During the 1998 Summer Meeting of the IEEE Power Engineering Society (PES), the Energy Development and Power Generation Committee sponsored a panel session on “Assessment of Latin American Deregulation Processes.” The panel session was organized by Hugh Rudnick, who is with the Catholic University of Chile, and Nelson de Franco, who is with the World Bank in Washington. The session was moderated by Thomas J. Hammons, chair of International Practices for Energy Development and Power Generation, University of Glasgow, Scotland, U.K. and cochaired by Nelson de Franco.

Deregulation in Latin America started more than 15 years ago. There is a wealth of experience on competition, pool organization, market power, transmission pricing, system expansion, etc. The panel reflected on that evolution in the region with a global overview by Hugh Rudnick and with presentations from Luis Sbertoli, Sigla, Argentina, and Carmenza Chahin, Colombian Regulatory Commission for Electricity and Gas. José G.A. do Nascimento and J.W. Marangon Lima, from the Brazilian National Agency for the Electric Power, discussed the challenges being faced in Brazil, the largest power market in Latin America, recently joining the deregulation process. Contributing from a different perspective, Philip Gray, World Bank, Washington, DC, made an assessment of the UK experience as it relates to Latin America.

Latin American Experience

Hugh Rudnick, Catholic University of Chile

Latin America is a region in political and economical transition, with a growing tendency to open economies and democratic governments. The debt crisis is coming to an end, irrespective of dramatic but transient slow downs like that of Mexico. Significant economic reforms are giving shape to market economies with increasing economic growth. Geopolitic reasons are making North America and Europe look with increasing interest to investments in the region, some of these being transferred from the troubled South-East Asia economies.

A further development of interest in the region is the contribution of new commercial international agreements to economic development. Among them, the new Mercosur pact created an integrated market of 200 million people over an area of 12 million square kilometers, incorporating Argentina, Brazil, Paraguay, Uruguay, Bolivia, and Chile.

Latin America is a region self-sufficient in energy reserves, with large reserves of natural gas and oil as well as important hydropower potential. Hydropower is responsible for 60 percent of the power generation in the region.

The electric energy industry in Latin America has faced a profound transformation, with no parallel worldwide. New electric sector regulations were set in Chile in 1982, Argentina in 1992, Peru in 1993, Bolivia and Colombia in 1994, and the Cen-
central American countries of Panama, El Salvador, Guatemala, Nicaragua, Costa Rica, and Honduras in 1997. Brazil has also joined the group, and Venezuela and Ecuador have initiated actions.

The diversity in the size of countries and power demand is striking, but all are following similar paths for reform (Brazil on one end is a country with a population of 160 million and an installed capacity of 58,000 MW, while Honduras has 4.4 million people and 396 MW). The level of electricity consumption is still low, if compared to the industrialized world. However, electricity demand has experienced a growth rate of approximately 5 percent a year since 1985, one of the highest consistent growth rates in the world.

Electric power was introduced in Latin America soon after electric light was inaugurated in New York City and London at the end of last century. Initially, the power sector developed based on private investment, with no special regulation. Nevertheless, during the Great Depression of the 1930s, private investment dried up throughout the region, to the detriment of electricity supply to cities, industry, and mining. In most countries, the governments seized the initiative and from the 1940s to the end of the 1970s put aggressive electrification programs into effect. Electrobras in Brazil, Endesa in Chile, Electroperú in Peru, ISA in Colombia, CFE in Mexico, Edelca in Venezuela, and ENDE in Bolivia were among the national electricity companies that were created. In general, power system development was concentrated in their hands, and they built large reservoirs, hydroelectric plants and transmission lines tying previously isolated networks into interconnected systems. Private firms still existed, but mostly at the electricity distribution level in the main metropolitan areas.

In most countries, however, the state-owned, vertically integrated electricity monopolies failed in the end to adequately manage the electricity business, and diverse technical and financial problems became endemic. For example, over-investment in the Argentinean electricity system was accompanied by a severe deterioration of the electricity service under State hands that failed to supply demand. In Colombia, prolonged power rationing had to be decreed in 1992-1993 because of its limited thermal generation development confronted by weather changes due to El Niño. In Brazil, a dire financial shortage halted public investment in the power system, in an economy with increasing energy needs. Meanwhile, in Bolivia and Peru, governments were failing to raise enough funds for the electricity sectors, yet at the same time subsidizing rates for poor users. A similar situation is present in Venezuela and the Central American countries.

Transforming the Industrial Organization

Driven by crisis or the search for alternative paths for development, several Latin American countries proceeded to change the regulatory frameworks for the electric energy sector. Reforms aimed at providing space for private initiative in the development of electricity supply. Explicit separation of the three businesses was defined (generation, transmission and distribution), making room for competition where possible and stimulating efficiency of monopolies through performance-based regulation. Some countries defined a fourth competitive business, separating commercialization suppliers from the providers of electric wires. New pricing systems were introduced, where both generation and transmission businesses have operational or capacity expansion marginal prices or both. Distribution service is priced based on capacity expansion average costs, which are evaluated using model distribution companies or price cap schemes.

Reforms have followed similar but not identical paths in all countries involved, each one benefiting from the experience of those that have made the changes earlier. To reduce market power, restrictions on cross-ownership among different categories of companies (i.e., generation versus transmission versus distribution) were introduced in most countries (Argentina, Bolivia, Colombia, and Peru, but they were not defined in Chile). Argentina, Bolivia, and Colombia further limited any generating company from holding more than 10, 25, or 30 percent of the market, respectively.

The system operator in charge of coordinating grid operation is run only by generators in Chile. In Peru, the operator also includes transmitters, and in Argentina and Bolivia distributors, large consumers and the regulator. While in Chile, Peru, and Bolivia generation is dispatched based on audited costs, bid prices are used in Argentina and Colombia.

While most countries formulated two-part tariffs for transmission services based on multinodeal marginal short-term marginal prices, coupled to tolls, Colombia used capital expansion marginal costs. While Peru, Colombia, and Bolivia left the transmission system under the control of a single company, Argentina and Chile have relied on market forces, favoring the development of several private transmitters.

Argentina, Chile, and Peru have chosen the concept of model distribution companies to set distribution rates; Bolivia has opted for the British price cap scheme, where rates are adjusted with inflation plus a yearly efficiency reduction.

Different privatization schemes have been used in each country. Private pension funds provided financing for the privatized electrical system in Chile, while in Argentina, Bolivia, Brazil, Colombia, and Peru, major foreign investment joined the limited local capital market. Bolivia developed a new privatization program called "capitalization." Foreign investors commit to the company's expansion, controlling the company as shareholders that contribute a predefined amount to finance further investment. Stranded assets have been sunk in all deregulation processes and absorbed by the State.

The last country to join the club was Brazil, where privatization steps have been taken in the area of power distribution and generation, with specific contracts between the buyers and the government. Behind the privatization process is the need for investment to support a growth of 1,350 MW a year of new generating capacity over the next 10 years, over $2 billion a year. In parallel, the federal government initiated a global restructuring plan to demonomize the industry and introduce incentives for competition, including the creation of a new regulatory agency.

Government-owned monopolies still run the electricity sectors in Mexico, Paraguay, and Uruguay and most of Ecuador and Venezuela. Incipient restructuring efforts have taken place, but the final structures are being discussed.

Impact on the Electricity Service

The reforms have had radical results in all countries. In Chile, two power suppliers have given place to seven generating companies competing in the main grid. In neighboring Argentina, still more strikingly, over thirty private generator rivals have replaced two state-owned companies. In Buenos Aires and Lima, two distribution companies compete not only against each other but also against an ideal model.

The countries that have restructured and privatized their electric power sectors have attracted investments from numerous

IEEE Power Engineering Review; December 1998
U.S., Canadian, French, Portuguese, and Spanish companies, with limited demand growth in their own countries. Chilean companies have grown into electricity multinationals present in generation, transmission, and distribution investments in Argentina, Bolivia, Peru, Brazil, Colombia, and are waiting for better conditions in Venezuela and Mexico. Chilean companies Gener and Endesa own more installed generation capacity outside the country than inside. In addition to Santiago, three other capital cities (Bogota, Buenos Aires, and Lima) are now supplied by Chilectra, which serves 39, 15, 17, and 17 percent of the Chilean, Colombian, Argentinean, and Peruvian populations, respectively.

Employment opportunities have undergone a metamorphosis. Downsizing and outsourcing have brought new jobs into being and made old ones disappear. Productivity of the labor force has increased in all the countries where restructuring and privatization has taken place. In Chile, for example, the number of customers per distribution worker more than doubled in ten years, and dramatic growth in electricity production has coupled to increasing productivity.

The impact of the changes on the quality of service has been no less remarkable. In Argentina, availability of thermal generation plant has risen significantly. An extraordinary reduction in unsecured energy has taken place, coupled to energy price reductions in the contract market. Nevertheless, prices not necessarily have decreased everywhere; in Peru they increased over two times when subsidies to final consumers were eliminated.

Distribution losses have shrunk in several countries where deregulation has taken place; losses in Chile, energy theft included, were halved in 7 years and in Argentina, in just three years. During roughly the same period in Argentina, investment in the generation-transmission-distribution chain dropped from $6,000/kW of installed capacity to around $2,000/kW, indicating a tripling of the productivity of money put into the system.

At the same time, very strict electric quality standards have been set in Argentina, Bolivia, and Peru, with penalties for noncomplying. More efficient maintenance, the upgrading or replacement of existing equipment, and more sophisticated control systems for a tighter use of installations—all have been used to increase reliability and postpone further capital investment. Development has been stimulated by the search for more efficient technologies in generation equipment as well as cheaper energy resources. Many investors have sought to build combined-cycle gas units, with related investments in transporting natural gas across international frontiers.

A chronic problem in Latin America has been the illegal use of electricity, which usually imposed severe burdens on the utilities. Losses over 20 percent were not uncommon, and, even now, some utilities in Venezuela lose more than 50 percent of energy bought. A political solution chosen by some countries had been to share this burden among all paying consumers, assuming electricity theft was a social problem. However, in the new regulatory schemes, where distribution companies are asked to compete with a model or a price cap, control over these strictly nontechnical losses is necessary if company revenues are to be increased. Creative solutions have been developed jointly by public authorities and private companies. As a result of this and the obligation of distribution companies to serve any consumer, electricity population coverage is being increased.

**Challenges for the Future**

The electricity industry reforms in Latin America have been dramatic, with all agents involved compelled to increase their efficiency, either in supply or demand. The challenges have posed difficult questions to all concerned, particularly as competition increases beyond geographical and political boundaries. Private generation investment has taken place without government intervention, increasing supply in countries where electricity growth is a basic requirement for economic development. Despite the success of the deregulation processes in the region, there are diverse pending issues to be solved to increase competition and transfer to the general public the benefits of increased efficiency in the production and distribution of electric energy. Improvements are due in all areas, particularly in those related to the role of the independent system operator, the transmission pricing and open access arrangements, the discipline of market power and the regulations of the distribution monopolies.

Countries outside the region have examined with interest these reforms and have benefited in their design of competitive markets. Advisers to Margaret Thatcher in the UK learned directly from the Chilean reformers before starting their world-known privatization of the state-owned Central Electricity Generating Board. Even China is observing the South American experience in its initiatives to create wholesale markets.

**About the Panelist**

Hugh Rudnick graduated as a civil electrical engineer from University of Chile, later obtaining his MS and PhD from Victoria University of Manchester, UK. He is a professor of electrical engineering at the Catholic University of Chile, Santiago, Chile. His research activities focus on the economic operation, planning, and regulation of electric power systems. He has been a consultant with utilities and regulators in Argentina, Bolivia, Central America, Chile, Colombia, Peru, and Venezuela. He is a member of the IEEE PES Governing Board and Latin America representative to the board.

**Power Sector Deregulation in Argentina, 1991-1998**

Luis V. Sbertoli, SIGLA S.A.

Power sector deregulation in Argentina started with the State Reformation Law enacted in 1989. This law contained the first elements aimed at separating the state from operating functions and restructuring state-owned companies. Restructuring activities for the power sector started in 1990, resulting in the enactment of the Electric Power Regulatory Frame (Law 24065). This law established the organizational features of each activity within the sector and created the National Regulatory Agency. It also officially established the Wholesale Power Market (MEEM), which already existed, though on a preliminary basis, within the structure of the previous state companies.

In this review, the year 1992 will be used as the reference year as regards the initiation of the transformation process, as the privatization processes leading to the commercial organization of the market began in that year.

**Features of the Transformation Process**

In Argentina, the transformation of the power sector was based on the following main aspects:

- Focus of the state on the regulatory role; creation of the National Regulatory Agency (ENRE)
The increasing number of commercial actors in the system will strengthen the long-term contract segment of the market and will perhaps lead to the appearance of derivative markets (futures, options) which will require regulation.

About the Panelist

Luis Sbertoli graduated as an electrical engineer from University of Buenos Aires in 1974. He has specialized in energy planning and economics, electrical transmission systems and energy market analysis. He is a partner and director of SIGLA, a consulting company in Buenos Aires, directly involved with privatization of the generation, transmission and distribution business in Argentina. He has done consulting work abroad, mainly in Brazil, Uruguay, and Costa Rica, and for companies in the United States and Italy. He worked as the national director of Energy Sector Planning at the Ministry of Energy. He was among those who defined the master plan for the Argentinean Power Sector Deregulation and Reorganization. He is a faculty member at the Argentine Institute for Post-Graduate Training in the Electric Sector.

New Regulatory Framework for the Colombian Electrical Sector

Carmenza Chahín, Colombian Regulatory Commission for Electricity and Gas

Electric energy service in Colombia began at the end of the nineteenth century, and its development was the result of initiatives by private investors, who constituted the first electricity companies. In the 1950s, under pressure from the political classes of the different regions, companies were nationalized, based on the paradigm that linked electricity with economic development. At the beginning of the 1990s, an assessment was made of the management and achievements of the state electricity companies. It showed highly unfavorable results in terms of their administrative, operative, and financial efficiency. The sector as a whole faced a financial crash, which led to severe and extended electricity shortages in the 1991-1992 period.

The government, with powers invested under the "economic emergency state" established in the new 1991 Constitution, issued the Decree 700. This decree established in 1992 the rules for the entrance of private investors in the generation business and empowered the government to make decisions about the construction of new generation plants and the conferring of the respective guarantees. Under this framework, several generation projects included in the expansion plan were impelled.

An important institutional transformation process was then led by the government at the end of 1992 through decrees to modernize the state. One of these decrees restructured the Ministry of Mines and Energy and created the Energy Regulation Commission (CRE). It also closed the National Tariff Board and the National Energy Commission, whose functions were more in the line of the state centralized planning.

To provide a more stable and safe framework for all the participant agents in the public services business, Congress approved two laws in July 1994, the Delivery Public Services Law (DPSL) and the Electricity Law (EL). DPSL established a general framework for residential public services, including natural gas and liquefied petroleum gas. EL specifically regulated the electricity service. It transformed the CRE into the CREG entity with an eight member board: the minister of Mines and Energy as the head; the minister of Treasury and Public Finance, the National Planning director, and five experts directly designated by the president of the republic. Majority takes the decisions of the board, but the favorable vote of one of the government members is required.

The CREG designed, ruled, and adopted the new institutional and regulation framework of the electricity and gas sectors. In the electric case, the adopted model is similar to the English scheme, although it has important variants, especially in relation to the commercialization or supply business.

The first rulings issued by the CREG for the electricity sector are from the end of 1994, developing a regulation framework applicable to the generation, transmission, distribution and commercialization activities. The regulations apply the managerial, commercial, technical and operative aspects of these businesses.

Characteristics of the Regulation Framework

Four separate activities are classified: generation, transmission, distribution, and commercialization of electric energy. The regulation was defined based on the particular characteristics of each of those activities. Rules promoting free competition in the generation and commercialization businesses were implemented. Transmission and distribution businesses were treated as monopolies, and competition conditions were implemented where possible.

The norms are summarized as follows. The vertically integrated companies constituted before the laws came into effect could continue developing more than one activity simultaneously, but managing separate accounts for each business. The companies constituted after the laws came into effect could only develop simultaneous activities when considered complementary. They were generation with commercialization or distribution with commercialization. Activities that excluded each other were generation and transmission, generation and distribution, transmission and distribution, transmission and commercialization.

Besides, CREG ruled limits for the vertical and horizontal integration between businesses as follows:

- No company will have more than 25 percent of the effective installed capacity of electricity generation in the national interconnected system.
- No company will have more than 25 percent of the commercialization activity.
- No company will have more than 25 percent of the distribution activity.
- No generator company will have shares, fees, or participation in more than 25 percent of the share capital of a distribution company. The same rule will apply to the distribution companies that have shares, fees or participation in the share interests of a generator company.

Wholesale Electricity Market

The wholesale market of electricity came into operation on 20 July 1995. Its operation is supported by an energy stock market (generators pool) where commercial exchanges take place in the context of a spot market and a central operator (National Dispatch Center) of the National Interconnected System (NIS).

The generators who have plants or generation units connected to the NIS, with a capacity superior or equal to 20 MW, are forced to participate in the wholesale market. The participation of plants with a capacity superior or equal to 10 MW and smaller to 20 MW is optional. All the commercial dealers, who
assist end users connected to the NIS, are also forced to make their energy transactions in the wholesale market.

Transactions between generators and commercial dealers in the wholesale market of electricity, are made under two modalities:

- Through the subscription of guaranteed bilateral energy contracts
- Through direct transactions in the energy stock market, in which, the prices are determined by free offer and demand.

**Capacity Charge.** One of the underlying theoretical principles in the pool price system is that it must, in the long term, provide adequate economic signals for capacity expansion. Also, the evolution and the behavior of the prices must reflect the supply reliability level that national demand is prepared to pay or the reliability level fixed by the regulator.

However, the high volatility of prices in the stock market is an important risk for those generators, especially new ones, who have fewer possibilities of concluding an investment project with financial support by contracts. They must offer, totally or partially, their generation capacity to a volatile spot market. The price volatility in the Colombian energy stock market is explained in large by the high hydraulic component of the country generation resources and the climatic seasonal effect in the availability of these resources (7 months of winter and 5 months of summer). Colombia is a country where, due to past experiences, the political and public opinion is very sensitive to the topic of energy shortages. It was found necessary to implement a mechanism that permitted to reduce the risk faced by generators that deal in the spot market. A capacity charge (CC) was designed, and its conception and purpose are summarized in the following points:

- CC is an exogenous mechanism to the market price, helping the long-term price signal to respond to the reliability supply levels required by the system.
- CC is a financial mechanism intended to reduce the volatility risk and the seasonal price changes in the stock market. As such, it reflects a proportion of the present value of the expected rationing cost.
- CC is received by the generator who contributes with firm power to the system, under assumed conditions of a summer season critical hydrology. It is valued as the cost, per installed kW, of the most efficient technology in terms of capital costs. Currently, the generation from open cycle gas turbines is taken as the reference, with an estimated cost of US$5.25/kW available per month.

The collection of the CC payments is made in the stock market, applying an equivalent price of the CC in energy units to each of the generated kWh. The design of the collection scheme permits to keep a unique price in the spot market. It constitutes an important base for those agents who exclusively deal their energy in the stock market.

**Intervention of the Reservoir Bid Prices.** A methodology was rolled defining minimum operative levels for the reservoirs of the NIS. It establishes two operative minimums, a superior and an inferior level. The purpose of establishing these minimum patterns is getting enough water storage in the system before the beginning of the summer period, with the purpose of reaching an adequate energy availability to cover the country requirements during that season. When the level of a reservoir is lower than a superior operative minimum level, its bid price is intervened by the government. The intervention mechanism guarantees that the intervened resource is valued as one of the most expensive of the system so that it will be dispatched among the last feasible alternatives. Depending on the severity of the hydrology, the price of an intervened hydraulic resource could reach the rationing cost.

**Situation of Energy Rationing.** The Colombian system, given the hydrothermal characteristics of its supply, is very sensitive to weather conditions and the emergence of droughts. The recurrent El Niño conditions may originate severe national energy shortages, with unknown consequences and magnitude, and directly dependent on the characteristics of the phenomenon.

Given that the composition of the generating park will only change gradually, the CREG issued a Statute of Rationing to improve those conditions. Rationing may be declared either when the price signal in the stock market is higher than the rationing cost or when the analysis of the foreseen energy situation indicates it is necessary. Rationing is distributed according to the type of user (residential, commercial and industrial). The energy stock price is established with the same current rules for conditions of normal operation of the system and in the same way the liquidation of transactions is established.

**Transmission Constraints and Ancillary Services.** The regulation framework adopted for the wholesale market assumes that the generator bids are made in a single bus, abstraction made of the existing constraints in the electricity transport grid. This scheme has permitted to develop a high degree of competitiveness in the generation business. The single bus scheme involves an "ideal dispatch" different from the system "real dispatch." In the ideal dispatch, generation units necessary to supply the national demand are selected by merit order, according to their offer prices. In real dispatch, the need arises to force generation as required by the operation of the national interconnected system. This is due to the presence of static restrictions, transport limits, transformation limits and voltage regulation needs and dynamic restrictions (minimum generation required by stability conditions). It is also necessary to force generation to cover the requirements of frequency secondary regulation. The resultant differences between the ideal dispatch and the real dispatch are adjusted through a scheme of reconciliation accounts of the transactions in the spot market. The scheme guarantees, in the case of an out of merit generation or forced generation, the payment of the dispatched energy at its bid price. In the same way, the scheme guarantees the merit generator, whose ideal generation is superior to its real one, to keep the economical margin implicit in its ideal transaction.

**Transmission**

The national transmission system (NTS) is defined as the interconnected transmission system with lines, and corresponding substations, operating at voltages equal or superior to 220 kV. Interconexión Eléctrica is the most important transporter in the NTS, and it is the owner of about 75 percent of the transmission assets. The other 25 percent is distributed among the other 10 companies. The most relevant aspects of the current regulation framework are summarized as follows:

- The NTS expansion plan is defined by a committee composed by representatives of the generation, transmission, and commercialization businesses.
- Projects of the expansion plan are assigned through a scheme of public bids. Payments to the resultant transmission installations are based on the winning bid.
- There is open access to the NTS network.
Transmission payments are based on two items: connection charges, and use of network charges.

Connection charges are established through contracts between the agent who requires an access point and the corresponding transmitter, based on the rules defined in the connection code.

Generators and commercialization dealers connected to the NIS pay charges based on their use of the system, determined through a method that assesses their contribution to maximum flows in a minimum network. A centralized collection of these usage charges is made.

**Distribution**

The distribution activity takes place in the transport systems that operate at voltages below 220 kV. It applies to the regional transmission systems (RTS) and the local distribution systems (LDS). Currently, all distribution companies are commercialization dealers too. However, all commercial dealers are not necessarily distributors.

The regulation framework applicable to distribution companies is also based on open access to the RTS and the LDS, with both connection and use of network charges.

**Commercialization**

The Delivery Public Services Law establishes that it is the right of the users of public services to freely choose their service supplier. The definition of the electricity commercialization business as an independent activity was the unique option to fulfill, in economical terms, the objectives of the law. The commercialization business is basically the service of an intermediary between the end users and the agents who generate, transmit, and distribute electricity.

The commercial dealers may act either in the regulated market or the nonregulated market or in both. However, their actions are regulated differently in both markets, given their particular characteristics. While the financial equilibrium of the commercialization business in the nonregulated market depends on the volume of the sold kWh, the equilibrium point in the regulated market basically depends on the number of users.

The rendering of electric energy service to an end user has a cost chain determined by the combination of generation + transmission + distribution + other costs + commercialization. The components of that cost chain are similar in the two markets except on those related to generation and commercialization. In the case of regulated users (with a monthly consumption below 0.5 MW), these components are calculated through a formula established by the CREG.

**Evolution of the Electrical Sector**

The Colombian electrical sector has evolved since the new law came into force, with an increase of the number of actors, the rise of competition, and the growing contribution of the private sector to system expansion.

**Number of Agents.** The number of agents has increased, as indicated in Table 1. Additionally, at present, there are 37 distribution companies.

<table>
<thead>
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<th>Activities</th>
<th>July 1995</th>
<th>March 1998</th>
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<tr>
<td></td>
<td>Public</td>
<td>Private</td>
</tr>
<tr>
<td>Generators</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td>Transmitters</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Commercial dealers</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
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<tbody>
<tr>
<td>Public</td>
<td>98%</td>
<td>75%</td>
<td>58%</td>
</tr>
<tr>
<td>Private</td>
<td>2%</td>
<td>25%</td>
<td>42%</td>
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**Privatization Process.** Private participation has increased significantly, as illustrated in Table 2. The main privatizations in 1997 were:

- Pacific Energy Company sold 56 percent of its shares (US$535 million) in May 1997, to a consortium composed of the Caracas Electricity Company from Venezuela and Houston Industries from the United States.
- Bogota Energy Company, one of the companies with more financial difficulties, was transformed, and 48.5 percent of shares were sold to the private sector. From that transformation, two new companies were created, one for generation-commercialization and the other for distribution-commercialization. A head company was created to host the transmission and the control center. That process finished in September 1997, when Chilean and Spanish companies acquired the shares and took control of the management of the two new companies.

**Generation Expansion.** Expansion in generation is taking place. From 1997 on, eight generation plants with a total of 1,513 MW have been incorporated to the system.

**Competition in Commercialization to Nonregulated Users.** Competition has increased to over 16%, as indicated in Table 3.

**Competition in Commercialization to Regulated Users.** Two new commercialization companies came into operation in the regulated market. They went from 50 users to 350 from March to July 1998.

**About the Panelist**

Carmenza Chahín graduated as an electrical engineer from the National University of Colombia. She then specialized in management of energy systems at the Andes University and obtained her MS degree in economics from the Javeriana University. She has 15 years of experience with the energy sector in Colombia and Ecuador and has collaborated with the power sector restructuring process in Colombia. She is currently working as an advisor at the Colombian Regulatory Commission for Electricity and Gas, Bogota, Colombia.

IEEE Power Engineering Review; December 1998
New Regulatory Framework in the Brazilian Power Industry


Covering an area of 8.5 million square kilometers, Brazil is the world’s fifth largest country. With about 160 million inhabitants, it has a low population density (under 20/km²). Brazil occupies a position among the world’s twelve leading economies with a per capita gross domestic product (GDP) approximately equal to US$3,000. From 1970 to 1996, the installed capacity of the power industry increased more than five times. In 1996, it stood at 57,564 GW, where 91.6 percent corresponds to hydroelectric and 8.4 percent to thermal and nuclear generation. Electricity consumption from 1970 to 1997 grew about 7.9 percent annually.

Two strong motives for considering the restructuring of the Brazilian electric power industry are the desire to inject competition in the electric business and the need for private money to make the necessary investments. As with many other countries in Latin America, Brazil is undertaking a restructuring process in its power industry. Originally owned by the government, the electrical utilities are being privatized after unbundling the production, transmission, and distribution activities.

Regulatory Framework

Although the deregulation process in Brazil is being held in a gradual way compared with other countries, there are some laws and decrees that are important steps towards the new structure, such as:

- Law 8987 of 13 February 1995 (Law of Concessions) that defined important attributions for the concession authority to regulate the granted service and investigate it permanently, intervene in the installation of the service and extinguish the concession, ratify adjustments and revise tariffs, control the quality of the service, motivate competitiveness, stimulate the formation of consumers’ associations
- Law 9427 of 26 December 1996 that created the regulatory agency (ANEEL)
- Law 9648 of 27 May 1998 and Decree 2655 of 2 July 1998 that created the wholesale energy market (MAE) and the independent system operator (ONS). This decree established a schedule for the current GCOI activities gradual transfer to the ONS. The GCOI is the current operational coordinator where the main utilities share the system operation.

Many other specific rules are being elaborated by ANEEL to define the entire regulatory framework.

Energy Market

Competition in the electric industry has been introduced by departing from the rate-of-return pricing philosophy to a market-based price. In this approach, an auction mechanism at the generation side seems to be the best alternative to accomplish this goal. Then, the electric energy is seen as a commodity that is traded in the cash and futures market.

In the Brazilian case, a wholesale energy market (WEM) was created, but some particularities made it dissimilar to the general approach followed by other countries. The spot price is not determined by a generation bidding process but by the simulation of a hydrothermal optimization program. One main reason for this is that 95 percent of the generation sources are hydro plants, which need to be coordinated, otherwise the risk of deficit can be very high. As a subproduct of this simulation, the dispatch and exchanges between the generation companies are also determined. Freedom is found only in the bilateral contracts, which is a way to avoid the exposure of agents to volatile spot prices. It may be considered as a forward market. The market rules are currently under revision, but the main guidelines are:

- Power purchase and sale transactions accomplished through the WEM using market agreement signed by the agents
- The market agreement contemplates obligation to: buy and sell all energy through the WEM; registration of bilateral contracts; rules for commercialization, accountancy, and settlement; financial warranty related to the amounts marketed in the WEM; mediation among the members; contract of independent auditing to do inspections in the operation of the market; rules for the treatment of the hydrological risks

An energy reallocation mechanism (ERM) was created to share the hydrological risks among the generation companies. Each generator participating in the ERM is assigned a level of guaranteed energy. If the actual energy is greater or less than the total guaranteed energy, the energy will be reallocated among the participants such that each receives the same proportionate surplus or shortfall in their guaranteed level, respectively.

IPPs, free consumers, brokers, and distribution/retail companies are eligible to participate in the WEM. They can negotiate bilateral contracts and ask for access to the transmission and distribution systems. In the first year, only customers with a power greater than 3 MW can participate in the market; but, in 2003, everyone above 0.3 MW will also be able to buy energy directly from the producer.

Following the gradual transition from the old scheme to the new one, native customers within a distribution concession are temporarily protected from the price volatility of the market. This is possible by segregating these consumers in a group with special contracts called initial contracts (contratos iniciais). These contracts keep the current status of distribution supply contracts. However, a schedule is established to decay them, i.e., in each year from 2003 to 2006, 25 percent of the total demand contracted will be released to the free market. In this last year, there will be only free customers.

Transmission and Distribution Network

The Brazilian transmission network is composed of three blocks. Two large systems cover the southeast/south/midwest (SE/S/MW) and northeast/north (NEN). They will be connected by the beginning of 1999. Northern Brazil and the central region house more than 300 decentralized and mini-grid electrical systems, mostly in the Amazon region. Table 4 shows the main system characteristics.

The vertically integrated companies owned by the federal and state governments are being unbundled, and, for the transmission portion, new transmission companies are being created. Each transmission company or Tranco will make all their assets

<table>
<thead>
<tr>
<th>System</th>
<th>Installed Capacity (GW)</th>
<th>Energy Consumption (TWh/yr)</th>
<th>Users (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolated</td>
<td>1.8</td>
<td>5.6</td>
<td>1.1</td>
</tr>
<tr>
<td>SE/S/MW</td>
<td>42.0</td>
<td>206</td>
<td>29.5</td>
</tr>
<tr>
<td>NEN</td>
<td>14.4</td>
<td>50.3</td>
<td>9.4</td>
</tr>
</tbody>
</table>
available to the independent system operator named **operador nacional do sistema** (ONS). The ONS will pay a recognized revenue to the transmission companies according to their assets. The ONS will be in charge of the operation of the system including the centralized dispatch according to the hydrothermal optimization program; the definition of the necessary investments on the transmission system; and the administration of transmission services including access conditions and ancillary services.

The most valuable aim of the creation of the ONS is to guarantee nondiscriminatory access to the transmission grid. All transmission users pay a wheeling charge. Nodal transmission pricing was developed based on a long-term marginal cost approach. Although the method is always referred to as a nodal LTMC, it is really an approximation in which the circuit capacities match the circuit flows. No transmission expansion plan is used in this method.

Ancillary services are initially included as the ONS responsibility, but, in the long run, other parties may explore them.

The distribution and retail companies (D/R) are obliged to make different accounts concerning to the commercialization/retail side and to the distribution, i.e., the use of the "wires." The first activity consists of trading electricity at the wholesale market and selling it to the end users. The second activity is a natural monopoly and is similar to the transmission activity. This account split is important because the first activity is deregulated whereas the second is regulated.

As the pure distribution activity is regulated, the method to establish distribution charges must be common for all companies. This method is under development, but the guidelines are:
- Establish a set of primary feeder families where all distribution assets can be represented
- With such families, a long-term incremental cost (LTIC) is determined as the basis for the distribution charge
- For 69 through 138 kV transmission lines, a local pricing structure slightly different from the basic network pricing method is used.

There is a great concern that both the transmission and distribution pricing structures should set the right economic signals and should have a smooth transition between them.

**Privatization Process**

The Brazilian government is undertaking a privatization process successfully, even with the problems of the global stock markets. The state and federal companies of mining, telecommunication, and electricity have been privatized. In the electricity sector, the main distribution companies are already privatized, as shown in Figure 2.

Although there are some small private generation companies, the main federal companies have not been privatized. The necessary adjustments are being developed to sell Gerasul, the federal southern generation company. The total generation capacity being sold is 3,688 MW.

The transmission companies will continue to be owned by the government in a first stage. However, all agents are allowed to build new transmission assets by means of a concession given by ANEEL.

**Regulatory Agency**

Before the creation of ANEEL, the Law of Concessions defined important attributions for the concession authority. Law 9427 increased the competencies of ANEEL, including to:
- Implement the politics and the federal government's guidelines
  - Promote a bidding process to hydroelectric plant concessions
  - Define the optimal use for hydro power potential
  - Celebrate and manage concession contracts
  - Solve conflicts among the agents
  - Approve approaches for calculation of transmission charges
  - Articulate with the Regulatory Agency of the fuels sector the approaches for fixation of the prices of transports of those fuels, when destined to the generation of electric energy.

One of the important points in the creation of the agency is its independence. ANEEL is a special autarchy, with its own juridical personality. All the juridical responsibilities for the accomplished acts should be answered by the own agency through its General Attorney. ANEEL has its financial autonomy guaranteed by the existence of its own budget, derived from the fiscalization tax, which is a federal tribute paid by all power industry agents.

**Basic Structure.** The ANEEL regulatory agency has the following structure:
- Board of directors
- General attorney's office
- Superintendencies of processes

The board of directors is constituted by five members, a head director and four directors, who make majority decisions. The mandate of the members is 4 years. One of the directors receives the ombudsman function, i.e., the attendance of complaints.

The general attorney's office is responsible for providing the juridical assistance to the directors, emitting juridical opinions and exercising the juridical representation of the Autarchy.

The Superintendencies are divided in twenty areas, contained in seven affinity groups:
- Economic regulation of market and incentive to the competition
- Relationships with the market and attendance
- Administration of the hydraulic potentials
- Concessions and authorizations
- Investigations of the generation, power quality, and economic/financial
- Technical regulation and services standards
- Planning and administrative management.
A staff of 325 employees located in Brasilia is executing all of these activities. Agreements with state agencies are under development to share some responsibilities.

**Instruments of Action.** The agency should use several mechanisms to execute the necessary activities for the good operation of the industry. The regulatory mechanisms of ANEEL should define the standards for quality, cost, attendance, and safety of the services and facilities. ANEEL should increase the offer of energy in an effective and efficient way. The regulation areas should modernize the conditions for exploration of the services and facilities of electric power. Above all, maintenance of free competition in the market of energy should be guaranteed.

Attendance to the complaints or mediation are not new activities in the legislation, but ANEEL should execute them in a more effective way, promoting articulations with several agents of the sector and the consumers. Mediation, together with the public hearing, will provide solutions to problems that come from regulatory and investigation actions.

**Pace and Success of Restructuring**

The Brazilian restructuring process is being undertaken at a gradual pace. Some mechanisms were created, such as the initial contracts, the ERM, in order to guarantee a smooth transition from the old environment to the new one, especially to the native consumers. Given the Brazilian power system characteristics, the spot price is determined through an optimization program, where the dispatch and contracts are also assessed. Competition is assured by the bilateral contracts between the players: the distribution/retail companies, large consumers, independent power producers, brokers, etc.

The success of this new enterprise depends mostly on the ability and capacity of the regulatory agency for providing favorable conditions to the development of the electric power sector with balance and fairness among the economic agents and the consumers, contributing to the benefit of the whole society.

**About the Panelists**

José Guilherme A. do Nascimento holds BS and electrical engineering degrees from the Federal School of Engineering Itajubá (EFEI), Minas Gerais, Brazil, in 1990 and 1992, respectively. He was with DANAE, the former regulatory agency for the power sector from 1992 to 1997. He is currently a technical advisor at the National Agency for the Electric Power (ANEEL), Brasilia, Brazil.

J.W. Marangon Lima holds BS, MS, and DS degrees in electrical engineering, from the Military Institute of Engineering, in 1979, from the Federal School of Engineering at Itajubá, in 1990, and from the Federal University of Rio de Janeiro (COPPE-UFRJ), in 1994, respectively. From 1980 to 1992, he was with Eletrobrás, the Brazilian agency for the power sector. He is a professor of electrical engineering at EFEI and a director advisor at ANEEL.

**Competition and Regulation in Electricity: Experiences from England and Wales and Implications for Latin America**

**Philip Gray, World Bank**

This presentation discusses regulation in the context of power sector reform, in particular, the introduction of competition in generation and supply (this presentation adopts the UK terminology in that supply is defined here as the bulk purchase and resale of power to final consumers and distribution refers to the maintenance and upkeep of the low voltage network). As has been noted before, the introduction of competition into formerly monopolistic industries has required far more ongoing discretionary regulatory intervention than was hitherto thought (see Helm D., 1993, "Regulating the Transition to the Competitive Market," presented to the London Business School seminar on energy regulation), both to reign in the market power of the dominant incumbent, and to correct for the initial design defects that prevented competition from being fully effective.

Two views can be discerned about this regulatory intervention. The first is an optimistic one that these are teething problems that can be settled after an initial period of extensive regulatory interventions. The other view is more pessimistic: that the experiment to introduce competition in electricity is doomed to failure, likely to be negated by actions such as vertical integration, and too costly to bring real and lasting benefits to consumers.

To provide a definitive answer to this debate is likely to be achieved only through detailed empirical analysis, and even then is really answerable only in a longer time span. The recent results in the UK and elsewhere have been encouraging, however. Productivity of existing plant has increased significantly, new plant has been built rapidly and cost-effectively, and the sector is more environmentally benign as a result of the phase-out of coal-fired plant for gas-fired CCGT. In the mean time, other countries seeking to implement market-based reforms can learn from the experiences of the early adopters and improve on the efforts of these reformers, both by designing a better privatization program, e.g., through splitting up the incumbent into sufficiently small units and designing an efficient and effective marketplace for the competition to take place, and to know what kind of regulatory interventions are likely to be required once the system is operational.

This presentation discusses the UK experience with the introduction of competition in electricity to allude to some of the issues that will be faced by other countries attempting to introduce similar reforms. Indeed, reforms in Latin America sometimes precede the UK experience (e.g., Chile) or were done soon after (e.g., Argentina and Colombia). Other countries where such experience might provide a useful pointer to the regulatory issues involved include Peru and Bolivia, which have recently introduced market-based reforms, and Brazil, which is on the brink of doing so.

The presentation actually discusses the reforms in England and Wales, which were the most ambitiously market-oriented. The sector structures that were developed in Scotland and Northern Ireland were somewhat different and less market-oriented.

**Background**

The UK electricity system was privatized between 1990 and 1994. The key privatizations in England and Wales were of the distributors in 1990 and the generators in 1991. Unlike previous privatizations in the UK (e.g., British Telecom and British Gas), the industry was radically restructured prior to privatization to explicitly promote competition. In particular, generation was separated from transmission and a market system known as the “pool” was developed.

The publicly owned generation and transmission company, the Central Electricity Generating Board (CEGB), was split up
into generation and transmission components. At flotation, the sizes of the main generating companies were as follows:

- National Power, 29,486 MW (46 percent)
- PowerGen, 18,764 MW (29 percent)
- Nuclear Electric, 8,357 MW (13 percent)
- Others, 7,838 MW (12 percent)

The main players in the market were, therefore, National Power, PowerGen, and Nuclear Electric. A number of more minor competitors included export sales from France and Scotland through interconnections, pumped storage plant that was held by the National Grid Company (NGC), the national transmission operator, some smaller nuclear stations owned by the company responsible for reprocessing nuclear fuel (British Nuclear Fuels Ltd, BNFL), and experimental plant run by the UK Atomic Energy Authority (AEA) and a number of smaller independent power producers (IPPs).

Transmission assets of the CEBG were separated out and vested in a separate company, known as the National Grid Company (NGC), whose shares were given to the privatized distributors (known as Regional Electricity Companies, RECs) roughly according to their size. In 1995, the RECs floated the NGC’s shares, and it is now an independent publicly quoted company. Despite the joint ownership of the RECs, strict controls, both regulatory and through the shareholders agreement, prevented the RECs from using the NGC anticompetitively.

At the center of these new reforms was the new electricity marketplace, known as the pool, so-called because all power in and power out of the system was pooled and bought and sold at a single market-clearing price. The market worked through utilizing the CEBG’s old scheduling software (GOAL), with relatively few modifications. A detailed description of the pool can be found elsewhere (for example, The Pool (1993) An Introduction to the Pool Rules, London). Although all power flows are required to flow through the pool system and all electricity is bought and sold through the Pool, the whole system was overlaid by an elaborate system of contracts, which are generally known as contracts for differences (CFDs), which work like swap contracts in other commodity markets. (A contract for difference effectively establishes a fixed price between the two parties. The buyer of the contract is entitled to the difference between the pool price and the strike price when the pool price exceeds the strike price, the seller receives the difference between the strike price and the pool price when the pool price is less than the strike price, all for a given quantity. This effectively sets the price to the two parties at the strike price.)

**Disciplining Market Power**

Almost from the inception of the reforms, there were problems associated with the actual and perceived dominance of the two generators, National Power and PowerGen, despite the fact that the pool price was in fact very low in the first few years, as shown in Table 5.

The main difficulty was that, despite the fact that there were at least five significant players selling power (National Power, PowerGen, Nuclear Electric, the French, the Scottish, and IPPs), most of the flexible plant that could be used to set the price was owned by National Power and PowerGen, which effectively operated as a duopoly, although with market share increasingly being captured by Nuclear Electric as the availability of the nuclear plant improved, and through the entry of IPPs, as shown in Table 6.

This effective duopoly of price setting has been a constant concern of the regulator and has meant continuous monitoring of the market power of the key players and regular regulatory interventions. A list of the main interventions is shown in Table 7.

### Table 5. Time-weighted averages of pool prices (nominal prices £/MWh)

<table>
<thead>
<tr>
<th>Year</th>
<th>PSP</th>
<th>PPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990/91</td>
<td>18.34</td>
<td>17.42</td>
</tr>
<tr>
<td>1991/92</td>
<td>22.43</td>
<td>20.82</td>
</tr>
<tr>
<td>1992/93</td>
<td>24.19</td>
<td>22.80</td>
</tr>
<tr>
<td>1993/94</td>
<td>26.62</td>
<td>24.44</td>
</tr>
<tr>
<td>1994/95</td>
<td>26.34</td>
<td>24.00</td>
</tr>
</tbody>
</table>

### Table 6. Market shares of generators over time

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>National Power</td>
<td>48</td>
<td>45.5</td>
<td>43.4</td>
<td>41</td>
<td>35</td>
<td>33.25</td>
<td>31.5</td>
<td>24.1</td>
<td>21</td>
</tr>
<tr>
<td>PowerGen</td>
<td>29.7</td>
<td>28.3</td>
<td>28.1</td>
<td>27</td>
<td>26</td>
<td>24.55</td>
<td>23.1</td>
<td>21.5</td>
<td>19.6</td>
</tr>
<tr>
<td>Nuclear Electric</td>
<td>16.5</td>
<td>17.4</td>
<td>18.8</td>
<td>21.3</td>
<td>23</td>
<td>22.75</td>
<td>22.5</td>
<td>24.2</td>
<td>24.2</td>
</tr>
<tr>
<td>Eastern</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.3</td>
<td>1.3</td>
<td>6.6</td>
<td>9.7</td>
</tr>
<tr>
<td>Other 2</td>
<td>5.8</td>
<td>8.7</td>
<td>9.3</td>
<td>9.6</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10.1</td>
<td>10.1</td>
</tr>
<tr>
<td>IPPs</td>
<td>0</td>
<td>0.1</td>
<td>0.3</td>
<td>1.1</td>
<td>6</td>
<td>8.8</td>
<td>11.6</td>
<td>13.5</td>
<td>15.3</td>
</tr>
</tbody>
</table>

1 Nuclear Electric was privatized in 1996, although approximately 3.4 GW of older Magnox-class nuclear stations remained in the public sector.

2 Includes imports via interconnections with Scotland and France, pumped storage plant and some minor nuclear plant.

**Source:** OFFER Decision on MMC reference February 1994, OFFER Consultation Paper on the bid by PowerGen for East Midlands Electricity.

**Note:** Columns do not add due to rounding errors.

### Table 7. OFFER inquiries into generation market

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Date</th>
<th>Focus</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool price inquiry</td>
<td>December 1991</td>
<td>PPP spikes</td>
<td>Controls on availability; Condition 9A</td>
</tr>
<tr>
<td>Constrained on report</td>
<td>October 1992</td>
<td>Uplift</td>
<td>Voluntary restraints / debate on uplift</td>
</tr>
<tr>
<td>Review of pool prices</td>
<td>December 1992</td>
<td>SMP</td>
<td>Avoidable costs study</td>
</tr>
<tr>
<td>Pool price statement</td>
<td>July 1993</td>
<td>SMP</td>
<td>MMC decision, undertakings</td>
</tr>
<tr>
<td>Report on pool price increases in winter 1997/98</td>
<td>June 1998</td>
<td>SMP</td>
<td>Voluntary disposal, possible MMC inquiry</td>
</tr>
</tbody>
</table>

IEEE Power Engineering Review; December 1998
The first of these interventions led to controls on availability, because of evidence of the generators gaming the amount of capacity they would declare available to the pool. The second inquiry led to voluntary controls on the bidding of certain plant that was constrained on or constrained off, that is, given some monopoly power as a result of transmission constraints. The third inquiry focused on increases in the overall level of pool prices and their relationship to avoidable costs. The Pool Price Statement was subsequently published, which described a series of undertakings the two generators had agreed to in order to prevent a referral to the UK antitrust authorities, the Monopolies and Mergers Commission.

The undertakings were twofold. First, that the generators committed to bid into the pool in such a way that, under reasonable assumptions of other generators' bids and taking seasonal fluctuations into account, the annual Pool Purchase Price would in normal circumstances reasonably be expected not to exceed the level 2.4 p/kWh time-weighted and 2.55 p/kWh demand-weighted in October 1993 prices.

The second undertaking was on the sale or disposal of plant. It stated that the licensee would use all reasonable endeavors to negotiate the sale or disposal of about 4,000 MW for National Power and 2,000 MW for PowerGen of coal or oil-fired generation plant by 31 December 1995 for operation in the England and Wales market.

The consequence of these actions was effectively to freeze the action of the market temporarily while the structural reforms, i.e., the divestiture of plant and the entry of new gas-fired plant could take effect. The generators complied with the condition by leasing five coal-fired plant with a combined capacity of around 6,000 MW to Eastern Group, the largest REC, representing just under 10 percent of the total market capacity in 1996.

Although some structural reforms have taken place, the regulator is still fighting the market power of the incumbents. On 18 June 1998, the regulator warned that the generators might again be investigated by the MMC if the government-imposed ban on new gas-fired generation restricted competition. Customers have complained that National Power, PowerGen, and Eastern set prices 86 percent of the time in 1997. Later in June, the regulator published a further analysis of the increase in prices that took place during the autumn and winter of 1997/98.

In his statement on the price rises, the regulator stated that in real terms, SMP was 26 percent higher in winter 1997/98 than 1996/97, and 30 percent in money terms. The rise cannot be explained by an increase in demand (demand growth was minimal), or by a reduction in available capacity (the capacity margin was higher); none of the generators' arguments that prices should be examined over the entire year, that 1996/97 was an exceptional basis for capacity, that higher SMP was to be expected when capacity payments were low, and that pool selling price was more relevant were accepted as reasons to reduce the significance of the price increases; most generators significantly increased their bid prices from winter 1996/97, with National Power and PowerGen setting SMP around 70 percent. They were significantly better placed than other generators to influence SMP, and seem to have exercised this influence. In winter 1997/98, most market participants sought price increases, but also expanded output within their capacity limits. National Power and PowerGen increased prices but reduced output, facilitating price increases. Professor Littlechild has concluded that this seems to have been part of a strategy of profitable withdrawal from the coal-fired sector of the generation market.

In other words, while market shares have reduced, and their capacity to influence prices has as well, National Power and PowerGen's actions in the market are still the subject of considerable concern of the regulator. In addition, it has been more controversially argued that the regulator also tried to actively encourage new entry, e.g., through treating the RECs leniently by allowing them to vertically integrate upstream through long-term contracts with IPPs, with which they often held equity stakes as well. The claim is that this was done by not taking a tough line on the RECs' Economic Purchasing Condition (RECs are required as a condition of their licenses to try to purchase power economically, i.e., at least costs) and maintenance of full cost pass-through for these contracts in the review of the RECs' supply businesses. Whether or not one takes a view that the regulator acted with undue lenience towards these new entrants, the consequence of these regulatory actions has been significant new entry of gas-fired CCGT plant and the continued decline in the amount of coal used in generation.

As well as the accusation of the exercise of market power in the pool, the generators have been accused of exerting dominance in the contract market, particularly in the negotiation of the quasipolitical coal contracts. The main issue is whether or not the generators extracted excessive margins from these contracts. Indeed, an unpublished analysis of the costs and margins of the regulators, particularly in the coal contracts, was part of the threat the regulator used to extract the undertakings from the generators in return for a promise not to refer their activities to the Monopolies and Mergers Commission.

Partly as a response to these difficulties, the generators have repeatedly attempted to vertically integrate by taking over a REC. Both generators bid for RECs in 1995, National Power bidding for Southern Electric, and PowerGen bidding for Midlands Electricity. The previous Conservative government blocked these bids on the grounds that they would restrict competition still further and make regulation more difficult.

Vertical integration has, however, already occurred in the other direction, most notably through the actions of Eastern Electric that bought six GW of coal-fired capacity from National Power and PowerGen, and Scottish Power, that acts as generator through exports to the Pool, and bought Manweb in 1995. As a result, PowerGen has again bid for a REC, this time East Midlands, and is proposing to divest further coal-fired plant as a quid pro quo for allowing the bid to go ahead. Major vertical integration would be likely to change the complexion of the market and ensure that strict regulatory oversight of the players would be necessary to prevent potential abuse.

Lessons Learned

The optimistic view is that the reforms in the UK, although beset with many teething problems, and complicated by the political problems that led to insufficient initial competition at the outset, are resolvable, and that in the long run regulation can be left to residual price regulation of the natural monopolies in distribution and transmission and general antitrust supervision of the generation and supply markets.

A pessimistic view is that competition in electricity is a step too far. In this view, the attempt to introduce markets in generation is a false step in a system where generation costs are beset with the difficulties of contracting where significant sunk costs exist, where supply and demand must match instantaneously and where the costs of metering mean that the costs of the introduction of supply competition exceed the benefits. In this view, the markets may be marginalized by attempts to veri-
cally integrate and spot markets may be left to a residual short-run balancing function and regulation will remain extensive and intrusive over vertically integrated monopolies.

In a sense, even after 10 years of experimentation, the jury is still out and empirical analysis of similar systems, reformed and unreformed, will be required to give a definitive view on whether it was worth it. Results so far, however, in the UK and elsewhere have been encouraging in terms of the productivity of all parts of the system, the entry of new plant into the market and the environmental impact. The cost, however, is often discretionary and rather heavy-handed regulation in a transitional period after the market has been established.

The applicable lessons for other countries are:
- Transitions take time. Fundamental reforms to the system are still being made 8 years after competition was initially introduced.
- Structural decisions taken in haste will be repented at leisure. The ramifications of the government’s decision to introduce only two major fossil-fuel generators at privatization are still being felt.
- Regulatory actions to introduce competition can be complex and a regulator needs discretion to iron out the kinks and counteract the market power of incumbents. The rules and the “how to’s” of competition in electricity are still being worked out and cannot be hard-wired into initial rules. In countries with less of a track record with the use of discretionary authority will face a tough tradeoff between imperfect competition caused by inadequate rules and greater regulatory discretion to manage the transition.

About the Panelist

Philip Gray holds economic degrees from the London School of Economics and Oxford University, UK. He is a consultant at the World Bank, Washington, D.C., on regulatory issues in infrastructure. He is currently working in Brazil and Uganda and has worked in Colombia, Oman, Yemen, and Nicaragua with the World Bank. He also organizes training in the World Bank and has published a number of papers and reports on these issues. Before joining the World Bank, he worked in an UK based consultancy Oxera, advising UK utilities on regulatory strategies. He helped develop a model of the UK Power Pool for forecasting and advisory purposes.

1999 Power Industry Computer Applications Conference

The twenty-first international conference on Power Industry Computer Applications (PICA) will be held 16-21 May 1999 at the Santa Clara Convention Center in Santa Clara, California. Santa Clara is in the center of the world famous technology region known as Silicon Valley.

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- Provide technical sessions that help industry participants learn the latest technology and trends
- Attract a full spectrum of exhibitors from the energy industry to allow participants to find a total solution for their operational and business needs on the show floor.

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