



ESMAP seeks to provide intellectual leadership on energy-related issues to client countries as well as the development community at large. To ensure the sustainability of its work, ESMAP maintains a sharp focus on building local capacity in client countries. Therefore, ESMAP's welcomes activities that not only generate new knowledge but are also designed to involve the client institution(s) and stakeholders such that their own capacities to continue the work are enhanced.

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Project Title: Power Sector Strategy

Region/Country: Paraguay

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Implementation Partner (if applicable):

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ESMAP Strategic Areas:

Energy Poverty	X
Energy Environment	
Market Development	X

I. Context

During the last five years, per capita income in Paraguay has declined by 15 percent in local terms and from US\$ 1,810 to US\$ 1,170 as measured by the World Bank Atlas. Poverty¹ stood at 34% of the population in 2001 and is now likely to be even higher as a result of the economic decline. In accordance with the Bank's Country Assistance Strategy for Paraguay outlined in December 2003, the Government's development objectives focus on achieving fiscal stability, promoting economic growth, improving governance and transparency, as well as extending coverage and efficiency of various public services.

The power sector is important to the achievements of the above objectives. In the last three years, the Administración Nacional de Electricidad (ANDE)—the vertically integrated state-owned utility—accumulated financial losses for about US\$80 million, eroding important fiscal resources. Only as recently as 2003, the company recorded a profit, although this was mainly due to the effects of a weak dollar and lower power purchase costs.

Since 1997, due to its weak financial performance, ANDE had to delay important investments in rehabilitation of transmission and distribution facilities, which in turn deteriorated the quality of service throughout the country, particularly in the rural areas. ANDE's operational performance also requires improvement to reduce technical and non-technical losses which reached the level of 28% in 2003, and threaten to aggravate further its financial performance. The institutional and legislative framework of the sector, with overlapping regulatory and operational roles of ANDE,

¹ Defined as people living below \$1 a day.



and the weak ministerial arrangement to issue and carry out energy policies and administrative functions, is of concern. Although ANDE was able to expand access to electricity in the country impressively in the 1990s, it is estimated that about 20 percent of the population is still without electricity. Rural areas are underserved due to a combination of substandard equipment installed during the large grid expansion and the single phase supply which impedes the use of electricity for economic activities.

In this context, GoP and ANDE have requested assistance to the Bank so that they can formulate a consistent strategy for the power sector.

Background

Paraguay generates nearly all its electricity from three hydropower plants: Itaipu (13,300 MW), a binational dam it jointly owns and operates with Brazil which supplies 94 percent of the country's electricity demand, its own plant Acaray (210 MW) and Yacyreta, a binational project with Argentina with an installed capacity of 3,200 MW, and still under further extension. Thermal generation accounts for less than 1 percent of the country's total power generation capacity.

While Paraguay has an installed generating capacity of 8,700 MW, peak demand is only 1,300 MW and total consumption no more than 2.6 TWh, and the country is therefore an important electricity exporter. In 2001, Paraguay exported 42.3 TWh of electricity, or 94 percent of its national electricity generation. Given the magnitude of its generation capacity, energy supply is estimated to meet the requirements of domestic demand for the next three decades.

However, despite its large generation capacity, Paraguay is unable to satisfy national demand mainly because of inadequate transmission and distribution facilities. For more than a decade, service and maintenance on the transmission and distribution network have been only remedial. The sustained absence of systematic and preventive grid conservation has resulted in a surge of blackouts, a significant decline in the overall quality of service and a critical deterioration in the safety of installations.

The cause of the above problems lies in the poor financial condition of ANDE, resulting from a high level of debt and significant technical and non-technical losses (over 28% in 2003). Thus, ANDE has been cutting back on maintenance expenses and delaying rehabilitation investments for the last 7 years. Transmission and distribution facilities were most affected by this negligence, which in turn deteriorated the quality of service throughout the country, particularly in the rural areas.

Although ANDE was able to improve access to electricity in the country impressively during an ambitious grid expansion program in the 1990s, it is estimated that about 40 percent of the rural population is still without electricity. Moreover, many rural areas that were connected during the 1990s are still underserved due to the installation of short-lived substandard equipment and cost-saving single phase supply throughout the expansion program. Both the low quality of equipment as well as the single phase supply are inhibiting the use of electricity for economic activities and therefore significantly reduce the social benefits of rural access.

The Bank has never had an active dialogue with Paraguay regarding power sector reform and modernization. Only recently, the Government of Paraguay has approached the Bank for



providing assistance for developing a medium term strategy to address the present constraints of the power sector.

Within this context, the proposed study attempts to respond to the concerns and challenges at hand with the goal of developing a strategy for an appropriate framework to enhance the financial sustainability of ANDE, improve the present tariff structure and subsidy targeting, remove the present bottlenecks in the distribution network, and scale up access to electricity for Paraguay's rural areas.

II. Objectives and Activities

The proposal supports ESMAP's priority of sector assistance under the Market Development and Energy Poverty thematic areas. The objective of the study is to assist ANDE in developing a comprehensive strategy for the power sector in Paraguay, involving institutional, regulatory and policy advice, sector organization, financial and social issues such as tariff design and subsidies targeting, as well as on/off-grid schemes for rural electrification. Another objective of the assistance is to build local capacity and involve stakeholders in the discussion on power sector reforms. Five professionals from ANDE will work on the study in close collaboration with local and international consultants, with Bank staff providing further assistance. The study will also review the ongoing work on institutional arrangements and regulatory framework for the energy sector as a whole, being undertaken by consultants with financing from the European Union. An initial workshop with various stakeholders to brainstorm on power sector issues and options as well as a final workshop to discuss the conclusion of the study will be held in Asunción.



The project will consist of seven complementary activities:

1. *Institutional, Legal and Regulatory Framework*

The governance and institutional arrangements in the sector need to be improved. Under the present legislation, ANDE is vested with the responsibility of supplying electricity in the country. At the same time, ANDE has regulatory overview on the sector, with the exception of tariff setting, which is performed by the National Council for Economic Coordination (a Cabinet committee). The study would analyze the options available for a clearer separation of these functions and the parallel creation of a regulatory body.

The board of directors of ANDE was recently abrogated (along with that of all other state owned enterprises), and the entire supervision of the company's operations is left to the President of the Company, appointed by the Cabinet. The study would analyze the pros and cons of this arrangement and propose options to ensure checks and balances in the oversight and administration of ANDE.

2. *Sector Organization and Private Sector Participation*

Because of the small size of the Paraguayan power system, and the large excess capacity derived from the abundant hydro resources, the establishment of a wholesale power market does not appear to be an appropriate solution to improve efficiency. However, a better separation of the regulatory and operational functions of ANDE would be a necessary first step to allow private sector investments.

Options to involve the private sector in distribution will be examined with a view on addressing the two main issues - the need for loss reduction and investments in grid rehabilitation. The transmission sector, in particular the integration of Yacyreta and Itaipu through a connector line, could also be of interest for private sector involvement.

3. *Enhancement of ANDE's Financial Sustainability*

ANDE's financial predicaments essentially stem from four factors. First, ANDE is suffering from substantial non-technical losses. Secondly, ANDE has to manage a significant structural foreign exchange exposure due to the fact that 75 percent of its cost (mainly power purchases from Itaipu), but only 16 percent of income is denominated in US Dollars. Third, ANDE is struggling with the cumulative effects of weak collection processes and the exceptionally poor payment discipline of the public sector. Accounts receivables are currently at more than 30 percent of total sales and up to three times the amount of uncollected accounts of similar utilities in Peru or Colombia. Finally, ANDE has accumulated an unsustainable burden of \$120 million debt at 12 percent interest rate with Itaipu Binational resulting from three years of accrued outstanding power purchases.

The scale and scope of the financial challenges at hand will require the development of a wide-ranging strategy involving a loss-reduction program, the mitigation of foreign exchange exposure, the streamlining of collection processes and a debt reduction and rescheduling plan for ANDE's obligations towards Itaipu.

4. *Tariff Level, Structure and Subsidy Targeting*

Due to its hydro-dominated system, Paraguay has the lowest electricity rates in the Mercosur, with 5 cents/kWh, on average. The industrial rate is around 3 cents/kWh. A significant tariff increase (+38 percent) in 2002, after a decade of predominantly negative returns on capital, per kWh revenues have finally covered costs. This was mainly due to the relative weakness of the US Dollar and the favorable renegotiations of the bulk tariff from Itaipu. However, uncertainties related to future currency fluctuations and the outcome of negotiations of the bulk tariff from Itaipu, raise concerns for the future financial performance of ANDE. The proposed study would examine options for hedging and cost pass through, to ensure the sustainability of full cost recovery.

Given a per capita GDP of more than 35 percent below the LAC average², 40 % of the population living in poverty and almost 20 % of the population living below the extreme poverty line³, the social implications of tariff adjustments are very significant. To alleviate the negative consequences of the recent tariff hikes, ANDE implemented a “social tariff,” amounting to 45 percent of the normal tariff, available to households with consumption below 2,200W and 100kWh per month. Today, roughly 40 percent of the population is benefiting from the subsidized tariff. With Paraguay’s large excess capacities, the possibility of maintaining low and socially acceptable tariffs is favorable. However, given the broad and relatively undifferentiated application of the “social tariff”, the targeting and efficiency of the subsidy need to be further examined.

5. *Network Rehabilitation*

The destitute state of the Paraguayan distribution network imposes a great cost on the economy and has a particularly negative impact on the growth potential of the predominantly poor rural communities. Moreover, the bad condition of the grid has significantly increased the likelihood and occurrence of electricity related accidents. In 2003, ANDE launched a program to refurbish the distribution network as a part of its five-year investment plan. The objective of the overhaul program was to improve the technical conditions of rural, urban and peri-urban networks that were built within the scope of former electrification initiatives (“Programa de Autoayuda”). The common characteristic of the electrification initiatives carried out during the early 1990s was the widespread utilization of low cost materials, and in particular wooden, untreated pylons with very low weather resistance and durability. Today, as a result of the natural aging of installations and major disruptions caused by El Nino, most of this infrastructure has to be replaced or reinforced.

There is a need to review this investment program to ascertain the major economic benefits. Furthermore, as the rehabilitation of the system will involve the conversion of single phase to three phase supply, the study will analyze and identify the main geographical areas where such a conversion is justified in view of the increasing load and potential for economic activities.

² WDI (2003)

³ equal to less than \$1 a day, HDI (2001)



6. Rural Electrification

An estimated 80-85 percent of the Paraguayan population is connected to the main grid, although about 40 percent of rural households do not have access to electricity. The lack of rural access and the poor condition of the distribution work has created a strong demand for grid extension and off-grid solutions such as small-scale generators and renewables.

The study would develop a program for grid extension where economically sound and for the support of off-grid/mini-grid solutions powered by stationary gensets or small-scale renewables for the remote rural areas.

7. Energy Integration Prospects

A review of Paraguay's energy integration prospects in the sub-region will be carried out. The review will build on the results of the recently completed first phase of the ESMAP analytical and advisory project "Regional Electricity Markets Interconnections", and on more recent studies.

Objective	Activities	Deliverables	Impact indicators
Prioritization of Issues and Options in Paraguay Power Sector	Task 1: Discussion with stakeholders on priorities for the power sector in the country	Output 1: Launch study workshop	Participation of Stakeholders in the workshop
Clarifies roles and responsibilities of various institutions in the power sector with regard the regulatory, administrative and policy functions	Task 2: Review of the regulatory functions of ANDE and GoP under existing legislation. Analyse available options to create a regulatory body. Task 3: Analysis of existing institutional arrangements for the management of ANDE and for the determination of energy policies in the country.	Output 2: A report in the form of legislative and regulatory reforms with recommendations on the creation of a regulatory entity, ensure appropriate checks and balances in the administration and oversight of ANDE management, and strengthening energy policy making functions.	Better awareness of the overlapping roles and responsibilities of the power sector and the need for functional separation.
Promote Private Sector Participation	Task 4: Analysis of possible alternatives for private sector participation in distribution.	Output 3: A presentation of options, and related pros and cons, to involve the private sector in distribution, taking into account the main problems faced by Paraguay	Raise understanding of benefits of private sector involvement in distribution.
Enhance ANDE's financial sustainability	Task 5: Development of financial projections for ANDE and identification of main drivers of profitability/loss. Task 6: Analysis of options to reduce volatility and guarantee sustainability of profitability	Output 4: A set of recommendations on ensuring sustainability of the financial performance of ANDE	Better understanding of the main drivers for ANDE's financial performance and potential measures to achieve greater sustainability.

<i>Improving Subsidy Targeting</i>	Task 7: Review available data and surveys to identify who benefits from the present Tarifa Social and explore alternative arrangements	Output 5: A number of subsidy delivery mechanisms that are more efficient and effective than the present subsidy scheme.	<i>Raise awareness of subsidy targeting - issues.</i>
<i>Rehabilitate transmission and distribution network</i>	Task 8: Review rehabilitation program of ANDE, and assess its benefits.	Output 6: Cost benefit analysis of proposed investment program	<i>Better understanding of the need for a comprehensive approach for network rehabilitation.</i>
<i>Expand provision of rural electrification services</i>	Task 9: Analysis of the present issues in increasing access to electricity services and formulation of key options for expansion, including the development of renewables.	Output 7: A set of options for grid expansion, including the development of renewables.	<i>More efficient and better targeted approach to rural electrification.</i>
<i>Examine prospects for sub-regional power integration</i>	Task 10: Review of proposed sub-regional interconnection.	Output 8: Review of present integration options and prospects.	<i>More detailed understanding of the implications and potential benefits of sub-regional interconnection.</i>
<i>Review and discussion</i>	Task 11: Across-the-board review of the study, prioritisation results and recommendations.	Output 9: Discussion of the Final Report including all tasks to be presented at a workshop.	Report and Final Workshop

IV. Sustainability & Risks

As this study directly responds to the request from the client and will be carried out in collaboration with ANDE, and fits into Bank priorities, it is likely that the output of the study will be openly discussed. A follow up to the study in the form of technical assistance and/or a project could emerge.