

Ex-ante Evaluation

1. Name of the Project
Country: India Project: Purulia Pumped Storage Project (III) (Loan Agreement: 03/31/2006; Loan Amount: 17,963 million yen; Borrower: The President of India)
2. Necessity and Relevance of JBIC's Assistance
<p>Looking at India's electricity supply/demand situation nationwide, whereas the demand for electric power in FY2004 was 591,373 GWh, the supply was 548,115 GWh (representing a shortage of 7.3%), and whereas the demand at peak time was 87,906 MW, the supply at peak time was 77,652 MW (representing a shortage of 11.7%). Since FY1998, serious electric power shortages have been constantly occurring, with shortages of about 11% to 13% at peak time and 6% to 8% annually.</p> <p>In its 10th Five-Year Plan (April 2002 – March 2007), the Government of India has decided to develop 41,110 MW of new power sources, as well as to strengthen the nationwide high-voltage transmission network to efficiently supply electric power from the north, northeast, and east where power source is concentrated to other parts of the country. In the current administration's Common Minimum Programme as well, development of infrastructure such as electric power is an issue of the highest priority.</p> <p>In JBIC's current Medium-Term Strategy for Overseas Economic Cooperation Operations, a priority area in assistance to India is "Economic Infrastructure Development." The assistance provided by this project is consistent with the strategy.</p> <p>In State of West Bengal, in FY2004 there was an electric power supply of only 3,891 MW for a peak demand of 4,175 MW, creating an electric power shortage of 7.0%. However, if active development of power sources is undertaken, including this project, then peak supply shortages are expected to be resolved in FY2006 together with the completion of this project. Moreover, this project will pump up water by using the surplus electric power from existing thermal power plants, which will lead to an improvement in the operational efficiency of the thermal power plants, so JBIC's assistance in this project is highly necessary and highly relevant.</p>
3. Project Objectives
The objective of this project is to strengthen peak-time power supply capacity by constructing a pumped storage of a 900 MW (225 MW x 4 generating units) capacity with related transmission and substation facilities in Purulia District, State of West Bengal, in eastern India, thereby contributing to the economic development of the region.
4. Project Description
(1) Target Area Purulia District, approximately 300 km northwest of the city of Kolkata in State of West Bengal in eastern India
(2) Project Outline (a) Construction of a pumped storage power plant (b) Construction of transmission and substation facilities (c) Support for institutional strengthening (building of the tariff setting and payment system in

inter-state power trading, total quality management (TQM), construction of a management system for transmission facilities)

(d) Consulting services

(3) Total Project Cost/Loan Amount

73,521 million yen (Yen Loan Amount: 62,061 million yen; Phase III Amount: 17,963 million yen)

(4) Schedule

July 1994 – December 2008 (174 months)

This loan is for the final phase of this project, and the four generating units are scheduled to begin operation in turn between March 2007 and December 2007.

(5) Implementation Structure

(a) Borrower: The President of India

(b) Executing Agency: West Bengal State Electricity Board (WBSEB)

(c) Operation and Maintenance System: Same as (b)

(6) Environmental and Social Consideration

(a) Environmental Effects/Land Acquisition and Resident Relocation

(i) Category: Does not apply

(ii) Reason for Categorization

For this project, the “OECD Guidelines for Environmental Considerations” (first edition) are applied. (Furthermore, this project is classified as Category A under the “Japan Bank for International Cooperation Guidelines for Confirmation of Environmental and Social Considerations” (established April 2002) because it is in the hydroelectric power sector and is in a region that is susceptible to impact.)

(iii) Environmental Permit

An environmental assessment report was prepared by the executing agency in September 1992. Environmental clearances were received from the central government’s Ministry of Environment and Forests in October 1993, February 2002, and February 2003, and forest clearances were received in October 1995, February 2002, and January 2003.

(iv) Anti-Pollution Measures

No particular negative impact on the water quality in the lower river basin is expected because the water storage time is short, and sedimentation is held in the irrigation pond directly below the lower dam.

(v) Natural Environment

This project is likely to have minimal adverse impact on the natural environment because the project area is not considered an important habitat for protected species, etc., and appropriate measures are being taken, including improvement of vegetation cover in the adjacent forest and provision of movement corridors for animals between the upper and the lower dams. Also, there is very little likelihood of habitation by fish that swim upstream.

Moreover, afforestation is planned in non-forest areas with an area that is larger than the

forest area acquired for this project, and in addition, there is construction of an erosion-prevention dam, implementation of afforestation and grass planting as necessary on land owned by residents and forest land, and construction of drinking holes for wild animals.

(vi) Social Environment

The necessary land acquisition for this project has been completed and totals approximately 442 ha, including 373 ha of forest land, 41 ha of private land, and 28 ha of state government land. This project will not involve any involuntary resettlement.

(vii) Other/Monitoring

The executing agency will conduct activities for environmental conservation and improvement, including afforestation and grass planting in the surrounding area and building of erosion-prevention dams, and will monitor the water quality and sand accumulation in the upper and lower dams.

(b) Promotion of Poverty Reduction

None

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

As part of its contribution to society in the project area, the executing agency will offer the 132 kV substation and transmission lines, used for construction of this project, for general use. Through this, it will be possible to provide electricity to un-electrified households including the poor in the Purulia District where the project is located, in conjunction with central government's and the West Bengal government's rural electrification support plan.

(7) Other Important Issues

None

5. Outcome Targets

(1) Evaluation Indicators (Operation and Effect Indicator)

Indicator		Target (2010, 2 years after completion)
Unplanned outage hours (hours/year)	Mechanical failure	168
	Human error	0
	Other	90
Planned outage hours (for inspections and repairs) (hours/year)		42
Comprehensive circulating efficiency (%)		75.5
Gross energy production (GWh/year)		1,721.4
Maximum output (MW)		900

*This project will also lead to operational efficiency of thermal power plants from which the plant receives the sources for pumping, and so in the project evaluation, the plant load factor and the rate of operation of the Bakreswar Thermal Power Plant (a yen loan project), which is the plant likely to be used for this, will be referenced.

(2) Internal Rate of Return

Financial Internal Rate of Return (FIRR): 5.3%

- (a) Cost: Project cost, operation and maintenance expense
- (b) Benefit: Income from sale of electricity
- (c) Project Life: 25 years

Economic Internal Rate of Return (EIRR): 10.4%

- (a) Cost: Project cost (excluding tax), operation and maintenance expense
- (b) Benefit: Savings on purchases of other electric power
- (c) Project Life: 25 years

6. External Risk Factors

Economic stagnation/deterioration in India and the surrounding area of the project as well as natural disasters

7. Lessons Learned from Findings of Similar Projects Undertaken in the Past

In the ex-post evaluation of previous pumped storage power plant projects, it has been learned that it is important to secure surplus electric power as the sources for pumping, for the early realization of the project's effects.

Because the sources for pumping will mainly be received from a thermal power plant that is currently being constructed in the same state through a yen loan, this project will periodically confirm the progress of the thermal power plant's construction and will closely observe the electricity supply/demand situation in State of West Bengal, together with endeavoring to coordinate with related agencies as necessary, so that the operation of this project is not hindered.

8. Plans for Future Evaluation

(1) Indicators for Future Evaluation

- (a) Unplanned outage hours (hours/year)
 - mechanical failure
 - human error
 - other
- (b) Planned outage hours (for inspections and repairs) (hours/year)
- (c) Comprehensive circulating efficiency (%)
- (d) Gross energy production (GWh/year)
- (e) Maximum output (MW)
- (f) Internal rate of return: EIRR (%), FIRR (%)

(2) Timing of Next Evaluation

After project completion