

## Case Study From



## Results of Electricity Sector Restructuring in Peru<sup>1</sup>

*Peru restructured its electricity sector in the early 1990s. While being slow and leaving much of the Peru's electricity sector in the hands of the government, sector reforms and privatization brought significant changes, and Peruvian electricity sector started to benefit from increased reliability, efficiency and declining transmission losses.*

- How did sector reforms proceed?
- What were some of the characteristics of the Peruvian model that yielded the positive results?

### Sector Reforms

As a part of globalization and deregulation of economy, in 1992 the Peruvian government issued the Electric Power Concession Law (the Law), which established a new regulatory



framework that promoted competition and efficiency in generation, transmission and distribution of electric power by requiring the unbundling of these activities. The Law also called for the privatization of all state-owned commercial operating assets. It also permitted to set electricity tariffs according to marginal costs and free market. Large customers received the freedom to negotiate directly with generation and distribution companies. From 1997, single investors could own a maximum of 15% of generation, transmission and distribution, or a maximum of 5% across the industry as a whole. The law also gave the government the right to deny mergers in the electricity sector if the merger is not in the "national interest."

With the adoption of the Law, consumers using small amounts of electricity received protection from large tariff increases, with pricing overseen by an autonomous entity, the Electricity Tariffs Commission (CTE), which was later renamed the Energy Tariffs Commission. The Law also created the Committee for the Economic Operation of the Interconnected System (COES) to be in charge of dispatch of the system. COES comprises of the owners of the generation plants and transmission systems of each interconnected system, and coordinates the operation of the system at the lowest possible cost. It works to guarantee the safety of the electricity supply, and to ensure the best possible use of the electricity resources of each interconnected system. Another body created by this Law is OSINERG whose principle functions are to oversee compliance with provisions that make up the legal, technical, and commercial regulatory framework governing electricity production.

Generation and distribution have both undergone privatization, which had disposed of more than 60% of the state's holdings in the sector by the end of 1998. Electrolima and

<sup>1</sup> This case study was prepared using publicly available information.

Electroperú, the largest electric power companies in Peru, were the first to be unbundled and partially privatized. The regional utilities have been restructured into separate generation, transmission and distribution units.

Peru has about 5,500 MWs of installed capacity. About half of generation capacity in 1999 was hydroelectric, with thermal plants fired by diesel, fuel oil and coal supplying the remainder. The rate of electrification in Peru remains low (under 75%), but power demand is growing rapidly. Public investment in the 1970s was concentrated on construction of the Mantaro hydroelectric complex and on the SICN. Increases in supply kept pace with demand. During the 1980s, the work focused on the third state of the Mantaro complex. While there are efforts to attract private investment in developing new generation capacity, especially gas-fired plants to make use of the country's gas resources, the government continues with the development and construction of new hydro facilities.

Due to the country's diverse geographical characteristics and scattered population centers, the nation is composed of two interconnected systems, the Central Northern Interconnected System (SICN) and the Southern Interconnected System (SIS), and several smaller isolated systems. The two grids in the south and west of the country were unified with the construction of the Tintaya-Socabaya transmission line in 1996, although the SICN remains by far the largest system, with more than three-quarters of generating capacity.

### Restructuring Outcomes

Even after restructuring and privatization, a large portion of Peru's power sector remains in the hands of the government. As of early 2000, private companies handled about 65% of generation capacity and 80% of distribution. The generation sector in Peru is formed by a large number of companies that compete for customers in the market. The largest companies are the result of the unbundling and privatization process of Electrolima and Electroperú. Electroperú still holds the largest generating capacity, as it owns the 798-MW Mantaro hydroelectric power plant (see Table below). Edegel, which was formerly owned by Electrolima, has an installed operating capacity of 870 MW.

#### Major Electricity Generation Companies in Peru

Company	Total Capacity (MW)
Electroperú	1,200
Edegel	870
Enersur	553
Etevensa	540
Egenor	273
Electro Sur Este	241
Centromin Det	183
Aguaytia Energy del Peru	155
Empresa Electrica de Piura	119
Empresa Generacion Electrica San Gaban	110
Egasa	110
Hidrandina	75
Egesur	64
<b>Total</b>	<b>4,493</b>

Source: Utility Data Institute

The electric industry in Peru is open to private investment, and the private sector currently generates around four-fifths of the country's electricity and is responsible for more than a half of the distribution. Foreign investment has increased enormously starting from 1997. Almost \$9 billion was attracted in the energy sector since 1994.

#### Direct foreign investment (\$ million)

	1994	1995	1996	1997	1998	1999	2000	2001	Total
Energy sector	364.82	364.82	748.63	1,283.47	1,382.83	1,533.28	1,553.01	1,553.01	8,738.87

Source: Ministry of Economy and Finance

In distribution, a total of \$37 million has been allocated in 1999 and 2000 to the expansion of power infrastructure, monitoring of the quality of the product and supply, as well as modernization of information and communication systems.

As indicated by the number of companies and the amount of investment attracted in the industry the installed capacity increased by 33% between 1990 and 1999 (see Table below). Most of the increase was in thermal plants (and most of the increase in thermal capacity was gas-fired). As a result, the installed thermal capacity surpassed installed hydro capacity in 1998. Thermal capacity increased almost 69% between 1990 and 1999 from 1,743 MW to 2,943 MW, while hydro capacity increased only about 7% over the same period. This diversification is important for reducing the dependence of the Peruvian system on hydroelectric power, which can endanger the system during dry years.

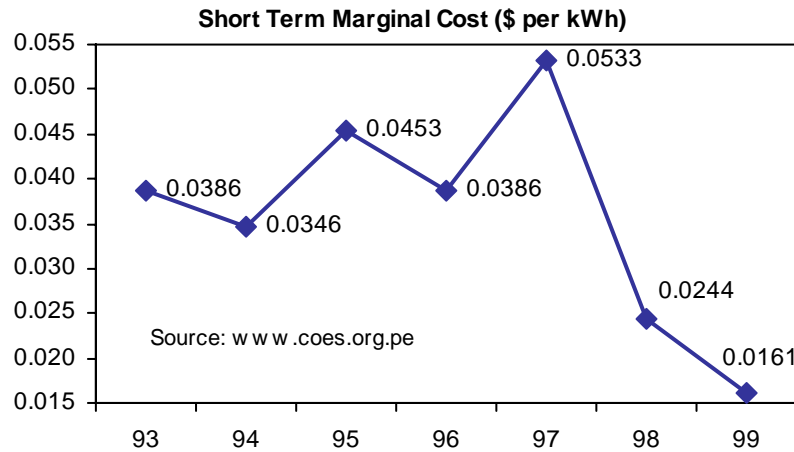
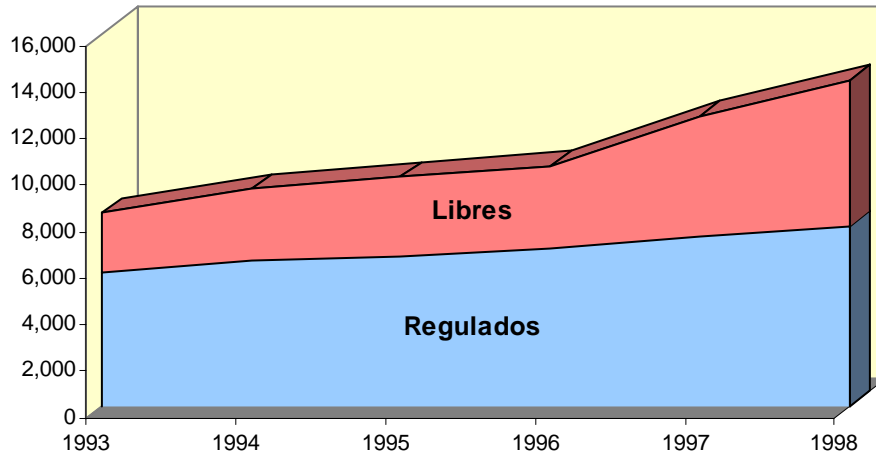
#### Installed Capacity in Peru, 1990-99 (GW)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Hydroelectric	2.40	2.45	2.46	2.45	2.45	2.45	2.47	2.49	2.51	2.57
Conventional Thermal	1.74	1.73	1.71	1.70	1.92	1.92	2.05	2.14	2.52	2.94
<b>Total Capacity</b>	<b>4.14</b>	<b>4.18</b>	<b>4.17</b>	<b>4.15</b>	<b>4.37</b>	<b>4.37</b>	<b>4.52</b>	<b>4.63</b>	<b>5.03</b>	<b>5.51</b>

Source: EIA

The generation companies compete to supply distribution companies and large industrial consumers in the deregulated market. Open access to the transmission grid is enforced. Distribution and transmission activities are regulated as natural monopolies. Retail markets for electricity consumers with loads of less than 1 MW are regulated monopolies and fall under the jurisdiction of the Energy Tariffs Commission. Distribution companies can compete with generators for sales to deregulated consumers (those with a demand of 1 MW or more). Nevertheless, free sale of electricity (especially by generators in the wholesale level) has increased significantly and faster than the regulated sales, especially since 1996 (see chart below).

#### Sales of Electricity (GWh)

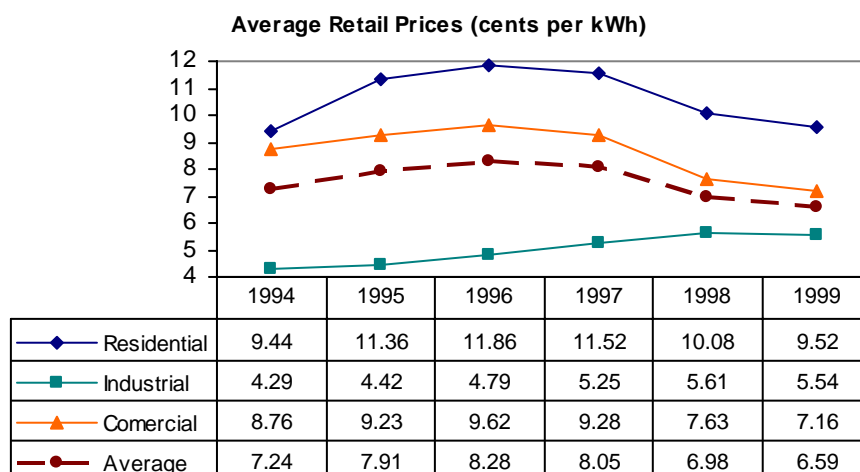


Source: [iee.prcaribe.org/files/rudnickpuertorico.pdf](http://iee.prcaribe.org/files/rudnickpuertorico.pdf)

Increased competition and efficiency in generation appear to have an impact on cost. The chart below shows that the short-term marginal costs have declined significantly, especially during 1998 and 1999. Moreover, the volatility within the year appears to have diminished during these two years as well. The lowest average marginal cost between 1993 and 1997 was 3.46 cents per kWh, which is more than twice the average marginal cost for 1999 at 1.61 cents per kWh.

A similar pattern is also observed for average wholesale energy prices and marginal costs for both peak and non-peak periods. Table below provides a summary of these averages during the 1995-99 period. Again, in 1998 and 1999, there are significant decreases in both costs and prices. Interestingly, peak energy marginal cost in 1999 is lower than non-peak marginal cost in 1995 and 1997.

### Average Prices and Marginal Costs (\$/MWh)



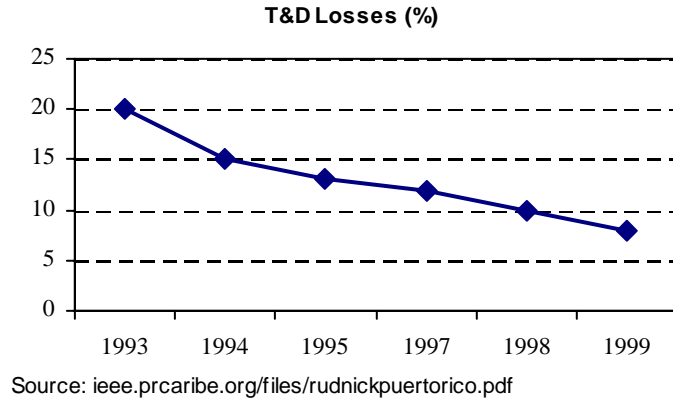
Source: Utility Data Institute

	<b>Peak energy price</b>	<b>Non-peak energy price</b>	<b>Peak energy marginal cost</b>	<b>Non-peak energy marginal cost</b>
<b>1995</b>	59.13	24.37	66.27	39.81
<b>1996</b>	59.29	29.79	60.16	30.45
<b>1997</b>	56.96	26.26	66.10	48.22
<b>1998</b>	42.02	20.69	44.00	18.55
<b>1999</b>	38.15	21.53	33.27	9.87

Source: [www.edegel.com/estadisticas/stat\\_045.htm](http://www.edegel.com/estadisticas/stat_045.htm)

At the retail level as well, one can observe the same trends for all customer groups except for industrial users. For residential and commercial users, the rates increase from 1994 to 1996 before declining significantly. Although the industrial rate increases each year between 1994 and 1998, the average retail price is dominated by the residential and commercial users. The chart below indicates that average retail price declined almost two cents per kWh (or about 20%) from 1996 to 1999, while the industrial price increased from 4.79 to 5.54 cents over the same period. Note that the industrial sector still has the lowest rate among the three customer groups.

The decline in transmission and distribution (T&D) losses is another benefit associated with restructuring and privatization in the electricity industry. As shown in the chart below, transmission and distribution losses have continuously declined from 20% in 1993 to less than 10% in 1999.



Over the period of restructuring of the industry, electrification in Peru has also increased from 58.5% in 1994 to 70% in 1998 (see chart below), increasing the number of users to 3.1 million in 1998 from 2.3 million in 1994.

