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AN EVALUATION OF THE REFORMS IN THE ARGENTINEAN POWER SECTOR IN THE NINETIES

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Foreword

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Any comments or suggestions are welcome and should be addressed to the authors for consideration.

Gilberto M. Jannuzzi
Diretor (Latin America)
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Apresentação

A série **Energy Discussion Paper** tem o objetivo de disseminar os artigos e relatórios preparados pelos membros ou associados do escritório regional da **International Energy Initiative**. A intenção é estimular o debate sobre temas correntes na área de energia e desenvolvimento sustentável.

Comentários e sugestões são bem-vindos e devem ser encaminhados diretamente aos autores, para consideração e eventuais revisões.

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Loza, Andrés

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1. Power sector reforms 2. Public benefits 3. Energy policy

AN EVALUATION OF THE REFORMS IN THE ARGENTINEAN POWER SECTOR IN THE NINETIES[1]

RESUME:

During the nineties Argentina carried out important structural reforms in the electric sector as part of broad economic reform programs. These economic reforms were part of the so-called "Plan de Convertibilidad", that was established to deal with the macroeconomic instability of the country at the beginning of the nineties.

As far as the electric sector is concerned, the initial objectives were focused on restructuring and regulating the sector, seeking to achieve economic efficiency, low energy prices, improve customer services, and long-term energy supply sustainability.

This paper analyses the performance of the electric sector reforms during the last decade. Moreover, it evaluates the public benefits that have resulted from its implementation and some of their contribution towards the sustainable development in the country.

The study concludes that:

- Private investment in electric generation has been directed towards the installation of combined cycle natural gas technology. Huge quantities of liquid fossil fuel have been replaced by natural gas. However, there have not been enough incentives to promote private investment in large-scale hydropower plants.

- Long-term energy supply sustainability is at risk due to over dependency on private investment decisions which are strongly influenced by macroeconomic performance.

- While the reforms have significantly contributed to lower the wholesale spot energy prices, the gain has not been transferred to the household consumers

- Regional Governments and Cooperatives have shown initiative to promote RES (Renewable Energy Systems) technologies and electrification in isolated rural areas.

1. INTRODUCTION

During the nineties, Argentina carried out important structural reforms in the electric sector. The reforms ended with the State monopoly and encouraged the participation of the private sector. The major reason for this was the failure of the public sector's managerial skills.

[1] The author was granted a scholarship from the Latin American International Energy Initiative office to prepare this report in Brazil.

These reforms were part of the so-called *"Plan de Convertibilidad"* [2], that was established to improve the country's macroeconomic stability.

As far as the electric sector is concerned, the initial objectives were focused on restructuring and regulating the sector, seeking to achieve economic efficiency, low energy prices, improve customer services, and long-term energy supply sustainability. Some studies done before this concluded that the reforms have been successful in achieving efficiency gains, competition and lower wholesale prices.

This paper analyses other important dimensions of the electric sector in connection with public benefits and sustainable development. It also deals with long-term supply sustainability, electricity tariffs to households, renewable energy and potential rural markets for electricity.

Section 2 presents a review of the experience after the reforms in Argentina. It explains and evaluates the major changes in the sector for the urban grid market. In section 3, a more specific analysis of the policies in rural markets and the promotion of non-conventional and renewable energy technologies is made. In section 4, conclusions and policy recommendations are made.

2. ANALYSIS OF THE REFORMS PERTAINING TO THE URBAN GRID MARKET

Argentina suffered a shortage of electricity supply in the 1988/1989 summer. The supply deficit was 50% of the total capacity in the worst moment of the crisis and gave rise to rationalization of energy.

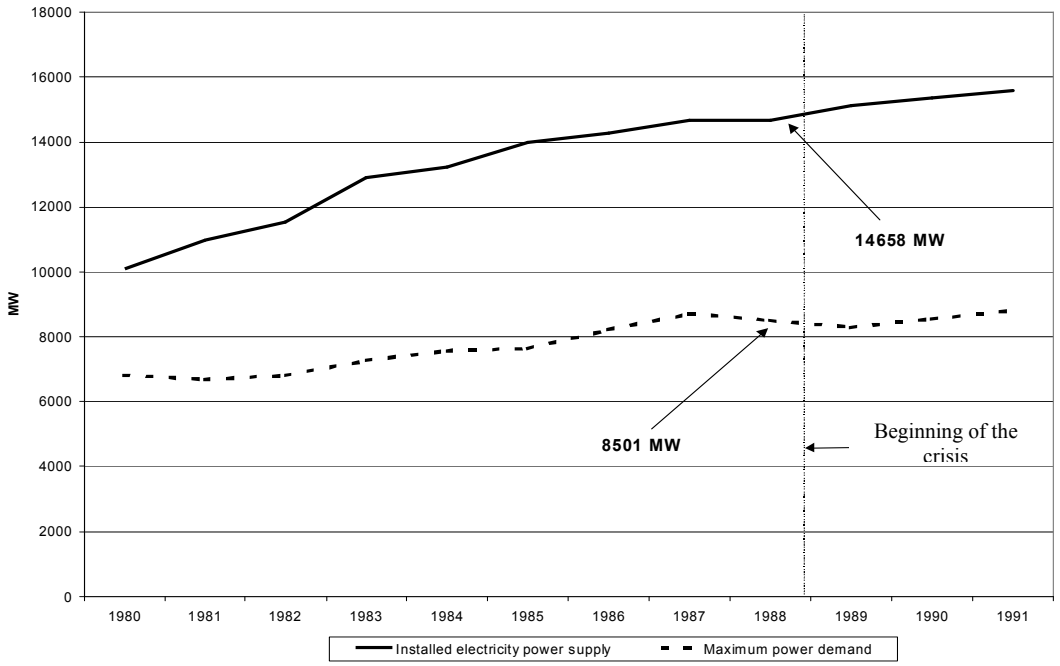
Just before the power supply crisis, the installed power supply was more than enough to support the peak demand (the excess power was more than 40%), as can be seen in Figure 1. However, the combination of natural factors and managerial failures to maintain the generation capacity in optimal conditions reduced the availability by almost 50% of the total installed capacity.

The crisis was mainly caused by low rainfall which led to low levels of water in the main rivers and hence low water levels in the reservoir dams. Furthermore, the prototype nuclear power station Atucha I was out of service. In addition, thermal stations that should have supported the adverse shortage of power generation from hydropower plants had high levels of breakdowns and non-availability.

Clearly, the crisis was not caused by lack of public investments. High levels of breakdowns and unavailability of the thermal plants were the result of low maintenance. It could be said that the Government failed in the allocation of funds between investment and maintenance (see Romero 1999).

[2] Basically, under the *"Plan de Convertibilidad"* (1991-2001) the Argentinian currency peso was pegged to the US dollar, the economy opened to the foreign trade and the international financial market, and a privatization process was carried out.

Meanwhile, in June 1989, Carlos Menem assumed the presidency of Argentina. He initiated a program that included two key laws for the future of the reforms which set the base for privatizations: the Economic Emergency Act and the State Reform Act.



Source: Secretariat of Energy

Figure 1. The evolution of the power demand and supply before the reforms.

In April 1991, the restructuring of the electric sector began. The MEM (wholesale power market) was created. Generation, transmission, and distribution of electricity were vertically unbundled. MEM began its activities in June 1991 under its manager company CAMMESA.

In January 1992, the Argentinean Statute No. 24065 established the legal bases for the electric sector and created the ENRE (National Entity for Electricity Regulation). The aim of the regulatory reforms was to provide the power sector with incentives to improve investment and operating efficiency, and to ensure that consumers benefit from efficiency gains. Some of the objectives of the electric policy were to protect user's rights, assure the long-term supply by encouraging private investment, reduce spot prices by promoting competition wherever possible, and to fix fair tariffs for transmission and distribution of electricity.

At the beginning of the reforms, this program, supported by the World Bank, did not include public benefits such as rural electrification and low-income households programs, demand-side management3, and renewable energy.
Electric generation became a free market[4] promoting a full competition environment in the generation sub-sector, enabling big users[5] to purchase and contract energy directly from the producers.

[3] A program that encourages the customer to use electricity efficiently.
[4] For any firm that could meet the operating safety and technical standards.
[5]Nowadays with a consumption of more than 50KW per annum

The MEM prices have followed the marginal principle. The marginal short-term cost of the next power plant plus a charge for capacity fixed cost –whether it is in use or not- determines the spot price of electricity. This sector does not need price regulation due to competition in generation.

Since transmission and distribution are natural monopolies, they need regulation when managed by private agents. The pricing model adopted was the price cap, revised by "RPI-X" method. The regulated price cap sets the maximum price that a distributor can charge the final consumers. Distributors maximize their profits by delivering electricity at the lowest average cost per kilowatt[6]. Both transmission and distribution companies must permit free access to the grid, charging for its access.

The transmission company has the obligation to maintain the existing grid, but it is not its duty to expand it. However, any other agent can do that. Transmission is under national regulation.

The distribution company has the obligation of expanding the grid to all any user along the concession area. In September 1992, the distribution lines were privatized in the City of Buenos Aires and its suburbs - metropolitan area of Buenos Aires (BA) known as *"El Gran Buenos Aires"*.

Distribution of electricity within *"El Gran Buenos Aires*" is under national regulation. On the other hand, Argentinean provinces can create its own regulatory institutions under Statute No. 24065. In addition, they can own and manage the distribution lines.

The following section presents an analysis of the most important trends in the power sector which allow drawing some conclusions concerning public benefits and the reforms. First, the flow of investments in the generation sector will be described. Secondly, the evolution of the electricity prices will be evaluated.

2.1. THE DEVELOPMENT OF INVESTMENTS IN GENERATION IN THE POST-REFORM PERIOD

Figure 2 shows the evolution of the installed power capacity before and after reforms. Before the reforms, there was a positive trend in investment in generation capacity. However, this declined significantly two years before the end of the eighties electricity crisis. After the reforms, investments had a new impulse, recovering the positive trend but in a more upward-slope. This push ended in 2001, in the middle of a situation characterized by a depressed economic activity and uncertain about the continuity of the currency board.

Considering the level of investments, its flow after the reforms has provided enough electricity to meet the demand growth. No more crisis episodes have been registered after the reforms.

The power sector reform led to a shift in the power matrix of the country. During the eighties, hydropower projects had changed the composition of energy supply in favor of

[6] A reservation against the use of price cap regulation is that sales maximization incentive conflicts with the objectives of socially desirable programs such as demand-side management.

hydropower technologies, but the composition was reverted after the reforms. This is showed in Figure 3.

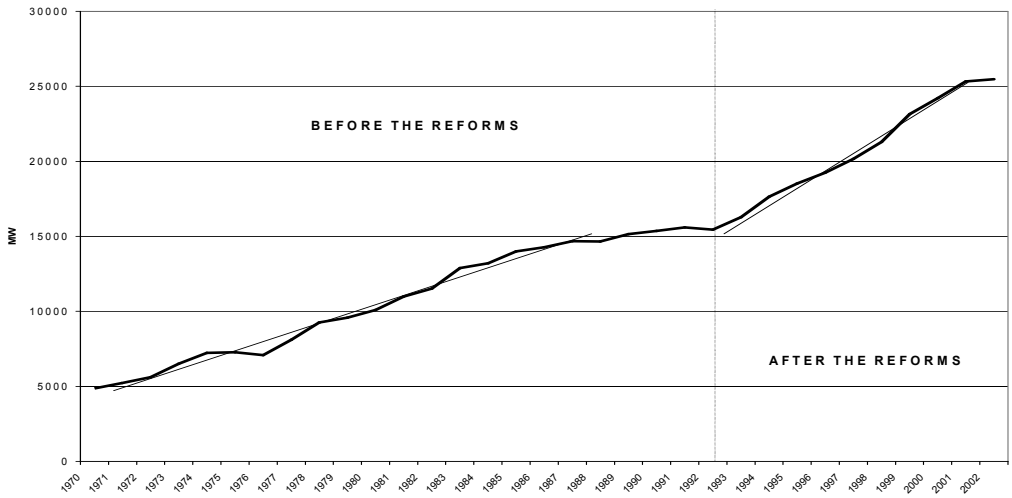
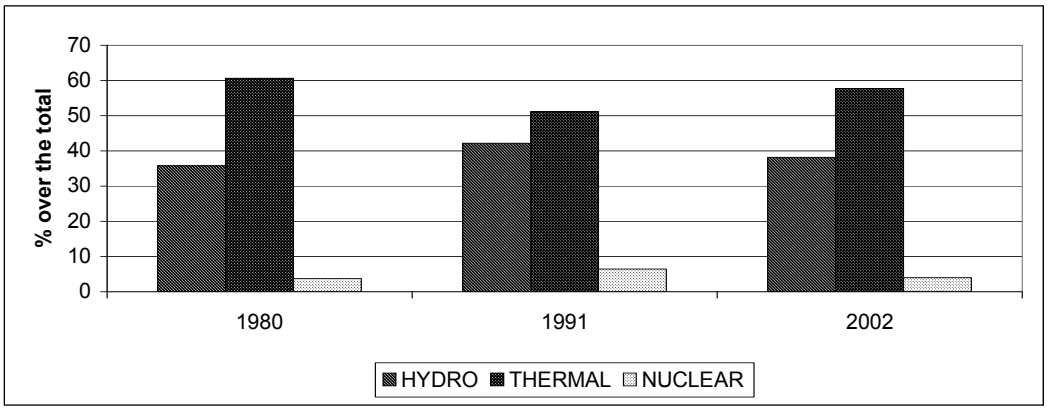


Figure 2. Evolution of the installed power capacity.



Source: Secretariat of Energy.

Figure 3. Share of installed power capacity by energy source.

The ratio of the installed hydropower capacity to the total in 1980 was 35.7% while it reached 42.2% in 1991. Nuclear power also grew its participation in the same period, from 3.7% to 6.5%.

In contrast, during the nineties, the generation from hydro and nuclear technology - both providing the base-load supply - lost participation, reaching 38.2% and 4.0% respectively, while thermal power generation gained participation significantly.

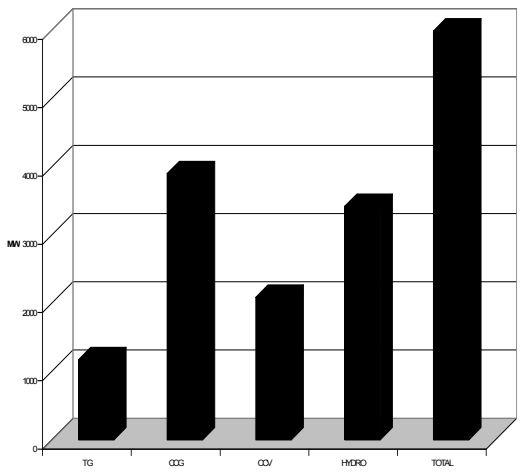
Figure 4 shows the allocation of investments in electric generation after the reforms. The total capacity has increased by nearly 10600 MW in ten years, representing an increase of 57% in the installed capacity. More than half of this increase was due to the

CC (combined cycle) thermal technology. In contrast, the increase in the installed hydropower capacity was 32%, and for the turbo “old-fashioned” thermal technology was 11%.

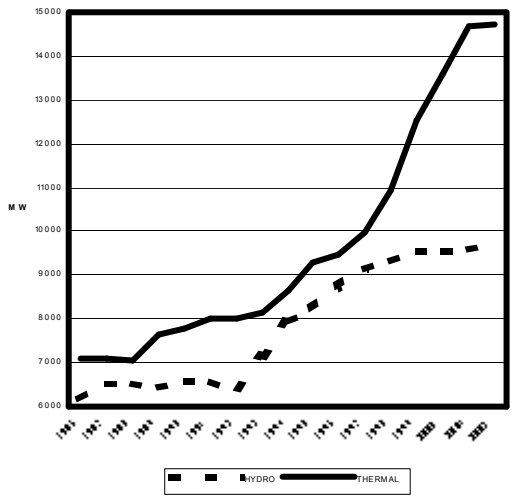
Thermal generation capacity increased 2428.3 MW during the period of 1993-97. With the “boom” of CC technology, there was an increase of 4732.2 MW during 1998-2002.

It is important to point out that macroeconomic crisis affected the private investment decisions which reached its peak in 1998 (last year of economic growth in Argentina) and then declined to nearly zero in 2002. It seems – and it is reasonable - that the macroeconomic cycle affected the decisions of private agents. This highlights the problem of leaving the timing and allocation of investments, in a strategic long-term sector such as energy, entirely to private agents. Therefore, one way of avoiding long-term power supply sustainability problems would be an explicit participation of the Government in investments.

a) Total investments 1993-2002



b) Evolution of thermal and hydropower capacity



Source: Secretariat of Energy

Figure 4. The Argentinian installed power capacity for the last ten years.

The installed hydropower capacity increased by 2861.3 MW during the first five years after the reforms (1993-97), when two huge projects, which could not be financed in the eighties, like Yaciretá and Piedra del Águila, were finished. In the Southwest of the country, two hydropower projects were finished: Piedra del Águila (1994) with 1400 MW, and Pichi Picun Leufu (1999) with 255 MW. Such dams were built by the state and then privatized. Another important hydropower project was Yaciretá (1550 MW, 1994-98), which is being managed together with Paraguay. Provincial governments have invested in smaller projects. After that, only small size projects, representing 559.3 MW (1998-2002), were carried out.

While the private sector concentrated its investments in thermal power plants, the public sector had the role of being the sole investor in hydropower plants. The private sector

focused its investments on CC thermal generation because an optimal scale plant requires less amount of finance compared to big hydropower projects.

Private investments have changed consumption in generation towards a higher participation of natural gas instead of fuel oil. During the first years after the reforms (see Table 1), mainly turbo gas (TG) technology was installed, but from 1997 onwards, CC gas and vapor was preferred. Moreover, some TG plants were transformed into CC gas[7].

Table 1. Investments in thermal power equipment: 1993-2002 (MW)

Technology	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
CC gas	0	0	266	0	437.4	728.8	1173	496	798.7	0	3900
CC vapor	0	0	20	0	0	558.6	733.9	284	491.5	0	2088
TG	118.5	541.5	368.8	381.6	294.5	243.2	-778	0	-113.5	116	1173
Total	118.5	541.5	654.8	381.6	731.9	1531	1129	780	1177	116	7161

Source: Secretariat of Energy

Argentina has a comparative advantage in gas production, which is cheaper than fuel oil. Figure 5 shows the substitution of fuel oil by natural gas. This has a positive effect in environment once natural gas combustion is cleaner. High efficiency of CC units has declined CO2 emissions per unit of electric generation: in 1994, they were 755 tons of CO2 / GWh while, in 2000, they were 454 tons of CO2 / GWh[8].

A description of the ownership structure in power generation is summarized in Table 2. The private sector manages 75.5% of the total installed capacity. According to ENRE (2001), in the national on-grid market, 53,7% (5815 MW of 10834 MW) of the installed hydropower capacity is managed by the private sector due to privatization[9].

Table 2. The structure of property in power generation in 2001.

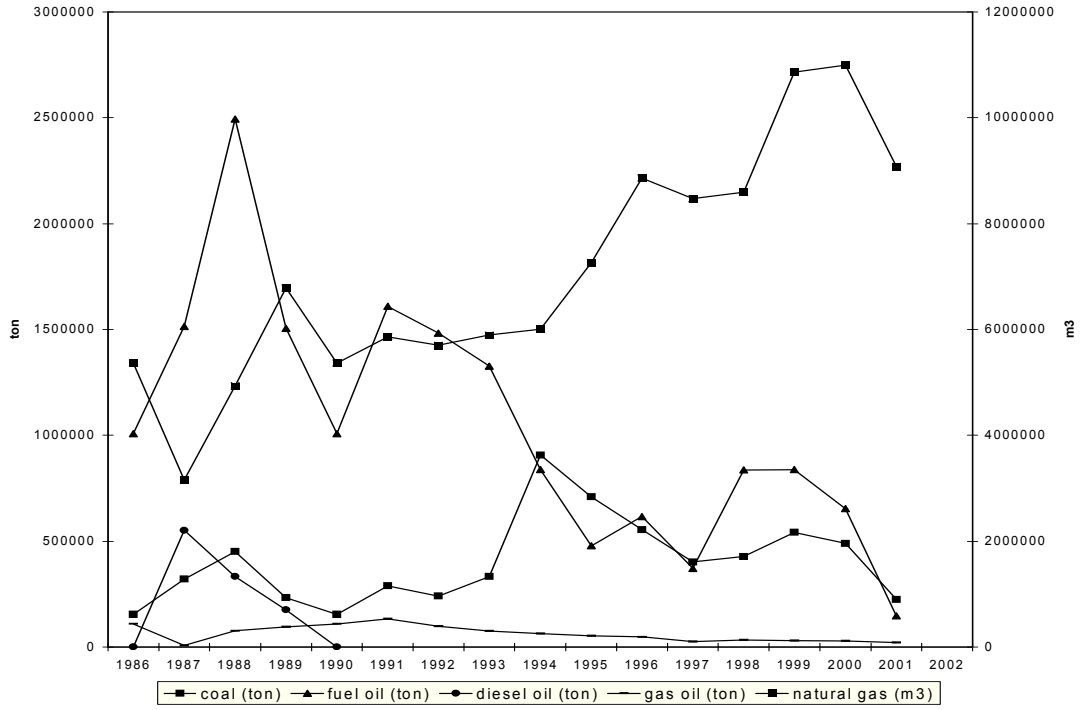
percent of the total	thermal	hydro	nuclear	other renewables	TOTAL
National Government	0.0%	9.9%	4.0%	0.0%	13.9%
Private Sector	51.9%	23.6%	0.0%	0.0%	75.5%
State and Local Governments and Cooperatives	6.0%	4.5%	0.0%	0.1%	10.6%
TOTAL	57.9%	38.0%	4.0%	0.1%	100.0%

Source: Secretariat of Energy

[7] CC gas technology is more efficient than TG technology: it is estimated that CC gas consumes 1600 kcal/kWh whereas TG consumes 2200 kcal/kWh.

[8] Data are from Secretariat of Energy. A provisional data for 2001 was 400 tons of CO2 / GWh; see ENRE (2001).

[9] Concessions for hydropower projects are for thirty years



Source: Secretariat of Energy

Figure 5. Fuel consumption for thermal power generation.

The national government manages 14% of the total installed capacity, including the Binacional - Hydros Yaciretá y Salto, which represents 26% of the total installed hydropower capacity, and the whole nuclear plants.

Regional Governments and Cooperatives manage 10.6% of total capacity with both hydro- and thermal power technology. They have little participation in using non-conventional renewable energy sources for electricity generation. It is important to mention that Regional Governments and Cooperatives have shown real initiative in developing power plants using non-conventional renewable energy sources (see section 3).

The main conclusions from the above sub-section are summarized as follows:

a) Since reforms have been carried out, the level of investments was able to supply the growth of electric demand. However, macroeconomic cycle affected private agents decisions. This highlights the problem of leaving the decisions to invest in the power sector entirely to private agents, .

b) Moreover, the private sector has not shown interest in investing in big hydropower projects, and has focused mainly in CC thermal technology. Thus, an outcome of the investments in power generation during the nineties was the higher participation of thermal technology in the total production in relation to the beginning of the reforms.

c) As regards to thermal power production, private investments have changed fuel consumption towards a higher participation of natural gas instead of fuel oil. This has a positive effect in the environment because natural gas combustion is cleaner than liquids such as diesel and fuel oil. Higher efficiency of CC units has led to lower CO2 emissions per unit of electric generation.

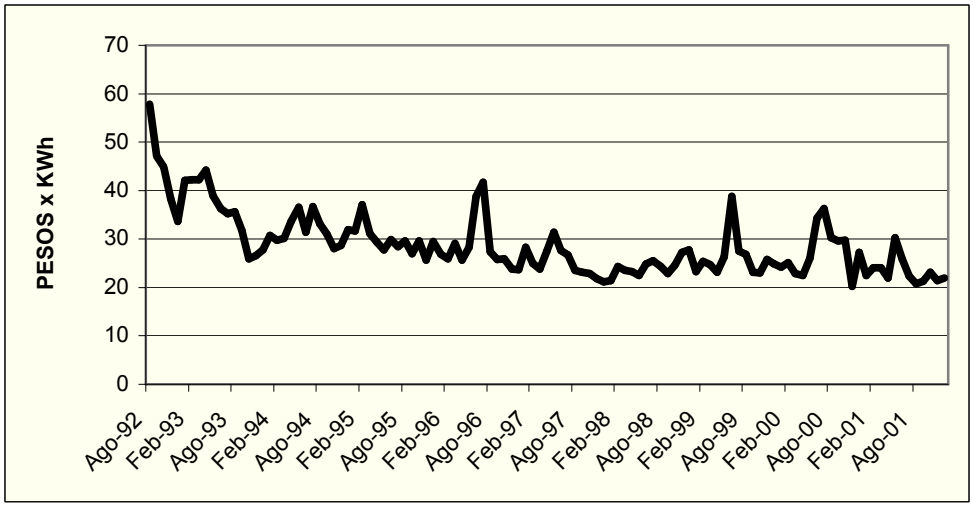
d) It is important to notice that Regional Governments and Cooperatives have shown real initiative in developing non-conventional renewable resources for electric generation.

2.2. THE EVOLUTION OF THE ELECTRICITY PRICES DURING THE POST-REFORM PERIOD

As we mentioned earlier, one of the initial objectives of the reforms in the electric sector was to achieve low energy prices. However, this paper is interested in evaluating if households have been favored with lower prices. To study the evolution of prices, it is better to contemplate the macroeconomic situation in Argentina.

The macroeconomic environment during the post-reform period can be divided into two segments. One characterized by price and exchange stability, which extended during the *"Plan de Convertibilidad"*. The other began in 2002 with the huge devaluation of the peso.

As explained before, one of the primary objectives of the reforms was to lower prices in real terms. The reforms have achieved this target at the wholesale spot market (see Figure 6). However, public benefits require that lower prices be extended to the families, and (see Figure 7 and Table 3) this was not an outcome of the Argentinian reform case.



Source: MEM.

Figure 6. Evolution of nominal wholesale spot price.

Figure 7 shows the final consumer and wholesale prices[10] deflected by the Consumer Price Index. After the reforms, it is observed that wholesale real prices showed a clear negative tendency while the real retail prices showed a slight rise.

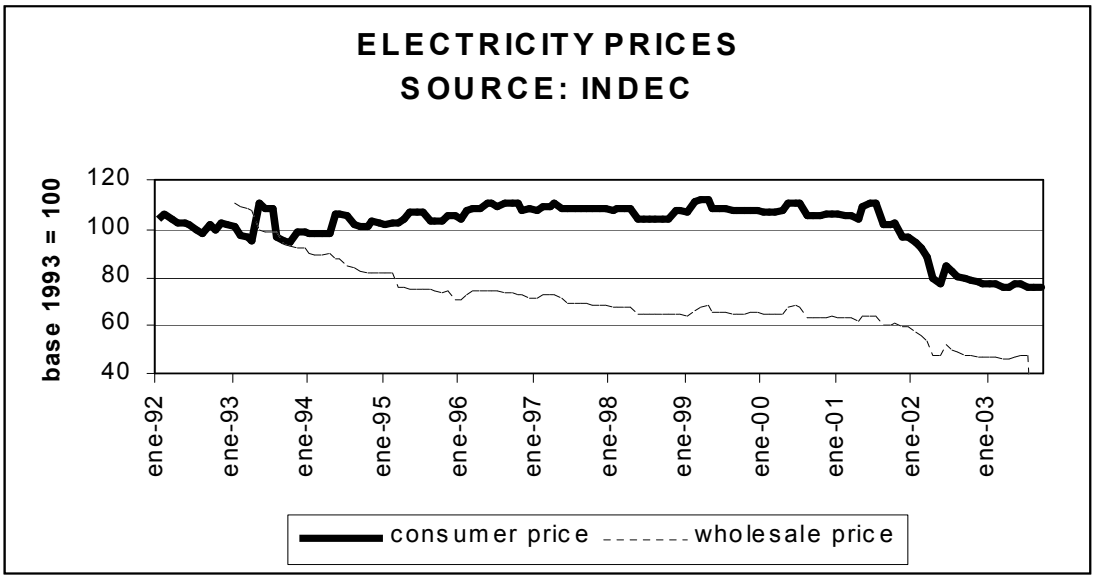


Figure 7. Consumer and wholesale prices evolution after the reforms.

Consumers have not benefited from the fall in spot prices during the *"Convertibilidad"*, as it can be seen in Table 3. Since 2002, both wholesale and retail prices have been falling in real terms. The devaluation of the Argentinian currency peso resulted in a fall in real term prices of more than 20%, because tariffs remained fixed in nominal terms while general prices rose. Power utilities cash flows have been worsened. Uncertainty about the course of tariff negotiation complicates future investments in the sector.

Table 3. Real prices index (1993=100). Source INDEC.

	real price to consumers	wholesa real price
1993	100	100
2001	104	62
% change	4.00%	-38.20%

In order to understand why consumer prices did not fall during the *"Convertibilidad"*, it is now explained how prices are fixed[11].

The rate to end users consists of two terms. One term is the purchase cost of power and capacity in the wholesale market, which is directly passed on to users (pass-through). The other terms represent the compensation to the company for the electric power distribution and sale activity (one cost or distribution added value – VAD), which contemplates the cost of investment required for grid expansion and replacement,

[10] This cannot be confused with the spot wholesale energy price (Figure 7). The price showed in Figure 8 is final and includes the charge for transmission, distribution and taxes.
[11] For a detailed description of the Argentine electric power pricing system, see Legisa (2000).

operation and maintenance of equipment and facilities dedicated to user service, ensuring a reasonable rate of return to companies operating efficiently. The VAD is the part of the rate that is adjusted by "RPI-X" method. The following formula summarizes the pricing method:

$T_d = P_w (1+d) + CPD$

where:

T_d: Tariff to final customers ($)

P_w: Wholesale price of energy ($)[12]

d: Allowed distribution losses (%)

CPD: Distribution cost subject to price cap ($).

It can be argued that institutional factors kept consumer prices higher in real terms. According to Green and Rodriguez Pardina (1999), the government has encouraged eight-year fixed electricity price contracts between the newly created generation and distribution companies as part of the privatization package. Then, the gap between spot prices and contract prices was transferred directly to the consumers. This fact shows a weakness in the reform criteria, worsened by the absence of public policies to provide access to low income consumers[13].

Bouille et al (2002) argue that the discrepancy in prices may also be due to a possible mistake made by ENRE in the allocation of distribution costs within different kinds of consumers, which remained incorrect during the first 10-year tariff period.

To sum up, while the reforms have significantly contributed in lowering the wholesale spot energy prices, benefiting bigger consumers who can buy energy directly from the wholesale market, this gain has not been transferred to residential consumers during the *"Convertibilidad*. After the peso devaluation, the government did not comply with the duties under concession contracts, freezing tariffs in nominal terms.

3. ANALYSIS OF THE REFORMS IMPLEMENTED IN ISOLATED RURAL AREAS

This section is a review of the activities carried out to expand electricity in off-grid areas.

At the end of the nineties, the Argentine Government and the World Bank began a project based on a concession approach in order to further private investments in isolated rural areas. Small-scale rural utilities seek opportunities to develop power systems based on RES technologies. The section presents a description of the main aspects of the project, a case study of an Argentinian Province, and some preliminary results.

[12] Recall that spot wholesale market price is determined in a competitive market.

[13] Another weakness of the reforms is the lack of demand-side management polices aimed to decrease the electric consumption.

Argentina has a significant percentage of its population (95%) with access to the electricity service[14]. But about 1.6 million people who live in isolated rural markets (MED[15]) do not have access to this public service. Several problems arise from high cost of electricity supply in the MED. This situation is worsened by the great number of families in poverty conditions. A background of the rural situation in 2001 is showed in Box 1.

Box 1. Argentina's isolated rural markets 2001 situation

•The electrification rate in Argentina is 95%.
•The remainder 5% do not have access to electricity and live in isolated rural areas.
•4 millon people (11% of Argentina's population) live in isolated rural areas. Only 60% of them have access to electricity.
•Most of these people live in lowincome households.
•Most public services (schools, first aid and health centers, civil services, police etc) do not have access to electricity.

Limitations

•High investment costs required to produce electricity in isolated rural markets.
•Financial restrictions on Regional Governments to support electricity projects in the MED.
•Weak provincial institutions to support Renewable Energy System (RES).

The costs of electricity supply in the MED, by using standalone photovoltaic systems, is expected to be paid by consumers in small quotas covering 50% of the system's total lifecycle cost[16]. The remaining 50% is covered by the government though using subsides.

The financial problem calls for the cooperation of the public and private sectors to create a sustainable electricity supply program in this area. Multilateral Creditors are important players to provide financial assistance and to coordinate programs that alleviate the problem of living without electricity. The PERMER (Renewable Energy for Rural Electricity Markets) program is an interesting case study.

The PERMER has been developed since 1999[17] to provide Argentina's rural communities with reliable and sustainable electricity for lighting and small appliances (such as radio and TV) by utilizing renewable sources and environmentally clean technologies wherever feasible. The project should promote private sector investment through concessions of electricity provision in rural areas, minimizing governmental subsidies and still enabling the concessionaires to obtain a fair profit for their participation. A separate project component should improve provincial governments' capacity to regulate private sector participation in the MED. A summary of the PERMER's objectives is on Box 2.

[14] The electrification access was 91% before the reforms were implemented. But this improvement in access was due largely to the formalization of previously illegal connections in urban and suburban areas rather than to expansion of electricity services in rural areas (see Bouille, et all, Ob. cit).
[15] MED stands for "Mercados Eléctricos Dispersos", that is the Spanish for "isolated electricity markets".
[16] Including initial installation, maintenance and battery charges.
[17] The PERMER will be finished in 2005.

BOX 2. RENEWABLE ENERGY IN THE RURAL MARKET PROJECT OBJECTIVES

To achieve a credible and sustainable power supply in Isolated Rural Markets, using renewable resources technologies whenever possible.
To promote private investments in Isolated Rural Market.
To encourage regional goverments to take part in regulation activities.
To relieve poverty in isolated rural areas improving the quality of life and diminishing immigration.

Global Enviroment Finance (GEF) objectives:
To remove market barriers for the development of renewable energy technologies.
To avoid greenhouse gas (GHG) emissions, changing diesel, candles, kerosene, GLP, and batteries for renewable energy technologies.

The following is the explanation of the project finance. National and provincial government and the users are charged with the cost of the PERMER investments. The WB (World Bank) finances 30 million dollars. The FEDEI (Special Fund for the Development of the Electrification in the Countryside[18]) and the GEF (Global Environmental Finance Facility) support with subsidies as well. The GEF's grant of 10 million dollars is intended to promote RES technologies and to avoid the use of fossil fuels. Box 3 shows the present source of funding planned to assign to the PERMER[19].

The allocation of the PERMER budget is 88% in investments, 7,5% in technical assistance, and 4,5% in program administration.

BOX 3• PERMER Present Budget

- Financing Plan:
•National and Provincial Government US$26,5 M
•IBRD Loan US$30 M (20 years, LIBOR rate)
•GEF (Global Environmental Facility) Grant US$ 10 M
•Concessionaries US$ 43,2 M
•TOTAL US$ 120,5 M
•Institutions in charge: Energy Secretary and provincial governments
•Starting date: September 1999
•Termination date: September 2005

The PERMER's challenge is to cover a market with 85,000 users in five years. After this first step and conditioned by the results, there is a commitment of the WB to finance the extension of the service to 300,000 users.

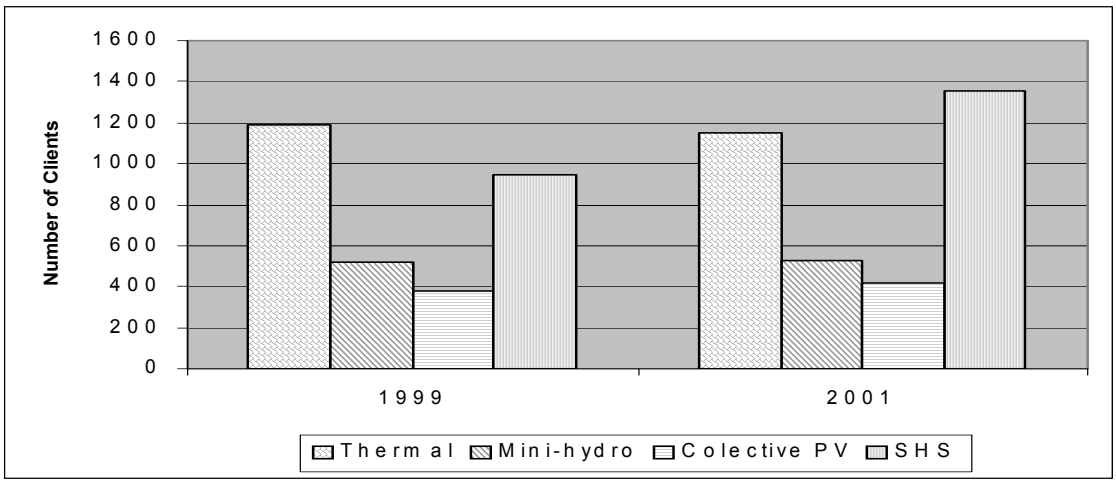
Provinces should regulate the provision of electricity in these markets. The purchases of equipments are shared by the participants of the program. Families pay a charge for connection and tariffs according to their ability to pay. The government subsidizes any user incorporated.

[18] "Fondo Especial para el Desarrollo Eléctrico del Interior" in Spanish.
[19] It had a cut of funding in dollars for the Governments and concessionaries after the devaluation of the peso compared with the initial budget.

For instance, the province of Jujuy is an interesting case study to be mentioned. Jujuy is in the Northwest of Argentina, lying in the border with Bolivia and Chile. Jujuy is one of the first provinces where PERMER was implemented. The WB, the provincial government, and EJEDSA[20] have worked together to supply electricity in the MED of Jujuy.

EJEDSA began its activities in 1997. It has a concession of 55 years with a monopoly regime. For the first five years, EJEDSA has reached 3,500 consumers (Figure 8).

As Figure 9 shows, the PERMER could not draw investments to renewable energy power. The main source of electricity production in the MED of Jujuy is still fossil fuels technologies, followed by mini-hydro plants. However, Solar Home Systems (SHS) have shown a 300% increase in production [MWh-year] during 1999-2001, while collective PV has shown just a 25% increase [MWh-year] in the same period.



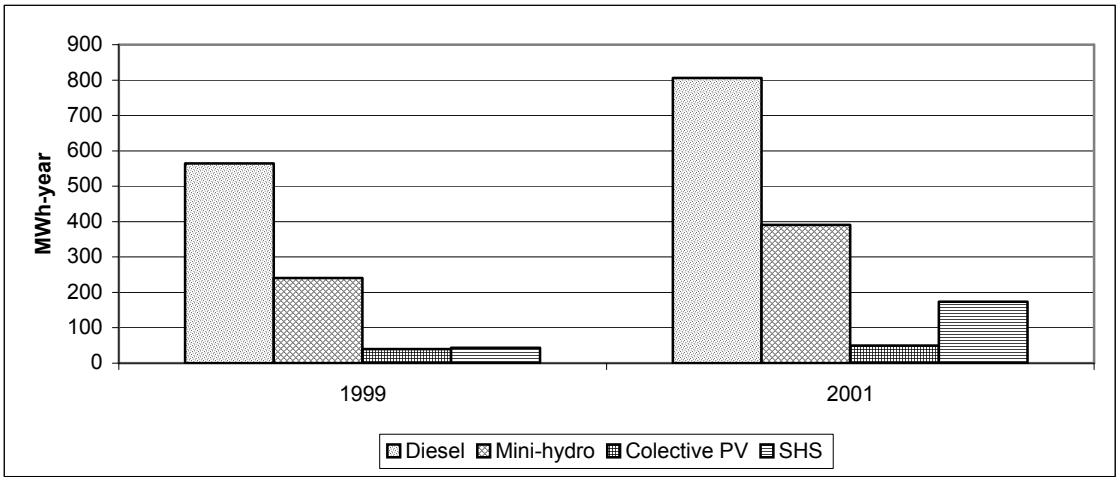
Source: EJEDSA.

Figure 8. EJEDSA – Number of clients (it does not include public lights)

The devaluation of the peso worsened the situation for investments in RES, making the expansion of the neighboring grid more attractive[21]. It was worthwhile how the provincial regulator coped with the new macroeconomic environment, because it decided to expand the grid area. Then, there was a transfer of the concession area from the distributor in the MED – off-grid – to the distributor in the grid market[22].

A last comment regarding RES is that Argentina has favorable natural conditions for wind power technologies, especially in the South of the country (known as *Patagonia*).

[20] Empresa Jujeña de Electricidad en Mercados Dispersos S.A, a private company that has the off-grid electricity concession.
[21] Argentina does not produce these kinds of technologies, therefore they must be imported. Then, the devaluation of the peso raised the cost of connecting RES technologies relative to the cost of expanding the grid.
[22] Both distributors have the obligation to expand the service to any user inside the concession area.



Source: EJEDSA.

Figure 9. EJEDSA – Energy Sources.

Although wind power technologies have been favored with tax benefits in order to promote investments, there are some limitations, namely:

- Problems of the technology itself to connect it to the main grid.
- Poor managerial skills
- Lack of transmission lines connecting the generating zone with big consuming centers.

4. CONCLUSIONS

This paper studied several dimensions of the power sector in connection with public benefits and sustainable development. According to long-term energy supply sustainability, the paper analyzed the investment process.

Three main conclusions are made:

a) Since reforms were carried out, the level of investment was able to supply the growth of electric demand. However, macroeconomic cycle affected private agents' decisions. This highlights the problem of leaving the role of investors in a strategic long-term sector, such as energy, entirely to private agents.

b) Moreover, the private sector has not shown interest in investing in big hydroelectric projects, and focused their investments mainly in combined-cycle thermal power technologies. Therefore, an outcome of the investments in electric power after the reforms is that thermal technology has reached a higher participation in the total power supply.

c) As regards thermal power production, private investments have changed consumption towards a higher participation of natural gas instead of fuel oil. This has a positive effect in environment because gas is cleaner than fuel oil.

Higher efficiency of combined-cycle units has declined CO2 emissions per unit of electric generation.

Another important issue of this paper is the evolution of the prices. Although reforms have significantly contributed in lowering the wholesale spot energy prices, the gain has not been transferred to households.

Nowadays, the low return rate of the power sector put the investment flow at risk. This requires a rise in the distribution tariffs which will make electricity expensive, worsen consumers, especially low income households.

A major challenge for future policies regarding the electric sector in Argentina would be to fix fares to the electricity tariffs to promote private investments within the new macroeconomic environment. This should be accompanied by subsidies to low-income consumers and promotion of rational use of energy. On the other hand, the Government should take an explicit participation in the investment process to reach long-term sustainability, mainly in projects that may not be of the private sector interest.

Concerning isolated rural areas, in the mid-1990´s programs for setting electric distribution in those areas began. The World Bank and the GEF provided financial funds for such projects. Preliminary results showed that energy renewable systems would not become the main source of power. Thermal power production is still leading.
Moreover, after the devaluation of the Argentinean currency, the expansion of the grid became more attractive than supplying electricity with non-conventional technologies in marginal areas.
It is important to note that regional Governments and Cooperatives have shown real initiative in developing non-conventional renewable resources for electricity generation. However, the level of production using renewable resources is bound to technological factors and lack of transmission lines connecting the generating zone with big consuming centers.

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