distribution. Competition was introduced through separation of generation, transmission and distribution, and by adding intermediary systems which allowed the cheapest generator to produce more by being able to sell more to the grid and by contracts between generators/large consumers.

The reorganized power sector consists of the following:

CEGB has been divided into three large generating companies – Nuclear, National Power and Powergen – which operate under license and work in a deregulated sector with competitive supply/market conditions. Only the nuclear sector remains in government hands.

Area boards have been converted into 12 privately owned regional electricity companies (RECs). The RECs provide distribution services in non-exclusive interconnected service areas. The RECs can supply to large customers in different distribution areas, increasing competitive pressure on distributors.

The strictly regulated National Grid Company (NGC) possesses and operates the national interconnected transmission grid and sub-stations and performs dispatch function under an operating license. The NGC is jointly owned by 12 RECs, but works under the regulator's supervision.

The maximum competitive pressure is applied by bulk power sales through non-regulated contract and a 'pool' or spot market. The English power pool encompasses the
power system of England and Wales, but it is also open to electricity imports from France and Scotland. The 'pool' consists of generators, distributors and trading power intermediaries. The pool price is determined for each half-hour period based on an optimum dispatch schedule, without network constraints, but in merit order according to bids offered by generators or other sellers. The bids lead to a single purchase price every half-hour. The final pool price is determined after adjustment for the eventual difference due to actual load dispatch.

(Newbery & Pollitt, 1997) carried out a social cost-benefit analysis of the privatization and restructuring of CEGB. In their study they found the main benefits came from generator efficiency gains, switching from nuclear power and lower emissions.

4.1.3 United States

For decades, the US power sector worked under the traditional regulatory model where vertically integrated investor-owned utilities supplied power within defined territories, subject to financial and price regulation. The US privately owned electricity sector, due to the creation of vertically integrated geographical monopolies, was sheltered from competition and was criticized for inefficiency. PURPA Act, 1978 encouraged co-generators and transmission regulation. This led to dynamic increase in diversified supply sources much beyond the initial expectations and increased competition, thus weakening IOUs monopoly. By mid-1990s, federal policy created the framework for a competitive market in wholesale power. This led to states vying with each other to be among the first to introduce competition and customer choice in the retail markets. The US restructuring system has given marked independence to states in setting their own development policies. The state utility commissions establish entry rules and incentives to bring in more competition and lower consumer prices. At the federal level, FERC sets prices for interconnected transmission services.

The likely congestion in the transmission grid owing to increasing market agreements between generators, distributors and large consumers seeking wheeling services is an area of concern in the US.

The first power pool (PJM) in the world was established in the mid-Atlantic region of North America by the owners of various power utilities. It became a limited
liability company in 1997, and started operating as an ISO with membership open to
generators, transmitters and consumers. Before formation of PJM, transmission system
comprised of monopoly transmission companies where operation was influenced by
demand and supply gap in a particular zone. It was observed that sometimes the
marginal cost of generation is lower in another zone for a consumer than in the zone to
which he belonged. It was then that zonal transmission companies decided to form an
ISO with energy exchange taking place across the zone on marginal cost basis. It is
pertinent to mention that any transmission work in a zone is to be taken up by a
transmission company which enjoys monopoly status in the zone. Similar ISOs have
been set up in other parts of the US also. This is against the pattern of only a few years
back where the state utilities traded bilaterally only with state interconnectors and
almost without any regulation.

Sioshansi (2008) argue that the pace of growth in retail competition has slowed
down in recent years in US and the transition to national competitive market has stalled.

4.1.4 Australia

Prior to the reforms of recent years, the supply of electricity in Australia was
provided by vertically-integrated, publicly-owned state utilities. The power industry
was never operated on a national basis. Interstate grid connections were weak and
electricity trade had been limited between interconnected states. The state governments
were responsible for operational and planning activities, and tariff structures. The
national government's only involvement was as a principal shareholder in a major
hydro-electric scheme with the state also being partners in the JV. Some regulatory
controls were exercised, mainly control over state borrowing limits, taxation, foreign
ownership, and environmental regulations.

Electricity reforms in Australia, initiated in mid-1990s have occurred both at the
state and national levels. The nature of reforms is somewhat similar to reforms in the
US. The national government's effort has led to a more active role for the national
government through the establishment of a national grid and national pool. The new
national regulatory regime is light-handed and a form of price regulation has been
applied to regulated sectors.
The objective of reform in Australia was to deliver more efficient and sustainable use of capital infrastructure and energy resources to improve Australia's domestic and international performance. The state governments have estimated that electricity reforms would add an estimated $5 billion annually to the country's GDP.

The largest gainers from the reform process were the large industrial and commercial consumers, who were able to take advantage of competition among retailers. Households saw little change in real average price of electricity (Abbott, 2006)

The reforms were initiated in the states by the national government agreeing to provide financial assistance payments to the states totalling $4.2 billion (Australian) dollars in return for the state meeting their agreed obligation, including reform of their electricity, gas, water and road transport industries. The national government also encouraged reforms by creating a competitive national market. This was done through unbundling; ensuring non-discriminating areas to the national, transmission and distribution system; establishing transmission prices that are reflective of actual costs; ensuring that customers, i.e., generators, marketers and traders have a choice of supplier; using a merit order dispatch system; providing for inter-state of generation; ensuring non-discriminatory access for new industry participants in generation and marketing; and establishing uniform regulation based on an industry code of conduct.

The target is that the fully competitive Australian national electricity market (NEM) would develop in stages up to 2001.

The national electricity code establishes the regulatory and operational framework of the new Australian electricity market and binds all participants in the wholesale power generation market to specified rules. The code addresses market rules, grid connection and access, metering, network pricing, system security and procedures for code administration.

At the state level, significant reforms have been initiated in preparation for their eventual entry into the national electricity market. Although some states have decided not to participate in the NEM, they have implemented reforms where possible to gain efficiencies to supply customers and generators. Each state government has made different arrangements for separating the segments of their electricity industries for
entrance into the national competitive market. The state of Victoria is the first and most advanced in its reform among states that are participating in the NEM.

Victoria started its reforms in 1993 with the separation of the electricity systems into generation, distribution and transmission. In 1994, Victoria restructured its state-owned industry further with the intention of privatizing it. The generation sector was divided into five companies and the Victoria power exchange was established to operate the wholesale power generation market. The transmission system was divided into two components, high voltage grid network and the power exchange responsible for pool operation and system dispatch.

In addition, the office of regulator general was created to promote competition and efficiency, and to protect the rights of consumers. Victoria initially permitted the five distribution companies to retain monopoly rights to supply power to customers in their respective geographical regions. However in 1996 in an attempt to introduce competition into what was still a state-owned system, large users were allowed to purchase power from any of the generating companies. The current requirement that the five distribution companies have to supply electricity to large customers will be phased out by December 2000. In December 2000, all customers in Victoria would be contestable.

In 1995, Victoria began the privatization of its electricity assets. Since launching its privatization programme, the state has generated almost $16 billion as revenue, an amount which is mostly being used to repay state government debt.

4.1.5 Brazil

Till 1993, Brazil's power sector was dominated by Electrobras, a PSU, holding most of the country's generation, transmission and distribution assets. The government was responsible for setting tariffs and controlling investment decisions. Electricity pricing, being a government decision, was characterized by a failure of average tariffs to cover average or marginal costs, discrimination by end-users, and uniformity of tariffs across regions, despite differences in costs. The system also suffered the ills of overstaffing, high energy losses and underinvestment in system improvements.

The 1993 privatization programme included abolition of uniform tariffs, guaranteed rates of return for power companies and established a national grid with
open access to IPPs and captive power plants, to sell either to distribution companies or end-users.

(Mota, 2003) conducted a study on the social welfare impacts of privatization process in Brazilian distribution and supply markets during 1995-2000 period. The study adopted a social cost-benefit methodology and found that the net benefits were significant, but producers absorbed the net gains. The paper concluded that had regulation been tougher since the beginning, consumers could have benefited more from the privatization.

However, the main weakness in Brazil's reform plan was not to clearly specify the reform up front or the sector's reorganization plan and associated national regulatory regime. This lack of clarity has hampered privatization efforts. The sale of two distribution companies were marked by disappointing levels of participation, both in the number of bidders (1-2) and the value of bids. The disappointing response was attributed to the lack of transparent regulatory regime, the infrequency and uncertainty of tariff adjustments and the consequent inability to predict an adequate stream of future revenue. This has deterred private investors from making substantial investments in the Brazilian power sector.

4.1.6 New Zealand

In the mid-1980s, the government started examining the efficiency of all spheres in the economy, with particular reference to those sectors which were under state control and where economic gains could be obtained by restructuring through commercialization and subsequent privatization. The decision to restructure electricity industry was taken to increase efficiency of the sector by privatizing generation through competitive entry of private generators, and deregulating and most importantly, offering customer choice at the distribution level.

In 1993, a corporatised transmission company was created. In 1995, a wholesale electricity market was created, operated by an independent organization, the Electricity Market Company (EMCO). The 1995 policy also placed a limit on how much new capacity the central generating company can build in the future. In 1996, this company was broken into two. The central generating companies offer energy in the market and electricity is purchased by bids for energy. The offers are ranked as per the price offer
and electricity is purchased based on these bids and generators are dispatched on merit order. Electricity purchase prices are set at the spot-price to satisfy demand every half hour. Large consumers have been given the choice for purchase of power from companies other than the area company.

4.1.7 European Union

Whereas changes were initiated in the vertically integrated power sector in the US, the UK and in many other countries during the 1970s and 1980s, most of the countries in Europe continued with their vertically integrated structure of the power sector till mid-1990s. Most of the changes were initiated after the formation of the EEC and as late as on February 19, 1999 competition was officially introduced in the European electricity markets. European Union directives stipulate that large industrial consumers will then have the right to choose their electricity suppliers. At the same time, new entrants will be allowed to submit tenders for building power stations and supplying customers with power directly over European union transmission lines. Thus for continental Europe, this would start the dismantling of the old vertically integrated model of electricity production and supply – a model which was built and maintained by different countries, fearing market failure in case of breaking up of the vertically integrated monopoly.

Traditionally, electricity utilities were vertically integrated in European countries, with state or municipality owned enterprises playing an important role. The market was highly with very limited opportunities for users to switch to alternative suppliers. There was no third party access to the transmission grid. (Fiorio et al., 2007) Political and technological changes have made this kind of centralization obsolete, so the trade-offs that formally justified less than optimally efficient integrated systems no longer hold. Thus in the first phase of liberalization introduced by the European Union, the business downstream, wires (transmission, sub-transmission) and retailing (distribution), would be separated from generation. At this point, generators of electricity must compete to sell their output, and such competition becomes feasible. In the second phase, the wires part of the business would be separated from retailing and forced to operate as a 'common carrier'. The unbundling requirements did not guarantee independence of access to the network and the negotiated third party access (TPA)
option offered the incumbent companies a way to keep out competitors. Retail Competition was restricted with no more than

Enforcing competition by EU would mean different things in different countries. Scandinavia and the UK are already competitive; Holland and Spain are close behind; Italy, Germany and Eastern Europe are about five years away and France is further behind. Though each country in Europe now recognizes that competition would come eventually, utilities would work to slow down the process of liberalization/restructuring/competition wherever they can.

(Vickers & Yarrow, 1988) argue that the mixed results from the empirical literature on the effects of privatization are due to a focus on the ownership variable. Other factors that should be taken into account include the nature of market competition and the role of institutions such as well developed capital markets and private property rights (Vickers & Yarrow1988; Lee et al, 1999; Villalonga, 2000)

4.1.8 Argentina

The restructuring of the economy in Argentina was a key element in the stabilization policy adopted after the hyperinflation years of 1989 and 1990. It had both economic and political goals: the revenues realized from the sale of public assets were critical in financing the fiscal deficit and reducing public debt, and the continuity of the effort enhanced the credibility of the government's commitment to remedy the problems of the economy. The privatization process occurred within a very short time frame in early 1990s, and generally accomplished the goals that had been set for it, raising US $ 17.3 billion for the electricity sector alone.

The power sector in Argentina faced major problems in early 1990s: (a) public inefficiencies; (b) breaks in the payment chain leading to multiple inefficiencies in supply chain; (c) tariffs not related to economic costs leading to inefficient use; (d) supply and transport restrictions; and (e) blackouts. These factors forced the government to plan for major restructuring and in 1992, the transformation took place and a legal framework similar to the one used in the UK was adopted that divided the vertically integrated electricity business into three distinct activities of generation, transmission and distribution. Under the new law the following agencies were set up:
- CAMMESA – manages wholesale electricity market players transparently, using high technology, facilitating efficient energy generation and sale.
- ENRE – works as the regulator for the entire power sector.
- WEM – consists of all generators, transmitters, distributors and large users as well as other participants like traders and brokers.
- Generators – 80 per cent of the generation is privatized. Generators have freedom to enter into contracts with distributors and large consumers.
- Transmitters – consist of the national company Transener (mostly 550 KV) (a private company) and six regional and two independent transmitters at 220 and 132 KV level.
- Distributors – 70 per cent of the sector is privatized and there are about 28 companies in the distribution sector.
- Large users – enter into agreement with generator, distributor or traders.
- Traders – are responsible for commercialization of generation, demand, royalties and exports/imports.

The impact of Argentina’s power reforms has been very impressive. Formerly the electricity market was immersed in continuing technical and financial crises and unmet demand resulted from insufficient supply. Today, Argentina has surplus power which can be exported to neighboring countries. Installed capacity during the reform period (1992-97) has increased 36.5 per cent, overall thermodynamic efficiency has improved by 45 per cent, and net demand has grown by 36 per cent. The contract market now accounts for 60 per cent of the electric energy consumed. Mean prices have declined 47 per cent – from US $ 49/MwH to $ 26.

Until the macroeconomic crisis of 2002, power sector reforms in Argentina proved successful. This is illustrated by the decrease in the electricity tariffs an the improved investment situation for generator in the decades between reforms being implemented and the economic crisis (Nagayama & Kashiwagi, 2007)

The speed with which the system was privatized has left some serious problems which are now being addressed: A weakness of the regulatory system is that it depends
upon competition in generation to set prices and fines in transmission and distribution to assure service quality. There have been cases of failure in transmission and distributions system. The price cap regulation does not provide the near term (five years) for the benefits of productivity gains to be passed on to the rest of the economy through price reductions. Expansion of the grid can only take place if the investment criterion of the private sector owners is justified and the beneficiaries are willing to pay. This often leads to underinvestment in the sector, leading to a sub-optimal grid.

### 4.1.9 Summary of International Experiences

Experience of different countries has shown that restructuring of the power sector consists of many parts; each part complementary to the other and the efficiencies of reforms are dependent on the quick and time-bound enforcement of the entire package. Experience in these countries has also shown that half-hearted reforms can lead to problems in the working of the power sector. The components of reform package in most countries are:

1. The separation of the government from commercial activities in the sector, but retaining the role of policy-maker for it.
2. Setting up of national and state level regulatory commissions to supervise the working of different players in the power sector and regulating them through clear-cut and transparent rules and setting their tariff levels.
3. Unbundling the power sector into transmission, distribution and generation.
4. Decentralization of planning process through automatic and easy entry of generators, with no commitment regarding supply and purchase.
5. Setting up a wholesale electricity market at the national and state level. (Setting up a national level wholesale market normally catalyses the setting up of such markets at the state level.)
6. Introduction of regulations in the sector that encourage competition and efficiency.
7. Transparent economic dispatch system at the national and state level.
8. Incorporatisation of the private sector under its own risk conditions in a free entry/exit power market.
9. Direct agreements between generators and also distance distributors with large consumers (to increase competitive pressures on generators and distributors)

10. Compulsory access to the grid at predetermined wheeling charges for generators, distributors, subject to line capacity being available.

Interest in restructuring and reform of the power sector is a worldwide phenomenon, being pursued in different forms in different countries, depending on the structure and condition of the economy and political institutions. Yet the core of the reform programme remains the same, viz, establishment of transparent regulatory structure, unbundling of the sector, creation of national and state grids with transparent and efficient dispatch, entry and exit systems, wholesale market in power, more choice regarding purchase to the consumers and other measures that improve competition and efficiency in the sector.

In the western countries, the reform programme is seen as an element of redefinition of the state while in other parts of the world, reform is seen as one component of a broad economic agenda that includes price liberalization, macro-economic stability, privatization, creation of legal framework and financial systems that encourage private investment, both through national and international companies. The importance of the power sector in the growing national economies of the developing world puts a lot of pressure on the successful formulation of a restructuring plan. In view of the vital importance of the sector, once a decision to reform/restructure is taken, the national governments cannot allow the policy-makers or implementers to drift and yet at the same time err in deciding the transformation route.

The experience of reform/restructuring in different countries has shown that it generally fails on account of missing pieces in the reform legislation. The reform programmes have been less successful wherever:

- They were not clearly defined in an identified time schedule.
- They did not lead to setting up of unambiguous regulatory structures to decide on rules regarding tariff, entry to the sector, etc.
- The reform was not an integrated programme which could look at the restructuring requirements of all the players (generation, transmission and distribution) in the sector.
The reform programme did not remove the potential for political interference in working of entities and in areas other than policies.

There was inadequate commercialization of the system before privatization efforts were initiated.

In Argentina, the restructuring process of the electricity sector that started in 1992 fares among the most successful, both when compared to other sectors in Argentina and when compared to other electricity sector reforms in the world.

In the ten years that have elapsed since this transformation, we find improvements in efficiency at all stages (power generation, distribution, transmission and supply). With steady or diminishing prices in real terms and with enhanced reach and service quality.

As to generation, this transformation led to the conformation of one of the most competitive markets in the world, with over forty actors, very low concentrations of supply and significant access of new actors. In time, this translated into sharp falls in the spot market prices, into substantial improvement in the availability of the thermic industrial park, and into sizeable increases in the installed capacity.

Overall empirical evidence seems to suggest that, in assessing the results of Privatization and Competition in India & Argentina, the effects of Privatization, Competition & Regulation should be taken into account separately. Most of the existing studies of electricity have dealt only with one of these factors. Another Gap in the literature exists because the studies focusing on changes in the electricity sector have been mostly drawn from the developed economies, such as UK, US and Scandinavian countries there is a lack of empirical study of the effects of Privatization, competition and regulation among developing countries. This paper undertakes such an analysis.

4.2 Argentina power sector

In the case of Argentina, The transformation of the power system was conditioned by larger macro-economic reforms intended to correct serious current account deficit, fiscal imbalances, and chronic hyperinflation plaguing the country the end of 1980s and beginning of the 1990s. The reforms drew from neo liberal economic thinking on the appropriate role of the state and markets in the economic development.
4.3 The Electricity Sector Before 1991

Argentina is one of the world’s leading countries in terms of comprehensive electricity sector reform. The sector was substantially restructured in 1992 as part of the reorganization and privatization programme of the first term of the government of President Menem. This reform saw the break-up of the three vertically integrated state owned companies into 27 separate generating units, 7 transmission companies and several distribution companies. These were then privatized. This reform took place only 2 years after the landmark reorganization of the UK’s electricity sector. Together with its next door neighbor, Chile, Argentina was long thought of as having been host to the most comprehensive and generally successful electricity reform among developing countries.

The experience of the electricity sector in Argentina cannot be separated from that of the rest of the economy. Argentina has had a turbulent economic and political history. In 1900 Argentina had the second highest income per capita of any country. Its wealth was based on its large and fertile agricultural land area capable of producing high value added exports, in particular beef cattle (Chisari, Estache & Waddams, 2001). However the country struggled to convert its initial advantages into successful industrial development and was troubled by a substantial underclass and associated poor distribution of income. The election of a populist government led by General Peron in 1946 was followed by a military government in 1955, which continued with only brief interludes of democracy until 1983. This sorry history was marked by class conflict between rich landowners, the middle classes and thunderclaps. By 1983 Argentina had been reduced to a developing country with large international debts and high unemployment. Following a sharp deterioration in the country’s fortunes during the 1980s, Carlos Menem was elected president in 1989. Menem was a populist from the Peronist party and initially espoused an agenda of radical social reform. However realizing that Argentina’s hyperinflation was driven by large fiscal deficits, the Menem government began a massive privatization programme which eventually privatized 154 state companies in energy (including gas supply and electricity) telecommunications,

65 As Joseph Stiglitz (former chief economist of the World Bank) stated recently: "at the beginning of the 1990s, the nations of Southeast Asia freed their financial and capital markets not because they need to attract funds – some of them having 30% or higher savings rates – but due to international pressure". Statements within the framework of the Annual meeting held in Prague.
railways, banking and other sectors (Ennis & Pinto, 2002).

The privatizations raised $19.4bn, including $14bn of cash and $13.7bn of nominal debt repurchased – this sum represents around 13% of GDP in 2002. 80% of the revenue was raised between 1990 and 1993. The privatizations also substantially reduced the losses on state owned companies, which had been 3% of GDP in 1989 (Galiani, Gertler, Schargrodsky & Sturzenegger, 2003). The scale and speed of the privatization was staggering. Even the UK, thought to be the world leader in mass privatizations, the total sum raised was only around 10% of 2002 GDP and it took around 12 years to raise 80% of the total value (Pollitt, 1999). If we date the UK privatization programme from October 1979 to July 1996, the total value raised was £61,973m, 80% of this was not raised until March 1999.

The privatization of the electricity sector was one of the most significant privatizations and was masterminded by the Minister of Energy, Carlos Bastos. Bastos as one of the leading reformers within the government. The privatization program occurred against the important macroeconomic background of the creation of one to one convertibility between the Argentine Peso and the US dollar in 1991. This provided assurance for foreign investors who enthusiastically bought shares in the newly privatized companies and began to invest heavily in upgrading the capital stock of their companies. The privatization program successfully reduced the government debt in the early 1990s and associated interest payments.

Government debt fell from $78.9bn in 1990 to $69.6bn in 1993 and associated interest payments as a percentage of GDP stayed low in the first years of the 1990s before rising sharply as the privatization revenue stream slowed.

Public support for commercial activity fell from 11.7% of public expenditure in 1991 to 5.4% in 2000, of this fall more than half was due to reduced support for the electricity and gas sectors. The stock market was stimulated with 38.5% of all dividends paid between 1992-1999 coming from privatized companies. However in the second Menem term government expenditure began to increase rapidly and the fiscal deficit began to worsen. This put pressure on the parity between the dollar and the peso. Menem left office in 1999.

The macro-economy continued to deteriorate and in early 2002 the government
was forced to abandon peso parity with the dollar and let the currency float freely. The Peso collapsed to less than 30% of its former value and Argentina defaulted on its overseas debts. This economic crisis which was accompanied by bank runs and a massive surge in unemployment provoked a political crisis. The elected President Fernando de la Rua was forced to resign in December 2001 to eventually be replaced by the interim administration of Eduardo Duhalde in January 2002. His administration lasted until fresh elections in May 2003 when Nestor Kirchner succeeded to the presidency. The economy began a recovery as its exports benefited from the effect of the massive devaluation but the economic and political situation remains fragile in mid 2004. In particular the country has defaulted on its sovereign debt and investors currently rate Argentina as one of the worst prospects for electricity investment of any large developing country. (Bastos, Carlos, Abdala, 1996).

The period since the crisis of February 2002 has had a marked effect on the privatized sectors. Most privatized companies were under foreign control at the start of the crisis and had prices that were officially pegged to the US dollar. This was the contractual underpinning of the large investments which overseas companies have made in Argentina since 1990. In the electricity sector total investment was $12.5bn, of which 60% is represented by post-privatization investments (much of it coming from overseas investors). Regulated residential tariffs were frozen in peso terms in February 2002 leaving most companies shouldering heavy financial losses once loans have been repaid in dollars. The World Bank has been involved in negotiations with the government about allowing the prices to rise in order to allow some recovery of initial investments and to ensure that future investment is not prejudiced. This process has not lead to a resolution of the contractual disputes between the private companies and the government and the political cost of substantial price rises for utilities remains high. Since the beginning of 2004 strong demand for electricity stimulated by rapid economic growth and low relative energy prices, has led to electricity supply shortages and emergency measures to reduce demand and increase domestic supply. Argentina is an enigma among developing countries. In spite of a well-educated workforce, abundant natural resources and strong cultural links to both Europe and the US it is characterized by political instability and periodic macroeconomic crises of substantial magnitude. The political system finds it very difficult to manage the state budget responsibly and to
stabilize the macro environment. Within this context, making credible commitments not to arbitrarily regulate the electricity sector and to honour concession contracts is very difficult (Murillo, 2001),

Argentina is an important case study of electricity reform because it shares many of the features of developing countries’ electricity systems. Like Brazil and India it is a federal state and the provinces retain a large degree of autonomy over the regulation of local utilities including the power to privatize local distribution utilities and to set residential prices. The population is significant at 38.4m and it has some ability to exploit economies of scale. The GDP per head was US $2700 in 2002 (at market exchange rates), this figure being barely unchanged from that in 1992 following a 15% fall in GDP between 2000 and 2002. However there has been a significant economic recovery in 2003 and into 2004 with annualized GDP growth of around 8% in 2003 and around 10% at the beginning of 2004. Electricity consumption per head is relatively low but grew rapidly between 1992 and 2002 (3.3% p.a.). The electricity system has significant hydro capacity (just under 40% of the total in 2002) (CAISE, 2002). Argentina shares the political and macroeconomic instability of many other developing countries but is perhaps unusual in its capacity for designing and running sophisticated economic institutions such as those required by a deregulated electricity market.

4.4 Evolution of Electricity Reforms in Argentina

The privatization of the electricity sector was one of the most comprehensive of the Menem period. Starting from an industry which was wholly state and provincially owned, More than 80% of the generation, all of the transmission and 60% of the distribution sector was transferred into private ownership. Remaining public ownership was limited to the state owned nuclear power generating company and two hydro-electric plants (with foreign ownership) in the generation sector and some provincially owned distribution companies. There was also come co-operative ownership.

The comprehensive nature of the electricity reform in Argentina reflected the neo-liberal nature of the incoming government and the poor performance of the sector
prior to privatization.\textsuperscript{66} Severe blackouts had occurred in the summers of 1988 and 1989, thermal generation plant suffered from poor availability (over 50\% in 1991) and distribution system losses (up to 22\% in 1991) were high (partly due to theft) (CAISE, 2002). Half of the population live in the Greater Buenos Aires area (the so-called Gran Buenos Aires). This area accounts for nearly half of GDP and of electricity demand. The national transmission system is focused on supplying power to this region. It was the state owned companies in this region that were at the forefront of the privatization. A first attempt to address the problems of the sector was the adoption of the Federal Electricity Pact (Pacto Federal Electrico) in November 1989, but by early 1991 nothing much had changed.

Therefore a new electricity industry was designed in 1990-91 by the Ministry of Energy, supported by the World Bank. It came into being with a new Electricity Law (24,065) in April 1992 and was carried out over 1992-93 (Delfino & Casarin, 2003). This law together with Decree 634/91 of April 1991 constituted the legal framework for the transformation of the sector and provided for: the break-up and sale of the existing state owned companies; the creation of wholesale energy market; the creation of a sector specific regulator; and the definition of the powers of the Secretary of Energy in the new system. It also established a Federal Energy Council to advise the Secretary of Energy and the Congress and administer the National Fund of Electricity, which is used for regional subsidies.

Law 24,605 characterized electricity transmission and distribution as public services to be provided under monopolistic conditions and thus prescribed regulatory oversight of prices and quality to guard against the abuse of market power and monopolistic exploitation. The law further required “open access” for transmission and distribution facilities—third parties are afforded non-discriminatory access to the grid. Distributors were placed under a public utility obligation to supply all the energy.

\textsuperscript{66} Several authors have analyzed the potential options for the transfer of public assets and their implications. One of the most interesting works is that prepared by three economists (Jones/Tandon/Vogelsang) for the World Bank and published in 1990 by MIT under the title “Selling Public Enterprises: A cost-benefit methodology.” In it the authors state that the transfer of public production assets to the private sector differs radically from transfers developed between private agents. In the latter case, the selling agent need not worry about the destination and use that the buying agent may give to the transferred good. However, the state cannot ignore its fiduciary role and its responsibility to defend public assets and interests. Thus, it should be concerned not only about the transfer but also its condition and future situation.
demanded within their concession areas. Generation on the other hand was deemed to be a structurally competitive activity. Still the law required all generators to receive a uniform rate (taking into account the system’s short-marginal cost and the cost of non-supplied energy) at each delivery site determined by the National Load Dispatch.

The restructuring that preceded privatization was designed to lead to competition between the soon-to-be-privatized electricity companies and was modeled after earlier restructuring by Chile and the price-cap regulation of the United Kingdom.67

4.5 The Industry Restructuring and Privatization Plan

The most recent round of privatizations by Argentina was conducted with guidance from the World Bank. Although the World Bank was not directly involved in each individual privatization, Argentina largely adopted the Bank’s recommendations in restructuring and privatizing its industries.

Prior to the Initial Sale:-After the passage of industry-specific privatization laws, the companies to be privatized were restructured so that a competitive industry with multiple companies could be created. Regulatory bodies for the newly-privatized industries also were established. Technical specialists defined and structured the assets into viable, independent business units. Legal advisors created charters for new corporations spun off from the privatized entity and prepared bidding documents, contract terms, and conditions consistent with sale objectives and with the government’s intent regarding privatization of the sector (Ferreira, 2002),

Financial advisors determined necessary investment and price levels for the viability of the privatized entities. Advisors were paid expenses, an agreed-upon fee, and a bonus linked to the price the government received for the privatization(s) on which they worked.

The Initial Sale:-Privatized companies were sold through auction. The auction method used is known as the "two-envelope" process. Firms and consortia were pre qualified for an intentionally short list of bidders. Those selected as bidders submitted a two-part bid. The first part of the bid was the technical offer, which had to conform to

---

67 Although it enjoyed the general support of the public, the privatization policy was a government initiative rather than one proposed by particular social actors.
the requirements established by the bidding documents. Firms not meeting the technical requirements were eliminated. The second part of the remaining companies' bids, which contained the financial offers for the assets, were then examined. Winners either offered the highest price for the concession offered or agreed to provide the minimum level of service at the lowest price.

After the Initial Sale:- The initial auction usually resulted in privatization of at least a bare majority (51 percent) of the company. During early privatizations of federal electricity assets, the Argentine government retained no more than 39 percent and set aside at least 10 percent for company employees. However, as much as 90 percent of formerly government-owned companies was sold, with the employees receiving 10 percent of the company and the federal government retaining no ownership CAISE (2002). At least one 1995 sale resulted in the privatization of 98 percent of a relatively small (448 megawatts) hydroelectric company to an Argentine aluminum manufacturer, with the federal government retaining no ownership and only 2 percent retained for the generator's employees.

The shares retained by the Argentine government during the initial sale/privatization could be sold later. Depending on how successfully winners of the initial sale operate the privatized company, the value of the government shares may change. However, sometimes the average price hardly changed. For example, in the case of the privatization of the southern distribution company of greater Buenos Aires, $511 million was paid for a 51-percent share in 1992 by a consortium. The federal government's 39-percent share retained after the initial sale was sold in December 1995 for $390 million, essentially the same per-share price as in the 1992 sale. (Bacon & Robert, 1995).

The Creation of a Competitive Industry:-Argentina first restructured the federal electricity companies and the electricity industry in general, and then privatized them. The restructuring began in 1992 with the creation of a national regulatory body, Enre, for the soon-to-be privatized Argentine electricity industry. Also during 1992 a national electricity wholesale market was organized and the privatization of companies began, within the new rules established by the various treaties and privatization laws discussed earlier. The first three of the federally-owned electricity companies that were privatized
produced a total of about 80 percent of the nation's supply of electricity. The companies were Segba, Ayee, and Hidronor, Segba.\textsuperscript{68}

The first of the federal companies privatized was Segba, which served the greater Buenos Aires area, including the city of La Plata. (Buenos Aires accounts for one-third of Argentina's total population.) Before Segba was privatized it was restructured by separating it vertically, and, to a lesser extent, horizontally. First, power generation was separated from transmission and distribution. Then, the constituent power generation facilities were separated from one another resulting in six separate companies.

Fig 4.1: Argentine Federal Electricity restructuring of conventional power generation

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{Fig4.1.png}
\caption{Argentine Federal Electricity restructuring of conventional power generation}
\end{figure}

Power transmission and distribution also were separated. The transmission assets were combined with those of Ayee and Hidronor to create a single high-voltage transmission company and six regional transmission companies.

The distribution assets of Segba were separated into three companies, one each serving northern Buenos Aires, southern Buenos Aires, and La Plata.\textsuperscript{69}

Privatization of Segba's components began during 1992. The first sales were Segba's power generators. Of these, the first sold was Central Puerto in April 1992. Central Costanera and Central Alto Valle were next, in May and August 1992, respectively. Next to be sold were the distribution companies formed from Segba. The two distribution companies serving northern and southern greater Buenos Aires were sold in September 1992. Subsequently, the remaining three power generation companies, the remaining distribution company, and the high-voltage transmission company, Transener, were privatized. One interesting aside concerning the

\textsuperscript{69} The contracts established when the SEGBA stations were sold and later imposed on the EDESUR and EDENOR concessions actually implied the withdrawal from competition of a significant share of demand. Since 1998 and after the strong growth of the commercial bypass of the large consumers of the area, the electricity purchases of these distributors represented nearly 35\% of the total of the Electricity Wholesale Market.
privatization of Transener, the high-voltage transmission company, is that National Grid Group, PLC was one of the members of a consortium that purchased a 95-year concession for 65 percent of Transener. National Grid Group, PLC operates the transmission grid in the United Kingdom.

Ayee:- The second of the federal electricity companies privatized had generation and transmission assets nationwide (i.e., everywhere but the Buenos Aires/La Plata metropolitan area). Because of the large area for which Ayee was responsible, its restructuring resulted in many more individual companies than the restructuring of Segba, but affected substantially fewer electricity customers in total.

The restructuring of Ayee also separated the stages of power generation and transmission, and divided the generation facilities from one another. A total of 12 generation companies were created from the former federal utility. As previously mentioned, the transmission assets of Ayee were combined with those of Segba and Hidronor, creating a total of six transmission companies. As with Segba, the first assets of Ayee privatized were power generators. The first privatized was the thermal
generator Central Termica Guemes in September 1992. Subsequently, nine additional thermal generators and two hydroelectric generators were privatized.

Hidronor:-The final privatization of the federal electricity companies involved Hidronor, which oversaw several hydroelectric power generations in southern Argentina. Hidronor's primary assets were its four hydroelectric power facilities, each of which was restructured into a separate company and then privatized. Again, the transmission assets of Hidronor were combined with those of Segba and Ayee. The first privatized was Central Hidroelectrica Alicura, S.A. in August 1993. Also privatized in August 1993 were Cerros Colorados and Chocon. By December 1993, the fourth and final generation company, del Aguila, was privatized.

Nuclear, Binational, and Provincial Enterprises: - Although still not privatized, nuclear electricity assets were restructured in July 1994. The federal government separated the functions of the original nuclear agency into three distinct entities.

Fig 4.4: Argentine electricity restructuring of the Federal Nuclear Agency

The first is a company that the Argentine government wishes to privatize. It includes two operational nuclear generation plants. The second is the nuclear regulatory agency, which will continue to be government-owned and will regulate the individual nuclear power plants after the plants are privatized. The third is the Argentine federal nuclear research organization, which retained the name of the original nuclear agency and will remain government-owned.
Also still unprivatized are Argentina's two binational hydroelectric generation facilities. One is jointly owned with Uruguay (Salto Grande), and the other is jointly owned with Paraguay and is still under construction (Yacyreta). Following the onset of privatization of federally-owned electricity companies, restructuring of the provincial electricity companies began. Nearly all distribution assets outside Segba's service area (Buenos Aires and La Plata) belong to these companies. However as of early 1997, relatively few of the 19 provincial companies have been privatized. The most prominent of the exceptions is Eseba, the electricity company of the Buenos Aires province, which has been partially privatized.

As with the federal electric companies, Eseba was separated both vertically and horizontally, and two generation companies, one regional transmission company, and three distribution companies were created. However, unlike the federal privatizations, the first provincial companies privatized were distribution companies, not power generators. In April 1997, 95-year concessions for 90 percent of the ownership of each of the three distribution companies were awarded. Since then, privatization temporarily ceased; bids for the two generation companies were unexpectedly low and the governor of Buenos Aires province was advised to delay privatization. At the writing of this report (during the summer of 1997), it is unclear as to whether the privatization of the transmission company, planned for the summer of 1997 (Pollitt, 1999), will proceed as scheduled.

One apparently unprecedented event occurred during the privatization of Eseba. Among the companies unsuccessfully attempting to buy the distribution companies of Eseba were both of the privatized former-federal distribution companies of Buenos Aires (Edesur and Edenor) and one of the privatized former-federal power generators, Central Costanera. The Atlantic region concession was awarded for $404 million to a consortium of United Utilities International (a UK company, which is the parent of the regional electric company Norweb), Camuzzi (an Italian natural gas company), and Loma Negra (Argentina's largest cement manufacturer). A consortium of AES Corp and Community Energy Alternatives (both U.S. companies) won the concessions for the northern and southern areas of the province, paying $565 million. Apparently, there was little concern with possible problems arising from increasing the concentration of
Argentine power distribution, should Edesur or Edenor have won any of the three provincial distribution concessions.\(^{70}\)

### 4.6 The Structure and Regulation of Industry Segments

The regulatory structure of Argentina's electricity industry was guided by earlier efforts by Chile and the United Kingdom. The federal regulator of Argentine electricity is Enre, which regulates all stages of the electricity industry, but most extensively transmission and distribution (Johnson & Wasty, 1993) Enre mediates disputes between electricity companies and enforces federal laws, regulations, and terms of concessions. Enre also establishes service standards that distribution companies must meet and sets the maximum price that transmission and distribution companies may charge for their services. (This type of regulation is known as "price-cap regulation." Enre oversees the operator of the wholesale electricity market, Cammesa (Rodriguez-Pardina, 2004), and the generation companies. However, the generation companies are not subjected to price-cap regulation.

The post-privatization Argentine electricity industry consists of conventional power generation, transmission, distribution, and large users. Each of these is discussed in the following sections.

Power Generation -- Conventional electricity (thermal and hydroelectric) facilities were sold separately, essentially making each privatized generation facility an independent power producer. The thermal generation facilities were sold outright, while concessions (averaging 30 years) were awarded for the hydroelectric plants. The majority of Argentina's privatized generation capacity was purchased by foreign companies. Because foreign companies generally showed little interest in small capacity generation facilities, these privatized facilities tended to be exclusively owned by domestic companies. Also, these domestic companies tended not to purchase generation facilities in order to sell electricity in the national wholesale market. Rather, the generation facilities were intended to be captive facilities, purchased to provide for

---

\(^{70}\) As a result of the rate policy implemented, the estimated average price of electricity of the EDENOR, EDELAP and EDESUR distribution companies fell some 10.8% during the period under analysis. Nevertheless, this household consumer with very low electricity consumption remained practically stable – falling some 1.5% during the period -, that of high-consumption consumers fell some 70.4%. Hence, the mean household rate dropped some 8.5%.
the companies’ own electricity needs. For example, two Argentine companies, a paper manufacturer and a steel producer, bought a 20-megawatt oil and gas-fired generating plant for $8.5 million.

The post-privatization Argentine power generation industry (including conventional and non-conventional power facilities) is composed of independent, largely unregulated power generation companies. The companies are essentially unregulated because electric power generation is considered a competitive market. The nearly 40 generating companies operating in Argentina are assured by the national electricity regulatory body (Enre) of having open and equal access to the national grid and receive unregulated prices. Nonetheless, some restrictions have been placed on power generators. In order to avoid market concentration difficulties, generation companies are legally restricted to a market share of 10 percent or less of the national electricity sales volume. They also are prohibited from owning majority shares in electricity transmission facilities.

About ten power generators (including both conventional and non-conventional) are still owned by the federal or provincial governments (in addition to those under construction or in the planning stage), either because efforts to privatize have not begun or because efforts are still unsuccessful. Nuclear power plants and the binational hydroelectric power generation facilities have been more problematic. Even though still state-owned, the companies yet to be privatized effectively act as independent power producers, selling the power they generate through the wholesale electricity market. (Any power they generate is always dispatched.) Additional power demand is met by dispatching power from thermal power generators and cogenerators, in reverse order of their marginal cost of generation.

Generation companies receive income from providing actual electricity and reserve capacity to the transmission network. All generators whose power is dispatched by Cammesa receive a price equal to the marginal cost of the last generator whose power is dispatched. Generators whose production costs are too high to be dispatched by Cammesa receive a payment for providing the system with reserve power. The
payment is based on the power they agree to provide, effectively creating a price floor for generators.\textsuperscript{71}

Wholesale Electricity Market - The wholesale electricity market (also known as a power pool) has both a supply side and a demand side. The supply side of the wholesale electricity market is composed of independent power producers, privatized generators, generators still owned by the federal government (including the two nuclear power plants), the two binational hydroelectric power plants (also still not privatized), and foreign producers selling imported electricity. The demand side of the wholesale market is composed of distribution companies, large users, and foreign consumers purchasing exported electricity (Ferreira, 2002)

The interaction of the supply and demand sides of the wholesale market largely determines wholesale prices for electricity. Additionally, a fixed charge is added to all of the market-determined prices to cover payments made by Cammesa to power generators providing reserve capacity to the electricity grid. Three kinds of wholesale electricity prices exist in the Argentine electricity industry: contractual prices, seasonal prices, and spot prices. Of these, seasonal and spot prices are determined directly in the wholesale market, while contractual prices are affected indirectly by the wholesale market.

Use of the wholesale electricity market has increased substantially since its creation in 1992. For example, the number of exchanges taking place in the market has increased from approximately 20 (between February and April 1994) to around 450 (between November 1995 and January 1996). The number of participants in the wholesale market has demonstrated similar growth over the same period, particularly by large users, as total participants increased from about 50 (between February and April 1994) to more than 500 (between November 1995 and January 1996).

The wholesale market is administered by Cammesa, a nonprofit, independent operating agency jointly owned wholesale by the government and the power generation companies. Cammesa is directed by a board composed of two representatives from each of the following: Argentina's federal government, power generators, transmission

\textsuperscript{71} The reserve payment is sufficiently low that generators have a dual incentive to reduce their costs -- foremost, to have their electricity dispatched and, second, and to increase the difference between electricity production costs and revenues from sales.
companies, distribution companies, and large users.\textsuperscript{72} The board of directors makes decisions based on simple majority rule.

(However, the president of the board of directors is the Secretary of Energy, who has veto power over board decisions and apparently can be overridden only by the President of Argentina.)

Cammesa has three primary tasks:

- Dispatching power
- Determining the fixed charges and other fixed fees added to spot, seasonal, and contractual prices to cover the full costs of transmission
- Ensuring that the power system maintains adequate reserve capacity.

Power is dispatched to the national electricity grid by Cammesa. Cammesa determines the cost of generation for each producer and then dispatches electricity to the transmission grid sending the cheapest power first until current demand has been satisfied. The price that is paid to each generator is determined largely by the highest cost producer whose power is dispatched.

Power Transmission - Although the wholesale market allows buyers and sellers of electricity to interact and determine prices, it is the transmission network of Argentina that physically links the buyers and sellers of electricity to one another, delivering power to distribution companies and to large industrial users. The transmission network has two parts, one high-voltage (500 kilovolts) transmission system, and six lower-voltage (220 kilovolts) regional transmission systems.

As in the United Kingdom and Australia, electricity transmission has been defined by ENRE (the national electricity regulator) as a natural monopoly and is closely regulated. Firms may enter the industry only after successfully bidding for a fixed-duration concession for a particular area and may charge no more than regulated prices for their services. Concessionaires are required to allow open access to their transmission network to third parties. Transmission companies are not allowed to buy or sell electricity.

\textsuperscript{72} The definition of a large consumer was revised downward to an entity or individual that consumes > 30 kW.
Instead, their revenues come exclusively from the regulated prices they receive. The price is based on the availability (providing a fixed source of income) and the use (providing a variable source of income) of their network assets. The rate at which they are paid is capped by the federal electricity regulatory body, providing an incentive for Argentine transmission companies to reduce their costs.

The lower-voltage, regional transmission systems transmit power to and from the high-voltage transmission system. Transener (Ennis and Pinto, 2002), owns and operates the high-voltage segment of the Argentine transmission network (in addition to one of the lower-voltage, regional systems). Transener serves a total 14 of Argentina's 24 provinces, possibly carrying 90 percent of Argentina's transmitted power. Thus, Transener is considered the primary electricity transmission company in Argentina.

Among the six transmission companies, more than half have been at least partially privatized. The privatized companies are Distro Cuyo, Transnea, Transener, and Transpa. The creation of a seventh private regional company was approved by the Argentine national electricity regulatory body during 1996. The company will construct, operate, and maintain transmission lines and transformer stations associated with the binational Yacyreta hydroelectric plant.

Power Distribution -The final stage through which electricity passes between creation and use is the distribution stage. In Argentina electricity distribution is defined as a natural monopoly within the geographic area for which a concession is awarded. Firms may enter distribution only after successfully bidding for a concession. Distribution concessions are 95 years in length. As with transmission companies, distribution companies have regulated maximum rates that they may charge for their services and must allow open access to their distribution network to third parties.

Distribution companies provide power to their end users at rates that are capped by regulators. Incentives to reduce operating costs are provided by price-cap regulation, and the benefits of cost reductions are received by the regulated company and its stockholders. Customers, too, eventually save from lower operating costs because the cap is reset every five to eight years.

Distribution assets formerly owned by federal electric utility companies
generally were privatized or transferred to the provinces, which have begun to privatize
the distribution operations. Several distribution companies were created by the
restructuring.

The two largest, which serve greater Buenos Aires, were the first privatized.73
Large Users- Large users (who consume at least 2 megawatt hours of electricity
annually) may choose to be supplied by the distribution company serving their area or
purchase electricity directly from a generation company. The energy market was
liberalized for customers with demands greater than 5 MW; this has been successively
reduced to 30KW.

The wholesale electricity market classifies large users of energy into three
categories: Major Large Users (Grandes Usuarios Mayores or GUMAs) which
consume at least 4,380 megawatt hours of electricity annually, Minor Large Users
(Grandes Usuarios Menores, or GUMEs) which consume less than 4,380 megawatt
hours of electricity annually and Particular Large Users (Grandes Usuarios Particulares,
or GUPAs).

Each of these categories of users has different requirements with respect to
purchases of their energy demand. For example, GUMAs are required to purchase 50%
of their demand through supply contracts and the remainder in the spot market, while
GUMEs and GUPAs are required to purchase all of their demand through supply
contracts.

Large users choosing to be supplied directly by a generation company pay a
contracted price determined through bilateral negotiation with a generation company.
Large users who instead choose to be supplied by a distribution company pay the same
rate charged any other customer of the distribution company. Large users additionally
are permitted to buy power directly from the wholesale electricity market, paying the
spot price. The number of large users active in the wholesale electricity market has
increased from about 5 in 1993 (none during 1992) to more than 200 in early 1996.

Contractual Prices:- Contractual prices are negotiated between generation
companies and distribution companies, or between generation companies and large

---

73 As one of the people interviewed stated, the main idea was to foster the right conditions for
privatization, by cutting the size increasing the efficiency of provision governments
users. The length of the contracts is typically one year. These prices are largely unregulated. Hydroelectric generators may contract only up to 70 percent of their anticipated monthly production. (Note that weather conditions and other factors may dramatically affect water levels and, therefore, the generation capacity of hydroelectric generators.) Similarly, thermal generators may not contract for more delivered electricity than their net generation capacity (some electricity use occurs at the generation facility).

Seasonal Prices - Seasonal prices are determined by Cammesa in the seasonal component of the wholesale electricity market and officially maintained for 6-month periods, beginning May 1 and November 1 of each year. The seasons are based on water level and generally correspond to winter/spring and summer/fall, respectively. Every 3 months Cammesa receives updates to the information it uses to determine seasonal prices and may then revise the current seasonal price. Thus, seasonal prices are effectively 3-month prices.

Cammesa sets seasonal prices by using information provided by distribution, transmission, and generation companies. The information includes demand forecasts for typical days, unavailable reactive power, and weekly load curves from distribution companies; availability, restrictions, reactive power equipment unavailable, and net equipment information from transmission companies; capacity, efficiency, planned maintenance, internal electricity consumption, and availability from all generation companies; fuel use and prices from thermal generation companies; and historical and predicted water flows and other characteristics of the reservoirs from hydroelectric generation companies. (USAID, 1998)

The seasonal price is paid by distribution companies purchasing power in excess of the amount they had contracted to purchase from power generators. Seasonal prices during the winter/spring presume that hydroelectric generators are the primary source of power and have lower seasonal prices than the summer/fall period. Alternatively, seasonal prices during the summer/fall presume that thermal generators are the largest source of power and have relatively higher prices.

Spot Prices:-Spot prices are determined by the interaction of buyers and sellers in the spot component of the wholesale electricity market. Spot prices vary hourly. The
buyers who pay the spot price include generators and large users. Generators buy electricity they contractually agreed to provide in excess of actual generation. Additionally, large users who contracted for too little power to cover their current need may purchase additional electricity in the wholesale market, paying the spot price.

Sellers receive the spot price and may include distribution companies, generators, and large users. Distribution companies contracting for more electricity than actually purchased by their customers may sell their excess electricity in the spot market. Similarly, generators may sell electricity produced beyond their contractual obligations (to either distribution companies or large users) in the spot market. Large users, too, may sell any electricity they have contracted to buy that exceeds their current use, receiving the spot price.

Spot prices received are adjusted through application of fixed charges. These charges are assessed by Cammesa and are to cover the costs of ensuring some minimum level of reserve capacity and coverage of transmission and other losses.

Reserve capacity provided by thermal generators is based on the level of undispatched, but available, capacity they provide. Hydroelectric generators are paid on the basis of the amount of power generated. Reserve capacity is assigned on the basis of least-cost generation.

Transmission loss charges are based on the physical distance of the electricity seller from Buenos Aires. The greater the distance, the more the price received is discounted to cover transmission losses.

4.7 Power Market in Argentina

In this section we report some indicators of performance of the sector over the reform period. The areas, which we look at, are those that relate most directly to the social welfare effects of the reform and those indicators that are most important in a developing country context.

Investment:-Between the beginning of 1992 and the end of 2002 the installed capacity in the main MEM system expanded from 13,267 MW to 22,831 MW (4.9% p.a.). The capacity of the MEMSP system was only 778 MW at the end of 2002. The reserve margin was 46% at the peak in 2002 (highest demand divided by available
The expansion of generation capacity was achieved by privately owned operators and while keeping prices low. The number of units delivered increased by 45800 GWh to 72106 GWh from 199 to 2002 (4.6%). The total investment was around $7.5bn in fixed assets between 1992 and 2002. In transmission the route length of transmission lines in the main MEM system expanded from 16,958 km to 22,140 km (2.7% p.a.) between 1992 and 2002. In distribution the total number of electricity customers was 9.835m in 2001. Of these the number in the two largest SEGBA successor companies was 4.34m in 2002, this was an increase of 11% from 1993. This includes the effects of an ambitious plan to connect 650,000 shanty town households to the electricity network between 1994 and 1998 via collective meters that achieved its objectives over the period. By the standards of other developing countries this is a very good investment record (Sweeney, 2002).

Prices: - Currently electricity prices in Argentina are the lowest in Latin America and extremely low by world standards. In May 2002 residential tariffs were just 2.5 US cents per kWh for a residential consumer compared with 9.8 cents a kWh in the US, while industrial tariffs were a mere 1.3 cents per kWh (against 5.9 cents in the US). This reflects the effect of pesification on the sector. Prior to the crisis the comparable prices were 8.9 cents and 4.8 cents per kWh. These prices reflected the significant amount of hydro in the Argentine generation mix (33% of total capacity) and the efficiency improvements seen in the generation sector since 1992. It is clear that the pricing mechanism eliminated the large fluctuations in the real value of tariffs seen in the 1980s. It also leads to a fall in the average real tariff from 9.1 cents per kWh to 6.4 cents per kWh (29%).

Financial Performance:- The low price of electricity and high rates of investment in the sector prior to 2002 were accompanied by strong financial performance by the companies involved. Financial performance in the SEGBA had been very poor prior to its reorganization. After privatization the average post-tax rates of return on shareholders’ funds in generation were 4.6% in 2000, though they appear to have been higher in previous years. And in transmission Transener’s post tax rate of

---

return on equity was 6.8% in 2000. Among the distribution companies rates of return on equity were rather higher: Edenor and Edesur earned post tax rate of returns on equity of 10.9% and 9.5% in 2000. These rates of return are respectable by international standards but look low given the country risk associated with Argentina. In Transener’s price control review of 1998 the country risk premium was estimated to be 4.89%p.a. in real terms. It seems clear that investors were not getting this return in generation before the crisis. One can therefore question whether financial performance was satisfactory in this period and whether investors’ original investment levels were rational given subsequent returns. The macro-economic crisis has caused returns to fall in 2002. Electricity prices fixed in pesos, while most debts were denominated in US dollars. This resulted in widespread defaulting on debt payments and significant losses of shareholder value. Transener had a loss of 121% on shareholders equity. This reflected a sharp decline in income as a result of the crisis and exchange rate losses on debts. Distribution companies also posted big losses. Edenor had a 30% loss on start of year shareholders’ equity in 2002 and Edesur had financial losses amounting to 13% of start of year shareholders’ equity.

Generation Net income divided by Net Worth for a sample of four generation companies (Central Puerto, Central Termoelectrica Buenos Aires, Central Costanera and Central Termica Guemes companies announced significant losses for 2002. Foreign currency investors saw the foreign currency value of their remaining shareholder funds decline by at least two thirds.

The UK’s National Grid sold its stake in Transener for less than 10% of its pre-crisis investment value in March 2004. Electricity firms pointed out that at current price levels new investment was not profitable and supply shortages were likely in the near-term if low prices continued

Efficiency Improvements:-The falls in prices and moderate rates of return reflect large efficiency improvements in the industry. Employment in SEGBA and its successor companies fell, from 21,535 in 1987/90 to 7,945 in 1997, a fall of 63%. As a result of the rate policy implemented, the estimated average price of electricity of the EDENOR, EDELAP and EDESUR distribution companies fell some 10.8% during the period under analysis. Nevertheless, this reduction affected the different types of consumption in a quite heterogeneous way. While rates corresponding to household consumers with very low electricity consumption remained
This overall improvement reflects a large decrease in generation plant unavailability from over 50% to around 20% in just 5 years as well as labour efficiency improvements in both generation and distribution. There was sharp improvement in generation plant availability.

Labour productivity in Endesa Argentina (the second largest generator in 2002) improved from 13 to 35 GWh generated per employee between 1995 and 2000. Sales per employee in the two largest distribution companies improved from less than 2 GWh in 1993 per employee to 5.7 GWh per employee in 2001. These numbers compare very favorably with experience in the UK where labour productivity improved by less over a longer period.

Quality of Supply: - Quality of supply has improved overall within the Argentine electricity sector since 1992. Technical and non-technical losses have fallen sharply. For the utilities in the Greater Buenos Aires area the number of hours of supply lost per year was 21 in 1988, 16.8 in 1993/94 and dropped to 5 in 2000/01.62 This reflects significant improvement in metering and bill collection to reduce non-technical losses (i.e. theft). However it is worth noting that the recent macroeconomic crisis has been accompanied by a small upturn in the measured losses, possibly due to a combination of increased theft, under-investment and fundamental supply shortage.

Power outages in the transmission system have fallen since privatization. In the Transener transmission system the rate of own failures per year was 1.48 in July 1994 and was 0.57 in 2002 well below the limit of 2.50 set in the concession contract.

As a consequence of these reforms, there was a strong private investment in the electrical market, which resulted in the transformation and modernization of the electric generation park and the distribution lines. The total installed capacity grew from 13,000 MW in 1998 to 22,490 MW in 1992, extending the energy supply to 97 percent of the country. In addition, the electricity tariff was also reduced.

However, since 2001 economic crisis that resulted in the Argentine’s peso evaluation and the introduction of the emergency public law, the energy sector has been experiencing increased costs as the energy rates were frozen while the primary energy practically stable – falling some 1.5% during the period -, that of high-consumption consumers fell some 70.4%. Hence, the mean household rate dropped some 8.5%.
sources remain at international prices, in U.S. dollars. Overall, the Argentine utility rates are 50% below those seen in other countries. This provision has resulted in years of under-investment to expand production and has resulted in structural bottlenecks for the energy industry.

With regards to fuel supply, the introduction of a cap on natural gas prices for the internal marker has lowered the gas prices, while other fuels, mainly the derivatives of crude oil, are aligned with international prices, making natural gas less expensive than other alternate fuels. As a result, the private sector remained reluctant to invest in the exploration and construction of new oil fields.

Since 2004, Argentina has been importing natural gas from Venezuela to supply the energy sector due to its scarcity in the country. In addition, the government established a different mechanism to guarantee the internal provision of natural gas and suspended the exportation of surplus that can serve the internal market. At present, the government is subsiding companies to compensate the extra cost of using the diesel or heating oil to replace natural gas to meet their power needs.

As energy rates remain fixed and the energy generation and fuel prices are growing, no investments in new capacity have been made since 2001, to respond to the surging demand that accompanied the economy’s rapid expansion. Lack of investment, coupled with a rapid economic growth, has impacted both the residential and industrial customers, causing rolling blackouts, forcing companies to retard their productions and investments.

The Argentine energy requirements are highly dependent on fossil fuels, which imply the urgent need for new investments in exploration and exploiting of those fuels.

4.8 Challenges for Argentina Electricity Market

The Argentine electricity system has operated successfully at the national level for the 12 years since the restructuring of the state owned system. This is in spite of the recent macro-economic crisis, which has disrupted the basis of the payment arrangements within the sector. The most serious problem the system has actually had was the infamous Edesur incident in 1999. 64 This was a serious power blackout in the city of Buenos Aires, which was handled badly by the private company involved and did much to damage the local reputation of privatization. The incident shares some
similarities with the Auckland Crisis of February 1998 when the centre of Auckland was without power for three weeks. During the early morning of February 15 there was a fire in a new substation as it was being energized. This resulted in 156,540 customers being without power. By that night 60,000 customers were still without power. It was not until February 24 that the last customer was reconnected. The situation was poorly handled by Edesur, who continually promised that the problem would be solved imminently. The blackout occurred during some of the hottest days of the summer and lead to street protests. Edesur compounded the bad impression left by the incident by their subsequent initial reluctance to fully indemnify losses. Eventually a fine of $51m dollars was imposed on the company by the regulator because of the seriousness of the blackout and the total cost after compensation payouts reached around $80m.

Since then there have been other serious incidents but these have not attracted the same level of fine as the Edesur incident. There have also been suggestions that recent power outages caused by shortage of capacity have been caused by strategic under-investment by electricity companies in generation, transmission and distribution. There seems little evidence of strategic under-investment but plenty of evidence that prices are much too low to justify any additional investment in capacity to increase quantity or quality of supply (Vignolo, 2000).

4.9 Detailed Lessons from the Reforms of the Argentine Electricity Sector

We discuss the reforms in detail looking at the issues under five headings: generation, transmission, distribution, retailing, practice of regulation and general institutional framework. In our view the picture that emerges is one a system which has worked well and significant benefits since its inception. In 1992, the design of the electricity market drew on best practice design experience at the time. In the 2003 the system continues to function well in spite of an enormous macro-economic shock. We examine the Argentine experience in the light of best practice as it currently stands. To summaries these under each of our five headings:

A. Generation markets work best when characterized by a lack of integration with monopoly transmission and distribution networks, low degrees of concentration in the price setting segment of the market and when generators freely contract with customers.
B. Transmission systems need appropriate regulation of incumbents to ensure both fair prices and an adequate rate of return on investment. In a relatively well developed transmission network there needs to be some institution charged with proposing and overseeing system wide planning to ensure timely building of new transmission links.

C. Distribution companies need to be regulated to ensure that distribution charges both incentivise efficiency and are fair. Third party access charge regulation is essential to ensure efficient financial bypass of the distribution network by customers free to choose supplier. Supply competition is itself feasible for all industrial and commercial customers and has been successfully implemented for residential customers in some countries.

D. Economic regulation of the electricity sector is best practiced by a single independent regulatory agency with minimal ministerial control. Statutory duties to ensure adequate planning of future demands in the sector can be effectively delegated to this body. Output based regulation using appropriate quasi-market mechanisms can deal with issues of quality of supply, network extension and consumer cross-subsidy which are the areas most subject to political interference.

E. The general institutional environment in which the electricity sector is placed must be stable and foster long-term investment based on protection from arbitrary changes. Legislation regarding the electricity sector should be credible and sustainable. However there should be the capacity for the regulation regarding the system to respond to new information. The ability of the regulator and the Independent System Operator (ISO) to do this requires clear and quick dispute resolution/review mechanisms especially in the case of disputes between companies and the regulatory agency. Given the technical nature of many of the issues this should involve specialist arbitration panels perhaps under the authority of the general Competition Agency.

The Generation Sector:-The Argentine electricity system illustrates the potential for larger developing countries to operate competitive power markets. Argentina’s power market has successfully delivered low prices and reasonable rates of return for investors prior to the macro-economic crisis. There have been no problems of the
strategic exploitation of market power due to both the cost based bidding system and the degree of competition in the market which has meant that generators have in general not even bid up energy prices to the maximum price allowed for their technology. There has been significant new entry and so far the market share of the largest four firms has remained lower than in 1991. The system of independent system of operation and dispatch has worked well and supported the market.

The vertical separation of electricity generation from both transmission and distribution created a vigorous competitive market for industrial customers. Argentina learnt well the negative lessons from Chile about the need to separate electricity generation from both transmission and distribution. In Chile the continued integration of Endesa generation and transmission combined with negotiated third party access created hold up problems for other generators. This has not been a problem in Argentina where generation and transmission are legally separate.\textsuperscript{76} Similarly in Chile integration of Endesa generation and Chilectra distribution has made it difficult for other generators to compete for large customers embedded within the Chilectra distribution network. In Argentina these hold-up problems did not exist and there have been no incentives for distribution companies to prevent efficient financial bypass of their network. The result has been a very competitive market for free customers, where a significant percentage has left their local distribution company in the Greater Buenos Aires area.

Price based bidding could have worked in Argentina whereas the actual cost bidding system was flawed- There is little evidence of market power being exercised in the generation market; this may have been because of the way the capacity payment was paid. Generators did not get capacity payments for availability, as theory would suggest. Instead they received capacity payments when they were actually running during the non valley hours. This gave generators an incentive to underbid on their energy cost in order to ensure that they got to run their generating plants. This may have lead to plants running out of merit order and could easily have been corrected by given capacity payments for availability. An alternative approach would have been closer auditing of energy costs. It is clear that a price based bidding system could have

\textsuperscript{76} No company participating generation, transmission or distribution activities is permitted a controlling interest in more than one of these activities
worked under the competitive situation of the Argentine market. Price based bidding systems, in theory, provide better signals for long term investment as dispatch is on the basis of the scarcity value of electricity rather than on the basis of current costs. Such a system would have reduced the transaction costs and scope for cost based gaming in the current system. The gains from switching to this system would initially have been small but might have provided less scope for government interference. It is interesting to note that the proposed reform in 1999 (Resolution 545) did include a provision for day ahead price based bidding in the energy market; the 2001 reform also included a provision for a move to price based bidding.

The long term contract market was negatively affected by the seasonal price that distribution companies paid for power. Distribution companies could only pass-through the seasonal price of electricity, which was an expectation of the spot price. This left little scope for a meaningful long-term contract market between generators and distributors. Distributors would never wish to pay a price higher than the seasonal market and on average generators would only be interested in long term contracting if they could get a price greater than the average spot price. In the situation when the spot price was falling, as it was for most of the 1990s, distributors would be happy to purchase power spot. The absence of long term contracts is worrying in that long term contracting and price signals reduce the future supply shortages by providing signals of future scarcity. A lack of long term contracting in the Californian electricity market was one of the key reasons for the financial problems experienced by electricity distribution companies during the 2000-01 power crises. The unwillingness of distributors to sign long term contracts in the context of a developing country with high and variable demand growth can expose the sector to unnecessary power shortage risks.

Increases in concentration in generation and mergers between distributions and generation are worrying. The initial structure of the Argentine market in terms of horizontal and vertical disintegration was extremely favorable to the operation of successful liberalized market. Recently concentration has been allowed to increase in the generation market, partly because of the need to improve the financial viability of generating companies in the macro-economic crisis via merger. For example, AES has been selling generation assets to Total Fina, the largest generator. Edelap, the smallest of the distribution companies in Greater Buenos Aires, is part of the AES group. There
is a lot of cross shareholding across generation and distribution.

EdF now has shareholdings in Edenor and in some hydro power plants and Endesa of Spain has shareholdings in Edesur and Endesa Argentina (in generation). Such mergers have been motivated partly by the macro-economic crisis, which has reduced the price of electricity assets for foreign owned companies and allowed them to acquire assets cheaply. It has also been motivated by incentives to improve quality of supply on distribution companies who can reduce the penalties for failures in the transmission system by investing in nearby generation. Such changes in market structure will hamper the operation of both the market for wholesale power, increasing the potential for market power and lessening the benefits of a move to price based bidding. It will also reduce the effectiveness of competition for free customers embedded within distribution networks (Ullberg, 2002)

Changes in the nature of the bidding and payment rules of the power market have been arbitrary and unnecessary. The crisis has led a number of attempts by the Secretary of State to reduce the payments crisis problems within the electricity sector by interfering with the way the market price is determined. Such moves have had incentive properties and threaten the orderly nature of trading observed in the market since 1992. One example of an arbitrary change was to remove fuel oil plants from the calculation of the system marginal price. Thus the merit order was determined as normal but only the most expensive fuel oil plants on the system receive the true system marginal prices; other plants received the lower price which would have prevailed in the absence of the fuel oil plants being required. This change had the effect of reducing the amount of money required to pay the generators within the context of fixed regulated prices. These sorts of interventions do not change the overall revenue going in to the sector but change the distribution of that revenue between generators and distributors. (IADB, 2000)

The Transmission Sector:- The system of regulated third party access charges for existing transmission lines did successfully ensure the revenue adequacy of the transmission operator - There were no problems of non-payment for particular existing lines in Argentina. Transener received enough revenue during the pre-crisis period to meet its concession obligations and to improve the quality of its service. There was no
The system of competitive tendering for new lines was successful. Argentina obliged all new public transmission investments above $2m to be competitively tendered. This implied that the incumbent transmission companies did not have a monopoly on new lines in their areas. Between 1992 and 1997, there were four competitive tenders for nearly 2000 km of new lines. The first three attracted new entrants, the final one was won by Transener.

The Argentine system implemented an untried model of transmission expansion, which proved controversial. The ‘Public Contest’ mechanism of transmission system expansion was accused of being biased against investment in transmission. In this case, as newline access rights would belong to those who paid for the line, it might be worthwhile to free-ride on the initial investment of others. This is because new users of the line might be able to pay just marginal usage costs. The building of the fourth line from the Comahue to Buenos Aires illustrates the controversial nature of the ‘Public Contest’ mechanism for building new lines. Seven generators were due to benefit from the line in terms of energy benefits. However, two of the generators were closer to Buenos Aires than the others. This meant that they were able to benefit from higher nodal prices when the line from further away from Buenos Aires was constrained. The new line would have relieved the transmission constraint facing the other 5 generators but reduced the local energy price facing the first 2 generators. Hence, these two generators voted against it. They were joined by some distributors who did not want the amount of power that they bought from further away from Buenos Aires to increase. This was because they would not benefit from the reduced price of power (as this was passed through to customers) but they would face higher risk of transmission system failure and associated supply failures. In theory, side payments were possible but in practice, companies were very unlikely to pay them given that exerting political pressure to change the system was always an alternative to

77 This was because if new lines were built every one who used the line would have to pay for it independently of how it affected their net revenues. If 30% of users objected on the basis of this charging mechanism then it would not go ahead. If the line was built under a direct contract between a transmission company and beneficiaries of the line there were other potential problems (this was the ‘Contract between Parties’ methods).
actually making such payments. The failure to initially agree on the building of the fourth line has been seen by much in the industry as evidence that the ‘Public Contest’ mechanism was flawed. Proposals for National Transmission Plan were a promoted as a consequence of the perceived problems with the ‘Public Contest’ mechanism. The line was eventually built some 18 months later than under the initial proposal. This implies that even if the benefits were positive the costs of delay were small. They also make the important observation that the voting system was successful in reducing the number of unnecessary transmission investments motivated by political interests. This had been a problem prior to privatization, as regional governments’ lobbied for upgraded transmission links paid for by the system as a whole. (Oliveria, 1992)

A system of system wide planning is desirable and necessary in a developing country context - In developing country large and timely transmissions expansions are important to meet the demands of electrification and rapid economic growth.

In advanced countries with very low demand growth nodal pricing on the meshed transmission network may be a good way to price existing transmission capacity and may give good signals for transmission expansion along existing pathways. In developing countries with linear transmission systems merchant transmission expansion may be successful. This is because loop flows do not complicate the allocation of benefits. Such systems are unlikely to work well in rapidly growing meshed systems.

System wide planning in a meshed system is useful for identifying transmission expansions that should go ahead especially in the light of expected rather than actual demand growth. In Argentina it would seem sensible that one institution is charged with producing a transmission expansion plan and given some power to commission newlines. Allowing private companies alone to decide on transmission lines with important implications for the location of future economic development (and significant loop flow effects) is unlikely to lead to socially optimal (or indeed politically acceptable) outcomes. The case of the fourth line from Comahue to Buenos Aires, discussed above, illustrates this. Although the decision may have been marginal on economic grounds it would seem sensible to have a system which is, if anything biased slightly towards transmission expansion, rather than against it. In suggesting this it is
important to stress that the power to plan and implement transmission investments can be separated from the actual building of new lines. Incentives need to be in place to ensure that the system planner does not benefit unduly from over expansion of the transmission network and that alleged wider social benefits are evaluated systematically. (Jamasb & Pollitt 2001)

National Transmission Plan to be produced by Transener needs to build in effective regulatory oversight of proposals – The problems raised by the building of the fourth line have lead the government to propose a National Transmission Plan which does provide for system wide planning lead by Transener.78

A regular national plan needs effective regulation to avoid being biased in favour of too much investment. Proposals need to be audited to ensure that they are necessary and effective incentives need to be put in place to ensure that new lines are built at least possible cost. The danger in the context of Argentina is that unless these are genuinely independently regulated the process of approval of transmission investments will become unduly politicized. This could lead to speculative expansions of the transmission network to politically valuable regions and with the costs being spread among all customers. In the UK, centralized planning of capacity expansions is carried out by Transener’s former parent company, National Grid, and capacity expansions are subject to external audit by consulting engineers commissioned by the energy regulator, OFGEM, as part of the 5 year regulatory review process.

Some equivalent process, with appropriate provision for the objective valuation of regional development benefits, should be required in Argentina under a centralized planning system. Worryingly, the current transmission investment law specifically exempts the proposed investments from regulatory review. The regulation of Transener was subject to political interference and did not work well. There were problems with both the setting of the regulated revenue for Transener during the 1998 price review. ENRE had responsibility for carrying out the review and carried out a detailed assessment of Transener’s cost requirements. They concluded that Transener should face a significant revenue reduction and rebalancing of its charges. Transener subsequently appealed the ENRE decision to the Secretary of Energy. The government

78 Indeed in December 2003 a plan for certain named transmission investments was approved (Law 25822).
minister overturned the ENRE decision and increased the regulated charges. This process of events involved considerable lobbying of the Secretary of Energy by Transener and was not good for the cause of independent regulation in Argentina (World Bank, 1993). Transener was the first price review it conducted and it worked hard to do a thorough job. The regulatory process should have involved the possibility of an appeal to the Competition Commission not to a politician. However for this to be effective the regulatory institutions (including the Competition Commission) need to be subject to reduced political interference (Ferreira, 2002)

There is a need for a proper regulation of the third party access charge in order to correctly regulate the access to the monopoly distribution network by third party suppliers. In competitive retail electricity market proper regulation of third party distribution system access charge is essential. This charge needs to be set in such a ways to encourage efficient financial bypass of the distribution network. In theory this should be a component of the regulation of final electricity tariffs to regulated customers. As ENRE is the regulatory body responsible for regulating these tariffs, it should also be responsible for setting the distribution access charge. However access charge is currently set by the Secretary of State. As there is not proper accounting separation of distribution and supply it is not clear what is the basis of Secretary’s decision.

The suggestion is that the access charge has been too low since 1992 encouraging inefficient financial bypass by free customers which results in regulated customers having to pick up the short fall in distribution revenue created. The current system is subject to both political interference and double jeopardy caused by the fact that both the regulator and the Secretary need to work out the efficient level of marginal costs in order to make their determinations and hence may use different numbers (WRI, 2002). The result of this will be to raise the uncertainty facing the revenue of the Distribution Company and likelihood of mis-pricing. The political pressure on the Secretary of Energy is for lower access charges for large free customers, allowing this in turn produces politically difficult pressure on the price paid by regulated residential customers. If it is the regulatory agency’s task to regulate the profitability of the
distribution Company then it should have control over both the final price and the access charge. The access charge should be set according to the well-known Efficient Component Pricing Rule (ECPR).

Final Price flexibility is required if the access charge is kept below the efficient level in order to stimulate competition in the liberalized market - If an essentially political decision is taken to keep distribution access charges below the ECPR level then the distribution utility needs to compensated for the loss of revenue. Prices to the remaining captive customers should be allowed to rise in order to allow revenue adequacy of the distribution company. The issue here is that the regulated firm should be given opportunity to rebalance its charges in order to allow it to maintain its pre-determined revenue stream. The suggestion is that the current charging mechanism is biased against distribution companies being able to maintain their regulated revenue.

Private ownership of distribution utilities combined with clear incentives to increase connection of poor customers can dramatically improve access among the poorest households - One of the striking achievements of the early years of Argentine electricity reform was the sharp increase in the number of poor households with electricity supply. Between 1986/7 and 1996/7 electricity access rose from 65.2% for the poorest deciles in the Greater Buenos Aires area to 98.98%. This was the result of the 4-year framework agreement following privatization which saw government incentives paying off past debts of shanty town dwellers and paying for the installation of meters. Municipal governments paid for this with 60% of the tax on household electricity consumption, the other 40%subsidised new connections. For the new customers Edenor and Edesur had an 85%collection rate with some direct subsidy coming from the government in the form of payment for very poor groups of consumers on municipal meters and payments for pensioners collecting the minimum pension. Many developing countries face problems of improving the access of the poorest while giving financial incentives to companies to supply them. Argentina handled this problem in an economically efficient way. The increase of access to poor consumers was calculated to have yielded large increases in social welfare and be a significant benefit of the restructuring of the sector (Steiner, 2001).

In contrast to its success in connecting poor urban consumers, the government
has limited success in extending the electricity network to include 2-3 million inhabitants of rural areas without access to electricity - In 1995 the Secretary of Energy launched a scheme to supply power to these areas. The Disseminated Population Electricity Supply Program (PAEPRA) was to connect 314,000 rural users. Only of a fraction of those connections were actually put in by 1999.

The system of penalties for supply outages combined with the pass through of nodal prices to customers has created perverse incentives for distribution companies. Distribution companies are directly liable for all failures to supply their customers regardless of the cause. In theory, where prices are not regulated, this should not matter for efficient investment in reducing the risk of supply failures. However in practice there are high transaction costs in writing supply quality contracts between transmission operators and distribution companies and a lack of incentive to minimize the total costs of electricity supply facing distribution companies. These two facts mean that distribution companies have had a strong incentive to minimize the risk of transmission failure by contracting with generators who are close by or even to engage in physical bypass of existing transmission networks. This may lead to under-utilization of some parts of the transmission network and pass through of higher nodal power costs to customers. (Oliveria de, 1997).

The seasonal pricing system is unnecessary, inefficient and creates an opportunity for political interference - 50% of electricity demand is subject to the seasonal price for purchased power. The purpose of this price is to reduce the exposure of residential customers to price spikes, which might exist in a hydro system in years of extremely unfavorable hydrological conditions. This is misconceived. In a completely free market, customers who value price stability can buy stable prices direct from their supplier’s who will then absorb or re-insure against the risks of high spot prices. In other words long-term contracts (which allow recovery of a surplus in periods of low spot prices to compensate for losses in periods of high spot prices) can be entered into if valued by customers. The problem when there are regulated customers who have only one supplier is how to encourage the optimal amount of price smoothing. The Argentine system (like the Chilean system of node pricing, which performs a similar

79 The main problem for the PAEPRA was the unwillingness of provincial governments to contribute subsidy payments.
function) imposes smoothing by only allowing distributors to pass through the smoothed price. However the smoothing mechanism itself is problematic. It represents a six month forward looking average of electricity prices and is reset every six months. As pointed out above the existence of a seasonal price puts a ceiling on the amount that distributors can pay for purchased power. This has worked to inhibit efficient long term contracting. An open auction for long-term contracts to supply regulated customers combined with some benchmarking of the long-term contract prices paid by the distributors on behalf of their regulated customers would ensure a large degree of smoothing. It would also ensure that high prices at times of shortage would be reflected (at least in expectation and in the price of un-contracted demands) in the regulated price.

If there was still a need for smoothing the final price there could be a smoothing mechanism introduced on the final price to spread the payment for the high cost electricity by regulated customers. This could easily be achieved by a limit on the maximum price rise in any six month period followed by a period of over recovery in prices to make up any revenue shortfall to cover the extra purchased power costs. A major problem with the seasonal price recently has been the fact that it is formally set by the Secretary of Energy. From 1992 until 2002 this price was set at the value suggested by the CAMMESA model. However recently the Secretary of Energy set the price at a lower level than the model suggested. Normally this would be problematic because it would lead to a shortfall in what generators would get paid by distributors. However the Secretary also had control over the fund which balanced the differences between the spot prices paid to the generators and the seasonal prices by distributors. He was able to use the accumulated surplus in this fund (arising from the period when the seasonal price lagged the downward movements in the spot price) to bridge this deficit. If there is to be a seasonal price it should always be based on a computer simulation not on a political decision. (Hawdon, 1996)

The final customer market further liberalized - Currently customers with peak demands above 30 kW can choose supplier freely. Prior to the recent crisis the Argentine electricity sector had got all of the preconditions in force for full retail competition, as the ultimate target in the development of its electricity market. This would have important positive downstream effects in terms of reducing the degree of
regulation in the industry and its potentially distortion effects. Such a move towards full supply competition was part of the failed proposals for reform in 1999 (Resolution 545 of 1999). The advantages of full supply competition might include better long term contracting for electricity supply and the emergence of multi-utility consumer offerings should consumer’s value these.

Small users should have been formally represented in the regulatory process. One of the rationales for heavy central government involvement in the electricity sector is to represent the interests of small customers. However this can be done directly by involving small users on the CAMMESA board and via a separately constituted consumer body to handle customer complaints (currently these are handled within ENRE). Such a body would have created an informed consumer voice, which would have reduced the need for the involvement of the Secretary of Energy in the process. It would also have educated consumers of the benefits of the reforms and need for a quicker resolution of the current payments crisis within the sector.

Accounting separation of distribution and retailing should have been a priority for ENRE. A notable failure in the practice of regulating the electricity sector has been the failure to establish the detailed information collection systems on which modern regulation of incumbent network utilities depend. As we noted above there should be clear separation of the regulated and non-regulated businesses and between the noncompetitive and potentially competitive businesses. If there is to be effective regulation of distribution access charges and further retail market opening it is essential to collect detailed information on distribution and retailing costs. It was the strict separation of these costs in the UK that eventually leads regulated distribution utilities to realize that they did not benefit from integration with supply companies. This has lead to the separation of many of the regional distribution wires businesses from the local retailing of power. ENRE has been existence for over a decade; most regulatory agencies make the establishment of appropriate financial reporting by regulated companies a top priority.

demonstrate prolonged supply failures raise questions about the efficacy of reform. While supply failure penalties encourage investment to reduce supply failure risk, it is neither possible nor sensible to eliminate all risk of supply failure. This implies that there should be a crisis management plan should a bad supply failure occur. As the integrity of the system is called into question by such a failure it should be the job of the regulatory agency to ensure that all the relevant companies have an up to date crisis management plan. It should also be the case that the regulatory agency itself knows how to respond in crisis. During the Edesur incident the company apparently did not have an adequate crisis management plan, particularly for handling the media. It also seems to be the case that ENRE did not have a similar crisis management plan and was itself slow to realize that its own competence and the competence of the whole privatized industry would be called into question by this incident (CAISE, 2002).

ENRE enforced arbitrary quality standards. Distribution companies in Argentina complain about the enforcement of arbitrary quality standards by ENRE. ENRE were free under the legislation to define quality standards but these were significantly tightened during the 1990s to the extent that fine income was increasing in spite of the fact that general supply quality was improving. The effect of these apparently arbitrary standards was to threaten revenue adequacy and increase uncertainty. The serious ‘Edesur incident’ resulted in ENRE imposing a special fine of $100m instead of the $10m, which would have been due under the existing quality incentive scheme. Arbitrary fines of this nature violate the principle that fines should be levied on observed outcomes not on intermediate measures (such as the observation of management failure).

The reason for this principle is to encourage efficient responses (especially among firms who are not fined) to well specified social preferences for quality. Serious incidents, which call the existing penalty system into question, should be handled by ex post inquiry to learn lessons for the future. Edesur paid the fine rather than risk losing their concession; however in principle incompetent franchisees should not be given the opportunity to buy their way back into the franchise if the costs of leaving them in place in the future may outweigh the benefits. If ENRE were serious about learning the regulatory incentives from Edesur they would have enquired into it thoroughly. However there was not a full enquiry into the incident and the only document ENRE
ever published on the incident was a chapter in their annual report. By contrast the recent New York power cut led to many pages of reports on the FERC website.

The regulatory agency, ENRE, has been politically undermined over the years. Instead of evolving a strong independent regulatory agency for electricity ENRE appears to have grown much weaker over the years. This is because of continuing interference by the Secretary of Energy. This has manifested itself via: the pressure to impose a large number of penalties; the continuing role for the Secretary of Energy in the setting of the access charge the contract price; and the overturning of the 1998 Transener price review and the delaying of the 2002 distribution price review. The number and quality of professional staff declined over time and for several months during 2003 ENRE only had 2 commissioners out of 5. As ENRE needs 3 commissioners to pass any resolutions it is effectively unable to function in its current state. Once established by statute, regulatory agencies should not be subject to operational oversight from a government minister but should be subject to judicial review by the Competition Authority or the independent government auditor (IADB, 2000)

Individual electricity customers should have to pay market-based prices for electricity. Between 1992 and 2001 Argentina successfully moved from a pricing system for electricity in which many poor customers were allowed to avoid paying for electricity to one where those who could pay, paid something, and those who could not received a direct subsidy to pay their electricity bill. Many developing countries face this nonpayment problem and have struggled to deal with it. Argentina dealt with it in a way that is consistent with the economic principle that re-distributions of wealth should be achieved via taxes and subsidies not via cross subsidy. This principle encourages more efficient and safe use of energy and encourages companies to connect poor customers to their networks (as was the case with shanty town connections). Since the crisis, artificially low electricity and gas prices have served to create disequilibrium between the demand and supply of electricity. The experience of 2002-2004 and the inevitable power cuts and increased government intervention amply illustrate that the laws of supply and demand should be allowed to apply to the electricity market.

In the electricity sector, as in the economy in general, one politically inspired
distortion of prices and regulation tends to make additional political interference more likely. We have noted a number of examples of political interference in the Argentine electricity sector which have only led to further problems. These include: the keeping of the access charge in distribution too low leading to pressure on residential rates; the restriction of the rise in final prices leading to payment problems in the generation market; and the failure to appoint directors to ENRE leading to the inability of the regulatory agency to function properly leading to more political input into the regulation. Successful regulatory regimes involve self-restraint by politician’s and political institutions in what is often the complex business of setting the right incentives in the electricity sector. Arbitrary intervention by politicians in the operation of decentralized electricity market is likely to have unintended consequences, because ministers are less well informed than well resourced regulatory agencies. The setting up of a state owned energy company to respond to some of the ‘market failures’ associated with politically inspired price setting in the energy sector illustrates the vicious circle of ever increasing intervention to which badly thought out policies lead (Murillo, 2001).

Government ministers should not be involved in approving or implementing regulatory decisions, which should properly be delegated to a regulatory agency. In general government ministers, such as the Secretary of Energy, should not undertake tasks that should properly be the task of regulatory agencies, such as setting regulated prices. They should not be able to control funds collected from electricity consumers for specific purposes, such as smoothing price differentials or paying for transmission capacity. Instead these funds should be in ring fenced funds. In the case of Argentina there should have been no role for the Secretary of Energy in the governance of CAMMESA, in the setting of the seasonal price, in the arbitration of disputes or in the approving of regulated tariff changes or in the control of electricity specific funds. In Argentina the Secretary of Energy continued to control the operation of the electricity market and its regulation despite the setting up of an ISO and an independent electricity regulator via his control of the governance structure of CAMMESA and his authority over ENRE. The government should restrict itself to the setting of future policy developments and avoid having anything to do with the day to day running of the current system. Oversight of this should rest initially with another regulatory authority, namely the Competition Agency.
ENRE should have become a truly national regulatory agency with authority over electricity utilities in the country. For a small country like Argentina, the establishment of separate regulatory agencies for each province does not make sense. Even in the UK where there is now a Scottish Parliament, the interconnected electricity system in England and Wales and Scotland is regulated by the national electricity regulator, OFGEM. Germany has recently been forced by the European Union to introduce a national energy regulatory agency, having previously left regulation of distribution utilities to its provinces. The seasonal pricing mechanism in Argentina was motivated by the inability to get the provinces to standardize their distribution tariffs. Distribution access pricing rules and regulated customer seasonal price pass-through arrangements can differ by province. Many regulatory agencies in the provinces are small (they range from 7 to 40 staff and often cover several industries). ENRE has played a key role in providing support to provincial regulatory agencies. These agencies have limited capacity to regulate distribution and retail tariffs. ENRE itself would benefit from extension of its role as it could undertake benchmarking exercises between the large number of distribution utilities that there are in Argentina as opposed to the three that it regulates. A compromise measure might be to merge all of the provincial regulators into one body, though this poses political problems given the unwillingness of the provinces to cede power to the central government (Newbery, 2002a).

The current position of ENRE was not inevitable. The government has let ENRE’s credibility and expertise wither away because of neglect. While this is understandable given the magnitude of the macroeconomic crisis, it was not the only strategy available to them. It reflects an unwillingness to deal with the payments crisis facing the sector. Maintaining a strong ENRE would have allowed the government to use the regulatory agency to take a lead role in assessing financial requirements of the industry as part of pricing negotiation with the companies. The current strategy stores up trouble for the future as it demonstrates a predisposition on the part of state to circumvent an independent regulatory authority when convenient, rather than work with it. It is not an optimal policy response to a macroeconomic crisis to throw out what should be one of your most effective microeconomic institutions. It is interesting to observe that the inevitable political response to a crisis in the electricity sector is not to always get rid of the electricity regulatory agency or weaken its powers. The two
agencies responsible for the regulation of the Californian electricity market (the FERC and the local California Public Utilities Commission) were heavily criticized but they did not have their powers weakened (Delfino & Casarin, 2003).

In an economy with significant overlapping electricity and gas interests the gas and electricity regulators should be merged. Currently there are separate electricity and gas regulators in Argentina. This has created inconsistencies in the way that the gas and electricity markets have been handled in recent years. There is no spot market in gas and the gas price has been fixed in Pesos. This has lead to scheduling distortions between stations using Argentine and Bolivian gas. There is a need to co-ordinate the expansion of the gas and electricity networks to ensure least cost optimization of the two networks. It is currently (mid 2004) the case that it is easier to expand the gas network. There is a strong possibility of inefficient arbitraging between the gas and electricity markets to make optimal use of energy. To achieve this there is also a need to co-ordinate the regulate rate of return and the congestion charging regimes in the two networks in order to prevent inefficient arbitrage. Regulatory consistency is required. Incidentally, it may also be easier to keep the Secretary of Energy from interfering in the sector if there is a more powerful regulatory agency with responsibility for consistent regulation between the two sectors.

Argentina’s electricity reform contains two sets of lessons for developing countries.

- First, comprehensive electricity reform can work in a developing country.
- Second, well organized markets and effective network regulation are undermined by political interference in the pricing of electricity.

Argentina’s electricity reform is a fascinating test case. It represents the application of a combination of the successful Chilean and UK electricity models in a developing country context. Between 1992 and 2001 the reformed sector functioned very well. The generation market was very successful and was the least concentrated generation market then operating anywhere in the world. It managed to deliver falling prices, improving productivity and new investment. In transmission and distribution private ownership was successful at improving technical and cost efficiency and increasing investment (Mota, 2004). However some serious regulatory issues emerged. In particular the process for approval of large transmission upgrades was controversial.
and the regulator was subject to political influence, which unnecessarily increased the uncertainty of the regulated revenue of network companies. Private ownership and the private institutions of the market (CAMMESA and the various industry associations) performed well. However the problems that existed in the sector prior to 2002 had been widely recognized and somewhere in the process of being solved. At the heart of any well functioning private industry is the operation of the fundamental laws of supply and demand. This implies that prices must be allowed to rise to bring the supply and demand for electricity into balance. Private companies must be given the prospect of earning fair returns to new investments.

If this is not allowed to happen either electricity shortages in Argentina will get worse and/or economic growth will be further reduced and/or other forms of government intervention (such as state ownership and subsidies) will increase. Electricity sector reform requires a minimum commitment on the part of the government to market based pricing of energy and to a stable regulatory environment. Clearly the macroeconomic crisis of 2002 profoundly affected the Argentine economy as a whole and the electricity sector in particular. The private sector has been remarkably disciplined in keeping the lights on while negotiations about current pricing and compensation for past losses continue. However the normal operation of the laws of supply and demand need to be re-established if the substantial advantages that private ownership and organization of the electricity system have delivered in Argentina are not to be undone.