

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country : India

Project : Odisha Transmission System Improvement Project

Loan Agreement : May 15, 2015

Loan Amount : 21,787 million Yen

Borrower : The President of India

2. Background and Necessity of the Project

(1) Current State and Issues of the Energy Sector in India

With its recent fast-paced annual economic growth, energy consumption in India has been increasing, which has made the country become the fourth largest energy consumer in the world. However, energy supply has not met the energy demand. In FY2014 (April 2014 - March 2015), there are serious electricity supply shortages of 3.6% of total requirements, and 4.7% of peak demand. In addition, the high rate of power transmission and distribution losses (FY2010: estimated at 23.04% on an average for all of India) has become serious problems with respect to the power supply.

(2) Development Policies for the Energy Sector in India and the Priority of the Project  
In India's Twelfth Five Year Plan for national development (FY 2012 to 2016), the Government has set a course of strong energy policies for the institutional and system reform in power sector, development of electrical power resources, power transmission and distribution network and rural electrification. Odisha Transmission System Improvement Project (hereinafter referred to as "the Project"), the objective of which is to strengthen transmission system throughout the state, contributes to Odisha's efforts and plans.

(3) Japan and JICA's Policy and Operations in the Energy Sector in India

In Japan's Country Assistance Programs for India (May 2006), "Promotion of Economic Growth" has been identified as one of the priority areas. Accordingly, in its Country Analysis Paper (March 2012), JICA has set "Promotion of Sustainable Growth through the Development Assistance to the Infrastructure" as a priority area. In order to deliver a stable and efficient power supply, strengthening the power supply capacity as well as the power transmission capacity is necessary. JICA's primary assistance includes the establishment of highly efficient power supply facilities (power stations and transmission/distribution systems), the improvement of efficiency of the existing old power facilities, and the reduction of transmission/distribution losses, which are all consistent with the objective of the Project. As for the past Japanese ODA loan projects in the energy sector, there were 78 projects totaling 1,241.2 billion yen as of April 2015.

#### (4) Other Donors' Activity

The World Bank and the Asian Development Bank (ADB) have been supporting not only the power sector reforms in India, but also projects related to the establishment of transmission and distribution systems, strengthening of the capacity of state electric power corporations, development of hydroelectric power generation, and energy efficiency improvement. The ADB is currently formulating a distribution and transmission project in the coastal areas of the state of Odisha with Odisha Power Transmission Corporation Ltd (OPTCL), so as to mitigate potential damages from cyclones.

#### (5) Necessity of the Project

With a population of approximately 42 million people, Odisha in eastern India is one of the richest states in mineral resources, having approximately 17% of the country's total mineral reserves, and has extensive forests that yield teak, bamboo and other natural resources. Industries based on those resources have developed, rapidly in recent years, and a substantial increase in the power demand is expected going forward. Under these circumstances, by implementing and improving transmission systems, the Project aims to achieve stabilization of the power system in Odisha, reduction of the transmission loss rate, and stable power supply. Therefore, the aim of the Project is in line with the development policy of the Government of India as well as the foreign aid policy of the Government of Japan and of JICA. Consequently, JICA's assistance to the Project is necessary and relevant.

### 3. Project Description

#### (1) Project Objective

To reduce overloading of transmission system for enhanced reliability of power supply and deliver additional energy generated at new power plants in the state of Odisha by strengthening transmission system throughout the state, thereby promoting economic growth in the state and the Eastern region of India.

#### (2) Project Site/Target Area

The entire state of Odisha

#### (3) Project Component(s)

1) Procurement of materials and equipment needed for new construction and enhancement for transmission lines (400kV, 132kV, 33kV, total of approximately 971 km), including low-loss conductors (163 km circuit length), and civil work (International competitive bidding)

2) Procurement of materials and equipment for construction of 18 new substations and, including a Gas Insulated Switchgear substation, and civil work (International competitive bidding)

3) Consulting services (e.g. basic design, tender preparation and project supervision) (Short list)

(4) Estimated Project Cost (Loan Amount)

29,172 million Yen (Loan Amount : 21,787 million Yen)

(5) Schedule

April 2015 - January 2021 (70 months). Project completion is scheduled in January 2020 for commencement of commercial operation.

(6) Project Implementation Structure

1) Borrower : The President of India

2) Executing Agency : Odisha Power Transmission Corporation Limited

3) Operation and Maintenance System : same as 2)

(7) Environmental and Social Consideration/Poverty Reduction/Social Development

1) Environmental and Social Consideration

① Category B

② Reason for Categorization: The Project does not include sensitive sectors, characteristics or areas described in the Guidelines for Environmental and Social Considerations (issued in April 2010), therefore, the adverse impact of the Project is considered to be moderate.

③ Environmental Permit: The Environmental Impact Assessment (EIA) report is not required for the Project under the country's domestic laws.

④ Anti-Pollution Measures: During construction, appropriate mitigation measures will be taken to reduce the dust by spraying water and covering freight carriers and for vehicles and heavy machinery while performing the works.

⑤ Natural Environment: The project areas are not located in or around any environment-sensitive areas such as national parks, and thus adverse impact on the natural environment caused by the Project is expected to be minimal. None of the sites for the installation of transmission lines or construction of substations are located in reserved forests, thus there is no problem in this regard.

⑥ Social Environment: Out of 85.31 hectares (ha) of land that the Project requires, 2.27 ha (1 substation out of 18 still needs land acquisition) owned by Private is in the process of being acquired with the reacquisition price under the domestic procedures of India as well as compensation policy enacted by the Executing Agency. The land acquisition is scheduled to be completed by the time of construction begins. The Project involves no resident resettlement.

⑦ Other/Monitoring: During construction, the Executing Agency will monitor air quality, water quality, noise, and vibration. After the completion of the Project, the Executing Agency will monitor the waste, discharged water, solid waste, air quality, noise, and other parameters, if any.

2) Promotion of Poverty Reduction: None

3) Promotion of Social Development (e.g. Gender Perspective, Measure for Infectious Diseases Including HIV/AIDS, Participatory Development, Consideration for the Person with Disability etc.) :None

(8) Collaboration with Other Donors: The ADB is currently formulating a distribution and transmission project with OPTCL with the project cost of approximately Rs. 10,000 million (Rs. 2,300 million for Transmission and Rs. 5,850 million for Distribution). There is no overlap with ADB's project scope, but the collaboration in introducing items with new specification can be expected because the ADB plans to include underline cables as part of its subprojects.

(9) Other Important Issues: The Project aims to improve energy efficiency by reducing transmission losses, therefore, it will contribute to controlling Greenhouse Gas (GHG) emissions.

**4. Targeted Outcomes**

(1) Quantitative Effects

1) Performance Indicators (Operation and Effect Indicator)<sup>1</sup>

Indicators		Baseline (2013)	Target (2022) (2 Years after Project Completion)
Availability Factor (%)	400kV/220kV	-	49.00
	220kV/132kV	-	50.08
	132kV/33kV	-	38.27
Electricity Supply (GWh)		22,865	36,340
Transmission System Losses (%)		3.79	3.65
Installed Transformer Capacity (MVA)	400kV/220kV	1,890.0	2,520.0
	220kV/132kV	5,290.0	6,410.0
	220kV/33kV	280.0	400.0
	132kV/33kV	5,657.0	5,972.0
Transmission Line Length (span length) (km)	400kV	518.23	521.23
	220kV	5,730.33	6,319.33
	132kV	5,455.91	5,835.37

2) Internal Rate of Return

Based on the conditions indicated below, the Economic Internal Rate of Return (EIRR) for the Project is 14.9%, and Financial Internal Rate of Return (FIRR) is 9.0%.

**【EIRR】**

Cost : Project cost (excluding tax and duties), operation and maintenance expenses

Benefit : Increase in transmission tariff revenue by the enhanced transmission system, Energy saving due to decreased transmission losses

Project Life : 35 years

<sup>1</sup> In the column of available factors of 400kV/220kV and 132kV/33kV, only representative ones among 18 subprojects are shown.

## 【FIRR】

Cost : Project cost (including tax and duties) and maintenance expenses

Benefit : Increase in transmission tariff revenue by the enhanced transmission system

Project Life : 35 years

- (3) Qualitative Effects: Improvement in power supply situation by the energy efficiency, Mitigation of climate change, Improvement of the delivery of additional energy generated at new power plants in the state and the Eastern region of India.

## 5. External Factors and Risk Control

Deterioration of political and economic situation and natural disasters in India and the area around the Project area

## 6. Lessons Learned from Past Projects

### (1) Evaluation Results of Similar Projects

From the ex-post evaluation of previous energy project named “Anpara Power Transmission System Project (1) (2)”, there was a lesson learned for introducing items with new specification, such as a super-high voltage transmission lines, it is necessary to design a realistic implementation plan, with sufficient study of difficulties and obstacles in administrative approval process that did not occur with the old specifications.

### (2) Lessons To Be Applied to the Project

Based on the lessons described above, JICA will appoint consulting services for those projects where advanced technologies are being introduced such as Low-Loss conductors and outdoor gas-insulated switchgear (GIS) substations to assist OPTCL for their smooth implementation of basic design, tender preparation and project supervision. As for the environmental clearance, JICA will pay attention to get the forest clearance without delay.

## 7. Plan for Future Evaluation

### (1) Indicators to be Used

- 1) Substation's Availability Factor (%)
- 2) Electricity Supply (GWh)
- 3) Transmission System Losses (%)
- 4) Installed Transformer Capacity (MVA)
- 5) Transmission Line Length (circuit km)
- 6) Economic Internal Rate of Return (EIRR) (%)
- 7) Financial Internal Rate of Return (FIRR) (%)

### (2) Timing: Two years after project completion