POLICY RESEARCH WORKING PAPER 2074

# Light and Lightning at the End of the Public Tunnel

## Reform of the Electricity Sector in the Southern Cone

*Antonio Estache*
*Martin Rodriguez-Pardina*

Competition, rather than privatization, is the key to transforming the electricity sector in Latin America's Southern Cone—and not just head-to-head competition. Competition for the market *and against yardsticks are also* important instruments for regulators.

The World Bank
Economic Development Institute
Regulatory Reform and Private Enterprise Division
March 1999

## Summary findings

Estache and Martin Rodriguez-Pardina provide an overview of recent privatization experiences in Argentina, Brazil, and Chile.

They focus on both achievements and outstanding problems in the electricity sector. They pay special attention to the issue of whether regulators can enforce compliance and sustain the spirit of reform — bringing the forces of competition to the sector — despite the unavoidable adjustments and fine-tuning that effective regulation requires.

Among the lessons: Competition, rather than privatization, is the key to transforming the sector. For competition to work, several conditions must be met:

1) The primary energy source must be competitive for competition in the wholesale market to work. (In Chile, the fact that most of the water rights have been allocated to the major generator company seriously limits efficiency in the sector.)

2) Monopolistic stages must be formally separate from other stages, with clear rules for third-party access. (Here, the structure adopted by Argentina seems superior to that adopted by Chile.)

3) New entry into the system is the ultimate test of competition. The main gain from competition in electricity generation comes from the decentralization of decisions about when, how much, and what type of generation has to be brought to the market, rather than from short-term gains from minimizing costs.

Overall, vertical and horizontal separation in the sector increases rather than reduces the burden and complexity of regulation. In a disintegrated system, the issues that arose in a traditional monopoly situation (fair rate of return, asset base, tariff to final consumers, and so on) are significantly increased. New issues include third-party access, the promotion of competition, interconnection pricing, and consistency of regulations across stages of competitive development.

Restructuring and privatization are still in their early stages so lessons drawn from experience must be considered tentative.

---

This paper — a product of the Regulatory Reform and Private Enterprise Division, Economic Development Institute — is part of a larger effort in the institute to increase understanding of infrastructure regulation. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Gabriela Chenet-Smith, room G2-148, telephone 202-473-6370, fax 202-334-8350, Internet address gchenet@worldbank.org. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/html/dec/Publications/Workpapers/home.html. Antonio Estache may be contacted at aestache@worldbank.org. March 1999. (22 pages)

COMMENTS WELCOME

# Light and lightning at the end of the public tunnel: The reform of the electricity sector in the Southern Cone

**Antonio Estache**
**(The World Bank,**
**Washington, D.C.)**

**and**

**Martin Rodriguez-Pardina**
**(Centro de Estudios Economicos de la Regulacion,**
**Buenos Aires, Universidad Argentina de la Empresa)**

**Abstract**

This paper provides an overview of the recent privatization experiences in Argentina, Brazil and Chile. The paper focuses on achievements but also on outstanding problems, in particular with respect to the capacity of regulators to enforce compliance and to ensure that the spirit of the reform--i.e. to unleash the forces of competition in the sector--can remain the guiding force through the unavoidable adjustments and fine-tuning that effective regulation requires.

JEL Classification Nos.: D82, L51
Keywords: Government Organization, Regulation, Multiprincipal, Collusion.

We are indebted to Eduardo Bitran, Jose-Luis Guasch and Jean-Jacques Laffont for useful discussions, comments and suggestions. However, the views expressed in this paper are our own and should not be attributed to any of the institutions we are affiliated with.

## 1. Introduction

Throughout Latin America, the structure of the electricity sector has been changing dramatically since the beginning of the 1990s. The search for competition in its basic organization to improve performance is widespread and so is the search for private investment to finance the dramatic system expansion requirements. Large countries such as Brazil, Colombia or Peru as well as much smaller countries such as Panama or Bolivia already have or are about to rely on some sort of competitive bulk pricing system. This is how they see the light at the end of the tunnel they were lead through because of the difficulties governments had in managing these sectors effectively without political interferences.

All these countries are recognizing that change is possible and often desirable. Until about a decade, the traditional view in the Energy Ministries was that the generation, transmission and distribution of electricity were best ensured by a vertically integrated monopoly. The argument was simple: there were economies of scale in generation and network economies in transmission and distribution and the need to coordinate the various component of the system is obvious. Moreover, the standard view was that the financing requirements of expansion of these networks were so large that only the public sector could afford to own them.

As in many infrastructure sectors, technological changes as well as a better understanding of the organizational aspects of these sectors show that policymakers in the UK but also in Chile and in Argentina understood that this line of argumentation was no longer sustainable. The optimal size for generation plants is now smaller, the time to build these plants is generally much shorter than it used to be and there is an increase in the standardization of the design. Similarly, on the supply, technological progress in computers and data processing reduces the transaction costs and significant improvements have been achieved in metering technology. This means that generation and supply are potentially competitive activities. Moreover, fiscal crises throughout Latin America have impeded the governments to offset the dissatisfaction with deteriorating service quality through the financing of the investment requirements. Once the liberalization of international capital flows was decided by reforming governments, the opportunities to rely on foreign private capital further reduced the likelihood of survival of a public provision of electricity in countries or regions that could be attractive to foreign investors. An institutional reform that would allow some type of privatization of the sector was difficult to avoid.

This is basically the story that explains the changes in the Southern Cone. The specific institutional form adopted or being considered to introduce competition and attract private investment to finance the investment requirements is however somewhat different in each country as discussed next. The leaders in the implementation of these changes are Chile and Argentina and it is quite obvious that the most recent reformers are trying to learn from these main precursors. As a matter of fact, Chilean and Argentinean consultants can be found throughout Latin America, presenting the lessons of their country's experience and explaining to potential reformers how the market can work in this sector and generate the light at the end of the "public tunnel". They are obviously successful in their quest to spread the word since to a large extend, the latest reformers are adopting and improving upon many of the elements of the changes brought about by these precursors. What these consultants often fail to discuss is the lightning that shows up with the newfound light. These lightning results from the difficulty governments are having in taking on their role as regulators. Yet this role is essential if the gains from private sector involvement and competition in some segment of the electricity market are to

be shared between investors and consumers rather being fully captured by the new owners of the sectors.

The Chilean and Argentinean reforms are the main focus of the paper. It provides an overview and assessment of the impact of what these changes have actually achieved in Argentina and Chile and the main lessons that can be drawn for countries, large or small, with relatively large shares of thermal sources of energy. The paper also shows how the principles underlying these changes can in fact also be adopted and adapted to countries such as Brazil where the large proportion of hydro-based electricity lead many sector specialists to believe that market based instruments would be difficult to implement.

The paper is organized as follows. Section 2 presents how these revolutions allowed the market dreams to turn reality in Chile and Argentina. Section 3 shows how some nightmares still haunt the dreamers. Section 4 explains how Brazil is managing to draw on these experiences in spite of the very particular nature of its generation sources. Section 5 draws the main lessons from the experiences reviewed in the paper.

## 2. How the dreams of light turned reality in Argentina and Chile

Historically, it is difficult not to describe Chile's experience first. It led the way very clearly in the region and in the developing world in privatization in general. Argentina is also a precursor but more in terms of the scope and speed with which change took place in infrastructure in particular. It managed to improve not only on what Chile had achieved but many would argue also over what was achieved in the UK. The Chilean and Argentinean privatization experiences in electricity reform are now reviewed in that order.

### *Chile.* [1]

As in most countries considering reform, the conditions that lead to reforms in the sector included price controls, service rationing, overstaffing and large deficits in the public electricity utilities. Within an overall deregulation strategy for the economy but in a context that required strong political support after a difficult earlier privatization wave, the main "declared" goal was increasing the distribution of ownership rather than maximizing revenue or simply returning the economy to the market.

*The privatization strategy.* The overall privatization strategy was simple enough. The utilities had to be transformed in public companies with tradable shares and subject to standard commercial auditing procedures. Privatization per se started in 1986 and most took place within 4 years--only two generation companies were left to be privatized by 1990 and have been privatized since. This was done through three mechanisms:

- the sale of the smallest companies through public auctions --awarding the deal to the highest price bidder--;
- the auction of share packages on the stock market for the largest companies and;

[1] This section builds on Bitran, Estache, Guasch and Serra (1997), mimeo

- the sale of small packages of shares in the largest companies (popular capitalism). [2]

The percentage of private owners of ENDESA increased slowly from 30% in December 1986 to 72% three years later. Institutional investors (such as pension funds) would eventually account for about 25% of the total stocks of privatized utilities, providing a good long term commitment to the financing of the sector. Usually workers of the privatized utilities would get between 5 and 10% of the shares to ensure their political support although a small percentage of former civil servants in fact managed to acquire a large percentage.

*The restructuring strategy.* The restructuring per se was done in two stages. The first took place between 1974 and 1979. Its main purpose was intended to adjust price to allow the public utilities to achieve self-financing and to prepare for the future private sector participation. The second stage, started between 1979 and 1990, with the separation of generation and transmission from distribution and continued with significant institutional reforms discussed below, including the introduction of a new regulatory framework in 1982.

From an historical perspective, these events were quite important: they were showing that unbundling in the electricity sector could work. More specifically, the two existing utilities, ENDESA and Chilectra, had been decentralized and regionalized. ENDESA, the largest company, had been divided into 14 companies: 6 generation companies (with capacities varying from 35MWE to 1832MW), 6 distribution companies (with customers bases varying from 5,000 to 143,000 and two companies combining generation and distribution (Edelaysen (15,000 clients) and Edelmag (35,000)). Chilectra was divided into three firms: a generating company (Chilgener with 756MW capacity) and two distribution companies, (Chilectra with 1,064,000 clients and Chilquinta with 322,000 clients).

The restructuring did not go to the limits of the possibilities offered by technology to introduce competition in the sector. The most important failure in that respect was the fact that Endesa was privatized jointly with its transmission system, which is the largest one in the country. The main reason was that the transmission pricing rules had not yet been fully defined and as seen below, this decision is continuing to haunt Chile's regulators. This brings us to the discussion of the regulatory framework.

*The strong legal support reforms.* A new electricity sector legislation was introduced in 1982. Its stated goal is to maximize social welfare by establishing conditions in which the energy system can develop and operate efficiently. Distinguishing explicitly between generation, transmission and distribution, the electricity law spells out the main rules for their regulation but also for the allocation of licenses, pricing, investment, quality and safety. In addition, it makes clear the obligations and rights of all players involved: the service providers as well as the government institutions. It also includes detailed regulations with explicit mechanisms for settling disputes between the regulators and the utilities, with the judiciary as final arbiter.

Distribution (to small users) and transmission are considered natural monopolies. Competition is the norm in generation and in the supply to large users (those requiring more than 2MW of power and it could be argued that this is too large a number to be able to achieve effective competition). There are no limits to vertical or horizontal integration. The access rules are different

[2] Privatization was also conducted though a very specific approach which involved giving shares as a way of returning the financial deposits users had to make per kW of connected power.

for generation, transmission and distribution. The use of property for the generation of electricity requires a concession. This implies that entry is free for thermal generation while it is not for hydro and geothermal generation. However, while some firms can operate without a license, most will want to have one since a license provides some exclusive rights. The granting of the license is organized as a competitive process in which projects are ranked according to costs. Each year, the Energy Commission assesses the minimum cost expansion plan for the system and clears the conditions for entry. For transmission, entry is free. For distribution, concessions are needed for systems larger than 1500kW. These licenses are granted for an indefinite period, but they can be withdrawn when service quality falls below the legal standard. It is possible for the service areas of two or more operators to overlap to further promote competition in the sector.

*The price system.* The price system consists of regulated charges for small customers and freely negotiated rates for large customers whose maximum power demand exceeds 2MW. The regulated rates must be within a 10% band of the average price of freely negotiated contracts. These contracts represent about 40% of the total consumption. The regulated price to final customers has two components: a node price, at which distributors buy energy from generating companies, and a distribution charge. The node price adds up to the sum of the marginal cost of energy, the marginal cost of peak power and the marginal cost of transmission. It is thus designed to approximate long run marginal costs. The Economics Ministry, with technical support from the National Energy Commission, calculates node prices.

The distribution charge is recalculated every four years in a procedure that consists of determining the operating costs of an efficient firm and setting rates to provide a 10% real return on the replacement value of assets. These rates are then applied to existing companies so as to ensure that the industry average return on the replacement value of assets does not exceed 14 percent or fall below 6 percent. If the actual average industry return falls outside this range, rates are adjusted to the nearest bound. The operating costs of an efficient firm and the replacement value of assets are obtained as a weighted average of estimates made by consultants hired by the industry and by the NEC, respectively, where the weight of the NEC estimate is two thirds.

*The Regulatory Institutions.* The sector is controlled by three key government institutions. In fact, their creation preceded the actual privatization--which is in principle a good thing. The National Energy Commission (NEC) was established in 1978 to develop medium- and long-term guidelines for the sector independently of the potential influence of the large utilities in the sector. It is managed by a board of directors composed of seven Ministers and has an executive secretariat, technical staff and resources to recruit special advisors as needed. The NEC proposes policies to be implemented through laws, decree of ministerial resolutions. It sets tariffs. It also grants licenses to public service distributors for specific areas.

The electricity law also resulted in the creation of an *Economic Load Dispatch Center* (ELDC) to coordinate the activities of all generating companies--in other words, it is essentially a generators' pool. Its specific objectives are to achieve the minimum total operating cost for the system as a whole and ensure equitable market access to all generating companies. Each member of an ELDC is entitled to make direct supply contracts with clients for amounts up to its available firm capacity. Any shortfall has to be purchased from other members at the marginal cost of peak power, equal to the annual cost of increasing installed capacity during peak demand periods by one kilowatt.[3] The ELDC plans daily production and computes the instantaneous marginal energy cost by considering the variable costs of generating units currently operating, independently of any direct supply contracts there may be. The programming of electricity generation, disregarding supply contracts, gives rise to energy transfers between generators, and these are priced at the system's instantaneous marginal energy cost.

The last key government actor of the sector is the Superintendence of Electricity and Fuels created in 1985. It was set up as an administrative branch of the Economics Ministry. It supervises compliance with the law and regulation and monitors the quality of services. Finally, it deals with users' and suppliers' complaints and prepares the information for the price-setting process carried out by NEC.

The multiplicity of these institutional actors and their lack of independence may be the most salient feature of these institutional arrangements. The only apparent form of independence in the whole system stems from the role of the antitrust commission. The regional Comisiones Preventivas and the Comision Resolutiva seem to have the required independence but in dealing with the electricity sector they may lack the required technical skills to make the most of their independence.

*The outcomes.* Overall, performance has improved greatly with deregulation and privatization.[4] Coverage rates have reached 97% and over 70% of the required investment has been done by the private operators. Consumption has grown at an average 8 percent between 1986 and 1997.[5] Energy losses are about a third of its historical levels (less than 8 percent in recent years). Labor productivity has doubled (from less than 300 clients/employee at the end of the 1980s to almost 600 by 1997). Similarly, the number of GWh of output generated per worker went up from less than 5 to almost 8.

*Argentina*

Following partially the models adopted for the electric sector in Chile and the United Kingdom, and in order to allow competition in those stages of industry where it is possible, the new legal framework of electricity vertically separated the industry. Generation, transport, distribution and supply (or commercialization which is an activity which was not unbundled in Chile) were separated and legal restriction were put to prevent reintegration. But in many ways, one of the most innovative aspects of Argentina's reforms is the introduction a quite a rigorous set of processes. In fact, this is one of the things most systematically copied by most other

[3] The firm capacity of each producer is the maximum power which its generating units can contribute in the peak period of the system with a reliability exceeding 95%.

[4] A more analytical assessment of the welfare gains of utilities deregulation and privatization is provided by Galal (1992) and Luders (1993) and summarized in a critical survey by Paredes (1995).

[5] The growth rate was almost 9% between 1990 and 1996.

countries in the region and this is one of the main focuses of this section.[6] This is because it seems increasingly clear that establishing a regulatory framework before privatization improves the outcome of the restructuring process. A comparison of Argentina cross-sectoral experience seems to confirm that Gas and Electricity, where law established the regulatory framework before the restructuring and privatization took place show better performance and less controversy than telecoms and transport privatization. This success requires time and preparation and this deserves some detailed explanations.

*The big picture of the privatization process.* The main purpose of the reform of Argentina's electricity sector was to reach efficient pricing and production levels in the short term, and an investment level sufficient to meet demand in the long run. This entailed a major restructuring of the sector which started in 1989 and is still going on in the provinces. The legal basis of the restructuring process is spelled out in the 1989 laws deciding the global reform of the state. For the electricity sector, the process began when the federal government franchised the distribution and commercialization activities of SEGBA,[7] the vertically integrated utility supplying electricity to 13 million people in the Greater Buenos Aires. The main next step was in 1992, with the privatization of the electric generation and transmission activities that SEGBA was still carrying.[8] With these two changes, the original public firm had been vertically disintegrated into seven business units: four generation firms,[9]and three distribution firms. These units were either sold or concessioned to the private sector through international bids.[10]

*The Regulatory Framework.* A law (Law 24065) provides the regulatory framework of the electricity sector. Congress approved this law in 1992. This law sets up the general objectives for the sector and creates an independent regulator in charge of enforcing them. Its discussion and approval by Congress guarantees the strong support and the matching commitment to the changes and their stability.

The general objectives spelled out in the electricity law--and now found in most similar laws in Latin America -- guide not only the overall design of the regulatory framework but also the regulatory decisions taken by the regulators. According to the law, the objectives of the reform are to protect adequately user's rights; promote competitiveness in both electricity production and demand markets and encourage investment ensuring long term supply; promote development, reliability, equality, free access of all transmission and distribution facilities; regulate electricity transmission and distribution ensuring fair and reasonable tariffs; promote efficient supply, transmission, distribution and use of electricity by establishing the appropriate pricing systems and promote private investment in production, transmission and distribution

---

6 A peculiarity of the Argentinean restructuring process is that there were restrictions on the jurdisdiction over which the reformers could act. Indeed, the reforms were intitiated by the National government and were only of direct application to activities under their responsibilities. This included generation and transmission but it only cover the distributions services that were provided in the capital city of Buenos Aires. This is still significant since about a third of the population live in or around that metropolitan area. The initial outcome was that the 3 large companies that were under federal responsibility before 1991 (one with generation and distribution, one with generation and transmission , one with all stages) were transformed into 18 new companies (13 in generation, 2 in transmission and 3 in distribution)

7 Servicios Electricos del Gran Buenos Aires.

8 Law n° 24.065 (December 1991) and decree n° 1.398/92 (January 1992) establishing the "Electricity Regulatory Framework" In January 1991, SEGBA had a generation capacity of 2500 MW supplying 10 33 Twh to 4 5m connected customers.

9 Central Puerto S A., Central Costanera S A , Central Pedro de Mendoza S A y Central Dock Sud S A.

10 For two other state-owned entities, Agua y Energia Electrica (AyE)and Hydronor, the reform process was more complex because of the provincial location of most of their plants. Some of the assets were privatized while part was transferred to the provinces concerned.

ensuring market competitiveness, where appropriate.

*Building up the Regulatory Capacity.* The law also put in place an independent regulator: the Ente Nacional Regulador de la Electricidad (ENRE). This is a fundamental difference in philosophy between Argentina and Chile. The Agency has a structure composed by a board of 5 directors appointed by the State through the Secretary of Energy. The appointment of the president and vice president was based on a public job offering. Requirements to participate included being an engineer or an economist and specific experience. The final selection was based on interviews conducted by a private consulting firm (who made a short list of 3 out of which the Secretary of Energy selected the President and the Vice President. A third director was chosen with the same mechanism (with conditions including being an economist, engineer or lawyer). The last two came from the short list proposed by the Federal Energy Council (which is an organism of the provinces). Directors last for five years and they can be reelected. The initial appointment was made in such way as to ensure staggered terms with one director changing every year.

Box 1. ENRE's functions and obligations

The functions and obligations or the electricity regulator in Argentina (ENRE) are clearly stated in the law. They are:

- enforce the regulatory framework, the contracts and the public service obligations
- issue rules and regulations on matters of: safety, technical procedures and norms, measurement, billing, control and use of meters, interruption and reconnection of service, access and service quality
- prevent anticompetitive, monopolistic, discriminator behavior
- define the basis for the calculation of tariffs set in contracts
- control tariff enforced
- publish the general principles to be respected by distributors and transporters to ensure free access to their services
- determine the basis and criteria for the assignment of concessions
- organize and implement the bidding, adjudication and signature of contracts
- organize public hearings
- monitor the respect of property rights, environments and public safety
- take to court the relevant issues
- regulate the proceedings to impose sanctions
- impose sanctions
- publish information and advise all actors in the system
- issue an annual report and recommend actions when needed
- do whatever is necessary to ensure respect of the law
- collect information from transporters.

It is important to note that these functions and obligations are vested upon the regulator by the law, i.e. parliament and not by the executive power. This is a necessary condition (although not a sufficient one) to ensure the needed independence and accountability of the regulator.

The accountability is further increased by the way the agency is financed. The financing of the agency is based on fees paid by all participants in the industry. ENRE makes and publishes

its own budget annually, to give a chance to all agents to object to it. Then the budget has to be approved by parliament as part of the national budget. Once it is approved, ENRE charges generators, transporters and distributors an inspection and control fee. Each agent paying in proportion to its own share in the value of gross production of the wholesale market.

*Restructuring for Competition.* Following the promotion of competition principles established in the Law, the sector was vertically and horizontally unbundled into separate activities. Table 1 summarizes the major changes. Generation and supply where open to competition while distribution and transmission where concession as regional monopolies. There is no partial integration as allowed by Chile.

Table 1: Sectoral Reforms

| Generation | Transmission | Distribution |
|---|---|---|
| • restructuring through vertical separation from transmission and distribution<br>• considered to be a service of general interest and organized ask a risk oriented activity and hence restructured to create a market<br>• creation of 25 business units sold separately (GIVE SIZES RANGE) | • restructuring through vertical separation from distribution and generation<br>• this is a public service and it was concessioned<br>• its regulation is based on the need to ensure open access under a toll regime | • restructuring through vertical separation from transmission and generation (GIVE RANGE OF NUMBER OF CLIENTS)<br>• this is a public service and was concessioned<br>• to be regulated through the setting of tariffs based on economic costs and a system of sanctions to protect users against unjustified quality adjustment |

*How competition works.* As seen in table 1, some form of competition has been introduced in the three functional stages. Generation allows true market competition, maybe the most important aspect of the reform. The 25 operators can sell electricity on a spot market or through contracts (which can vary in quantity and prices). This market matches electricity demand and supply with an hourly and seasonal price. The coordination of the demand and supply is done by CAMMESA. It is essentially responsible for the dispatching activity. It is a non-profit joint-stock company owned in equal proportion by the Energy Secretary and associations of generators, distributors, transmission carriers and large users. Widely speaking, it implements the operating rules issued by the Energy Secretary. Its main role is to control exchanges in the bulk market and the operations through the transmission network. It also performs settlements for all participants in the wholesale market. Its dispatch decisions aim at minimizing the generation and transmission costs while satisfying demand.

Large consumers can contract directly with generators to further increase competition (between distributors and large users). However, while they bypass commercially, they cannot do so physically. This requires strict rules for the access to the distributors' infrastructure and for fees paid to the distributor for this service. Gaps in these rules can affect significantly the value of distribution companies in the eyes of potential private investors.

For distribution as well as transmission, the allocation of concessions through auctions allows ex-ante competition also known as competition for the market. But these activities are natural monopolies and conditions for ex-post competition are not easily satisfied. This is why

while the exclusivity of the concession is for 95 years, this total duration is divided into a sequence of management periods. The first is 15 years and is followed by 10 years management periods. Six months before the end of the each period the sale of the concessionaire controlling block is organized by the regulator (jointly with the tariff regime to be applied over the following 5 years). The concessionaire is also one of the participants in the bids. If its offer is lower than any other the concession is lost and the government reimburses the departing concessionaire the value of the sale (net of debt).

*The price system.* The market determines the generation price as explained above. It is computed at the load center and equates demand and supply and guarantees that the price of the last kWh bought is equal to the cost of supplying it. The energy from generating plants is dispatched by order of merit, which means by order of increasing short run marginal cost of production (cost of generating and transporting to the load centers an additional kWh). The most expensive generator used to meet demand sets the clearing price. Any generator with a lower cost makes a profit. This is what drives the incentive to cut costs. Generators are also paid for their capacity to ensure that they have the right incentive to invest to meet the long term needs and to decrease the probability of failure in the whole system (since short term and long run marginal costs differ, an extra-incentive is needed).

The pricing of distribution and transmission, the two remaining non-competitive segments is determined by the regulatory framework. Basically, in both segments, the tariffs are set in US$ and in both areas, the regulation is a version of the standard price capping formula. In other words, the regulation sets maximum prices with total pass through of the costs of energy and with an indexation to the US price index. In practice, transmission charges cover three components: A connection charge ( a fixed charge differentiated according to voltage), a capacity charge (also fixed to cover all operation and maintenance of the existing equipment) and an energy charge (reflecting the difference between the value of the energy received at a receiving node and the value of energy at a sending node). The first two components are fixed for the first 5 years only and can be reduced yearly (by no more than 1% and with a cumulative maximum of 5 % over each management period). As of distribution, the main elements are an energy charge (based on seasonal electricity costs), a loss charge (corresponding to losses and equivalent to about 11% of the distributor's purchases), the connection and transmission costs, the cost of capacity in the wholesale market and a fixed distribution charge (differentiated for small and large users).

The explicit definition of penalties is one of the key ingredient of the success of this reform that ensure that companies do not trade-off quality for prices. They are clearly spelled out in the concession contracts and their revenue (a limit of 10% of the companies' annual income) is rediscounted to the users.

*Outcome.* Argentina's reform is not yet fully completed since many provincial distribution companies are still for sale. However, while the experience is still young and complete, it generates enough evidence on the changes of perceptions around the privatization process itself. Labour productivity (measured as Gwh/employee) has increased by over 23%, efficiency gains measured through cuts in input requirements by about 20% and service quality has improved significantly in the same direction. However, the most quoted achievement is the cut in energy prices observed wherever private distributors rule.

With respect to prices, the results are much more clear-cut where the private sector is responsible for distribution (and this is only in 9 provinces and in Buenos Aires). A sharp reduction in prices which in most cases flows directly to final consumers (except for transferred contracts) is the most obvious outcome of the reforms. Taking a typical residential consumer, wholesale prices represent 50% of their total bill. In the case of the privatization of the federal distribution companies (Edenor, Edesur, and Edelap) 50% of their load is bought through eight-year fix-price contracts sign prior to privatization. The impact in the reduction of wholesale prices is then approximately 25%. This means that a fall of 56% in wholesale prices (from an average of 32 U$/MWh in 1993 to 20 u$/MWh in 1996) implied a reduction of around 16% in residential tariffs. For large industrial user the impact is even larger as wholesale prices account for up to 95% of their total electricity bill. For these users the reduction in electricity costs is in the region of 25%.

Table 2: Spot Prices

| | Average | Max. | Min. |
|---|---|---|---|
| 1992 | 41.85 | 80.59 | 20.47 |
| 1993 | 32.11 | 58.75 | 20.51 |
| 1994 | 24.99 | 78.15 | 18.41 |
| 1995 | 22.06 | 80.13 | 14.58 |
| 1996 | 20.57 | 68.83 | 12.85 |

As seen in Table 2, the fall in average prices is in great part explained by the fall in the minimum price. This reflects the entry and availability improvements achieved by the new rules in the system. Maximum observed prices are still high as in most cases they represent transmission constraints, which result in out of merit dispatch. Between, 1992 and 1997 the minimum observed hourly price in the interconnected system fell from over 20 u$/MWh in the moment of restructuring (1992) to near 13 u$/MWh in 1997.

An additional point worth mentioning is the trend in the prices paid for the concessions. In Buenos Aires (in bold in the Table), at least, there is an observable trend to improved sale prices for the electricity distribution companies as time goes by as seen in Table 3. (The results are less transparent for the provincial distribution companies since the levels and types of risks faced by investors are much more diverse than around Buenos Aires). But the evolution observed around BAs over time can suggest that as the regulatory framework is better established, investors are willing to reduce the risk premium demanded and as a result better prices are paid for the concessions.

This may also suggest that a sequential approach to privatization in which a gradual sale of the firms in the sector is done can improve the outcome. As confidence in the new arrangements increases as a result of time investors reduce the risk premium demanded to invest in the sector resulting in larger prices paid for the companies (lower discount rate).

Table 3: Privatization of Distribution Companies

| Distribution Company | Privatization Date | $/client | $/kWh |
|---|---|---|---|
| **Edelap** | **92-Dec** | **1362.7** | **261.1** |
| **Edenor** | **92-Sep** | **520.5** | **115.2** |
| **Edesur** | **92-Sep** | **633.3** | **142.4** |
| San Luis | 93-Mar | 238.6 | 37.8 |
| S. del Estero | 95-Ene | 165.5 | 75.1 |
| Formosa | 95-Feb | 141.5 | 62.5 |
| La Rioja | 95-Jun | 290.9 | 83.9 |
| Tucumán | 95-Jun | 416.6 | 111.8 |
| Catamarca | 96-Ene | 220.1 | 84.7 |
| San Juan | 96-Ene | 551.0 | 150.7 |
| Entre Rios | 96-May | 856.8 | 309.5 |
| Salta | 96-Jul | | |
| Rio Negro | 96-Ago | | |
| Jujuy | 96-Nov | | |
| **ESEBA** | **97-Jul** | **1484.4** | **282.8** |

## 3. Lightning shows up with the light

While the achievement discussed above are very impressive, there are some clouds over the reforms in both countries. These clouds have not yet resulted in storms, but some lightning has been seen and is forcing both countries to work on the need to fine-tune their models. The discussion focuses on those outstanding regulatory issues that have some direct relevance for other countries considering following these two leaders in the region.

### *Chile*

*Early signs of the need for fine tuning in the regulation of utilities.* While the population has generally benefited from coverage expansion and improvements in service quality as a result of privatization so far, the impressive efficiency gains have indeed not necessarily translated into lower charges, even after two rate reviews. Drastic price reductions have only occurred in cases where competition has emerged. But in electricity distribution for instance, prices do not reflect the enormous reduction in distribution losses that has been achieved since privatization. The price of electricity for residential customers increased from US¢ 8.05 per KWh in 1988 to US¢ 13,13 per KWh in 1995 and has since decreased but only to 11.83 US¢ per Kwh by end of 1997. Overall, this situation has led to significant increases in the profits of regulated firms in electricity distribution with regulated segments reporting much higher rates of return on equity (ROE) than competitive (unregulated) segments in the same industry. This difference is even more striking when one considers that there are fewer risks in the regulated segments as they are natural monopolies. In the electricity sector, the average ROE among regulated distribution companies was 30 percent in 1995, whereas for (largely) unregulated generating companies the figure was 15 percent.

*Regulatory pitfalls.* Although the regulatory framework assumes competition in generation and supply to large users, there is a problem. Endesa the dominant firm in the system together with its affiliates has 60 percent of installed capacity.[11] It also owns the transmission grid (which it manages through a subsidiary) and has links to 40 percent of the distribution sector through ENERSIS, an investment group who recently took control of Endesa. But the concentration problem is a more generic one. The second generating firm, Chilgener, and the third one, Colbún, own 22 percent and 11 percent of installed capacity, respectively, which gives a Herfindahl Index for the three largest generators of 0.43.

This industry structure, combined with ambiguities in the regulatory framework, increases the risk for new firms that might be considering investing in the generating sector. For instance, the law is not sufficiently explicit about how transmission grid development costs should be allocated between generating companies. While criticisms of Chile's transmission pricing policies are well known and a major threat to competition in the sector, a recent review of the behavior of Endesa by Paredes (1995) found no analytical evidence of monopoly pricing. It did find however some evidence of strategic behavior by Endesa in its negotiation of charges. Charges are negotiated between the owner of the grid and the generators, and lack of agreement leads to a compulsory arbitration process. By delaying its interactions and decisions with other generators, Endesa can favor its own generation companies. An illustration of this problem is provided by the recent attempt to privatize Colbún. Despite the government's efforts to guarantee a successful sale, including retaining the services of the investment bank Kleinwort-Benson, only one of the six firms on the short list made an offer for the company. Unofficially some of the firms that desisted from making an offer made it known that the reasons were the ownership structure in the sector. While the law establishes a maximum response period, potential bidders know that Endesa will always have an incentive to use the whole period available because it improves the opportunities for business for its own companies.

Even more important still, the dominant generating company owns the water rights on the most attractive future projects. Hence, by postponing the development of these projects it can obtain significant rents on its existing capacity. In fact, of the total non-consuming water rights that have already been appropriated, only 13 percent are being used.[12] Endesa holds 60 percent of allocated non-consuming water rights, of which it has developed 13 percent. Most of these rights belonged to Endesa prior to its privatization when it was the only major hydroelectric generator, and it is safe to assume that they represent the most profitable investment opportunities. Moreover, Endesa also applied for additional non-consuming water rights that would have given it 80 percent of all water rights in the country, but recently the Preventive Commission advised the agency in charge of the rights to refuse such requests, unless they were requested for a specific project.

The import of natural gas from Argentina, which began recently, has already lowered entry barriers in the generating sector. Although gas transportation has natural monopoly characteristics, *ex-ante* competition between two consortia willing to build a pipeline to transport gas from Argentina, and anti-price-discrimination clauses drafted into the regulatory framework, have brought transport prices down to a competitive level.[13] In fact, to obtain financing, the consortia

[11] In 1995, the SIC had an installed capacity of 4,084 MW, while the interconnected system in the north of the country (SNG) had an installed capacity of 1,120MW.

[12] The holder of a non-consuming exploitation right has to restore the water to its natural course after use. Non-consuming rights are mainly used for hydroelectricity generation.

[13] A recent ruling by the Preventive Commission is response to a query by the Superintendent of Electricity and Fuels put forward various conditions for awarding franchises for gas transport. These include: (i) franchises should be awarded only to

needed to have contracts signed with large customers, and this led to open competition for customers. The combined-cycle gas turbine electricity power plants that will be built close to demand centers, in conjunction with Colbún's decision to build a transmission line between its generating units and the main demand node, will diminish the impact of the transmission monopoly. Although a number of future power projects will involve combined-cycle gas turbines and more stringent environmental rules will have to be satisfied in the construction of dams, hydroelectricity is still the most attractive option.

There also are some problems in supplying unregulated customers located in the franchise areas of distribution firms, which in 1995 represented 23 percent of all sales to unregulated customers. Indeed, when a generator gains a free-price customer from a distribution firm, it has to negotiate with the latter a toll for using its electricity wires, in which the absence of agreement leads to arbitration. There is enough uncertainty in this procedure for some generating firms to desist in their attempt to supply such clients directly. It is difficult for a firm to participate in the process of bidding to supply potential customers unless it knows how much it will have to pay in transmission and distribution (use of wires) costs. In addition, the distributors are generating firms' main customers, so taking clients from them is bound to be costly. For instance, a claim by Colbún against Chilectra in September 1996 brought before the antitrust agencies focused on this aspect. The lack of competition in supplying unregulated customers is also relevant for regulated customers, as the regulated node price has to be adjusted within a 10 percent band centered on the average of unregulated prices.

Finally, there are also significant problems in establishing electricity distribution value-added. The fact that the costs of the simulated efficient firm are calculated as a weighted average of studies carried out by the NEC and the firms themselves, gives rise to obvious incentives for each party to bias the estimates. In the 1992 price-setting process, discrepancies in estimating distribution costs and the replacement value of assets in some cases exceeded 50 percent. A better solution could be for an arbitrator to decide which study best reflects the costs of a model firm in his/her judgment

The Resolutory Commission was asked by the National Economic Prosecutor to rule on the vertical disintegration of the group of firms controlled by Enersis. In a recent resolution (June 1997) the Commission ruled against compulsory disintegration, but nevertheless issued a series of instructions in recognition of market imperfections in the electricity sector. Firstly, it asked the government to introduce legal amendments to disambiguate the mechanisms for determining transmission and distribution charges. Secondly, it instructed distributors in future to put their energy requirements out to tender among all generating firms, so as to avoid suspicion of distribution companies favoring related generators and with the aim of reducing costs to final consumers. Finally, it resolved that, within a "prudent" time, the Endesa transmission subsidiary (TRANSELEC) should become a joint stock company operating exclusively in electricity transmission, thereby opening the company up for parties other than Enersis to participate in ownership.

---

firms specializing exclusively in this activity, with no links to final customers, mainly electricity companies; (ii) franchises should not be exclusive; and (iii) gas transport should be subject to an open access requirement, i.e. the services should be provided under non-discriminatory conditions and information on supply and conditions should be publicized.

*Argentina*

Most of the issues emerging from a careful analysis of the Argentinean system point to institutional problems that represent risks in terms of the long term sustainability of the impressive short term gains. The main issue that may require some fine tuning can be summarized as follows.

While Argentina has been very good at dealing with processes, the first problem that comes to mind is in fact about a problem with the legal framework. Argentina's experience shows the importance of a legal framework for general principles in which tariffs can be determined. This framework can be utilized in case problems arise with the specific regulations of the concession contract, either due to defects in the regulations (as in the case of electric transmission), or changes in the objective circumstances in which the activity unfolds.

Consider the importance of the adoption of price-caps and revenue-caps in the sector. It avoids the perverse signal associated with tariffs equal to marginal costs of the network (since the income is fixed), and signals at the same time information in terms of consumer localization. However, for these signals to be effective, the revenue and prices must be reassessed regularly. This is where the first problem shows. The transport concession contract is probably the best illustration of the importance of the good. It establishes the recalculation of revenue for transported energy every five years based on an estimate of the average losses predicted for the following five years. That is, the income of the transporter in the second tariff period would depend on the estimated average losses and the expected value of energy during this lapse. Since both variables are out of the transporters' control, and are independent of the transport costs, the recalculation rule violates two of the efficiency conditions. First, the rule is inefficient from the allocative perspective, since the tariffs don't reflect the costs of providing the service. Second, one could argue that a substantial variation of the price of energy results in, the transporter obtaining income that is either insufficient or too much to finance the activity.

Although the rule for recalculating energy's variable income contains errors causing it to be inefficient, this is tempered in part by the existence of general regulations at the legal level, which present the framework within which one should develop the concession contract. Therefore, the legal mandate from which the tariffs should be "fair and reasonable, and provide those who operate in a economical and prudent form, the opportunity to obtain sufficient income to satisfy reasonable operational costs applicable to the service, taxes, repayment and a reasonable return rate to those businesses that operate efficiently," should serve as a framework for determining the revenue for transported energy in the following tariff periods.

The next lesson that can be drawn from this experience is that while the standardization of contracts as was the case for distribution contracts in Argentina may appears to be the easy and more efficient solution, it is not problem free when the composition of clients of the various distribution companies vary significantly. More specifically, adopting an uniform concession contract and tariff regime for the federal companies (Edenor, Edesur, Edelap) seem sensible as these were the outcome of splitting a single company with a relatively uniform market. When this same scheme was used in some of the provinces, some problems arose with the tariff structure. The two-part tariff structure used in Buenos Aires in which large users pay a capacity charge based on the annual maximum demand was also applied in some provinces such as La Rioja, Catamarca and Santiago del Estero. These provinces have a large share of agricultural

customers whose demand is mainly for irrigation purposes on a highly seasonal basis. This meant having to pay a large capacity charge during the whole year to use pumping equipment for very short periods of time as the availability of water is severely restricted in this region of the country. In many cases this prove to be beyond the financial capability of rural producers resulting in very high uncollectable rates and social and political turmoil.

Although the two-part tariff system makes sense from a point of view based exclusively on economic efficiency, other considerations have to be taken into account particularly during a transition period. The fact that the irrigation systems in these provinces was developed under a different arrangement in which no capacity payments where in place and the affordability of the tariff should have been taken into account in designing the concession contract. This would have minimized the problems of the concession.

The final issue that come to mind stems from the linkages between tariffs, property rights and investment needs in transmission. The concessionaire is not responsible to build and finance new lines. The justification is that this natural monopoly would have an exorbitant power on all other agents upstream and downstream. In addition, it earns a fixed remuneration so that there is no distortion in the spot prices of electricity or in the prices fixed by contracts. Expansion rules for transmission are based on decentralized decisions to be taken by beneficiaries of the expansion. The design of the privatization has been a problem in this respect. Beneficiaries are identified based on use of the expansion rather than economic profits derived form its use. The outcome is that in the current system, investments in transmission are very difficult to approve. Of the three major expansions proposed so far, one was undertaken directly by the state without going through the beneficiaries methodology, the other was veto in a public hearing by part of the "beneficiaries" and only approved two years later after the Secretary of Energy changes dispatch rules and only one was approved in the first request.

*Comparing Argentina and Chile*

Overall, Argentina has been much more successful in ensuring that consumers benefit from the introduction of competition. In Argentina there are 35 generating firms belonging to eight independent groups. The Herfindahl index for the three largest firms is 0.15, which results in a highly competitive market, where large customers pay up to 30 percent less for electricity than their Chilean counterparts.[14] The price difference is partly explained by the availability of primary energy sources (gas fields) in this country, but the situation should tend to become more equal as the pipeline bringing gas from Argentina comes on stream. It may also be explained by the fact that the distribution franchises, as well as the transmission concession, have very clear third-party access rules and vertical desintegration has minimized the incentives for strategic behavior and market foreclosure. Finally, Argentina has an independent body responsible for administering the sector (CAMMESA), owned jointly by the government and the associations of generators, distributors, transmission firms and large-scale users as well as an independent regulator whereas Chile's institutional arrangements are more subject to capture. [15] Moreover, Argentina has a single

[14] This considers together the generating plants in which Enersis has participation. The same is done for generating plants in which Chilgener has participation. By considering grouped firms, concentration is overestimated because although Chilgener and Endesa participate in the ownership of more than one plant, they do so with different partners and percentages.

[15] Although Argentina has problems stemming from the decentralization of the responsibility for the regulation of distribution

sector specific regulator managed by a commission of experts for transmission and distribution under federal jurisdiction. This entails fewer coordination problems and also increases the accountability for decisions taken or not taken. The funding and the staffing of the agency also provide some guarantee of if independence which may be of some relevance to the next wave of regulatory reforms in Chile.

## 4. The dream lives on in the Southern Cone: Reforms in Brazil

Brazil's electricity sector, one of the largest in the world, was until very recently made up of more than 65 mostly vertically integrated, federally and state-owned monopolies. The most pressing problems in these public agencies were excessive operational costs--about 2 years ago they were still 20 to 30% too high on average--and large investment needs in the face of rapidly growing demand--in 97, consumption grew by over 6.5% and the average for the next 10 years is expected to be around 5%-- and very limited public finance to pay for the investment requirements.

The federal government but also many of the state governments decided over 4 years ago that competition should be introduced in the sector. Firstly to attract private sector financing and secondly to reduce the need for politically costly tariffs increased to finance investment needs--about US$7.2 billion/year according to the latest official estimates. The idea was that opening the sector to private participation in a competitive environment should cut costs and generate most of the resources needed for expansion. Uniform tariff were abolished, a national grid with open access for independent power producers and self generators to sell to either distribution companies or end-users was introduced and many states started to get ready for the sale of their distribution companies. Finally, a major study was commissioned by the federal government and is about to be concluded by Coopers and Lybrand to propose a new design for the sector, and in particular to define the new regulatory framework under which all the private operators will have to work.

The main proposals of this study were presented to the public in July 1997 but there are many details still being worked on. This means that it is quite difficult to make an assessment of the specific changes brought about by the reforms. However, while the final details are being worked on, the overall shape of the reform is already understood. Moreover, some changes have taken place already and this mere fact is quite revealing about the organization of the restructuring process adopted by Brazil and provides useful lessons for other countries. It should be clear however that the following assessment of the changes is only partial and is subject to revisions as more is known about the details.

*The light at the end of the tunnel.* As recommended now in a standard way by experts, the potentially competitive segments of the market will be separated from its natural monopoly components because there is a lot of room for competition in the Brazilian electricity system. Another standard recommendation made by international experts, the electricity law, has been drafted (and subject to many drafts in fact). This key component of the new governance structure introduced by the reforms is currently in Congress and is expected to be discussed any time now.

The main changes introduced by the law are the creation of a wholesale market (MAE)

---

services, this aspect is not relevant to the debate in Chile at this time.

and a system operator (AOS). The MAE would replace the current system of regulated prices in generation and the regulated renewable supply contracts. It would have to be composed by the main participants to the market (as in Argentina). The AOS would be a non-profit organization responsible for the planning, monitoring, dispatch and investment decisions in transmission in the Brazilian electricity system and its international interconnections. The AOS would also be a settlement agency for all transmission transactions. So far, it is quite standard are there are few major surprises. The implementation of these decisions is where surprises will come from.

The main implementation challenge is the introduction of competition in generation in a system where over 90% of the energy is hydro. This involves two main issues. First, to ensure open entry and the long term viability of competition, the government has to have a clear rule to allocate water rights. Second, to provide incentives for investing in generating capacity. The solution adopted by Brazil places the AOS at the center of the decisions. Its optimal management of the system will be based on two types of transactions: bilateral long terms contracts (with 5 years lead time) and short term sales and purchases. The participants will have to negotiate 90% of their transactions on the long term market and agree on contracts specifying prices and volumes. This will be decided by the AOS who will also act as a settlement agent in the transaction markets. Transmission and distribution will be subject to regulation. Retail will be progressively liberalized as well.

The market price will be determined by a complex formula which reflects the seasonal variations of the main primary energy source. Essentially, as part of the final operational planning stage, the AOS will have to compute a price representing the marginal cost or spot price which balances demand and supply of energy. This price will vary every day and possibly during the day as well. The long term contracts will protect all parts involved from risks induced by the high volatility of the spot price determined by the MAE. There are some restrictions built in the design of the market. Generators will not be allowed to do competitive bidding on the spot market because of the difficulty of decentralizing the calculation of the value of water in such a large system. The contract based prices however will be deregulated. Overall, revenue, rather than prices, will be subject to a cap providing an incentive to cut costs. Every activity (generation, transmission and distribution) will be subject to a different formula. Specific benchmarks will be used where possible. The final tariff revenue will be determined by the sum of these individual sources of revenue.

There will also be restrictions to the share of regional and total markets that can be supplied by a single generator. The regional shares are restricted to 25% in the Southern Region in each subsystem and 35% for the North and Northeastern region in aggregate. The total share in the country's generation market is restricted to 20%. Similar restrictions have in fact been imposed for market shares in distribution. In the South, the regional share of the distribution market is limited to 25% and 35% in the North. The national share is limited to 20%. For companies already involved in both generation and distribution, the total of the shares at the national level will have to be below 30%. Newcomers in either field are not subject to this restriction.

At the institutional level, the regulator will be ANEEL. It was created formally in 1996 to guarantee the fairness of tariffs, monitor quality, arbitrate conflicts and promote fair competition while ensure that the rights of users are respected. The directors enjoy a 4 year term (these terms are not coincident). The agency is financed through an inspection tax that guarantees its

autonomy. Between 1995 and 1997, it closed 22 paralyzed constructions, readjusted tariffs and organized the bidding for 8 new hydro plants. Some of its responsibilities are decentralized but ANEEL would set minimum standards for the key parameters. For instance, in April 1998, ANEEL signed with the State of Sao Paulo an agreement to delegate to the State some of its responsibilities. The Energy Commission of the state will be allowed to monitor the quality of service and arbitrate in conflicts within the state as a first step (although appeals will go back to ANEEL). This approach is an alternative to the decentralized model offered by Argentina in which coordination problems are more likely to arise.

Some important outstanding decisions to take include the arrangement for the distribution of ownership of the transmission line, the actual separation of many of the activities still integrated and owned by the states, the implementation procedures for the decision taken to have open access and the specific pricing rules for transmission and distribution. The main issue with these themes is that they require a consensus between the states and the federal government and as discussed below, the states have already taken a number of decisions before the federal government was able to put forth its reform proposals.

*The upcoming lightning.* The fact that a market based approach will be used in a hydro based system is quite an achievement.[16] The main sources of problems will come from the implementation details for the reform discussed above and in particular from the fact that many of the states took active steps towards privatization before these details were known to investors. Since 1995 (and as of May 1, 1998), 16 companies have been concession to private operator. Starting with Escelsa in July 1995 and ending most recently with Eletropaulo in Sao Paulo in April. Throughout 1998 and 1997, the premium over the minimum price asked for the companies has tended to increase. The premium for Escelsa was 11.78%. It went as high 96% with the concessioning of Energipe. These numbers however fail to show that the firm value the bidders are willing to per megawatt hour is declining. The record was for Excelsa with Over $500 per megawatt hour. In November 1997 however, this had fallen to $400 as reflected by the bid for the Cia Paulista de Forca e Luz (CPLF). In fact, the price has probably gone much lower since one of the two distribution auctioned by Sao Paulo in April, one did not find a buyer.

Why is this happening? Possibly as Sally Hunt puts it because Brazil is putting the chart before the horse. [17] Investors and private operators like to know the rules of the game before they start playing the game. Initially, the game was a strategic one. It consisted of international firms in getting positioned in the Brazilian market. Well most of the key players are now there (in addition to some large Brazilian groups--including pension funds--,the Chilean, the French, the Americans and the Spaniards are all there). Now that all have won something in that initial game, a new game has to be played. It consists in taking over businesses that will make money. This games requires a good knowledge of the rules and while as many rules as possible were built in the concession/sale contracts, this was not enough to cover all the information needs, including tariff design and adjustment rules among the most important. The delays in introducing details on the overall regulatory framework are increasing the perceived regulatory risk levels and the Asian crisis may not have helped in terms of the other risks international investors face. The

[16] Although this is not completely a surprise since various authors had been arguing this outcome was quite likely; see for instance: Estache, A. and M. Rodriguez-Pardina (1997), "The Real Possibility of Competitive Genreation Markets in Hydro Systems: The Case of Brazil", in *The World Bank, The Private Sector in Infrastructure.*

[17] S. Hunt (1997), "Energy Reform and Privatization in Latin America: Distilling the Signal from the Noise", mimeo, Inter-American Development Bank.

premia are shrinking, the number of bids, which was never very large to begin with is also shrinking. The new restrictions on market shares into entry in generation or distribution will not help much.

The perception that risks not increasing fast enough are involved come from another source as well. One of the most striking features is that in most of these auctions, the number of bidders has been small and shrinking. Moreover, the same players are always there, working jointly as partners in consortia in which the controlling shares are distributed in what appears to be a "fair" distribution of markets that allows the respect of the market power restrictions. There were two bidders for Eletropaulo which controls 13% of the national market. This resulted in a determination of a minimum price that only guarantees a 12% rate of return--vs. 18% in the earlier privatizations. [18] The fear is that over time mergers will lead to a shrinking number of players in the sector and this is one of the fears that an increased participation of the private sector is bringing in Brazil.

This fear has recently been fueled by frequent and serious outages in the service area covered by Light, one of the first private distribution companies. Severe fines were imposed on the company which were necessary to penalize poor service. It seems that ANEEL found many problems with the operational choices made by Light. Excessive staff cuts were decided in areas were risks were high...but all this discussion results in concern by private investors over the risks of micro management by the regulator. The contracts signed by Light should have been clearer about quality and matching fines. But in the meantime, the regulator has potentially the right--Law decree 2335-- to impede the participation of the key owners of Light in other privatizations. This would exclude AES and Houston from the US, EDF from France and CSN from Brazil as well as ....BNDES who is the national development bank who is one of the key participants in all privatization processes in Brazil.[19]

Overall, the main lessons of this very incomplete experience are sweet and sour. Sweet because it shows that competition can be potentially successful in cutting costs in hydro systems. Sour because the problems encountered recently by the Brazilian electricity privatization program suggest that there is an optimal sequence to follow and that coordination matter. When returns are potentially very high, private investors will take risks but when the macroeconomic situation combines with a high degree of regulatory uncertainty, these are sometimes not enough to ensure that competition for the market achieves its potential payoffs.

## 5. Lessons

When analyzing the outcomes of restructuring and privatization in South America it is important to bear in mind that the process is still in its early stages so any lessons that we can draw are necessarily preliminary and subject to review as the process unfolds. Of the three countries analyzed in this paper only Chile has a sufficiently long history of a reformed power sector to allow for some more o less definitive conclusions. Argentina's experience although not new, still has not develop enough (for example no major price review, of privatized distribution or transmission company, has yet occurred) as to permit a definitive assessment. Brazil is still in the

[18] "Concentracao antecipada do setor eletrico", Gazeta Mercantil, 13 de Abril, 1998, , p.B-5
[19] Gazeta Mercantil, op.cit.

very early stages of the process in terms of restructuring and setting new rules although it has advanced in terms of privatization. This in itself seems a sequence which could lead to a less than optimal outcome in the long run.

This short time is a serious limitation particularly in a sector like the electricity supply industry with long time to build and long life of assets. In Argentina for example more than half the new entry in generation are projects decided and started under the state owned system. This lag necessarily imposes a serious limit on the long-term validity of any conclusions. Moreover, the reforms where aimed at changing the long-term pattern of functioning of the sector in terms of investment, pricing and quality standards. This is particularly important due the negative effect that short-term considerations (particularly political limitations to price setting) had in the past over the efficiency and sustainability of the sector.

The first lesson to be drawn from the experiences analyzed in this paper is that competition rather than privatization is the key ingredient for a successful transformation of the sector. The stages of the electricity sector in which competition has been introduced are the ones that show the better performance in terms of prices, investment and quality. The Argentine wholesale market which improved on the Chilean experience by separating transmission, and on the UK experience by fragmenting the generation to reduce market power, is probably the best example of this.

But for competition to work there are several conditions to be met. Primary energy sources. Firstly, the primary energy source has to be competitive if competition in the wholesale market is to work. No matter how many generators are there, if there is monopoly control over the primary source (gas, water, etc.) there are little chances to have competition as the monopolist can extract all the rents from the downstream activity. In this context, the fact that in Chile most of the water rights have been allocated to the major generator company are a serious limitation to an efficient electricity sector.

Secondly, the monopolistic stages have to have a distinct separation with clear rules for third party access. Arrangements with no formal separation, particularly for transmission, increase the burden of regulation and can easily lead to market foreclosure by the owner of the bottleneck facility. In this also the structure adopted by Argentina seems to be better than the Chilean.

Thirdly, the ultimate test for competition is new entry into the system. The major gain from competition in generation come from the decentralization of the decisions regarding when, how much and what type of generation has to be brought to the market rather than short term gains arising from cost minimization. The proposed scheme for Brazil could fall short of this criteria as it seems to leave in hands of the State the main decisions concerning new entry.

An additional lesson form the experiences reviewed in this paper regarding competition is that this is not necessarily confined to head-to-head competition. Competition for the market and yardstick competition are also important instruments for regulators. Competitive tendering for monopoly concessions can improve the efficiency of the process. The periodic re-tendering of the concession as proposed in Argentina seem to be an interesting approach although high transaction costs and the asymmetry of information between the incumbent and other participants might prove to be a serious limitation.

Yardstick competition is also a powerful instrument to help regulators to extract

informational rents from the regulated companies. By comparing different companies the regulator can increase incentives for efficiency. This requires comparable, homogeneous and timely information on the different companies something is clearly lacking the Argentine case. In this sense the horizontal separation of distribution companies in Argentina has resulted in costs with any of the potential benefits associated to having several regional monopolies.

Other lesson from these experiences for Chile and for other countries is that more needs to be done to ensure competition in the sector. To enhance competition, a substantial reduction in the power demand needed to be considered an unregulated customer, to 100KW for example. This would permit the appearance of supply firms which would compete for clients. A solution like this would considerably diminish the role of the State because, while the authority would still retain responsibility for setting transmission and distribution rates, it would play more of an intermediary role between trading firms and transmission and distribution companies. This increased competition would also provide for better opportunities for overlapping concessions in electricity distribution to meet their purpose.[20]

Competition can not be introduced in all the stages of the electricity sector and for the foreseeable future distribution and transmission will remain natural monopolies and as such in need of regulation. An important point is that the interests of consumers needs to be taken into account explicitly in the design of the reforms. The regulators should be granted jurisdiction to set tariffs to ensure that consumers can share in the efficiency gains. This would require transmission and distribution tariffs to be based on more transparent incentive-based formula. The issues of pricing and terms of access and interconnection remain. The current structure favors the incumbent integrated firm and thus does not facilitate competition. These approaches and the provision of equal access, would in turn further promote competition since this is the agenda for the next wave of privatization.

As for transmission, the lessons from the international experience are less promising. Argentina restructuring did separate transmission from generation and distribution but its pricing rules are not as efficient as one would want and fail to achieve dynamic efficiency. The main challenge for Chile is to decide whether its is not worth going one more step in the direction of restructuring and keeping dispatch and transmission joint. The strengthening of the institutional capability to monitor the behavior is at best a backup strategy on paper. It is clear that the first best strategy which would involve a new restructuring of Endesa would be much more politically challenging

Overall, vertical and horizontal separations increase rather than reduce the burden and complexity of regulation. In a disintegrated system, the traditional monopoly regulation issues of fair rate of return, asset base, tariff structure to final consumers, etc. is significantly increased. Third party access, promotion of competition, interconnection pricing, assuring consistency of regulations across stages, are all new problems which demand strong technical skills and commitment from the regulators. In this sense, the experiences of the countries surveyed in this paper suggest that although much has been done in the right direction there is still a heavy task to be faced by the regulators in term of fine-tuning the systems and providing long run sustainability to the reform.

---

[20] As Paredes (1995) suggests, if overall competition rules are not effective in the sector, overlapping concession areas impedes taking advantage of economies of scale rather contribute to contribute to promote competition.

A significant part of the problems faced by state owned companies in the region which finally led to the need of restructuring and privatization were due to short term interference (mainly for political reasons) with an industry that necessarily needs a long term view. The current arrangements in these countries have set up the basis for what can be a sustainable long run structure of an efficient electricity sector providing a cost effective high quality service to the people. For this to be workable, efficient regulation is of paramount importance and serious considerations has to be given to the problems as they appear as the gains already achieved can be easily jeopardized by some of the structural problems that still exist. Therefore any sunny days a system might be enjoying could be worth nothing if the lightning that in some cases is already perceivable turns into a major storm.

## Policy Research Working Paper Series

| | Title | Author | Date | Contact for paper |
|---|---|---|---|---|
| WPS2059 | Financial Intermediation and Growth: Causality and Causes | Ross Levine<br>Norman Loayza<br>Thorsten Beck | February 1999 | K. Labrie<br>31001 |
| WPS2060 | The Macroeconomics of Delayed Exchange-Rate Unification: Theory And Evidence from Tanzania | Daniel Kaufmann<br>Stephen A. O'Connell | February 1999 | D. Bouvet<br>35818 |
| WPS2061 | A Framework for Regulating Microfinance Institutions | Hennie van Greuning<br>Joselito Gallardo<br>Bikki Randhawa | February 1999 | A. Thornton<br>80409 |
| WPS2062 | Does Financial Reform Increase or Reduce Savings? | Oriana Bandiera<br>Gerard Caprio, Jr.<br>Patrick Honohan<br>Fabio Schiantarelli | February 1999 | A. Yaptenco<br>38526 |
| WPS2063 | The Practice of Access Pricing: Telecommunications in the United Kingdom | Tommasso M. Valletti | February 1999 | G. Chenet-Smith<br>36370 |
| WPS2064 | Regulating Privatized Rail Transport | Javier Campos<br>Pedro Cantos | February 1999 | G. Chenet-Smith<br>36370 |
| WPS2065 | Exporting, Externalities, and Technology Transfer | Howard Pack<br>Kamal Saggi | February 1999 | C. Bernardo<br>31148 |
| WPS2066 | Flight Capital as a Portfolio Choice | Paul Collier<br>Anke Hoeffler<br>Catherine Pattillo | February 1999 | A. Kitson-Walters<br>33712 |
| WPS2067 | Multinational Firms and Technology Transfer | Amy Jocelyn Glass<br>Kamal Saggi | February 1999 | L. Tabada<br>36896 |
| WPS2068 | Quitting and Labor Turnover: Microeconomic Evidence and Macroeconomic Consequences | Tom Krebs<br>William F. Maloney | February 1999 | T. Gomez<br>32127 |
| WPS2069 | Logit Analysis in a Rotating Panel Context and an Application to Self-Employment Decisions | Patricio Aroca González<br>William F. Maloney | February 1999 | T. Gomez<br>32127 |
| WPS2070 | The Search for the Key: Aid, Investment, and Policies in Africa | David Dollar<br>William Easterly | March 1999 | E. Khine<br>37471 |
| WPS2071 | The World Bank's Unified Survey Projections: How Accurate Are They? An Ex-Post Evaluation of US91–US97 | Jos Verbeek | March 1999 | M. Galatis<br>31177 |

## Policy Research Working Paper Series

| | Title | Author | Date | Contact for paper |
|---|---|---|---|---|
| WPS2072 | Growth, Poverty, and Inequality: A Regional Panel for Bangladesh | Quentin T. Wodon | March 1999 | J. Badami 80425 |
| WPS2073 | Politics, Transaction Costs, and the Design of Regulatory Institutions | Antonio Estache David Martimort | March 1999 | G. Chenet-Smith 36370 |