



## Review of Empirical Studies on Electricity Market Reform and the Poor in Argentina

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**Electricity Systems Discussion Group  
Working Paper**

**July 2005**

**Review of Empirical Studies on Electricity Market  
Reform and the Poor in Argentina**

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# Electricity Market Reform in Argentina

## 1. Available Empirical Studies on Electricity Reform and the Poor in Arg.

This paper presents published quantitative data and analysis on the relationship between electricity market liberalisation and low income consumers in Argentina. Some studies suggest that market reform has benefited low-income consumers (mainly through increased access to electricity), whilst other facts and figures present a different story. The aim of this paper is to provide a factual grounding by identifying various perspectives and positions taken by different analyses of the relationship between electricity market reform and its resulting impacts upon low-income groups.

As the available data remains largely incomplete, and to various degrees contradictory, the purpose of this paper is to show how the facts and figures relate to each other and how they have been used to reveal and emphasise certain aspects and outcomes of the reform experience. The qualitative approach developed for this thesis will use the data presented here as a means to isolating and investigating the range of understandings that exist with regard to electricity market reform and its consequences for low-income urban consumers.

Broadly, the data addresses (to various extents) the three main welfare dimensions of electricity supply:

- **Access**  
Electrification (% household connections)  
Electricity consumption per capita
- **Affordability (Price)**  
Fixed costs (connection fee)  
Variable costs (tariff structure)
- **Service Quality**  
Blackouts / Brownouts, Maintenance and Safety levels
- **Industry Employment**

Firstly, it is useful to summarise the electricity reform experience in Argentina, to help construct a clearer understanding of the basic structure and key characteristics of the liberalised and privatised market, before exploring the welfare and distributional impacts.

## **2. Electricity Liberalisation and Privatisation in Argentina**

### **Background**

For the Argentine government, privatisation of the energy sector was the most significant of all the public industry privatisations (GNESD, 2004). Of the 297 companies that were sold, the four major energy companies (YPF, Gas del Estad., AyEE and SEGBA) yielded approximately US\$8 billion million in cash and US\$10 billion in nominal external public debt reduction, constituting 84.5% of the total cash and 33% of the bonds raised through the privatisation of state companies. The rest was attributed mainly to telecommunication and air transport service companies (GNESD, 2004 p.18, Manzetti, 1999). Along with oil and gas, electricity production constituted a major part of these commercial activities. Up until market reform, the Argentine electricity system was governed by public companies of federal (national and bi-national) or provincial jurisdiction. Companies under federal jurisdiction operated all the large power plants, most of the high voltage transmission lines, and the distribution network within Greater Buenos Aires. The public companies under provincial jurisdiction, together with electricity co-operatives (defined as ‘major large users’) acted almost exclusively as distribution agents in the provinces (GNESD, 2004 p. 15).

### **Structure of the Reformed Electricity Sector**

Restructuring of the state owned electricity enterprises began in 1992 and the three stages of production (generation, transmission and distribution) were vertically disintegrated. Generation became competitive, with transmission and distribution markets operating as regulated private monopolies (Chisari et al, 1999). The Wholesale Electric Market (MEM) that supplies 93% of Argentina’s demand<sup>1</sup> has an installed capacity of 22,831 MW (as of 2002), of which 46% is hydroelectric, 49% thermal and 5% nuclear (CAMMESA, 2003). Total installed capacity has increased by 42% since 1992, of which the majority has been met by investments in new thermal generation, particularly Gas-fired combustion. The MEM also comprises the Argentine Interconnection System (SADI), which manages 8,000 km of 500 kV high-tension transmission lines. Since liberalisation, consumers with a peak demand equal or greater than 30 kW can purchase directly in the MEM (Diaz, 2000). Transactions in various sub-markets that make up the MEM are managed by CAMMESA. CAMMESA is responsible for the coordination of the technical operations of SADI, and operates the technical and economic dispatching of the interconnected generating capacity. They are also charged with ensuring safety and quality of supply. The Department of Energy, generators, transmitters, distributors and major users jointly own CAMMESA, although the Department of Energy has veto rights over decisions.

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<sup>1</sup> An independent system in Patagonia supplies another 6% of the demand, with the remaining 1% covered by separate electric systems (CAMMESA, 2003)

**Figure 1. Time line of key events surrounding electricity market reform**

|               | Key Event  |
|---------------|--|
| 1992, January | The <i>Electricity Law</i> passed, establishing a legal structure for the restructuring and privatization of the electricity industry.   |
| 1992, March   | The <i>Bilateral Investment Treaty</i> is signed, giving U.S. companies the right to invest in Argentina under terms at least as favourable as those accorded Argentine firms.   |
| 1992, April   | 60% of the thermal generator Central Puerto (formerly part of the federal electricity company SEGBA) is sold to three Chilean electricity companies, marking the initial privatization of Argentina's electricity industry.                            |
| 1992, May     | 60% of the thermal generator Central Costanera (formerly part of the SEGBA) is sold to foreign companies, including the U.S. company Entergy. This was the first purchase of an Argentine electricity company by a U.S. company.                       |
| 1993          | The <i>Amendment to the Foreign Investment Law</i> is passed, removing the requirement that foreign investors must receive federal approval prior to all investment (a few investments still require the prior approval step).                         |
| 1993          | The <i>Decree 1853</i> is passed removing most remaining restrictions on foreign investment. The Decree allows 100-percent foreign ownership of Argentine firms and full repatriation of profits and capital to the home country of foreign investors. |
| 1994          | ' <i>Acuerdo Marco</i> ' or 'Four-year framework agreement' signed to address access of electricity by low-income urban consumers  |

The Department of Energy (which is part of the Ministry of Economy) is responsible for establishing regulations and industry policies, including rules on technical dispatching, the calculation of MEM prices and to settle appeals made against the regulatory agencies. The regulator, ENRE, is charged with ensuring private companies comply with the law, imposing appropriate sanctions, making sure concession agreements are carried out, preventing anti-competitive behaviour and monitoring service quality. They also establish bases for calculating regulated rates and ensuring that they are applied. Fundamentally, the regulatory mechanism for distribution prices operates on an RPI-x basis where productivity gains x were proposed to be adjusted every 5 years.<sup>2</sup>

**Figure 2. Installed Electricity Capacity in the MEM Before and After Reform (MW)**

|                       | 1991          | 2002          |
|-----------------------|---------------|---------------|
| Agua y Energía        | 4,703         | -             |
| HIDRONOR              | 2,660         | -             |
| SEGBA                 | 2,601         | -             |
| CNEA (Nuclear)        | 985           | 985           |
| Bi-national ownership | 1,220         | 2,655         |
| Provincial bodies     | 2,366         | 1,851         |
| Others                | 162           | -             |
| Private Actors        | -             | 17,340        |
| <b>Total</b>          | <b>14,696</b> | <b>22,831</b> |

Source: Adapted from IDEE on the basis of CAMMESA (2003)

<sup>2</sup> The first review was completed in 1996, although the second coincided with the economic crash of 2001 and is effectively being replaced by the much wider government *commission for the renegotiation of public contracts*, currently in progress.

**Figure 3. Number of Actors in Wholesale Electricity Market (MEM)**

| Actors              | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---------------------|------|------|------|------|------|------|------|------|------|
| Generators          | 22   | 27   | 33   | 38   | 40   | 40   | 40   | 39   | 39   |
| Self-Generators     | 2    | 5    | 9    | 9    | 11   | 12   | 12   | 13   | 11   |
| Commercial agents   | -    | -    | -    | -    | 2    | 3    | 3    | 3    | 3    |
| Distribution agents | 21   | 21   | 23   | 25   | 28   | 28   | 47   | 54   | 58   |
| Major large users   | 9    | 69   | 189  | 246  | 331  | 373  | 390  | 379  | 364  |
| Minor large users   | -    | -    | 207  | 458  | 793  | 1497 | 1541 | 1430 | 1828 |
| Private large users | -    | -    | -    | -    | -    | -    | 26   | 58   | 51   |

Source: Adapted from IDEE on the basis of CAMMESA figures (2003)

The 16 million (approx.) inhabitants of greater Buenos Aires are supplied by two distribution companies, EDENOR and EDESUR serving the north and south of the city and suburbs respectively. EDENOR is majority owned by the French energy company Electricite De France (EDF) whilst EDESUR's parent company is Endesa of Spain. Together with the province of Buenos Aires, the capital city constitutes 56% of total national demand.

### 3. Electricity Market Reform – Cure or Disease for the Poor?

There exist no comprehensive data in Argentina on the relationship between household income and access or tariff levels of electricity. Consequently, the exact welfare and distributional impacts of market liberalisation and privatisation for low-income consumers remain contested. This debate over the distributional consequences of reform has been addressed by a number of observers, such as the work of Antonio Estache in his 2003 paper '*Argentina's 1990s utilities privatization: cure or disease?*'. In it, Estache highlights that:

‘Argentina has not yet developed a full system of regulatory accounts and hence it is difficult to make fair assessments and fair comparisons across sectors. Until regulators are able to argue around specific figures, it will be just as hard to argue for privatization as a disease or a cure.’

(Estache, 2003 p.18)

Estache, from the World Bank, argues that the wider debate surrounding the liberalisation project in Argentina since the 2001/02 economic crisis has been ‘very emotional and dogmatic<sup>3</sup>’, adding that ‘much of the criticisms covered by the media is based on anecdotes and widely publicized incidents, with very little reference to more rigorous

<sup>3</sup> Throughout the whole of Latin America, the disapproval ratings of privatisation have increased in recent years. In 2000, 63% of people surveyed in 17 Latin American countries disagreed or strongly disagreed with the statement '*The privatization of state companies has been beneficial. . .*' In 2002 almost 90 percent of Argentines surveyed disapproved of privatization (Kessides, 2004 p. 52)

analytical studies' (2003, p.2). Estache's paper was written in an attempt to address this criticism, and the following sections (4 and 5) present his and others' key findings and analysis relating to the access and affordability of electricity before and after the process of market liberalisation and privatisation.

In a recent working paper (July 2004), Jamasb et al. present a range of empirical evidence to address issues relating to the performance of liberalised electricity markets in LDCs. They too state that the welfare and distribution impacts of the reform experience is an important issue 'that most studies do not address' (Jamasb et al., 2004 p. 44). They point out that 'a straightforward way to incorporate this dimension would be the use of price ratios but quality measures, including some indicator(s) of customer service and access to service, could also be used'. However, they also acknowledge the problem of the lack of relevant data. They go on to suggest that 'a second best but more feasible approach is to separately test a set of coherent hypotheses that, collectively, can shed light on aspects of reform' (Jamasb et al., 2004 p.44). Listed below are the four hypothesis which they argue reflect the key distributional issues as observed from the experiences of electricity market reform in LDCs:

- *Reforms in developing countries bring improved access for residential consumers, but at higher prices*
- *Reforms in developing countries bring prices closer to costs (which may be lower) for industrial consumers, as well as better quality and more efficient input price signals*
- *Reform brings different welfare and distributional effects at different levels of income and electrification*
- *Inadequate competition and ineffective regulation prevent the benefits being passed on to consumers*

(Adapted from Jamasb, 2004)

The second hypothesis addresses the issue of price (tariff) re-balancing from the removal of cross-subsidies to consumers after reform, whilst the third hypothesis is based upon the idea that 'the general benefits of reform may be lower in countries with high electrification rates but increased access might offset price rises for poor residential consumers'. The fourth hypothesis enables investigation into 'the widespread observation in the UK, Chile, and Argentina that, at least initially, regulators are slow to pass the gains onto customers in the form of lower prices'(Jamasb, 2004 p.44). The following sections present empirical data which seek to test these hypotheses from the reform experience in Argentina, focussing primarily upon the two central aspects of *Access to* and *Price of* Electricity.

#### 4. Access to Electricity

Argentina has a Universal Service Obligation (USO) clause written into the electricity reforms, so that distributors are unable to ‘cream-skim’ customers. According to the Latin American Organisation of Energy (OLADE), the electrification level for the whole of Argentina grew from 91% per cent in 1991 to 95% in 1997. Within that total, the figures state that the system currently covers 98% of households in urban areas and about 70% in rural areas (SIEE-OLADE, 2003). Figure 4. below presents this data in absolute numbers.

**Figure 4. National Electrification Rates for Argentina**

|           | Electrification rate % | Without electricity | With electricity |
|-----------|------------------------|---------------------|------------------|
| Argentina | 94.6                   | 2.0 million         | 35.0 million     |

Source: Adapted from EIA (2002)

The table below (figure 5) presents figures estimated by Navajas (1999) as to how the national electrification rate can be broken down by household income quintiles. The percentages that Navajas uses for the post-reform access levels are significantly higher than those published by OLADE, suggesting that the overall national level is almost 100%.

**Figure 5. Access to electricity (% houses with formalised connections)**

|        | 1st quintile | 2    | 3    | 4    | 5    | Average |
|--------|--------------|------|------|------|------|---------|
| 1985/6 | 72.2         | 87.5 | 92.4 | 91.1 | 98.8 | 88.2    |
| 1996/7 | 99.6         | 99.7 | 99.9 | 100  | 100  | 99.8    |

Source: Adapted from Navajas (1999) estimated from INDEC Statistics

When looked at objectively, the figures of access to electricity give the impression that market reforms have resulted in investments for a new service to those who had previously gone without. However, others studies have highlighted that this isn’t necessarily the case:

‘Before the reforms, the poor were illegally connected to the grid and this was not considered a serious problem. For example, in the area covered by EDENOR, technical and non-technical losses totalled 30%, of which 9.5% corresponded to ‘non-clients’, that is, illegal users.’

(GNESD, 2004, p.22)



In a 2002 publication by the Washington-based World Resources Institute entitled *'Power Politics: Equity and Environment in Electricity Reform'*, Bouille et al. provide an account of how the issue of connecting the poorest urban consumers was initially dealt with by market reforms in Argentina:

'Those least able to pay - illegally connected *'colgados'* ('hangers') concentrated in urban slums - were initially cut off from service by distribution companies. The International Finance Corporation (IFC) provided loans to distribution companies to fund technical and infrastructure changes that made electricity theft very difficult. As a result, non-technical losses in distribution networks were drastically reduced. These changes ensured the solvency of the distribution companies, but ignored the problem of how to provide basic electricity services to those without the economic resources.'

(Bouille et al. 2002, p. 40)

#### 4.1 The 'Four-year Framework Agreement'

The so called 'four-year framework agreement' (*Acuerdo Marco*) constitutes the most important set of market intervention policies relating to the welfare and distributional impacts of reform for low-income households in Buenos Aires. The agreement was an idea put forward by the private distribution companies supplying Buenos Aires (EDENOR and EDESUR) after they cut supplies to illegally connected *colgados*, which led to public disapproval, negative media and a number of court cases brought against them on the basis that they were depriving a significant population of basic services, even though they were obtained illegally (Bouille et al., p.40). The objective of the agreement, between the distribution companies and local government (municipalities), was to establish a framework of guidelines and rules to regulate and co-ordinate technical and economic support that the parties would contribute towards the supply and maintenance of electricity in 'deprived neighbourhoods' within each of the concession areas (GNESD, 2004 p.20). In order to classify 'deprived neighbourhoods', four categories were defined:

Type A Settlement: Groups of dwellings without inner streets, where it is not possible to regularise plots of land (*Villa Miserias*)

Type B1 Settlement: Groups of dwellings where it is possible to open up streets and to regularise plots of land

Type B2 Settlement: Groups of dwellings with streets and in the process of regularising plots of land

Type C Settlement: Groups of dwellings with streets, partially regularised and with identified users in each plot of land (*Barrios Carenciados*)

(GNESD, 2004)



The above photo is of a typical *Villa Miseria* (Type A) with densely packed temporary or semi-permanent housing with narrow streets.



The above photo gives an example of where it has been possible to open up streets and regularise plots of land, defined as Type B2



Many slums in Buenos Aires are located close to, or within, wealthier parts of the city. The above photo is taken in *Villa 31*, located next to the city's Central Business District (CBD)



In most slums, electricity is accessed through informal connections. These are often precarious and home-made solutions, presenting many health risks which the private distribution companies do not take legal responsibility for.



These connections are maintained by residents without any training, appropriate tools or protective clothing.



In many Barrios Carenciados (Type C), illegal 'hook-ups' are made to the grid where many, or most consumers have a formalised (metered) service with individual billing. The above photo shows how this is achieved through the tampering of overhead cables.

The framework agreement therefore distinguished between two types of residential area; those that were 'regularisable' (*Barrios Carenciados*) and 'non-regularisable' (*Villa Miserias*). The agreement was intended to operate from 1 July 1994 to 1 July 1998, during which time the distribution companies were to systematically 'normalise' supplies where possible, involving the installation of new substations, power lines and household metering (Botton, 2004). According to the agreement, these infrastructure investments were primarily funded by local authorities through a tax on newly formalised connections, and with help from the federal and state governments (GNESD, 2004 p. 20). Specifically, the agreement outlined that:

- Local authorities would reimburse the distribution companies for unpaid balances from illegal connections for the period since privatisation
- (Until such areas are formally 'urbanised') *Villas* to be supplied with medium tension power lines from which several access points enable household connections. Each access point to these lines is equipped with a meter, making possible the measurement of total consumption for the slum (macro counting)
- Community groups within the *Villas* requested to pay for their consumption, whilst companies also send a bill (*adviso de pago*) to the local government if they cannot pay
- The Federal and Provincial (state) government of Buenos Aires be put in charge of, and contribute to, a 'special fund' to reimburse distribution companies for the supply to *Villas* (types A and B1 settlements), and to finance the infrastructure needed to 'normalise' supplies to *Barrios Carenciados* (type B2 and C settlements)
- A tax on payments by newly 'regularised' customers (those with individual household metering) within a municipality (i.e. from the *Barrios Carenciados*) to finance the ongoing 'special fund'.
- The distribution companies are not liable for the quality of services obtained illegally between September 1992 and January 1994.

(Adapted from Botton, 2004 and GNESD, 2004)

In addition to these basic financing mechanisms, the agreement also stated that both local municipalities and distribution companies fulfil a number of obligations. Namely, that all local authorities party to the agreement conduct a census to record the number of inhabitants and dwellings in type A and B1 settlements and to open up streets where possible. Similarly, the distribution companies were given a range of responsibilities including to conduct censuses in Type B2 and C settlements, whilst detailing their planned schedule for installing individual meters at the rate of 10,000 a month within these *Barrios Carenciados*. At the same time the companies were obliged to install the

collective meters in type A and B1 settlements within a four month period. After the completion of the censuses, the agreement covered over 700,000 inhabitants throughout both distribution concession areas in Greater Buenos Aires (GNESD, 2004). The table below (Figure 6) displays the reductions in non-technical for the distribution companies supplying Greater Buenos Aires achieved after privatisation and the institution of the four-year agreement.

**Figure 6. % Change in non-technical losses in electricity distribution**

| Year | EDENOR % Losses | EDESUR % Losses |
|------|-----------------|-----------------|
| 1992 | 29.33           | 25.6            |
| 1993 | 26.14           | 22.1            |
| 1994 | 20.2            | 16.2            |
| 1995 | 16.97           | 12              |
| 1996 | 14.37           | 10.1            |
| 1997 | 11.73           | 8.3             |
| 1998 | 10.66           | 8.1             |
| 1999 | 10.15           | 7.8             |

Source: Pírez, 2002

However, Pírez (2002) shows that by breaking down these figures into geographical categories, it can be demonstrated that the efforts to reduce energy theft were not been as universally successful as it appears. For example, the 10.15% figure for overall non-technical losses recorded by EDENOR in 1999 hides the fact that losses from supplies to the Capital city (inner city) constituted 5.97%, whilst in the poorer neighbourhood of *Pilar* on the outskirts of the city, non-technical losses ran at 15.07% (Pírez, 2002 p. 12).

Botton (2004) points out that the agreement was intended to be temporary ‘since it envisaged putting an end to the problems related to the access of electricity in poor urban areas’ (Botton, 2004, p. 11), although it was subsequently renewed for another four years in an addendum to the original agreement issued by federal decree 0093/1998. The reasons given for this extension by the federal government were that whilst most of the objectives of the initial agreement had been met, new settlers arriving after the original census had put an extra strain on the demands of infrastructure (GNESD, 2004 p.21).

Pírez (2002) presents data which shows that in 1998 in the EDESUR concession area, 87.25% of all the electricity supplied to consumers formalised by the market agreement was paid for. Within this figure, 94.67% was paid for by formalised supplies to B2 and C households, whilst only 0.19% of electricity to *Villas* (A and B1) was paid for (Pírez, 2002 p.13) by community groups collecting money from within the slums for the electricity consumed through the collective meters. However, due mainly to the protracted economic problems experienced in Argentina since the late 1990s, and persistently high levels of unemployment and urban poverty, the rate of illegal electricity connections has increased again in recent years (GNESD, 2004). The Bariloche foundation maintain that the key welfare impacts of reform upon the poor can be understood by the sharp increase in the rate at which those households formalised under

the four-year agreement are now in arrears for payments to the distribution companies (See figure 7), concluding that:

‘even though more people today are legal users registered with electricity companies, this does not mean new access to a service that did not exist before, nor is it a direct consequence of market rules. If anything, it is an achievement resulting from the ‘Four-Year Agreement’, which was financed by the State and the users themselves.

(GNESD, 2004 p.22)

Furthermore, the Bariloche foundation point out that the agreement cannot be considered a subsidy to low-income consumers, as it was simply a means to ‘normalise’ irregular users through investments financed by the users themselves, adding that ‘in any case, if there was a subsidy, this existed among the neighbourhood users themselves, as types B2 and C contributed the payments for Types A and B1’ (GNESD, 2004 p.21)

**Figure 7. Users with formalised supplies in arrears in 1999-2000**

| Distribution Company | no. of formalised users | Users with service cut off more than twice |         |         | %Users with service cut off more than twice |      |      |
|----------------------|-------------------------|--|---------|---------|---|------|------|
|                      |                         | 1999                                       | 2000    | 2001    | 1999  | 2000 | 2001 |
| EDESUR               | 331,930                 | 44,793                                     | 47,834  | 90,085  | 13  | 14   | 27   |
| EDENOR               | 369,745                 | 121,393                                    | 171,168 | 207,604 | 33  | 46   | 56   |
| Total                | 701,675                 | 166,186                                    | 219,002 | 297,689 | 24  | 31   | 42   |

Source: FB-CACME, (2003).

Likewise, Birdsall and Nellis (2003) conclude that the increase in access levels recorded in Argentina is misleading as it simply reflects the increase in *formalisation*, as pre-reform levels of electricity theft meant that many consumers (both rich and poor) had access to electricity, albeit with a less reliable and less safe supply. This conclusion is supported by Delfino and Casarin (2001) who calculated that 436,000 of the first 481,000 additional subscribers to the privatized electricity system in Buenos Aires were those who had previously illegal connections (Delfino and Casarin, 2001, p.23). Birdsall & Nellis (2003) also argue that the process of formalisation constitutes a welfare loss in strictly economic terms for the poorest households, echoing Pérez’s (2002) claim that the state-owned and operated electricity companies provided (intentionally or not) a proxy form of social welfare through such ‘illegal’ consumption patterns (Pérez, 2002 p.5), stating that:

‘In economic terms the shift from theft to paying status results in a clear welfare loss. On the assumption that a majority of those with illegal connections were lower-income people, the result is likely to be an increase in inequity’

(Birdsall and Nellis, 2003 p.1626)

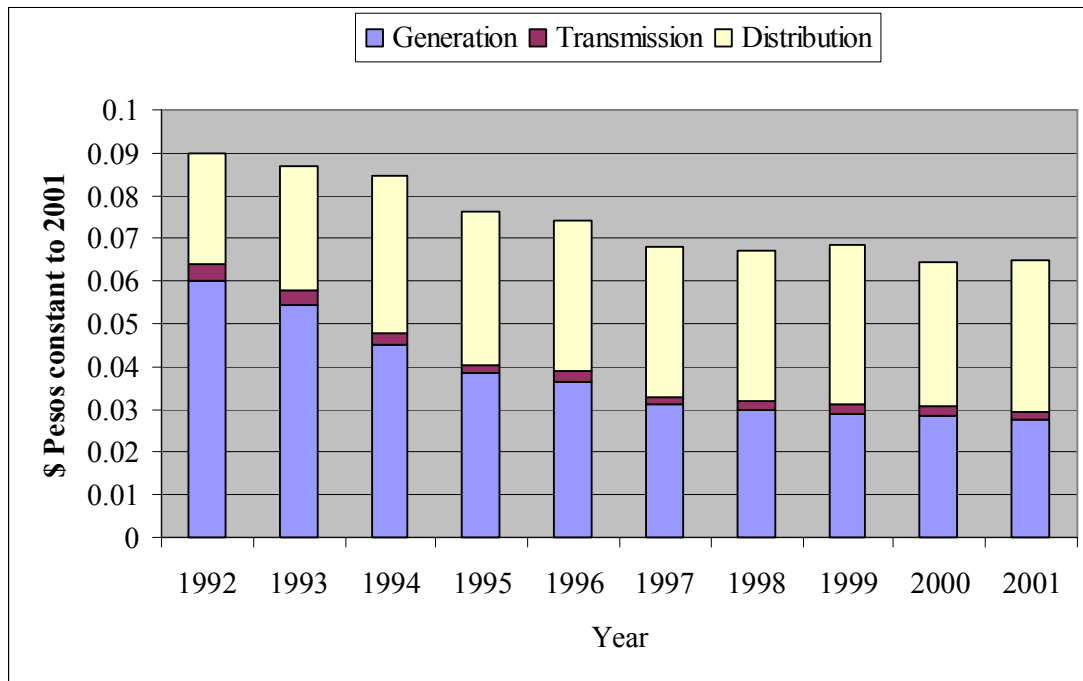
Overall, since the exact figures of new connections for low-income households are not publicly available, the extent to which market liberalisation resulted in genuinely new access to electricity, as opposed to the formalisation of electricity supplies, remains contested. Critics (Birdsall and Nellis, 2003; GNESD, 2004; Pérez, 2002) point out that the four-year agreement was designed to improve revenues for the distribution companies, doing little to improve access to electricity amongst the urban poor whilst increasing household indebtedness. On the other hand, advocates of privatisation and the four year agreement point out that formalisation of supplies is the only way to know for sure how many households now have access to electricity, whilst at the same time delivering legal rights and health and safety benefits (EDENOR, 2003; Kessides, 2004; Navajas, 1999)



## 5. Price Distribution

Figure 8 shows how wholesale electricity prices since reform have dropped significantly. In 1992, electricity was sold at 48.76 US\$/MWh, but by 1997 it had reduced by nearly 50% to 25.67 US\$/MWh. It is widely acknowledged that a combination of new and more efficiency generation technologies and market competition within the privatised generation market accounts for this price reduction, where market entrants increased from 13 in 1992 to 44 by 1997 (Diaz, 2000; Estache et al, 2000).

**Figure 8. Breakdown of Historical Change in the Total Cost of Electricity**

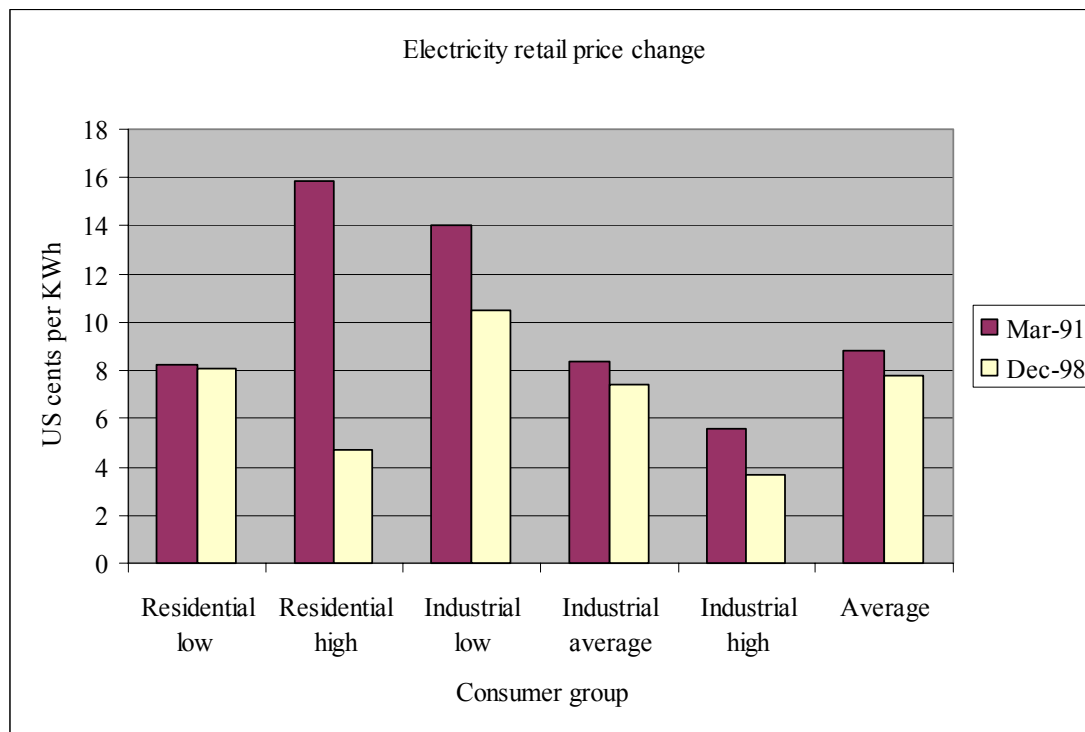


Source: CAMMESA, 2003

However, the cost of electricity generation is just one of three main elements which constitute the total (or final) cost of electricity for consumers. Noticeably, the cost of electricity distribution increased both in absolute terms and as a proportion of the total cost of electricity. Nonetheless, as the above graph clearly shows, the total cost of electricity has dropped significantly since reform, giving the impression that market liberalisation has resulted in straight-forward price reductions. This graph however reveals nothing about the way in which this overall price reduction has been distributed amongst consumer groups.

One study of final-user prices between 1991-98 reveals how residential and industrial consumers with the highest levels of consumption enjoyed the largest price reductions (71% and 44% respectively). In comparison, households with the lowest consumption levels experienced only fractional price declines of 1.6% (FLASCO, 1999).

**Figure 9. Change in Electricity Retail Prices Amongst Consumer Groups**



Source : Adapted from figures in Bouille et al. (2002)

Another study by Delfino and Casarin (2001) examined the welfare impacts of reform in the Gran Buenos Aires area, using historical tariff data from EDENOR (whose prices are harmonised with those of EDESUR by the regular). They found that between the time of privatisation and the end of 1999, household expenditure on electricity for a representative small consumer with an average monthly maximum consumption of less than 150 KWh increased in real terms by about 20%, while an average large user (>150 KWh) enjoyed a tariff reduction of 23% (p.9). Furthermore, they calculated that the fixed cost of electricity rose 50% for low-demand customers, whilst remaining about the same for high-demand consumers (Delfino and Casarin, 2001 p.25).

Ennis and Pinto (2002) present a more positive picture of the price distributional effects of reform by looking at residential prices in real terms (although the accuracy of this measure is complicated by periods of high inflation, the convertibility plan, and subsequent collapse of the currency), and as a whole - i.e. by not dividing prices according to consumption levels. They highlight that whilst household survey data shows that the budget share of electricity rose for the lower income deciles after reform (See figure 10), in real terms electricity prices for residential users, inclusive of taxes, remained stable, although pre-tax prices were 12% higher (Ennis and Pinto, 2002, p.66). In addition, they present 1996 residential electricity prices in Argentina (at US\$ 0.0968 per KWh) as low when compared to richer countries such as the UK, France, Germany, Spain and Japan (p.21)

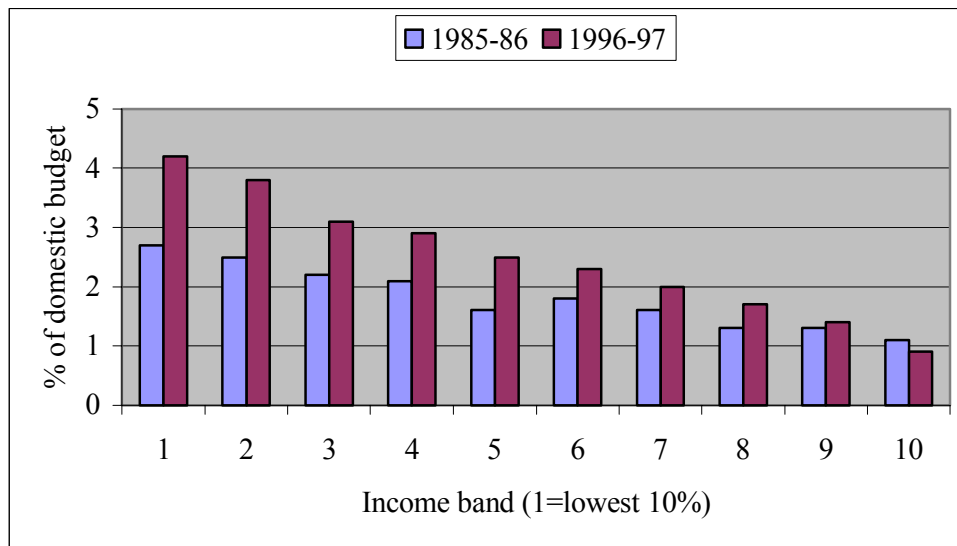
Ennis and Pinto (2002) also point out that the data used by Delfino and Casarin (2001) gives a misrepresentation of the price changes since reform as the 1999 data they use fails to recognise the impacts of deflation and macroeconomic instability beginning in Argentina at that time. In their analysis, Ennis and Pinto deflate the figures from the final price index to match the retail price index (p.28). McKenzie and Mookherjee (2002) use this data to calculate the overall welfare impacts of reform, refusing to consider the price changes since reform as separate from the increase in recorded access levels, thereby concluding:

‘we can estimate what the increase in price needs to be to make the overall welfare impact negative, given the increase in access which took place. Prices would need to have risen 32% for the welfare impact to be negative for the first decile, and price rises of over 60% would be necessary for the second and third deciles to have overall negative welfare effects.’

McKenzie and Mookherjee (2002, p.28)

Despite the lack of figures correlating electricity tariffs to household income, there do exist census figures which show the change in the cost of electricity as a percentage of total domestic budgets (See figure 10 below), which gives an idea of the change in *affordability*. Although the graph clearly shows how the poorest deciles paid more for electricity relative to richer household after reform, it also shows that all income bands (apart from the top 10% who paid less in 1996-7) paid relatively more for their electricity than when the industry was state owned and operated.

**Figure 10. Cost of electricity as a percentage of total household budget**



Source: Arza (2002), adapted from INDEC statistics

The table below (figure 11) presents numbers suggesting that the average connection fee (fixed cost) has more than doubled since market reform. In addition, the table presents cost figures for a proxy lifeline tariff based upon the consumption of a low 100KWh bi-monthly amount. In the absence of any real ‘lifeline tariff’ in Argentina, it presents an interesting way to help understand the price impacts upon those households that consume the least. In order to explain why the per-unit price of electricity is higher for low-consumption users, Bouille et al. (2002) explain that ‘distribution costs are in inverse proportion to the quantity and voltage of the supply. Thus, consumers with low consumption and voltage levels pay more relative to industrial and high residential consumers. In effect, the more one consumed, the lower the per-unit price’ (Bouille et al. 2002, p.41)

**Figure 11. Electricity Tariffs Before and After Reform**

|                                    | Pre-Reform (1985-89) | Post-Reform (2001) |
|------------------------------------|----------------------|--------------------|
| Connection fee (\$US)              | 28.5                 | 62.95              |
| Existence of lifeline tariffs      | No                   | No                 |
| Lifeline tariff charges (USc/kWh)* | 4.35                 | 11.77              |

Source: Adapted from GNESD (2004) \* *Source (Alexander, M., 2001) Uses the cost of 100Kwh per 2-month period in the EDENOR and EDESUR distribution area as a proxy life-line tariff.*

Despite his pro-reform position, Estache (2003) makes it clear that ‘privatization could be perceived as unfair, at least from the viewpoint of some of the users, if the efficiency gains were not distributed fairly’ (p.12). Here, Estache focuses ‘efficiency’ upon *Total Factor Productivity* (TFP), measuring the ratio between various inputs over outputs<sup>4</sup>. He presents data on the relationship between efficiency and tariffs, and again, between tariffs and electricity consumption levels (figure 12), showing how ‘efficiency gains’ have been received by high-demand consumers. With regard to understanding the income distributional impacts, the Bariloche Foundation point out that ‘since it can be reasonably assumed that there is a correlation between low consumption levels and populations with the lowest incomes, this implies that the reforms had a negative impact on the poor’ (GNESD 2004, p.19).

**Figure 12. Change in Cost (%) of Electricity by Demand Levels since Privatisation**

|  | <150KWh / month | >150KWh / month |
|--|-----------------|-----------------|
| Per unit residential charge (before taxes)   | + 2%            | -5%             |
| Fixed residential charge since privatization | + 6%            | + 0.6%          |
| Total residential expenditure                | + 1.9%          | - 3.3%          |
| Indirect tax                                 | 20-30%          | 20-30%          |

Source: Adapted from Estache (2003)

<sup>4</sup> Estache makes the distinction between the degree of *technical and cost efficiency*, which reflects operators concerns to minimize costs for a given level of production, or to maximize production for a given level of inputs, and *allocative efficiency* which reflects the need to ensure that tariffs reflect marginal costs.

On the correlation between average tariffs and efficiency changes, Estache calculates that in the period since privatisation to 2001 there was an annual average tariff change of -0.75%, whilst approximate annual efficiency gains to be used in tariff revision amounted to +1%. Estache concedes that the correlation between efficiency and average tariff changes is a very approximate test of establishing if and how efficiency gains have been passed through to consumers, but argues that the weak historical correlation means that the efficiency gains identified 'have apparently not yet been passed to users on average.' (p.12)

Consequently, Estache hypothesizes that a significant economic rent was created by the privatised distribution market as a result of these efficiency gains not being passed through to consumers. There exist various possible explanations for this. Here, Estache (2003) points out the perverted incentive structure whereby even though the government reduced direct taxation on electricity consumption, by not insisting that efficiency gains be passed onto consumers, taxes on end-use consumption gave them greater revenues. Or, as Estache puts it 'bad regulation is regressive but it is good fiscally since large rents imply large income taxes' (Estache, 2003 p.14). As previously mentioned, the regulatory mechanism for distribution prices operates on an RPI-x basis where productivity gains  $x$  were proposed to be adjusted every 5 years. However, Estache et al. (2003) argue that this price-cap regulation has not been very successful. They maintain that whilst operating efficiencies did improve, the price-cap increased the cost of capital, reflected in the tariff structures. Crucially however, they suggest that regulatory weakness and a lack of clear government commitment to tackle the rent created by the distribution companies is the main reason why improved efficiencies have not led to corresponding reductions in consumer tariffs (Estache et al, 2003 p.16).

## **5.1 Prices and Subsidies**

Although the electricity reform act was based upon market principles which stated that prices must reflect costs in order to achieve allocative efficiency (Chisari et al., 1999; Estache, 2003; Navajas, 1999), some subsidies for electricity were retained after privatisation. Decree 1398/1992 maintained subsidies for pensioners, public interest institutions, non-profit organizations, and electricity-intensive industries (Bouille et al., 2002 p.41). The pensioners entitled to this subsidy are given a 50% discount on the fixed charge and a 50% reduction on the first 210 KWh of electricity consumed per two months. All consumption above the 210 KWh is charged at the normal tariff. At the same time however, pensioners with bimonthly consumption over 430 KWh receive no discount (Ennis and Pinto, 2002 p.9). Furthermore, the National Electricity Act (Law 24065) established a National Electricity Fund financed through a tax on electricity sales in the wholesale market. 60% of these tax revenues are distributed to state provinces that conform to the federal scheme of subsidising distribution tariffs, whilst the remainder 40% is used to fund rural electricity infrastructure developments (Bouille et al., 2002 p.41).

## 5.2 Macro-economic and Indirect Assessments of the Reform Impacts

Assessments of the welfare and distributional impacts of electricity market reform have also been made by focussing on outcomes at the macro-level. For example, Chisari et al. (1999) applied a computational general equilibrium model to the price-cap regulatory regime to quantify the benefits to consumers from private sector management. Using data from 1993 and 1995, they calculated that the gains delivered to the economy as a whole from the electricity generation market amounted to 0.05% of GDP, whilst the gains from the distribution market amounted to 0.17% of GDP (Chisari et al., 1999 p.17). Although they find that gains to the economy are greater when calculated using a flexible regulatory price mechanism, this study suggests that the US\$1.6 billion (i.e. the total cost achieved through increased operational efficiency), in ‘benefits’ were distributed equitably when presented relative to the % of income spent on electricity (see figure 13 below).

**Figure 13. Minimum gain achieved from transfer to the private operators by 1993**

| Income Group | Savings from operational efficiencies (millions USD) | As % of income expenditure on electricity |
|--------------|--|---|
| 1- Poorest   | 205  | 30%                                       |
| 2            | 222  | 27%                                       |
| 3            | 342  | 34%                                       |
| 4            | 335  | 27%                                       |
| 5- Richest   | 549  | 31%                                       |
| <b>Total</b> | <b>1653</b>  | <b>30%</b>                                |

Adapted from Chisari et al. (1999, p25)

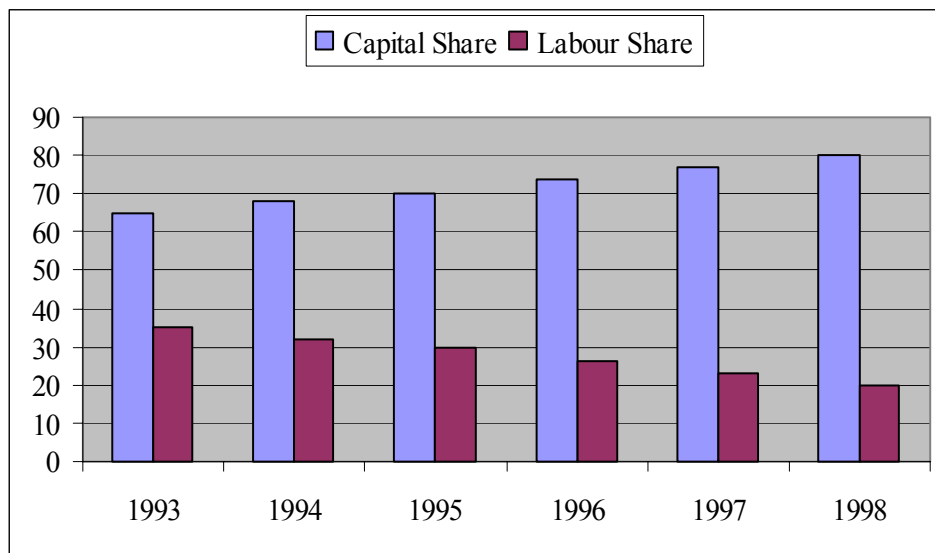
Kozulj (2002) argues that the ten year period in which the currency Convertibility Plan was in place had significant indirect impacts for the poor, vis-à-vis the cost of domestic energy. The most important impact was the way in which *convertibility* led to an increase in the price of domestic energy products relative to the price of goods and services in the wider economy. Since the currency was pegged to a strong US dollar, imports became cheaper and in the ten years after the plan’s adoption in 1991, many low-income consumers were able to purchase energy intensive household appliances, greatly increasing their consumption of electricity<sup>5</sup> (Kozulj, 2002). Furthermore, the Bariloche Foundation conclude that without monetary appreciation (from pegging the peso to the US dollar), energy market liberalisation wouldn’t have been attractive to the private sector as profitability levels would have been a lot lower, demand would not have grown as much, and the relationship between revenues and the cost of capital would have been weaker (GNESD, 2004 p.19).

<sup>5</sup> Figures for electricity consumption show that in the decade after electricity market liberalisation, average monthly household consumption grew by 25% from 155KWh in 1990 to 205KWh in 1999, whilst the national average of electricity per capita increased from 113 to 174KWh (GNESD, 2004, p.23).

### 5.3 Market Reform and Labour ‘Productivity’

Within the electricity sector, total employment stood at 22,500 before reform. By 1998 this figure stood at 6,500, with more than 50% of these losses occurring within the first two years (Duarte, 2002). Figure 14 shows how the returns to capital and the returns to labour within large utilities in Argentina have increased and decreased respectively. In the first 6 years after reform, labour lost more than 15% of its previous share in the gross product of utilities, whilst capital repayments increased from 65% to 80%, showing how utilities have become more capital intensive.

**Figure 14. Change in Capital-Labour Ratio in the Electricity Industry**



Source: Duarte (2002), based on INDEC figures (1999, 2000)

Employment figures for the electricity sector have decreased by 70% since reform, which is even more significant when considering the 42% growth in total electricity production since 1992. This shows how labour efficiency (unit of productive value per employee) has increased massively since reform. As well as the absolute reductions in employment figures, the nature of employment within the electricity sector has also changed radically. There has been a trend in liberalised markets to out-source as many operations as possible. By contracting out particular services, private companies can utilize ‘flexible’ labour that does not demand pension payments and other longer-term obligations, as labour is hired on a needs basis. Although these changes may have benefited some high-skilled labour such as Lawyers acting as consultants, they have had a disproportionately negative impact upon the lower-skilled lower-waged labour. This is because non, or semi-skilled labour is easier to find and therefore obtainable at much lower rates with little or no fringe benefits.

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