Assessment of Energy Sector Reforms:

Case Studies from Latin America

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Abstract

This article discusses three main issues. The first is the particular nature of poverty in Latin America and the Caribbean (LA&C) related to the growing importance of the urban poor. The second is the difficulty of analyzing the direct impact of energy reforms on the poor because most of the indicators studied could easily measure the impacts of phenomena other than those directly brought about by the reforms. The third is the reforms' indirect impact on poverty, which results from many of them having been carried out through macroeconomic schemes that caused local currencies to appreciate significantly. This monetary change undermined the productive system and increased foreign indebtedness and structural unemployment in the countries, leading to an increase in poverty.

1. Introduction

This article is based on the results from Phase I of the project *Energy Access: Assessment of energy reform--case studies for Latin America and the Caribbean (LA&C)* [Kozulj, et al., 2003a] within the framework of the Global Network on Energy and Sustainable Development (GNSED). The research reported here analyzes the direct and indirect impacts of reforms in the Argentinean, Peruvian, and Salvadoran electricity sectors.

The methodological guidelines agreed upon by the global project [Karekezi, 2003] proposed five indicators of the impact of reforms, and grouped these indicators under two headings: *Access* and *Affordability*. Three indicators were proposed for evaluating access to energy: a) national electrification levels, b) national electrification rates, and c) electricity consumption per capita. Affordability was to be measured by a) electricity tariffs and b) household electricity expenditures as a percentage of total household income. The methodological guidelines, which were intended to facilitate the comparability of the varied cases analyzed by the research centers in the different regions, suggested that the indicators be evaluated for both poor and non-poor users.

Our research revealed some limitations to these indicators. Some of the indicators – which are also suggested in current literature [Foster, 2001; Alexander, 2000] – may not accurately measure the impacts intended,

especially the indicators under the *Access* heading. The rate of new connections and average household consumption levels may reflect behavior that is a consequence of factors completely unrelated to the success or failure of the reforms. For example, if a system is about to reach saturation in a densely urban area, the rate of new connections will necessarily decrease in relation to the past, whether reforms were carried out or not. In addition, a high rate of connections may indicate that users who previously had illegal connections "regularized" their service after the reforms. This is not a sign of increased access. Before the reforms, these users simply had access to the service illegally, without paying. Finally, official data for poor and non-poor users for periods before and after reforms are not available, nor are they recorded by energy distribution companies [Kozulj, 2002]. All of these limitations suggest that these indicators may not accurately reveal the reforms' effects on the access of the poor to electricity service.

The indicators listed under the *Affordability* heading, by contrast, were more effective in our study. The data for these indicators are generally available if we assume that the poor are those whose electricity consumption is low. The results in the three cases analyzed indicate that higher tariffs in absolute and relative terms adversely affected low-consumption users.

One of the dominant ideas of the reform was the removal of subsidies and the design of tariffs following the theory of marginal value. This approach – mainly supported by the World Bank – was based on the

deficits experienced by the state utilities prior to the reforms due to general and cross subsidies. The deficits led to an inflationary tax that mainly affected the poor, and they also resulted in an inefficient allocation of resources.

Nevertheless, as will be demonstrated below, the confusion between the concept of subsidy itself and the notion that a subsidy constitutes considering domestic prices different from border prices had macroeconomic consequences. Energy costs rose higher after reform than they had before. The result was an absolute increase in poverty levels, a rising foreign debt, and a direct negative impact on rates for low-income consumers. Because the incomes earned by the poor did not increase after the reforms, increased electricity charges directly affected family budgets.

The dominant philosophy during the 1990s in LA&C concerning subsidies was to regard any price below international levels to constitute a subsidy. The privatization that took place with the reforms aimed at levelling the prices of domestic services with the relevant international prices. In the case of basic prices that determine energy services (e.g., gas and fuel prices), strategies such as income redistribution of natural resources among producers and consumers have been mistaken for subsidies. Production costs, which are the only valid criterion for determining whether there is a real subsidy or not (a subsidy occurs when a product or service is priced below its true production cost), have been completely overlooked

[UNEP, 2003]. Because the cost and price structures of domestic economies were sometimes distorted, the levelling of domestic and foreign prices was implemented by overvaluing the local currency, which led to increased poverty, unemployment, and foreign debt levels. It is almost impossible not to relate these macroeconomic mechanisms to the financial success of the reforms and accompanying privatization of energy companies, especially in Argentina. The indirect impact turns out to be more important than the effects measured by the indicators defined by the global project for this study; this article addresses this indirect impact in detail.

Our study also notes the particular evolution of urban poverty as a characteristic feature of Latin America. This phenomenon poses a challenge to energy policies that include the goal of energy access for the poor. Although our research addresses the electricity sector in particular, many of its conclusions could apply to the other commercial energy sources consumed by the poor.

2. The importance of energy access and the unique features of poverty in Latin America and the Caribbean

Access to clean and efficient energy sources on the part of the poor has been defined as one of the highest political priorities in various world forums and analyses [RISO-UNEP, 2002; WEC, 2000; Kozulj, et al., 2001; Wodon, et al., 2000]. The goal is that approximately 2,000 million inhabitants of developing countries should be able to access energy sources, in a context where around 2,800 million people live on less than 2 dollars a day [Karekezi, 2003; RISO-UNEP, 2002]. It is hoped that this access can be created under desirable economic and environmental conditions that can be maintained over the long term.

Many poor people find it difficult to access energy sources, and even when they do, they have difficulty maintaining continuous and regular energy service supply because they lack adequate income and/or stable and well-paid employment. Appropriate subsidy and promotion policies are also lacking.

2.1. The evolution of poverty in LA&C

The total number of people living below the poverty line in the year 2000 in LA&C is estimated at 211,4 million (43.8% of the total population), of which 89,4 million people (18.5% of the total population) were destitute [CEPAL, 2001].

The proportion of poor people in urban areas in LA&C in relation to the total population increased significantly during the 1990s as compared with the 1980s. The number of poor people in urban areas in 1980 was 14% lower than the number of poor people in rural areas, but in 1999 the number of urban poor was 74% higher than the number of rural poor [CEPAL, 2001]. In 1980 the urban poor accounted for 46% of the total of poor population in the region; in 1999 that proportion was 63.5% (Figure 1).

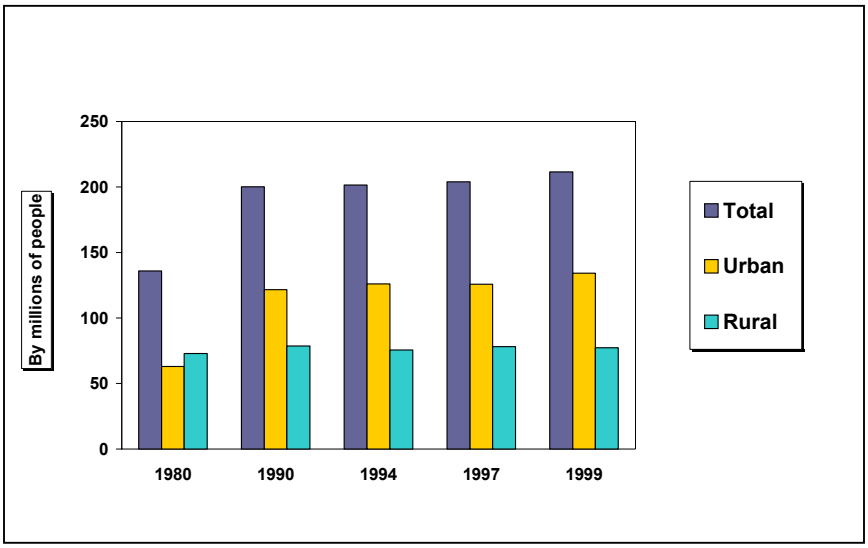

Figure 1. Characteristics of the evolution of poverty in LA&C

Source: authors' estimations with ECLAC data, *Panorama Social de América Latina 2000-2001*, figure 1.3, p. 38.

Paradoxically, the investigation of energy and poverty in LA&C has typically focused on the energy problems of the rural poor rather than the problem of access to energy services for the urban poor. This has been partly because, at least in the case of electricity, non-technical losses or

energy theft was overlooked when service was provided by state-run companies. This issue has only recently been addressed overtly.

The energy problems of the urban poor have also been given scant attention because of the complexity of urban poverty. Lacking an adequate and stable income, the urban poor may suffer a greater shortage of goods than the rural poor, and/or this shortage may be different than that faced in rural areas because the urban poor face different consumption standards (i.e., those established during the modernization process) [Kozulj, et al., 2003].

The radical energy-sector reforms implemented in some LA&C countries, which have constituted a substantial part of structural macroeconomic reforms, have had direct and indirect effects on the poor and on poverty levels. Care needs to be taken not to reduce analysis of the consequences of these reforms only to a few direct indicators whose links to explanatory variables may be weak, doubtful, and difficult to prove rigorously.

2.2. Poverty in the three case studies

Table 1 shows poverty data for the three cases analyzed: Argentina, Peru, and El Salvador.

Table 1. Total population classified according to area of residence and degree of poverty

	Total Population			Population below the poverty line			Population below the indigent line		
Countries	Total population in thousands of inhabitants	Urban	Rural	Country total	Urban	Rural	Country total	Urban	Rural
Argentina	37032	90%	10%	27%	27%	30%	7%	7%	8%
El Salvador	6276	55%	45%	50%	38%	64%	22%	13%	33%
Perú	25939	72%	28%	49%	38%	76%	22%	12%	50%
LA&C total	488547	76%	24%	42%	37%	59%	17%	12%	34%

Source: Author's estimations with ECLAC data, LA&C Statistical Yearbook 2001, figure 123, and *Panorama Social de América Latina 2001-2002,* figure 14, annex 2002PDF.

An analysis of these data reveals different degrees of urbanization and poverty. These differences, together with differing nature of the reforms and the varied geographic regions involved, mean that the three cases differ, which is in keeping with the diversity of the region.

3. Description of electricity sector reforms

The electricity sector reforms in the three cases, though not identical, are not so different. The general reform model applied in all three countries consisted of the vertical unbundling of the electricity industry, the total or partial privatization of energy companies, the introduction of competition in generation, and the creation of regulatory bodies for the industry segments constituting natural monopolies, such as distribution. [Kozulj, et al., 2003a].The general guidelines for the electricity sector reforms were consistent in the following features: a) de-monopolizing the electricity sector, which was run by public entities prior to the reforms; b) unbundling generation, transportation, and distribution activities, with several degrees of limitation imposed on the vertical integration of the system; c) creating competition at the generation level and creating spot markets; d) creating relatively independent Regulatory Bodies or Tariff Regulatory Commissions; e) privatization; f) modifying the criteria for cost allocation among users and increasing the average tariff level; g) totally or partially removing subsidies and banning cross subsidies among categories of users.

In some cases, especially Peru and Argentina, macroeconomic reforms focused strongly on privatization of most public services, especially in the energy sector. Monetary appreciation schemes were used to reduce the foreign debt-GDP relationship and increase the dollar profitability of

privatized services. Because capital goods were granted to new private companies at a cost much lower than the replacement value of the assets (quoted in U.S. dollars), the higher income in terms of foreign currency (as a result of the overvaluation of the domestic currency) yielded an extraordinary profit to the companies acquiring the assets. The process also involved capitalization of foreign and domestic debt bonds that were practically in default. Tariffs set for distribution and transportation costs based on the replacement value of the grids and for generation costs based on capital costs and fuel prices that were close to international levels.

In the case of Argentina, the regulatory framework did not address the obligation to invest in electricity system infrastructure. In other words, the rules of the game were set in such a way that energy companies could act as financial companies instead of being committed to the energy sector for the long term. In Peru, many of the investments remained in the hands of the state.

Although the deadlines and depth of the reforms in each country varied, mostly in response to the existing governments and institutions, the underlying philosophy was the same in all cases, and World Bank guidelines were followed.

3.1. The Argentine case

When reforms took place, mainly in 1992 and 1993, the Argentinean electricity sector was made up of public companies with almost exclusive

federal or provincial jurisdiction. Global socioeconomic phenomena throughout the 1980s seriously undermined public companies, especially federal ones. Delayed increases in electricity charges because of anti-inflationary policies and unfair contracts with the private sector caused a rapid rise in indebtedness and created a severe financial imbalance, which had to be covered by national treasuries. This, in turn, increased inflationary pressures that became difficult to curb [Kozulj, 2002].

Toward the end of the 1980s, the Argentinean electricity system was virtually insolvent, which coincided with significant service shortages caused by drought, technical problems in a nuclear power plant, and serious deterioration of the thermal energy supply because of poor maintenance. Although these problems were real, the magnitude of the crisis was overstated to ensure that the reforms would be readily accepted.

The main reforms included the vertical unbundling and horizontal separation of the system (especially of activities associated with generation and distribution), the transfer of emerging companies to the private sector, and the establishment of the principle of free access of third parties to transportation and distribution networks. Legally independent productive units were created out of the large power plants that belonged to the former national companies, and these units were then privatized separately.

Although the legislation then in force aimed at the vertical unbundling of the companies and the clear separation of the electricity

market into the different participant categories – generators, transportation agents, commercialization agents, distribution agents, and large users – in practice it meant a process of vertical reintegration into dominant commercial corporations. This integration was strengthened among the different energy chains, especially those connected with oil and gas and electricity generators, which participate in transmission and distribution.

Table 2 shows the evolution of the participants in each activity in the electricity chain, and Table 3 shows the evolution of installed capacity in Argentina. These tables make clear that reforms in the electricity sector, together with those in the rest of the energy sector, brought about strong private investment in generation.

This private investment, along with the reduction of generation costs to competitive international levels, were some of the key outcomes of electricity reform in Argentina. However, low-consumption, captive users did not benefit. Other users sharply increased their consumption because of the relative price policy, which meant that prices were low in the domestic market but high in terms of dollars as a consequence of the overvalued *peso*. This increase in consumption can mainly be attributed to excessive growth in demand, facilitated by mass imports of inexpensive household electrical equipment. In this context, companies maximized the net present value of their investments because it was clear that the currency overvaluation was unsustainable in the long run, which became evident after the successive

recession crises starting in 1999 and finally in the financial crisis of 2001, ending with the devaluation in 2002.

Table 2. Numbers of participants in the Wholesale Electricity Market (MEM) in Argentina*

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
Co-Generators	-	-	-	-	2	3	3	3	3
Commercialization agents	-	-	-	-	-	1	2	3	4
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

*As of December 31st of each year

Source: CAMMESA, Annual Report 2001

Table 3. Installed capacity (MW) in public service electric power plants before and after reforms in Argentina

Plant Owner	1991	2001
Agua y Energía	4,703	
HIDRONOR	2,660	
SEGBA	2,601	
CNEA	985	985
Binational Ownership	1,220	2,655
Provincial bodies	2,366	1,851
Others	162	
Private Actors		17,340
TOTAL	14,696	22,831

Source: IDEE on the basis of CAMMESA data

3.2. The Peruvian case

Economic growth in Peru had been healthy until 1987, with an average GDP growth rate of 3.8% per year between 1970 and 1980 and 3.1% per year between 1970 and 1987. However, the collapse of the industrialization process caused by import substitution and the impact of urbanization left the country unable to cope with growing foreign debt, a decrease in the prices of exports, and the negative effects of the El Niño phenomenon, which is important for Peruvian agriculture and fishing.

At the beginning of the 1990s, Peru went through a serious crisis. The country's decision not to repay its foreign debt and its handling of financial policy created an inflationary spiral that reduced average real incomes. Between 1985 and 1990, per-capita GDP fell by around 18%. The purchasing power of the minimum legal salary was reduced by 50%, and social expenditure per inhabitant was also considerably reduced during this time.

The traditional political parties were accused of leading the country into a serious political, economic, and moral crisis [Becerra, 2002]; as a consequence, Fujimori won the 1990 presidential election and implemented a neo-liberal economic program that was very popular from political, social, and welfare perspectives. As in Argentina, the energy reforms implemented in Peru were strongly influenced by global macroeconomic conditions; there

was a return to primary production and a worsening of poverty as the recession deepened.

Between 1993 and 1997, Peru went through a period of high GDP growth. However, since 1997, the country's economy has stagnated, and the high growth rate during the mid 1990s was more a consequence of the deep previous recession than of the success of the energy reforms (GDP in 1997 was only 9.6% higher than GDP in 1987). The reforms led to strong foreign indebtedness: between 1990 and 1996 public foreign debt rose by 48%.

Similar to many other Latin American countries, Peru had state-owned companies in sectors that were considered strategic, including energy. During the 1960s and most of the 1970s, the state expropriated oil and electricity service companies from foreign firms. Until 1992, the three segments of the Peruvian electricity system – generation, transmission, and distribution – as well as the commercialization segment were operated by the state-run company ELETROPERÚ.

In the electricity sector, a regulatory model was established by the 1992 Law of Electricity Concessions, based on adaptations of the Chilean and Argentinean models as well as a model adopted by the United Kingdom. The Peruvian model entailed vertical unbundling, separating generation, transportation, distribution, and commercialization activities. Between 1993 and 1998, the main generation and distribution units were privatized.

As a result of privatization, a high degree of horizontal and vertical unbundling was achieved, which was evident in the creation of a large number of companies. When the reform was implemented, the number of companies rose to 40: 16 generators, 20 distributors, and four transportation entities. However, in spite of this increase, there was a high level of market concentration in the generation and distribution segments.

In 1995, installed capacity in public sector electric power plants totalled 3,186 MW. In 2001, this capacity reached 4,703 MW, 36% of which belonged to the state and the remaining 64% of which belonged to the private sector.

Table 4. Changes in Generation Capacity and Ownership in Peru (in MW)

	1995	2001
ELECTROPERÚ	3,186	1,027
State-run corporations		632
Private agents		3,044
TOTAL	3,186	4,703

Source: based on data from *Anuario de Energía Eléctrica*, Peruvian Ministry of Energy and Mines, Technical Bureau of Energy., OTERG-MEM 2001.

Privatization of distribution companies started by mid-1994, but the state still retains total control and ownership of transmission systems except for the lines leased under the Build, Own, Operate, and Transfer (BOOT) scheme. The state provides electricity to 50% of the national market.

In contrast to the Argentinean case, the Peruvian reforms did not involve an increase in generation capacity but a transfer of ownership. Like the Argentinean case, however, tariffs rose considerably, especially in the household sector, and the reforms also led to an increase in the number of participants in the system.

3.3. The Salvadoran case

In the Salvadoran case, the reforms were of a slightly different nature than in the Argentinean and Peruvian cases. The process in El Salvador encompassed previous reforms aimed at increasing electrification levels and a recent removal of subsidies.

Until 1997, the electricity system was operated by a monopolistic scheme. CEL was an autonomous, vertically integrated national service company, controlling all phases of energy supply, from production to distribution. The Ministry of the Economy determined end-user tariffs by means of decrees. CEL was in charge of awarding rights for exploitation of natural resources and owned the transmission and distribution grids. The operation and dispatch of electric power was centralized and carried out by the CEL Operations Center, which also operated hydro-electric power-plants in a centralized manner. Distribution companies could freely acquire all the energy they needed to cater to the demands of their end users at the price determined by established tariffs.

When the General Law of Electricity was passed, it limited CEL's responsibilities in the energy sector, making it a company exclusively devoted to electric power generation. Within the scope of the new scheme that was implemented in January 1998, competition started; several horizontally integrated generation and distribution companies had free access to the transmission and distribution networks. These generation companies resulted from the restructuring of CEL and the sale of the electric power distribution companies to the private sector. Today, the system is controlled independently by the "Transaction Unit" (a body that runs and coordinates the electricity supply), according to a Commercial and Operative criterion to ensure the quality and reliability of supply.

The General Law of Electricity established an open competition scheme to develop Salvadoran thermo-electrical generation capacity. The new legal framework established prices that follow the natural balance between supply of and demand for electric energy. The law established free concessions, for any operator that requests one, for the exploitation of natural resources. The fees are fixed by the General Superintendent of Electricity and Telecommunications (SIGET), which is the regulatory body, on the basis of electric power market behavior.

SIGET is in charge of ensuring compliance with all laws and regulations related to the electricity and telecommunications sectors in El Salvador. SIGET is an autonomous institution; its top official is the General

Superintendent, appointed by the President of the Republic, whose tenure lasts seven years. SIGET responsibilities include: fixing maximum tariffs for household end users with low electricity consumption levels, approving the tariffs established by distribution companies in their own distribution areas, guaranteeing compliance with all regulatory requirements in the electricity sector, penalizing those who do not comply with these regulations, and settling conflicts between operators.

Given that under this new legal framework the decision to expand the electricity grid is entirely up to the transmission or distribution agents, the National Investment Fund for Electricity and Telephone System (FINET)[1] was created to promote the development of electricity supply, particularly in rural areas. This fund will finance electricity services for the rural and lower-income sectors where distribution and transmission agents are unlikely to expand the system because of the difficulties of doing so.

Table 5 shows the evolution of electricity capacity and energy balances from 1980 to 2000. The effects of the new legal framework established in 1996 and of the General Law of Electricity[2] can be seen in this table.

Table 5. Evolution of Electricity Capacity and Energy Balances – El Salvador – 1980/2000

	Capacity in MW		Reserve		Energy in GWH								
Year	Installed Capacity	Maximum Demand	(MW)	% max.Dem.	Public Net Generation	Private Generation Buying	Exports	Imports	Available	Rationing	Sales	Losses	Load Factor
1980	440.0	269.0	180.9	67.2%	1427.8	0.0	0.0	0.0	1427.8	14.0	1261.4	11.7%	60.5
1985	631.8	318.0	313.0	98.4%	1650.6	0.0	0.0	0.0	1650.6	33.3	1439.6	12.8%	59.2
1990	650.4	412.0	238.4	57.9%	2164.3	0.0	9.4	10.8	2165.7	81.3	1828.2	15.6%	60.0
1994	817.5	566.0	251.5	44.4%	3075.3	0.0	43.3	32.0	3064.0	21.6	2586.7	15.6%	61.8
1995	908.5	592.0	316.5	53.5%	3071.0	200.0	64.9	29.7	3235.8	15.1	2832.7	12.5%	62.4
1996	943.4	626.0	317.4	50.7%	2686.2	654.0	21.0	41.7	3360.9	13.8	2926.2	12.9%	61.3
1997	943.4	666.0	277.4	41.7%	2622.9	925.0	18.2	106.3	3636.0	15.3	3184.5	12.4%	62.3
1998	943.4	694.0	249.4	35.9%	2804.6	933.0	22.7	60.7	3775.6	7.4	3375.1	10.6%	62.1
1999	988.4	718.0	270.4	37.7%	2319.4	1319.0	207.8	458.2	3888.8	7.0	3276.0	15.8%	61.8
2000	1102.5	758.0	344.5	45.4%	2465.0	912.0	111.7	807.7	4073.0	0.0	3436.0	15.6%	61.3

Source: IDEE/FB (2001) Diagnóstico del Sector Eléctrico de El Salvador, Análisis comparado.

Table 6 shows the evolution of installed capacity and electricity generation by participant type (public or private).

Table 6. Evolution of installed capacity (MW) according to type of participant, 1996-2000

Actor	1996	2000
CEL	943	806
Private Agents		300
Total	943	1106

Source: Authors' estimation on the basis of SIEE-OLADE data

4. Critical analysis of access indicators and research results in the three cases

This section discusses the advantages and disadvantages of the indicators used to measure the impact of energy reforms on the poor. The results of the analysis for the three cases are summarized briefly and compared to evaluate the direct impact of the reforms on the poor.

4.1. Analysis of the proposed indicators

The proposed indicators of the impact of energy reform are: a) national electrification levels; b) national electrification rates, c) per-capita electricity consumption; d) electricity rates; and e) household electricity expenditures (as a percentage of total household income). The advantages and drawbacks of these indicators must be considered from several viewpoints, including: (1) their ability to represent the effects of the reforms on the poor; and (2) the difficulties in obtaining the data necessary to employ these indicators as well as the relevance of the data or the proxies used when the data are not available, especially for comparing the poor and non-poor.

In the LA&C, energy-related data that enable us to distinguish between the poor and non-poor sectors are scarce. Except for information related to tariff levels (assuming that the poor are represented by households with low energy consumption), data do not exist regarding impacts of reforms on household incomes and energy products used. This lack of data

is underscored by the fact that, prior to the reforms, a significant number of the urban poor used electricity services illegally.

In the literature on the impact of reforms on the poor [Foster, 2001; Alexander, 2000], it is assumed that reforms and their impact on the poor can be analyzed in causal terms, expressed in the behavior of indicators such as those suggested here and that a comparative analysis of different countries will permit us to draw valid, universal lessons. This assumption depends on an oversimplification: that the same reforms will yield more or less similar results wherever they are applied or, even worse, that the causal links between reforms and results may be reduced to indicators. However, in developing countries, the behavior of these indicators may result from many phenomena completely unrelated to the reforms. So, although the search for a set of indicators that can represent the impact of the reforms in different countries is legitimate and desirable, simply extrapolating from traditional indicators is not an appropriate strategy if these indicators do not address the numerous causal factors that may be at work in a given country. Each of the suggested indicators is analyzed in detail below.

a) National electrification levels

This indicator measures the proportion of households that have access to the electricity service. In general, it is possible to obtain information for urban and rural areas. However, data are not available to allow us to classify households into poor and non-poor categories. To

address this limitation, we have defined poor users based on low electricity consumption: households that use 50 kWh/month or less, or 100 kWh/month or less are used as proxy for the poor. All others are defined as non-poor.

Other limitations must be considered in analyzing the significance of this indicator. For each case analyzed, it is necessary to take into account to what extent the electricity system was developed when the reforms were implemented. If the system was well developed, the reforms should not have major effects because electrification levels have always depended to a large extent on the development and speed of urbanization. If reforms are implemented at the same time that significant urbanization is under way, the likely increase in electrification might be wrongly attributed to the reforms rather than the growth of urban areas. Furthermore, if the indicator is analyzed on the basis of consumption bands and the reforms have caused average household consumption to increase, the indicator might reveal a decrease in the number of poor users given that our definition of "poor" users is based on low consumption. Likewise, if those who were illegal consumers of electricity before the reforms become legitimate users after the reforms, an increase in electrification rates may partly reflect the statistical inclusion of previously uncounted users.

b) National electrification rates

This indicator measures the rate of growth in new electricity connections. For the same reasons as for the previous indicator, the values of this indicator before and after the reforms are not in themselves very revealing.

c) Electricity consumption per capita

This indicator assesses the impact of the reforms in quantitative terms at a national level and at the level of poor and non-poor users if they can be differentiated. If data for poor and non-poor users are not available, defining these categories based on consumption levels as described earlier will show whether the average per-capita consumption has moved up or down but will not reveal much useful information about the impact of reforms on the poor. The impact on average consumption may be a result of fluctuations in prices, income, equipment ownership, and so on.

d) Electricity tariffs

This indicator reflects the cost of electricity before and after reforms. Costs may be subdivided into average costs by consumption category or band; connection cost; and addition or removal of subsidized charges for bands of poor consumers. In general, this indicator is clear and can be applied and interpreted in direct terms. However, indirect impacts should be considered when prices have depended on sharp fluctuations of external and internal relative prices because such variations almost always affect the poor and increase their number.

e) Household electricity expenditure as a percentage of total household income

This indicator measures the impact of electricity expenditures on the family budget before and after the reforms. Data on electricity expenditures are generally obtained through household surveys.

4.2. Data surveyed and comparative analysis of the cases

Table 7 shows a series of indicators selected from the research results, corresponding to the three cases analyzed in this study.

Table 7. Comparative results of the analysis for some indicators selected from the three case studies

Selected Indicators	Argentina		Peru		El Salvador	
	Pre-Reform	Post-Reform	Pre-Reform	Post-Reform	Pre-Reform	Post-Reform
Total electrification level (%)	91	95	38	62 [a]-72[b]	62	76
National electrification rate (% per year)	2.0	1.0	7.8	5.8	6.6	4.1
National average per capita electricity consumption (kWh/month)	113	174	31	50	36	47
Average household sector electricity consumption (kWh/month)	155	205	136	106	104	112
Poor households' lifeline tariff *proxy* (in $U.S. / month)	4.35	11.77	6.8	17.2	4.8[c]	8.6[d]- 16.8[e]

[a]Data from SIEE, OLADE
[b]Data from the Household Survey
[c]Data related to the 1979-1993 average of household average charges equivalent to the consumption band subsidized between 1998 and 1999; the variability coefficient (standard/average deviation) is 20.7%.
[d]Value corresponding to 1998 with subsidy
[e]Value corresponding to 2001

Source: Kozulj, et al., 2003a

As noted above, indicators related to electrification levels and growth rate of new connections are not totally appropriate to measure the impact of the reforms. A key problem is that data are not available to compare the poor and non-poor. Although energy companies may have such

information at least indirectly (for example, poor and non-poor geographical areas[3] could be identified), it is unlikely that these data would be processed in a systematic way. Moreover, even the data were recorded, they would probably not be available to researchers because private companies are in general reluctant to provide information that might be counter to expectations (e.g., contrary to the "pro-privatization" ideology) or might be considered confidential.

Despite the shortcomings of the indicators, the data show an increase in the electrification levels in all countries (especially in Peru) after the reforms. However, the trend in electrification rates indicates a decline during the post-reform period.

All three cases show a noticeable decrease of total losses as a result of regularization of previously illegal connections after privatization. It should be noted that this is not a true increase in access as the consumers who "regularized" their service after reforms had access prior to the reforms even if that access was illegal. In addition, if global reforms worsen the problem of poverty, as happened in Argentina and El Salvador, then the apparent improvement in the form of regularization of previously illegal service may be countered by a reduction in real tariff collection from users who do not have sufficient income to afford some or all of the cost of the service. In Argentina, this problem is being accepted even by private participants in the electricity industry, who, in spite of claiming higher

tariffs after the devaluation in 2002, admit that the increases could not be applied to low-consumption users, identified as equivalent to poor consumers [Kozulj, et al., 2003b].[4]

In the case of the household consumption level indicator, there is a decline in Peru, stagnation in El Salvador, and an increase in Argentina. The decline and stagnation are related to inadequate equipment and insufficient income to pay the higher cost of energy after the reforms. The increase in consumption in Argentina resulted from the lower price of electricity in terms of the local currency for customers with average and high consumption. However, the mechanism of resorting to an overvalued currency to make the reform feasible is the reason for the destruction of the production system, which is the main cause of poverty (through unemployment as well as the negative effect of the corrective devaluation on the cost of living and population incomes as explained above) [Kozulj., 1995, 2002; Ministry of Economy and Production, 2004; Frenkel, 2003; Krueguer, 1984; Dornbusch & Fischer, 2003].

Indicators connected with prices and impacts on household budgets clearly show the deeply regressive nature of the reforms. Not only has electricity service become more expensive for low-consumption users, but the real income of the population has declined or remained unchanged [Arza et al., 2002].

5. Indirect Impact of Energy Sector Reforms

Apart from the direct impact of reforms, this analysis emphasizes that the indirect impact of energy sector reforms, which are closely linked to the macroeconomic policies that were applied, has been more severe than the direct impact. The reforms have affected the capacity for generating employment, increased foreign indebtedness, and inevitably led to corrective policies that have further worsened the problem of poverty. The Argentine case is especially relevant as it reveals that there may have been covert subsidies for producers by way of subtle mechanisms whose impact on the poor and on future generations is very serious.

In the three cases analyzed, monetary appreciation increased the current income of privatized service providers while leaving the cost structure, which was dominated by capital costs, practically unchanged. In the case of privatization, these capital costs were below replacement values, always expressed in foreign currency regardless of the relation between local and foreign currency. This practice of making prices and tariffs viable at values close to those of developed countries while ignoring the average income differences of their respective populations distorts the entire relative price structure of the economy, favouring importers, the financial sector, and privatized public services companies to the detriment of productive sectors.

Table A1 in Appendix 1 gives the Argentine price and tariff values for several energy products before and after the reforms. These values are expressed in local currency and in dollars and show the splitting process that prices went through after the structural reforms suggested by the World Bank and the International Monetary Fund were applied.

Figure A1 also shows the level of currency overvaluation related to reforms, compared with currency values in previous periods. The objective presentation of overvaluation is an answer to the general neglect or denial of this effect. It also shows that devaluation has meant a return to historical values in Argentina regarding exchange rates.

Once the positive effect linked to price stability and access to credit for consumption dissipated, a reduction of the productive system was inevitable. This manifested in growing unemployment and a deepening recession. The reform plans ended up producing strong recessions and an increase in poverty levels and social inequality. At the same time, the remittance of privatized company benefits required foreign loans, which in turn increased the foreign indebtedness of the affected countries, making the continuation of monetary appreciation infeasible. Devaluation followed, and its negative impact on living costs increased poverty. The best example of this recurring and dramatic cycle is the Argentinean case, but the same dynamic is evident in El Salvador and, to a lesser extent, in Peru, where a recession had already existed for three years, or even longer.

It is curious that current literature on the topic of subsidies does not consider these issues in its critical analysis. On the contrary, several approaches present overly broad definitions of subsidies, regarding the deviation of prices and tariffs from "market values" as a subsidy without any reference to the question of costs. In those cases, the distribution of one part of the energy rent to users is taken as constituting a subsidy, when a subsidy should clearly mean a product or service that is sold at a price below production costs, including all the stages of production and a normal profit on the capital invested.

The cycle described above is highly relevant for discussions of sustainable development in developing countries because such development is not possible if, in order to sell energy products at international prices, it is necessary to resort to permanent monetary appreciation, which will lead to destruction of the country's economic base. In the case of Argentina, for example, the foreign debt level rose from around 60,000 million dollars to more than 140,000 in only one decade. Such a level of indebtedness can be explained, to a large extent, as a consequence of the remittance of privatized company profits abroad and the systematic payment of higher prices for imports than for exports, a behaviour that is linked to the exchange parity level in both cases [Kozulj, 2002; Frenkel, 2003; Dornbusch & Fischer, 2003].[6] Peru also increased its foreign debt but managed to correct its debt growth as a result of recession, which did not occur in Argentina until 1999

although the unemployment and lack of competitiveness brought about by currency overvaluation started to be felt as early as 1994. What is relevant for the purpose of this research is the need to recognize that these new policies can legitimately be seen as producer subsidies that have not promoted electricity access, but have instead had negative effects on prices and household budgets.

Negative macroeconomic effects have been much more serious than the direct negative impact of the energy sector reforms. Overt and covert unemployment rates in Argentina increased from almost 10% to almost 25%. As a consequence, the number of poor people increased just as much as the gap between minimum and real incomes, driving a large proportion of the population to levels very close to the poverty line [INDEC, 2003]. The struggle between productive sectors and privatized services has become almost impossible to resolve, which gives rise to the need for new energy sector reforms and strong public intervention.

When the utilization of debt is analyzed, it is possible to verify the subtle mechanism of producer subsidies. As can be observed in Appendix 1 (Table A2), the interest paid and the remittance of company profits abroad represented 41% of foreign indebtedness between 1992 and 1999, and a significant part of this can be attributed to privatized companies. Some considerations are necessary here: 27% of that indebtedness corresponds to the negative balance of trade, and trade between companies of the same

economic group is responsible for an significant proportion of this [Kosacoff et al., 2002]. Also, 19% of the debt increase corresponded to the increase in reserves that made the monetary appreciation scheme feasible. If all these elements are taken into account, the conclusion is that foreign debt financed the profitability of the private companies. The situation is even more serious when we take into consideration that the whole of that increase in reserves was sent abroad between March and November 2001 through the financial system (banks and pension funds), which is closely linked to privatized companies.

If the magnitude of the financial and social imbalance brought about by the reforms is taken into account, it is obvious that it has by far exceeded that of the 1980s, which constituted the critical foundation for the reforms of the 90s. Thus we see the importance of analyzing its implications for structural poverty in the region.

In the case of Peru, the evolution of employment has been clearly unfavourable, with all employment indicators revealing a worsening tendency. Although Peru still experiences serious structural poverty problems resulting from productive stagnation, the reforms were accompanied by state measures that prevented them from having an even worse impact, which would have been felt had these welfare measures not existed.

In the Salvadoran case, the impact of energy reforms was not so closely connected to macroeconomic guidelines until privatization began in 1997. Since then, as was the case in Argentina, the reforms had a negative impact on the poor and on the country's general poverty level in particular, because the reforms were accompanied by a harmful monetary appreciation process. Income distribution measures reveal that the relative gap between the poor and the rich has widened in El Salvador. The Gini coefficient rose from 0.72 in 1977 to 0.74 in 1992, and it can be assumed that this value was even more unfavourable in 2000.

The argument that subsidies to users must be avoided because they generate fiscal deficits and an inflationary tax, which in the long term is harmful for the poor, should be considered in the context of the negative impact that overvaluation has had on local currencies. Ignoring the fact that this overvaluation had a purpose closely linked to privatization during the 1990s may not only be inappropriate but also tremendously dangerous. This question has not been comprehensively debated at a regional level, and participants in the energy system appear to ignore these connections. Solutions such as subsidies for specific sectors are still based on old arguments.

6. Conclusions

In all three countries studied, electrification levels increased. However, the growth rate of new connections decreased in the post-reform period as compared with the pre-reform period.

All three cases recorded growth in average consumption per inhabitant along with an increase in tariffs. This apparent contradiction is explained by several factors. First, average consumption per inhabitant grew on a par with the growth in global electrification and urbanization, which meant an increase in electricity consumption in the services and industrial sectors. Even more importantly, changes in tariff schemes reduced commercial and industrial electricity charges relative to electricity rates for households, which explains the growth of consumption per inhabitant in the three cases. Second, tariff increases in dollars reflected the general monetary appreciation[5] discussed earlier.

The analysis of the three cases revealed a decrease in electrification rates and a substantial increase in prices and tariffs for low consumption users. Because consumption levels were used as a proxy for the poverty of users, the results show that the situation has worsened. Not only are tariffs higher, but electricity costs also represent a higher proportion of poor families' expenditures because real incomes have declined as a result of the severe recession in the region.

The indicators used in this study to measure the direct impact of energy reforms on the poor and to facilitate the comparability of the results with those from other regions turned out to be unsuitable for evaluating access to energy services but effective for assessing the impact of tariffs and their effect on household budgets of the poor in the LA&C region. The lack of specific data for the poor and non-poor in the pre- and post-reform periods was a major barrier that prevented the formulation of more precise research conclusions than those presented here. It is hoped that the difficulties in applying them and criticism of the results will lead to improvements in the methodology for future phases of the research.

Apart from the direct impact of reforms, this article emphasizes that the indirect impact of energy sector reforms, which are closely linked to the macroeconomic policies that were applied, has been more severe than the direct impact. The reforms have affected the capacity for generating employment, increased foreign indebtedness, and inevitably led to corrective policies that have further worsened the problem of poverty.

A significant element of future research should be analysis of indirect global impacts, which will capture the complex links between energy reform and its impact on the poor in specific countries as well as its impact on global poverty levels.

Appendix I

The relationship between macroeconomic reforms and energy reforms: critical evidence from the Argentina case study

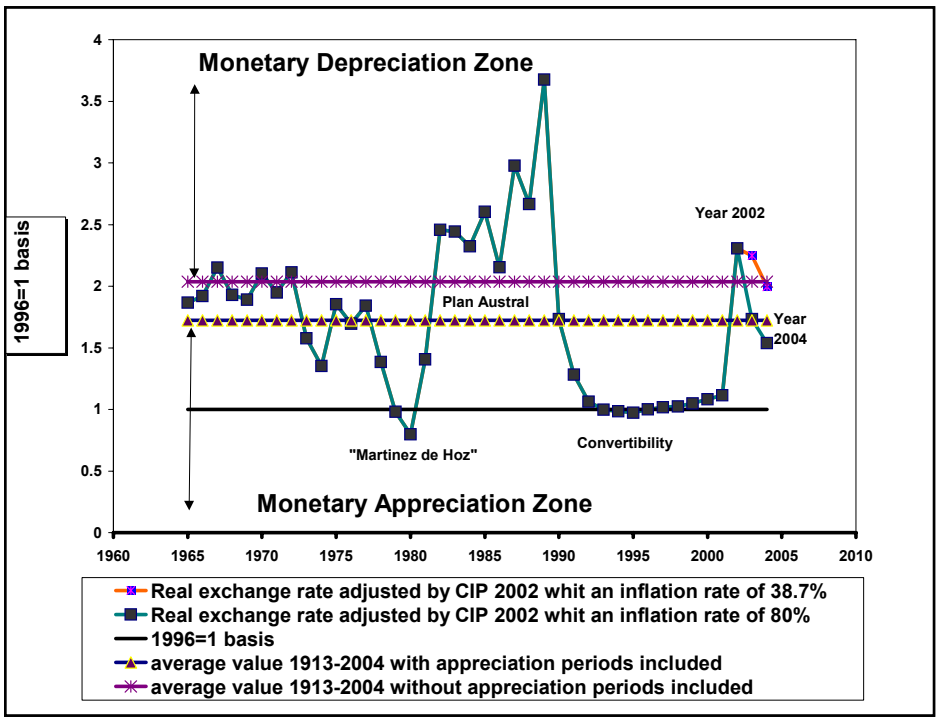

Figure A1. Evolution of real exchange rate in Argentina, adjusted by inflation in the USA; 1965-2002 Period

Source: estimations with INDEC and BCRA data, on the basis of data from Techint News Bulletins.

Table A1

Argentina: energy price fluctuations after the reforms in local constant currency and foreign currency

Natural Gas	Household (75 m^3/ 2-month period)	Household (250 m^3/ 2-month period)	Household (500 m^3/ 2-month period	COMMERCIAL (450 m^3/ 2-month period)	2500m^3/ day	200000m^3/day	
1984-1989/1993-2000 in domestic prices	60%	29%	-1%	-11%	-14%	-45%	
1984-1989/1993-2000 in dollars	300%	219%	146%	122%	112%	35%	
Oil derivatives	Regular gasoline (l)	Premium gasoline (l)	Kerosene (l)	Gas Oil (l)	Diesel Oil (l)	Fuel Oil (k)	Price of the compound (l)
1984-1989/1996-2001 in domestic prices	-38%	-34%	-21%	-31%	-32%	-55%	-25%
1984-1989/1996-2001 in dollars	83%	95%	134%	108%	100%	33%	123%
Electric Energy (GBA)	Household Tariff 100 kwh/2-mongh period	Average household tariff	Average commercial tariff	Average industrial tariff	Average global tariff		
1984-89/1990-92 in pesos	-33%	-13%	18%	44%	11%		
1984-89/1990-92 in dollars	3%	30%	78%	119%	67%		
1984-89/2001 in pesos	28%	-39%	-51%	-44%	-49%		
1984-1989/2001 in dollars	270%	83%	47%	71%	55%		

Source: IDEE/FB on the basis of data from several studies on Energy Price Policies in Argentina, COPED Network and R. Kozulj, Balance de la Privatización de la Industria Petrolera en Argentina y su impacto sobre las inversiones y la competencia en los mercados minoristas de combustibles, ECLAC, Recursos Naturales e Infraestructura Series N° 46, Santiago de

Chile, July 2002, and Resultados de la reestructuración de la industria del gas en Argentina, ECLAC, Recursos Naturales e Infraestructura Series N° 14, Santiago de Chile, November 2000.

Table A2. Composition of foreign indebtedness in Argentina between 1992 and 1999 and its relation with the monetary overvaluation and privatization processes

	1992-1999 Period	
Areas of currency demand	**in millions of U$S**	**in %**
Negative balance (goods)	**22327**	**27.3%**
Total amount of interests paid	**14000**	**17.1%**
Interests (privatized)	***5830***	**7.1%**
Total Profits and Dividends	**19594**	**23.9%**
Profits (privatized)	***7536***	**9.2%**
Average increase in reserve level	**15336**	**18.7%**
Rest of Foreign Financing	**10631**	**13.0%**
Total of Foreign Debt increase	**81888**	**100.0%**

Source: Authors' estimations with data from Ongaro, Cena y Carluccio (2001), *El proceso de privatizaciones en la Argentina desde una perspectiva de la balanza de pagos*, Ministry of Economy, Buenos Aires 2001.

Notes

1. Decree 354. Official Gazette, San Salvador, 29 July, 1998.
2. Legislative Decree 843. Official Gazette, San Salvador, 25 October, 1996.
3. The geographical area criterion has in any event proved difficult to implement as different social levels co-exist in the same neighborhood or settlement. Analyzing each dwelling would require a previous survey and identification of each with its address and meter number. The companies do not have this kind of systematic information, and it has not been possible to obtain it, even for more specific studies [Kozulj et al., 2003b].
4. The many attempts to determine a social rate and the work of one of the authors within UNIREN (Contract Renegotiation Unit, Ministry of Economy) and as consultant to the Argentine Committee to the World Energy Council support such a statement.
5. By the monetary appreciation process, we understand the rising evolution of internal prices parallel to the stability of the U.S. dollar or foreign currency. It is synonymous with an overvalued currency, defined in objective terms by the degree of distance from balanced exchange parity – in other words, that which does not yield a constant divergence in terms of rising external debt.
6. The correlation between the actual exchange rate and the trade balance yields R2=.86, all statistical parameters being reliable [Kozulj, 2002]. Hence, it proved impossible to pay off the debt. To pay off the debt by means of fiscal accounts required cutting expenses, which brought fiscal income down because of the restrictive effects of the cuts [Frenkel, 2003]. The literature provides a record of the criticism of the financial policies implemented by Argentina [Krueguer, 1984; Dornbusch and Fischer, 2004]. Several articles in local journals warned about the dangers of overvaluing the local currency during "the convertibility plan": Diario Clarín, suplemento económico, 10-10-1993, R. Frigerio y M. Lascano notes; W. Rhodes (from Citycorp)" Banqueros preocupados por la sobrevaluación del peso," Clarín, 26-4-1994; Ámbito Financiero, 1-6-1995; Ámbito Financiero, 12-6-1995, p20.; Ámbito Financiero, 3-12-1997, p13. Ámbito Financiero, 16-05-1998, p6.

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