

## Ex-ante Evaluation

### **1. Name of the Project**

Country: The Republic of Paraguay

Project: Yguazu Hydropower Station Construction Project

(Loan Agreement: February 16, 2006; Loan Amount: 21,402 million yen; Borrower: Republic of Paraguay)

### **2. Necessity and Relevance of JBIC's Assistance**

While the peak demand in the country is 1,241 MW (2004), Paraguay's own installed capacity is as low as 216 MW. Paraguay thus has to purchase power from the Itaipu Hydropower Station (12,600 MW), which the country developed jointly with Brazil, in order to meet over 80% of its power demand. Since power supply is contracted on a power output volume basis (kW) with the Itaipu Hydropower Station, it is economical if there is constant use to meet base demand, but could be relatively expensive when some power remains unused during off-peak time in covering peak demand. In addition, the buying cost is exposed to high exchange risk, as the contract is denominated in US dollars, and is very likely to increase due to exchange rate fluctuations. Paraguay is restraining expenditure for buying power, and as a result, there are blackouts because peak demand cannot always be covered. Thus, the power supply system seems unstable.

Since the country's power demand is supposed to increase by 3.4% per year henceforth to reach 1,800 MW in 2015, Paraguay aims to stabilize the power supply under the governmental program (2003-2008), and gives high priority to constructing its own domestic power station along with related equipment in the electric sector development plan (1998-2007).

This project involves constructing a hydropower station in order to meet peak demand by utilizing the existing Yguazu Reservoir (total water volume, approx. 8.5 billion m<sup>3</sup>; surface area, approx. 620 km<sup>2</sup>). Since the project was attempted with participation of private sector but suffered setbacks, ODA loan assistance was requested. Moreover, this project is recognized in a context "The Initiative for the Integration of Regional Infrastructure in South America (IIRSA)", in light of the fact that stabilizing the power supply in Paraguay will enable power interchange with neighboring countries and contribute to a stable power supply system across the region in the future.

Furthermore, in JBIC's Medium-Term Strategy for Overseas Economic Cooperation Operations (April 1, 2005 – March 31, 2008), "A Foundation for Sustained Growth" is considered a priority area. Consequently, there is a strong need and high relevance for the ODA loan assistance for this project.

### **3. Project Objectives**

This project aims to stabilize the power supply in Paraguay by constructing a hydropower station in the departments of Caaguazú and Alto Paraná, with a facility output of 200 MW, to meet peak demand and thereby contribute to sustainable economic growth of the country.

#### 4. Project Description

(1) Target Area: Caaguazú and Alto Paraná Department (approximately 290 km east from the capital city of Asunción)

##### (2) Project Outline

Construction of hydropower station utilizing the existing Yguazu Reservoir and construction of transmission facilities to connect the power station with the power supply system

- Construction of hydropower station (200 MW)
- Laying of transmission lines
- Connection to transformer substation
- Consulting services

##### (3) Total Project Cost/Loan Amount

28,536 million yen (ODA Loan Amount: 21,402 million yen)

##### (4) Schedule

March 2006 - February 2012 (72 months)

##### (5) Implementation Structure

- (a) Borrower: Republic of Paraguay
- (b) Executing Agency: Administración Nacional de Electricidad (ANDE)
- (a) Operation and Maintenance System: ANDE

##### (6) Environmental and Social Consideration

###### (a) Environmental Impacts/Land Acquisition and Resident Relocation

###### (i) Category: B

###### (ii) Reason for Categorization

This project is classified as Category B because it is not in a sector (large-scale hydropower station) defined in the “Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations” (established April 2002). Moreover, no serious undesirable environmental impact is anticipated, and it is not in a region that is susceptible to or has characteristics likely to cause the impact declared in the above-mentioned guidelines.

###### (iii) Environmental Permit

The EIA Report was approved by the Secretary of Environment (SEAM) of Paraguay in September 2005.

###### (iv) Anti-Pollution Measures

The project consists of construction of a hydropower station utilizing an existing reservoir, and it is likely to have no particular negative impact. Also, it is planned to spray water to prevent the spread of dust during the construction period.

###### (v) Natural Environment

The project site is not located in or around any sensitive area such as a nature reserve, as

designated by domestic law or international agreements, etc., and there has been no finding of habitation by rare species. Thus, it is likely to have no particular impact.

(vi) Social Environment

The project requires land compensation of about 1.6 km<sup>2</sup> (necessary for right of way under the transmission lines), which will be implemented in accordance with the country's domestic procedures. The project will not involve any land acquisition or involuntary resettlement.

(vii) Other/ Monitoring

Environmental impact regarding such issues as air and water quality will be monitored by the executing agency.

(b) Promotion of Poverty Reduction

Since there are blackouts in economically disadvantaged residential areas when power demand in Paraguay temporarily exceeds supply capacity, the project will contribute to raising the quality of life of the poor through stabilizing the power supply.

(c) Promotion of Social Development (e.g. Gender Perspective)

The executing agency plans to plant a forest preserve (not covered under this ODA loan) to prevent soil erosion, etc., around the Yguazu Reservoir and plans to employ local residents for the planting, operation and maintenance of the forest preserve.

(7) Other Important Issues

None

**5. Outcome Targets**

(1) Evaluation Indicators (Operation and Effect Indicator)

Indicator	Target (in 2014, 2 years after completion)
Capacity Factor (%)	10.5%
Unplanned Outage Hours (hour/year)	0 hour
Planned Outage Hours (day/year)	18 days
Gross Electricity Energy Production (GWh/year)	182.83 GWh
Maximum Output (MW)	200 MW

(2) Internal Rate of Return

- Economic Internal Rate of Return (EIRR): 15.4%
  - (a) Cost: Project cost (excluding taxes), operation and maintenance expense
  - (b) Benefit: Reduction of power buying expenditures to Itaipu Binacional
  - (c) Project Life: 30 years
- Financial Internal Rate of Return (FIRR): 12.1%
  - (a) Cost: Project cost, operation and maintenance expense
  - (b) Benefit: Reduction of power buying expenditures to Itaipu Binacional
  - (c) Project Life: 30 years

<b>6. External Risk Factors</b>
None
<b>7. Lessons Learned from Findings of Similar Projects Undertaken in the Past</b>
From ex-post evaluations of completed ODA loan projects in the past, it has been learned that geological conditions are one of the main factors affecting the project cost and the implementation period of hydropower station construction, and so the executing agency should conduct a detailed geological study prior to project implementation. In this project, it has been confirmed through geological studies conducted when Yguazu Dam was constructed and through the SAPROF study that there is no particular concern about geological conditions because massive horizontal bedrock lies at the base. In any case, an additional geological study will be conducted through the detailed design under the consulting services for this project.
<b>8. Plans for Future Evaluation</b>
<p>(1) Indicators for Future Evaluation</p> <ul style="list-style-type: none"> <li>(a) Capacity Factor (%)</li> <li>(b) Unplanned Outage Hours (hour/year)</li> <li>(c) Planned Outage Hours (day/year)</li> <li>(d) Gross Electricity Energy Production (GWh/year)</li> <li>(e) Maximum Output (MW)</li> <li>(f) Internal Rates of Return (EIRR and FIRR,%)</li> </ul> <p>(2) Timing of Next Evaluation After Project Completion</p>