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STAFF APPRAISAL REPORT

ARGENTINA - PARAGUAY

YACYRETA HYDROELECTRIC PROJECT

September 21, 1979

Projects Department
Latin America and the Caribbean Regional Office

Currency Equivalents 1/

Currency Unit	=	Argentine Peso ($a)
1US$	=	1,000 $a

Weights and Measures

kW	=	Kilowatt
MW	=	Megawatt (1,000 kW)
GW	=	Gigawatt (1,000 MW)
kWh	=	Kilowatt hour
MWh	=	Megawatt hour (1,000 kWh)
GWh	=	Gigawatt hour (1,000 MWh)
kv	=	Kilo volt (1,000 volts)
kvA	=	Kilo volt-ampere
MVA	=	Megavolt-ampere (1,000 kvA)
km_2	=	Kilometer (0.6214 mile)
km^2	=	Square kilometer (0.386 sq. mile)
m^3	=	Cubic meter
hm^3	=	Cubic hectometer
kcal	=	Kilocalorie (3.968 BTU)
t.o.e.	=	Tons of oil equivalent

Glossary of Abbreviations

a.c.	=	Alternating Current
d.c.	=	Direct Current
AyEE	=	Agua y Energia Electrica
ANDE	=	Administracion Nacional de Energia Electrica (Paraguay)
CIAE	=	Compania Italo Argentina de Electricidad S.A.
CIDY		Consultores Interacionales de Yacyreta
CNEA	=	Comision Nacional de Energia Atomica
CONCAP	=	Comision Nacional de la Cuenca del Plata
CTMSG	=	Comision Tecnica Mixta de Salto Grande
DEBA	=	Direccion de Energia Electrica de la Provincia de Buenos Aires
DUC	=	Despacho Unificado de Carga
EPEC	=	Empresa Provincial de Energia de Cordoba
FC	=	Fondo de Combustibles
FCCC	=	Fondo Chocon-Cerros Colorados
FEDEI	=	Fondo Especial para el Desarrollo Electrico del Interior
FNE	=	Fondo Nacional de Energia
FNEE	=	Fondo Nacional de Energia Electrica
FNGO	=	Fondo Nacional de Grandes Obras Electricas
HIDRONOR	=	Hidroelectrica Norpatagonica, Sociedad Anonima
SDR	=	Special Drawings Rights
SEGBA	=	Servicios Electricos del Gran Buenos Aires
YACYRETA	=	Entidad Binacional Yacyreta

Fiscal Year

January 1 - December 31

1/ As of December 31, 1978

1. This report is based on findings of a joint Bank/IDB appraisal mission carried out in July-September 1978. Because of delays in the prequalification process of the main civil works contractors (six months) and in the resolution of complex issues on dam alignment and financial compensation between the Governments of Argentina and Paraguay (another six months), the bidding procedures are now expected to start in November 1979 instead of November 1978, as envisaged during appraisal (see para. 4.18) and as a result the commissioning of the first units of the Yacyreta hydroelectric project will be delayed by about 12 months. This delay is likely to cause an increase in the cost of the project (in current dollars), of about US$150 million, i.e. 6% of total construction cost of the project because of price escalation.

2. No difficulties are anticipated in this additional amount being financed by US$50 million of additional export credits and by US$100 million in additional borrowings from the Electrical Funds, (from US$2.6 to US$2.7 billion). With this exception, the structure of the overall financing scheme for the project is unchanged in relation to the appraisal forecast.

3. The resolution of the dam alignment and compensation issues between the two Governments has been confirmed by the signing on August 30, 1979, of side letters to the Yacyreta Treaty, in which the final agreements are incorporated. The dam alignment remains virtually unchanged from the one appraised. Under the new compensation arrangement, not considered in this report, YACYRETA would pay compensation for the flooding of Paraguayan and Argentine territories, once the power plant was in full operation. From 1990 onwards, Paraguay would receive some US$21 million per annum and Argentina some US$6 million per annum (both in 1979 prices - adjusted annually to maintain its value in real terms). This compensation will be payed by Argentina's power consumers in the form of a special tariff surcharge representing only a 0.5% of the tariff in 1990. It is not expected to affect the demand growth, and will decrease thereafter as power consumption grows. YACYRETA will only act, in substance, as an agent for the transfer of these funds and therefore its financial viability, which is protected by the terms of the Treaty, will not be affected.

4. A revised economic justification analysis, taking into account current fuel costs, capital cost of nuclear power plants, and the new compensation arrangement, shows that an expansion program that includes Yacyreta coming on line in 1986 is the least-cost solution for meeting Argentina's power needs for all discount rates up to above 20% when compared with an expansion program that excludes it. The return on investment remains at 14%.

5. With reference to the development of the relocation/resettlement program satisfactory to the Bank mentioned in paragraph 4.35, further progress has been made in recent months. A more detailed version of the program has been undertaken and is expected to be reviewed by the Bank in October 1979.

9/21/79

ARGENTINA-PARAGUAY

STAFF APPRAISAL REPORT ON THE YACYRETA HYDROELECTRIC PROJECT

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This report is based on the findings of an appraisal mission which visited Argentina and Paraguay during July/August 1978. The mission comprised Messrs. Manfredo Linder, Alain Barbu, Claude Besse, Kunio Kikuchi, Raghuvir Vinekar, Alejandro Funes, Andres Rigo, Earl Kessler (Consultant) and Ms. Paula Stone. The appraisal was carried out jointly with an IDB appraisal mission composed of Messrs. Daniel Camp, Luis Rubio, Patricio Millan, Roberto Pastor, Jose de la Torre, and Ms. Cristina Ortiz and members of IDB offices in Buenos Aires and Asuncion.

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STAFF APPRAISAL REPORT

YACYRETA HYDROELECTRIC PROJECT

CHAPTER I

THE SECTOR

Paraguay's Energy Resources and the Parana River

1.01 Besides its share of the enormous hydroelectric potential of the Parana river, which forms the international boundary between Brazil and Paraguay and between Argentina and Paraguay along parts of its length, Paraguay has no other known important energy resource that can be developed.

1.02 The Parana river has a length of about 4,300 km between its source in Brazil and its confluence with the Rio de la Plata. It is one of the largest rivers in the world in terms of flow and a drainage basin of about 3 million km^2 with an average annual rainfall ranging from 1,200 to 1,600 mm. The average river flow ranges from 9,000 to 12,000 m^3/sec in the section forming the international bounderies with Paraguay and is about 11,000 m^3/sec at the height of the Yacyreta-Apipe Islands.

1.03 With a view to harnessing the hydroelectric potential of the Parana river, Paraguay signed treaties with Brazil and Argentina in April and December 1973 to build the hydroelectric power projects of Itaipu and Yacyreta with capacities of 12,600 and 2,700 MW and with average annual generation of 60,000 and 17,500 GWh respectively. Under both treaties, Paraguay would be entitled to half the power output of both projects, would not be required to invest any money in the projects which would be completely financed by Brazil and Argentina respectively, but would acquire 50% ownership of the projects i.e. including dams, navigation lock in the case of Yacyreta, power house etc, to be paid for out of its share of the revenue from power sales (para. 6.15).

1.04 Paraguay's electric power system is one of the least developed in Latin America. Only about 35% of the population of 2.7 million inhabitants have access to electricity, and the average per capita consumption is 110 kWh p.a., roughly one tenth that of Argentina. Total installed public service capacity in 1977 was 268 MW, of which 190 MW corresponds to Acaray, a hydroelectric project on the Acaray river, the remaining 78 MW being thermal. Captive plant amounted to 14 MW. Total public service consumption in 1977 was 365 GWh, 76% of which was consumed in Asuncion the capital of Paraguay. IDB, which has made several loans to Administracion Nacional de Electricidad (ANDE), the national entity responsible for the country's electric power development, estimates that public service consumption will grow at an average rate of 12% in the foreseeable future. Under these assumptions, existing generating plant is sufficient to cover the power needs of Paraguay until 1985/86, i.e., beyond the commissioning time for the first unit of Itaipu presently estimated in 1983.

1.05 The future power needs of Paraguay beyond 1985/86 are expected to be supplied by Itaipu, because the Itaipu treaty specifies lower cost for Paraguay on the use of energy from Itaipu than the Yacyreta treaty for energy from Yacyreta. Hence, in the foreseeable future all the output of Yacyreta is expected to be consumed by Argentina. In any case, as shown in para 1.04, Paraguay's power needs under current projections would only requires a minimum proportion of the total estimated output of these plants and therefore only Argentina's power sector is analyzed in detail in this report.

Argentina's Energy Resources

1.06 The principal source of energy in Argentina is petroleum which in 1977 accounted for about 64% of total primary consumption of energy estimated at about 37 million t.o.e. 1/, while 23% was in the form of natural gas, 5% of hydraulic origin, 1% nuclear, 2% coal and 5% wood products and sugar cane bagasse.

1.07 The mix of Argentina's energy resources is completely different from the above consumption pattern as the hydroelectric potential (measured over a period of 50 years and converted to t.o.e. at 2,500 calories/kWh) represents about 67% of total energy resources, while proven reserves of oil and gas account for only 10% and 7%, respectively, the remaining 16% corresponding to coal, uranium, wood products and sugarcane bagasse.

1.08 Argentina's proven oil and gas reserves are somewhat limited amounting to 370 million tons of oil and 250 billion m^3 of gas and present domestic production covers about 89% of the country's requirements. In 1976 and 1977, Argentina had to spend about US$500 million yearly on imports of oil and gas. To increase domestic production the Government intends to improve productivity of the existing wells by increasing secondary production, and to increase exploration. The Government is seeking to attract the participation of foreign firms in the exploration and possible exploitation of the oil reserves and has passed legislation that will allow it to sign risk contracts to this effect.

1.09 Argentina's proven coal reserves amount to about 450 million tons of which about 120 million tons are considered to be commercially exploitable. However, coal extraction is costly because it necessitates shaft mining. Also, the mines are located in the south of the country, far from the possible consumption areas, and therefore costly investments would be required in transport infrastructure to utilize any increased coal output.

1.10 Argentina is well endowed with hydroelectric resources (at least 45,000 MW of installed capacity) but the majority of these are relatively high-cost and far from the load centers, therefore requiring heavy transmission investment. Only about 4% of this potential has been developed up to the present. Projects totalling another 8% of the known potential are under construction. In 1977, only about 17% of total electricity generation was of hydroelectric origin and about 75% of fossil fuel origin.

1/ T.o.e. = Ton of oil equivalent i.e. 10^7 K calories.

1.11 Argentina's indigenous uranium resources amount to about 30,000 tons of U_3O_8, based on a cost of below US$36/lb. Another 10,000 tons would be available at a cost of US$60/lb. Based on these resources Argentina was the first Latin American country to develop a nuclear energy program based on natural uranium fuel and commissioned its first unit in 1974 with a capacity of 340 MW subsequently upgraded to 370 MW. A second unit of 644 MW (CANDU) 1/ is being installed and is expected to be commissioned by 1982/83. Argentina is making great efforts to become independent of foreign suppliers for its need for heavy water and fuel rods and intends to build facilities shortly to enable it to produce both heavy water and fuel rods. The Government has decided, in order to maintain and augment its nuclear technical know-how, to install further natural uranium fueled units of 600 MW capacity at the rate of about one every five years (see para. 7.08).

1.12 Other fuels (wood and sugar cane bagasse) amount to about 5% of total primary consumption and their usage is expected to remain stable in the future so that they will represent a decreasing proportion of the total.

1.13 Of the non-conventional sources of energy, it appears that Argentina has a sizable potential for tidal, geothermal, solar and wind energy, with perhaps the largest potential being for developing tidal energy. Preliminary studies mention a possible annual production of 15,000 GWh from tidal energy resources. However, more research needs to be carried out before these non-conventional resources can be developed commercially and none are expected to contribute significantly to Argentina's energy production in the foreseeable future.

The Role of the Sector in the Economy

1.14 When compared to other Latin American countries, Argentina is a highly electrified country as about 80% of the population had access to electric energy with a per capita consumption of 1050 kWh in 1977. In that year public service generation amounted to 27,200 GWh and captive generation was about 5,000 GWh. Total installed capacity was 9,300 MW of which about 2,000 MW corresponded to captive plant. Industry accounted for 54% of total electric energy consumption. Historically, industrial consumption has grown at an average rate of 11% p.a. while residential consumption has grown at an average rate of 7% p.a. The planned installation of a number of electricity-intensive industries will increase the proportion of electricity consumed by industry in the future. For the period 1962-1974 (excluding the recessionary years 1975-1977) a very good correlation has existed between total electricity consumption and GDP; the rate of growth of electricity consumption was 1.55 times that of GDP. This relationship should increase in the future due to the incorporation of electricity-intensive industries (See Chapter III).

History of Bank Involvement with Sector

1.15 Since 1962, when the Bank made its first loan to Servicios Electricos del Gran Buenos Aires (SEGBA), the Bank has made a total of five loans to

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1/ Canadian design, natural uranium fuelled, moderated with heavy water.

Argentina's power sector, four of which were to SEGBA to help finance oil-fired thermal generation plant as well as transmission/sub-transmission/distribution equipment and one to HIDRONOR for the construction of the 1,200 MW El Chocon hydroelectric power plant. The four loans to SEGBA helped build up that institution and, through the last loan (1330-AR approved in November 1976), the Bank has been instrumental in helping Argentina prepare a national power expansion program based on least-cost criteria for the period 1985-2000. Project performance audit reports have been distributed to the Executive Directors on all loans that have been completely disbursed. 1/ These reports conclude that while the physical objectives of the projects were largely met, the financial objectives were not. In effect, only in the years 1968 and 1969 did SEGBA achieve its covenanted rate of return of 8% and only in 1978 did Hidronor achieve its covenanted rate of return of 8%. Because of this unsatisfactory financial performance, the Bank has had continuous discussions during 1976 and 1977 on this subject with the Argentine authorities, which may have helped the present Government to implement, since the beginning of 1978, a more realistic pricing policy for all energy products, including electric energy. Present prices are generally in line or nearly so, with their economic costs.

Sector Organization and Regulation

1.16 The Argentine power sector, although essentially owned by the National Government, has a fragmented organization. It is regulated partially by the Secretaria de Energia, a branch of the Ministry of Economy. The only privately owned company is Compania Italo Argentina de Electricidad S.A. (CIAE), 2/ which serves one third of the city of Buenos Aires and has an installed generating capacity of 585 MW. There are a number of provincially owned electric utilities whose principal function is to distribute electric energy although some own generating installations.

The major entities involved in the power sector are (in alphabetical order):

- AyEE — Agua y Energia Electrica (operates in the whole country and also is in charge of irrigation).
- CONCAP — Comision Nacional de la Cuenca del Plata (controls the Argentine representatives in the two international entities YACYRETA and CTMSG).
- CIAE — Compania Italo Argentina de Electricidad, S.A. (a private company operating in Buenos Aires 2/).

1/ Loans 308-AR and 525-AR, see IBRD Report No. Z-17/1.
Loan 644-AR, see Sec M 76-121.
Loan 577-AR, see Sec M 76-772.

2/ Agreement has been reached between the Government of Argentina and the Shareholders of CIAE (mainly Swiss) for Argentina to purchase CIAE, which will subsequently be absorbed by SEGBA, once the purchase of CIAE is finalized.

- CNEA Comision Nacional de Energia Atomica (in charge of nuclear energy; constructs and operates the nuclear power plants).

- CTMSG Comision Tecnica Mixta de Salto Grande (the Uruguayan-Argentine binational authority in charge of building and eventually operating the hydroelectric project of Salto Grande).

- DEBA Direccion de Energia Electrica de la Provincia de Buenos Aires (provincial electric utility serving a part of Buenos Aires province).

- EPEC Empresa Provincial de Energia de Cordoba, the provincial electric utility serving the Cordoba region.

- HIDRONOR Hidroelectrica Norpatagonica, Sociedad Anonima (the utility in charge of the development and operation of the hydro resources of the North Patagonian region. It has completed the El Chocon hydroelectric project (1,200 MW) and the Planicie Banderita hydroelectric power plant (450 MW), and is commencing the construction of the Alicura hydroelectric power plant.

- SEGBA Servicios Electricos del Gran Buenos Aires (the major utility serving the Buenos Aires region).

- YACYRETA Entidad Binacional Yacyreta (the binational Paraguayan-Argentine authority in charge of the planning, construction and eventually operation of the Yacyreta hydroelectric project on the Parana river).

1.17 The regulation carried out by the Secretaria de Energia consists of:

(a) the granting of concessions for electric power supply; and

(b) the approval of electric tariffs.

However, the Secretaria de Energia does not (i) grant concessions for the installation of nuclear power plants, which are authorized directly by the President of the Republic; (ii) grant concessions for the construction of generating facilities by the companies owned by the Provincial Governments; and (iii) approve the tariffs of these companies. Also, it has little voice in the decisions regarding binational projects which up to the moment have been made by the Ministry of Foreign Affairs.

1.18 Although the Government owns virtually all major generation, transmission and distribution facilities of Argentina, the manner of controlling the various entities is not uniform (see Annex D - Attachment 1-1). As can be seen, the Secretary of Energy controls SEGBA, HIDRONOR and AyEE, the Ministry of Foreign Affairs controls the Argentine representation in the two binational

entities YACYRETA and CTMSG, the President of Argentina controls CNEA, and the Provincial Governments control the two main provincial electric utilities EPEC and DEBA.

1.19 This situation has resulted in the past in a number of unsatisfactory investment decisions and the present Government, fully aware of this situation, is preparing the first comprehensive national power expansion program (through the year 2000) and a sector organization study. Both these studies (financed by the proceeds from loan 1330-AR to SEGBA), are nearing completion and should be finished by end 1979. As a first step towards rational sector organization, the Secretaria de Energia has submitted to the pertinent Government authorities a reorganization plan of the Subsecretaria de Energia Electrica, calling for centralization in the Secretaria of planning and financial responsibilities as well as the setting of electricity tariffs. On a more long-term perspective, the Secretaria intends to organize the sector entities so that the national bulk hydro and conventional thermal generation and transmission would in the future, be the responsibility of one or more national institutions (possibly HIDRONOR and a modified AyEE), and subtransmission and distribution and sales to ultimate consumers, would be the responsibility of provincial (regional) distribution entities. During negotiations, the Government of Argentina has agreed to exchange views with the Bank, from time to time, on the evolution of the organization of the power sector.

1.20 To ensure the most economical use of sector bulk supply facilities to meet load, generation by these utilities their operation is coordinated by a central dispatching system, "Despacho Unificado de Carga (DUC)", operated by AyEE.

1.21 Basically the DUC operates satisfactorily as follows:

(a) daily load forecasts (for half-hour periods) of the system are made one day in advance;

(b) the availability of all system components (generating units, transmission circuits, etc.) is determined one day in advance;

(c) based on the availability and incremental generating cost of each component, the most economical loading of the generation and transmission system is determined with the help of a computer;

(d) DUC is responsible for calculating the average monthly power and energy bought and sold by each interconnected entity for billing purposes; and

(e) DUC is also responsible for the medium-term (up to two years) operational planning of: (i) the timing of maintenance of generating units; and (ii) the use of reservoirs.

Revaluation of Assets

1.22 There is no consistent approach to revaluation of power sector assets: e.g. SEGBA's concession stipulates using historic US dollar value adjusted only by the effect of the US dollar parity as stipulated by IMF,

while and other entities use different methods. As part of the sector organization study, the Secretaria de Energia intends to formulate proposals for a methodology of revaluation of assets taking into account both local and international inflation, such methodology to be applied uniformly in Argentina to enable all the power utilities to maintain a realistic value of their assets. This methodology will be applied in 1981 and 1982 and thereafter (see para 6.05). The Government has agreed during negotiations to exchange views with the Bank on a proposed methodology for asset revaluation, to be carried out in accordance with sound economic and financial principles, taking into account both local and international inflation.

Power Tariff Regulation

1.23 The tariffs charged by SEGBA, HIDRONOR, AyEE and CIAE are approved by the Secretaria de Energia and in the case of the provincial enterprises DEBA and EPEC by the Provincial Governments. CNEA's tariffs are fixed under agreements with the Secretaria de Energia to make them compatible with those charged by HIDRONOR.

Power Tariffs

1.24 Historically, tariff levels in Argentina have nearly always been set more on political rather than on financial/economic grounds. As a result, sector internal cash generation contributed only marginally to sector expansion in the last two decades. The Government, however, has instituted built-in financing mechanisms through the utilization of specific Funds for sector expansion. These Funds are based on taxes on hydrocarbons and electricity sales, (see Annex B for a detailed explanation of the funding and use of these Funds) and they provide a useful mechanism for channeling resources from energy consumers to priority projects. This would otherwise be difficult, given the fragmented organization of the power sector. For example, these funds helped HIDRONOR and CTMSG to build the Chocon and Salto Grande hydroelectric power plants and would also be used for the proposed project. Because of inadequate tariffs SEGBA has had to rely heavily on foreign and local borrowings to continue with its on-going expansion program. Only since the end of 1977, following extensive discussions between the Government and the Bank, have tariff levels reached reasonable values for all entities except AyEE which is expected to do so by 1981, (see para. 6.05). Due to the extreme inflationary process underway in Argentina, the Government, with a view to maintaining tariffs in line with costs, has since the beginning of 1978, granted monthly tariff increases, averaging about 6% per month. Besides the taxes on electricity sales to finance the Electric Funds, adding up to 15% of the consumers' electricity bills, the different entities collect a variety of municipal and other taxes which tend to distort the levels of tariffs between the various regions of the country. Based on the results of the sector organization study (para 1.19), the Government intends to improve this situation.

Tariff Structure

1.25 The pattern of relative price levels for the different categories of consumers appears in general reasonable e.g., large residential consumers subsidize the low "social" price levels of smaller residential consumers.

However the relative level of industrial tariffs appears to be high when compared with other Latin American countries, and the Government authorities have received numerous complaints from industrialists. The Government has been using the monthly increases mentioned in para 1.24 to improve the relationship between the levels of the different consumer categories by e.g. increasing residential tariffs more than the industrial tariffs.

Electricity Consumption

1.26 Historical public service consumption per category is shown in Annex D - Attachment 1-2. Data for some key years are shown below:

ARGENTINA

Historical Public Service Consumption per Consumer Category

Year	Residential GWH	Commercial GWH	Industrial GWH	Others GWH	Total GWH
1962	2 735	936	2 352	1 203	7 226
1970	4 987	1 853	5 241	2 013	14 094
1975	6 599	2 217	9 073	2 644	20 533
1976	6 957	2 229	8 993	2 830	21 009
Average Growth Rates % p.a.					
(1962-1975)	7.0	6.9	10.9	6.2	8.4
(1962-1976)	6.9	6.4	10.1	6.3	7.9

During this same period, captive generation has grown slowly from 4,000 to 5,000 GWh p.a.

Existing Facilities

1.27 Total installed capacity in Argentina was about 9,300 MW at the end of 1977, of which 7,324 MW corresponded to public service generation, the latter breaking down as follows:

Type	Installed Capacity (MW)	%	Firm/Effective Capacity (MW)	%
Steam Turbines	3,760	51.3	3,346	50.2
Gas Turbines	1,282	17.5	1,241	18.6
Nuclear	370	5.1	352	5.3
Hydroelectric	1,912	26.1	1,722	25.9
Total:	7,324	100 %	6,662	100 %

The existing transmission system is shown in map No. 14129. It can be seen that except for interconnections in the Litoral-Buenos Aires regions the other regions operate substantially independently.

Sector Investment Program

1.28 Investments of the major power sector entities to AyEE, SEGBA, HIDRONOR, CNEA and Salto Grande and including the transmission system related to Yacyreta) for the period 1978-1985 amount to US$8,650 million (December 1977 prices) (see Annex D, Table 6-1 for details).

Constraint on Sector Development

1.29 The major constraint on sector development, given the high level of the investment required, is the availability of local funds, and consequently the feasibility of maintaining tariff levels in line with the basic assumptions underlying the financing plan for the sector (see para. 6.05). The latter is directly related to the effectiveness of the Government's fight against inflation.

Coordination between the Bank and the Inter-American Development Bank (IDB)

1.30 In August 1976, the Minister of Economy of Argentina and the Minister of Finance of Paraguay sent letters to the Bank and IDB, requesting the participation of both Banks in the financing of the Yacyreta project. This request was later supplemented by letters from YACYRETA in October 1976. As a result, from then onwards, both Banks carried out joint missions to Argentina and Paraguay to review the project and, whenever meetings were held in Washington with representatives of the Governments of Argentina and Paraguay and of YACYRETA, such meetings were attended by staff of the two Banks. All policy decisions were agreed upon by both Banks and in general, the Banks have worked jointly in the preparation of the project and in the processing of their respective loans.

CHAPTER II

THE BENEFICIARY

General Description

2.01 The "Entidad Binacional Yacreta" (YACYRETA) was constituted under the Yacyreta Treaty between Argentina and Paraguay signed on December 3, 1973 and ratified by laws No. 20646 of Feb. 22, 1974 and No. 433 of December 28, 1973, by each country respectively; YACYRETA, whose Statutes are included in Annex A of the Treaty, was formally established on September 6, 1974 as a Binational Entity, with headquarters in Buenos Aires and Asuncion, and a capital of US$100 million equally shared between AyEE for Argentina and ANDE for Paraguay (see para. 6.12).

Organization and Administration

2.02 YACYRETA is administered by a Board of Directors ("Consejo de Administracion") and an Executive Committee ("Comite Ejecutivo") whose respective functions and responsibilities are spelled out in the Statutes of YACYRETA. The Board of Directors establishes the general policies of YACYRETA and approves important proposals made by the Executive Committee, such as loan contracts and annual budget. The Board consists of 12 members appointed by the two Governments (six for each country) for a four-year period. The Executive Director and his alternate participate as non-voting members in the Board's deliberations, which are held at least every other month. Decisions are taken with a majority of votes and, in case of a tie, are submitted for the consideration of both Governments.

2.03 The 12-member Executive Committee is in charge of the day-to-day management of YACYRETA. It includes the Executive Director and the five Directors for its legal, technical, administrative, financial and coordination functional areas as well as their respective alternates of the other nationality. Each Government appoints three directors and three alternate for each country, as proposed by AyEE and ANDE respectively for five-year periods. The Executive Committee meets at least twice a month and decisions are taken with a majority of votes. In a side letter signed simultaneously with the Treaty, the two Governments agreed that during the first two five-year periods, i.e. until 1983, the Executive, Technical and Financial Directors would be appointed by Argentina and the Legal, Administrative and Coordination Directors by Paraguay (and vice-versa for their alternates).

2.04 On the basis of the broad responsibilities and functions defined in its Statutes, YACYRETA has, with the help of international consultants, finalized its organizational structure for the period of the project execution (see Annex D - Attachment 2-1). YACYRETA is presently also studying, with the help of consultants, the optimization of intra-company information flows for the construction period. Its organizational structure and definition of responsibilities have been reviewed by the Bank and found acceptable, taking into account the constraints imposed by the binational character of YACYRETA in particular with regards to staffing and decision-making procedures. Beyond 1985 YACYRETA's organization will necessarily evolve, however, as the Entity enters progressively into its operating/commercial stage.

Personnel

2.05 YACYRETA's staff numbered 375 as of June 30, 1978. These were approximately equally distributed between the Buenos Aires and Asuncion offices, in accordance with the terms of the Treaty (Article XI) which stipulates that, in as much as possible, equal manpower, skilled and non-skilled, should be used from the two countries. This policy is expected to be applied during the whole life of the project. YACYRETA has been, and is expected to continue to be able to attract qualified and experienced staff thanks to competitive salaries and benefits.

Accounting and Financial Systems

2.06 YACYRETA has qualified staff in the area of management systems. It has, for example, been able to develop its own computer model for financial projections. However, present accounting procedures, primarily manual, are likely to prove inadequate when major construction starts. So far, preparation of financial statements has, on average, taken two months, which is excessive in view of YACYRETA's presently limited activities. Within 12 months of loan signature, YACYRETA has agreed to provide the Bank with evidence that it has implemented an acceptable accounting system for the project execution phase, and will, if the Bank deems it necessary, hire consultants to assist in improving it.

2.07 YACYRETA decided on July 27, 1976 to choose the Special Drawing Right (SDR) as the currency of account 1/. However this decision may result, in the future, in burdensome bookkeeping reconciliations since (i) most of the foreign transactions (i.e. relative to equipment contracts and loans) are likely to be expressed in US dollars, and (ii) the Treaty itself implicitly recognizes the US dollar as the currency of reference 2/. The external auditors, in their first report, should express their judgement on the adequacy of the present procedures and propose changes if necessary (para. 2.08).

Auditing

2.08 YACYRETA's internal auditing section reports directly to the Executive Director and its work is considered satisfactory; its staff will be increased as the volume of transactions rises. YACYRETA's financial statements for 1975, 1976, 1977 have been externally audited by individual Argentinian and Paraguayan CPA's; a similar arrangement has been considered acceptable for the 1978 accounts in view of the relatively small volume of transactions during that year. YACYRETA has agreed during negotiations, to have its financial statements (including a sources and applications of funds statement) audited, starting in 1979, by an independent CPA firm acceptable to the Bank; their first report will include an evaluation of YACYRETA's accounting procedures, in particular with respect to the present currency of account, and their recommendations for changes, if necessary; YACYRETA has agreed to discuss these recommendations with the Bank.

Insurance

2.09 YACYRETA will, at the suggestion of the Bank, hire an international expert to advise it on insurance policy by September 30, 1979. 3/ YACYRETA has agreed during negotiations to discuss the expert's recommendations with the Bank.

1/ Transactions are first registered in their original currency and then converted in SDR at the prevailing exchange rate between the SDR and this currency at the time of the transaction.

2/ By relating the escalation formula to the variations between the US dollar and the SDR, and other indices expressed in US dollars. (see Annex C, Table A-1).

3/ Later (August 1979) changed to November 30, 1979.

CHAPTER III

THE POWER MARKET

3.01 The Secretaria de Energia carried out a detailed analysis of the historical power market of Argentina. For this purpose the country was subdivided into nine different electrical regions as follows:

(a) Greater Buenos Aires (GBA);

(b) Litoral, covering the Provinces of Santa Fe and Entre Rios and the northeast of the Province of Buenos Aires;

(c) Comahue, covering the Provinces of Neuquen, Rio Negro and La Pampa;

(d) Buenos Aires Sur (BAS), covering the southern part of the Province of Buenos Aires not covered by GBA;

(e) Centro, covering the Provinces of Cordoba and San Luis;

(f) Cuyo, covering the Provinces of San Juan and Mendoza;

(g) Northeast Argentina (NEA), covering the Provinces of Corrientes, Chaco, Formosa and Misiones;

(h) Northwest Argentina (NOA), covering the Provinces of Jujuy, Salta, Tucuman, Catamarca, Santiago del Estero and La Rioja; and

(i) Patagonica, covering the Provinces of Chubut and Santa Cruz.

3.02 Five regions, GBA, Litoral, Comahue, BAS and Centro, are electrically interconnected and form the "Sistema Interconectado Nacional" (SIN). An analysis was carried out for those regions not connected to the SIN, as to what would be the least cost solution for meeting the growing demand in those regions through 1985, and it was shown that the least cost solution for discount rates up to at least 20% would be to interconnect these regions with the SIN. (See Map No. 14129)

Public Service Consumption

3.03 The forecast of public service consumption for the period 1978-1985 is based on estimated regional growth rates. To prepare these regional forecasts, the historical regional trends for the periods 1965-1972, 1965-1973 and 1965-1974, 1/ were analyzed and the lowest of these historical growth

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1/ Historic data is shown in Annex D - Attachment 3-4.

rates were used as the base forecast for the future. The years 1975 and 1976 were not included in the analysis because it was thought that it would be unrealistic to consider years corresponding to an extremely serious period of economic recession.

3.04 The base average annual growth rates of public service sector consumption that were adopted for each region are the following: GBA: 7%; Litoral Subregion A 1/: 9.9%; Subregion B 2/: 11.7%; Comahue: 13.3%; BAS: 11.0%; Centro: 7.5%; Cuyo: 12.5%; NEA: 11.7%; NOA: 12.2%; and Patagonica: 4.2%. These average growth rates were projected from 1978 onwards in all regions. 3/ The resulting average annual growth rate for the whole country is 8.8% for the period 1978-1985 and 8% p.a. for the period 1975-1985.

3.05 A number of important industrial projects under construction such as aluminum smelters, electric furnaces for the steel industries, and heavy water production facilities cannot be considered to be covered by the above historical trends because of their special electricity-intensive characteristics. These special industries have been estimated to consume 5960 GWh in 1985 with a maximum demand of 910 MW; 95% of this load is expected to be connected by 1982.

3.06 Adding these special industries to the base forecast, the average annual growth rate increases to 9.9% for the period 1978-1985 and 9.1% for the period 1975-1985. The growth rate is higher at the beginning of the period due to the incorporation of the special industries mentioned above and tapers off to reach 8.3% for the year 1984-1985. These projections are reasonable when compared to historical growth rates; for the period 1965-1974, the average annual growth rate was 8.6% and for the period 1967-1972, one of economic stability in Argentina, the average growth rate was 10.7%.

3.07 For the period 1985-2000 the public service growth rate was assumed to continue at the same rate as at the end of the 1978-1985 period, i.e., 8.3% p.a., which corresponds to the historical load growth on a more long-term basis.

Captive Generation

3.08 Captive generation has historically grown at a lower rate than public service. While it accounted for nearly 30% of total consumption in 1965, its share had decreased to 17% in 1977. The Secretaria de Energia has projected the increase of captive generation so that by the year 2000, it would not represent more than 5% of total consumption, which is reasonable. This corresponds to an average annual increase of 2.7%.

1/ Excluding the northeast of Buenos Aires Provinces.
2/ Northeast of Buenos Aires Province.
3/ In Comahue and Cuyo, they were used from 1979 onwards, using lower figures for 1978 (See Annex D - Attachment 3-4).

Total Consumption in Relation to Economic Growth

3.09 Total consumption, public service and captive is expected to grow at an annual average growth rate of 9% for the period 1978-1985 and 7.9% for the period 1986-2000, averaging 8.3% for the total period 1978-2000. (See Annex D, Attachment 3-2.)

3.10 This market forecast was checked against macroeconomic assumptions by correlations between GDP and total consumption, exclusive of the electricity-intensive consumers for which no historical data exist and which should have little influence on the GDP. The base forecast correlates well with an average annual GDP growth of 5.5% p.a., which is the Government's goal for the period 1978-1985, and which compares with an annual GDP growth of 5.7% during the period 1968-1974, when economic stability prevailed in Argentina.

Generation Forecasts

3.11 For the purpose of preparing energy and demand balances, losses in distribution, subtransmission and transmission were added to convert the consumption forecast to the generation forecast, and the load factors of the different regions were used to calculate the regional maximum demands. To arrive at total maximum demand, decreasing diversity factors were used during the period until total interconnection is achieved (1984). (See Annex D - Attachment 3-2.)

Expansion Plan for the Period 1978-1985

3.12 During 1977, the Secretaria de Energia completed the first phase (1977-1985) of the national power expansion program which is now under construction and which adds 7,877 MW of installed capacity of which 5000 MW is hydroelectric. During this same period, 900 MW of obsolete thermal plant will be eliminated. Annex D - Attachment 3-1 shows the list of the addition of generating capacity through 1985 (see para. 1.27 for existing facilities). This investment program is the result of previous commitments made by the previous Government and which were not always based on choosing the least cost alternative but rather were motivated by political or other non-economic considerations. The present Government, given the constraints of the commitments, has optimized the commissioning sequence of the individual projects so that each project is completed when needed and unnecessary premature investments are avoided. Under these conditions this program is reasonable. From 1985 onwards the expansion program is based on the least cost alternative approach (see paras 7.01 through 7.04).

CHAPTER IV

THE PROJECT

Background

4.01 The Yacyreta hydroelectric project has its origin in studies carried out since the beginning of this century initially with the main objective of improving navigation on the Parana river at the rapids of Apipe. In 1958 the Governments of Argentina and Paraguay formed the "Comision Mixta Tecnica Paraguayo-Argentina" (CMT) for the purpose of studying the hydroelectric potential of these rapids and improvements in navigation. The prefeasibility study was completed in 1964, and in 1971 an international consortium of consultants, formed by Harza Engineering Co. (U.S.), Lahmeyer International GMBH (Germany), A.D.E., S.A. (Argentina), Yacyreta S.A. (Paraguay) and Cuyum, S.A. (Argentina) was hired to prepare a feasibility study. This study was completed in December 1973, and its conclusions provided the basis for the preparation of the Treaty of Yacyreta which was ratified in that same month by both Governments.

4.02 The more important aspects contained in the treaty relate to:

(i) the creation of "Entidad Binacional Yacyreta" (YACYRETA) to study, design, build and operate the Yacyreta hydroelectric project and related works;

(ii) the co-ownership of the works to be constructed;

(iii) the ratification of the principle of free river navigation and the construction of the necessary facilities to this effect; and

(iv) the rules on the use of energy produced by the project.

The Treaty has three annexes:

(a) statutes of YACYRETA;

(b) description of the works for electricity production, navigation improvements, complementary works for other uses of the Parana, e.g. irrigation; and

(c) financial agreements on level of tariffs, escalation, etc. (see Chapter VI).

4.03 A further step in the preparation of the project was taken in 1974, when YACYRETA hired the consortium Harza, Lahmeyer and Associates to prepare the final design for the project which has been practically completed during the period 1974-1978.

Project Description and Objectives

4.04 The project is located on the Parana river, the international boundary between Argentina and Paraguay (see Map No. 14128), about 80 kms. downstream from the towns of Posadas (Argentina) and Encarnacion (Paraguay).

The main objective of the project is to provide base-load hydroelectric energy for Argentina's power sector. Other objectives are to improve navigation on the Parana river by eliminating the rapids of Apipe and to provide possible irrigation for both Argentina and Paraguay in the provinces of Misiones and Corrientes and the Department of Itaipu, respectively, and to augment the fishery industry of the region. Article VI of the Yacyreta Treaty stipulates that Argentina and Paraguay would carry out the demarcation of their common boundary in the project area as established in Article I of the Boundary Treaty of February 3, 1876. During negotiation, Argentina and Paraguay agreed to take all necessary steps to satisfy this requirement for the project area six months before taking any project related action which would affect the natural course of the Parana river. As a condition of effectiveness of the Bank loan, Argentina and Paraguay agreed to take initial measures satisfactory to the Bank with respect to Article VI of the Treaty.

4.05 The project comprises:

(a) an earth dam, approximately 70 km long 1/ (including power house, spillways and navigation lock), with a uniform elevation above sea-level of 86 m, and a maximum height of 33 m, creating a reservoir with an area of about 1,700 km^2 and a total storage capacity of 21,000 hm^3;

(b) two spillways with a total discharge capacity of 95,000 m^3/sec;

(c) a conventional covered power house with 20 Kaplan turbines 2/ of 135 MW, operating at 71.4 rpm; 20 generators of 150 MVA, with a power factor of 0.9, operating at 50 c/s, 13.2 kv; and transformers, control equipment, etc.;

(d) fish passage facilities to preserve the enormous fishery resources of the Parana river;

(e) a navigation lock which would allow the passage of ships with a maximum draft of 12 ft;

(f) irrigation intakes, one in each country each with a maximum intake capacity of less than 1% of average river flow, to permit the development of agriculture in the lands bordering the reservoir. The project only includes the intake structure. The irrigation infrastructure will be designed and built by the corresponding national authorities;

(g) the Aguapey dike, 3/ with the same elevation as the main dam, to avoid flooding of potentially rich agricultural land in Paraguay;

1/ Total earthfill 58 Mm^3, with concrete works totalling 3.3 Mm^3.

2/ The power house will contain intake structures for 10 additional units to be possibly installed in the future when the extra peaking capacity would be justified.

3/ During negotiations between Argentina and Paraguay in 1979, three minor dikes, having marginal additional costs, were included in the Project. These dikes are: Tacuary, Caraguata and San Martin.

(h) permanent villages to house supervisory personnel during construction and, afterwards, the personnel in charge of operation;

(i) about 90 km. of access roads which will be incorporated to the road systems of both countries;

(j) a bridge, 1500 m. long, over the Ana-Cua branch of the river needed for access to the project site;

(k) the relocation of infrastructure works such as railways, ports, highways, sanitation works and electric and telephone installations;

(l) the resettlement of about 33,000 persons on both riverbanks as the result of the creation of the main reservoir (see Annex A); and

(m) studies to be carried out by the Secretaria de Energia related to the power sector, consisting of (see para. 4.06):

(i) design for the future national transmission system, and

(ii) the use of micro and/or small hydroelectric power plants in isolated regions.

Studies

4.06 The Secretaria de Energia has requested, following the example of the Bank's loan to SEGBA (Loan 1330-AR), that the Bank loan for the Yacyreta project also help finance studies to be carried out by the Secretaria. These studies would be:

(i) Feasibility studies including technical studies such as stability, short-circuit, etc. and the necessary engineering for preparing bidding documents for the development of the high voltage (above 220 kV) transmission system of Argentina. These studies would take about 24 months with a total input of about 530 staff-months of consultant input. Foreign consultants (30% of total) are estimated to cost US$6,000 per staff-month and local consultants (70%) from US$4,000 to US$5,000 per man-month.

(ii) Studies to determine the possibility of using micro and/or small hydroelectric power stations to provide electric energy to isolated regions. This would include all the necessary studies up to and including the preparation of a feasibility study. These studies would take about 12 months with a total input of about 140 staff-months of consultants input of which about 20% is estimated to be foreign cost calculated at US$8,000 per month (short-term services of high-level experts) and 80% of local cost estimated at an average of about US$3,500 per staff-month (principally field exploration).

Transmission system

4.07 Although the transmission system associated with Yacyreta would not be financed by the Bank loan and does not form part of the project, 1/ it has been analysed and its costs have been estimated (see paras. 4.08-4.10).

4.08 The Secretaria de Energia, as part of the national power expansion study financed by the Bank through Loan 1330-AR to SEGBA has carried out a prefeasibility study of the expansion for the national high voltage transmission system for the period 1982-1994. This study, based on the demand forecast and generation expansion program, considers the nine different electrical regions of Argentina (see para 3.01) and analyzes different alternatives for transmission voltages ranging from 220 to 750 kv alternating current and from ±250 to ±600 kv direct current. The method of optimization was based on a linear programming model and its conclusions are complemented by load flow, stability and short-circuit studies.

4.09 The study concludes that for the development of the national high voltage transmission system 500 kv a.c. is the least cost solution for discount rates up to at least 20% except for the interconnection between the North-East and North-West regions. In this latter case, ±400 kv d.c. appears to be the least-cost solution, subject to further studies to confirm the solution for this interconnection. These conclusions do not exclude the possibility of a future interconnection with Brazil, which would have to be in direct current anyway given the different frequencies used in the two countries (60 Hz-Brasil, 50 Hz-Argentina). Such an interconnection would allow both countries to benefit from the diversity between the patterns of load curves and hydrological conditions of the two electric systems leading to savings in power sector investments and operational costs in both countries. An interconnection, for example, could be possible once negotiations are concluded to build Corpus, a binational Argentina/Paraguay hydroelectric project further upstream on the Parana river, or Roncador and Garabi, two binational Brazil/Argentina hydroelectric projects, on the Uruguay river.

4.10 This study also identified the specific transmission system related to Yacyreta and its construction chronogram (1982-1988) is shown in Annex D - Attachment 4-1. The estimated cost is US$512 million (December 1977 price levels) and this figure was used in the economic justification of the project.

4.11 The Secretaria de Energia has decided that, with the exception of the transmission systems related to hydroelectric projects built by HIDRONOR in the Comahue region, all other transmission developments in Argentina will be built in the future by AyEE. For this purpose AyEE has created a special group within its organization, reporting directly to the General Manager, which is in charge of the engineering, procurement and supervision of construction of the high voltage transmission system. The activities of this group will be

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1/ The construction of this transmission system is the responsibility of the Argentine Government (through AyEE).

coordinated by the Secretaria de Energia who has appointed a high-level official to carry out this coordination. The Secretaria will be responsible for the planning of the future transmission network and for the channelling of the necessary funds.

4.12 Given the importance that the timing and execution of the transmission system related to Yacyreta has for utilization of the project's energy production, the Argentine Government has agreed during negotiations that within 12 months after the signing of the loan, a satisfactory overall financing plan would be prepared for this transmission system and that it would provide adequate funds for its construction.

Status of Engineering Design

4.13 The preparation of the designs and bidding documents for the main civil works and the electromechanical equipment is practically completed.

4.14 The engineering and design of all infrastructure works to be relocated are well-advanced. Bidding documents are under preparation, requiring only the results of some topographical and geological studies currently underway and which should be completed very shortly. These designs have been approved in each country by the corresponding competent authority responsible for these services.

4.15 The designs for the dwelling and community facilities for resettlement of the people affected by the flooding caused by the reservoir, in Encarnacion (Paraguay) are satisfactorily advanced, but those in Posadas (Argentina) have been delayed because of redesign requested by the Bank and IDB. Bank and IDB staff are actively involved in assisting YACYRETA to formulate adequate policies for resettlement (see Annex A).

Project Execution

4.16 YACYRETA has decided to continue with the services of Harza Eng. Co. (U.S.A.) together with Lahmeyer International (Germany) and their Argentine and Paraguay associates for the preparation of final designs and for the technical supervision of the execution of the project. This new consortium called "Consultores Internacionales de Yacyreta" (CIDY), has negotiated and signed a contract with YACYRETA, satisfactory to the Bank and IDB. CIDY will have total responsibility for supervising the execution of the project, and YACYRETA intends to control the activity of its consultant by establishing on the project site a superintendent of works with a small group of qualified professionals. (See organization chart in Attachment 2-1 of Annex D). Given the exceptional size of the project both in physical and in financial terms, YACYRETA has agreed during negotiations to hire a panel of well-known international experts satisfactory to the Bank in different disciplines (geology, hydraulics etc.), to review the concept of the dam and related structures and the adequacy of their design and to conduct periodic reviews

of the dam and structures during construction. YACYRETA also agreed to propose to the Bank for review not later than one year before the expected completion of the dam, appropriate arrangements to periodically inspect the dam and related structures during the operation of the project.

4.17 The execution of the main civil works contract which is the critical path of the project, will commence with mobilization of the contractor, foreseen for November 1979 and will be completed in approximately 10 years when the last of the 20 units will be installed. This period can be divided into three main stages as follows:

(i) First stage. During the first stage of about 47 months the river will flow normally. The preparatory works will be completed, the first stage of the spillways will be built, the navigation lock will have been completed and construction of the powerhouse, side embankments and the main dam will have begun;

(ii) Second stage. During this period of about 10 months, the building of the cofferdams and river diversion will be carried out; and

(iii) Third stage. This last stage of about 63 months includes the completion of the main dam, the dikes, spillways and powerhouse and the erection of the 20 units commencing in 1985 and ending in 1989. The reservoir will be filled at the beginning of 1985.

Procurement

4.18 For the execution of the project the following bidding chronogram, corresponding to the more important project components, is foreseen.

Item	Start of bidding procedure	Receipt of bids	Bid award
Turbines and generators	November 1978	May 1979	October 1979
Gates	November 1978	March 1979	June 1979
Main civil works contract	November 1978	May 1979	October 1979

The procurement program for the remaining project components considers placing practically all the orders during 1980 and 1981. The contracts for the construction of the relocation works (infrastructure and dwellings) will be placed in agreement with the requirements of the relocation program (see Annex A).

4.19 The Bank-financed portion of the project, i.e., the civil works contract, would be awarded through ICB under procedures in agreement with the Bank's guidelines for procurement. The bulk of the construction equipment for the civil works contract would be financed by export credits (see para. 5.14) obtained by YACYRETA from the major industrialized countries. Bidders will be obliged to make use of these credits for "major" construction equipment (unit price above US$100,000) 1/ and will be free to use them or not for minor equipment leaving the choice of supplier and country up to the bidder. Bidders will quote on the one hand, unit prices excluding the cost of the construction equipment financed by export credits from such unit prices, and on the other hand the cost of the construction equipment, both major and that portion of the minor financed by these export credits. Bids will be evaluated on a cash basis by adding the two items mentioned above without taking into account financing charges. All other contracts for goods and services will be awarded as the result of public bidding for all contracts with a value above US$500,000; contracts for relocation and resettlement works will be restricted to Argentine and Paraguayan contractors.

4.20 Given the size of the main civil works contract and the importance of the contracts for generating equipment, YACYRETA has carried out prequalification exercises for both civil works contractors and suppliers of turbines, generators and regulators. In the case of the civil works contractors, of 15 interested bidders five were prequalified and in the case of suppliers for generating equipment all the interested major international manufacturers were prequalified.

Disbursements

4.21 Disbursements for the Bank loan of US$210 million would be as follows: (a) 38% of foreign expenditures for the main civil works contract (excluding construction equipment financed by export credits), during the period 1979-1985, the latter being the year when the major part of the civil works will have been completed and the first generating units will have been commissioned; (b) 50% of foreign expenditures for engineering services for project execution during the loan disbursement period, 1979-1985; and (c) 50% of expenditures for consulting services for studies related to the power sector to be carried out by the Secretaria de Energia. Disbursements would be made against normal documentation duly certified by YACYRETA. The estimated schedule of loan disbursement is shown in Annex D - attachment 4.2.

Environmental Aspects

4.22 The environmental impact that the project will cause is related to the transformation of the river's natural flow conditions (see para. 4.23) and the flooding of areas in Argentina and Paraguay (see Annex A). Research on the ecological aspects of the project began in 1972, and to date several field studies have been completed. In September 1978, YACYRETA approved a long-range program for the environment coordinated with project implementation that includes studies on water quality, fishery resources, river-bank forestry

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1/ This does not actually cause any restriction on procurement as this type of equipment is only manufactured in a limited number of industrialized countries which have offered these export credits (see para 5.14).

species, development of natural reserves, animal rescue, reservoir cleaning and public health. This program is acceptable to the Bank, and during negotiations YACYRETA agreed that this program would be carried out.

4.23 One of the outstanding ecological features of the Yacyreta project is the proposed construction of up-stream migration fish passage/facilities using modern technology. Construction of the Yacyreta dam without these facilities would mean closing off 650 km of the river to fish migration with possible adverse effects on reproduction of the species and fishing all along the river. The planned fish passage facilities provide for the passage of species with a broad range of behavioral patterns such as displacement velocities and normal depth habitat. Downstream migration of the fish will be allowed through the spillways, navigation lock and the turbines themselves. In order to develop the fishery potential of the Yacyreta reservoir, YACYRETA has decided to set up a special program to study fishery resources. The first phase will include research on the bioecology of major fish species and on inventory of fish industries and fishery conditions in the zone. These studies will serve as the basis for the formulation and implemention of a program to develop and manage fish production.

4.24 Conversion of the river into a reservoir will produce changes in water quality such as turbidity, conductivity, alkalinity (pH factor) and biological productivity of phytoplankton. However, these changes will not have damaging effects since the power plant will be operated as a "run-of-the river" plant to permit a steady flow of the water. The most negative effects will be felt immediately after the reservoir is filled because of the decomposition of organic material in the flooded area. YACYRETA is preparing guidelines for clearing as much of the dam area as necessary to achieve acceptable quality of water including ways of utilizing the resulting timber. The correct implementation of this program should decrease significantly the negative effects during the early years.

4.25 Over the long run water quality can be negatively affected by pollution resulting from population growth and industrial development in the area. Treatment plants for liquid waste are envisaged in the Posadas and Encarnacion resettlement projects, and since these cities do not have such facilities at this moment, river pollution from this source will decline. YACYRETA will install in the near future a hydrobiological laboratory in Posadas to monitor water quality.

4.26 The experience of other dams in similar climates indicates that it may be possible to develop in the Yacyreta reservoir conditions that will discourage water hyacinths and ferns. The problem will be more serious in shallow areas. Clearing of the reservoir will help to impede development of that vegetation, which needs a suitable bottom in which to anchor. However, control measures may have to be adopted in the future. Eutrophication, that is, the reduction of oxygen levels, transformation of organic material into gases such as toxic hydrogenated sulphurs, are not expected to be important because Yacyreta is a run-of-the-river plant, but the process will have to be carefully monitored.

4.27 The flooded areas, mainly on the Island of Yacyreta, contains certain species of animals in danger of extinction. These include swamp deer, maned wolf (aguara-guazu), alligator (yacare) and possibly two species of otter. YACYRETA has decided to create a natural reserve park in Paraguayan

territory for transfer of the wild animals in the area. Preliminary studies have already been made for the placement of that reserve, since transfer of the species on Yacyreta Island should be carried out at the time construction begins in the area.

4.28 Operation of the Yacyreta plant will produce certain fluctuations in river level downstream of the dam. However, no significant erosion is expected to occur because of its development nor will it have any harmful effect on navigation. Proposed operation of the plant stipulates that minimum water discharge will be very similar to the minimum average river flow and, since this is a "run-of-the-river" plant, the difference in water level between dry and rainy seasons will closely follow normal river behavior.

4.29 Project construction will not exert negative effects on the life cycle of fish and other aquatic organisms living downstream from the dam. The variation in oxygen level from water discharge will not be expected to be significant. A 4.5 Km section of the Ana-Cua arm would be dried up when the spillway located on that arm is not in use (78.5% of the time). Another 6 Km of that arm would receive only water from the Atinguy arroyo. Since this will form shallow pools of water with unfavorable ecological and health effects, the problem is being studied by YACYRETA, which is considering the possibility of maintaining a minimum water flow in the Ana-Cua arm.

4.30 Conservation of river bank forestry species is an important aspect of ecology in the project zone. YACYRETA has decided to carry out a program aimed at making recommendations on proper use and conservation of the forest and river-side habitat. This will not only help reduce evaporation and waves but will also reduce erosion and increase the esthetic value of the project, which is highly important for tourism.

4.31 YACYRETA, since 1975, has conducted studies on health aspects in the project zone, ascertaining that water-borne diseases are present in the area. Seventy percent of the population suffers from intestinal parasites. There is also the risk of contracting diseases transmitted by vectors (malaria, Chagas disease, yellow fever, etc.). The construction contracts contain provisions on health actions designed to control endemic diseases in the area. Moreover, YACYRETA has asked the Ministries of Health in Argentina and Paraguay to request public health specialists from the Pan American Health Organization to advise it in this matter, and YACYRETA's ecology unit will monitor all health aspects from now on.

4.32 Finally, archaeological reconnaisance and, if necessary, salvage will be undertaken by the Universidad Nacional de Misiones in Argentina, and by Paraguayan archaeologists in Paraguay.

Risks

4.33 No special physical risks are foreseen in the execution of the project, given (a) the advanced stage of topographical and geological studies and of the engineering design; and (b) the competence of the consultant consortium which will be in charge of the supervision of project execution.

4.34 The major foreseeable risk is of a financial nature, namely the availability of local funds and the capability of Argentina to obtain the necessary loans from the international banking community. If the economic situation of Argentina were to deteriorate in the future and the authorities were unable to increase tariffs as needed (in nominal terms) and/or YACYRETA would be unable to obtain the foreign loans as assumed, the project might be delayed, and as a result have important cost-overruns and in general enter into difficulties in its execution. Another possible risk, given the bi-national nature of YACYRETA (para 2.04), is that management effectiveness might be strained when taking important decisions on procurement and in carrying out satisfactorily the relocation/resettlement program (para 4.35).

4.35 The resettlement program for the 33,000 persons affected by the flooding of the reservoir area is complex (see Annex A), and YACYRETA has recognized the difficulty of and the enormous importance of this component of the project. With the assistance of Bank and IDB staff, YACYRETA is taking satisfactory steps to prepare a complete resettlement program by 1980. For example, YACYRETA has (i) established a unit of qualified professionals responsible for the planning and implementation of the resettlement program; (ii) prepared a skeleton chronogram, satisfactory to the Bank, for its implementation; (iii) taken steps to accelerate the acquisition of land identified for resettlement programs in Argentina and Paraguay; (iv) established an office of property assessment; (v) initiated publicity programs; and (vi) made substantial progress in the preparation of rural resettlement programs. During negotiations YACYRETA has agreed to carry out the resettlement agreed to carry out the resettlement component according to programs and timetables satisfactory to the Bank. The Bank, on its part, is planning to review progress of this component with frequent supervision missions to the project area.

CHAPTER V

PROJECT COST AND FINANCING

Project Costs

5.01 The project cost estimate for the construction period 1979-1990 is summarized below:

Millions of US dollars [1] (December 1977 price levels)

A. Project Works	Local Cost	Foreign Cost	Total	%
Direct Construction Cost				
Preliminary works	103.3	-	103.3	3
Main civil works	516.8	557.7	1,074.5	28
Generation equipment	12.8	232.4	245.2	6
Electro-mechanical equipment	66.0	90.3	156.3	4
Navigation lock	78.8	51.4	130.2	3
Land	66.4	-	66.4	2
Relocation/Resettlement (economic)	172.7	-	172.7	5
Relocation/Resettlement (improvements)	189.3	-	189.3	5
Sub-Total	1,206.1	931.8	2,137.9	56
Engineering and Administration				
Engineering and Supervision	79.5	53.0	132.5	4
Administration	90.0	-	90.0	2
Sub-Total	169.5	53.0	222.5	6
TOTAL DIRECT COSTS	1,375.6	984.8	2,360.4	62
Physical contingency	168.4	128.5	296.9	8
Price contingency	643.1	405.9	1,049.0	28
TOTAL ESTIMATED CONSTRUCTION COST [2]	2,187.1	1,519.2	3,706.3	98
Working capital	74.7	-	74.7	2
TOTAL	2,261.8	1,519.2	3,781.0	100
B. Studies				
Base cost	2.2	0.9	3.1	81
Contingencies	0.4	0.2	0.6	19
TOTAL	2.6	1.1	3.7	100

1/ Given the high rate of inflation in Argentina (about 170% during 1978). it would not be meaningful to estimate local price contingencies, and thus overall project costs in Argentine currency.

2/ Without financial charges.

September, 1979

Basis for Cost Estimates

5.02 The original cost estimate was prepared by Harza, Lahmeyer and Associates (the consultant) with July 1976 price levels. At the request of the Bank and IDB at the end of 1977, an independent cost estimate of the cost of the main civil works contract and the electro-mechanical equipment was prepared by A.A. Mathews, Inc., a consulting firm with special expertise in preparing cost estimates. The costs of the Aguapey dike, preliminary works and relocation were revised jointly by YACYRETA and the consultant. A.A. Mathews was also required to update the overall cost to December 1977 prices and to propose escalation coefficients for local cost during the construction period. A.A. Mathews' final figures were substantially the same as the consultant's original figures and were those finally adopted.

5.03 The direct cost estimate of the main civil works contract was based on an analysis of unit prices of labor, equipment and materials and on quantities derived from the engineering analysis. General expenses and mark-up by the contractor were then added. To establish local and foreign components of this cost the following assumptions were made:

(a) All labor would be local (Argentine and Paraguayan) with the exception of a small number of foreign experts to initially help train local labor and to supervise erection of equipment.

(b) Construction equipment costs were based on the unit costs used by the U.S. "Construction Equipment Cost Reference Guide", adjusted for local conditions. Internal transport, maintenance personnel, fuel, lubricants and general expenses were considered local cost while the C.I.F. price of equipment and spare parts was considered foreign costs.

(c) All construction materials were assumed to be of local origin.

5.04 The cost of the electromechanical equipment was estimated on the basis of recently known bids and from information obtained from major international manufacturers. Turbines, generators, regulators and control equipment were assumed to be foreign cost while transformers, cranes, gates and auxiliary equipment were assumed to have the same foreign/local cost composition as in similar equipment used in the Salto Grande project. Erection was assumed to be carried out according to normal practice i.e. supervision by the manufacturer using locally hired contractors.

5.05 The cost of the preliminary works, assumed to be totally local, was estimated on the basis of recently awarded local bids.

5.06 The estimate of the costs - assumed local - of the relocation of affected infrastructure works and the resettlement of about 33,000 persons was prepared by the consultants in agreement with the corresponding national agencies for the different infrastructure works and was reviewed by YACYRETA. These cost estimates, although apparently conservative, were considered to be

approximate given the status of the design of the different components and therefore a physical contingency of 20% was applied to all the relocation-resettlement costs. For the purpose of project economic and financial analyses, the relocation costs were analyzed from two different points of view, namely (i) their so-called economic cost, the portion of these costs attributable to the project, which was used in the project economic analysis and (ii) the financial cost to YACYRETA which includes the improvements desired, and agreed upon by, the Governments of Argentina and Paraguay in the infrastructure works and in the living conditions of the people affected by the project. Attachment 5-1 of Annex D shows a breakdown of both the economic and financial cost, per country. The financial projections assume that, in the case of Argentina, this additional cost would be borne by YACYRETA, which in turn would pass it on to the electric power sector of Argentina through its tariffs, although it is expected that agreements would be reached eventually with Argentine institutions that will benefit from this additional investment (e.g. Ministries of Housing and Transportation) to restitute the corresponding funds to the power sector. In the case of Paraguay, the Argentine Government has agreed to finance the improvements in Paraguay through the Argentine power sector.

5.07 The cost related to engineering and supervision, which represent about 6.7% of the direct construction cost of the project, is based on a negotiated contract with CIDY. The proposed contract stipulates that Harza would be leader of the consortium and that the local (Argentina and Paraguay) contribution would be 70% in volume. The total cost is based on an average staff-month cost of foreign consultants of about US$6,000 and of local consultants of about US$4,000.

5.08 The administration costs during the construction period were estimated on the basis of YACYRETA's 1978 budget.

5.09 The values of physical contingencies were estimated as follows:

civil works	15%
electromechanical equipment	8%
relocation and resettlement	20%
engineering and supervision	12%

5.10 Price contingencies adopted for the foreign cost component of the project are the following:

	Equipment	%	Civil Works
1978	7.0		8.0
1979	6.5		7.5
1980 and thereafter	6.0 p.a.		7.0 p.a.

These figures give a total foreign cost price escalation of 36% over the construction period.

5.11 Price contingencies for the local cost component of the project were analyzed by "Fundacion Investigaciones Economicas Latinoamericanas," an Argentine firm specialized in economic studies, subcontracted by A.A. Mathews Inc. (para 5.02) and reviewed by Bank and IDB staff. Fifteen different elements for the project's local cost were analyzed separately, resulting in the following final escalation coefficients for the most important items:

	Labor	Steel	Cement
1977	1.00	1.00	1.00
1978	1.035	1.047	1.006
1979	1.123	1.130	1.039
1980	1.259	1.198	1.075
1981	1.407	1.270	1.112
1982	1.581	1.347	1.149
1983	1.733	1.427	1.189
1984	1.893	1.513	1.227
1985	2.068	1.604	1.271
1986	2.259	1.700	1.314
1987	2.468	1.822	1.359
1988	2.697	1.910	1.409
1989	2.946	2.024	1.453
Average annual % of growth	9.42	6.05	3.16

Labor costs were assumed to increase in real terms 1/ during the construction period due to the current depression of wages in Argentina, and cement costs were assumed to decrease in real terms due to technological improvements presently being implemented in the industry. Total local cost price escalation, expressed in US dollars, over the construction period is 42%.

Project Financing

5.12 Total financial requirements for YACYRETA over the 1978-1990 period are estimated at US$7,038 million, including:

(i) the basic cost of the project of US$3,781 million (para. 5.01); and

(ii) debt service of US$3,257 million.

Total foreign exchange requirements are estimated at US$4,107 million, i.e., 58% of the total. Foreign sources of financing, which include the Bank, IDB, Buyers' Credits and foreign commercial banks are expected to cover 48% of total direct project expenditures (excluding debt service and working capital requirements) and 31% of total financial requirements during the period. Local financing includes capital contributions, loans from the Electrical Funds, local bank loans, and YACYRETA's gross internal cash generation. YACYRETA's overall financing plan for the period 1978-1990 is summarized below:

1/ An average of 4.5% p.a. for the period 1979-1983, when it was assumed that salaries would regain the purchasing power of 1975, and 2% p.a. thereafter.

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Overall Financing Plan 1978-1990

(in millions of current US$)

	Financial Requirements			Financial Sources							
Direct Cost of Project	FC	LC	Total	IBRD	IDE	Suppliers' Credits	Foreign Banks [1]	Local Banks	Electric. Funds	Int. Cash Generat.	Capital
Engineering and Adm.	75.4	296.4	371.8	32.2	32.2	-	1.8	56.1	199.5	-	50.0
Preliminary works	-	116.2	116.2	-	-	-	20.7	-	95.5	-	-
Civil works	868.3	918.6	1,786.9	176.0	175.7	257.3 [2]	406.6	243.9	527.4	-	-
Generation and Electro-mechanical equipment	575.5	151.3	726.8	-	-	572.2	32.2	-	122.4	-	-
Indemnizations	-	114.3	114.3	-	-	-	50.9	-	63.4	-	-
Relocation	-	590.3	590.3	-	-	-	29.6	-	560.7	-	-
Sub-total	1,519.2	2,187.1	3,706.3	208.2	207.9	829.5	541.8	300.0	1,568.9	-	50.0
Debt Service											
Amortization	1,310.6	300.0	1,610.6	-	-	-	-	-	604.2	1,006.3	-
Interests paid	1,276.8	369.4	1,646.2	-	2.1 [3]	-	403.5	-	369.4	871.2	-
Sub-total	2,587.4	669.4	3,256.8	-	2.1	-	403.5	-	973.6	1,877.5	-
Increase (dec.) in working capital	-	74.7	74.7	-	-	-	-	-	67.9	6.8	-
TOTAL	4,106.6	2,931.1	7,037.7	208.2	210.0	829.5	945.3	300.0	2,610.4	1,884.3	50.0
Percentages:	58.4	41.6	100.0	3.0	3.0	11.8	13.4	4.3	37.1	26.7	0.7

1/ Includes loan of US$15 million already signed with European Banking Co.
2/ Heavy construction equipment.
3/ IDB's inspection fee (1% of loan amount).

November 1978

5.13 The Bank loan of US$210 million would have a maturity of 15 years, including 6 years of grace 1/ due to the unusually long construction period (7 years) of the Yacyreta project and the need to minimize refinancing during the early years when the project cannot yet generate substantial revenues. The loan would be made to the Republic of Argentina since a direct Bank loan to YACYRETA would have had to be guaranteed by the Republic of Paraguay which Paraguay is not willing to do because Argentina has specifically agreed to guarantee all loans made to YACYRETA. Of those US$210 million, US$208.25 million would be on-lent to YACYRETA on the same conditions 2/ and the exchange risk would be assumed by YACYRETA 3/ The Bank loan would finance about 38% of the foreign exchange cost of the main civil works contract (excluding construction equipment), 50% of the foreign exchange cost of engineering and supervision between 1979 and 1985, and US$1.75 million would finance 50% of the cost of studies to be undertaken by the Secretaria de Energia (para. 4.06).

5.14 IDB approved in 1978 a loan of US$210 million to YACYRETA with a maturity of 20 years including a 6 year grace period. The IDB loan will finance the main civil works contract as well as the engineering and supervision and main civil works contract in about the same proportions as the Bank loan. A condition of effectiveness of the Bank loan will be that all conditions prior to the initial disbursement of the IDB loan had been met. The foreign exchange cost of the heavy construction, generation and electro-mechanical equipment (US$830 million) is expected to be financed by export credits with a maturity of 18 years (including 8 years of grace). After sending a mission in July 1978--in which staff of both Banks participated--to visit export credit agencies in Europe, America and Japan, YACYRETA received, in October 1978, "Letters of Intent" from the major supplier countries (Annex C, T-8) which support the assumptions made in the financing plan as regards to conditions (Annex C-T1). "Master Agreements" are expected to be signed with each country during 1979.

5.15 Other foreign loans, totalling about US$945 million, mainly between 1980-1984, would help in (i) refinancing foreign financial charges (US$404 million) 4/; and (ii) financing direct project expenditures, of which approximately US$430 million would be local costs. In addition to the standard general commitment from the Argentine Government to finance any shortfalls in the financing of the project, the Loan Agreement includes the Government's agreement to authorize YACYRETA to borrow from abroad any additional funds necessary to carry out the project, and to use the funds so obtained to finance foreign and local expenditures. YACYRETA has agreed to submit to the Bank, as a condition of loan effectiveness, satisfactory evidence that it will be able to obtain financing from foreign commercial sources in 1980 and 1981 as estimated to be required for those years in the financing plan (Annex D - Attachment 6-2).

1/ Instead of the 3 year grace period normally included in Bank loans to Argentina.

2/ A rate of interest of 8% was assumed in YACYRETA's financial projections.

3/ There is presently no domestic lending institution involved in this type of long-term financing.

4/ Refinancing needs are due to the project's long construction period and the provisions of the Treaty which limits equity contributions to US$100 million (1973 price levels), (see paras. 6.12 and 6.16).

5.16 With the assistance of its financial adviser (First Boston Corp., U.S.), YACYRETA prepared a strategy to optimize the type, size and timing of its borrowings in foreign capital markets, including the Bank's co-financing and the IDB's complementary financing. YACYRETA is finalising a first borrowing of US$200 millions from the international syndicated bank loan market at exceptionally favorable terms. 1/ Two further borrowings in early 1980 and 1982 are scheduled to be co-financing operations in order to obtain better terms than would otherwise be possible. Since the international financial community has shown keen interest to participate in the financing of this project in association with the proposed Bank loan, the Bank has indicated its willingness to co-finance up to US$500 million equivalent in up to three tranches. YACYRETA intends to obtain through IDB's complementary financing scheme additional US$210 million equivalent in two tranches, probably in early 1980 and 1982. Such a strategy is considered reasonable by the Bank since it should permit YACYRETA to:

(i) take immediate advantage of still extremely favorable market conditions (in terms of spreads and maturities) at a time when the Argentine Republic's credit standing is viewed as excellent by lenders; and

(ii) establish a strong working relationship with a group of lenders (well distributed geographically) who will have the resources to sustain their committment throughout the project construction period.

5.17 Local financial resources during 1978-1990 will consist mostly of (i) loans made to YACYRETA by Argentina from the proceeds of Electrical Funds (para. 6.11); and (ii) gross internal cash generation starting in 1986, which altogether total US$4,500 million, i.e., 64% of YACYRETA's total financial requirements during the period. Of these total local resources, about US$2,182 million equivalent will be used to service foreign currency debt between 1984 and 1990; such payments are not expected to strain Argentina's balance of payments position. During negotiations, the Argentine Government has agreed to provide YACYRETA with at least US$2.7 billion equivalent (current dollars) from the Electrical Funds, on terms and conditions satisfactory to the Bank. Certain assumptions have been made in YACYRETA financial projections as regards to (i) the conditions of the loans from Argentina; and (ii) the level of YACYRETA's tariffs during the 1985-1990 interim operational period, which provide for tariffs compatible with economic costs while in the spirit of the Yacyreta Treaty. Agreement between Argentina and YACYRETA on the terms and conditions of the loans from the electrical funds is a condition of loan effectiveness (para. 6.17).

5.18 Other local sources of financing include: (i) Paraguay's equity contribution of US$50 million to be made in several installments between 1979 and 1984 (Argentina's share has already been paid-up); and (ii) local medium-term bank loans estimated at US$300 million equivalent, during 1981-1983. During negotiations, the Argentine Government has agreed to authorize YACYRETA to borrow locally at least US$300 million.

1/ Expected terms are a 12-year maturity (including 7 years of grace), at 3/4% over LIBOR, with a two-year drawdown period.

CHAPTER VI

FINANCES

Sector Finances

6.01 Excluding interest during construction, total investment expenditures of the Argentine power sector's major entities 1/ will reach about US$11.1 billion (constant 1977 US dollars) over the period 1978-1985 of which US$2.4 billion (i.e., 22%) is for Yacyreta. Because of this large share of Yacyreta in the overall sector investment program and because a large part of this project's financing is to be covered by Sector Funds (para 6.11), it was felt that a review of sector finances should form an integral part of the appraisal.

6.02 Sector finances deteriorated sharply between 1970 and 1976, as a result of the previous Governments' unwillingness to raise tariffs in line with the increases in the entities' costs produced by inflation and a significant drop in productivity. During this period, the annual rates of return on net fixed assets in operation of the two largest entities, SEGBA and AyEE 2/, were far below the 8% stipulated in their Concessions and the return was even mostly negative in AyEE's case. The consolidated sources and application of funds statements of the five major entities of the sector in 1976 (Annex D - Attachment 6-1) show that net internal cash generation of the sector plus the proceeds of the Electric Funds 3/ accounted for only 19% of total investments.

6.03 The tariff increases granted by the Government during 1977 permitted only a modest improvement in the companies' operating results with SEGBA's and AyEE's rate of return increasing to 1.6% and 2.9% from -1.5% and 0.3% in 1976 respectively. At the same time, however, the overall investment expenditures of the sector almost doubled (up to US$1.2 billion), which led to heavy borrowings by the companies, a large part of it short-term debt due to the absence of medium- or long-term funds in the local capital market. At the end of 1977, SEGBA's and AyEE's short-term debts had reached US$34 million and US$246 million respectively representing, 11% and 47% of total debt.

6.04 Tariff increases of about 50% were granted in December 1977 and monthly increases of about 6% in 1978. For 1979, the Government has fixed monthly increases in tariffs which would be in line with costs if the goals regarding inflation were to be met. Under these conditions the operating income of the five main power 1/ companies improved in 1978 and will improve in 1979 (Annex C, T10-T14). Progress was most notable in the case of SEGBA, which raised its operating income from US$24 million 4/ in 1977 to US$105 million 4/ in 1978, and whose rate of return on net fixed assets reached, on

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1/ SEGBA, AyEE, Hidronor, CNEA, CTMSG and YACYRETA.
2/ Which together account for about 75% of the country's electricity sales to final consumers.
3/ I.e., including certain surcharges on fuel channeled to power sector investments (see para. 6.10).
4/ In current prices.

average, 8% during 1978, on a monthly basis 1/. SEGBA's rate of return, however, is estimated to have been only about 5% in 1978, if calculated according to its Concession 2/. This is in contravention to the rate of return covenant in Loan 1330-AR to SEGBA. The Government has argued that the literal interpretation of the concession was not warranted in periods of high inflation and that only an 8% monthly rate of return should be abided by. The Bank has not insisted on a literal application of the SEGBA's concession in view of satisfactory financial prospects shown by both SEGBA and the sector as a whole (paras. 6.07 and 6.08). AyEE, whose rate of return is estimated at 2% in 1978, is still impaired by a low productivity, but the appointment of a new management team for AyEE in April 1978 plus slight tariff increases in real terms during 1979, 1980 and 1981 should enable it to attain an 8% rate of return in 1981 (para. 6.05). In spite of the tariff increases and the resulting improved operating income mentioned above, the net internal cash generation of the sector 3/ in 1978 and 1979 will remain negative 4/ due to the following: (i) a heavy debt service resulting from 1977 and 1978 short- and medium-term borrowings (Annex D, Attachment 6-1), required to carry out the investments programs; and (ii) the contributions from the sector entities to the Treasury, which in 1979 will amount to about US$149 million (in 1977 prices). During negotiations, the Government agreed that, starting in 1980, any contributions to the Treasury or taxes to be paid by the sector entities will be recuperated by tariffs or compensated by the Government.

6.05 The Secretaria de Energia, as part of the power expansion program study financed under the Bank's loan to SEGBA (1330-AR), prepared investment plans and financial projections for the sector's five major entities 3/, in addition to YACYRETA. The financial projections (in constant December 1977 (US$) are based on the following main assumptions:

(a) corrective assets revaluations 5/ in 1981 and 1982, and annual assets revaluations to compensate for inflation 6/ from 1983 on;

(b) tariff increases sufficient to allow for an 8% return on revalued rate bases for HIDRONOR, CNEA and CTMSG from 1979 onwards and rates of return of 4% in 1979, 6% in 1980 and 8% in 1981 and thereafter for AyEE;

1/ i.e., on a rate base expressed in U.S. dollars and converted into pesos at the exchange rate of each month.

2/ Which provides that the rate base should be converted into pesos at the year-end exchange rate.

3/ SEGBA, AyEE, HIDRONOR, CNEA and CTMSG.

4/ However, in the case of SEGBA, the actual internal cash generation in 1978 was US$34 million (December 1977 US dollars), substantially increased from the amount of US$4 million estimated at the time of appraisal.

5/ i.e., to offset present undervaluation of the entities' assets.

6/ This is taken care of in the forecasts by expressing rate bases in constant December 1977 US$.

(c) maintenance of SEGBA's tariffs at their January 1979 levels in real terms until 1981, and increases sufficient to allow for annual returns of 8% starting in 1982; and

(d) institution of a "billing" (transmission) charge of about US mills 5.5/kWh (see Annex C - Table 9 for details) to compensate AyEE (mainly) for its investment in the future national transmission system. This charge would be added on top of the normal bulk tariff charged by DUC (para 1.20) and would represent additional revenues for AyEE, thus avoiding that AyEE's customers bear the full burden of the national transmission investments.

These assumptions provide for a realistic way to put the power sector back on a sound financial footing within a reasonable timeframe; they have been discussed at length with the Argentine authorities and represent formal commitments on their part which are included as covenants in the proposed loan. In the particular case of SEGBA, the Government agreed during negotiations to (i) increase SEGBA's tariffs on January 1, 1980 to a level which would reflect the maintenance of SEGBA's tariffs (at January 1, 1979 levels) in real terms related to a composite index of SEGBA's total costs; 1/ (ii) make its best efforts to recuperate any revenue shortfall for the year 1979 during 1980 and 1981; and (iii) during 1980 and 1981 adjust SEGBA's tariffs whenever these fall 3% below the level they would have achieved if they had been adjusted monthly to reflect changes in SEGBA's composite cost index. The Government has agreed during negotiations to institute a system of billing charges by December 31, 1979.

6.06 Summary financial projections (in constant 1977 US$) for each individual company are shown in Annex C, T10-T14. A consolidated funds statement for the power sector is summarized below:

1/ This composite cost index is expressed as follows: Labor-22%, Fuel-32%, rate of exchange of US$-26%, wholesale price index-12%, and construction cost index-8%. It was established by analyzing SEGBA's cash-flow cost structure for 1980 and was agreed with the Government.

ARGENTINA

POWER SECTOR 1/

Sources and Applications of Funds
(in millions of constant 1977 US$) 5/

	Total 1978-81 US$	%	Total 1978-85 US$	%
SOURCES				
Gross internal cash generation	1,931	32	6,477	54
Less: Debt service 2/	(1,481)	(24)	(3,733)	(31)
Net Internal cash generation	450	8	2,744	23
Electrical Funds	1,908	31	4,449	37
Net Sectoral Funds	2,358	39	7,193	60
Borrowings 2/	2,376	39	4,140	35
Others (incl. equity)	86	1	114	1
TOTAL SOURCES	4,820	79	11,447	96
APPLICATIONS				
Investments (excl. IDC)	5,523	90	11,071 3/	93
Increase in working capital	598	10	828	7
Other	2	-	2	-
TOTAL APPLICATIONS	6,123	100	11,901	100
Surplus (deficit)	(1,303)	(21)	(454)	(4)
Financing of deficit				
New borrowings 4/	1,577	26	2,232	19
New debt service	(274)	(5)	(1,512)	(13)
New surplus (deficit)	-	-	266	2
New net intern. cash generation	176	3	1,232	10
New net sectoral funds	2,084	34	5,681	47

1/ AyEE, SEGBA, HIDRONOR, CNEA, CTMSG, and YACYRETA.
2/ Existing and easily obtainable (i.e. suppliers') loans.
3/ Includes transmission system related with Yacyretá project.
4/ Sum of borrowings necessary to cover AyEE's and SEGBA's deficits taken individually. Assumed conditions are 9% interest rate and 9 years (incl. 3 years of grace).
5/ YACYRETA's forecasts in current US$ have been deflated by the forecast index of international inflation on a yearly basis.

May 1979.

6.07 These forecasts point to a financing gap 1/ for the sector (excluding YACYRETA) of about US$1,300 million (constant December 1977 US$) during 1978-1981, shared between AyEE (US$1,100 million) and SEGBA (US$200 million). These gaps are considered to be manageable through medium-term external financing if the two entities can borrow sufficient funds on reasonable terms, including from foreign sources if medium- or long-term local financing continues to be unavailable. The Government has agreed during negotiations to allow local and/or foreign borrowings on reasonable terms by AyEE and SEGBA as needed by their investment programs, or to make available equivalent funds.

6.08 Assuming coverage of the above-mentioned financing gaps through reasonable medium-term financing 2/, the sector's projected funds statement shows a net sectoral 3/ contribution to investments of 34% during 1978-81 and 47% during 1978-85; those levels can be considered as sound, and represent a dramatic improvement over recent years.

Electrical Funds

6.09 Financial flows in the Argentine power sector are characterized by a rather complex system of consumer contributions to various Electrical Funds through surcharges and special taxes (Annex B). The Secretaria de Energia is presently studying the pertinent legislation with a view to improve and simplify the administration of the Electrical Funds. The four largest Funds are the Fondo Nacional de Grandes Obras Electricas (FNGOE), the Fondo Chocon Cerros Colorados (FCCC), the Fondo Nacional de la Energia Electrica (FNEE) and the Fondo Nacional de la Energia (FNE), which altogether are expected to have provided in 1978 about US$400 million to major entities and projects of the power sector, namely AyEE, CTMSG, HIDRONOR, CNEA and Yacyreta; a fifth Fund, the Fondo Especial para el Desarrollo Electrico del Interior (FEDEI), has its resources earmarked for power supply to the interior of the country and rural electrification.

6.10 The Electrical Funds are financed by (i) taxes on hydrocarbons comprising a portion of the sales taxes on petroleum derivatives and natural gas and a special tax on the value of crude oil refining; and (ii) surcharges on electricity sales. The share of electricity surcharges on electricity sales in total Electrical Funds resources is estimated at 36% for 1978 and is expected to increase progressively to 46% by 1985.

1/ Meaning financing resources not (i) already committed or (ii) easily obtainable (e.g., suppliers' credits).

2/ Nine years maturity including 3 years grace period and 9% interest rate, which is in line with terms recently obtained by Argentine public borrowers.

3/ Including surcharges on fuel (para. 6.10).

6.11 The Government has decided to assign to YACYRETA all resources still available from the Electrical Funds after commitments with other recipients 1/ have been met. Of a total of US$4,450 million (constant 1977 US dollars) to be provided to the power sector over the period 1978-1985, about US$1,300 million is expected to be made available to YACYRETA, essentially from FCCC and FNGOE.

YACYRETA's Capital

6.12 The Treaty of Yacyreta (Annex A, Chapter II) provides that YACYRETA shall be owned equally by ANDE (for Paraguay) and AyEE (for Argentina), with a total capital of US$100 million (in 1973 US dollars 2/), to be paid-in before the start-up date (1985); advance equity contributions made before 1985 shall be indexed 3/ and shall bear interest at 6% p.a. (Side Letter No. 12, dated April 22, 1977); the indexed contributions and, if necessary, the 6% compounded interest, shall form YACYRETA's capital. An issue arises from the fact that, given the agreed time schedule of Paraguayan contributions 4/ (see Annex D - Attachment 6-2), ANDE's share (including indexation and interest) would not, in all likelihood, reach by 1985 50% of the US$100 million indexed from 1973. It was assumed in YACYRETA's financial forecasts (Annex D - Attachment 6-4) that YACYRETA's paid-in capital would equal only two times the smallest--Paraguayan--contribution (including indexation and interest), and that the excess of Argentina's contributions over 50% of this capital would be considered as a loan from Argentina to YACYRETA. 3/ Argentina and Paraguay have agreed during negotiations to provide the Bank with a method agreed-upon between the two countries for valuation of YACYRETA's paid-in capital at least six months before starting the operation of the project.

YACYRETA's Tariff

6.13 Under an arrangement similar to the ones included in the Treaties of Itaipu (Brazil-Paraguay) and Salto-Grande (Argentina-Uruguay) for two other binational hydroelectric projects, the Yacyreta Treaty (Annex C, Chapter III), provides for a "financial tariff," to cover all its annual cash obligations, namely:

(i) debt service;

(ii) cash operating costs;

1/ AyEE, HIDRONOR, CTMSG and CNEA.
2/ The Treaty provides for a specific indexation formula (see Annex C, A-1).
3/ The Treaty (Side Letter No. 20) provides that ANDE's (Paraguay) contribution of US$50 million shall be financed by a loan from the Government of Argentina on specified conditions (6% p.a. on indexed principal, 40 years maturity including 8 years grace).
4/ Bearing interest at 6% p.a. over indexed principal, and with a 50 year maturity (including 25 years of grace), as provided in Side Letter No. 12.

(iii) dividends to ANDE and AyEE at the rate of 12% p.a. on paid-in capital;

(iv) mandatory payments ("Resarcimiento") to ANDE and AyEE as defined in the Treaty at the rate of US$166 per Gwh generated 1/; and

(v) adjustment for any negative or positive balance in the prior year's cash flow.

6.14 Given YACYRETA's very heavy debt-service requirements between 1985 and 1990 (averaging US$450 million a year) and the fact that YACYRETA's generation will reach full capacity only at the end of this interim operational period, the literal application of the Treaty's provisions during 1985-1990 would lead to wide fluctuations in YACYRETA's tariffs which would ultimately harm Argentina's overall tariff policy. However, this can be avoided if (i) YACYRETA refinances part of its debt service during the interim period through loans from the Electrical Funds, and (ii) Argentina adjusts the terms and conditions for such loans, so as to smooth out variations in YACYRETA's tariffs. This is what has been assumed in YACYRETA's financial projections (see para. 6.17). Those conditions will be met if the Argentine Government promulgates a decree (the draft of which has been reviewed by the Bank), which would specify the terms and conditions, including amounts and timing of drawdowns, of the Electrical Funds loan to YACYRETA. Promulgation of the decree and its acceptance by YACYRETA on terms satisfactory to the Bank would be a condition of loan effectiveness. Argentina and Paraguay have also agreed to provide the Bank, at least six months before the plant enters into operation, with a program for putting into effect the rate system specified in the Treaty for Yacyreta. Subject to compliance with the above, the arrangements for tariff setting provided by the treaty are satisfactory.

Other Financial Arrangements Under the Yacyreta Treaty

6.15 The Treaty (Articles XIII and XIV and Annex C, Chapter II) provides that all the power generated by Yacyreta will be purchased by ANDE and/or AyEE, or their local designatories, under successive 8-year contracts; since Paraguay will be able to purchase energy at a lower cost from the Itaipu plant, it is expected that Argentina will be the only buyer in the foreseeable future. By reselling to Argentina the power to which it is entitled (50% of total generation), Paraguay will be receiving "compensation payments" (i.e., royalties) from the Argentine Government 2/ at the rate of about US mills 3 per kWh (1973 US dollars 3/); this represents about US$25 million per year with full generation (1973 prices). Other financial clauses include tax exemption for YACYRETA (Article XII), Governments' guarantee of foreign exchange conversion as needed for YACYRETA's debt service (Article X), and the Argentine Government's agreement to guarantee fully all loans to be contracted by YACYRETA. The Treaty finally provides that the main financial arrangements shall be renegotiated 40 years from its effective date (1973).

1/ At 1973 prices, to be indexed under the Treaty formula (Annex C, A-1).
2/ The Argentine Government intends to fund these compensation payments through a special surcharge on electric bills, starting in 1985.
3/ To be indexed yearly under the Treaty formula (Annex C, A-1).

YACYRETA's Financial Outlook

6.16 YACYRETA's forecast financial statements (Funds Statements, Income Statements and Balance Sheets) until 1995 are shown in Annex D - Attachments 6.2 through 6.4. In analyzing these forecasts, however, it is important to realize that, due to the Treaty's peculiar financial provisions and the fact that YACYRETA is a one-project entity, YACYRETA's finances cannot be assessed only on the basis of traditional financial criteria; commonly used concepts such as rate of return on revalued assets 1/, net internal cash generation, or long-term debt ratios, in particular, are not relevant to YACYRETA's case. In spite of its basic reliance on borrowings, YACYRETA is fundamentally free of major financial risks due to the provisions of the Treaty which guarantee a market for whatever power it generates, at prices sufficient to cover all of its cash requirements. The Loan Agreement specifies that the present financial provisions of the Treaty, particularly as regards to purchase of energy and setting of tariffs, will be applied during the life of the loan unless the Bank otherwise agrees.

6.17 YACYRETA's financial projections assume that, in order to minimize tariffs fluctuations during the interim 1985-1990 period (para. 6.14), drawdowns on loans from the Electrical Funds and debt service on these loans would be adjusted so as to (i) provide for a tariff approximately in line with economic costs 2/, starting in 1985; 4/ and (ii) keep it constant (in real terms) as long as possible; correspondingly, the forecasts assume that (i) YACYRETA would refinance about US$800 million of its debt service between 1985 and 1987 through loans from the Electrical Funds; and (ii) debt service on those same loans would be mostly deferred during the forecasting period 3/.

6.18 YACYRETA's rate structure during (a) the interim operational period (1985-1990); and (b) the first 5-year period of generation at full capacity is summarized below:

1/ The adequate cost recovery objective of the traditional rate of return covenant is already taken care of by the treaty's specific tariff setting arrangements (paras 6.13 and 6.14).

2/ A tariff level of US mills 15.8/kWh (December 1977 prices) was used in the projections; it was calculated on the basis of the project's economic cost of US$2,430 million (December 1977 prices), assuming a life of 50 years, a cost of capital of 11% and annual operating costs estimated at 0.3% of total investment.

3/ No amortization at all; interests to be paid starting in 1989, and only partially (42% of interests incurred during 1989-1995 would be deferred).

4/ The financial projections of YACYRETA were prepared under the assumption that the mobilization of the main civil works contractor would take place in Septembver/October 1979 which would have allowed the commissioning of first machines in late 1985, thus generating revenues in that year. However, delays in the bidding process (prequalification of bidders) have delayed the mobilization of the contractor to at least June 1980 (para. 4.16) thus delaying the start-up of the first units until mid-1986.

	1985-1990		1990-1995	
	current US$10^6	%	current US$10^6	%
Debt service	1,884.3	89.7	3,075.6	88.8
Operating Costs	98.3	4.7	206.8	6.0
Dividends	91.6	4.4	143.2	4.1
Mandatory payments	25.7	1.2	40.0	1.1
Total cost of service	2,099.9	100.0	3,465.6	100.0
Sales (GWh)	70,284		87,505	
Average tariff (US mill/kWh)	29.9 /1		39.6 /1	

/1 in current US dollars; Average tariff would remain constant in real terms.

6.19 Terms and conditions assumed for YACYRETA's borrowings (Annex C-T7) are conservative estimates of what YACYRETA should be able to obtain over the next ten years. YACYRETA has agreed during negotiations to provide the Bank, two months before the end of each year starting from 1980 with detailed reports on (i) its actual borrowings during the past year; and (ii) proposed borrowing operations for the next year. YACYRETA also agreed to exchange views with the Bank on the contents of these reports. YACYRETA has also agreed during negotiations not to accumulate at any time without the Bank's consent, short-term debt (less than 1 year terms) in excess of (i) 10% of total debt; or (ii) 100% of contracted but undisbursed loans from private banks (excluding export credits), whichever amount is greater.

6.20 During negotiations the Governments of Argentina and Paraguay agreed that, whenever the two Governments would cause YACYRETA to undertake new projects or expansion or modifications of the project described in this report, they would take measures satisfactory to the Bank to ensure that such project, expansion or modifications shall not adversely affect the execution or operation of this project.

Performance Indicators and Reporting

6.21 A number of financial indicators are shown with the financial forecasts for each of the sector's 5 major entities (Annex C, Tables T-10 through T-14); the Government has agreed, during negotiations, to send the Bank not later than 4 months after the end of each year of the construction period, a statement including the year's main performance indicators for each of these 5 entities. Some key financial indicators for YACYRETA are included in YACYRETA's forecast financial projections (Annex D - Attachments 6-2 through 6-4). YACYRETA has agreed, during negotiations, (i) to provide the Bank with YACYRETA's audited statements not later than 4 months after the end of each fiscal year; and (ii) to prepare such other reports as the Bank may reasonably request, including a project completion report. The Argentine Government also agreed to prepare reports such as the Bank may reasonably request including progress reports on the studies (para 4.06).

CHAPTER VII

ECONOMIC ANALYSIS

7.01 The Secretaria de Energia prepared an energy and maximum demand balance for the period 1978-1989 based on the demand projections (see Chapter III) and on the existing generation facilities and those under construction for the period 1978-1985. The analysis carried out shows that base-load energy would be needed by 1985. If additional energy were not available in that year, the existing inefficient thermal units (diesel and gas turbines) would be called upon to be used at a high operating cost and dry hydrological conditions would cause load shedding. (See Annex D - Attachments 7-1 and 7-2 for energy and maximum demand balances.)

Least Cost Solution

7.02 The methodology used to determine the least cost expansion program for the Argentine power sector is a comprehensive one based on:

(i) a steady state, continuous variable, linear programming model to determine the size and sequence of projects as well as regional energy network linkages;

(ii) a load dispatching model to determine the most economical loading of hydro and thermal plants, thereby generating fuel cost input into (i) above;

(iii) a hydrology verification model to test the ability of the alternative expansion programs to meet demand under critical hydrological conditions; and

(iv) a reserve verification model to test the electric system's capacity to meet demand with a preset degree of reliability and to measure the reliability of supply.

7.03 The set of projects considered consists of all known possible hydro projects (26 altogether), oil and coal fired thermal-steam plants, nuclear plants (natural uranium fueled-CANDU type) and gas turbines. The costs used for its hydroelectric plants were analyzed and compatibilized by a reputable Argentine consulting firm and the cost data used for thermal plant is as follows: 1/

1/ Base cost including engineering and physical contingency but excluding interest during construction and escalation (December 1977 price level).

	Capital Cost	Fuel Cost
Steam plant	US$510/kw	US$12.5/bl of fuel oil US$50/ton of coal
Nuclear plant	US$1,000/kw 1/	US mills 4/kwh (based on US$45/lb of U_3O_8)
Gas turbines	US$250/kw (30 MW units)	US mills 28/kwh

7.04 The objective of the linear programming model is to minimize the summation of total costs (investment plus operating costs) over the planning period thus providing the least-cost investment program. The model selected the following sequence as the optimum one using a 12% discount rate;

	Installed Capacity	Type	First Unit Commissioning Date
Yacyreta	2,700 MW	Hydro	1985
Los Blancos	350 MW	"	1986
Piedra del Aguila	1,060 MW	"	1987
Pichi Picun Leufu	300 MW	"	1987
Roncador (binational with Brazil)	1,500 MW	"	1988
Corpus (binational with Paraguay)	3,440 MW	"	1989
Cordon del Plata	1,300 MW	"	1990
Michihuao	380 MW	"	1992
Pati	1,712 MW	"	1992
Garabi (binational with Brazil)	760 MW	"	1993
Cuyo	600 MW	Nuclear	1994

Sensitivity Analysis

7.05 Then, in order to test the sensitivity of the optimum solution (Alternative 1), three alternatives were generated by imposing the following constraints on the model:

Alternative 2: exclude Yacyreta;

Alternative 3: impose the commissioning of Yacyreta in 1986;

Alternative 4: impose the entry of nuclear plants according to the schedule defined by the National Atomic Energy Commission (one unit about every five years).

1/ Including the first charge of fuel and heavy water estimated to cost 20%, i.e., US$200/kw.

7.06 The model selected slightly different sequences than the one shown in para. 7.04 above for the optimum solution for each constraint. The exclusion of Yacyreta would result (i) in the commissioning of a nuclear plant in 1985 and (ii) would also mean that thermal plant (steam, diesel and gas turbines) operate at full capacity in 1986, which is also the case if Yacyreta's commissioning were delayed until 1986. With a forced entry of nuclear plants under a predetermined schedule--Alternative 4--the model again selects 1985 as the commissioning date for Yacyreta.

7.07 The costs of the four alternatives thus defined are shown below, on a present worth basis using discount rates ranging from 8% to 20%:

(Millions of December 1977 dollars)

Discount rate	Alternative 1	Alternative 2	Alternative 3	Alternative 4
8	10,808.9*	11,544.1	10,922.3	10,965.5
10	8,436.6*	8,944.8	8,497.5	8,591.0
12	6,766.8*	7,110.7	6,786.8	6,913.0
14	5,541.6	5,765.2	5,528.2*	5,677.8
16	4,612.8	4,747.6	4,573.6*	4,738.9
18	3,890.3	3,959.3	3,831.0*	4,007.0
20	3,316.9	3,337.0	3,241.9*	3,424.9

* Identifies the minimum cost in each line of the table.

7.08 As can be seen in the table, or interpolated from it:

(i) The expansion program that includes Yacyreta entering in 1985 is less costly than that excluding it for discount rates up to at least 20%;

(ii) The commissioning of Yacyreta in 1985 is more economical than in 1986 for discount rates up to 13.2%;

(iii) The expansion program that includes Yacyreta entering in 1986 is less costly than that excluding it for all discount rates up to at least 20%; and

(iv) The imposed entry of nuclear power plants results in total present worth only at a maximum 2% higher than the optimum expansion plan for all discount rates up to 20%.

7.09 Additional sensitivity analyses were carried out to evaluate the influence of variations in (i) the cost of Yacyreta; (ii) the cost of nuclear plants; (iii) fuel costs and load forecast assumptions. The analyses show that:

(i) an increase of 29% in the cost of Yacyreta would be needed to reduce to 12% the equalizing discount rate between alternatives 1 and 2;

(ii) an increase of 16% in the cost of Yacyreta would be needed to reduce to 12% the equalizing discount rate between alternatives 1 and 3;

(iii) a decrease of 50% in nuclear power plant investment cost would be needed to reduce to 12% the equalizing discount rate between alternatives 1 and 2;

(iv) a decrease of 180% in the cost of fuel (fuel oil and nuclear) would be needed to reduce to 12% the equalizing discount rate between alternatives 1 and 2;

(v) a lower load forecast of 9.0% p.a. average annual growth rate, corresponding to an average G.D.P. growth of 4.5% p.a. for the period 1978-1985, was used to determine the optimum expansion program from 1985 onwards, using a discount rate of 12%. The least-cost solution again is the commissioning of Yacyreta in 1985. As previously, a sensitivity study was made by imposing constraints on the L.P. model and it was shown that with this market forecast the expansion program with Yacyreta entering in 1985 is more economical than excluding it or postponing it by one year for all discount rates up to 13%; and

(vi) finally the average yearly rate of growth of demand for the period 1978-1985 that makes equivalent the entry of Yacyreta in 1985 and 1986 for a 12% discount rate was found to be 8% p.a., which is less than the historical growth rate of 8.4% p.a. (1962-1974).

Verification Models

7.10 The hydrology verification model, using 72 years of monthly data for the 8 major river basins of Argentina, was used to analyze the four expansion program alternatives mentioned in para. 7.05, with respect to the ability to meet electricity demand under critical 1/ hydrologic conditions. The analysis, using linear regression analysis to determine the interrelationships between the river basins, consisted of a process of simulation and iteration with the objective to maximize the monthly energy generated by each hydropower plant, thus arriving at the yearly hydroelectric output for each alternative expansion program for the period 1985-1994. This in turns permitted the determination of the additional necessary energy from thermal origin to meet demand. It was found that with Yacyreta entering in 1985 the energy requirements under critical hydrological conditions could be met with existing gas turbines working under acceptable conditions (2,000 hours per year). However, with Yacyreta entering in 1986 or a fortiori if Yacyreta is excluded altogether the gas turbine generation becomes excessive and/or infeasible throughout the whole period of analysis these indicating the security added to the system by the incorporation of Yacyreta in 1985. This also shows that alternatives 2 and 3 should be loaded with the capital costs of additional gas turbines which would make them even less competitive.

1/ Once every 33 years.

7.11 The reserve verification model permitted the analysis of the reserve required to achieve a specified quality of service. Given plant characteristics and system configurations the analysis evaluates the probability of system failure resulting from an insufficient margin between effective installed available capacity and peak load demand. The method employed is the loss of load probability method which establishes a relationship between margins of reserve and quality of service measured in terms of average number of years during which demand cannot be fully met. The results of the study indicate that for the alternatives 1 and 4 including Yacyreta in 1985, the quality of service of one failure in five years (considered reasonable) can be obtained with a margin of reserve of 19%. (The L.P. model used a predefined margin of reserve of 20%). Without Yacyreta more reserve is required to achieve a comparable quality of service.

Least-cost Solution - Summary and Conclusions

7.12 The analysis carried out shows that Yacyreta entering in 1985 forms part of the least cost solution for meeting Argentina's electric power needs from 1985 onwards. This is true for different average demand growth rates varying from 8% to 9.9% p.a. Yacyreta, in addition, increases the security of supply under critical hydrological conditions and adequate service is reliably assured with a reasonable margin in reserve (given the high degree of regulation of the Parana river).

7.13 This economic justification for the start-up of Yacyreta in 1985 hinges on the interconnection of all the nine regions (see para 3.02) into one integrated national grid and therefore during negotiations Argentina gave assurances that these interconnections would be completed when needed.

7.14 In addition, Yacyreta will contribute substantially to the increase of the use of renewable sources of energy and will help reduce the country's dependence on hydrocarbon fuels - some of which is imported (see para. 1.07).

7.15 In addition to the generation of electric power, Yacyreta will:

(i) improve navigation on the Parana river;

(ii) promote agricultural development in Southern Paraguay and Northeastern Argentina, resulting from new irrigation possibilities; and

(iii) develop fishing.

Navigation

7.16 At present the stretch of the Parana river between Ituzaingo and Posadas is critical for navigation because narrow passes and curves limit the size of river craft and prolong travel time. The main bottleneck is at the Apipe rapids where the force of the current is too strong for most vessels resulting in time-consuming maneuvers and higher transportation costs. With the construction of Yacyreta, the Upper Parana will no longer be restricted to

small craft with limited freight-carrying capacity, and will become an efficient means of communication. The size of the lock to be built in the dam will allow the passage of 6 barges weighing 1,500 tons each 1/ without having to break down the load thus resulting in substantially reduced cost and travel time.

7.17 To quantify the economic benefits of improved navigation facilities a selection was made of the products representing the most important volumes of freight to and from the zones of influence and estimates were made of the freight potentials of these products between 1985 and 2034 with the most probable points of origin and destination. Wood and soybeans account for most of the goods going down stream with petroleum products predominant in that shipped upstream. On the basis of this traffic forecast, the benefits were determined by calculating the total savings in costs of transport when comparing the situation of building the dam with and without the lock. These benefits amount to US$16 million in 1985, increasing to US$59 million by 2005 and remaining at that value thereafter (December 1977 price levels).

Irrigation

7.18 The main dam for the Yacyreta hydroelectric project calls for the construction of two irrigation intakes (the cost of which is marginal), one on the Argentine side and the other on the Paraguayan side (See para. 4.05). The consultants identified 140,000 hectares in Paraguay and 6,650 in Argentina as priority development areas because of soil quality and carried out the corresponding prefeasibility studies for irrigation and drainage works for those areas. The execution of these works is of vital importance to the development of that region of Paraguay because it would open a vast new area to intensive agricultural production (altogether about 60,000 hectares of which 50,000 hectares could be used for rice production). The Ministry of Agriculture of Paraguay and authorities of the Province of Corrientes in Argentina have indicated their intention to commence with the corresponding feasibility studies and the final engineering design to develop the area mentioned above.

Fishing

7.19 YACYRETA intends to implement measures (see para. 4.23) to protect the enormous fishery resources of the Parana river, as part of its plan to minimize the environmental impacts of Yacyreta. If these measures are adopted and properly managed, the reservoir could produce 8,250 tons of fish annually which is double of today's production for the whole river.

Return on Investment

7.20 The return on investment was estimated as the discount rate which equates the present worth of the power benefits and total economic costs of the Yacyreta hydroelectric project including the cost of the navigation lock but excluding the cost of the improvements considered in the relocation/ resettlement program (para 5.06). Costs include the total economic direct cost of the Yacyreta hydroelectric project (including physical contingencies,

1/ At present the Apipe rapids limits the weight of each barge, which has to pass singly, to 300 tons.

see para 5.01), plus investment for the associated transmissions, subtransmission and distribution facilities necessary to bring the energy to the final consumer. The investment in transmission was estimated at US$512 million (December 1977 price levels - see para 4.10). The incremental investment in subtransmission and distribution was estimated on the basis of the cost of SEGBA's current expansion program, partially financed by Bank loan 1330-AR, and which amounts to US$500 per kw of installed generation capacity. Benefits were measured by the forecast revenues from the sale of electricity at the retail levels using as the tariffs the average sales price of US mills 54 per kwh (December 1977 price levels) that would be in effect in 1985, the year of start-up of Yacyreta, in agreement with sector financial projections, plus the average tax paid by the consumer. As the benefits were measured by the consumers' total financial charges rather than full economic benefits (para 7.22) the return on investment really determines the adequacy of consumer charges rather than the economic soundness of the project. The rate of return is 14% on this basis. If one adds the benefits derived from the navigation lock the return would increase by 0.9% or 0.7% depending on whether these benefits are estimated as derived in para 7.17 or as revenues to be derived from the toll that would be charged (assumed to be US$7.5 ton). Sensitivity analysis shows that an increase of 10% in project cost or a decrease of 10% in the value of benefits would decrease the rate of return by 1%.

7.21 The use of efficiency prices for labor would increase the return. An increase in the rate of exchange by 20% would decrease the return by only about 1%.

7.22 The rate of return obtained understates the real economic rate of return on the project as the revenues from the sale of electricity do not measure the overall benefits to society from the project such as benefits from agriculture and fishing, replacement of fossil fuel by a renewable energy source and the indirect benefits to industry and commerce whose production and employment depend on reliable energy sources. In any case the rates of return obtained compare favorably with the opportunity cost of capital in Argentina which is estimated at 11%.

Rate of Return of Navigation Lock

7.23 The rate of return was calculated for the navigation lock considered as a separate component based on the traffic forecast and benefits as described in para. 7.17. The cost of the lock used was that estimated by the consultants and revised by A.A. Mathews's Inc. Operation and maintenance were estimated at US$400,000 p.a. The resulting rate of return was found to be 14.4%. Using as an alternative measure of the benefits the revenues obtained from the estimated toll that would be charged (US$7.5/ton) the rate of return that results is 13.4%. These results show that the lock is justified by itself when comparing these rates of return with the opportunity cost of capital of 11%.

CHAPTER VIII

AGREEMENTS REACHED AND RECOMMENDATION

8.01 During negotiations, agreements have been reached with the Argentine and Paraguayan Governments and YACYRETA as corresponding on the following:

(a) The Government of Argentina will exchange views with the Bank on the evolution of the organization of the Argentine power sector (para. 1.19);

(b) YACYRETA will provide the Bank, within 12 months of loan signature, with evidence that it has implemented an acceptable accounting system for the project execution phase and, if the Bank deems necessary, will hire consultants to assist in improving it (para. 2.06);

(c) YACYRETA will have its accounts externally audited, starting in 1979, by an independent CPA firm acceptable to the Bank; their first report will include an evaluation of YACYRETA's accounting procedures and their recommendations for changes, if necessary; YACYRETA will discuss these recommendations with the Bank (para. 2.08);

(d) YACYRETA will hire an international expert by September 30, 1979 to advise it on insurance policy and discuss with the Bank the expert's recommendations (para. 2.09);

(e) Argentina and Paraguay will take all necessary measures with respect to Article VI of the Yacyreta Treaty to ensure the demarcation of their common boundary in the project area six months before taking any project related action which would affect the natural course of the Parana river (para. 4.04).

(f) the Argentine Government will, within 12 months of loan signature, formally present an overall financing plan, satisfactory to the Bank, for the construction of the Yacyreta transmission system and provide adequate funds for this purpose consistent with such plan (para. 4.12);

(g) the Governments of Argentina and Paraguay and YACYRETA agreed to carry out an environmental program acceptable to the Bank to minimize the environmental impact of the project (para. 4.22);

(h) the Governments of Argentina and Paraguay and YACYRETA will carry out the resettlement component according to programs and timetables satisfactory to the Bank (para. 4.35);

(i) the Argentine Government will authorize YACYRETA to borrow from abroad any additional funds necessary to carry out the project and to use the funds so obtained to finance foreign and local expenditures (para. 5.15);

(j) the Argentine Government will provide YACYRETA with at least US$2.7 billion equivalent (current US dollars) from the Electrical Funds, on terms and conditions satisfactory to the Bank (para. 5.17);

(k) the Argentine Government will authorize YACYRETA to borrow locally at least US$300 million equivalent (para. 5.18);

(l) the Government of Argentina agreed that, starting in 1980, any contribution to the Treasury or taxes to be paid by the sector entities would be recuperated by tariffs or compensated by the Government (para. 6.04);

(m) the assets of the five major entities of the Argentinian power sector will be subject to a 2-step corrective revaluation in 1981 and 1982, and subsequently yearly revalued from 1983 onwards, in accordance with sound economic and financial principles, taking into account both local and international inflation (paras. 1.22 and 6.05);

(n) the Argentine Government will approve tariff increases sufficient to allow for an 8% rate of return on revalued rate bases for HIDRONOR, CNEA and CTMSG from 1979 onwards, and rates of return of 4% in 1979, 6% in 1980, and 8% in 1981 and thereafter for AyEE (para. 6.05);

(o) the Argentine Government agreed to: (i) increase SEGBA's tariffs on January 1, 1980 to a level which would reflect the maintenance of SEGBA's tariffs (at January 1, 1979 levels) in real terms related to a composite index of SEGBA's total costs; (ii) make its best efforts to recuperate any revenue shortfall for the year 1979 during 1980 and 1981; (iii) during 1980 and 1981 adjust SEGBA's tariffs whenever these fall 3% below the level they would have achieved if they had been adjusted monthly to reflect changes in SEGBA's composite cost index; and (iv) starting in 1982 approve tariffs to allow for annual rates of return of 8% on revalued assets (para. 6.05);

(p) the Argentine Government has agreed to institute by December 31, 1979 a system of "billing" charges to compensate AyEE (mainly) for its investment in the future national transmission system (para. 6.05); and;

(q) the Argentine Government will allow local and/or foreign borrowings on reasonable terms by AyEE and SEGBA as needed by their investment programs, or make available to them equivalent funds or parts thereof (para. 6.07);

(r) Argentina and Paraguay have agreed to provide the Bank with a program for putting into effect the rate system specified in the Treaty for YACYRETA, including a method of valuation of YACYRETA's capital, at least six months before starting plant operation (paras. 6.12 and 6.14);

(s) present financial provisions of the Yacyreta Treaty will be applied during the life of the loan unless the Bank otherwise agrees (para. 6.16);

(t) YACYRETA , starting in 1980, will provide the Bank, two months before the end of each year, with detailed annual reports on (i) its actual borrowings during the past year; and (ii) proposed borrowing operations for the next year, YACYRETA will exchange views with the Bank on the content of these reports (para. 6.19);

(u) YACYRETA will not accumulate at any point in time, without the Bank's consent, short-term debt (less than 1 year) in excess of (i) 10% of total debt or (ii) 100% of contracted but undisbursed loans from private banks (excluding export credits), whichever amount is greater (para. 6.19);

(v) the Governments of Argentina and Paraguay agreed that, whenever the two Governments would cause YACYRETA to undertake new projects or expansions or modifications of the project described in this report, they would take measures satisfactory to the Bank to ensure that such project, expansion or modification shall not adversely affect the execution or operation of this project (para. 6.20);

(w) YACYRETA and the Government of Argentina agreed to accept the standard Bank reporting requirements (para. 6.21). In addition, the Argentine Government has agreed to send to the Bank after each year during the construction period statements including the main performance indicators for each of the five major sector entities (para. 6.21);

(x) Argentina gave assurances that the regional interconnections foreseen in the national power expansion program for the period 1978-1985 would be completed when needed (para. 7.13);

8.02 As a condition of loan effectiveness:

(a) Argentina and Paraguay should have taken initial steps satisfactory to the Bank to comply with Article VI (demarcation of boundaries) of the Yacyreta Treaty (para. 4.04);

(b) All conditions prior to the first disbursement of the IDB loan should have been met (para. 5.14).

(c) YACYRETA should have submitted to the Bank satisfactory evidence that it will be able to obtain financing from foreign commercial sources in 1980 and 1981 as estimated to be required for those years in the financing plan (para. 5.15);

(d) Argentina and YACYRETA should have agreed on terms and conditions satisfactory to the Bank for the loan from the Electrical Funds (para. 6.14).

8.03 With the assurances listed above, the project constitutes a suitable basis for a Bank loan of US$210 million equivalent. The loan would be paid over a period of 15 years including 6 years of grace.

9/21/79

ANNEX A

RELOCATION ASPECTS

A. Background

1.01 Annex B to the Treaty of Yacyreta indicates the concern of the two Governments for relocation of the population and installations displaced by project execution. YACYRETA was assigned responsibility for conducting an adequate program since this would be the immediate and direct result of the construction of Yacyreta. The governing principle is construction and replacement of installations affected and resettlement of groups displaced in equal or upgraded conditions.

1.02 This responsibility implies that YACYRETA will not only expropriate or purchase property as required for the works or pay indemnity for damages suffered by third parties but also carry out activities designed to adapt the population concerned to its new location, endeavoring insofar as possible to avoid creating social distortions or breaking ties with work, welfare and cultural centers. Thus the entity will execute housing complexes to meet the needs of the group and provide suitable urban improvements, endeavoring to relocate the industries affected in the same area, provide commercial facilities and develop social programs to assist the population concerned.

1.03 Moreover the physical relocation should be functional, that is the works and installations undertaken should be able to achieve minimum levels of service in relocation areas. Likewise the indemnity alternative is viewed as a formula constituting one of the actions legally available to those affected.

1.04 Basic studies on the relocation program were begun in 1974 by several consulting firms that conducted their work in both Argentina and Paraguay. In 1975 the first planning memoranda were completed containing general criteria for development of subsequent activities. Those memoranda include an evaluation of the urban and rural areas, a socioeconomic profile of inhabitants, general proposal for relocation taking into consideration technical, legal and economic aspects, and preliminary costs estimates. Cartographic surveys of the area were also made and national and local authorities contacted to bring them into the process of defining the relocation program. These preliminary steps now need to be developed to create meaningful roles for these authorities and to initiate, update and finalize the physical and social resettlement programs.

1.05 In the following years the project consultant continued the studies, defining relocation alternatives more exactly. For the urban sector a structural approach to the cities concerned was adopted, taking into account development possibilities and existing relationships and interdependencies. The information provided includes detailed plans of population density, possible relocation and expansion areas, housing and population distribution, sanitary equipment, soil use, educational facilities and spheres of influence, current status of building affected, road networks and connections, etc.

ANNEX A

1.06 The design for railroad, port, road, sanitary, electrical and telephone installations and for the housing complex to be built at Encarnacion have almost been completed. Lacking still is a minimal solution that will be necessary for low-income squatter families. The project for the Posadas urban and rural zones is to be initiated when a resettlement team is established.

1.07 In 1977 a complete survey of the population affected was conducted, with results available in mid-1978 as a basis for the cadastral studies to begin at the end of this year. Special social studies were also conducted to ascertain the features of the population concerned.

B. Description of Flood Zone

1.08 The water from the Yacyreta reservoir with a normal elevation of 82 m over sea level, will flood an approximate area of 1,663 km^2, of which 852 km^2 is located in Paraguay, 230 km^2 in Argentina and 581 km^2 is covered by the river and its adjacent canals. Current land use in the dam zone shows that 18.8 km^2 is used for farm crops and 248.4 km^2 for natural pastures. The land subject to periodic flooding is 209.8 km^2, the swamps are 401.5 km^2, the woods and shrubs account for 196.4 km^2 and the towns and cities cover 6.7 km^2. On the Argentina side the dam extends from Rincon de Santa Maria 15 km upriver from the town of Ituzaingo to the point on the coast in Misiones Province across from Corpus Island.

1.09 According to the population census conducted by the binational entity in 1977, the group displaced would total 32,996 persons, of whom 18,440 are located in Argentina and 14,556 in Paraguay. This represents 4,257 and 2,990 families, respectively. The cities of Posadas in Argentina and Encarnacion and Carmen del Parana in Paraguay account for the heaviest concentrations.

1. Argentina

1.10 Of the total population affected in Argentina, 17,840 persons, that is, 97% of the total, reside in the Province of Misiones and 600 in the Province of Corrientes. The urban population, located exclusively in the city of Posadas (Misiones Province) accounts for 69.4% of the population affected. In addition, 3,321 individuals live in a semiurban habitat some distance from the Posadas urban center. A total of 87.6% of the population concerned is of Argentine nationality, with the rest predominantly Paraguayan.

1.11 The population census indicates that 12% of the group over six years of age can neither read nor write and 61% did not finish primary school. Sixty-five percent of the households have family income equal to or lower than the minimum wage prevailing on the census data.

1.12 The housing affected by the dam numbers 4,562 units. 1/ Of that total, 18% are substandard units built with discarded materials and 8% are slabs with adobe walls, straw roofs and dirt floors. Of the housing 89% does

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1/ Complete data are available on 4,100 houses only.

not have running water, with 44% supplied by public fountains, 36% from wells and the rest directly from the river. Only 39% has electricity and 62% has outside privies without flushing capacity. Property tenure indicates that 30% of the families are land and housing owners, 7% are land and housing tenants and 63% are land occupants with no legal title.

1.13 From the socioeconomic standpoint the population in the zone to be flooded in the city of Posadas can be characterized as belonging primarily to the most depressed and marginal strata. Activities relating to the provision of personal services for the Posadas urban center and temporary jobs (changas) predominate. A large group operates on a subsistence level dependent upon the river setting from which they derive water, firewood, fish and income from contraband. However, despite its marginality, the population affected plays a specific role within the overall urban context of Posadas, which should be taken into account in the relocation plan.

1.14 The rural area flooded on the Argentine side amounts to 225 km^2. It is characterized chiefly by natural pasture and, to a lesser extent, by rice fields, which are irrigated by water pumped from the Parana River and adjacent streams. In addition wheat and soybeans with very low yields are produced. The lack of suitable practices and technologies and poor irrigation and drainage conditions are factors limiting farm output. There are some wooded areas, particularly pine forests. With regard to land tenure, the predominant system is large landed estates, especially in the Province of Corrientes, but there are 120 farms of less than 24 hectares operating on a subsistence economy and employing only family labor.

1.15 The flooding will affect a large number of community services and industrial and commercial establishments. These includes three primary schools, two first aid clinics, police installations and the naval headquarters, nine lumber industries, one cold storage operation, one shipbuilding outfit, and 122 olerias. The olerias deserve special mention since they use the clay soil on the banks of the Parana River to make bricks and tites. Their traditional sources of raw material will disappear entirely when the dam is built. The port installations and railroad station at Posadas will be under water, as will 22 km of main railroad tracks, 10 km of roads, the Empresa Electrica de Misiones (EMSA) thermal power plant, and the electrical telephone and water supply networks.

2. Paraguay

1.16 The urban population affected in Paraguay number 7,413 persons in Encarnacion, about one third of the city, 1/ and 466 persons in Carmen del Parana. The rural population total 6,677 persons, or 46% of the total. Income data classify 69% of the population affected at Encarnacion as belonging to the middle and higher income strata. In contrast in the rural area 95% are low income.

1/ The population of Encarnacion is estimated at 23,000 and that of Carmen del Parana at 2,000.

1.17 The number of housing units affected in the zone is 3,132, of which 1,714 are located in urban areas (1,552 in Encarnacion) and 1,418 in rural areas. Of the urban housing 41% has more than 700 m^2 in land and 85% more than 360 m^2, indicating a pastoral setting that will change radically with the construction of the new international bridge, the influx of workers and proposed regional development plans for the area which would render these lot sizes inappropriate.

1.18 The flooding will have major implications for the urban dynamics of the city, since it will affect its central area and major commercial sector. Moreover, those displaced belong to the economic strata with the greatest economic, cultural and political weight. Seventy per cent of the houses are occupied by their owners who also own the land, 90% have electric lights and 64% a septic tank waste disposal system.

1.19 As a result of the dam, the city of Carmen del Parana will be converted into a peninsula, limiting its potential to expand in a single direction. The affected population is mostly from the middle and low strata. Unless special measures are adopted, the employment level in the city could be substantially reduced because of inundation of major jobs sources and loss of land suitable for rice growing.

1.20 In the rural area of Paraguay there are 12.5 km^2 of cultivated land and 119.6 km^2 of natural pastures, 392.6 km^2 of swamps, 132 km^2 of woods and brush and 192.6 km^2 of land subject to flooding. The major crops are rice and cotton. Stock raising is extensively practiced but productivity is low. On Yacyreta, Talavera and other islands that would be under water, farming is essentially at the subsistence level.

1.21 The total number of commercial establishments flooded will be 570, of which 454 are located in Encarnacion. The number of industrial enterprises affected is 280. Most of them are involved in processing farm commodities from the area (mills, tanners, sawmills, grain silos, oil factories, etc.), with about 100 olerias which, as noted on the Argentine side, will lose their traditional source of raw material. Special programs have to be prepared to address these situations.

1.22 The infrastructure works flooded include the major Paraguayan public administration buildings in the Department of Itapua, three schools, two churches, military installations, the launch dock and wharves in the city of Encarnacion, 106 km of railroad lines, the Encarnacion electric power plant and 70% of the electricity distribution network, 80% of the telephone lines, the recently completed water supply facility and much of the water supply distribution network.

C. Relocation Policy of Binational Entity

1.23 The basic standards for the policy on resettlement of the urban, semi-urban and rural population affected by the dam were approved by the Executive committee of YACYRETA on September 5, 1978. Generally speaking,

the principle established is that all those inhabiting urban or semi-urban housing, whether owners, tenants or occupants, are entitled to have another housing unit built for them by YACYRETA. However, if the person displaced should not wish to relocate, YACYRETA will pay proper indemnity.

1.24 The housing to be delivered to owners will be similar in quality and size to that expropriated but should have the improvements necessary to meet minimum health and habilitation standards. If the value of the property affected is less than that to be delivered in exchange, YACYRETA will absorb a reasonable difference in price; if more, YACYRETA will compensate for the price difference or have access to housing programs to be run by the National Housing Ministries or other institutions yet to be determined.

1.25 The tenants, comodatarios and occupants of housing and/or lands belonging to others will be allocated minimum housing as their own property to be paid for with financing and conditions suited to their payment capacity. 1/ If their financial position permits, those beneficiaries could choose better quality and/or larger housing.

1.26 The minimal housing program is aimed at relocation of very low income family groups, generally with uncertain rights to the land they occupy. 2/ Minimal housing is the initial stage of a house that can progressively develop as the economic and labor resources of the families increase. In the urban sector of Paraguay minimum housing lots will not exceed 360 m^2, 3/ will have running water and sewerage with a connection pipe or septic tank and electricity installation with connection as the owner wishes, together with public lighting and minimum finishing for adequate hygienic and maintenance conditions.

1.27 The policy defined for the rural sector stipulates that owners could be indemnified but that every farm producer directly working a rural field affected by the dam will be entitled to have the entity award him another plot constituting an "economical farming unit". The award would be based on a sale at cost to be paid for by a long-term development credit. "Economical farming unit" is construed to mean a plot which, when worked rationally by a family, enables it to meet its needs and ensures favorable development of the farming enterprise. Preferably the plots will be awarded in farm settlements. In Paraguay, six options for rural families have been

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1/ The characteristics and mechanisms of the financing have not yet been defined but an effort has been made to design the minimum housing standards so that monthly payments do not exceed 30% of minimum wages on normal conditions of housing financed for low-income sectors.

2/ As indicated earlier, land occupants account for 63% of the population displaced at Posadas and 30% at Encarnacion.

3/ 300 m^2 in Argentina.

identified but they need to be developed and presented to the affected families for their response before these options are finalized.

1.28 As defined, the relocation policy for the urban, semi-urban and rural population is adjusted to the socioeconomic position of those affected, with a view to the least possible negative impact of the flooding. This particularly facilitates the improvement of the conditions of life of very low income groups with a reduced capacity for response to the impact of the dam and provides them with a benefit in the form of possible access to housing with minimum habilitation. Special attention should be given to the fact that the relocation policy is adapted to the particular features of property structure in the area and endeavors to retain the rural population on the farm. The success of these aims will depend on the specific implementation plans to be undertaken by YACYRETA.

1.29 Relocation of the urban population will be carried out in integrated groups, and YACYRETA will undertake the construction necessary to urbanize the area and to provide the requisite community services. For relocation of the businesses involved, commercial areas will be established in those complexes in which they will be given relocation preference.

D. Development and Implementation of Relocation Plan

1.30 In developing the relocation plan to be implemented by YACYRETA a distinction should be made among: (a) infrastructure works; (b) urban housing; (c) rural programs; and (d) social programs.

1.31 The designs for the infrastructure works were done by consultants belonging to the Harza, Lahmeyer and Associates Consortium and are virtually complete. These designs were coordinated with the competent public institutions of Argentina and Paraguay. A general description of the works to be carried out is as follows:

(a) Argentine side

(i) Railroad: construction of 31 km of main lines; passenger terminals for trains and buses, with a covered surface, including sheds, of approximately 14,000 m^2; freight station, with an 11,500 m^2 surface; 4 km of road embankment protectors; and services infrastructure.

(ii) Port works: construction of freight and passenger docks approximately 300 m in length; buildings for passengers and customs administration, with a covered surface of some 700 m^2; and services infrastructure.

(iii) Road projects: construction of 9.5 km of highways and two bridges with spans of approximately 200 m each.

(iv) Sanitation works: construction of intakes with a pumping capacity of 60,000 m^3/day, 2 km of discharge pipes; 1.7 km of feeder pipes; two 750 m^3 storage tanks and a 500 m^3 regulator tank; 33 km of distribution networks; a purification plant for liquid sewage; 35 km of sewer lines; 3 km of outfalls with a pumping station; 12 km of network storm drains.

(v) Electric and telephone works: installation of a provisional 24 MW turbo-gas plant until the city of Posadas is fed power from the Yacyreta plant; a 132/13.2 KV transformer substation; 9 km of medium-tension lines; 33 transformer stations and 10 km of distribution networks; and relocating 66 km of medium-tension lines and 80 telephone lines.

(b) Paraguayan side

(i) Railroads: construction of 93.4 km of railroad lines; a passenger and freight station, with 17,000 m^2 of covered surface; and services infrastructure.

(ii) Port facilities: construction of 320 m of freight and passenger docks; buildings for passengers and customs administration, with an area of 950 m^2; services infrastructure.

(iii) Roads: construction of 8 km of highway sections; 230 m of bridges and other road structures.

(iv) Sanitation facilities: construction of a pumping plant; a 500 m^3 storage tank; 36 km of potable water networks; a sewage purification plant; a 36 km network of sewers; a pumping station with discharge piping; 14 km network of storm drains and 1.5 km of open canals.

(v) Electric and telephone: construction of a 66/23 KV step-down substation; 17 km of medium-tension lines; 35 km of low-tension lines; 65 transformers stations; relocation of telephone network.

1.32 The habilitation programs undertaken on the Paraguayan side by the consultants have been generally accepted by YACYRETA and are consistent with socioeconomic and cultural patterns of the population to be relocated. An attempt has been made to avoid social distortions or a break in ties to job sites. The new area for resettlement in Encarnacion was chosen with a structural approach to the city of the future, taking into account the forthcoming construction of the Encarnacion-Posadas international bridge and the necessary ties between the city and rapidly developing farm settlements in the Department of Itapua. The consultants should adapt the project only to the minimum housing program and the results of the final cadastral studies of housing affected, which will begin at the close of 1978.

1.33 In the case of Argentina, following the concerns brought up by the mission sent by the Banks in April 1978, the housing solution originally proposed for Posadas was not accepted since it called for building housing groups that would substantially alter the housing patterns of the population concerned. The entity is now studying a project of relocation in four diversified areas flexible enough to accommodate the different socioeconomic groups of the population involved. A new group of consultants has been contracted to design single-family housing consistent with the housing and cultural patterns of the population to be relocated.

1.34 The programs for the rural population in both countries are in an initial phase of study. On the Paraguayan side it is believed that the best alternative for most of the 1,230 houses affected would be to include them in expanding existing national settlements. This needs to be discussed with the affected families for indication to the contrary have been noticed by regional government officials. This alternative would require formulation of an integrated rural development project, including technical and credit assistance, social services, road infrastructure, organization of producers for marketing purposes and other activities. On the Argentine side about 500 dwellings will be affected, 331 in Misiones and 148 in Corrientes. An agreement was recently entered into with the Province of Corrientes whereby the latter would identify alternatives for relocation of its rural population, and a similar agreement is expected to be signed with the Province of Misiones.

1.35 The social programs, which will support and expedite relocation of the population involved, are also in a preliminary stage. Those programs call for undertaking the following activities, among others:

(i) Report to the population on characteristics of the Yacyreta project and relocation plans;

(ii) Identification and recording of needs and desires of the population group involved and preparation of replies by the entity to their concerns;

(iii) Individual and collective advisory services to the population to be relocated on options offered by YACYRETA;

(iv) Implementation of labor training programs to enable the local population to take advantage of job facilities created by the project; and

(v) Implementation programs to familiarize the relocated population with their new housing, job and human environment and to assist them in solving problems created by adjustments during the initial resettlement period.

1.36 The social programs would be carried out in three phases: before, during and after relocation. A start should be well in advance of negotiation with the population affected. YACYRETA has decided on setting up a follow-up

and control unit under the Coordination Directorate which would be responsible for gauging the efficiency and effectiveness of social programs, controlling adaptation and transformation of the groups involved and changes in quality of life and proposing corrective action required by the relocation plan.

1.37 Implementation of the relocation plan will be the responsibility of the Coordination Directorate of YACYRETA, which could contract independent groups to execute the various programs. In order to adapt the Coordination Directorate to the implementation needs of the relocation plan, the Executive Committee, on September 5, 1978, approved a new organizational structure for the office. That structure is described in the following paragraph.

1.38 The programming, implementation and evaluation of all programs under the relocation plan will be the responsibility of the superintendent, who will perform his functions in the work area on the right bank (Paraguay) and a deputy superintendent who will operate in the left bank (Argentina). Each of these superintendents will be responsible for four areas: (a) road, port and railroad works and supplementary jobs; (b) housing, services and community facilities; (c) planning and administration and relocation program; and (d) studies and projects. Under the planning and administration of the relocation program are the social and rural programs and all aspects of the relocation plan not involving physical construction.

1.39 For the purpose of verifying how the population affected has adapted to its new environment and living conditions, and ex-post evaluation should be made two years after the project has been completed.

1.40 Pursuant to current plans for filling the reservoir during the first half of 1985, physical transfer of the population should begin in July 1981 for those located on land where infrastructure work is scheduled (about 1,600 families). This means that agreements with the population concerned should begin to be signed in mid-1980 and that housing construction should begin at the end of 1979.

ANNEX B

Special Funds for the Electricity Sector

1. Argentina's electric power sector is financed from three principal sources: (a) internal generation of funds, (b) resources generated by special Funds, and (c) external and domestic loans. The special funds are composed of (i) taxes on hydrocarbons, and (ii) taxes on electricity sales.

2. Financing of the national currency component for the Yacyretá project will come from the special Funds that are still available after existing commitments have been met. For this reason, the Secretaría has decided to estimate the amounts of the Funds for the period 1978-1985 and to determine the volume of resources committed and those available for Yacyretá.

Fondo de Combustibles

3. This Fund has two components:

(a) Tax on sales of petroleum derivatives (regular gasoline, premium gasoline, kerosene, gas-oil, diesel-oil, and fuel-oil), and

(b) Tax on natural gas sales.

4. The tax on sales of petroleum derivatives is calculated on the basis of a reference price fixed by the Ministry of Economy (see Table 1). Under Resolution 1195/77 ME a price of US$109/m^3 is set for regular gasoline, and on this the prices of the other petroleum derivatives are based (premium gasoline - 115%, kerosene and gas-oil - 90%, diesel-oil - 75%, fuel-oil - 60%).

5. The tax on sales of petroleum is calculated as a percentage over the reference price indicated in para. 4 (regular and premium gasoline - 50%, kerosene, diesel-oil and fuel-oil - 10%, and gas-oil - 30%).

6. The revenues generated by the tax on sales of petroleum derivatives are distributed as follows: 65% to the transportation sector and 35% to the energy sector.

7. The tax on natural gas sales is 10% of the natural gas average price. The current average price is US$0.044/m^3. The energy sector receives all the natural gas tax revenues (see Table 1).

Fondo Nacional de la Energía (FNE)

8. This Fund receives the portion of Fondo de Combustibles resources allocated to the energy sector. Part of FNE's resources are specifically assigned to other electricity funds.

9. The 35% of the petroleum derivatives tax is distributed as follows: (a) 21% stays in FNE, (b) 8.4% goes to Fondo Nacional de la Energía Eléctrica (FNEE), and 5.6% goes to Fondo Especial para el Desarrollo Eléctrico del Interior (FEDEI).

10. Revenues from the tax on natural gas sales, are distributed as follows: (a) 60% to FNE; (b) 24% to FNEE and (c) 16% to FEDEI.

11. FNE's own resources, composed of 21% of the tax on petroleum derivatives sales and 60% of the tax on natural gas sales, are allocated annually to the different agencies and companies in the energy sector. Traditionally the electricity subsector has received over 40% of FNE's resources, which have been earmarked for Agua y Energía Eléctrica (AyEE). The Secretaría's estimates are based on a future 40% allocation to the electricity subsector.

Fondo Nacional de la Energía Eléctrica (FNEE)

12. The sources of this Fund are the revenues channeled through FNE (8.4% of the tax on petroleum derivatives and 24% of the tax on natural gas) and a 5% surcharge on electricity sales. Of this surtax, 80% stays in FNEE and the 20% balance goes to FEDEI (see Table 2).

13. FNEE resources have been predominantly earmarked for AyEE. According to the Secretaría's projections, all of FNEE's resources will in the future be allocated to AyEE.

Fondo Chocón Cerros Colorados (CCC)

14. This Fund was originally set up to finance execution of the Chocón hydroelectric project, and was later expanded to finance future Hidronor's projects.

15. FCCC obtains its resources from (see Table 2):

(a) a 5% electricity sales tax, and

(b) a 5% tax on the value of the crude at refinery. The value of crude at refinery for 1978 was established on the basis of a weighted price that assumed that 85% of crude is of national origin, priced at US$43/m^3, and that 15% is imported, priced at US$83/m^3. For 1985, it was assumed that 100% of the crude at refinery would be of national origin, priced at US$55/m^3.

16. FCCC resources have exceeded Hidronor's requirements, and the surplus for 1978 has been allocated to AyEE and Yacyretá. The surplus for subsequent years will be assigned to Yacyretá.

Fondo Nacional de Grandes Obras Eléctricas (FNGOE)

17. The sources of this Fund are the same as those of FCCC (5% of the value of crude at refinery and 5% of electricity sales) (see Table 2).

18. There are no specific allocations for FNGOE. Its resources are earmarked for execution of Salto Grande and the CNEA nuclear power plants. Starting 1979, any surplus will be assigned to Yacyretá.

19. FNGOE's contributions to Salto Grande are broken down into: (a) loans to the Comisión Técnica Mixta de Salto Grande (Argentina-Uruguay) for the execution of works common to both countries, and (b) contributions for exclusively Argentine works.

20. Future payments made by Salto Grande in respect of principal and interest on loans from FNGOE will be reallocated into the power sector. As terms and conditions of these loans have not yet been defined, only net transfers between FNGOE and Salto-Grande have been included in Table 3.

Fondo Especial para el Desarrollo Eléctrico del Interior (FEDEI)

21. FEDEI's sources are (a) 5.6% of the tax on petroleum derivatives, (b) 16% of the tax on natural gas sales, and (c) 20% of the electricity sales surtax allocated to FNEE.

22. The Fund's resources are earmarked for small hamlet and rural electrification projects.

Other Funds

23. There are also other smaller funds at the provincial level, which in general cannot be accurately quantified.

24. The Fondo de Desarrollo Eléctrico de la Provincia de Buenos Aires, and the Fondo Especial Central La Brava are the most important. They finance works in the Province of Buenos Aires, chiefly in the areas handled by the Dirección de Energía Eléctrica de la Provincia de Buenos Aires (DEBA).

Projection of Funds

25. Tables 1 and 2 show the projected resources to be generated by each of the funds listed. Table 3 shows an estimation of how they will be used by the different enterprises and projects in the electricity subsector. A flow chart for the funds is also included.

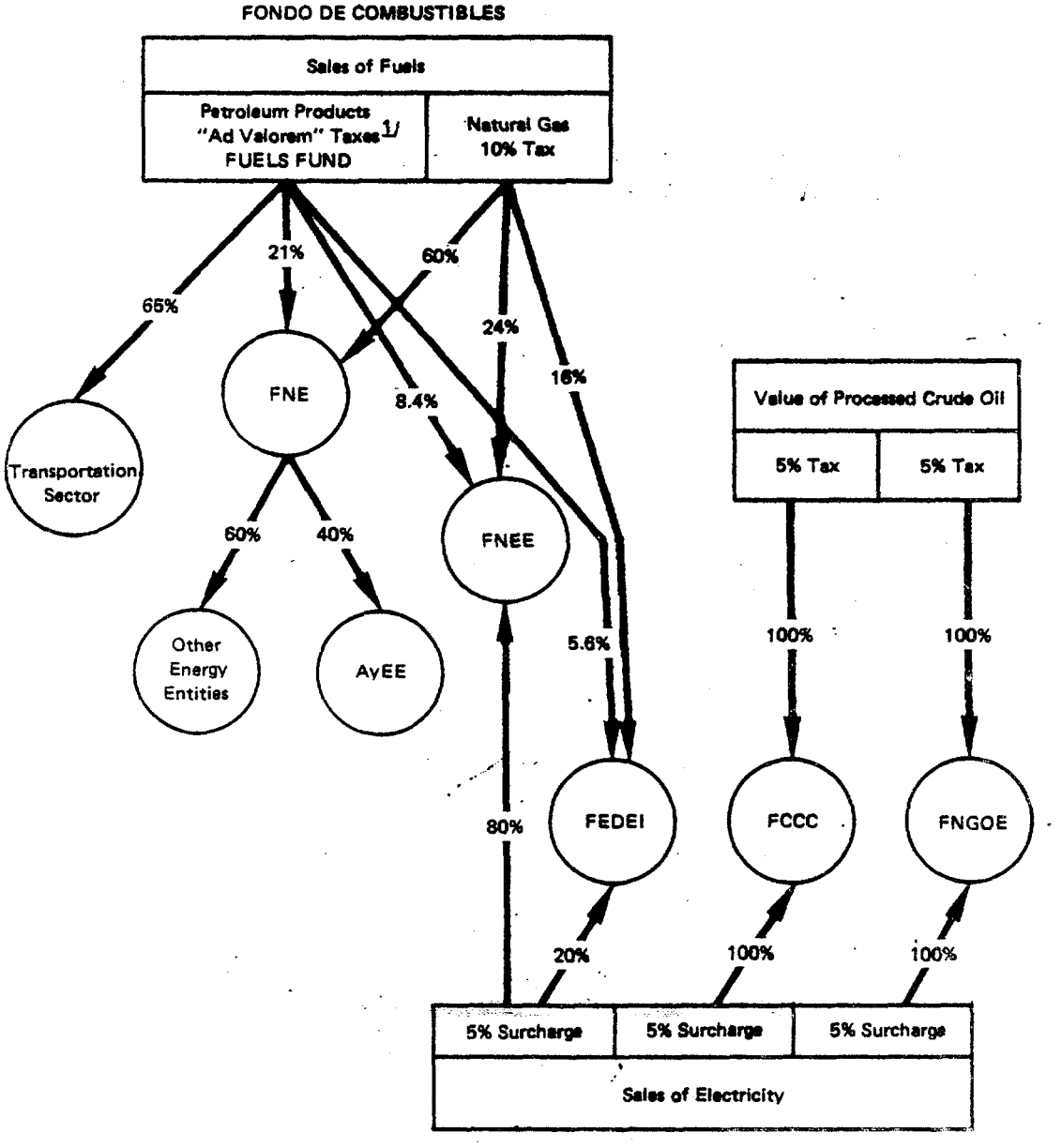
26. Table 4 shows resources for the period 1978-1985 by Fund and by source, which are estimated at US$4,782 million of which 41% corresponds to the electricity sales surcharges and 59% to the taxes on hydrocarbons. The financial analysis of the sector does not include FEDEI resources and other funds, since the investment programs of the power sector do not include the investments of the provincial components and small hamlet or rural electrification.

Legislation

27. The Secretaría is studying the pertinent legislation and the structure of the funds with a view to proposing amendments designed to: (a) consolidate funds whose financing and operations are similar (FNEE and FNGOE); (b) facilitate the use of surplus in specific funds (FCCC); and (c) create a mechanism to facilitate their use in accordance with the subsector investment program.

ANNEX B
Chart

ARGENTINA
ELECTRICAL FUNDS
FLOW CHART



1/ From 10% to 50% according to type of fuel.

World Bank — 19852

ANNEX B
Table 1

ARGENTINA

YACYRETA HYDROELETRIC PROJECT

FUELS FUNDS
(million of 1977 US$)

	1978	1979	1980	1981	1982	1983	1984	1985
A. Surcharge to Fuels sales								
Regular gasoline (millions of m^3)	2.9	3.1	3.3	3.4	3.6	3.7	3.9	4.1
Basic price (US$/$m^3$)	109	109	109	109	109	109	109	109
Total basic cost	318	336	354	372	390	406	424	442
Surcharge 50%	159	168	177	186	195	203	212	221
Premium gasoline (millions of m^3)	2.9	3.1	3.3	3.4	3.6	3.7	3.9	4.1
Basic price (1.15% gasoline price)(US$/$m^3$)	125.4	125.4	125.4	125.4	125.4	125.4	125.4	125.4
Total basic cost	366	386	407	427	447	468	488	508
Surcharge 50%	183	193	204	214	224	234	244	254
Kerosene (millions of m^3)	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.8
Basic price (90% gasoline price)(US$/$m^3$)	98.1	98.1	98.1	98.1	98.1	98.1	98.1	98.1
Total basic cost	95	92	88	85	82	79	77	74
Surcharge 10%	9	9	9	9	8	8	8	7
Gas-oil (millions of m^3)	6.3	6.7	7.0	7.3	7.6	8.0	8.3	8.6
Basic price (90% gasoline price)(US$/$m^3$)	98.1	98.1	98.1	98.1	98.1	98.1	98.1	98.1
Total basic cost	621	654	687	718	749	781	812	844
Surcharge 30%	186	196	206	215	225	234	244	253
Diesel-oil (millions of m^3)	1.4	1.5	1.6	1.7	1.7	1.8	1.8	1.9
Basic price (75% gasoline price)(US$/$m^3$)	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8
Total basic cost	114	123	131	136	141	146	150	155
Surcharge 10%	11	12	13	14	14	15	15	16
Fuel-oil (millions of m^3)	8.6	8.5	8.4	8.3	8.2	8.2	8.1	8.0
Basic price (60% gasoline price)(US$/$m^3$)	65.4	65.4	65.4	65.4	65.4	65.4	65.4	65.4
Total basic cost	562	556	549	544	539	537	528	523
Surcharge 10%	56	56	55	54	54	54	53	52
Total surcharge to fuels sales	604	634	664	692	720	748	776	803
Appropriated to-Energy Sector	211	222	232	242	252	262	272	281
Distribution by funds: FNE (21%)	127	133	139	145	151	157	163	169
FNEE (8.4%)	51	53	56	58	60	63	65	67
FEDEI (5.6%)	33	36	37	39	41	42	44	45
B. Surcharge to Natural Gas								
Natural gas sales (M m^3)	7244	7769	8387	9444	10262	11016	11824	12658
Basic price US$/$m^3$	0.044	0.044	0.044	0.044	0.044	0.044	0.044	0.044
Total basic cost	319	342	369	416	452	485	520	557
Surcharge (10% to Energy Sector)	32	34	37	42	45	49	52	56
Distribution by funds: FNE (60%)	19	21	22	25	27	29	31	34
FNEE (24%)	8	8	9	10	11	12	13	13
FEDEI (16%)	5	5	6	7	7	8	8	9
Total Fuel Fund appropriated to Energy Sector								
FNE	146	154	161	170	178	186	194	203
FNEE	59	61	65	68	71	75	78	80
FEDEI	38	41	43	46	48	50	52	54
Total	243	256	269	284	297	311	324	337

May 1978

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

SURCHARGE TO ELECTRICAL SALES AND CRUDE AT REFINERY
(million of 1977 US$)

	1978	1979	1980	1981	1982	1983	1984	1985
A. Surcharge to Electrical Sales								
Energy sales (GWh)	25,914	29,629	32,491	35,287	39,142	42,185	45,480	49,275
Energy sales subject to surcharge (GWh)	22,467	25,688	28,170	30,594	33,936	36,574	39,431	42,721
Average energy sale US¢/kWh	5.0	5.0	5.0	5.4	5.7	5.6	5.5	5.5
Income subject to surcharge	1,123	1,284	1,409	1,640	1,947	2,053	2,173	2,360
Surcharges: FNEE	45	51	56	66	78	81	87	95
FCCC	56	64	70	82	97	103	109	118
FNGOE	56	64	70	82	97	103	109	118
FEDEI	11	13	14	16	20	21	21	23
Total Electrical Surcharges	168	192	210	246	292	308	326	354
B. Surcharge to Crude at Refinery								
National production ($M\ m^3$)	24.6	25.4	27.0	28.7	30.6	32.5	34.5	36.5
Imported " ($M\ m^3$)	4.3	4.5	3.8	3.2	2.5	1.7	0.9	-
Total	28.9	29.9	30.8	31.9	33.1	34.2	35.4	36.5
Basic price for national production ($US\$/m^3$)	43	43	45	47	49	51	53	55
Basic price for imported ($US\$/m^3$)	82	82	85	88	91	94	97	100
Reference cost for national production	1,058	1,092	1,215	1,349	1,499	1,658	1,829	2,008
Reference cost for imported fuel	353	369	323	282	228	160	87	-
Total Reference Cost	1,411	1,461	1,538	1,631	1,727	1,818	1,916	2,008
Surcharges: FCCC (5% of reference cost)	71	73	77	82	86	91	96	100
FNGOE (5% of reference cost)	71	73	77	82	86	91	96	100
Total Surcharges to Crude at Refinery	142	146	154	164	172	182	192	200

September 1978

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

ELECTRICAL FUNDS

SOURCES AND APPLICATIONS

(millions of 1977 US$)

	1978	1979	1980	1981	1982	1983	1984	1985	TOTAL 1978-1980	TOTAL 1978-1985
SOURCES										
Fondo Nacional de Grandes Obras Eléctricas (BNGOE)	127	137	147	164	183	194	205	218	411	1,375
Fondo Chocon Cerros Colorados (CCC)	127	137	147	164	183	194	205	218	411	1,375
Fondo Nacional de la Energia Electrica (FNEE)	103	113	121	134	149	156	165	175	337	1,116
40% Fondo Nacional de la Energia (FNE)	58	108 2/	65	66	71	74	78	81	231	603
Total	415	495	480	530	586	618	653	692	1,390	4,469
APPLICATIONS										
Agua y Energia Electrica (AyEE)	194	211	186	202	220	230	243	256	591	1,742
Hidroelectrica Norpatagonica S.A. (HIDRONOR)	43	32	81	115	137	153	99	95	156	755
Salto Grande 1/	56	69	(8)	(11)	-	(5)	(11)	(16)	117	74
Comision Nacional de Energia Atomica (CNEA)	71	68	73	96	99	91	51	31	212	580
Total	364	380	332	402	456	469	382	366	1,076	3,151
Available for YACYRETA										
- FCCC	51	115	66	49	46	41	106	123	232	597
- FNGOE	-	-	82	79	84	108	165	203	82	721
Total	51	115	148	128	130	149	271	326	314	1,318
Escalation Factor	1.034	1.101	1.167	1.237	1.311	1.390	1.474	1.562		
Available for YACYRETA in current MUS$	53	127	173	158	170	207	400	509	357	1,801

1/ Net of repayments and interests.
2/ 70% in 1979.

May 1979

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

SUMMARY OF ELECTRICAL FUNDS
(million of 1977 US$)

	1978	1979	1980	1981	1982	1983	1984	1985	Total 1978-85
TOTAL BY FUNDS									
40% of FNE appropriated to power (AyEE)	58	108 1/	64	68	71	74	78	81	603
FNEE	104	112	121	134	149	156	165	175	1116
FNGOE	127	137	147	164	183	194	205	218	1375
FCCC	127	137	147	164	183	194	205	218	1375
Sub-total	416	494	479	530	586	618	653	692	4469
FEDEI	49	54	57	62	68	71	73	77	512
Total appropriated to power	465	548	536	592	654	689	726	769	4981
TOTAL BY SOURCES									
Fuels fund (appropriated to power)	155	210	172	182	190	199	208	215	1531
Surcharge to crude at refinery	142	146	154	164	172	182	192	200	1352
Total from fuels	297	356	326	346	362	381	400	415	2883
Surcharge to electricity sales	168	192	210	246	292	308	326	354	2098
Total appropriated to power	465	548	536	592	654	689	726	769	4981
Percentage by sources									
Taxes on fuels (%)	64	65	61	58	55	55	55	54	58
Surcharge to electricity sales (%)	36	35	39	42	45	45	45	46	42

1/ 70% in 1979.

May 1979

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Forecast Loan Disbursements
(in millions of current US$)

	1978	1979	1980	1981	1982	1983	1984	Total 1978-84	1985	1986	1987	1988	1989	1990	Total 1978-90	1991	1992	1993	1994	1995	Total 1978-95
I.B.R.D.	-	3.3	52.9	35.3	35.1	34.6	30.4	191.6	16.6	-	-	-	-	-	208.2	-	-	-	-	-	208.2
I.D.B.	-	3.3	53.4	35.6	35.4	34.9	30.6	193.2	16.8	-	-	-	-	-	210.0	-	-	-	-	-	210.0
European Banking	15.0	-	-	-	-	-	-	15.0	-	-	-	-	-	-	15.0	-	-	-	-	-	15.0
Suppliers' credits																					
Construction equipment 1	-	-	124.3	-	-	-	-	124.3	-	-	-	-	-	-	124.3	-	-	-	-	-	124.3
Construction equipment 2	-	-	-	98.5	-	-	-	98.5	-	-	-	-	-	-	98.5	-	-	-	-	-	98.5
Construction equipment 3	-	-	-	-	34.5	-	-	34.5	-	-	-	-	-	-	34.5	-	-	-	-	-	34.5
Electromechanical equipment	-	-	1.5	41.1	39.2	27.3	31.8	140.9	19.4	23.4	3.7	0.4	-	-	187.8	-	-	-	-	-	187.8
Generation equipment 1	-	-	2.3	-	-	44.6	-	46.9	3.0	2.7	-	-	-	-	52.6	-	-	-	-	-	52.6
Generation equipment 2	-	-	3.6	-	-	29.8	47.3	80.7	-	4.4	5.7	-	-	-	90.8	-	-	-	-	-	90.8
Generation equipment 3	-	-	3.6	-	-	-	31.6	35.2	50.1	-	5.7	6.0	-	-	97.0	-	-	-	-	-	97.0
Generation equipment 4	-	-	3.6	-	-	-	-	3.6	33.4	52.4	-	6.1	6.4	-	101.9	-	-	-	-	-	101.9
Generation equipment 5	-	-	1.5	-	-	-	-	1.5	-	35.4	-	-	2.5	2.7	42.1	-	-	-	-	-	42.1
Sub-total Suppliers' Credits	-	-	140.4	139.6	73.7	101.7	110.7	566.1	105.9	118.3	15.1	12.5	8.9	2.7	829.5	-	-	-	-	-	829.5
Foreign Loans (Com. Banks)																					
1980	-	-	122.1	-	-	-	-	121.6	-	-	-	-	-	-	121.6	-	-	-	-	-	121.6
1981	-	-	-	138.8	-	-	-	138.5	-	-	-	-	-	-	138.5	-	-	-	-	-	138.5
1982	-	-	-	-	206.6	-	-	206.3	-	-	-	-	-	-	206.3	-	-	-	-	-	206.3
1983	-	-	-	-	-	311.6	-	311.3	-	-	-	-	-	-	311.3	-	-	-	-	-	311.3
1984	-	-	-	-	-	-	151.1	150.8	-	-	-	-	-	-	150.8	-	-	-	-	-	150.8
Sub-total Foreign Loans	-	-	122.1	138.8	206.6	311.6	151.1	930.2	-	-	-	-	-	-	930.2	-	-	-	-	-	930.2
Local Loans (Banks)																					
1981	-	-	-	100.0	-	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0
1982	-	-	-	-	100.0	-	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0
1983	-	-	-	-	-	100.0	-	100.0	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0
Sub-total Local Loans	-	-	-	100.0	100.0	100.0	-	300.0	-	-	-	-	-	-	300.0	-	-	-	-	-	300.0
Electrical Funds	41.4	126.1	172.7	158.3	170.4	207.0	399.2	1,275.1	4[illegible]9	401.1	231.4	118.0	43.6	44.4	2,610.4	-	-	-	-	-	2,610.4
TOTAL BORROWINGS	56.4	132.7	541.5	607.6	621.2	789.8	722.0	3,471.2	636.2	519.4	246.5	130.5	52.5	47.1	5,103.4	-	-	-	-	-	5,103.4

Forecast Long-Term Debt Balances
(in millions of current US$)

ANNEX C
Table 2

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
I.B.R.D.	-	3.3	56.2	91.5	126.6	161.2	191.6	198.3	175.0	151.7	128.4	105.1	81.8	58.5	35.2	11.9	-	-
I.D.B.	-	3.3	56.7	92.3	127.7	162.6	193.2	202.5	187.5	172.5	157.5	142.5	127.5	112.5	97.5	82.5	67.5	52.5
European Banking	15.0	15.0	15.0	15.0	15.0	13.5	10.5	7.5	4.5	1.5	-	-	-	-	-	-	-	-
Suppliers' Credits	-	-	140.4	280.0	353.7	443.0	531.4	611.5	698.9	664.9	609.2	539.7	459.6	376.6	293.6	223.0	162.3	105.0
Foreign Loans (Com. Banks)	-	-	122.1	260.9	467.5	779.1	930.2	881.1	799.3	665.6	506.8	348.0	213.5	102.1	25.1	-	-	-
Local Bank Loans	-	-	-	100.0	200.0	300.0	275.0	225.0	150.0	75.0	25.0	-	-	-	-	-	-	-
Sub-total	15.0	21.6	390.4	839.7	1290.5	1859.4	2131.9	2125.9	2015.2	1731.2	1426.9	1135.3	882.4	649.7	451.4	317.4	229.8	157.5
Electrical Funds	42.6	180.6	383.5	594.1	841.3	1155.1	1707.4	2425.2	3123.0	3720.3	4265.2	4728.8	5139.7	5454.6	5735.8	5920.5	6042.4	6122.6
Loan for excess of cap. contri.	-	-	-	-	-	-	32.0	35.6	39.6	44.1	49.0	54.5	60.6	67.4	75.0	83.5	92.9	103.4
TOTAL LONG-TERM DEBT BALANCE	57.6	202.2	773.9	1433.8	2131.8	3014.5	3871.3	4586.7	5177.8	5495.6	5741.1	5918.6	6082.7	6171.7	6262.2	6321.4	6365.1	6383.5

November 1978

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Forecast Interest Charges 1978-1995

(in millions of current US$)

	1978	1979	1980	1981	1982	1983	1984	Total 1978-84	1985	1986	1987	1988	1989	1990	Total 1978-90	1991	1992	1993	1994	1995	Total 1978-95
I.B.R.D.	-	0.8	3.8	7.0	9.6	12.1	14.5	47.8	16.2	15.4	13.5	11.7	9.8	7.9	122.3	6.1	4.2	2.3	0.5	-	135.4
I.D.B. 1/	-	1.7	4.8	7.6	9.8	12.0	14.9	49.9	15.8	14.9	13.8	12.7	11.5	10.4	126.9	9.3	8.2	7.0	5.9	4.8	162.1
European Banking	0.3	1.4	1.4	1.4	1.4	1.4	1.1	8.4	0.9	0.6	0.3	0.1	-	-	10.3	-	-	-	-	-	10.3
Suppliers' credits																					
Construction equipment 1	-	-	4.9	9.9	9.9	9.6	8.7	43.0	7.7	6.7	5.7	4.7	3.7	2.7	74.2	1.7	0.7	-	-	-	76.6
Construction equipment 2	-	-	-	3.9	7.9	7.9	7.7	27.4	6.9	6.1	5.3	4.5	3.7	2.9	56.8	2.2	1.4	0.6	-	-	61.0
Construction equipment 3	-	-	-	-	1.4	2.8	2.8	7.0	2.7	2.4	2.1	1.9	1.6	1.3	19.0	1.0	0.8	0.4	0.2	-	21.4
Electromechanical equipment	-	-	0.1	1.7	4.9	7.6	10.0	24.3	12.0	13.8	14.8	13.9	12.4	10.9	102.1	9.4	7.9	6.4	4.9	3.4	134.1
Generation equipment 1	-	-	0.1	0.2	0.2	2.0	3.7	6.2	3.9	4.0	3.7	3.3	2.8	2.4	26.3	2.0	1.6	1.2	0.7	0.3	32.1
Generation equipment 2	-	-	0.1	0.3	0.3	1.5	4.6	6.8	6.4	6.6	6.9	6.4	5.6	4.9	43.6	4.2	3.5	2.7	2.0	1.3	57.3
Generation equipment 3	-	-	0.1	0.3	0.3	0.3	1.6	2.6	4.8	6.8	7.1	7.3	6.8	6.0	41.4	5.3	4.5	3.7	2.9	2.1	59.9
Generation equipment 4	-	-	0.1	0.3	0.3	0.3	0.3	1.3	1.6	5.1	7.1	7.4	7.7	7.2	37.4	6.4	5.5	4.7	3.9	3.1	61.0
Generation equipment 5	-	-	0.1	0.1	0.1	0.1	0.1	0.5	0.1	1.5	3.0	3.0	3.1	3.2	14.4	3.0	2.6	2.2	1.9	1.6	25.7
Sub-total Suppliers	-	-	5.5	16.7	25.3	32.1	39.5	119.1	46.1	53.0	55.7	52.4	47.4	41.5	415.2	35.2	28.5	21.9	16.5	11.8	529.1
Foreign Loans (Com. Banks)																					
1980	-	-	5.8	11.6	11.6	11.6	11.6	52.2	11.0	8.7	6.4	4.0	1.7	-	84.0	-	-	-	-	-	84.0
1981	-	-	-	6.9	13.9	13.9	13.9	48.6	13.3	11.0	8.7	6.3	4.0	1.7	93.6	-	-	-	-	-	93.6
1982	-	-	-	-	10.3	20.6	20.6	51.5	20.6	19.8	16.3	12.9	9.5	6.0	136.6	2.6	-	-	-	-	139.2
1983	-	-	-	-	-	15.6	31.1	46.7	31.1	31.1	29.8	24.6	19.5	14.3	197.1	9.1	3.9	-	-	-	210.1
1984	-	-	-	-	-	-	7.5	7.5	15.1	15.1	15.1	14.5	11.9	9.4	88.6	6.9	4.4	1.9	-	-	101.8
Sub-total Foreign loans	-	-	5.8	18.5	35.8	61.7	84.7	206.5	91.1	85.7	76.3	62.3	46.6	31.4	599.9	18.6	8.3	1.9	-	-	628.7
Local Loans (Banks)																					
1981	-	-	-	4.8	9.5	9.5	8.9	32.7	6.5	4.2	1.8	-	-	-	45.2	-	-	-	-	-	45.2
1982	-	-	-	-	4.8	9.5	9.5	23.8	8.9	6.5	4.2	1.8	-	-	45.2	-	-	-	-	-	45.2
1983.	-	-	-	-	-	4.8	9.5	14.3	9.5	8.9	6.5	4.2	1.8	-	45.2	-	-	-	-	-	45.2
Sub-total Local loans	-	-	-	4.8	14.3	23.8	27.9	70.8	24.9	19.6	12.5	6.0	1.8	-	135.6	-	-	-	-	-	135.6
Electrical Funds																					
Total Interest	1.2	11.9	30.2	52.3	76.8	106.8	153.0	432.2	221.0	296.7	365.9	427.1	483.8	536.4	2,764.1	580.5	616.0	647.5	668.3	681.7	5,957.1
Less: Deferred Interest	1.2	11.9	30.2	52.3	76.8	106.8	153.0	432.2	221.0	296.7	365.9	427.1	420.0	366.4	2,529.3	314.9	281.2	184.7	121.8	80.2	3,512.2
Net interest paid	-	-	-	-	-	-	-	-	-	-	-	-	63.8	170.0	233.8	265.4	334.8	462.8	546.5	601.5	2,444.9
Loan for excess of cap. contrib. (all deferred)	-	-	-	-	-	-	-	-	3.6	4.0	4.5	4.9	5.5	6.1	28.6	6.8	7.6	8.5	9.4	10.5	71.4
TOTAL INTEREST	1.5	15.8	51.5	108.3	173.0	249.9	334.7	934.7	419.6	489.9	542.5	577.2	606.4	633.7	4,204.0	656.4	672.8	689.1	700.6	708.8	7,631.8
LESS: TOTAL DEFERRED INTEREST	1.2	11.9	30.2	52.3	76.8	106.8	153.0	432.2	224.6	300.7	370.4	431.9	425.5	372.5	2,557.8	321.7	288.8	193.2	131.2	90.7	3,583.5
TOTAL INTEREST PAID	0.3	3.9	21.3	56.0	96.2	143.1	181.7	502.5	195.0	189.2	172.1	145.3	180.9	261.2	1,646.2	334.7	384.0	495.9	569.4	618.1	4,048.3

1/ Includes IDB's inspection fee (1% of loan amount).

November 1978

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Forecast Loan Amortizations 1978-1995

(in millions of current US$)

	1978	1979	1980	1981	1982	1983	1984	Total 1978-84	1985	1986	1987	1988	1989	1990	Total 1978-90	1991	1992	1993	1994	1995	Total 1978-95
I.B.R.D.	-	-	-	-	-	-	-	-	11.6	23.1	23.1	23.1	23.1	23.1	127.1	23.1	23.1	23.1	11.6	-	208.2
I.D.B.	-	-	-	-	-	-	-	-	7.5	15.0	15.0	15.0	15.0	15.0	82.5	15.0	15.0	15.0	15.0	15.0	157.5
European Banking	-	-	-	-	-	1.5	3.0	4.5	3.0	3.0	3.0	1.5	-	-	15.0	-	-	-	-	-	15.0
Suppliers' credits																					
Construction equipment 1	-	-	-	-	-	12.4	12.4	24.8	12.4	12.4	12.4	12.4	12.4	12.4	99.2	12.4	12.4	-	-	-	124.0
Construction equipment 2	-	-	-	-	-	-	9.9	9.9	9.9	9.9	9.9	9.9	9.9	9.9	69.3	9.9	9.9	9.9	-	-	99.0
Construction equipment 3	-	-	-	-	-	-	-	-	3.5	3.5	3.5	3.5	3.5	3.4	20.9	3.4	3.4	3.4	3.4	-	34.5
Electromechanical equipment	-	-	-	-	-	-	-	-	-	-	9.3	18.8	18.8	18.8	65.7	18.8	18.8	18.8	18.8	18.8	159.7
Generation equipment 1	-	-	-	-	-	-	-	-	-	5.1	5.3	5.3	5.3	5.3	36.3	5.3	5.3	5.3	5.3	5.3	52.8
Generation equipment 2	-	-	-	-	-	-	-	-	-	-	8.7	9.1	9.1	9.1	26.0	9.1	9.1	9.1	9.1	9.1	81.5
Generation equipment 3	-	-	-	-	-	-	-	-	-	-	-	9.2	9.7	9.7	28.6	9.7	9.7	9.7	9.7	9.7	77.1
Generation equipment 4	-	-	-	-	-	-	-	-	-	-	-	-	9.7	10.2	19.9	10.2	10.2	10.2	10.2	10.2	70.9
Generation equipment 5	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	4.0	4.2	4.2	4.2	4.2	4.2	25.0
Sub-total Suppliers' Credits	-	-	-	-	-	12.4	22.3	34.7	25.8	30.9	49.1	68.2	78.4	82.8	369.9	83.0	83.0	70.6	60.7	57.3	724.5
Foreign Loans (Com. Banks)																					
1980	-	-	-	-	-	-	-	-	24.3	24.4	24.4	24.4	24.4	-	121.5	-	-	-	-	-	121.9
1981	-	-	-	-	-	-	-	-	23.2	23.2	23.2	23.2	23.2		138.6	-	-	-	-	-	139.2
1982	-	-	-	-	-	-	-	-	-	34.4	34.4	34.4	34.4	34.4	172.0	34.4	-	-	-	-	206.4
1983	-	-	-	-	-	-	-	-	-	-	51.9	51.9	51.9	51.9	207.6	51.9	51.9	-	-	-	311.4
1984	-	-	-	-	-	-	-	-	-	-	-	25.1	25.1	25.2	75.3	25.2	25.2	25.2	-	-	150.9
Sub-total Foreign Loans	-	-	-	-	-	-	-	-	47.5	42.0	133.9	159.0	159.0	134.7	716.1	111.5	77.1	25.2	-	-	930.2
Local Loans (Banks)																					
1981	-	-	-	-	-	-	25.0	25.0	25.0	25.0	25.0	-	-	-	100.0	-	-	-	-	-	100.0
1982	-	-	-	-	-	-	-	-	25.0	25.0	25.0	25.0	-	-	100.0	-	-	-	-	-	100.0
1983	-	-	-	-	-	-	-	-	-	25.0	25.0	25.0	25.0	-	100.0	-	-	-	-	-	100.0
Sub-total Local Loans	-	-	-	-	-	-	25.0	25.0	50.0	75.0	75.0	50.0	25.0	-	300.0	-	-	-	-	-	300.0
Electrical Funds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Loan for excess of cap. contribution	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL AMORTIZATIONS	-	-	-	-	-	13.9	50.3	64.2	145.4	229.0	299.1	316.8	300.5	255.6	1,610.6	232.7	198.3	134.0	87.5	72.3	2,335.4

November 1978

ANNEX C
Table 4

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Transfers to Plant

(in millions of current US$)

ANNEX C
Table 5

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
Investments															
Generation equipment	-	-	-	14.6	-	-	79.8	84.8	93.1	102.6	12.4	13.2	9.5	2.7	412.7
Capitalized interest on generation equipment 1/	-	-	-	0.5	1.2	1.2	4.2	10.3	16.8	24.0	27.8	-	-	-	86.0
Sub-total	-	-	-	15.1	1.2	1.2	84.0	95.1	109.9	126.6	40.2	13.2	9.5	2.7	498.7
All other works and equipment	-	54.5	118.2	511.3	567.0	542.8	555.4	353.1	195.9	134.9	91.8	68.0	52.4	48.3	3,293.6
Capitalized interest on other works & equip. 1/	-	1.5	15.8	51.0	107.1	171.8	245.7	324.4	399.0	461.6	510.1	-	-	-	2,288.0
Sub-total	-	56.0	134.0	562.3	674.1	714.6	801.1	677.5	594.9	596.5	601.9	68.0	52.4	48.3	5,581.6
Total Investments (incl. cap. interest)	-	56.0	134.0	577.4	675.3	715.8	885.1	772.6	704.8	723.1	642.1	81.2	61.9	51.0	6,080.3
Transfers to Plant															
Assets Existing on 12/31/77	-	-	-	-	-	-	-	-	49.2	-	-	-	-	-	49.2
All other works and equipment 2/	-	-	-	-	-	-	-	-	4,210.2	598.9	604.5	67.5	52.2	48.3	5,581.6
Generation equipment 3/	-	-	-	-	-	-	-	-	74.8	124.7	124.7	124.7	47.1	2.7	498.7
Total transfers to plant	-	-	-	-	-	-	-	-	4,334.2	723.6	729.2	192.2	99.3	51.0	6,129.5
Gross fixed assets in operation	-	-	-	-	-	-	-	-	4,334.2	5,057.8	5,787.0	5,979.2	6,078.5	6,129.5	
Work in Progress															
Increase (dec.) in work-in-progress	-	56.0	134.0	577.4	675.3	715.8	885.1	772.6	(3,629.4)	(0.5)	(87.1)	(111.0)	(37.4)	-	-
Work-in-progress balance	49.2	105.2	239.2	816.6	1,491.9	2,207.7	3,092.8	3,865.4	236.0	235.5	148.4	37.4	-	-	-

1/ Interest was assumed to be capitalized until 1987 (when half the generating units are in operation), and charged to operations from 1988 on.
2/ All expenditures incurred until 1985 are transferred to plant in 1985, and yearly thereafter as they are incurred.
3/ Transferred to plant as units enter into operation.

Depreciation Charges

(in millions of current US$)

ANNEX C
Table 6

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Generation equipment & existing on 12/31/77 (average yearly balance)	62.0	186.4	311.1	435.8	521.7	546.6	547.9	547.9	547.9	547.9	547.9
Annual depreciation (at 2.24%)	1.3	4.2	7.0	9.8	11.7	12.3	12.3	12.3	12.3	12.3	12.3
All other works & equipment (average yearly balance)	3,920.1	4,518.7	5,121.4	5,458.1	5,518.3	5,568.7	5,581.6	5,581.6	5,581.6	5,581.6	5,581.6
Depreciation coeficient (%) 1/	0.32	0.90	1.46	2.02	2.24	2.24	2.24	2.24	2.24	2.24	2.24
Annual depreciation	12.0	40.7	74.8	110.3	123.6	124.7	125.3	125.3	125.3	125.3	125.3
Total annual depreciation	13.3	44.9	81.8	120.1	135.3	136.9	137.6	137.6	137.6	137.6	137.6
Accumulated depreciation	13.3	58.2	140.0	260.1	395.4	532.3	669.9	807.5	945.1	1,082.7	1,220.3

1/ Depreciation assumed pro-rata tempore as units come into operation between 1985 and 1990.

November 1978

ANNEX C
Table 7

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Assumed Terms applicable to Long-Term Debt

	Interest Rate(%)	Grace Period (yrs)	Repayment Period (yrs)
IBRD	8	6	9
IDB	7.5	6	14
Export Credits			
- Heavy construct. equipment a/	8	3	10
- Electromechanical equipment	8	b/	10
- Generation equipment	8	c/	10
Foreign Loans (Banks) a/			
- In 1979 and 1980	9.5	5	5
- From 1981 until 1984	10	4	6
Local loans (Banks)	9.5	3	4
Loans from Electr. Funds	6 d/	e/	f/

a/ Separate loans were assumed for each year (3).
b/ Until mid-1987. One single loan was considered, with disbursements over several years.
c/ Until commissioning date for each group of generating units, for which separate loans (5) were considered.
d/ On indexed capital.
e/ At least until all other loans are repaid.
f/ Flexible.

November 1978

ANNEX C
Table 8

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Terms offered in "Letters of Intent" for Export Credits 2/

	Amount (10^6)	Grace Period (yrs)	Repayment Peri((yrs)
West Germany	DM (US$500 equiv.)	8	10
Austria	AS (US$200 equiv.)	8	10 to 15
Canada	US$775	8	15
United States	US$775	8	10
France	FF 2/	8	10
Great Britain	US$220	8	10
Italy	US$350	8	10
Japan	¥(US$775 equiv.)	8	10
Portugal	2/	8	10
Sweden	US$200	8	10
Switzerland	FS500	8	10
USSR	2/	N.A.	N.A.

1/ Interest rate as per OECD norms (presently 7.75%).
2/ No limit specified.

May 25, 1979

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

Power Sector

Calculation of Billing Charge

	1979	1980	1981	1982	1983	1984	1985
Annual investment in national Transmission grid (US$10^6)	82	266	123	260	-	65	315
Annual depreciation (3.3%)	3	12	16	24	24	26	37
Remunerable rate base 1/	41	216	406	586	697	705	870
Associated cost:							
Return on rate base (8%)	3	17	32	47	56	56	70
Depreciation	3	12	16	24	24	26	37
Operating costs (1.5%)	1	5	7	11	11	12	17
Total associated cost	7	34	55	82	91	94	124
Transported energy 2/ (GWh)	8,180	10,171	12,663	15,307	15,506	17,149	18,616
Billing Charge (US mills/kWh)	0.9	3.3	4.3	5.4	5.9	5.5	6.6

1/ Including 5% for working capital.

2/ Excluding sales to Comahue.

November 1978

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

SEGBA

Summary Financial Statements 1976-85

	Actual (Millions of US$)		Forecast (Millions of Constant 1977 US$)								Total
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1978-85
Energy Sales (GWh) 1/ own system	8,435	8,861	9,324	9,977	10,675	11,422	12,222	13,077	13,993	14,972	95,662
Average Tariff (mills/kWh) 2/	24.7	44.7	56.7	56.7	56.7	56.7	58.3	59.7	58.2	58.0	57.7
Operating Revenues											
Sales Revenues - own system	208	396	-	-	-	-	-	-	-	-	-
Total Operating Revenues	208	396	529	567	605	648	713	781	815	868	5,526
Operating Expenses											
Labor 3/	87	126	115	111	109	108	109	111	113	115	891
Fuel 4/	29	65	98	123	123	123	147	147	147	147	1,055
Energy Purchased 5/	36	76	92	49	65	80	66	87	107	145	691
Billing Charges 6/	-	-	-	2	11	18	17	25	29	35	137
Operation and Maintenance 7/	7	11	45	45	45	45	45	45	45	45	360
Taxes 8/	11	22	32	34	36	39	43	47	49	52	324
Depreciation 9/	54	72	53 10/	56	60	83	110	115	119	123	719
Total Operating Expenses	224	372	435	420	449	496	537	577	609	662	4,177
Net Operating Income:	(16)	24	94	147	156	152	176	204	206	206	1,341
Plus: Depreciation	54	72	53	56	60	83	110	115	119	123	719
Other Non-Operating Income (Net)	(3)	11	(34) 11/	(50) 11/	-	-	-	-	-	-	(84)
Gross Internal Cash Generation:	35	107	113	153	216	235	286	319	325	329	1,976
Less: Amortization	19	36	38	54	67	62	67	51	51	47	437
Interest	41	76	71	44	40	37	31	26	22	18	289
Total Debt Service	60	112	109	98	107	99	98	77	73	65	726
Net Internal Cash Generation:	(25)	(5)	4	55	109	136	188	242	252	264	1,250
Borrowings: Existing	29	55	48	50	32	24	-	-	-	-	154
Future Suppliers	-	-	16	-	-	-	-	-	-	-	16
Other Future	-	-	95	-	-	-	-	-	-	-	95
Total Borrowings	29	55	159	50	32	24	-	-	-	-	265
Contributions: Electr. Funds	-	-	-	-	-	-	-	-	-	-	-
Consumers Contrib.	1	3	1	1	2	2	3	3	3	4	19
Other (Incl. Equity)	45	75	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	50	128	164	106	143	162	191	245	255	268	1,534
Investments: Generation	14	8	42	49	27	20	7	3	2	2	152
Transmission	30	37	52	70	86	69	53	37	32	45	444
Distribution	26	39	26	39	46	49	51	56	62	68	397
Other	10	5	10	18	14	18	15	16	12	12	115
Total Investments	80	89	130	176	173	156	126	112	108	127	1,108
Increase (dec.) in Working Capital 12/	(30)	39	34	111 13/	3	3	8	9	3	2	173
Other Applications	-	-	-	-	-	-	-	-	-	-	-
TOTAL APPLICATIONS	50	128	164	287	176	159	134	121	111	129	1,281
Surplus (Deficit)	-	-	-	(181)	(33)	3	57	124	144	139	253
Financing of Deficit 14/											
- new borrowings	-	-	-	189	52	20	-	-	-	-	261
- new debt service	-	-	-	8	19	23	24	55	60	59	248
New Surplus	-	-	-	-	-	-	33	69	84	80	266
Other financial indicators:											
Total net fixed assets in oper.	1,127	1,204	1,220	1,262	1,326	1,789	2,396	2,449	2,454	2,456	
Total long-term debt 15/	319	317	438	623	640	622	555	472	380	283	
Debt/assets ratio (%) 15/	28	26	36	49	48	35	23	19	15	12	
Rate Base 16/	1,054	1,154	1,238	1,303	1,358	1,635	2,197	2,544	2,575	2,578	
Rate of return on rate base(%) 16/	-1.5	1.6	7.6	11.2	11.5	9.3	8.0	8.0	8.0	8.0	
Self-financing ratio (%) 15/	-20	-4	2	16	51	71	122	155	173	159	
Debt-service coverage(times) 15/	0.6	0.9	1.0	1.4	1.7	1.9	2.3	2.4	2.4	2.7	
Operating ratio (%) 17/	76	70	66	58	58	58	54	53	54	56	

May 1979

1/ Excluding sales to substations.

2/ Projected tariffs maintained constant (in real terms) at their May 1978 level until 1981; increased thereafter in order to allow for an 8% rate of return on revalued assets (see note 16).

3/ Forecasts based on the following projections of no. of employees and annual cost per employee:

	1978	1979	1980	1981	1982	1983	1984	1985
No. of employees	22,628	21,400	20,550	19,950	19,700	19,700	19,700	19,700
Unitary cost (US$)	6,000	6,120	6,242	6,367	6,495	6,624	6,757	6,892

4/ Forecasts based on a price of fuel of US$55/Tn starting in 1979.

5/ Excludes purchases from substations. Forecasts based on a DUC tariff of US mills 20/kWh, constant over the period.

6/ Transmission charge necessary to cover costs and remuneration associated with AyEE's investments in the National Transmission System; the following charges (US mills/kWh) were computed:

1978	1979	1980	1981	1982	1983	1984	1985
-	0.9	3.3	4.3	5.4	5.9	5.5	5.5

7/ Assumed at 40% of total labor costs in forecasts.

8/ 6% on sales.

9/ Computed at 3.1% average rate based on straight-line method.

10/ Decrease in 1978 is due to the methodology chosen for projections (in constant Dec. 1977 US$, while actual depreciation is computed on assets expressed in US$ using the end-of-year exchange rate).

11/ Includes a 22 million contribution to the Treasury and 12 million of indexations on overdue commercial debts in 1978, and 50 million contribution to the Treasury in 1979.

12/ Forecast working capital is maintained at 5% of average net fixed assets starting in 1980.

13/ Mainly consolidation of S-T debts.

14/ Assuming borrowings with 9 years maturity (incl. 3 years of grace) and 9% interest rate.

15/ Taking into account borrowings necessary to finance deficit.

16/ According to SEGBA's Concession - Assumes corrective assets revaluations of 35% in 1981 and 35% in 1982.

17/ Operating expenses (excl. depreciation and sales taxes)/Operating Revenues.

ANNEX 5
Table 10

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

HIDRONOR

Summary Financial Statements 1976 - 1985

	Actual (millions of US$)				Forecast (millions of constant 1977 US$)						
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	Total 78-85
Energy sales (GWh)-DUC	2,396	2,504	3,212	4,208	4,163	4,895	4,844	4,788	6,620	7,027	39,757
-Comahue	484	582	600	642	687	735	786	842	900	963	6,155
Total sales	2,880	3,086	3,812	4,850	4,850	5,630	5,630	5,630	7,520	7,990	45,912
Average tariff (mills/kWh)-Comahue	2.1	3.4	4.7	4.3	4.3	4.1	4.4	4.6	3.9	4.5	4.4
-DUC 1/	8.4	22.7	21.1	18.8	19.0	18.0	21.5	21.7	19.5	26.0	21.0
Operating Revenues											
Sales revenues-Comahue	1	2	3	3	3	3	3	4	4	4	27
-DUC	20	57	68	79	79	88	104	104	129	183	834
Other operating revenues	-	-	-	-	-	-	-	-	-	-	-
Total operating revenues	21	59	71	82	82	91	107	108	133	187	861
Operating Expenses											
Labor 2/	3	4	4	5	5	5	5	6	6	6	42
Fuel	-	-	-	-	-	-	-	-	-	-	-
Energy purchased	-	-	-	-	-	-	-	-	-	-	-
Operation and maintenance 3/	3	4	8	8	8	10	10	10	10	12	76
Sales taxes 4/	1	2	4	5	5	5	6	6	8	11	50
Depreciation 5/	9	17	2	3	3	3	4	4	5	7	31
Total operating expenses	16	27	18	21	21	23	25	26	29	36	199
Net Operating Income	5	32	53	61	61	68	82	82	104	151	662
Plus: depreciation	9	17	2	3	3	3	4	4	5	7	31
other non-oper. inc.(net)	2	-	(5)	(10) 10/	-	-	-	-	-	-	(15)
Gross Internal Cash Gen.	16	49	50	54	64	71	86	86	109	158	678
Less: Amortization	11	20	17	16	15	15	17	20	21	35	156
Interest	12	25	13	13	14	15	17	20	23	26	141
Total debt service	23	45	30	29	29	30	34	40	44	61	297
Net Internal Cash Generation	(7)	4	20	25	35	41	52	46	65	97	381
Borrowings											
Existing	32	38	7	-	-	-	-	-	-	-	7
Future - Suppliers	-	-	2	18	15	19	22	61	46	49	232
- Int'l. Fin. Organ.	-	-	-	-	15	20	35	-	-	-	70
Total Borrowings	32	38	9	18	30	39	57	61	46	49	309
Contributions											
Funds	22	47	43	32	81	115	137	153	99	95	755
Consumers	-	-	-	-	-	-	-	-	-	-	-
Other (incl. equity) 6/	38	10	-	-	-	-	-	-	-	-	-
Total Contributions	60	57	43	32	81	115	137	153	99	95	755
TOTAL SOURCES	85	99	72	75	146	195	246	260	210	241	1,445
Investments:											
Generation	25	21	48	66	120	125	162	165	130	198	1,014
Transmission	32	52	11	-	21	61	72	90	55	38	348
Distribution	-	-	-	-	-	-	-	-	-	-	-
Other	-	-	5	5	5	5	5	5	5	5	40
Total Investments	57	73	64	71	146	191	239	260	190	241	1,402
Increase in Working Capital 7/	28	26	8	4	-	4	7	-	20	-	43
TOTAL APPLICATIONS	85	99	72	75	146	195	246	260	210	241	1,445
Surplus (deficit)	-	-	-	-	-	-	-	-	-	-	-
Other Financial Indicators:											
Total net fixed assets in operation	-	-	-	-	-	-	-	-	-	-	-
Total long-term debt	181	249	241	243	258	282	322	363	388	402	-
Debt/assets ratio (%)	-	-	-	-	-	-	-	-	-	-	-
Rate base 8/	-	449	662	758	759	856	1,020	1,020	1,299	1,883	-
Rate of return on rate base (%) 8/	-	7.1	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	-
Self-financing ratio (%)	-8	4	28	47	24	21	21	18	31	40	-
Debt service coverage (times)	0.7	1.1	1.7	1.9	2.2	2.4	2.5	2.2	2.5	2.6	-
Operating ratio (%) 9/	29	14	17	16	16	16	14	15	12	10	-

May 1979

1/ Based on increases (in real terms) sufficient to allow for a rate of return of 8% on revalued assets (see Note 8) starting in 1978.

2/ Based on the following projections of No. of employees and annual cost per employee:

	1978	1979	1980	1981	1982	1983	1984	1985
No. of Employees	820	835	845	850	865	930	990	1,030
Unitary Cost (US$)	6,300	6,426	6,555	6,686	6,819	6,956	7,095	7,237

Only 85% of the total cost is charged to operations. The rest is capitalized.

3/ Assumed at about 200% of total labor cost in forecasts.

4/ 6% on sales.

5/ Projected depreciation was calculated according to the sinking fund method (as used for tariff setting purposes) whereas it was calculated with the straight-line method in historical income statements.

6/ Includes contributions from the Treasury.

7/ Forecast working capital was maintained at 4% of gross fixed assets (as per rate base calculation).

8/ Assumes corrective assets revaluations of 15% in 1981 and 15% in 1982.

9/ Operating expenses (excl. depreciation and sales taxes)/ operating revenues.

10/ Contribution to the Treasury in 1979.

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

Salto Grande

Summary Financial Statements 1976 - 1985

	----Actual---- (millions of US$) 1976	1977	----------Forecast---------- (millions of constant 1977 US$) 1978	1979	1980	1981	1982	1983	1984	1985	Total 78-85
Energy sales (GWh)-Uruguay	-	-	-	-	1,190	1,060	1,020	947	987	987	6,191
-Argentina(DUC)	-	-	-	1,530	3,560	5,320	5,630	5,913	5,913	5,913	33,779
Total Sales	-	-	-	1,530	4,750	6,380	6,650	6,860	6,900	6,900	39,970
Average tariff (per kWh) 1/	-	-	-	17.6	17.1	16.9	17.1	17.1	17.0	17.0	17.0
Operating Revenues											
Sales revenues-Uruguay	-	-	-	-	20	18	17	16	17	17	105
-Argentina	-	-	-	27	61	90	97	101	100	100	576
Total Operating Revenues	-	-	-	27	81	108	114	117	117	117	681
Operating Expenses											
Labor 2/	-	-	-	2	5	6	7	7	7	7	41
Fuel	-	-	-	-	-	-	-	-	-	-	-
Energy purchased	-	-	-	-	-	-	-	-	-	-	-
Other Oper. and maintenance 3/	-	-	-	1	2	2	2	2	2	2	13
Sales taxes	-	-	-	-	-	-	-	-	-	-	-
Depreciation 4/	-	-	-	1	3	4	5	5	5	5	28
Other	-	-	-	-	-	-	-	-	-	-	-
Total Operating Expenses	-	-	-	4	10	12	14	14	14	14	82
Net Operating Income(all Salto G.)	-	-	-	23	71	96	100	103	103	103	599
Plus: depreciation	-	-	-	1	3	4	5	5	5	5	28
other non-oper. inc.(net)	-	-	-	-	-	-	-	-	-	-	-
Gross cash gen. (all S.G.)	-	-	-	24	74	100	105	108	108	108	627
Gross cash gen. @89% 5/	-	-	-	21	66	89	93	96	96	96	557
Less: Amortization (excl. Funds)	3	1	1	2	-	30	56	56	56	56	257
Interest (excl. Funds)	14	21	13	42	45	44	41	35	29	24	273
Total debt-service 6/	17	22	14	44	45	74	97	91	85	80	530
Net internal cash generation	(17)	(22)	(14)	(23)	21	15	(4)	5	11	16	27
Borrowings: Existing	25	45	124	89	33	-	-	-	-	-	246
Future suppliers	-	-	-	-	-	-	-	-	-	-	-
Other future borrow.	-	-	179	-	-	-	-	-	-	-	179
Total borrowings 6/	25	45	303	89	33	-	-	-	-	-	425
Contributions: Funds (net) 7/	56	106	56	69	(8)	(11)	-	(5)	(11)	(16)	74
Consumers'	-	-	-	-	-	-	-	-	-	-	-
Other (equity)	17	26	10	15	15	-	-	-	-	-	40
Other Sources	-	-	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	81	155	355	150	61	4	(4)	-	-	-	566
Investments: Common works	74	137	248	103	22	-	-	-	-	-	373
Arg. works	7	18	107	48	30	-	-	-	-	-	185
Total Investments 5/	81	155	355	151	52	-	-	-	-	-	558
Increase (dec.) in working capital 8/	-	-	-	(1)	9	4	(4)	-	-	-	8
TOTAL APPLICATIONS	81	155	355	150	61	4	(4)	-	-	-	566
Surplus (deficit)	-	-	-	-	-	-	-	-	-	-	-
Other Financial Indicators 9/											
Rate base	-	-	-	287	890	1,196	1,246	1,293	1,293	1,293	-
Rate of return on rate base (%)	-	-	-	8.0	8.0	8.0	8.0	8.0	8.0	8.0	-
Operating ratio (%) 10/	-	-	-	11	9	8	8	8	8	8	-

October 1978

1/ Salto Grande's tariff, like YACYRETA's, is based on debt service requirements and is therefore very much dependent on the terms and conditions applied to borrowings from Argentina's Electrical Funds; at the time of appraisal, however, these had not yet been defined. It was assumed in the forecasts that they would be set so as to correspond to a 8% rate of return on fixed assets.

2/ Based on the following projections of No. of employees and annual cost per employee:

	1978	1979	1980	1981	1982	1983	1984	1985
Cost per Employees	-	300	800	900	1,000	1,000	1,000	1,000
Unitary Cost (US$)	-	6,120	6,242	6,367	6,495	6,625	6,757	6,892

100% of the total cost is charged to operations.

3/ Assumed at 30% of labor costs.

4/ Depreciation was calculated according to the sinking fund method.

5/ Only common and Argentinian works (89% of total cost) have been considered; therefore only 89% of the total cash generation of the company should be assigned to them.

6/ Borrowings and debt service exclude loans specifically contracted to finance purely Uruguayan works.

7/ This line represents the net transfers needed from the Electrical Funds (loan disbursements less debt service).

8/ Projected working capital was maintained at 2 months of billing except in 1979 and 1982 when some S-T borrowings were assumed.

9/ Due to the specifics of Salto Grande's financial arrangements, a number of commonly used indicators (i.e., debt and self-financing ratios) are irrelevant and are therefore ommitted.

10/ Operating expenses (excl. depreciation and sales taxes)/ operating revenues.

ANNEX C
Table 12

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

Comisión Nacional de Energía Atómica (CNEA)

Summary Financial Statements 1976-85

	-----Actual----- (Million of US$)		----------Forecast---------- (Million of Constant 1977 US$)								Total
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1978-85
Energy Sales (GWh)	2,409	1,537	2,448	2,448	2,448	2,448	6,621	6,621	6,621	6,621	-
Average Tariff (mills/kWh) 1/	6.6	14.3	17.57	17.57	17.57	18.38	18.43	18.43	18.43	18.43	-
Operating Revenues											
Sales Revenues	16	22	43	43	43	45	122	122	122	122	662
Other Operating Revenues	4	12	-	-	-	-	-	-	-	-	-
Total Operating Revenues	20	34	43	43	43	45	122	122	122	122	662
Operating Expenses											
Labor 2/	1	2	2	2	2	2	4	4	4	4	24
Fuel 3/	6	11	19	19	19	19	33	33	33	33	208
Energy Purchased	-	-	-	-	-	-	-	-	-	-	-
Operation and maintenance 4/	2	3	4	4	4	4	6	6	6	6	40
Taxes	-	-	-	-	-	-	-	-	-	-	-
Depreciation 5/	2	2	2	2	2	2	8	8	8	8	40
Total Operating Expenses	11	18	27	27	27	27	51	51	51	51	312
Net Operating Income:	9	16	16	16	16	18	71	71	71	71	350
Plus: Depreciation	2	2	2	2	2	2	8	8	8	8	40
Other Non-Operating Income (Net)	-	-	-	-	-	-	-	-	-	-	-
Gross Internal Cash Generation:	11	18	18	18	18	20	79	79	79	79	390
Less: Amortization	14	16	18	11	9	8	24	24	24	24	142
Interest	10	10	8	7	7	6	29	30	31	32	150
Total Debt Service	24	26	26	18	16	14	53	54	55	56	292
Net Internal Cash Generation:	(13)	(8)	(8)	-	2	6	26	25	24	23	98
Borrowings: Existing	38	52	54	88	40	30	-	-	-	-	212
Future Suppliers	-	-	-	-	-	4	18	30	32	26	110
Other Future	-	-	-	-	-	-	-	-	-	-	-
Total Borrowings	38	52	54	88	40	34	18	30	32	26	322
Contributions: Electr. Funds (Net)	9	17	71	68	73	96	99	91	51	31	580
Consumer Contrib.	-	-	-	-	-	-	-	-	-	-	-
Other (inc. Equity) 6/	30	51	-	-	-	-	-	-	-	-	-
TOTAL SOURCES	64	112	117	156	115	136	143	146	107	80	1,000
APPLICATIONS											
Investments: Generation	62	110	117	156	115	136	119	146	107	80	976
Tranmission	-	-	-	-	-	-	-	-	-	-	-
Distribution	-	-	-	-	-	-	-	-	-	-	-
Total Investments	62	110	117	156	115	136	119	146	107	80	976
Increase (dec.)in Working Capital 7/	2	2	-	-	-	-	24	-	-	-	24
TOTAL APPLICATIONS	64	112	117	156	115	136	143	146	107	80	1,000
Surplus (Deficit)	-	-	-	-	-	-	-	-	-	-	-
Other Financial Indicators:											
Total Net Fixed Assets in Operation	-	-	-	-	-	-	-	-	-	-	-
Total Long-term Debt	-	-	-	-	-	-	-	-	-	-	-
Debt/Assets Ratio (%)	-	-	-	-	-	-	-	-	-	-	-
Rate Base 8/	-	-	199	199	199	229	883	883	883	883	-
Rate of Retun on Rate Base (%)	-	-	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	-
Self-financing Ratio (%)	-20	-7	-7	-	2	4	18	17	22	29	-
Debt Service Coverage (times)	0.5	0.7	0.7	1.0	1.1	1.4	1.5	1.5	1.4	1.4	-
Operating Ratio (%) 9/											

1/ Based on increases (in real terms) sufficient to allow for a rate of return of 8% on revalued assets (see note 8) starting in 1978.

2/ Based on the following projections of No. of employees and annual cost per employee:

	1978	1979	1980	1981	1982	1983	1984	1985
No. of Employees	430	430	430	430	750	750	750	750
Unitary Cost (US$)	5,400	5,508	5,618	5,731	5,845	5,962	6,081	6,203

Only 85% of the total cost is charged to operations the rest is capitalized.

3/ Based on a price for nuclear fuel of US mills 7.7/kWh for the Atucha plant and US mills 3.7/kWh for the Rio Tercero plant.

4/ Assumed in forecasts at about 200% of labor costs until 1981 and 150% in 1982 and thereafter.

5/ Computed according to the sinking fund method using a life of 30 years.

6/ Includes contributions from the Treasury.

7/ Forecast working capital was maintained at 4% of gross fixed assets (as per rate base calculation).

8/ Assumes corrective assets revaluations of 15% in 1981 and 15% in 1982.

9/ Operating expenses (excl. depreciation and sales taxes)/operating revenues.

October 1978

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

Agua y Energia Electrica (AyEE)

Summary Financial Statments 1976-85

	Actual (Million of US$)		Forecast (Million of Constant 1977 US$)								Total
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1978-85
Energy Sales (GWh) - own system	8,164	9,064	9,312	10,827	12,922	14,172	16,126	17,442	18,862	20,611	-
- Futaleufu 1/	-	-	1,070	2,432	2,432	2,432	2,432	2,432	2,432	2,432	-
Total Energy Sales	8,164	9,064	10,382	13,259	15,354	16,604	18,558	19,874	21,294	23,043	-
Average Tariff (mills/kWh) - own system 2/	20.0	36.0	45.8	49.7	49.1	54.1	55.3	57.0	54.1	55.7	-
- Futalefú 1/	-	-	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	-
Operating Revenues											
Sales Revenues - own system	164	328	427	538	634	767	892	994	1,020	1,148	6,420
- Futaleufu	-	-	16	35	35	35	35	35	35	35	261
Total Sales Revenues	164	328	443	573	669	802	927	1,029	1,055	1,183	6,681
Other Operating Revenues	1	2	-	-	-	-	-	-	-	-	-
Billing Charge 3/	-	-	-	7	30	49	83	92	95	103	459
Total Operating Revenues	165	330	443	580	699	851	1,010	1,121	1,150	1,286	7,140
Operating Expenses											
Labor 4/	58	96	124	126	127	128	129	132	132	133	1,031
Fuel 5/ 6/	40	82	134	146	171	178	96	106	111	139	1,081
Energy Purchased - DUC	4	14	26	63	78	95	180	199	193	223	1,084
- HIDRONOR	-	-	3	3	3	3	3	4	4	4	-
Billing Charge 3/	-	-	-	3	13	21	46	56	52	54	245
Operation and Maintenance 7/	2	8	43	44	44	45	45	46	46	47	360
Taxes 8/	-	-	24	34	40	48	56	62	63	71	398
Depreciation 9/	31	47	54	75	83	115	159	167	181	197	1,031
Other	20	33	-	-	-	-	-	-	-	-	-
Total Operating Expenses	155	280	408	494	559	633	714	772	782	868	5,230
Net Operating Income:	10	50	35	86	140	218	296	349	368	418	1,910
Plus: Depreciation	31	47	54	75	83	115	159	167	181	197	1,031
Other Non-operating Income (Net)	-	-	8 10/	(89) 10/	-	-	-	-	-	-	(81)
Gross Internal Cash Generation:	41	97	97	72	223	333	455	516	549	615	2,860
Less: Amortization	- 11/	- 11/	62	82	79	71	112	124	116	116	762
Interest	-	-	175	55	53	56	52	43	33	32	499
Total Debt Service	-	-	237	137	132	127	164	167	149	148	1,261
Net Internal Cash Generation:	41	97	(140)	(65)	91	206	291	349	400	467	1,599
Borrowings: Existing	75 11/	121 11/	122	35	18	10	-	-	-	-	185
Future Suppliers	-	-	71	84	69	58	47	72	112	143	656
Other Future	-	-	208	-	-	-	-	-	-	-	208
Total Borrowings	75	121	401	119	87	68	47	72	112	143	1,049
Contributions: Electr. Funds	38	52	194	211	186	202	220	230	243	256	1,742
Consumers Contribution	-	-	-	-	-	-	-	-	-	-	-
Other (Incl. Equity)	128	96	13	-	-	-	-	-	-	-	13
TOTAL SOURCES	282	366	468	265	364	476	558	651	755	866	4,403
Investments: Generation	n.a.	n.a.	273	284	234	210	148	156	150	155	1,610
Transmission	n.a.	n.a.	99	124	187	200	172	193	300	333	1,608
Distribution	n.a.	n.a.	54	104	96	99	106	106	111	114	790
Other	11	16	76	85	70	70	70	71	77	78	597
Total Investments	268	758	502	597	587	579	496	526	638	680	4,605
Increase (dec.) in Working Capital 12/	(26)	(437)	(36)	394 13/	21	19	34	26	13	32	503
Other Applications 14/	40	45	2	-	-	-	-	-	-	-	2
TOTAL APPLICATIONS	282	366	468	991	608	598	530	552	651	712	5,110
Surplus (deficit)	-	-	-	(726)	(244)	(122)	28	99	104	154	(707)
Financing of Deficit: 15/											
- New Borrowings	-	-	-	760	327	229	94	156	208	197	1,971
- New Debt Service	-	-	-	34	83	107	122	255	312	351	1,264
Net Surplus	-	-	-								
Other Financial Indicators											
Total Net Fixed Assets in Oper.	447	739	1,098	1,584	1,866	2,583	3,728	3,839	4,172	3,[illegible]	-
Total Long-term Debt 16/	337	283	622	1,419	1,754	1,980	2,009	1,986	2,008	2,012	-
Debt/assets Ratio (%) 16/	75	38	59	90	94	77	54	52	48	40	-
Rate Base 17/	-	-	976	1,386	1,811	2,338	3,316	3,97?	4,206	4,843	-
Rate of return on Rate Base (%) 17/	0.3	2.9	2.0	4.0	6.0	8.0	8.0	8.0	8.0	8.0	-
Self-financing Ratio (%) 16/	-	-	-30	-10	1	17	32	17	29	38	-
Debt-service Coverage (times) 16/	n.a.	n.a.	0.4	0.4	1.0	1.4	1.6	1.2	1.2	1.2	-
Operating Ratio (%) 18/	75	71	74	66	62	55	49	48	47	47	-

May 1979

ANNEX C
Table 14

1/ Sales to aluminium plant.
2/ Based on increases (in real terms) sufficient to allow for rates of return on revalued assets (see Note 17) of 2% in 1978, 4% in 1979, 6% in 1980, and 8% in 1981 and thereafter.
3/ See Note 6/ of Table 10.
4/ Based on the following projections of No. of employees and annual cost per employee:

	1978	1979	1980	1981	1982	1983	1984	1985
No. of Employees	23,140	23,140	22,840	22,470	22,255	22,303	21,898	21,532
Unitary Cost (US$)	6,300	6,426	6,555	6,686	6,819	6,956	7,095	7,237

Only 85% of the total cost is charged to operations; the rest is capitalized.
5/ Forecasts based on prices US$55/ton for fuel oil, US$81/10^6liters and US$30/ton for coal.
6/ Forecasts based on tariffs of US mills 20/kWh for purchases from the DUC. See Table 11 for purchases from HIDRONOR (Comahue).
7/ Assumed at 35% of total labor costs in forecasts.
8/ 6% on sales.
9/ Computed at 3.1% average rate based on straight-line method.
10/ 8 million to be received from DEBA in 1978 and 89 million contribution to the Treasury in 1979.
11/ Borrowings, in 1976 and 1977, are net since AyEE's debt amortization figures are not available.
12/ Forecast working capital was maintained at 5% of average net fixed assets (as per rate base calculation).
13/ Mainly consolidation of S-T debts.
14/ Equity investments in Yacyreta.
15/ Assuming borrowings with 9 years maturity (incl. 3 years of grace) and 9% interest rate.
16/ Taking into account borrowings necessary to finance deficit.
17/ Excluding Futalefú plant; assumes corrective assets revaluations of 35% in 1981 and 35% in 1982.
18/ Operating expenses (excl. depreciation and sales taxes)/operating revenues.

ANNEX C
Table A-1

Yacyretá Treaty

Escalation Formula

I

$$F.A. = 1 + (0.50\ V_{DEG} + 0.25\ V_p\ Exp.\ UN + 0.25\ V_p\ Exp.\ IFS)$$

In Which:

F.A. = Adjustment factor to implement the adjustment referred to in IV.4, Annex "C".

V_{DEG} = Percentage change in the value of the Special Drawing Right with respect to its parity to the U.S. dollar, which at the present date is set at 1 US$ = .828948 S.D.R.

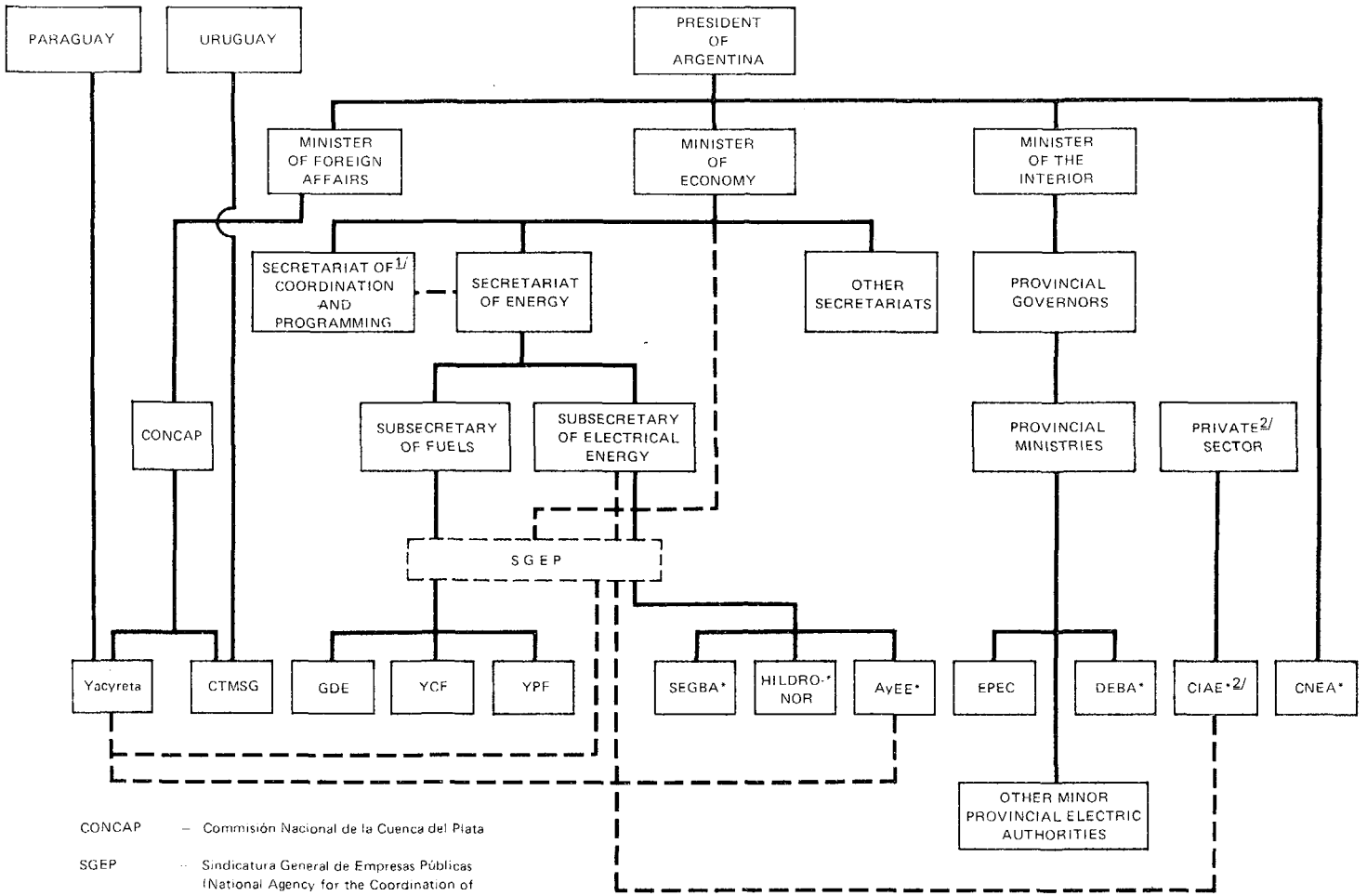
V_p Exp. UN = Percentage change in the Export Prices Index, stated in US. dollars and computed by the United Nations pursuant to the Paasche method and published in "International Financial Statistics".

V_p Exp. IFS = Percentage change in the Index of Export Prices of Developed Areas, stated in US. dollars, computed pursuant to the Laspeyres method and published in "International Financial Statistics" of the International Monetary Fund.

II

The following countries are considered as Developed Areas as used in the Index of Export Prices published in "International Financial Statistics" of the International Monetary Fund: United States of America, Great Britain, Austria, Belgium, Denmark, France, Federal Republic of Germany, Italy, Holland, Norway, Sweden, Switzerland, Canada and Japan.

AGENTINA
ORGANIZATION OF THE POWER SECTOR



CONCAP – Commisión Nacional de la Cuenca del Plata

SGEP – Sindicatura General de Empresas Públicas (National Agency for the Coordination of Public Corporations)

Yacyreta – Entidad Binacional Yacyreta

CTMSG – Comisión Técnica Mixta de Salto Grande

GDE – Gas del Estado (National Gas Corporation)

YCF – Yacimientos Carboníferos Fiscales (National Coal Corporation)

SEGBA – Servicios Electricos del Gran Buenos Aires

HIDRONOR – Hidroeléctrica Norpatagónica, S.A.

AyEE – Agua y Energia Eléctrica

EPEC – Empresa Provincial de Energia de Córdoba

DEBA – Dirección de Energia Eléctrica de la Provincia de Buenos Aires

CIAE – Compañia Italo Argentina de Electricidad

CNEA – Comisión Nacional de Energia Atómica

*The use of the energy generated by these entities is coordinated by the Unified Distribution System--Despacho Unificado de Carga (DUC). As interconnection increases in the future, other entities will be incorporated into it such as EPEC, CTMSG and Yacyreta.

1 Submits to the Minister of Economy the tariffs proposed by the Secretariat of Energy after reviewing them.

2 Negotiations by the Government to acquire this company are completed.

World Bank - 19851

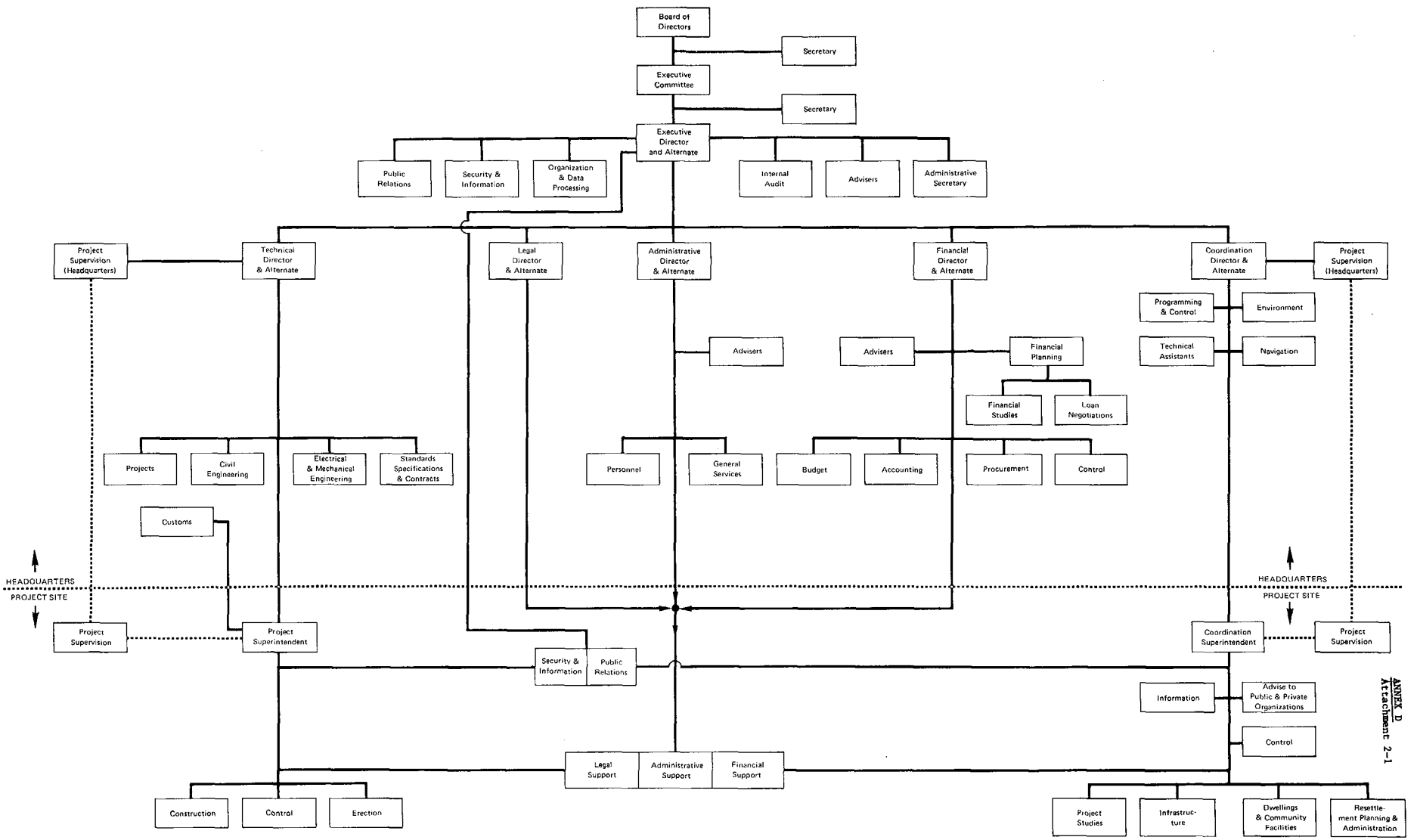
ARGENTINA

Electricity Consumption. Below, historical public service consumption per category is shown:

Year	Residential GWH	Commercial GWH	Industrial GWH	Others GWH	Total GWH
1962	2,735	936	2,352	1,203	7,226
1963	2,969	1,006	2,338	1,224	7,537
1964	3,148	1,096	2,779	1,307	8,330
1965	3,390	1,212	3,146	1,371	9,119
1966	3,600	1,266	3,349	1,427	9,642
1967	3,864	1,372	3,458	1,524	10,218
1968	4,159	1,496	3,831	1,737	11,223
1969	4,571	1,685	4,523	1,862	12,641
1970	4,987	1,853	5,241	2,013	14,094
1971	5,240	1,937	6,164	2,192	15,533
1972	5,603	2,057	7,048	2,290	16,998
1973	5,842	2,123	7,652	2,447	18,063
1974	6,104	2,136	8,373	2,508	19,121
1975	6,599	2,217	9,073	2,644	20,533
1976	6,957	2,229	8,993	2,830	21,009

December, 1978

ARGENTINA – PARAGUAY
ENTIDAD BINACIONAL YACYRETA
ORGANIZATION CHART



ANNEX D
Attachment 2-1

World Bank – 19849

ARGENTINA

		Installed Capacity	Commissioning Date
1.	Hydroelectric		
	Planicie Banderita	450	1978
	Cabra Corral	112	1978
	Futaleﬁ	448	1978
	Salto Grande	1,620	1979
	Piedras Moras	6	1981
	Agua del Toro	130	1981
	Arroyito	120	1981
	Los Reyunos	224	1982
	Puente Allum	30	1982
	Las Maderas	30	1982
	Potrero del Clavillo	760	1985
	Rio Grande	125	1984
	Alicura	750	1984
	Sub-total	5,005	
2.	Steam		
	Pilar	150	1978
	Barranqueras	15	1978
	Independencia	50	1978
	Sorrento B	160	1980
	San Nicolás	350	1982
	Costanera 7	310	1982
	Bahía Blanca I	310	1982
	Bahía Blanca II	310	1983
	Luján de Cuyo	125	1982
	Guemes	120	1982
	Sub-Total	1,900	
3.	Nuclear		
	Rio III	644	1982
4.	Gas Turbines		
	Cuyo	112	1978
	N.O.A.	104	1978
	N.E.A.	80	1978
	Patagónica	32	1978
	Sub-Total	328	
	TOTAL:	7,877	

ANNEX D
Attachment 3-2

ARGENTINA: PUBLIC SERVICE CONSUMPTION.
GENERATION AND MAXIMUM DEMAND

Year	Consumption 1/ GWh	Generation 2/ GWh	Maximum Demand 3/ (Coincident) MW
1978	25 914	30 043	5 910
1979	29 750	34 269	6 475
1980	32 491	37 417	7 014
1981	35 287	40 662	7 734
1982	39 142	45 059	8 510
1983	42 185	46 668	9 200
1984	45 480	52 480	9 794
1985	49 275	56 855	10 606
1986	53 364	61 907	11 533
1987	57 795	67 700	12 644
1988	62 589	73 602	13 714
1989	67 783	80 027	14 984
1990	73 409	87 152	16 302
1991	79 500	94 806	17 725
1992	86 100	102 890	19 177
1993	93 248	111 138	20 794
1994	100 985	119 942	22 505

1/ Total Public Service Consumption including special industries.
2/ Losses for each region calculated as a percentage were assumed to be those that occured in 1975, which is considered a normal year.
3/ The regional load factors of 1975 were used to determine regional maximum demands. To calculate the aggregate national maximum demand a diversity factor of 0.975 was used in the initial years and 0.959 from 1984 onwards when the national electric system is entirely interconnected.

ANNEX D
Attachment 3-3

ARGENTINA: FORECAST OF TOTAL ENERGY CONSUMPTION
(GWh)

Year	Captive	Public Service	Total
1978	4 622	25 914	30 536
1979	4 746	29 750	34 496
1980	4 878	32 491	37 369
1981	5 006	35 287	40 293
1982	5 141	39 142	44 283
1983	5 280	42 185	47 465
1984	5 422	45 480	50 902
1985	5 569	49 275	54 844
1986	5 719	53 364	59 083
1987	5 874	57 795	63 669
1988	6 032	62 589	68 621
1989	6 195	67 783	73 978
1990	6 363	73 409	79 772
1991	6 534	79 500	86 034
1992	6 711	86 100	92 811
1993	6 892	93 248	100 140
1994	7 078	100 985	108 063

December, 1978

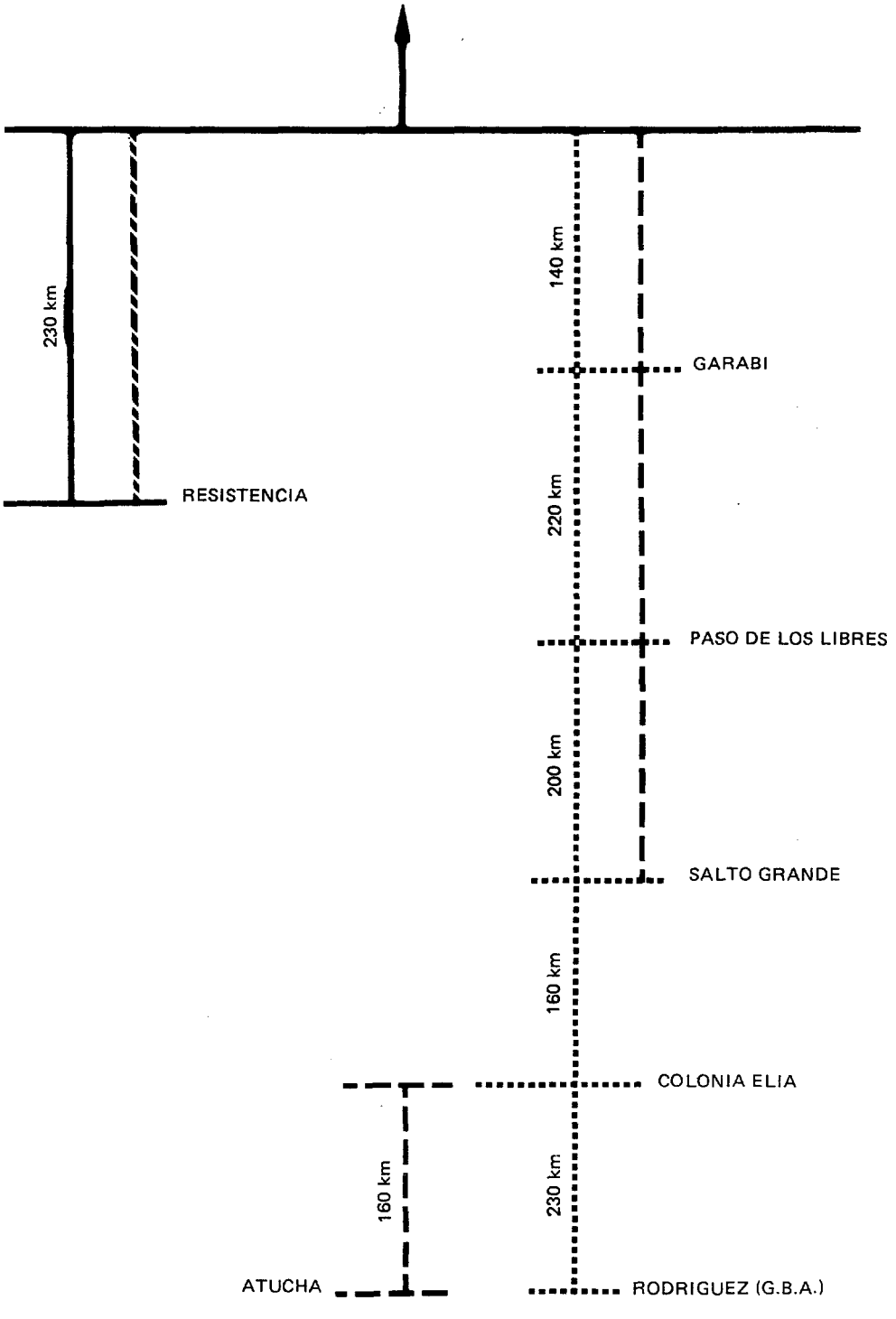
ARGENTINA: REGIONAL DISTRIBUTION OF PUBLIC SECTOR ELECTRIC CONSUMPTION (GWh)

Year	GBA	Litoral		Comahue	BAS	Centro	Cuyo	NEA	NOA	Patagónica	Total
		A(1)	B(2)								
					A.- HISTORICAL DATA						
1965	5 158	1 015	209	151	482	722	634	160	270	318	9 119
1966	5 389	1 080	231	159	527	757	713	176	286	324	9 642
1967	5 736	1 140	245	170	599	787	713	195	305	328	10 218
1968	6 292	1 250	280	179	673	860	781	213	344	351	11 223
1969	7 017	1 450	320	199	732	937	952	249	407	378	12 641
1970	7 694	1 607	364	272	848	1 021	1 142	275	478	393	14 094
1971	8 293	1 770	417	333	1 002	1 161	1 304	302	531	420	15 533
1972	8 914	1 977	494	395	1 088	1 223	1 531	347	605	434	16 998
1973	9 296	2 163	555	411	1 144	1 305	1 643	393	713	441	18 063
1974	9 446	2 403	564	489	1 230	1 389	1 824	456	818	471	19 090 (3)
1975	9 868	2 487	579	522	1 269	1 447	1 988	520	925	510	20 115 (3)
1976	9 917	2 631	578	568	1 320	1 474	2 068	531	993	510	20 590 (3)
1977	10 483	2 802	641	672	1 503	1 598	2 148	601	1 064	542	22 054 (3)
					B.- BASE FORECAST						
1978	11 217	3 079	716	761	1 668	1 718	2 324	671	1 167	565	23 886
1979	12 002	3 384	800	862	1 851	1 847	2 615	750	1 309	589	26 009
1980	12 842	3 719	894	977	2 055	1 986	2 941	838	1 469	614	28 335
1981	13 741	4 087	999	1 107	2 281	2 135	3 247	936	1 648	640	30 821
1982	14 703	4 492	1 116	1 254	2 532	2 295	3 585	1 046	1 849	667	33 539
1983	15 732	4 937	1 247	1 421	2 811	2 467	3 957	1 168	2 075	695	36 510
1984	16 833	5 426	1 393	1 610	3 120	2 652	4 369	1 305	2 328	724	39 760
1985	18 011	5 963	1 556	1 824	3 463	2 851	4 823	1 458	2 612	754	43 315

(1) Provinces of Santa Fé and Entre Ríos.
(2) Northeast of Buenos Aires Provinces.
(3) Excludes ALUAR and other big consumers who consumed 31 GWh, 418 GWh, 751 GWh and 1017 GWh in 1974, 1975, 1976 and 1977, respectively.

November, 1978

TRANSMISSION SYSTEM RELATED TO YACYRETA
ONE–LINE DIAGRAM: 500 KV C.A.
YACYRETA



ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

ENTIDAD BINACIONAL YACYRETA

FORECAST SCHEDULE OF LOAN DISBURSEMENTS
(in thousands of US$)

Assumptions

Loan signing: August, 1979
Effective date: November, 1979
Closing date: June, 1986

IBRD Fiscal Year and Semester	Disbursements During Semester	Cumulative Disbursements at end of Semester
1979/1980		
December 31, 1979	3.3	3.3
June 30, 1980	21.5	24.8
1980/1981		
December 31, 1980	32.4	57.2
June 30, 1981	18.6	75.8
1981/1982		
December 31, 1981	17.5	93.3
June 30, 1982	17.5	110.8
1982/1983		
December 31, 1982	17.6	128.4
June 30, 1983	17.2	145.6
1983/1984		
December 31, 1983	17.4	163.0
June 30, 1984	16.4	179.4
1984/1985		
December 31, 1984	14.0	193.4
June 30, 1985	9.6	203.0
1985/1986		
December 31, 1985	7.0	210.0

May 1979.

RELOCATION COST

(Million of US$ dollars)

	ARGENTINA			PARAGUAY			TOTAL		
Category	Economic	Improvements	Financial	Economic	Improvements	Financial	Economic	Improvements	Financial
Railways	31.2	13.3	44.5	7.3	22.1	29.4	38.5	35.4	73.9
Ports	3.2	7.6	10.8	.9	5.9	6.8	4.1	13.5	17.6
Roads	10.0	-	10.0	10.6	-	10.6	20.6	-	20.6
Sanitation Works	4.4	13.3	17.7	2.0	11.5	13.5	6.4	24.8	31.2
Electric and telephone Installation	1.3	3.9	5.2	2.1	8.5	10.6	3.4	12.4	15.8
Dwellings and community facilities	36.1	49.9	86.0	32.0	48.2	80.2	68.1	98.1	166.2
Indemnization (industrial and rural)	5.0	-	5.0	26.6	5.1	31.7	31.6	5.1	36.7
	91.2	88.0	179.2	81.5	101.3	182.8	172.7	189.3	362.0
Physical contingency	18.2	17.6	35.8	16.3	20.3	36.6	34.5	37.9	72.4
Price contingency	39.3	37.9	77.2	35.1	43.6	78.7	74.4	81.5	155.9
TOTAL:	148.7	143.5	292.2	132.9	165.2	298.1	281.6	308.7	590.3

November, 1978

ANNEX D
Attachment 6-1

ARGENTINA

YACYRETA HYDROELECTRIC PROJECT

Power Sector (excl. YACYRETA 1/

Consolidated Sources and Applications of Funds 1976 - 1985

	Actual (millions of US$)		Forecast (millions of constant 1977 US$)								Total
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1978-85
SOURCES											
Gross internal cash generation 2/	103	271	278	318	587	748	999	1,096	1,158	1,277	6,461
Less: Amortization	47	73	136	165	170	186	276	275	268	278	1,754
Interest	71	132	280	161	159	158	170	154	138	132	1,352
Total debt service 3/	124	205	416	326	329	344	446	429	406	410	3,106
Net internal cash generation	(21)	66	(138)	(8)	258	404	553	667	752	867	3,355
Electrical Funds (net)	125	222	364	380	332	402	456	469	382	366	3,151
Net sectoral funds	104	288	226	372	590	806	1,009	1,136	1,134	1,233	6,506
Borrowings:-existing	199	311	355	262	123	64	-	-	-	-	804
-future suppliers	-	-	89	102	84	81	87	163	190	218	1,014
-other	-	-	482	-	15	20	35	-	-	-	552
Total Borrowings 3/	199	311	926	364	222	165	122	163	190	218	2,370
Other (incl. equity)	259	261	24	16	17	2	3	3	3	4	72
TOTAL SOURCES	562	860	1,176	752	829	973	1,134	1,302	1,327	1,455	8,948
APPLICATIONS											
Investment expenditures (excl. IDC)											
- Generation	-	-	835	706	548	481	436	470	389	435	4,310
- Transmission 4/	-	-	162	194	294	330	297	320	387	416	2,400
- Distribution	-	-	80	143	142	148	157	162	173	182	1,187
- Other	-	-	91	108	89	93	90	92	94	95	752
Total Invest. exp.	548	1,185	1,168	1,151	1,073	1,062	980	1,044	1,043	1,128	8,649
Increase(dec.) in working capital	(26)	(370)	6	508	33	30	69	35	36	34	751
Other application	40	45	2	-	-	-	-	-	-	-	2
TOTAL APPLICATIONS	562	860	1,176	1,659	1,106	1,092	1,049	1,079	1,079	1,162	9,402
Surplus (deficit)	-	-	-	(907)	(277)	(119)	85	223	248	293	(454)
Financing of deficit:											
New borrowings 5/	-	-	-	949	379	249	94	156	208	197	2,232
New debt service	-	-	-	(42)	(102)	(130)	(146)	(310)	(372)	(410)	(1,51
New surplus (deficit)	-	-	-	-	-	-	33	69	84	80	266

1/ AyEE, SEGBA, Hidronor, CNEA and Salto Grande.
2/ Based on tariff increases (in real terms) which would allow for rates of return of about: AyEE: 2% in 1978, 4%-1979, 6%-1980 and 8% in 1981 and thereafter; Hidronor and CNEA 8% starting in 1978; SEGBA: 8% in 1978, 11% in 1979-80 and 9% in 1981 (so as to maintain SEGBA's tariffs at their 1978 level in real terms), 8% in 1982 and thereafter. Also, consider assets revaluations in 1981 and 1982, which will require additional tariff increases in those years to achieve proposed rates of return. Salto-Grande's tariffs are based on the Salto-Grande Treaty which provides for financial tariffs.
3/ Existing and easily obtainable (i.e. suppliers') loans.
4/ Includes transmission system related with YACYRETA project.
5/ Sum of borrowings necessary to cover AyEE's and SEGBA's deficits taken individually. Assumed conditions are 9% interest rate and 9 years (incl. 3 years of grace).

ANNEX D
Attachment 6-2

ENTIDAD BINACIONAL YACYRETA

Forecast Income Statements 1985 - 1995

(in millions of current US$)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Sales (GWR)	1,227	6,372	11,667	16,125	17,392	17,501	17,501	17,501	17,501	17,501	17,501
Tariffs (mills/kWh)[1]	24.1	25.8	27.4	29.3	30.6	33.2	35.1	37.2	39.5	41.8	44.4
Operating revenues	29.5	163.7	319.8	472.8	533.0	580.5	614.4	651.8	690.9	731.9	776.6
Operating expenses:											
Personnel[2]	1.2	5.1	7.9	9.4	11.5	18.0	19.6	21.4	23.3	25.4	27.7
Insurance[3]	0.2	0.5	0.9	1.4	2.0	2.2	2.3	2.4	2.5	2.7	2.9
Operation and Maintenance[4]	0.6	2.6	4.0	4.7	5.7	9.0	9.8	10.7	11.6	12.7	13.8
Other operating costs[5]	1.0	1.1	1.6	2.1	2.6	3.0	3.2	3.4	3.6	3.8	4.0
Total Operating Costs	3.0	9.3	14.4	17.6	21.8	32.2	34.9	37.9	41.0	44.6	48.4
Depreciation[6] - adjustment for reval. of capital	2.1	2.3	2.5	2.6	2.9	3.1	3.3	3.5	3.8	4.0	4.3
- plant-in-service	13.3	44.9	81.8	120.1	135.3	136.9	137.6	137.6	137.6	137.6	137.6
Total Operating Expenses	18.4	56.5	98.7	140.3	160.0	172.2	175.8	179.0	182.4	186.2	190.3
Net Operating Income	11.1	107.2	221.1	332.5	373.0	408.3	438.6	472.8	508.5	545.7	586.3
Other Expenses											
Resarcimiento[7]	0.4	2.1	4.0	5.8	6.5	6.9	7.2	7.6	8.0	8.4	8.8
Dividends[8]	1.4	7.3	14.3	20.6	23.3	24.7	25.9	27.2	28.6	30.0	31.5
Net income before interests	9.3	97.8	202.8	306.1	343.2	376.7	405.5	438.0	471.9	507.3	546.0
Interests:[9]											
Total interests	419.6	489.9	542.5	577.2	606.4	633.7	656.5	672.8	689.1	700.6	708.8
Less: interest charged to construction[10]	(416.0)	(485.9)	(538.0)	-	-	-	-	-	-	-	-
Net Interests charged to operation	3.6	4.0	4.5	577.2	606.4	633.7	656.5	672.8	689.1	700.6	708.8
Net Income	5.7	93.8	198.3	(271.1)	(263.2)	(257.0)	(251.0)	(234.8)	(217.2)	(193.3)	(162.8)

1/ corresponds to a level of US mills 15.8/kWh (Dec. 1977 prices) maintained constant in real terms; this figure was calculated on the basis of the project's economic cost of US $2,430 million (Dec. 1977 prices), assuming a life of 50 years, a cost of capital of 11%, and annual operating costs estimated at 0.3% of total investment.

2/ based on an average cost of US $9,300/employee (Dec. 1977 prices), increasing at 9% p.a., and a number of employees estimated at 700; between 1985 and 1990, personnel costs are progressively charged to operations, as generating units successively come into stream.

3/ based on an estimated cost of US $385 per 17W installed (Dec. 1977 prices).

4/ estimated at 50% of personnel costs

5/ discrete increases of US $0.5 million per year between 1986 and 1990 and US $0.2 million per year from 1991 onwards

6/ see details in Annex C, Table T-6

7/ provided by the Yacyreta Treaty (see para. 6.13) at the rate of US $166 per GWh produced (in 1973 prices, to be indexed under the Treaty formula; an indexation of 5% p.a. was assumed).

8/ 12% per year on paid-up capital (see para 6.13).

9/ see details in Annex C, Table T-3.

10/ assumed to be 100% of total interest (exclud. on loan for excess of capital contrib.) until 1987 (mid-point of construction period).

ENTIDAD BINACIONAL YACYRETA

Forecast Funds Statements 1978-1995

(in millions of current US$)

	1978 (Est.)	1979	1980	1981	1982	1983	1984	Total 1978-1984	1985	1986	1987	1988	1989	1990	Total 1978-1990	1991	1992	1993	1994	1995	Total 1978-1995
SOURCES OF FUNDS																					
Gross internal cash generation	-	-	-	-	-	-	-	-	24.9	145.3	287.2	428.8	481.4	516.7	1,884.3	546.4	579.1	613.3	648.9	687.9	4,959.9
Equity contributions 1/	10.0	-	20.0	-	10.0	-	10.0	50.0	-	-	-	-	-	-	50.0	-	-	-	-	-	50.0
Borrowings																					
IBRD	-	3.3	52.9	35.3	35.1	34.6	30.4	191.6	16.6	-	-	-	-	-	208.2	-	-	-	-	-	208.2
IDB	-	3.3	53.4	35.6	35.4	34.9	30.4	193.2	16.8	-	-	-	-	-	210.0	-	-	-	-	-	210.0
Suppliers 2/	-	-	140.4	139.6	73.7	101.7	110.7	566.1	105.9	118.3	15.1	12.5	8.9	2.7	829.5	-	-	-	-	-	829.5
Foreign banks 2/	-	-	122.1	138.8	206.6	311.6	151.1	930.2	-	-	-	-	-	-	930.2	-	-	-	-	-	930.2
Local banks 2/	-	-	-	100.0	100.0	100.0	-	300.0	-	-	-	-	-	-	300.0	-	-	-	-	-	300.0
Electrical funds 3/	41.4	126.1	172.7	158.3	170.4	207.0	399.3	1,275.1	496.9	401.1	231.4	118.0	43.6	44.4	2,610.4	-	-	-	-	-	2,610.4
Other(European banking)	15.0	-	-	-	-	-	-	15.0	-	-	-	-	-	-	15.0	-	-	-	-	-	15.0
Total borrowings	56.4	132.7	541.5	607.6	621.2	789.8	722.8	3,471.2	636.2	519.4	246.5	130.5	52.5	47.1	5,103.4	-	-	-	-	-	5,103.4
TOTAL SOURCES	66.4	132.7	561.5	607.6	631.2	789.8	732.8	3,521.2	661.1	664.7	533.7	559.3	533.9	563.8	7,037.7	546.4	579.1	613.3	648.9	687.9	10,113.3
APPLICATIONS OF FUNDS																					
Investment expenditures (excl. IDC) 4/	54.5	118.2	525.9	567.0	542.8	635.2	437.9	2,881.5	289.0	237.5	104.2	81.2	61.9	51.0	3,706.3	-	-	-	-	-	3,706.3
Increase (dec.) in working capital	11.6	10.6	14.3	(15.4)	(7.8)	(2.4)	62.2	73.1	31.7	9.0	(41.7)	16.0	(9.4)	(4.0)	74.7	(21.0)	(3.2)	(16.6)	(8.0)	(2.5)	23.4
Debt service:																					
Amortization 5/	-	-	-	-	-	13.9	50.9	64.2	345.4	229.0	299.1	316.8	300.5	255.6	1,610.6	232.7	198.3	134.0	87.5	72.3	2,335.4
Interests paid: 6/																					
Total interests	1.5	15.8	51.5	108.3	173.0	249.9	334.7	934.7	419.6	489.9	542.5	577.2	606.4	633.7	4,204.0	656.4	672.8	689.1	700.6	708.8	7,631.8
Less: deferred interests	1.2	11.9	30.2	52.3	76.8	106.8	153.0	432.2	224.6	300.7	370.4	431.9	425.5	372.5	2,557.8	321.7	288.8	193.2	131.2	90.7	3,583.5
Net interests paid	0.3	3.9	21.3	56.0	96.2	143.1	181.7	502.5	195.0	189.2	172.1	145.3	180.9	261.2	1,646.2	334.7	384.0	495.9	569.4	618.1	4,048.3
Total debt service	0.3	3.9	21.3	56.0	96.2	157.0	232.0	566.7	340.4	418.2	471.2	462.1	481.4	516.8	3,256.8	567.4	582.3	629.9	656.9	690.4	6,383.7
TOTAL APPLICATIONS	66.4	132.7	561.5	607.6	631.2	789.8	732.0	3,521.2	661.1	664.7	533.7	559.3	533.9	563.8	7,037.7	546.4	579.1	613.3	648.9	687.9	10,113.3

1/ Paraguayan contribution only (Argentina's share was paid up before 1978).
2/ See breakdown in Annex
3/ Between 1978-1985, determined by availability of Electrical Funds (see Annex); between 1986-1990, determined by financial requirements within the maximum limit of the 1985 receipts.
4/ Excludes YACYRETA transmission system (included in AyEE's investments).
5/ See Annex C, Table 4.
6/ See Annex C, Table 3.

ARGENTINA

ENTIDAD BINACIONAL YACYRETA

Actual and Forecast Balance Sheets 1977-1995

(in millions of current US$)

	1977 (Act.)	1978 (Est.)	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
ASSETS																			
Gross fixed assets in operation	-	-	-	-	-	-	-	-	4,334.2	5,057.8	5,787.0	5,979.2	6,078.5	6,129.5	6,129.5	6,129.5	6,129.5	6,129.5	6,129.5
Less: Depreciation	-	-	-	-	-	-	-	-	13.3	58.2	140.0	260.1	395.4	532.3	669.9	807.5	945.1	1,082.7	1,220.3
Net fixed assets in operation	-	-	-	-	-	-	-	-	4,320.9	4,999.6	5,647.0	5,719.1	5,683.1	5,597.2	5,459.6	5,322.0	5,184.4	5,046.8	4,909.
Work in progress	49.2	105.2	239.2	816.6	1,491.9	2,207.7	3,092.8	3,865.4	236.0	235.5	148.4	37.4	-	-	-	-	-	-	-
Total net fixed assets 1/	49.2	105.2	239.2	816.6	1,491.9	2,207.7	3,092.8	3,865.4	4,556.9	5,235.1	5,795.4	5,756.5	5,683.1	5,597.2	5,459.6	5,322.0	5,184.4	5,046.8	4,909.2
Adjustment for revaluation of capital 2/	-	12.2	19.9	30.1	41.9	55.8	71.4	89.5	97.2	105.3	113.8	122.7	132.1	141.9	152.2	163.0	174.4	186.3	198.8
Less: Depreciation	-	-	-	-	-	-	-	-	2.1	4.4	6.9	9.5	12.4	15.5	18.8	22.3	26.1	30.1	34.4
Net adjustment	-	12.2	19.9	30.1	41.9	55.8	71.4	89.5	95.1	100.9	106.9	113.2	119.7	126.4	133.4	140.7	148.3	156.2	164.4
Current Assets																			
Cash 3/	0.5	4.4	9.1	31.3	34.7	38.2	43.6	26.3	14.9	11.2	18.4	6.9	5.9	4.7	2.9	3.2	3.4	3.7	4.0
Accounts receivable 4/	-	-	-	-	-	-	-	-	6.1	33.7	65.3	95.7	109.6	116.7	123.7	131.2	139.1	147.3	156.3
Materials and Supplies 5/	-	-	-	-	-	-	-	-	-	-	-	-	-	12.0	12.7	13.5	14.3	15.2	16.1
Electrical Funds 6/	-	13.9	41.8	57.0	52.2	56.2	68.3	131.8	168.0	132.0	54.1	31.6	-	-	-	-	-	-	-
Total current assets	0.5	18.3	50.9	88.3	86.9	94.4	111.9	158.1	189.0	176.9	127.8	134.2	115.5	133.4	139.3	147.9	156.8	166.2	176.4
TOTAL ASSETS	49.7	135.7	310.0	935.0	1,620.7	2,357.9	3,276.1	4,113.0	4,841.0	5,512.9	6,030.1	6,003.9	5,918.3	5,857.0	5,732.3	5,610.6	5,489.5	5,369.2	5,250.0
LIABILITIES																			
Capital	45.9 7/	55.9	55.9	75.9	75.9	85.9	85.9	153.4 8/	161.1	169.2	177.7	186.6	196.0	205.8	216.1	226.9	238.3	250.2	262.7
Interests and index. on capital 9/	-	12.2	19.9	30.1	41.9	55.8	71.4	-	-	-	-	-	-	-	-	-	-	-	-
Retained earnings	-	-	-	-	-	-	-	-	5.7	99.5	297.8	26.7	(236.5)	(493.5)	(744.5)	(979.3)	(1,196.5)	(1,389.8)	(1,552.6)
Total equity	45.9	68.1	75.8	106.0	117.8	141.7	157.3	153.4	166.8	268.7	475.5	213.3	(40.5)	(287.7)	(528.4)	(752.4)	(958.2)	(1,139.6)	(1,289.9)
Long-term Debt																			
Loan for excess of capital contribution 10/	-	-	-	-	-	-	-	32.0	35.6	39.6	44.1	49.0	54.5	60.6	67.4	75.0	83.5	92.9	103.4
Electrical Funds	-	42.6	180.6	383.5	594.1	841.3	1,155.1	1,707.4	1425.2	3,123.0	3,720.3	4,265.2	4,728.8	5,139.7	5,454.6	5,735.8	5,920.5	6,042.4	6,122.6
Other loans 11/	-	15.0	21.6	390.4	839.7	1,290.5	1,859.4	2,131.9	2,125.9	2,015.2	1,731.2	1,426.9	1,135.3	882.4	649.7	451.4	317.4	229.8	157.5
Total long-term debt	-	57.6	202.2	773.9	1,433.8	2,131.8	3,014.5	3,871.3	4,586.7	5,177.8	5,495.6	5,741.1	5,918.6	6,082.7	6,171.7	6,262.2	6,321.4	6,365.1	6,383.5
Less: Current maturities of L-T Debt	-	-	-	-	-	(13.9)	(50.3)	(145.4)	(229.0)	(299.1)	(316.8)	(300.5)	(255.6)	(232.7)	(198.3)	(134.0)	(87.5)	(72.3)	(67.2)
Net Long-Term Debt	-	125.7	202.2	773.9	1,433.8	2,117.9	2,964.2	3,725.9	4,357.7	4,878.7	5,178.8	5,440.6	5,663.0	5,850.0	5,973.4	6,128.2	6,233.9	6,292.8	6,316.3
Current Liabilities																			
Current maturities of L-T Debt	-	-	-	-	-	13.9	50.3	145.4	229.0	299.1	316.8	300.5	255.6	232.7	198.3	134.0	87.5	72.3	67.2
Short-term debt	0.9	3.3	17.5 12/	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Interests payable 13/	-	-	0.8	5.1	13.9	24.1	36.0	40.7	56.8	46.6	43.5	36.5	29.2	51.0	85.7	97.3	122.4	139.5	151.8
Accounts payable (Contractors') 14/	2.9	6.7	13.7	50.0	55.2	60.3	68.3	47.6	30.3	18.6	13.7	10.9	8.3	8.0	-	-	-	-	-
Other accounts payable 15/	-	-	-	-	-	-	-	-	0.4	1.2	1.8	2.1	2.7	3.0	3.3	3.5	3.9	4.2	4.6
Total current liabilities	3.8	10.0	32.0	55.1	69.1	98.3	154.6	233.7	316.5	365.5	375.8	350.0	295.8	294.7	287.3	234.8	213.8	216.0	223.6
TOTAL LIABILITIES	49.7	135.7	310.0	935.0	1,620.7	2,357.9	3,276.1	4,113.0	4,841.0	5,512.9	6,030.1	6,003.9	5,918.3	5,857.0	5,732.3	5,610.6	5,489.5	5,369.2	5,250.0
Indicators:																			
Current ratio	0.1	1.8	1.6	1.6	1.3	1.0	0.7	0.7	0.6	0.5	0.3	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.8
Accounts receivable (days)	-	-	-	-	-	-	-	-	75	75	75	75	75	75	75	75	75	75	75

1/ See Annex C, Table 5.
2/ Partial revaluation of assets to compensate for the revaluation of **YACYRETA's capital required under the Yacyreta Treaty.**
3/ Estimated at 1 month of investment expenditures (excl. foreign const. equipment); from 1985, includes also 1 month of cash operating expenses.
4/ Estimated at about 75 days of billings.
5/ Estimated, in 1990, at about 20% of the cost of 2 generating units (1990 prices), then escalated at 6% p.a.
6/ A delay of about 4 months was estimated in the receipts of funds from the Electrical Funds (on the basis of past years' experience).
7/ Argentinian contribution (incl. interest and indexation).
8/ Equals two times the lowest - Paraguayan - contribution (incl. interest and indexation up to December 31, 1984).
9/ Computed at a rate of 11.3% p.a. (incl. interest at 6% p.a. and indexation assumed at 5% p.a.).
10/ Excess of Argentinian contribution over 50% of capital integrated on December 31, 1984 is considered as a loan from Argentina to EBY (bearing interest and index. and repayable from 2009).
11/ See breakdown in Annex
12/ Bridging arrangement needed by delay in receipt of Electrical Funds.
13/ Estimated at about 3 months of interests to be paid during the year.
14/ Estimated at about 45 days of investment expenditures in 1978 and 1979, and 60 days from 1980 on.
15/ Estimated at about 1 month of operating expenses.

November 1978

MAXIMUM DEMAND BALANCE
(MW)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Demand 1/	5,910	6,475	7,014	7,734	8,510	9,200	9,794	10,606	11,533	12,644	13,714	14,984
2. Supply 2/												
a. Hydroelectric plant	2,670	2,885	3,327	3,873	4,082 3/	4,312	4,910 4/	5,853	5,749	5,749	5,749	5,646
b. Nuclear plants	352	352	352	352	952 3/	952	952	952	952	952	952	952
c. Thermal plants												
- Steam, good efficiency	1,131	1,131	1,283	1,283	2,317	2,608	2,608	2,608	2,608	2,608	2,608	2,608
- Steam, average efficiency	1,486	1,486	1,486	1,486	1,599	1,599	1,599	1,599	1,599	1,599	1,318	1,318
- Steam, poor efficiency	735	735	735	735	704	386	339	325	325	250	250	227
- Diesel	770	770	770	770	727	663	600	329	301	301	301	215
- Gas Turbines	1,505	1,569	1,569	1,569	1,549	1,518	1,518	1,383	1,383	1,383	1,383	1,383
3. Maximum Demand Balance 5/												
a. Hydroelectric and Nuclear plants plus steam plants with good or average efficiency	-271	-621	-566	-740	440	271	275	406	-625	-1,736	-3,087	-4,460
b. All plants	2,739	2,453	2,508	2,334	3,420	2,838	2,732	2,443	1,384	198	-1,153	-2,635
4. Reserves 5/												
a. Hydroelectric and nuclear plants and steam plants with good or average efficiency 6/	-4.6	-9.6	-8.1	-9.6	5.2	2.9	2.8	3.8	-5.4	-13.7	-22.5	-29.8
b. All plants 6/	46.3	37.9	35.8	30.2	40.2	30.8	27.9	23.0	12.0	1.6	-8.4	-17.6
5. Additional Capacity from YACYRETA	-	-	-	-	-	-	-	405	1,080	1,755	2,430	2,700
6. Available Capacity with YACYRETA												
a. Hydroelectric and nuclear plants and steam plants with good or average efficiency	-271	-621	-566	-740	440	271	275	811	455 6/	19 6/	-657	-1,760
b. All plants	2,739	2,453	2,508	2,334	3,420	2,838	2,732	2,848	2,464 6/	1,953 6/	1,277	65
7. Reserves with YACYRETA												
a. Hydroelectric and nuclear plants and steam plants with good or average efficiency 7/	-4.6	-9.6	-8.1	-9.6	-5.2	2.9	2.8	7.6	3.9 6/	0.2 6/	-4.8 6/	-11.7 6/
b. All plants 7/	46.3	37.9	35.8	30.2	40.2	30.8	27.9	26.8	21.4 6/	15.4 6/	9.3 6/	0.4 6/

1/ Excluding reserves.
2/ Includes plants existing as of December 1977 plus the projects included in the 1977-85 National Electric Power Supply Plan, except for the YACYRETA hydroelectric plant.
3/ Includes Rio III nuclear plant with an installed capacity of 644 MW and net capacity of 600 MW.
4/ Includes Alicura hydroelectric plant with a guaranteed capacity of 485 MW in 1984 and 728 MW in subsequent years.
5/ Excluding YACYRETA and other projects after 1985.
6/ Preliminary supply plans call for the incorporation of other plants in addition to those included here.
7/ Percentage of projected demand.

ENERGY BALANCE
(GWH)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1. Demand	30,043	34,269	37,417	40,662	45,059	48,668	52,480	56,855	61,907	67,700	73,602	80,027
2. Electric Power Generated 1/												
a. Hydroelectric plants 8/	8,695	11,492 2/	13,503	15,606	16,432 3/	17,421	18,697 4/	20,139	19,647	19,647	19,647	19,155
b. Nuclear plants	2,281	2,281	2,281	2,281	6,169	6,169	6,169	6,169	6,169	6,169	6,169	6,169
c. Thermal Plants:												
- Steam, good efficiency	7,137	7,137	8,096	8,096	14,549	16,435	16,457	16,457	16,457	16,410	16,185	16,419
- Steam, average efficiency	7,781	9,277	8,867	9,283	4,416	6,925	10,090	10,090	10,090	7,005	6,222	6,648
- Steam, poor efficiency	1,235	1,107	989	1,279	888	152	701	1,688	1,688	-	-	-
- Diesel	1,719	1,382	1,484	1,458	1,182	275	115	1,064	1,121	-	-	-
- Gas Turbines	1,195	1,593	2,197	2,659	1,423	1,291	251	-	-	-	-	-
3. Energy Balance 5/												
a. Hydroelectric and nuclear plants plus steam plants with good or average efficiency	-4,149	-4,082	-4,670	-5,396	-3,493	-1,718	-1,067	-4,000	-9,544	-18,469	-25,379	-31,636
b. All plants	0	0	0	0	0	0	0	-1,230	-6,735	-18,469	-25,379	-31,636
4. Additional Energy from YACYRETA	-	-	-	-	-	-	-	1,230	6,390	11,700	16,170	17,440
5. Balance of Energy with YACYRETA	0	0	0	0	0	0	0	-	-345 6/	-6,769 6/	-9,209 6/	-14,196 6/
6. Percentage of Hydro Generation	28.9	33.5 2/	36.1	38.4	36.5	35.8	35.6	37.6	42.1 7/	46.3 7/	48.7 7/	45.7 7/

1/ Includes plants existing as of December 1977, plus the projects included in the 1977-85 National Electric Supply Plan, except for YACYRETA.
2/ Includes Salto Grande and Futaleufu hydroelectric plant operating at full capacity.
3/ Includes Rio III nuclear plant.
4/ Includes Alicura hydroelectric plant with an output of 1,055 GWh in 1984 and 2,360 GWh in subsequent years.
5/ Excluding YACYRETA and other projects subsequent to 1985.
6/ Preliminary plans call for incorporation of other plants in addition to those included here.
7/ Without considering other hydroelectric projects that will come on stream during these years.
8/ Average hydrological year.

December, 1978

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4. Construction Cost Estimates for the Yacyreta Hydroelectric Project. (March 1978). Prepared by A. A. Mathews, Inc.

5. Expansión del Sistema Nacional de Transmisión (Argentina). (1978). Prepared by the Secretaría de Energía with the help of consultants.

6. Summary the Economic Justification Study of Yacyreta. (April 1978). Prepared by the Secretaría de Energía (Argentina).

7. Plan Nacional de Equipamiento para los Sistemas de Generación y Transmisión de Energía Eléctrica for the period 1977-1985. (April 1977). Prepared by the Secretaría de Energía (Argentina).

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13. Environmental Studies. Prepared by YACYRETA.

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17. YACYRETA's Manual of Accounts.

18. YACYRETA. 1979 Budget.

19. YACYRETA. Computer outputs (YACYRETA's Financial Forecasts 1978-1995).

20. YACYRETA. Copies of letters of intent from Export Credit Agencies.

21. YACYRETA. Analysis of various financing alternative strategies.

22. YACYRETA. Descriptive memorandum for a Floating Rate Syndicated Bank Loan.

23. YACYRETA. Curriculum vitaes of independent auditors (1978 Accounts).

24. YACYRETA. Terms of reference for external auditors (1979 Accounts).

25. YACYRETA's Organization Manual.

26. Yacyreta Treaty.

27. Sector Financial Projections 1978-1985 (Secretaría de Energía).

28. Relevant decrees on sector tariffs.

29. Various financial and general documents of sector entities.

30. General Financial Working Papers.

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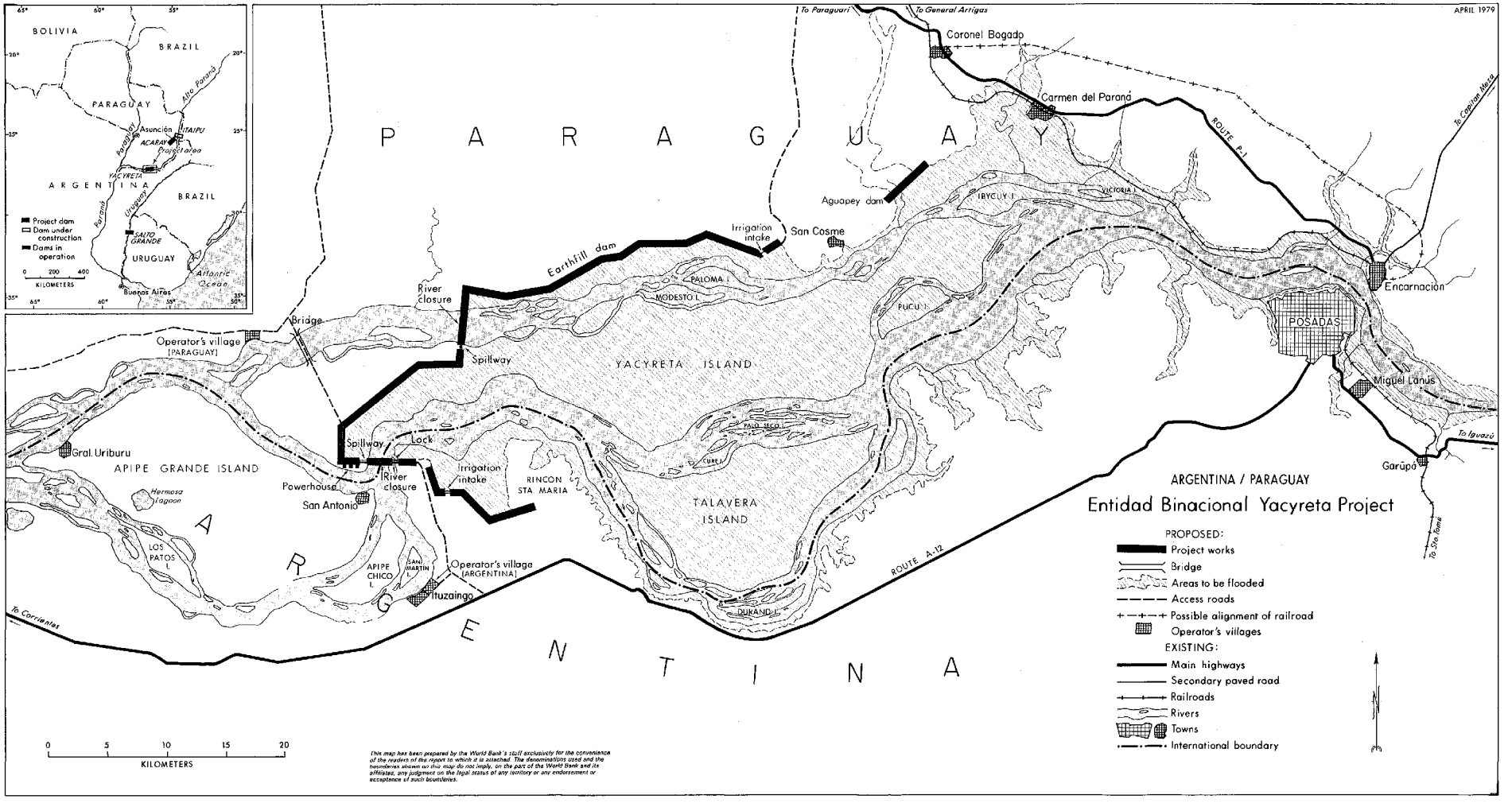

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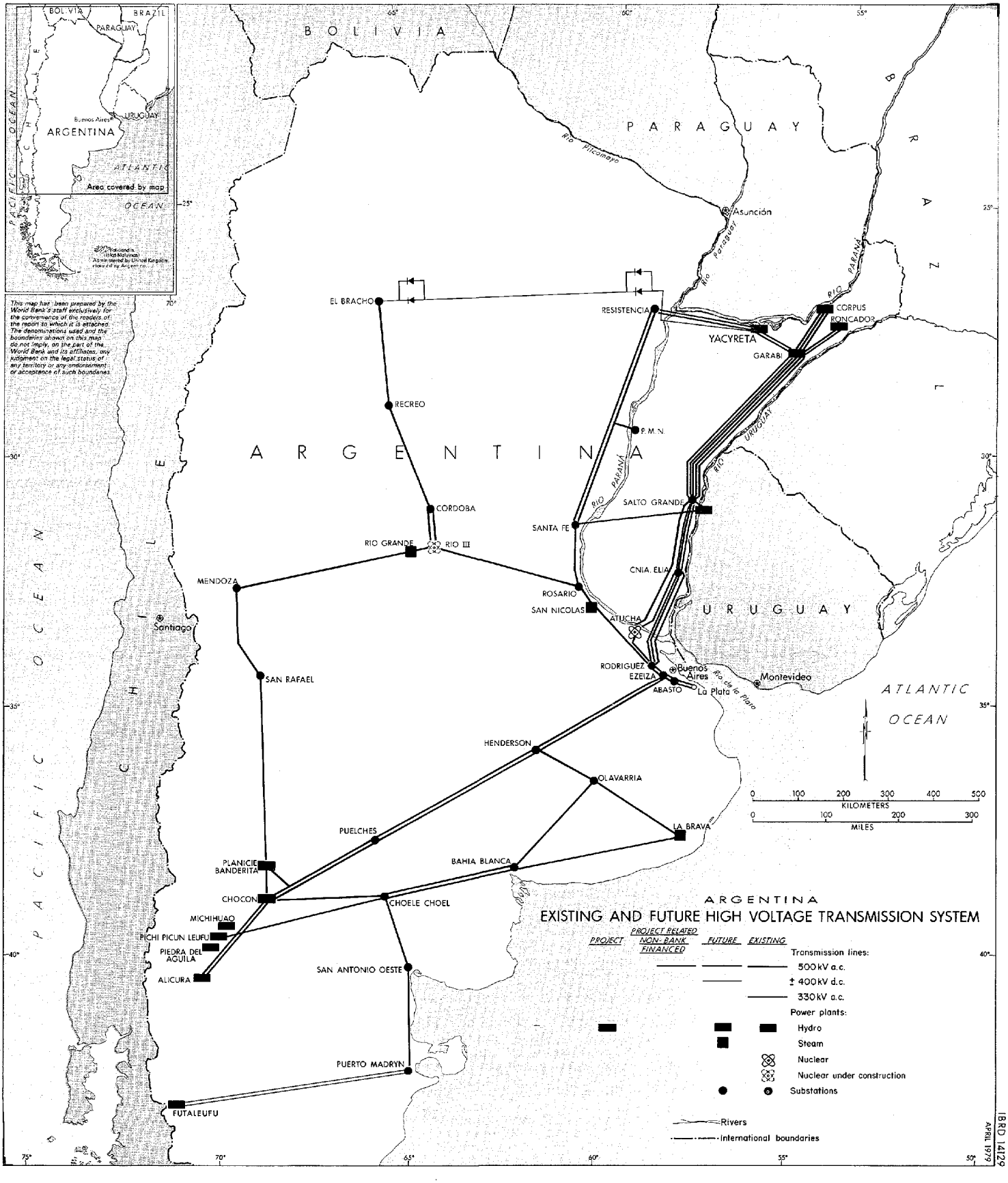
BOLIVIA
PARAGUAY
BRAZIL
ARGENTINA
URUGUAY
CHILE
PACIFIC OCEAN
ATLANTIC OCEAN
Area covered by map
Buenos Aires
Santiago
Asunción
Montevideo
Río Pilcomayo
Río Paraguay
Río Paraná
Río Uruguay
Río de la Plata
EL BRACHO
RESISTENCIA
CORPUS
RONCADOR
YACYRETA
GARABI
RECREO
P.M.N.
CORDOBA
SANTA FE
SALTO GRANDE
RIO GRANDE
RIO III
CNIA. ELIA
MENDOZA
ROSARIO
SAN NICOLAS
ATUCHA
SAN RAFAEL
RODRIGUEZ
EZEIZA
ABASTO
La Plata
HENDERSON
OLAVARRIA
LA BRAVA
PUELCHES
PLANICIE BANDERITA
BAHIA BLANCA
CHOCON
CHOELE CHOEL
MICHIHUAO
PICHI PICUN LEUFU
PIEDRA DEL AGUILA
ALICURA
SAN ANTONIO OESTE
PUERTO MADRYN
FUTALEUFU
0 100 200 300 400 500
KILOMETERS
0 100 200 300
MILES
ARGENTINA
EXISTING AND FUTURE HIGH VOLTAGE TRANSMISSION SYSTEM
PROJECT
PROJECT RELATED NON-BANK FINANCED
FUTURE
EXISTING
Transmission lines:
500 kV a.c.
± 400 kV d.c.
330 kV a.c.
Power plants:
Hydro
Steam
Nuclear
Nuclear under construction
Substations
Rivers
International boundaries
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