

Paraguay

The Republic of Paraguay (República del Paraguay (span.), Tetã Paraguay (guaraní)) with its capital Ascunción (546.637 inhabitants, 1994) comprises an area of 406.755 km². The total population of 5,496 million is leading to a population density of almost 14 inhabitants per km². The urban population of 55 percent is increasing steadily.

Paraguay is located in the central part of South America, and hence called the ‘Heart of South America’. It is an inland republic, bounded by Bolivia, Brazil, and Argentina. The Paraguay River divides the country into two contrasting regions. The oriental region, which is covered by dense forests with tropical grasses, palms, exotic flowers and many rivers with several waterfalls. In the west, the Chaco, a plain which extends into Bolivia and Argentina until the Andes, is covered by coarse tropical reeds, grasses, and stunted trees.

For much of its history it has distanced itself from the Latin American mainstream, and for a substantial period of this century was South America’s most notorious and durable police state. Paraguay has experienced political difficulties in the last years, including the March 1999 assassination of Vice President Luis Maria Agaña, the resignation of President Raúl Cubas and the May 2000 coup attempt by army officers. The uncertain political environment has made progress on economic reforms difficult, and many consider such reforms necessary to pull the country out of its two-year economic stagnation and to recover from the 1999 banking crisis. The current President, González, favours privatisation in the energy industries in order to raise government revenue and decrease state control. The Paraguayan Congress, however, lately has blocked such reforms. The economic recovery of the neighbour Brazil has positive implications for the Paraguayan economy, which has improved since 1999. Paraguay is a member of Mercosur, the Southern Common Market (Mercado Común del Cono Sur) which furthermore includes Paraguay, Uruguay, Brazil and Argentina.

Despite the relatively slow growth of the country’s economy, electricity consumption has risen rapidly in recent years, more than doubling between 1990 and 1997. Paraguay has one of the highest hydroelectric power potentials per person in the world. Its major hydroelectric power plants satisfy the country’s demand for electricity. According to Administración Nacional de Electricidad (ANDE), currently 51 percent of all households have access to electricity.

Paraguay is a major producer and exporter of hydroelectric power with an consumption of 1,92 million MWh and an overall generation of 51,5 million MWh in 2000. Hydropower is the major resource with an outstanding contribution of 99,8 percent. The combustion of fossil fuels in isolated areas contributed 0,07 percent, while renewable energy share was 0,13 percent.¹

Paraguay has three fully operable large-scale hydropower plants Itaipú, Yacyretá and Acaray. In order to compare the size and the different equipment, Table 4-2 shows the technical specifications of these hydropower plants.

¹ EIA 2002.

Table Fehler! Kein Text mit angegebener Formatvorlage im Dokument.-1 - Technical specifications of the Paraguayan hydropower plants

Power Plant	Technical specifications
Itaipú	Number of units: 18 generators with a capacity of 700 MW per unit. Total capacity: currently 12,6 GW Planned enlargement: 2 x 700 MW by 2004
Yacyretá	Number of units: 20 generators with a capacity of 175 MW per unit. Total capacity: currently 3,5 GW
Acaray	Number of units: 4 generators with a capacity of 50 MW per unit. Original capacity: 200 MW Recent enlargement: 56 MW Total capacity: currently 256 MW

Source: ITAIPÚ Centro Administrativo

<http://www.itaipu.gov.br>

‘Itaipú’, the largest operational hydroelectric dam in the world, has an installed capacity of currently 12,6 GW and was completed in 1982. The plant was built in co-operation with Brazil and is operated by both countries. It is planned to increase the capacity in two steps during the next years. Two 700 MW units will be added to the already existing 18 units. The first enlargement unit should begin service in 2003, while the second is expected to follow in 2004.² The project will increase peaking capacity of the Itaipú station to help meet demands on the Brazilian and Paraguayan grids. It also will allow maintenance outages to be performed on two units at a time, while keeping 18 units operating year-round. Figure 4-5 shows a photograph of the Itaipú plant.



² <http://www.itaipu.gov.br>

*Figure Fehler! Kein Text mit angegebener Formatvorlage im Dokument.-1 - Photo of the Itaipú
Hydroelectric Power Plant*

Source: Courtesy of Carlos Bruga, ITAIPU Centro Administrativo

The 8,5 milliard U.S. dollar 'Yacyreta' hydroelectric plant is a cooperation between Paraguay and Argentina and originally was intended to have an installed capacity of 4.050 MW, but it was later scaled down to 3.500 MW. The project was initially estimated to cost 1,5 milliard dollar and is about nine years behind schedule. Disagreements between the partner countries as well as financing difficulties and management irregularities, have led to delays. The 20th turbine was installed in October 1997 and came online in February 1998. The Argentine and Paraguayan governments have agreed to expand the power-generating capacity of Yacyreta by 30 percent. The projects are estimated at 850 million dollars and will be funded by a private company that would be paid back with energy sales³.

'Acaray', the first hydropower plant of Paraguay started its operation in 1968. The plant is wholly owned and operated by Paraguay and supplied almost all of the country's electricity in the 1970s and most of the 1980s. Recently the plant has been enlarged from the original capacity of 200 MW to 256 MW.

Paraguay and Argentina are planning to build jointly another hydroelectric dam on the Paraná, the 3.000 MW Corpus Critsi dam. The dam should be built about 200 kilometres upriver of the Yacyreta dam. To get the project moving, the governments of Argentina and Paraguay started a close co-operation on this issue in Mai 2000. The agreement calls for constructing the dam through international public bidding, and assures that the project's construction will be environmentally sound. There has been considerable opposition to the project among the local community and among environmentalists.

Paraguay has no proven oil, coal or natural gas resources. There are no coal or gas imports, but Paraguay imports crude oil and refined petroleum from Argentina. The overall oil consumption was estimated at 8,395 million barrels of oil equivalent in 2000.⁴ Even if no oil has been discovered in Paraguay up to now, exploration by both, local and North American companies continues, encouraged by the discovery of substantial deposits in the Argentine province of Formosa, close to the Paraguayan border.

The actual utilisation of biomass for energy generation is mainly based in rural and remote areas without access to the electricity grid. Potential sources could be sugarcane bagasse and cane juice as the present production is under its capacity.⁵ Other biomass resources are forestry/wood-processing and agricultural residues, including cotton. Table 4-3 shows the available biomass and the bioenergy potentials.

³ <http://www.yacyreta.gov.py>

⁴ EIA SIEE 2000.

⁵ WEC 2002.

Table Fehler! Kein Text mit angegebener Formatvorlage im Dokument.-2 - Available types of biomass with their conversion yields

Sugar cane bagasse	quantity of raw material available	0,36 million tons
Cane juice	quantity of raw material available	380 thousand tons
	ethanol production capacity	861,6 TJ/year
	yield of ethanol	1,303 GJ/ton
	ethanol production	295,4 TJ
Forestry/wood-processing	quantity of raw material available	1,433 million tons
	direct use from combustion	20.511,3 TJ
Agricultural residues - including cotton	quantity of raw material available	0,353 million tons
	electricity generation	46,6 TJ
	direct use from combustion	5.112,4 TJ
	total energy production	5.159,1 TJ

Source: World Energy Council, Survey of Energy Resources, 2002